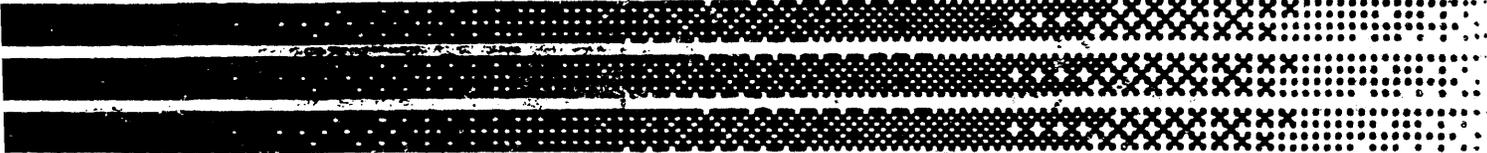


AZ-GM3AA-MN



# MicroVAX

## Maintenance Guide

Prepared by Educational Services  
of Digital Equipment Corporation

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## CHAPTER 1--SYSTEM OVERVIEW

### 1.1 INTRODUCTION

The MicroVAX II system is currently available in different sized enclosures:

The BA23 micro systems enclosure, which can be used in tabletop, pedestal, and rack mount installations

The BA123 micro systems enclosure, which is designed as a movable, floorstanding enclosure

The H9642 enclosure, designed to hold larger mass storage devices.

Figure 1-1 shows the BA23 enclosure (pedestal version), Figure 1-2 shows the BA123 system, and Figure 1-3 shows the H9642 enclosure. The most important differences between these systems are:

- mass storage device capacity
- backplane capacity (number of Q22-bus slots)
- available power

The remaining sections of this chapter will explain these differences in greater detail.

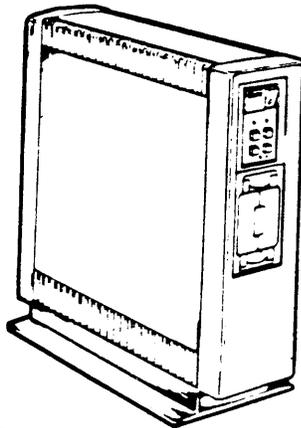


FIGURE 1-1. The BA23 enclosure.

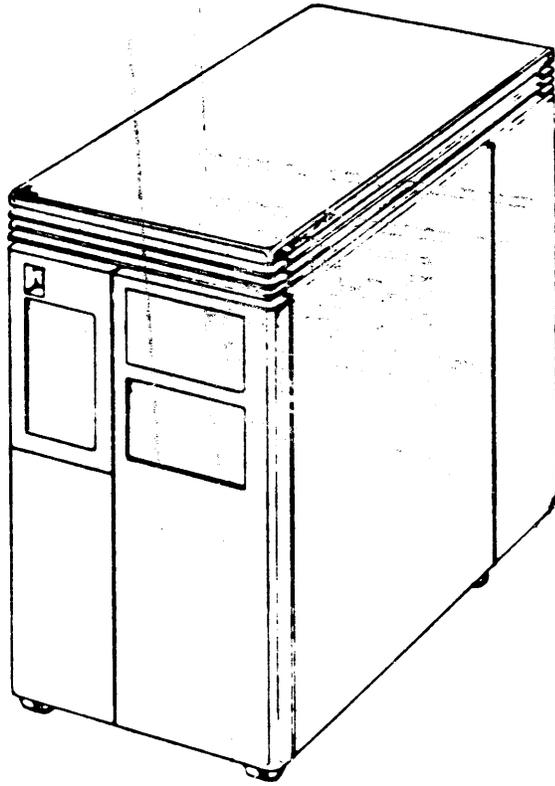


FIGURE 1-2. The BA123 enclosure.

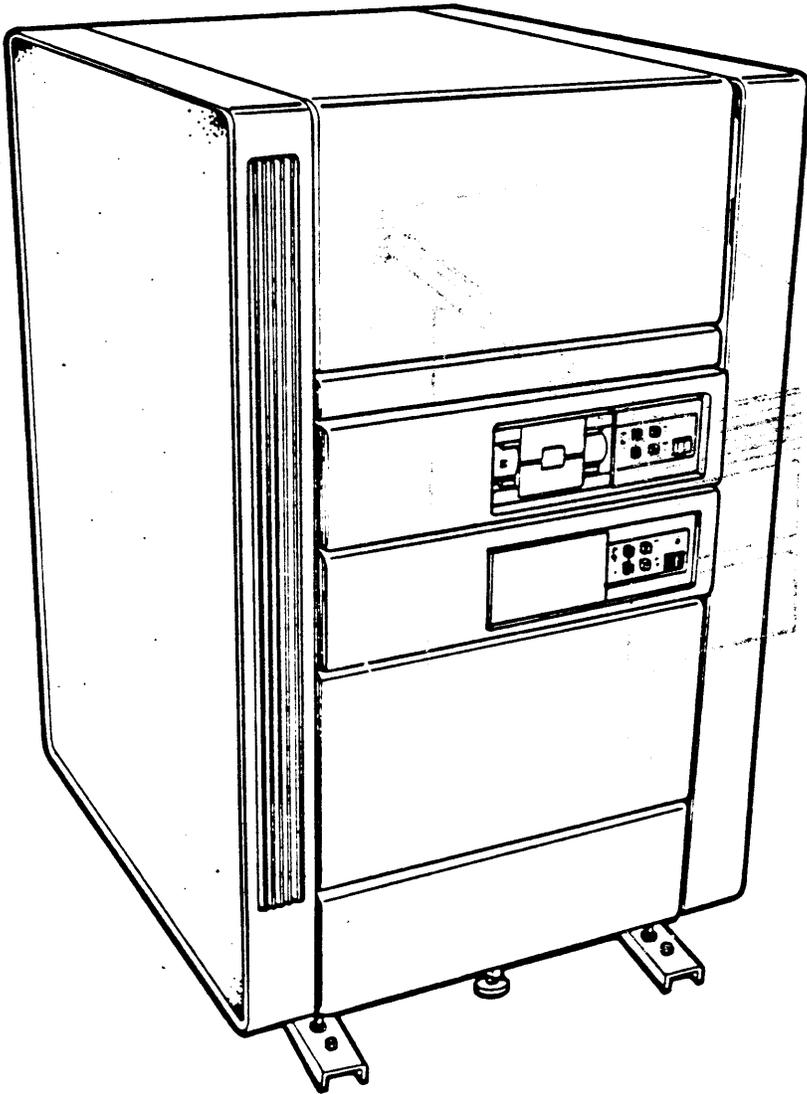


FIGURE 1-3. The H9642 enclosure.

## 1.2 MASS STORAGE CAPACITY

The size and quantity of mass storage devices which can be installed in a MicroVAX II system varies by enclosure. In addition to physical space, the number of mass storage devices in a system is also limited by available backplane slots and power for mass storage device controllers.

### 1.2.1 BA23 Enclosure

Two 5 1/4" mass storage devices may be installed inside the BA23 enclosure. Figure 1-4 shows the location of the mass storage devices. At present, one RD5n fixed disk drive and one removable drive (either an RX50 diskette drive or a TK50 tape drive) will be installed, although a system with two fixed disks may be used in the future when the system is part of a network. In addition to the two drives located inside the BA23 system, additional drives may be connected to the system via the rear I/O distribution panel. The number of drives connected in this manner are limited by the space available in the rear panel, available backplane space, and power to run the controller.

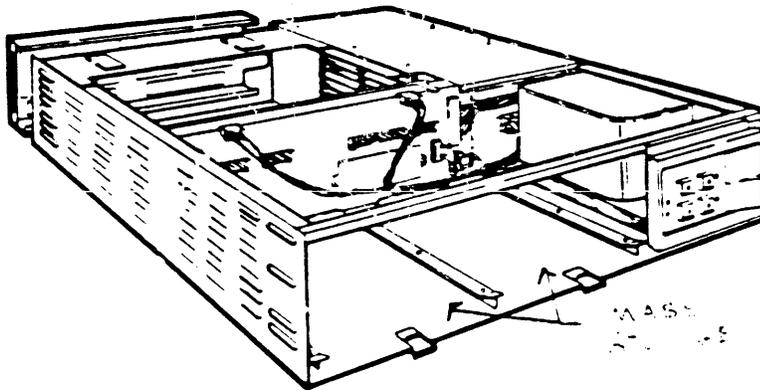


FIGURE 1-4. Mass storage locations in the BA23 enclosure.

### 1.2.2 BA123 Enclosure

Five 5 1/4" mass storage devices may be installed in the BA123 enclosure. The locations of the mass storage devices are shown in Figure 1-5. Typically, a TK50 tape drive is located in mass storage slot #4, while an RX50 is located in slot #5. The remaining slots are used for RD5n fixed disk drives.

NOTE: While there is a total of five slots, power considerations usually limit a BA123 system to a total of four mass storage devices.

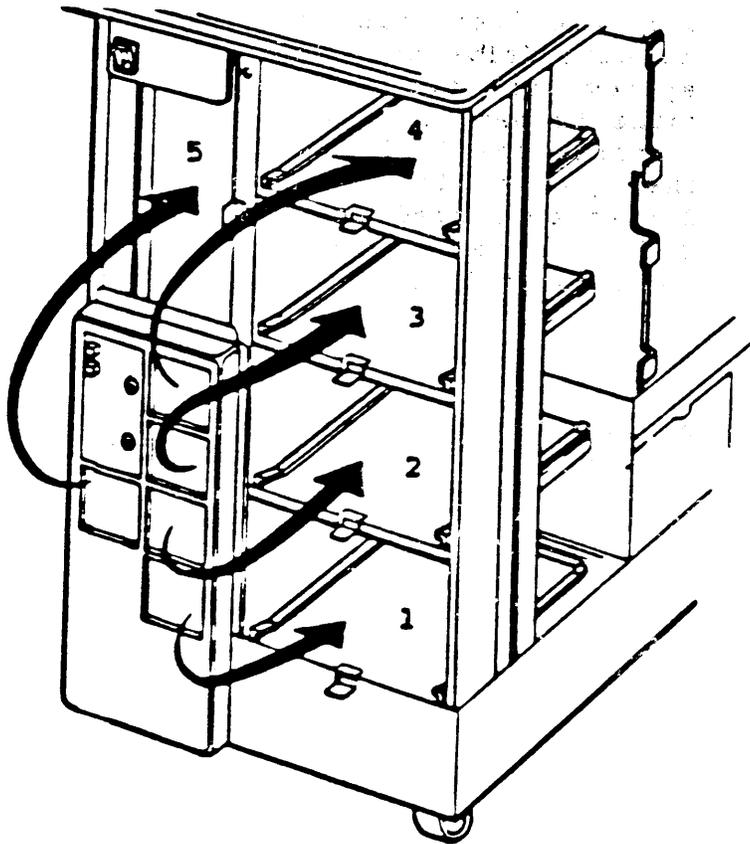


FIGURE 1-5. Mass storage locations in the BA123 enclosure.

### 1.2.3 Mass Storage Capacity in the H9642 Enclosure

The H9642 enclosure includes two rack-mounted BA23-A frames. Each one contains room for two 5-1/4" mass storage devices. Typically, the right slot of one frame contains a diskette drive, while the right slot of the other contains a tape drive. The left slots of each frame usually contains a fixed disk drive. In addition to the rack-mounted BA23 frames, the H9642 enclosure has room for two RA series drives (Figure 1-6).

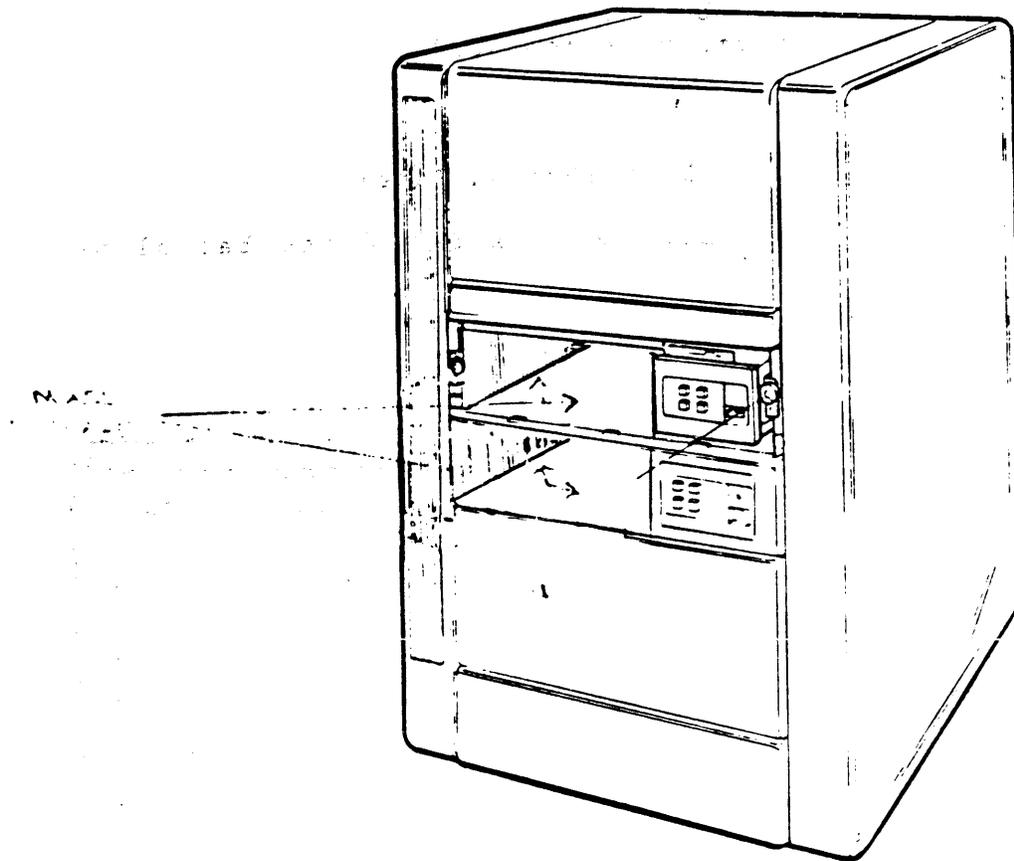


Figure 1-6 Mass storage locations in the H9642 enclosure.

### 1.3 SYSTEM BACKPLANES AND SIGNAL DISTRIBUTION

#### 1.3.1 BA23 Backplane Assembly

In the BA23 enclosure, the backplane assembly consists of three major parts:

- The BA23-A Mass Storage Signal Distribution Panel
- The sheet metal mounting bracket  
(not visible unless assembly is removed)
- The H9278 backplane

##### 1.3.1.1 The Mass Storage Signal Distribution Panel

The front or signal distribution panel side of the backplane assembly is shown in Figure 1-7.

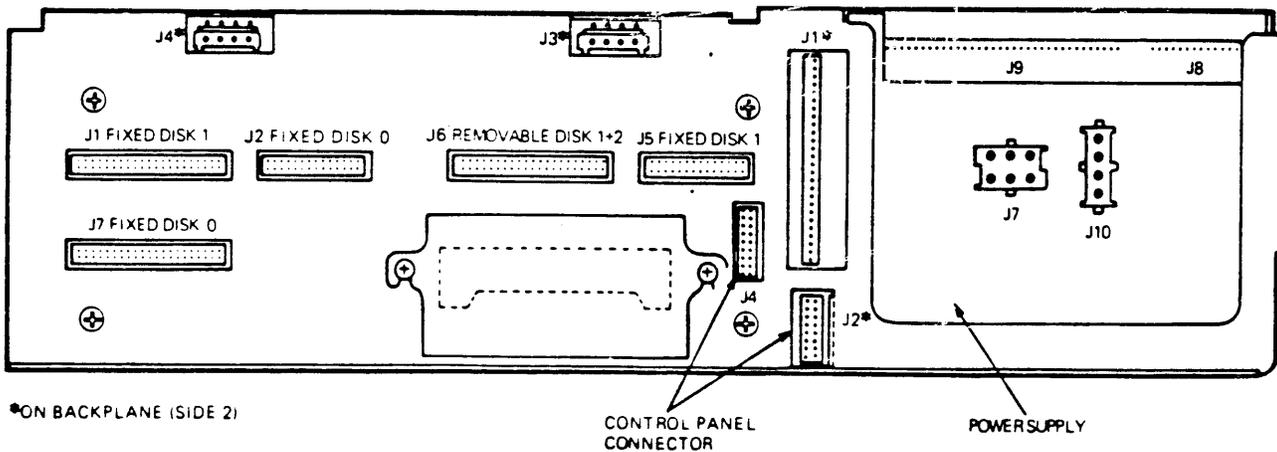


FIGURE 1-7. The Signal Distribution Panel in a BA23-Based System.

The connections between the signal distribution board and the rest of the components in a BA23 enclosure are shown in Figure 1-8.

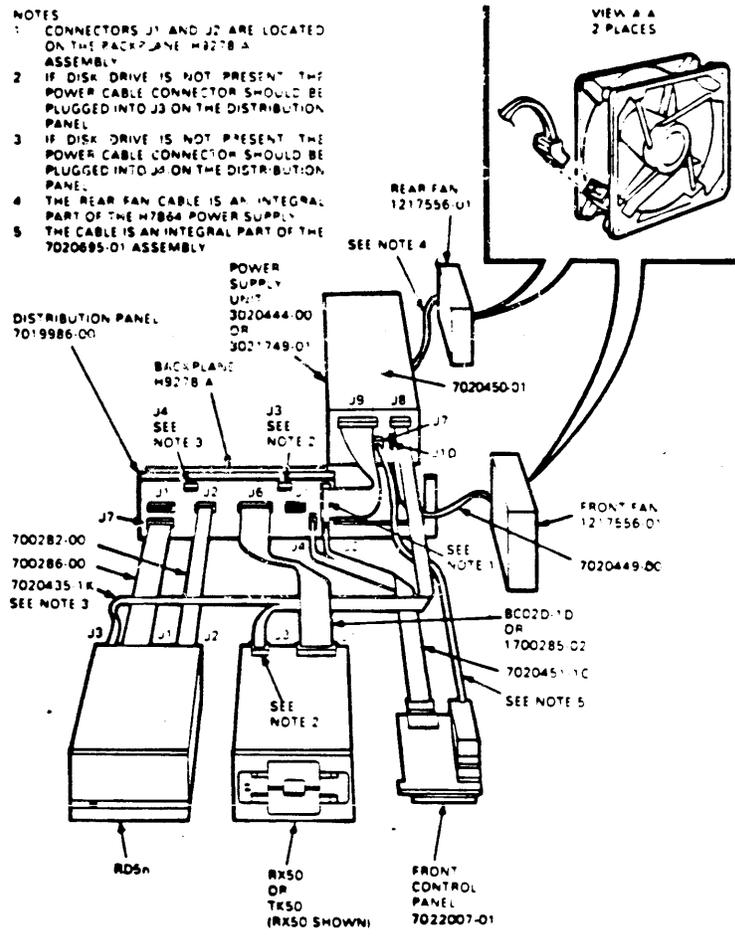


FIGURE 1-8. Internal Cabling for a BA23 Enclosure.

NOTE: If the BA23 enclosure contains a TK50 tape drive, the drive is not connected to the signal distribution board, but rather to its own controller via a TK50/M7546 interconnect cable contained in a TQK50 controller kit.

NOTE: Connectors J1 and J2 are located on the Backplane (H9278-A) assembly.

NOTE: If a tape or diskette drive is not present, the power connector cable should be plugged into J3 on the signal distribution panel.

NOTE: If a fixed-disk drive is not present, the power connector cable should be plugged into J4 on the signal distribution panel.

NOTE: The Rear fan cable is an integral part of the H7864 power supply.

NOTE: The power cable on the front control panel is an integral part of the 70-20695-01 assembly.

The signal distribution panel carries signals from an RQDX controller module installed in the Q22-bus backplane to the mass storage devices located within the enclosure. Six connectors on the signal distribution panel provide the following functions:

- o J6 Removable Disk 1, 2 - provide signals to an RX50 diskette drive. An RX50 diskette drive contains two disk units. When a fixed disk drive is present, the ROM code commonly labels these as Disk Unit 1 (DUA1) and Disk Unit 2 (DUA2).

- o J7 Fixed Disk 0 (two connectors) - provides signals to the first fixed disk drive. The ROM code commonly labels this fixed disk drive as Disk Unit 0 (DUA0).

- o J1 Fixed Disk 1, J5 Fixed Disk 1 - provide signals to the second fixed disk drive. Use these connectors when installing a second fixed disk drive in the BA23 enclosure. The ROM code commonly labels this disk drive as Disk Unit 1 (DUA1).

NOTE: The MicroVAX systems do not support a second fixed disk drive installed in the BA23 enclosure.

- o J4 - provides signals to the control panel printed circuit (PC) board from the mass-storage signal distribution panel.

### 1.3.1.2 The H9278 Backplane

The H9278 backplane used in the BA23-A enclosure supports a maximum of 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 (uA). The backplane itself presents 7 ac loads and no dc loads.

Four connectors on the front (signal distribution panel) side of the backplane provide the following functions:

- o J1 - provides the connection for the power supply backplane cable which carries the dc power and signals from the power supply.

- o J2 - provides the signals to the control panel printed circuit board from an installed CPU module.

- o J3 and J4 - provide for termination of the mass-storage power cable when no mass storage device is present.

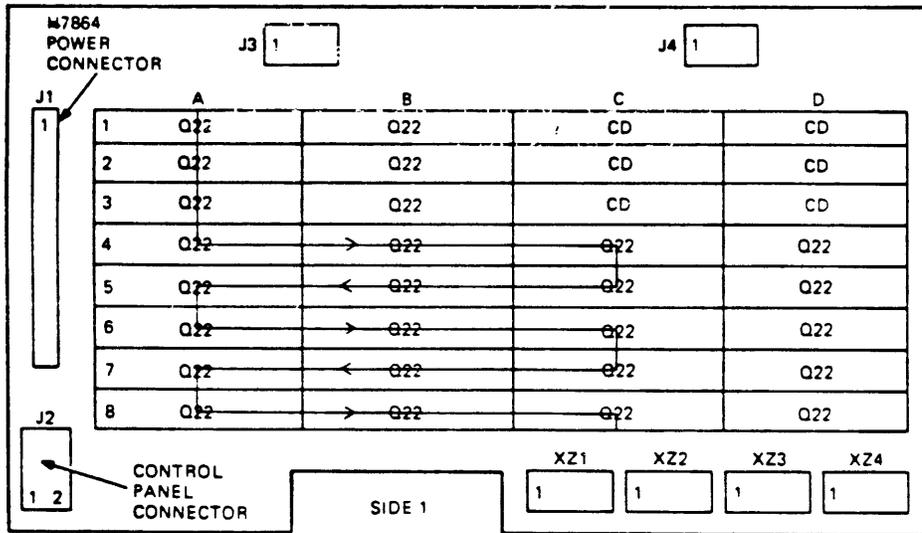
The backplane has an eight layered printed circuit board which is arranged as follows:

#### Layer

1	Signal
2	Signal
3	+5vdc from power supply regulator
4	Ground
5	Ground
6	+12vdc from power supply regulator
7	Signal
8	Signal

The H9278 backplane implements the extended LSI-11 Bus, which uses 22-bit addressing. This bus is commonly referred to as the "Q22-bus".

The backplane contains eight slots for the insertion of modules compatible with the Q22 bus. Four rows, A, B, C, and D run across each slot. Figure 1-9 shows the grant continuity for the backplane.



- NOTES
- CONNECTORS J1, J2, J3, AND J4 ARE MOUNTED ON SIDE 2
  - XZ1-4 ARE BACKPLANE TERMINATOR SOCKETS WITH SIP TERMINATION RESISTORS
  - J3 AND J4 ARE NOT POWER SOURCES THEY ARE USED TO SUPPLY POWER TO THE BACKPLANE WHEN THE RD51-A FIXED DISK DRIVE OR RX50-AA DISKETTE DRIVE IS NOT INSTALLED

FIGURE 1-9. The H9872 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.

NOTE: The C and D rows of slots 1, 2, and 3 provide an interconnection between the three slots. This interconnection is referred to as the "MicroVAX Memory interconnect." Only MS630-type modules should be installed in the CD rows. Any dual-height Q22-bus module may be installed in the AB rows of slots 2 and 3 (slot 1 is used by the CPU module).

NOTE: As a rule, dual-height modules in either the AB or CD rows of slots 3 through 8 require another dual height module or an M9047 grant card in the other two rows of the slot.

### 1.3.2 The BA123 Backplane and Signal Distribution Card

In the BA123 enclosure, the signal distribution board and backplane are not located back-to-back as in the BA23 enclosure. The signal distribution board for the BA123 is located in the bottom two rows (C and D) of the last slot (13) of the backplane. It is possible, if necessary, to install a second signal distribution board in the A and B rows of slot 13.

#### 1.3.2.1 The BA123 Backplane

The BA123 has a four row by thirteen slot backplane that measures 27.9 X 19.9 cm (11 in x 7.85 in). The backplane implements the extended LSI-11 bus (or Q22-bus), which uses 22-bit addressing.

The first twelve slots of the backplane provide space for dual or quad-height modules that are compatible with the Q22-bus.

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

NOTE: The C and D rows of slots 1-4 are interconnected. This interconnection is referred to as the "MicroVAX Memory Interconnect." Only MS630-type modules should be installed in the CD rows. Any dual-height Q22-bus module may be installed in the AB rows of slots 2 and 3 (slot 1 is used by the CPU module).

NOTE: As a rule, dual-height modules in slots 5 - 11 and rows A and B of slot 12 require another dual-height module or an M9047 grant card the in the other two rows of the 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 1-10 shows the grant continuity for the Q22-bus interrupt and for direct memory access (DMA).

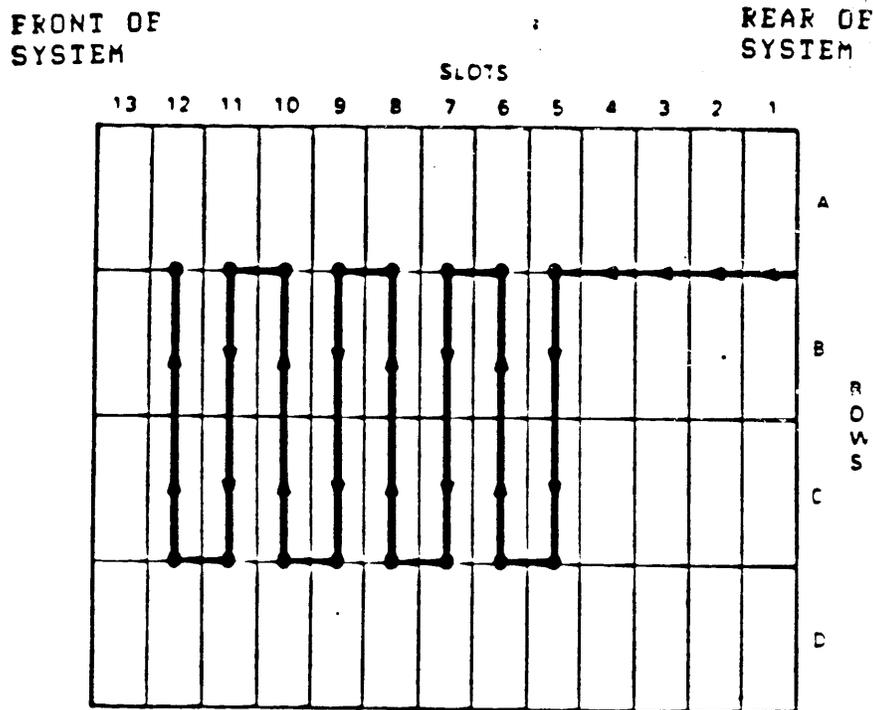


FIGURE 1-10. Backplane Grant Continuity

Four 120-ohm resistor packs between backplane slots twelve and thirteen are used to terminate the Q22-bus.

NOTE: This backplane is a 'bounded' system. That is, an additional backplane cannot be connected to the system.

The thirteenth slot of the backplane provides space for two dual-height modules (rows AB and CD). The Q22-bus is not implemented in this slot. The CD rows are used for the signal distribution board. The AB rows are available for future use. The thirteenth slot provides +5vdc, +12vdc, ground, and a signal (DCOK) that indicates that the DC voltage from the power supply is stable.

The backplane supports a maximum of 38 AC loads and 20 DC loads. Figure 1-11 shows three J connectors on the backplane. J1 and J2 are 18-pin connectors that receive DC power and signals from two independent regulators in the power supply.

The backplane balances the load on each of the power supply's two regulators. Regulator A connects to J1, supplying the odd-numbered slots and the resistor packs. Regulator B connects to J2, supplying the even-numbered slots.

The third connector, J3, is a 10-pin connector for a cable to the CPU console board.

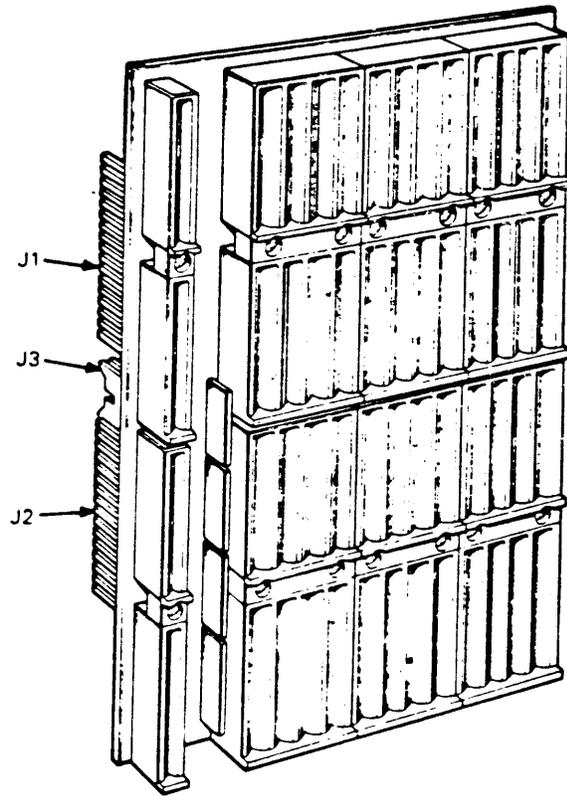


FIGURE 1-11. Backplane Connectors.

The backplane has an eight-layer PC board, which is arranged as follows:

layer

1	signal
2	signal
3	+5vdc and +12vdc from regulator A
4	ground
5	ground
6	+5vdc and +12vdc from regulator B
7	signal
8	signal

### 1.3.2.2 BA123 Signal Distribution Card

The BA123-A enclosure contains a separate signal distribution card, rather than a signal distribution board attached to the backplane, as in the BA23-A enclosure. Figure 1-12 shows the signal distribution card used in the BA123 enclosure.

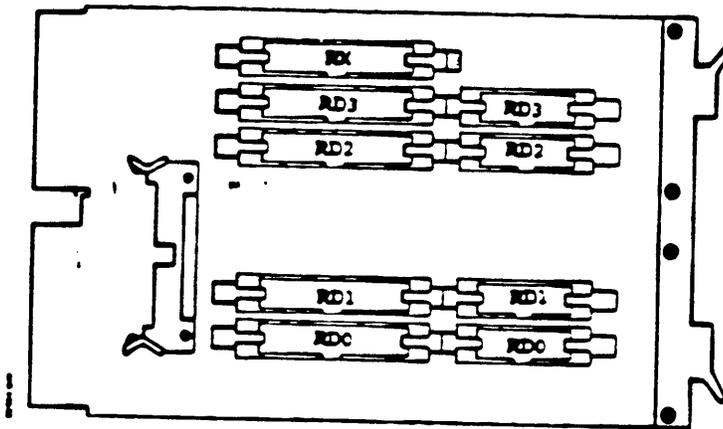


FIGURE 1-12. The Signal Distribution card in the BA123 enclosure (M9058).



### 1.3.3 Backplane for the H9642 Enclosure

The H9642 enclosure actually includes two BA23-A frames, rack-mounted one above the other. Each enclosure contains the backplane assembly detailed in Section 1.3.1. The backplanes are interconnected by two dual-height modules, the M9404 and M9504 interconnect modules. The M9404 module must occupy the last available dual-height slot (rows A and B or rows C and D) in the upper BA23 enclosure, while the M9504 module must occupy rows A and B of slot number one in the lower BA23 enclosure. Therefore, the lower enclosure never houses a CPU module. Except for the locations of the interconnect modules, all other module locations and priorities remain the same.

NOTE: If Direct Memory Access devices are put into the second backplane, all Q22-bus slots in the first backplane must either have a module or a grant card present. Otherwise, the devices in the second backplane will not work.

## 1.4 MICROVAX II POWER SUPPLIES

### 1.4.1 Power Supply for the BA23-A enclosure

The power supply for the BA23-A enclosure is shown in Figure 1-14. The supply features protection against excess voltages, currents, and temporary fluctuations in the ac supply.

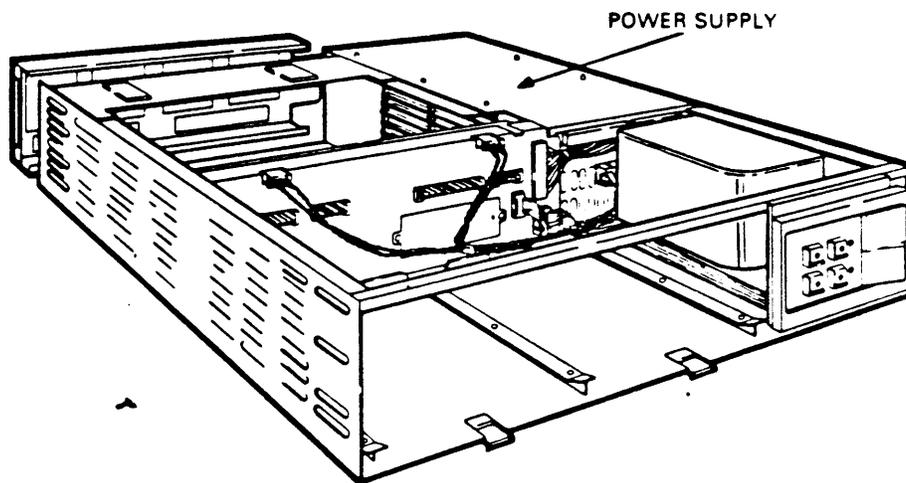


FIGURE 1-14 Location of Power Supply.

This power supply is a 230 watt unit that supplies +5vdc at 4.5 A to 36.0 A and +12vdc at 0.0 A to 7.0A to:

- o The backplane.
- o The fixed disk drive.
- o The diskette drive (or tape drive)

It also generates three system control signals to the backplane. The power supply asserts 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 includes two +10vdc at 0.45 A fan outputs for the front and rear dc fans. The fan voltages can be increased to +12vdc by changing a power supply jumper; however, the 630QA module thermal and acoustical specifications are based on the +10 volt setting. The required fan power does not effect the 230 watt output specification. See Table 1-1 for the power supply specifications.

Table 1-1 H7864 Power Supply Specifications

+5vdc Output

Voltage	+5.1 vdc +/- 2.5%
Current	4.5 A minimum 36.0 A maximum
Overcurrent	37 A minimum (averaged over 1 msec. must not trip) 42 A maximum (averaged over 1 msec. must trip)
Ripple and Noise	50 mv peak-to-peak maximum

+12vdc Output

Voltage	+12.1 vdc +/- 2.5%
Current	0 A minimum 7.0 A maximum
Normal Overcurrent	7.2 A minimum (averaged over 1 sec must not trip) 8.0 A maximum (averaged over 1 sec must trip)
Startup Overcurrent	9.0 A for 10 sec minimum (must not trip) 10.0 A for 5 sec minimum (must not trip) 11.5 A for 1 sec minimum (must not trip) 13.0 A for 500 usec (must trip)
Ripple and Noise	75 mv peak-to-peak maximum

The rear of the power supply contains a connector for remote power control (Figure 1-15). There is an International Electrical Commission (IEC) AC input connector for compatibility with international power cables. A circuit breaker protects the input power line. The voltage select (VOLT SEL) switch selects two ranges as follows:

- o 120V = 88 - 128 volts ac.
- o 240V = 176 - 256 volts ac.

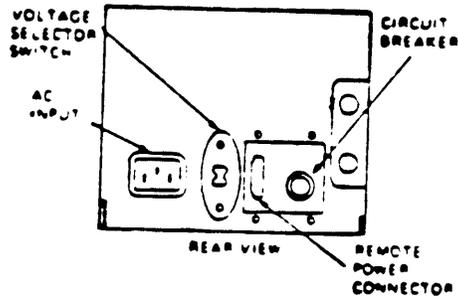


FIGURE 1-15. Power Supply Rear View.

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

The front of the power supply contains four connectors (refer to Figure 1-8) that provide the following functions:

- o J7 - provides the power for the front control panel.
- o J8 - provides the signals for the mass-storage power cable. The mass-storage power cable terminates in J3 on the backplane assembly if a removable media drive is not present, and in J4 if an RD5n fixed disk is not present.
- o J9 - provides the power for the backplane. The backplane power cable terminates in J1 of the backplane assembly.
- o J10 - provides the power for the front fan.

#### 1.4.2 Power Supply for the BA123-A Enclosure

The power supply for the BA123-A enclosure (Figure 1-16) is a 460 watt unit consisting of two regulators. Each regulator supplies power to one-half of the slots in the backplane, and to mass-storage devices inside the system.

The power supply provides protection against excess voltage and current, and protection against temporary fluctuations in the AC supply. Table 1-2 lists the minimum and maximum currents supplied by each regulator.

Table 1-2 Regulator A and B Current and Power

Regulator	Power	Current at +5vdc		Current at +12vdc	
	Maximum	Minimum	Maximum	Minimum	Maximum
A	230 watts	4.5 amps	36.0 amps	0.0 amps	7.0 amps
B	230 watts	4.5 amps	36.0 amps	0.0 amps	7.0 amps

NOTE: Total power used from each regulator must not exceed 230 watts. This means that maximum current at +5vdc and +12vdc cannot be drawn for both regulators at the same time.

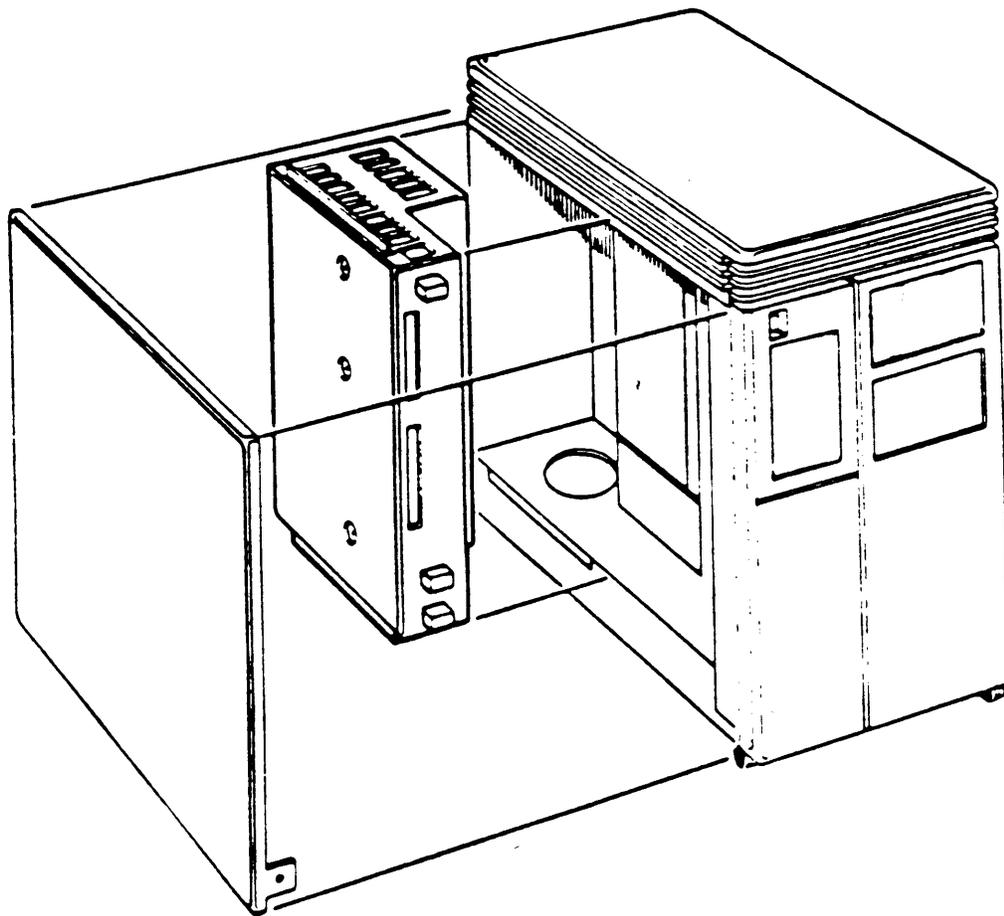


FIGURE 1-16 Power Supply for the BA123-A enclosure

The power supply also has two separate +12 volt dc outputs that are independent of the main 460 watt output. These are used to drive the two fans that are external to the power supply, and to provide power to the temperature sensor above the card-cage.

The power supply contains a connector at the back for remote control of power. The input power cable is protected by a circuit breaker (see Figure 1-17). There is an International Electrical Commission (IEC) AC input connector for compatibility with international power cables.

Two voltage ranges can be selected via the voltage selection switch:

120v = 88 - 128 volts ac ,  
240v = 176 - 256 volts ac

NOTE: In order to compensate for line cord voltage drop, a minimum of 90 volts AC (88 - 128 volt setting) should be present at the outlet for low line operation.

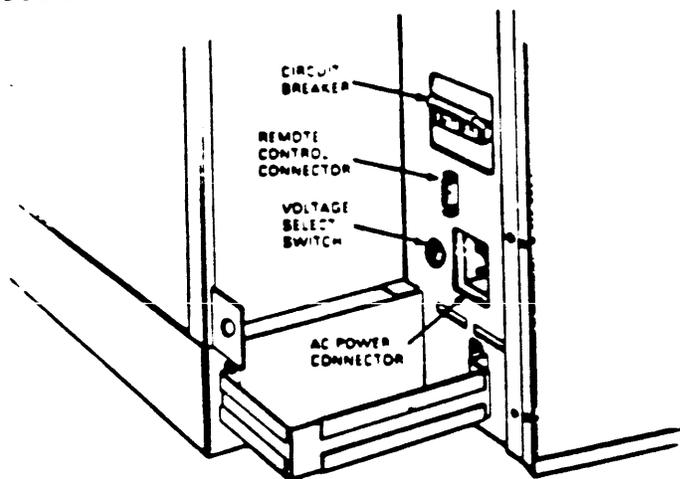


Figure 1-17 Circuit Breaker, Voltage Select Switch, Connectors  
(Rear View)

### 1.4.3 Power Supply for the H9642 enclosure

The H9642 enclosure contains two H7864-A power supplies (each BA23-A frame inside the enclosure contains one). For further information on each power supply, refer to Section 1.4.1.

## 1.5 I/O Distribution Panels

The I/O distribution panels on MicroVAX II systems are used for connecting the system to external devices. Removing the rear plastic bezel on the BA23 enclosure (for units installed as desktop or pedestal models) provides access to the I/O distribution panel. On the BA123-A enclosure, the rear door provides access to the I/O distribution panel. The I/O distribution panel on the H9642 enclosure is located on the back of the system.

Each module that connects to an external device comes with an internal cable, a filter connector, and an insert panel. Together, these three items are referred to as a cabinet kit. Chapter 4 provides cabinet kit information for modules that support external devices.

The filter connectors mount in the insert panels. The insert panels install in cutouts in the rear I/O distribution panel. The BA23 rear I/O distribution panel provides a place to install up to six insert panels, two of which can contain 50-pin connector insert panels.

### 1.5.1 BA23-A Rear I/O Distribution Panel

Figure 1-18 shows the rear I/O distribution panel with the SLU display panel of the KA630-A CPU module, which is typically installed in the top (or left) cutout.

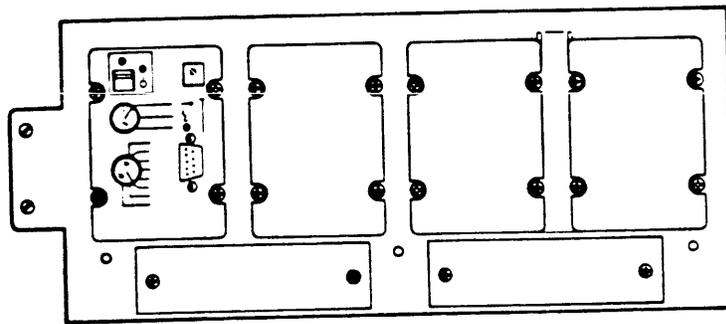


Figure 1-18 Rear I/O Distribution Panel

The rear I/O distribution panel in the BA23-A enclosure has six cutouts. The size of the cutouts, and the corresponding insert panels, is given in Table 1-3.

TABLE 1-3 Cutout, Insert Panel Size

		inch	mm
Type A (2):	Cutout	.6 x 3.2	15 x 81
	Insert Panel	1.0 x 4.0	25 x 102
Type B (4):	Cutout	2.25 x 3.2	57 x 81
	Insert Panel	2.5 x 3.3	64 x 84

In addition, a removable bracket between the third and fourth cutout permits installation of three more type A insert panels by installing an adaptor plate (DIGITAL P.N. 74-27720-01). Figure 1-19 shows typical type "A" and type "B" insert panels, and the adaptor plate.

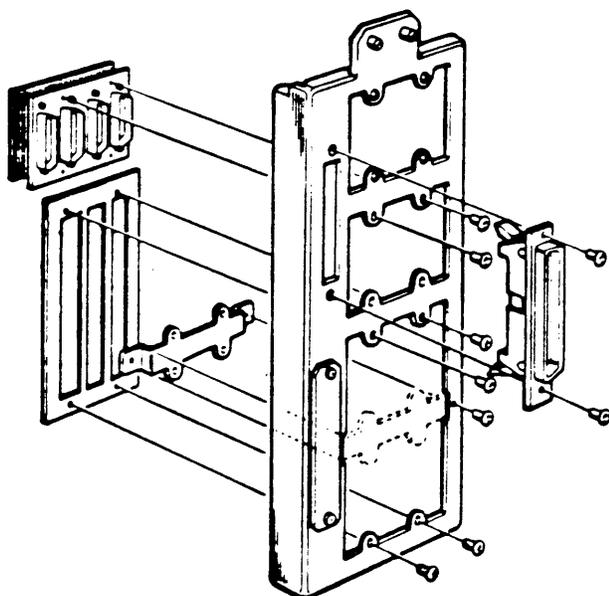


Figure 1-19 I/O Insert Panels And Adaptor Plate

### 1.5.2 BA123-A I/O Distribution Panel

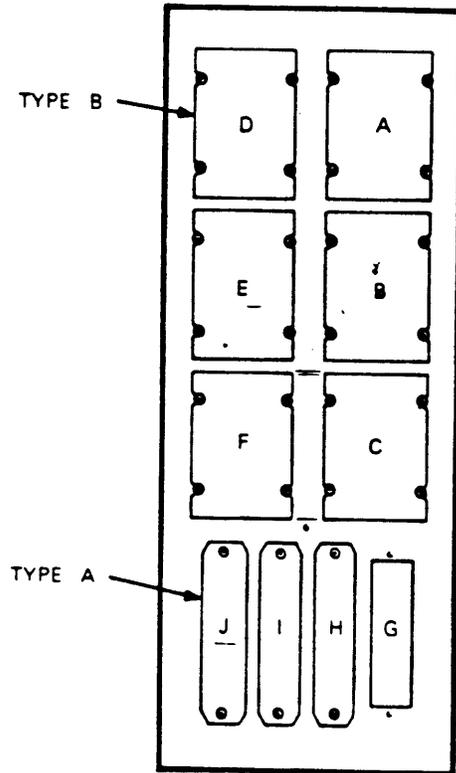
External devices supported by MicroVAX II connect to the BA123 enclosure through the I/O distribution panel shown in Figure 1-20. Each module that connects to an external device comes with an internal cable, a filter connector, and an insert panel. Together, these three items are referred to as a cabinet kit.

Filter connectors are mounted in the insert panels. The insert panels are then mounted in cutouts in the I/O distribution panel, in the order shown (by letter) in Figure 1-20. The CPU I/O Distribution Panel insert is typically mounted in cutout "A". Unused cutouts are covered by removable plates.

The rear I/O panel (Figure 1-21) has ten cutouts. The size of the cutouts, and the corresponding insert panels, is given in Table 1-4.

TABLE 1-4 Cutout, Insert Panel Size

		inch	mm
Type A (4):	Cutout	.6 x 3.2	15 x 81
	Insert Panel	1.0 x 4.0	25 x 102
Type B (6):	Cutout	2.25 x 3.2	57 x 81
	Insert Panel	2.5 x 3.3	64 x 84



MR 14037

Figure 1-20. Rear I/O Distribution Panel for the BA123-A Enclosure

In addition, a removable bracket post between the bottom 2 type B cutouts allows for the addition of 3 more type A cutouts by installing an adaptor plate (DIGITAL P.N. 74-27720-01).

Figure 1-21 also shows typical type A and type B connectors, and the adaptor plate.

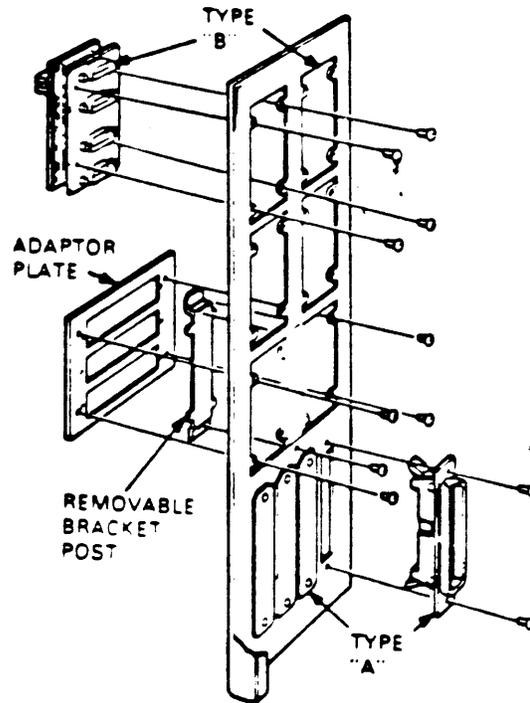


Figure 1-21 Filter Connectors and Adaptor Plate

### 1.5.3 I/O Distribution Panel for the H9642 enclosure

External devices connect to the H9642 enclosure through the H3490 rear I/O distribution panel, a metal bulkhead assembly mounted on the rear frame of the H9642 cabinet. The rear I/O panel (Figure 1-22) has 17 cutouts. The size of the cutouts, and the corresponding insert panels, is given in Table 1-5.

TABLE 1-5 Cutout, Insert Panel Size

		inch	mm
Type A (6):	Cutout	.6 x 3.2	15 x 81
	Insert Panel	1.0 x 4.0	25 x 102
Type B (11):	Cutout	2.25 x 3.2	57 x 81
	Insert Panel	2.5 x 3.3	64 x 84

In addition, a removable bracket post between cutouts G and K have allows for the addition of 3 more type A cutouts by installing the adaptor plate (DIGITAL P.N. 74-27720-01).

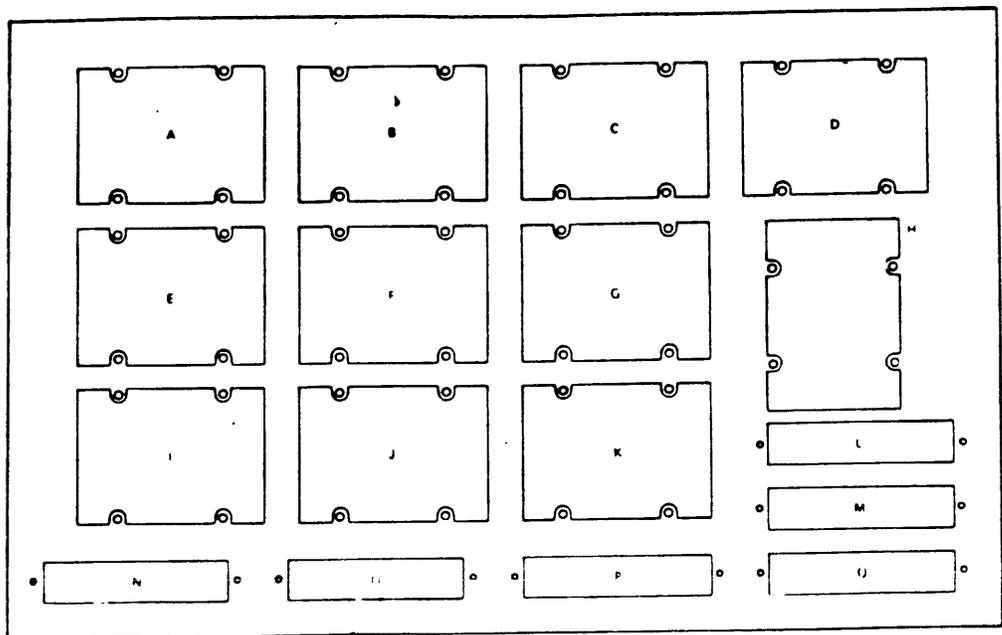


Figure 1-22. The I/O distribution panel for the H9642 enclosure.

## CHAPTER 2--INSTALLATION

### 2.1 Installation of a BA23-Based System

Before installing any system, make sure the site conforms to the environmental and safety requirements described in the site preparation instructions. To install the system, perform the following steps in order.

Step 1: Unpack the MicroVAX II system.

Step 2: Put the system where it will be used. Make sure to:

- o Allow space around the unit for air circulation and servicing. Figure 2-1 shows proper air flow.

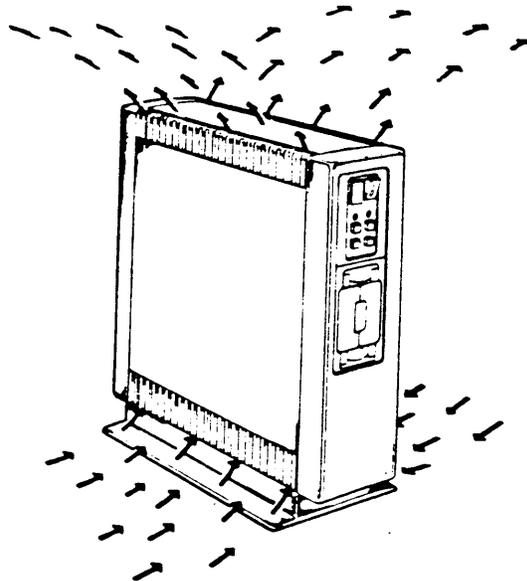


FIGURE 2-1. Proper air flow for the BA23 enclosure

- o Keep food and liquid away from unit.
- o Place the unit away from heaters, photocopiers, and direct sunlight.
- o Minimize static by placing the unit away from busy office corridors.
- o Keep the area free from dust and other abrasive materials.
- o Install the system in an operating environment that meets the requirements listed Appendix B of the MicroVAX II 630QY, 630QZ Owner's Manual.

Step 3: Label the control panel and diskette drive units. Figure 2-2 shows proper orientation.

- o Make sure that all buttons on the control panel are out.
- o If the unit contains diskette drives, label them 1 and 2.
- o Select labels for the appropriate language.

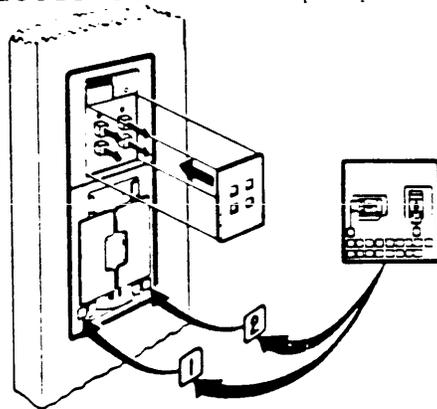


FIGURE 2-2. Orientation of Labels on a BA23-A enclosure.

Step 4: Unpack the installation and user guides for the first terminal to be connected to the system. This will be the console terminal.

Step 5: Use the installation guide to unpack and install the console terminal.

Step 6: Open the rear bezel of the unit. The bezel is held in place by a pop fastener.

Step 7: Set the controls on the CPU distribution panel (Figure 2-3) on the rear of the unit to the positions listed below.

- o Set the Baud control knob for the console terminal to 4800.
- o Set the Mode switch to the middle (language inquiry) position.
- o Set the Halt Enable/Disable switch to the disable (left or down) position.

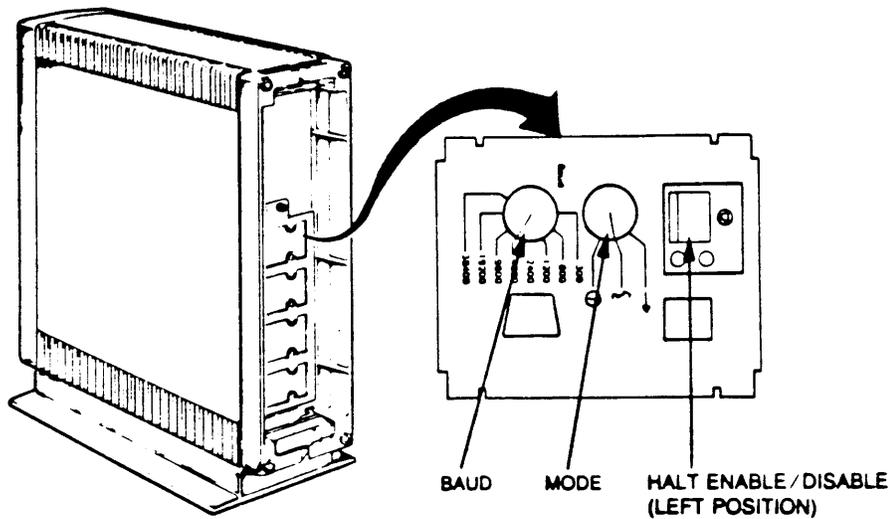


FIGURE 2-3. Setting the controls on the CPU Distribution Insert.

NOTE: MicroVAX systems respond to hardcopy terminals differently than they do to video terminals. To set up a terminal for use with a MicroVAX system, use the information provided in Table 2-1. Refer to the appropriate terminal Owner's Manual for further instructions.

Table 2-1 Terminal Set Ups for Use with MicroVAX Systems

TERMINAL TYPE	DATA BITS	PARITY	
		RECEIVE	TRANSMIT
Hardcopy	7	Ignore	Space Parity
	7	Ignore	Odd Parity
Video	8	Ignore	No Parity

Step 8: Connect the console terminal cable to the console terminal and the unit as shown in Figure 2-4.

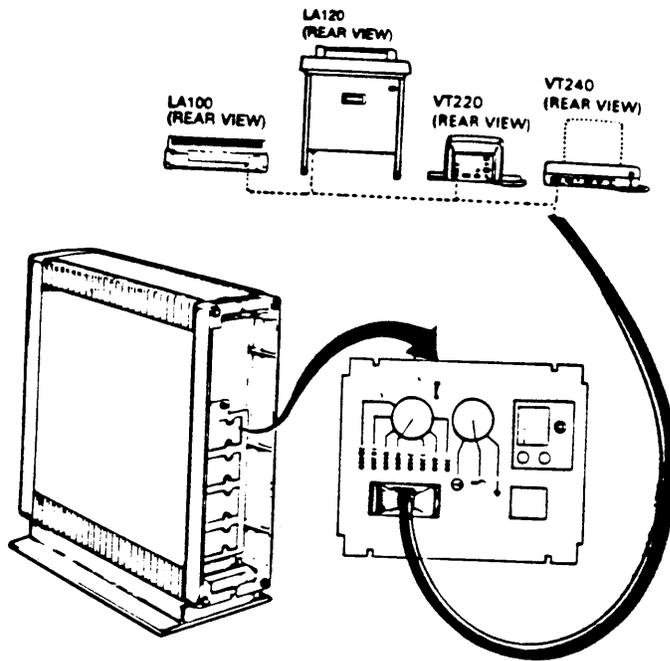


FIGURE 2-4. Connecting the Console terminal to the CPU Distribution Insert.

Step 9: Install and connect any additional devices through the appropriate I/O panel connectors as shown in Figure 2-5.

- o Additional devices may include terminals, printers, modems, and external storage devices. The devices may be connected in any order.

- o Refer to the installation guide included with each device.

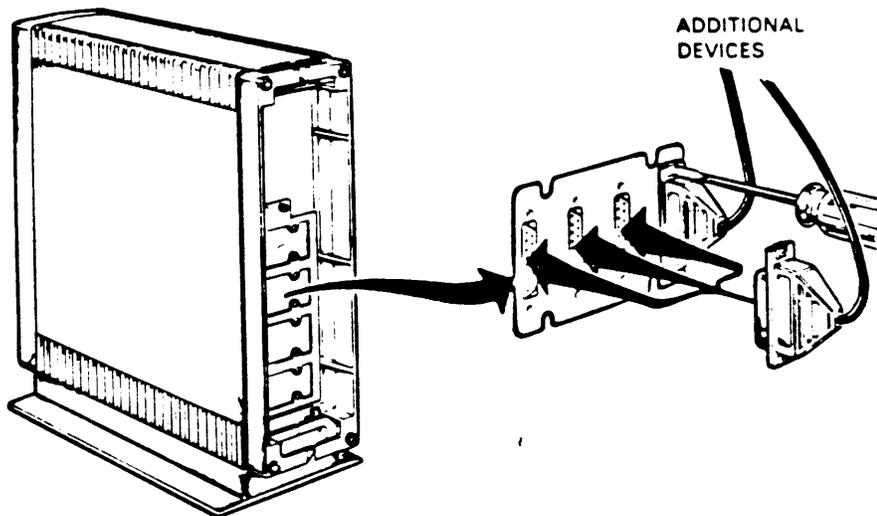


FIGURE 2-5. Connecting Additional devices to the BA23 enclosure.  
Step 10: Identify the power cable.

- o Make sure the power cable plug matches the wall outlet.

Step 11: Check the voltage switch setting. Peel back the label covering the switch to see the voltage setting on the BA23 enclosure as shown in Figure 2-6. If necessary, change the switch setting to match the voltage source to be used.

**CAUTION**

An incorrect voltage switch setting may damage the system.

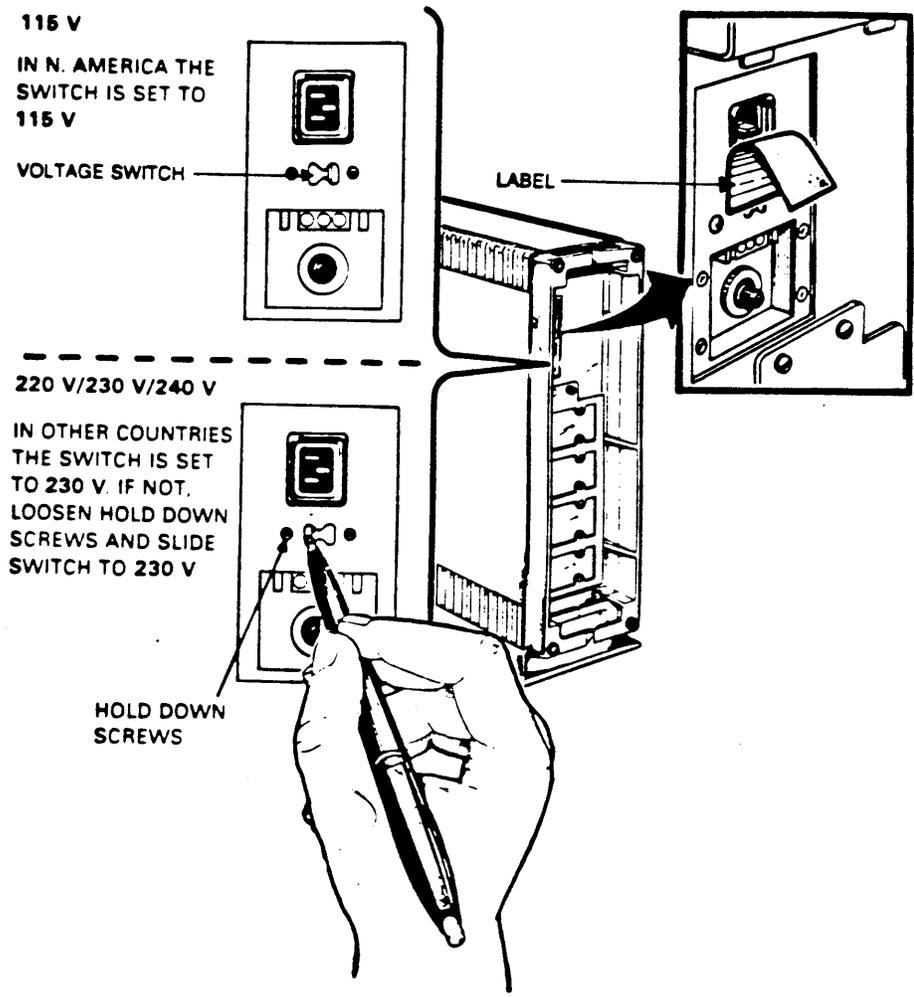


FIGURE 2-6. Checking the voltage setting on the BA23 enclosure.

Step 12: Set the power switch on the front of the unit to 0 (off).

Step 13: Plug in the power cable.

- o Thread all the cables through the lower cable guide.
- o Do not close the rear bezel at this time.

Step 14: The system may now be tested by running selection 1 of the MicroVAX Maintenance System's Main Menu. Further information for testing the system is available in Chapter 6, MicroVAX Maintenance System.

## 2.2 Installing A BA123-Based System

Before installing your system, make sure the site conforms to the environmental and safety requirements described in the site preparation instructions. To install the system, perform the following steps in order.

Step 1: Unpack the MicroVAX II system.

**CAUTION:** Do not pick up the MicroVAX II system unit by its front and rear covers when moving it, or use the lever on the TK50 tape drive as a handhold.

Step 2: Put the system unit where it will be used.

Make sure to:

- o Allow space around the unit for air circulation and servicing.

Figure 2-7 shows appropriate ventilation for the BA123-A enclosure.

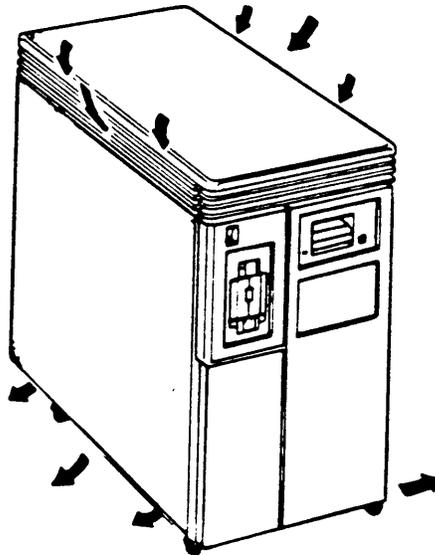


FIGURE 2-7. Ventilation for the BA123-A enclosure.

- o Keep food and liquid away from unit.
- o Place the unit away from heaters, photocopiers, and direct sunlight.
- o Minimize static by placing the unit away from busy office corridors.
- o Keep the area free from dust and other abrasive materials.
- o Install your system in an operating environment that meets the requirements listed in Appendix B of the MicroVAX II 630QB Owner's Manual.

Step 3: Label the control panel and diskette drive units as shown in Figure 2-8.

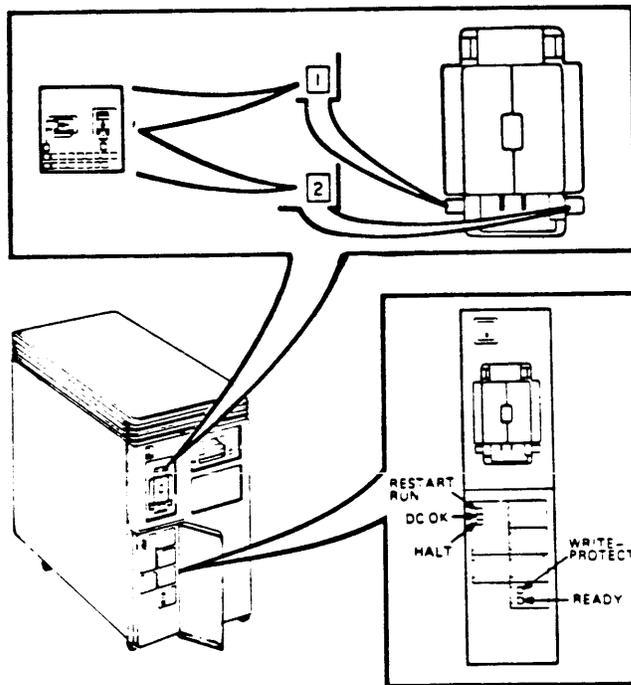


FIGURE 2-8. Labeling Controls on a BA123-Based system.

Make sure:

- All buttons on the control panel are out.
- Diskette drives are properly labeled 1 and 2.
- Proper labels are selected for the language to be used.

Step 4: Unpack the installation and user guides for the first terminal to be connected to the system. This will be the console terminal.

Step 5: Use the installation guide to unpack and install the console terminal.

Step 6: Open the rear door of your unit. The door is held in place by a pop fastener (see Figure 2-9).

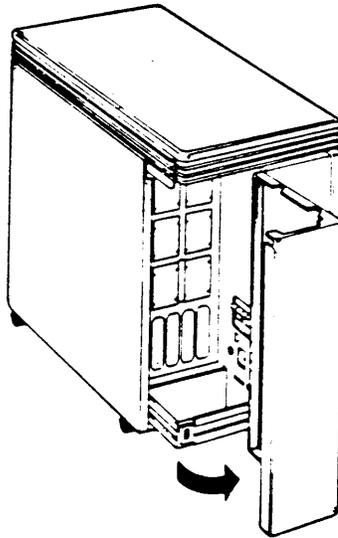


FIGURE 2-9. Opening the Rear door of the BA123-A Enclosure.

Step 7: Set the controls on the CPU distribution panel on the rear of the unit (shown in Figure 2-10) to the positions listed below.

- Set the Baud control knob for the console terminal to 4800.
- Set the Mode switch to the middle (language inquiry) position.
- Set the Halt Enable/Disable switch to the disable (down) position.

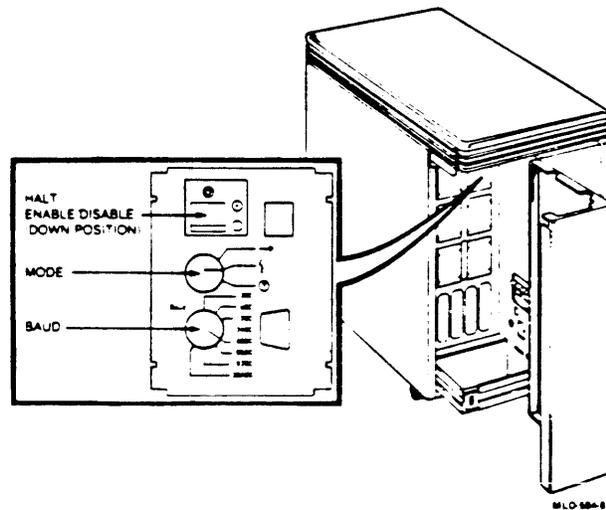


FIGURE 2-10. The CPU I/O insert as oriented on a BA123-A Enclosure.

Step 8: Connect the console terminal cable to the console terminal and the unit as shown in Figure 2-11.

NOTE: MicroVAX systems respond to hardcopy terminals differently than they do to video terminals. To set up a terminal for use with a MicroVAX system, use the information provided in Table 2-1. Refer to the appropriate terminal Owner's Manual for further instructions.

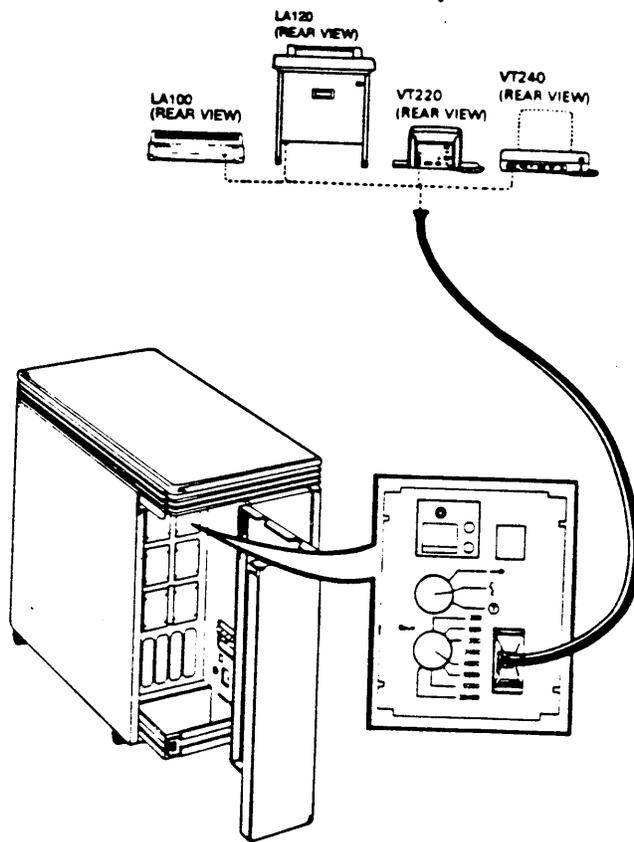


FIGURE 2-11. Connecting the Console terminal to the CPU distribution insert.

Step 9: Install and connect any additional devices as shown in Figure 2-12. Additional devices may include terminals, printers, modems, and external storage devices. The devices may be connected in any order. Refer to the installation guide included with each device.

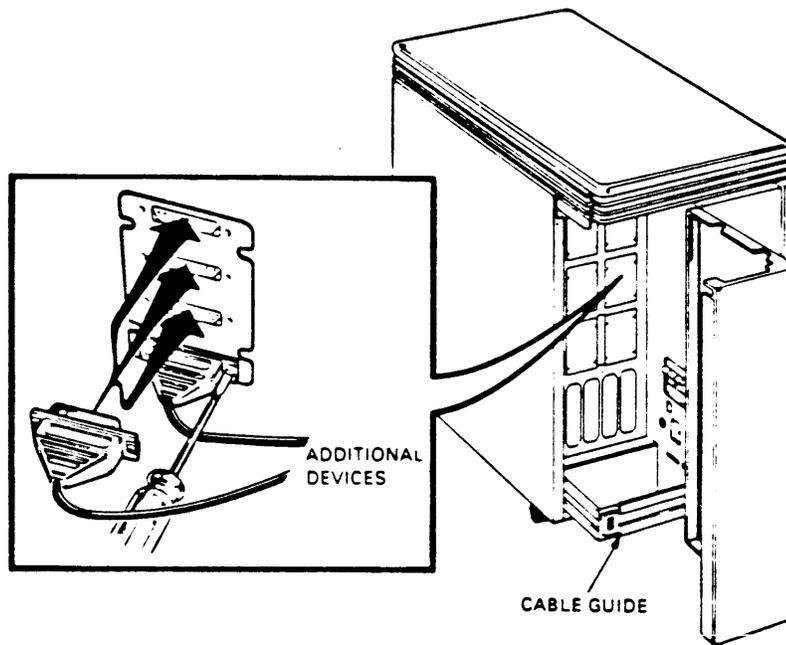


FIGURE 2-12. Connecting Additional devices to a BA123-Based System.

Step 10: Identify the power cable. Make sure the power cable plug matches the wall outlet.

Step 11: Check the voltage switch setting as shown in Figure 2-13. Peel back the label covering the switch to see the voltage setting. If necessary, change the switch setting to match the voltage source you are using.

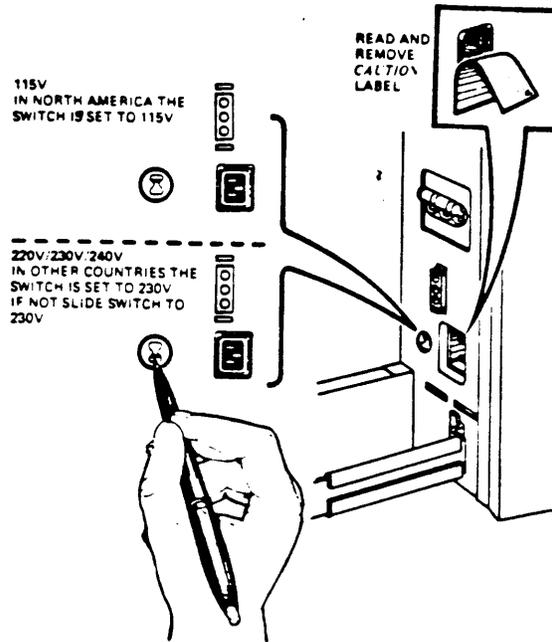


FIGURE 2-13. Checking the Voltage setting on a BA123-Based System.

**CAUTION**

An incorrect voltage switch setting may damage your system.

Step 12: Set the power switch on the front of the unit to 0 (off).

Step 13: Plug in the power cable.

- o Thread all the cables through the lower cable guide.
- o Do not close the rear door at this time.

Step 14: The system may now be tested by running selection 1 of the MicroVAX Maintenance System's Main Menu. Further information for testing the system is available in Chapter 6, MicroVAX Maintenance System.

### 2.3 Installation of a H9642-Based System

Before installing your system, make sure the site conforms to the environmental and safety requirements described in Appendix B of the MicroVAX II 630QE Owner's Manual. To install the system:

Step 1: Unpack the MicroVAX II system unit where it will be used.

- o Allow space around the unit for air circulation and servicing. Figure 2-14 shows proper air flow for the H9642 system.

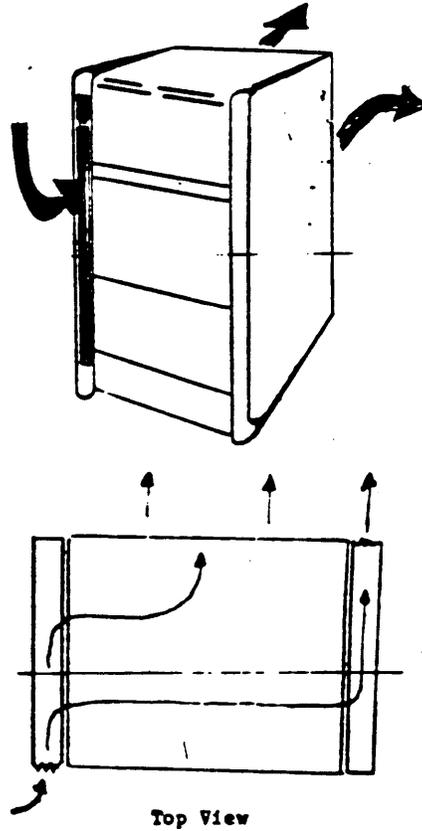


Figure 2-14 Proper air flow for H9642-based systems.

- o Keep food and liquid away from unit.
- o Place the unit away from heaters, photocopiers, and direct sunlight, and quiet work areas.
- o Minimize static by placing the unit away from busy office corridors.
- o Keep the area free from dust and other abrasive materials.

NOTE: The H9642-based system requires a 30 amp dedicated circuit for ac power.

Step 2: Allow enough clearance in the unpacking area for removing the cabinet from the skid. A minimum of 10 feet (3 meters) is necessary (see Figure 2-15).

- o Keep food and liquid away from unit.
- o Place the unit away from heaters, photocopiers, and direct sunlight, and quiet work areas.
- o Minimize static by placing the unit away from busy office corridors.
- o Keep the area free from dust and other abrasive materials.

NOTE: The H9642-based system requires a 30 amp dedicated circuit for ac power.

Step 2: Allow enough clearance in the unpacking area for removing the cabinet from the skid. A minimum of 10 feet (3 meters) is necessary (see Figure 2-15).

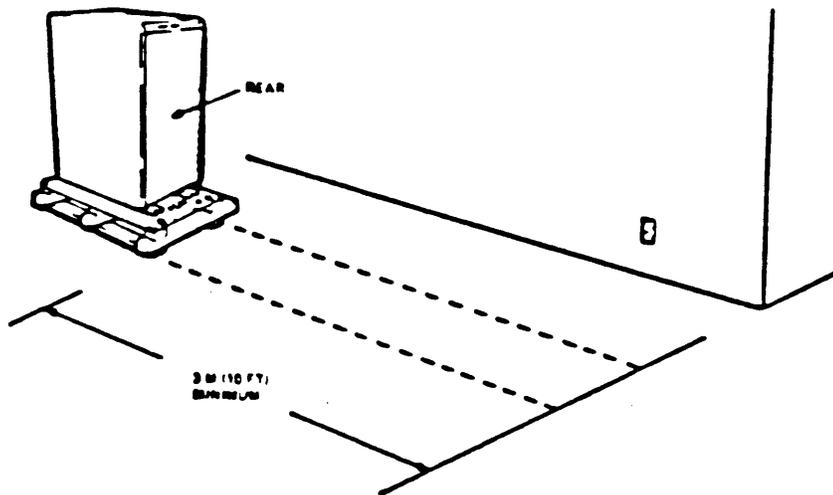


FIGURE 2-15 Clearance Required for Unpacking.

Step 3: Open the system cabinet box and remove the enclosed ramps.  
Remove the cardboard tube and plastic bag (see Figure 2-16).

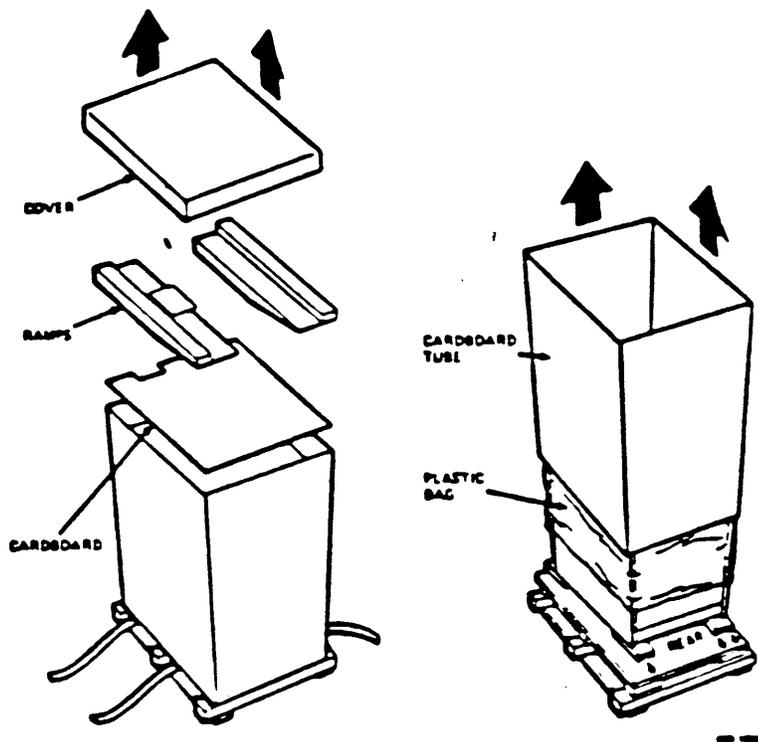


FIGURE 2-16. Proper removal of the shipping container.

Step 4: Engage the ramps in the skid grooves, aligning the arrows as shown in Figure 2-17.

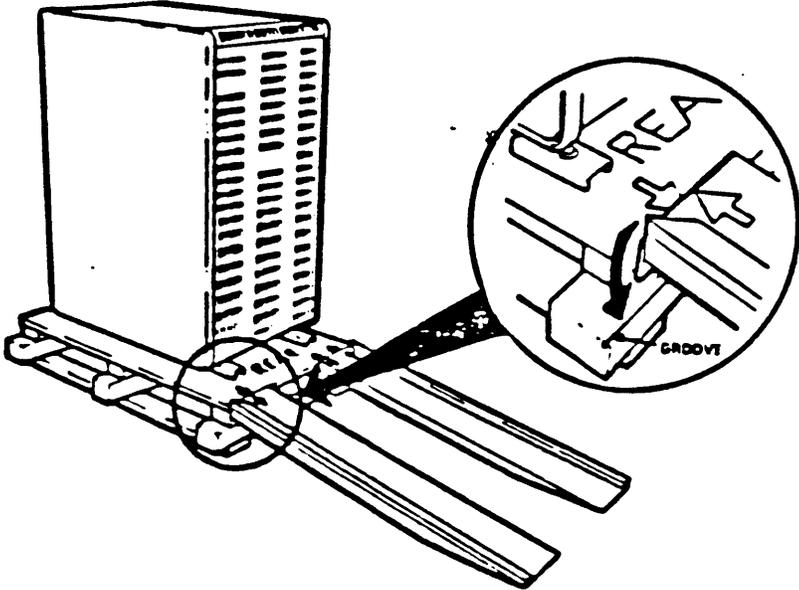


Figure 2-17. Engaging the Ramps.

Step 5: Remove the bag labeled "Tools and Cables" from the accessories bag (Figure 2-18) and remove the following items:

- o 9/16 x 1/2 wrench
- o 3/4 x 7/8 wrench
- o Hexagonal key (Allen wrench)
- o Flat blade screwdriver

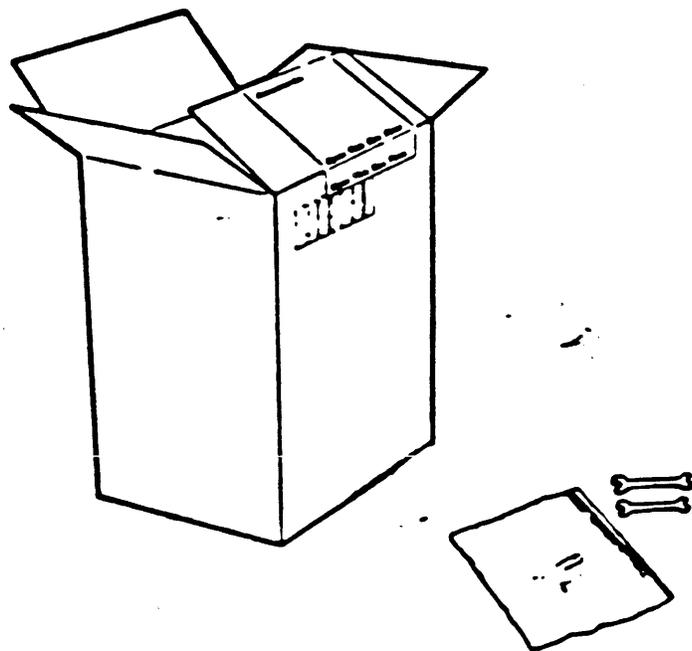


Figure 2-18. Remove the Tools from the Accessories Bag.

Step 6: Use the 9/16 wrench to remove the four shipping brackets from the leveling feet as shown in Figure 2-19.

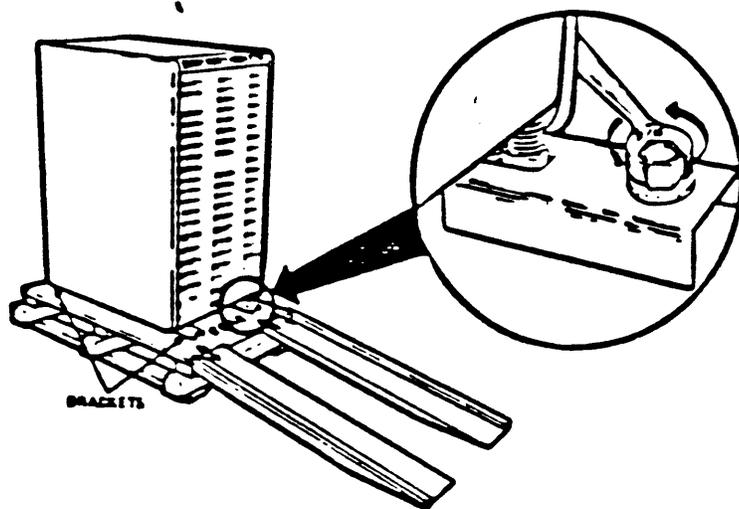


Figure 2-19. Remove the Shipping Brackets from the Leveling Feet.

Step 7: Raise the four leveling feet as described in Figure 2-20.

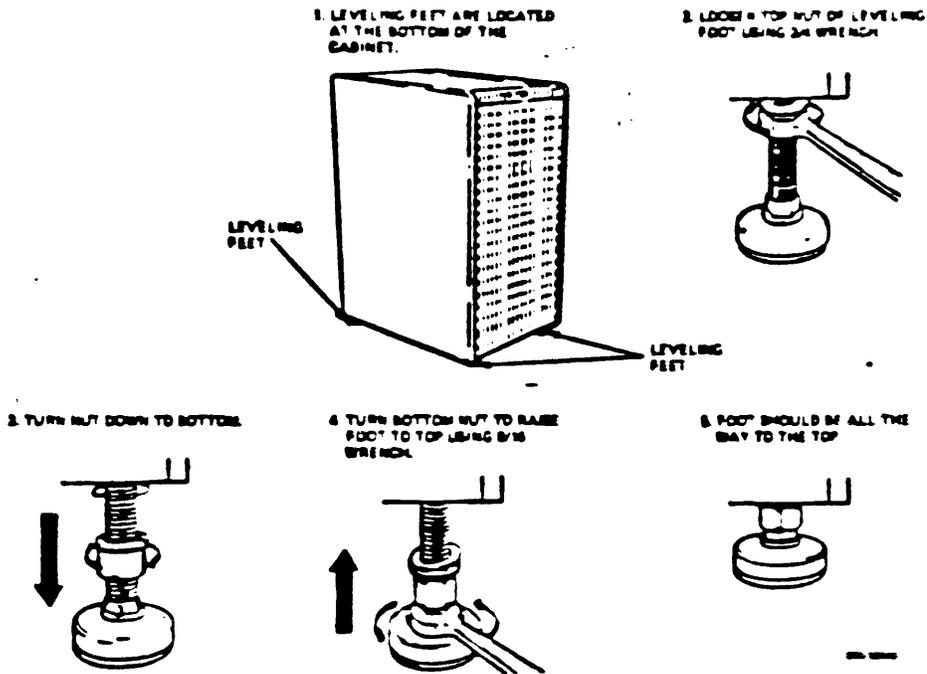


Figure 2-20. Raising the Four Leveling Feet.

Step 8: With two people, carefully roll the system unit down the ramps as shown in Figure 2-21.

**WARNING**

With two RAnn disk drives, the H9642 cabinet weighs in excess of 500 lbs. Make sure that the ramps are straight and secure.

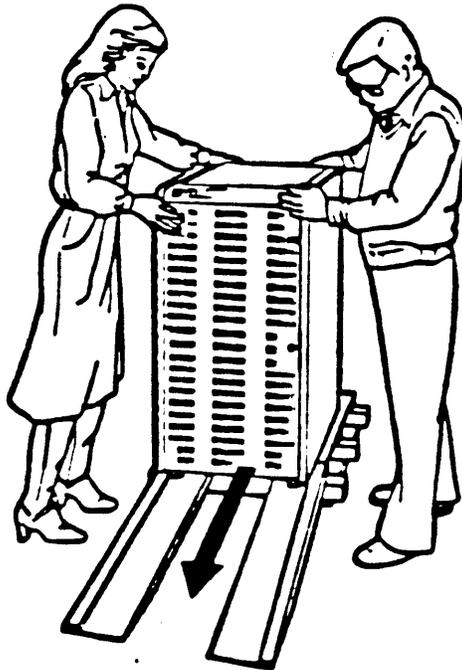


Figure 2-21. Carefully Roll the System Cabinet Down the Ramps.

Step 9: Roll the unit to the place where it will be used and lower the four leveling feet.

- o To lower the leveling feet, reverse the procedure described in figure 2-20.

Step 10: Label the system control panel and diskette drive units (see Figure 2-22).

- o Make sure that all buttons on the system control panel are set to the out position.
- o If the unit contains diskette drives, label them 1 and 2.
- o Select labels for your language.

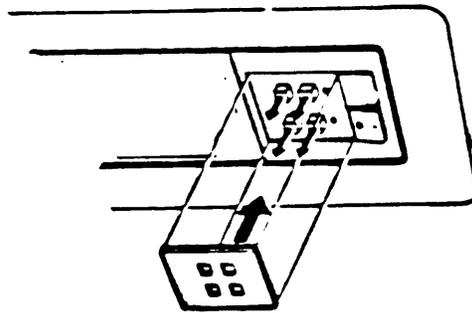


Figure 2-22. Label the Front Control Panel.

Step 11: Unpack the installation and user guides for the first terminal to be connected to your system. This will be the "console" terminal.

Step 12: Use the installation guide to unpack and install the console terminal.

Step 13: Open the rear door of your unit.

- o Use a hexagonal key (allen wrench) to unlock the door (see Figure 2-23).

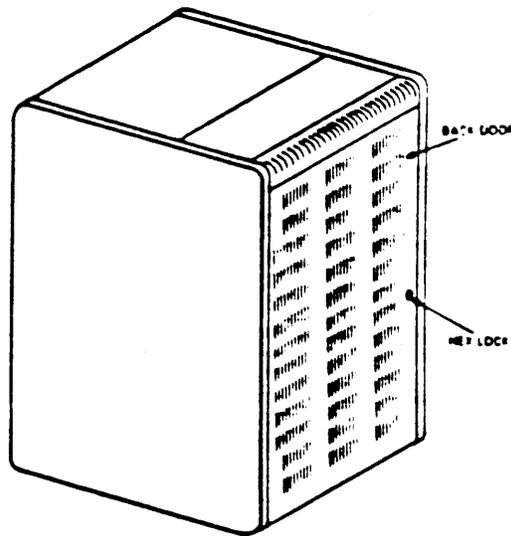


Figure 2-23. Use an Allen Wrench to unlock the Hex Lock.

- o Open the rear door by swinging it from from the right to the left.
- o Remove the rear door by depressing the top spring hinge located on the top inside of the rear door.

Step 14: Set the controls on the CPU distribution panel on the rear of the unit (see Figure 2-24) to the positions listed below.

- o Set the Baud control knob for the console terminal to 4800.
- o Set the Mode switch to the middle (language inquiry) position.
- o Set the Halt Enable/Disable switch to the disable (down) position.

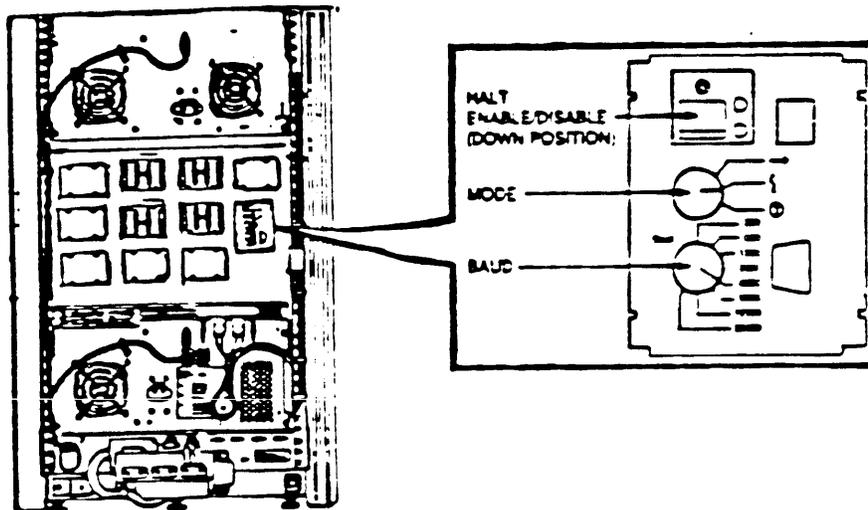


Figure 2-24. Set the controls on the CPU Distribution Insert.

Step 15: Connect the console terminal cable to the console terminal and the unit as shown in Figure 2-25.

NOTE: MicroVAX systems respond to hardcopy terminals differently than they do to video terminals. To set up a terminal for use with a MicroVAX system, use the information provided in Table 2-1. Refer to the appropriate terminal Owner's Manual for further instructions.

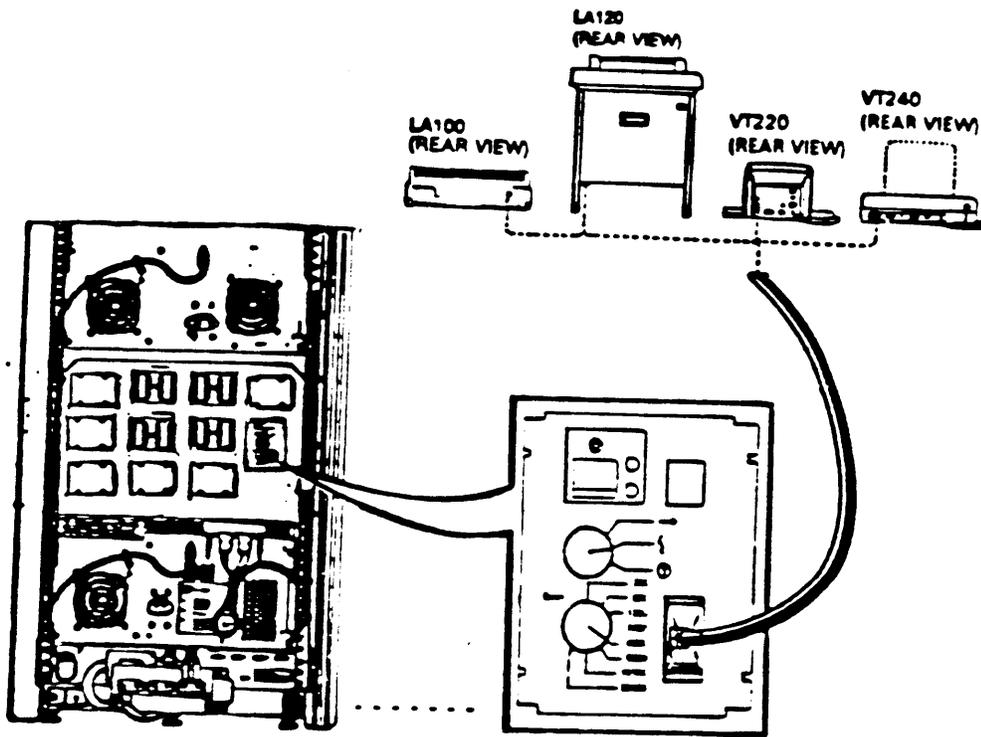


Figure 2-25. Connect the Console Terminal to the System.

Step 16: Install and connect any additional devices as shown in Figure 2-26.

- o Additional devices may include terminals, printers, modems, and external storage devices. The devices may be connected in any order.
- o Refer to the installation guide included with each device.

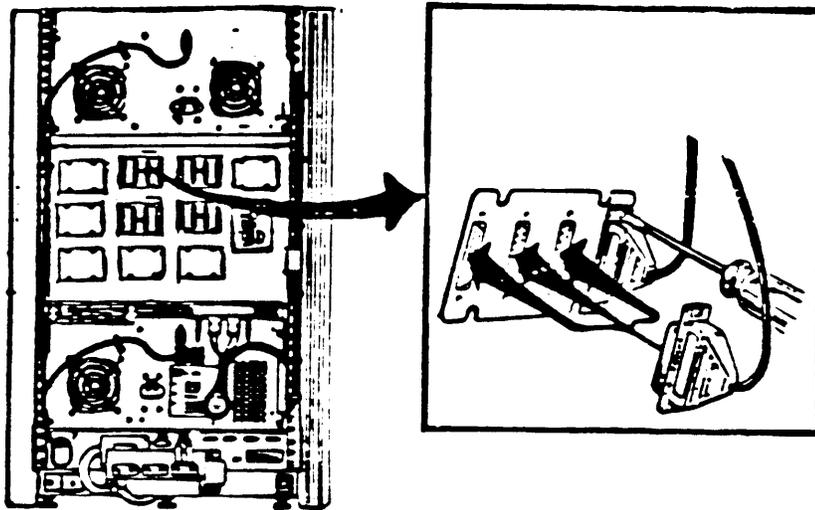


Figure 2-26. Install any additional devices.

Step 17: Identify the power cable.

- o Make sure the power cable plug matches the wall outlet.

NOTE: Do not plug the system into the outlet at this time.

Step 18: Check the two voltage switch settings.

- o Loosen and remove the two screws that hold the back panel door as shown in Figure 2-27.

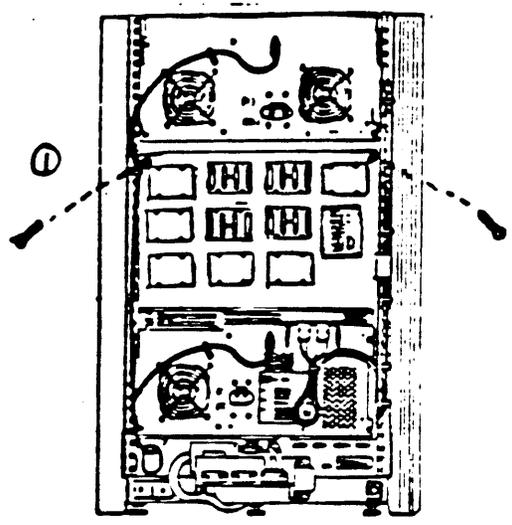


Figure 2-27. Loosen and remove the screws from the panel.

- o Lower the back panel door.
- o Loosen and remove the screw that holds the door covering the voltage switches and swing the door to the left as shown in Figure 2-28.

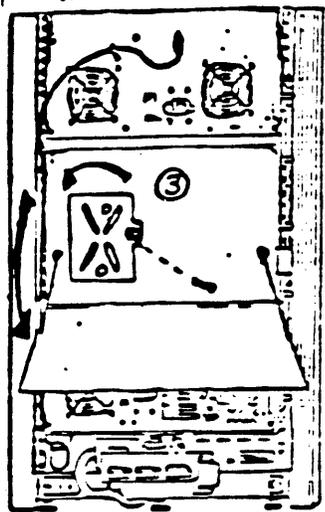


Figure 2-28. Swing the door covering the voltage selection switches to the left.

- o Peel back the labels covering the two switches to see the voltage settings. If necessary, change the switch settings to match the voltage source you are using (see Figure 2-29).

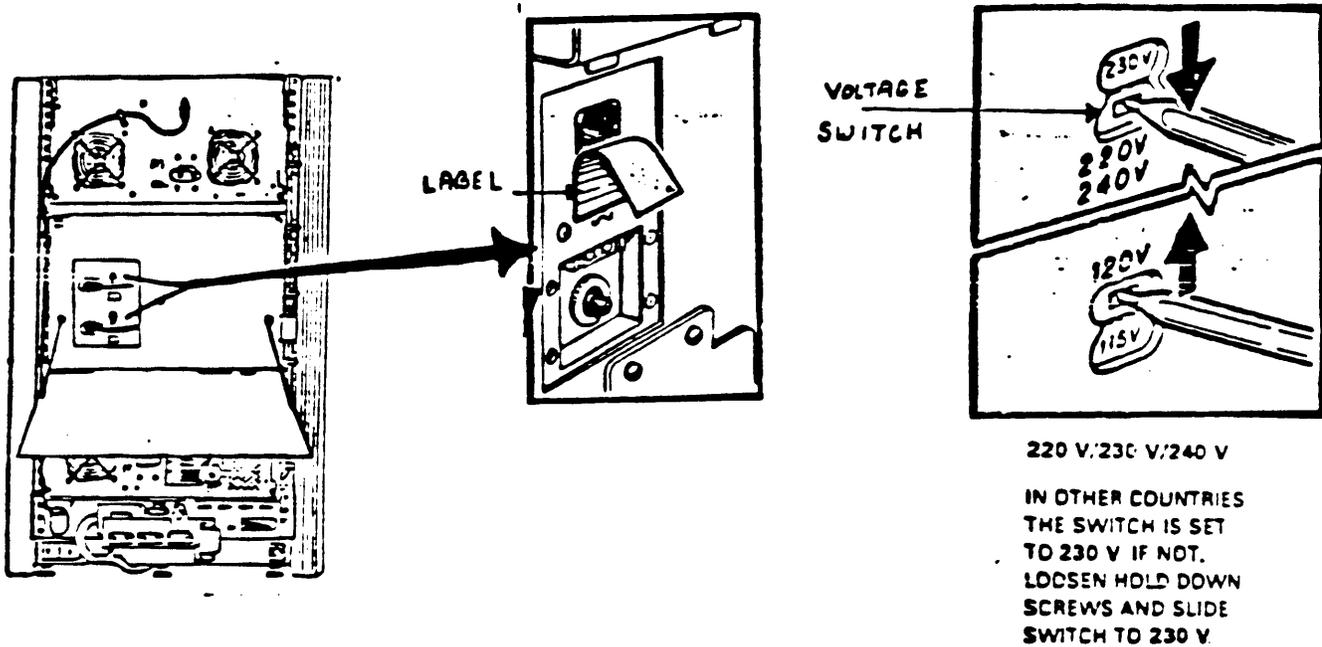


Figure 2-29 Make sure the voltage settings match the voltage source you are using.

- o Close the door to the switch settings.
- 6. Replace the back panel door and secure the screws.

CAUTION: An incorrect voltage switch setting may damage your system.

Step 19: Check the voltage information on the labels listed below to make sure the voltages match your voltage source.

- o The RA60 disk drive label located on the upper left corner of the system unit that begins, "This device is set for..".
- o The power supply label located in the center of the system unit.
- o The power controller label located on the lower left corner of the system unit.

Step 20: Unlock the positioner in the RA81 disk drive as shown in Figure 2-30.

- o Slide the stabilizer bar located under the front of the cabinet forward.
- o Unscrew the locking mechanism on the rear of the RA81 disk drive.
- o From the rear of the cabinet, slowly push the RA81 unit forward until it stops.

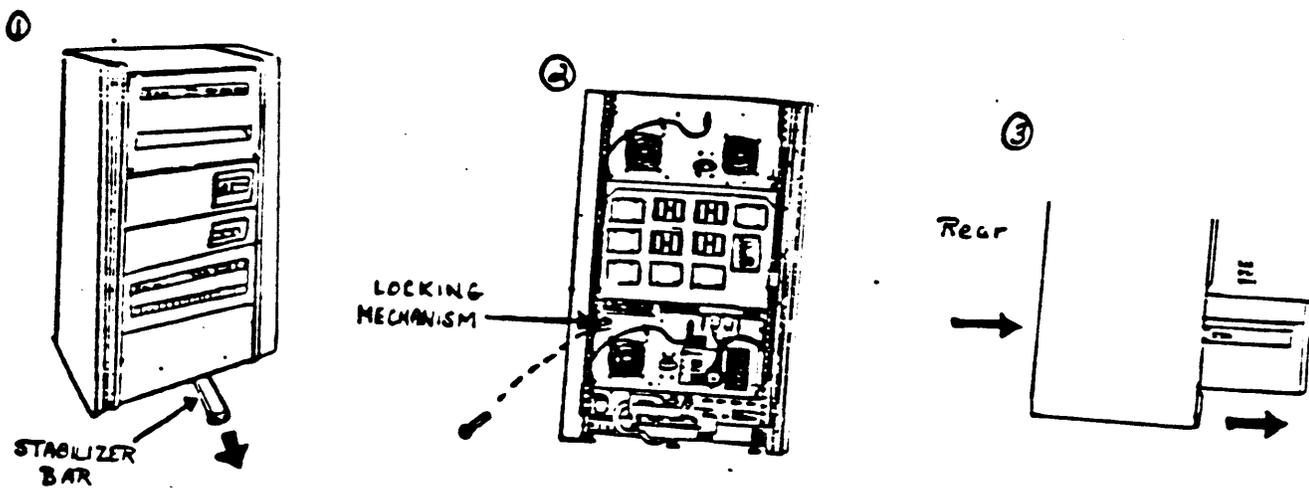


Figure 2-30. Unlocking the Positioner in the RA81 Disk Drive (1 of 3)

- o Lift up locking arms A (see Figure 2-30) on each side of the RA81 disk drive unit, and pull the unit forward until it is fully extended.
- o Unlock the top cover of the disk drive. Use a screwdriver to depress the release latch located behind the central vent opening on the front of the drive.
- o Raise the hinged top cover of the disk drive and swing it backward.

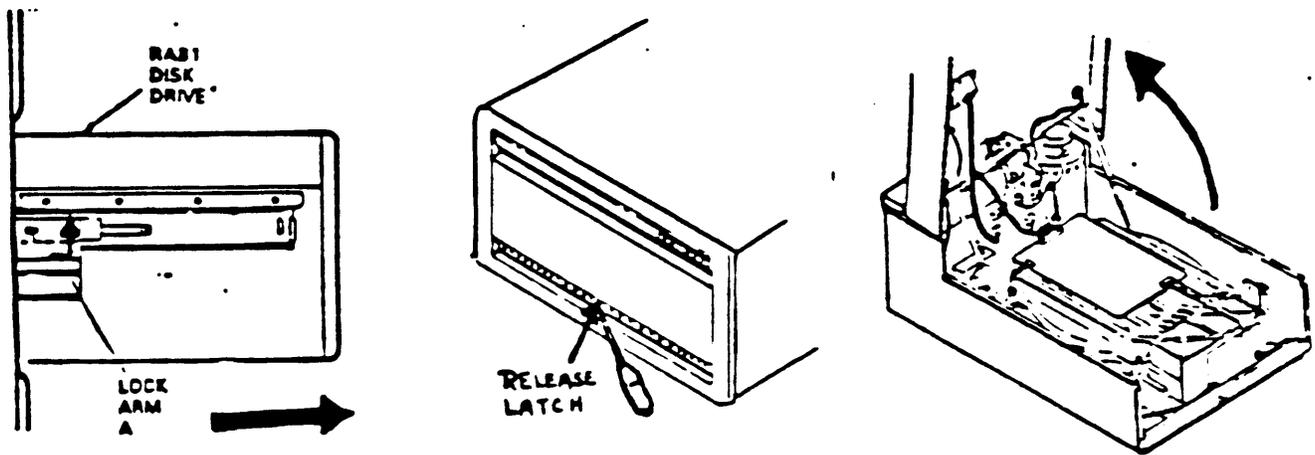


Figure 2-30. Unlocking the Positioner in the RA81 Disk Drive (2 of 3)

- o Lift and rotate the positioner lock from the lock to the unlock position (see Figure 2-31).
- o Lower the top cover of the disk drive.
- o Replace the front cover of the RA81 front panel and reinsert the 4 screws.
- o Depress locking arms B on each side of the RA81 disk drive unit, and slowly push the RA81 back into the cabinet.
- o Slide the stabilizer back underneath the cabinet.

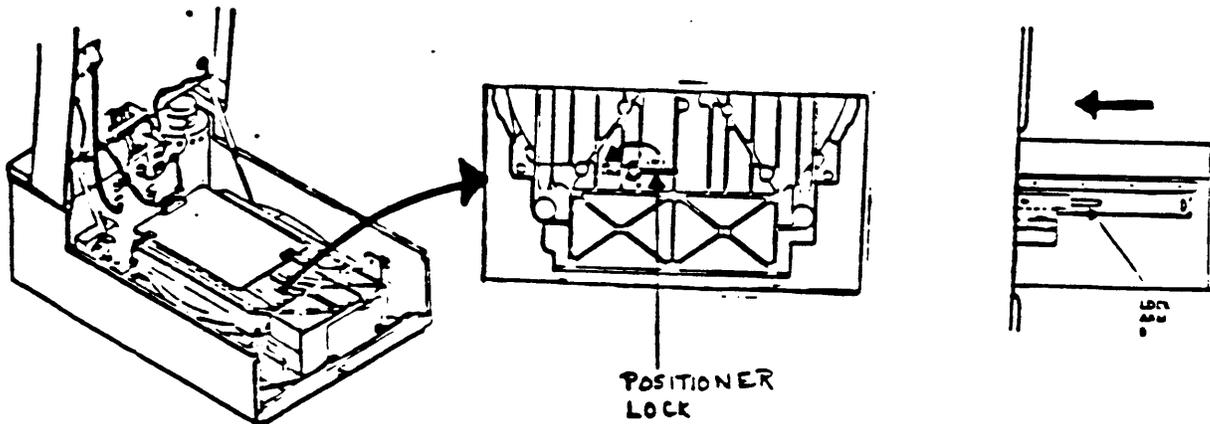


Figure 2-31. Unlocking the Positioner in the RA81 Disk Drive (3 of 3).

Step 21: Set the power switch on the front of the unit to 0 (off).

Step 22: Plug in the power cable.

Step 23: Make sure that the three circuit breakers at the rear of the system unit are set to 1(on) (see Figure 2-32).

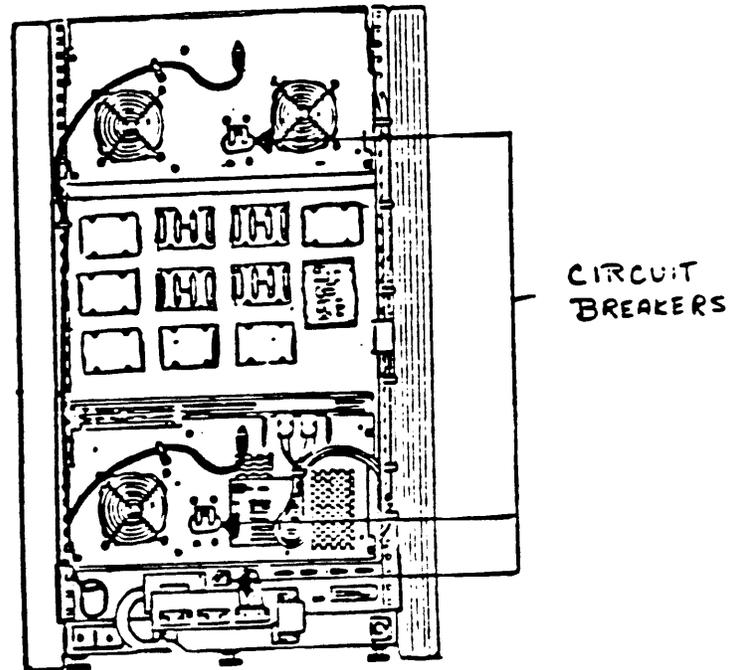


Figure 2-32. Set the three circuit breakers to the ON position.

Step 24: Set the power switch on the front control panel to 1 (on).

Step 25: Unlock the positioner in the RA60 disk drive as shown in Figure 2-33.

- o Press the lock release on the RA60 disk drive control panel.
- o Raise the RA60 disk drive cover and swing it backward.
- o Unscrew the locking bolt and remove it from the shipping hole.

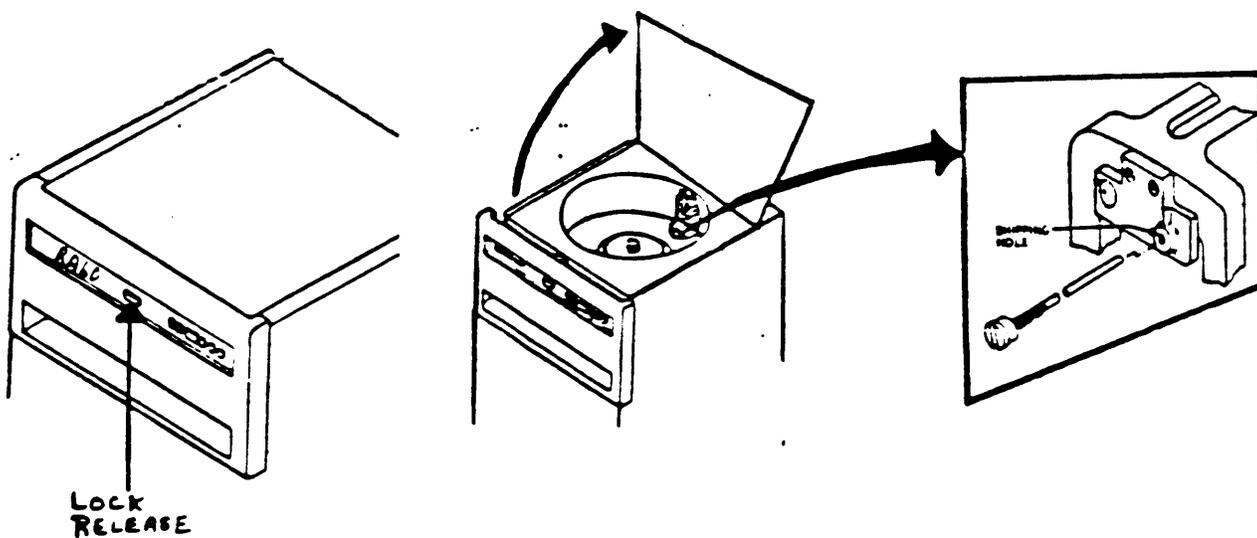


Figure 2-33. Unlock the Positioner in the RA60 (1 of 2).

- o Insert the locking bolt in the storage hole (see Figure 2-34).
- o Close the the RA60 drive cover.

**NOTE**

The RA60 disk drive can not be opened unless the power switch on the front control panel has been set to 1 (on).

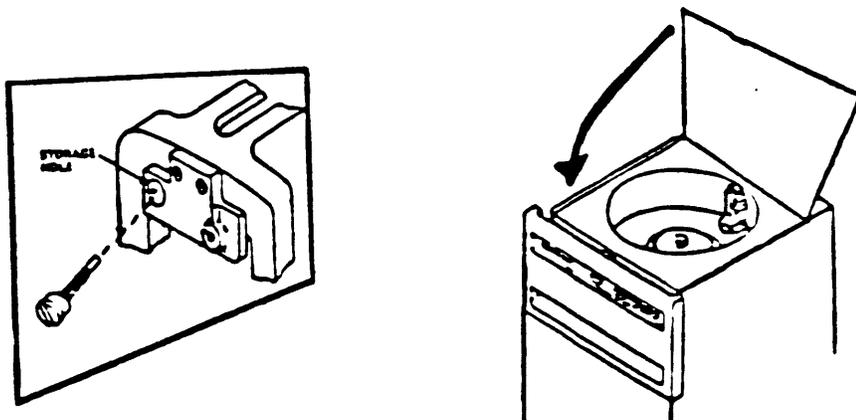


Figure 2-34. Unlock the Positioner in the RA60 (2 of 2).

Step 26: Load the RA60 disk pack into the disk drive as follows:

- o Make sure the RUN/STOP button is in the out (not lit) position.
- o Press the lock release on the RA60 disk drive control panel and raise the disk drive cover.
- o Look into the disk well (Figure 2-35) to make sure that the read/write heads are retracted from the disk shroud area. Failure to make sure that the heads are fully retracted could cause damage to the heads and/or the disk pack. If the heads are not retracted, refer to the RA60 Disk Drive Service Manual for further information.

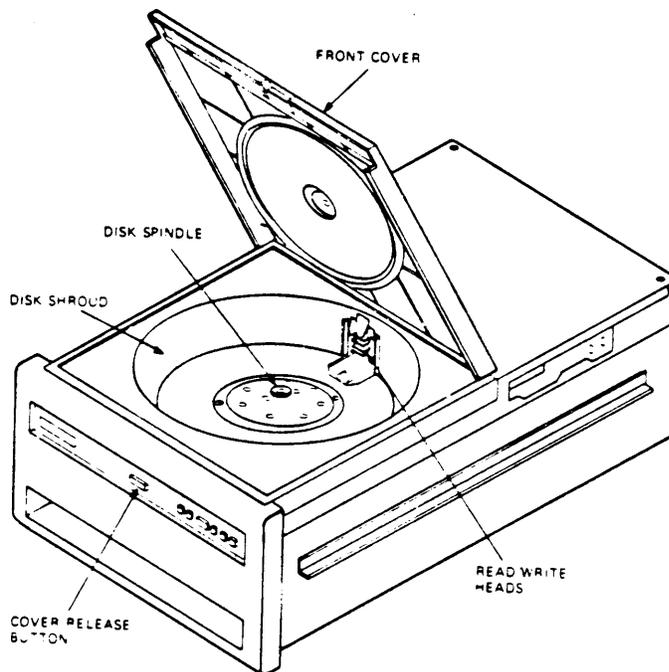


Figure 2-35 Make Sure the Read/Write Heads are Retracted.

- o Remove the bottom dust cover from the disk pack canister by squeezing together the two slide buttons on its underside (see Figure 2-36). Avoid placing fingerprints on the exposed disks inside the canister.

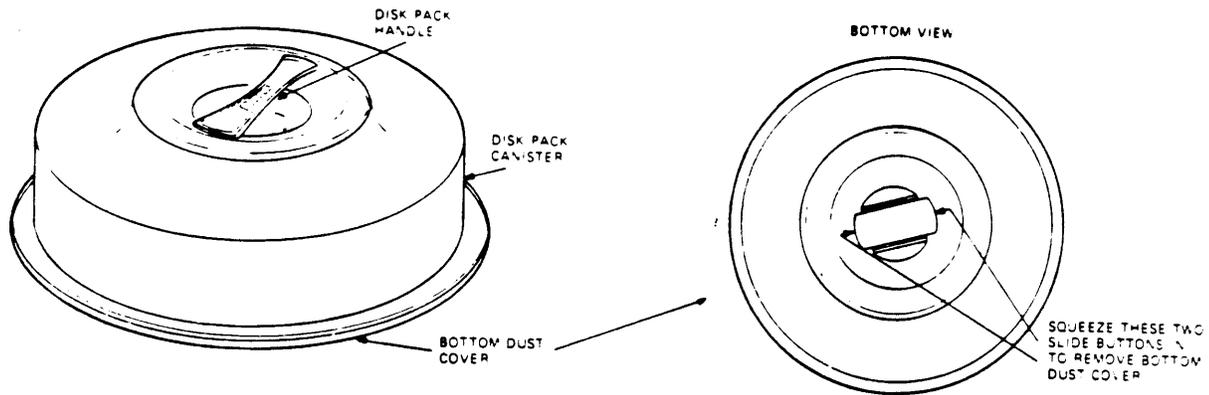


Figure 2-36 Remove the Bottom Dust Cover from the Canister.

- o Lifting the canister solely by its handle, set the pack onto the spindle.
- o Using one hand to turn the handle and the other to hold the disk pack stationary, press down on the handle and rotate it to the right until it stops
- o Remove the disk pack canister by lifting it up and out of the drive.
- o Replace the disk pack canister on the bottom dust cover.
- o Close the RA60 drive cover.

Step 27: Set the power switch on the front control panel to 0 (off).

Step 28: Set the Run/Stop, A, and B switches on the RA60 and RA81 disk drive control panels as shown in Figure 2-37.

- o Press the Run/Stop switches to the in position.
- o Press the A and B switches to the out position.

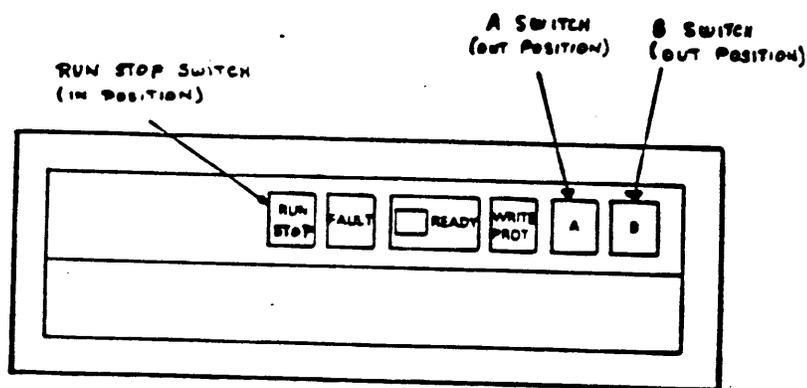


Figure 2-37. Set the switches on the RA60 and RA81 control panels.

Step 28: The system may now be tested by running selection 1 of the MicroVAX Maintenance System's Main Menu. Further information for testing the system is available in Chapter 6, MicroVAX Maintenance System.

## CHAPTER 3--CPU/MEMORY INFORMATION

### 3.1 INTRODUCTION

Each MicroVAX II system includes a micro systems enclosure (BA23-A BA123-A, or H9642 at present), a KA630-A CPU module, and a CPU Rear I/O Distribution Insert. The CPU module, which includes its own local memory (1 MB), will also support one or two MS630 memory modules, adding up to 8MByte of local memory, for a possible total of 9Mbyte.

### 3.2 KA630-A CPU

The KA630-A CPU version available for MicroVAX II systems is the KA630-AA, with floating point processor. It includes the following features:

MicroVAX processor chip, which provides a subset of the VAX instruction set and data types, as well as full VAX memory management.

1 MByte of on-board memory, with support for one or two MS630 memory modules.

Floating Point Processor (FPP) chip (KA630-AA only), which provides a subset of the VAX floating-point instruction set and data types. The FPP must be installed at the factory. It is not available as a field upgrade.

Console serial-line unit (SLU) with externally selectable baud rate. The console SLU is accessed using four VAX internal processor registers (IPRs).

Interval timer, with 10 millisecond interrupts. Interrupts are enabled via an IPR.

64 KByte boot/diagnostic ROM, which provides a subset of the VAX console program, power-up diagnostics, and boot programs for standard devices.

Q22-bus map/interface allows direct memory access (DMA) from the Q-22 bus to all local memory.

The KA630-A fields Q22-bus interrupt requests BR7-4.

Support for up to four gigabytes ( $2^{32}$ ) of virtual memory.

A block diagram of the KA630-A CPU is shown in Figure 3-1.

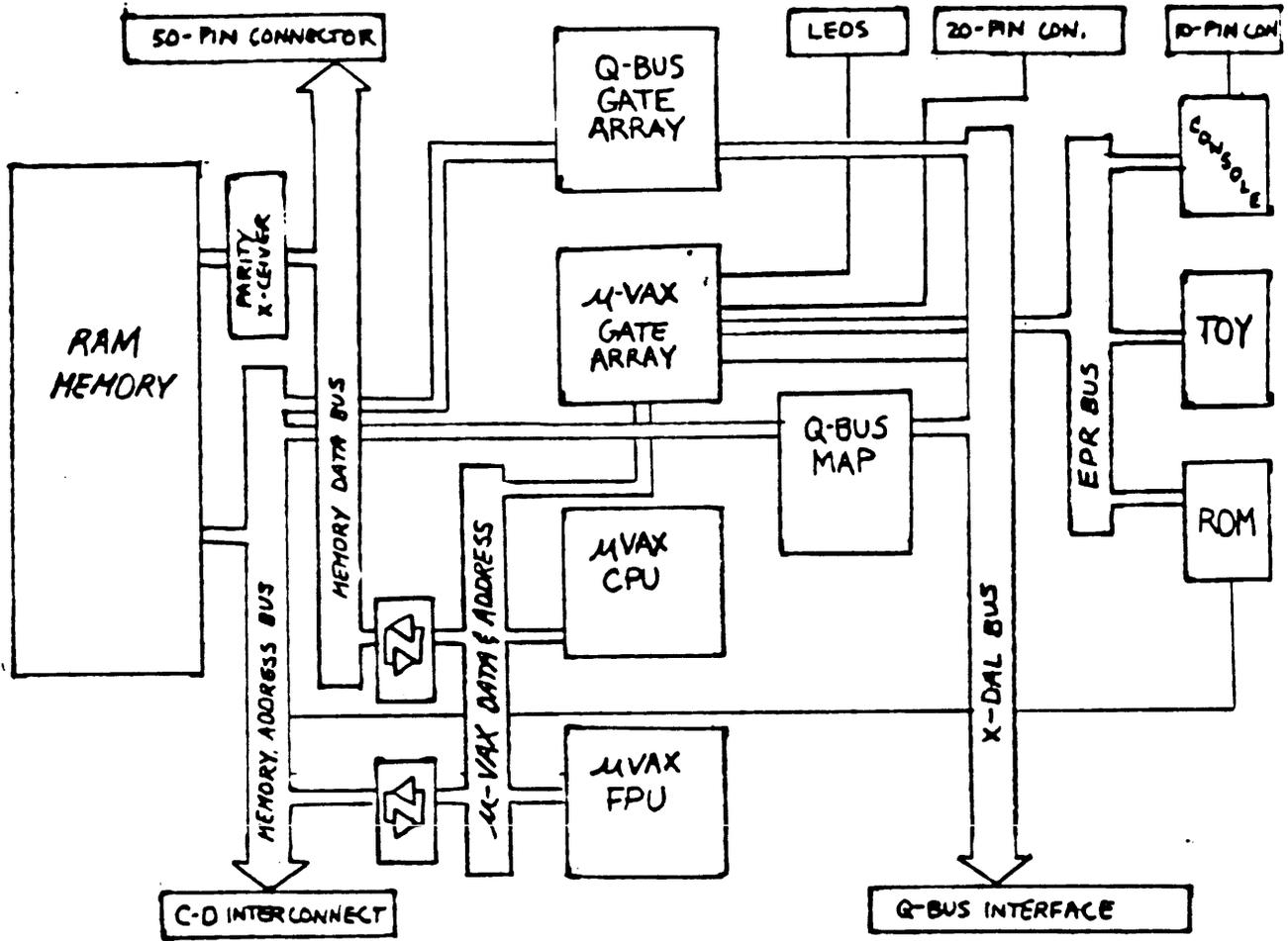


FIGURE 3-1 A Block diagram of the KA630-A CPU Module.

The KA630-A supports the following VAX data types:

- \* byte, word, longword, quadword
- \* character string
- \* variable length bit field
- \* f\_floating, d\_floating and g\_floating (KA630-AA only)

The remaining VAX data types are supported through software emulation.

The KA630-A implements the following subset of the VAX instruction set:

- \* integer
- \* address
- \* variable length bit field
- \* control and procedure call
- \* queue
- \* MOVC3/MOVC5
- \* floating point (KA630-AA only)

The remaining VAX instructions, including floating point instructions for the KA630-AB version, are supported through software emulation.

The KA630-A CPU communicates with mass-storage and peripheral devices via the Q22-bus. The KA630-A communicates with MS630 memory modules through a MicroVAX local memory interconnect in the CD rows of backplane slots 1 through 3, and through a cable between the CPU and MS630 memory modules.

The KA630-A (Figure 3-2) CPU contains three connectors:

- \* J1, for a cable connecting to an MS630 memory module.
- \* J2, for a cable to the configuration and display connector on the CPU Rear I/O Distribution Insert.
- \* J3, for a cable to the internal console SLU connector on the CPU Patch Panel Insert.

CAUTION: The KA630-A CPU module can only be installed into a slot that contains the MicroVAX local memory interconnect. It is normally installed in slot 1. It must not be installed in:

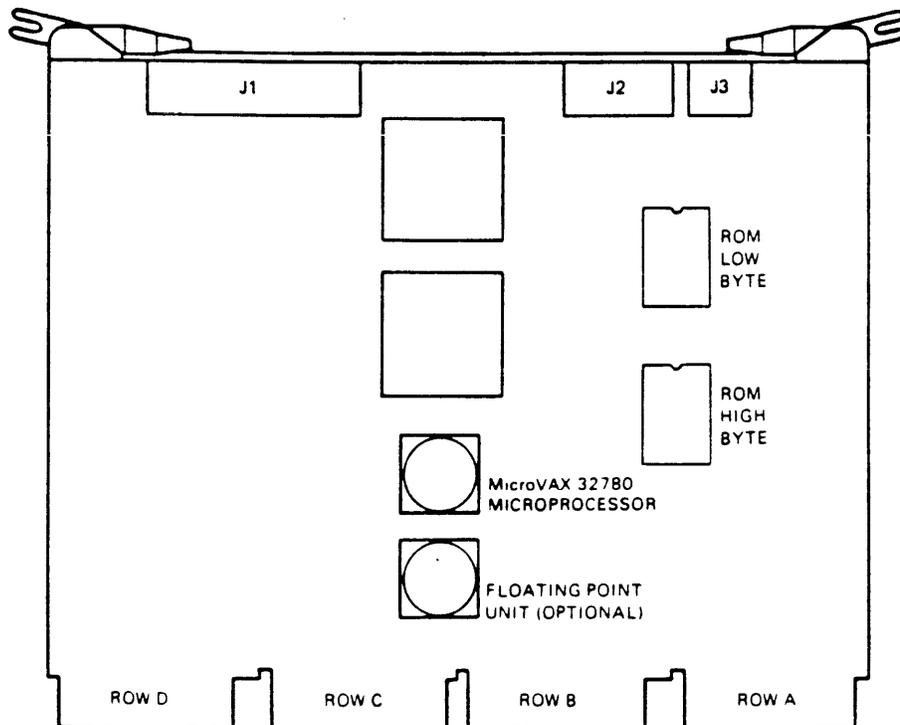
slots 4 - 8 of a BA23 enclosure

slots 4 -12 of a BA123 enclosure

slots 4-8 of the first backplane or any slots of the second backplane of a H9642 enclosure.

CAUTION: Static electricity can damage integrated circuits contained on modules installed in the BA23 enclosure and in mass storage devices. Always use a grounded wrist strap (29-11762-00) and grounded work surface when accessing any internal part of a computer system.

Figure 3-2 KA630-A CPU Module



MR 11307

### 3.2.1 Console Program

The console program, resident in two ROM chips on the module, receives control whenever the processor halts. For the KA630-A CPU, a halt means only that processor control has passed to the console program, not that instruction execution stops. The processor halts as a result of the following:

- \* system power-up or restart button pushed
- \* an external halt signal
- \* execution of a halt instruction
- \* a system error

At power-up, the system enters one of three power-up modes, which are set using a switch on the CPU Patch Panel Insert (section 3.2.3). The console program then determines console device type and console language.

If the console device supports the Multinational Character Set (MCS), the console program may be directed to output the console program in any one of 11 languages. The user language is recorded in battery backed up RAM (see section 3.2.3) so that the selected language is retained when the system is shut off.

If the console device does not support the MCS, no language prompt will occur and the console program will default to English.

The message "Performing normal system tests." is displayed. A countdown of ongoing diagnostic tests is displayed on the console terminal, on the CPU Patch Panel Insert LED Display, and on the CPU module's LEDs. These diagnostics test the CPU, the memory system and the Q22-bus interface. The diagnostic test codes and the corresponding messages are described in Chapter 7.

If the halt has been caused by a condition other than power-up, the console program will branch directly to service the halt. The console program may branch to diagnostics, to a restart sequence, to a primary bootstrap routine, or to 'console I/O' mode, depending on the nature of the halt.

If halts are enabled by the switch on the CPU Rear Distribution Insert (Section 3.2.3), the console program will enter 'console I/O mode' in response to any halt condition, including system power-up. Console I/O mode allows the user to control the system through the console terminal using a console command language (described in Appendix A). The console I/O mode prompt is " >>> ".

### 3.2.2 Primary Bootstrap Program (VMB)

If halts are disabled by the CPU Patch Panel switch, and the diagnostic tests are completed successfully, the console program will try to load and start (bootstrap) an operating system. To do so, it searches for a 64 Kbyte segment of correctly functioning system memory. It then copies a primary bootstrap program, called VMB, from the console program ROM into the base address of the segment plus 512. The console program then branches to VMB, which attempts to bootstrap an operating system from one of the following devices, in the order shown.

Table 3-1 Console Program Boot Sequence

	Controller Type	Controller	Unit Designation/ Device
1.	MSCP (Disk)	RQDX	DUm <sub>n</sub> (RX50 diskette drive)
2.			DUm <sub>n</sub> (RD5 <sub>n</sub> drive)
3.		KDA	DJm <sub>n</sub> (RA60 disk drive)
4.			DUm <sub>n</sub> (RA81 disk drive)
5.	MSCP (Tape)	TQK50	MUm <sub>n</sub> (TK50 tape drive)
6.	PROM	MRV11	PRm <sub>n</sub> (User defined)
7.	Ethernet adapter	DEQNA	XQm <sub>n</sub> (network)

\* m = controller designator (A = first, B = second etc.)  
n = unit number on specified controller

When VMB determines that a controller is present, it searches in order of increasing unit number for an bootable unit with a removable volume. If it finds none, it will repeat the search for a non-removable volume.

In console I/O mode, the system can also be directed to boot a specific device. To do so, use the boot command, followed by the unit designation for the device listed in Table 3-1 (for example, b dua0).

When the operating system is booted, the processor no longer executes instructions from the console program ROM. The processor is then in 'program I/O mode', in which terminal interaction is handled by the operating system.

### 3.2.3 CPU Rear I/O Distribution Insert

The CPU Rear I/O Distribution Insert (Figure 3-3) is mounted in the I/O distribution panel of the system enclosure.

The CPU Insert contains the following:

- 3 switches
- 1 LED display
- 1 external connector
- 2 internal connectors
- 1 battery backup unit (BBU)

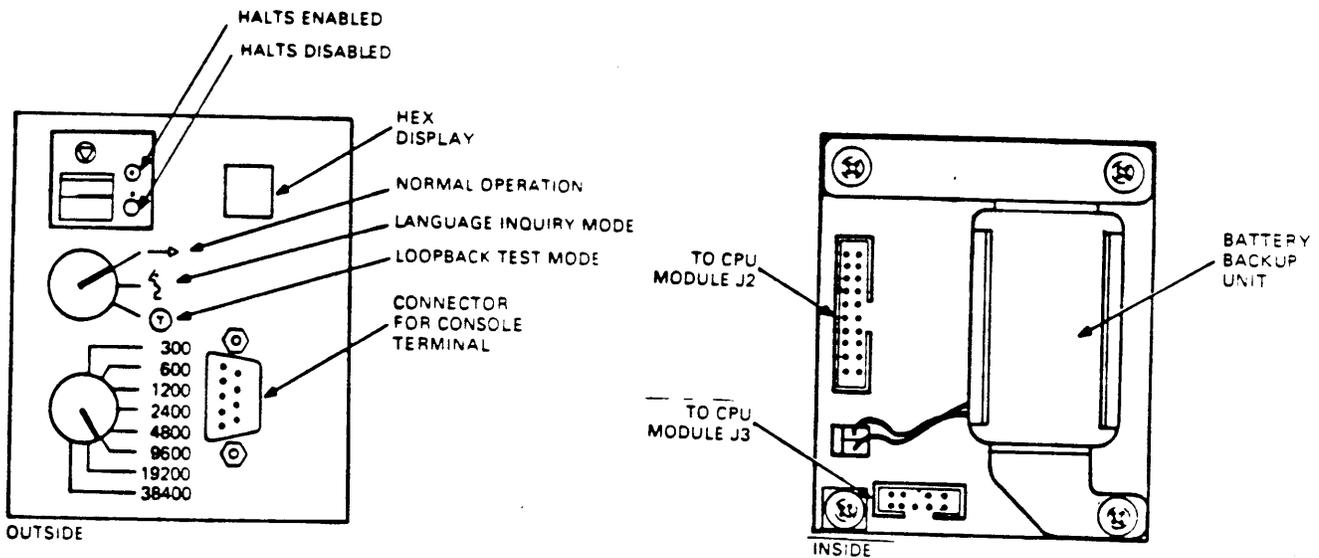


Figure 3-3 CPU Rear I/O Distribution Insert.

The three switches on the CPU Rear I/O Distribution Insert provide the following functions:

1 Halt Enable/Disable - (2-position toggle)

Switch Position -----	Function -----
Dot outside circle	Halts are disabled (factory setting). On power-up or restart, the system will attempt to load software from one of the devices at the completion of start-up diagnostics.
Dot inside circle	Halts are enabled. On power-up or restart, the system will enter console I/O mode at the completion of start-up diagnostics.

2 Power-Up Mode Selection - (3-position rotary)

Switch Position -----	Mode -----
(arrow)	Run (factory setting). If the console terminal supports the MCS, the user will be prompted for language only if the battery backup has failed. Full start-up diagnostics are run.
(face)	Language inquiry. If the console terminal supports MCS, the user will be prompted for language on every power-up and restart. Full start-up diagnostics are run.
(T in a circle)	Test. ROM programs run wrap-around serial-line unit (SLU) tests.

3 Baud Rate Select - (8-position rotary)

Sets the baud rate of the console terminal serial-line. The factory setting is 4800 baud. The baud rate of this switch must match that of the console terminal.

## LED Display

Displays numbers of on-going steps of power-up tests and booting procedures. If a failure occurs, the display indicates the field replaceable unit (FRU) that is the most probable cause of the failure. Chapter 7 lists the definitions of the test numbers.

### Console SLU Connector - (external)

9-pin connector for a cable to the console terminal.

### Console SLU Connector - (internal)

9-pin connector for a cable to connector J3 of the KA630-A CPU.

### Configuration and Display Connector - (internal)

20-pin connector for a cable to connector J2 of the KA630-A CPU. Connects the three switches and the LED display to the CPU.

### Battery Backup Unit (BBU) - (internal)

Provides power to the time-of-year (TOY) clock chip on the KA630-A CPU when the system is off. The code for the user's language is stored in RAM on this chip and is lost if the BBU fails.

For further information, refer to the MicroVAX 630 CPU Module User's Guide (EK-KA630-UG).

### 3.3 MS630 MEMORY MODULE

The MS630 memory module provides memory expansion for the KA630-A CPU module. It is available in three versions (Table 3-2), all populated with 256K RAM chips.

Table 3-2 MS630 Memory Module Versions

Version	Storage (Mbyte)	Module Height	Module Number
MS630-AA	1	Dual	M7607-AA
-BA	2	Quad	M7608-AA
-BB	4	Quad	M7608-LA

One or two MS630 modules can be used in the MicroVAX system. The MS630 modules interface with the KA630-A CPU through the MicroVAX local memory interconnect in the CD rows of slots 1 through 3 of the backplane, and through a 50-pin cable. This cable is installed between J1 of the KA630-A CPU and the corresponding J connector on one or both MS630 modules.

No hardware settings on the module are necessary.

#### CAUTION

MS630-B modules can only be installed in slots 2 or 3. They must not be installed in Q22-bus slots. MS630-AA can only be installed in the CD rows of slots 2 or 3.

## Chapter 4 - SUPPORTED OPTIONS

### 4.1 INTRODUCTION

This chapter describes the options currently supported by MicroVAX II. These options, as well as commonly used peripheral devices, are broken down into the following categories:

1. Communications
2. Disk Storage Devices
3. Tape Storage Devices

Each option section includes a description of the option, as well as configuration set-ups, appropriate option designations for each cabinet (BA23-A or BA123-A), and available diagnostic support. References to further documentation for each device are also listed.

#### NOTE

Current and bus loads for the following options are listed in Chapter 5, Configuration.

#### 4.1.1 Ordering Options

Two items must be ordered to get all the parts necessary for most options: a base module and a cabinet kit.

Example:	DEQNA-M	base module
	CK-DEQNA-KB	BA23-A cabinet kit (type A filter connector and internal cable)

#### 4.1.2 Module Configuration

Each module in a system has a device address, commonly referred to as a control and status register (CSR) address, and an interrupt vector, which must be set when the module is installed. The CSR address and interrupt vector are either fixed or floating.

A fixed address or vector means that there is an address location reserved in memory for the address or vector of that particular module. Modules with fixed addresses and vectors are usually shipped with the correct configuration for use as the first module of that type. If two modules of the same type are used, the factory setting for the second module must be changed.

A floating address or vector is assigned a location within an octal range. The exact address or vector within the range will depend on what other modules are in the system. The ranges are as follows:

floating CSR address: (1776)0010 - (1776)3776

floating interrupt vector: (00000)300 - (00000)774

Chapter 5 provides guidelines for determining floating CSR address and interrupt vector settings.

The address and vector settings are usually configured by means of switches or jumpers on the module. For example, the 22-bit setting for a CSR address of 17761540 is as follows:

21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	1	1	0	0	0	0	0
-----																					
^		^		^		^		^		^		^		^		^		^		^	
1		7		7		6		1		5		4		0							
-----																					

It is not necessary to change bits 21 - 13. It is only necessary to be able to change bits A12 - A2 to set the CSR address within a typical range. A typical switch setting would only show the following switches:

Switch	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	<- Add. bits
setting ->	0	0	0	1	1	0	1	1	0	0	
-----											
	^	^	^	^	^	^	^	^	^	^	
	6 *		1			5				4	
-----											

\* if A12 were set to a 1, this would be a 7

Similarly, an interrupt vector of 320 is typically configured using only the following bits:

Switch	V8	V7	V6	V5	V4	V3	<- Vector bits
setting ->	0	1	1	0	1	0	
-----							
	^	^	^	^	^	^	
		3			2		
-----							

**NOTE**

The switch layout for different modules varies. The line below the switch setting for each module shows the octal boundaries.

## 4.2 COMMUNICATIONS

### 4.2.1 DEQNA Ethernet Interface

Order:	DEQNA-M	base module
	CK-DEQNA-KB	BA23-A cabinet kit (type A filter connector and internal cable)
	CK-DEQNA-KA	BA123-A cabinet kit (type A filter connector and internal cable)
	CK-DEQNA-KF	H9642 cabinet kit (type A filter connector and internal cable)
Module Number:	M7504	
Diagnostics:	MicroVAX Maintenance System, all revs. 3 module LEDs	

The DEQNA is a dual-height module used to connect a Q-bus system to a local area network (LAN) based on Ethernet. The Ethernet is a communications system which allows data exchange between computers within a moderate distance (2.8 km/ 1.74 mi). The DEQNA can transmit data at a rate of 1.2 Mbytes per second, through coaxial cable. For high Ethernet traffic, an additional DEQNA may be installed.

The module is configured using three jumpers, W1 through W3 (Figure 4-1).

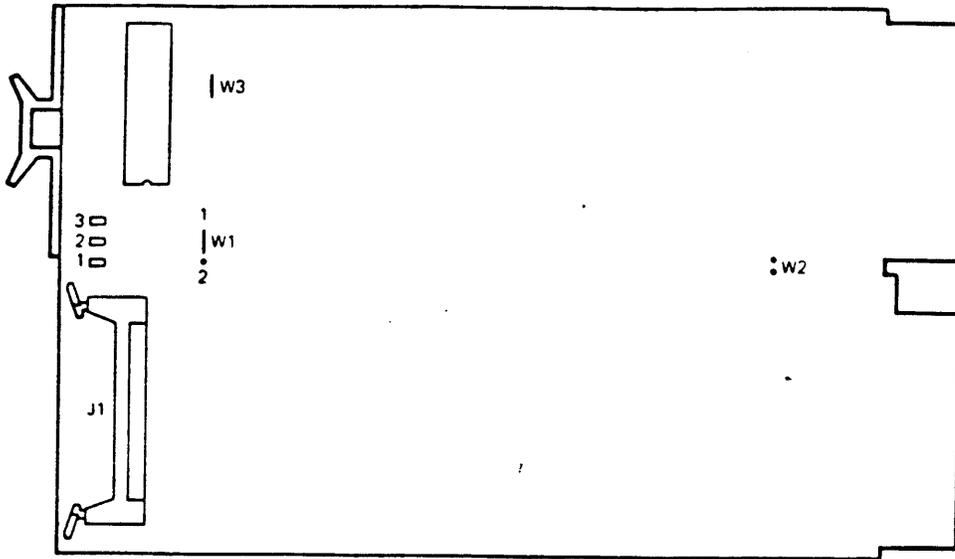


Figure 4-1 DEQNA Module Layout (M7504)

Jumper 1 (W1) determines the CSR address assignment. The DEQNA CSR addresses are fixed, as follows:

Module	CSR Address
1	17774440
2	17774460

If two DEQNAs are to be installed, move jumper W1 of the second DEQNA onto the left and center pins (Figure 4-1).

The interrupt vector is written into a read/write register by software. No hardware configuration is required. The interrupt vectors are as follows:

Module	Interrupt Vector
1	120
2	floating

Jumper W2 is normally removed. When removed, it provides 'fair' access to all DMA devices using the Q22-bus by causing the DEQNA to wait 5 usecs. before re-requesting the bus. Jumper W3 is normally installed. When installed it disables a sanity timer at initialization. Figure 4-2 shows the internal cabling for the DEQNA.

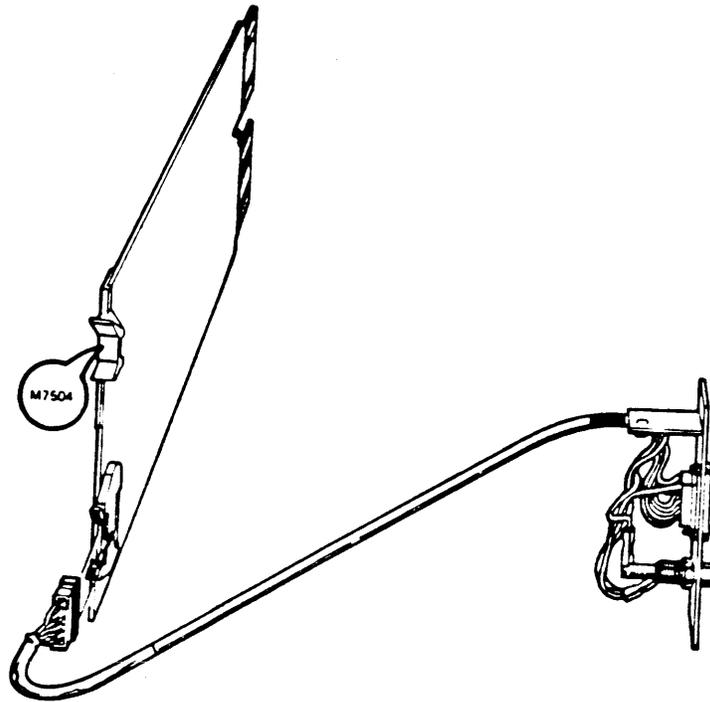


Figure 4-2 DEQNA Internal Cabling

For further information, refer to the DEQNA User's Guide (EK-DEQNA-UG).

#### 4.2.2 DHV11 Asynchronous Multiplexer - (eight lines)

Order:       DHV11-M               Base module

          CK-DHV11-AB       BA23-A cabinet kit (2 type B filter  
                                  connectors, 2 internal cables)

          CK-DHV11-AA       BA123-A cabinet kit (2 type B filter  
                                  connectors, 2 internal cables)

          CK-DHV11-AF       H9642 cabinet kit (2 type B filter  
                                  connectors, 2 internal cables)

Module Number:               M3104

Diagnostics:                MicroVAX Maintenance System, all revs.

                              1 module LED

The DHV11 (Figure 4-3) is an asynchronous multiplexer that provides support for up to eight serial lines, for data communications. It is a quad-height module with the following features:

- \* full modem control
- \* DMA or silo output
- \* silo input buffering
- \* split speed

The DHV11 is compatible with the following modems:

Digital modems:   DF01  
                  DF02  
                  DF03  
                  DF112

Bell modems:     103  
                  113  
                  203c  
                  202d  
                  212

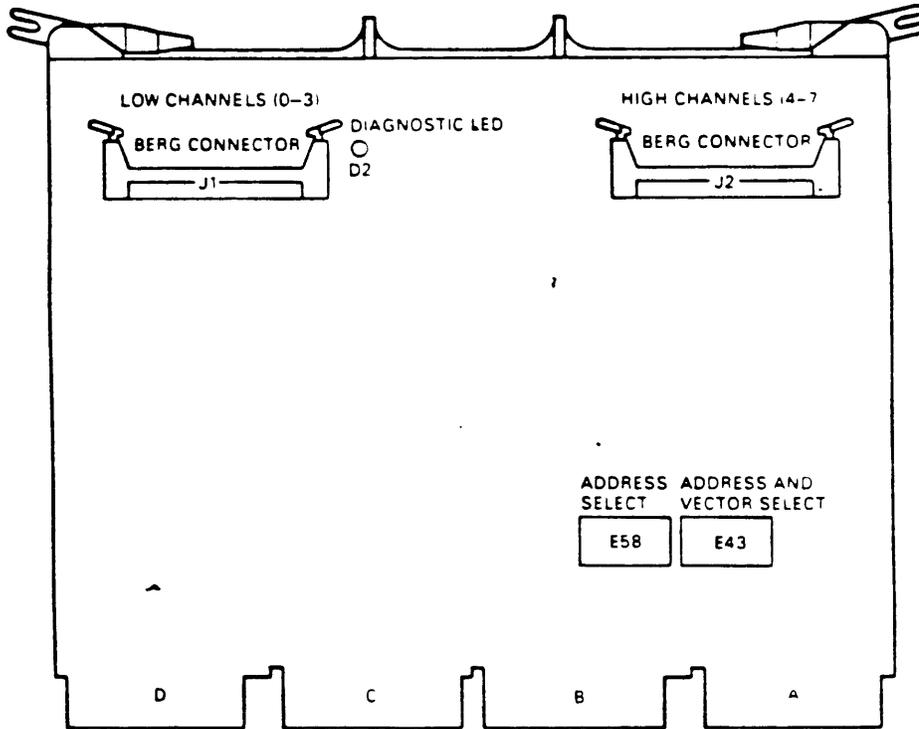


Figure 4-3 DHV11 Module Layout (M3104)

The CSR address and interrupt vector of the module are set using two DIP switches, E58 and E43 (Figure 4-3). The CSR address and interrupt vector are floating. Tables 4-1 and 4-2 show the factory and common settings.

Table 4-1 DHV11 CSR Address

CSR Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	<-Add. bits E43 1 <- Switches
	E58 1	2	3	4	5	6	7	8		
17760440	0	0	0	0	1	0	0	1	0	
17760460	0	0	0	0	1	0	0	1	1	(factory)
17760500	0	0	0	0	1	0	1	0	0	
17760520	0	0	0	0	1	0	1	0	1	
17760540	0	0	0	0	1	0	1	1	0	
17760560	0	0	0	0	1	0	1	1	1	

1 = switch on    0 = switch off

Table 4-2 DHV11 Interrupt Vector

Settings	V8	V7	V6	V5	V4	V3	<- Switch *
	E43-3	4	5	6	7	8	
300	0	1	1	0	0	0	(factory)
310	0	1	1	0	0	1	
320	0	1	1	0	1	0	
330	0	1	1	0	1	1	
340	0	1	1	1	0	0	
350	0	1	1	1	0	1	

1 = switch closed    0 = switch open

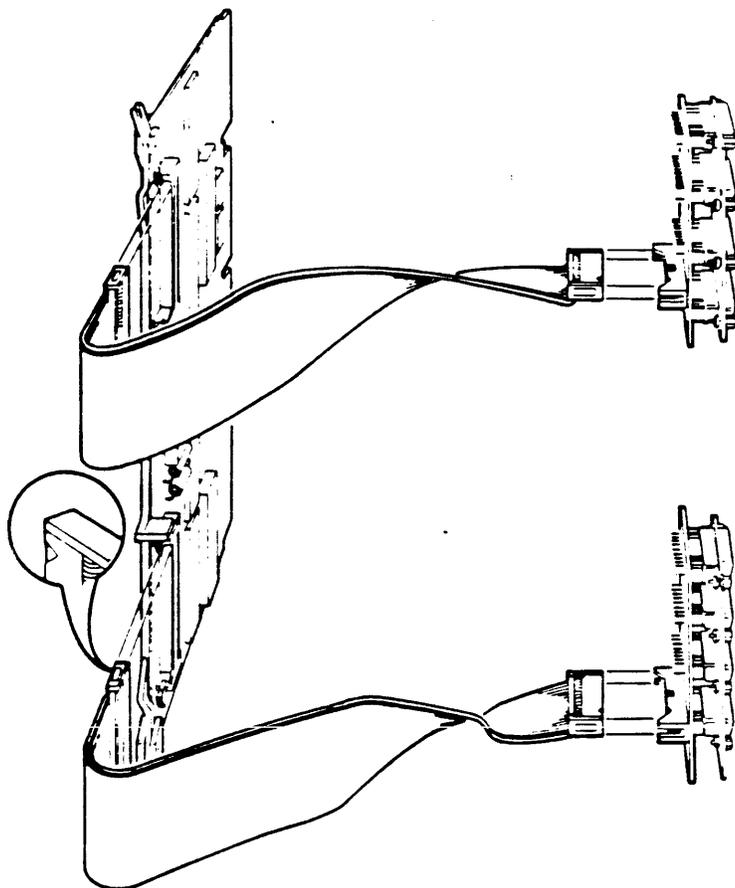
\* E43 switch 2 is not used

**NOTE**

The actual address and vector of the DHV11 will depend on what other modules are installed in the system. Refer to Chapter 5 for guidelines for setting the address and vector.

Figure 4-4 shows the internal cabling for the DHV11. The internal cables should be installed with the red stripe side connected to pin A (pin 1) of the DHV11 connectors. The other end of the cables should then be installed with the red stripe aligned with the small arrow (pin 1) on the filter connector.

Figure 4-4 DHV11 Internal Cabling



For further information, refer to the DHV11 Technical Manual (EK-DHV11-TM).

#### 4.2.2.1 DHV11 Remote Distribution Cabinet Kit

Order: CK-DHV11-VB (cabinet kit for BA23-A enclosure)  
CK-DHV11-VA (cabinet kit for BA123-A enclosure)  
CK-DHV11-AF (cabinet kit for H9642 enclosure)

The DHV11 Remote Distribution Cabinet Kit (figure 4-5) allows eight data-only serial lines to be distributed from one type B filter connector using a remote distribution panel. This increases the number of DHV11 serial-lines that can be connected to a MicroVAX enclosure, without using additional distribution inserts.

The DHV11 Remote Distribution Cabinet Kit contains the following:

H3176 Bulkhead Panel (fits into 1 type B I/O panel cutout)  
H3175 Remote Distribution Panel (contains 8 25-pin D-sub connectors)

BC22H-10 10' Cable (connects the Remote Panel to the Bulkhead Panel)  
BC05L-01 12" Cables (2) (connect the DHV11 to the BA23-A Bulkhead Panel)  
Or  
BC05L-1K 21" Cables (2) (connect the DHV11 to the BA123-A Bulkhead panel)  
Or  
BC05L-03 36" Cables (2) (connect the DHV11 to the H9642 Bulkhead panel)

The H3176 Bulkhead Panel is a type B panel consisting of two 40-pin headers and a fully filtered female 25-pin D-sub connector. It is connected to a DHV11 by two BC05L-0n cables, which supply eight pairs of data signals (transmit/receive) plus signal ground for each pair.

The H3175 Remote Distribution Panel distributes the eight pairs of data signals plus signal ground for each pair to eight male 25-pin D-sub connectors. It is connected to the Bulkhead Panel by the BC22H-10 cable. The Remote Distribution Panel has teardrop cutouts on both ends, and can be mounted vertically or horizontally on a wall or floor. The remote Distribution Panel measures 11"L X 3.4"W X .7"H (279mm X 86mm X 17.7mm).

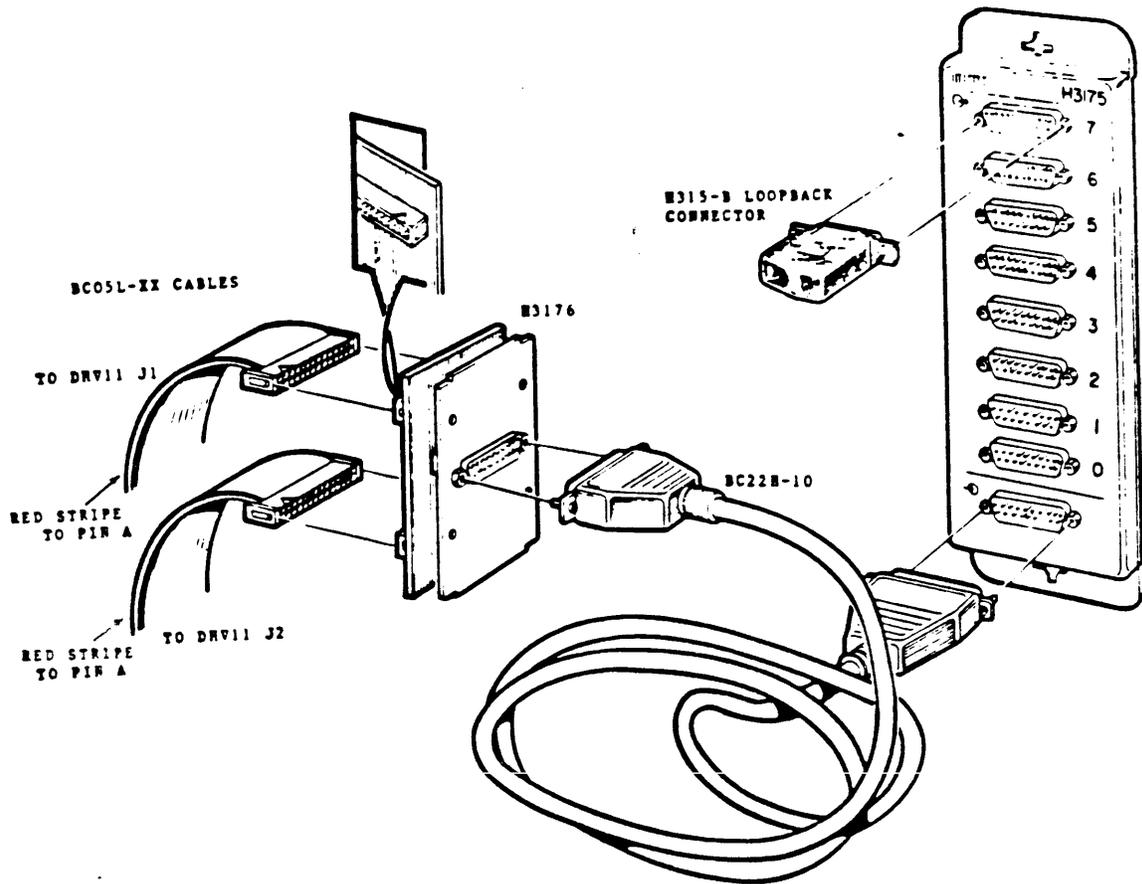


Figure 4-5. The DHV11 Expander Cabinet Kit.

#### 4.2.3 DLVJ1 ASYNCHRONOUS INTERFACE - (FOUR LINES)

Order:	DLVJ1-M	base module
	CK-DLVJ1-LB	BA23-A cabinet kit (type B filter connector, internal cable)
	CK-DLVJ1-LA	BA123-A cabinet kit (type A filter connector, internal cable)
	CK-DLVJ1-LF	H9642 cabinet kit (type B filter connector, internal cable)
	Diagnostics:	MicroVAX Maintenance System, all revs.
	Module Number:	M8043

The DLVJ1 (formerly DLV11-J) is a dual-height module that connects a Q-bus to up to four asynchronous serial lines (channels 0 - 3), for data communications. The serial lines must conform to EIA and CCITT standards. The DLVJ1 acts as four separate devices. The factory configuration of the module sets CH-3 as the console serial line unit (SLU).

#### NOTE

The DLVJ1 is not supported by the MicroVMS operating system.

The DLVJ1 module is configured using wire-wrap pins (Figure 4-6). The CSR address for two DLVJ1 modules are fixed. Table 4-3 lists the factory setting for the CSR address of the first channel (CH-0). The CSR address of the other channels is 10 (octal) greater. For example, if CH-0 is set at 17776500, the CH-1 CSR address will be 17776510, CH-2 will be 17776520 etc., with the following exception: when CH-3 is configured as the console device, its address is fixed at 17777560, regardless of the setting of the other channels.

Table 4-3 DLVJ1 CSR Address

Module	CH-0 CSR Address	A12	A11	A10	A9	A8	A7	A6	A5 <-Add. bits
1	17776500	1-x	1-x	1-x	0-x	1-x	R	x-h	0-x (factory*)
2	17776540	1-x	1-x	1-x	0-x	1-x	R	x-h	1-x

R = no wire-wrap = 0

x-y = wire-wrap on pins x and y

0-x = 0    1-x = 1

\* C1 and C2 are wire-wrapped on pins 1 and x. This sets the CH-3 CSR address to 17776500. To configure CH-3 as a non-console device, C1 and C2 should be wire-wrapped on pins 0 and x.

The interrupt vector is floating and is configured using wire-wrap pins. The interrupt vector of channel 0 can only be set at X00 or X40. The interrupt vector of the remaining channels is then 10 (octal) greater. For example, if the module is set at 300, then the interrupt vector of CH-1 is 310, CH-2 is 320 etc, with the following exception: when CH-3 is configured as the console device, its interrupt vector is fixed at 60, regardless of the setting of the other channels. The factory configuration is shown in table 4-4.

Table 4-4 DLVJ1 Interrupt Vector

Settings	V8	V7	V6	V5	V4	V3	← Vector bits
300	-	x-h	x-h	0-x	-	-	(factory*)
340	-	x-h	x-h	1-x	-	-	

x-h = jumper inserted between pins x and h = 1  
 0-x = jumper inserted between 0 and x = 0  
 1-x = jumper inserted between 1 and x = 1  
 \*CH-3 interrupt vector is 60 (receive) and 64 (transmit)

NOTE

The actual interrupt vector of the DLVJ1 depends on the other modules in the system. Refer to Chapter 5 for guidelines for determining the interrupt vector.

Figure 4-6 DLVJ1 Module Layout (M8043)

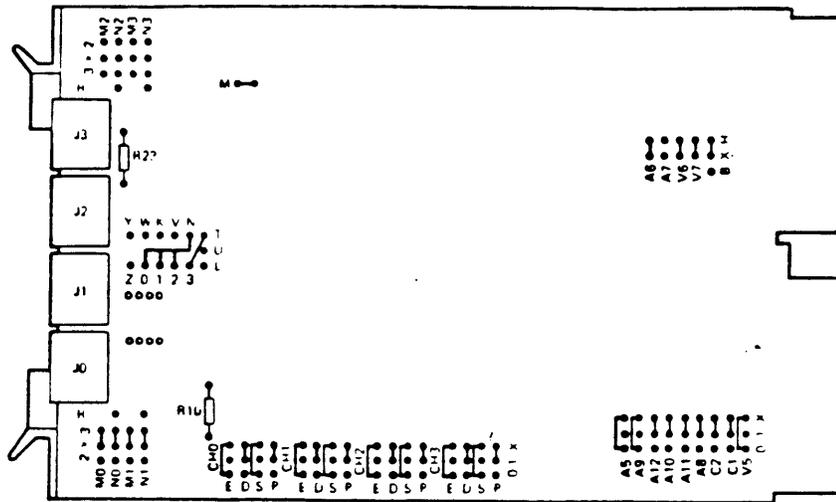
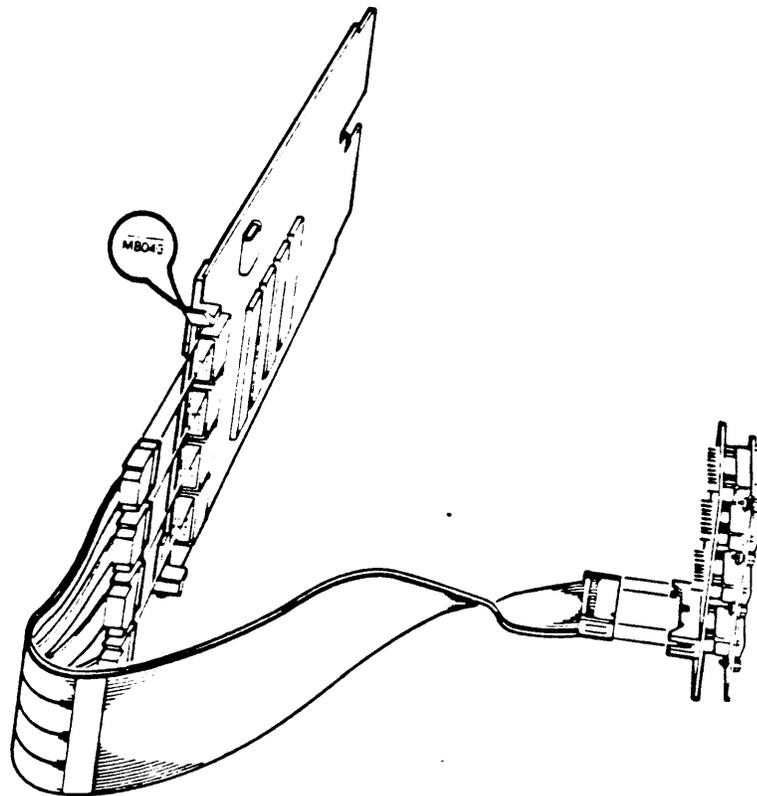


Figure 4-7 shows the internal cable set-up for the DLVJ1.

Figure 4-7 DLVJ1 Internal Cabling



For further information, refer to the DLV11-J Users Guide (EK-DLVIJ-UG).

#### 4.2.4 DMV11 Synchronous Controller

Order:       DMV11-M           base module

          CK-DMV11-xB       (BA23-A cabinet kit, see Table 4-5 for possible designations for x.)

          CK-DMV11-xA       (BA123-A cabinet kit, see Table 4-5 for possible designations for x.)

          CK-DMV11-xF       (H9642 cabinet kit, see Table 4-5 for possible designations for x.)

Module:     M8053 or  
            M8064

Diagnostics:                MicroVAX Maintenance System, Rev 1.02 and greater.

The DMV11 is a quad-height module that supports:

- \* full-duplex or half-duplex operations
- \* DMA
- \* point-to-point communications
- \* multipoint communications

It is available in four system options, each of which has a different interface capability. The option you choose depends on the interface requirements of your system. Table 4-5 lists the four system options and their corresponding upgrade components. Table 4-6 lists the interface for each system option, and the appropriate external cable.

Table 4-5 DMV11 Versions

Upgrade (base module + cabinet kit)	Module number	Module connector	I/O Panel insert type
DMV11-M + CK-DMV11-Ax	M8053	J2 (of 2)	B
-M + -Bx	M8053	J1 (of 2)	A
-N + -Cx	M8064	J1 (of 1)	B
-M + -Fx	M8053	J2 (of 2)	B

Table 4-6 DMV11 Interfaces

Order (base module + cabinet kit)	Interface	External cable
DMV11-M + CK-DMV11-Ax	EIA RS232-C/CCITT V.28	BC22E or BC22F
-M -Bx	CCITT V.35/DDS	BC17E *
-N -Cx	integral modem	BC55S or BC55T
-M -Fx	RS423-A/CCITT V.24	BC55D

\* cable included in the -BB, -BA, and -BF cabinet kits

The CSR address and interrupt vector of the DMV11 are configured by means of switches (figures 4-8, 4-9). The CSR address and interrupt vector are both floating. Tables 4-7 and 4-8 show the factory setting and another common setting.

Table 4-7 DMV11 CSR Address

CSR Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	<- Add. bits
									E54 (M8053)	E59 (M8064)	<- Switches
	8	7	6	5	4	3	2	1	2	1	
177760340	0	0	0	0	0	1	1	1	0	0	(factory)
177760360	0	0	0	0	0	1	1	1	1	0	

1 = on = closed      0 = off = open

Table 4-8 DMV11 Interrupt Vector

Interrupt Vector	V8	V7	V6	V5	V4	V3	<- Vector bits
							E54 (M8053)
	8	7	6	5	4	3	<- Switches
300	0	1	1	0	0	0	(factory)
310	0	1	1	0	0	1	

1 = on = closed      0 = off = open

**NOTE**

The actual settings will depend on the other modules in the system. Refer to Chapter 5 for guidelines for setting the CSR address and interrupt vector.

Another DIP switch on the DMV11 controls selectable features. Table 4-9 shows the function of this switch, and a common setting.

Table 4-9 DMV11 Switch Selectable Settings

```

-----
E107 (M8064)
E101 (M8053)
10*  9    8    7    6    5    4    3    2    1
off  off  on   on   on   on   on   on   on   on
-----
on = zero = function disabled
* unused on M8064
-----

```

Switch 10 OFF for EIA interface, ON for V.35  
 Switch 9 must be OFF for integral modem (M8064) or when running above 19.2K baud.  
 Switches 8, 7 and 6 set mode of operation when switch 1 is OFF.  
 Switch 5 OFF enables Remote Load Detect.  
 Switch 4 OFF enables Power On Boot.  
 Switch 3 OFF enables Auto Answer.  
 Switch 2 determines unit number for booting (ON = first DMV11, OFF = second DMV11).  
 Switch 1 OFF enables switches 8, 7, 6 to determine mode of operation. Switch 1 ON = mode of operation determined by software.

A DIP switch (E119 on M8064, E113 on M8053) determines the Digital Data Communications Message Protocol (DDCMP) address register tributary/password. This must be set to a unique site address. Further information is contained in the DMV11 Synchronous Controller's User's Guide (EK-DMV11-UG).

Figures 4-8 and 4-9 show the location of the DIP switches on the two DMV11 modules. Figures 4-10 and 4-11 show the internal cabling for the four DMV11 interfaces.

Figure 4-8 M8053 Module Layout

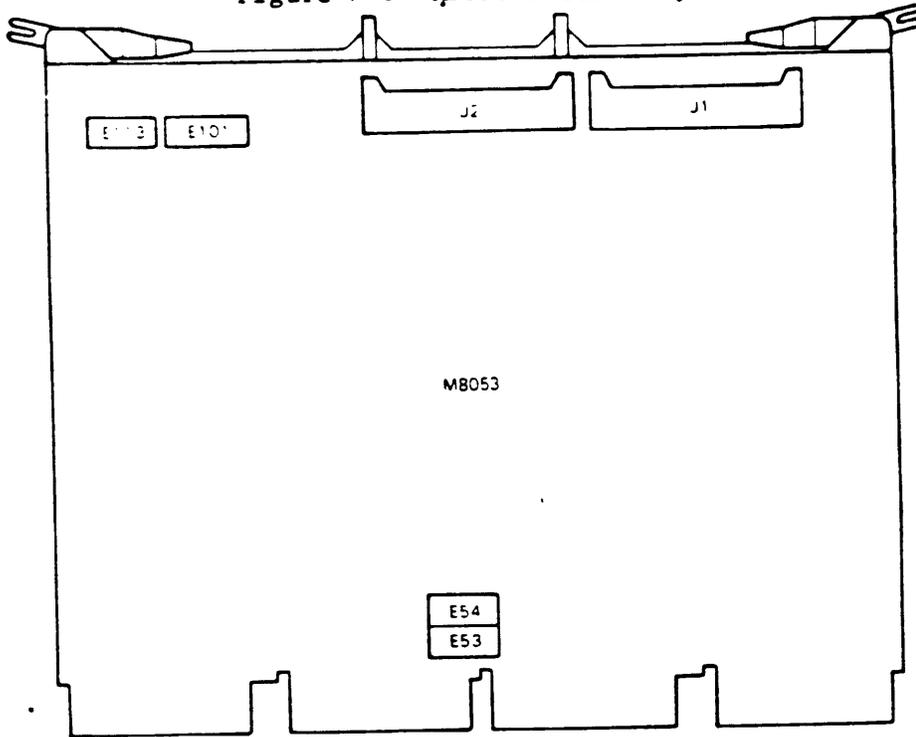


Figure 4-9 M8064 Module Layout

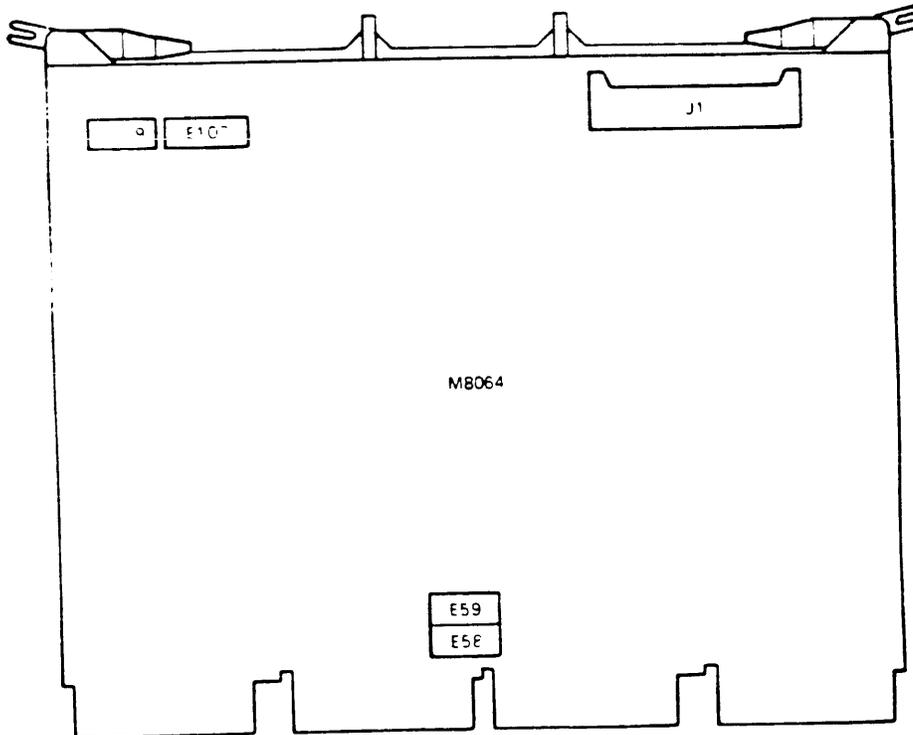


Figure 4-10 M8053 Internal Cabling

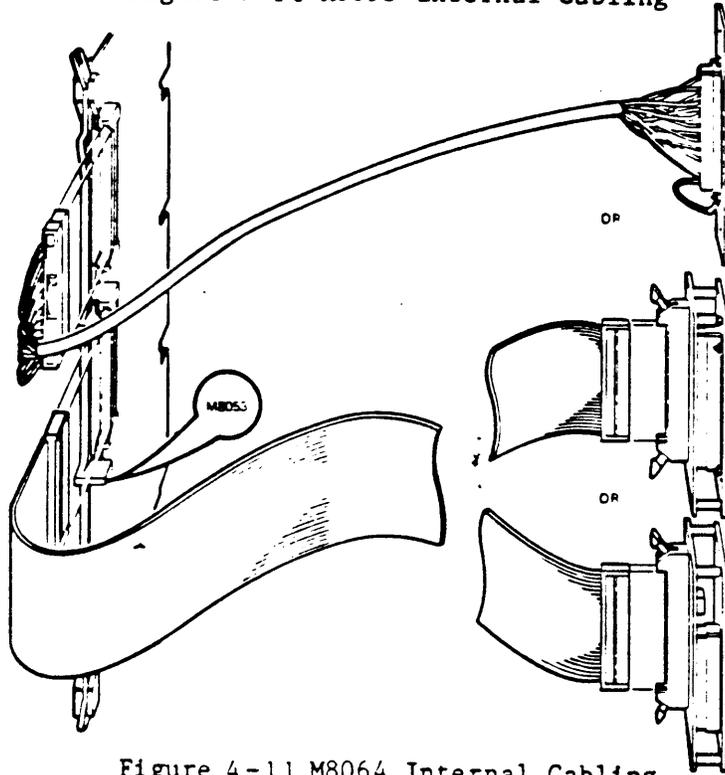
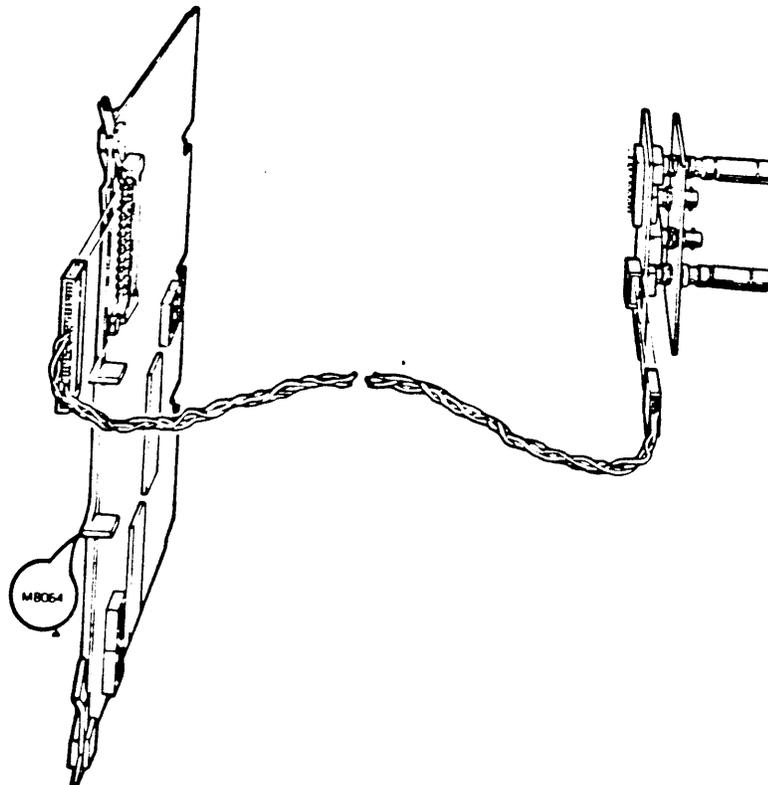


Figure 4-11 M8064 Internal Cabling



For further information, refer to the DMV11 Synchronous Controller Technical Manual (EK-DMV11-TM).

#### 4.2.5 DPV11 Synchronous Interface

Order:           DPV11-M           base module

                  CK-DPV11-AB       BA23-A cabinet kit (type A filter  
  connector, internal cable)

                  CK-DPV11-AA       BA123-A cabinet kit (type A filter  
  connector, internal cable)

                  CK-DPV11-AF       H9642 cabinet kit (type A filter  
  connector, internal cable)

Diagnostics:                        MicroVAX Maintenance System,  
  all revisions.

Module Number:                      M8020

The DPV11 is a dual-height module that connects the Q-bus to a modem, using a synchronous serial-line. The serial-line conforms to the following EIA standards:

                  RS-232-C  
                  RS-423-A  
                  RS-422-A

EIA compatibility is provided for use in local communications only (timing and data leads only). The DPV11 is intended for character-oriented protocols, such as Digital Data Communications Message Protocol (DDCMP), or communication protocols that are bit-oriented, such as Synchronous Data-Link Control (SDLC).



The CSR address and interrupt vector are both floating. Tables 4-10 and 4-11 show factory and common settings.

Table 4-10 DPV11 CSR Address

Setting	A12 W31	A11 W30	A10 W36	A9 W33	A8 W32	A7 W39	A6 W38	A5 W37	A4 W34	A3 W35	<- Add. bits <- Pin
17760010	0	0	0	0	0	0	0	0	0	1	(factory)
17760270	0	0	0	0	0	1	0	1	1	1	
17760310	0	0	0	0	0	1	1	0	0	1	

1 = jumper inserted between pin Wxx and pin 29 (ground)  
 0 = jumper removed

Table 4-11 DPV11 Interrupt Vector

Interrupt Vector	V8 W34	V7 W42	V6 W41	V5 W40	V4 W44	V3 W45	<- Vector bits <- Pin
300	0	1	1	0	0	0	(factory)
310	0	1	1	0	0	1	

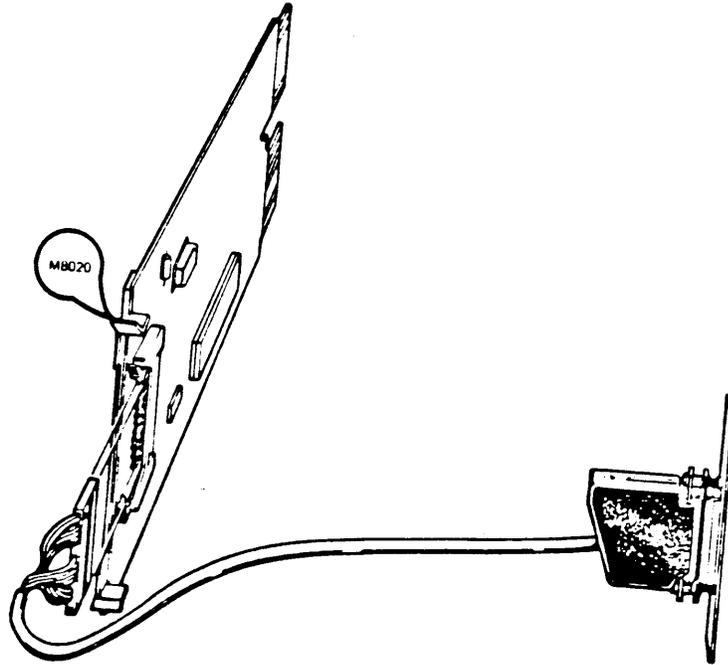
1 = jumper inserted between pin Wxx and pin 46 (ground)  
 0 = jumper removed

NOTE

The actual settings of the DPV11 will depend on the other modules in the system. Refer to Chapter 5 for guidelines for setting the CSR address and interrupt vector.

Figure 4-13 shows the internal cabling of the DPV11.

Figure 4-13 DPV11 Internal Cabling



For further information, refer to the DPV11 Synchronous Interface Users Manual (EK-DPV11-UG).



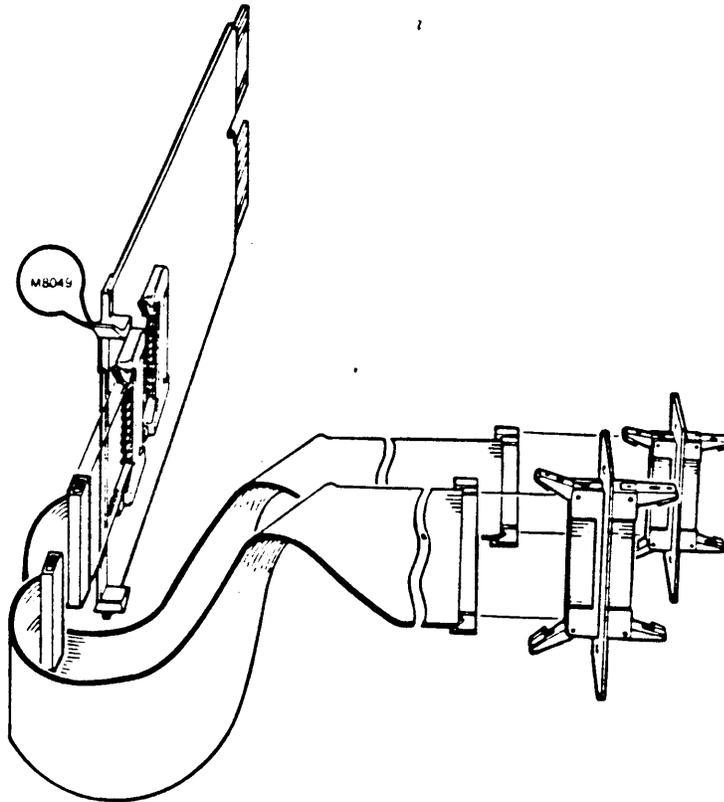
Table 4-12 DRV11-J CSR Address

Module	Starting Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	← Add. bits	
		W1	W2	W3	W4	W5	W6	W7	W8	W9	← Jumpers	
1	17764160	0	1	0	0	0	0	1	1	1	(factory)	
2	17764140	0	1	0	0	0	0	1	1	0		

1 = installed      0 = removed

Figure 4-15 shows the internal cabling layout for the DRV11-J.

Figure 4-15 DRV11-J Internal Cabling



For further information, refer to the DRV11-J Interface User's Manual (EK-DRV1J-UG).

#### 4.2.7 DZQ11 Asynchronous Multiplexer - (four lines)

Order:       DZQ11-M               base module

          CK-DZQ11-DB       BA23-A cabinet kit (1 type B filter connector, 1 internal cable)

          CK-DZQ11-DA       BA123-A cabinet kit (1 type B filter connector, 1 internal cable)

          CK-DZQ11-DF       H9642 cabinet kit (1 type B filter connector, 1 internal cable)

Diagnostics:                   MicroVAX Maintenance System, all revisions.

Module Number:                M3106

The DZQ11 is a dual-height module that connects the Q22-bus to up to four asynchronous serial lines. It conforms to the RS-232-C and RS423-A interface standards. The DZQ11 permits dial-up (auto-answer) operation with modems using full-duplex operations such as Bell models 103, 113, 212 or equivalent.

The CSR address and interrupt vector of the module are set using two DIP switches, E28 and E13 (figure 4-16). The CSR and interrupt vector are floating. Tables 4-13 and 4-14 show the factory and common settings.

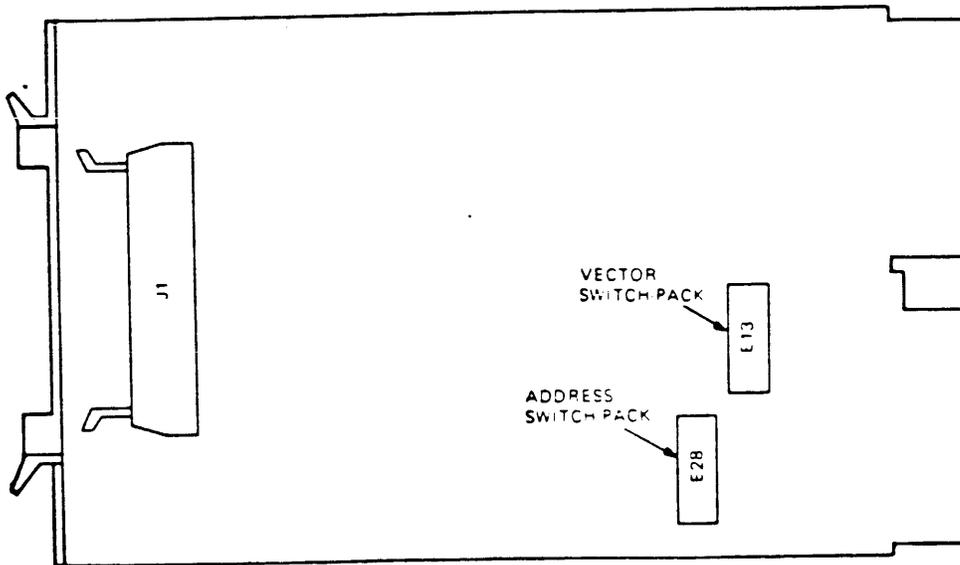


Figure 4-16 DZQ11 Module Layout (M3106)

Table 4-13 DZQ11 CSR Address

CSR Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	<-address bits
	E28	1	2	3	4	5	6	7	8	9	10 <-switches
17760010	0	0	0	0	0	0	0	0	0	1	(factory)
17760100	0	0	0	0	0	0	1	0	0	0	
17760110	0	0	0	0	0	0	1	0	0	1	
17760120	0	0	0	0	0	0	1	0	1	0	

0 = switch open    1 = switch closed

Table 4-14 DZQ11 Interrupt Vector

Interrupt Vector	V8	V7	V6	V5	V4	V3	<-vector bits
	E13	1	2	3	4	5	6 <- switches
300	0	1	1	0	0	0	(factory)
310	0	1	1	0	0	1	
320	0	1	1	0	1	0	
330	0	1	1	0	1	1	

0 = switch open    1 = switch closed

E13 switch 7 is not used. E13 switch 8 must be ON, and E13 switches 9 and 10 must be OFF for normal operation.

Figure 4-17 shows the internal cabling for the DZQ11.

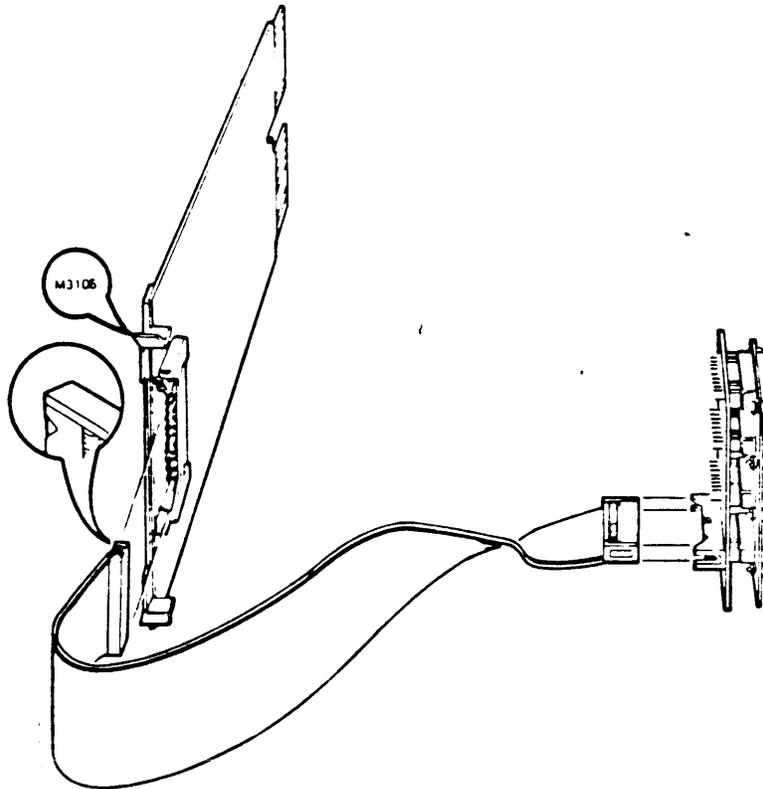


Figure 4-17 DZQ11 Internal Cabling (M3106)

For further information, refer to the DZQ11 Asynchronous Multiplexer User's Guide (EK-DZQ11-UG).

2.8 DZV11 Asynchronous Multiplexer - (four lines)

Order: DZV11-M base module  
 CK-DZV11-DB BA23-A cabinet kit (1 type B filter connector, 1 internal cable)  
 CK-DZV11-DA BA123-A cabinet kit (1 type B filter connector, 1 internal cable)  
 CK-DZV11-DF H9642 cabinet kit (1 type B filter connector, 1 internal cable)

Module Number: M7957

Diagnostics: MicroVAX Maintenance System, rev 1.06 and higher revisions.

The DZV11 (Figure 4-18) is a quad-height module that connects a Q22-bus to up to four asynchronous serial-lines. It conforms to the RS-232 interface standard, and permits dial-up (auto-answer) operation with modems using full-duplex operations.

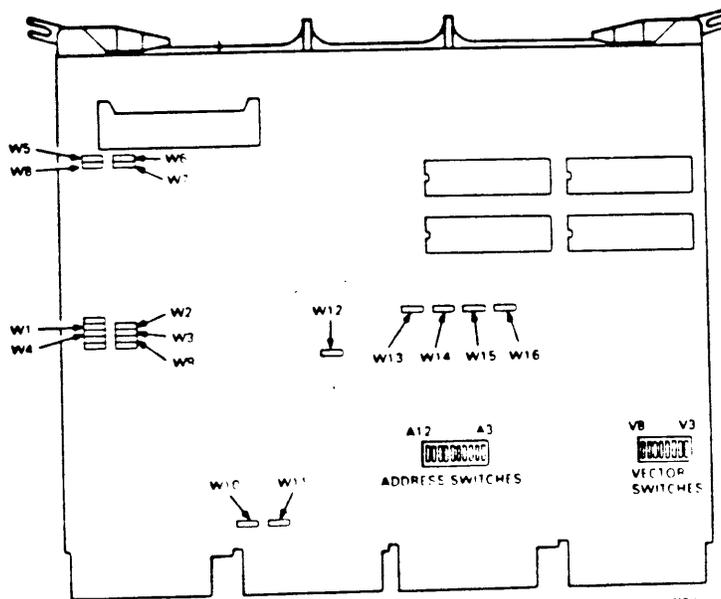


Figure 4-18 DZV11 Module Layout (M7957)

The DZV11 is configured using 16 jumpers and 2 DIP switches.

The CSR address and interrupt vector of the DZV11 are both floating. Tables 4-15 and 4-16 list the factory settings.

Table 4-15 DZV11 CSR Address

CSR Address	A12 E30	A11	A10	A9	A8	A7	A6	A5	A4	A3	<- Add. bits <- Switches
17760010	0	0	0	0	0	0	0	0	0	1	(factory)
17760100	0	0	0	0	0	0	1	0	0	0	

1 = switch closed    0 = switch open

Table 4-16 DZV11 Interrupt Vector

Interrupt Vector	V8 E2	V7	V6	V5	V4	V3	<- Vector bits <- Switches
300	0	1	1	0	0	0	(factory)
310	0	1	1	0	0	1	

1 = switch closed    0 = switch open

NOTE

The actual settings of the DZV11 will depend on the other modules in the system. Refer to Chapter 5 for guidelines for setting the CSR address and interrupt vector.

Figure 4-19 shows the internal cabling layout.

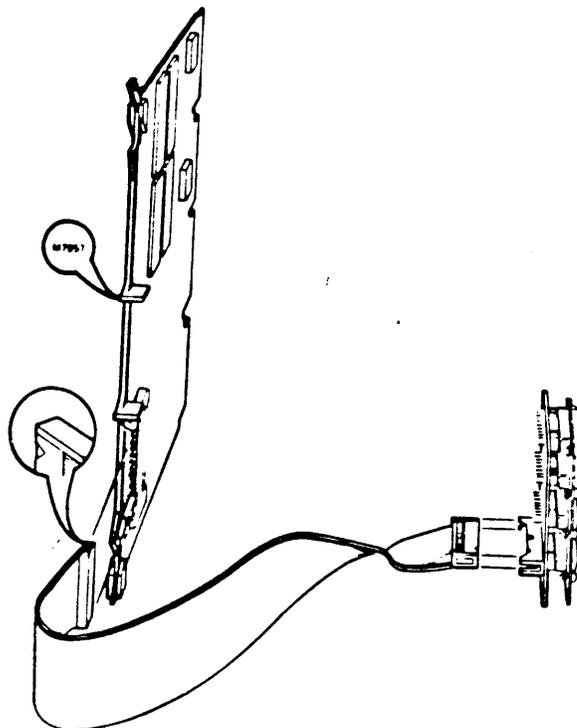


Figure 4-19 DZV11 Internal Cabling

For further information, refer to the DZV11 Asynchronous Multiplexer Technical Manual (EK-DZV11-TM).

4.2.9 LPV11 Interface Module - (for LP25 system printer)

Order: LPV11-AD (includes LP25-DA printer and LPV11 controller) For 64/96 US character set.

CK-LPV1A-KA BA23-A cabinet kit (includes type A filter connector and internal cable)

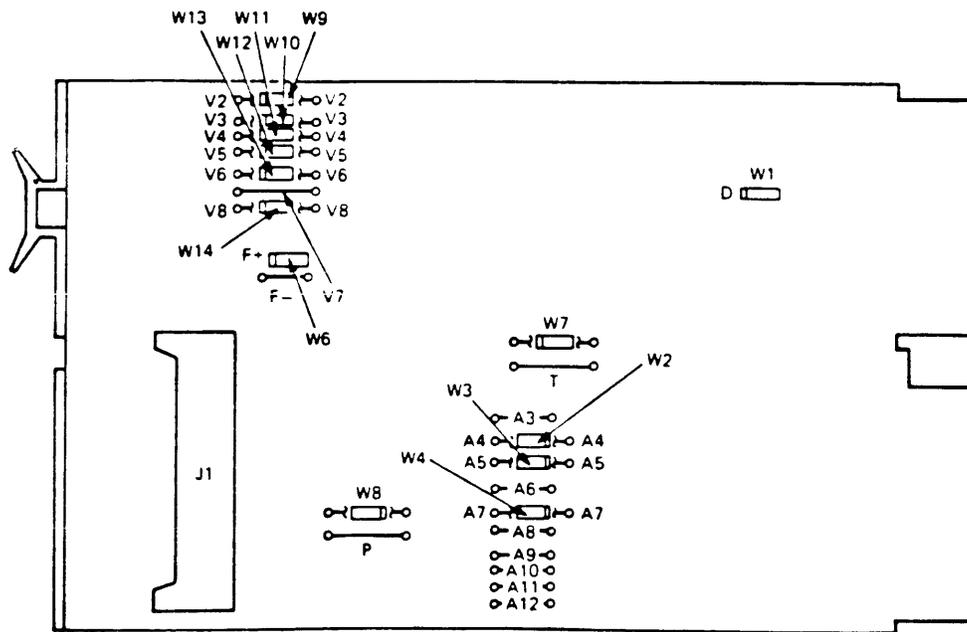
CK-LPV1A-KB BA123-A cabinet kit (includes type A filter connector and internal cable)

CK-LPV1A-KF H9642 cabinet kit (includes type A filter connector and internal cable)

Module Number: M8027

Diagnostics: MicroVAX Maintenance System, Rev 1.03 and higher.

The LPV11 is a dual-height module that controls the flow of data between the Q-22 bus and a line printer. It is configured using jumpers (Figure 4-20).



NOTE  
o = WIRE WRAPPIN.

Figure 4-20 LPV11 Module Layout (M8027)

The CSR address and interrupt are both fixed. Tables 4-17 and 4-18 list the factory configuration. Figure 4-21 shows the internal cabling set-up.

Table 4-17 LPV11 CSR Address

CSR Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	<- Add. bits (jumpers)
17777514	1	1	1	1	1	0	1	0	0	1	(factory)

0 = installed            1 = removed

Table 4-18 LPV11 Interrupt Vector

Interrupt Vector	V8 W14	V7 V7	V6 W13	V5 W12	V4 W11	V3 W10	V2 W9	<- Vector bits <- jumper
200	0	1	0	0	0	0	0	(factory)

0 = installed            1 = removed

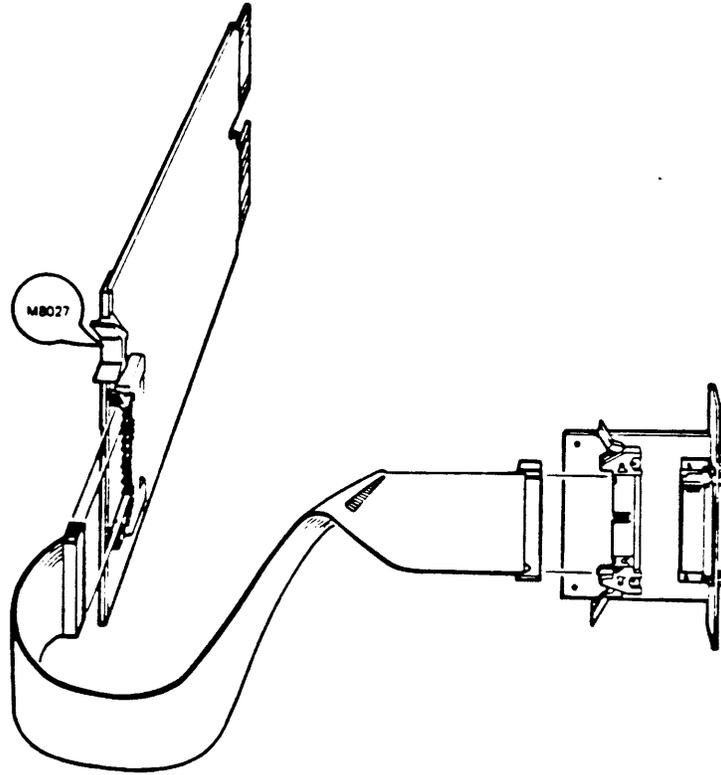


Figure 4-21 LPV11 Internal Cabling

## 4.3 DISK STORAGE DEVICES

### 4.3.1 RQDX2, RQDX3 Disk Controllers

Order: RQDX2-AA or RQDX3-AA (controller kit for BA23-A enclosure or H9642 enclosure)

The RQDX2-AA and RQDX3-AA kits include the following:

1. RQDX2 or RQDX3 controller module
2. 17-00285-02 50-pin signal cable

RQDX2-BA or RQDX3-BA (controller kit for BA123-A enclosure)

The RQDX2-BA and RQDX3-BA kits include the following:

1. RQDX2 or RQDX3 controller module
2. M9058 : signal distribution board
3. 17-00861-01 : cable, 50 pin I/O, RQDX to M9058
4. 17-00862-01 : cable, 40 pin, M9058 to 4 RD console boards

Module: M8639-YB (RQDX2)  
M7555 (RQDX3)

Diagnostics: MicroVAX Maintenance System, all revisions.

4 LEDs (RQDX2), 1 LED (RQDX3)

RQDX2 and RQDX3 are intelligent controllers with on-board microprocessors, used to interface fixed-disk drives and diskette drives to the Q22-bus. Data is transferred using DMA. Programs in the host system communicate with the controller and drives using the Mass Storage Control Protocol (MSCP).

The RQDX2 and RQDX3 can control a maximum of four drives. Each fixed-disk counts as one drive. Each RX50 counts as two drives. Figure 4-22 shows the jumper and LED locations for the RQDX2, while Figure 4-23 shows the jumper and LED locations for the RQDX3.

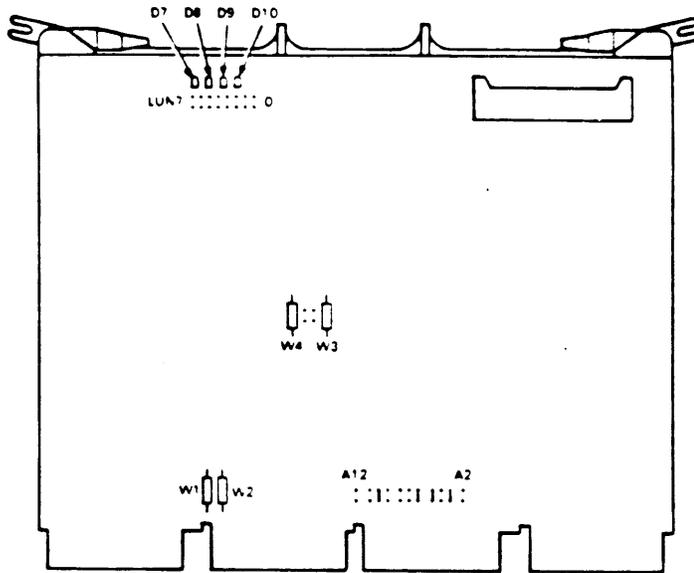


Figure 4-22 RQDX2 Module Layout

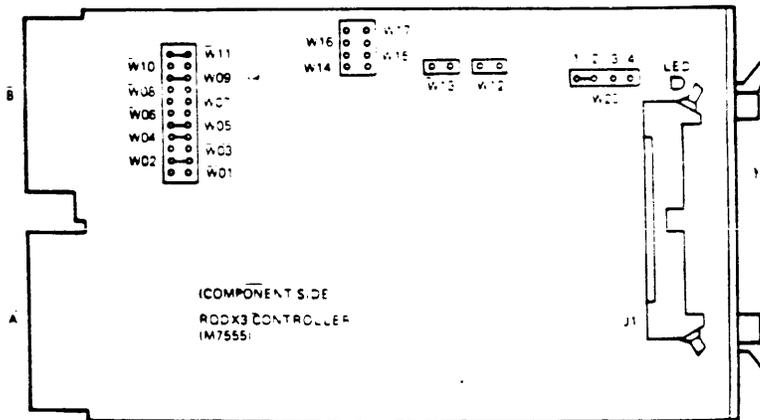


Figure 4-23 RQDX3 Module Layout

The CSR address of the first MSCP controller is fixed. If a second controller is installed, its CSR address will float. Table 4-19 lists the factory setting and common settings for a second MSCP controller.

Table 4-19 RQDX2/RQDX3 CSR Address

Starting address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	<-Add. bits (jumpers)
17772150	1	0	1	0	0	0	1	1	0	1	0	<- factory

possible settings for a second controller:

17760334	0	0	0	0	0	1	1	0	1	1	1	
17760354	0	0	0	0	0	1	1	1	0	1	1	
17760374	0	0	0	0	0	1	1	1	1	1	1	

1 = installed      0 = removed

The interrupt vector for the RQDX2 and RQDX3 controllers is set under program control. The first controller is assigned a fixed interrupt vector of 154. If a second one is installed, its interrupt vector will float.

NOTE: RQDX2 and RQDX3 controllers are MSCP devices. The first MSCP device in a system is assigned a CSR address of 17772150. If more than one MSCP device is installed, the CSR address of the second device must be set within the floating range. See Chapter 5 for more details. In MicroVAX II systems, Logical Unit Number (LUN) jumpers should not be installed on the RQDX2 or RQDX3 modules.

For further information, refer to the RQDX2 Controller Module User's Guide (EK-RQDX2-UG), or the RQDX3 Controller Module User's Guide (EK-RQDX3-UG).

4.3.2 RQDXE Extension Module (for use with BA23-A enclosure, or H9642 enclosure only)

Order: RQDXE-AA (cabinet kit for BA23-A enclosure)

RDDXE-FA (cabinet kit for H9642 enclosure)

Module: M7513-00

Diagnostics: None

The RQDXE extension module carries signals from an RQDX2 or RQDX3 controller module to external MSCP devices (e.g., additional RD5n or RX50 drives). The RQDXE is typically installed in the AB rows of the backplane directly underneath an RQDX2 or RQDX3 controller.

The RQDXE has jumpers for the configuration of up to four RD or RX drives. In a MicroVAX II system, one RD and one RX may be housed in the BA23-A or BA23-C (the second BA23 enclosure within an H9642) enclosure, and two drives may be housed in external tabletop enclosures.

NOTE: RQDX2 and RQDX3 controllers each support four drives, but count an RX as two drives (i.e. while an RQDXE has jumpers to configure three RD drives and one RX drive, an RQDX2 or RQDX3 controller can not support the five actual drive units).

Figure 4-24 shows the RQDXE module, including the jumpers used to configure the module for the various combinations of drives supported by MicroVAX II systems. Figure 4-25 shows the proper cabling of the module.

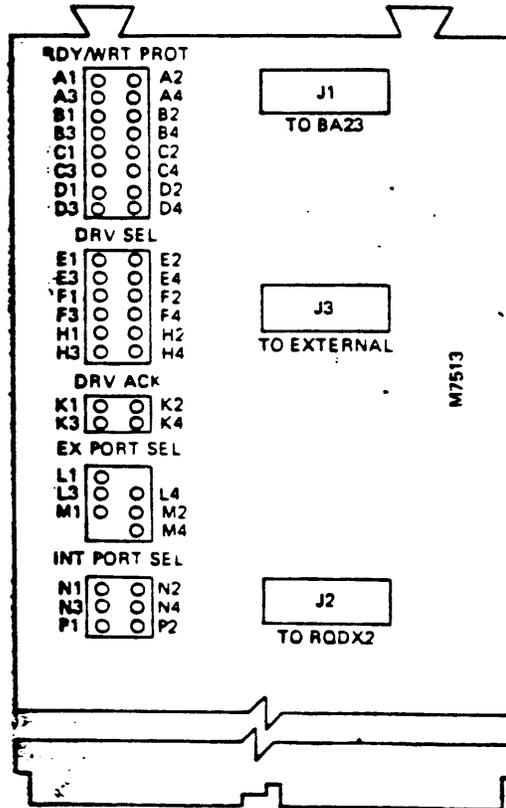


Figure 4-24 The RQDXE module Layout

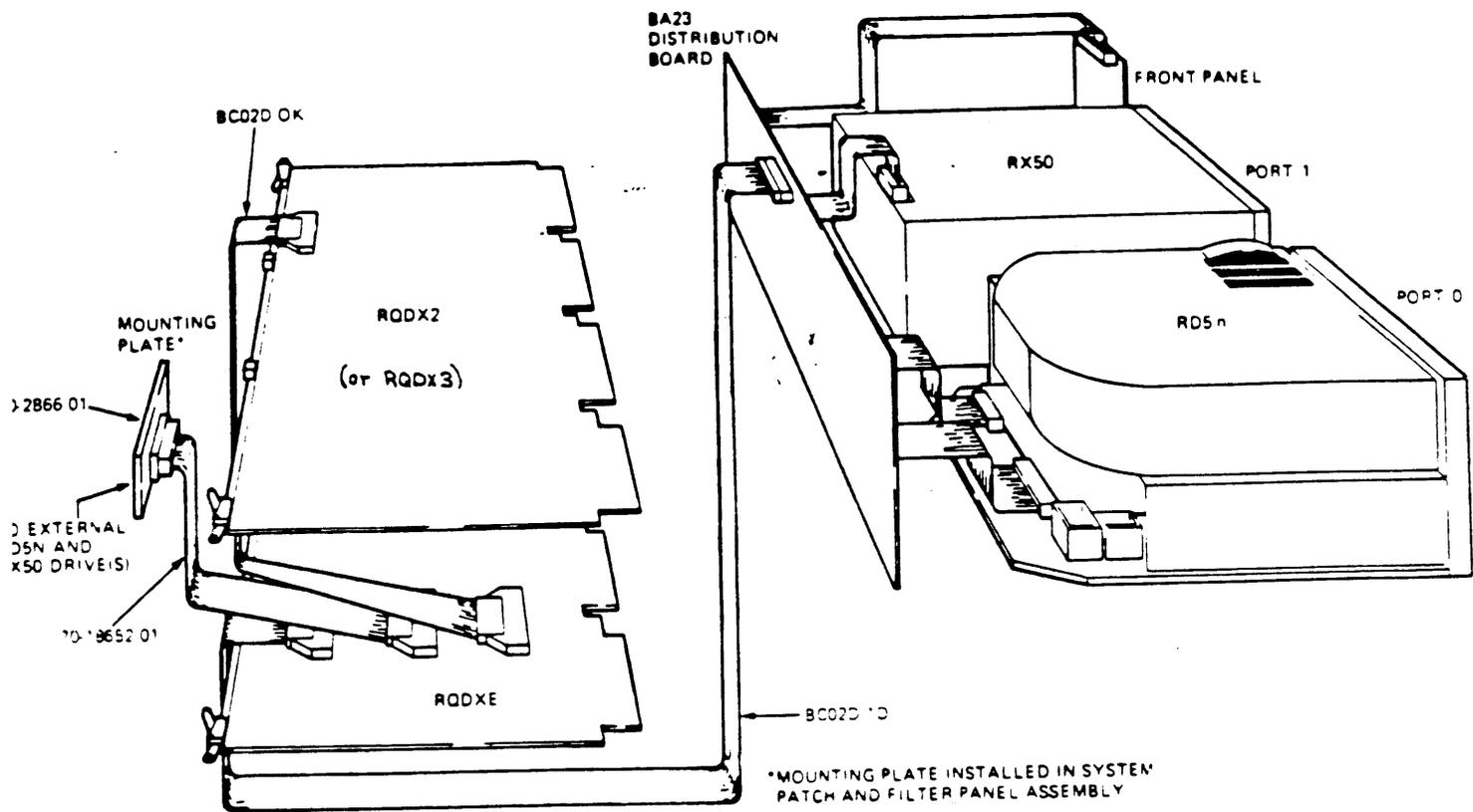


Figure 4-25 Internal cabling for an RQDXE Module.

Figure 4-26 provides jumper settings for the two mass storage slots within the BA23-A box. These settings should be made using the pins labeled INT PORT SEL on the module. In this table, Port 0 represents the mass storage slot to the left (bottom) of the system, while port one represents the mass storage slot in the middle (center) of the system.

NOTE: Selection B, which shows an RD in each internal mass storage slot, is not supported by BA23-A systems.

NOTE: A blank in either port indicates that either the mass storage location does not hold a drive, or holds a drive which does not use an RQDX controller (e.g., a TK50 drive in the center mass storage slot).

NOTE: Two blackened dots, surrounded by a box indicate that a jumper is installed.

Figure 4-26 Jumper settings for the internal mass storage slots.

		A	B	C	D	E
PORT 0	RDD	X	X	X	.	.
PORT 1	RD1 RX50	.	X	.	X	.
INT PORT SEL	N1 N2					
	N3 N4					
	P1 P2					

MR-18066

- NOTE:
- and indicates jumper not installed
  - and indicates jumper installed
  - Factory configuration column A or D.

Figure 4-27 Provides jumper settings for the two additional mass storage devices which can be housed in external tabletop cabinets and connected to the system via the rear I/O distribution panel. In this figure, Port 0 corresponds to the first external drive connected, while Port 1 corresponds to the second.

NOTE: The external enclosure which houses an RD or RX drives has two connectors (J1 and J2) on the rear of it. If the drive inside it is to be connected to Port 0, use J1 if it is to be connected to Port 1, use J2.

To use the figure, find the column which represents the combination of drives to be used (e.g., column E shows RD 1 in the first external enclosure, and no RD or RX type drive in a second external enclosure).

NOTE: As shown in the Figure 4-27, the drive contained in either port can be jumpered as RD 0, 1, 2, or 3. If a fixed disk drive is present in the BA23-A cabinet, that drive is typically considered to be RD0. If two additional fixed disk drives are present in the two external enclosures, they should be jumpered as RD1 and RD2, respectively.

NOTE: A blank in either port indicates that either the external drive is not present, or holds a drive which does not use an RQDX controller (e.g., a TK50 drive).

NOTE: Two blackened dots, surrounded by a box, indicate that a jumper is installed.

		A	B	C	D	E	F	G	H	I	J	K	L
PORT 0	RD0	X	X	X	.	.	.	.	.	.	.	.	.
	RD1	.	.	.	X	X	X	.	.	.	.	.	.
	RD2	.	.	.	.	.	.	.	X	X	X	X	.
	RD3	.	.	.	.	.	.	.	.	.	.	X	.
PORT 1	RD0	.	X	.	.	X	.	.	.	X	.	.	.
	RD1	.	.	.	.	.	X	.	.	.	.	X	.
	RD2	.	.	.	.	.	.	.	.	.	X	.	.
	RD3	.	.	.	.	.	.	.	.	.	.	.	X
	RX50	.	.	.	.	.	.	X	.	.	.	.	X
RDY AND WRT PROT	A1 A2	●●	●●	○●	○●	●●	●●	●●	○●	○●	○●	○●	○●
	A3 A4	○●	●●	○●	○●	●●	●●	●●	○●	○●	○●	○●	○●
	B1 B2	●●	●●	○●	○●	●●	●●	●●	○●	○●	○●	○●	○●
	B3 B4	○●	●●	○●	○●	●●	●●	●●	○●	○●	○●	○●	○●
	C1 C2	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●
	C3 C4	○●	○●	●●	○●	○●	○●	○●	○●	○●	○●	○●	○●
	D1 D2	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●
	D3 D4	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●
DRV SEL	E1 E2	●●	●●	○●	○●	●●	●●	●●	○●	○●	○●	○●	○●
	E3 E4	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●
	F1 F2	○●	●●	○●	○●	●●	●●	●●	○●	○●	○●	○●	○●
	F3 F4	●●	●●	●●	○●	○●	○●	○●	○●	○●	○●	○●	○●
	H1 H2	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●
	H3 H4	●●	●●	○●	○●	●●	●●	●●	○●	○●	○●	○●	○●
DRV ACK	K1 K2	●●	●●	●●	○●	○●	○●	○●	○●	○●	○●	○●	
	K3 K4	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	
EX PORT SEL	L1	○	○	○	○	○	○	○	○	○	○	○	○
	L3 L4	●●	●●	●●	○●	○●	○●	○●	○●	○●	○●	○●	○●
	M1 M2	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●	○●
	M4	○	○	○	○	○	○	○	○	○	○	○	○

NOTE:  
 1. ○○ and ○ indicates jumper not installed  
 2. ●● and ● indicates jumper installed

Figure 4-27 RQDXE Jumper settings for external mass storage devices.

### 4.3.3 RD51, RD52, RD53 Disk Drives

Order: RD5nA-AA (disk kit for BA23-A or H9642 enclosures) n = 1, 2 or 3

An RD5nA-AA kit includes:

1. RD5n-A : disk drive
2. 17-00282-00 : 20-pin cable to signal distribution panel
3. 17-00286-00 : 34-pin cable to signal distribution panel

RD5nA-BA (disk kit for BA123-A enclosure) n = 1, 2, or 3

An RD5nA-BA kit includes:

1. RD5n-A : disk drive
2. 17-00282-01 : 20-pin cable to signal distribution board
3. 17-00286-01 : 34-pin cable to signal distribution board
4. 70-22393-01 : control panel assembly

Diagnostics: MicroVAX Maintenance System, Rev 1.02

The RD51, RD52 and RD53 are fixed-disk drives with formatted storage capacities of 10, 31 and 71 Mbytes, respectively.

In addition to the cables listed above, a cable from the power supply must be connected to each RD drive in the system.

#### 4.3.3.1 Factory Configuration

The RD51 read/write printed circuit board (PCB) has a DIP shunt jumper consisting of seven breakable metal strips (Figure 4-28). Table 4-21 lists the configuration of the seven strips.

Table 4-21 RD51 DIP Shunt Jumper Configuration

Pin numbers	Connection
1 to 16	not used (nearest front of drive)
2 to 15	intact
3 to 14	intact
4 to 13	intact
5 to 12	broken
6 to 11	intact
7 to 10	broken
8 to 9	broken (nearest rear of drive)

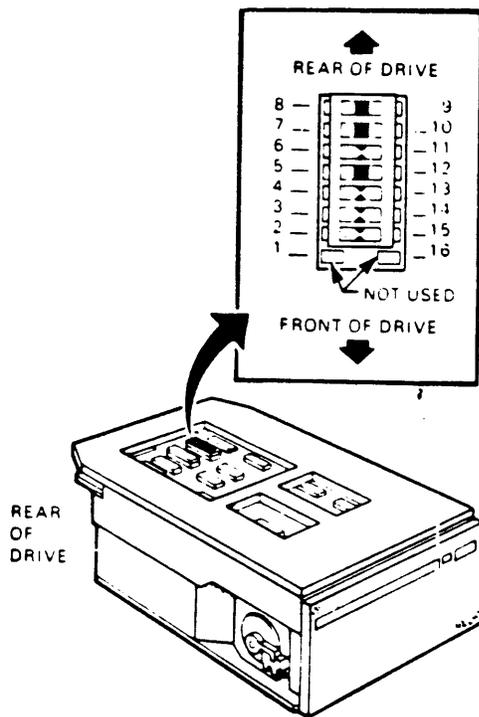
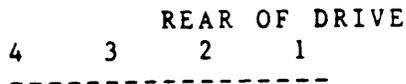


Figure 4-28 RD51 Disk Drive and Shunt Jumper

The RD52 read/write PCB has five pairs of pins (figure 4-29) that are used to select the drive. To configure an RD52 as drive DUA0, place a jumper on pins DS3. To configure an RD52 as drive DUA1, place a jumper on pins DS4.

The RD53 read/write PCB has four switches at its rear edge numbered as follows:



To configure an RD53 as drive DUA0, depress switch 3. To configure the RD53 as DUA1, depress switch 4.

If an RD5n drive is added to the system, it must be formatted. The formatting utility is available in the service version of the MicroVAX Maintenance System.

For further information, refer to:

- \* RD52-D, -R Fixed Disk Drive Subsystem Owner's Manual
- \* 11C23-UC/11C23-UE RD52 Upgrade Installation Guide

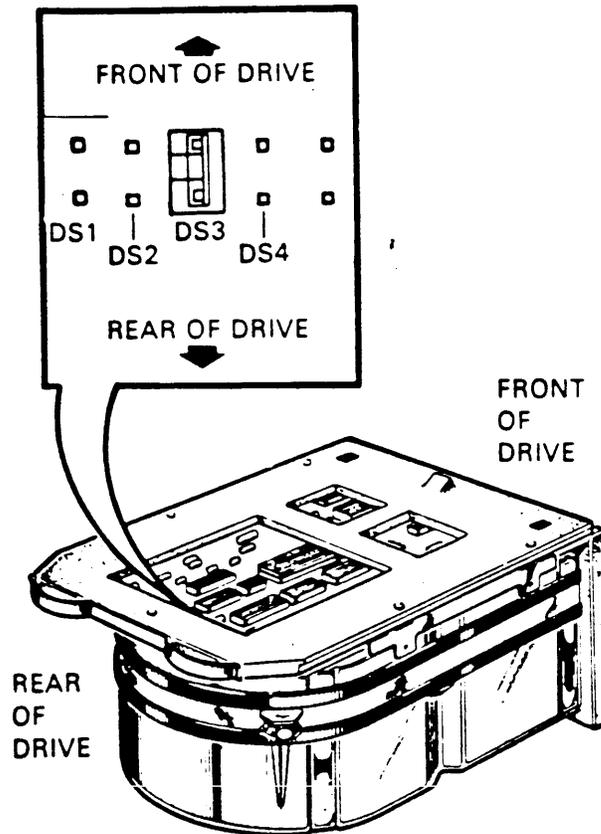


Figure 4-29 RD52 Disk Drive and Shunt Jumper

#### 4.3.4 RX50 Diskette Drive

Order: RX50A-AA (kit for BA23-A or H9642 enclosures)

The RX50A-AA kit includes:

1. RX50-AA : diskette drive
2. 17-00285-02 : 34-pin cable RX50 to signal distribution panel

RX50A-BA (kit for BA123-A enclosure)

The RX50A-AA kit includes:

1. RX50-AA : diskette drive
2. 17-00867-01 : 34-pin cable, RX50 to signal distribution board

Diagnostics: MicroVAX Maintenance System, all revs

The RX50 (figure 4-30) is a random-access, dual-diskette storage device that uses two single-sided 5 1/4" RX50K diskettes. It has a total formatted capacity of 818 Kbytes (409 per diskette). The RX50 has two access doors and slots for diskette insertion. A light next to each slot indicates when the system is reading or writing to the diskette in that slot.

#### NOTE

Only one RX50 drive can be used with one RQDX2 controller module.

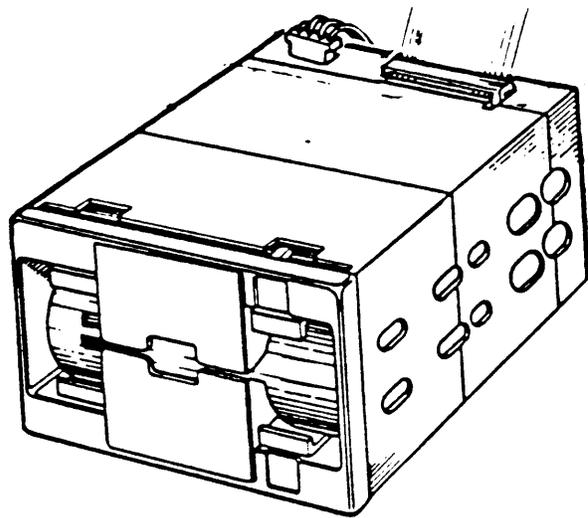


Figure 4-30 RX50 Diskette Drive

#### 4.3.5 TK50 Tape Drive Subsystem

The TK50 Tape Drive Subsystem can be installed in the BA23 enclosure, or can be ordered as a stand-alone desktop unit. When used with a BA123-A system, the TK50 is typically installed inside the enclosure.

Order:           TK50-AA (tape drive, cartridge)  
  
          TQK50-AA (controller module, internal cable for  
          BA23-A or H9642 enclosures)  
  
          TQK50-BA (controller module, internal cable for  
          BA123-A enclosure)

NOTE:   Both a TK50-AA' and a TQK50-xA  
          must be ordered for a complete  
          internally located subsystem

Stand-alone unit:   TK50-DA (-DB) (DA = 120V, DB = 240V line cord)

          TQK50-BB (controller module, internal cable  
          from module to BA123-A distribution panel,  
          filter connector)

          TQK50-AB (controller module, internal cable  
          from module to BA23-A distribution panel,  
          filter connector)

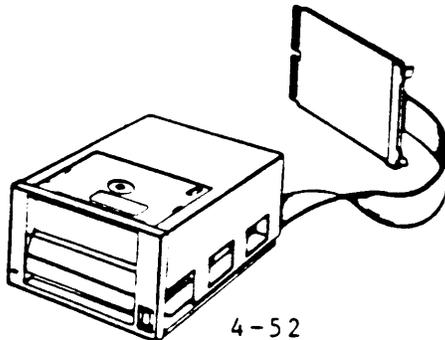
NOTE:   Both a TK50-Dx and a TQK50-xB  
          must be ordered for a complete  
          stand-alone subsystem

Diagnostics:   MicroVAX Maintenance System, rev 1.03 and greater

          Two LEDs on the M7546 module  
          One LED on TK50 drive

The TK50 is a streaming tape drive subsystem (figure 4-31) that can store up to 95 Mbytes on a tape cartridge for backup data storage.

Figure 4-31 TQK50 Tape Drive Subsystem



The M7546 controller module provides the interface between the TK50-AA tape drive and the Q22-bus.

Figure 4-32 shows the location of two DIP switches on the controller module, which are used to configure the following:

- \* hardware revision level (set at the factory)
- \* unit number

The hardware revision level DIP switch is set to match the module revision level, which is stamped on the back of the module. Check the revision level stamped on the module with the switch settings. The eight switches in this DIP switch represent a binary weighted value, as shown in table 4-23:

Table 4-23 Revision Level Switch Settings

Revision Level	Switches			
	1	2	3	- 8
0	0	0	0	- 0
1 (A)	1	0	0	- 0
2 (B)	0	1	0	- 0
3 (C)	1	1	0	- 0
etc.				

0 = open    1 = closed  
switch 8 is nearest module edge

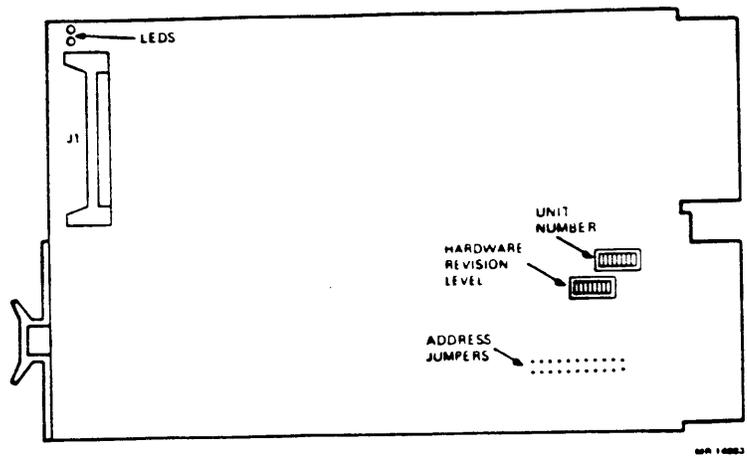
The unit number may be specified using the unit number DIP switch. It is not necessary to change this switch from the factory setting if the MicroVMS operating system is installed. The unit number is set as shown in table 4-24:

Table 4-24 Unit Number Settings

Unit Number	Switches			
	1	2	3	- 8
0	0	0	0	- 0 (factory)
1	1	0	0	- 0
2	0	1	0	- 0
3	1	1	0	- 0
etc.				

0 = open 1 = closed  
 switch 8 is nearest module edge

Figure 4-32 M7546 Module Layout



The M7546 controller is a Tape Mass-Storage Control Protocol (TMSCP) device. The CSR address for the first M7546 controller is fixed and is set using jumpers (figure 4-32). If an additional TK50 subsystem is added, the CSR address of the second controller will float. Table 4-21 lists the fixed CSR address for the first and common settings for a second controller.

Table 4-24 Controller Module M7546 CSR Address

CSR Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	<- Add. bits (jumpers *)
17774500	1	1	0	0	1	0	1	0	0	0	0	(factory)

possible addresses for second controller:

17760404	0	0	0	0	1	0	0	0	0	0	1	
17760444	0	0	0	0	1	0	0	1	0	1	1	

1 = jumper installed      0 = jumper installed

\* A2 is the jumper nearest the module edge

The interrupt vector is fixed at 260 and is set under program control.

For further information, refer to the TK50 Tape Drive Subsystem User's Guide (EK-LEP05-0M).

#### 4.3.6 KDA50-Q Disk Controller

NOTE: This option is available only for the H9642 cabinet kit.

Order: KDA50-QA (controller kit)

A KDA50-QA controller kit includes the following:

1. KDA50-Q controller modules (SDI and Processor modules),
2. 50-conductor module interconnect cable,
3. 40-conductor module interconnect cable,
4. Internal SDI cable,
5. Distribution Panel Insert.

Module Numbers: M7164 (Processor) and M7165 (Standard Disk Interconnect, SDI)

The KDA50-Q controller is used to interface up to four 16-bit RA series drives to the Q22 bus. The KDA50-Q consists of two quad-height modules; the processor module and the Standard Disk Interface (SDI) module. It is an intelligent controller with on-board microprocessors. Programs in the host system communicate with the controller and drives using the Mass Storage Control Protocol (MSCP).

Figures 4-33 and 4-34 show the jumper, switch and LED locations for the KDA50-Q controller module set.

Figure 4-33 M7164 Processor Module Layout

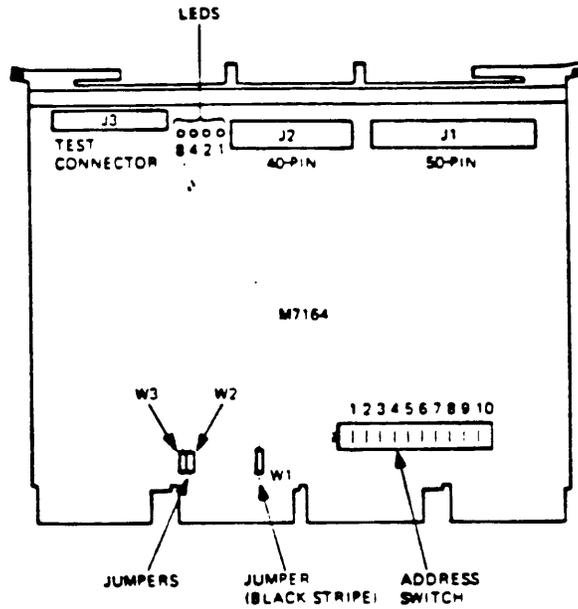
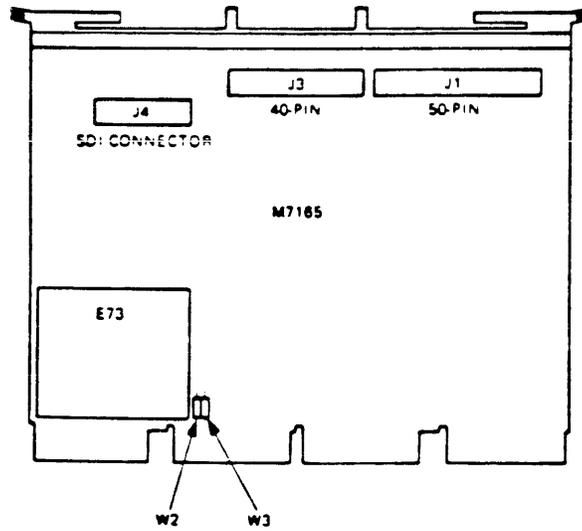


Figure 4-34 M7165 SDI Module Layout



The CSR address of the first MSCP device is fixed. If a second MSCP device is installed, its CSR address will float. Table 4-25 lists the factory setting and common settings for a second MSCP device. The KDA50-Q should be configured for a floating address.

Table 4-25 MSCP CSR Address

Starting address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	<-Add. bits
KDA50-Q Switch Setting	W1	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	
17772150	1	0	1	0	0	0	1	1	0	1	0	<- factory

possible settings for a second MSCP device:

17760334	0	0	0	0	0	1	1	0	1	1	1	
17760354	0	0	0	0	0	1	1	1	0	1	1	
17760374	0	0	0	0	0	1	1	1	1	1	1	

1 = Switch ON or M7164 Jumper W1 IN  
 0 = Switch OFF or M7164 Jumper W1 OUT

The interrupt vector for the KDA50-Q is set under program control. The first MSCP device is assigned a fixed interrupt vector of 154. If a second MSCP device (KDA50-Q) is installed, its interrupt vector will float.

NOTE: The KDA50-Q is an MSCP device. The first MSCP device in a system is assigned a CSR address of 17772150. If more than one MSCP device is installed, the CSR address of the second device must be set within the floating range. This description shows the KDA50-Q as the first device, but the RQDX disk controller is typically the first MSCP device in the MicroVAX II.

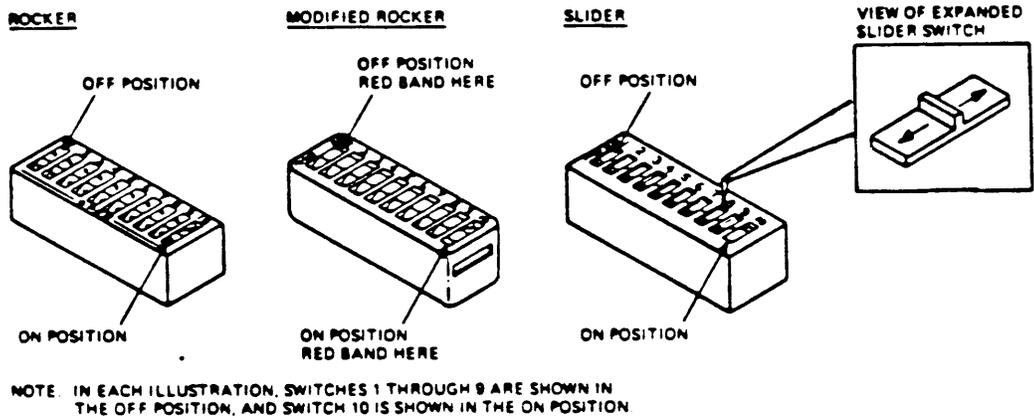


Figure 4-34 Address Selector Switch Operation

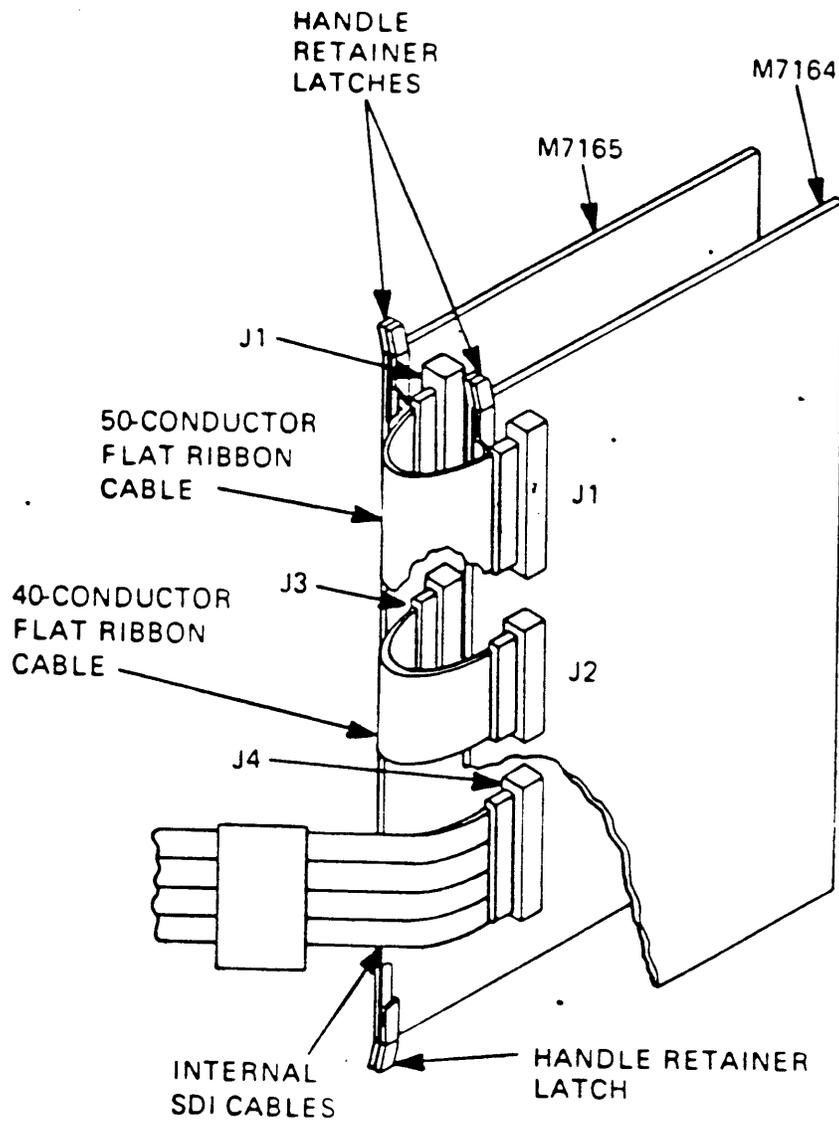


Figure 4-35 KDA50-Q Internal Cabling

For further information, refer to the KDA50-Q User Guide (EK-KDA5Q-UG).

#### 4.3.7 RA Series Disk Drives

NOTE: RA60 drives are supported only for use with the H9642 enclosure.

Order: RA60-AF (120V, 240V)

The RA60 disk drive (Figure 4-36) is a high capacity removable disk drive providing 205 Mbytes of formatted storage space. The drive incorporates microprocessor controlled diagnostics, and a 170-bit error correction code (ECC) for data reliability. The RA60 operates with the KDA50 controller set.

The BC26V-6 cable includes a connector block used to connect the BC26V-6 to the RA60 cables. The connector block is mounted on the bracket at the lower rear of the cabinet (Figure 4-37).

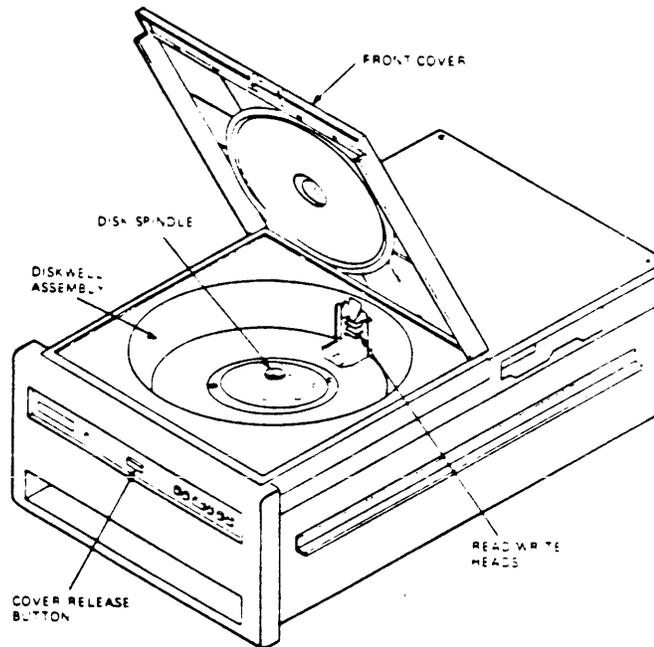
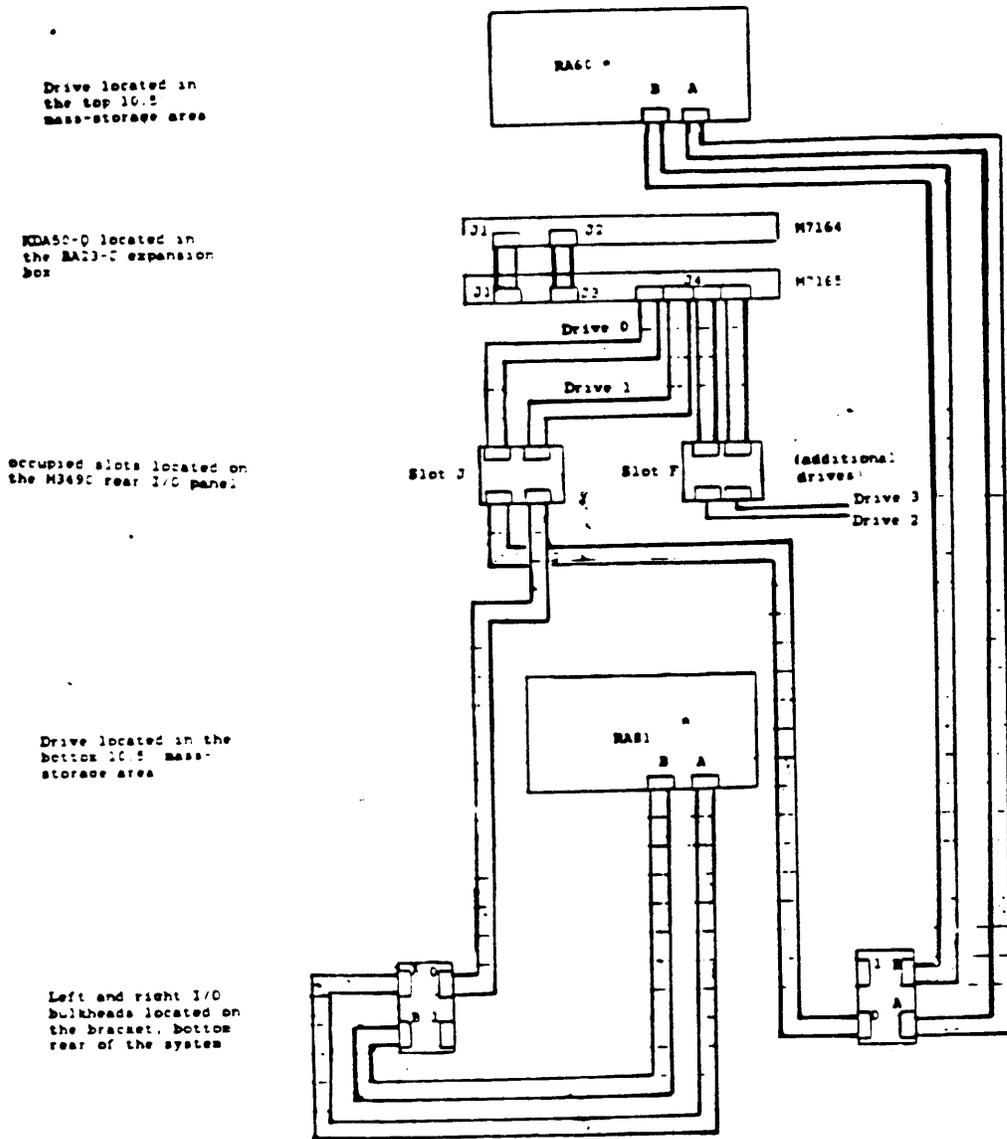


Figure 4-36 RA60 Disk Drive



Drive located in the top 10.5 mass-storage area

KDA50-0 located in the RA23-C expansion box

occupied slots located on the M349C rear I/O panel

Drive located in the bottom 10.5 mass-storage area

Left and right I/O bulkheads located on the bracket, bottom rear of the system

\* Factory configuration - port 0. In this configuration the port A switches on both drives must be depressed.

\*\* Port 0 : corresponds to port A for the primary CPU.  
Port 1 : corresponds to port B for an external CPU.

Figure 4-37 RA60 Cabling

#### 4.3.8 RA81 Disk Drive

NOTE: The RA81 disk drive is supported for use in an H9642 system only.

Order: RA81-HA (120V)  
RA81-HD (240V)  
BC26V-6 (cable from bulkhead panel to rear I/O panel)

The RA81 disk drive (Figure 4-38) is a high capacity fixed disk drive providing 456 Mbytes of formatted storage space. The RA81 uses the KDA50-Q controller set and incorporates the same ECC method as the RA60 (see Section 4.3.7).

The BC26V-6 cable includes a connector block used to connect the BC26V-6 to the RA81 cables. The connector block is mounted on the bracket at the lower rear of the cabinet (refer to Figure 4-37).

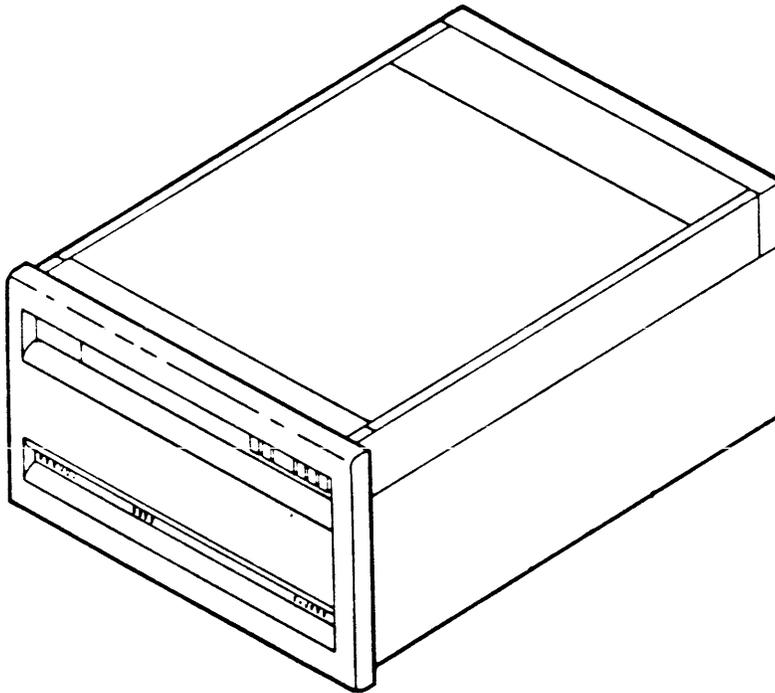


Figure 4-38 RA81 Disk Drive

#### 4.3.9 TS05 Tape Drive

NOTE: The TS05 Tape Drive is supported only for the H9642 enclosure.

Order: TSV05-ZA/ZB (120v, 240v)

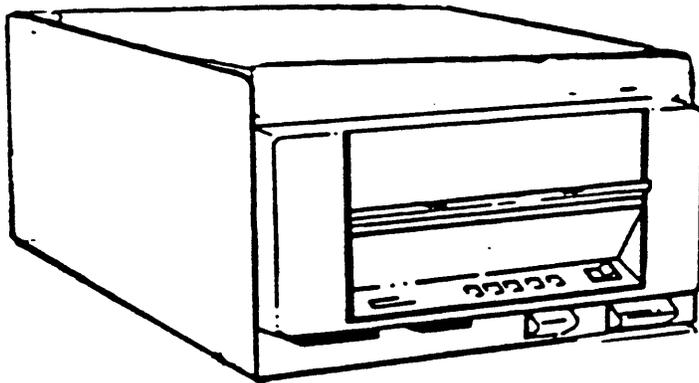
The TSV05-ZA/ZB option contains the following components:

- TS05-AA (120v) or TS05-AB (240v) tape drive
- TSV05 (M7196) controller module
- BC06L-03 36 inch internal cables (2)
- 70-16855-06 6 foot external cables (2)
- 50-pin type A insert panels (2)
- H9544-LN top access cover

The TS05 (figure 4-39) is a magnetic streaming tape drive that provides 40.5 Mbytes of backup data storage. It reads or writes up to 160,000 bytes per second in standard ANSI format. Automatic read after write verifies that data is accurately recorded. Tape data is buffered in 3.5 Kbyte of RAM on the TSV05 controller (M7196).

The TS05 occupies the top 10.5 inch mass-storage shelf.

Figure 4-39 TS05 Tape Drive



The TSV05 (M7196, figure 4-40) is the controller for the TS05 tape drive. The TSV05 is a Tape Mass-Storage Control Protocol (TMSCP) device. The CSR address and interrupt vector for the TSV05 are both fixed and set using jumpers (figure 4-40). Tables 4-26 and 4-27 list the factory setting for the CSR address and interrupt vector.

Table 4-26 TSV05 Controller Module (M7196) CSR Address

CSR Address	A12 E58 10	A11 E57 1	A10 2	A9 3	A8 4	A7 5	A6 6	A5 7	A4 8	A3 9	A2 10	<-Add.bits <-switches
17772520	1	0	1	0	1	0	1	0	1	0	0	
1 = switch ON      0 = switch OFF												

Table 4-27 TSV05 Controller Module (M7196) Interrupt Vector

Interrupt Vector	V8 E57 1	V7 2	V6 3	V5 4	V4 5	V3 6	V2 7	<-Vector bits <-Switches
224	0	1	0	0	1	0	1	

If a TSV05 controller is installed, it must be placed in slot 4 of the top BA23 backplane. The TS05 tape drive connects to the TSV05 controller through two type A insert panels installed in the cabinet I/O panel. Two 50-conductor cables run between the TS05 and the insert panels. Two 50-conductor cables also run internally between the insert panels and the TSV05 controller.

Refer to the TSV05 Tape Transport System User's Guide  
(EK-TSV05-UG) for further information.

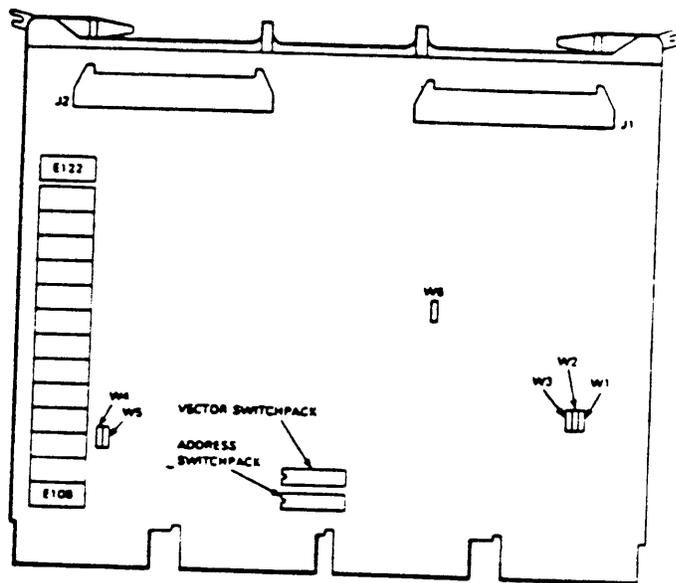


Figure 4-40 TSV05 Controller Module (M7196)

## CHAPTER 5 - CONFIGURATION

### 5.1 CONFIGURATION RULES

There are several factors to consider when configuring a MicroVAX system in a microsystems enclosure:

1. Module physical priority
2. Backplane and I/O panel expansion space
3. Power requirements
4. Module CSR addresses and interrupt vectors

Module physical priority and Module CSR addresses and interrupt vectors are independent of enclosure, and are given in Sections 5.2 and 5.3. Expansion space and power available to meet the requirements of supported options are enclosure dependent, and are detailed by enclosure in Sections 5.4 and 5.5.

### 5.2 MODULE PHYSICAL PRIORITY

The order in which options are placed in the backplane affects system performance. Modules should be installed according to the following rules.

- \* The KA630-A CPU is always installed in slot 1 (slot 1 of upper BA23 frame in H9642-based system, the second frame is referred to as the BA23-C).
- \* MS630-B memory modules are installed in slots whose CD rows have CD interconnect with slot 1 (2 and 3 for the BA23-A, 2-4 for the BA123-A).
- \* MS630-AA memory modules are installed in the CD rows of slots with CD interconnect (2 and 3 for BA23, 2-4 for BA123-A)
- \* No other dual height modules may be installed in CD rows of slots reserved for MS630 memory (slots 2-4 for BA23-A, and BA23-C, slots 5-12 for BA123). If no memory or quad height option is installed in these slots, leave them blank.

- \* Dual height modules may be placed in the AB rows of slots reserved for MS630 memory, if memory is not present. Grant continuity cards should be used in these AB rows if no dual height or quad height module is installed.

NOTE: If slots 2 and 3 of the BA23-A system backplane, or slots 2-4 of the BA123-A system backplane are not used for MS630 memory modules, and are not required for Q22-bus options (the number of modules in a given configuration will determine this), it is recommended that they be reserved for future memory expansion by installing M9047 grant continuity cards in the AB rows.

NOTE: Dual-height modules installed in slots 4 - 8 of the BA23-A enclosure, or slots 5 - 12 of the BA123-A enclosure can be located in either the AB or CD rows. As a rule the opposite rows must contain either another dual-height module or an M9047 grant continuity card.

- \* In an H9642-based system, the M9404 interconnect module is installed in the last slot of the upper BA23 frame which has the grant signal.
- \* In an H9642-based system, if an RQDX3 disk controller is present, it must be installed in the upper BA23 frame.
- \* In an H9642-based system, if a TSV05 tape controller is present, it must be installed in slot 4 of the upper BA23 frame.
- \* In an H9642-based system, if a TK50 tape controller and drive are present, they must be installed in the lower BA23 frame. A second TK50 tape controller and drive may be installed in the upper BA23 frame.

The following list shows the recommended module sequence:

1. KA630-A CPU
2. Local Memory Modules (no more than two):  
MS630-BB  
MS630-BA  
MS630-AA
3. Tape Controller  
TSV05
4. Q22-bus Memory Modules  
MRV11 M8047
5. Synchronous Communications Modules - No Silos  
DPV11 M8020
6. General Purpose I/O Ports  
DRV11-J M8049
7. Line Printer Interface:  
LPV11 M8027
8. Asynchronous Communications Module - No Silos  
DLVJ1 M8043
9. Asynchronous Communications Modules - With Silos  
DZV11 M7957  
DZQ11 M3106
10. Synchronous Communications Modules - DMA  
DMV11-M M8053  
DMV11-N M8064
11. Communications Module - Smart DMA  
DEQNA M7504
12. Asynchronous Communications Module - With Silo/DMA  
DHV11 M3104
13. Streaming Tape Controller - Smart DMA  
TQK50 M7546

- 14. Mass Storage Controller - Smart DMA
  - RQDX2 M8639-YB
  - RQDX3 M7555
  - KDA50 M7164 and M7165

The relative priority of these options is based on their preferred interrupt and DMA priority. The location of the MRV11 has no effect on interrupt and DMA priorities; its location may be changed to facilitate cable distribution, etc.

### 5.3 MODULE CSR ADDRESSES/INTERRUPT VECTORS

To operate properly in a MicroVAX II system, modules must be set to the correct CSR address and interrupt vector.

#### 5.3.1 Using a Table to Find CSR Addresses and Interrupt Vectors

Use Table 5-1 to determine the correct settings. The following rules must be observed:

1. Check off all the devices that will be installed in the system.
2. If there is a F in the vector column, the device has a floating interrupt vector. Assign a vector to each device checked, starting at (octal) 300 and continuing as follows:

DLVJ1	(increment of 40 to next device)
DRV11	(increments of 10 for subsequent devices)
DZV11 or DZQ11	
DPV11	
DMV11	
2nd MSCP	(first is fixed at 154)
2nd TQK50	(first is fixed at 260)
DHV11	

For example, from the list of devices above, systems containing the following modules would be assigned as shown:

<u>Example 1</u>		<u>Example 2</u>	
DLVJ1	300	DZQ11	300
DZV11	340	2nd MSCP	310
DMV11	350	DHV11	320
2nd MSCP	360		
DHV11	370		

3. If there is an F in the address column, the device has a floating CSR address. Table 5-2 lists the floating CSR addresses for common combinations of devices that will require configuration. These settings are only valid for the devices listed. They may change if other devices with floating CSR addresses are installed.

TABLE 5-1 Address/Vector Worksheet

Option	Module	Unit No.	Check if in System	Vector	CSR Address (N=177)
KA630-A	M7606	---	---	---	---
MS630-A	M760x	---	---	---	---
DPV11	M8020	1		F	F
DRV11-JP	M8049	1		F	N64120
DRV11-JP	M8049	2		F	N64140
LPV11	M8027	1		200	N77514
DLVJ1	M8043	1		F *	N76500
DLVJ1	M8043	2		F	N76510
DZV11	M7957	1		F	F
DZQ11	M3106	1		F	F
DHV11	M3104	1		F	F
DEQNA	M7504	1		120	N74440
DMV11	M8053	1		F	F
DMV11-CP	M8064	1		F	F
TQK50	M7546	1		260	N74500
RLV12	M8061	1		160	N74400
RQDX2	M8639	1		154	N72150
RQDX3	M7555	1		154	N72150
KDA50	M7164/ M7165	1		154	N72150

\*. The DLVJ1 vector can only be set at 300, 340, 400, 440 etc. If the first available vector is 310 (or 320, 330), the DLVJ1 should be set to 340 and the next device set to 400.

Table 5-2 Floating CSR Addresses

Device	Substitute the numbers below for the nnn in 17760nnn								
DZQ/V 1				100	100	100	100	100	100
DZQ/V 2				* 110	* 110	110	* 110	110	* 110
DZQ/V 3				* 120		120		120	
DPV11	* 270	* 270	* 270		* 310	* 330	* 310	* 330	* 310
DMV11			320				340	360	340
2nd MSCP		334	* 354		* 354	374	374	* 414	
2nd TK50	* 404	* 444	* 444	* 444		* 504	* 504	504	* 444
DHV11 1	440	500	500	500	500	540	540		500
DHV11 2	460	520	520	520	520				520

The following two examples demonstrate use of the table:

Example 1

1 DHV11 only: 17760440  
 (derived from the first column)

Example 2

DZQ11: 17760100  
 DPV11: 17760310  
 DHV11: 17760500  
 (derived from the fifth column)

### 5.3.2 Using the SYSGEN Utility (MicroVMS Operating Systems Only)

Whenever a device is added to a system configuration, the CSR address and the vector for that device must be correctly set for the system to "see" the device, and interact properly with it. For that reason, the CSR addresses and vectors were provided with each option listed in Chapter 4. There is also a utility available under the MicroVMS Operating System which provides this information, once it is given the devices installed in the system. To invoke the SYSGEN utility, type the following at the MicroVMS command prompt:

```
MCR SYSGEN
```

Then press the RETURN key.

The utility then responds with the prompt:

```
SYSGEN>
```

At this prompt, type:

```
CONFIGURE
```

and press the RETURN key.

The utility then responds with the prompt:

```
DEVICE>
```

At this point, it is necessary to enter the appropriate abbreviations for the devices in the system. Table 5-3 lists the abbreviations to be used. Always enter the abbreviation for one device in the system; then press the RETURN key. The DEVICE> prompt will then reappear, allowing further entries. Figure 5-1 shows a sample display provided by using the SYSGEN utility.

Table 5-3. Entries for Use with the SYSGEN Utility.

DEVICE	ENTRY MADE AT THE DEVICE PROMPT
DPV11	DPV11
DRV11-J	DR11W
LPV11	LP11
DLVJ1	DJ11
DZQ11	DZ11
DZV11	DZ11
DMV11-M	DMV11
DMV11-N	DMV11
DEQNA	QNA
DHV11	DHV11
TQK50	TU81
RQDXn	UDA
TSV05	TS11
KDA50	UDA

Once all the devices have been entered, hold down the CTRL key and press the Z key. This exits the DEVICE prompt, and displays the appropriate CSR addresses and vectors, the name the operating system has assigned to the device, and the operating system support status (yes if the operating system was designed to support the device, no otherwise). To exit the SYSGEN utility, type EXIT at the SYSGEN prompt and press the RETURN key.

NOTE: If more than one of a particular device is present in the system, a comma the number of like devices present should follow the device abbreviation (e.g., DHV11,2 indicates the presence of two DHV11 modules). An asterisk denotes a floating (configuration dependent) address and/or vector.

```

$ MCR SYSGEN
SYSGEN> CONFIGURE
DEVICE> DHV11,2
DEVICE> DMV11
DEVICE> QNA
DEVICE> UDA,2
DEVICE> TUB1
DEVICE> Exit
Device: UDA      Name: FUA      CSR: 772150    Vector: 154    Support: yes
Device: TUB1    Name: FTA      CSR: 774500    Vector: 260    Support: yes
Device: QNA     Name: XQA      CSR: 774440    Vector: 120    Support: yes
Device: DMV11   Name: XIA      CSR: 760320*   Vector: 300*   Support: yes
Device: UDA     Name: FUB      CSR: 760354*   Vector: 310*   Support: yes
Device: DHV11   Name: TXA      CSR: 760500*   Vector: 320*   Support: yes
Device: DHV11   Name: TXP      CSR: 760520*   Vector: 330*   Support: yes

```

Figure 5-1. A sample output using the CONFIGURE command under the SYSGEN utility.

## 5.4 BA23-A EXPANSION SPACE AND AVAILABLE POWER

### 5.4.1 Expansion Space

There are eight backplane slots available for Q-22 bus compatible modules. There are two type A (1X4) and four type B (2X3) cutouts available on the back panel for mounting I/O panel inserts. Also, the bottom two type B cutouts can be converted to provide 3 additional type A cutouts. Table 5-4 (in Section 5.4.2) lists the type of inserts used for each module. The configuration worksheet (Figure 5-2 in section 5.4.2) is used to keep track of the number of inserts that have been used.

### 5.4.2 Power Requirements

Table 5-4 lists the current drawn at +5v and +12v, the bus loads used, and the power used by the Q22-bus options. The configuration worksheet (Figure 5-2) is used to keep track of current and power used in the system. The total current and power of system modules and mass-storage devices must not exceed the following limits:

Current: at +5vdc = 36 amps  
          +12vdc = 7 amps

Power: 230 watts

#### NOTE

Maximum +5vdc and +12vdc current cannot be drawn at the same time, or the 230 watt limit will be exceeded.

Table 5-4. Power Requirements, Bus Loads, and I/O Inserts used for MicroVAX II supported options.

Option	Module	Current --(amps)--		Power (watts)	Bus Loads		I/O Inserts A=1x4, B=2x3
		+5v	+12v		AC	DC	
EA630-AA	M7606	6.2	0.14	32.7	2.7	1.0	B
MS630-AA	M7607	1.0	0.0	5.0	-	-	
MS630-BA	M7608	1.3	0.0	6.5	-	-	
MS630-BB	M7608	1.8	0.0	9.0	-	-	
HRV11-AA	M7942	2.8	0.0	14.0	1.8	1.0	
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-J	M8049	1.8	0.0	9.0	2.0	1.0	A (2)
LPV11	M8027	0.8	0.0	4.0	1.4	1.0	A
DLVJ1	M8043	1.0	0.25	8.0	1.0	1.0	B
DZV11	M7957	1.2	0.39	10.7	3.9	1.0	B
DZQ11	M3106	1.0	0.36	9.32	1.5	1.0	B
DMV11-M	M8053	3.4	0.4	21.8	2.0	1.0	A
DMV11-N	M8064	3.4	0.4	21.8	2.0	1.0	A
DHV11	M3104	4.5	0.55	29.1	2.9	0.5	B (2)
DEQNA	M7504	3.5	0.5	23.5	2.8	0.5	A
TQK50	M7546	2.9	0.0	14.5	2.0	1.0	
RQDX3	M7555	2.48	0.06	13.2	1.0	1.0	
RQDXE	M7513	0.8	0.0	4.0	1.0	0.0	
KDA50-Q	M7164/ M7165	13.5	0.03	67.9	3.0	0.5	B (2)
RX50		0.85	1.8	25.9	-	-	
RD51		1.0	1.6	24.2	-	-	
RD52		1.0	2.5	35.0	-	-	
RD53		0.9	2.5	34.5	-	-	
TK50		1.35	2.4	33.55	-	-	

NOTE: Bus loads must not exceed 38 AC or 20 DC loads. Although these limits will not be exceeded using standard Q22-bus options, bus loads for each option are included in Table 5-4 in case a non-standard module is installed. In such a case, the total bus loads of installed modules should be checked to be sure the total does not exceed these limits.

Figure 5-2 MicroVAX II BA23-A Configuration Worksheet

		-----ADD THESE COLUMNS-----				
		V	V	V	V	V
BACKPLANE SLOT	MODULE	CURRENT +5V	(amps) +12V	POWER (watts)	I/O PANEL INSERTS B (2X3) A (1X4)	
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		V	V	V		
	1					
	2					
TOTAL THESE COLUMNS:		V	V	V	V	V
MUST NOT EXCEED:		36.0	7.0	230	4	2 *

\* If more than 2 type A filter connectors are required, an adapter template (pn 74-27740-01) may be used. This will allow three additional type A filter connectors, but will reduce the available type B cutouts to 2.

## 5.5 BA123-A EXPANSION SPACE AND POWER AVAILABILITY

### 5.5.1 Expansion Space

There are twelve backplane slots available for Q-22 bus compatible modules. The configuration examples in this chapter show the slots occupied by modules and the number of open slots remaining.

#### I/O Panel Insert Space:

There are four type A (1X4) and six type B (2X3) cutouts available on the back panel for mounting I/O panel inserts. The bottom two type B cutouts can be converted to provide three additional type A cutouts. Table 5-4 in Section 5.4.2 lists the type of inserts used for each module. The configuration worksheet (Figure 5-3) is used to keep track of the number of inserts that have been used.

### 5.5.2 Power Requirements

The configuration worksheet (Figure 5-3) is used to keep track of current at +5v and +12v, power used, and bus loads used by each option. The total current drawn and power used by system modules and mass-storage devices in the enclosure must not exceed the following limits, for each regulator:

Current: at +5vdc = 36 amps  
          +12vdc = 7 amps

Power: 230 watts maximum from each regulator

Table 5-4 in Section 5.4.2 lists the current drawn, power used, and bus loads used by each supported Q22-bus option.

Figure 5-2 MicroVAX II BA123-A Configuration Worksheet

ADD THESE COLUMNS

SLOT	MODULE	REGULATOR A			REGULATOR B			I/O INSERTS	
		CURRENT +5 VDC	(AMPS) +12 VDC	POWER (WATTS)	CURRENT +5 VDC	(AMPS) +12 VDC	POWER (WATTS)	2 x 3 B	1 x 4 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								
9	AB								
	CD								
10	AB								
	CD								
11	AB								
	CD								
12	AB								
	CD								
13	AB	SIGNAL							
	CD	DIST	52			260			
	MASS STORAGE SHELF DEVICE								
5*									
4									
3									
2									
1									
TOTAL THESE COLUMNS		—	—	—	—	—	—	—	—
MUST NOT EXCEED		36A	7A	230W	36A	7A	230W	6	4**

\*RECOMMENDED FOUR DRIVES MAXIMUM—TWO IN SHELVES 1 AND 2, TWO IN 3, 4 OR 5  
 \*\*IF MORE THAN FOUR 1 x 4 I/O PANELS ARE REQUIRED, AN ADAPTER TEMPLATE MAY BE USED

## 5.6 H9642 EXPANSION SPACE AND AVAILABLE POWER

### 5.6.1 Expansion Space

There are two eight-slot backplanes available for Q22-bus compatible modules. There are six type A (1x4) and eleven type B (2x3) cutouts available on the back panel for mounting I/O panel inserts. Table 5-4 lists the type of inserts used for each module. The configuration worksheet in Section 5.6.2 is used to keep track of the number of inserts that have been used.

### 5.6.2 Power Requirements

Table 5-4 in Section 5.4.2 lists the current drawn at +5v and +12v, the bus loads used, and the power used by the Q22-bus options. The configuration worksheet shown in Figure 5-4 is used to keep track of current and power used by each BA23 frame.

NOTE: Maximum +5vdc and +12vdc current can not be drawn at the same time, or the 230 watt limit for each supply will be exceeded.

-----ADD THESE COLUMNS-----

BACKPLANE SLOT	MODULE	CURRENT (amps)		POWER (watts)	BUS LOADS		I/O INSERTS		
		+5V	+12V		AC	DC	B	A	
1	AB CD	KA630-AA	6.2	0.14	32.7	2.7	1.0	1	0
U 2	AB CD								
P 3	AB CD								
P 4	AB CD								
E 5	AB CD								
R 6	AB CD								
7	AB CD								
8	AB CD								
MASS STORAGE		XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXXXX	XXXXX			
1						XXXXX			
2						XXXXX			
			V	V	V	V			
COLUMN TOTALS:									
MUST NOT EXCEED:		36.0	7.0	230.0	17.0	V	V	V	
1	AB CD	M9405-YB	0.0	0.0	0.0	0	0	0	0
L 2	AB CD								
O 3	AB CD								
W 4	AB CD								
E 5	AB CD								
R 6	AB CD								
7	AB CD								
8	AB CD								
MASS STORAGE		XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXXX
1						XXXXX	XXXXX	XXXXXX	XXXXXX
2						XXXXX	XXXXX	XXXXXX	XXXXXX
			V	V	V	V	V	V	V
COLUMN TOTALS:								*	*
MUST NOT EXCEED:		36.0	7.0	230.0	17.0	20.0	11 (9)	6 (9)	

Figure 5-4 H9642 Configuration Worksheet.

## CHAPTER 6--THE MICROVAX MAINTENANCE SYSTEM

### 6.1 OVERVIEW

The MicroVAX Maintenance System (MMS) is a menu-driven maintenance and diagnostics operating system which employs the MicroVAX Diagnostic Monitor. MMS is bootable via an RX50 diskette drive or a TK50 tape drive. MicroVAX Maintenance System is available in two versions, The customer version (which is shipped with each system) and the service version (which can be purchased separately). While the two versions share the same Main Menu, only the service version contains full troubleshooting and maintenance capabilities.

### 6.2 LOADING MMS

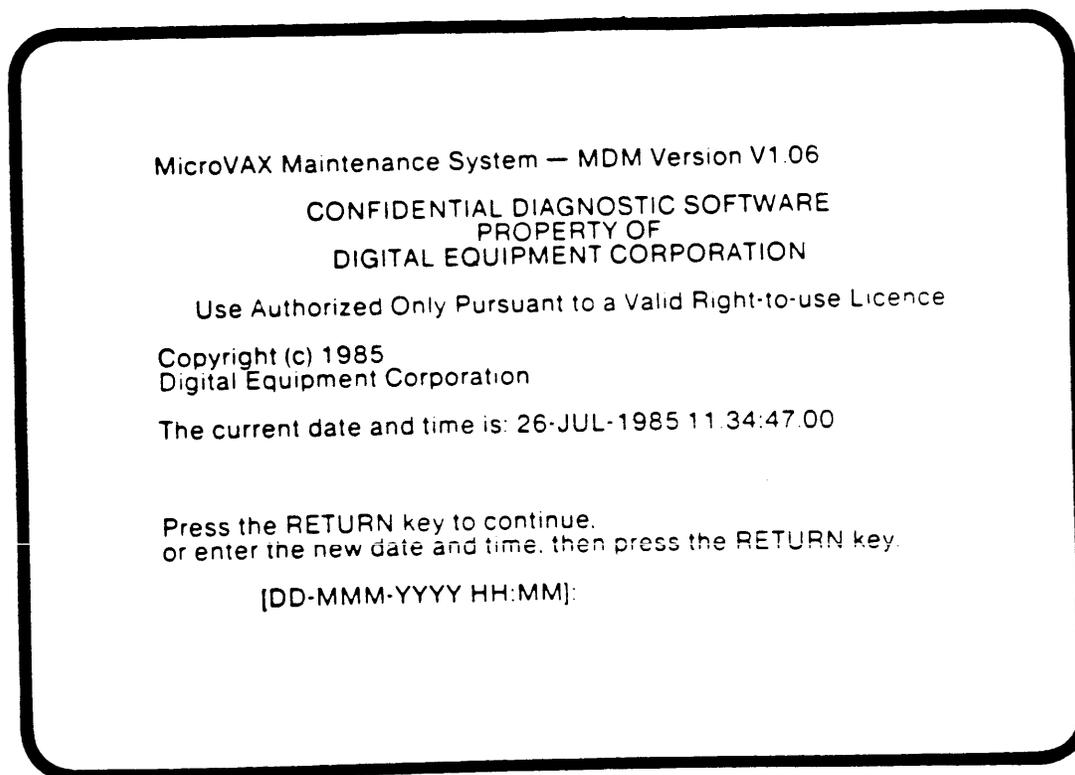
If the halts are enabled on the MicroVAX system, the prompt >>> will appear when the system is powered on. To boot the MMS under these conditions, enter one of the following commands:

```
>>>b DUxn, (to boot a specific disk drive containing MMS)
>>>b MUxn, (to boot a specific tape drive containing MMS)
>>>b      (to boot the first device found with bootable media)
```

NOTE: DU, x and n as in DUxn represent the controller type, controller number, and device number respectively (i.e., DUAL might be the first RX50 drive in the system, where DU indicates that an MSCP controller is used to control the drive, A indicates that the drive is controlled by the first such controller, and l indicates that the controller sees that drive as drive 1).

If halts are disabled when you power on the system, MMS will boot automatically, provided MMS has been loaded into one of the drives, and that drive is the first bootable device in the automatic boot sequence (see Section 3.2.2).

Once the MicroVAX Maintenance System has been booted, a disclaimer screen will appear. In addition to the standard copyright and license information found on this screen, it will also provide the release number of MMS. This is important, as the newer releases of MMS include tests for additional options. The individual option descriptions in Chapter 4 of this guide list the oldest release for which MMS provides diagnostic support. A sample MMS disclaimer screen is shown in Figure 6-1.



MR 16211

FIGURE 6-1. The Disclaimer screen for MMS.

The system will then prompt you for additional media (if you are using diskettes) until all the necessary diagnostics have been loaded (see Figure 6-2). MicroVAX Maintenance System will then display its Main menu.

```
[DD-MMM-YYYY HH:MM]:  
The current date and time is: 26-JUL-1985 11:37:50.22  
  
The system is preparing for testing.  
This may take several minutes.  
Please wait . .  
  
Please remove the diskette.  
Insert the next diskette in the same drive  
and press the RETURN key.  
If you can not insert the next diskette,  
type 1 and press the RETURN key  
>
```

Figure 6-2 Prompt to enter additional diskettes.

### 6.3 MAIN MENU SELECTIONS

The Main Menu allows the selection of system verification testing or system configuration display, and also allows access (service versions only) to more comprehensive service tests and maintenance utilities. The Main Menu for the MicroVAX Maintenance system is shown in Figure 6-3.

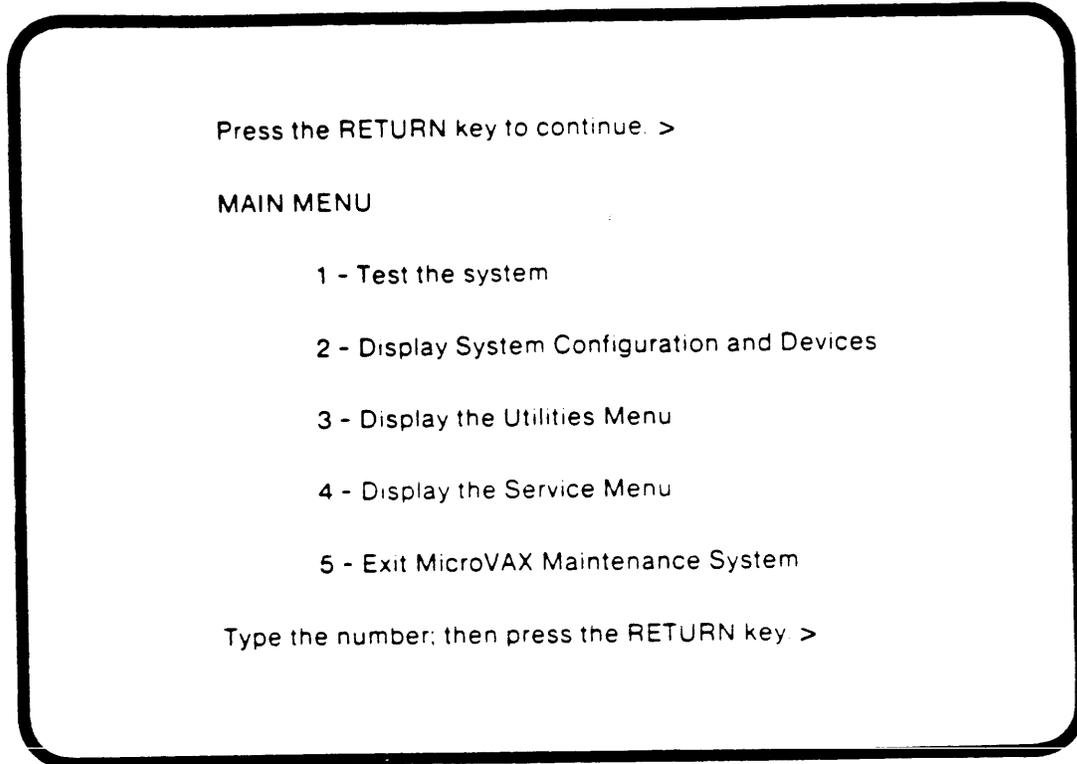


FIGURE 6-3. The MMS Main Menu.

### 6.3.1 Test the System (available on both versions)

Selection 1 on the Main Menu, Test the system provides a quick, general test of the system. This testing is designed to be run by any user (or service person) at any time, without jeopardizing data, and does not require any loopback connectors. This is the only level of testing which is suggested for use by non-technical personnel. If this testing fails to find and display a Field Replaceable Unit (FRU) an authorized service person should be contacted (if a problem is still suspected).

### 6.3.2 Display System Configuration and Devices (available on both versions)

Selection 2 from the Main Menu, Display System Configuration and Devices, provides information on all options which are recognized by the CPU as being in the system. This allows a user or a service person to quickly check the system. If a device which is physically present in the system is not listed under the System Configuration and Devices display, then the device is either configured to the wrong address, is broken, or is improperly connected.

This selection also allows the user to quickly check the revision level of the firmware, to help isolate problems caused by options with incompatible versions of firmware. If an option installed in the system contains read only memory (ROM) the System Configuration and Devices display will list the ROM revision levels on the line directly beneath the option.

A sample System Configuration and Devices display is shown in Figure 6-4.

#### NOTE

The last letter in each option listed differentiates between multiple devices of the same type (A=1, B=2, etc.).

NOTE

The string of characters listed underneath the DEQNA module is the Ethernet station address for the system.

SYSTEM CONFIGURATION AND DEVICES

SYSTEM CONFIGURATION

CPUA ... MicroVAX CPU  
KA630-AA 1MB, FPU MC=00 HW=00  
MEMA ... MicroVAX memory system  
9 megabytes. 18432 Pages.  
KA630 ... CPU module, 1MB on-board memory.  
MS630-BB ... Quad height memory module, 4MB.  
MS630-BB ... Quad height memory module, 4MB.  
RQDXA ... Winchester/diskette controller.  
Revisions =10 and 6  
RD52 ... Nonremovable  
RX50 ... Removable  
RX50 ... Removable  
TK50A ... Cartridge Tape Controller  
DEQNAA ... Ethernet controller.  
AA-00-03-01-3F-10  
DZD11A ... Asynchronous line controller.  
DHV11A ... 8 line asynchronous multiplexer  
ROM Rev - PROC1: 2, PROC2: 2

Press the RETURN key to return to the previous menu. >

FIGURE 6-4. A sample System Configuration and Devices display.

### 6.3.3 Display the Utilities Menu (service version only)

This selection is reserved for future use.

### 6.3.4 Display the Service Menu (service version only)

The Display the Service Menu command is functional only for the Service Version of the MicroVAX Maintenance System, and should be used by qualified service personnel only. The levels of testing accessible through the service menu may destroy data, and should be attempted only when non-destructive testing (selections 1 and 2 of the Main Menu) has failed to indicate a faulty FRU. The Service Menu is shown in Figure 6-5.

## SERVICE MENU

**CAUTION:** This menu is intended for use by qualified service personnel only. Misuse of the commands could destroy data.

1 - Set test and message parameters

2 - Exercise system continuously

3 - Display the device menu

4 - Enter system commands

Type the number; then press the RETURN key,  
or type 0 and press the RETURN key to return to the Main Menu. >1

FIGURE 6-5. The MMS Service Menu.

### 6.3.4.1 Set Test and Message Parameters

This selection allows the selection of several parameters which control operation and message output of MMS. A sample screen displaying parameters which can be changed is shown in Figure 6-6. To change a parameter, just select the option containing that parameter.

SERVICE MENU  
TEST AND MESSAGE PARAMETERS

Parameter	Setting
1 - Display test progress messages .....	ENABLED
2 - Display detailed error messages .....	DISABLED
3 - Stop testing on error .....	DISABLED
4 - Ring bell on error .....	DISABLED

Type the number of the parameter and press the RETURN key to reverse the setting or type 0 and press the RETURN key to return to the previous menu >

FIGURE 6-6 Screen for setting test type and message parameters.

#### 6.3.4.2 Exercise System Continuously

This selection automatically performs one pass of each functional test (for enabled devices), and then runs the exerciser tests for all enabled devices until CTRL C is typed. Loopback connectors are required on all communications devices (see Appendix D for a list of appropriate connectors). Once this selection is chosen, MMS will prompt the user to install appropriate loopbacks, and display a warning about the destruction of data.

#### CAUTION

Destructive tests are performed on all disks and tapes in the system. All removable media should be replaced with blank media before testing. Fixed disks should be backed-up, write-protected, or taken off-line if they contain customer data or operating system programs.

#### 6.3.4.3 Display the Device Menu

This selection displays a list of devices in the system with device-specific tests or device-specific utilities. A sample screen is shown in Figure 6-7. Choosing a selection from this menu causes MMS to display another menu which allows the user to enable or disable testing for the device, perform functional or exerciser tests on the device, or display the maintenance/troubleshooting utilities available for the device. This menu is shown in Figure 6-8.

SERVICE MENU  
DEVICES

This menu lets you enable or disable testing for devices and perform functional and exerciser tests on a selected device.

- 1 - CPUA - MicroVAX CPU
- 2 - MEMA - MicroVAX memory system
- 3 - RQDXA - Winchester/diskette controller.
- 4 - TK50A - Cartridge Tape Controller
- 5 - DEQNA - Ethernet controller.
- 6 - DZQ11A - Asynchronous line controller.
- 7 - DHV11A - 8 line asynchronous multiplexer

Type the number; then press the RETURN key,  
or type 0 and press the RETURN key to return to the previous menu. >

FIGURE 6-7 A sample screen showing the Device Menu.

SERVICE MENU  
DEVICES

RQDXA - Winchester/diskette controller.

Testing is ENABLED

- 1 - Enable/disable testing for device
- 2 - Perform all functional tests
- 3 - Perform the exerciser test
- 4 - Display the device utilities menu

Type the number; then press the RETURN key,  
or type 0 and press the RETURN key to return to the previous menu. >

FIGURE 6-8 The menu for device-specific functions.

#### 6.3.4.3.1 Enable/disable testing for device

Enables or disables testing for the device chosen. If the device was previously enabled, selecting this option disables it. If the device was previously disabled, selecting this option enables it. This selection is used in conjunction with the Exercise System Continuously selection on the Service Menu to control which devices are tested.

#### 6.3.4.3.2 Perform all functional tests

Performs all functional tests on the device chosen.

#### 6.3.4.3.3 Perform the exerciser test

Performs the service mode exerciser test on the device chosen.

#### 6.3.4.3.4 Displays the device utilities menu

Displays the maintenance/troubleshooting utilities available for the device chosen. As an example, Figure 6-9 shows that utility number 1 available for the RQDX controller is a formatter for RD51, RD52, and RD53 disk drives. Table 6-1 lists the specific utilities available for supported devices.

```
SERVICE MENU
DEVICES
RQDXA - Winchester/diskette controller.
UTILITY PROGRAMS AND TESTS
```

Utility selections are:

- 1 - Formatter for RD53, RD52 and RD51 winchester.
- 2 - Utility MSCP Exerciser

Type the number; then press the RETURN key.

FIGURE 6-9 The device-specific utilities for the RQDX2.

If a service person wants to format a drive, selection 1 should be chosen from this menu. The screen in Figure 6-10 will then be displayed. The service person should then answer the questions asked. In the sample shown, user responses have been underlined.

#### RUNNING A UTILITY SERVICE TEST

To halt the test at any time and return to the previous menu, type ^C by holding down the CTRL key and pressing the C key.

```
RQDXA started.
WARNING, this utility will destroy any user data on the selected drive.
Do you want to continue [YES=1,(NO=0)] ? 1
What unit do you want to format (0-3) ? 1
Is this the correct unit number [(Yes=1),No=0] := 1
Please enter the date [MM-DD-YYYY] := 06-13-1985
Do you want to use existing bad block information ?
If first FORMAT on RQDX3 then Answer (No=0) [(Yes=1),No=0] := 1
Continue if bad block information is detected [Yes=1,(No=0)] := 1
Please type in a six digit serial number := 123456
```

FIGURE 6-10 The screen displayed when disk formatting is requested

Once all necessary information is given, MicroVAX Maintenance System formats the disk and displays the information shown in Figure 6-11 underneath the information shown in Figure 6-10. Approximate times for formatting the drives (when controlled by an RQDX2 controller) are:

RD52	11-17 minutes
RD53	24-35 minutes

NOTE: Times are approximate and are given for the Autoformat Mode. Times are dependent on the number of bad blocks encountered by the formatting program.

Formatting has begun ...  
The controller reported a successful termination of the FORMAT command.

Figure 6-11. The message displayed as a disk is formatted.

Table 6-1. MMS Device Utilities

DEVICE	UTILITY
MEMA (Memory)	<ol style="list-style-type: none"> <li>1. Print detailed memory map</li> <li>2. Extended free-standing memory test</li> </ol>
DEQNA	<ol style="list-style-type: none"> <li>1. Loopback utility</li> <li>2. Remote loopback utility</li> <li>3. Loopback server</li> </ol>
DHV11	<ol style="list-style-type: none"> <li>1. Staged loopback test</li> <li>2. loopback characters from terminal</li> <li>3. transmit repeated pattern test to terminal</li> </ol>
DLVJ1	<ol style="list-style-type: none"> <li>1. Staged loopback test</li> <li>2. Terminal echo test</li> <li>3. Transmit pattern test</li> </ol>
DZQ11 / DZV11	<ol style="list-style-type: none"> <li>1. Staged loopback test</li> <li>2. Terminal echo test</li> <li>3. Transmit pattern test</li> </ol>
KDA50	<ol style="list-style-type: none"> <li>1. Comprehensive disk subsystem exerciser</li> <li>2. DUP basic subsystem functional test</li> <li>3. SDI disk drive formatter</li> </ol>
RQDX controller	<ol style="list-style-type: none"> <li>1. Formatter for RD5n disk drives</li> <li>2. Utility RQDX exerciser</li> </ol>

#### 6.3.4.4 Enter System Commands

This selection lets you control the MicroVAX Diagnostic Monitor (MDM) via the Command Line Interface (CLI). While all the tests run from the service menus can be run using CLI, there are no menus. Tests are run by entering appropriate commands, rather than selecting menu entries. The only display seen will be the MDM command prompt:

```
MDM>>
```

For help in selecting the tests and parameters and entering the appropriate commands, type HELP at the prompt. You will then receive a screen display which lists the commands that can be entered along with a short description of each. The screen display is shown in Figure 6-12.

#### NOTE

All communications devices must have loopback connectors installed when testing is performed in the Service mode, as available from the Command Line Interface. (see Figure 6-12). Also, all removable media should be replaced with blank media, and all fixed-disks with customer data should be taken off-line, write protected, or backed up.

MDM>> HELP

Current Commands Are:

CONFIGURE	- Configure system
SELECT Diag_Name	- Select diagnostic (all units) to run
DISABLE Diag_Name	- Prevent a diagnostic from running
ENABLE Diag_Name	- Allow a diagnostic to run
SET DETAILED ON	- Display detailed messages
DETAILED OFF	- DO NOT display detailed messages
MODE VERIFY	- Set verify mode tests
SERVICE	- Set service mode tests
PROGRESS OFF	- Display no progress messages
PROGRESS BRIEF	- Controller progress messages
PROGRESS FULL	- Controller and test progress messages
SECTION FUNCTIONAL	- Set functional test section
UTILITY	- Set utility test section
EXERCISER	- Set exerciser test section
TEST ALL	- Run all enabled tests
xx	- Run only test number xx
PASSES xx	- Run tests for xx passes
START	- Start selected tests running
START ALL	- Start all enabled tests running
SHOW CONFIGURATION	- Show system configuration information
SHOW DEFAULT	- Show default settings
SHOW DEVICE UTILITIES	- Show utility titles
SHOW ERRORS	- Show reported errors

MDM>>

FIGURE 6-12. A partial list of selections from the MDM HELP display.

Using the command line interface (CLI) allows the execution of in-depth testing without the structure of menus. This provides less help to the beginning service person, but allows experienced service personnel the flexibility to perform tests more quickly.

Two "modes" of testing are available from the CLI - verify and service. In verify mode, all tests run are non-destructive, and require no loopback connectors or special setup. They provide a quick check of device functionality, and are the same as tests run from selection 1 of the Main Menu. In service mode (the default mode found each time the CLI is entered), the tests run are more rigorous, and as mentioned previously, loopback connectors are required, and customer data may be destroyed. These tests are the same as those run from selection 2 of the service menu, as well as from the various device menus.

Each mode is divided into three sections - functional, exerciser, and utility. In the functional section, each device test runs independently. Functional tests give better isolation of faults than exerciser tests. In the exerciser section, however, all device tests run concurrently, testing device interaction not checked in the functional section. In the utility section, device specific programs such as disk formatters and special fault isolation tests are provided. To switch modes, or sections within a mode, the SET MODE and SET SECTION commands are used. The SHOW DEFAULT command can be used to display the current default mode and section.

The SHOW DIAGNOSTICS UTILITIES command displays the available diagnostics for the selected device. The device currently selected is also displayed by the SHOW DEFAULT command. The SELECT command is used to change the device for which available utilities will be displayed.

To control the frequency and detail of messages displayed while running tests, the SET PROGRESS and SET DETAILED\_MESSAGES commands are used. Detailed messages and full progress messages are recommended for most troubleshooting. Again, current default conditions are displayed by the SHOW DEFAULT command.

To exit the Command Line Interface, the RESTART command is used.

## 6.4 BACKING UP MICROVAX MAINTENANCE SYSTEM DIAGNOSTICS

Before using the MicroVAX Maintenance System diagnostic diskettes, a backup copy should be made using the appropriate procedure under the operating system installed.

### 6.4.1 Copying Diagnostics Using MicroVMS

To make a copy of the MMS diagnostic diskettes, it is first necessary to show the list of device drives to determine which device names have been given to the two diskette drives within the RX50. At the prompt type:

```
SHOW DEVICE DU
```

The system will respond with a display similar to that shown in Figure 6-13.

Figure 6-13 A display of the DU-type drives in the system.

DU-type drives include all RD5n drives and each drive of an RX50. Typically, the highest numbered drives (e.g., drives DUA2 and DUA3) are assigned to the RX50.

To make a backup using the system of Figure 6-13, place the first MMS diskette in drive DUA2, the first diskette drive, and place a blank diskette in drive DUA3, the second diskette drive. Then type:

```
MOUNT/FOREIGN/OVER=ID DUA2
```

The system should respond with:

```
%MOUNT-I-MOUNTED, ELAN                mounted on _DUA2:
```

Then type:

```
MOUNT/FOREIGN DUA3
```

The system should respond with:

```
%MOUNT-I-MOUNTED,                mounted on _DUA3:
```

Then type:

```
BACKUP/PHYSICAL/VERIFY/INIT DUA2: DUA3:
```

The system should respond with:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

When the \$ prompt returns, a copy of the diskette in DUA2 has been made on the diskette in DUA3. When completed type:

```
DISMOUNT DUA2  
DISMOUNT DUA3
```

This process should be repeated for each MMS diskette.

#### 6.4.2 Copying Diagnostics Using Ultrix-32M

To copy MMS diskettes using Ultrix-32M, use the following command:

```
dd if=/dev/rala of=/dev/ra2a
```

Where dev/rala and dev/ra2a are the logical names of the input diskette and output diskette, respectively. This assumes the system has one RD5n disk drive labeled dev/ra0a. If the system has two RD5n drives, then the two diskette drives are labeled dev/ra2a and dev/ra3a.

NOTE: This procedure will generate one error as the system tries to read past the end of the input disk, but all the data will be successfully copied if the system reaches this point.

#### 6.5 DETERMINING WHAT DEVICE DIAGNOSTICS ARE ON AN MMS DISKETTE (MicroVMS Only)

To determine what individual device diagnostics are on an MMS diskette, first determine the device name of the first diskette drive using the SHOW DEVICE DU command (see Section 6.4.1). Then place the MMS diskette in that drive and type the following commands:

```
MOUNT/OVER=ID DUA2  
DIR DUA2:[*...]
```

The system will respond with a list of files on the diskette. A sample is shown in Figure 6-14.

Figure 6-14 A list of files on an MMS diskette

For each device diagnostic, there is a file named:

GGSKMxxx.EXE;nn

Where the letters in positions xxx represent the device. Table 6-2 gives the abbreviations used for each supported device.

Table 6-2 Directory Abbreviations for Each Supported Device

ABBREVIATION	DEVICE
DHA	DHV11
DLA	DLVJ1
DMA	DMV11
DPA	DPV11
DRA	DRV11-J
DZA	DZQ11 or DZV11
IEA	IEQ11-A
KAA	KA630
KDA	KDA50-Q
KMA	KMV11-A
LPA	LPV11
MSA	MS630
RRA	RRD50
RXA	RX50, RD5n, RQDXn
TKA	TQK50
TSA	TSV05
XQA	DEQNA

When done, type:

DISMOUNT DUA2

and remove the diskette.

## CHAPTER 7--TROUBLESHOOTING

### 7.1 Introduction

This chapter performs two basic functions. It provides:

1. An overview of diagnostic and maintenance tools available for use with the MicroVAX II (except the MicroVAX Maintenance System, discussed in Chapter 6).
2. A roadmap for the diagnosis and repair of failures.

### 7.2 KA630 Boot and Diagnostic ROM

MicroVAX II boot and diagnostic ROM provides a console emulation program as well as diagnostic tests for the KA630 and MS630 modules. Commands used with the console emulation program are listed in Appendix A. The console emulation program may also generate hexadecimal error messages during either testing or normal use. A list of these error messages, and their explanations, is found in Appendix B.

Tests can be executed in either of two ways:

- Automatically (on power-up or by pressing restart)
- Manually (by typing explicit commands at the console terminal)

#### 7.2.1 Power-up Tests

Upon power-up or restart, the ROM diagnostics, in conjunction with the boot programs, test the KA630 module's ability to load and run an operating system, the MicroVAX Maintenance System, or other diagnostic software.

A test of the console port can also be selected by setting the power mode switch on the CPU rear I/O distribution insert to the T position before powering up the system. This causes the console port transmit and receive lines to be connected and a continuous loopback test to be executed.

While the test is executing, the 7-segment LED display on the insert should alternate between 9 and F. Any other behavior by the LED constitutes a failure of the test and indicates that the rear I/O distribution insert, the interconnecting cables, or the CPU module have failed.

The test can be repeated with a KA630CNF (H3263-00) to isolate between the cables and the insert. If the test then fails (judged by the LED values on the CPU module itself, see Figure 7-1) the CPU is bad. If the test then passes, the insert or cabling is bad. See Appendix F for a description of the switch settings in the KA630CNF.

Table 7-1 provides a description of each test executed by the ROM diagnostics, and the test number displayed on the MicroVAX II CPU I/O distribution insert while each test is being run. The test number is also displayed in binary form by a series of red LEDs on the KA630-A module (Figure 7-1). For values of 7 or less, on the console terminal will also display the test number.

If a failure occurs, the start-up sequence will stop with the number of the failing test remaining in the display. Table 7-1 lists the probable field replaceable units (FRUs) for each nonzero value of the display.

For tests 7-3, the number of the failing subtest may also be displayed on the console. This information can be used to further isolate failures. Figure 7-2 shows the format for these error messages and Table 7-2 lists the subtests for each test.

NOTE: Test number 7 builds a list of map of good and bad memory pages. It will only fail if less than 64 kbytes of good memory is found. A utility for reading this map has been provided in the service version of MMS, and will find the location of bad memory pages (see Section 6.3.4.3.4).

Table 7-1. LED Status and Error Messages.

LED	ERROR MESSAGE/PROBABLE FRU FAILURES
F	<p>WAITING FOR DCOK</p> <ol style="list-style-type: none"> <li>1. KA630-A module (does not recognize DC OK assertion)</li> <li>2. Power supply (negating DC OK on bus)</li> <li>3. A Q22-bus device (negating DC OK on bus)</li> <li>4. Backplane (DC OK shorted to another signal)</li> <li>5. Power supply cable (defective or not properly connected)</li> </ol>
E	<p>WAITING FOR POK</p> <ol style="list-style-type: none"> <li>1. KA630-A module (does not recognize P OK assertion)</li> <li>2. Power supply (negating P OK on bus)</li> <li>3. A Q22-bus device (negating P OK on bus)</li> <li>4. Backplane (P OK shorted to another signal)</li> </ol>
D	<p>RUNNING CHECKSUM TEST ON CPU ROM</p> <ol style="list-style-type: none"> <li>1. KA630-A module</li> </ol>
C	<p>SEARCHING FOR RAM MEMORY REQUIRED FOR CPU ROM PROGRAMS</p> <ol style="list-style-type: none"> <li>1. KA630-A module</li> <li>2. MS630 module(s)</li> <li>3. KA630-A/MS630 interconnect cable (short- or open circuited)</li> </ol>
B	<p>READ KA630-A IPCR REGISTER (accesses Q22-bus)</p> <ol style="list-style-type: none"> <li>1. KA630-A module</li> <li>2. A Q22-bus device (preventing the CPU from acquiring the bus)</li> <li>3. Backplane (preventing the CPU from acquiring the bus)</li> </ol>

```
+-----+-----+
| LED   | ERROR MESSAGE/PROBABLE FRU FAILURES |
+-----+-----+
```

A TESTING VCB01 VIDEO CONSOLE DISPLAY (if present)

1. Keyboard for VCB01 (defective or not connected)
2. Video display for VCB01 (defective or not connected)
3. VCB01 graphics module
4. KA630-A module (can't read or write Q22 bus; may be shorting Q22-bus)
5. A Q22-bus device (preventing the CPU from acquiring the bus)
6. Backplane (preventing the CPU from acquiring the bus)
7. VCB01 distribution insert

9 IDENTIFYING CONSOLE TERMINAL

1. KA630-A module (if console does not respond within 6 seconds, CPU will proceed to 7)

8 LANGUAGE INQUIRY OR CPU HALTED

NOTE: When the LED is stopped at 8, the system is either: A) preparing to ask the user to supply the selected language to be used, B) informing the user that the CPU is halted or C) actually indicating a failure. If the system is not indicating a halt, but waiting for a language to be entered, it will time out and continue testing within 2 to 6 minutes.

NOTE: Before the console reaches 8, a heading should appear which reports the version of CPU installed in the system, as well as other system information. If the LED reaches 8 or less and the

+-----+  
| LED | ERROR MESSAGE/PROBABLE FRU FAILURES |  
+-----+

console terminal doesn't display a heading, the following problems should be suspected:

1. KA630-A module (probably console interface)
2. Console cables (defective or not connected)
3. Console baud rate (mismatched)
4. Console terminal (powered off)
5. Console terminal (broken)
6. CPU distribution insert (broken or improperly set)

7 RUNNING DATA TESTS ON RAM MEMORY

1. KA630-A module (RAM memory failure)
2. MS630 module
3. Backplane (CD interconnect short- or open-circuited)
4. KA630-A/MS630 interconnect cable short- or open-circuited)

6 RUNNING ADDRESS TESTS ON RAM MEMORY

1. MS630 module
2. Backplane (CD interconnect short- or open-circuited)
3. KA630-A/MS630 interconnect cable short- or open-circuited)

5 RUNNING TESTS THAT USE Q22-BUS MAP TO ACCESS LOCAL MEMORY

1. KA630-A module
2. Q22-bus device (preventing the CPU from acquiring the bus)
3. Backplane (preventing the CPU from acquiring the bus)

4 CPU INSTRUCTION AND REGISTER TESTS

1. KA630-A module

LED	ERROR MESSAGE/PROBABLE FRU FAILURES
-----	-------------------------------------

3            RUNNING INTERRUPT TESTS

1. KA630-A module
2. Q22-bus device (incorrectly requesting interrupt)
3. Backplane (Q22-bus BR4-BR7 line shorted)

2            SEARCHING FOR BOOTSTRAP DEVICE

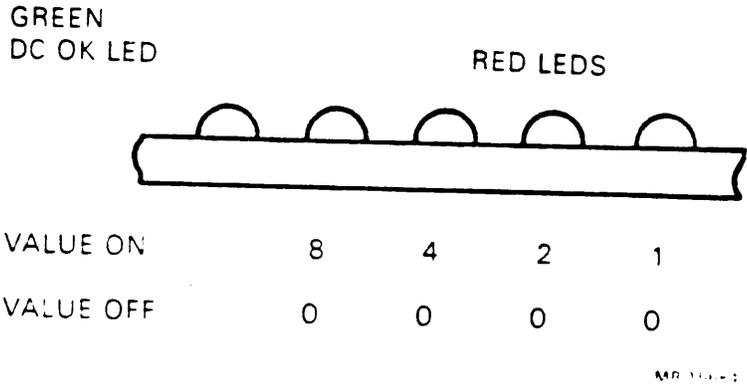
NOTE: Be sure to try the remedies in the Troubleshooting section of the Owner's Manual before exploring these possibilities.

NOTE: Please check signal and power cables before assuming drives or controllers to be defective. Once cables have been checked, examine power-up LEDs on individual devices and refer to Section 7-3.

1. RQDX controller, RD5n drive, RX50 drive, or interconnect cable defective or not properly connected.
2. TQK50 controller, TK50 drive, or interconnect cable defective or not properly connected.
3. MRV11D module
4. DEQNA module, interconnect cables, fuse, ethernet transceiver, or ethernet cables.
5. KA630-A module

LED	ERROR MESSAGE/PROBABLE FRU FAILURES
1	BOOTSTRAP DEVICE FOUND
	1. Q22-bus bootstrap device 2. Signal cable to bootstrap device (defective or not connected) 3. Power cable to bootstrap device (defective or not connected) 4. KA630-A module
0	TESTING COMPLETED

Figure 7-1. LEDs on the KA630-A CPU module



The the sum of values of all LEDs ON (when translated to hexadecimal) corresponds to the hexadecimal values listed in Table 7-1. A complete set of number system conversion tables is given in Appendix H.

- 1.
- 2.
- 3.
- 4.
- 5.

```
KA630-A.XX  
PERFORMING NORMAL SYSTEM TESTS.  
7 . . .  
? <SUBTEST> <P1> <P2> <P3>  
FAILURE.  
NORMAL OPERATION NOT POSSIBLE.
```

514 13085

Figure 7-2. Example of a console terminal error message.

1. Identifies the processor and the version number of the console program ROM.
2. Explains that the system is performing normal system tests as programmed on the ROM.

3. Begins a countdown sequence to show that the system is progressing through its tests. The numbers displayed have the same meaning as the numbers displayed on the rear I/O panel insert.
4. Indicates the failing subtest number. A list of subtests is given in Table 7-2.
5. Indicates that the test has failed and that the console program has stopped executing.

Table 7-2 Subtests for Tests 7-3

---

7 RUNNING DATA TESTS ON RAM MEMORY

1. 64 kbytes of good memory not found
2. unexpected interrupt
3. error in a known good page

6 RUNNING ADDRESS TESTS ON RAM MEMORY

1. error found in memory on KA630 CPU
2. error found in memory on 1st MS630
3. error found in memory on 2nd MS630
4. error in a known good page
5. write wrong parity logic error
6. nonexistent memory time out error

Table 7-2 (cont.)

-----  
5      RUNNING TESTS THAT USE Q22-BUS MAP TO ACCESS LOCAL MEMORY

1.      couldn't clear IPCR
2.      bits don't match mask
3.      unexpected interrupt

4      CPU INSTRUCTION AND REGISTER TESTS

1.      byte mask error
2.      64 kbytes of good memory not found
3.      memory management unit error
4.      floating point unit error ,

3.     RUNNING INTERRUPT TESTS

1.      interval timer error
2.      console error
3.      IPCR could not be cleared in a MSER subtest
4.      MSER subtest failed, no Q bus operation involved
5.      MSER subtest failed, Q bus operation involved
6.      Could not drive data into known good memory through Q bus
7.      tried to create nonexistent memory time-out
8.      IPCR subtest failed

7.2.2 Console Mode

In the Console I/O mode, one of the ROM tests may be selected using the TEST command. In addition, the EXAMINE command lets the user EXAMINE the contents of registers and memory, and the BOOT command, when combined with the appropriate qualifier, selects the boot device. Further details on console commands are given in Appendix A.

### 7.3 Power-up LEDs on Mass Storage, Backup, and Communications Devices

Several of the supported options (modules) for MicroVAX II have LEDs which provide information on device-level power-up testing. Figures 7-3 through 7-5 show the orientation of LEDs on these modules, and Tables 7-2 through 7-4 explaining the definitions of possible LED readings, and the likely field replaceable units (FRUs).

NOTE: DEQNA LED operation is as specified below only when the DEQNA is used as the boot device. If not used as a boot device, all DEQNA LEDs remain on.

Figure 7-3 LED orientation on the DEQNA module

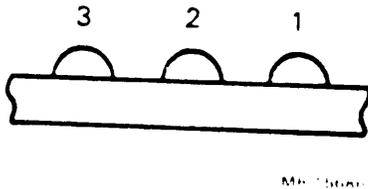


Table 7-2 DEQNA Module LED indications

LEDS			DEFINITION/FRU		
3	2	1			
ON	ON	ON	Performing DEQNA Address PROM test	Station	
			1. DEQNA module		
			2. KA630 module		
			3. Q22-bus device		
			4. Backplane		



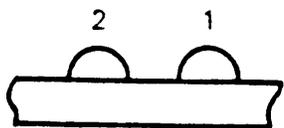
Table 7-3 RQDX2 Module LED Indications

LEDs				Definition/FRU
D10	D9	D8	D7	
ON	ON	ON	ON	Beginning power-up testing 1. RQDX2 Module
OFF	OFF	OFF	ON	Performing T11 processor test 1. RQDX2 Module
OFF	OFF	ON	OFF	Performing T11 timer/counter/ address generator test 1. RQDX2 Module
OFF	OFF	ON	ON	Performing Q22-bus timer/ counter/ address generator test 1. RQDX2 Module
OFF	ON	OFF	OFF	Performing Serializer/ Deserializer test 1. RQDX2 Module
OFF	ON	OFF	ON	Performing CRC generator test 1. RQDX2 Module
OFF	ON	ON	OFF	Performing hardware version test 1. RQDX2 Module

OFF	ON	ON	ON	Performing ROM checksum test 1. RQDX2 Module
ON	OFF	OFF	OFF	Performing RAM test 1. RQDX2 Module
ON	OFF	OFF	ON	Performing diagnostic interrupt test 1. RQDX2 Module
ON	OFF	ON	OFF	Performing shuffle oscillator test 1. RQDX2 Module
ON	OFF	ON	ON	Performing valid configuration test 1. RQDX2 Module
ON	ON	OFF	OFF	NOT USED
ON	ON	OFF	ON	NOT USED
ON	ON	ON	OFF	NOT USED
OFF	OFF	OFF	OFF	Testing completed

+-----+-----+

Figure 7-5 LED orientation on the TK50 module



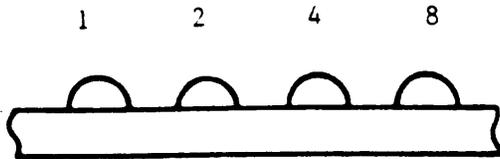
MR-15688

Table 7-4 TK50 Module LED Indications

LEDs		Definition
2	1	
ON	ON	Failed to pass power-up test 1. TQK50 module
OFF	ON	Failed U/Q port initialization 1. Controller 2. Interconnect cable 3. Drive
BLINKING	BLINKING	Fatal error detected by controller 1. Interconnect cable (improperly keyed) 2. Controller 3. Drive
OFF	OFF	Normal operation

FIGURE 7-6 LED orientation on the KDA50-Q modules

M7164



M7165

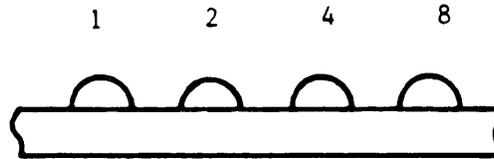


Table 7-5 KDA50 Module LED Indications

M7164 LEDs* 8 4 2 1	M7165 LEDs* 8 4 2 1	Error Symptoms	Most Likely Failure
0 0 0 1 0 0 1 0	x x x x 0 0 0 0	Hex 1. undefined Hex 2. microcode stuck in init step 2	Undefined M7164 or software
0 0 1 1	0 0 0 0	Hex 3. microcode stuck in init step 3	..
0 1 0 0	0 0 0 0	Hex 4. microcode stuck in init step 4 or QBUS timeout error	M7164 or bus inactive

(Cont.)

Table 7-5 KDA50-Q LED Indications (continued)

M7164 LEDs <sup>a</sup> 8 4 2 1	M7165 LEDs <sup>a</sup> 8 4	Error Symptoms	Most Likely Failure
B L 0 1 0 1 N K	0 0 0 0	Hex 4/5, test complete. Normal display for operating KDA50-Q	No problem
0 1 1 0 x x x x	x x x x 0 1 1 0	Hex 6, undefined	Undefined
0 1 1 1 x x x x	x x x x 0 1 1 1	Hex 7, undefined	Undefined
1 0 0 0	0 0 0 0	Hex 8, wrap bit 14 set in SA register	M7164 or software
1 0 0 1 0 0 0 0	0 0 0 0 1 0 0 1	Hex 9, board one error	M7164
1 0 1 0 1 0 1 0	0 0 0 0 1 0 1 0	Hex A, board two error	M7165
1 0 1 1 x x x x	x x x x 1 0 1 1	Hex B, undefined	Undefined
x x x x 1 1 0 0	1 1 0 0 x x x x	Hex C, Timeout error, check error code in SA register. Refer to Table 2-2.	Many causes
1 1 0 1 x x x x	x x x x 1 1 0 1	Hex D, RAM parity error	M7165
1 1 1 0 x x x x	x x x x 1 1 1 0	Hex E, ROM parity error	M7164
1 1 1 1	1 1 1 1	Hex F, sequencer error	M7164
Cycling pattern	Cycling pattern	None	No problem ...
		The cycling pattern continues beyond the start of the initialization process. The KDA50-Q is not responding to the host CPU.	M7164

<sup>a</sup> The bit order significance of the KDA50-Q LEDs is the reverse order (1 2 4 8) when viewed with the module handles positioned horizontally (chips upward).

Several supported options for the MicroVAX II system have a single LED which indicates proper operation of that option. Those options include:

DRV11 (on indicates proper operation)

DHV11 (on indicates proper operation)

RQDX3 (on indicates failure)

## 7.3 Logging and Reporting Errors Using MicroVMS

The MicroVMS operating system supported by MicroVAX II includes programs which record and isolate intermittent problems. To install, run, or modify these programs, the MicroVMS SYSTEM account, or another account with full system privileges must be used. The two utilities which provide this function are:

- ERRFMT, a program which collects the errors while the system is running
- Error Reporting Facility (ERF), the program which formats and prints the error information

### 7.3.1 Enabling the MicroVMS Error Log

The ERRFMT utility may or may not be enabled on a MicroVAX system running MicroVMS. To determine whether or not ERRFMT is enabled type SHOW SYSTEM and press the RETURN key. A display similar to Figure 7-7 will appear.

```
$ SHOW SYSTEM
VAX/VMS V4.1 on node MOTHRA 29-APR-1985 22:45:42.61 Uptime 0 02:22:15
  Pid  Process Name  State Pri  I/O      CPU      Page flts Ph.Mem
00000010 NULL             COM    0    0    0 02:19:27.53    0    0
00000011 SWAPPER         HIB   16    0    0 00:00:00.42    0    0
00000014 JOB CONTROL   HIB    8   26    0 00:00:00.26    86   177
00000015 ERRFMT        HIB    8   94    0 00:00:00.77    67    87
00000016 NETACP        HIB   10   96    0 00:00:03.36   279   203
00000017 REMACP        HIB    9   29    0 00:00:00.21    70    38
00000018 OPA0:NiteOwl    HIB    5  15922  0 00:00:51.62  2461  308
00000029 SYSTEM        CUR    4  1106    0 00:00:14.84  1582  267
$
```

Figure 7-7 The display showing system processes enabled.

Check the Process name column. If a process named ERRFMT is listed, the ERRFMT utility is enabled. If ERRFMT is not enabled, it can be enabled in one of two ways:

1. To collect errors that until the next time the system is shut down, ERRFMT must be started. To start ERRFMT type:

```
@SYSSSYSTEM:STARTUP ERRFMT
```

and press the RETURN key.

2. To collect errors that occur whenever VMS is running, the Startup Command file must be modified. To modify the file type:

```
EDIT/NOCOMMAND SYSSMANAGER:SYSTARTUP.COM
```

and press the RETURN key.

The system will respond with:

```
1          $ WRITE SYSSOUTPUT ""
```

\*

At this asterisk type:

```
" ERRFMT"
```

and press the RETURN key.

The system will respond with:

```
nn          $ !@SYSSSYSTEM:STARTUP ERRFMT
```

\*

Where nn stands for the number of the line in the start up command file which contains the command for ERRFMT. At this asterisk type:

```
SUB /!//
```

and press the RETURN key.

The system will respond with:

```
      21          $ @SYSS$SYSTEM:STARTUP ERRFMT  
1 substitution
```

\*

At this asterisk type:

```
EXIT
```

and press the RETURN key.

The system will respond with:

```
SYSSSYSROOT:[SYSMGR]SYSTARTUP.COM;n nnn lines
```

Where n indicates the revision level of the start up command file, and nnn indicates the number of lines in the file.

Once the ERRFMT is running, it collects errors as they occur, and stores them in a file called SYSS\$ERRORLOG:ERRSYS.SYS. If the system has been set to collect errors every time it runs, this file can become unmanageably large. Also, new or current errors are often those which provide the most insight into current problems. To save the errors found from previous sessions, and start a new file with only current errors type:

```
RENAME SYSS$ERRORLOG:ERRSYS.SYS SYSS$ERRORLOG:ERRLOG.OLD
```

and press the RETURN key.

### 7.3.2 Installing the Error Reporting Facility

Not all MicroVMS operating systems have the Error Reporting System installed. To verify installation, enter the System account and type:

```
. ANALYZE/ERROR_LOG/SUMMARY=ENTRY/NOFULL
```

If the Error Reporting Facility is NOT installed, Figure 7-8 will be displayed.

```
&DCL-W-ACTIMAGE, error activating image SYS$SYSTEM:ERF.EXE  
-CLI-E-IMAGEFNF, image file not found DUA0:[SYS0.][SYSEXE]ERF.EXE;
```

Figure 7-8 Display seen when the Error Reporting Facility is not installed.

If the Error Reporting Facility is installed, Figure 7-9 will be displayed.

Error Log Report Generator

Version V04-002

SUMMARY OF ALL ENTRIES LOGGED BY SID 08000000

SYSTEM START-UP	7.
ERRLOG.SYS CREATED	1.
FATAL BUGCHECK	6.
TIME-STAMP	2.
VOLUME MOUNT	7.
DEVICE ATTENTION	7.
ERL\$LOGMESSAGE	7.
DATE OF EARLIEST ENTRY	4-JAN-1978 09:54:57.28
DATE OF LATEST ENTRY	29-APR-1985 22:54:26.29

Figure 7-9 Display seen when the Error Reporting Facility is installed.

In the event that the Error Reporting Facility is not present, it must be installed from the MicroVMS distribution. When preparing to install the facility, the following conditions should be observed:

- DECnet should be stopped
- All users should log off the system
- A current backup should be made

NOTE: The installation of the Error Reporting Facility should in no way affect existing data. The backup listed is just a precautionary measure.

If the MicroVMS distribution used is on diskettes, the diskette labeled BIN RX50 1/n UTIL (diskette 1 of number n in a set) into the first drive. If the distribution used is on tape, load the cartridge provided into the TK50 tape drive. Once the first diskette or the tape has been loaded, type the appropriate command:

```
@SYSSUPDATE:VMSINSTAL UTIL $FLOPPY1 (for diskette)
```

```
@SYSSUPDATE:VMSINSTAL UTIL $TAPE1 (for tape)
```

and press the RETURN key. A display similar to Figure 7-10 should be seen.

VAX/VMS Software Product Installation Procedure V4.0

It is 30-APR-1985 at 02:52.

Enter a question mark (?) at any time for help.

\* Are you satisfied with the backup of your system disk [YES]?

Figure 7-10 Installing the Error Format Facility (1 of 6)

Press the RETURN key. A display similar to Figure 7-11 should now be displayed.

Please mount the first volume of the set on \$FLOPPY1:.  
\* Are you ready?

Figure 7-11 Installing the Error Format Facility (2 of 6)

Type yes, and press the RETURN key. Once the distribution is accessed by the procedure, it will display the mount information and the name of the product option being installed (in this case the Error Format Facility), as shown in Figure 7-12.

```
%MOUNT-I-MOUNTED, UTIL01          mounted on _DUAL:
The following products will be processed:
```

```
UTIL V4.1
```

```
Beginning installation of UTIL V4.1 at 02:52
```

Figure 7-12 Installing the Error Format Facility (3 of 6)

The system will then ask if the entire kit is to be installed. Answer no, and press the RETURN key. The display will then ask if each of the options should be installed, as shown in Figure 7-13. Answer no for each option except the Error Log Report Generator.

- \* Do you want to install the entire kit: NO
- \* Do you want to install the MAIL utility: NO
- \* Do you want to install the SEARCH utility: NO
- \* Do you want to install the DIFF utility: NO
- \* Do you want to install the DUMP utility: NO
- \* Do you want to install the RUNOFF utility: NO
- \* Do you want to install the PHONE utility: NO
- \* Do you want to install the MicroVMS HELP library: NO
- \* Do you want to install the Remote terminal support via SET HOST/DTE: NO
- \* Do you want to install the Drivers for network communication devices: NO
- \* Do you want to install the LAT-11 terminal server support (via Ethernet): NO
- \* Do you want to install the Stand-alone backup on system disk support: NO
- \* Do you want to install the MicroVAX-I bootstrap that works for any MSCP system diskette: NO
- \* Do you want to install the Error Log Report Generator utility: YES

Figure 7-13 Installing the Error Format Facility (4 of 6)

Once all the questions have been answered, the system will display a message similar to Figure 7-14. If tape was used, the distribution will continue to completion without further interaction. If the distribution is diskette, the system will request the installation of the contents of each diskette in the UTIL set - in order. When the system is ready for the next diskette, it displays the prompt shown in Figure 7-15.

%VMSINSTAL-I-RESTORE, Restoring product saveset N...

Figure 7-14 Installation of Error Format Facility (5 of 6)

Please mount the next distribution volume on \$FLOPPY1:.  
(If no more volumes, answer NO.)  
\* Are you ready?

Figure 7-15 Installation of Error Format Facility (6 of 6)

### 7.3.3 Accessing and Reading the Error Log

By accessing the contents of the error file, an authorized service person or technically-oriented user may determine the faulty FRU. Reading the entire error log, however, is typically not necessary. Several commands and qualifiers help limit the scope of the error information formatted and displayed, to more efficiently isolate the current problem. A possible error log command is given here as an example.

```
S ANALYZE/Error_log/INCLUDE=(DISK)/SINCE [=10/20/85]
```

1                    2                    3                    4

1. The ANALYZE command requests the MicroVMS operating system to analyze a file.
2. Error\_log specifies the file to be analyzed.
3. INCLUDE=(DISK) specifies that entries in the file pertaining to disk drives be included in the analysis.
4. SINCE [=10/20/85] requests that only those entries which have occurred since 10/20/85 be included in the analysis.

With the information given above, it is apparent that the command given would analyze all entries in the error log concerning disk drives which occurred after 10/20/85. This would help isolate and interpret an intermittent disk problem that failed to occur when field service personnel answered a service call. A list of parameters and keywords for using the MicroVMS error logging utility is given in Appendix C.

### 7.3.4 Copying an Error log

It is possible to make a copy of the error log file for analysis at a remote location. If the copy is to be made on a diskette, place a blank diskette in the first drive and enter the following commands:

```
ALLOCATE $FLOPPY1
INITIALIZE $FLOPPY1 ERRORLOG
MOUNT $FLOPPY1 ERRORLOG
```

The system will respond with:

```
%MOUNT-I-MOUNTED, ERRORLOG          mounted on _DUAL:
```

Then enter the following commands:

```
CREATE/DIRECTORY $FLOPPY1:[SYSERR]
COPY SYSSERRORLOG:ERRSYS.SYS $FLOPPY1:[SYSERR]*.*
DISMOUNT $FLOPPY1
```

If the copy is to be made on a TK50 tape, place a blank tape in the tape drive and enter the following commands:

```
ALLOCATE $TAPE1
```

The system will respond with:

```
DCL-I-ALLOC, _MUA0: allocated
```

Then enter the following commands:

```
INITIALIZE $TAPE1 ERRORLOG
MOUNT/WRITE $TAPE1 ERRORLOG
```

The system will respond with:

```
%MOUNT-I-MOUNTED, ERRORLOG          mounted on _MUA0:
```

Then enter the following command:

```
COPY SYSSERRORLOG:ERRSYS.SYS $TAPE1:
```

When the prompt returns, the copy has been made. Then type:

```
DISMOUNT $TAPE1
```

## 7.4 CAPTURING MICROVMS SYSTEM CRASH INFORMATION

When a severe error condition causes the system to crash, the error reporting facility described in section 7.4 may not capture all the information necessary to determine the problem. In such cases, it may still be possible to determine the entire system status and perform an analysis of event(s) which caused the system to crash. To do so, it is necessary to create a system dump file.

### 7.4.1 Creating A System Dump File

NOTE: A system dump file should only be set up when attempting to capture intermittent problems, as the system dump file (sys\$system:sysdump.dmp) is several thousand blocks in size. Once the problem is solved, delete this file if disk space is at a premium.

NOTE: The information captured during a system crash and stored in the SYSDUMP file contains detailed processor register and memory contents information. The analysis of this data should be left to properly trained personnel. The intent of this procedure is merely to capture the data.

1. Log in under the System Manager's account.
2. Type: Show Memory

and press the RETURN key. A display will detail how memory is being used in the system. Record the total number of pages.

3. Add 4 to the total number of pages. Record this number.

4. Type: Show Devices

and press the RETURN key. Determine if the number of free blocks on the system disk is at least three times greater than the number calculated in Step 3. If this many blocks are not available, disk space will need to be made available before continuing.

5. Type: Set Default Sys\$update

and press the RETURN key.

6. Type: @Swapfiles

and press the return key.

7. The program will identify the sizes of the Page File and Swap Files currently in the system. If there is already a System Dump File, it will also be identified. Follow the instructions printed out by the program. If no change is required to the Page, Swap, or System Dump files, the program specifies that a carriage return be entered. When the program asks for a System Dump File, enter the value recorded in Step 3. This is the size of the file in blocks.

NOTE: If memory has just been added to the system, it is necessary to increase the size of the System Dump File.

8. Apply the following modifications to SYSTARTUP.COM in the SYSMGR account:

```
$ ! Procedure to store the most recent crash dump
$ COPY SYSSYSTEM:SYSDUMP.DMP SYSDUMP.OLD
$ PURGE SYSDUMP.OLD /KEEP=3
```

You will need to utilize the EDIT/EDT text editor to enter the above commands into the SYSTARTUP.COM file. This is most easily accomplished on a video terminal. Refer to the MicroVMS User's Manual for help in using the EDT editor.

9. Perform an orderly shutdown. Be sure all users log out and then type:

Shutdown

and press the RETURN key.

10. Reboot the system. The system is now ready to capture a system crash.

#### 7.4.2 Copying the SysDump and Errorlog Files to a TK50 Tape

This procedure will copy both the System Dump and Error Log files to TK50 tapes. This allows the system information to be analyzed at a remote location.

NOTE: The size of the System Dump file is extremely large. The only practical medium to copy it onto is a TK50 tape. For convenience the instructions also include the copying of the Errorlog files. If just the Error log files are needed, refer to section 7.4.4. If just the System Dump file is needed, omit Step 6.

1. Login to the System Manager account.
2. Insert and load a blank TK50 into the TK50 drive.
3. Type: INITIALIZE MUA0: and press the RETURN key.
4. Type: MOU /OVER=ID MUA0: and press the RETURN key.
5. Type: COPY SYSDUMP.OLD;\* MUA0 and press the RETURN key.
6. Type: COPY SYSSERRORLOG:ERRLOG.SYS MUA0:\*  
and press the RETURN key.
7. Type: DISMOUNT MUA0: and press the RETURN key.

### 7.4.3 Deleting a System Dump File

When the cause of a crash has been discovered and corrected, it may be desirable to delete copies of the Dump File to conserve disk space. To delete the file:

1. Log in under the System Manager account

2. Type:

```
DELETE SYSSSYSTEM:SYSDUMP.DMP;1
```

and press the RETURN key.

3. Type:

```
DELETE SYSDUMP.OLD;*
```

and press the RETURN key.

4. Delete the lines added to SYSTARTUP.COM using the EDT editor.

## 7.5 ULTRIX-32M ERROR INFORMATION

The Ultrix operating system supported by MicroVAX collects system and device errors which are maintained in an error log file called (/usr/adm/messages).

### 7.5.1 Displaying Ultrix Error Information

This file is in a format which can be easily displayed on a terminal by using the "cat" command. To display the entire error log file type:

```
cat /usr/adm/messages
```

and press the RETURN key.

To display only the last "n" number of lines in the error log file, limiting the amount of information displayed, type:

```
tail -n /usr/adm/messages
```

and press the RETURN key.

To prevent the information from scrolling up a video screen too quickly, it is helpful to use the more command. This command will stop the display when the screen is full, and prompt for a command before continuing. It also facilitates a selective search through the error file. For example, to display the errors logged on or after April 1, type:

```
more -d +'Apr 1' /usr/adm/messages
```

and press the RETURN key

To use this procedure, always abbreviate the month by its first three letters, and remember to place the month and date in single quote marks ('Apr 1').

### 7.5.2 Printing Ultrix Error Information

To print the error log file for a MicroVAX system running Ultrix, type:

```
lpr /usr/adm/message
```

and press the RETURN key

## 7.6 CAPTURING SYSTEM CRASH INFORMATION USING ULTRIX-32M

When a severe error condition causes the system to crash, the error reporting facility described in section 7.6 may not capture all the information necessary to determine the problem. In such cases, it may still be possible to determine the entire system status and perform an analysis of event(s) which caused the system to crash. To do so, it is necessary to create a system dump file.

### 7.6.1 Creating a System Dump File

NOTE: A system dump file should only be set up when attempting to capture intermittent system problems, as this type of file is typically several thousand blocks in size. System dump files can be deleted when the problem is resolved if disk space is at a premium.

NOTE: The information captured during a system crash and stored in the /usr/crash directory contains detailed processor register and memory contents information. The analysis of this data should be left to properly trained personnel. The intent of this procedure is to capture the data only.

1. Login as root while the system is in multi-user mode.

2. Type:

```
ls /usr/crash
```

If the resulting display reads:

```
usr/crash not found
```

The crash directory doesn't exist. To create one type:

```
mkdir /usr/crash
```

This will create the directory, necessary to hold the crash dump information.

3. Edit the file /etc/rc.local using the vi(1) text editor by typing:

```
vi /etc/rc.local
```

4. Locate the "savecore" line by typing:

```
/savecore/
```

5. Replace the default line with a valid one by typing:

```
s=.*=/etc/savecore /usr/crash >/dev/console=
```

Then save the file by typing:

```
:w!  
:q
```

The system is now prepared to capture a system crash.

## 7.6.2 Copying System Dump Information for Remote Analysis

When a crash occurs, the best way to save the information for remote analysis is to copy it to a backup medium. If the system has a TK50 tape drive, copy the crash information to the drive by typing:

```
tar c /usr/crash
```

If the system does not have a TK50, you will have to save the files on diskettes. To copy the crash information to diskettes, type:

```
cd /usr/crash
ls *|cpio -o >/dev/rraXa
```

Where "X" in the second line is the number of fixed-disk RD drives that are in the system. For example, if there is only one fixed-disk drive, an RD52, then "X" would be a 1, and the line typed would be:

```
ls *|cpio -o>/dev/rrala
```

The cpio(1) program will now take over, and as each diskette is filled, Remove it, label it (in order), replace it with another blank diskette, and type:

```
/dev/rraXa
```

as the device to continue copying. Again, replace "X" with the number of fixed-disk drives in the system. When the copying is completed (several diskettes filled), cpio(1) reports the number of blocks transferred and then terminates.

NOTE: Be sure to number the diskettes correctly. The cpio(1) program does not check for proper order as diskettes are loaded.

### 7.6.3 Deleting a System Dump File

1. Login as root.
2. Type: `rm /usr.crash/*`

## 7.7 TROUBLESHOOTING PROCEDURES

When the MicroVAX II system or a supported option fails or exhibits erratic behavior, one of several tools may be used to help diagnose the problem. The primary tools used to troubleshoot the MicroVAX II system are:

- Front panel indicators and lights
- Power-up self-tests
- The MicroVAX II Owner's Manual
- The MicroVAX II System Technical Manual
- MicroVAX Maintenance System--customer version
- The MicroVAX II System Maintenance Guide
- MicroVAX Maintenance System--service version
- Operating System Error Logs and Crash Dumps

NOTE: Before using the Troubleshooting section of this manual, please read the problem/solution section of the Owner's Manual.

Most problems exhibited by a MicroVAX II system will fall under one of the following categories:

- Unknown system problems (system fails to boot)
- Suspected device problems (system can boot, problem may be intermittent). Device problems can be further divided into 4 types:

CPU problems

Memory problems

Mass storage problems

Communications problems

The following sections give a suggested method of troubleshooting each family of problems.

### 7.7.1 Unknown System Level Problems (system fails to boot)

Figure 7-16 outlines the general procedure for troubleshooting the system when either an operating system or the MicroVAX Maintenance System fails to boot.

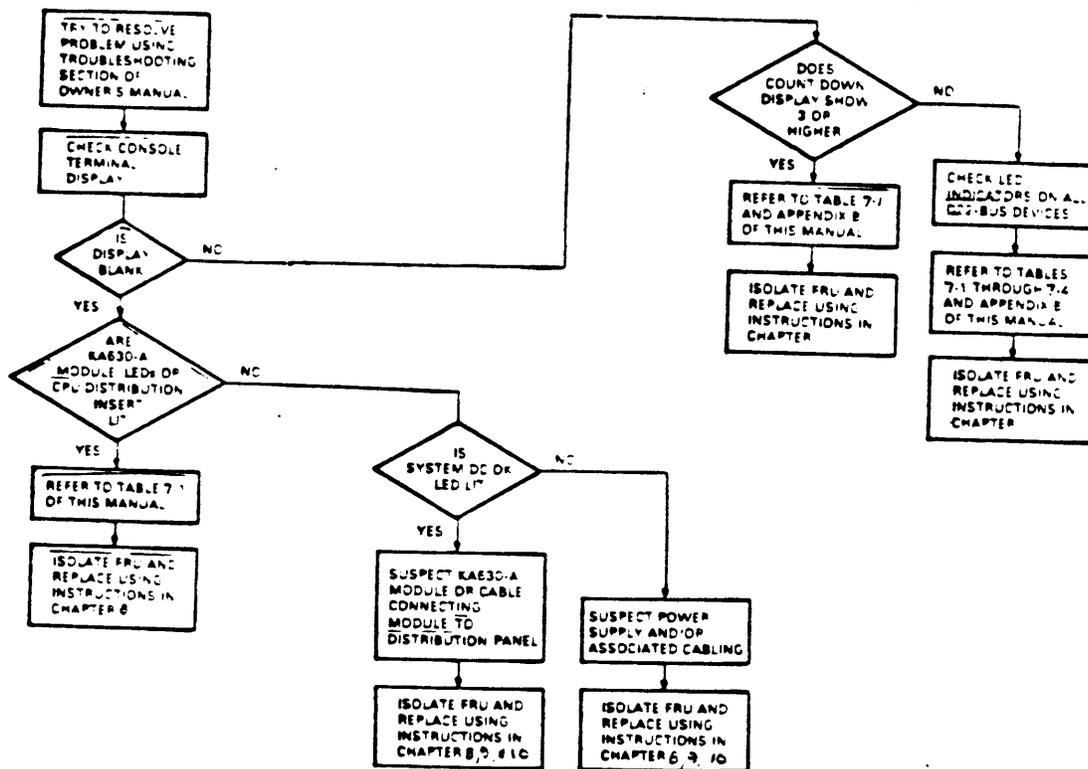
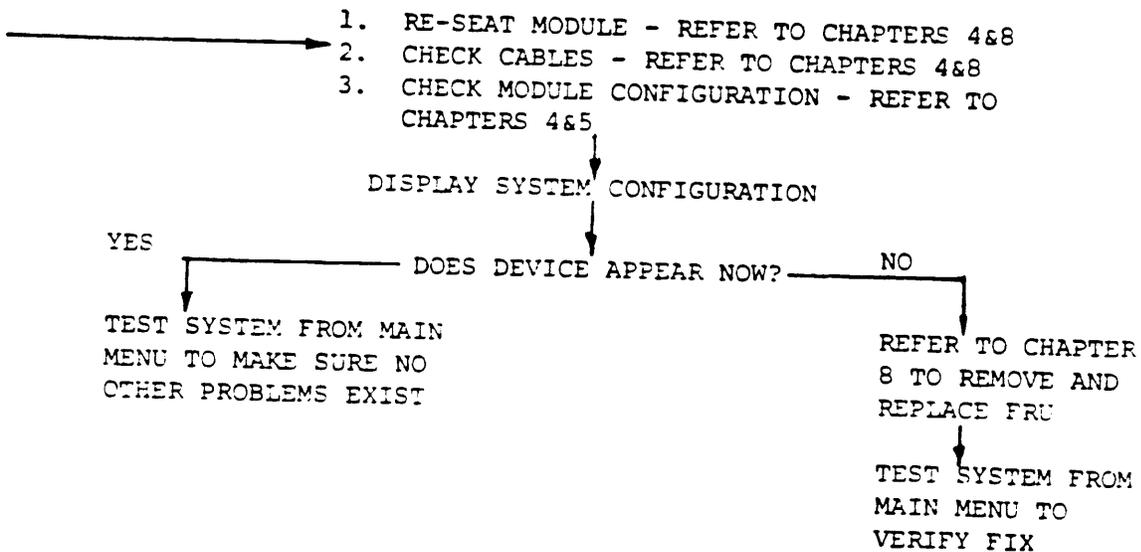


Figure 7-16. Troubleshooting flow for fail-to-boot problems.



SEE NOTE BELOW



NOTE: Only devices which are configured for standard fixed and floating addresses and vectors can be recognized and tested by MMS.

7.3 Intermittent Problems

Figure 7-18 outlines the general troubleshooting procedure for isolating an intermittent problem.

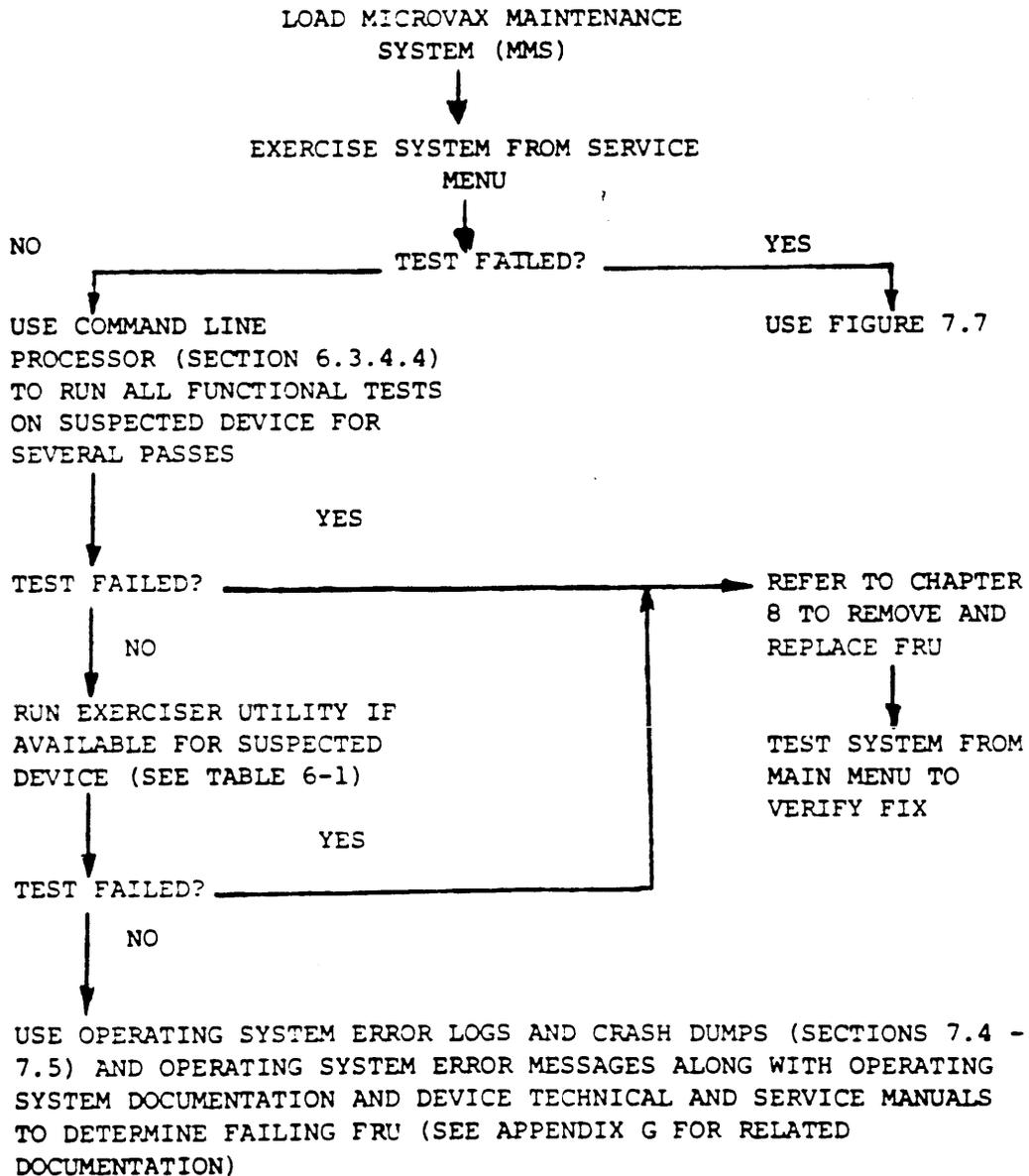


FIGURE 7-18. Troubleshooting flow for intermittent problems.

## CHAPTER 8--BA23-A FRU REMOVAL AND REPLACEMENT PROCEDURES

### 8.1 INTRODUCTION

This chapter describes the removal and replacement procedures for the field replacable units (FRUs) in the BA23 enclosure. Figure 8-1 shows the major FRUs as seen from the front of the enclosure. Table 8-1 provides a list of the FRUs and their part numbers.

**CAUTION:** Static electricity can damage integrated circuits contained on modules installed in the BA23 enclosure and in mass storage devices. Always use a grounded wrist strap (29-11762-00) and grounded work surface when accessing any internal part of a computer system.

**NOTE:** Only qualified service personnel should perform any of these removal and replacement procedures.

Table 8-1 Field Replacable Units

Component	Order Part Number
H7864-A Power supply*	30-21749-01
Power supply ac power cable with ac switch	70-20434-01
System dc fan (rear)	12-17556-01
System dc fan (front)	12-17556-01
Dc fan power cable	70-20449-00
Backplane assembly	70-19986-00
Q22-bus backplane	H9278-A
Signal distribution panel	54-15633-00
Backplane dc power cord	70-20450-01
Diskette drive	RX50-AA**
RX/RD power cable	70-20435-1K
RD51 fixed disk drive	RD51-AA**
RD52 fixed disk drive RD52-AA**	30-21721-02**
or	30-23227-02**
RD53 fixed disk drive	RD53-AA**

Table 8-1 BA23 Field Replaceable Units

Component	Order Part Number
RD51 read/write printed circuit board	29-24665-00
RD52 main printed circuit board	29-24992-00
RD53 device electronics printed circuit board	29-25339-00
RD51 dip shunt	29-24115-00
RX50 signal cable	17-00285-02
RD5n signal cable (20 wire)	17-00282-00
RD5n signal cable (34 wire)	17-00286-00
Front Control panel	70-22007-01
Control panel cable	70-20451-1C
Patch and filter assembly	70-19979-00
CPU distribution insert	54-16744-01
Battery pack for CPU distribution insert	12-19245-01
SLU cable 10 pin	17-00624-01
LED cable 20 pin	17-00712-02
Adaptor plate	74-28684-01
Front Bezel (rack mount)	74-29501-01
Front Bezel (floor/table)	74-29559-0
Rear Bezel	74-27560-0
Pedestal (floor)	74-27012-0
Enclosure plastic skins	70-20469-01
Rack mount kit	70-22025-01
Chassis support kit	70-20761-01
Loopback connectors	12-15336-00
KA630-AA CPU module	M7606-AA
KA630-AB CPU module	M7606-BA
MS630-AA memory module (1 MB)	M7607-AA
MS630-BA memory module (2 MB)	M7608-AA
MS630-BB memory module (4 MB)	M7608-BA
DZQ11	M3106
DZV11	M7957
DZV11 cabinet kit	CK-DZV11-DB

DLVJ1	M8043
DLVJ1 cabinet kit	CK-DLVJ1-LB
DEQNA	M7504
DEQNA cabinet kit	CK-DEQNA-KB
RQDX2**	M8639-YB
TK50 drive and cartridge	TK50-AA
TQK50 controller	M7546
TK50/TQK50 interconnect cable	70-22313-01
Grant card	M9047
Battery Backup Unit, CPU Distribution Insert	12-19245-01

\* A replacement power supply must have the same part number as the power supply you removed.

\*\* If you are adding one of these drives to a previously diskless system, you need to use the RX50A-AA, RD51A-AA, RD52A-AA, or RD53A-AA options, as well as the RQDX2-AA (for BA23-A) or RQDX-BA (for BA123-A) option. RD5nA-AA options contain drive and signal cables, while the RQDX2-AA and -BA options contain the controller module and a drive/module interconnect cable.



This chapter presents FRU procedures from the front to the rear of the enclosure.

CAUTION: Make sure to power down system and remove power cable for all FRU removals and installations.

NOTE: Unless otherwise specified, replace FRUs by reversing the order of the removal procedures.

## 8.2 CONTROL PANEL REMOVAL

Use the following procedure to remove the control panel (Figure 8-2).

1. Unplug the ac power cord from the wall socket.
2. Remove the front plastic cover by holding each end and pulling the cover away from the system
3. Remove the front chassis retaining bracket.
4. Push the subsystem forward.
5. Remove the subsystem storage cover.
6. Remove the four screws retaining the control panel assembly.
7. Disconnect the Berg connector from the control panel.
8. Remove the power supply connector from J7 on the power supply.

## 0 INSTALL A REPLACEMENT CONTROL PANEL

1. Reverse steps 1 through 8.
2. Make sure the LTC switch and the Restart enable switch on the Control panel printed circuit board are in the out position.

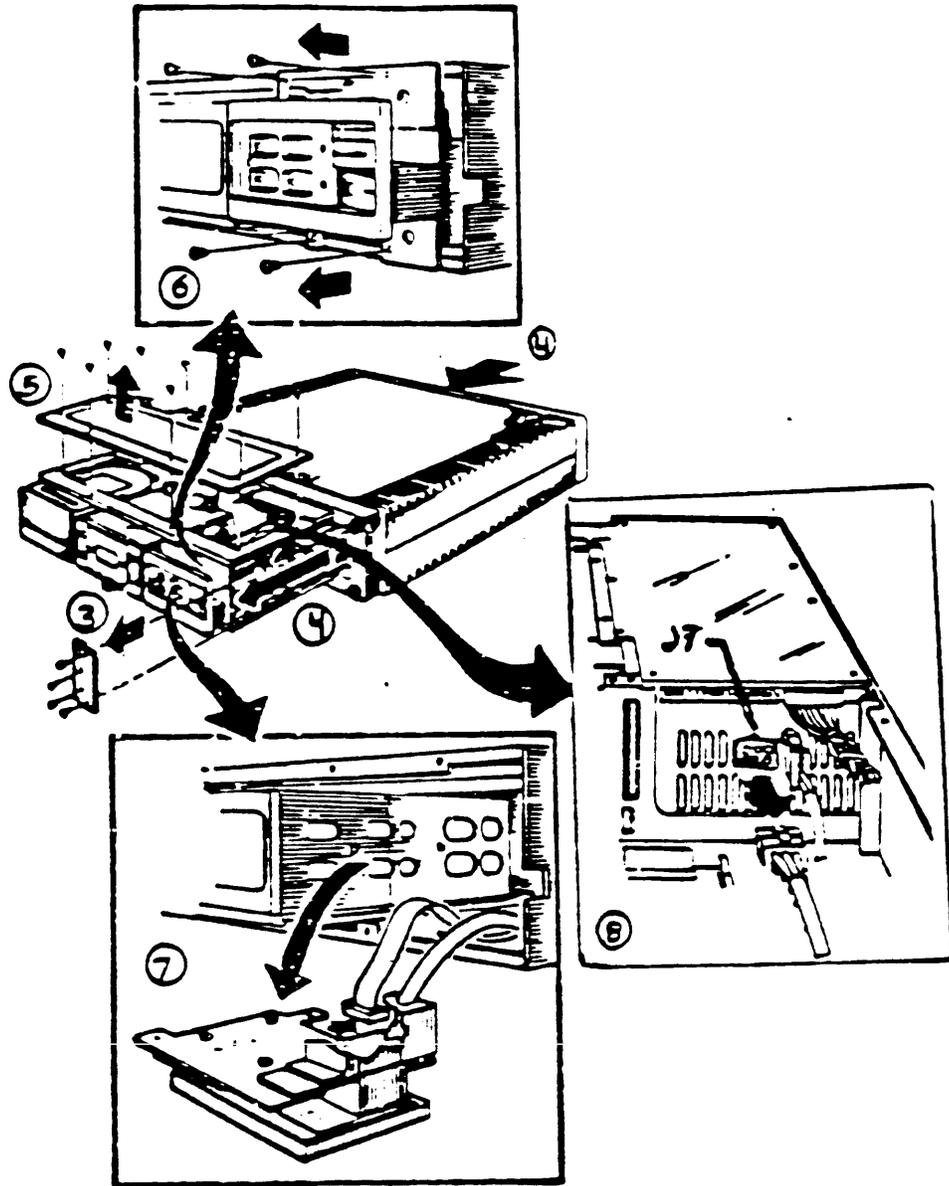


Figure 8-2 Remove the Control Panel

### 8.3 RX50/TK50 DRIVE REMOVAL (RX50 SHOWN)

Use the following procedures to remove the RX50 diskette (TK50 tape) drive (Figure 8-3).

#### NOTE

The diskette and tape drives are single field replaceable units (FRUs). Do not disassemble them or remove any of the printed circuit boards. All adjustments must be made in a special test configuration.

#### NOTE

Only use formatted RX50K diskette available from Digital and its licensed distributors.

1. Remove both bezel and the ac power cord.
2. Remove the front chassis retaining bracket.
3. Push the subsystem forward.
4. Remove the subsystem storage cover.
5. Disconnect the signal cable and the dc power cable from the diskette or tape drive by pulling straight up on the connectors.
6. Push down on the release tab, slide the drive forward and remove.

NOTE: Remove the cardboard shipping insert from a newly installed RX50 diskette drive. When returning a defective drive, install the shipping insert before returning it.

NOTE: When removing or installing a TK50 tape drive, do not insert hands or other foreign objects into the cartridge opening.

NOTE: Do not power down the TK50 or the system with a TK50 cartridge in place.

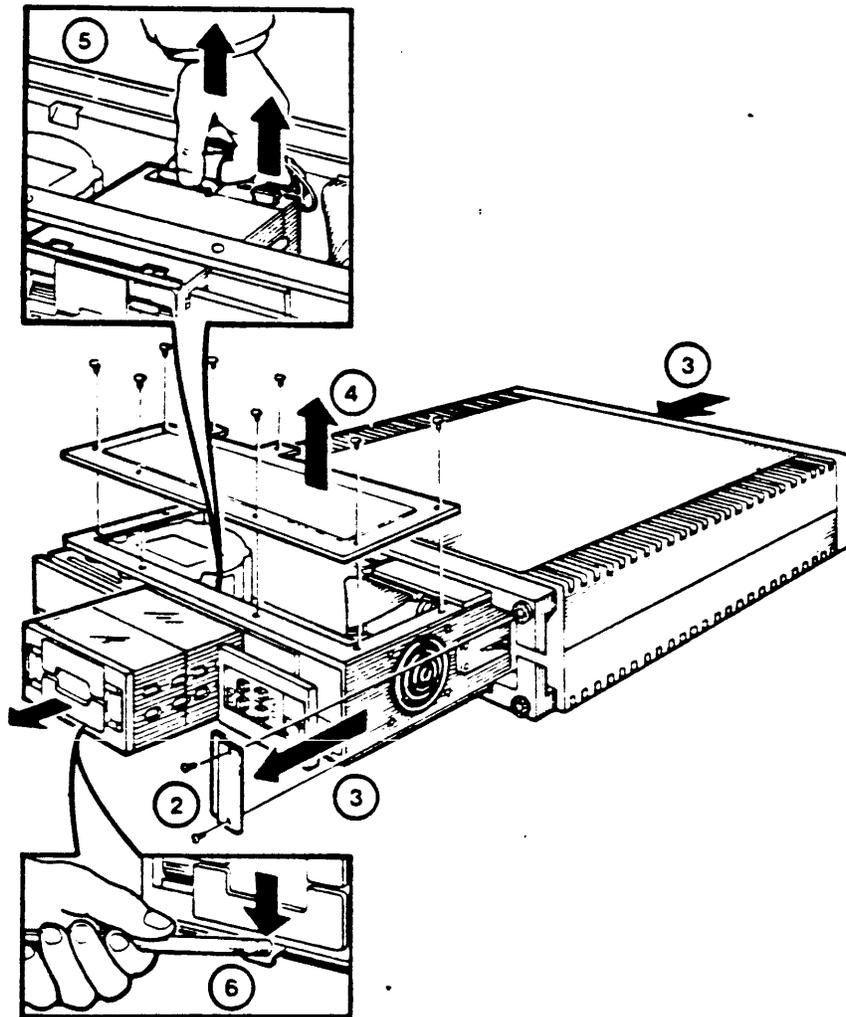


Figure 8-3 RX50/TK50 Drive Removal (RX50 shown)

### 8.3.1 TK50/TQK50 INTERCONNECT CABLE REMOVAL AND INSTALLATION

The TK50 tape drive is connected to its TQK50 controller module via an interconnect cable which runs through the trap door on the signal distribution panel, and underneath the modules in the card cage. Once you have removed the TK50 drive from the BA23 enclosure, use the following procedure to remove the interconnect cable.

1. Release the interconnect cable from the wire tie which holds it to the trap door on the signal distribution panel.
2. Remove the two screws which attach the trap door to the signal distribution panel, and remove the door. Depending on the tools available, this may require partial removal of an RD5n drive.

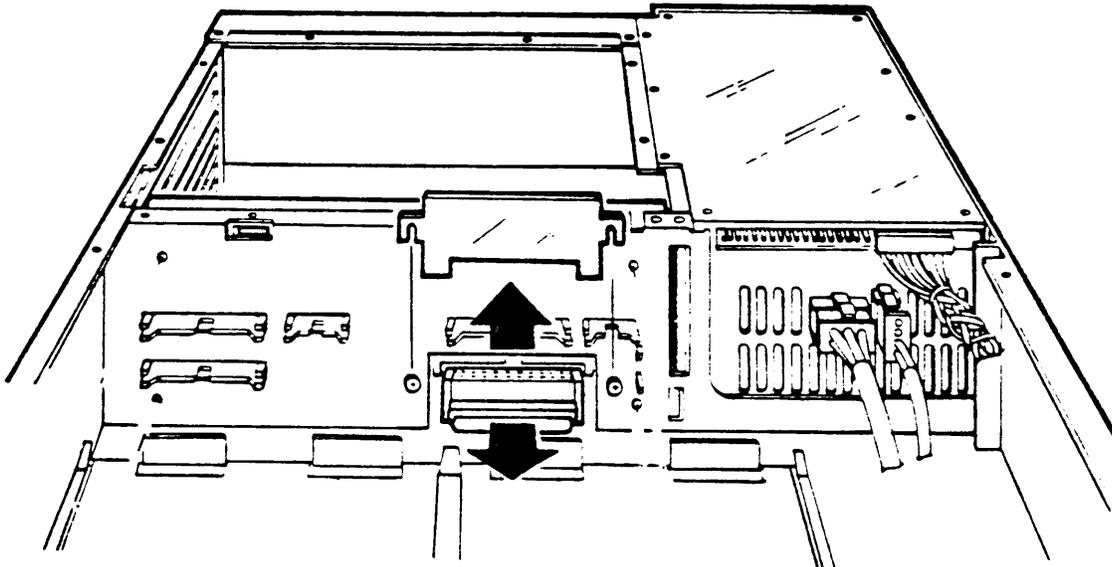


Figure 8-4 Trap Door Removal

3. Disconnect the RQDX controller cable (also present behind the trap door) and move it to the side to provide working room.
4. Go to the rear of the BA23 enclosure and remove the module in slot 8 (the bottom slot) of the backplane (see Section 8.9).
5. From the back of the enclosure, pull the TK50/TQK50 interconnect cable through the signal distribution panel, backplane, and card cage.

NOTE: When replacing the interconnect cable, be sure to observe the "THIS SIDE UP" marking on the cable. As a check, the striped side of the cable should be nearest the front fan of the enclosure.

NOTE: Replace or install the cable by reversing the removal procedure. EXCEPT push the cable from through from the front of the enclosure to the back, rather than from back to front.

NOTE: When installing a TK50 in a BA23 enclosure which has not previously contained a TK50 drive, make sure to also install the New trap door shipped with the TK50. Do not try to use the trap door which originally came with the system.

#### 8.4 RD5n FIXED DISK DRIVE REMOVAL

Use the following procedure to remove an RD5n fixed disk drive (Figure 8-5):

**CAUTION:** Handle any fixed disk drive with care. Dropping or bumping the drive can damage the disk surface.

**NOTE:** Package any disk drive to be returned in the replacement disk drive's shipping carton. If the shipping carton is not available, one may be ordered (Digital Part No. 99-90045-01).

**NOTE:** You must format a newly installed RD5n disk drive before testing the system and using the drive.

1. Remove both covers and the ac power cord.
2. Removed the front chassis retaining bracket.
3. Push the subsystem forward.
4. Remove the subsystem storage cover.

**CAUTION**

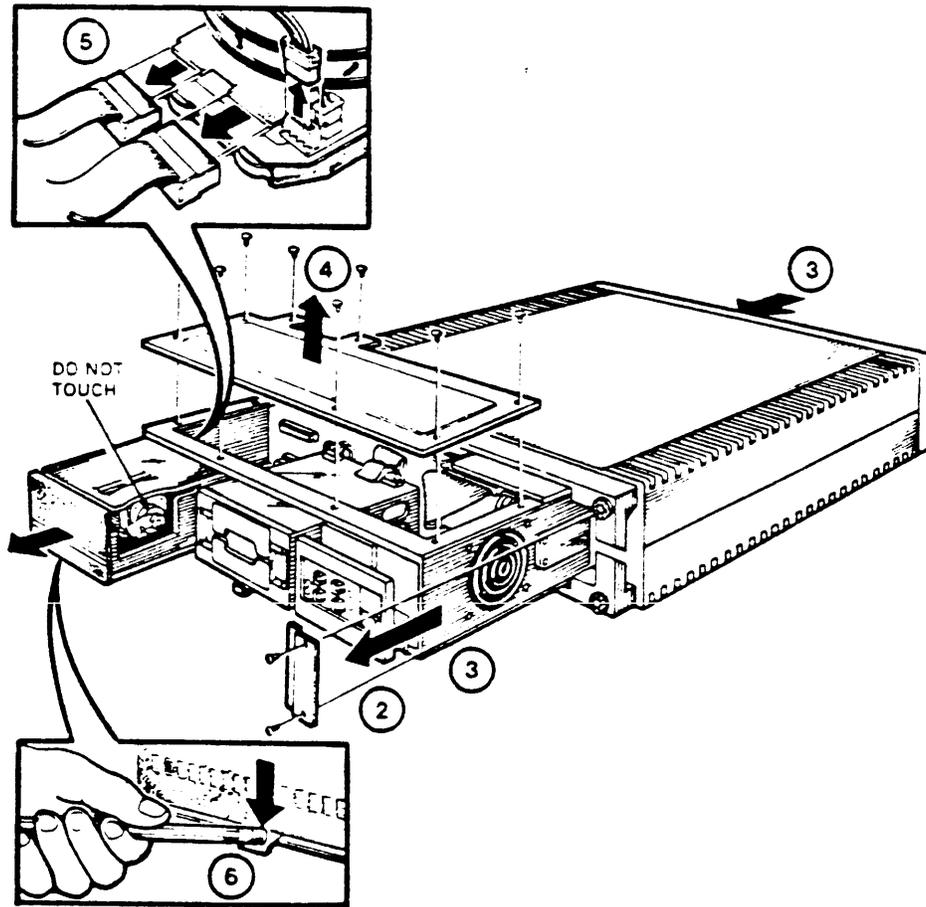
The RD51 fixed disk drive has an exposed head positioner flag on the front right side. DO NOT touch this area. Doing so can cause the head positioner flag to rotate, resulting in damage to the drive.

**NOTE**

An RD52 disk drive does not have an exposed head positioner flag.

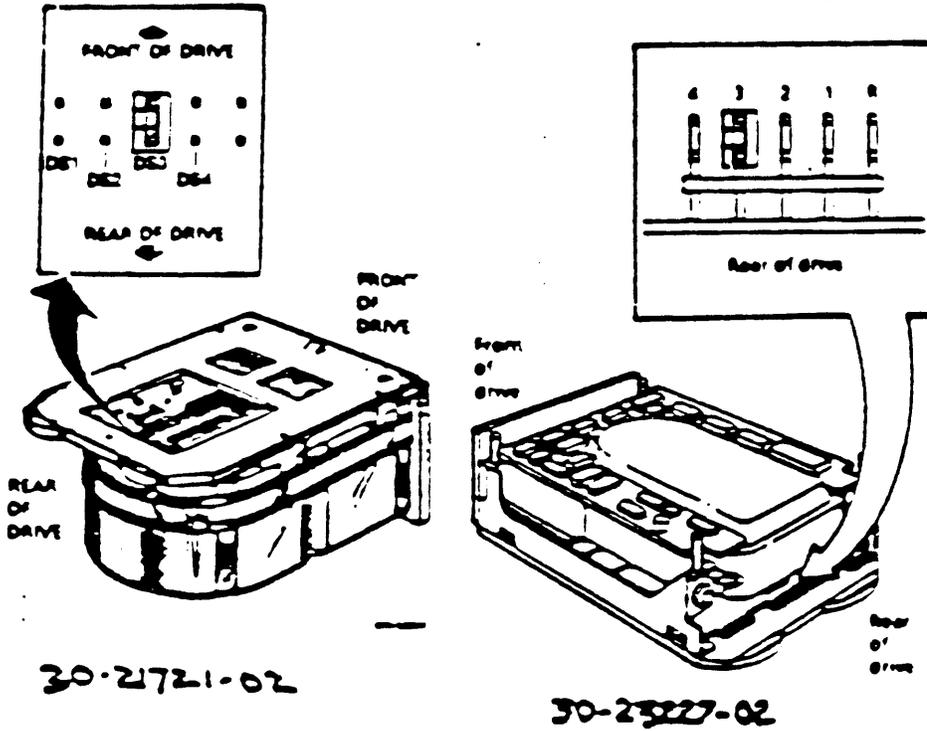
5. Remove the power plug and two ribbon cables from the RD5n drive.
6. Push down on the release tab, slide the RD5n disk drive forward and remove.

Figure 8-5 RD5n Removal (RD51 Disk Drive Shown)



NOTE: To configure an RD5n drive as DUO or DUA0, make sure the jumper clip is set at DS3 (figure 8-6).

Figure 8-6 Set the RD52 Jumper Clip



NOTE

Only format a fixed disk drive when you replace a complete RD5n drive assembly.

Write-protect any other RD5n disk drives that may be present before you format a newly installed RD5n disk drive. Remember to write enable these additional RD5n disk drives when formatting of the new RD5n disk drive is complete.

#### 8.4.1 RD51 DISK DRIVE READ/WRITE BOARD REMOVAL

The RD51 read/write board is the only part of an RD51 drive that is replaceable. Always try replacing the read/write board before you replace an entire RD51 disk drive.

1. Remove the four phillips screws retaining the skid plate. Set the skid plate aside (Figure 8-7)

#### CAUTION

The RD51 fixed disk drive has an exposed head positioner flag on the front right side. DO NOT touch this area. Doing so can cause the head positioner flag to rotate, resulting in damage to the drive.

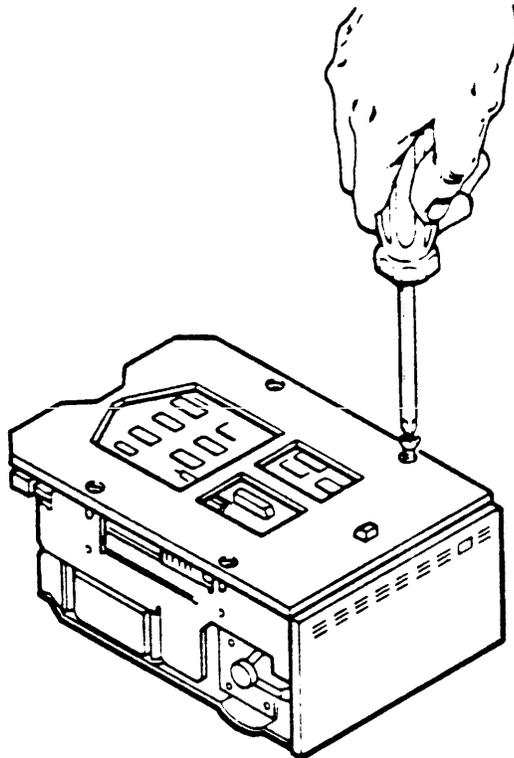


Figure 8-7 RD51 Disk Drive Skid Plate Removal

2. Using a 3/32-inch allen wrench, remove the four screws that hold the read/write printed circuit board to the fixed disk drive (Figure 8-8).
3. Disconnect connector P5 from the side of the board.

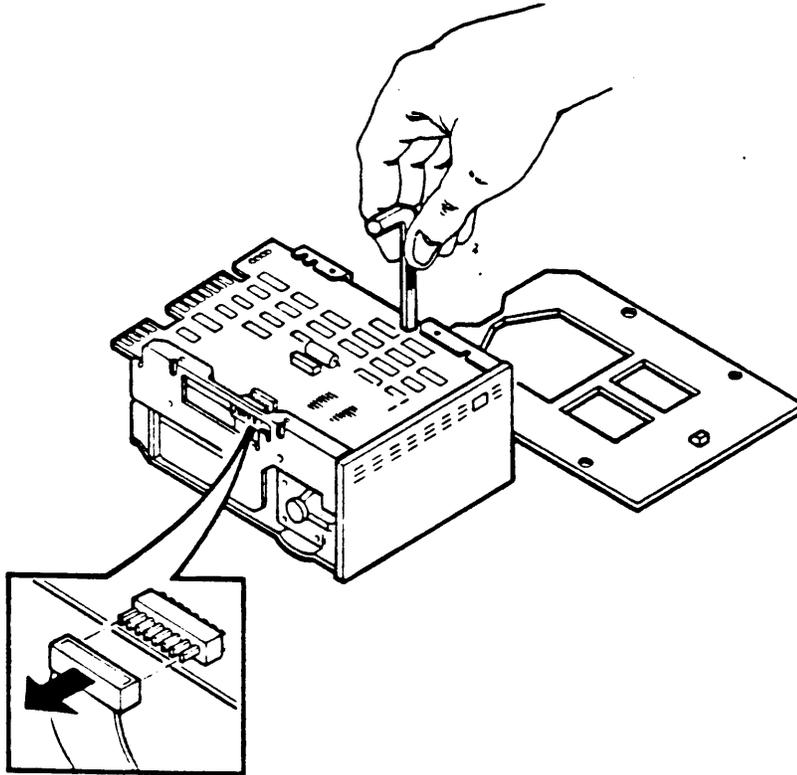


Figure 8-8 RD51 disk drive allen screws and connector P5 removal.

4. Disconnect connectors P6, P7 and P8 from the front of the read/write printed circuit board (Figure 8-9).
5. Disconnect connector P4, a 2 wire connector found on the rear of the read/write printed circuit board next to the dc power connector.
6. Remove the fixed disk drive read/write board.

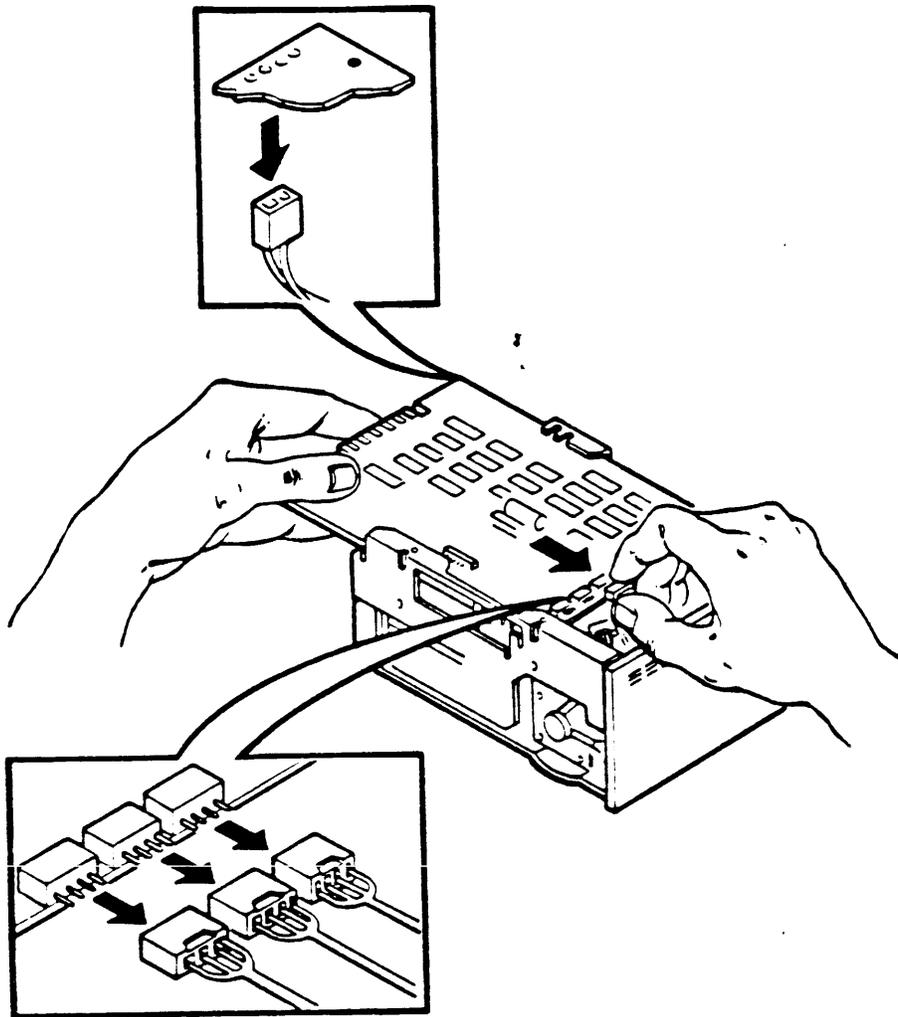


Figure 8-9 RD51 Disk Drive Connectors P6, P7, P8, and P4

7. Make sure the jumper configuration of the 14-pin DIP shunt pack matches the listing in Table 8-2.

Table 8-2 RD51 Jumper Configuration (assumes DUA0)

Pin Numbers	Pin Connection
1 to 16	Not used*
2 to 15	In
3 to 14	In
4 to 13	In
5 to 12	Out
6 to 11	In
7 to 10	Out
8 to 9	Out

\* Place the 14-pin DIP jumper pack in the rear 14 receptacles of the 18-pin socket (Figure 8-10).

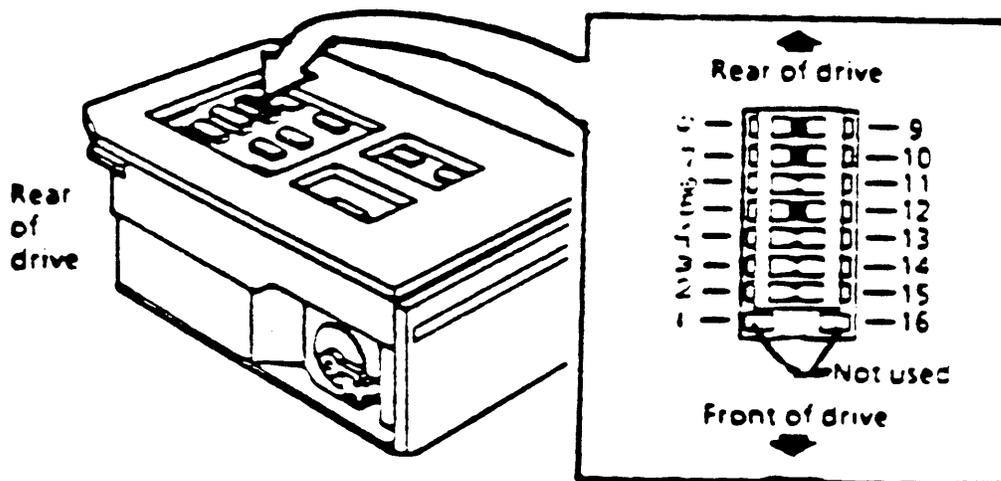


Figure 8-10 DIP Shunt Pack Setting

NOTE: You do not need to format an RD51 disk drive when you only replace the read/write board.

#### 8.4.2 RD52 MAIN PRINTED CIRCUIT BOARD REMOVAL

##### NOTE

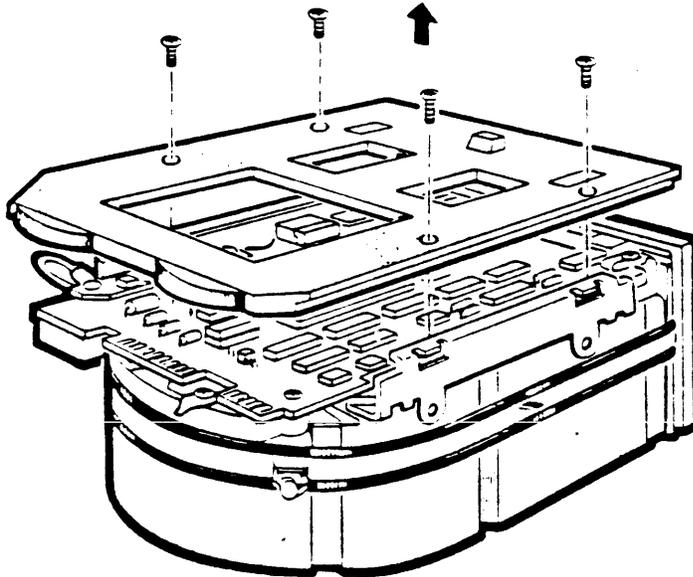
Replace the main printed circuit board (MPCB) only on RD52 disk drives with a drive part number of 30-21721-02.

##### NOTE

Screws located on the slide plate and MPCB are different sizes. Make sure you reinstall the screws in their proper location.

1. Remove the four phillips screws retaining the slide plate and ground clip. Set the slide plate aside (Figure 8-11).

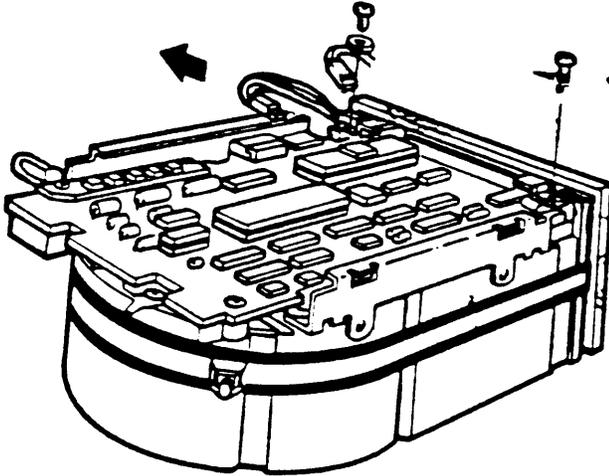
Figure 8-11 Remove the Slide Plate



2. Unplug the 2-pin connector (Figure 8-12).

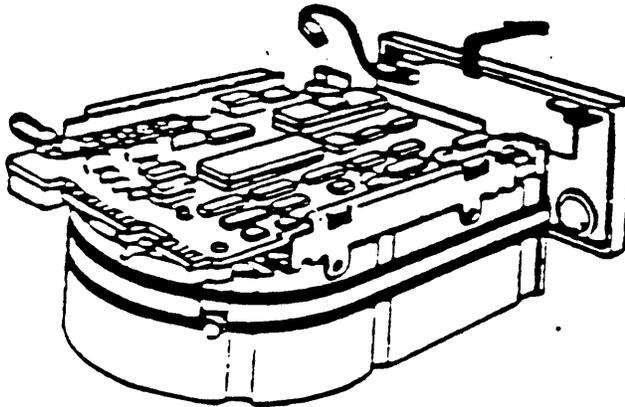
3. Remove the two Phillips screws that attach the front bezel to the drive.

Figure 8-12 Remove the 2-pin Connector and Screws



4. Remove the front bezel by pulling it away from the drive. The bezel is held in place with pop fasteners (Figure 8-13).

Figure 8-13 Remove the Front Bezel



5. Remove the three Phillips screws from the heatsink, grounding strip, and the corner opposite the heatsink (Figure 8-14).

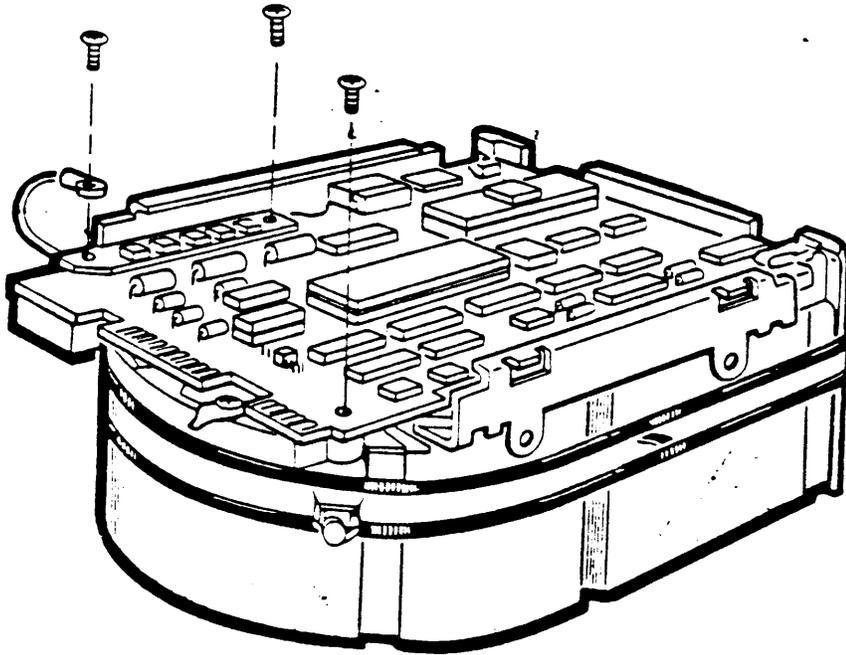


Figure 8-14 Remove Phillips Screws from Heatsink

6. Lift the MPCB straight up until it clears the chassis. This disconnects P4, a 12 pin fixed plug (Figure 8-15).
7. Disconnect P5, a 10-pin connector.

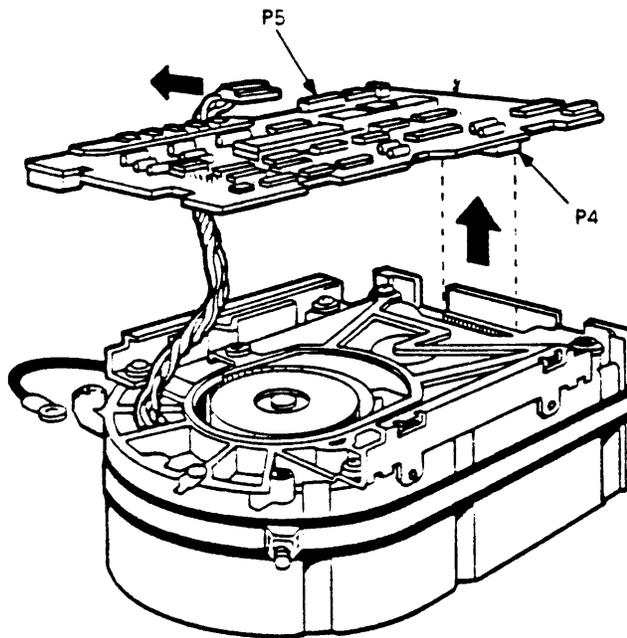


Figure 8-15 Remove the MPCB

### 8.4.3 RD53 DISK DRIVE DEVICE ELECTRONICS BOARD REMOVAL

The RD53 device electronics board is the only part of an RD53 drive that is replaceable. Always try replacing the device electronics board before you replace an entire RD53 drive.

1. Remove the four phillips screws retaining the slide plate and ground clip. Set the plate aside (figure 8-16).
2. Loosen the two captive screws which hold the device electronics board in place.
3. Rotate the board upward (the board pivots in hinge slots at the front of the drive). Being careful not to strain any of the connectors or cables, tilt the board over center until it comes to rest against the outer frame.

CAUTION: Flexible circuit material is fragile and requires careful handling to avoid damage.

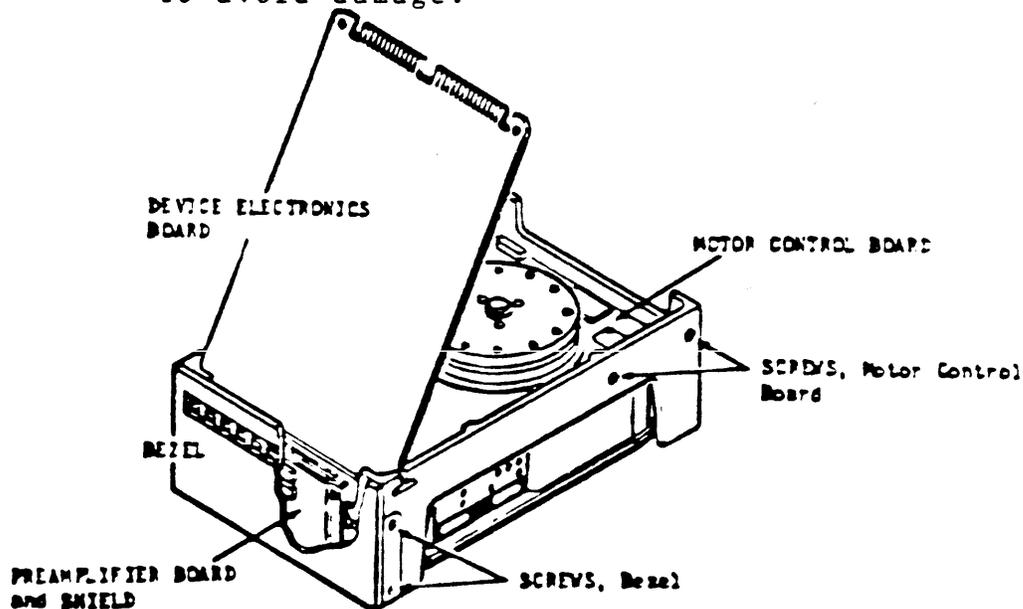


Figure 8-16 RD53 Device Electronics Board Removal

4. Disconnect the Motor Control board connector J8 and the Preamplifier board connector J9 from the read/write board. Both connectors and cables are fragile, handle them with care.
5. Lift the board out of the hinge slots.

NOTE: Make sure to set the jumpers and switches for the new board to the same positions as the old one.

#### 8.4.4 RD5N/RQDX INTERCONNECT CABLE REMOVAL AND INSTALLATION

RD5N and RX50 drives are connected to the signal distribution panel, which is in turn connected to the RQDX controller module via an interconnect cable which runs from the signal distribution panel underneath the modules in the card cage to the back of the RQDX module. Once you have removed the drives from the BA23 enclosure, use the following procedure to remove the interconnect cable.

1. Release the TK50 interconnect cable (if present) from the wire tie which holds it to the trap door on the signal distribution panel.
2. Remove the two screws which attach the trap door to the signal distribution panel, and remove the door (figure 8-17).

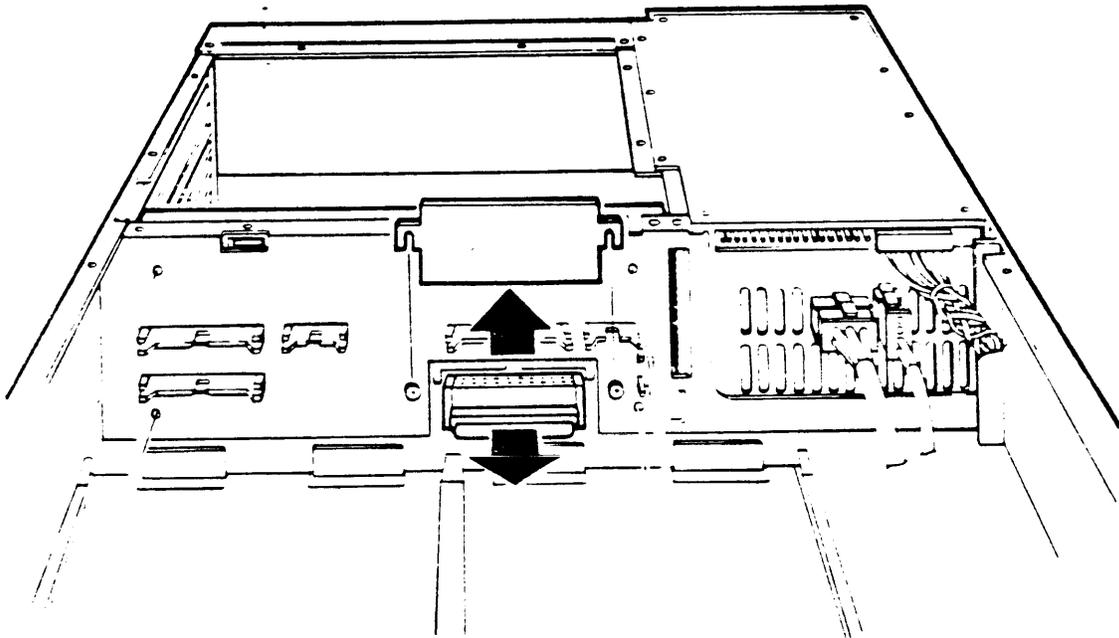


Figure 8-17 Trap Door Removal (non-TK50 model shown)

3. Disconnect the TK50 controller cable (which may also be present behind the trap door) and move it to the side to provide working room.
4. Disconnect the RD5n/RQDX interconnect cable from the connector which was exposed by removing the trap door.
5. Go to the rear of the BA23 enclosure and remove the module in slot 8 (the bottom slot) of the backplane (see Section 6.9).
6. From the back of the enclosure, pull the RD5n/RQDX interconnect cable through the signal distribution panel, backplane, and card cage.

NOTE: You may also have to remove the TK50/TQK50 cable to get the RD5n/RQDX cable out.

NOTE: When replacing the cable, it is easiest to push the cable from through from the front of the enclosure to the back, rather than from back to front.

NOTE: When replacing the TK50/TQK50 interconnect cable, be sure to observe the "THIS SIDE UP" marking on the cable. As a check, the striped side of the cable should be nearest the front fan of the enclosure.

## 8.5 BACKPLANE ASSEMBLY REMOVAL

Use this procedure to remove the backplane assembly.

1. Remove the front and rear covers and all cables. Label them for reinstallation later.
2. Remove the rear retaining bracket and slide the subsystem completely out through the back.
3. Remove both the subsystem storage cover and the Q22-bus module cover (Figure 8-18).

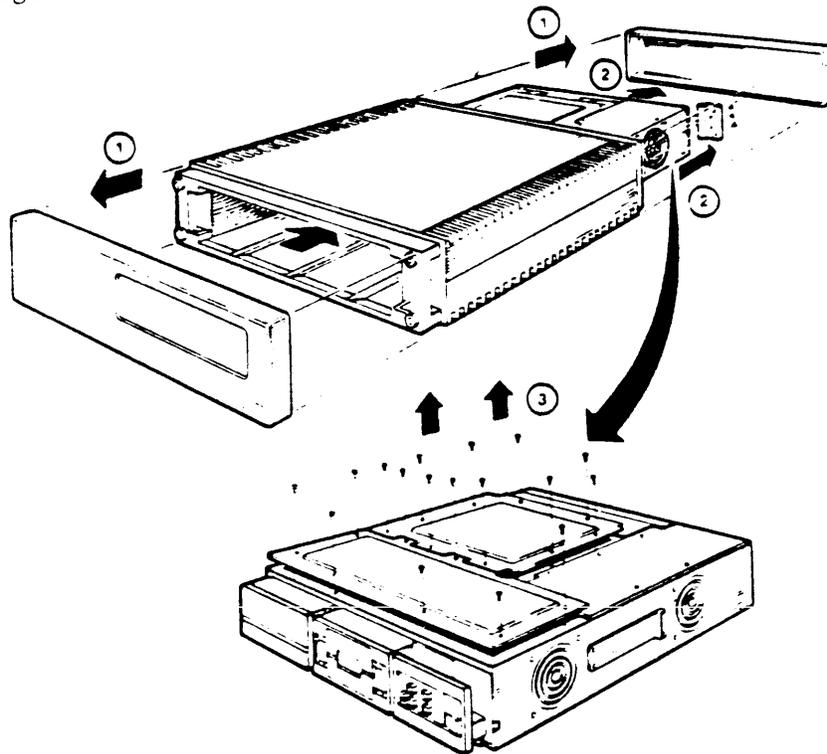


Figure 8-18 Backplane Removal (1 of 4)

4. Open the rear I/O panel assembly by loosening the two captive screws, disconnect any cables attached to the I/O panel. Label them for reinstallation later. Note the orientation of the red stripe on any cables you remove.
5. Remove all modules (Figure 8-19) Refer to 6.9 for instructions.

NOTE: Document the location of each module as it is being removed to help ensure correct reinstallation.

6. Remove the cowling (if present) from the front fan.
7. Remove any RX50 and RD5n disk drives that may present (see 8.3 and 8.4).
8. Remove the RX50 and RD5n disk drive signal cables from J6, J2 and J7 on the signal distribution panel.
9. 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.

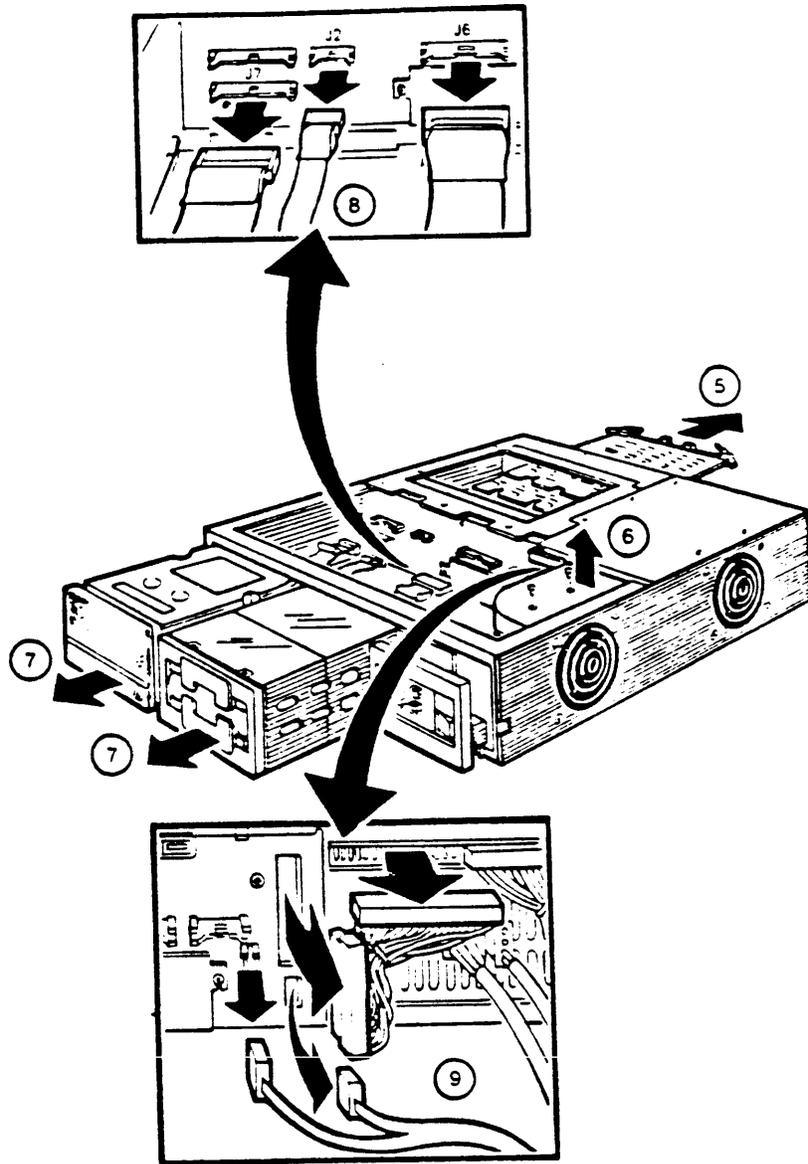


Figure 8-19 Backplane Removal Removal (2 of 4)

10. Loosen the two screws retaining the trap door. Remove the cover and disconnect the cable from side two of the backplane (Figure 8-20)
11. Remove the four screws holding the backplane assembly to the chassis.

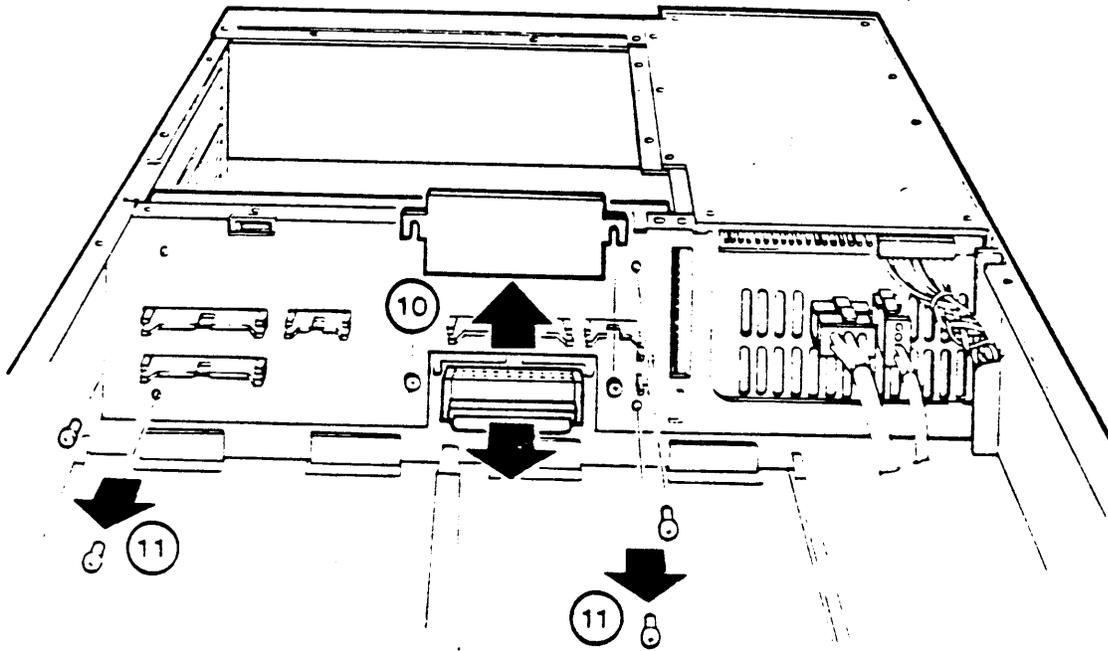


Figure 8-20 Backplane Removal (3 of 4)

12. Pivot the CD side of the backplane assembly 45 degrees toward the rear and lift it straight up (figure 8-21).

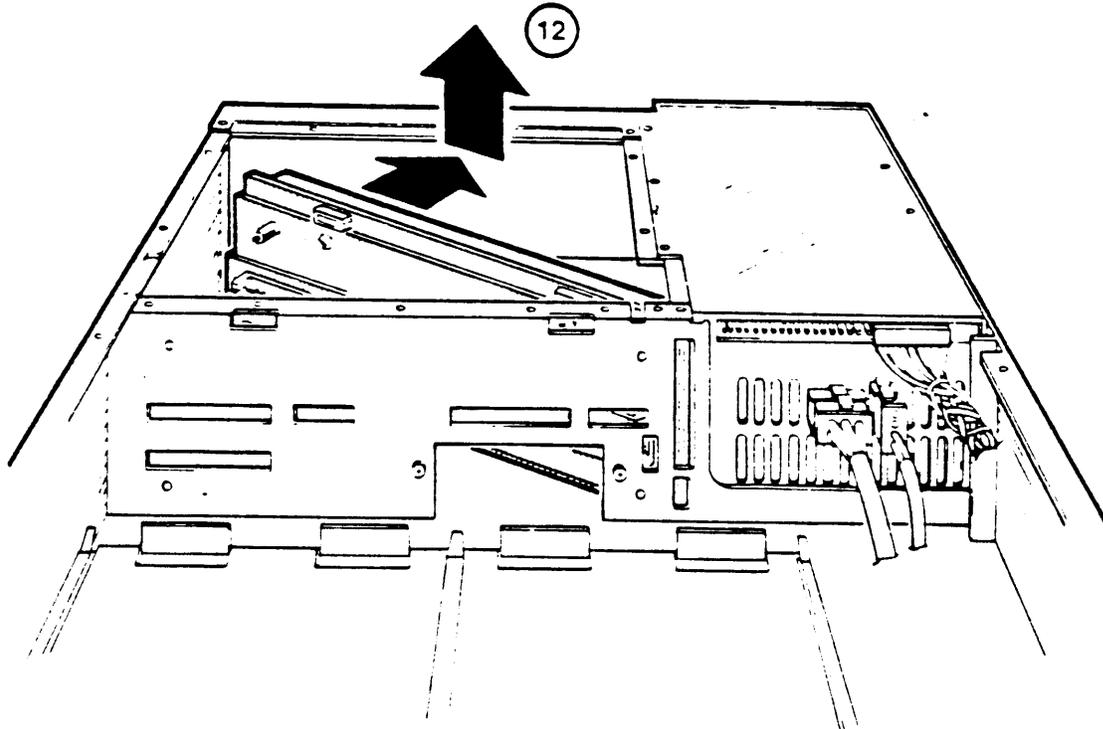


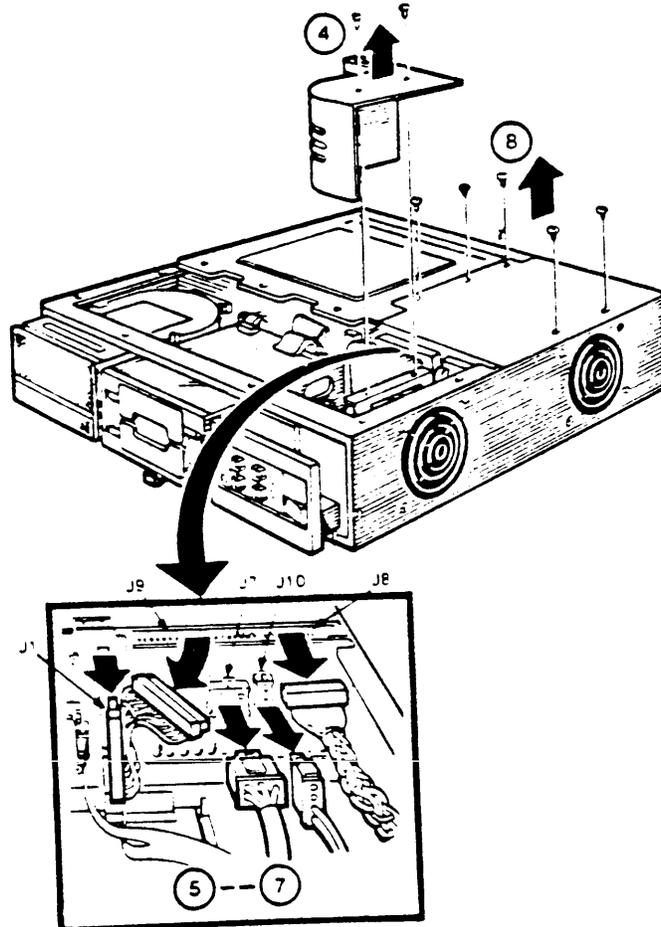
Figure 8-21 Backplane Removal (4 of 4)

## 8.6 POWER SUPPLY (H7864-A) REMOVAL

Use the following procedure to remove the power supply (Figure 8-22).

NOTE: The H7864-A power supply is not adjustable, nor does it contain replaceable printed circuit boards. The +5 Vdc and +12 Vdc regulators are fixed. Voltage tolerance is +5.1 Vdc (+/- 2.5%) for the +5 Vdc regulator, and +12.1 Vdc (+/- 2.5%) for the +12 Vdc regulator. Ripple is 50 mV peak to peak at +5 Vdc, and 75 mV peak to peak at +12 Vdc.

1. Remove the front and rear covers and all cables.
2. Remove the rear chassis retaining bracket and slide the subsystem completely out through the back.
3. Remove the subsystem storage cover.
4. Remove the fan cowling and cowling holder (if present).



NOTE  
 REPLACE A POWER SUPPLY WITH ONE THAT  
 HAS AN IDENTICAL PART NUMBER

Figure 8-22 Power Supply Removal

5. Disconnect the backplane power connector from J9 on the power supply and J1 on the signal distribution panel.
6. Disconnect the mass storage power connector from J8.
7. Disconnect the front fan power connector, and the front control panel power connector, from J10 and J7. These connectors are keyed and have a locking assembly.
8. Remove the five screws holding the power supply to the chassis.
9. Lift the power supply assembly out of the chassis and rest it on top of the Q22 bus modules cover (Figure 8-23).
10. Disconnect the power connector from the rear cooling fan.

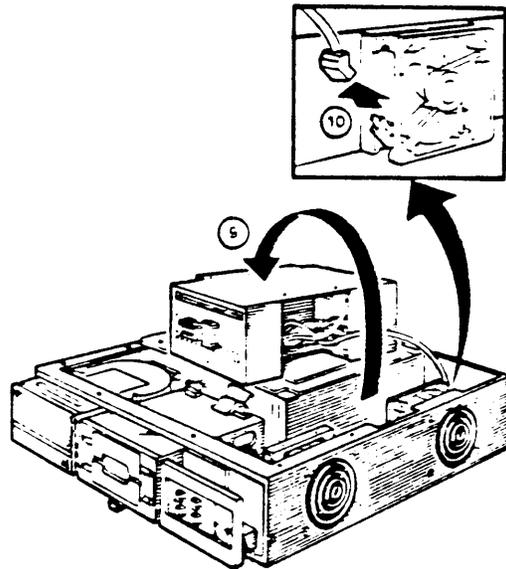


Figure 8-23 Remove Power Supply and Fan Connector

TO INSTALL A REPLACEMENT POWER SUPPLY

1. Place the replacement power supply on top of the Q22 bus module cover and connect the rear fan power cable.

CAUTION: The rear fan power cable is not keyed. Observe the polarity of the connector. The curve of the connector must match the curve of the fan housing (Figure 8-24).

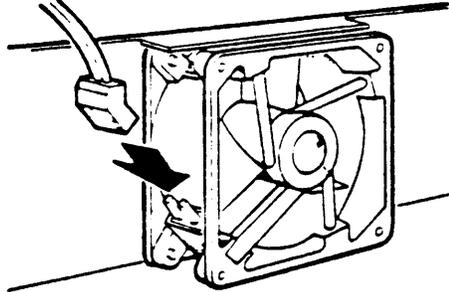


Figure 8-24 Install Rear Fan Power Cable

2. Place the power supply in position. Make sure you route the rear fan cable over the top of the rear fan (Figure 8-25).
3. Reverse steps 1 through 8 of the removal procedure to finish installing the power supply.

Figure 8-25 Rear Cooling Fan Power Cable Position

## 8.7 REAR FAN REMOVAL

Use the following procedure to remove the rear fan (Figure 8-26).

1. Remove the front and rear covers and all cables.
2. Remove the rear retaining bracket and remove the subsystem from the enclosure.
3. Remove the power supply unit and disconnect the rear fan power connector (refer to section 8.6).
4. Remove the four screws and spacers that hold the fan to the chassis and remove the fan.

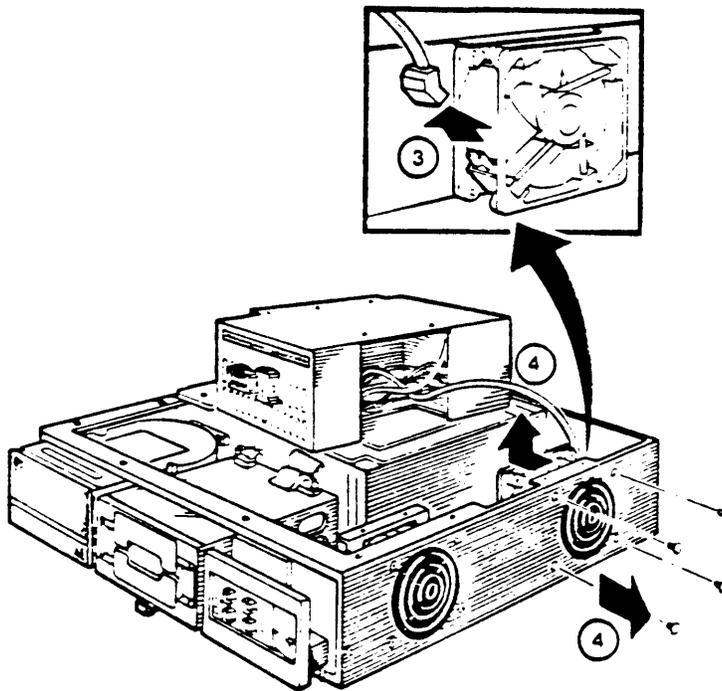


Figure 8-26 Remove the Fan from the Chassis

TO INSTALL A REAR REPLACEMENT FAN.

1. Relocate the four screws and place the fan guard on the screws. Make sure the cross members of the fan guard face the inside of the unit (figure 8-27).
2. Place the spacers on the screws and secure the fan. Make sure the fan is oriented as shown. The airflow must be away from the power supply.
3. Reverse steps 1 through 3 of the removal procedure.

CAUTION: The rear fan power cable is not keyed. Observe the polarity of the connector. The curve of the connector must match the curve of the fan housing as shown in Figure 8-24.

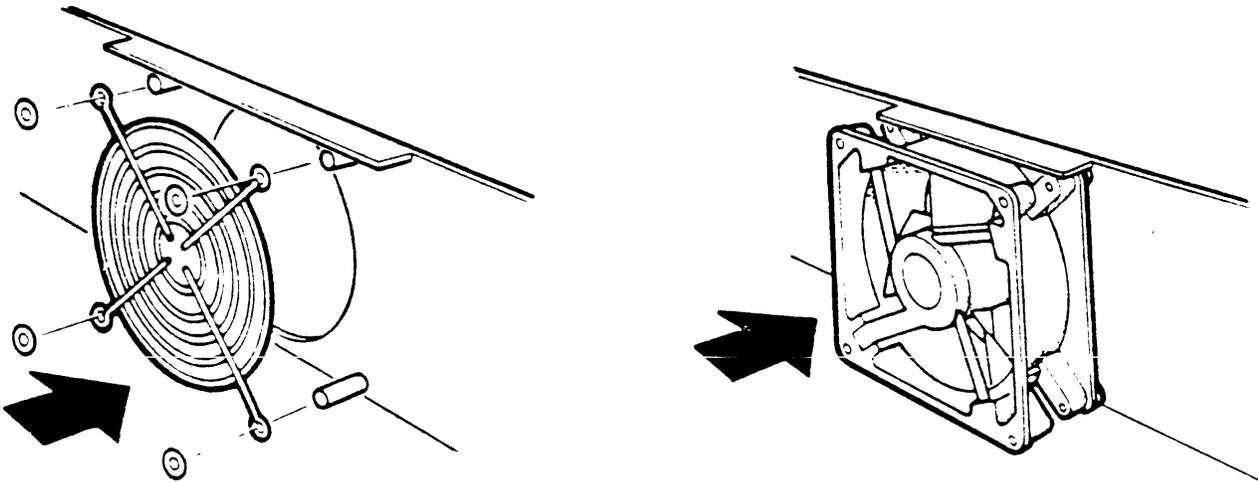


Figure 8-27 Install the Rear Fan.

## 8.8 FRONT FAN REMOVAL

Use the following procedure to remove the front fan (Figure 8-28).

1. Disconnect the ac power cable and remove the front cover.
2. Remove the front retaining bracket and push the subsystem forward.
3. Remove the subsystem storage cover.
4. Remove the front fan cowling (if present).
5. Disconnect the front fan power cord from J10 on the power supply and from the fan.

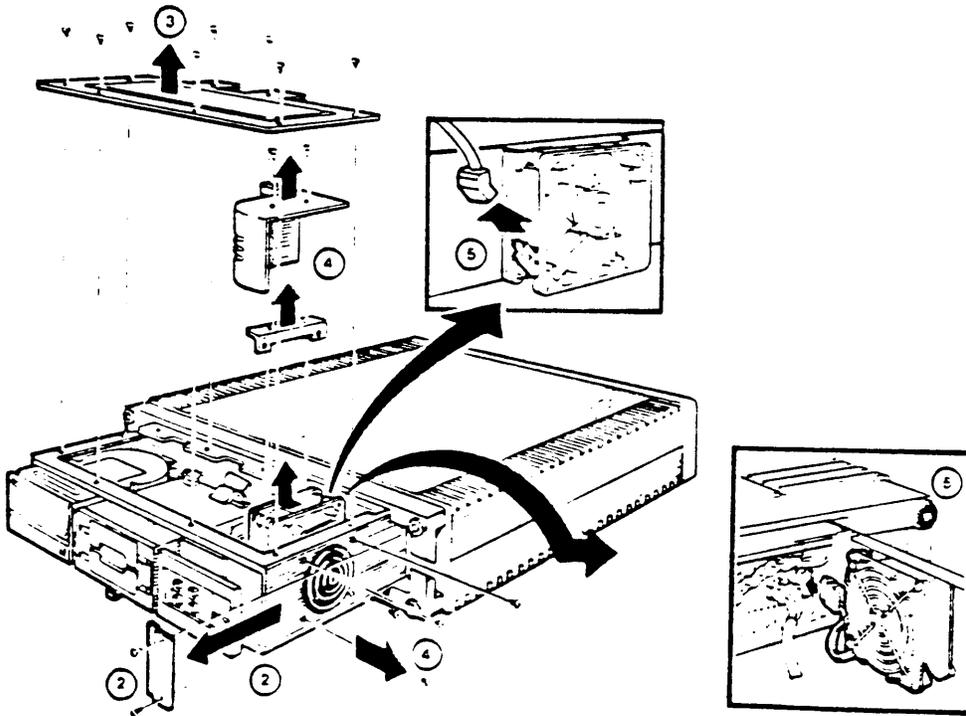


Figure 8-28 Disconnect the Front Cooling Fan

7. Remove the four screws and spacers that hold the fan and fan guard to the chassis and remove the fan (Figure 8-29).

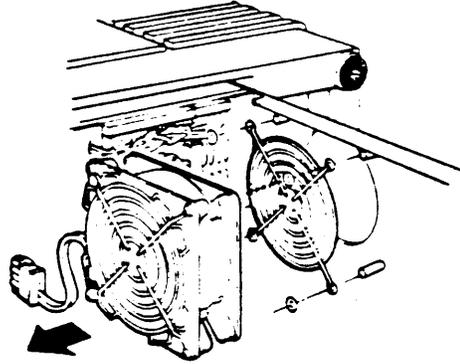


Figure 8-29 Remove the Front Cooling Fan

TO INSTALL A REPLACEMENT FRONT FAN

1. Remove the power cable and fan guard (if present) from the intake side of the old fan and fit them to the replacement fan (Figure 8-30).

**CAUTION:** The front fan power cable is not keyed. Observe the polarity of the connector. The curve of the connector must match the curve of the fan housing as shown in Figure 8-30.

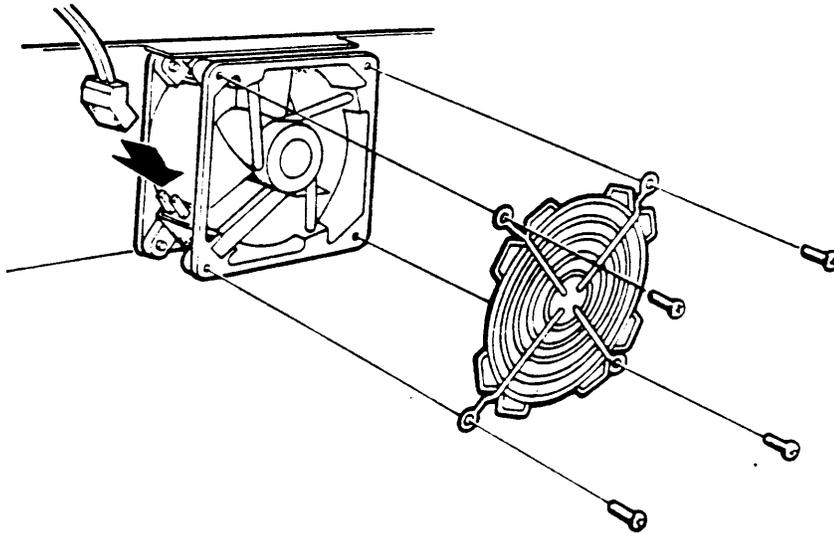


Figure 8-30 Connect Front Fan Power Cable and Fan Guard

2. Relocate the four screws and place the fan guard on the screws. Make sure the cross members of the fan guard face the inside of the unit (Figure 8-31).
3. Place the spacers on the screws and secure the fan. Make sure the fan is oriented as shown. The airflow must be away from the mass storage area.
4. Reverse steps 1 through 6 of the removal procedure to finish installing the front cooling fan.

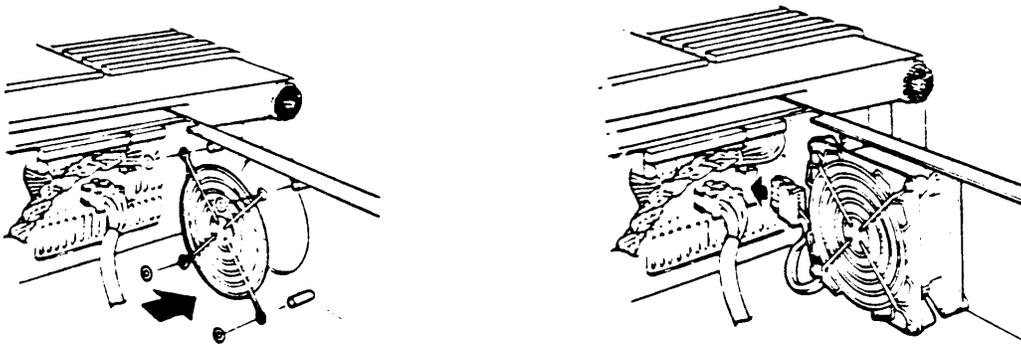


Figure 8-31 Install Replacement Fan

## 8.9 MODULE REMOVAL

Use the following procedure to remove modules from the BA23 enclosure (Figure 8-32).

**CAUTION:** Static electricity can damage modules. Always use a grounded wrist strap and grounded work surface when working with or around modules. A static kit, Part # 29-11762-00, provides the appropriate tools for use in module removal and replacement.

**CAUTION:** Remove and install modules carefully to prevent damage to module components, other modules, or possibly changing the switch settings.

**NOTE:** Replacement modules come wrapped in special antistatic packaging material. A silica gel packet is also included to prevent damage from moisture. Use this antistatic packaging material and silica gel packet to protect any modules you store, transport or return.

**NOTE:** If you install dual-height Q22-bus modules in slots 1, 2 or 3 of the BA23 backplane, you must install them in rows A and B. MS630-AA modules, if present, must be installed in rows C and D.

If no modules are installed in these A and B rows, a grant continuity card should be installed in row A. As a rule, If you install dual height modules in slots 4 through 8 of the BA23 backplane, you must install a grant continuity card (M9407) in rows A or C if a second dual height module is not installed in the same slot.

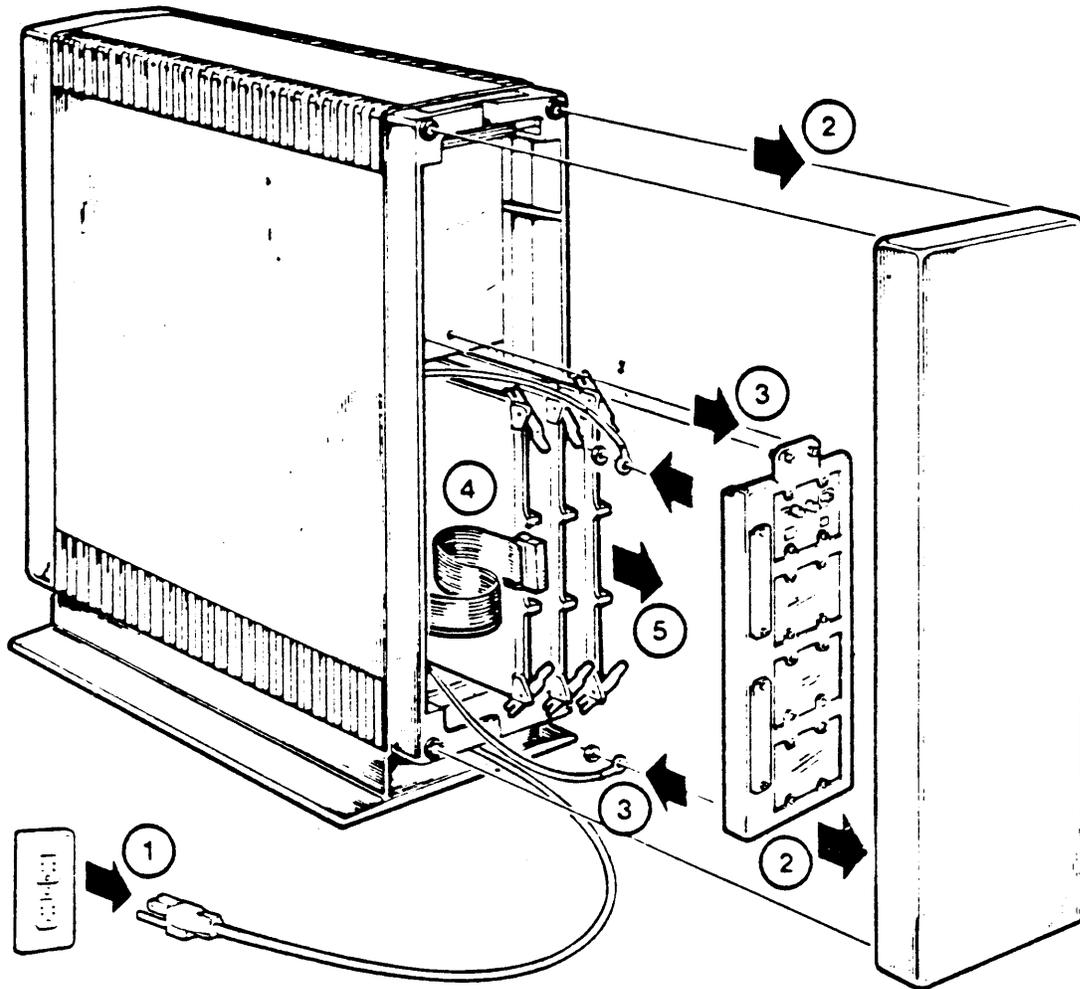


Figure 8-32 Module Removal

1. Remove the ac power cable from the wall outlet.
2. Remove the rear cover and all cables. Label all cables for reinstallation later.
3. Loosen the two screws retaining the rear I/O panel assembly. Swing the assembly open and remove the ground strap screws.
4. Disconnect any cables attached to the back of the I/O panel assembly. Note their specific location and the orientation of the red strip on each cable.
5. Slide the module partially out of the backplane and remove any cables that are present. Note the orientation of the red strip on each cable.
6. Remove the module from the chassis.

NOTE: Document the location of each module as it is being removed to help ensure correct reinstallation.

NOTE: Q22 bus quad height modules have levers at each end used to lock the module in place and to assist in releasing the module from the backplane. Figure 8-33 shows the operation of these ejector levers.

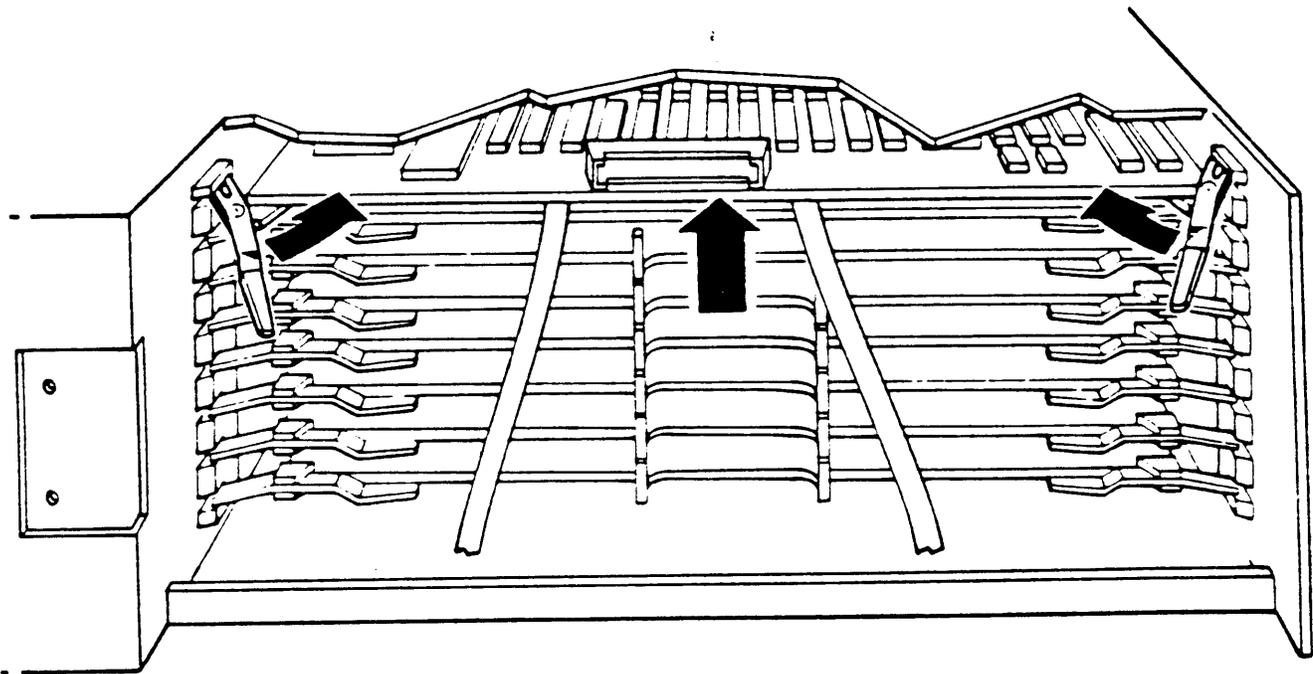
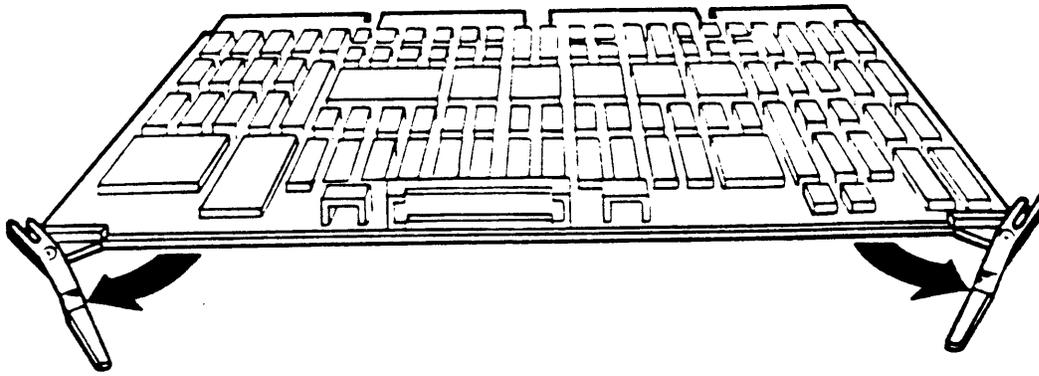


Figure 8-33 Quad Module Ejector Levers

## TO INSTALL MODULES

1. Make sure you set the jumper and switch configuration of replacement modules correctly. Check the setting against the old module or refer to the users or installation guide supplied with the new module.
2. Reverse step 1 through 6 of the removal procedure.
3. Retest the system to confirm that the system is working correctly.

### 8.10 REAR I/O INSERT PANEL REMOVAL

Use the following procedure to remove a rear I/O insert panel (Figure 8-34).

1. Remove the ac power cord for the wall outlet.
2. Remove the rear cover and all cables attached to the insert that is to be removed. Label the cables for reinstallation later.
3. Loosen the two screws retaining the rear I/O panel assembly. Swing the assembly open and remove the ground strap screws.
4. Disconnect any cables attached to the patch panel insert. Note the orientation of the red strip on each cable.
5. Remove the screws holding the panel insert to the rear I/O panel assembly and remove the insert.

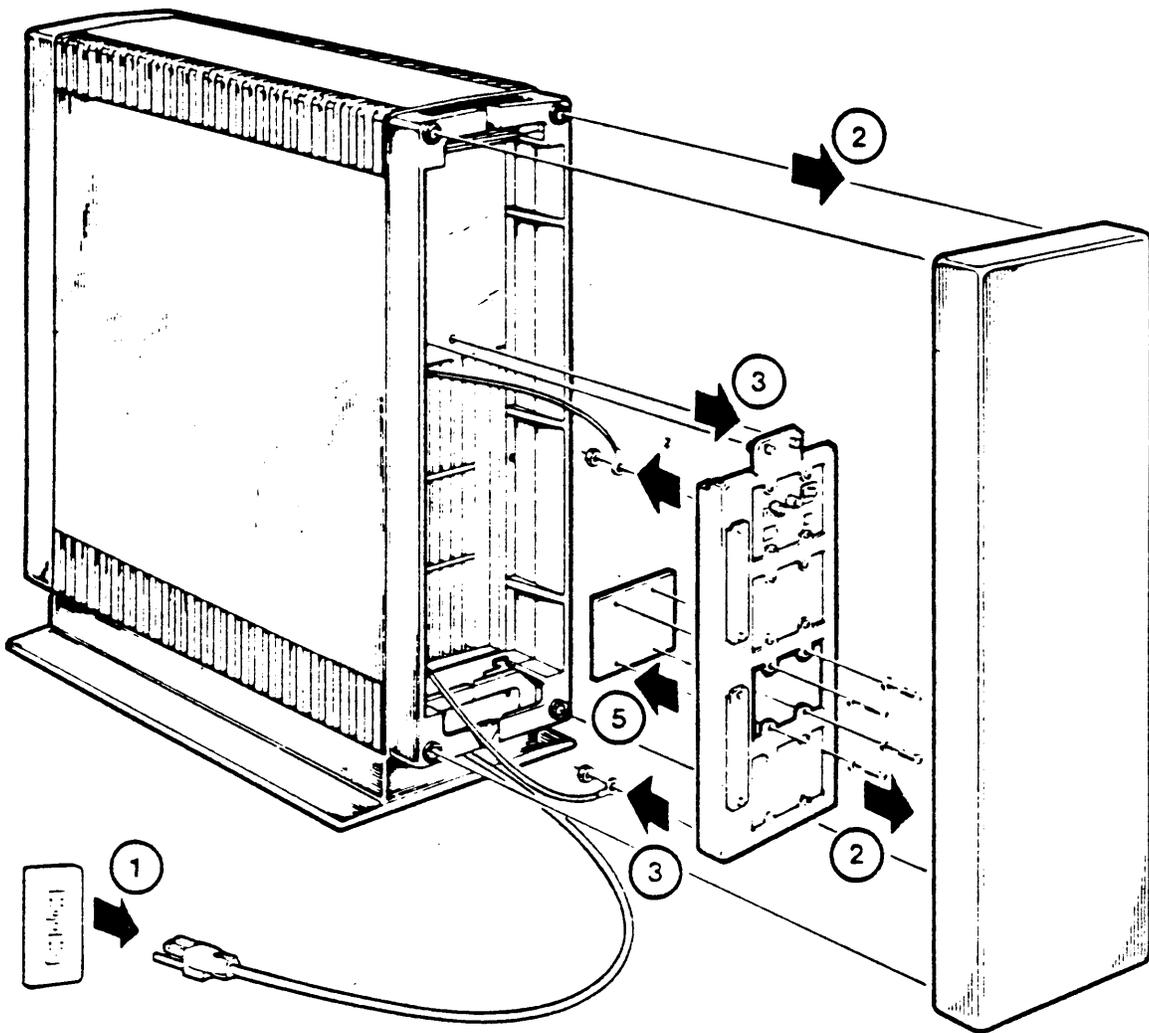


Figure 8-34 Rear I/O Insert Panel Removal

## 8.11 TIME OF YEAR CLOCK BATTERY BACKUP REMOVAL

Use the following procedure to remove the battery backup unit for the time of year (TOY) clock.

1. Remove the ac power cord from the wall outlet.
2. Remove the rear cover and remove the console terminal cable from the CPU distribution insert (Figure 8-35).

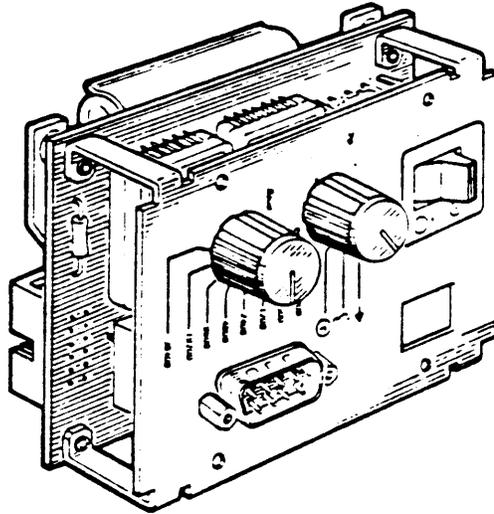


Figure 8-35 rear I/O Distribution insert (front view)

3. Loosen the two screws retaining the rear I/O panel assembly. Swing the assembly open and remove the ground strap screws.
4. Disconnect any CPU module cables from the insert panel. Note the orientation of the red strip on each cable removed.
5. Disconnect the battery backup unit (BBU) from the CPU panel insert (Figure 8-36).
6. Carefully spread the plastic BBU holder and pop the battery back up unit out (Figure 8-37).

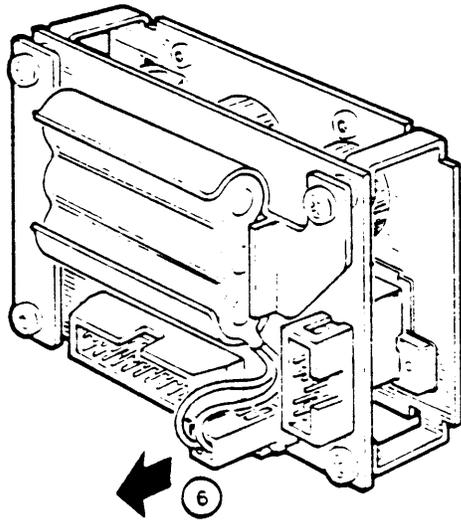


Figure 8-36 Disconnect the BBU

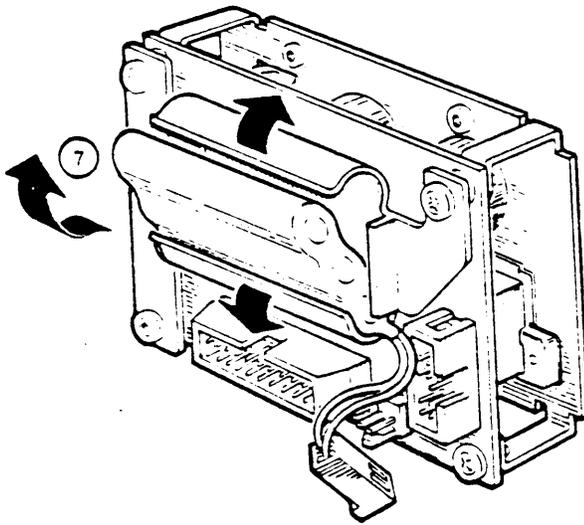


Figure 8-37 BBU Removal

## CHAPTER 9-- BA123 FRU REMOVAL AND REPLACEMENT PROCEDURES

### 9.1 Introduction

This chapter describes the removal and replacement procedures for the field replaceable units (FRUs) in the BA123-A enclosure (table 9-1, figure 9-1).

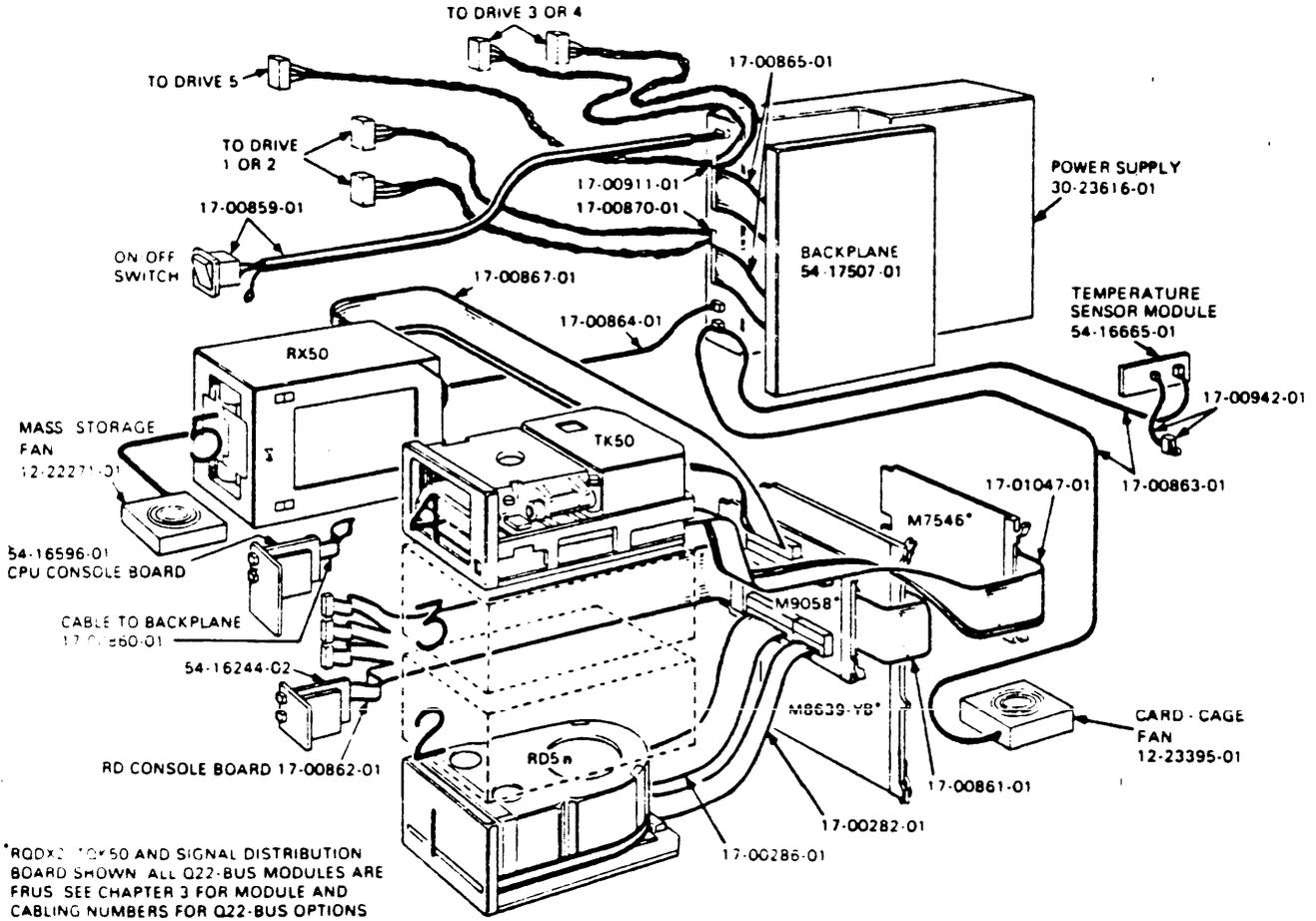
Table 9-1 BA123-A FRUs

Part Number	Description
17-00859-01	switch, AC power to power supply, and cable from switch to power supply
17-00860-01	cable, backplane to CPU console board
54-16596-01	CPU console board
17-00862-01	cable, signal dist. board to 4 RD consoles
17-00282-01	cable, 20 conductor, RD drive
17-00286-01	cable, 40 conductor RD drive
54-16244-02	RD5n console ready/write protect panel
17-00861-01	cable, 50 conductor, RQDX to signal dist. board
17-00867-01	cable, signal dist. board to RX50
17-01047-01	cable, TK50/M7546 interconnect
M9058	signal distribution board
12-23395-01	fan, 12.7 cm, 5 inch (card-cage)
12-22271-01	fan, 11.4 cm, 4.5 inch (mass-storage)
17-00942-01	switch, door interlock, and cable from switch to temperature sensor board
54-16665-01	temperature sensor board
17-00863-01	cable, power supply to card-cage fan and temperature sensor
17-00864-01	cable, power supply to mass-storage fan
17-00865-01	cable, regulator "A" to backplane
17-00865-01	cable, regulator "B" to backplane
17-00870-01	cable, regulator "A" to 2 drives via 2 plugs
17-00911-01	cable, regulator "B" to 3 drives via 3 plugs
30-23616-01	power supply
54-17507-01	Q22-bus backplane, 13 slot, quad-height
54-16744-01	CPU distribution panel insert
12-19245-01	Battery backup unit, CPU distribution insert
12-23985-01	Caster, shock-isolating, fixed (2)
12-23985-02	Caster, shock-isolating, swivel (2)

**NOTE**

Unless otherwise specified, FRUs are replaced by reversing the order of the removal procedures.

**CAUTION:** The system should be powered down and the AC power cord removed before an FRU is removed from the system.



**Figure 9-1 BA123-A FRUs**

## 9.2 Removal of the Exterior Panels

The exterior panels must be taken off before beginning most removal and replacement procedures. The following two sequences will be referenced in the procedures that follow.

### 9.2.1 Removal of the Right Side Panel

1. Turn the system OFF and unplug the AC power cord from the wall socket.
2. Open the rear door.
3. Loosen the captive screw that connects the right side panel to the rear of the enclosure frame (figure 9-2).
4. The panel is attached to the bottom of the enclosure frame by two snap fasteners. Pull the bottom of the panel out until the panel detaches from the bottom of the enclosure.
5. Lift the panel slightly to release it from the lip at the top of the frame and remove the panel (figure 9-3).

Figure 9-2 Unhooking the Right Side Panel

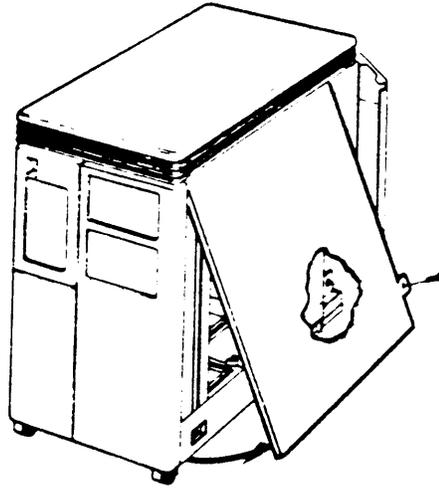
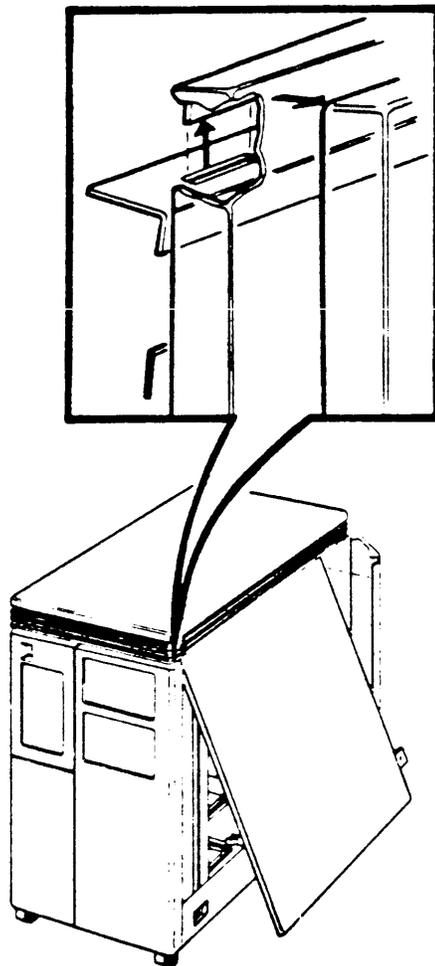


Figure 9-3 Removing the Right Side Panel



### 9.2.2 Removal of the Left Side Panel

1. Turn the system OFF and unplug the AC power cord from the wall socket.
2. Open the control panel door.
3. Loosen the screw that connects the left side panel to the front of the enclosure frame (figure 9-4).
4. The panel is attached to the bottom of the enclosure frame by two snap fasteners. Pull the bottom of the panel out until the panel detaches from the bottom of the enclosure.
5. Lift the panel slightly to release it from the lip at the top of the frame and remove the panel (figure 9-5).

Figure 9-4 Unhooking the Left Side Panel

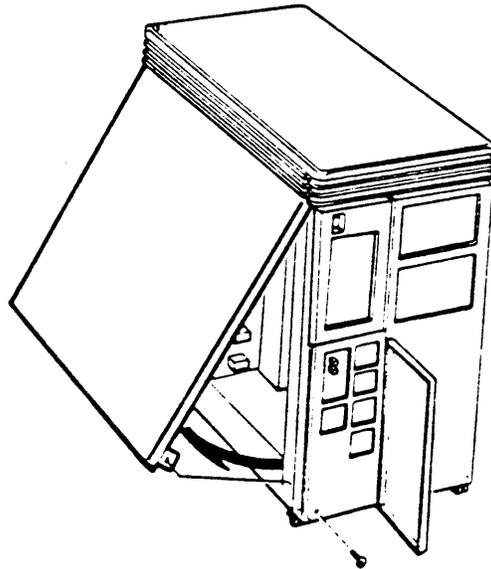
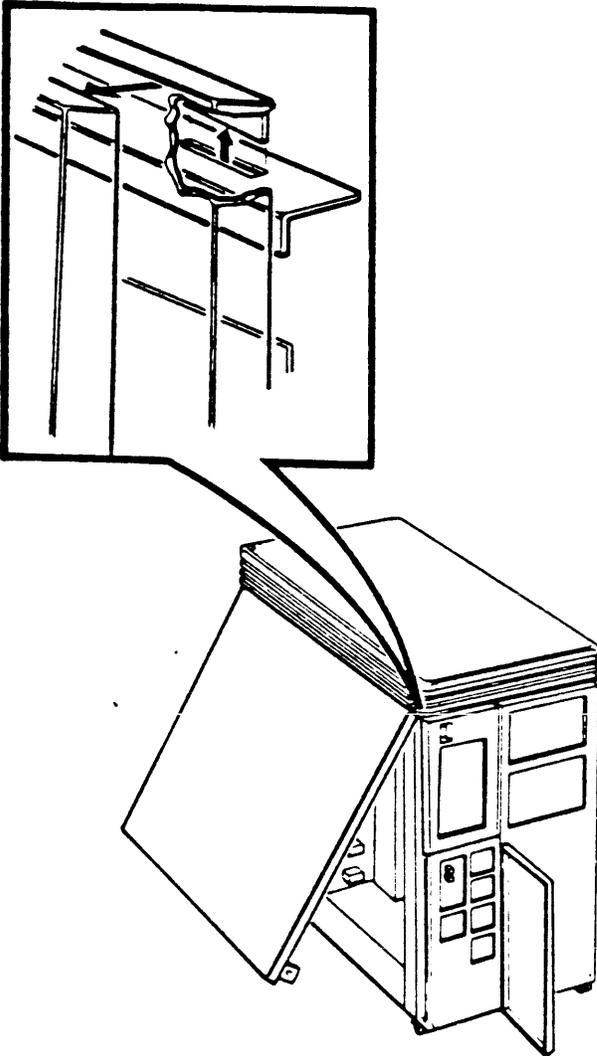


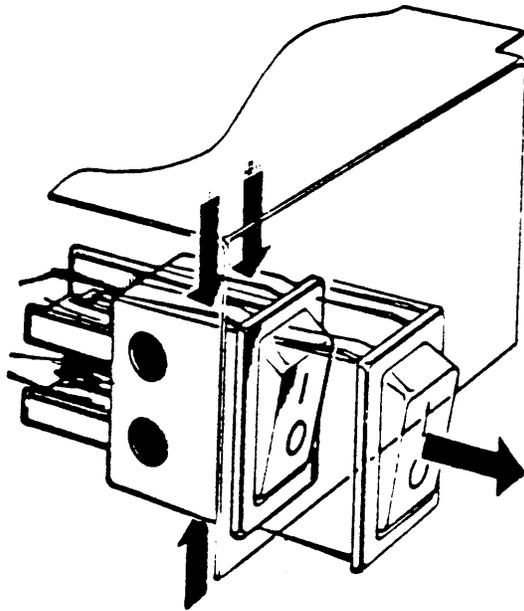
Figure 9-5 Removing the Left Side Panel



### 9.3 ON/OFF Switch Removal

1. Remove the left side panel as described in section 9.2.2.
2. Unplug the ON/OFF switch cable from the power supply.
3. Remove the nut that holds the cable's ground lead to the enclosure frame. Disconnect the ground lead.
4. Press the top and bottom of the ON/OFF switch and push the switch and its cable out from the inside of the front panel (figure 9-6).

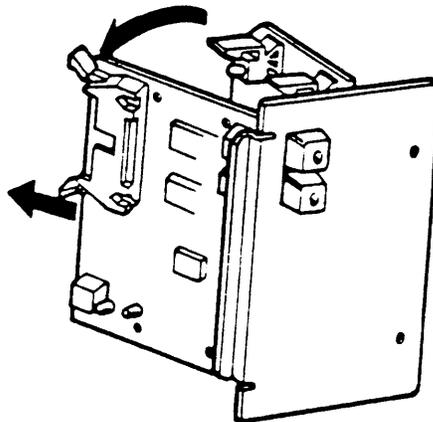
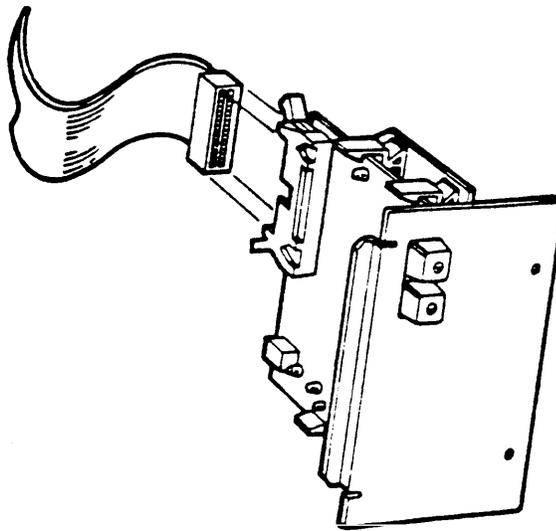
Figure 9-6 ON/OFF Switch Removal



#### 9.4 CPU Console Board Removal

1. Remove the left side panel as described in section 9.2.2.
2. Disconnect the ribbon cable from the CPU console board (figure 9-7).
3. Remove the two screws that hold the CPU console board assembly to the control panel.
4. Remove the board from the plastic brackets.

Figure 9-7 CPU Console Board Removal



## 9.5 5 1/4" (13.3 cm) Mass-Storage Device Removal

The following procedure applies to both removable and fixed media drives.

1. Remove both side panels as described in sections 9.2.1 and 9.2.2.
2. The front panel is attached to the enclosure by four snap fasteners. Remove the front panel by pulling it from the frame until the snap fasteners detach.
3. Disconnect all signal cables and DC power cables from the device.
4. Push down on the release tab found below the front of the device and slide the device out of the shelf.  
NOTE: When removing or installing a TK50 tape drive, do not insert hands or other foreign objects into the cartridge opening.

NOTE: Do not power down the TK50 or the system with a TK50 cartridge in place.

### 9.5.1 RD52 MAIN PRINTED CIRCUIT BOARD REMOVAL

#### NOTE

Replace the main printed circuit board (MPCB) only on RD52 disk drives with a part number of 30-21721-02.

#### NOTE

Screws located on the slide plate and MPCB are different sizes. Make sure you reinstall the screws in their proper location.

1. Remove the four phillips screws retaining the slide plate and ground clip. Set the slide plate aside (Figure 9-8).

2. Unplug the 2-pin connector (Figure 9-9).
3. Remove the two Phillips screws that attach the front bezel to the drive.

Figure 9-8 Remove the Slide Plate

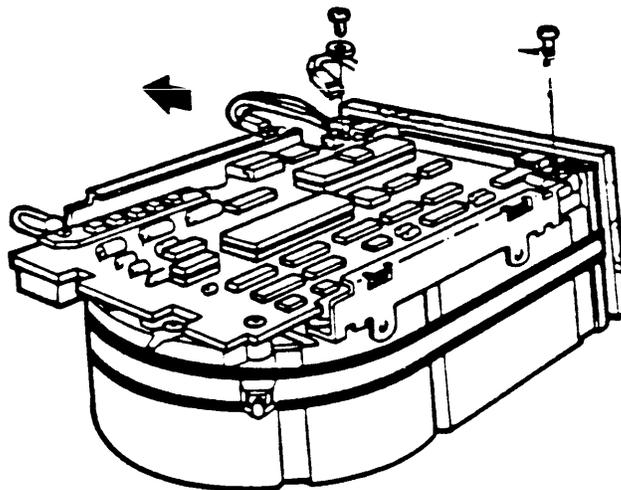
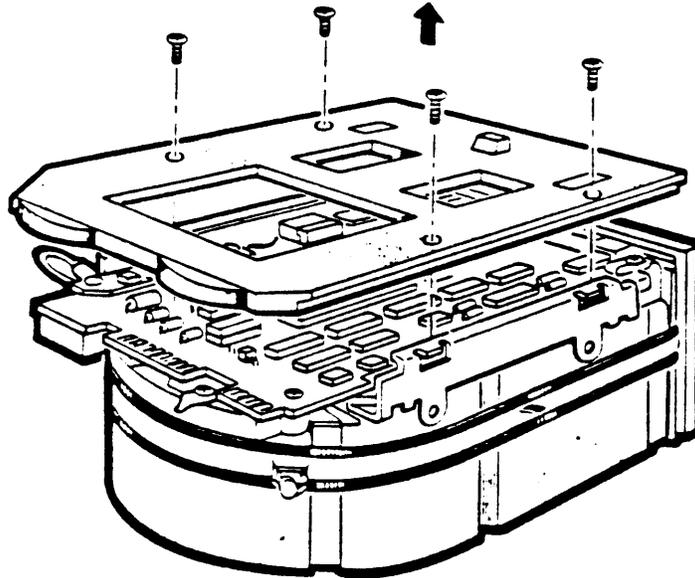


Figure 9-9 Remove the 2-pin Connector and Screws

4. Remove the front bezel by pulling it away from the drive. The bezel is held in place with pop fasteners (Figure 9-10).
5. Remove the three Phillips screws from the heatsink, grounding strip, and the corner opposite the heatsink (Figure 9-11).
6. Lift the MPCB straight up until it clears the chassis. This disconnects P4, a 12 pin fixed plug (Figure 9-12).
7. Disconnect P5, a 10-pin connector.

Figure 9-10 Remove the Front Bezel

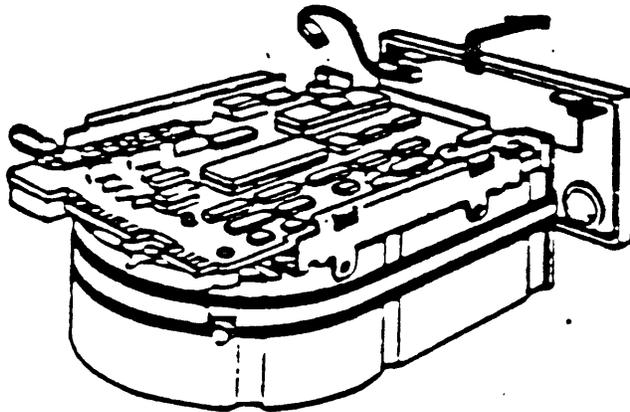


Figure 9-11 Remove Phillips Screws from Heatsink

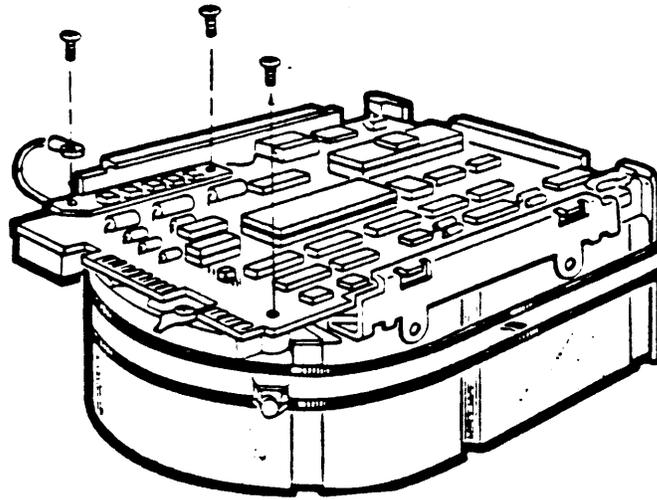
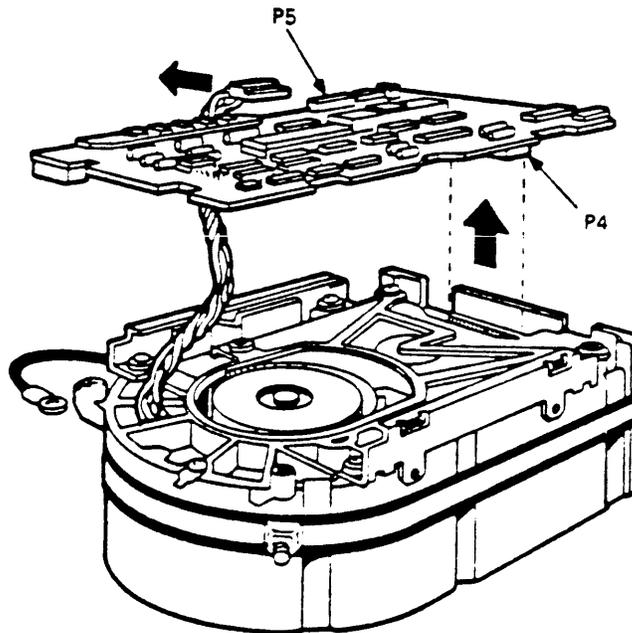


Figure 9-12 Remove the MPCB



### 9.5.2 RD53 DISK DRIVE DEVICE ELECTRONICS BOARD REMOVAL

The RD53 read write board is the only part of an RD53 drive that is replaceable. Always try replacing the device electronics board before you replace an entire RD53 drive.

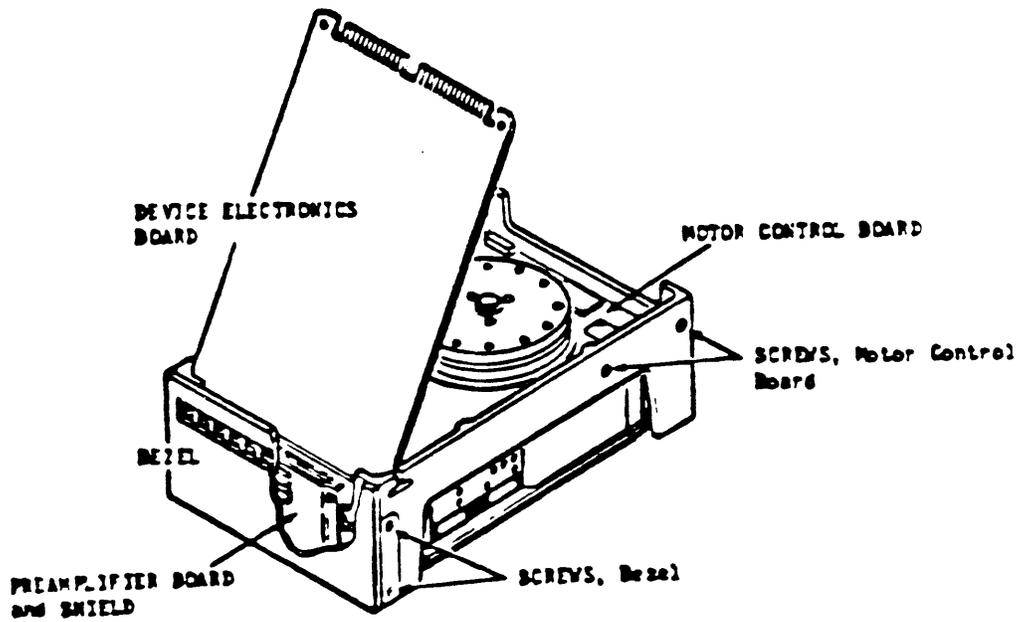
1. Remove the four phillips screws retaining the slide plate and ground clip. Set the plate aside (figure 9-13).
2. Loosen the two captive screws which hold the device electronics board in place.
3. Rotate the board upward (the board pivots in hinge slots at the front of the drive). Being careful not to strain any of the connectors or cables, tilt the board over center until it comes to rest against the outer frame.

CAUTION: Flexible circuit material is fragile and requires careful handling to avoid damage.

4. Disconnect the Motor Control board connector J8 and the Preamplifier board connector J9 from the read/write board. Both connectors and cables are fragile, handle them with care.
5. Lift the board out of the hinge slots.

NOTE: Make sure to set the jumpers and switches for the new board to the same positions as the old one.

Figure 9-13 RD53 Device Electronics Board Removal



### 9.6 Fan Removal

The following two sections list the procedures for removing the card-cage fan and the mass-storage fan. The fan in the power supply is not an FRU.

### 9.6.1 Mass-Storage Fan Removal

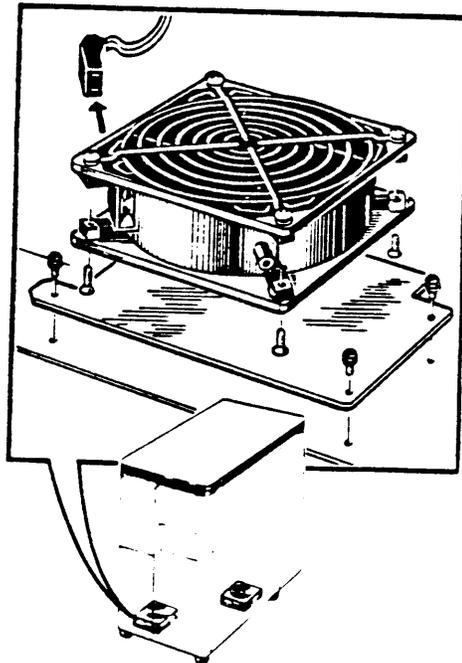
1. Remove the left side panel as described in section 9.2.2.
2. Note that the DC power cable's plug is contoured to fit along the side of the fan. Disconnect the cable from the fan. When replacing the fan be sure to align the cable the same way (see Figure 9-14).
3. Remove the three screws that connect the fan's metal base plate to the enclosure frame (figure 9-14).

#### NOTE

Observe the alignment of the fan before removing it. Be sure to align the replacement fan in the same direction.

4. Remove the four screws that connect the fan to the metal base plate.

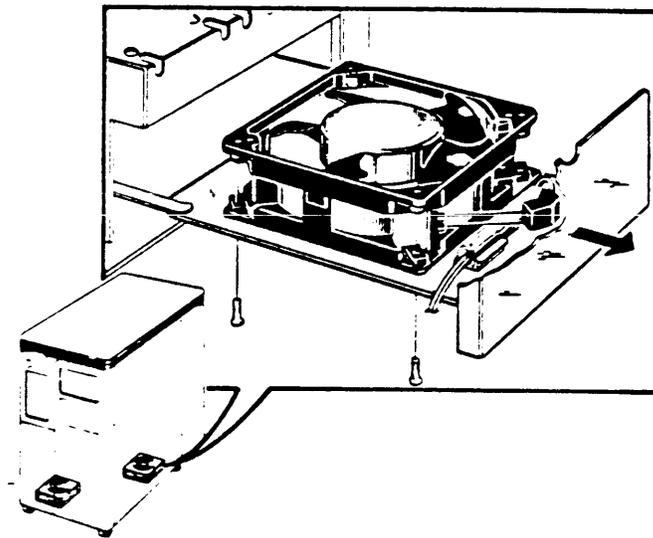
Figure 9-14 Mass-Storage Fan Removal



### 9.6.2 Card-Cage Fan Removal

1. Remove the right side panel as described in section 9.2.1.
2. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open.
3. Slide the tray below the card-cage partially out (figure 9-15).
4. Note that the cable's DC power plug is contoured to fit along the side of the fan. Disconnect the cable from the fan. When replacing the fan be sure to align the cable the same way (see Figure 9-15).
5. Remove the four screws that connect the fan to the tray.

Figure 9-15 Card-Cage Fan Removal



## 9.7 Module Removal

**NOTE:** When removing modules from the card cage, carefully but firmly pull the levers which hold the module in place. When installing modules, make sure the levers latch properly as you are trying to seat the module in the backplane.

**CAUTION:** Static electricity can damage modules. Always use a grounded wrist strap and grounded work surface when working with or around modules.

**CAUTION:** Remove and install modules carefully to prevent damage to module components and other modules, or possibly changing the switch settings.

**NOTE:** Replacement modules come wrapped in special antistatic packaging material. A silica gel packet is also included to prevent damage from moisture. Use this antistatic packaging material and silica gel packet to protect any modules you store, transport, or return.

**NOTE:** If you install a dual-height module in slots 1-4 of the backplane, you must install it in the AB rows. If no modules are installed in the AB rows of this slot, a grant card must be installed. MS630-AA memory modules must be installed in the CD rows of slot 2 or 3. If you install dual-height modules in slots 4 through 12 of the backplane, you must install a grant continuity card (M9407) or a second dual-height module in the other two rows of the slot.

1. Remove the right side panel as described in section 9.2.1.
2. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open (see Figure 9-16).
3. Slide the module partially out of the backplane (figure 9-16).
4. Note the alignment of any cables attached to the module. Disconnect the cables.
5. Remove the module from the enclosure.

NOTE: Be sure that the jumper and switch configurations on the replacement module are the same as those on the module removed.

NOTE: Before removing a module from the backplane, be sure to note the position of all modules and the alignment of any cables that you disconnect.

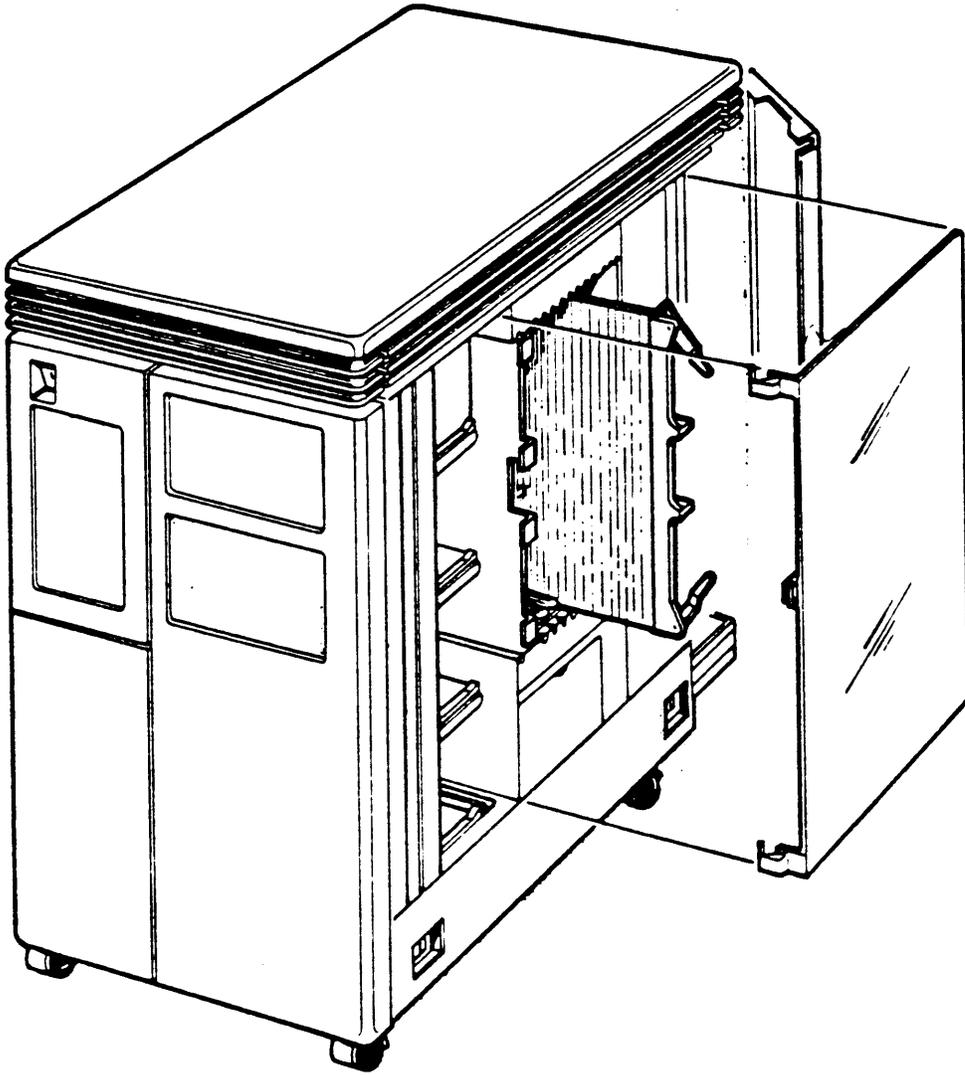


Figure 9-16 Module Removal

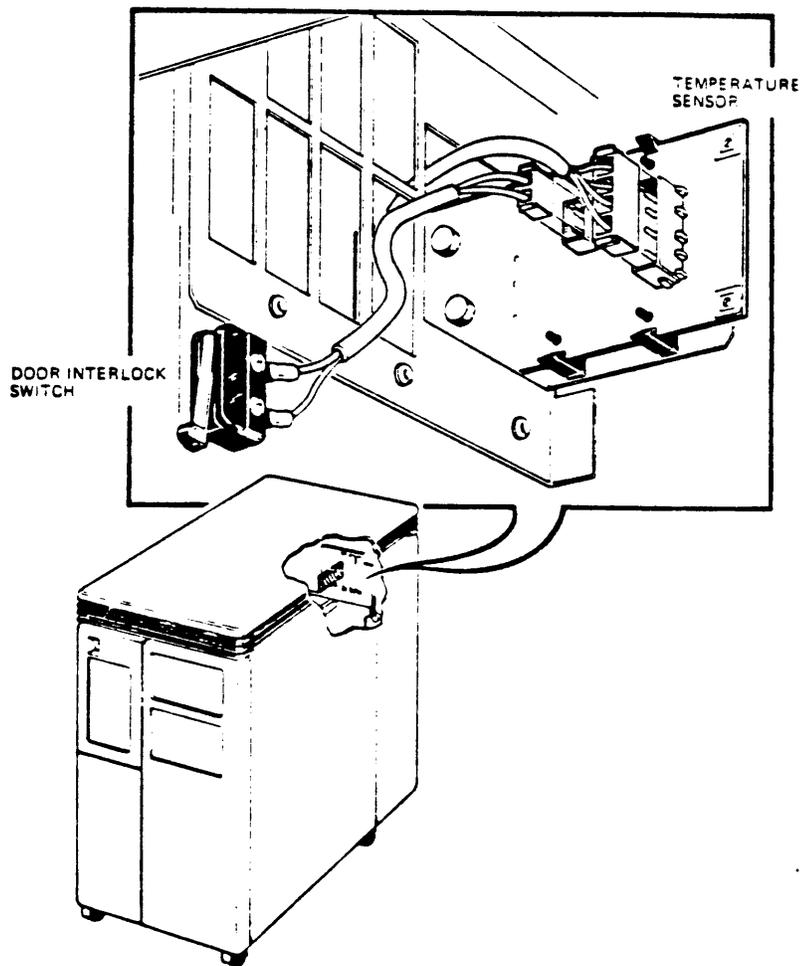
## 9.8 Door Interlock Switch Removal

1. Remove the right side panel as described in section 9.2.1.
2. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open.
3. There is a cable connecting the interlock switch to the temperature sensor. Disconnect the cable from the temperature tensor (figure 9-17).
4. Remove the two screws that connect the switch to the side of the card-cage and remove the switch and the cable.

## 9.9 Temperature Sensor Removal

1. Remove the right side panel as described in section 9.2.1.
2. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open.
3. There is a cable connecting the interlock switch to the temperature sensor. Disconnect the cable from the temperature sensor (figure 9-17).
4. There is a cable connecting the temperature sensor to the power supply. Disconnect the cable from the temperature sensor.
5. Remove the temperature sensor from the four plastic brackets connecting it to the enclosure frame.

Figure 9-17 Temperature Sensor / Door Interlock Switch



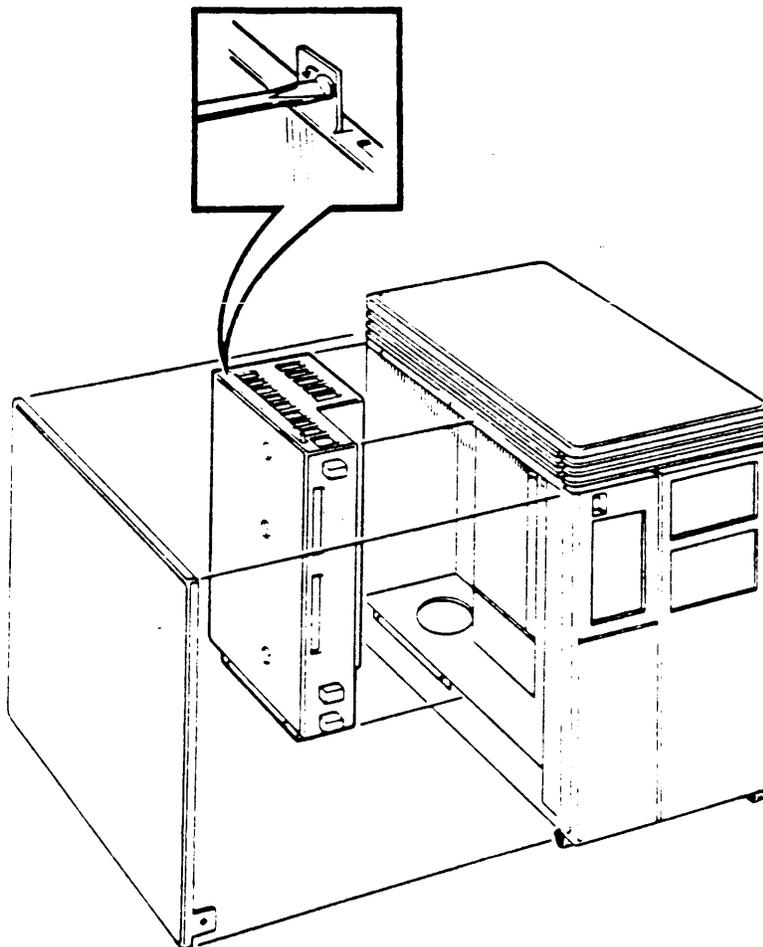
## 9.10 Power Supply Removal

1. Remove the left side panel as described in section 9.2.2.
2. Note the location and alignment of all cables attached to the power supply. Disconnect all cables, including the AC power cord at the rear of the system.
3. Remove the four 1/4 turn fasteners holding the power supply to the enclosure frame and remove the power supply (figure 9-18).

### CAUTION

Before installing a new power supply, verify that the voltage select switch at the rear of the power supply is set for the correct AC voltage. Damage to the system could result if the switch is not properly set.

Figure 9-18 Power Supply Removal



## 9.11 Backplane Removal

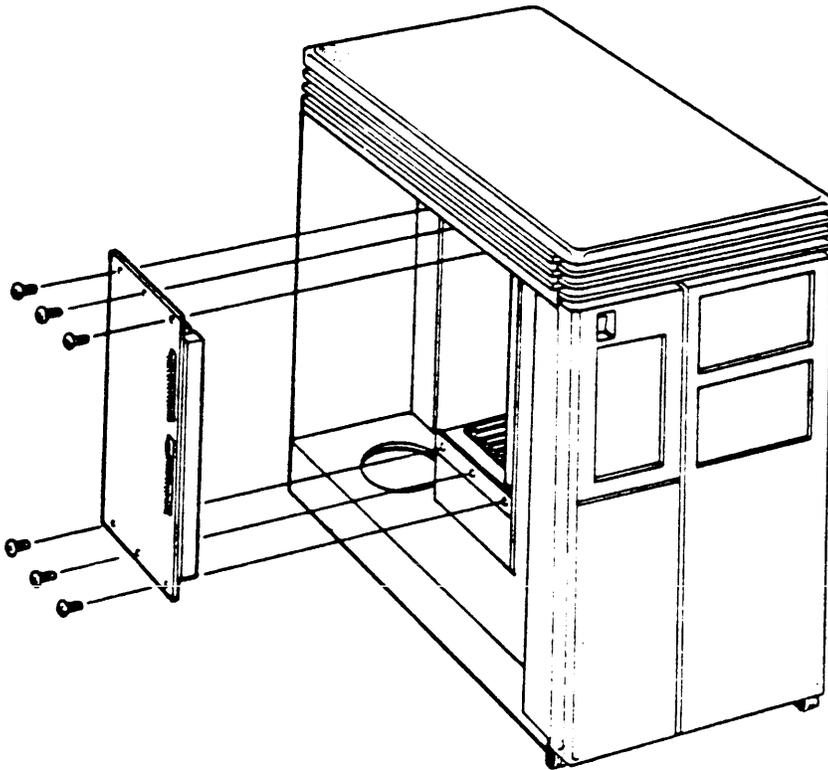
1. Remove both side panels as described in section 9.2.1 and 9.2.2.
2. Slide all modules partially out of the backplane, including the signal distribution board.
3. Remove the power supply as described in section 9.10.
4. There is a metal plate between the backplane and the power supply. Remove the six screws that hold the plate to the enclosure frame (see Figure 9-19).
5. Lift the metal plate and the backplane out of the back of the card-cage (figure 9-19).
6. Remove the screws that hold the metal plate to the backplane.

The backplane is replaced as follows:

1. Insert the screws that hold the metal plate to the backplane.
2. Place the backplane and the metal plate at the back of the card-cage.
3. Insert a module in the first and the last card guide of the card-cage.
4. Align the backplane so that the two modules can be fully inserted into the backplane. Insert the modules.
5. Insert the six screws that hold the metal plate to the enclosure frame.
6. Check the alignment of the backplane by inserting all of the system modules in their original slots.

7. Replace the power supply by reversing the procedure described in section 9.10.

Figure 9-19 Backplane Removal



## 9.12 Filter Connector Removal

1. Turn the system OFF and unplug the AC power cord from the wall socket.
2. Open the rear door.
3. Disconnect any cables attached to the filter connector. Note where the cables were attached.
4. Remove the right side panel as described in section 9.2.1.
5. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open.

### NOTE

Some of the internal cables that connect to the back of filter connectors may not be keyed. Observe the alignment of the internal cables and be sure to re-connect them the same way.

6. Disconnect any cables that connect the filter connector insert to modules inside the enclosure.
7. Remove the screws that hold the filter connector to the rear I/O panel.
8. Remove the filter connector.

## CHAPTER 10--H9642 FRU REMOVAL AND REPLACEMENT

### 10.1 Introduction

This chapter lists removal and replacement procedures for field replaceable units (FRUs) in the 630QE system. Table 10-1 lists the FRUs and their part numbers.

Unless otherwise specified, FRUs are replaced by reversing the order of the removal procedures. Removal and replacement procedures should be done by qualified service personnel only.

Table 10-1 630QE Field Replaceable Units

Component	Order Part Number
Adapter plate	74-27720-01/A
BA23 rackmount enclosure (top BA23)	BA23-A
BA23 expander enclosure (bottom BA23)	BA23-C
Backplane assembly	70-19986-00
Cable, BA23, front control panel to backplane	70-20451-1C
Cable, BA23, power supply to front fan	70-20449-00
Cable, BA23, power supply to backplane	70-20450-01
Cable, BA23, power supply to mass-storage devices	70-20435-1K
Cable, CPU module to CPU patch panel insert (10-conductor)	17-00624-01
Cable, CPU module to CPU patch panel insert (20-conductor)	17-00712-02
Cable, CPU module to MS630 memory module	17-00716-01
Cable, between M9404 and M9405-B interconnects	BC02D-03
Cable, RX50 to distribution panel	17-00285-02
Cable, RA60/RA81 to I/O bulkhead	BC26V-6
Cable, BA23, RD5n to distribution panel (20 con.)	17-00282-00
Cable, RD5n to distribution panel (34 conductor)	17-00286-00
Cable, TK50 to TQK50 controller	70-22300-01
Chassis support kit	70-20761-01
CPU patch panel insert	54-16744-01
DEQNA	DEQNA-M
DEQNA cabinet kit	CK-DEQNA-KF
DHV11	DHV11-M
DHV11 cabinet kit	CK-DHV11-AF
DLVJ1	DLVJ1-M
DLVJ1 cabinet kit	CK-DLVJ1-LF
DZQ11	DZQ11-M
DZQ11 cabinet kit	CK-DZQ11-DF
DZV11	DZV11-M
DZV11 cabinet kit	CK-DZV11-DF
Fan, DC, front or rear (same part)	12-17556-01
Front control panel (lower BA23)	70-22007-09
Front control panel (upper BA23)	70-22007-01
Grant card	M9047

Table 10-1 630QE FRUs contd.

---

Interconnect module (top BA23)	M9404
"    "    (bottom BA23)	M9405-YB
KA630 CPU module	KA630-AA
KA630-A cabinet kit	CK-KA630-AF
KDA50 disk controller (processor and SDI modules)	KDA50-Q
KDA50 50-conductor ribbon cable, from processor module to SDI module	70-18448-00
KDA50 40-conductor ribbon cable, from processor module to SDI module	70-18447-00
KDA50 cable from module to bulkhead panels	17-00951-02
KDA50 bulkhead assembly (2 bulkhead panels)	74-30990-01
MS630 memory module (1 MB)	MS630-AA
"    "    "    (2 MB)	MS630-BA
"    "    "    (4 MB)	MS630-BB
Power controller (120V, 24A)	H374-D
"    "    (240V, 12A)	H374-F
Power supply, BA23	H7864-A
RA60 removable disk drive (120v, 240v)	RA60-AF
RA81 fixed disk drive (120v)	RA81-HA
"    "    "    "    (240v)	RA81-HD
RD52 fixed disk drive (drive only)	RD52-A
"    "    "    "    (drive and cables)	RD52-AA*
RD53 fixed disk drive (drive only)	RD53-A
"    "    "    "    (drive and cables)	RD53-AA*
RD52 read/write board	29-24992-00
RD53 read/write board	29-25339-00
RQDX2 (RD/RX controller module)	M8639-YB
RQDX3 ( " " " " )	M7555
RQDX extender module	RQDX1-E
RQDX extender module cabinet kit	CK-RQDXE-KA
RX50 Diskette drive	RX50-AA*
TK50 streaming tape drive	TK50-A
Controller for TK50	TQK50-AB
TS05 tape drive (120V)	TS05-AA
"    "    "    (240V)	TS05-AB
Controller for TS05	TSV05

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\* If you are adding a drive to a system that did not already contain a drive, order the -AA option. The -AA option includes the necessary cables.

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#### CAUTION

Static electricity can damage system components. Use a grounded wrist strap (29-11762-00) and grounded work surface when accessing any internal part of the system.

## 10-2 Opening the Rear I/O Panel

The rear I/O panel must be opened before beginning many removal and replacement procedures. For example, it should always be opened after extending or removing a BA23 enclosure, to be sure that internal cabling is not pinched when the BA23 is slid back into the cabinet. This sequence will be referenced in the procedures that follow.

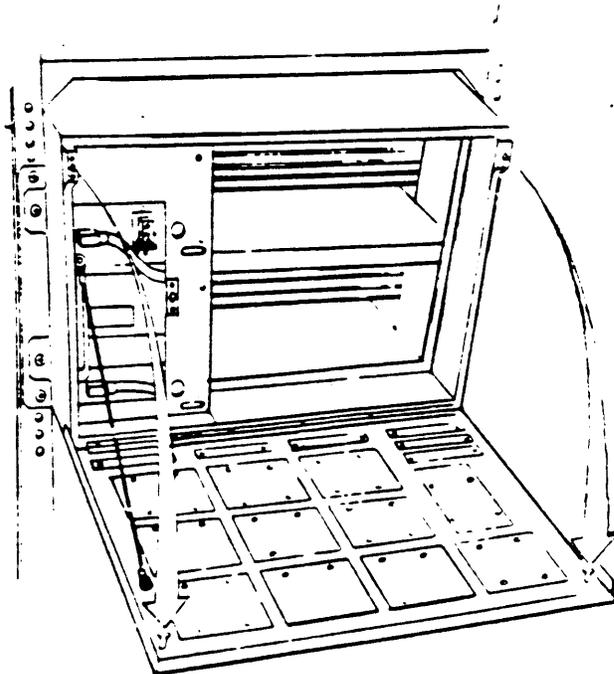
1. Turn the system power off at the top BA23 enclosure ON/OFF switch and disconnect the ac power.
2. Use the hex wrench supplied with the system to unlock the rear door of the cabinet. Press down on the spring clip in the upper left hand corner of the door and swing the door open.

### NOTE

The rear door can be removed if more working space is required. To do so, you must disconnect the ground wire from the door to the cabinet frame (figure 10-5).

3. Use a screwdriver to loosen the two quarter-turn fasteners in the upper left and right corners of the rear I/O panel. Open the rear I/O panel (figure 10-1).

Figure 10-1 Opening the Rear I/O Panel



### 10.3 Rear I/O Panel Insert

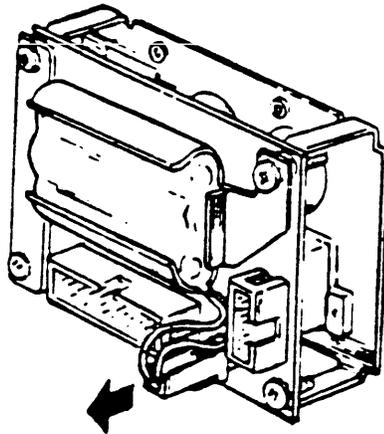
The following procedure applies to any panel insert attached to the rear I/O panel, including the CPU patch panel insert.

1. Open the rear I/O panel as described in section 10.2
2. Remove any internal cables connected to the insert. Note the orientation of the cables. When installing a new insert, be sure to connect the internal cables in the same way.
3. Remove the screws holding the insert panel to the I/O panel and remove the insert.

#### 10.3.1 Battery Backup Unit (BBU) Removal

1. Remove the CPU patch panel insert as described in section 10.3.
2. Disconnect the red and black leads on the battery from the CPU patch panel insert (figure 10-2).
3. Carefully spread the plastic holder and remove the batteries.

Figure 10-2 Disconnecting the BBU Leads



## 10.4 Module Removal

Modules in the H9642 cabinet system must be installed according to the configuration rules listed in Chapter 4. Refer to Chapter 4 before removing or installing modules.

### CAUTION

Static electricity can damage modules. Use a grounded wrist strap and grounded work surface when working with modules. Remove and install modules carefully.

1. Open the rear I/O panel as described in section 10.2.

### NOTE

When removing modules, note the orientation of the internal cables. Some cables have a red stripe, others are keyed. When installing a new module, be sure to re-install the cables in the same way. Incorrect cabling after replacing an FRU is a common cause of system problems.

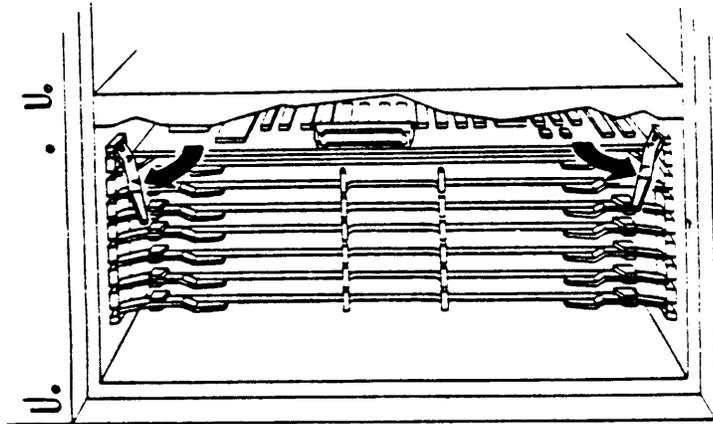
2. When removing a module you may have to disconnect cables attached to modules above or below the one you are removing. In this case, disconnect the cables from the insert panels in the I/O panel, not from the modules themselves.
3. Quad height modules have levers on each outside corner. These levers are used to remove the module from the backplane, and to lock the module in place at installation. Slide the module partially from the backplane by firmly pulling the levers towards you. Apply pressure to both levers evenly.
3. Remove any cables that are connected to the module and remove the module from the system (figure 10-3).

### NOTE

Be sure that the jumper and switch settings of the replacement module are the same as those on the module you removed.

Replacement modules are wrapped in antistatic packaging material. A silica gel packet is also included to prevent damage from moisture. Use these materials to protect any modules you store or return.

Figure 10-4 Removing a Module



### 10.5 10.5" Mass-Storage Devices

The MicroVAX 630QE cabinet system can contain the following drives:

- RA60 (top mass-storage area only)
- RA81 (top or bottom mass-storage area)
- TSV05 (top mass-storage area only)

The procedures listed in this section describe only the removal of the drives from the cabinet.

Some components within the drives can be removed without removing the drives from the cabinet. Before attempting to remove a drive from the cabinet, refer to the following documents to determine if removal of the drive is necessary:

- RA60 Disk Drive Service Manual (EK-ORA60-SV)
- RA81 Disk Drive Service Manual (EK-ORA81-SV)
- TSV05 Tape Transport Pocket Service Guide (EK-TSV05-PS)

These documents describe removal and replacement procedures for components within the drives.

### 10.5.1 RA60

Use two people and a lifting device to remove an RA60 disk drive from the cabinet.

1. Spin down all the drives in the system as described in chapter 2 of the system owner's manual. Remove the disk from the RA60.
2. Switch the ON/OFF switch on the upper BA23 front control panel OFF.
3. Use the hex wrench supplied with the system to unlock the rear door. Press down on the spring clip in the upper left corner of the door. Disconnect the ground wire between the door and the cabinet frame (figure 10-5) and remove the door.
4. Switch the 874 power controller circuit breaker OFF (0).
5. Disconnect the system ac power cord at the wall outlet.
6. Extend the front center support leg and lock it in place.
7. Label and disconnect the SDI cables of the RA60 at the drive.
8. Remove the four screws holding the top rear cover of the RA60 and remove the cover (figure 10-6).
9. Remove the four screws holding the rear shield and remove the shield (figure 10-6).

Figure 10-5 Removing the Rear Door

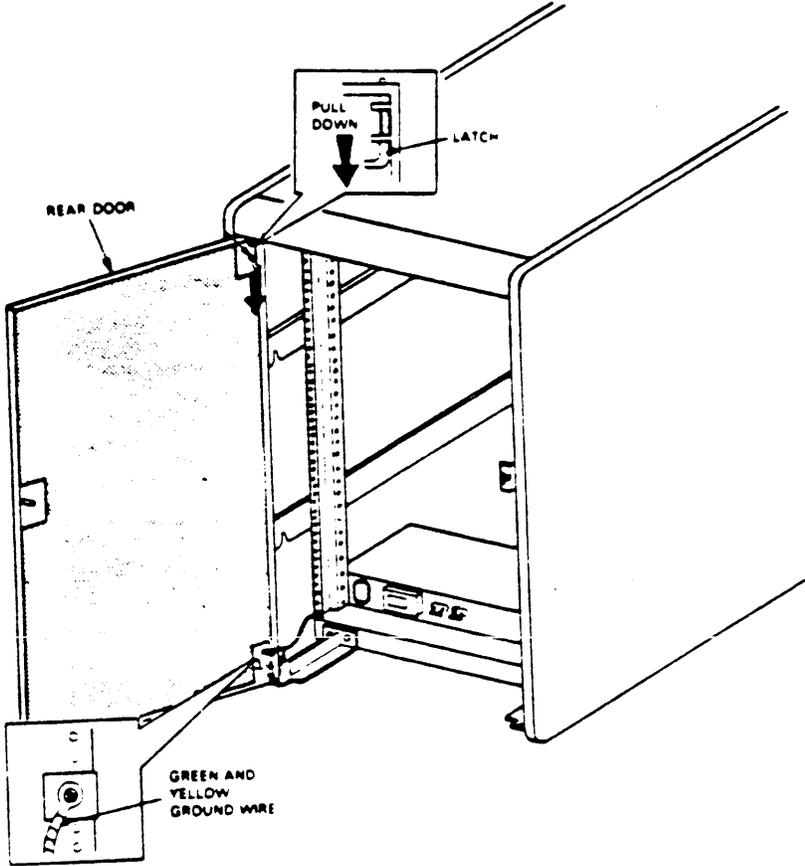


Figure 10-6 Removing the RA60 Rear Cover and Shield

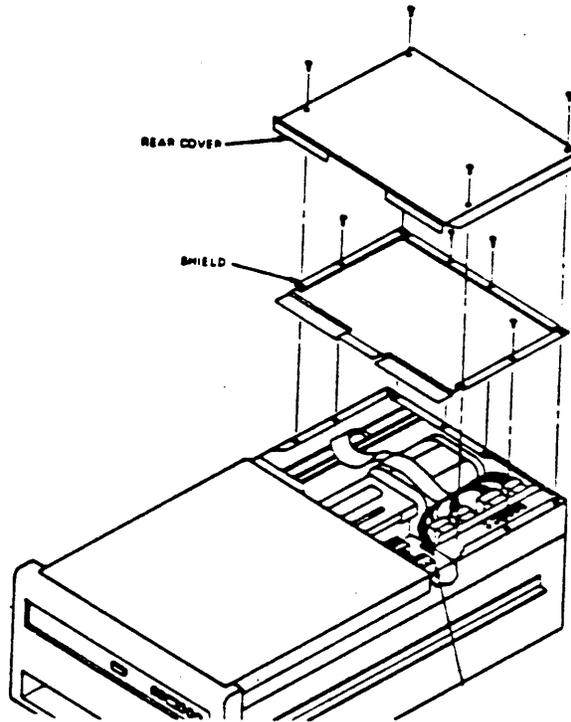
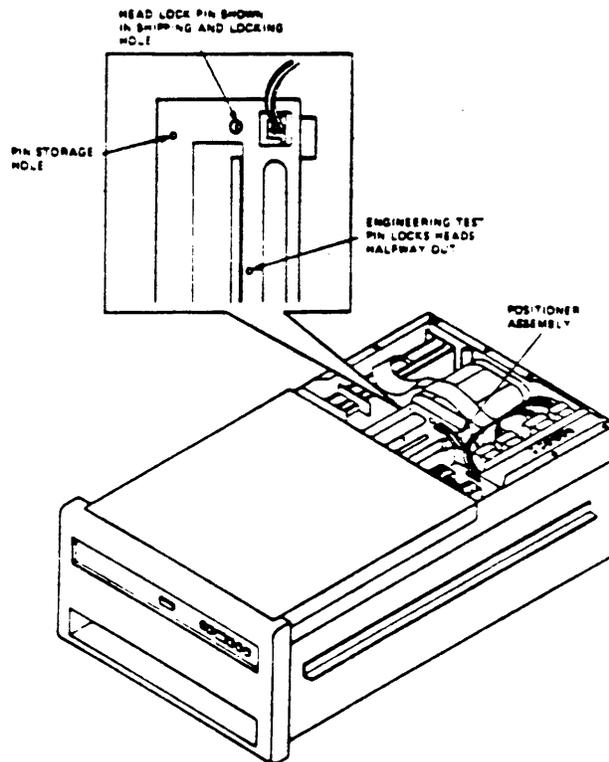
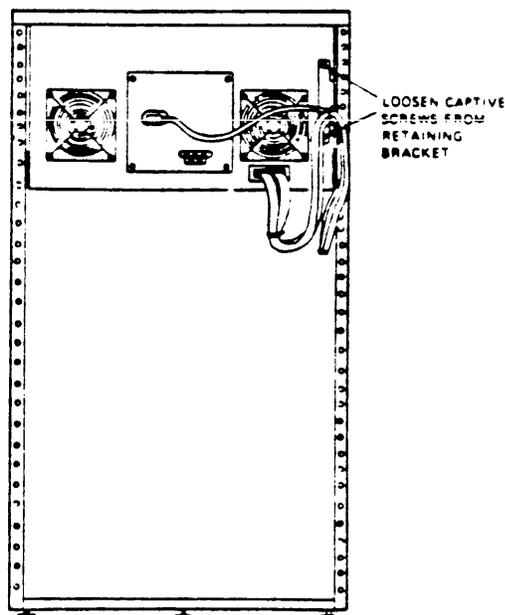


Figure 10-7 Inserting the RA60 Head Locking Pin



10. Pull the head locking pin out of its storage hole and place it in the locking hole of the positioner assembly (figure 10-7).
11. Replace the shield and top rear cover.
12. At the right rear of the system, loosen the two spring loaded quarter-turn screws that secure the drive to the cabinet frame (figure 10-8).
13. Extend the drive until the restraint mechanism is fully engaged.
14. Insert a flatblade screwdriver under the restraint lever and push the lock toward the back of the slide (figure 10-9).
15. Push down on the restraint lever and extend the drive to the service position.
16. Place a lifting device directly underneath the RA60 drive. Be sure that the RA60 drive is resting on the lifting device and is taking the weight off the chassis slides.

Figure 10-8 Loosening the RA60 Retaining Bracket Screws



17. Remove the ten screws (5 on each side) that secure the drive to the chassis slides (figure 10-10). The full weight of the drive should be on the lifting device.

Figure 10-9 Extending the RA60 Drive

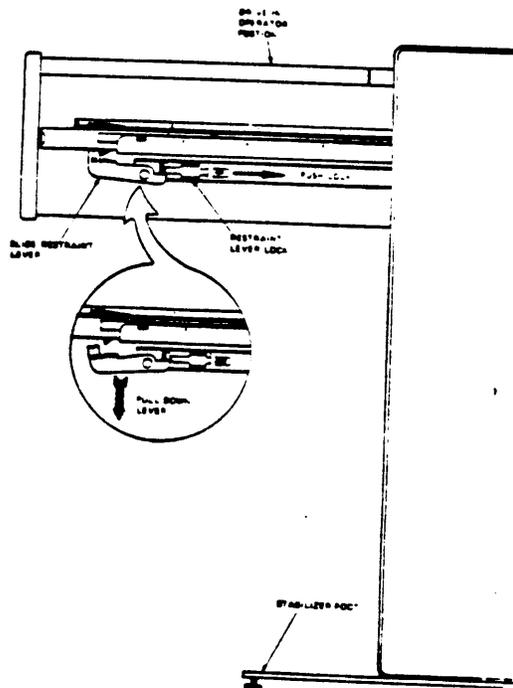
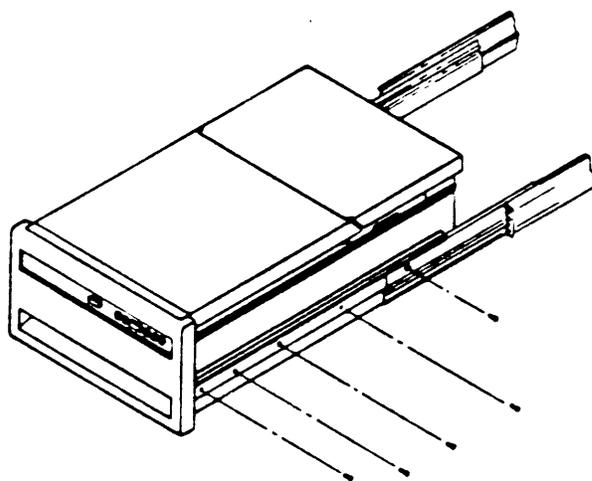


Figure 10-10 Removing the Screws from the Chassis Slides



### 10.5.2 RA81

The RA81 can be installed in either the top or bottom mass-storage area. The removal procedure is the same in either case.

#### CAUTION

Use two people to remove the RA81 disk drive.

1. Spin down all the drives in the system as described in chapter 2 of the system owner's manual.
2. Switch the ON/OFF switch on the upper BA23 control panel OFF.
3. Use the hex wrench supplied with the system to unlock the rear door. Press down on the spring clip in the upper left corner of the door. Disconnect the ground wire between the door and the cabinet frame (figure 10-4) and remove the door.
4. Switch the 874 power controller circuit breaker OFF (0).
5. Disconnect the system ac power cord at the wall outlet.
6. Extend the front center support leg and lock it in place.
7. Disconnect the internal SDI cables of the RA81 drive at the I/O bulkheads located at the bottom rear of the cabinet (figure 10-11). Do not attempt to disconnect the SDI cables at the drive.
8. At the rear of the system, locate and remove the screw that secures the drive to the electrostatic discharge bracket (ESD) (figure 10-12) on the lower left.
9. Extend the drive until the locking mechanism is fully engaged. (figure 10-13)
10. Push down on the slide arm lock A to extend the drive to the limits of the slides.
11. Place a lifting device directly underneath the RA81 drive. Be sure that the RA81 drive is resting on the lifting device and that it is taking the weight off the chassis slides.
12. Use the lifting device to lower and remove the drive from the system.

Figure 10-11 Removing RA81 SDI cables from the I/O Bulkheads

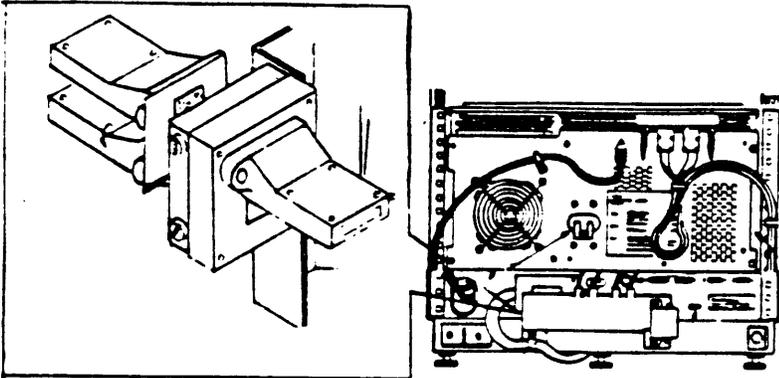


Figure 10-12 Removing the Screw from the EDP

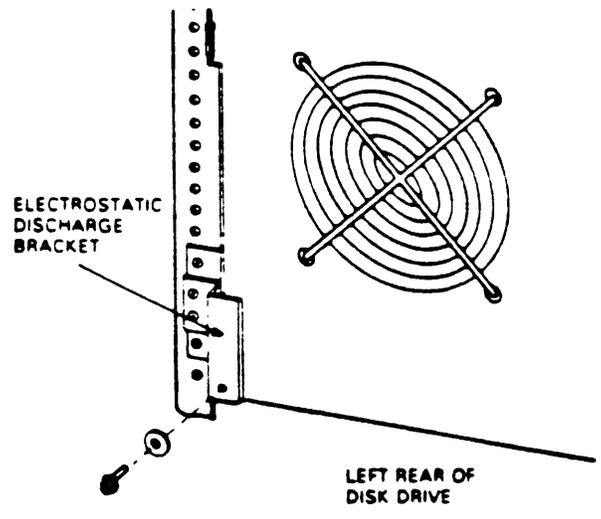
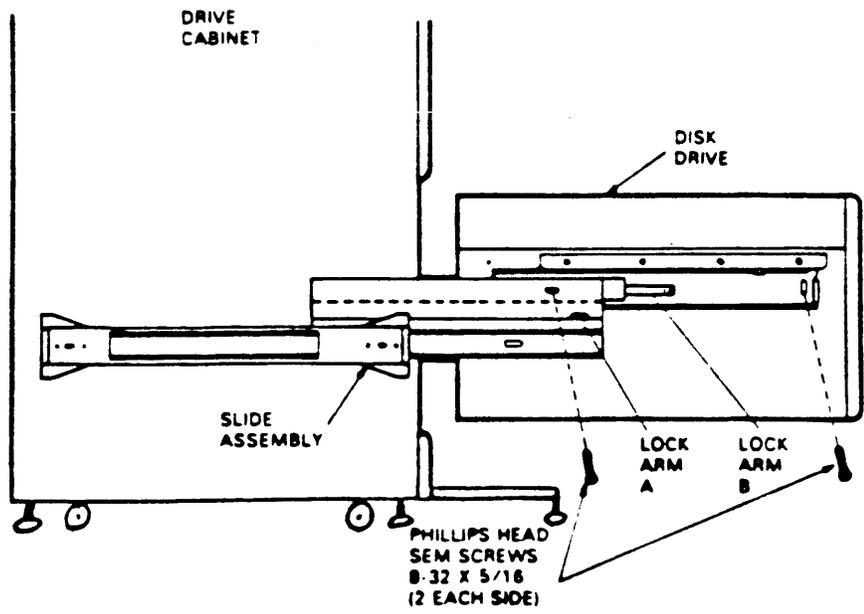


Figure 10-13 Extending the RAB1 on the Chassis Slides



### 10.5.3 TS05 Tape Drive Removal

The TS05 Tape Drive is installed in the top mass-storage area. To remove the TS05, one side panel of the cabinet must be removed to unplug the TS05 from the power controller at the bottom of the system.

#### CAUTION

Use two people to remove and install the drive.

1. Turn the system power off and disconnect the ac power at the wall outlet.
2. Turn the circuit breaker at the rear of the TS05 OFF.
3. Extend the front center support leg and lock it in place.
4. Use the hex wrench supplied with the system to unlock the rear door. Press down on the spring clip in the upper left corner of the door. Disconnect the ground wire between the door and the cabinet frame (figure 10-5) and remove the door.

Steps 5 - 10 should only be performed if the power cord on the TS05 in your system cannot be disconnected at the TS05. If this is the case, then the power cord must be disconnected at the power controller at the bottom of the cabinet. If you can disconnect the power cord at the TS05, ignore steps 5 - 10.

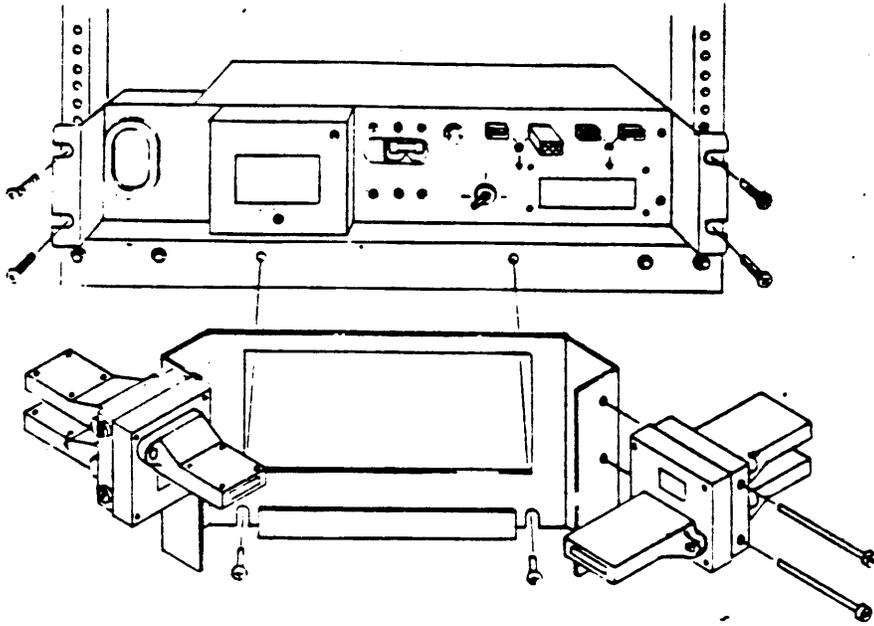
5. At the top rear of the system, remove the bracket plate between the two side panels by loosening the two screws that hold the plate to the side panel and lifting the plate straight up and off.
6. At the bottom rear of the system, loosen the two screws that hold the lower left cabinet bracket to the frame and remove the cabinet bracket.
7. Lift the left side panel up off the key buttons on the cabinet frame and put the panel to the side. The side panel is attached to the cabinet frame by a ground strap. If you need more space, disconnect the ground strap and remove the side panel.
8. At the right rear of the system, locate and remove the two spring loaded quarter-turn screws that secure the RA81 drive in the bottom mass-storage area to the cabinet frame (figure 10-8).
9. Extend the RA81 until the restraint mechanism is fully engaged.
10. From the side of the system, reach in and disconnect the TS05 ac power cord from J5 on the power controller.

11. Locate and remove the black bracket that secures the TS05 to the cabinet frame. Swing the bracket around slightly so that it will clear the chassis slides when the TS05 is pulled forward.
12. Push the TS05 forward until the spring latches engage. Press down on the spring latches on both sides of the chassis slides and extend the TS05 out BUT NOT OFF of the chassis slides.
13. Use a lifting device to lift the TS05 off the chassis slides and out of the system.

#### 10.6 Power Controller

1. Turn the system power off and disconnect the ac power.
2. Use the hex wrench supplied with the system to unlock the rear door. Press down on the spring clip in the upper left corner of the door and swing the door open.
3. Label and disconnect all cables to the drive interconnect bracket. Remove the two screws that hold the bracket to the cabinet frame (figure 10-14) and remove the bracket.
4. Remove the power sense cable from socket J12 of the power controller.
5. Remove the four screws that hold the power controller to the cabinet frame (figure 10-14).
6. Slide the power controller out to gain access to the ac outlet on the power controller. Label and disconnect all power cords at the power controller.
7. Remove the screw that holds the ground strap to the power controller. Remove the ground strap and the power controller.

Figure 10-14 874 Power Controller Removal



## 10.7 Control Panel Assembly

The control panel assembly in the top BA23 includes the control panel PC board, the system ON/OFF switch, and the cable from the ON/OFF switch to the power supply.

1. Turn the system power off and disconnect the ac power.
2. Remove the front cover of the enclosure. Slide the enclosure forward.
3. Remove the screws to the subsystem storage cover and remove the cover.
4. Remove the four screws retaining the control panel assembly.
5. Disconnect the ribbon cable from the control panel assembly.
6. Disconnect the cable from J7 on the power supply.

When installing a new control panel, make sure both switches on the control panel PC board DIP switch are OFF.

When re-installing the BA23 enclosure, slide the enclosure half-way back into the cabinet, then open the rear I/O panel as described in section 10.2. Slide the enclosure back into the cabinet, then close the rear I/O panel, taking care not to pinch the internal cables between the BA23 and the cabinet frame.

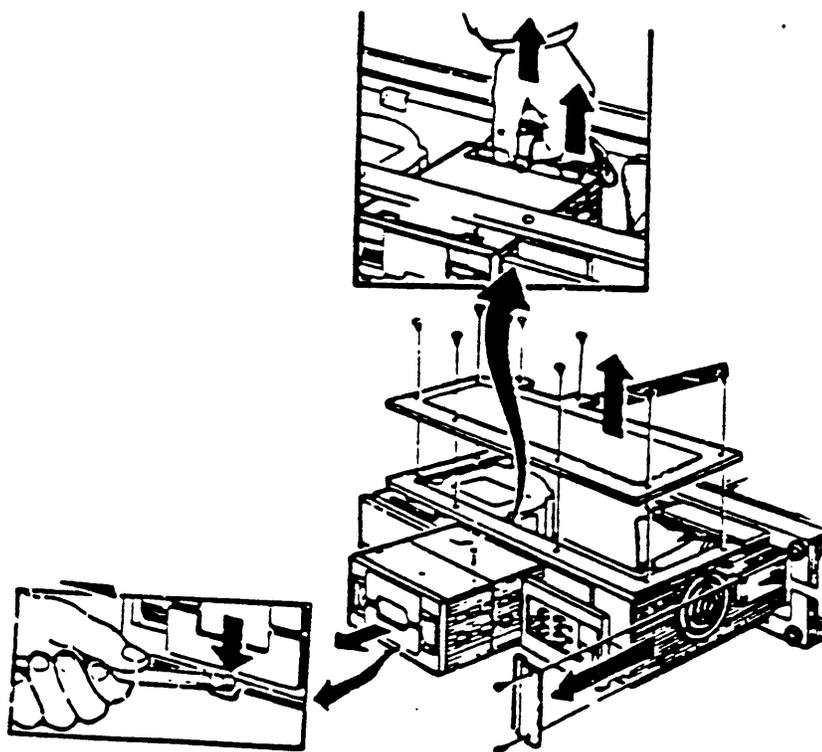
## 10.8 RD5n/RX50/TK50 Drive Removal

The procedure for removing an RD5n, RX50, or TK50 drive is the same. Figure 10-15 uses the RX50 as the example.

1. Turn the system power off and disconnect the ac power.
2. Remove the front cover of the enclosure. Slide the enclosure forward.
3. Remove the screws from the subsystem storage cover and remove the cover.
4. Disconnect the signal cable(s) and dc power cable from the drive by pulling the cable connectors. Do not pull the cables themselves.
5. Push down on the release tab, slide the drive forward and remove.

When re-installing the BA23 enclosure, slide the enclosure half-way back into the cabinet, then open the rear I/O panel as described in section 10.2. Slide the enclosure back into the cabinet, then close the rear I/O panel, taking care not to pinch the internal cables between the BA23 and the cabinet frame.

Figure 10-15 RX50 Drive Removal



RD5n fixed disk drives should be handled with care. Sudden shocks can damage the disk surface. Disk drives to be returned should be packed in the shipping carton of the replacement drive. A shipping carton may be ordered (Digital p/n 99-90045-01).

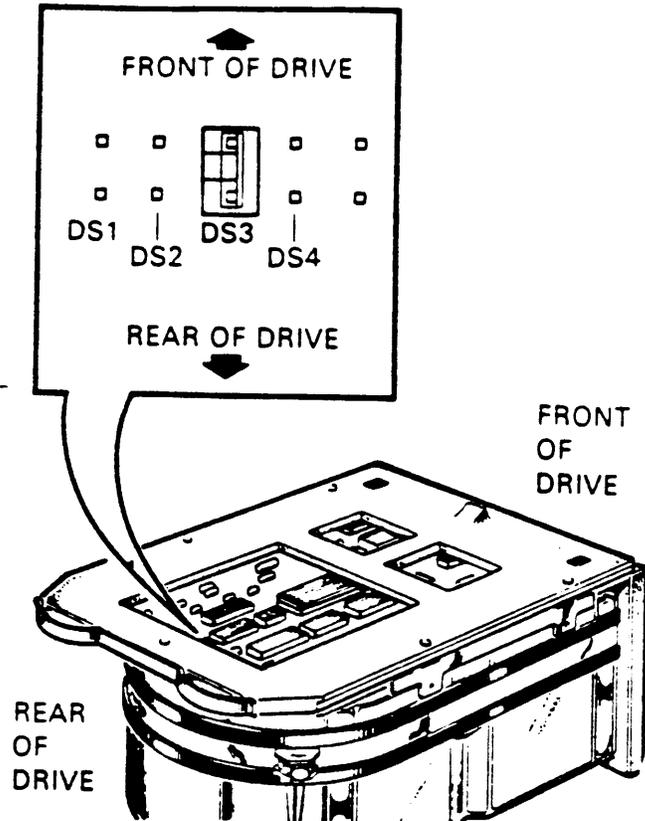
Newly installed RD5n disk drive must be formatted. The formatting utility is available in the Service Version of the MicroVAX Maintenance System, or from DIGITAL field service.

If you are upgrading your system from an RQDX2 to an RQDX3 controller module, all RD5n disks formatted using the RQDX2 must be re-formatted. Data on all RD5n disks should be backed up onto TK50-AA tape cartridges or RX50-C diskettes. Format the RD5n disks using the format utility in the Service version of the MicroVAX Maintenance System. Reinstall the data onto the RD5n drive.

You do not need to re-format a disk after replacing the read/write board. Formatting a fixed disk drive is necessary only when you replace the entire drive. Write-protect any other RD5n drives that may be present before formatting a new RD5n drive. Remember to write enable these additional RD5n drives when formatting of the new RD5n drive is complete.

If the RD5n is installed in the left side mass-storage area of either BA23 enclosure, the drive select jumper on the drive's read/write board should be installed on DS3 (figure 10-16). This is the factory setting. If the RD5n is installed in the right side mass-storage area of either BA23 enclosure, the drive select jumper should be installed on DS4.

Figure 10-16 Setting the RD52 Jumper Clip



#### 10.8.1 RD52 Read/Write Board Removal

Screws on the slide plate and read/write board are different sizes. Be sure to re-install the screws in the correct location.

1. Remove the RD52 fixed disk drive as described in section 10.7.
2. Remove the four phillips screws retaining the RD52 slide plate and ground clip. Remove the slide plate (figure 10-17).
3. Unplug the 2-pin connector (figure 10-18).
4. Remove the two Phillips screws that attach the front bezel to the drive.
5. The bezel is held in place with pop fasteners. Remove the bezel by pulling it away from the drive (figure 10-19).
6. Remove the Phillips screws from the heatsink, ground strip, and the corner opposite the heatsink (figure 10-20).
7. Lift the read/write board straight up until it clears the RD52 chassis. This disconnects P4, a 12-conductor plug (figure 10-21).
8. Disconnect P5, a 10-pin connector.

Figure 10-17 Removing the Slide Plate

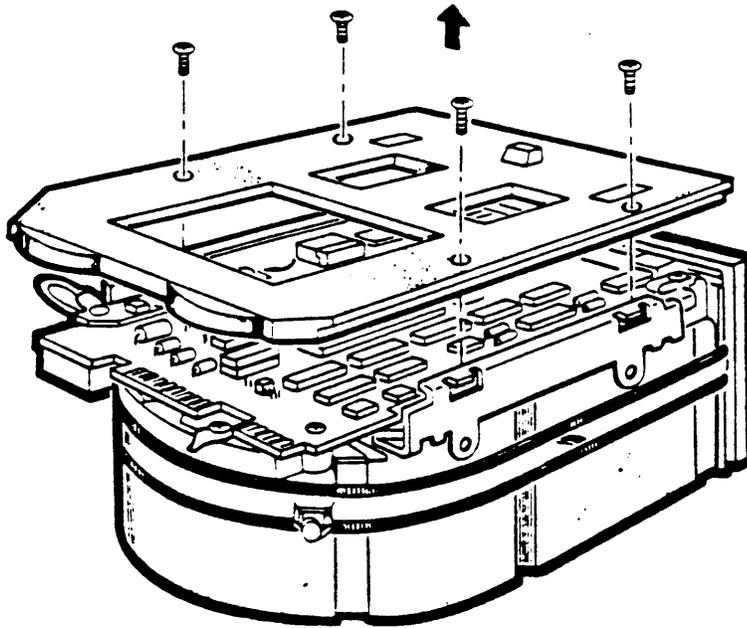


Figure 10-18 Removing the 2-pin Connector and Screws

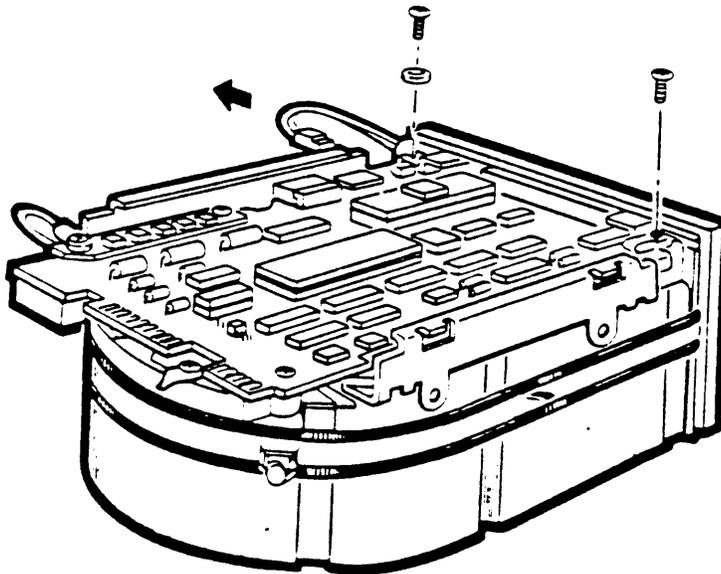


Figure 10-19 Removing the Front Bezel

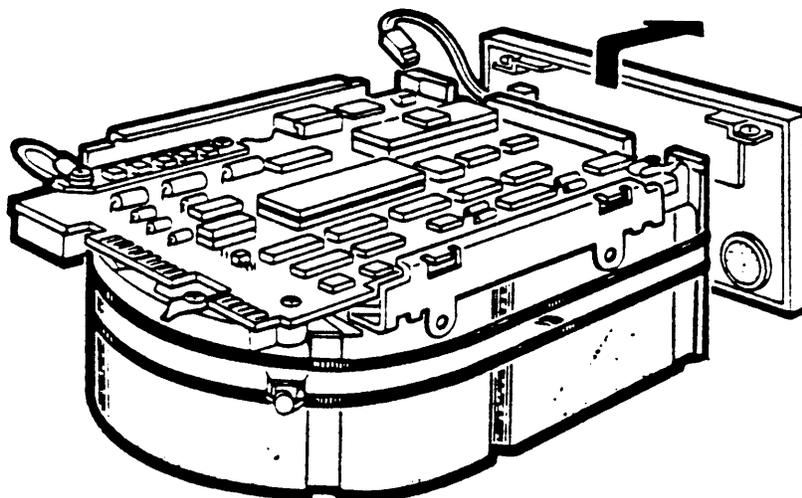


Figure 10-20 Remove Phillips Screws from Heatsink

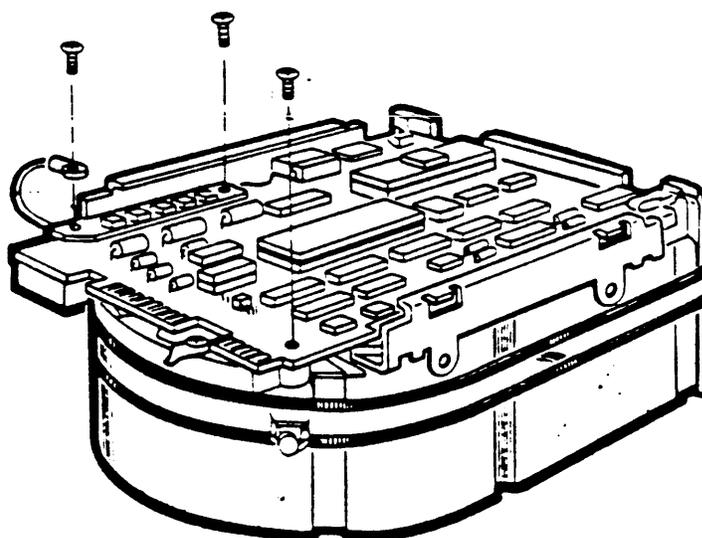
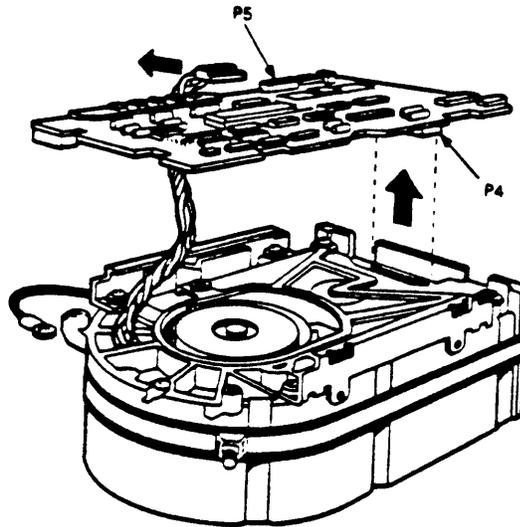


Figure 10-21 Remove the MPCB

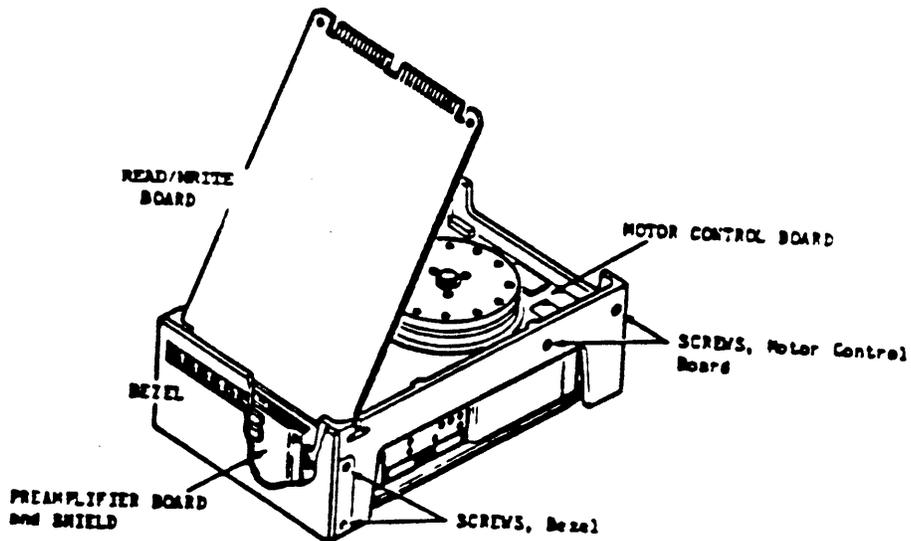


#### 10.8.2 RD53 Read/Write Board Removal

Data can sometimes be recovered from a faulty RD5n disk drive by replacing the read/write board without replacing the entire disk drive.

1. Remove the RD53 disk drive as described in section 10.7.
2. Remove the four phillips screws retaining the slide plate and ground clip. Remove the slide plate (figure 10-17).
2. Loosen the two captive screws that hold the read/write board in place.
3. Rotate the board upward (the board pivots on hinge slots at the front of the drive). Tilt the board over center until it comes to rest against the outer frame. Do not strain any of the connectors or cables.
4. Disconnect the Motor Control board connector J8 and the Preamplifier board connector J9 from the read/write board. Both connectors and cables are fragile, handle them with care.
5. Lift the read/write board out of the hinge slots (figure 10-22).

Figure 10-22 RD53 Read/Write Board Removal

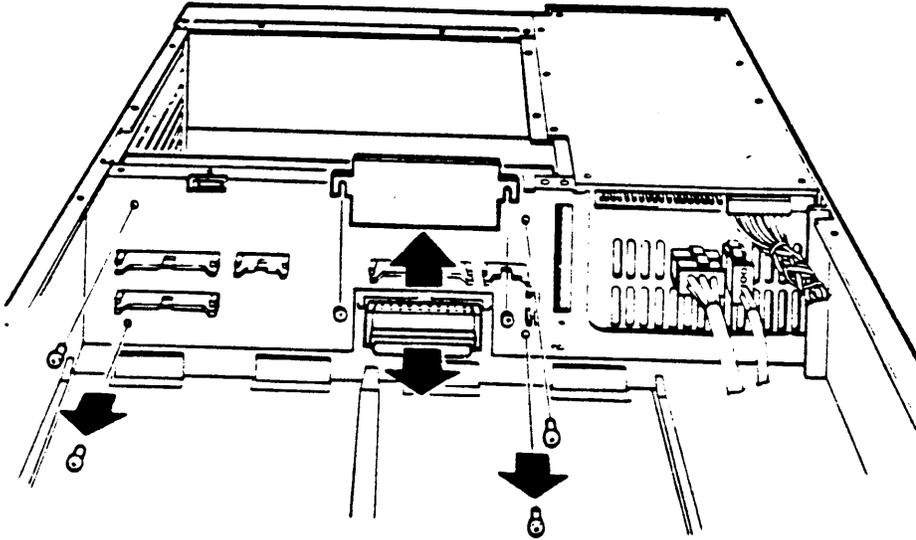


There are four switches on the read/write board of an RD53. Set the switches for the new board to the same positions as the old one. The second switch from the left (rear view of RD53) should be depressed if the drive is to be installed in the left side shelf of the BA23.

#### 10.8.3 RQDX Cable Removal

1. Remove all drives from the enclosure containing the RQDXn as described in section 10.7.
2. Release the TK50/TQK50 cable (if present) from the wire tie that holds it to the trap door of the signal distribution panel.
5. Remove the two screws that attach the trap door to the signal distribution panel, and remove the door (figure 10-18).

Figure 10-23 Trap Door Removal (non-TK50 model shown)



6. Disconnect the TK50/TQK50 cable (if present) and move it to the side.
7. Disconnect the RQDX cable from the connector that was exposed by removing the trap door.
8. Remove the module in backplane slot 8 (the bottom slot) as described in section 10.4.
9. Pull the RD5n/RQDX interconnect cable through the signal distribution panel, backplane, and card cage.

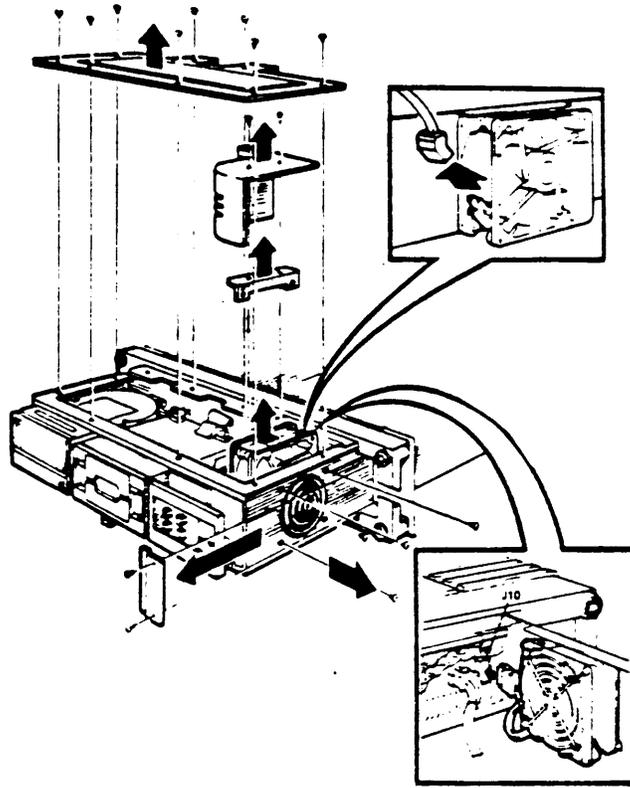
You may also have to remove the TK50/TQK50 cable to get the RD5n/RQDX cable out. When replacing the cable, push the cable through from the front of the enclosure to the back.

When replacing the TK50/TQK50 cable, be sure to observe the "THIS SIDE UP" marking on the cable. The striped side of the cable should be nearest the enclosure front fan.

#### 10.9 Front Fan Removal

1. Turn the system power off and disconnect the ac power.
2. Remove the front cover of the enclosure and slide the enclosure forward.
3. Remove the front fan cowling.
4. Disconnect the front fan power cord from J10 on the power supply and from the fan.

Figure 10-24 Disconnecting the Front Fan



5. Remove the four screws and spacers that hold the fan and fan guard to the chassis and remove the fan.

To install a replacement front fan:

1. Remove the cable and fan guard (if present) from the intake side of the old fan and fit them to the replacement fan.
2. Relocate the four screws and place the fan guard on the screws. Make sure the cross members of the fan guard face the inside of the unit.

3. Place the spacers on the screws and secure the fan. Make sure the fan is oriented as shown. The airflow must be away from the mass storage area.
4. Reverse steps 1 through 6 of the removal procedure.

When re-installing the BA23 enclosure, slide the enclosure half-way back into the cabinet, then open the rear I/O panel as described in section 10.2. Slide the enclosure back into the cabinet, then close the rear I/O panel, taking care not to pinch the internal cables between the BA23 and the cabinet frame.

#### 10.10 BA23 Enclosure

A BA23 enclosure must be removed from the cabinet only if it is necessary to remove a power supply, backplane, or rear fan. The upper and lower BA23 enclosures are both removed in the same way.

##### NOTE

Use two people to remove a BA23 enclosure from the cabinet.

1. Turn the system power off and disconnect the AC power.
2. Use a hex wrench to unlock the rear door of the cabinet. Open the door and press down on the spring clip in the upper left hand corner and swing the door open.
3. Lower the H3490 rear I/O panel as described in section 10.2.
4. At the rear of the system, open the door at the left of the BA23 and unplug the ac power cord at the BA23 enclosure to be removed. If you are removing the top BA23 enclosure, also remove the power sense cable that is attached to the power cord by a wire tie.
5. Label and disconnect all cables from modules within the enclosure to the rear I/O panel.
6. Remove the front cover on the BA23 that is to be removed.
7. Remove the two screws connecting the BA23 to the front of the cabinet frame.
8. Gently pull the enclosure forward.
9. Using two people, slide the enclosure out of the cabinet and place it on a flat work area.

When re-installing the BA23 enclosure, slide the enclosure half-way back into the cabinet, then open the rear I/O panel as described in section 10.2. Slide the enclosure back into the cabinet, then close the rear I/O panel, taking care not to pinch the internal cables between the BA23 and the cabinet frame.

Check all cable connections, module seatings and the mechanical security of all FRUs before applying power to the system.

#### 10.10.1 BA23 Backplane

1. Remove the BA23 enclosure from the cabinet as described in section 10.10.
2. Remove the subsystem storage cover and the Q22-bus module cover from the top of the BA23.
3. Remove all modules as described in section 10.4.

#### NOTE

Write down the location of each module in the backplane before removing it.

4. Remove the cowling from the front fan.
5. Remove the RX50, TK50, and RD5n drive signal cables from J6, J2 and J7 on the signal distribution panel.
6. Remove any drives that may be present in shelves A and B.
7. 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.
8. There is a small trap door on the sheet metal on the front side of the distribution panel. Loosen the two screws retaining the trap door and disconnect the cable underneath.
9. Remove the four screws holding the backplane assembly to the chassis.
10. Pivot the side of the backplane that is further from the power supply 45 degrees toward the rear and lift the backplane out of the system.

When re-installing the BA23 enclosure, slide the enclosure half-way back into the cabinet, then open the rear I/O panel as described in section 10.2. Slide the enclosure back into the cabinet, then close the rear I/O panel, taking care not to pinch the internal cables between the BA23 and the cabinet frame.

#### 10.10.2 Power Supply

1. Remove the BA23 enclosure from the cabinet as described in section 10.4.
2. Remove the subsystem storage cover and the Q22-bus module cover.

3. Remove the front fan cowling.
4. Disconnect the backplane power connector from J9 on the power supply and J1 on the signal distribution panel.
5. Disconnect the mass storage power connector from J8.
6. Disconnect the front fan power connector, and the front control panel power connector, from J10 and J7. These connectors are keyed and have a locking assembly.
7. Remove the five screws holding the power supply to the chassis.
8. Lift the power supply assembly out of the chassis and rest it on top of the Q22 bus modules cover.
9. Disconnect the power connector from the rear fan.

To install a replacement power supply:

1. Place the replacement power supply on top of the Q22 bus module cover and connect the rear fan power cable.
2. Put the power supply into the enclosure, making sure you route the rear fan cable over the top of the rear fan.
3. Reverse steps one through nine of the removal procedure.

When re-installing the BA23 enclosure, slide the enclosure half-way back into the cabinet, then open the rear I/O panel as described in section 10.2. Slide the enclosure back into the cabinet, then close the rear I/O panel, taking care not to pinch the internal cables between the BA23 and the cabinet frame.

#### 10.10.3 Rear Fan

1. Remove the power supply as described in section 10.10.2.
2. Remove the four screws that hold the fan to the chassis and remove the fan.

When re-installing the BA23 enclosure, slide the enclosure half-way back into the cabinet, then open the rear I/O panel as described in section 10.2. Slide the enclosure back into the cabinet, then close the rear I/O panel, taking care not to pinch the internal cables between the BA23 and the cabinet frame.

## APPENDIX A--CONSOLE COMMANDS

### A.1 CONSOLE COMMAND SYNTAX

The console accepts commands up to 80 characters long. Longer commands are responded to with an error message. The count does not include rubouts, rubbed out characters, or the terminating carriage return.

Commands may be abbreviated. Abbreviations are formed by dropping characters from the end of a keyword. All commands are recognized from their first character.

Multiple adjacent spaces and tabs are treated as a single space by the console. Leading and trailing spaces and tabs are ignored.

Command qualifiers can appear after the command keyword, or after any symbol or number in the command.

All numbers (addresses, data, counts) are in hexadecimal. (Note, though, that symbolic register names include decimal digits.) Hex digits are 0 through 9, and A through F. The console does not distinguish between upper and lower case either in hex numbers (A through F) or in commands. Both are accepted.

### A.2 REFERENCES TO PROCESSOR REGISTERS AND MEMORY

The KA630 console is implemented by macrocode executing from ROM. For this reason, the actual processor registers may not be modified by the command interpreter. When console I/O mode is entered, the console saves the processor registers in a scratch page and all command references to them are directed to the corresponding scratch page locations, not to the registers themselves. When the console reenters program mode, the saved registers are restored and any changes become operative only then. References to processor memory are handled normally except where noted below.

Normally, a free page on the interrupt stack is used for the scratch page so the console does not modify the machine state. If a free page on the interrupt stack cannot be located, the console program uses the last valid page in contiguous physical memory and the original machine state is lost. This should normally occur only on power up.

References to the console scratch page by EXAMINE and DEPOSIT commands must be qualified by the "/U" qualifier. (Access is primarily to simplify debugging of the console program.) The binary load and unload command may not reference the console scratch page.

### A.3 CONSOLE COMMANDS

#### A.3.1 BINARY LOAD AND UNLOAD

X <address> <count> <CR> <checksum>

The X command is for use by automatic systems communicating with the console. It is not intended for use by operators. The console loads or unloads (that is, writes to memory, or reads from memory) the specified number of data bytes, starting at the specified address.

If bit 31 of the count is clear, data is to be received by the console, and deposited into memory. If bit 31 of the count is set, data is to be read from memory and sent by the console. The remaining bits in the count are a positive number indicating the number of bytes to load or unload.

The console accepts the command upon receiving the carriage return. The next byte the console receives is the command checksum, which is not echoed. The command checksum is verified by adding all command characters, including the checksum, (but not including the terminating carriage return or rubouts or characters deleted by rubout), into an 8 bit register initially set to zero. If no errors occur, the result is zero. If the command checksum is correct, the console responds with the input prompt and either sends data to the requester or prepares to receive data. If the command checksum is in error, the console responds with an error message. The intent is to prevent

inadvertent operator entry into a mode where the console is accepting characters from the keyboard as data, with no escape sequence possible.

If the command is a load (bit 31 of the count is clear), the console responds with the input prompt, then accepts the specified number of bytes of data for depositing to memory, and an additional byte of received data checksum. The data is verified by adding all data characters and the checksum character into an 8 bit register initially set to zero. If the final contents of the register is non-zero, the data or checksum are in error, and the console responds with an error message.

If the command is a binary unload (bit 31 of the count is set), the console responds with the input prompt, followed by the specified number of bytes of binary data. As each byte is sent it is added to a checksum register initially set to zero. At the end of the transmission, the 2's complement of the low byte of the register is sent.

If the data checksum is incorrect on a load, or if memory errors or line errors occur during the transmission of data, the entire transmission is completed, and then the console issues an error message. If an error occurs during loading, the contents of the memory being loaded are UNPREDICTABLE.

Echo is suppressed during the receiving of the data string and checksums.

It is possible to control the console through the use of the console control characters (control-C, control-S, control-O, etc.) during a binary unload. It is not possible during a binary load, as all received characters are valid binary data.

Data being loaded with a binary load command must be received by the console at a rate of at least one byte per second. The command checksum that precedes the data must be received by the console within 10 seconds of the <CR> that terminates the command line. The data checksum must be received within 10 seconds of the last data byte. If any of these timing requirements are not met the console aborts the transmission by issuing an error message and prompting for input.

The entire command, including the checksum, may be sent to the console as a single burst of characters at the console's specified character rate. The console is able to receive at least 4K bytes of data in a single 'X' command.

### A.3.2 BOOT

BOOT [<qualifier list>] [<device>]

The device specification is of the format 'ddcu', where 'dd' is a two letter device mnemonic, 'c' is an optional one digit controller number, and 'u' is a one digit unit number.

The console initializes the processor and starts VMB running. (See the section on System Bootstrapping.) VMB boots the operating system from the specified device. The default bootstrap device is determined as described in the section on system bootstrapping.

Qualifier:

- o /R5:<data> - After initializing the processor and before starting VMB, R5 is loaded with the specified data. This allows a console user to pass a parameter to VMB. (To remain compatible with previous processors, /<data> will also be recognized to have the same result.)

### A.3.3 COMMENT

! <comment>

The comment command is ignored. It is used to annotate console I/O command sequences.

#### A.3.4 CONTINUE

##### CONTINUE

The processor begins instruction execution at the address currently contained in the program counter. Processor initialization is not performed. The console enters program I/O mode.

#### A.3.5 DEPOSIT

DEPOSIT [<qualifier list>] <address> <data>

Deposits the data into the address specified. If no address space or data size qualifiers are specified, the defaults are the last address space and data size used in a DEPOSIT or EXAMINE command. After processor initialization, the default address space is physical memory, the default data size is long, and the default address is zero.

If the specified data is too large to fit in the data size to be deposited, the console ignores the command and issues an error response. If the specified data is smaller than the data size to be deposited, it is extended on the left with zeros.

The address may also be one of the following symbolic addresses:

- o PSL - the processor status longword. No address space qualifier is legal. When PSL is examined, the address space is identified as "M" (machine dependent).
- o PC - the program counter (general register 15). The address space is set to /G.
- o SP - the stack pointer (general register 14). The address space is /G.

- o Rn - general register 'n'. The register number is in decimal. The address space is /G. For example:  
D R5 1234 is equivalent to D/G 5 1234

D R10 6FF00 is equivalent to D/G A 6FF00

- o '+' - the location immediately following the last location referenced in an examine or deposit. For references to physical or virtual memory spaces, the location referenced is the last address, plus the size of the last reference (1 for byte, 2 for word, 4 for long). For other address spaces, the address is the last address referenced, plus one.
- o '-' - the location immediately preceding the last location referenced in an examine or deposit. For references to physical or virtual memory spaces, the location referenced is the last address minus the size of this reference (1 for byte, 2 for word, 4 for long). For other address spaces, the address is the last addressed referenced minus one.
- o '\*' - the location last referenced in an examine or deposit.
- o '@' - the location addressed by the last location referenced in an examine or deposit.

Qualifiers:

- o /B - The data size is byte.
- o /W - The data size is word.
- o /L - The data size is longword.

- o /V - The address space is virtual memory. All access and protection checking occur. If the access would not be allowed to a program running with the current PSL, the console issues an error message. Virtual space DEPOSITs cause the PTE<M> bit to be set. If memory mapping is not enabled, virtual addresses are equal to physical addresses.
- o /P - The address space is physical memory.
- o /I - The address space is internal processor registers. These are the registers addressed by the MTPR and MFPR instructions.
- o /G - The address space is the general register set, R0 through PC.
- o /U - Access to console program memory is allowed. This qualifier also disables virtual address protection checks.
- o /N:<count> - The address is the first of a range. The console deposits to the first address, then to the specified number of succeeding addresses. Even if the address is the symbolic address "-", the succeeding addresses are at larger addresses. The symbolic address specifies only the starting address, not the direction of succession. For repeated references to preceding addresses, use "REPEAT DEPOSIT - <data>".

NOTE: Only memory may be accessed as bytes or words. Registers, the PSL and the IPRs must be accessed using the longword reference. This means that the /B and /W qualifiers may not be used with the /I and /G qualifiers.

For example:

D/P/B/N:1FF 0 0	Clears the first 512 bytes of physical memory.
D/V/L/N:3 1234 5	Deposits 5 into four longwords starting at virtual address 1234.
D/N:8 R0 FFFFFFFF	Loads general registers R0 through R8 with -1.
D/N:200 - 0	Starting at previous address, clear 513 bytes.

If conflicting address space or data sizes are specified, the console ignores the command and issues an error response.

#### A.3.6 EXAMINE

EXAMINE [<qualifier list>] [<address>]

Examines the contents of the specified address. If no address is specified, "+" is assumed. The address may also be one of the symbolic addresses described under DEPOSIT.

Qualifiers:

The same qualifiers may be used on EXAMINE as may be used on DEPOSIT.

RESPONSE: <tab><address space identifier> <address> <tab> <data>

The address space identifier can be:

- o P - physical memory. Note that when virtual memory is examined, the address space and address in the response are the translated physical address.
- o G - general register.

- o I - internal processor register.
- o M - machine dependent (used only for display of the PSL).

### A.3.7 FIND

FIND [<qualifier list>]

The console searches main memory starting at address zero for a page-aligned 64 kilobyte segment of good memory, or a restart parameter block (RPB). If the segment or block is found, its address plus 512 is left in SP. If the segment or block is not found, an error message is issued, and the contents of SP are UNPREDICTABLE. If no qualifier is specified, /RPB is assumed.

Qualifiers:

1. /MEMORY - search memory for a page aligned segment of good memory, 64 kilobytes in length. The search includes a read/write test of memory and leaves the contents of memory UNPREDICTABLE.
2. /RPB - search memory for a restart parameter block. The search leaves the contents of memory unchanged.

### A.3.8 INITIALIZE

#### INITIALIZE

A processor initialization is performed. The following registers are set (all values are hexadecimal):

PSL	041F0000
IPL	1F
ASTLVL	4
SISR	0
ICCS	0
RXCS	0
TXCS	80
MAPEN	0

All other registers are UNPREDICTABLE.

The previous console reference defaults (the defaults used to fill in unsupplied qualifiers for DEPOSIT and EXAMINE commands) are set to physical address, longword size and address 0.

### A.3.9 HALT

#### HALT

The HALT command has no effect, the processor is already halted when in console I/O mode.

#### A.3.10 REPEAT

REPEAT <command>

The console repeatedly displays and executes the specified command. The repeating is stopped by the operator typing control-C. Any valid console command may be specified for the command with the exception of the REPEAT command.

#### A.3.11 START

START [<address>]

The console starts instruction execution at the specified address. If no address is given, the current PC is used. If no qualifier is present, macroinstruction execution is started. If memory mapping is enabled, macroinstructions are executed from virtual memory. The START command is equivalent to a DEPOSIT to PC, followed by a CONTINUE. No INITIALIZE is performed.

#### A.3.12 TEST

TEST [<test number>]

The console invokes a diagnostic test program denoted by <test number>. Valid test numbers are 3 through 7 and "B". If no test number is supplied, no test is performed.

#### A.3.13 UNJAM

An I/O bus reset is performed.

APPENDIX B—CONSOLE ERROR MESSAGES AND EXPLANATIONS

HEX VALUE	MESSAGE	EXPLANATION
02	EXT HLT	Break was typed on the console, QBINIT or QHALT was asserted.
04	ISP ERR	In attempting to push state onto the interrupt stack during an interrupt or exception, the processor discovered that the interrupt stack was mapped NO ACCESS or NOT VALID.
05	DBL ERR	The processor attempted to report a machine check to the operating system, and a second machine check occurred.
06	HLT INST	The processor executed a HALT instruction in kernel mode.
07	SCB ERR3	The vector had bits <1:0> equal to 3.
08	SCB ERR2	The vector had bits <1:0> equal to 2.
0A	CHM FR ISTK	A change mode instruction was executed when PSL<IS> was set.
0B	CHM TO ISTK	The exception vector for a change mode had bit <0> set.
0C	SCB RD ERR	A hard memory error occurred while the processor was trying to read an exception or interrupt vector.
10	MCHK AV	An access violation or an invalid translation occurred during machine check exception processing.

11	KSP AV	An access violation or an invalid translation occurred during processing of an invalid kernel stack pointer exception.
15	CORRPTN	The console database was corrupted. The console program simulates a power-up sequence and rebuilds its database.
16	ILL REF	The requested reference would violate virtual memory protection, the address is not mapped, the reference is invalid in the specified address space, or the value is invalid in the specified destination.
17	ILL CMD	The command string can not be parsed.
18	INV DGT	A number has an invalid digit.
19	LTL	The command was too large for the console to buffer. The message is issued only after receipt of the terminating carriage return.
1A	ILL ADR	The address specified falls outside the limits of the address space.
1B	VAL TOO LRG	The value specified does not fit in the destination.
1C	SW CONF	For example, two different data sizes are specified with an EXAMINE command.
1D	UNK SW	The switch is unrecognized.
1E	UNK SYM	The symbolic address in an EXAMINE or DEPOSIT is unrecognized.

1F	CHKSM	The command or data checksum of an X command is incorrect. If the data checksum is incorrect, this message is issued, and is not abbreviated to "Illegal command."
20	HLTED	The operator entered a HALT command.
21	FND ERR	A FIND command failed either to find the RPB or 64 kb of good memory.
22	TMOU	During an X command, data failed to arrive in the time expected.
23	MEM ERR	Parity error detected.
24	UNKINT	An unexpected interrupt or exception has occurred.
40	NOSUCHDEV	No bootable devices found.
41	DEVASSIGN	Device is not present.
42	NOSHUCHFILE	Program image not found.
43	FILESTRUCT	Invalid boot device file structure.
44	BADCHKSUM	Bad checksum on header file.
45	BADFILEHDR	Bad file header.
46	BADIRECTORY	Bad directory file.
47	FILNOTCNTG	Invalid program image file.
48	ENDOFFILE	Premature end of file encountered.
49	BADFILENAME	Bad file name given.
4A	BUFFEROVF	Program image does not fit in available memory.

4B	CTRLERR	Boot device I/O error.
4C	DEVINACT	Failed to initialize boot device.
4D	DEVOFFLINE	Device is off line.
4E	MEMERR	Memory initialization error.
4F	SCBINT	Unexpected SCB exception or machine check.
50	SCBZNDINT	Unexpected exception after starting program image.
51	NOROM	No valid ROM image found.
52	NOSUCHNODE	No response from load server.
53	INSMAPREG	Invalid memory configuration.
54	RETRY	No devices bootable, retrying.

## APPENDIX C--MICROVMS ERROR LOG COMMANDS AND QUALIFIERS

### ANALYZE

#### /ERROR\_LOG

##### Parameters

file-spec[....]

Specifies one or more files that contain binary error information to be interpreted for the error log report. If you omit the file specification, the default file is SYS\$ERRORLOG:ERRLOG.SYS.

### ANALYZE

#### /ERROR\_LOG

##### Command Qualifiers

/BEFORE

/BEFORE[=date-time]

Specifies that only those entries dated earlier than the stated date-time be selected for the error report. You can specify an absolute time, a delta time, or a combination of absolute and delta times. See Section 2.5 in the VAX/VMS DCL Dictionary (or access the HELP topic SPECIFY) for details on specifying times.

/BINARY

/BINARY[=file-spec]

/NOBINARY

Controls whether the binary error log records are converted to ASCII text or copied to the specified output file. The output file will contain image copies of the binary input records (the records will not be translated to ASCII).

/BRIEF

/BRIEF

Generates a brief report, which supplies minimal information for an error log entry.

/ENTRY

/ENTRY[=(start:decimal-value[,end:decimal-value])]

Generates an error log report that covers the specified entry range or starts at the specified entry number. If you specify /ENTRY without the entry range or omit the qualifier, the entry range

defaults to START:1,END:EOF.

/EXCLUDE

/EXCLUDE=(device or entry-type[....])

Excludes errors generated by the specified device(s) and/or errorlog entry type(s) from the error log report.

You can specify one or more devices by device class or name. The following keywords and name constructs are valid for specifying devices:

Device Class Keywords

BUSES  
DISKS  
REALTIME  
SYNC COMMUNICATIONS  
TAPES

Device Name Constructs

DB - group of devices  
DBA1 - specific device/unit number  
DBA1,HSC1\$DUAL,DYAO - list of devices  
DB,DR,XF - list of device groups

You can specify one or more of the following keywords that identify entry types:

ATTENTIONS	Exclude device attention entries from the output report.
BUGCHECKS	Exclude all types of bugcheck entries from the report.
CONTROL_ENTRIES	Exclude control entries from the report.
CPU_ENTRIES	Exclude CPU-related entries from the report.
DEVICE_ERRORS	Exclude device error entries from the report.
MACHINE_CHECKS	Exclude machine check entries from the report.
MEMORY	Exclude memory errors from the report.
TIMEOUTS	Exclude device timeout entries from the report.
UNKNOWN_ENTRIES	Exclude any entry that had either an unknown entry type or an unknown device type/class.
UNSOLICITED_MSCP	Exclude unsolicited MSCP entries from

the output report.

VOLUME\_CHANGES

Exclude volume mount and dismount entries from the report.

/FULL

/FULL  
/NOFULL

Generates a full report, which provides all possible information available for an error log entry. This is the default report format.

/INCLUDE

/INCLUDE=(device or entry-type[....])

Includes errors generated by the specified device(s) and/or errorlog entry type(s) in the error log report.

You can specify one or more devices by device class or name. The following keywords and name constructs are valid for specifying devices:

Device Class Keywords

BUSES  
DISKS  
REALTIME  
SYNC COMMUNICATIONS  
TAPES

Device Name Constructs

DB - group of devices  
DBA1 - specific device/unit number  
DBA1,HSC1\$DUA1,DYAO - list of devices  
DB,DR,XF - list of device groups

You can specify one or more of the following keywords that identify entry types:

ATTENTIONS	Include device attention entries in the output report.
BUGCHECKS	Include all types of bugcheck errors in the report.
CONTROL_ENTRIES	Include control entries in the report.
CPU_ENTRIES	Include CPU-related entries in the report.
DEVICE_ERRORS	Include device errors in the report.
MACHINE_CHECKS	Include machine check errors in the report.

MEMGRY	Include memory errors in the report.
TIMEOUTS	Include device timeout errors in the report.
UNKNOWN_ENTRIES	Include any entry that had either an unknown entry type or an unknown device type/class.
UNSOLICITED_MSCP	Include unsolicited MSCP entries in the output report.
VOLUME_CHANGES	Include volume mount and dismount entries in the report.

/LOG

/LOG  
/NOLOG

Controls whether informational messages that specify the number of entries selected and rejected for each input file are sent to SYS\$OUTPUT. By default, these messages are not displayed.

/OUTPUT

/OUTPUT[=file-spec]

Specifies the output file for the error log report. If you omit the /OUTPUT qualifier, output is directed to SYS\$OUTPUT.

/REGISTER\_DUMP

/REGISTER\_DUMP

Used in conjunction with the /INCLUDE qualifier to generate, in a hexadecimal longword format, a report that consists of device register information. Only for memory, device error, and device timeout entries. No translation of any of the device register information occurs.

/REJECTED

/REJECTED[=file-spec]

Allows the user to specify the name of a file that will contain binary records for rejected entries.

/SID\_REGISTER

/SID\_REGISTER[=%Xhexadecimal-value]

Generates a report that consists of error log entries that occurred on the specified CPU. The optional hexadecimal-value is the value obtained from the system ID register.

/SINCE

/SINCE[=date-time]

Specifies that only those entries dated later than a particular time be selected for the report.

/STATISTICS

/STATISTICS

Generates a report that consists of the page faults, buffered I/O, direct I/O, and cpu time used in the execution of the ANALYZE/ERROR\_LOG command.

/SUMMARY

/SUMMARY[=summary-type[...]]

Generates an error log report that consists of a statistical summary, using one or more of the following summary-type keywords:

Keyword	Meaning
DEVICE	Include the Device Rollup section in the report.
ENTRY	Include the Summary of Entries Logged section in the report.
HISTOGRAM	Include the Processed Entries Hour of Day Histogram in the report.
MEMORY	Include the Summary of Memory Errors section in the report.
VOLUME	Include the Volume Label section in the report.

ANALYZE

/ERROR\_LOG

Examples

1. \$ ANALYZE/ERROR\_LOG

All defaults occur as specified.

2. \$ ANALYZE/ERROR\_LOG/ENTRY=(START:1,END:18) ERRLOG.SYS

The entry range for the error log report generated from the file ERRLOG.SYS is limited to entry numbers 1 through 18.

3. \$ ANALYZE/ERROR\_LOG/EXCLUDE=MTAD ERRLOG.SYS

The device MTAD is excluded from the error log report for the file ERRLOG.SYS.

4. \$ ANALYZE/ERROR\_LOG/EXCLUDE=(MTAD,DRAS) ERRLOG.SYS

The devices MTA0 and DRAS are excluded from the error log report for the file ERRLOG.SYS.

5. \$ ANALYZE/ERROR\_LOG/EXCLUDE=(DISKS,BUGCHECKS) ERRLOG.SYS

All disk devices and all bugcheck entries are excluded from the error log report for the file ERRLOG.SYS.

## APPENDIX D--LOOPBACK CONNECTORS

### D.1 MATCHING LOOPBACK CONNECTORS WITH DEVICES

Table D-1 lists the Q22-bus devices supported by MicroVAX II and the appropriate loopback connectors for testing those devices.

TABLE D-1

DEVICE	EXTERNAL CONNECTOR	INTERNAL CONNECTOR
DEQNA	12-22196-02	70-21489-01
DHV11	12-15336-00 or H325	H3277
DLVJ1	12-15336-00 or H325	H3270
DMV11-AP	H325	H3255
DMV11-BP	H3250	H3254
DMV11-CP		
DMV11-FP	H3251	H3255
DPV11	H3259	H3260
DRV11-J	NONE	BC05WA
DZQ11	12-15336-00 or H325	H329
DZV11	12-15336-00 or H325	H329
LPV11	NONE	NONE
Expander box for DHV11	H3165	NONE
KA630	NONE	H3263



## APPENDIX F--KA630CNF CONFIGURATION BOARD

The KA630CNF (H3263-00) Configuration Board can be used in place of the CPU Distribution Insert to configure the KA630-A CPU module. The configuration board, as shown in Figures F-1 and F-2, allows configuration of the CPU by setting ten switches. The KA630CNF connects to the CPU by plugging directly into connectors J2 and J3 on the module. In addition, connector J4 on the configuration board provides a connector for a battery backup (BBU). The battery backup must provide 3.75 volts DC (minimum 3.6 VDC). The J4 pin closest to connector J1, as shown in Figure F-1, is the positive pin. Table F-1 provides information on the parameters selectable and the corresponding switch settings.

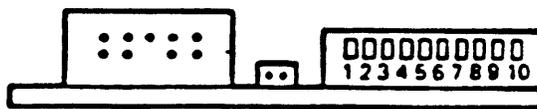


FIGURE F-1. KA630CNF, Side View

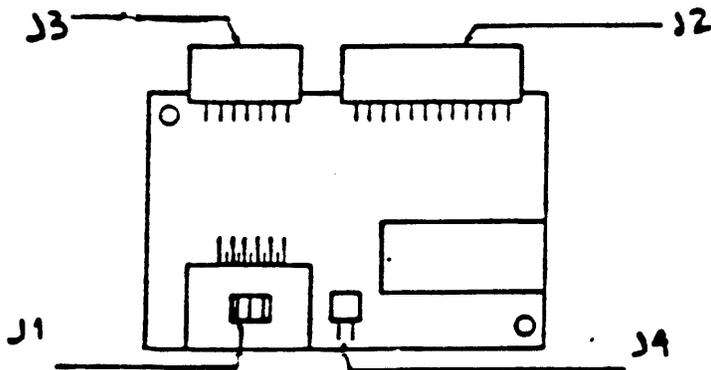


FIGURE F-2 KA630CNF, Top View

Table F-1, KA630CNF Switch Selections

SWITCH 1	HALT ENABLE
OFF	Halts Disabled
ON	Halts Enabled

SWITCHES 2-4

	2	3	4	
OFF	OFF	OFF		300
ON	OFF	OFF		600
OFF	ON	OFF		1200
ON	ON	OFF		2400
OFF	OFF	ON		4800
ON	OFF	ON		9600
OFF	ON	ON		19200
ON	ON	ON		38400

SWITCHES 5-6 CONSOLE POWER UP MODE

	5	6	
OFF	OFF		Normal
ON	OFF		Language Inquiry Mode
OFF	ON		Loopback Test Mode (Maintenance)
ON	ON		Manufacturing Use Only

SWITCHES 7-8 KA630-A MODULE CONFIGURATION

	7	8	
OFF	OFF		Arbiter
ON	OFF		Auxiliary 1
OFF	ON		Auxiliary 2
ON	ON		Auxiliary 3

SWITCHES 9-10

BOOT AND DIAGNOSTIC CODE (BDG)

9 10

OFF OFF  
ON OFF  
OFF ON  
ON ON

Send Only  
Normal  
Loopback Test Mode (Maintenance)  
Illegal State (DO NOT USE)

APPENDIX G--RELATED DOCUMENTATION

Table G-1 provides a list of related documentation for The MicroVAX System Maintenance Guide.

Table G-1 Related Documentation

TITLE	NUMBER
Communications Mini Reference Manual	EK-CMIVI-RM
RA60 Disk Drive Service Manual	EK-ORA60-SV
RA81 Disk Drive Service Manual	EK-ORA81-SV
TSV05 Tape Transport Pocket Service Guide	EK-TSV05-PS
MicroVMS User's Manual	AA-Z209B-TE
KDA50-Q Service Manual	EK-KDA5Q-SV
Ultrix-32M Master Index	AA-CN36B-TE
Ultrix-32M Programmer's Manual Section 1	AA-CN25B-TE
630QY Maintenance Print Set	MP-02065-01
630QZ Maintenance Print Set	MP-02068-01
630QB Maintenance Print Set	MP-02071-01
630QE Maintenance Print Set	
MicroVAX 630 CPU Module User's Guide	EK-KA630-UG
MicroVAX II 630QB Owner's Manual	AZ-FE08A-TN
MicroVAX II 630QY, 630QZ Owner's Manual	AZ-FE05A-TN
MicroVAX II 630QE Owner's Manual	AZ- -TN
MicroVAX II 630QB Technical Manual	AZ-FE09A-TN
MicroVAX II 630QY, 630QZ Technical Manual	AZ-FE06A-TN
MicroVAX II 630QE Technical Manual	AZ- -TN
DEQNA Ethernet User's Guide	EK-DEQNA-UG
DHV11 Technical Manual	EK-DHV11-TM
DLV11-J User's Guide	EK-DLV1J-UG
DMV11 Synchronous Interface User's Guide	EK-DMV11-UG
DPV11 Serial Synchronous Interface User's Guide	EK-DPV11-UG
DZV11 Asynchronous Multiplexer User's Guide	EK-DZV11-UG
DZQ11 Asynchronous Multiplexer Technical Manual	EK-DZQ11-TM