HP SureStore E Disk System HVD10

User and Service Guide

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Safety Notices

To protect against personal injury and product damage, do not attempt to lift the product without the assistance of another person or lift device.

Components bearing this symbol may be hot to touch.

Components bearing this symbol are fragile. Handle with care.

Components bearing this symbol are susceptible to damage by static electricity. ESD precautions are required.

Operation

The front door should be closed and locked at all times during the operation of this product except when replacing disks.

This product is intended to be operated in a restricted access area.

Service

Maintenance or repair of the backplane and mezzanine boards must be performed by authorized service-trained personnel.

Format Conventions

	Denotes
WARNING	**A hazard that can cause personal injury**
Caution	A hazard that can cause hardware or software damage
Note	Significant concepts or operating instructions
this font	Text to be typed verbatim: all commands, path names, and file names. Also menu and button selections in GUI contexts
`this font`	Text displayed on the screen

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1 PRODUCT DESCRIPTION

General Description

The HP SureStore E Disk System HVD10 (referred to as the disk system) provides high-speed and high-capacity storage on multimode LVD/SE disks with High Voltage Differential (HVD) connections to HP e3000 and HP 9000 Series 700 and 800 hosts. Depending on the host bus adapter, the disk system supports speeds up to 40 Mbytes per second per bus.

At release, the disk system stores data sizes ranging from .5 Gbytes (one 536-Mbyte solid state disk) to 730 Gbytes (ten 73-Gbyte hard drive disks). As higher-capacity disks become available, maximum capacity will increase. (Consult an HP sales representative for the latest supported disks.) A 2-meter HP Rack System/E filled with 11 disk systems and 73-Gbyte disks holds 8.0 Terabytes of information.

The standard disk system includes one fan, one power supply, and one Bus Control Card (BCC) with two SCSI ports. Options for a second BCC (HP 9000 only), fan, and power supply add redundancy and high availability.

Accessible and hot-pluggable components make the disk system easy to upgrade and service. Disk modules slide into slots in the front of the disk system. Fans, power supplies, and BCCs insert in the back. You can add or replace disk modules and redundant BCCs, fans, and power supplies without downtime. Some file management may be required.

The disk system supports standard HP-UX and MPE/iX disk utilities.

Features

The disk system occupies 3.5 EIA units in a standard 19-inch rack. Disk modules mount in the front, shown in Figure 1. Power supplies, fans, and BCCs mount in the back, shown in Figure 2 on page 18. A lockable front door shields the environment from RFI and provides access to disks and the power button.

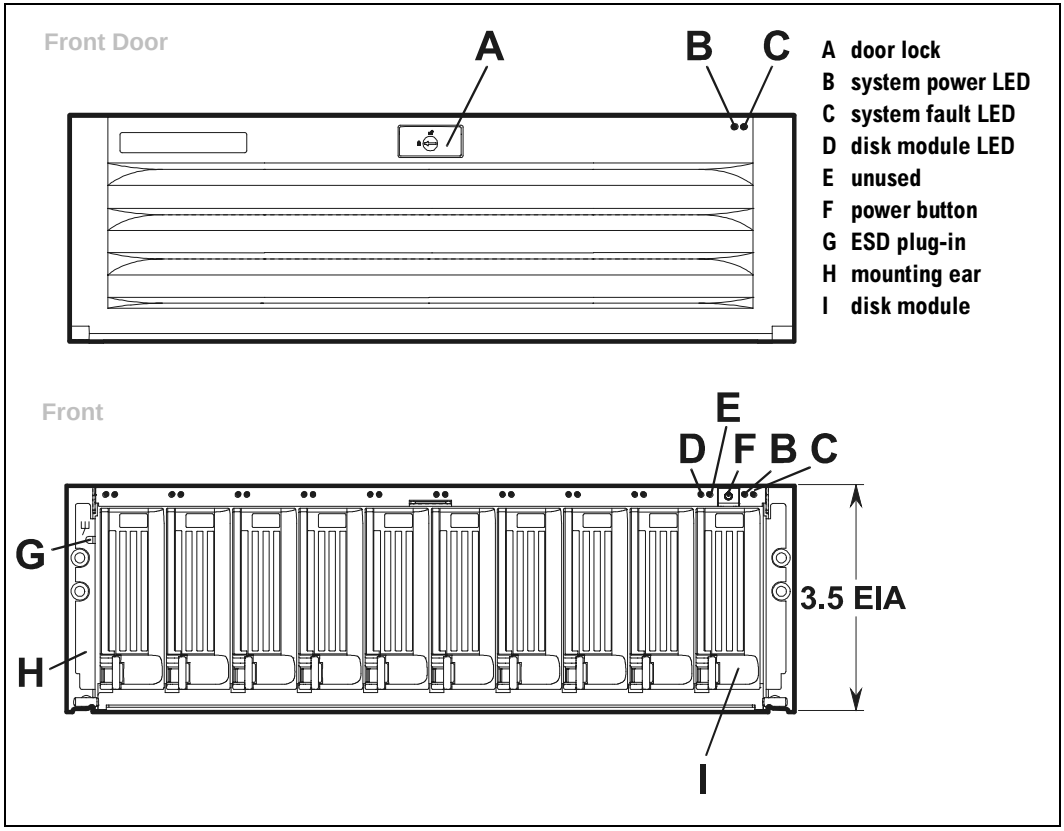


Figure 1 Disk System Front Views

Status Indicators

Disk system LEDs help you detect faults and prevent downtime.

- On the front of the disk system (Figure 1), LEDs indicate the status of the disk system and I/O activity on the disk modules:
  - The system power LED (B) indicates that power is on or off.
  - The system fault LED (C) indicates whether or not a fault has occurred in the disk system fan or power supply.
  - Above each disk module, the LED on the left (D) indicates I/O activity. (The LED on the right is not used.)
- On the back of the disk system (Figure 2), LEDs (D) indicate component and bus status.

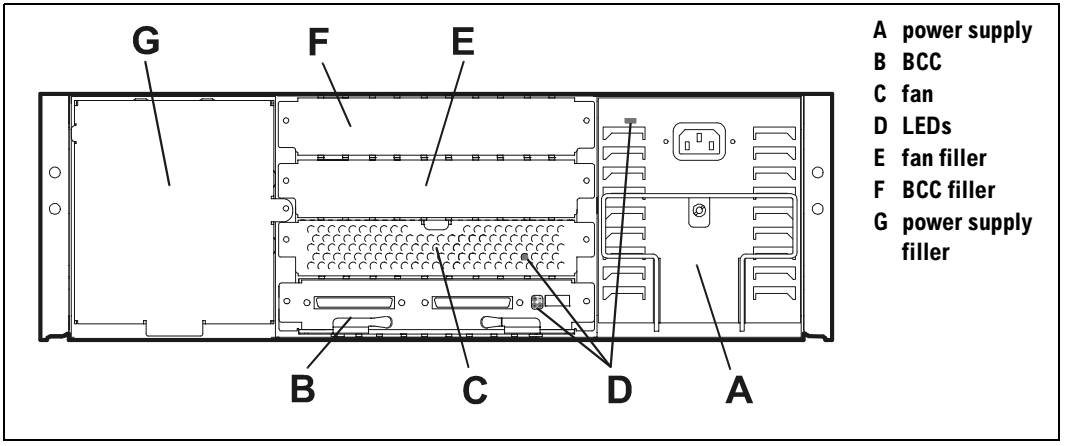


Figure 2 Standard Disk System Back View

For additional information about LEDs, see chapter 4, Troubleshooting.

Power Button

Located in the upper right corner behind the disk system door, the power button (F in Figure 1) terminates power from the power supply to the BCC and other internal components.

High Availability

High availability is a general term describing computer systems that are designed to minimize planned and unplanned downtime. The disk system supports current systems' high availability requirements through the following features:

- Dual SCSI bus
- Hot-pluggable, high-capacity, high-speed disks
- Hot-pluggable, user-replaceable, and optional redundant BCCs, fans, and power supplies
- Support for mirrored disks inside the disk system and in HP-UX environments with MC/LockManager and ServiceGuard
- Online disk firmware upgrades
- Support for disk diagnostics and monitoring tools

Upgradability

You can upgrade the disk system by adding storage capacity, updating disk firmware, and converting to the HP SureStore E Disk System SC10.

- Increase storage capacity by replacing disk modules with higher-capacity modules, by adding disk modules in unused slots, and by adding another disk system to the bus (split bus only). None of these actions require shutting down the disk system.
- Update disk firmware using an on-line download function (STM for HP-UX and MPE/iX 6.5, SYSDIAG for MPE/iX 6.0).
- Convert the disk system to an HP SureStore E Disk System SC10 (HP A5272A) by installing new BCCs (upgrade kit HP A5664A). The SC10 provides Ultra2 SCSI LVD connections to HP 9000 Series 700 and 800 hosts and throughput up to 40 Mbytes per second. (Contact an HP sales representative for the date of this capability on HP e3000).

Hardware Event Monitoring (HP-UX only)

Hardware monitors use HP-UX Event Monitoring Services (EMS) to report changes in hardware resources to user-defined locations such as an email address or a console. The Disk Monitor is the hardware monitor for disk devices. Using the Disk Monitor, you can avoid undetected disk failures and reduce system downtime and potential data loss.

Note The hardware Disk Monitor should not be confused with the EMS disk monitor used to monitor LVM resources.

The *EMS Hardware Monitors User's Guide* is available in Adobe® Acrobat® format on the HP document web site, *http://www.docs.hp.com/hpux/systems/*.

Components

User-replaceable components enable high availability and easy maintenance. This topic describes the following user-replaceable components:

- Disk modules
- Bus Control Card (BCC)
- Fan
- Power supply

Disks

Disk modules, shown in Figure 3, are 3.5-inch Low Profile or Half Height disks in open metal carriers. The open carrier design requires careful handling to avoid disk damage by breakage and static electricity, and to prevent personal harm by contact with hot surfaces and static electricity.

WARNING **Touching exposed circuits can discharge electricity and disable the disk. Disk modules require careful handling and ESD precautions.**

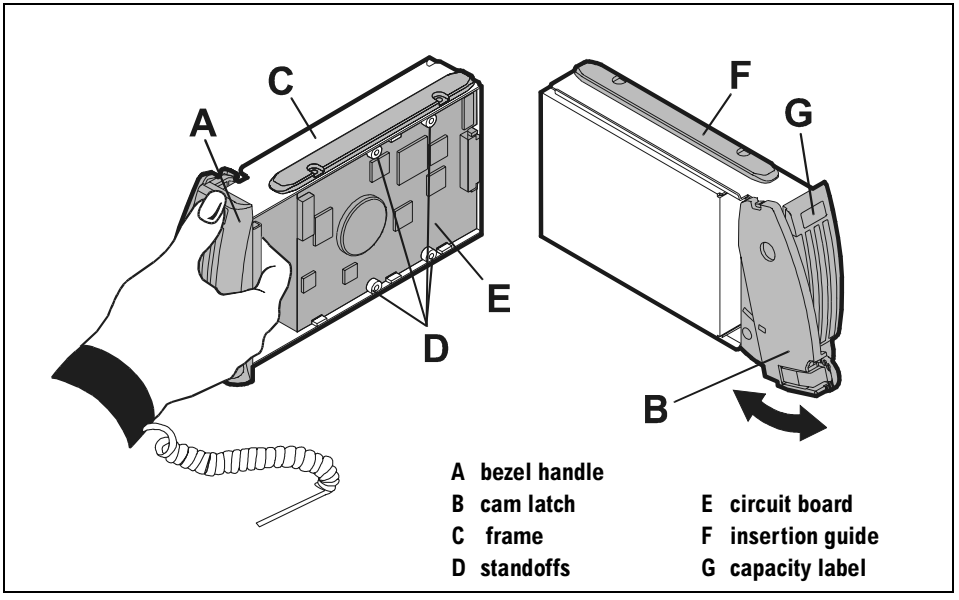


Figure 3 Disk

The plastic parts of the disk module are safe to touch:

- Bezel handle (A in Figure 3)
- Cam latch (B)
- Insertion guide (F)

Metal standoffs (D) protect exposed circuits against damage when the disk module is laid circuit-side down on a flat surface.

The initial options for this product range from 9-Gbyte to 73-Gbyte 10-K RPM hard disk drives and, on HP 9000, a 536-Mbyte solid state disk. A label (G) on the disk module shows the storage capacity and rotational speed of the installed disk. (Obtain information about the latest disk options from an HP sales representative.)

Bus Control Card

The Bus Control Card (BCC), shown in Figure 4, is an electrical assembly in an open metal tray. The card plugs into the top or bottom horizontal slot in the back of the disk system. The bottom slot is the factory default. The BCC provides the path from dual HVD host connections to SE buses inside the disk system.

Caution Touching exposed circuits can discharge electricity and disable the card. BCCs require careful handling and ESD precautions.

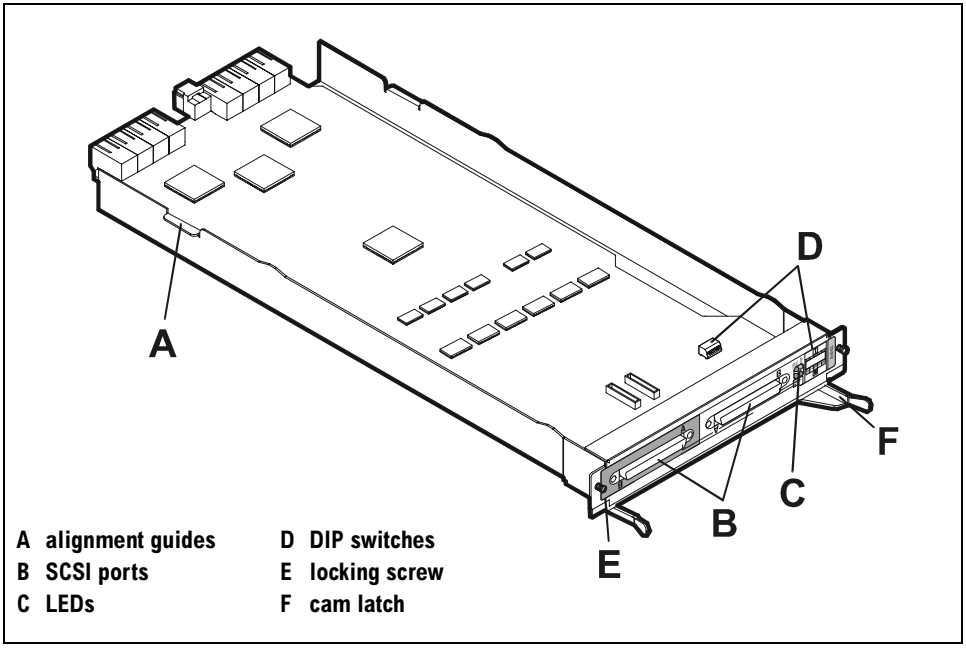


Figure 4 Bus Control Card

Each SCSI port (B in Figure 4) is connected to one of two SE buses on the backplane. In full-bus mode (external DIP switch 1 set to "I"), the buses are bridged to form a single bus of ten disk modules. Both ports are on the same bus. In split-bus mode (external DIP switch 1 set to "0"), port A is on one bus with the odd-numbered slots (1, 3, 5, 7, 9) and port B is on a separate bus with the even-numbered slots (0, 2, 4, 6, 8).

Dual BCCs add redundancy and double the number of hosts that can be attached to the bus on HP 9000 hosts. The BCC in the bottom slot is the primary BCC if both cards are installed when the disk system is powered on. Otherwise, the card first installed is the primary BCC. The primary BCC controls bus structure, addressing, and other options. If the primary BCC fails and is removed, the second BCC assumes the primary role.

Five DIP switches (D) on the front of the BCC determine full-bus/split-bus mode, high/low bus addressing, and bus termination. Five internal DIP switches (D) specify automatic bus reset after a power failure or disk insertion.

Other features of the BCC:

- LEDs (C) indicating BCC status, bus mode, and bus activity
- Locking screws (E)
- Cam levers (F)

BCC circuitry performs the following functions:

- Configures the bus
- Isolates the bus
- Expands and converts the bus (HVD to SE)
- Detects system faults
- Detects BCC configuration faults
- Generates disk addresses

Fans

The fan blows cooling air over system components using two internal high-speed blowers (A in Figure 5), an LED (B), a pull tab (C), and two locking screws (D).

Internal circuitry senses blower motion and triggers a fault when the speed of either blower falls below a critical level. At the same time, the fan LED turns amber.

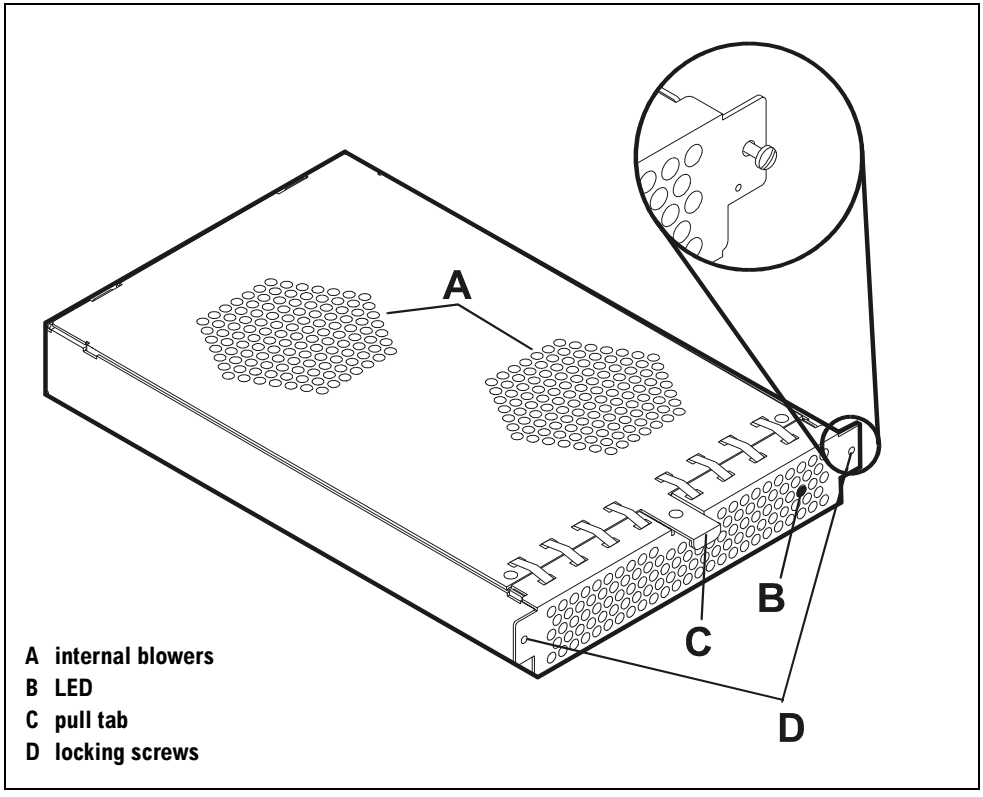


Figure 5 Fan

Power Supply

A hot-pluggable 450-watt power supply converts wide-ranging AC voltage from an external main to stable DC output and delivers it to the backplane. The power supply has two internal blowers, an AC receptacle (A in Figure 6), a cam handle (B) with locking screw, and an LED (C). Internal control prevents the rear DC connector from becoming energized when the power supply is removed from the disk system.

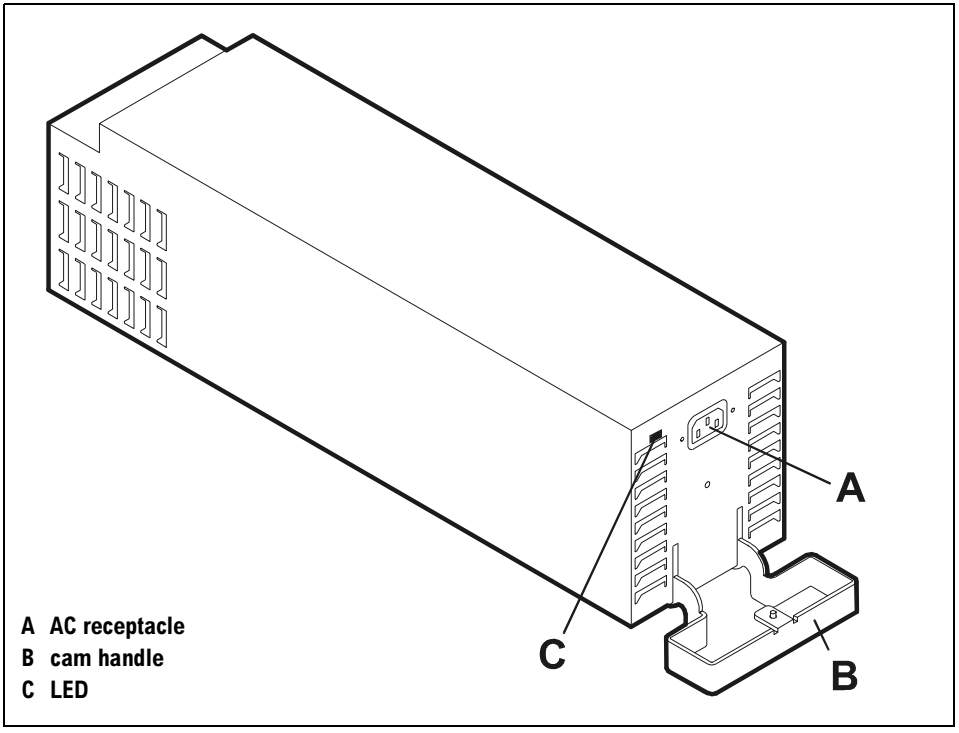


Figure 6 Power Supply

Internal circuitry triggers a fault when a blower or other power supply component fails. The power supply LED turns solid amber to signal the fault. Blowers remain on if other parts fail in order to maintain cooling air flow through the disk system. If a blower fails, the power supply shuts down.

Optional redundant power supplies share the load reciprocally; that is, each supply automatically increases its output to compensate for reduced output from the other, and vice versa. If one power supply fails, the other delivers the entire load.

Hardware/Software Requirements

The disk system is supported on MPE/iX and HP-UX operating systems running on HP servers and workstations. For specifics, see Table 1, below.

Table 1 Operating System Requirements

System	Class	MPE/iX 6.0 PowerPatch 2 and greater	HP-UX 10.10	HP-UX 10.20 and 11.0
HP e3000	9x8, 9x9, 99x	X		
HP 9000	D-Class		X	X
	K-Class		X	X
	T-Class		X	X
	I-Class		X	X
	A-Class			X
	L-Class			X
	N-Class			X
	R-Class			X
	V-Class			X
Workstations	B-Class		X	X
	C-Class		X	X
	J-Class		X	X
	C-3000			X
	J-5000			X
Workstation 715	N/A		X	X
Workstation J2XX	N/A		X	X

The disk system interfaces with the host's core I/O card and the following host bus adapters (HBAs) on supported servers and workstations.

Table 2 Supported Host Bus Adapters

System	Class	HBA Product #	HBA Description
HP e3000	9x8, 9x9, 99x	28696A	HP-PB Fast Wide Differential SCSI-2 Host Adapter
		A2969A	HP-HSC Fast Wide Differential SCSI-2 Interface
		Also supported with the HVD built-in adapter on the 9x9KS Server Multi-Function I/O card	
HP 9000	D-Class R-Class	A4107A	HP-HSC Fast Wide Differential SCSI-2 Controller
		A2679A	HP-EISA Fast Wide Differential Host Adapter
	K-Class	A2969A	HP-HSC Fast Wide Differential SCSI-2 Interface
		28696A	HP-PB Fast Wide Differential SCSI-2 Host Adapter
	T-Class	A3644A	HP-HSC SCSI Card for T600
		28696A	HP-PB Fast Wide Differential SCSI-2 Host Adapter
	I-Class	28696A	HP-PB Fast Wide Differential SCSI-2 Host Adapter
	A-Class L-Class N-Class	A4800A	Fast Wide Differential SCSI-2 Card for HP 9000
		A5159A	Dual Port Fast Wide Differential SCSI (PCI Bus) Adapter. **Note**: At the time of publication, no v-cables are available for use with this HBA. Consult an HP sales representative for current cable products with VHDCI connectors.
	V-Class	A4800A	Fast Wide Differential SCSI-2 Card for HP 9000
Workstations	B-Class C-Class J-Class	A4107A	HP-HSC Fast Wide Differential SCSI-2 Controller
	C-3000 J-5000	A4976A	PCI Fast Wide Differential SCSI
Workstations 715 and J2XX	N/A	A4268A	HP-HSC Fast Wide Differential SCSI Card for 743i and 748i

Topologies

The disk system can be connected to one or more hosts, to another disk system, and to other HP storage devices. Sample topologies are described on the following pages. For information about specific supported topologies, consult an HP sales representative. To install and configure these topologies, see chapters 2 and 3 in this guide.

The disk system connects to HP e3000 and HP 9000 hosts the same way except that HP 9000 allows multiple hosts on a bus and HP e3000 does not.

On HP e3000 and HP 9000 Hosts

The disk system supports high availability on HP e3000 and HP 9000 hosts using disk mirroring.

Mirrored Disks

The topology shown in Figure 7 allows internal disk mirroring. Each port on the BCC is connected to a separate host bus adapter (HBA), and the disk system is in split-bus mode. Two buses comprise five disk modules each. If the buses are mirrored, the host has two paths to the same data. If redundant HBAs are not required, a v-cable can be used to connect a single HBA to both BCC ports.

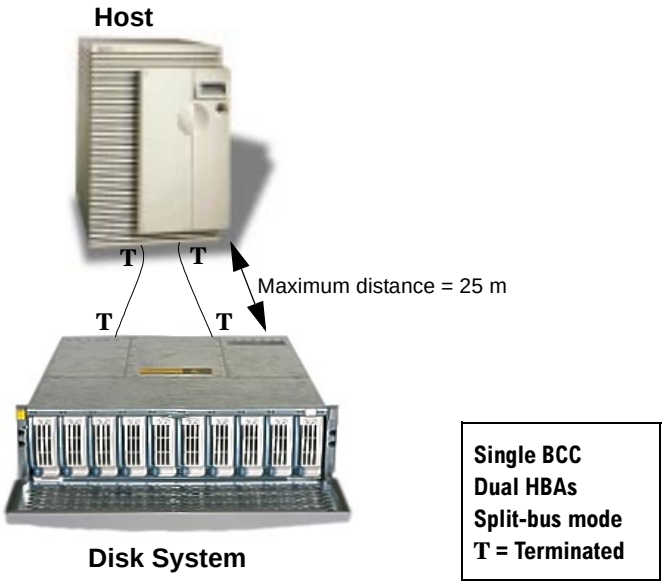


Figure 7 Mirroring Inside the Disk System

In this example, termination is enabled at each port on the BCC.

Mirrored Disk Systems, Two Hosts

Figure 8 shows two hosts each with dual HBAs connected to separate disk systems. If the disks are mirrored across disk systems, each host has two paths to the same data. If redundant HBAs are not required, a v-cable can be connected from a single HBA to two disk systems.

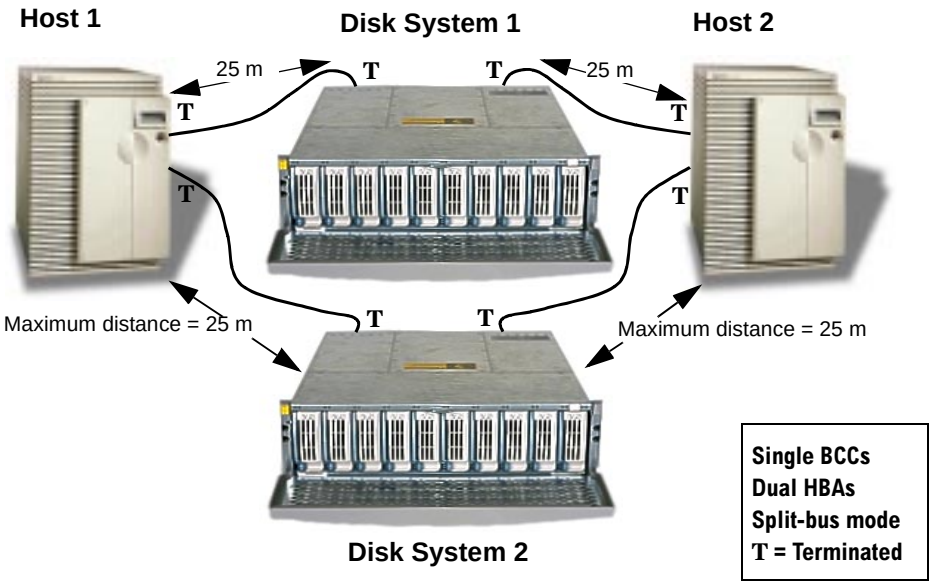


Figure 8 Mirrored Disk Systems

Termination is enabled on each BCC port in this example.

Daisy-Chained Disk Systems

Daisy-chaining disk systems in split-bus mode increases the number of disks on each bus from five to ten. As shown in Figure 9, both disk systems must be in split-bus mode and they must be connected with a v-cable. Proper addressing using the disk system DIP switches is also important to avoid bus contention.

Note Each disk system in full-bus mode uses ten SCSI addresses. Daisy-chaining two disk systems in full-bus mode would put twenty devices on the bus, causing bus looping and contention.

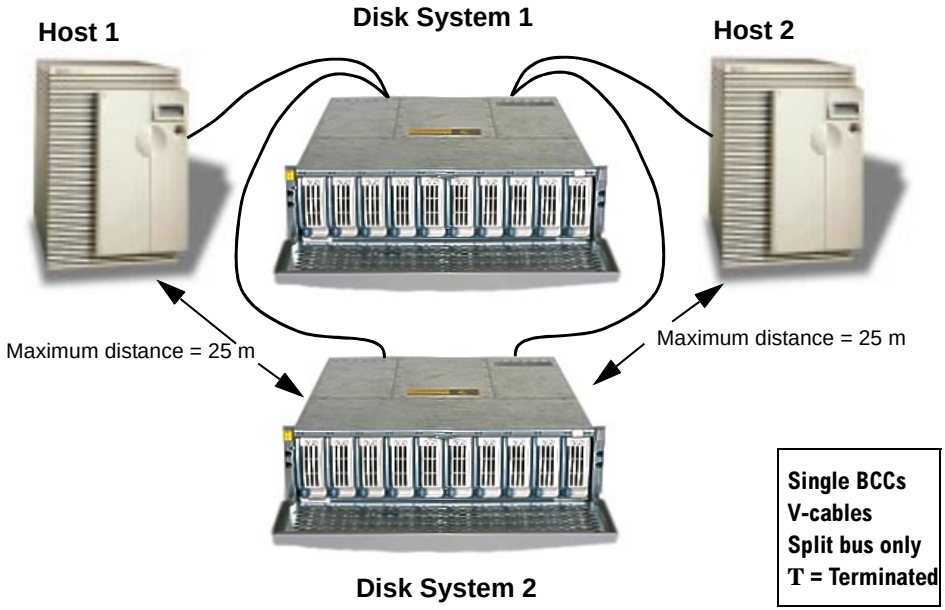


Figure 9 Daisy-Chained Disk Systems

The combined length of both legs of the v-cable is 25 meters or less. Termination is disabled on the BCC port at the "V" of the v-cable. Termination is enabled on the BCC port at the end of the cable.

Mixed Daisy Chains

The disk system can be daisy-chained to other HP SCSI storage devices, including the High Availability Storage System (HASS) and the SureStore E Disk Array 12H. Figure 10 shows the disk system connected to a HASS. The connection between the HASS and the disk system must be a v-cable so that if the disk system goes off-line, the host maintains access to the HASS.

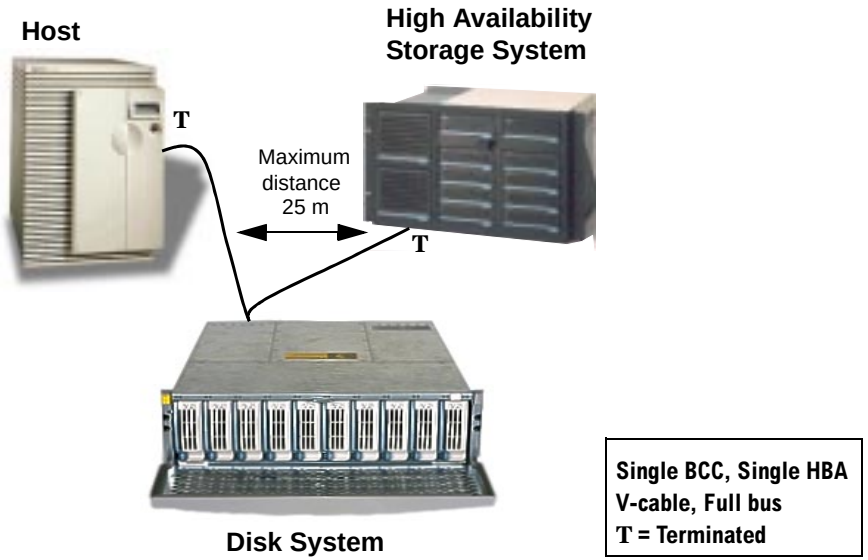


Figure 10 Mixed Devices

The combined length of both legs of the v-cable is 25 meters or less. Termination is disabled at the BCC port because it is in the middle of the bus.

HP 9000 Only

In HP 9000 topologies, the disk system supports high availability through disk mirroring, multiple hosts, and redundant BCCs. Each SCSI port can be connected to a different HBA in the same or separate hosts. When v-cables are used, each port can be connected to two HBAs in the same or separate hosts. Dual BCCs increase the number of hosts that can be connected with straight cables. The maximum number of hosts per bus is four.

Four Hosts

Connecting each port on a BCC to redundant hosts achieves high availability at the system level. In Figure 11, two HBAs in separate hosts are connected to each BCC port. In full-bus mode, all four hosts can reach all ten disk modules. In split-bus mode, hosts 1 and 2 have access to half of the disk modules; hosts 3 and 4 have access to the other half. The two buses inside the disk system can be mirrored for redundancy at the disk level.

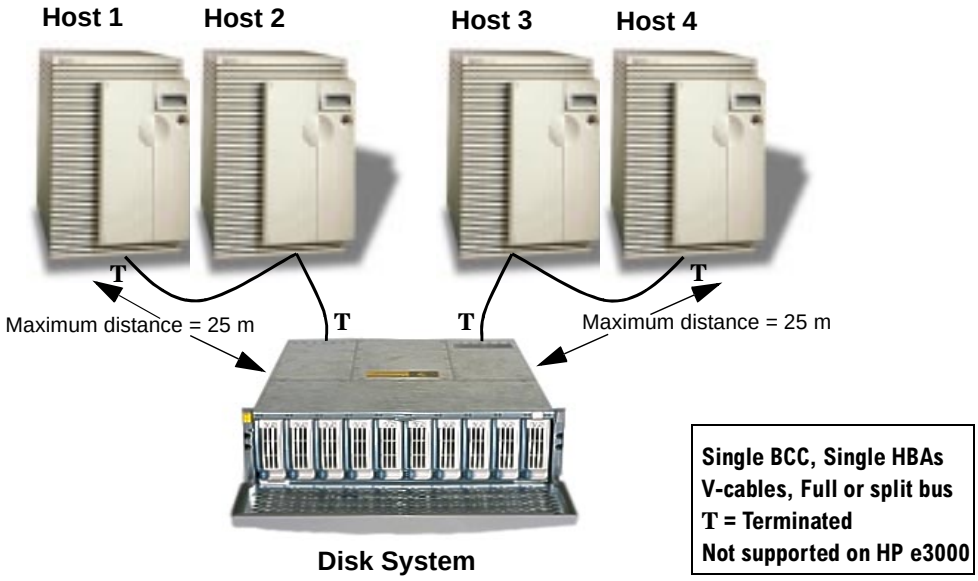


Figure 11 Four Hosts and One Disk System

Connections from the host to the disk system are SCSI HVD v-cables, maximum 25 meters. Termination is enabled at each port on the BCC.

Mirrored Disk Systems, Four Hosts

Connecting mirrored disk systems to redundant hosts achieves high availability at the disk and host levels. This topology, shown in Figure 12, is the same as the preceding topology (Figure 11) but with two disk systems and two HBAs in each host. In full-bus mode, each host can reach all ten disk modules in both disk systems. If one of the disk systems or HBAs goes off-line, all four hosts maintain access to the data.

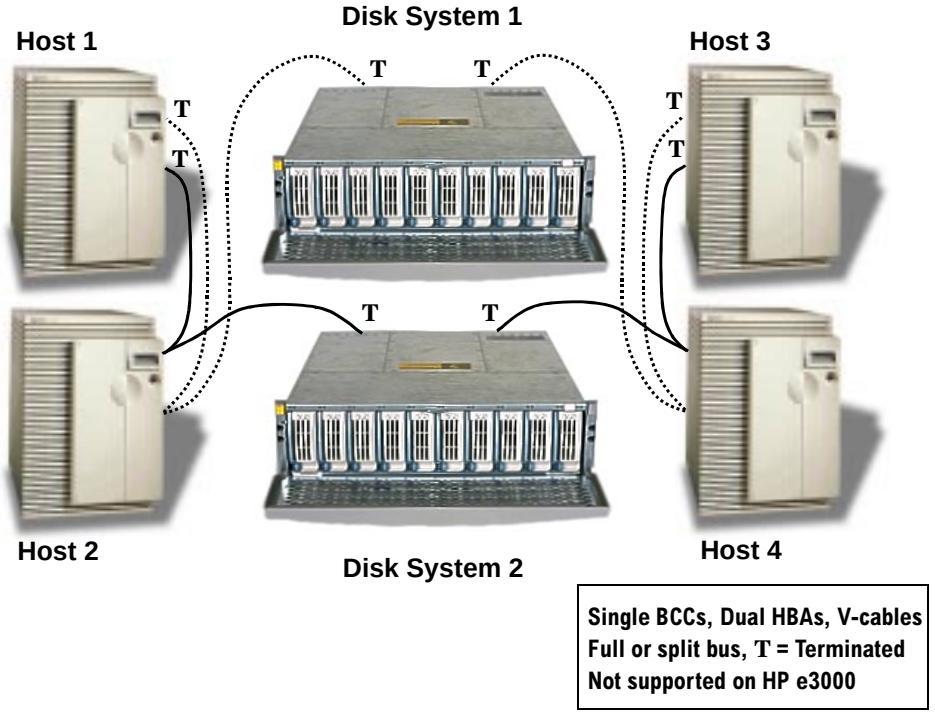


Figure 12 Mirrored Disk Systems and Four Hosts

All connections from the host to the disk system are SCSI HVD v-cables, maximum 25 meters. Termination is enabled at each BCC port.

Two BCCs, Four Hosts

Dual BCCs increase the number of hosts or HBAs that you can connect to a single disk system. In Figure 13, eight HBAs in four hosts are connected to dual BCCs in split-bus mode. All four hosts can reach each pair of mirrored disks inside the disk system. If a BCC, cable, or HBA is off-line in this topology, all four hosts maintain access to the data. This configuration is supported in split-bus mode only.

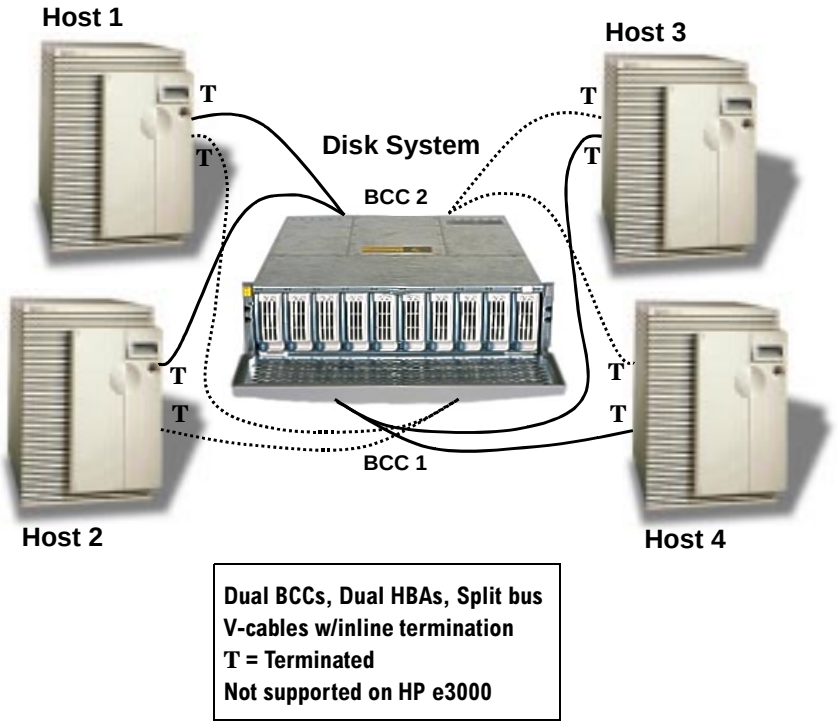


Figure 13 Dual BCCs and Four Hosts

All connections from the host to the disk system are SCSI HVD v-cables with inline termination, maximum 25 meters. Termination is disabled at each BCC port because the disk system is in the middle of the bus.

Mixed Devices, Three Hosts

The disk system supports multiple hosts attached to other HP storage devices, including the High Availability Storage System (HASS) and the SureStore E Disk Array 12H. Figure 14 shows the disk system connected to a HASS and three hosts. The connection from the HASS to the disk system and the host must be a v-cable so that the host maintains access to the HASS if the disk system goes off-line. With three hosts, the number of disk modules in the disk system and the HASS is limited to 13; there are only 16 addresses on a SCSI bus.

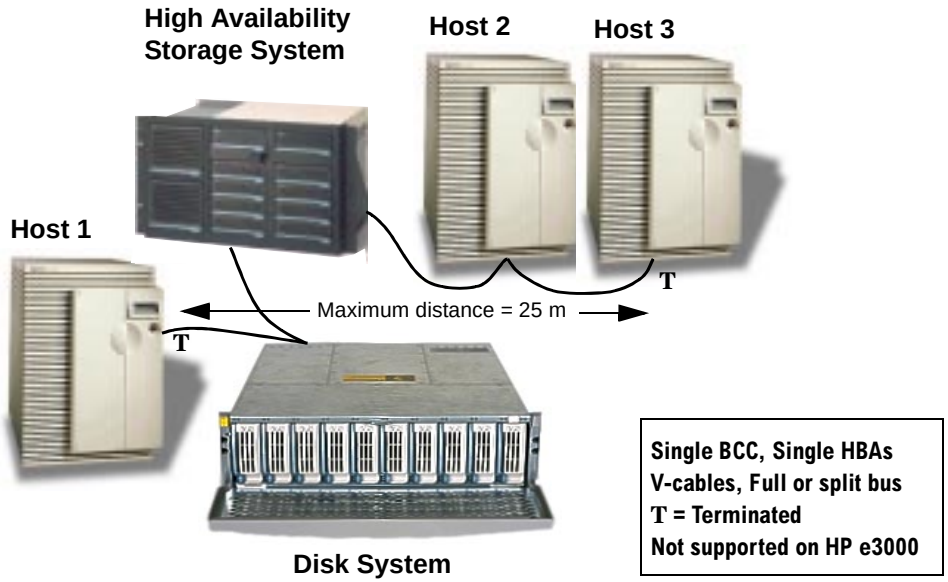


Figure 14 Mixed Devices and Multiple Hosts

Termination is disabled on the BCC port because it is in the middle of the bus.

Definitions

The following terms have specific meanings in the context of this guide:

High availability (HA)

HA describes hardware and software systems that are designed to minimize planned and unplanned downtime. High availability is measured at the system level and stated as the percentage of time the system is in a state to do useful work; for example, 99.95% availability equals four hours of downtime per year.

Hot-pluggable

Hot-pluggable signifies the ability of a component to be installed or replaced without interrupting storage operations but within the restrictions of the operating environment. All customer-replaceable disk system components can be replaced under power. Adding or replacing disk modules or BCCs may require the use of HP-UX commands to manage file systems.

HVD

HVD (High Voltage Differential) is a type of SCSI signalling that filters out common-mode noise by taking the difference of two high-voltage signals. HVD supports cable lengths up to 25 meters and data rates up to 20 Mbytes/sec in Fast Wide mode, or 40 Mbytes/sec in Ultra mode. The disk system connection to the host is HVD.

LVD

LVD (Low Voltage Differential) is a type of SCSI signalling that filters out common mode noise by taking the difference of two low-voltage signals. LVD supports cable lengths up to 12 meters and data rates up to 80 Mbytes/sec (in Ultra2 mode). The HP SureStore E Disk System SC10 provides LVD connections.

PDU and PDRU

PDUs (power distribution units) *distribute* power from a single inlet to multiple outlets. PRUs (power relay units) connect one or more PDU inlets to a single on/off *switch*, such as a cabinet power switch. Units that both *distribute and switch* power are referred to as PDRUs.

SE

SE (Single Ended) is a type of SCSI signalling that uses a single driver and receiver per signal. SE Wide (16 bits) with Fast SCSI supports data rates up to 20 Mbytes/sec, and SE Wide with Ultra SCSI supports data rates up to 40 Mbytes/sec. The disk system's internal connections to the disks are SE Wide Ultra SCSI.

V-cable

A v-cable has three SCSI connectors instead of the usual two. The cable is shaped like a "V" with two cables joined at the center connector (see figure). For the purpose of meeting SCSI signalling requirements, the length of the cable is the combined lengths of its segments.

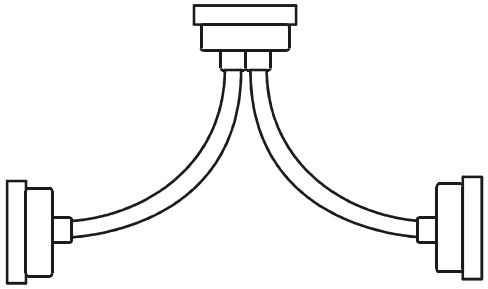


Figure 15 V-Cable

2 INSTALLATION (HP-ONLY)

Electrical Preparation

Before you install the disk system, make sure electrical wiring and power distribution units (PDUs) are adequate for peak demands.

Electrical Requirements

All electrical wiring to the service point (plug) must be sized to carry the following inrush and steady-state currents:

Table 3 Inrush (Surge) Current and Duration

No. of Disk Systems on Circuit*	Inrush Current and Duration
1	10 amps declining over 10 to 12 cycles
2	20 amps declining over 10 to 12 cycles
3	30 amps declining over 10 to 12 cycles
4	40 amps declining over 10 to 12 cycles

* Assumes one power supply per disk system. Double the amps for two power supplies.

Table 4 Maximum Operating Current

Incoming Voltage AC RMS	Maximum RMS Current Drawn by One Disk System
100 – 120 volts	6.5 amps
200 – 240 volts	3.2 amps

Caution Adding disk systems with two power supplies to 120V circuits rapidly increases amp requirements. Always make sure that the total current drawn does not exceed circuit capacity.

Circuit breakers must be adequately rated for inrush and operating currents. Hewlett-Packard recommends magnetic-type circuit breakers, which are capable of handling large inrush currents for short durations (10 to 12 cycles) and are rated adequately for steady state currents. In Europe, install the following breaker types:

Table 5 Recommended European Circuit Breakers

No. of Disk Systems	Breaker Rating	Breaker Type*
1 to 3	16 amps	Type C or Type D per IEC 898 **or** Type K per IEC 947-2
4	16 amps	Type D per IEC 898 **or** Type K per IEC 947-2

* Data assumes no other devices share the circuit breaker.

Note Circuit breaker rating must be adequate for the total current drawn by *all* devices on *all* electrical paths that share a circuit breaker.

Choosing PDUs

Peak power requirements and PDU capacity affect the number of disk systems that can be installed in a rack. For example, to install more than four disk systems in Hewlett-Packard legacy racks (HP C2785A, C2786A, and C2787A), you must upgrade standard 3-foot and 5-foot PDUs to 19-inch PDUs.

Besides rack density, the following factors can help you choose PDUs:

- **Redundant power source.** To connect redundant power supplies to separate PDUs, install redundant PDUs.
- **Number of cords to the AC source**. Using 30-amp PDRUs instead of 16-amp PDUs reduces the number of cords to the wall.

- **Future needs**. Installing surplus PDU capacity allows you to add disk systems and redundant power supplies later.
- **Inrush margins.** For installations that require four or more 16-amp PDUs, Hewlett-Packard recommends HP 30-amp PDRUs (E7681A, E7682A) for their inherent inrush protection.
- **On/Off switch capability**. Some PDU/PDRU options support the use of a single-point on/off switch. See Table 6 and Table 7.

The following tables show how many and what kind of PDU/PDRUs are needed to install one or more disk systems in an HP rack. Data assumes 220V AC nominal power and nonredundant configurations. For redundant power supplies and redundant PDU/PDRUs, multiply the number of recommended PDU/PDRUs by 2.

Table 6 Recommended PDU/PDRUs for Multiple Disk Systems in HP Legacy Racks

No. of Disk Systems	1.1 meter (21 U)	1.6 meter (32 U)	2.0 meter (41 U)
1 – 4	1 3-foot 16-amp PDU* ***or*** 1 19-inch 16-amp PDU	1 5-foot 16-amp PDU* ***or*** 1 19-inch 16-amp PDU	
5 – 8	NA**	1 19-inch 30-amp PDRU	
9 – 10	NA**	NA**	2 19-inch 30-amp PDRUs

* Supports the cabinet on/off switch.
** Rack height does not allow additional disk systems.

Table 7 Recommended PDU/PDRUs for Multiple Disk Systems in HP System/E Racks

No. of Disk Systems	1.25 meter (25 U)	1.6 meter (33 U)	2.0 meter (41 U)
1 – 4	1 19-inch 16-amp PDU ***or*** 1 19-inch 30-amp PDRU*		
5 – 8	NA**	1 19-inch 30-amp PDRU*	
9 – 11	NA**	NA**	2 19-inch 30-amp PDRUs

* Supports the cabinet on/off switch option.
** Rack height does not allow additional disk systems.

Installing PDUs

The 19-inch PDUs and PDRUs can be installed vertically or horizontally in the rack. Choose PDU/PDRU locations with the following guidelines in mind:

- Place PDU/PDRUs within the reach of disk system cords.
- Place PDU/PDRUs vertically whenever possible. Installing PDU/PDRUs horizontally interferes with the ability to service disk systems that are behind the PDU/PDRU.
- Place vertical PDU/PDRUs on the same side as the power supply so that the power cord does not cross over replaceable components in the middle of the product.
- In a full rack, install HP PDRUs (HP E7681A and E7682A) directly behind disk systems. Hinges allow the PDRU to swing aside for access to obscured power supplies. (See sample installation in Figure 16.)

See sample PDU/PDRU installations for redundant power supplies under “Installing a Second Power Supply” in chapter 6, Upgrading.

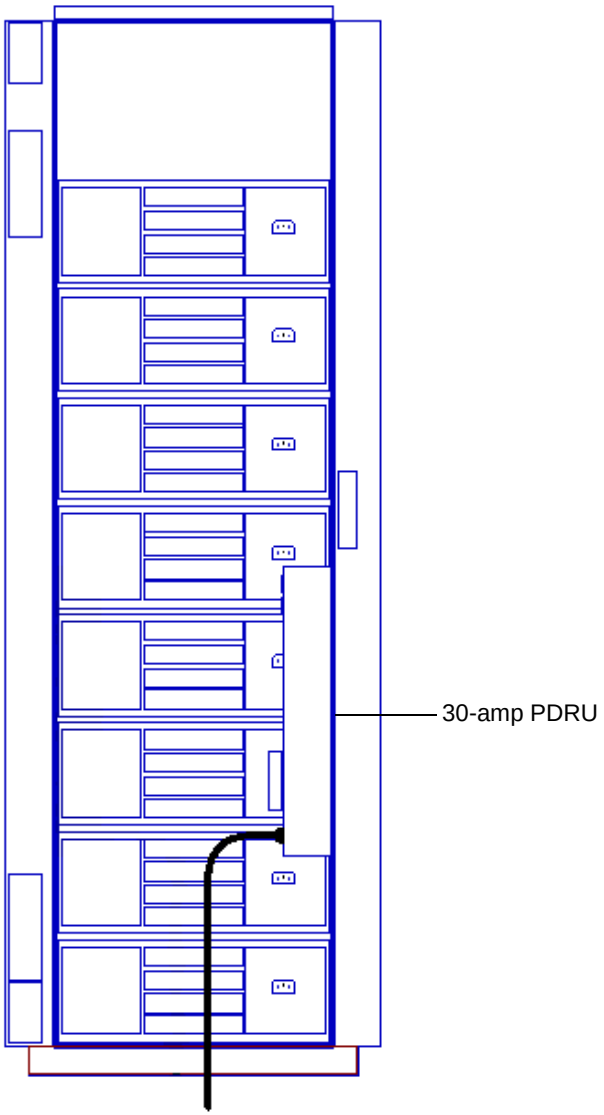


Figure 16 PDRU Placement in 1.6-Meter Rack

Tools

You need the following tools to install the disk system:

- Torx T25 screwdriver
- Torx T15 screwdriver
- Thin (1/8") flat-blade screwdriver (to set DIP switches)
- ESD strap (shipped in the accessories box)
- Pencil (to mark switch settings)

Step 1: Check Parts

Verify that you have all the parts you need to install the disk system. See Figure 17. If a part is missing, contact an HP sales representative.

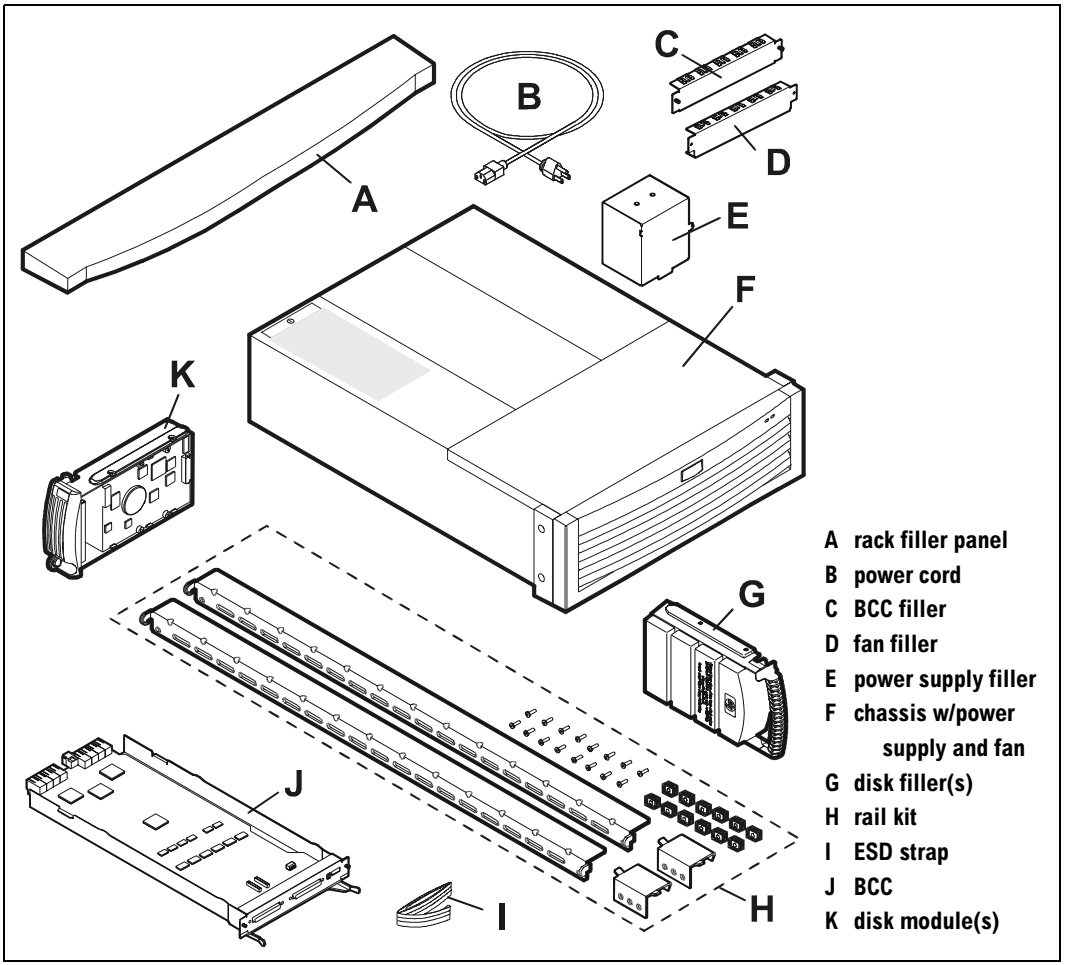


Figure 17 Disk System Parts

Step 2: Install Rails

The procedure for installing rails depends on the type of rack:

- If the rack is an HP C2785A, C2786A, C2787A, A1896A, or A1897A, follow the instructions labeled "For HP Legacy Racks" (see below). The rail kit for these racks is included with the purchase of the disk system.
- If the rack is an HP Rack System/E, follow the instructions labeled "For HP Rack Systems/E" on page 52. The rail kit for these racks is a product option.

For HP Legacy Racks

1. Unpack rail kit HP A5250A and verify the contents shown in Figure 18. If a part is missing, contact an HP sales representative.

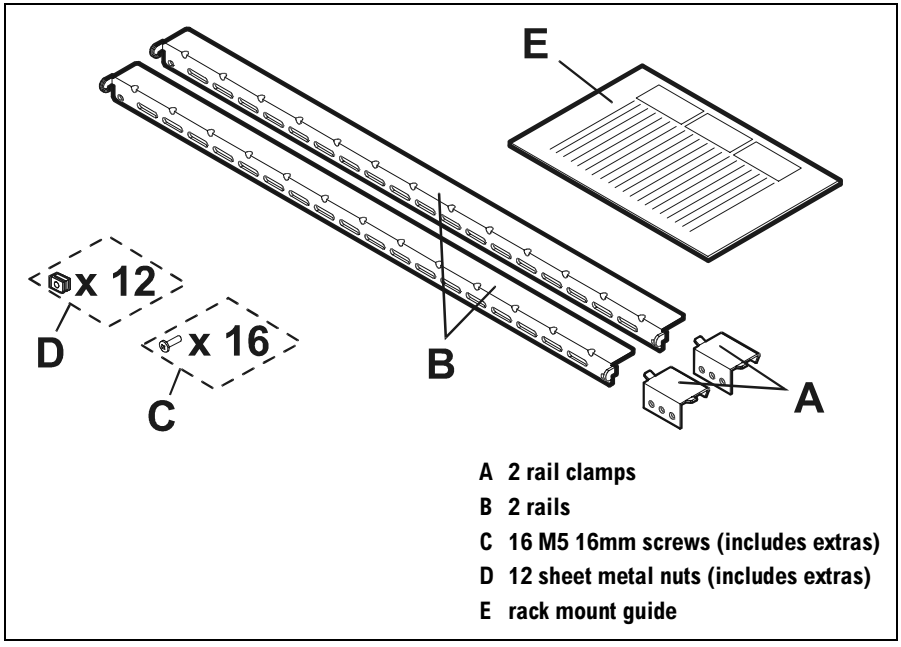


Figure 18 Rail Kit HP A5250A Contents

2. Select racking location(s) and install sheet metal nut(s) on the first column.

   The disk system consumes 4 EIA Units (U) in a legacy rack, 3.5 for the product and .5 for the rail. Select a 4-U space on the rack column and install a sheet metal nut (B in Figure 19) on the bottom hole.

   If you are installing multiple disk systems, install sheet metal nuts every 12 holes on the column.

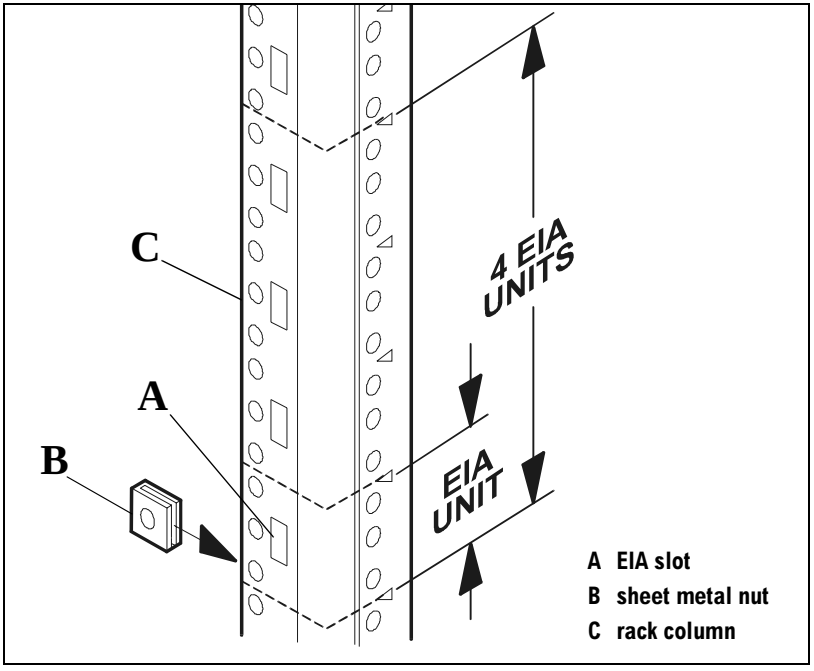


Figure 19 Rack Column Detail – HP Legacy Racks

3. Install sheet metal nuts on the other three columns at the same height as on the first column.

4. Install rails on the left and right columns as follows:

   a. Insert rail tabs into the bottom slots of the selected space on the front and back rack columns. Make sure that the rail is level and that rail holes align with the sheet metal nuts (C in Figure 20) previously installed.

   b. Insert a screw (B) through each rail end and sheet metal nut (C) on the rack column. Tighten screws with a Torx T25 screwdriver.

   c. Repeat steps a. and b. on the other side of the rack.

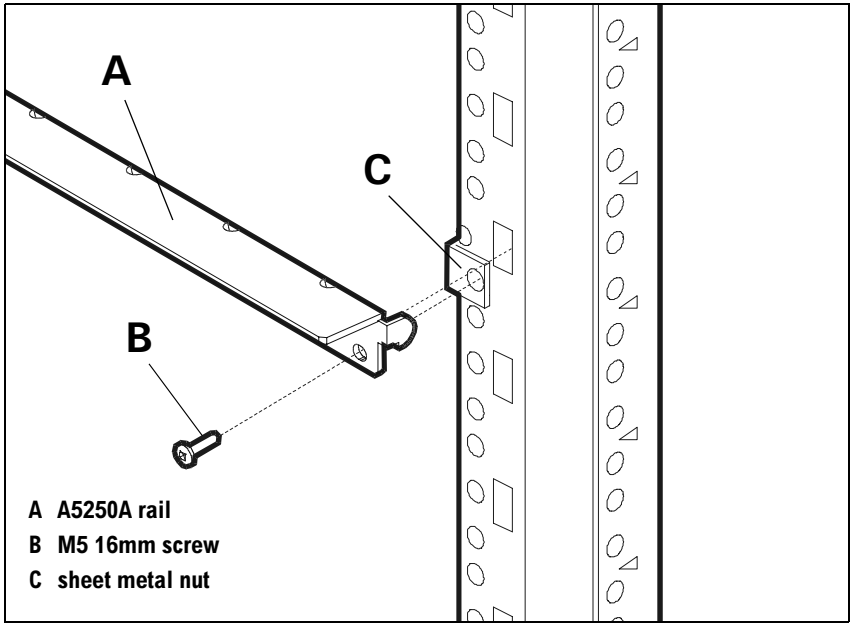


Figure 20 Rail Assembly – HP Legacy Racks

For HP Rack Systems/E

If you are installing the disk system in an HP Rack System/E, complete the following instructions. For other HP racks, see “For HP Legacy Racks,” page 49.

1. Unpack the rail kit A5251A and verify the contents shown in Figure 21. If a part is missing, contact an HP sales representative.

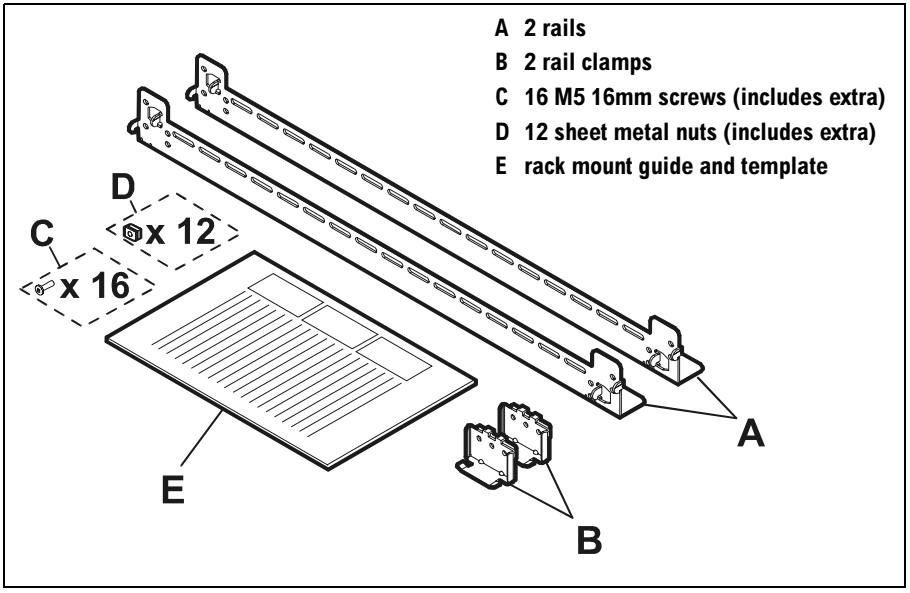


Figure 21 Rail Kit HP A5251A Contents

2. Select 3.5 Units of empty rack space and set rails on the right and left sides of the rack, as follows.

Note In a Rack System/E, each disk system occupies exactly 3.5 EIA Units. To rack multiple disk systems without gaps, alternate rails between Unit and mid-Unit positions, described below. (EIA Units are numbered on the column.)

– To leave a half EIA at the top, insert the *lower* rail tab (C in Figure 22) in the bottom EIA slot (B). This is the Unit position.

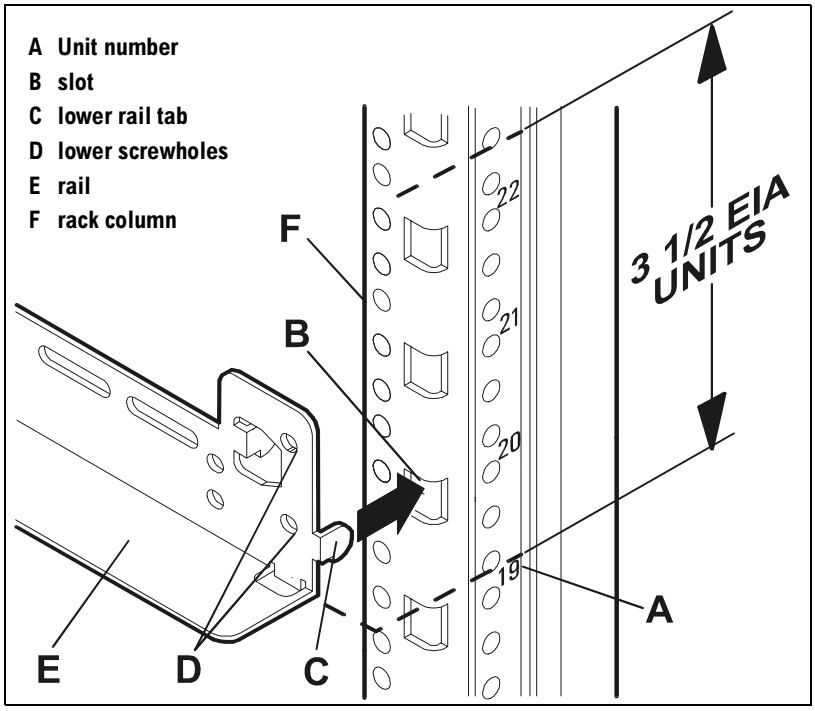


Figure 22 Unit Rail Position

– To use a half EIA at the bottom, insert the *upper* rail tab (C in Figure 23) in the bottom slot (B). This is the mid-Unit position.

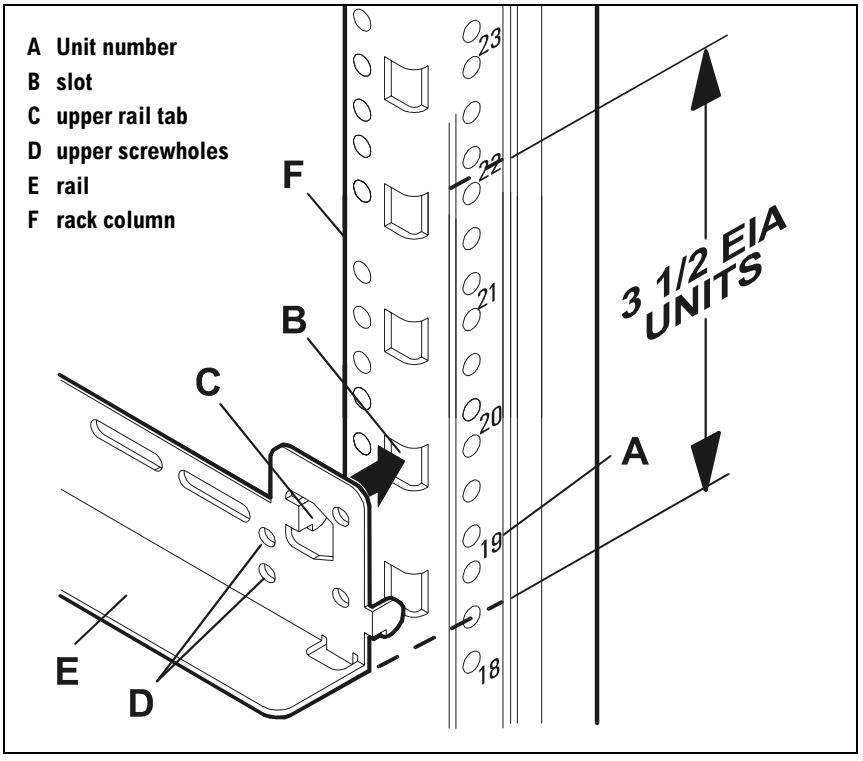


Figure 23 Mid-Unit Rail Position

Note Because the interior/exterior position of upper and lower tabs is reversed on opposite ends of the rail, one rail sits farther back in the rack than its mate on the other side.

To install additional disk systems without gaps, alternate rails between lower and upper tabs, 4 and 3 Units apart, respectively. For example, starting at the bottom of a 2-meter rack, set rails at the following Unit numbers:

Table 8 Rail Positions for Sequential Disk Systems

Disk System	EIA Unit	Using
One	0	lower tab in slot 0
Two	between 3 and 4	upper tab in slot 4
Three	7	lower tab in slot 7
Four	between 10 and 11	upper tab in slot 11
Five	14	lower tab in slot 14
Six	between 17 and 18	upper tab in slot 18
Seven	21	lower tab in slot 21
Eight	between 24 and 25	upper tab in slot 25
Nine	28	lower tab in slot 28
Ten	between 31 and 32	upper tab in slot 32
Eleven	35	lower tab in slot 35

Note Be sure to use the same tab—upper or lower—on opposing rails.

3. Install sheet metal nuts (C in Figure 24) on all four columns as follows:

   Using the rail as a guide, slide two sheet metal nuts (C) on matching holes in each rack column (D). Lift the rail away from the column, if needed, to insert the nuts.

Note Hole patterns vary at opposite ends of the rail.

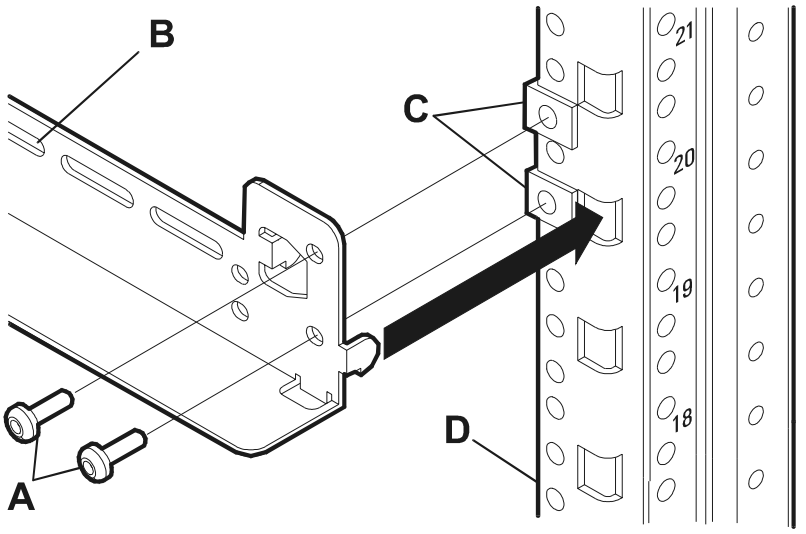


Figure 24 Rail Assembly – HP Rack Systems/E

4. Insert two screws (A in Figure 24) through each rail end and prepared rack column. Use a Torx T25 screwdriver to tighten the screws securely.

Step 3: Prepare Rack Front

Install one sheet metal nut each on the right and left front columns as follows:

Note The rack mount guide and template, provided with the rail kit, can help you locate front holes.

- In legacy racks (HP C2785A, C2786A, C2787A, A1896A, and A1897A), count six holes (4 inches) up from the installed rail ledge.
- In HP Rack Systems/E:
  - If the bottom of the rail (A in Figure 25) is at the EIA Unit number, count six holes up from the rail ledge and install the sheet metal nut.

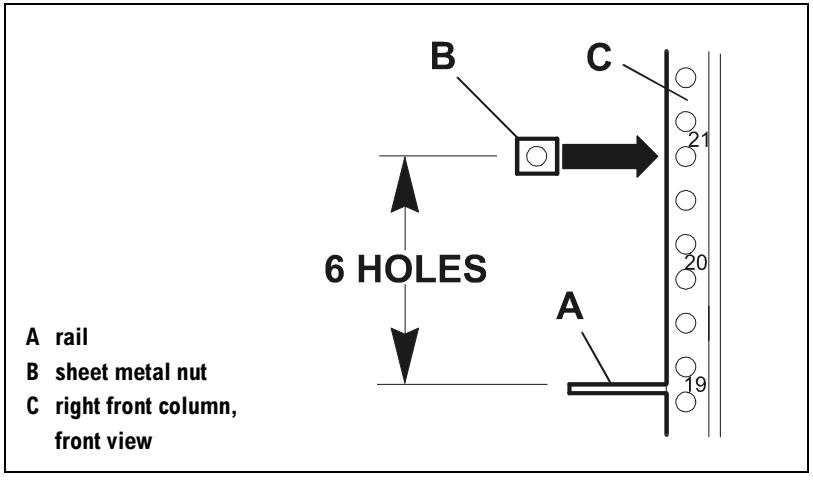


Figure 25 Rack Front Preparation: Unit Rail Position

– If the bottom of the rail (A in Figure 26) lies between EIA numbers, count seven holes up from the rail ledge and install the sheet metal nut.

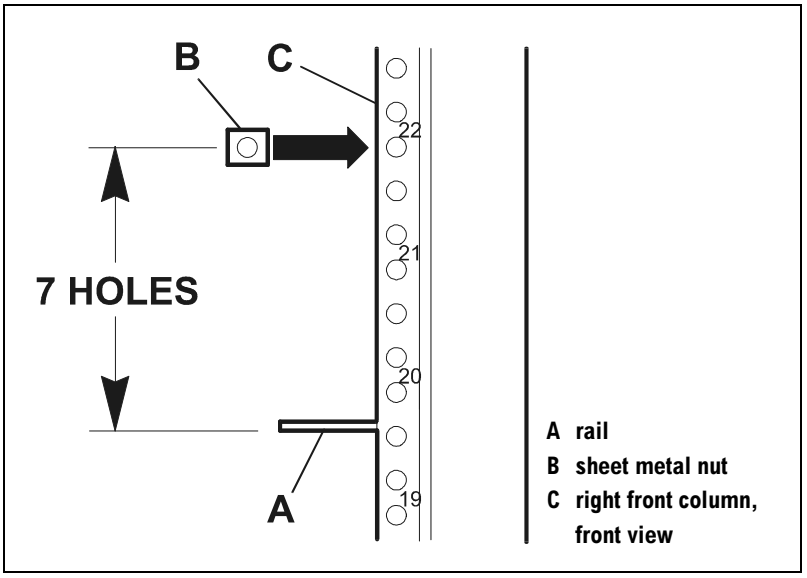


Figure 26 Rack Front Preparation: Mid-Unit Rail Position

Note If you do not install these nuts correctly now, you will have to remove the disk system to install them later.

Step 4: Mount the Disk System

You may choose to postpone this step and install disk system components (page 63 through page 69) before mounting the disk system. Consider the additional weight of the disk system with components installed, especially power supplies, versus the accessibility of the disk system in the selected rack location.

1. (Optional) Remove the power supply to prepare the disk system for lifting.
   a. Loosen the screw in the handle of the power supply.
   b. Pull the cam handle down to disengage the power supply from the backplane.
   c. Pull the power supply out of the chassis, using your free hand to support the far end of the power supply as it clears the chassis.

WARNING **Do not lift the disk system without the help of another person or lift device. Even without power supplies and disk drives, the disk system weighs 50 pounds.**

2. With another person or using a lift device, carry the disk system to the front of the rack and slide the back end onto the rails (Figure 27). Push the disk system into the rack as far as it will go.

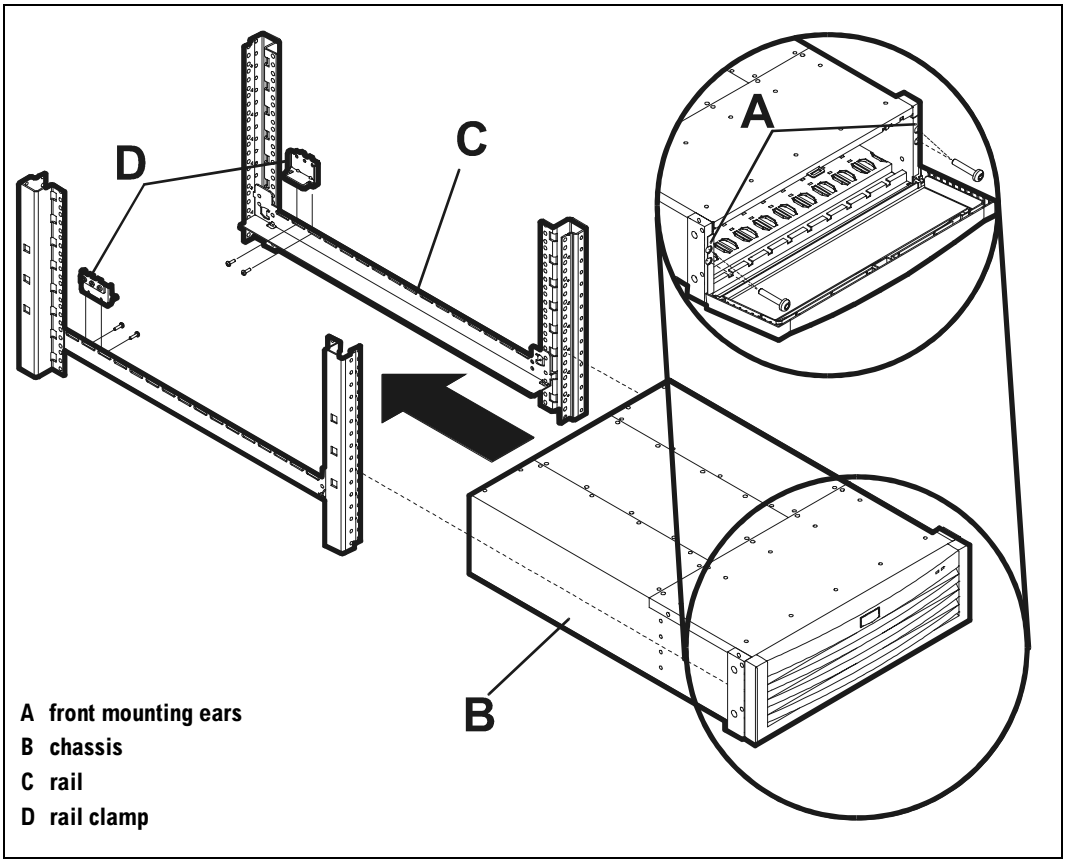


Figure 27 Mounting the Disk System (Rack System/E Shown)

Caution To protect the door, do not lift or move the disk system with the door open.

3. Once the disk system is in the rack, unlock and open the disk system door using a thin flat-blade screwdriver to turn the lock.

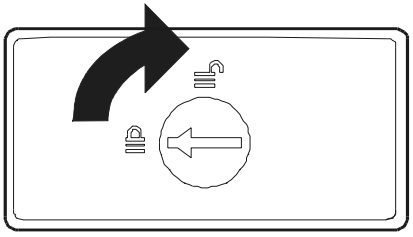


Figure 28 Door Lock

4. Ensure that one hole in each mounting ear (A in Figure 27) aligns with the sheet metal nuts previously installed on the rack front columns.
   - In legacy racks, the upper holes align with the rack column holes.
   - In Rack Systems/E, the upper or lower holes align with the rack depending on whether the rail is at the Unit or between Units.
5. Insert and tighten two screws through the matching holes in the disk system mounting ears and rack front columns.
6. Close the door.
7. Fasten the back of the disk system to the rails using the clamps from the rail kit.
   a. If you are installing the disk system in an HP legacy rack, set the clamp (A in Figure 29) on top of the rail (B) so that the tabs point up and the screw holes are on the slotted side of the rail. Skip to substep c.
   b. If you are installing the disk system in an HP Rack System/E, set the clamp (D in Figure 27) inside the rail so that the holes in the clamp meet the slots in the rail.

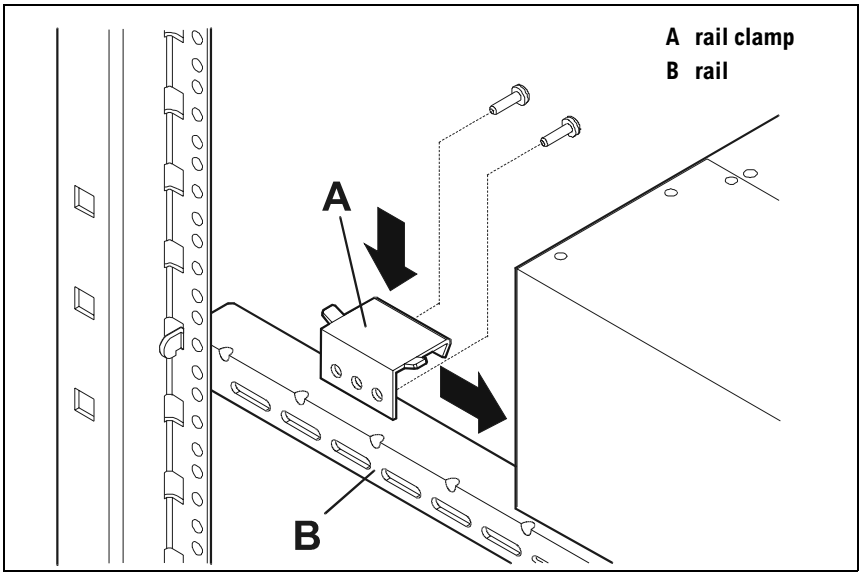


Figure 29 Legacy Rack Rail Clamp

c. Push the clamp tight against the back of the disk system. The raised tab of the clamp should overlap the bottom edge of the disk system chassis.

d. Insert and tighten two M5 16mm screws through each clamp and rail.

8. If you previously removed the power supply, reinstall it now.

9. Install rack filler panel(s) wherever there is a half-Unit gap between products. A half-Unit gap exists between products in HP legacy racks and when an odd number of disk systems are installed in the Rack System/E.

Step 5: Install the Bus Control Card

Set DIP switches and install the BCC as follows:

Note If you chose to postpone mounting the disk system (Step 4), use a lift device or human assistance to set the chassis on a comfortable working platform.

1. Determine whether you need to change any DIP switch settings (D in Figure 30). There are two sets of DIP switches on the BCC:
   - Internal switches determine whether or not the disk system issues a SCSI reset when a disk module is removed or inserted and when the power fails. These switches are inaccessible once the BCC is installed.
   - External switches select full/split bus, bus termination, and high/low bus addressing.

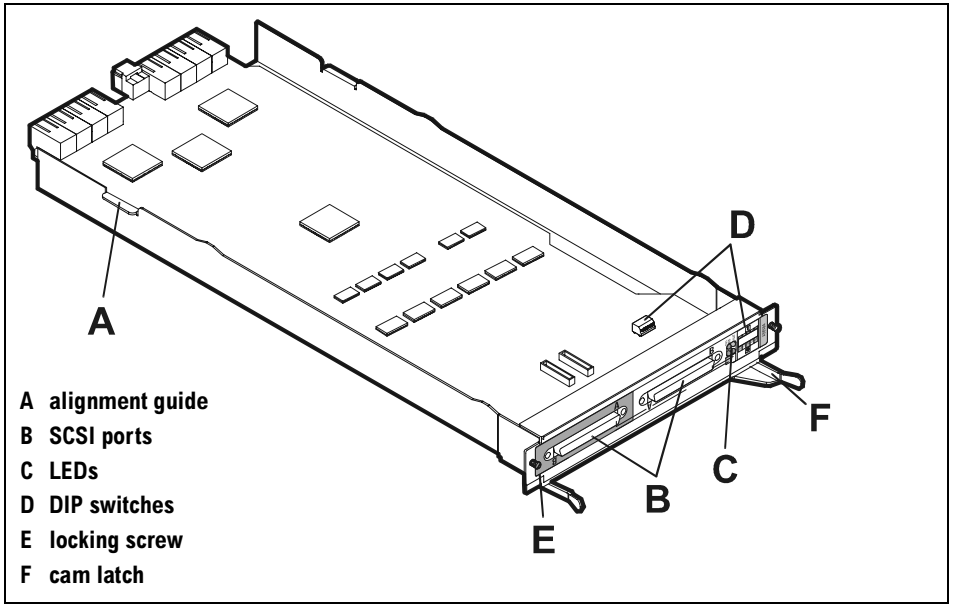


Figure 30 DIP Switch Locations

The reference card (C) on top of the disk system identifies specific switches. See chapter 3, Configuration, for detailed switch descriptions and guidelines. All DIP switches are ON when the disk system leaves the factory.

2. Attach your ESD strap to ground.

Caution Do not touch the pins on the back of the BCC.

3. Unpack the BCC from the shipping carton and ESD bag.
4. Set DIP switches as needed. A narrow (1/8") flat-blade screwdriver is a helpful tool.
5. Use a pencil to mark the internal switch settings on the information card (Figure 31). This can avoid the need to remove the BCC later to verify switch settings.

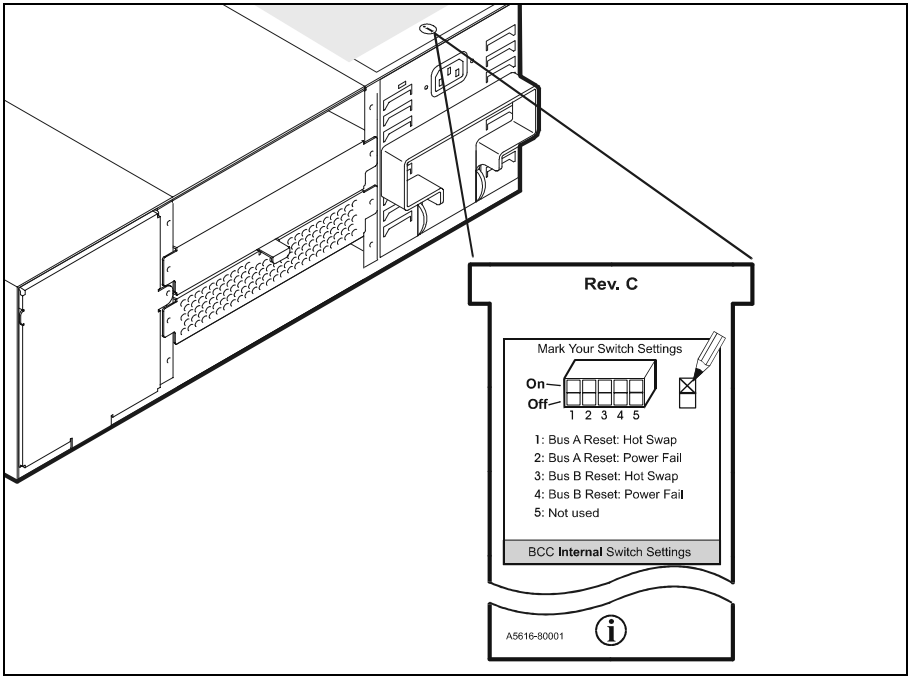


Figure 31 Switch Information

6. Open the BCC cam latches (A in Figure 32) by pulling them away from the center of the BCC bulkhead.

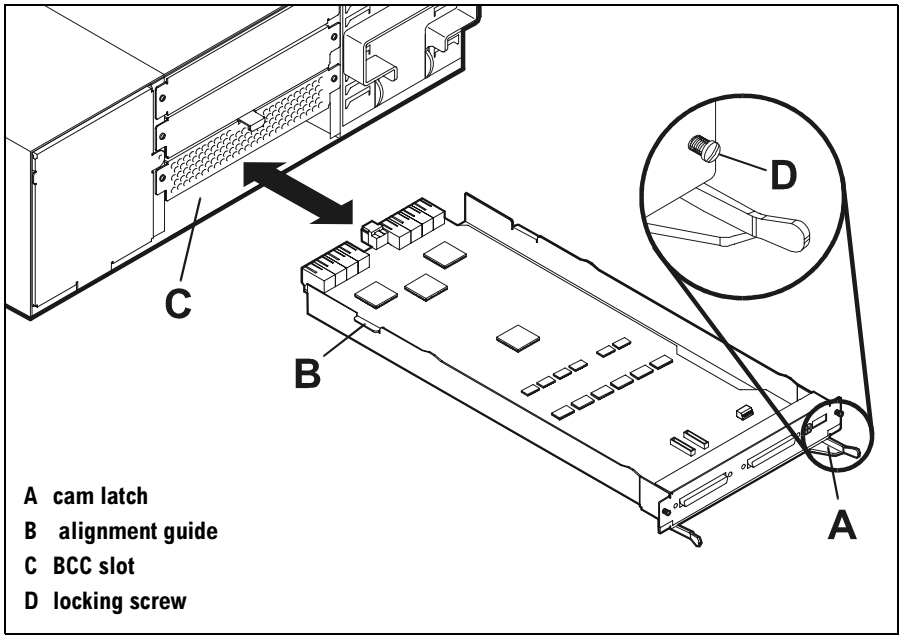


Figure 32 Installing the Bus Control Card

7. Align the BCC flanged edges (B) with the rails inside the bottom slot (C), and slide the BCC into the chassis. Stop pushing when the BCC meets the backplane.
8. Press the cam latches (A) inward and flat against the center. The cam action draws the BCC completely into the slot and engages the connector pins on the backplane.
9. Use a Torx T15 or flat-blade screwdriver to tighten the locking screws (D).
10. If there is a second BCC, repeat steps 3 through 9 with the following differences:
    - Set DIP switches to match the settings on the first BCC except for bus termination (external switches 3 and 5). Set bus termination switches according to your configuration (see chapter 3).
    - Turn the card over to insert it in the top slot.

Step 6: Install Optional Fan and Power Supply

Install the redundant fan and power supply, if purchased.

1. With the pull-out tab at the top and facing you, insert the fan (A in Figure 33) in the second slot from the top.

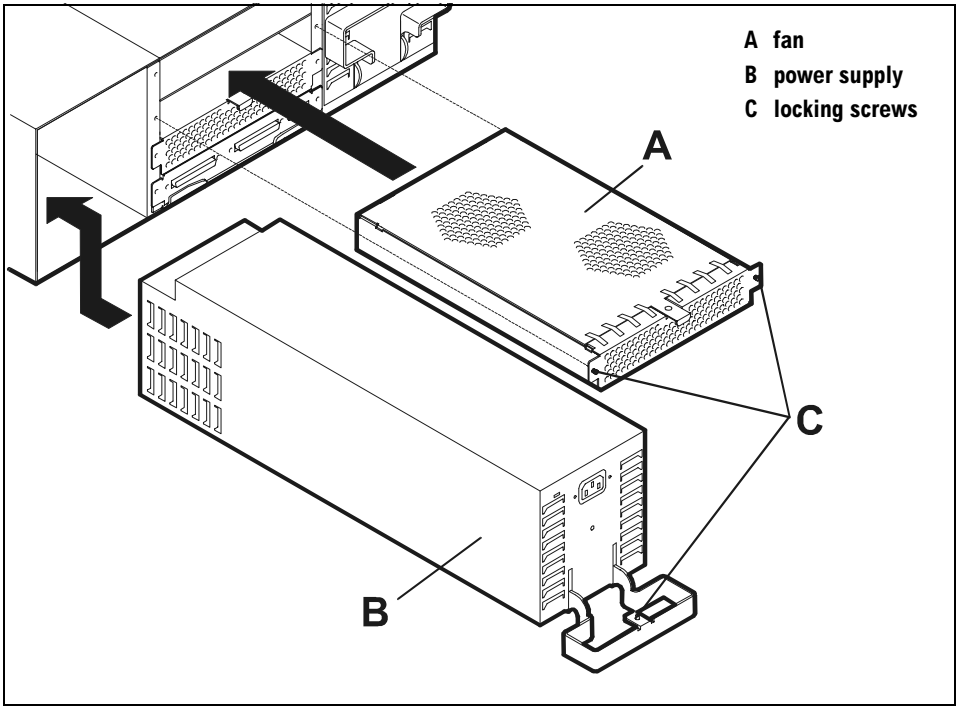


Figure 33 Install Optional Fan and Power Supply

2. With the handle down and facing you, slide the power supply (B in Figure 33) into the left slot. Stop pushing when you feel the resistance of the power supply against the backplane. About 3/8 inch (8mm) of the power supply will be protruding from the chassis.

3. Rotate the power supply handle up to draw the power supply the last 3/8 inch into the chassis. The power supply must be flush with the edge of the chassis.
4. Using a flat-head or Torx T15 screwdriver, tighten the screws in the power supply handle and the fan.

Step 7: Install Filler Panels

Caution Every slot must contain a filler or active component for proper operation.

Install BCC, fan, and power supply fillers in empty slots:

1. Align the screws on the BCC filler (A in Figure 34) with the holes at the right and left of the top slot. Properly oriented, the screws of the BCC filler are slightly above center. Insert the BCC filler in the slot.

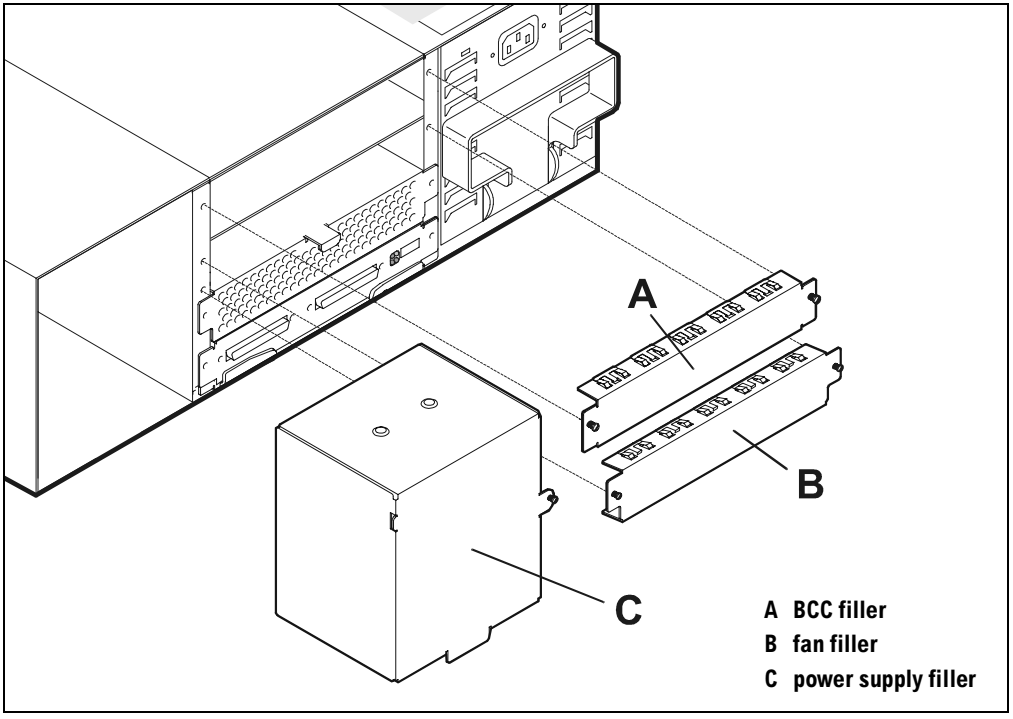


Figure 34 Installing Filler Panels

2. Align the screws on the fan filler (B) with the holes at the right and left of the second slot from the top. Properly oriented, the notched corners are at the bottom of the fan filler. Insert the fan filler in the slot.
3. Turn the power supply filler (C) so that the screw is on the right and the square tab is at the bottom. Insert the power supply filler in the slot.
4. Tighten the screws in all fillers using a Torx T15 or flat-head screwdriver.

Step 8: Connect SCSI and Power Cables

Note If you chose to postpone mounting the disk system in the rack, return to Step 4 (page 59) and complete the rack mounting before beginning Step 8.

1. Choose a valid topology.

   See sample topologies in chapter 1. For additional supported HP 9000 topologies, refer to the internal document *HP 9000 Enterprise Servers Configuration Guide*.

   Maximum cable length is 25 meters.

2. Attach HVD SCSI cables to SCSI port A and/or B.
3. Attach the other end of each SCSI cable to a host bus adapter.

Caution Do not attach the second end of the SCSI cable to another disk system or to another port on the same disk system.

4. If using v-cables, attach the third end to another host bus adapter, another disk system (in split-bus mode), or other supported HP storage device. See sample topologies in chapter 1.
5. Ensure that termination (external switches 3 and 5) is correctly enabled or disabled at each port used. (See termination strategies in chapter 3.)
6. Plug a power cord into the AC receptacle of each power supply.
7. Attach the other end of each power cord to a preinstalled PDU/PDRU.

   Choose outlets that prevent power cords from interfering with the removal and replacement of serviceable components. Leave a 6-inch service loop when attaching the cord to HP's 30-amp PDRU.

8. Wrap or tie cables and power cords to the side and behind rails so that cables and cords do not hide LEDs or interfere with serviceable components.

Step 9: Install Disk Modules

Caution Touching exposed areas on the disk can cause electrical discharge and disable the disk. Be sure you are grounded and be careful not to touch exposed circuits.

Disks are fragile and ESD sensitive. Dropping one end of the disk module just two inches is enough to cause permanent damage. In addition, static electricity can destroy the magnetic properties of recording surfaces. Grip disk modules only by their handles (A in Figure 35) and carriers (D), and follow strict ESD procedures.

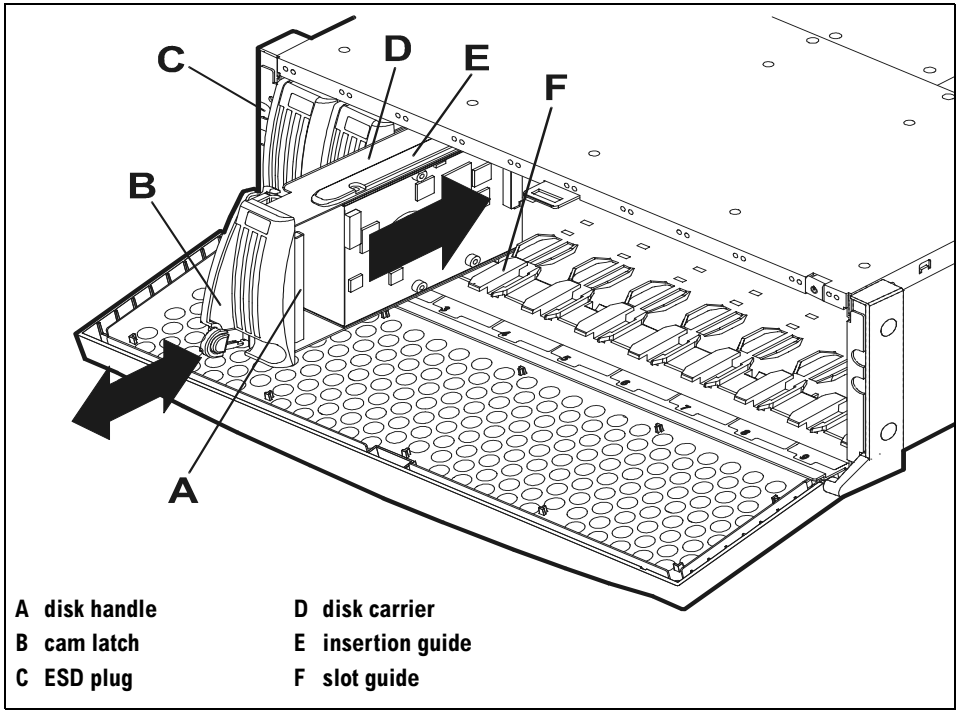


Figure 35 Disk Module Installation

1. Open the disk system door.
2. Determine which slots, 0 through 9, will contain hard disk or solid state disk modules and which slots will contain fillers.
   - If installing solid state disk modules, see chapter 3 for valid configurations.
   - If external DIP switch 1 is set to "|" (full-bus mode), choose any slots for hard disk modules or fillers.
   - If external DIP switch 1 is set to "0," choose odd-numbered slots for bus A and even-numbered slots for bus B.
3. Attach your ESD strap to ground. An ESD plug-in (C in Figure 35) is provided on the front of the disk system.

Caution Disks are fragile. Handle carefully.

Be careful to grasp the disk module by its handle and avoid touching exposed circuits

4. Remove a disk module from the disk pack and its ESD bag.
5. Pull the cam latch (B in Figure 35) toward you.
6. Keeping the latch open, push the module as far as it will go into the selected slot.

Note Install disk modules left to right for easier insertion.

7. Close the cam latch by pushing the latch toward the module until it clicks. The cam action draws the module completely into the slot and seats the connecting pins on the backplane.
8. Repeat steps 4 through 7 to install additional disk modules.
9. Insert disk fillers in the remaining slots.

Caution Every slot must contain either a disk module or filler.

Step 10: Turn on the Disk System

Caution When starting up the disk system, do not override automatic spin-up by issuing SCSI start commands to the disk drives. Doing so could cause an overcurrent fault, requiring a power cycle to recover.

1. Press the power switch (A in Figure 36) to turn on the disk system.

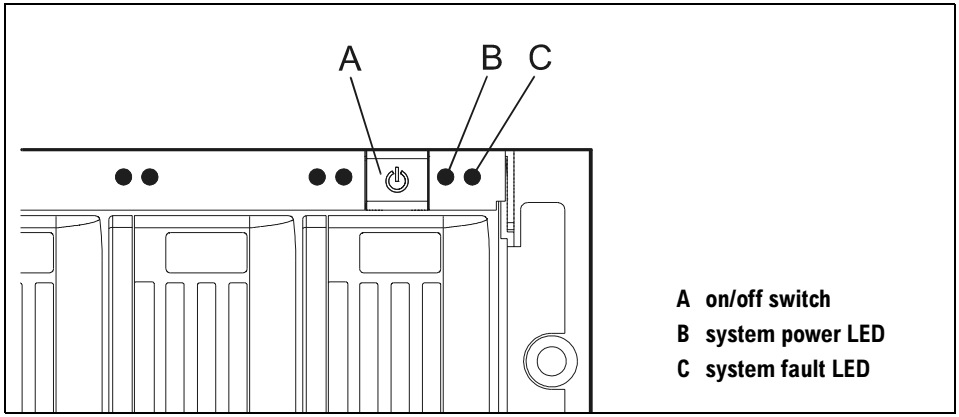


Figure 36 On/Off Switch and System LEDs

2. Watch the system LEDs for confirmation that the disk system is operational. The system power LED (B) should be green, and the fault LED (C) should be off.

   If the LEDs indicate a problem, refer to chapter 4, Troubleshooting.

Note An amber light that is on briefly when a component turns on is normal. If this light remains on more than a couple of seconds, a fault has been detected.

3. Close and lock the disk system door.

Step 11: Verify Devices on the Host

Verify that the installed disk modules are visible to the host by executing the appropriate command for your operating system: HP-UX or MPE/iX

HP-UX

On the HP 9000, run IOSCAN (**ioscan -f**) and inspect the output for the installed disk devices. If the displayed "S/W State" is not "claimed," begin troubleshooting (see chapter 4). The following example shows a disk system with split buses and low addressing (external switches 2 and 4 are set to "0").

```
Class     I   H/W Path           Driver       S/W State  H/W Type     Description
=============================================================================================
bc        0                      root         CLAIMED    BUS_NEXUS
bc        1   8                  bc           CLAIMED    BUS_NEXUS    Pseudo Bus Converter
ba        0   8/0                GSCtoPCI     CLAIMED    BUS_NEXUS    PCI Bus Bridge-GSCtoPCI
ext_bus   0   8/0/1/0            c720         CLAIMED    INTERFACE    Ultra2 Wide SCSI
target    0   8/0/1/0.0          tgt          CLAIMED    DEVICE
disk      1   8/0/1/0.0.0        sdisk        CLAIMED    DEVICE       SEAGATE ST118202LC
target    1   8/0/1/0.1          tgt          CLAIMED    DEVICE
disk      2   8/0/1/0.1.0        sdisk        CLAIMED    DEVICE       SEAGATE ST118202LC
target    2   8/0/1/0.2          tgt          CLAIMED    DEVICE
disk      3   8/0/1/0.2.0        sdisk        CLAIMED    DEVICE       SEAGATE ST39102LC
target    3   8/0/1/0.3          tgt          CLAIMED    DEVICE
disk      4   8/0/1/0.3.0        sdisk        CLAIMED    DEVICE       SEAGATE ST39102LC
target    4   8/0/1/0.6          tgt          CLAIMED    DEVICE
ctl       5   8/0/1/0.6.0        sctl         CLAIMED    DEVICE       Initiator
target    5   8/0/1/0.13         tgt          CLAIMED    DEVICE
disk      5   8/0/1/0.13.0       sdisk        CLAIMED    DEVICE       SEAGATE ST39102LC
ext_bus   1   8/0/2/0            c720         CLAIMED    INTERFACE    Ultra2 Wide SCSI
target    7   8/0/2/0.0          tgt          CLAIMED    DEVICE
disk      6   8/0/2/0.0.0        sdisk        CLAIMED    DEVICE       SEAGATE ST118202LC
target    8   8/0/2/0.1          tgt          CLAIMED    DEVICE
```

```
disk       7   8/0/2/0.1.0       sdisk       CLAIMED    DEVICE       SEAGATE ST118202LC
target     9   8/0/2/0.2         tgt         CLAIMED    DEVICE
disk       8   8/0/2/0.2.0       sdisk       CLAIMED    DEVICE       SEAGATE ST118202LC
target    10   8/0/2/0.3         tgt         CLAIMED    DEVICE
disk       9   8/0/2/0.3.0       sdisk       CLAIMED    DEVICE       SEAGATE ST39102LC
target    11   8/0/2/0.5         tgt         CLAIMED    DEVICE
ctl        6   8/0/2/0.5.0       sctl        CLAIMED    DEVICE       Initiator
target    12   8/0/2/0.13        tgt         CLAIMED    DEVICE
disk      10   8/0/2/0.13.0      sdisk       CLAIMED    DEVICE       SEAGATE ST39102LC
```

MPE/iX

Boot the HP e3000 and at the ISL prompt run Mapper (**run mapper**). Inspect the output for the installed devices. If the "Component Name" does not show the device name (for example, SEAGATE ST39204LC), begin troubleshooting (see chapter 4). The following example shows a disk system with split buses and high addressing (external switches 2 and 4 are set to "I").

```
                                                 Type  HW    SW    Revisions
Path          Component Name                     ID    Mod   Mod   Hdwr Firm
----------      ---------------------------------------------  -----  -----  ----- ----
8             I/O Adapter                        CH    580H  BH    7    0
8/63          GSC+ Port                          7H    501H  CH    1    0
10            I/O Adapter                        CH    580H  BH    7    0
10/4          Upper Bus converter                7H    500H  CH    0    0
10/4/0        HP-PB LAN/Console                  2H    5H    60H   0    1
10/4/4        HP-PB Fast Wide SCSI               4H    4H    3BH   0    0
10/4/4.8.0    SEAGATE ST318404LC                 -     -     -     -    HP00
10/4/4.9.0    SEAGATE ST39204LC                  -     -     -     -    HP00
10/4/4.10.0   SEAGATE ST336704LC                 -     -     -     -    HP00
10/4/4.11.0   SEAGATE ST39204LC                  -     -     -     -    HP00
10/4/4.12.0   SEAGATE ST39204LC                  -     -     -     -    HP00
. . .         . . .                              ...   ...   ...   ...  ...
10/4/24       HP-PB Fast Wide SCSI               4H    5H    3BH   0    0
10/4/24.8.0   SEAGATE ST336704LC                 -     -     -     -    HP00
10/4/24.9.0   SEAGATE ST39204LC                  -     -     -     -    HP00
10/4/24.10.0  SEAGATE ST39204LC                  -     -     -     -    HP00
10/4/24.11.0  SEAGATE ST318404LC                 -     -     -     -    HP00
10/4/24.12.0  SEAGATE ST39204LC                  -     -     -     -    HP00
. . .         . . .                              ...   ...   ...   ...  ...
```

3 CONFIGURATION

Bus–Port Relationship

Buses are identified by the letters A and B. Bus A comprises the disk modules in the odd-numbered slots (1, 3, 5, 7, and 9). Bus B comprises the disk modules in the even-numbered slots (0, 2, 4, 6, and 8). Whether the BCC is in the top or bottom slot, bus A is always on the left port, and bus B is always on the right port. The letters that are right side up on the BCC label identify the buses. (See Figure 37.)

Buses are distinct from ports, which are identified by shading. When the BCC is in the bottom slot of the chassis, bus A is on the shaded port, but when the BCC is in the top slot, bus A is on the unshaded port. (See Figure 37.) Conversely, bus B is on the unshaded port in the bottom slot and on the shaded port in the top slot.

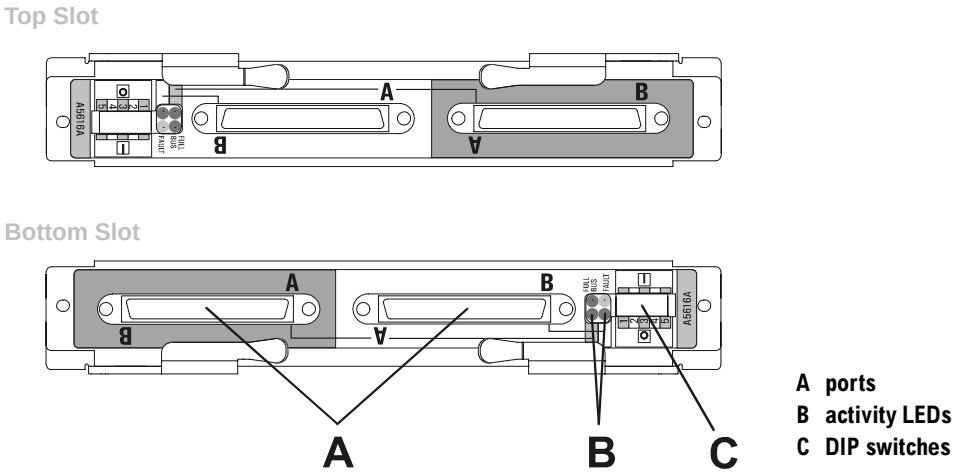


Figure 37 Bus Control Card Labels

The distinction between buses and ports is important when you interpret LEDs or set DIP switches. Activity LEDs (B in Figure 37) on the BCC bulkhead correspond to the ports, not the buses. Shading around the LEDs mimics the shading around the respective ports. Some DIP switches correspond to buses and others correspond to ports. Specifically, the DIP switches that control bus termination correspond to ports whereas the DIP switches that control bus addressing and bus resets correspond to the bus identifiers A and B.

Setting DIP Switches

Five DIP switches (A in Figure 38) on the BCC bulkhead determine bus structure, addressing, and termination. Another bank of switches (B), inside the BCC, determine how buses act when a disk is removed or the power fails. A reference card (C), attached to the top of the disk system, identifies switch positions.

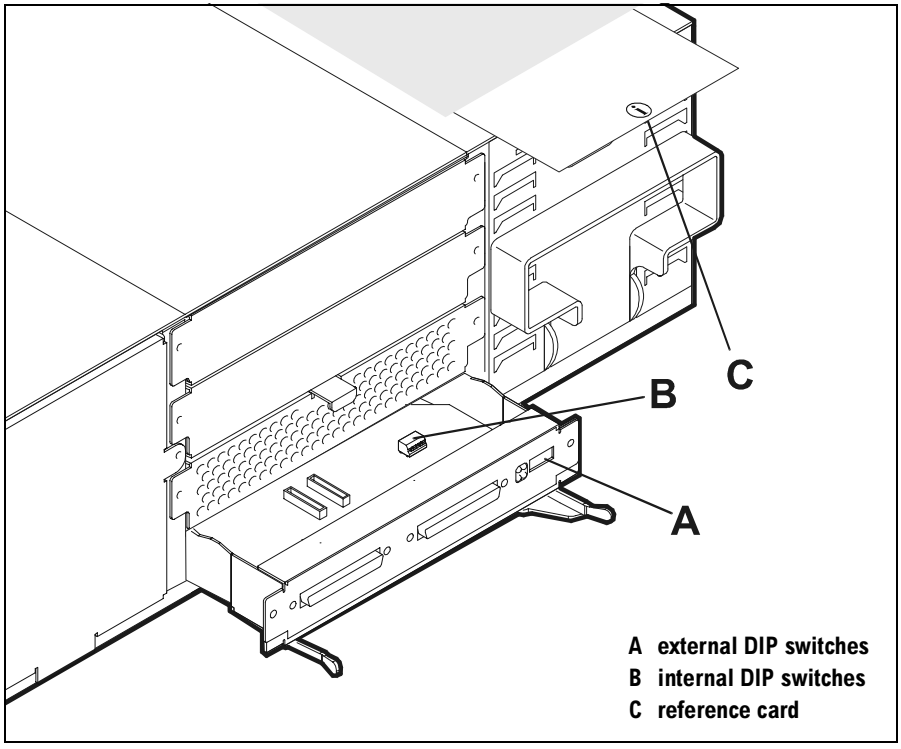


Figure 38 DIP Switch Location

Tool Required

For best access to internal and external DIP switches, use a narrow (1/8-inch) flat-blade screwdriver.

For Bus Structure, Addressing, and Termination

DIP switches on the BCC bulkhead determine whether disks are all on one bus or split across two buses, whether bus addresses are high or low, and whether or not buses are terminated at the BCC. As shown in Figure 39, switches are numbered 1 to 5, left to right.

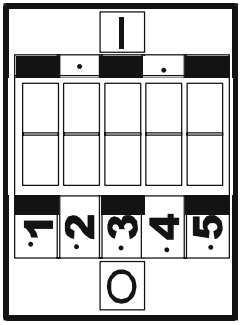


Figure 39 External DIP Switches

External DIP switches are ON in the "I" position, OFF in the "0" position. The default position is ON ("I"). See Table 9 for external DIP switch ON/OFF definitions.

Table 9 External DIP Switch Definitions

ON (I)	Creates a single bus of 10 addresses (full-bus mode)	Assigns high SCSI addresses (8-12) to slots on bus A in split-bus mode	Terminates the bus using the shaded port (see rules on page 84)	Assigns high SCSI addresses (8-12) to disks on bus B in split-bus mode	Terminates the bus using the unshaded port (see rules on page 84)
OFF (0)	Creates two buses: bus A (odd-numbered slots) and bus B (even-numbered slots)	Assigns low SCSI addresses (0-3, 13) to slots on bus A in split-bus mode	Disables termination for the bus using the shaded port (see rules on page 84)	Assigns low SCSI addresses (0-3, 13) to disks on bus B in split-bus mode	Disables termination for the bus using the unshaded port (see rules on page 84)
Switch	1	2	3	4	5

For Bus Reset Options

DIP switches inside the BCC determine whether or not the disk system triggers a SCSI bus reset in two circumstances: (1) when a disk module is inserted or removed, and (2) when the power fails. As shown in Figure 40, switches are numbered 1 to 5, left to right.

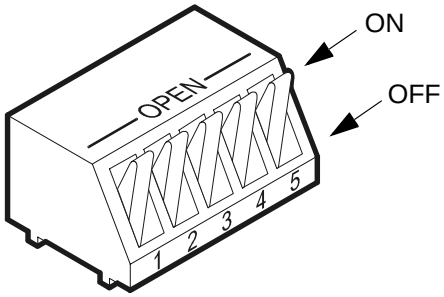


Figure 40 Internal DIP Switches

Internal DIP switches are ON in the "open" position, OFF in the opposite position. The factory default position is ON. See Table 10 for internal DIP switch ON/OFF definitions.

Table 10 Internal DIP Switch Definitions

ON (Open)	Issues a SCSI reset on bus A when a disk module is inserted or removed from the bus	Issues a SCSI reset on bus A when voltage exceeds minimum or maximum limits	Issues a SCSI reset on bus B when a disk module is inserted or removed from the bus	Issues a SCSI reset on bus B when voltage exceeds minimum or maximum limits	(This switch is not used. It can be ON or OFF.)
OFF	Does not issue a SCSI reset on bus A when a disk module is inserted or removed	Does not issue a SCSI reset on bus A for power violations	Does not issue a SCSI reset on bus B when a disk module is inserted or removed	Does not issue a SCSI reset on bus B for power violations	
Switch	1	2	3	4	5

DIP Switch Rules and Rationales

A few rules govern the setting of these switches.

- When full-bus mode is enabled (external switch 1 is "I""), address high switches (external switches 2 and 4) have no effect. Drives in the odd-numbered slots have the high addresses, and drives in the even-numbered slots have the low addresses.
- When split-bus mode is enabled (external switch 1 is "0"), the addresses for a daisy-chained bus must be set high ("I") at one of the disk systems and low ("0") at the other.
- When the disk system is at the end of a bus, bus termination (external switches 3 or 5) must be on. Set bus termination off only if you are attaching the disk system at the "V" of a v-cable. See page 84 for more information about termination.

DIP switch choices depend on many factors, including business priorities and incidentals. Table 11 shows some typical reasons for choosing specific DIP switch settings.

Table 11 DIP Switch Usage

Switch	Reasons to Set ON	Reasons to Set OFF
Full Bus	– Full-bus mode is the only way to access all ten disks through one SCSI port. – Full-bus mode allows you to use the second SCSI port to attach additional hosts (HP-UX only).	– Split bus allows you to mirror disks within the disk system. – Having fewer devices on the bus improves bus performance. – Split bus allows daisy chains of two disk systems.
Address High (split bus only)	The disk system is daisy-chained to another disk system, which is using the low addresses.	– High addresses are used by other devices on the bus. – Low addresses give disks higher priority on the bus, potentially improving access time.
Bus Termination	The disk system is at the end of a bus. See page 84 for details.	The disk system is in the middle of a bus. See page 84 for details.

Table 11 DIP Switch Usage (cont'd)

Switch	Reasons to Set ON	Reasons to Set OFF
Bus Reset: Power Fail	Bus reset reduces the chances of data corruption and saves the time (30 to 60 secs.) that the host would spend determining that the disk system was unavailable. Bus reset signals the host to resend outstanding I/O requests.	Bus control is restricted to the host.
Bus Reset: Hot Swap		– Bus control is restricted to the host. – The entire bus is not reset for one disk.

Bus Termination

All SCSI buses require termination on the device at each end of the bus. Termination on the disk system occurs at the BCC ports. The disk modules are on an internal self-terminated bus that is electrically isolated from the external bus. (See Figure 41.)

Three chips on the BCC terminate each external bus, so there is no need for terminator hardware. External DIP switches 3 and 5 are used if it is necessary to turn termination off. (See page 79 for information about DIP switches.) The remainder of this topic explains when termination is and is not required.

At the End of the Bus

Termination at the BCC is required and must be enabled whenever the disk system is at the end of a bus. In Figure 41, for example, the disk system is at the end of the bus, and port A must be terminated. Host 2 is at the other end of the bus and is also terminated. Host 1, on the other hand, is in the middle of the bus and is not terminated.

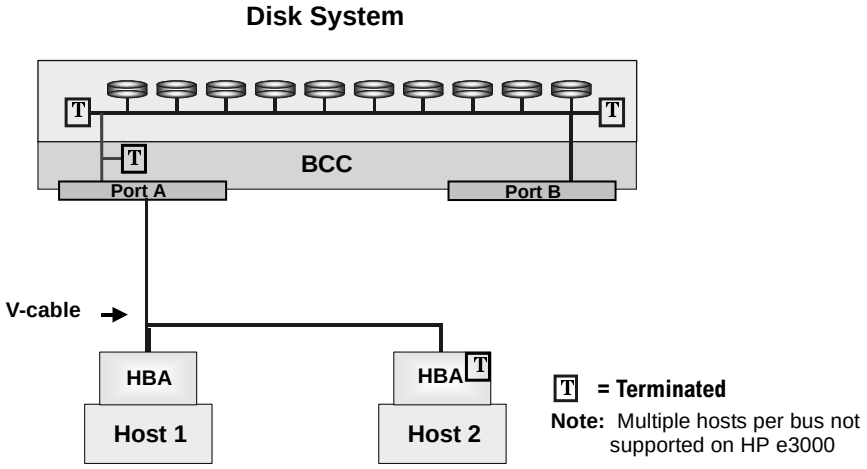


Figure 41 Disk System at the End of a Bus

In the Middle of the Bus

Termination at the BCC is not required and must be disabled when the disk system is in the middle of the bus. In Figure 42, termination is required at hosts 1 and 2 because they are at the ends of the bus, but termination is disabled on the disk system because it is in the middle of the bus.

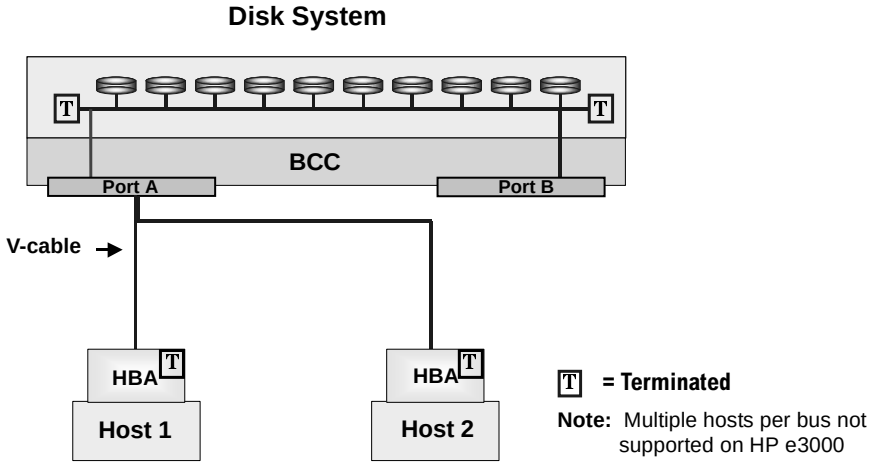


Figure 42 Disk System in the Middle of the Bus

In a Daisy Chain

Another example, Figure 43, shows daisy-chained disk systems in split-bus mode. In this case bus A is terminated at host A and disk system 2, and bus B is terminated at host B and disk system 2. Termination is disabled for both buses on disk system 1 because disk system 1 is in the middle of each bus.

Using inline terminating cables increases availability in this configuration. If the cable is disconnected from disk system 2 without inline terminating cables, the host could lose access to disk system 1.

Note Daisy chaining requires the use of v-cables.

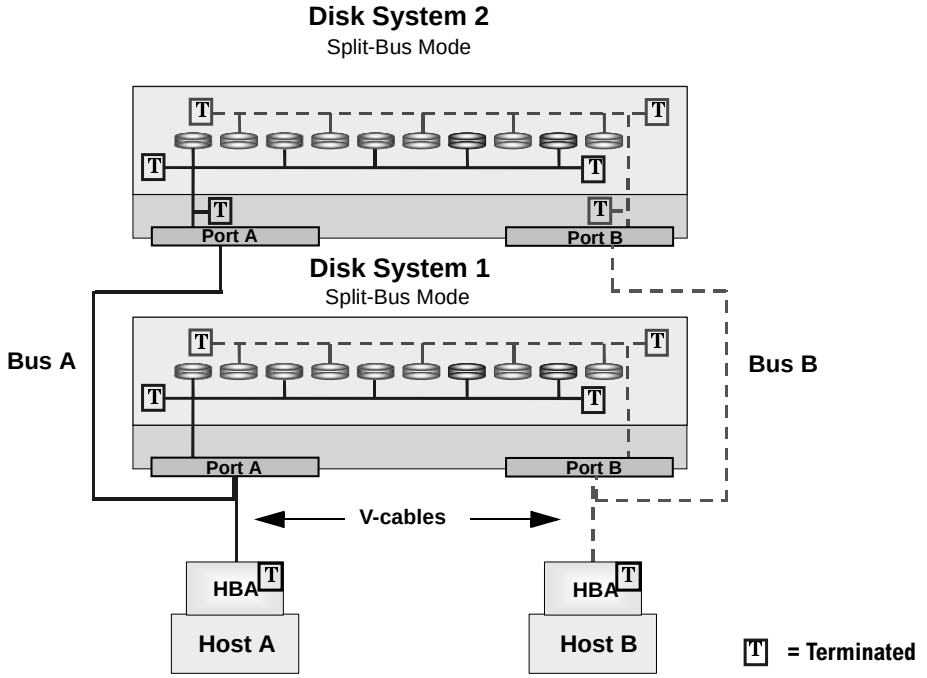


Figure 43 Daisy-Chained Disk Systems

Of Independent Buses

Because bus A and bus B are physically isolated, termination can be set differently for each, even in full-bus mode. Figure 44 shows a disk system in full-bus mode with different termination requirements on bus A and bus B. The disk system is in the middle of bus A, so termination is OFF for port A. On the other hand, the disk system is at the end of bus B, so termination is ON for port B. Nevertheless, in full-bus mode bus A and bus B are logically one bus connecting ten disks and three hosts.

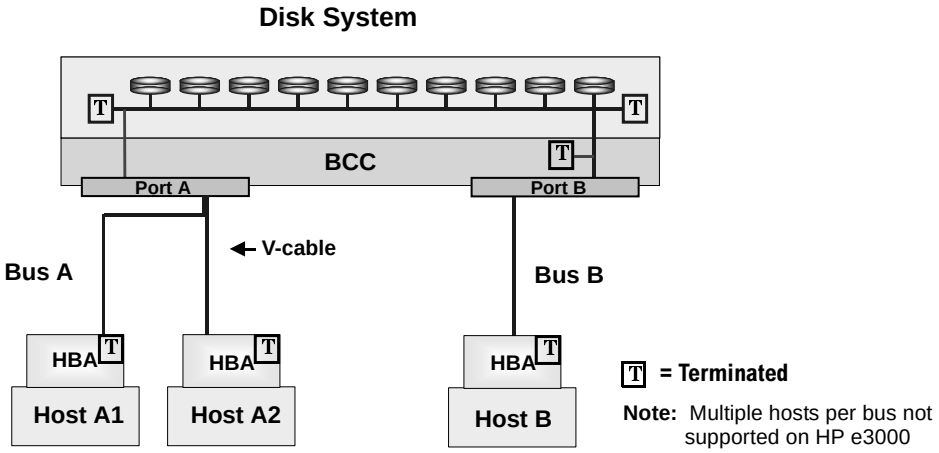


Figure 44 Buses with Different Termination in Full-Bus Mode

Disk Addressing

Each slot in the disk system occupies a separate address (SCSI ID) on the SCSI bus. Slot addresses range from 0 to 3 and 8 to 13 in full-bus mode. In split-bus mode, slots are addressed according to the Address High switch setting: 8 through 12 when Address High is on, and 0, 1, 2, 3, and 13 when Address High is OFF. Addresses 4, 5, 6, and 7 are reserved for host bus adapters.

Table 12 shows the SCSI addresses of all slots in full-bus and split-bus modes and with low and high addressing.

Table 12 Slot Addresses in Full and Split-Bus Modes

	Disk System Slot #	Full Bus	Split Bus	
			Addr High = 0	Addr High = |
SCSI Bus B	0	0	0	8
	2	1	1	9
	4	2	2	10
	6	3	3	11
	8	13	13	12
SCSI Bus A	1	8	0	8
	3	9	1	9
	5	10	2	10
	7	11	3	11
	9	12	13	12

High addresses have lower priority on the SCSI bus. Table 13 lists SCSI bus addresses in priority order from the highest to the lowest, left to right.

Note Shaded IDs are not used by the disk system.

Table 13 SCSI Bus Address Priority

SCSI ID	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Priority	Highest	→													Lowest	

Solid State Disks

The disk system supports solid state disk (SSD) modules on HP 9000 Classes A, D, K, N, T, and V. (Contact an HP sales representative for other platforms, including HP e3000, that may have been added to this list after publication.)

General Restrictions

The special characteristics of SSDs limit the configurations in which they can be installed. The following restrictions apply to all configurations unless otherwise noted:

- No more than two hosts are allowed on a bus with SSDs
- Split buses must use high addresses (see Setting DIP Switches on page 79)

Supported Configurations

The following configurations are supported at initial release. (Ask an HP sales representative for the current configurations.)

All SSDs or Fillers

In full-bus mode, install one to ten SSDs with fillers in unused slots. In split-bus mode, install one to five SSDs on each bus with fillers in unused slots.

One SSD per Bus and Up to Nine Hard Disk Drives or Fillers

Install the SSD in the slot with the lowest priority on the SCSI bus and hard disk drives (HDDs) in the remaining slots:

- In full-bus mode, install the SSD in slot 1 (SCSI ID 8). See Table 14.

Table 14 Slot Assignments for One Solid State Disk in Full-Bus Mode

ID	0	8	1	9	2	10	3	11	13	12
Disk	hdd	SSD	hdd	hdd	hdd	hdd	hdd	hdd	hdd	hdd
Slot	0	1	2	3	4	5	6	7	8	9

- In split-bus mode, install SSDs in slot 0 on bus B and in slot 1 on bus A. Slots 0 and 1 are SCSI ID 8 when Address High is ON. See Table 15.

Table 15 Slot Assignments for One Solid State Disk per Split Bus (Address High)

ID	8	8	9	9	10	10	11	11	12	12
Disk	SSD	SSD	hdd	hdd	hdd	hdd	hdd	hdd	hdd	hdd
Slot	0	1	2	3	4	5	6	7	8	9

One Hard Disk Drive and Up to Nine SSDs or Fillers

Save the slot with the *highest* priority on the bus for the *hard disk drive*. In full-bus mode, install SSDs or fillers in all *but* slot 6. Install the hard disk drive (HDD) in slot 6 (SCSI ID 3). See Table 16.

Note This configuration is limited to one host and full-bus mode.

Table 16 Slot Assignments for Nine Solid State Disks with One Hard Disk Drive (Full Bus)

ID	0	8	1	9	2	10	3	11	13	12
Disk	SSD	SSD	SSD	SSD	SSD	SSD	hdd	SSD	SSD	SSD
Slot	0	1	2	3	4	5	6	7	8	9

Setting Up the Hardware Event Monitor (HP-UX Only)

Hardware event monitors run on HP-UX hosts, versions 10.20 and 11.0. The Disk Monitor (disk_em) monitors all disks bound to sdisk drivers. Consequently, if the Disk Monitor is active on your host, it is already set up to monitor the disks of a new disk system. If you need to install or activate the Disk Monitor, refer to the *EMS Hardware Monitors User's Guide* in the latest IPR Support Media or on the Web (*http://www.docs.hp.com/hpux/systems/#ems*).

Note This Disk Monitor should not be confused with the EMS disk monitor that is used to monitor LVM resources.

The way you configure the monitor determines, among other things, where event messages will be sent and what level of severity will be reported.

4 TROUBLESHOOTING

Overview

The following steps will help you identify and resolve disk system failures:

1. Gather information from all sources:
   - Hardware event notifications (page 95)
   - Disk system LED status (page 97)
   - Online information tools (page 100)
2. Isolate the cause of the problem (page 101).
3. Correct the problem. (See chapter 5 for removal and replacement.)
4. Verify operational status with IOSCAN or other host utilities.

Event Notification (HP-UX Only)

The Disk Monitor, an EMS hardware event monitor, reports changes in disk status. Depending on how the monitor is set up, it sends messages to the console, an e-mail address, a log file, or a third-party application. These messages give early notice of a disk problem. Events include media errors, failed read and write attempts, invalid commands, changed operating parameters, failed diagnostics, and many others.

Event severity ranges from critical to informational:

Critical	An event that causes data loss, host system downtime, or other loss of service. Host system operation will be affected if the disk system continues to be used without correction. Immediate action is required. For example, read data could not be recovered.
Serious	An event that may cause data loss, host system downtime, or other loss of service if left uncorrected. Host system and hardware operation may be adversely affected. The problem needs repair as soon as possible. For example, the request queue is full.
Warning	An event that could escalate to a serious condition if not corrected. Host system operation should not be affected and normal use of the disk system can continue. Repair is needed but at a convenient time. For example, the bus failed to reset.
Information	An event that is expected as part of the normal operation of the hardware. No action is required. For example, write protection was switched on or off.

Event messages (see Figure 45) contain the following types of information:

- Message Data – Date and time the message was sent, the source and destination of the message, and the severity level
- Event Data – Date and time of the event, the host, event ID, name of the monitor, event number, event class, severity level, hardware path, associated OS error log entry ID

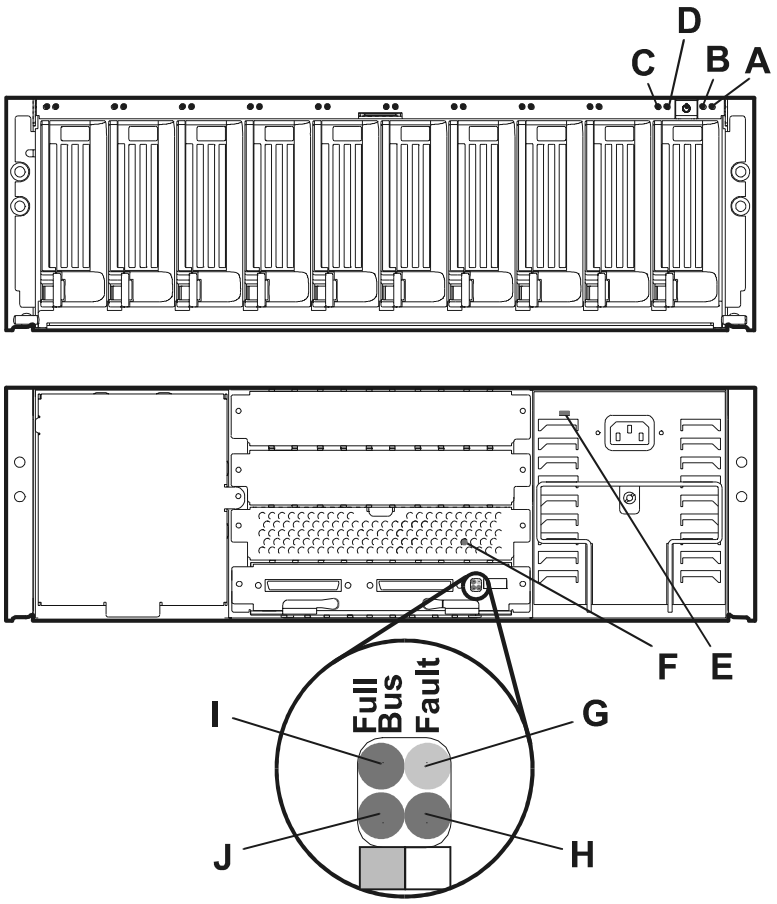
- Error Description – Narrative information indicating the component that experienced the event and the nature of the event
- Probable Cause/Recommended Action – The cause of the event and suggested steps toward a solution. This information should be the first step in troubleshooting.

```
Notification Time:  Wed Feb 3 11:27:15 1999

yourserver sent Event Monitor notification information:

/storage/events/disks/default/10_4_4_0.0 is >=1.
Its current value is CRITICAL(5)

Event data from monitor:

Event Time: Wed Feb 3 11:27:15 1999
Hostname: yourserver.rose.hp.com      IP Address : 15.43.213.13
Event ID: 0x0036b8a313000000002       Monitor    : disk_em
Event # : 100037                      Event Class: I/O
Severity : CRITICAL

Disk at hardware path 10/4/4/0.0 : Media failure
Associated OS error log entry id(s) : 000000000000000000

Description of Error:

     The device was unsuccessful in reading data for the current I/O
     request due to an error on the medium. The data could not be
     recovered. The request was likely processed in a way which could
     cause damage to or loss of data.

Probable Cause / Recommended Action:

     The medium in the device is flawed. If the medium is removable,
     replace the medium with a fresh one. Alternatively, if the medium
     is not removable, the device has experienced a hardware failure.
     Repair or replace the device, as necessary.
```

Figure 45 Sample Hardware Event Notification

Status LEDs

LEDs indicate the status of the disk system itself and each of its components (see Figure 46). Green and amber system LEDs are visible on the front of the disk system with the door closed. They show that (A) a fault has occurred and (B) power is on. Disk activity LEDs (C) are on the front of the disk system above each disk module. Other LEDs are on each component in the back of the disk system.



A system fault LED
B system power LED
C disk activity LED
D unused
E power supply LED
F fan LED
G BCC Fault LED
H bus active LED
I Full Bus LED
J bus active LED

Figure 46 LED Status Indicators

LED states are described in Table 17.

Table 17 LED Functions

LED	State	Indication
System Power	Green	Power is on
	OFF	Power is off
System Fault	Amber	Self-test[1] / Component fault
	OFF	Normal operation
	Flashing	An incompatible BCC is installed in the second slot, or the DIP switch settings on dual BCCs are incompatible.
Full Bus	Green	Buses are bridged, combining all ten disk modules on one bus
	OFF	Disk modules are distributed, odd and even, across two buses
(BCC) Fault	OFF	Normal operation
	Flashing	An incompatible BCC is installed in the second slot, or the DIP switch settings on dual BCCs are incompatible.
Bus Active LEDs (LEDs correspond to bus connectors, left to left, right to right.)	Green	Bus is available for use[3]
	OFF	Bus is not available (isolator chip is disabled)[3]
	Flashing	I/O activity on the bus
Fan	Amber	Start-up[1] / Fault
	Green	Normal operation
	OFF	Power is off
Power Supply	Amber	Start-up[1] / Fault
	Green	Normal operation
	OFF	Power is off

1 Start-up and self-tests occur briefly when the unit is powered on.
2 When a disk module is installed with power on, its activity LED stays on until the disk has spun up. When the disk is ready, the LED turns off. Thereafter, it flashes when there is I/O to the disk.
3 If there is no term power supplied by a host connect, the isolator chip will be disabled to prevent “noise” on the backplane. The bus LED turns on when term power is present.

Table 17 LED Functions (cont'd)

LED	State	Indication
Disk Activity[2]	ON	Installed and spinning up. If the LED is still on 3 minutes after power is engaged, the disk may be faulty.
	Flashing	I/O activity on the disk
	OFF	Not installed, not operating, or no I/O activity

1 Start-up and self-tests occur briefly when the unit is powered on.
2 When a disk module is installed with power on, its activity LED stays on until the disk has spun up. When the disk is ready, the LED turns off. Thereafter, it flashes when there is I/O to the disk.
3 If there is no term power supplied by a host connect, the isolator chip will be disabled to prevent "noise" on the backplane. The bus LED turns on when term power is present.

Note An amber light that is on briefly when a component first comes on is normal. If this light remains on more than a couple of seconds, a fault has been detected.

View Disk Status

HP-UX and MPE/iX utilities provide descriptive and diagnostic information about disks, including disk type, firmware revision, and errors. On HP-UX and MPE/iX 6.5, the disk utility is Support Tools Manager (STM). On MPE 6.0, use SYSDIAG.

STM Disk Information: HP-UX

STM displays the last-generated Information Log for a selected disk. Start STM and run the Information tool as follows.

1. Log on the system.
2. At the system prompt, type **xstm&**. STM starts and displays a graphic of the devices on the system.
3. Select the desired disk.
4. Select **Information** from the Tools menu.
5. To generate a current log, select **Run**. The log will be displayed as soon as it is generated

   To view a log without updating the contents, select **Information Log**.
6. Select **Done** when you have finished viewing the information.
7. To quit STM, type **exit**.

Figure 47 shows a sample Information Log.

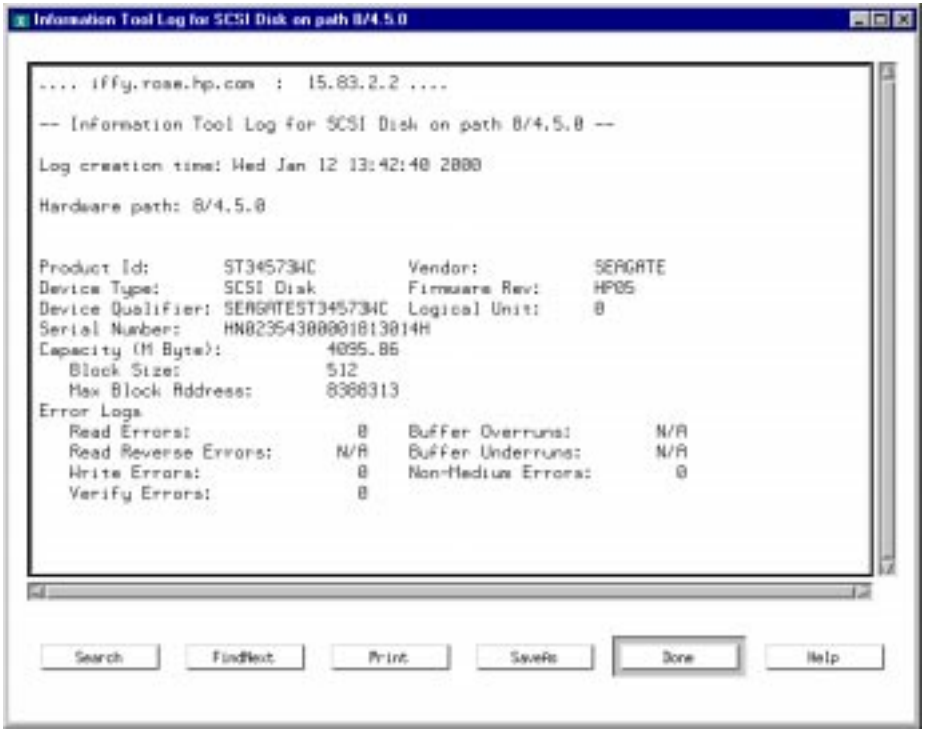


Figure 47 Sample STM Information Log (HP-UX)

STM Disk Information: MPE/iX 6.5

STM displays the last-generated Information Log for a selected disk. Start STM and run the Information tool as follows.

1. Log on the system.
2. At the system prompt (:), type **vsclose** <physical volume number>. This removes the disk from use.
3. At the system prompt (:), type **cstm**. STM starts.
4. At the cstm prompt, type **map**. STM displays a list of all the disks installed on the system.
5. Select the desired disk by typing **select device** <number>; for example, **select device 15**.
6. Type **information**. STM updates the system map.
7. To display the information log, type **infolog**.

   STM's Expert Tool is another way to view the internal error logs of a selected disk. Type **experttool** at the cstm prompt; then type **viewlog**

   Figure 48 shows a sample Disk Expert error log.
8. Type **exit** when you have finished viewing the information.
9. To perform a read-only media test, type **experttool**;
   then type **seekrand**. Type **exit** when you have finished viewing the information.
10. Quit STM by typing **exit**.
11. At the system prompt (:), type **vsopen** <physical volume number> to restore the disk to use.

```
Write Error Statistics

    Errors Corrected Without Delay:   N/A
    Errors Corrected With Delay:      0
    Total Retries:                    0
    Total Errors Corrected:           0
    Correction Algorithm Executions:  0
    Total Bytes Processed:            6.3253e+10
    Total Uncorrected Errors:         0

Read Error Statistics

    Errors Corrected Without Delay:   23781
    Errors Corrected With Delay:      0
    Total Retries:                    0
    Total Errors Corrected:           23781
    Correction Algorithm Executions:  23781
    Total Bytes Processed:            9.6191e+10
    Total Uncorrected Errors:         0

Read Reverse Error Statistics

    Errors Corrected Without Delay:   N/A
    Errors Corrected With Delay:      N/A
    Total Retries:                    N/A
    Total Errors Corrected:           N/A
    Correction Algorithm Executions:  N/A
    Total Bytes Processed:            N/A
    Total Uncorrected Errors:         N/A

Verify Error Statistics

    Errors Corrected Without Delay:   0
    Errors Corrected With Delay:      0
    Total Retries:                    0
    Total Errors Corrected:           0
    Correction Algorithm Executions:  0
    Total Bytes Processed:            36864
    Total Uncorrected Errors:         0

Non-Medium Error Counts:              0
```

Figure 48 Sample STM Expert Tool Disk Error Log (MPE/iX 6.5)

SYSDIAG Disk Information: MPE/iX 6.0

SYSDIAG displays the disks' internal logs, which are automatically updated each time Predict runs.

To use SYSDIAG, you must supply a password (HP-Only or temporary) and the physical and logical device number of the target disk.

1. Log on the system.
2. At the system prompt (:), type **vsclose** <physical volume number>. This removes the disk from use.
3. At the system prompt (:), type **suplicen** <HP-Only or temporary password>.
4. Still at the system prompt (:), type **sysdiag**.
5. At the sysdiag prompt (DUI>), type **scsidsk2 ld=**<logical device number> **sc=17**
6. At the scsidsk2 prompt (SCSIDSK2>), type **acc**. The Access Log utility displays the type of disk drive and prompts for a log type: (D) usage and data log, (H) hardware error log, or (B) both.

Note Type **help** to view the complete list of scsidsk2 commands.

7. Enter the letter of your log choice: D, H, or B. The log is displayed. The composition of error logs varies with the disk model and diagnostics version. See Figure 49 for an example.

```
Usage and Data Error Log
========================

Area = Volume
Access Count = 7
Blocks Accessed = 1186341
First Retry Count = 0
Multiple Retry Count = 0

There are no data error log entries

Hardware Error Log
==================

There are no hardware error log entries
```

Figure 49 Sample SYSDIAG Information Log (MPE/iX 6.0)

8. To clear the log for later reinspection, type **cle**.
9. To run a read-only media test on the disk, type **ro**.
   Choose the option **s** (selected area) and specify a block or vector address. Reading the whole volume takes a long time.
10. Exit SYSDIAG by typing **exit** at the SCSIDSK2 prompt and again at the DUI prompt.
11. Restore the disk to use by typing **vsopen** <physical volume number>.

Isolating Faults

Table 18 lists the probable causes and solutions for problems you may detect on the disk system. When more than one problem describes your situation, investigate the first solution that applies. The table lists the most basic problems first and excludes them from subsequent problem descriptions.

Table 18 Troubleshooting Table

Problem Description	LED State	Probable Cause/Solution
Disk system fails to power on when installed	System power LED and power supply LED are off	– Power cord is not plugged in. – The power button is not pressed. – AC breaker is tripped or AC power source has failed. – The PDU/PDRU is defective. Replace. – Power supply is faulty. Replace.
	System power LED is off; power supply LED is amber	A faulty component is causing power supplies to turn off. Remove all components and reinsert one at a time, starting with the power supplies, until the faulty component is isolated.
Alarm sounds at startup	System fault LED and BCC fault LED flash	– An incompatible BCC is installed in the second slot. – DIP switch settings on secondary BCC are incompatible with the primary BCC.
System fault LED is on	Power supply LED is off	– A redundant power supply is present but not connected to AC. – The PDU/PDRU or primary power source for the (redundant) power supply has failed.
	Fan LED is amber	Fan has slowed or stopped. If the fan is not redundant, shut down the disk system. Replace fan.
	Power supply LED is amber	– Power supply hardware is faulty. If the power supply is not redundant, shut down the disk system. Replace power supply. – An incompatible or defective component caused a temporary fault. Unplug the power cord and wait for the LED to turn off. Reinsert the power cord. If the fault persists, replace the power supply.

Table 18 Troubleshooting Table (cont'd)

Problem Description	LED State	Probable Cause/Solution
Alarm sounds when BCC is inserted	BCC and system fault LEDs flash	Internal or external DIP switches on the new BCC do not match the DIP switch settings on the installed BCC.
EMS reports critical errors	Disk module LED is on or off	Use diagnostic utilities (STM or Sysdiag) to determine disk status. Depending on the results, monitor or replace disk module.
IOSCAN (HP-UX) lists disk as NO_HW, or Mapper or DSTAT ALL (MPE/iX) lists no device type	On or off	– Disk module is faulty. Replace. – Backplane is faulty. Replace. – If the all disks on the bus have this problem, the cable is faulty. Replace the cable. – If all disks in the disk system have this problem, the BCC is faulty. Replace the BCC.
SCSI cable is connected but corresponding LED is off	Bus active LED is off	– The host is not on. – The disk system is connected in an invalid configuration. Reconnect in a valid configuration (see chapter 3). – The HBA is faulty. Troubleshoot the HBA.

5 REMOVAL AND REPLACEMENT

Disk Module

Bus Control Card

Fan

Power Supply

Disk System

Door

Top Cover (HP-Qualified Only)

Backplane/Mezzanine (HP-Qualified Only)

Caution Do not remove fillers or hot-pluggable components until you are ready to install the replacement parts. An empty slot will cause uneven cooling and eventual overheating.

Disk Module

Add or replace disk modules to increase storage capacity or eliminate faults. (See chapter 4 for troubleshooting procedures.) Disk modules must be Ultra-2 SCSI (LVD) but can vary in capacity. For current information about supported disks, consult an HP sales representative.

You do not need to turn off the disk system to replace a disk module or filler.

Preparation

Removing or replacing a disk module has consequences for the file systems and logical volumes located on the disk. Before removing or replacing a disk module, complete the appropriate system administration for your environment and configuration. For HP-UX instructions, please refer to *How HP-UX Works: Concepts for the System Administrator*. For MPE/iX instructions, refer to *Communicator 3000 MPE/iX* for your operating system release or see the *Mirrored Disk/iX User's Guide*.

In addition to dismounting file systems, if you are replacing a solid state disk module, issue a SCSI STOP UNIT command before removing the target disk. This command causes the solid state disk to download data from volatile solid state memory to the disk's hard drive. If you do not initiate the download before removing the disk module from the disk system, the disk will perform the download using its battery power.

Tools

- Small flat-blade screwdriver
- ESD wrist strap

To Remove a Disk Module or Filler

Caution To prevent damage from static electricity, follow standard ESD procedures and avoid touching exposed circuitry.

Do not remove a disk module or filler from an operating product until you have the replacement part and are ready to install it. An empty slot will cause uneven cooling and eventual overheating.

1. Unlock and open the disk system door.
2. Insert the plug of your static wrist strap into the disk system ESD socket (A in Figure 50).

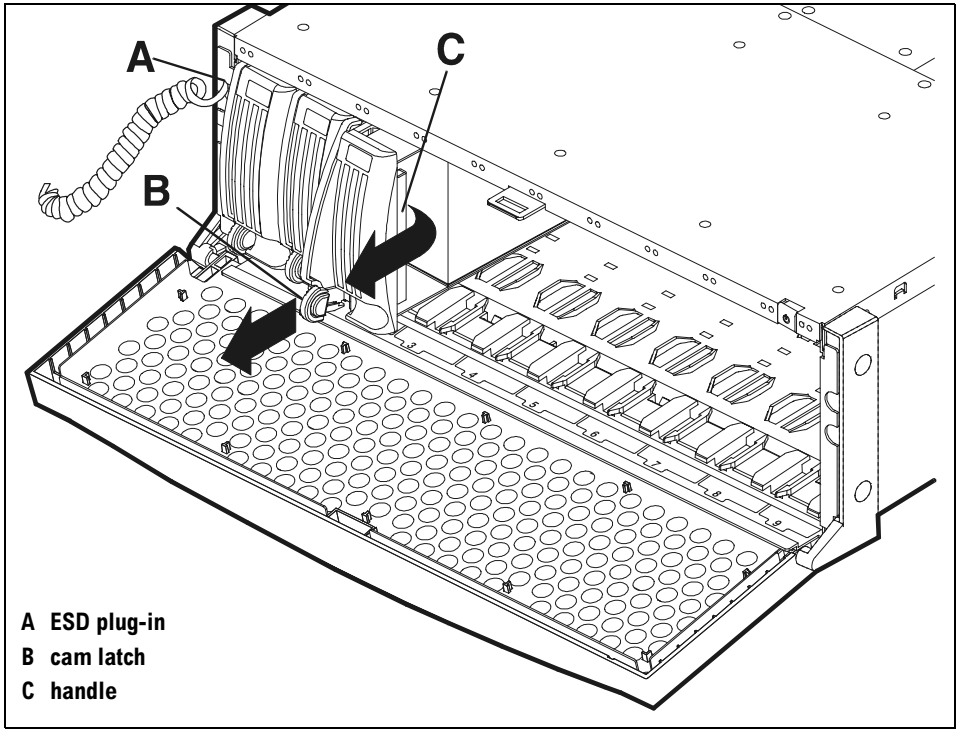


Figure 50 Disk Removal

3. If you are removing a filler, pull out the filler and begin the procedure for inserting disk modules on page 113.

   If you are removing a disk module, continue with Step 4.

Caution Spinning disks generate heat and gyratory force. Wait for a spinning disk to slow down and cool off before completely removing the module from the disk system.

4. Squeeze the cam latch (B) and pull it toward you just enough to disconnect the disk module from the backplane.

WARNING **High current available: Avoid touching the backplane or adjacent disk electronics when removing and inserting disk modules.**

5. Wait for the disk to spin down and then pull the module out of the slot, using the latch until the handle (C) is exposed enough to grasp.

   – A hard disk drive needs about 30 seconds to spin down.

   – A solid state disk module needs up to 8 minutes to download any data that is still in solid state memory to its hard disk component. If you did not issue a SCSI STOP UNIT command before removing the disk module, the operation will begin as soon as the disk disengages the backplane. Make sure that the disk's internal LEDs are off and that all noise has stopped before removing the module completely from the disk system.

Caution If the disk module will be reused, place it on a static mat or other ESD-protected surface.

Replace the disk module or filler immediately (see below).

To Insert a Disk Module

Caution Follow standard ESD procedures and avoid touching exposed circuitry. Touching the disk circuit board can cause high energy discharge and permanently damage the disk.

Disks are fragile. Handle carefully.

1. Remove the replacement disk module from its ESD bag, being careful to grasp the module by its handle (A in Figure 51).

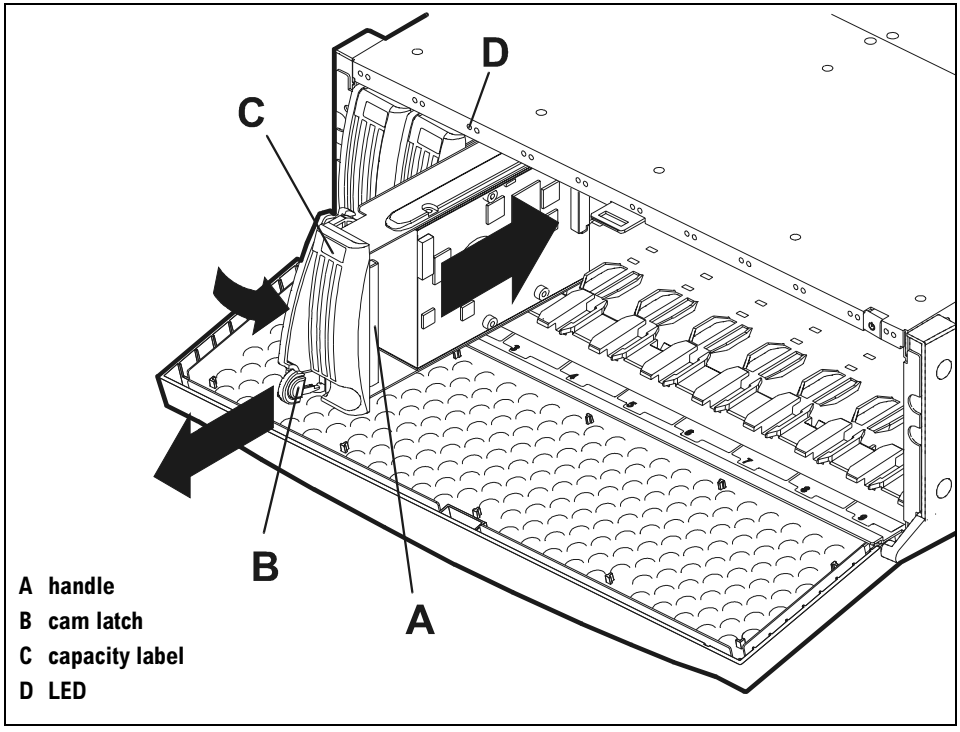


Figure 51 Disk Installation

2. Pull the cam latch (B in Figure 51) away from the module.

Note For safe insertion, use two hands to hold the module — one on the handle and the other on the frame.

3. Slide the disk module, capacity label up (C), into the empty slot.
4. Close the cam latch to seat the module firmly on the backplane. An audible click indicates the latch is closed.
5. Monitor the LED (D). It will be on while the disk spins up and then turn off. Thereafter the LED blinks when there is I/O activity. If you observe different results, refer to chapter 4, Troubleshooting, for probable causes and remedies.

Note The solid state disk module will spin up but its solid state memory will not be available until the module's battery is fully charged. A fully discharged battery takes 8 hours to charge after it is powered on. In the meantime, the module will use its hard disk component to record data.

6. Unplug your ESD strap and close and lock the disk system door.
7. Ensure that the host recognizes the new disk. On HP-UX, run IOSCAN and make sure that the disk is CLAIMED. On MPE/iX, run **dstat all** and confirm the logical device and type.
8. Restore file systems and data as needed (see your system administration guide).

Bus Control Card

Replace a Bus Control Card (BCC) when the card is faulty (see “Isolating Causes” in chapter 4).

There is no need to turn off the disk system to remove and replace a BCC. However, all disks will be unavailable for I/O while the BCC is removed. Please refer to your system administrator manual for recommended file management procedures.

Tools

- Torx T15 or flat-blade screwdriver
- Narrow (1/8-inch) flat-blade screwdriver (to set switches)
- ESD wrist strap

To Remove a BCC

Caution Do not remove a BCC from an operating product until you have the replacement BCC and are ready to install it. An empty slot will cause uneven cooling and eventual overheating.

1. Attach the clip end of your ESD wrist strap to ground. There are designated ground studs at the top of HP cabinets.
2. Disconnect the cable(s) from the BCC.
3. Loosen the two locking screws (A in Figure 52) until they clear the disk system chassis. The screws stay in the card.

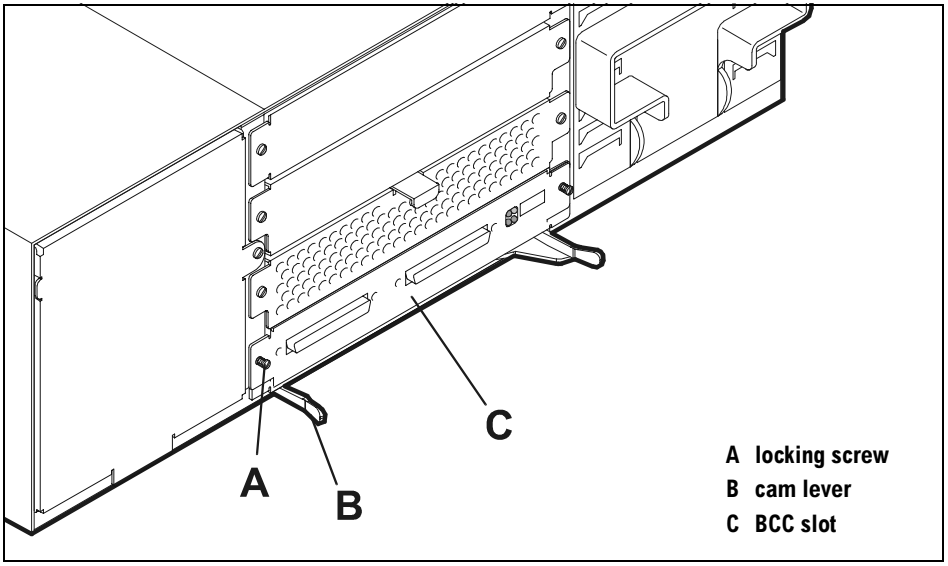


Figure 52 Bus Control Card Removal

4. Open the cam levers (B) by pulling them away from the center of the card. This disconnects the BCC pins from the backplane.

Caution Touching the BCC pins can cause high energy discharge and permanently damage the BCC.

5. Pull the BCC out of the slot, avoiding contact with exposed circuits.

   Replace the BCC immediately if the disk system is in operation (see next step).

To Insert a BCC

Caution Touching the BCC pins can cause high energy discharge and permanently damage the BCC.

1. Remove the replacement BCC from its ESD bag.
2. Set internal and external DIP switches on the new BCC as needed. If there is no reason to change the previous configuration, match the switch settings of the BCC that is being replaced. To evaluate switch settings, refer to chapter 3, Configuration.
3. Open the cam levers (A in Figure 53) by pulling them away from the center of the card.

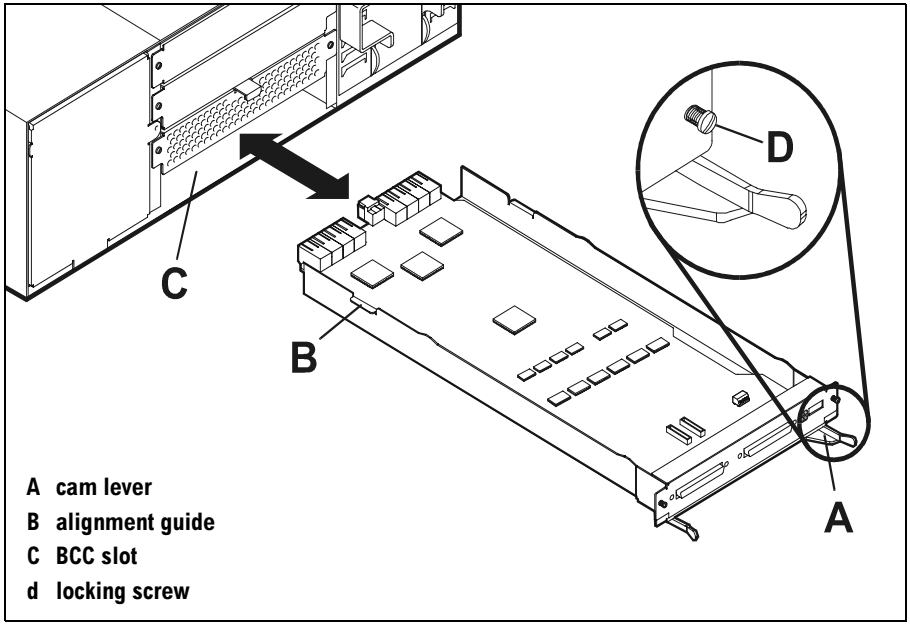


Figure 53 Bus Control Card Insertion

4. Align the flange (B) on the BCC with the rail inside the bottom slot (C), and insert the BCC. The open side of the canister faces up in the bottom slot, down in the top slot.

5. Push the cam levers flat against the center to seat the BCC pins firmly on the backplane.

   A short beep indicates the BCC is engaged and operational. If the fault LED stays on, replace the BCC.

6. When there is no fault indication, tighten the locking screws (D in Figure 53).

7. Reattach the SCSI cable(s) to port A or B, or both. The corresponding bus LED(s) will be lit if the bus is operational.

Fan

Replace a fan as soon as possible upon determining a fan failure (see chapter 4, Troubleshooting). If a second fan is installed, it maintains proper air flow through the disk system. If the second fan is not installed or fails before the first is replaced, the disk system must be turned off to avoid overheating.

You do not need to turn off the disk system to replace a redundant fan.

Tool

- Torx T15 or flat-blade screwdriver

To Remove and Replace a Fan

Caution Do not remove a fan from an operating product until you have the replacement fan and are ready to install it. An empty slot will cause uneven cooling and eventual overheating.

1. Loosen the two locking screws (A in Figure 54) until they clear the disk system chassis. The screws stay with the fan.
2. Pull the fan out of the chassis by the metal tab (B).
3. Insert the replacement fan into the vacated slot (C).
4. Monitor the fan LED. It should flash amber and then turn green. If the LED is not green, refer to chapter 4, Troubleshooting.
5. Tighten the locking screws (A).

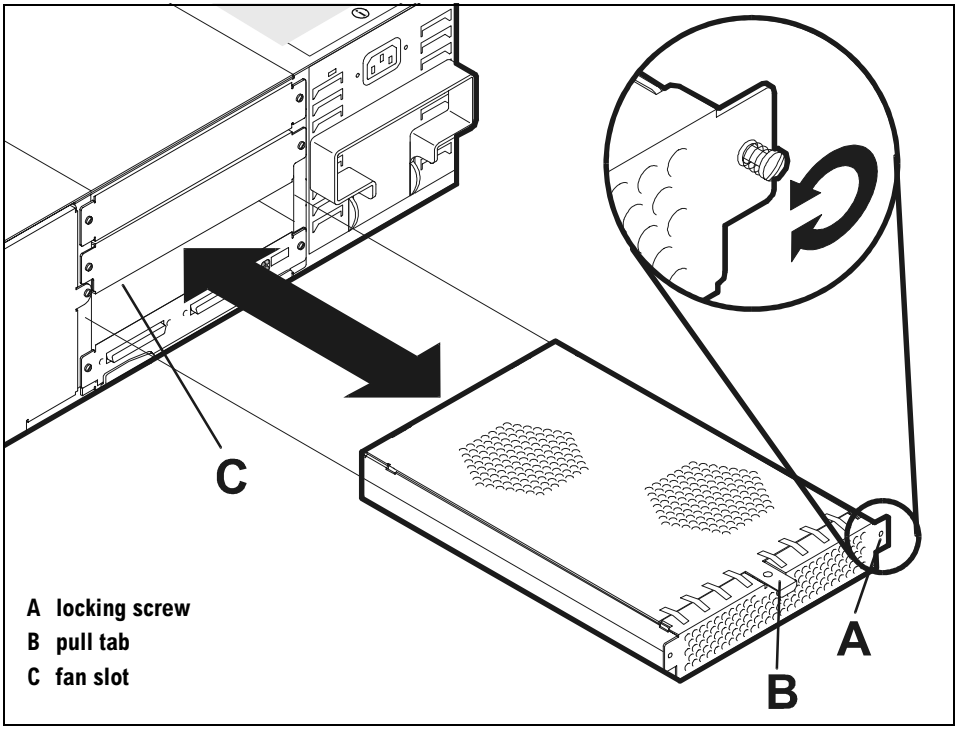


Figure 54 Fan Removal and Replacement

Power Supply

Replace a power supply as soon as possible when you detect a power supply failure (see "Isolating Causes" in chapter 4). If a second power supply is installed, it provides proper voltage to the disk system. If the second power supply is not installed or fails before the first is replaced, the disk system will turn off.

You do not need to turn off the disk system to replace a redundant power supply.

Tool

- Torx T15 or flat-blade screwdriver

To Remove and Replace a Power Supply

Caution Do not remove a power supply from an operating product until you have the replacement and are ready to install it. An empty slot will cause uneven cooling and eventual overheating.

Power supply may be hot to touch.

1. Disconnect the power cord from the power supply.
2. Loosen the screw (B in Figure 55) from the cam handle (A).
3. Pull the handle down to disengage the power supply from the backplane.
4. Pull the power supply out of the chassis. Support the far end of the supply with your free hand as it clears the chassis.

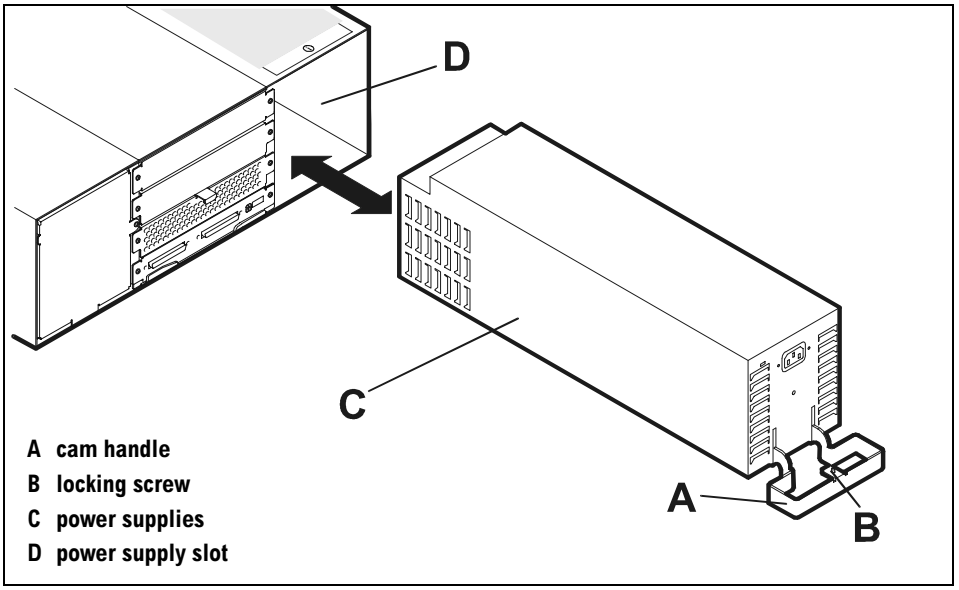


Figure 55 Power Supply Removal and Replacement

5. With the handle down, slide the replacement power supply into the vacated slot (D in Figure 55). As the power supply begins to engage the backplane, 3/8 inch (8mm) will still be exposed.
6. Rotate the handle up to draw the power supply the last 3/8 inch into the chassis and firmly seat the power supply on the backplane. The power supply should be flush with the edge of the chassis.
7. Tighten the screw (B) in the cam handle (A).
8. Plug the power cord into the power supply and electrical source.
9. Monitor the power supply LED. It should turn green. If the LED is dark or stays amber, see chapter 4, Troubleshooting.

Disk System

Use this procedure if you need to remove and replace the disk system, or if you need to push the disk system forward in order to replace the door, backplane, or mezzanine board.

The disk system must be off for this procedure.

Caution Do not move the disk system with disk modules installed and power on. Even a 1-inch drop of the disk system can damage spinning disks.

Tools

- Torx T25 screwdriver
- Small flat-blade screwdriver

To Move a Disk System

1. Perform recommended system administration for dismounting drives. (See system administration documentation for file management procedures.)
2. Use a flat-blade screwdriver to unlock and open the disk system door (see Figure 56).

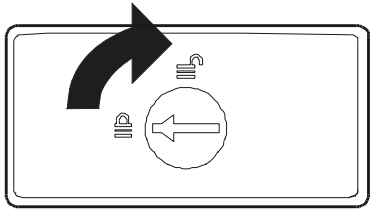


Figure 56 Door Lock

3. Press and release the power button (A in Figure 57) to turn off the disk system.
4. If you are going to replace the backplane or mezzanine, remove disk modules and fillers at this time. See page 111.
5. Remove the screws from the disk system mounting ears (B).

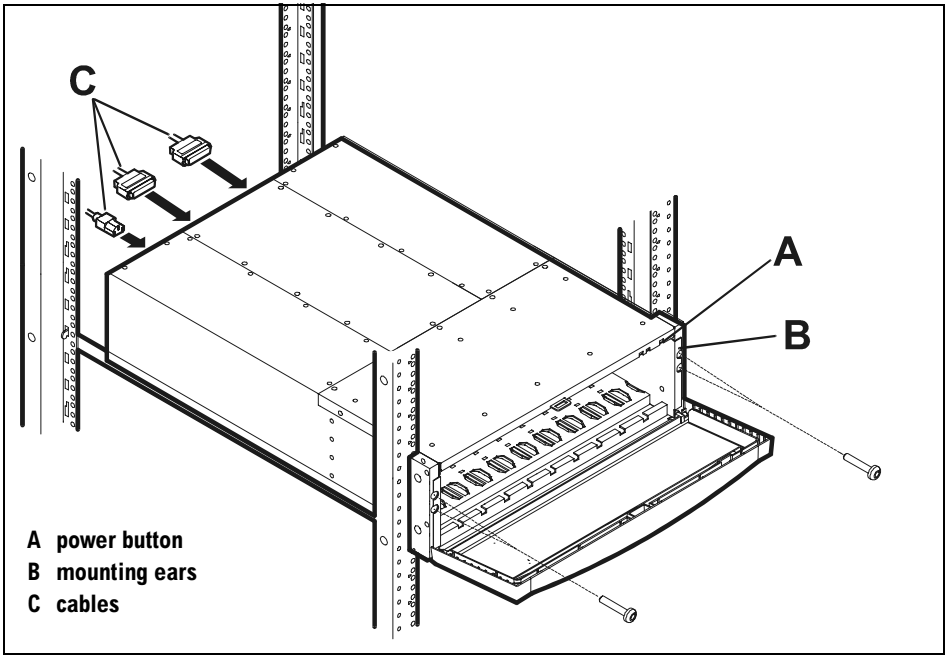


Figure 57 Disk System Removal and Replacement

6. Close and lock the door.
7. Disconnect power and SCSI cables (C) from the back of the disk system.

WARNING **Product is heavy (~65 lbs. without disks). If you choose to remove the disk system from the rack, use the assistance of another person or a lift device.**

8. Push the disconnected disk system forward or lift it completely out of the rack, as needed.

To Mount a Disk System

WARNING **Product is heavy (~65 lbs. without disks). If you choose to remove the disk system from the rack, use the assistance of another person or a lift device.**

1. When you are ready to remount the disk system, push the chassis back into the rack.
2. Unlock and open the door.
3. Insert and tighten the screws in the mounting ears (B in Figure 57).
4. Reinstall all disk modules and fillers that were removed. See page 113.
5. Reconnect SCSI cables and power cords (C).
6. Return to the front and press the power button (A) to turn on the disk system.
7. Watch the disk module and disk system LEDs for activity. If an amber light remains on for more than a couple of seconds, begin troubleshooting. If a disk LED remains on longer than 3 minutes, begin troubleshooting.
8. When no faults are indicated, close and lock the door.
9. Perform necessary system administration to return file systems to service.

Door

The front door is required for regulatory compliance. Replace the door immediately if it is damaged.

You will need to turn off the disk system because replacing the door requires moving the disk system forward in the rack. Turning the power off and disconnecting power and SCSI cables prevent inadvertently pulling out live cables and causing an unplanned shutdown.

Tools

- Torx T25 screwdriver
- Small flat-blade screwdriver

To Remove and Replace the Door

1. Move the disk system 2 to 3 inches forward in the rack. See To Move a Disk System on page 123.
2. With the door closed, remove two screws from each hinge block (C in Figure 58).
3. Pull the hinge blocks straight out from the sides of the product, letting the latch hold the door in place.
4. Supporting the door with one hand, unlock and remove the door.
5. To replace the door, insert the bottom flange (D) of the disk system between the gasket and bottom edge of the new door.
6. Close and lock the door, letting the latch hold the door.
7. Insert the right and left hinge blocks behind the disk system mounting ears (E), aligning all holes and inserting the hinge arm (F) over the pin on the bottom of the door.
8. Insert and tighten two screws through each hinge block and disk system chassis.

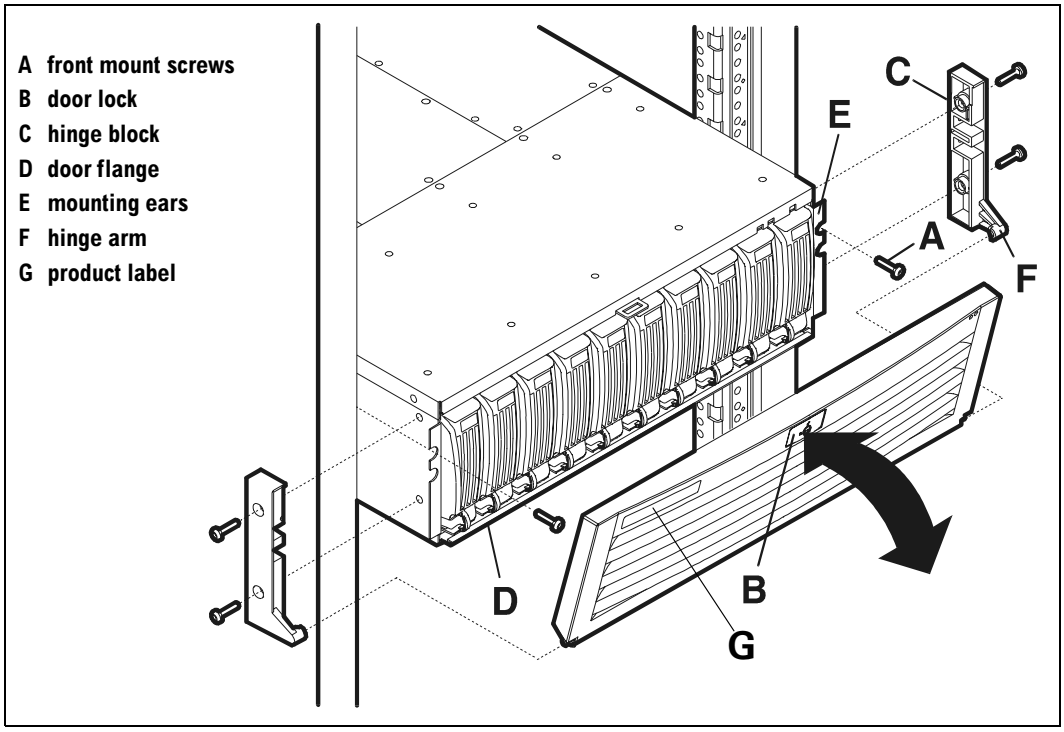


Figure 58 Door Removal and Replacement

9. Peel the backing off the HP SureStore E Disk System LVD10 product label and press the label into the recessed area (G) on the outside of the door.
10. Reattach the disk system to the rack. See page 125.

Top Cover (HP-Qualified Only)

The following procedure is for HP-qualified personnel only.

Remove and replace the top cover (not a replaceable part) in order to replace the backplane or mezzanine board.

Power must be off for this procedure.

Tools

- Small flat-blade screwdriver
- Torx T25 screwdriver
- Torx T10 screwdriver

To Remove the Top Cover

Caution Disk module slots must be empty before removing the top cover.

1. Move the disk system 10 inches forward, or remove the disk system entirely. See instructions on page 123, and be sure to include the step for removing disk modules.

Caution Removing the top cover with the power switch in the ON (in) position can damage the internal switch.

2. Remove the nine Torx T10 screws from the back and side edges of the cover plate (A in Figure 59). Screws are marked by a star pattern in the sheet metal.
3. Slide the cover forward about 1 inch; then lift up and out of the product.

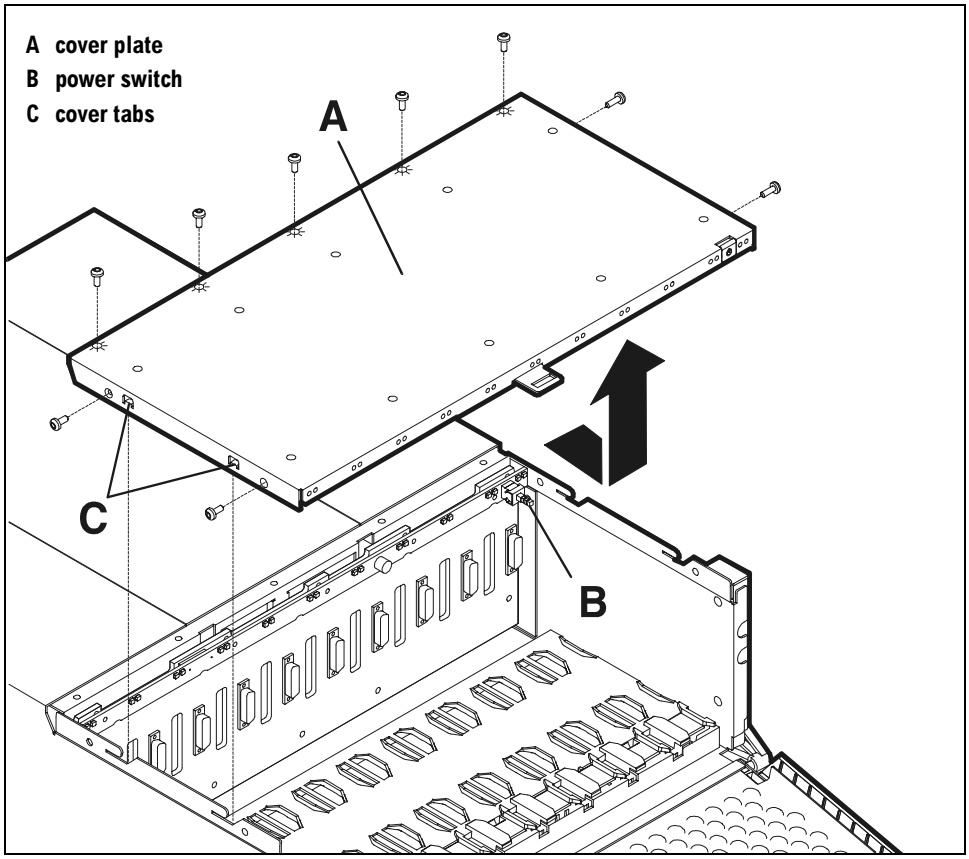


Figure 59 Top Cover Assembly

To Install the Top Cover

1. When you are ready to replace the cover, set the cover on the chassis so that the tabs (C in Figure 59) settle into the slots in the upper edge of the chassis.
2. Slide the cover to the middle of the chassis. The push rod automatically engages the internal switch (B).
3. Insert and tighten the Torx T10 screws along the back and side edges of the cover.
4. Follow the steps to remount the disk system, including disk modules and fillers. See page 125.

Backplane/Mezzanine (HP-Qualified Only)

The backplane and mezzanine boards are replaceable by HP-qualified personnel only.

Replace the backplane based on troubleshooting results (see “Isolating Causes” in chapter 4). Disk modules, BCCs, fans, and power supplies connect to the backplane. The backplane also contains the mezzanine board, which can be replaced independently if it is damaged or broken. The mezzanine contains the power switch.

The power must be OFF (out) and the top cover removed in order to remove and replace the backplane and/or mezzanine board.

Caution Turning off a disk system isolates the enclosed disks from the host. Perform recommended system administration to prevent loss of pending I/Os to the disks.

Tools

- Small flat-blade screwdriver
- Torx T25 screwdriver
- Torx T15 screwdriver
- Torx T10 screwdriver
- ESD strap

To Remove and Replace the Mezzanine or Backplane

1. Remove the top cover. See page 128.
2. Put on your ESD strap and attach the free end to the ESD plug on the disk system.

Caution Static discharge can destroy functional components on the backplane.

3. If you are removing only the mezzanine:

   a. Remove the five Torx T10 screws securing the mezzanine to the backplane (see Figure 60).

   b. Pull the mezzanine board free of its connector (C) on the backplane.

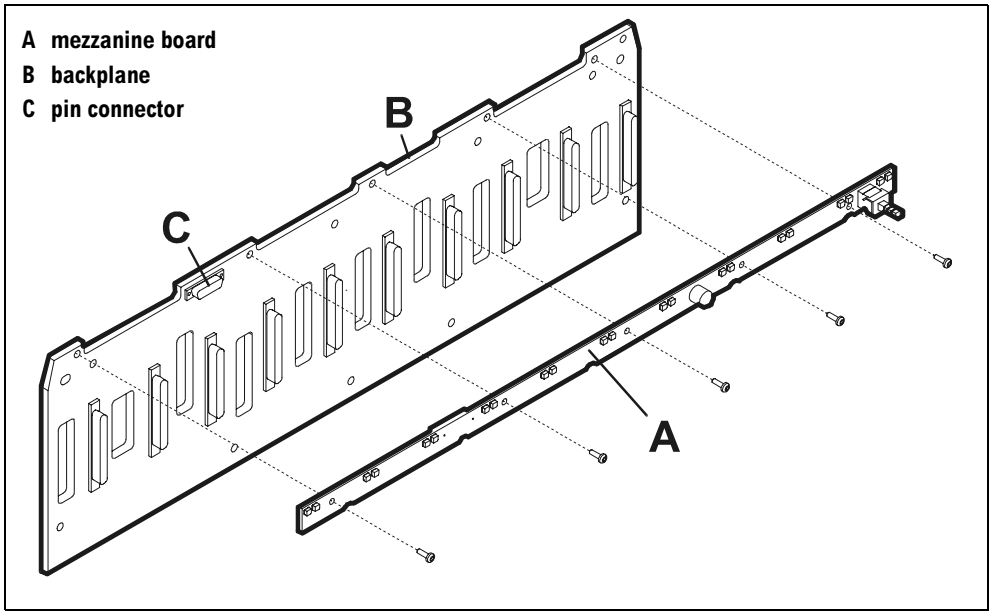


Figure 60 Mezzanine Assembly

4. If you are removing the backplane:

   a. Remove the locking brackets and pull the power supplies free of the backplane (see page 121).

   b. Loosen the locking screws, open the extractors, and pull the BCCs free of the backplane (see page 115).

Note There is no need to loosen the fans.

c. Remove the ten Torx T15 screws along the top and bottom edges of the backplane (see Figure 61).

d. Pull the backplane forward to clear the alignment pins (B) and lift the backplane up and out of the disk system.

5. To replace the backplane:

a. Stand the new backplane inside the chassis and push it over the alignment pins (B in Figure 61). Connectors automatically align with the floating fan connectors inside the chassis.

b. Insert and tighten ten screws into the backplane and chassis.

c. Reseat and secure the BCC (see page 117).

d. Reseat and secure the power supplies (see 5. on page 122).

6. To replace the mezzanine:

a. Attach the new mezzanine to the backplane pin connector (C in Figure 60).

b. Insert and tighten five Torx T10 screws through the mezzanine and into the backplane.

7. Replace the top cover and remount the disk system. See page 129.

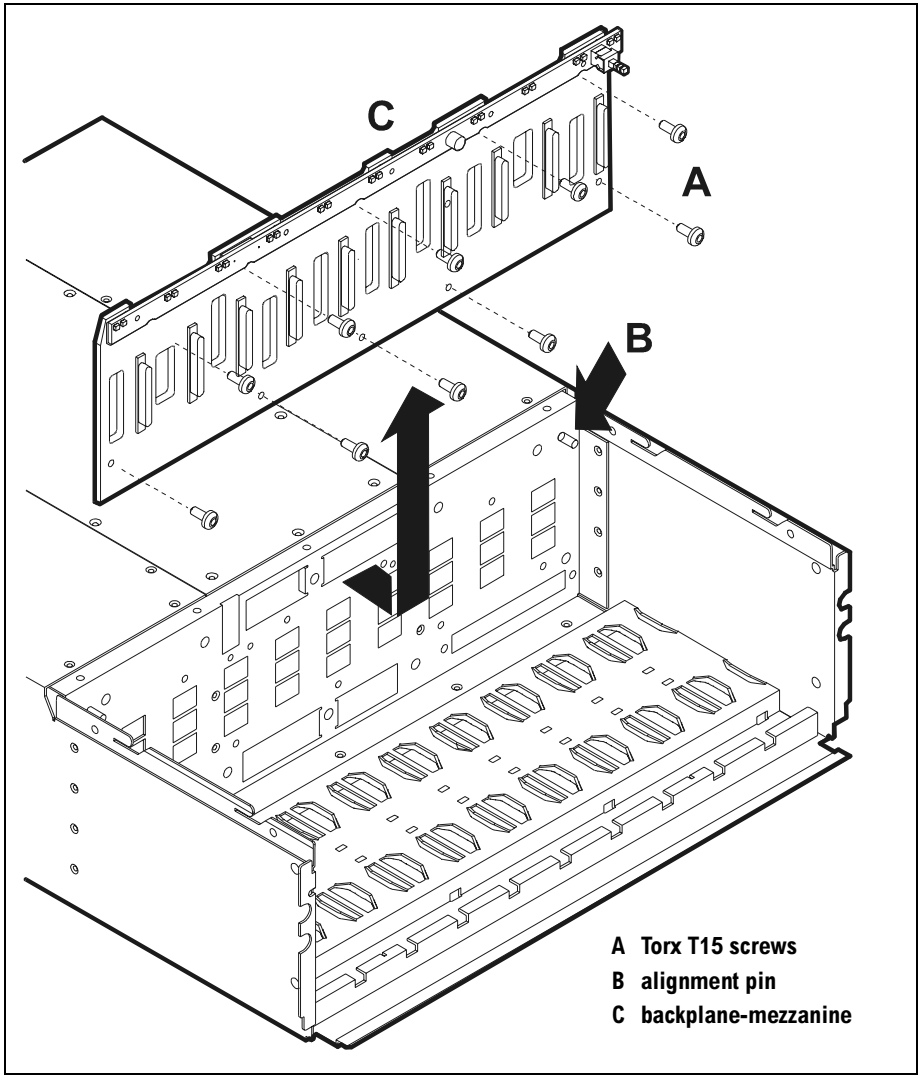


Figure 61 Backplane Assembly

6 UPGRADING

Adding Redundancy

If you purchased a standard disk system, you can add redundancy and improve the disk system's availability by installing a second fan (HP A5629A), power supply (HP A5630A), and BCC (A5632A).

Installing a Second Fan

Install the second fan in the second slot from the top in the rear of the disk system. You do not need to turn off the disk system to add a fan.

Tool

Torx T15 or flat-blade screwdriver

Procedure

Caution Do not remove the filler panel unless you are ready to install the fan. An empty slot will cause uneven cooling and eventual overheating.

1. Loosen the screws and remove the filler panel from the second slot from the top in the rear of the disk system (Figure 62).

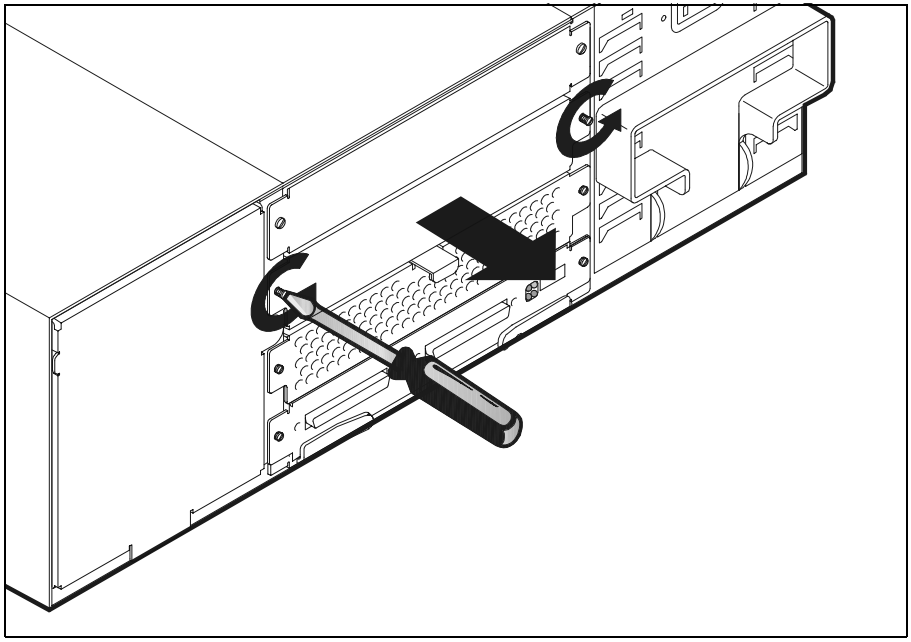


Figure 62 Removing Fan Filler Panel

Save or discard the filler panel. If you ever need to remove the fan, the filler could be useful.

2. Slide the fan into the empty slot (Figure 63).

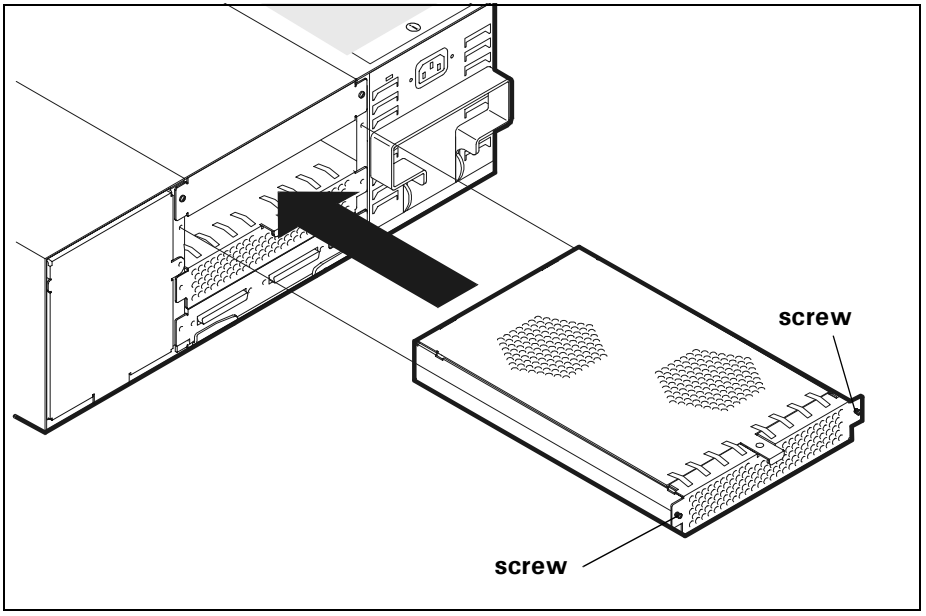


Figure 63 Installing a Second Fan

3. Tighten the locking screws in the left and right ends of the fan bulkhead.

Installing a Second Power Supply

Install the second power supply in the leftmost slot at the rear of the disk system. You do not need to turn off the disk system to add a power supply.

Tool

Torx T15 or flat-blade screwdriver

Procedure

Caution Do not remove the filler panel unless you are ready to install the power supply. An empty slot will cause uneven cooling and eventual overheating.

1. Loosen the screw and remove the filler panel from the left power supply slot (Figure 64).

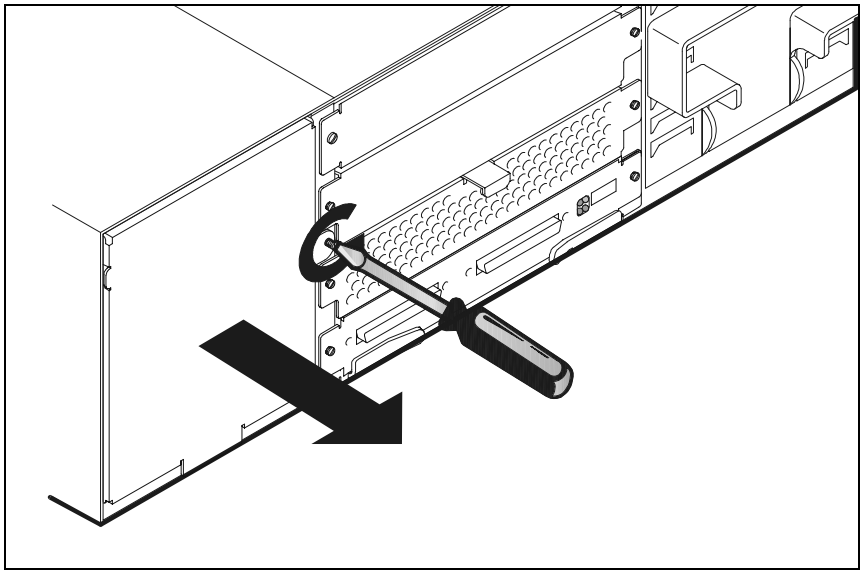


Figure 64 Removing Power Supply Filler Panel

Save or discard the power supply filler. If you ever need to remove the power supply, the filler could be useful.

2. With the handle down and facing you, slide the power supply into the empty slot (Figure 65). You will feel the resistance of the backplane when all but 3/8 inch of the power supply has been inserted.

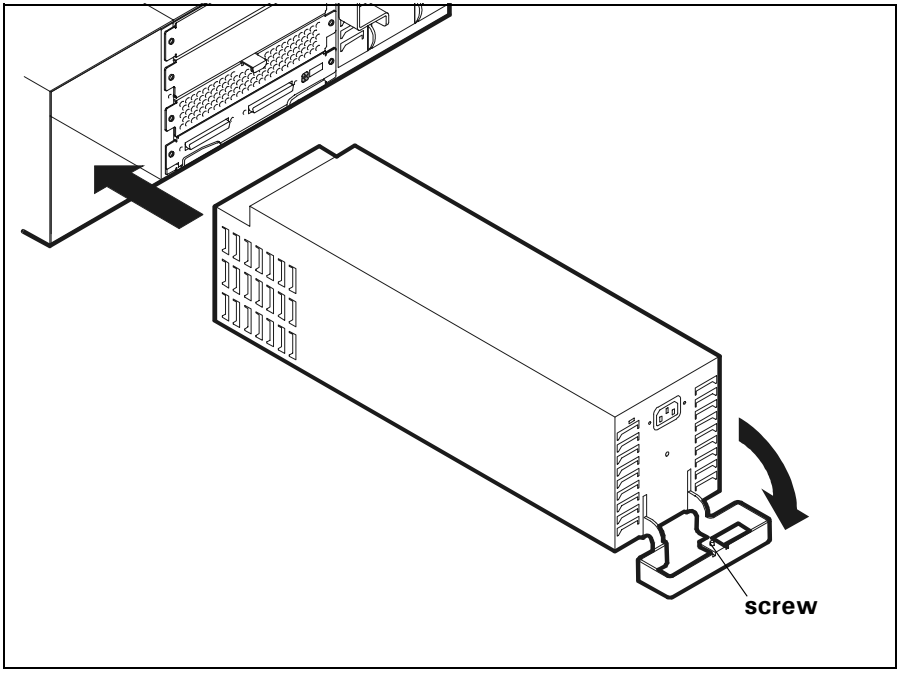


Figure 65 Installing a Second Power Supply

3. When you feel the resistance of the power supply against the backplane, rotate the cam handle up. This will draw the power supply the last 3/8 inch into the chassis.
4. Tighten the locking screw in the power supply handle.
5. Plug the power cord into the AC receptacle of the power supply and the PDU/PDRU (or main power source). Remember to choose a PDU outlet that avoids interference with the removal and replacement of serviceable components.

Wiring Tips

You may need to add a PDU/PDRU to accommodate the additional power supply or to extend redundancy to the power source. Figure 66 shows where to install redundant PDRUs in a full rack of power-redundant disk systems. To take advantage of redundant PDU/PRDUs, attach the cords of redundant power supplies to separate PDU/PDRUs.

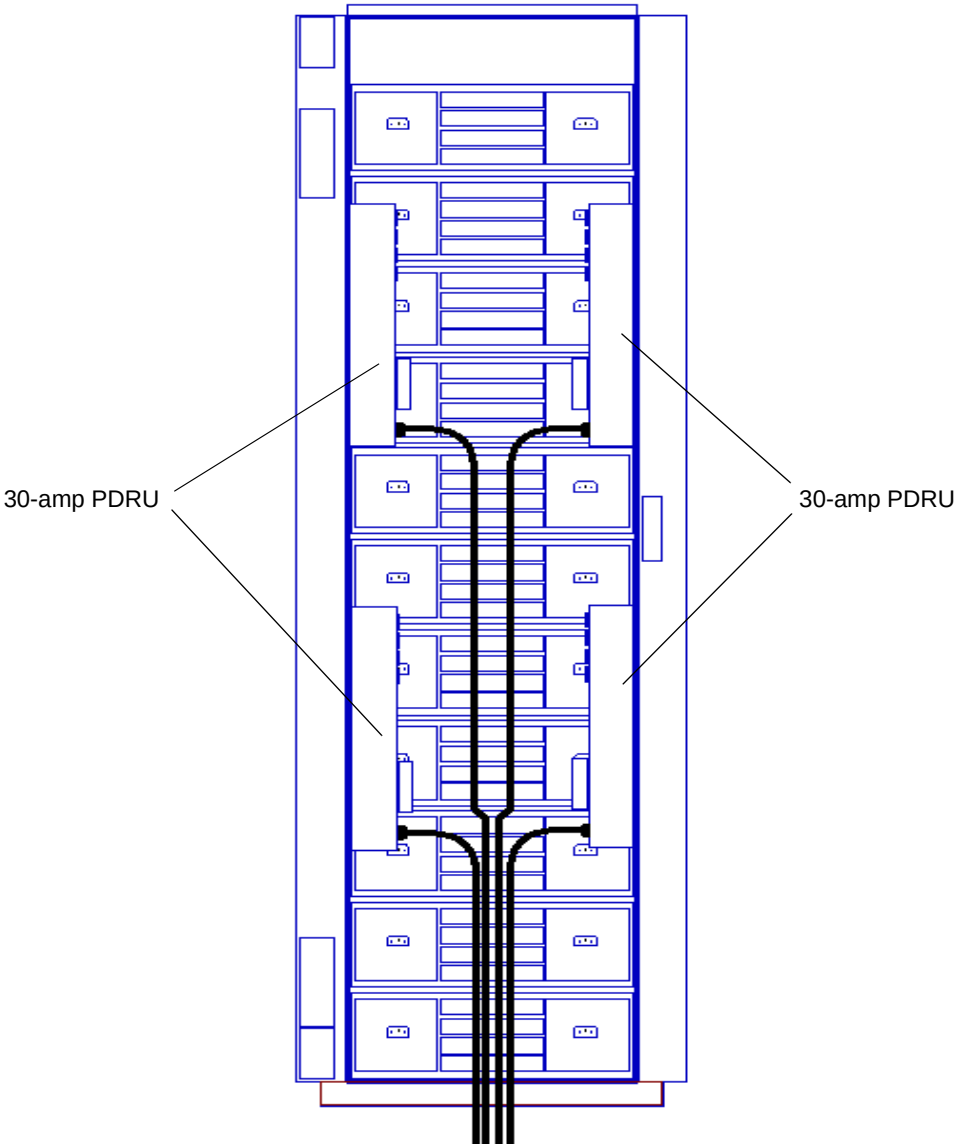


Figure 66 PDRU Placement in 2.0-Meter Rack

Avoid connecting the redundant power cords of multiple disk systems to the same pairs of PDU/PDRUs. If the primary PDU/PDRU fails, you do not want an overwhelming power surge to the backup PDU/PDRU. A cautious distribution of power cords is represented in Figure 67 and Figure 68. If PDRU bank A fails in the first example (Figure 67), the power load of the top four disk systems would be distributed to two independent banks (C and D) in the backup PDRU. In the second example (Figure 68), redundant power cords can be connected to independent PDRUs, not just independent banks of a PDRU, because there are four PDRUs.

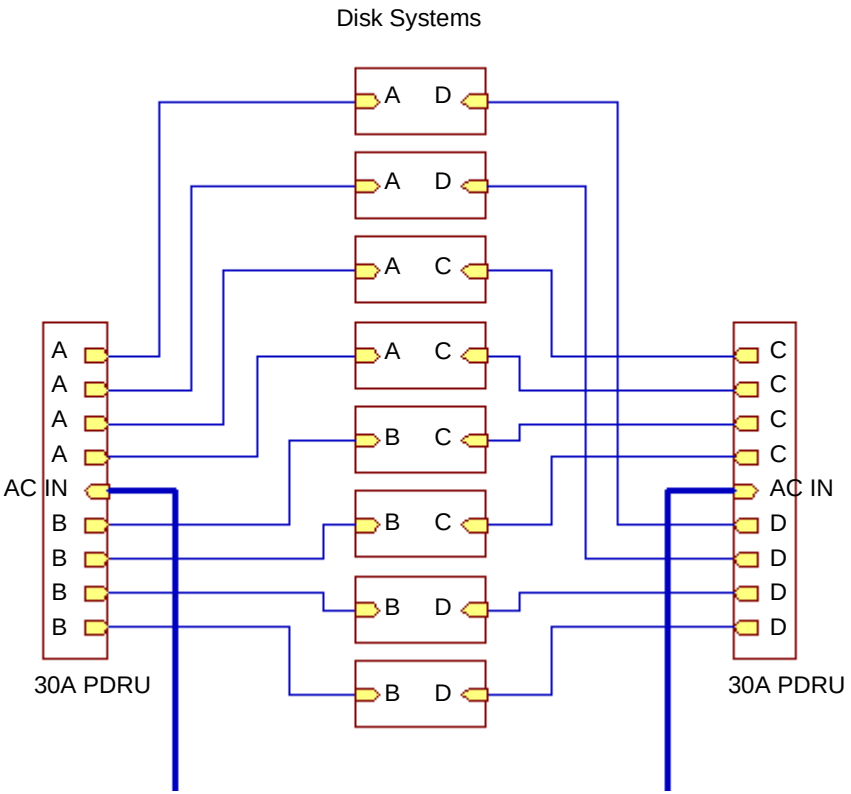


Figure 67 Wiring Scheme for Power-Redundant Disk Systems in a 1.6-Meter Rack

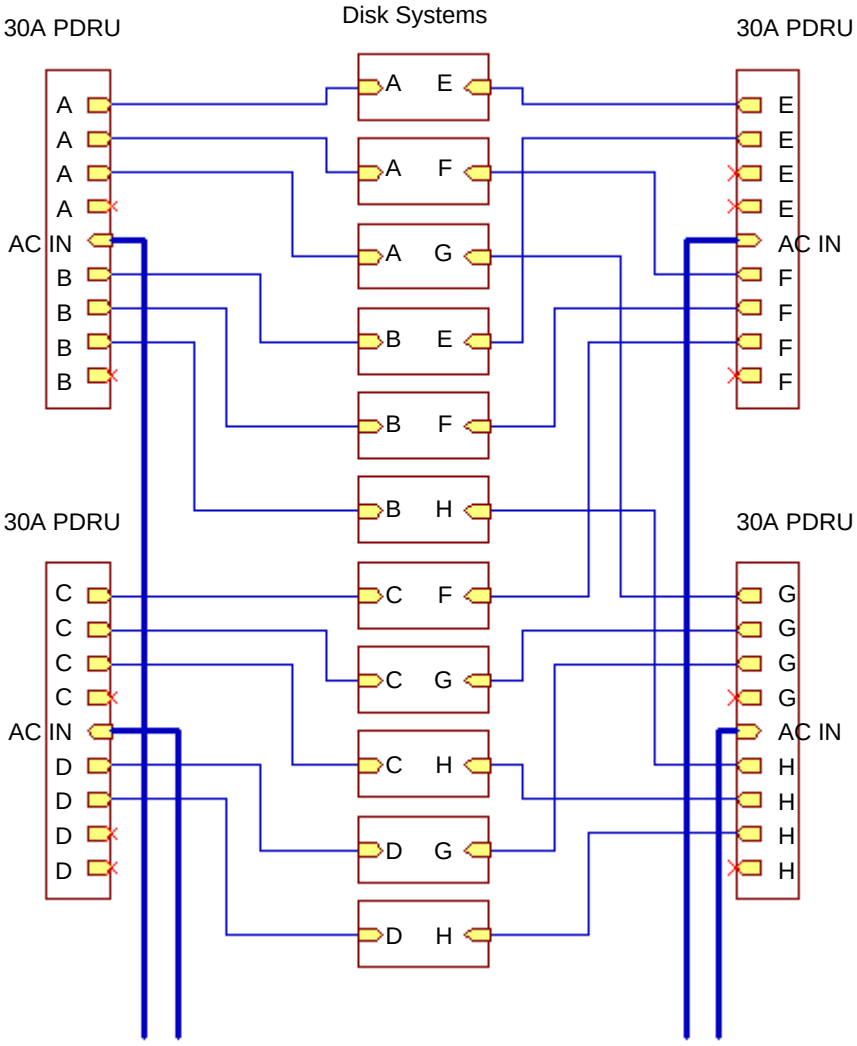


Figure 68 Wiring Scheme for Power-Redundant Disk Systems in a 2-Meter Rack

Upgrading Disk Firmware (HP-Qualified Only)

Obtain the latest firmware release from the support site before traveling to the customer site. On HP-UX hosts, use STM to update disk firmware. On MPE hosts, use SYSDIAG.

Using STM to Download Disk Firmware (HP-UX)

1. Log on the system.
2. Save the firmware file on the customer's system, preferably in the default firmware directory: /var/tmp
3. Start STM by typing **xstm&** on the HP-UX command line. This command starts the graphic version of STM and keeps the X window open when you quit STM. (To use the terminal version of STM, type **mstm**.)
4. Select **License** from the System menu and install the password-protected HP-Only license.
5. In the device display, select the device to receive the new firmware.
6. Select **Firmware Update > Run** from the Tools menu. A tool window opens, displaying the current firmware version and instructions for updating. A second window (Figure 69) lists the available firmware files in the var/tmp directory.

   If there are no firmware files in the default directory, a popup window instructs you to select an optional path and STM displays a list of directories. Enter the directory path you used to save the firmware file (in step 1) and click **OK**.
7. Select the firmware file from the list of files displayed in the default or specified directory. Click **OK**.
8. Select **Start Update...** from the Update menu. STM prompts you to confirm or cancel the firmware update (see Figure 70).

The tool window displays the success or failure of the firmware download.

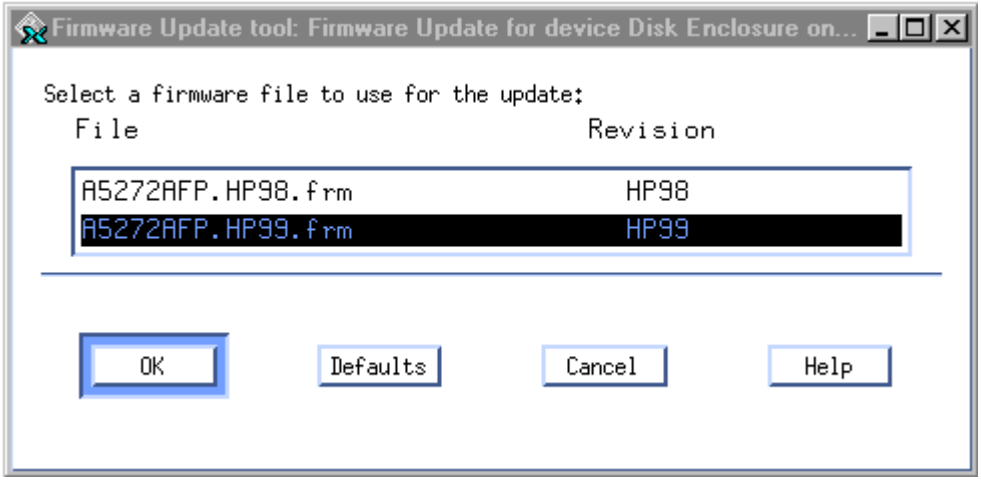


Figure 69 Firmware File Selection Window

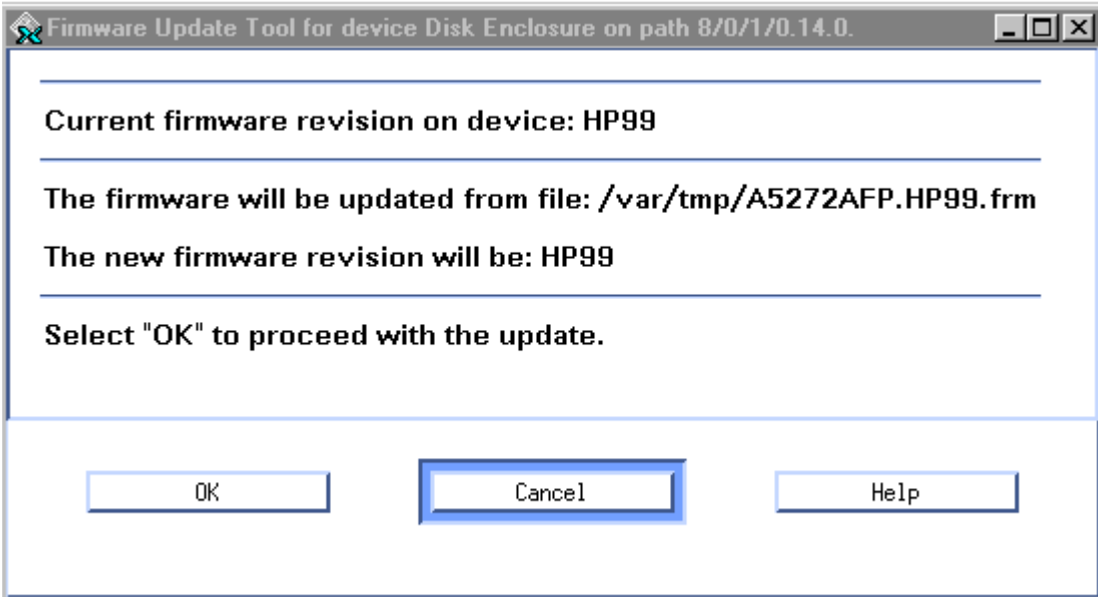


Figure 70 Firmware Download Confirmation Window

Using STM to Download Disk Firmware (MPE/iX 6.5)

1. Log on the customer's system.
2. Save the firmware file on the system. Typically, you will be downloading the file from a UNIX system:
   a. Use **chgroup** to move to the directory where you want to put the firmware
   b. At the system prompt (:) type **run sh.hpbin.sys**.
   c. Execute **ftp** to connect to the UNIX system
   d. At the FTP prompt, type **bytestream**
   e. Change (**cd**) to the directory where the firmware is located
   f. Still at the FTP prompt, type **get** <firmware_name><firmware_name.frm>; for example get st3184571lc_hp01.frm st18gb.frm
   g. Exit FTP.
   h. Exit sh.
3. Remove the target disk from use. At the system prompt (:), type:

   vsclose <physical volume number>
4. Start STM by typing **cstm** STM starts and displays a prompt (cstm>).
5. Confirm the current firmware version on the disk. At the cstm prompt, type **map.** STM displays a list of all installed disks and their firmware versions.
6. Select the desired disk by typing:

   select device <number>
7. Start the firmware update utility. At the cstm promt, type **firmwareupdate.** The program prompts you for a directory of firmware files.
8. Select the firmware file you want to use.
9. Download new firmware. At the firmware update prompt, type **su.**
10. When the download is complete, quit the firmware update utility by typing **exit.**

11. Verify the new firmware version with another map. At the cstm prompt, type **map.** Mapper output should show `Fw update successful`.
12. Repeat steps 6 through 11 until all disks have updated firmware.
13. When done, quit STM by typing **exit.**
14. Return the physical volume to use. At the system prompt (:), type:

    vsopen <physical volume number>
15. Log off the system.

Using SYSDIAG to Download Disk Firmware (MPE/iX 6.0)

1. Log on the system.
2. Save the firmware file on the customer's system. Typically, you will be "restoring" the file from tape.
3. Remove the target disk from use. At the system prompt (:), type:

    vsclose <physical volume number>
4. Enter the HP-Only password. At the system prompt (:), type:

    suplicen <password>
5. Start SYSDIAG. At the system prompt (:), type **sysdiag.**
6. At the SYSDIAG prompt (DUI>), type:

    scsidsk2 ld=<logical device number> **sc=17**
7. Confirm that a previous firmware version is on the disk. At the SCSIDSK2 prompt , type **in.**
8. Download new firmware. At the SCSIDSK2 prompt, type **down.**The utility prompts for the location of the firmware file.
9. When prompted, type the firmware file name for the target disk; for example, se9ghp08.seagate.firmware.
10. Verify that the firmware has been updated. At the SCSIDSK2 prompt, type **in.**

11. Enter the logical device number of the next target for new firmware. At the SCSIDSK2 prompt, type:

    ld <logical device number>

12. Repeat steps 7 through 11 until all disks have updated firmware.
13. When done, quit scsidsk2 and SYSDIAG by typing **exit.**
14. Return the physical volume to use. At the system prompt, type:

    vsopen <physical volume number>

15. Log off the system.

Upgrading to an SC10 Disk System

Order the upgrade kit (A5664A) to convert a SureStore E Disk System HVD10 to a SureStore E Disk System SC10. The disk system SC10 offers LVD connections to the host with Ultra2 disk speeds. (Contact an HP sales representative for the date of this capability on HP e3000 hosts).

The upgrade kit includes:

- 2 BCCs
- 2 cables
- 2 terminators
- SureStore E Disk System SC10 nameplate
- *SureStore E Disk System SC10 User and Service Guide*
- Installation instructions

Conversion to a disk system SC10 also requires a fan and power supply upgrade if you do not already have redundant fans and power supplies.

7 REFERENCE

Product Models and Options

The disk system is available in two models:

- A5616A field-racked (by HP-qualified service engineers)
- A5616AZ factory-racked

Product options, shown in Table 19, include redundant components, a rail kit, and various disk modules. For cable options, see Table 20.

Table 19 Product Options

Option	Description
001	Second fan and power supply
002	Rail kit for HP Rack Systems/E (A5616A only)
003	Second BCC
090	536-Mbyte solid state disk module, qty. 1*
104	9-Gbyte 10K rpm LVD disk modules, qty. 4
108	9-Gbyte 10K rpm LVD disk modules, qty. 8
110	9-Gbyte 10K rpm LVD disk modules, qty. 10
204	18-Gbyte 10K rpm LVD disk modules, qty. 4
208	18-Gbyte 10K rpm LVD disk modules, qty. 8
210	18-Gbyte 10K rpm LVD disk modules, qty. 10
304	36-Gbyte 10K rpm LVD disk modules, qty. 4
308	36-Gbyte 10K rpm LVD disk modules, qty. 8
310	36-Gbyte 10K rpm LVD disk modules, qty. 10
404	73-Gbyte 10K rpm LVD disk modules, qty. 4
408	73-Gbyte 10K rpm LVD disk modules, qty. 8
410	73-Gbyte 10K rpm LVD disk modules, qty. 10

* Order only one option 090 if ordering other disk options for A5616AZ. Order up to two 090 options if ordering other disk options for A5616A.

Cable Products

Table 20 lists supported cables. To order cables with the disk system, use the option number. To order cables separately, use the HP product number A3401A and the option numbers.

Table 20 Cable Options and Products

Option	Description
801	1.0 m cable: 68-pin HD to 68-pin HD
802	2.5 m cable: 68-pin HD to 68-pin HD
803	5.0 m cable: 68-pin HD to 68-pin HD
804	10 m cable: 68-pin HD to 68-pin HD
805	20 m v-cable: 68-pin HD to 68-pin HD
806	1.0 m cable: 68-pin HD LP to 68-pin HD LP
807	2.5 m cable: 68-pin HD LP to 68-pin HD LP
808	5.0 m cable: 68-pin HD LP to 68-pin HD LP
809	10 m cable: 68-pin HD LP to 68-pin HD LP
811	1.0 m 90-ohm cable: 68-pin VHDCI to 68-pin HD
812	2.5 m 90-ohm cable: 68-pin VHDCI to 68-pin HD
813	5.0 m 90-ohm cable: 68-pin VHDCI to 68-pin HD
814	10 m 90-ohm cable: 68-pin VHDCI to 68-pin HD
840	2 m v-cable: 68-pin VHDCI to 68-pin HD
841	2 m v-cable: VHDCI to VHDCI to 68-pin HD
842	2 m v-cable: VHDCI to VHDCI IL term to 68-pin HD
843	2 m v-cable: 68-pin HD to VHDCI to 68-pin HD
844	2 m v-cable: 68-pin HD to VHDCI IL term to 68-pin
851	10 m V-Class cable: 68-pin HD to 68-pin HD IL term
871	2 m/5 m V-Class v-cable: 68-pin HD IL term to 68-pin HD
873	2 m/3 m V-Class v-cable: 68-pin HD IL term to 68-pin HD
875	5 m V-Class cable: 68-pin HD to 68-pin HD

Table 20 Cable Options and Products (cont'd)

Option	Description
B25	4 m v-cable: VHDCI to VHDCI to 68-pin HD
B26	4 m v-cable: VHDCI to VHDCI IL term to 68-pin HD
B27	4 m v-cable: 68-pin HD to VHDCI to 68-pin HD
B28	4 m v-cable: 68-pin HD to VHDCI IL term to 68-pin HD

Upgrade Products

Order the following parts to expand or reconfigure your original purchase:

Table 21 Upgrade Products

Order No.	Description
A5615A	536-Mbyte solid state disk module
A5276A	9-Gbyte 10K rpm LVD disk module
A5282A	18-Gbyte 10K rpm LVD disk module
A5595A	36-Gbyte 10K rpm LVD disk module
A5622A	73-Gbyte 10K rpm LVD disk module
A5629A	Fan
A5630A	Power supply
A5632A	BCC
A5250A	Rail kit for HP C2785A, C2786A, C2787A, A1896A, and A1897A
A5251A	Rail kit for HP Rack Systems/E
A5664A	SC10 Upgrade Kit, HVD to Ultra

PDU/PDRU Products

Table 22 PDU/PDRU Products

Order No.	Description
E7676A	19-inch, 100-240 V, 16 Amp, 1 C20 inlet, 10 C20 outlets
E7671A	19-inch, 100-240 V, 16 Amp, 1 C20 inlet, 2 C19 & 6 C13 outlets
E7674A	19-inch, 100-240 V, 16 Amp, 1 C20 inlet, 1 C19 & 7 C13 outlets
E7679A	19-inch, 100-127 V, 16 Amp, 2 C20 inlets, 2 C19 outlets, switch accessory
E7680A	19-inch, 200-240 V, 16 Amp, 2 C20 inlets, 2 C19 outlets, switch accessory
E7681A	19-inch, 200-240 V, 30 Amp, L6-30P, 2 C19 & 8 C13 outlets, switch accessory
E7682A	19-inch, 200-240 V, 30 Amp, IEC-309, 2 C19 & 2 C13 outlets, switch accessory
E4452A	36-inch, 220 V, 16 Amp, L6-20P, 6 C-13 outlets
E4453A	36-inch, 220 V, 16 Amp, no plug, 6 C-13 outlets
E5933A	36-inch, 110-220 V, 16 Amp, UPS, IEC-320, 10 C-13 outlets
E4456A/B	60-inch, 220 V, 16 Amp, L6-20P, 10 C-13 outlets
E4457A/B	60-inch, 220 V, 16 Amp, no plug, 10 C-13 outlets
E5930A	60-inch, 110-220 V, 16 Amp, UPS, IEC-320, 10 C-13 outlets
E5931A	60-inch, 220 V, 16 Amp, UPS, LP-30P, 10 C-13 outlets
E5932A	60-inch, 220 V, 16 Amp, UPS, no plug, 10 C-13 outlets
E7677A	Switch panel accessory for PRU
E7678A	Switch control jumper cord for PRU

Replaceable Parts

Table 23 Replacement and Exchange Part Numbers

Replacement Part Order No.	Exchange Part Order No.	Part Description
0588-001MH		20 top cover screws 6-32x3/16 T10
8120-6514		Power cord
A5236-60003		Fan
A5616-67003		Fan filler panel
A5272-67014		Door assembly
A5236-60023	A5236-69023	Power supply
A5616-67004		Power supply filler panel
A5272-67003		Backplane and mezzanine assembly
A5236-60021		Mezzanine board
A5616-67005	A5616-69005	Bus Control Card (BCC)
A5616-67002		BCC filler panel
J1525-60001		Half-U rack filler panel
A5236-40024		Disk filler
A5276-67001	A5276-69001	9-Gbyte LP disk module
A5282-67001	A5282-69001	18-Gbyte HH or LP disk module
A5595-67001	A5595-69001	36-Gbyte HH disk module
A5622-67001	A5622-69001	73-Gbyte HH disk module
A5615-60001	A5615-69001	536-Mbyte solid state disk module

Specifications

Dimensions

The maximum dimensions of the disk system with the door and power supply handles closed are as follows:

- Height: 15.0 cm (5.91 in.)
- Width: 48.0 cm (18.90 in.)
- Depth: 69.1 cm (27.20 in.)

Weight

A fully loaded disk system weighs approximately 90 pounds. Component weights are shown in Table 24.

Table 24 Product Weights

Component	Weight of Each (lbs)	Quantity	Subtotal (lbs)
Disk Module (HH)	3	10	30
Fan	3	1	3
Power Supply	11	1	11
BCC	3	1	3
Midplane-Mezzanine	6	1	6
Door	2	1	2
Chassis	35	1	35
		Approx. Total	91 lbs

AC Power Input

The disk system operates at 100-127 and 200-240 V AC, 50-60 Hz, single phase, power factor corrected. Maximum current is 6.5 amps over the low voltage range and 3.2 amps over the high voltage range. Average power consumption with medium load (10 disks running idle) is 347 watts.

DC Power Output

- Disk: +5 V and +12 V from power supply
- BCC: +5 V and +3.3 V from power supply
- Fan: +12 V from power supply

Heat Output

- 2200 BTU/hr.

Environment

The following environmental specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to make sure these specifications remain true when products are retested under the same conditions. However, the limits of these specifications do not represent the optimum for long, trouble-free operation and specifically are not recommended for maximum satisfaction. The recommended conditions are stated when appropriate.

- Operating temperature: 5° C to 40° C (50° F to 104° F)
  Recommended: 20° C to 25.5° C (68° F to 78° F)
- Maximum gradient: 20° C per hour (36° F per hour)
- Relative humidity: 20% to 80% noncondensing, max. wetbulb at 26° C
  Recommended: 30% to 50% noncondensing
- Altitude: 3000 m (10,000 ft)

Note For continuous, trouble-free operation, the disk system should NOT be operated at its maximum environmental limits for extended periods of time. Operating within the recommended operating range, a less stressful operating environment, ensures maximum reliability.

The environmental limits in a nonoperating state (shipping and storage) are wider:

- Temperature: -40° C to 70° C (-40° F to 158° F)
- Maximum gradient: 24° C per hour (43.2° F per hour)
- Relative humidity: 15% to 90% noncondensing
- Altitude: 4600 m (15,000 ft)

Acoustics

- Sound power: 6.8 Bels
- Sound pressure at operator's position: 58.8 dB(A)

Safety Certifications

UL listed, UL 1950:1995 – 3rd Edition

CSA certified, C22.2 No. 950:1989

TUV certified with GS mark, EN 60950:1992 + A1:1993, A2:1993, A3:1995, A4:1997

CE mark (see G. Declaration of Conformity on page 164)

EMC Compliance

Australia: AS/NZS 3548, Class A

Canada: ICES-003, Class A

China: CB9254-88

European Union: EN55022 Class A, EN50082-1

Japan: VCCI Class A

Taiwan: CNS 13438, Class A

US: 47 CFR Parts 2 & 15, Class A

Regulatory Statements

A. FCC Statement (For U.S.A. Only)

The Federal Communications Commission (in 47 CFR 15.105) has specified that the following notice be brought to the attention of the users of this product.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

B. IEC Statement (Worldwide)

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

C. Spécification ATI Classe A (France)

DECLARATION D'INSTALLATION ET DE MISE EN EXPLOITATION d'un matériel de traitement de l'information (ATI), classé A en fonction des niveaux de perturbations radioélectriques émis, définis dans la norme européenne EN 55022 concernant la Compatibilité Electromagnétique.

Cher Client,

Conformément à la Réglementation Française en vigueur l'installation ou le transfert d'installation, et l'exploitation de cet appareil de classe A, doivent faire l'objet d'une déclaration (en deux exemplaires) simultanément auprès des services suivants:

– Comité de Coordination des Télécommunications 20, avenue de Ségur - 75700 PARIS

– Préfecture du département du lieu d'exploitation

Le formulaire à utiliser est disponible auprès des préfectures.

La déclaration doit être faite dans les 30 jours suivant la mise en exploitation.

Le non respect de cette obligation peut être sanctionné par les peines prévues au code des Postes et Télécommunications et celles indiquées dans la loi du 31 mai 1993 susvisée.

Arrêté du 27 Mars 1993, publié au J.O. du 28 Mars - ATI

D. Product Noise Declaration (Germany)

Schalldruckpegel Lp = 58.8 dB(A)

Am Arbeitsplatz (operator position)

Normaler Betrieb (normal operation)

Nach ISO 7779:1988 / EN 27779:1991 (Typprufung)

E. VCCI Statement (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Harmonics Conformance (Japan)

高調波ガイドライン適合品

F. BCIQ EMC Statement (Taiwan)

警告使用者：這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

G. Declaration of Conformity

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hewlett-Packard Company
Enterprise Storage Business Unit

Manufacturer's Address: 8000 Foothills Blvd.
Roseville, CA 95747
USA

declares, that the product

Product Name: SureStore E Disk System – HVD10

Model Number(s): A5616A and A5616AZ

Product Options: All

conforms to the following Product Specifications:

Safety: IEC 950:1991 + A1, A2, A3, A4 / EN 60950:1992 + A1, A2, A3, A4
GB 4943-1995

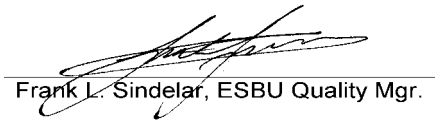
EMC: CISPR 22:1993 +A1, A2 / EN 55022:1994 +A1, A2 - Class A[1]
GB 9254-1988
EN 50082-1:1992
IEC 61000-4-2:1995 / EN 61000-4-2:1995
IEC 61000-4-3:1995 / EN 61000-4-3:1996
IEC 61000-4-4:1995 / EN 61000-4-4:1995
IEC 61000-4-6:1996 / EN 61000-4-6:1996
IEC 61000-4-8:1993 / EN 61000-4-8:1993
IEC 61000-4-11:1994 / EN 61000-4-11:1994
IEC 61000-3-2:1995 / EN 61000-3-2:1995, Class A
IEC 61000-3-3:1994 / EN 61000-3-3:1995

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly.

1)The product was tested in a typical configuration with the HP 9000 Class A server system - Product A5182A – Model 180

Roseville, March 13, 2000



Frank L. Sindelar, ESBU Quality Mgr.

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department HQ-TRE, Herrenberger Straße 130, D-71034 Böblingen (FAX: + 49-7031-14-3143)

Product Web Site

This guide is available in Adobe® Acrobat® format on the HP Customer Care web site for storage (*http://www.hp.com/support/storage*). Choose HP Online Storage:Disks and then HP Disk Systems. The SureStore E Disk System HVD10 is one of the disk system selections.

Related Documents

The following manuals explain how to use the system software interfaces to the SureStore E Disk System HVD10:

- *EMS Hardware Monitors User's Guide*, available at *http://www.docs.hp.com/hpux/systems/*
- *Online Diagnostics (for HP 9000): Support Tools Manager Overview*, available at *http://www.docs.hp.com/hpux/systems/*
- *HP-UX System Administration Tasks Manual*, HP Order No. B2355-90079
- *Configure HP-UX for Peripherals for 10.01*, HP Order No. B2355-90053
- *System Start-up, Configuration, and Shutdown Reference Manual*, MPE/iX for HP 3000 Series 900 computers, HP Order No. 32650-90855
- *Volume Management Reference Manual*, MPE/iX, HP Order No. 32650-90491
- *Mirrored Disk/iX User's Guide*, HP Order No. 30349-90005

Note HP order numbers are subject to change with new releases of system documents. For the latest documentation, refer to the HP web site *http://www.docs.hp.com*.

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Reader Comment Sheet

Hewlett-Packard SureStore E Disk System HVD10 User and Service Guide

We welcome your evaluation of this manual. Your comments and suggestions will help us improve our publications. Remove this page and mail or FAX it to 916-785-2299. Use and attach additional pages if necessary.

	Agree				Disagree	N/A
The manual is well organized.	◯	◯	◯	◯	◯	◯
The information is technically accurate.	◯	◯	◯	◯	◯	◯
Information is easy to find.	◯	◯	◯	◯	◯	◯
Step-by-step procedures are easy to perform.	◯	◯	◯	◯	◯	◯
There are enough examples and pictures.	◯	◯	◯	◯	◯	◯
The examples and pictures are useful.	◯	◯	◯	◯	◯	◯

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