user's guide

hp StorageWorks disk system 2300

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Notice

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Caution	Identifies a hazard that can cause hardware or software damage
Note	Identifies significant concepts or operating instructions

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<this font> - used for variables used in commands

this font - used for GUI menu options and screen controls

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Product Description

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General Description

Hewlett-Packard's StorageWorks Disk System 2300 (referred to in this guide as the disk system) is a high-availability Ultra160 SCSI storage product. Dual SCSI ports on dual bus controllers provide LVD connections to the host. Fourteen slots accept high-speed, high-capacity LVD SCSI disks connected to an LVD midplane. Maximum data throughput is 160 Mbytes/sec. Thirteen disk systems fill a 2-meter System/E rack. Filled with 18-Gbyte disks, the 2-meter Rack System/E yields 3.3 Terabytes of storage; with 36-Gbyte disks, 6.6 Terabytes of storage and with 73-Gbyte disks, 13.3 Terabytes.

Modular and redundant components are easy to upgrade and maintain. Disks, power supply/fan modules, and bus control cards (BCCs) are replaceable parts that plug into individual slots in the front and back of the disk system. Redundant power supply/fan modules, and BCCs can be removed and replaced without interrupting storage operations. Disks also can be replaced with the system on and with only the affected file systems taken off-line. Hewlett-Packard technical support is optional for these procedures.

Special electronics and HP-UX software enable remote monitoring and diagnostics. Sensors on the BCCs monitor the disk system environment, including temperature, voltage, fan speed, and component status. Hewlett-Packard's Command View SDM reports any changes in environmental status to user-defined locations. Standard HP-UX diagnostic utilities also report environmental data for enhanced troubleshooting.

HP Command View SDM (Software Device Manager) software is designed to provide storage management for HP disk systems. This software, available on the HP Command View SDM CD-ROM, provides simple, yet sophisticated device management tools for the disk system. HP Command View SDM is supported on the following:

- HP-UX 11.00 (see Support Plus web site for the required patches)
- HP-UX 11.11 (see Support Plus web site for the required patches)
- Windows NT 4.0 (Service Pack 6a or greater)
- Windows 2000 (Service Pack 1 or greater)
- Linux Red Hat 7.2

HP TopTools is a web-based, device management tool that enables administrators and MIS managers to use a web browser to obtain information about devices on their network. It provides specific management to the following HP products:

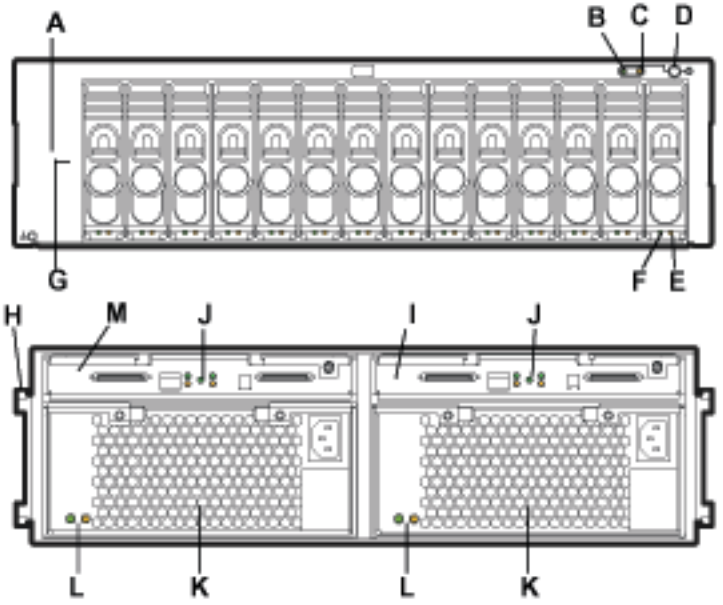
- HP Vectra and Brio Desktops
- HP Kayak and Visualize Workstations
- HP Omnibook Notebooks
- HP Netservers
- HP Procurve and AdvanceStack networking devices
- HP LaserJet and JetDirect products
- HP Jornada PC Companions
- HP StorageWorks products
- HP Network Attached Storage (NAS) products
- HP-UX systems with EMS
- Windows systems

Features

The disk system occupies 3 EIA units in a standard 19-inch rack. Disk drives mount in the front of the system. Redundant power supplies, and BCCs mount in the back. See Figure 1 and Figure 2 below. For disk slots and SCSI addressing, see Figure 49.

Figure 1. Disk System - Racked Views

Front View

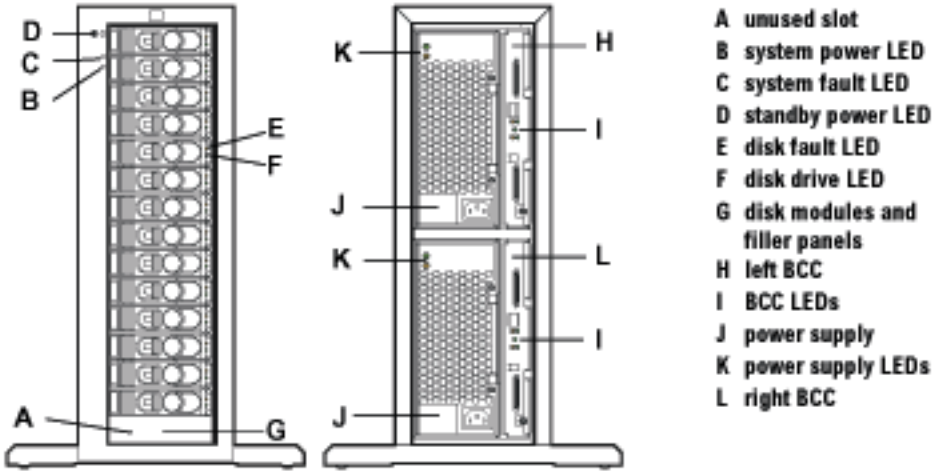


A unused disk slot
B system power LED
C system fault LED
D standby power switch
E disk fault LED
F disk drive LED
G disk modules and filler panels

H mounting ear
I right BCC
J BCC LEDs
K power supply
L power supply LEDs
M left BCC

Rear View

Figure 2. Disk System Deskside Views



Status Indicators

LEDs on the disk system enable you to detect and replace failed components and so prevent or minimize users' downtime. For additional information about LEDs, see Chapter 4, Troubleshooting.

On the front of the disk system, a pair of LEDs indicates the status of the disk system, and an LED for each slot shows disk I/O activity:

- The system power LED (B in Figure 1) indicates that power is on or off.
- The system fault LED (C in Figure 1) indicates whether or not a fault has occurred anywhere in the disk system.
- At the bottom of each disk module, the left LED (F in Figure 1) indicates the presence of I/O activity on the disk.
- The second LED on each disk module (E in Figure 1) can be flashed to help a customer engineer (CE) locate the disk for physical inspection or removal.
- The second LED is also used as a fault indicator for that specific disk module.

LEDs (I and K in Figure 2) on the back of the disk system indicate the status of replaceable components and the SCSI bus: See Chapter 4, Troubleshooting, for specific LED information.

Power/Standby Switch

Located at the upper right corner of the front of the disk system, the power switch (D in Figure 1) interrupts DC power from the power supplies to the BCCs and other internal components. Input AC power to the power supplies is controlled by the power cords and the AC source.

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:

- Hot-pluggable, high-capacity, high-speed disks
- Redundant, hot-pluggable, user-replaceable power supplies and BCCs
- Online firmware upgrades
- Hardware event monitoring and real-time error reporting

Clustering (NT)

The HP Disk System 2300 is Microsoft® Cluster certified for a variety of solutions. For specific information about supported configurations, see the Hewlett-Packard Company or Microsoft web pages:

http://hp.com

http://microsoft.com

Upgradability

You can increase disk system storage capacity by:

- Replacing disk drives with higher-capacity disk drives
- Adding disks in unused slots

None of these actions require shutting down the product, but some may require the use of system utilities to manage file systems.

Upgrade BCC and disk firmware using an on-line download function. See Chapter 3, *Updating Firmware*.

Environmental Services

Environmental services circuitry monitors the following elements:

- Fan rotation
- Power supply output
- Power supply status (fan status)
- Disk drive status, presence
- BCC status
- Temperature
- Self-test results

Each BCC reports the status of all elements in the disk system, even if the BCC does not have direct access to the element.

Additionally, the EEPROM on each BCC stores 2 Kbytes of configuration information and user-defined data, including the manufacturer serial number, and product number.

Hardware Event Monitoring

A hardware event monitor monitors the disk system and reports changes in environmental status to Hewlett-Packard's Event Monitoring System (EMS) for HP-UX. Hardware event monitoring is an important tool for implementing high availability. Using hardware event monitors, you can virtually eliminate undetected hardware failures that interrupt system operation or cause data loss.

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 section describes the following components:

- Disks and disk fillers
- BCCs and BCC fillers
- Power supply/fan modules

Disk Modules and Disk Module Filler Panels

Disk modules, shown in Figure 3, contain 3.5-inch Low Profile Ultra 3 LVD disks.

The disk module's components are protected by a metal grill on the disk module's bottom side.

WARNING Disks require careful handling and ESD precautions.

The plastic parts of the disk are safe to touch:

- Extractor handle (A in Figure 3)
- Latch tab (B)

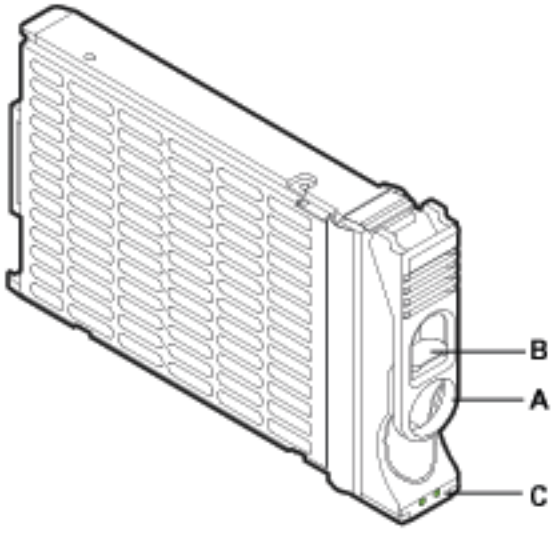
You may also safely touch the top and bottom of the disk module without damaging the disk module.

A metal grill protects exposed circuits against damage when the disk module is laid circuit-side down on a flat surface.

The initial disk options for this product are 18-GByte, 36-GByte, and 73-Gbyte 10 K RPM disk drives. 18-GByte and 36-GByte 15 K RPM disk drives are also supported. A label on the disk carrier shows the storage capacity and rotational speed of the installed disk. Obtain information about the latest disk options from HP sales representatives.

Caution Fillers must be installed in unused slots in order to maintain even cooling for the installed disk modules.

Figure 3. Disk Module



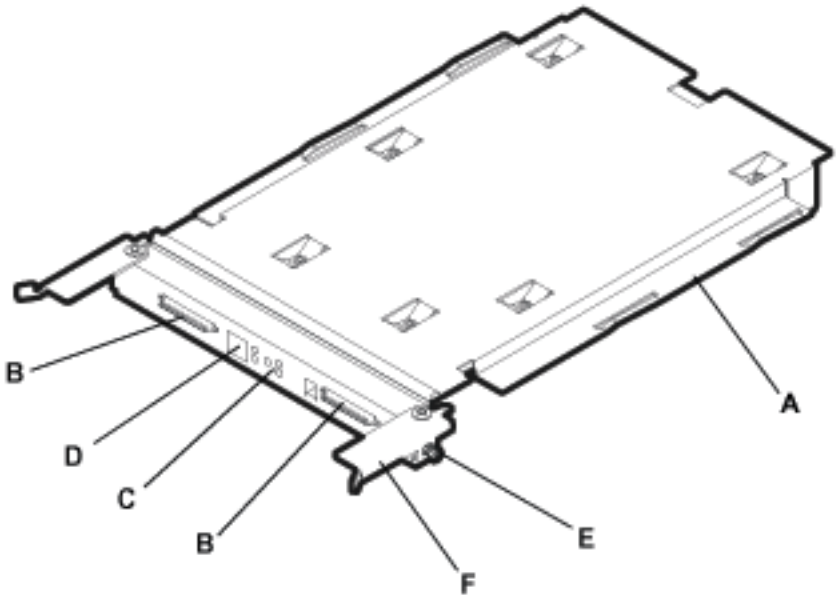
A extraction har
B latch tab
C LEDs

BCCs and BCC Filler Panels

BCCs (Bus Control Cards) plug into two slots in the back of the disk system. Each BCC connects to both LVD (low voltage differential) buses inside the disk system. In full bus mode (DIP switch 1 set to “|”), both BCCs have access to all installed disks. The two SCSI buses are bridged. If either BCC fails and LVM primary and alternate paths are defined, data can be accessed through the other BCC. In split bus mode (DIP switch 1 set to “0”), the left BCC (as viewed from the rear of the disk system), is on the high numbered bank (with disk slots 8, 9, 10, 11,12, 13, and 14) and the right BCC is on the low numbered bank (with disk slots 0, 1, 2, 3,4, 5, and 6) of disk slots. See Figure 1.

Two SCSI ports (B in Figure 4) on each BCC provide dual LVD connections to the same or separate hosts. If a host is connected to one of the BCC ports, an LVD terminator must be connected to the other port on that BCC.

Figure 4. BCC



A alignment guide
B SCSI ports
C LEDs
D DIP switches
E locking screw
F cam lever

Other features of the BCC are:

- LEDs (C) indicating BCC status and bus configuration
- DIP switches (D) on the rear panel:

  1 Bus Mode (full or split bus)

  2 Monitor Mode (SAF-TE or SES)
- Locking thumbscrews (E)
- Cam levers (F)

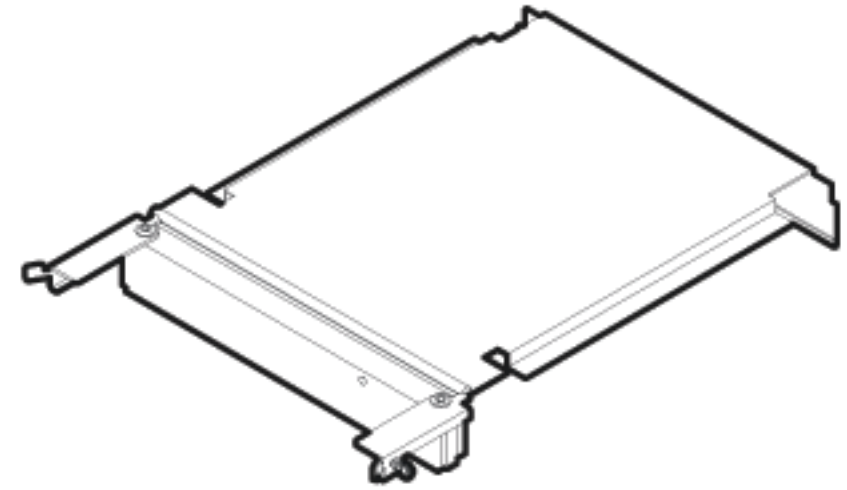
BCC circuitry provides the following functions:

- Bus configuration (see “Setting DIP Switches” in Chapter 3)
- Bus expansion (LVD)
- SCSI environmental services (see page 17)
- System fault detection

A BCC filler panel (Figure 5) replaces the second BCC when redundancy is not required.

Caution The BCC filler panel maintains even cooling inside the disk system when the second BCC is not present. A BCC filler panel must be installed if the BCC is removed.

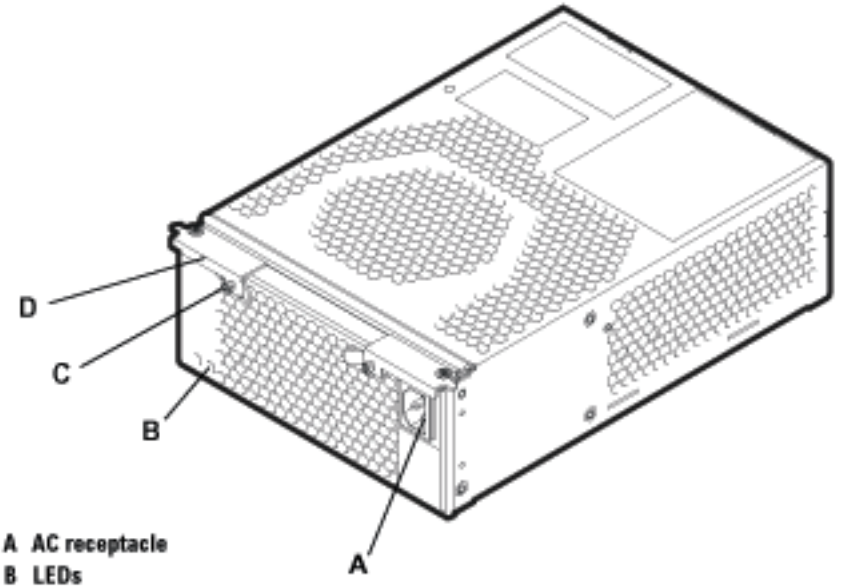
Figure 5. BCC Filler Panel



Power Supply/Fan Module

Redundant, hot-pluggable 340-watt power supplies convert wide-ranging AC voltage from an external main to stable DC output and deliver it to the midplane. Each power supply has an internal fan, an AC receptacle (A in Figure 6), two ejector handles (D) with thumbscrews (C), and 2 LEDs (B). Internal control prevents the rear DC output connector from becoming energized when the power supply is removed from the disk system.

Figure 6. Power Supply/Fan Module



A AC receptacle
B LEDs
C locking thumbscrew
D ejector handle

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.

Internal circuitry triggers a fault when the internal fan or other part fails. At the same time, the power fault LED (amber) illuminates, and, if enabled, the hardware event monitor sends an event message. The power supply fan remains on if other parts fail in order to maintain cooling air flow through the system. If the fan fails, the power supply shuts down. The fan in the other working power supply will increase to full speed to compensate for the failed fan. The failed power supply/fan module must be removed and the replacement power supply/ fan module installed within two minutes. In the event of a failure, if a replacement fan module/power supply is not available, leave the failed power supply/fan module installed until you are ready to replace it. This should be done to maintain proper cooling for the disk system.

Internal circuitry senses fan motion and triggers a fault when the speed of the power supply's internal fan falls below a critical level. At the same time, the LED turns amber, and, if enabled, the hardware event monitor sends an event message.

Hardware/Software Requirements

The disk system is supported on the following operating systems:

- HP-UX 11.00 with HWE 0302 (March 2002 Patch bundles) or greater
- HP-UX 11.11 with HWE 0302 (March 2002 Patch bundles) or greater
- Linux Red Hat 6.2, 7.0, 7.1
- Windows NT 4.0 (Advanced Server, Enterprise Edition)
- Windows 2000 (Server and Advanced Server)
- Microsoft Windows.Net (Server and Advanced Server)
- SCO UnixWare 7.11
- SCO OpenServer 5.06
- HP MPE/iX 7.0

The following SCSI host bus adapters (HBAs) support the Disk System 2300:

- A4999A, Ultra2 Low Voltage Differential SCSI Host Bus Adapter for B-, C-, J-, and X-Class systems
- A5140A Single Port Ultra 2 SCSI HBA Host bus adapter for A-, L-, V-Class, and Superdome.
- A5149A, Single Port Ultra 2 SCSI HBA (PCI bus) Host bus adapter for rp54X0, rp7400, rp7410, and rp8400 servers and A-, N-, L-, V-Class, and Superdome systems (Full length card).
- A5150A, Dual Port Ultra 2 SCSI (PCI bus) Host bus adapter for rx4610 and rx9610 servers and A-, N-, L-, V-Class, and Superdome systems (Full length card).
- A5159A, Dual Part FWD SCSI PCI Host bus adapter for rx4610 and rx9610 servers
- A5838A, Dual-Port 100Base-T/Dual-Port Wide Ultra2 Host bus adapter for A-, N-, L-, V-Class, and Superdome systems.
- A5856A, RAID 4Si - 4-Port Ultra2 LVD/SE RAID Host bus adapter for rp54X0, rp7400, rp7410, and rp8400 servers, and A-, N-, L-, V-Class, and Superdome systems.
- A6828A, Single Port Ultra 160 SCSI HBA (PCI bus) Host bus adapter for rp54X0, rp7400, rp7410, and rp8400 servers, and A-, N-, L-, V-Class, and Superdome systems (Full length card).

- A6829A, Dual Port Ultra160 SCSI (PCI bus) adapter Host bus adapter for rp54X0, rp7400, rp7410, and rp8400 servers and A-, N-, L-, V-Class, and Superdome systems (Full length card).

The following host bus adapters are supported on HP Netservers:

- C7430A, PCI Ultra2 wide Host bus adapter
- D5025A, HP Ultra/Wide SCSI Host bus adapter for Netservers
- D9161A, NetRAID 4M/64MB Cache Host bus adapter for HP Netservers
- D9351A, NetRAID 4M/128MB Cache Host bus adapter for HP Netservers
- P3413A, Single port Ultra160 SCSI Host bus adapter for HP Netservers

The following HP Netserver models are supported by the Disk System 2300:

- rc7100
- tc7100
- tc 6100
- tc4100
- tc3100
- rx4610
- LXr8000
- LXr8500
- LH3/LH3r
- LH4/LH4r
- LH3000/LH3000r
- LH6000/LH6000r
- LC2000/LC2000r
- LT6000
- LPr
- LP1000r
- LP2000r
- E45/E50
- E55/E60
- E200/E200se
- E800

The following host bust adapters are not supported at this time:

- D2140A, NetRAID 1Si Host bus adapter
- D5955A, NetRAID 3Si Host bus adapter
- P3410A, NetRAID 1M Ultra160 SCSI Host bus adapter with 64MB
- P3411A/B, NetRAID 2M Ultra160 SCSI Host bus adapter with 64MB
- P3475A/B, NetRAID 2M Ultra160 SCSI Host bus adapter with 128MB

Topologies

The disk system supports high availability through redundant components and redundant connections to redundant hosts. Each SCSI port on a BCC can be connected to a different host bus adapter in the same or different hosts. Internal mirroring within the disk system is also possible.

Basic high availability topologies are described on the following pages. For information about specific supported topologies, consult an HP sales representative.

This disk system can hold up to 14 disk modules. The maximum number of disk modules can be installed in either Full Bus Mode or Split Bus Mode. However, host and disk drive addressing must be closely managed.

Full Bus Mode

The maximum of 14 disk modules can be supported in Full Bus Mode provided there there is only one host bus adapter (HBA) connection and the HBA has the SCSI address of 7.

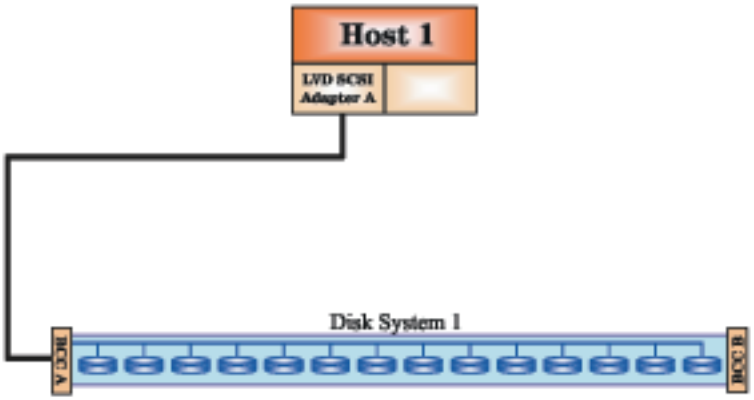
If more than one host connection is required, the slot with the SCSI address corresponding to the SCSI address of the additional host must not have a disk module installed in it to avoid bus contention. For example, if two connections are made to a Disk System 2300 with HBAs having SCSI addresses of 6 and 7, then SCSI ID 6 (slot 7)must not have a disk module installed in it.

Note SCSI address 15 should never be used by an HBA when connecting to a Disk System 2300 because this address is reserved on the SCSI bus for the enclosure services microprocessor.

Connecting one disk system to redundant hosts achieves system level high availability. A single host bus adapter in each host is connected to a different port in the disk system. With the disk system in full bus mode (switch 1 on), each host can reach all the disks. If the right BCC (viewed from the rear of the disk system) fails in this topology, there is still one path to the disks through BCC B. With the disk system in split bus mode (two internal busses), the Disk System 2300 supports data mirroring between the two internal busses within the same disk system. All connections from the host to the disk system are SCSI LVD cables.

Another type of high availability topology connects mirrored disk systems to redundant hosts. Dual host bus adapters in each host are connected to mirrored disk systems. With the disk systems in full bus mode (switch 1 on), each host can reach all disks in both disk systems. If one of the disk systems fails in this topology, all hosts will still have access to the data on the mirrored disk system. All connections from the host to the disk system are SCSI LVD cables.

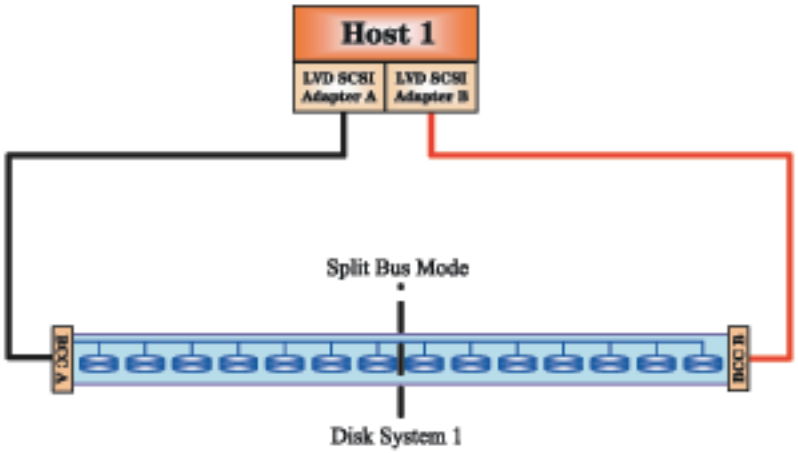
Figure 7. Basic Configuration - Single Host, Single Disk System



Due to SCSI ID limitations, daisy chaining of the Disk System 2300 is not supported. The maximum storage capacity with this type of configuration is approximately one Terabyte. This configuration does not provide any redundant paths to the data, however there is some hardware redundancy provided by the disk system hardware (i.e. power supply/fan modules and BCCs). This configuration can be used for boot, root, swap, or file system storage. Using Mirror/UX software, one or more mirrors can be created on the same hardware path to provide a basic level of data protection.

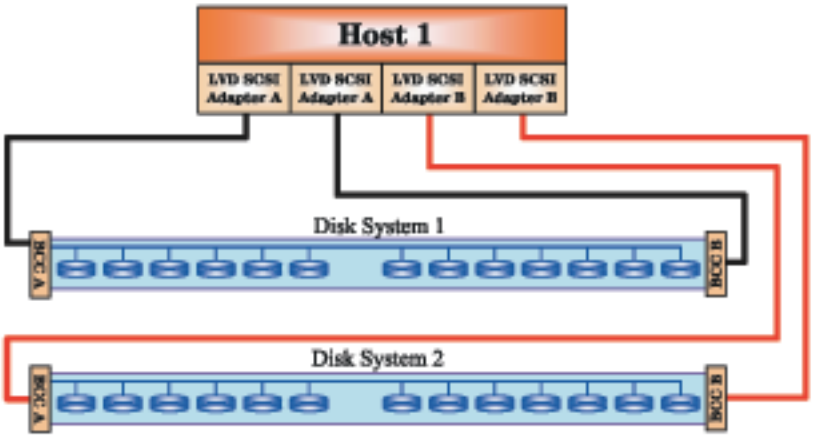
In figures 7 through 11, any BCC shown with only one cable connection should be understood to have a terminator attached to the other SCSI connector.

Figure 8. Single Host, Split Bus Configuration



The disk system can be connected to a single host with two host bus adapters (HBAs) in a split bus configuration. See Figure 8. Each HBA will do reads and writes to a maximum of seven disks. This configuration can provide a maximum capacity of approximately 1.1 Terabytes. This configuration can also do basic mirroring across different hardware paths, still providing a maximum data capacity of approximately 0.5 Terabytes. This configuration can also yield a maximum performance of 320 MB/s, since each BCC card is capable of 160MB/s performance in a split bus mode.

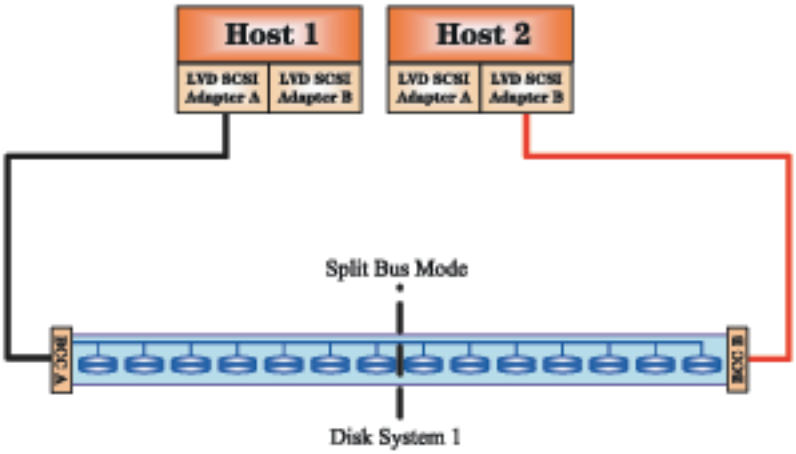
Figure 9. Single Host PV-Links Configuration



Data path redundancy can be secured with the configuration shown in Figure 9. Using an additional host bus adapter (HBA) and the LVM software, alternate links can be created, providing a redundant path to data for each disk system. In addition, a separate mirror path can be created for data protection. This configuration provides protection against any single component failure (i.e., cables, HBAs, disks). Figure 9 depicts connecting two disk systems to a single host.

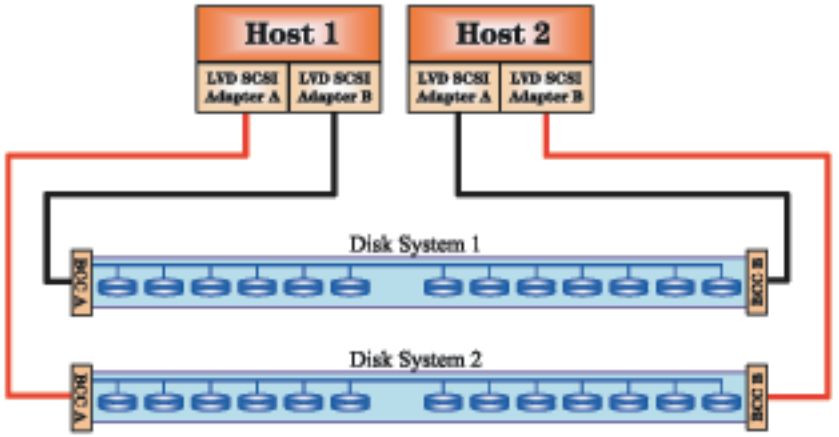
The only limit on the number of disk systems per system is the maximum number of supported HBAs. For large configuration, it is recommended that multiple CPUs have large amounts of memory to handle the system load. Each disk system in this configuration is capable of 160MB/s performance. Due to SCSI ID limitations, a maximum of 13 disks is supported per disk system (13 disks + 2 HBAs + 1 SES = 16 SCSI IDs).

Figure 10. Two Host Non-High Availability Configuration



For customers with small data storage needs, a single disk system can be connected to two hosts in a split bus mode. Each host can do reads and writes to a maximum of seven disk modules. Each BCC can provide disk system status to the host it is connected to. Each host can operate independently of the other. System reboots and shutdowns do not need to be coordinated between the hosts. In a split bus configuration, the two SCSI buses are physically isolated. Problems on one bus are transparent to the other bus.

Figure 11. Two Host High Availability Configuration



A two-host configuration could be constructed using the Disk System 2300. Each disk system could still be configured using mirrors. High availability software will protect against a system failure. See Figure 11, above.

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 translates to 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 and within the restrictions of the operating environment. All customer-replaceable disk system components can be replaced under power. Adding or replacing disks or BCCs may require the use of HP-UX commands to manage file systems.

JBOD

Pronounced jay-bod, a JBOD (Just a Bunch Of Disks) is an enclosed group of disks.

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 25 meters including SCSI cable lengths inside devices on the bus. The disk system's connection to the host is LVD.

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.

Ultra160 SCSI

Ultra160 is a SCSI interface that transfers 160 Mbytes/sec for wide busses.

Installation

2

Preparation

Before installing the disk system, make sure (1) electrical wiring, breakers, and PDUs meet power needs, (2) the required support software is installed on the host, and (3) if you are connecting the disk system to a V-class server, auto-termination is enabled on the host bus adapter. This section covers all three of these topics.

Electrical Requirements

All electrical wiring to the service point (plug) must be sized to carry the appropriate inrush (20 amps per power supply) and steady state currents. See Table 1 for examples.

Table 1 Inrush (Surge) Current and Duration

No. of Disk Systems on Circuit (2 power supplies per disk system)	Inrush Current and Duration
1	40 amps declining over 100 ms (5 cycles)
2	80 amps declining over 100 ms (5 cycles)
3	120 amps declining over 100 ms (5 cycles)
4	160 amps declining over 100 ms (5 cycles)

Table 2 Maximum Operating Current

Incoming Voltage AC RMS	Maximum RMS Current Drawn by One Disk System
100 – 120 volts	4.8 amps
200 – 240 volts	2.0 amps

Caution Adding disk systems 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.

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 Rack Systems/E (HP Models J1500A(1.96M), J1501A(1.60M), or J1502 (1.25M)), you must upgrade 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 system units 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 Figure 12 and Figure 13.

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 redundant PDU/PDRUs*. For nonredundant configurations, divide the number of recommended PDU/PDRUs by 2.

Table 3 Recommended PDU/PDRUs for Multiple Disk Systems in HP Computer Cabinets

No. of Disk Systems	1.1 meter (21 U)	1.6 meter (32 U)	2.0 meter (41 U)
1 – 5	2 3-foot/16-amp PDUs ***or*** 2 19-inch/16-amp PDUs	2 5-foot/16-amp ***or*** PDUs*	2 19-inch/16-amp PDUs
6 – 8	NA**	4 19-inch/16-amp PDRUs or 4 19-inch/30-amp PDRUs	
9 – 10	NA**	NA**	4 19-inch/30-amp PDRUs

* Supports cabinet on/off switch.

** Rack height does not allow additional disk systems.

Table 4 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	2 19-inch/16-amp PDUs ***or***	2 19-inch/30-amp PDRUs*	
5 – 8	NA**	2 19-inch/30-amp PDRUs* 4 19-inch/30-amp PDRUs	
9 – 11	NA**	NA**	4 19-inch/30-amp PDRUs
12 - 13	NA**	NA**	4 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. See sample installations in Figure 12 and Figure 13. Installing PDU/PDRUs horizontally interferes with the ability to service disk systems that are behind the PDU/PDRU.
- Place vertical PDU/PDRUs on each side of the disk system so that the cord from either power supply does not cross over replaceable components in the middle of the product.
- To achieve maximum density in 2-meter racks, install 30-amp PDRUs on hinged brackets directly behind disk systems. Hinges allow the PDRU (HP E7681A and E7682A) to swing aside for servicing obscured components. (See Figure 13.)

Figure 12. PDRU Placement in 1.6-Meter Rack

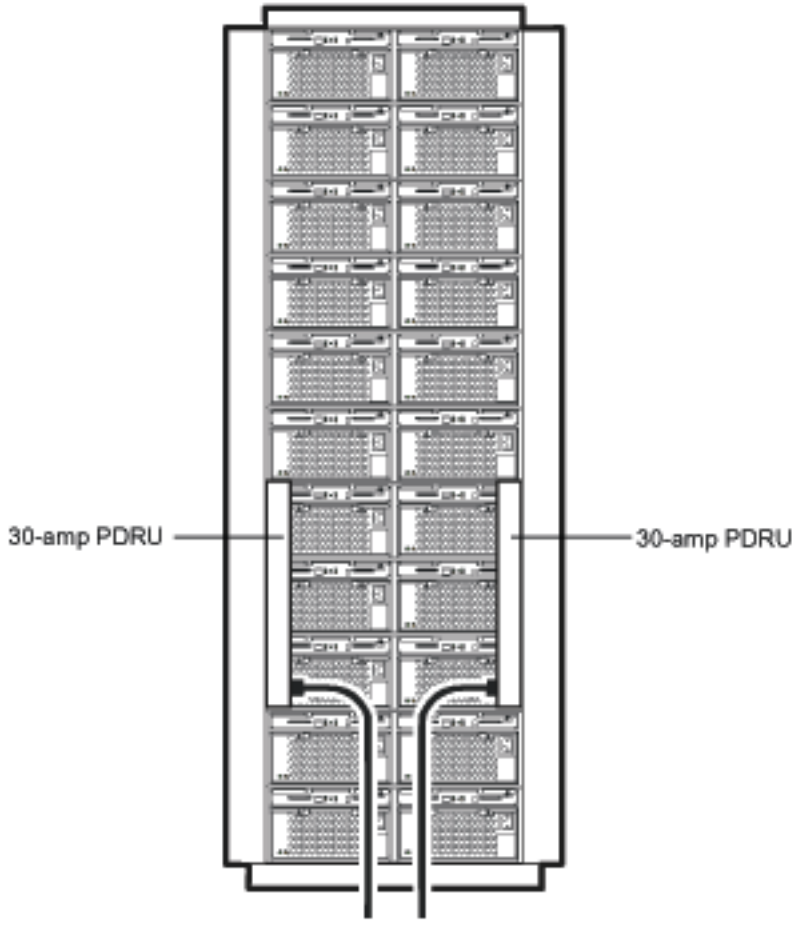
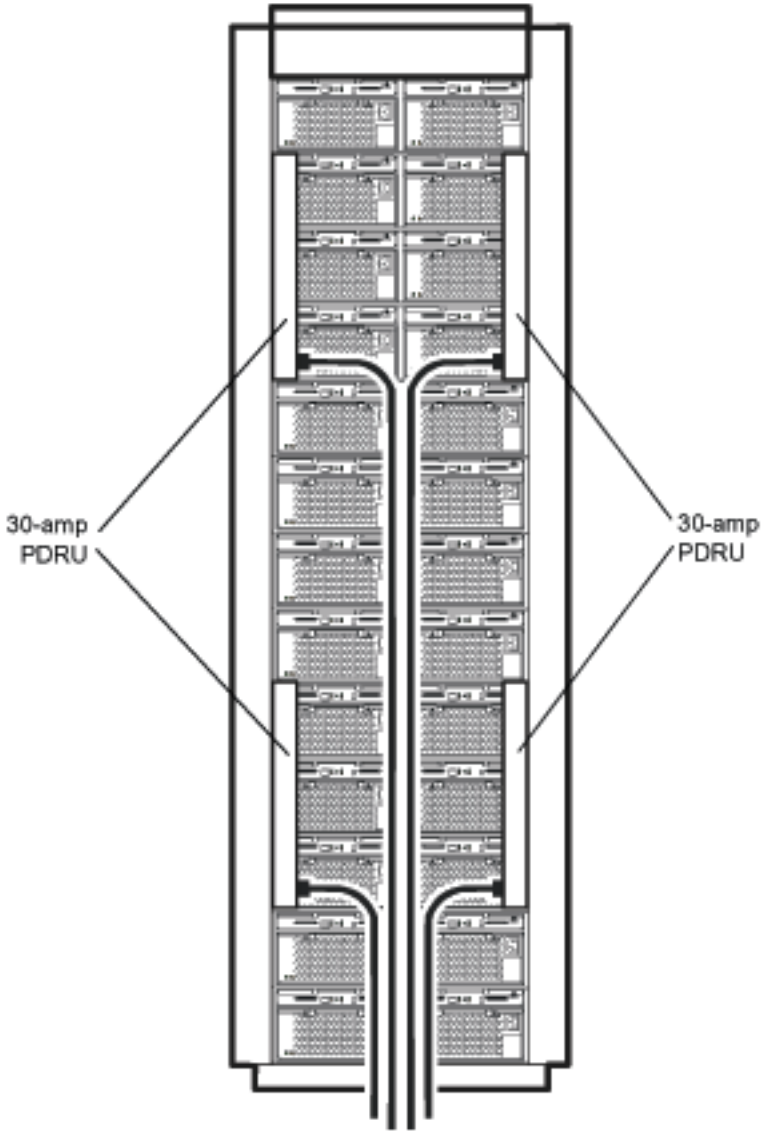


Figure 13. PDRU Placement in a 2.0-Meter Rack



Software Requirements

Ensure that the minimum revisions of HP-UX extension software and online diagnostics are installed. These release packages enable CommandView SDM and EMS for the disk system.

1. At the host console, enter swlist | grep HWE and look for the following extension software according to the installed HP-UX revision:

   HP-UX 11.00 with HWE 0302

   HP-UX 11.11 with HWE 0302

2. Enter swlist | grep Online and look for the following online diagnostics according to the installed HP-UX revision:

   - `Online Diags B.11.00.20.09`, or greater, on HP-UX 11.00
   - `Online Diags B.11.11.06.09`, or greater, on HP-UX 11.11

   If swlist does not report the specified releases, install them from the latest CD-ROM in any of the following products:

   — For HP-UX 11.00:

   o B3920EA HP-UX OE Media for Servers

   o B6261AA HP-UX 11.00 Extension Upgrade Media Kit

   — For HP-UX 11.11:

   o B3920EA HP-UX OE Media for Servers

   o B6191AA HP 9000 Support Plus Media

   o B6821AA HP-UX TCOE Media

   o B6845AA HP-UX 11.11 Minimal Technical OE Media

   o B7993AA HP-UX Enterprise OE Server Media

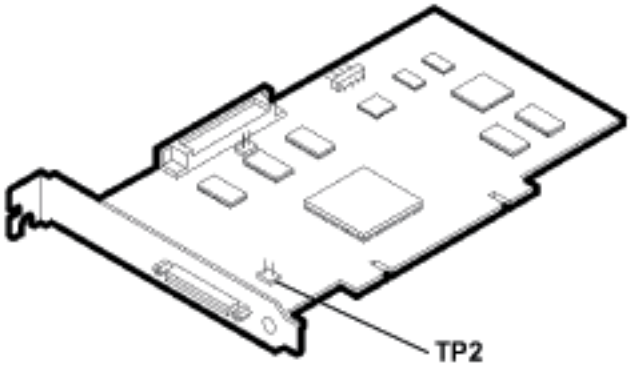
   o B7994AA HP-UX Mission Critical OE Comm. Media

The external IT Resource Center web site is:
http://us-support3.external.hp.com/

Auto-Termination

Auto-termination is disabled when a shunt is installed over both pins on the TP2 pinset. To enable auto-termination, remove the shunt entirely or move it to only one of the pins. The result must be open pins, as shown in Figure 14. Verify that auto-termination is enabled on the host system. For other HBAs, check the documentation for your particular host bus adapter.

Figure 14. Host Bus Adapter HP A5149A



Step 1: Gather Tools

Once the electrical, software, and special V-class preparations are complete, collect the tools you need to install the disk system hardware:

- Torx T25 screwdriver
- Torx T15 screwdriver
- Small flat-blade screwdriver

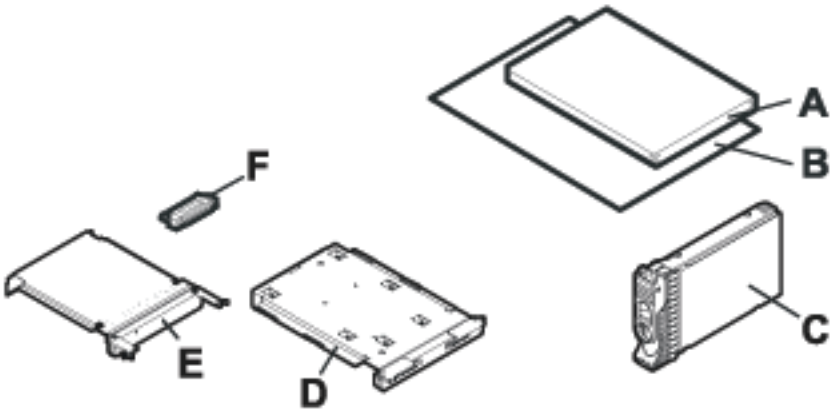
Step 2: Unpack the Product

1. Lift off the overcarton and verify the contents of the accessories (top) box. See Table 5 and Figure 15.

Table 5 Disk System Accessories

Figure Label	Part (part number)
A	User guide (A6490-96001)
B	Quick installation guide (A6490-96003)
C	Disk Modules and filler panels (A6198-60002)
D	BCC (A6491-60001)
E	BCC filler (A6490-67002)
F	LVD terminator (5021-1121)
-	Racking Kits not shown

Figure 15. Disk System Accessories



2. Lift off the accessories box and the top of the under box, and verify the contents shown in Table 6 and Figure 16.

Figure 16. Disk System ContentsDisk System Contents

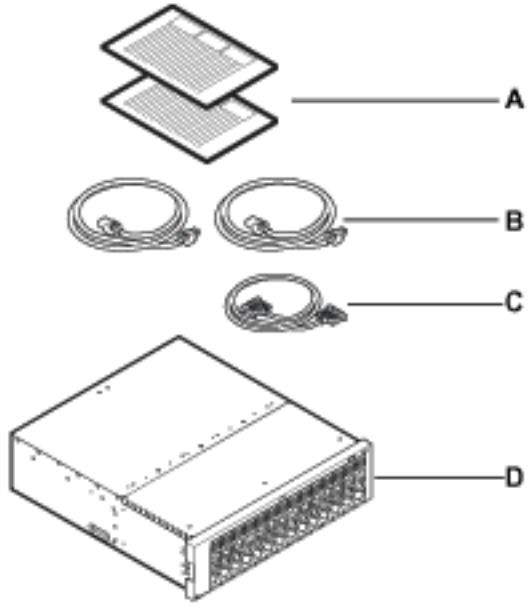


Table 6 Disk System Contents

Figure Label	Part (part number)
A	Installation Manual (A6490-96003)
B	Two power cords (8120-6514)
C	SCSI Cable (see Reference Section for part numbers)
D	Disk System Chassis (A6490-60100)

If a part is missing, contact an HP sales representative.

Step 3: Install the device

Follow the procedures in this section to install your storage device in one of the following rack systems:

- HP Rack System/E
- HP Computer Cabinet
- Rittal-Style Rack

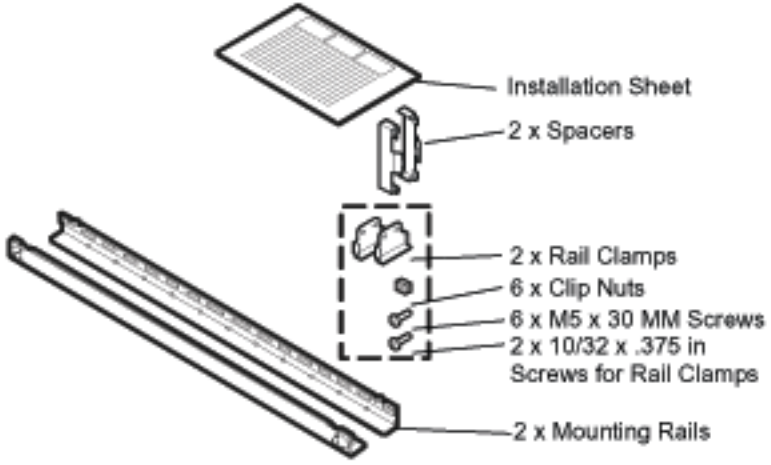
Installing the Storage Device into a Rack System/E

Your storage device can be installed into any of these HP Rack System/E Products:

- A4902A HP Rack System/E41 (1.96 M; 41U)
- A4901A HP Rack System/E33 (1.60 M; 33U)
- A4900A HP Rack System/E25 (1.10 M; 25U)

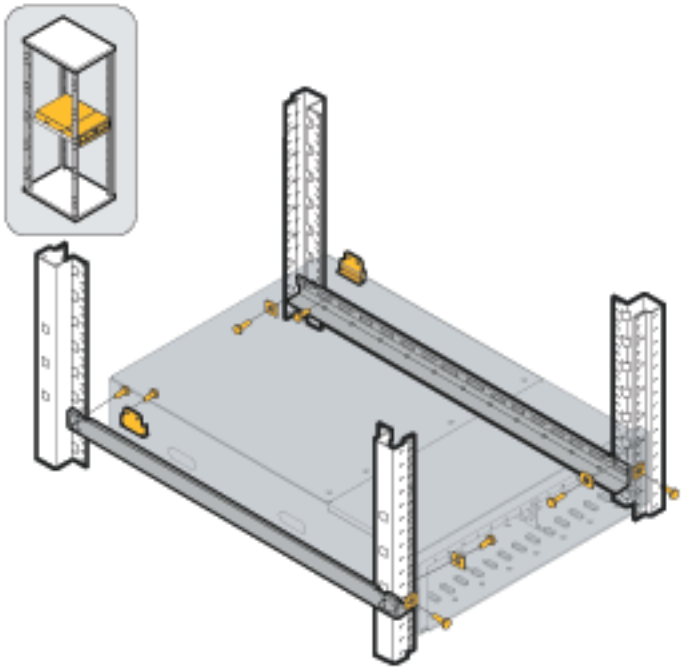
1. Check the rail kit contents (see Figure 17). If any parts are missing, call your nearest HP sales office.

Figure 17. HP Rack System/E Rail Kit Contents



2. Study the installation overview (see Figure 18).

Figure 18. HP Rack System/E Installation Overview



The following tools are required for the installation of the storage device:

- Flat-blade screwdriver
- T25 nut driver

WARNING To ensure cabinet or rack stability and avoid possible injury, always install the storage devices in the rack or cabinet from the bottom up.

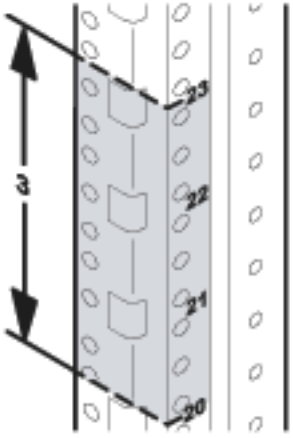
3. Locate a place on the rack columns with the available space required for the installation of the storage device. The storage device and the rail kit require 3 EIA units of space.

Use the following table as a guide for placement of the rails in a Rack System/E where multiple disk systems will be installed. You can rack multiple disk systems without gaps installing rails every three EIA units. For example, starting at the bottom of a 2-meter rack, set rails at the following unit/hole locations:

Table 7 Rail Positions for Sequential Disk Systems

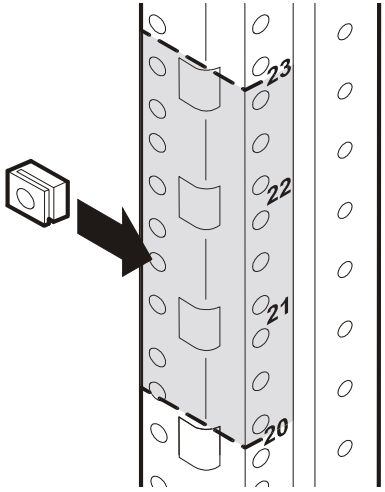
Disk Systems	Hole from Rack Bottom
One	1
Two	4
Three	7
Four	10
Five	13
Six	16
Seven	19
Eight	22
Nine	25
Ten	28
Eleven	31

Figure 19. Locating the site for the device installation in a System/E Rack



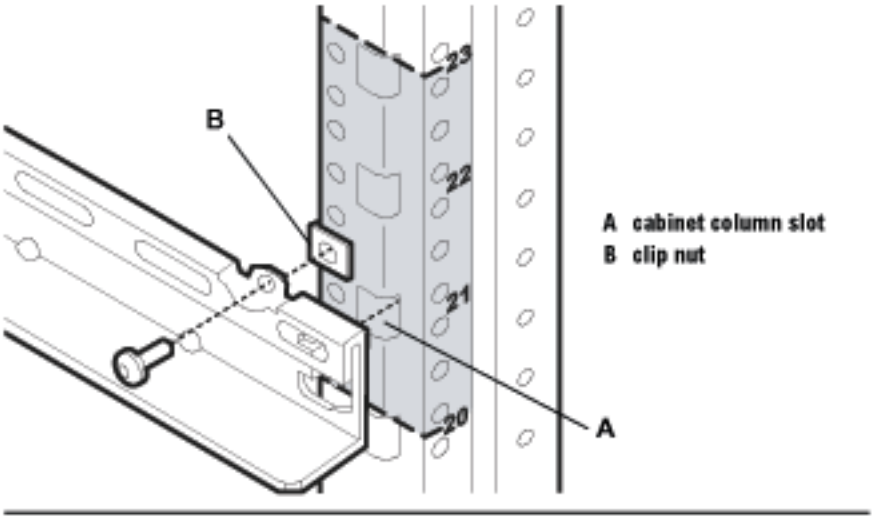
4. Install clipnuts as shown in Figure 20.

Figure 20. Installing clipnuts for an HP Rack System/E



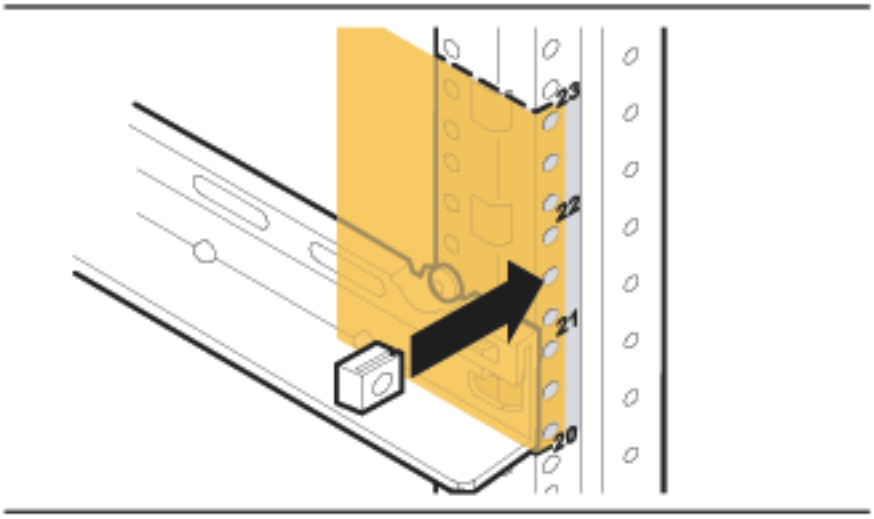
5. Insert the rail tabs into the appropriate column holes (see Figure 21).

Figure 21. Installing rails in an HP Rack System/E



6. Secure the rail ends with one M5 screw each.
7. Install clipnuts on the front columns of the cabinet (see Figure 22). These are used for the retention bracket screws.

Figure 22. Installing the enclosure clipnut

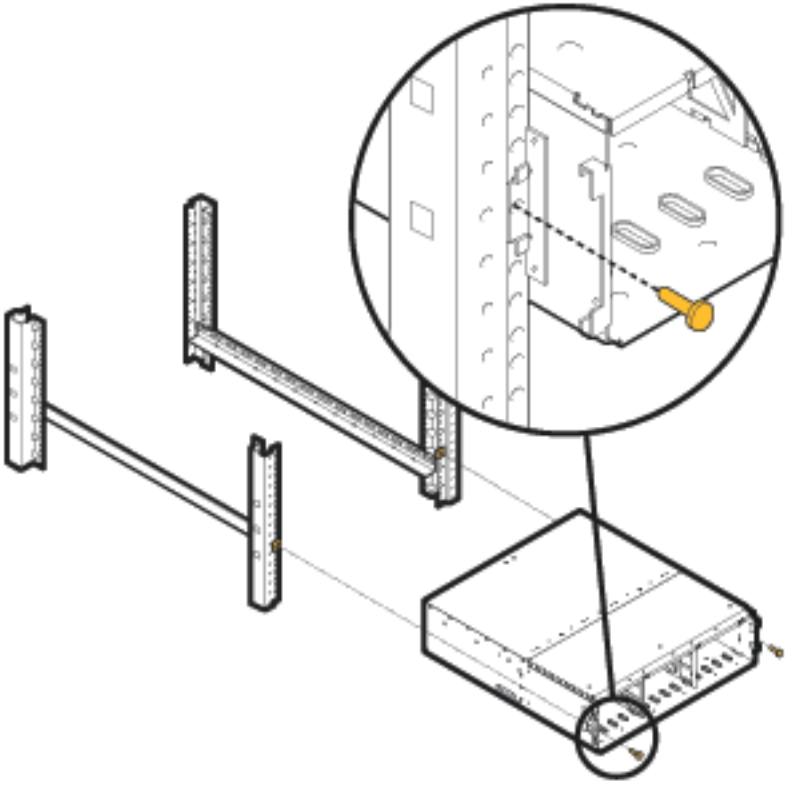


8. Place the storage device on the rails and slide it into the cabinet until the retention bracket comes in contact with the rack column (see Figure 23).

WARNING An empty storage device weighs more than 54 pounds (24.5 kg) (without disk modules installed). To avoid personal injury, it is recommended that two people install the storage device in the rack.

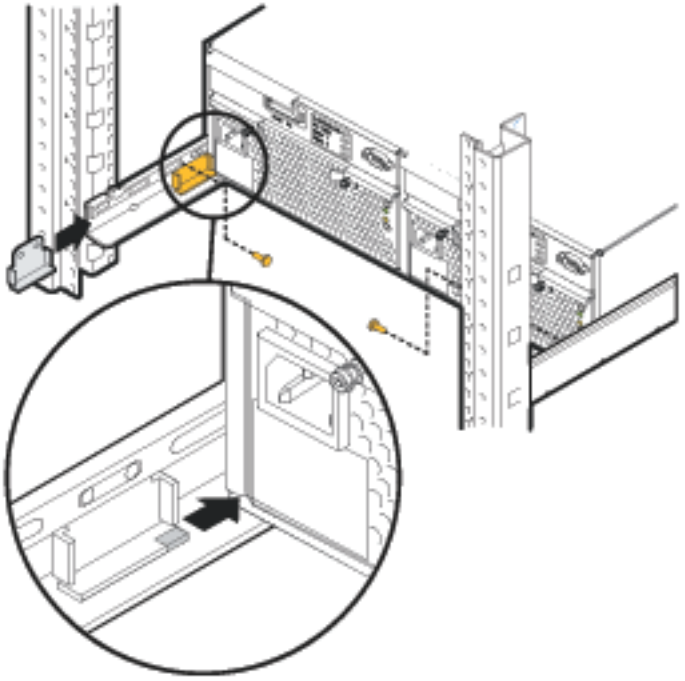
9. Insert and tighten the storage device retention (M5) screws through the retention bracket (see Figure 23).

Figure 23. Installing the storage device in the Rack System/E



10. Place a rail clamp on each rail and slide them to each bottom rear corner of the storage device.(see Figure 24).
11. Secure the clamps to the rails. Use one 10-32 screw for each rail clamp.

Figure 24. Installing enclosure rail clamps in an HP Rack System/E



Installing the storage device into an HP Computer Cabinet

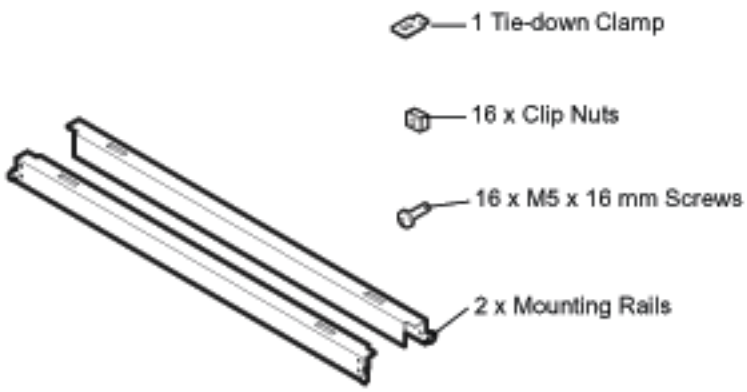
Your storage device can be installed into the following Computer Cabinets:

- C2785A Computer Cabinet (1.10M; 21U)
- C2786A Computer Cabinet (1.60M; 32U)
- C2787A Computer Cabinet (1.96M; 41U)

Caution To ensure proper installation, only use the instructions in this manual for installing the storage device in the HP Computer Cabinet. Do not use the instructions enclosed in the rail kit box.

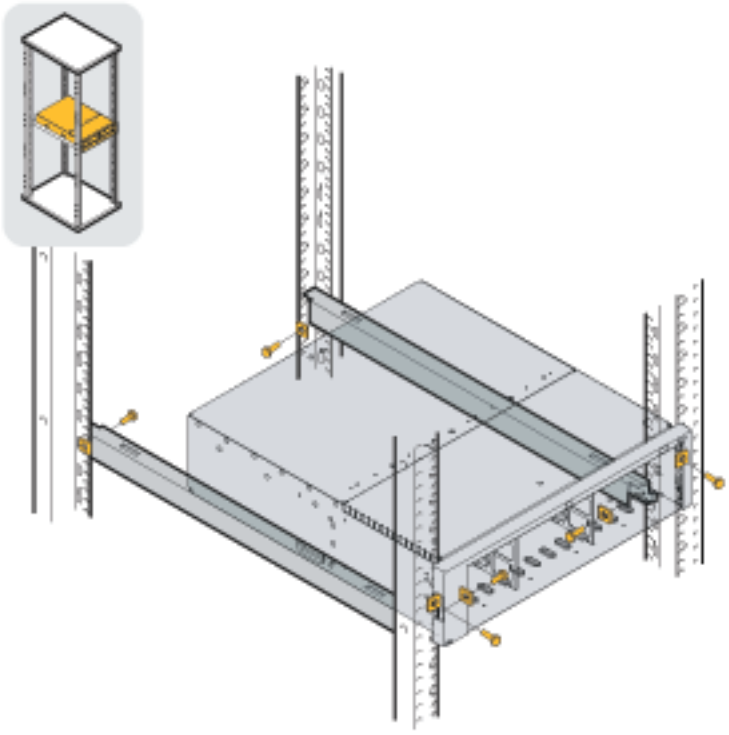
1. Check the rail kit contents (see Figure 25). If any parts are missing, call your nearest HP sales office. The tie-down clamp is not used and may be discarded.

Figure 25. HP Computer Cabinet Rail Kit Contents



2. Study the installation overview (see Figure 26)

Figure 26. HP Computer Cabinet Installation Overview



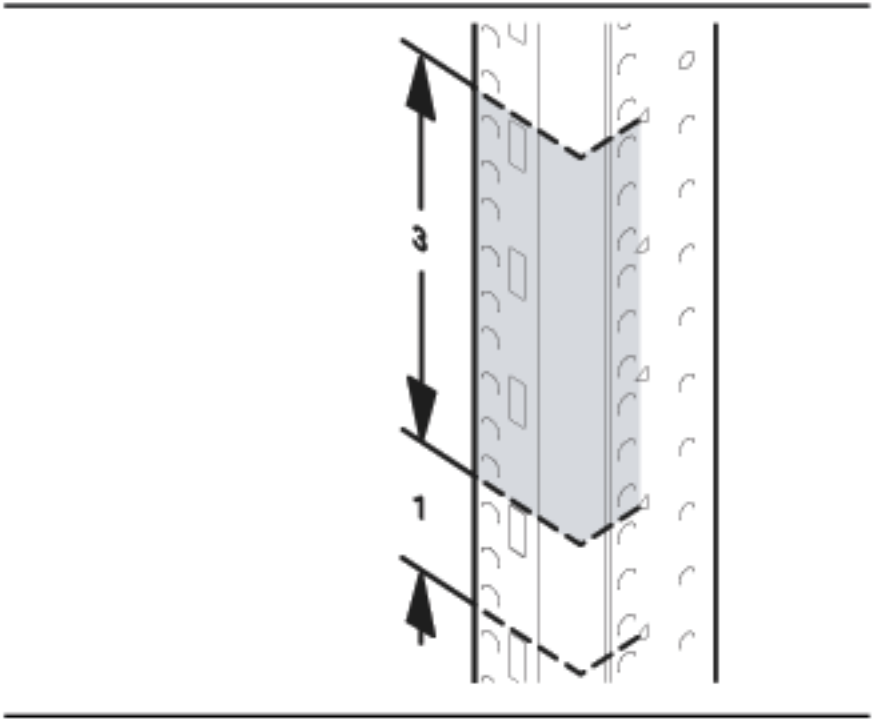
The following tools are required for the installation of the storage device:

- Flat-blade screwdriver
- T25 nut driver

WARNING To ensure cabinet or rack stability and avoid possible injury, always install storage devices in the rack or cabinet from the bottom up.

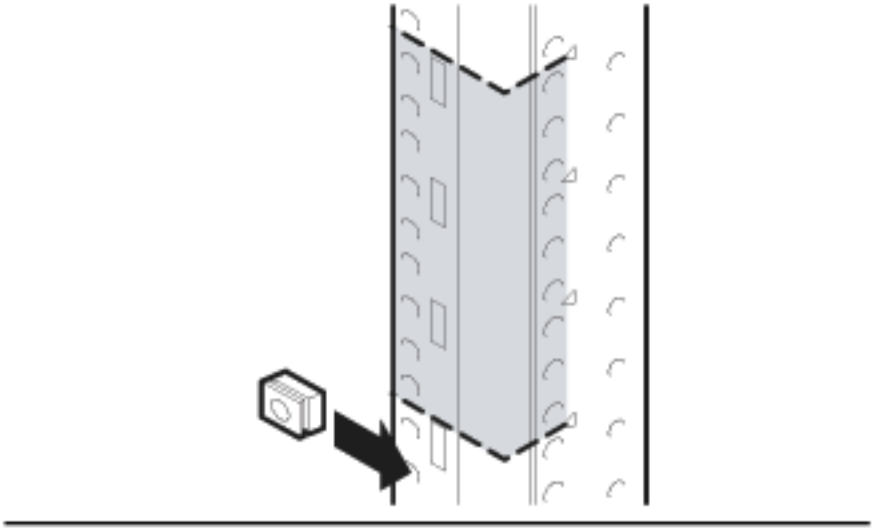
3. Locate a place on the rack columns with the available space required for the installation of the storage device. The storage device and the rail kit require 4 EIA units of space, three units for the storage device and one unit for the rails (see Figure 27).

Figure 27. Locating the site for the device installation in an HP Computer Cabinet



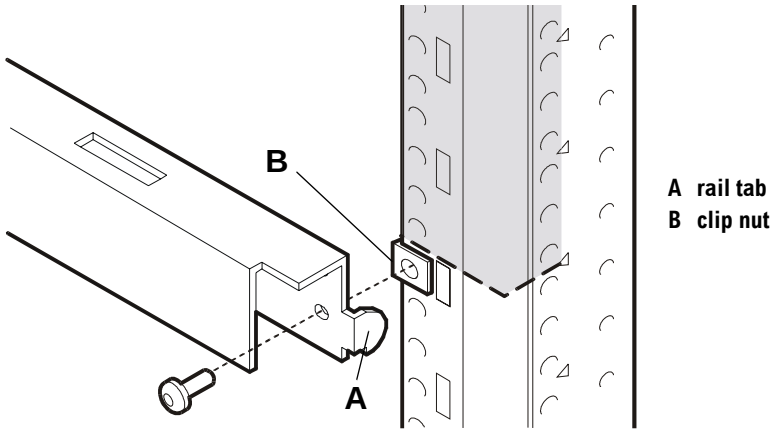
4. Install clipnuts as shown in Figure 28

Figure 28. Installing rail clip nuts in the HP Computer Cabinet



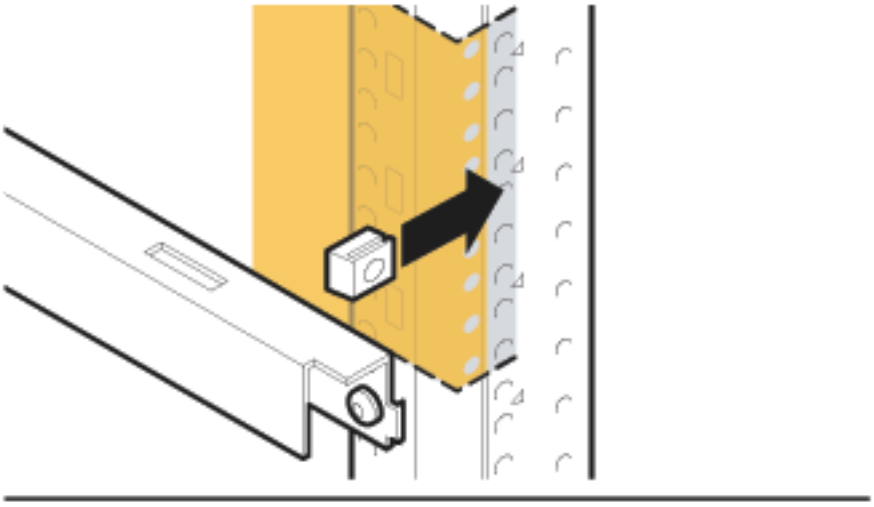
5. Insert the rail tabs into the appropriate holes on the HP Computer Cabinet columns (see Figure 29).
6. Secure the rail ends with one M5 screw each.

Figure 29. Installing rails in the HP Computer Cabinet



7. Install clipnuts on the front columns of the cabinet (see Figure 30). These are used for the device retention screws.

Figure 30. Installing enclosure retention clipnuts in an HP Computer Cabinet

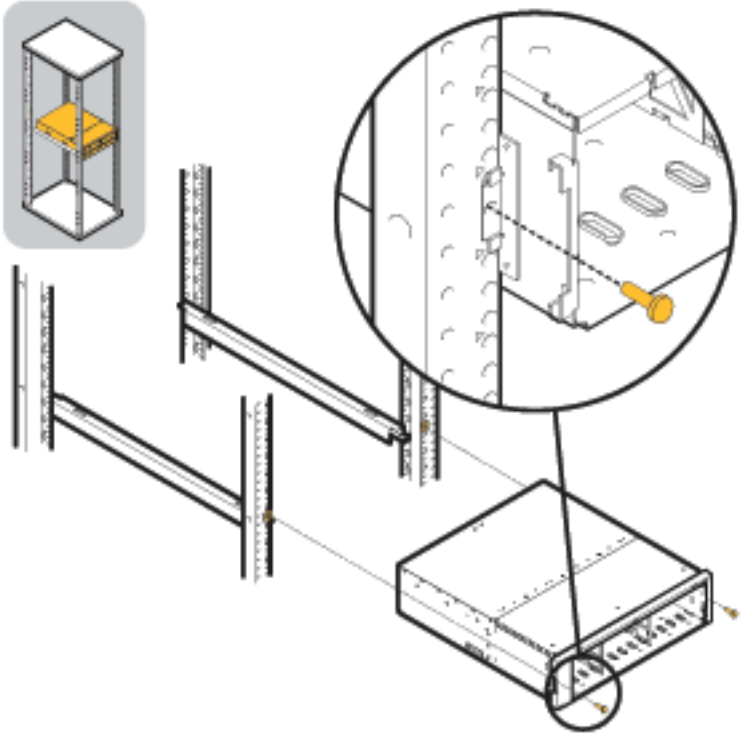


8. Place the storage device on the rails and slide it into the cabinet until the retention bracket comes in contact with the rack column (see Figure 31).

WARNING An empty storage device weighs approximately 54 pounds (without disk modules installed) (24.5 kg). To avoid personal injury, it is recommended that two people install the storage device in the rack.

9. Tighten the storage device retention (M5) screws through the retention bracket (see Figure 31).

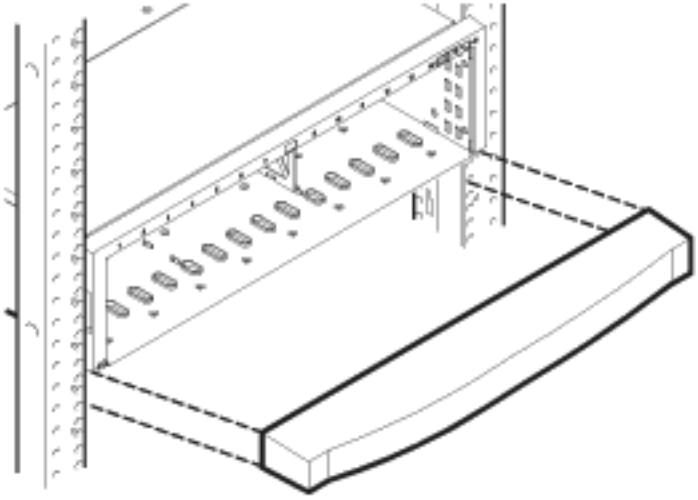
Figure 31. Installing the storage device in an HP Computer Cabinet



10. Install a filler panel in the space below the storage device.

    If a filler panel is required, it must be ordered separately. Contact your local HP sales representative for assistance.

Figure 32. Installing a filler panel in an HP Computer Cabinet

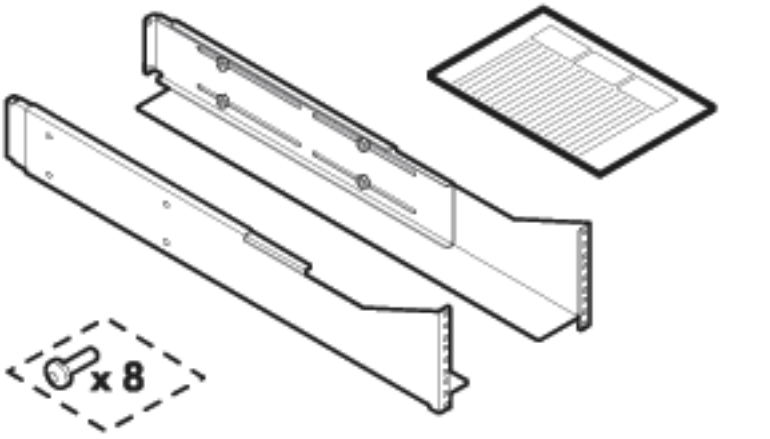


Installing the Storage Device into a Rittal-Style Rack

Your storage device can be installed into the Rittal-Style Rack by doing the following steps:

1. Inspect the contents of the rail kit. If any parts are missing, call your nearest HP sales office. See Figure 33.

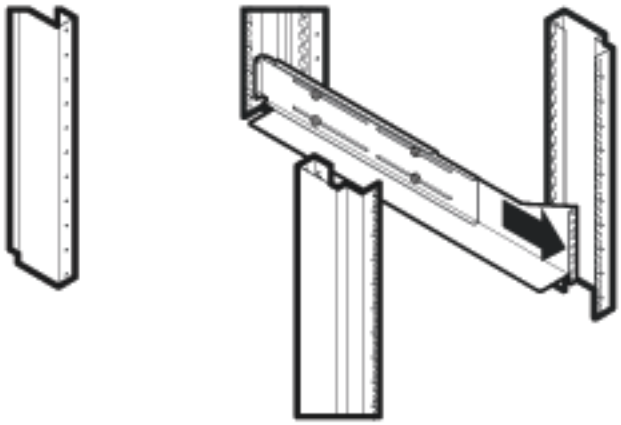
Figure 33. Rittal-Style Rail Kit Contents



2. Align the front of rails to the inside of the front cabinet column.

   Carefully observe the alignment of the groups of holes on the columns so the holes in the rails align properly.

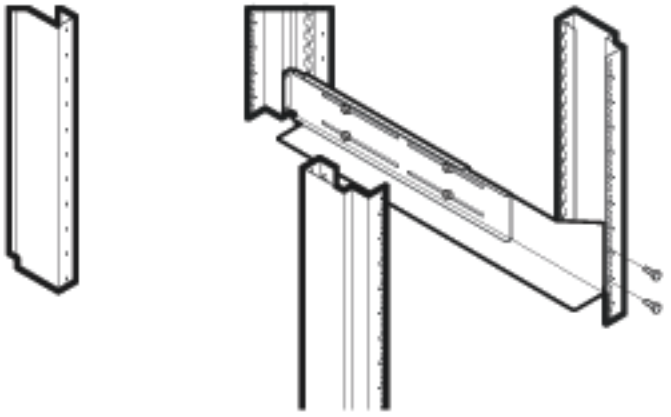
Figure 34. Rail Alignment



3. Insert and finger tighten the rail mounting screws.

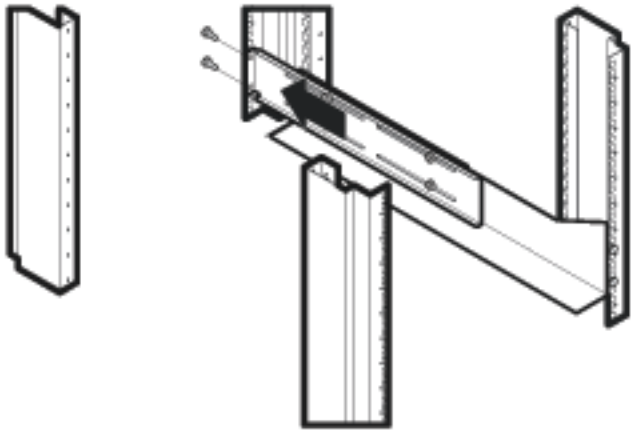
   Use the third and seventh holes from the top of rail to mount the rail to the front column of the cabinet.

Figure 35. Front Screw Installation



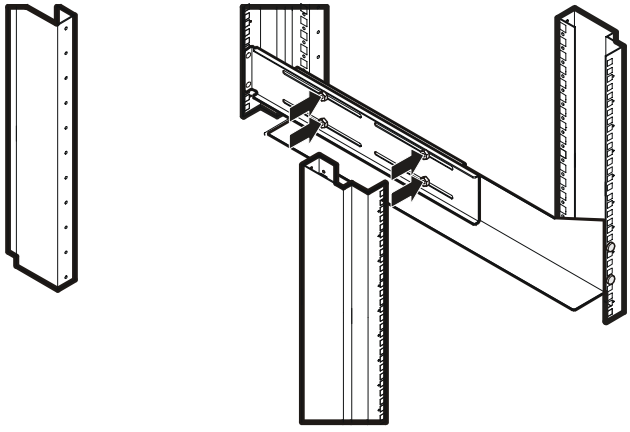
4. Extend the adjustable slide to the back column of the cabinet.
5. Insert the mounting screws and finger tighten them through the rear column of the cabinet.

Figure 36. Rear Slide Extension



6. Tighten the center nuts to finger tightness.

Figure 37. Center Nut Tightening

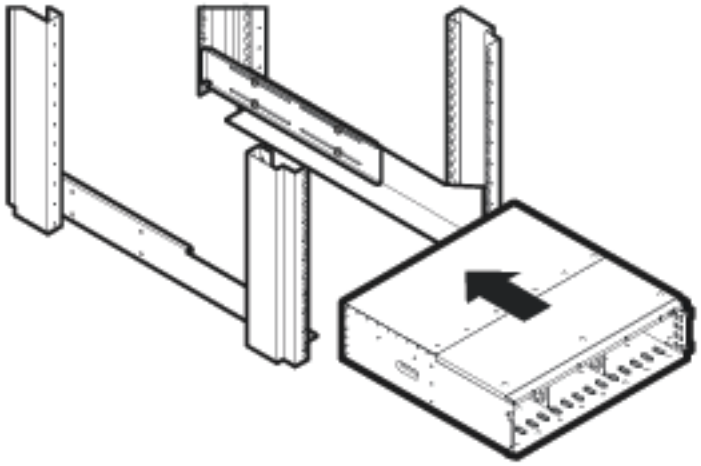


7. Tighten all screws to their final tightness using a driver.

   Tighten the screws that hold the rail to the columns first, *before* tightening the center slide nuts to their final tightness.

8. Repeat the procedure above for the other rail.
9. Insert the disk system (with disk modules and power supplies removed) onto the rails.

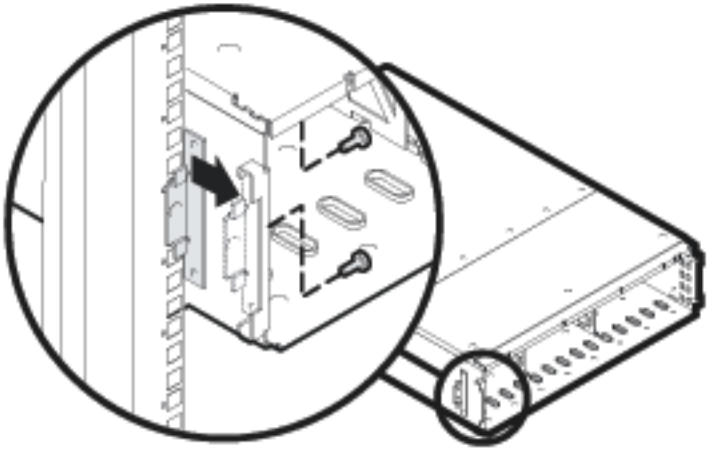
Figure 38. Installing a Disk System into the Rittal-Style Rack



10. Move the disk system retention brackets to the frontmost set of mounting holes.

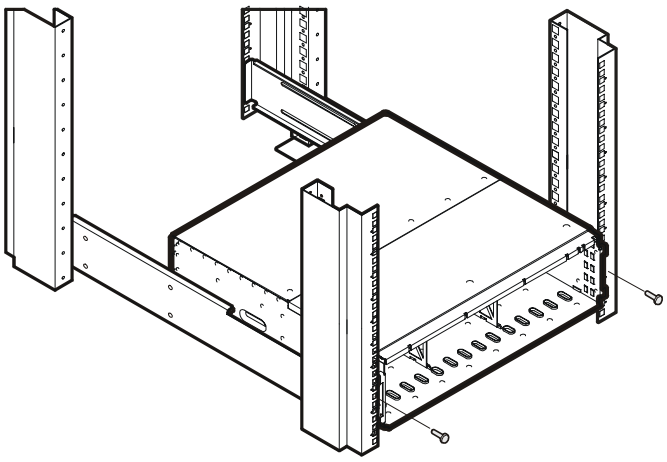
    This allows the disk system to install further back into the cabinet; and so, allows the cabinet doors (if present) to close properly.

Figure 39. Moving a Disk System Retention Bracket



11. Push the disk system back into the rack until the disk system retaining bracket is flush against the front column of the rack.
12. Bolt the disk system to the front column. Use the fifth hole from the top of the front of the rail.

Figure 40. Bolting the Disk System to the Front Column of the Rack



Install the Disk System

1. Remove the power supply/fan modules to prepare the disk system for lifting:
   a. Loosen the screws in each extractor handle of each power supply/fan module with the chassis still in the box.
   b. Pull the extractor handles out from the center of the power supply to disengage the it from the midplane. Pull each power supply/fan module out of the chassis. Support the far end of the power supply/fan module with your free hand as it clears the chassis.
   c. Set the power supply/fan module aside, on an antistatic pad, to be reinstalled later.

WARNING Do not attempt to lift the disk system without the help of another person or a lift device. Even without power supplies and disk drives, the disk system weighs 54 pounds.

2. Remove the disk modules from the disk system. Place them aside on the pink anti-static foam pad supplied with your disk system.
3. Carry the disk system to the front of the rack and slide the back end onto the rails (Figure 38) with the help of another person or using a lifting device. Push the disk system into the rack as far as it will go.
4. Secure the disk system as appropriate for the rail kit and cabinet at the installation site.

Step 4: Install BCCs

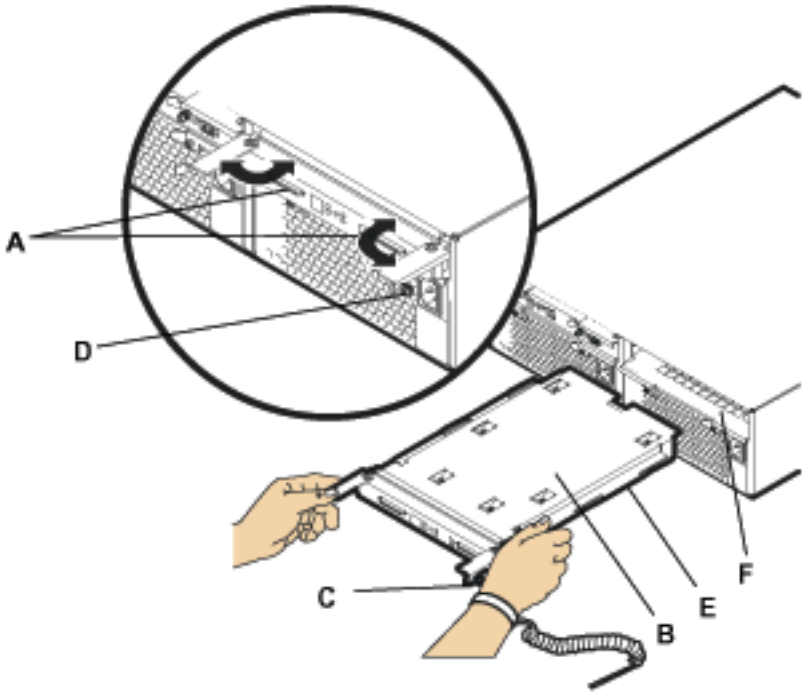
The disk system comes with one or two BCCs, depending on the option purchased. If you are installing only one BCC, you will install a BCC filler in the open BCC slot.

1. Attach your ESD strap to ground.
2. Unpack the BCC from the accessories box and ESD bag.

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

3. Loosen the locking screws (D in Figure 41) if necessary on the BCC cam latches.
4. Open the BCC cam latches (C in Figure 41) by pulling them away from the center.
5. Align the BCC alignment guides (E) with the slot, and insert the BCC into the the left slot at the back of the disk system. Stop pushing when the BCC meets the midplane.
6. Press the cam latches inward and flat against the center. The cam action draws the BCC completely into the slot and seats the connector pins on the midplane.
7. Tighten the locking screw (D).

Figure 41. BCC Installation

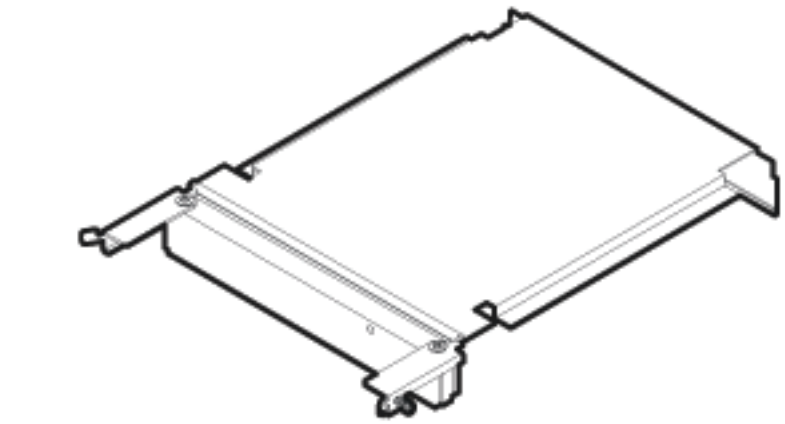


A SCSI ports
B BCC
C cam latch
D locking screw
E alignment guides
F BCC slot

8. If you have a second BCC, repeat steps 2 through 6, installing the second BCC in the right slot.

9. If you do not have a second BCC, install the BCC filler as follows:
   a Unpack the BCC filler from the accessories box.
   b Align the filler panel edges with the appropriate slot and insert the filler into the open slot until the cam handles engage.
   c Press the cam handles toward the center of the BCC until they are against the face of the filler panel.
   d Tighten the locking thumbscrew (see Figure 42).

Figure 42. BCC Filler Panel



Step 5: Set DIP Switches

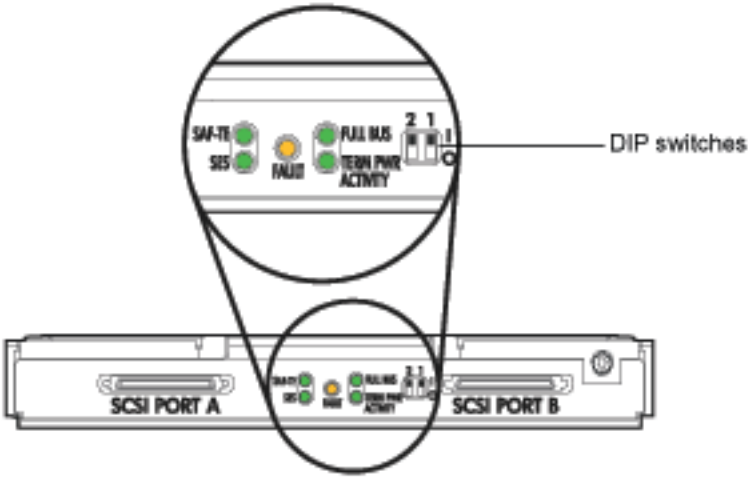
BCCs are shipped from the factory with all DIP switches (see Figure 43) in the "|" position. The pull-out label on top of the disk system identifies each switch position.

Caution — DIP Switch settings must be the same on both BCCs. If settings differ, the disk system will fail its power-on self-test and the disks will not be accessible through the second BCC.

Set dip switches as needed. See Chapter 3, Configuration, for switch definitions and guidelines.

There is a switch bank that is recessed from the BCC bulkhead. Typically, they do not need to be reset. The BCC must be removed from the disk system to access this switch bank. See switch bank 2 in Chapter 3. Also see Tables 33 and 34 for switch settings and usage.

Figure 43. BCC DIP Switches



Step 6: Connect SCSI and Power Cables

1. Attach an LVD SCSI cable to SCSI port A or B, on one or both BCCs. (Sample topologies appear in Chapter 1.)
2. Attach the other end of each SCSI cable to a host bus adapter. (See bus configuration options in Chapter 3.)
3. Attach an LVD terminator to any empty SCSI port that is on a BCC with a cable attached.

   The terminators can be found in bags tethered to the BCC locking thumbscrew(s).
4. Plug a power cord into the AC receptacle of each power supply.
5. Attach the other end of each power cord to a preinstalled PDU/PDRU. Choose outlets according to the following guidelines:
   - Redundancy. To extend the redundancy of the product, attach each cord to a different PDU. This is represented in Figure 44 and Figure 45 by the absence of duplicate letters in each disk system.
   - Reliability. To avoid cascading faults for a group of disk systems that are plugged into the same PDU, distribute redundant power cords to as many different combinations of PDUs as possible. This is represented in Figure 44 and Figure 45 by the least number of duplicate pairs of letters among all disk systems. Cascading faults occur when a backup PDU is overloaded with power surges after the primary PDU fails.
   - Serviceability. Choose PDU locations that prevent power cords from interfering with the removal and replacement of serviceable components. Also leave a 6-inch service loop to allow for the rotation of PDRUs.

The letters A, B, C, D, E and F in the following diagrams represent independent PDUs or PDU banks. The absence of duplicate letters in individual disk systems indicates the products are using redundant PDUs. The minimal number of duplicate letter pairs indicates the disk systems are protected against cascading faults.

Figure 44. Wiring Scheme for 1.6-Meter Rack

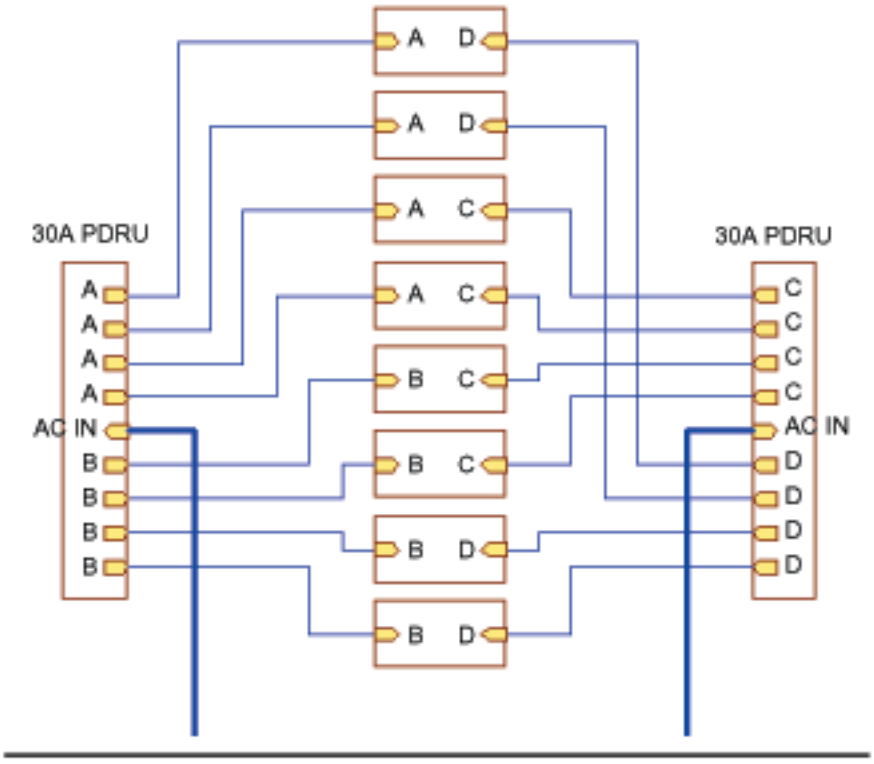
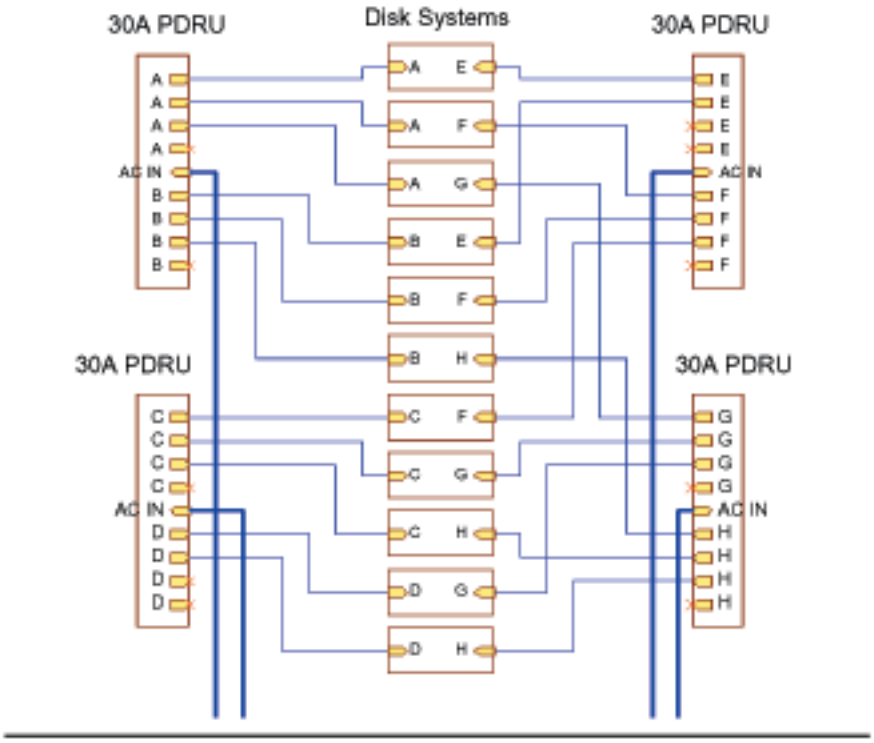


Figure 45. Wiring Scheme for 2.0-Meter Rack

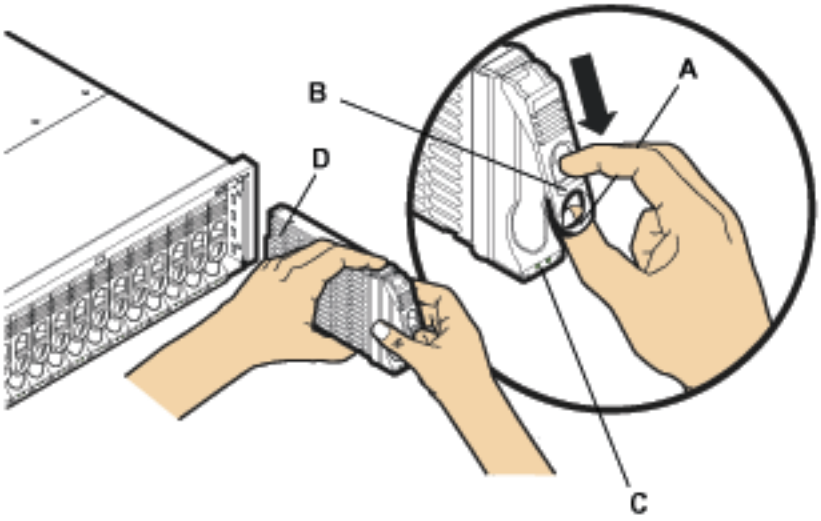


Step 7: Install Disk Modules

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.

Disk modules are fragile and ESD sensitive. Dropping one end of the disk just two inches is enough to cause permanent damage. In addition, static electricity can destroy the magnetic properties of recording surfaces. Grip disks only by their handles (A in Figure 46) and carriers (D), and follow strict ESD procedures.

Figure 46. Disk Module Installation



A extraction handle
B cam latch
C Leds
D carrier

1. Determine which slots, 1 through 14, will contain disk modules and which will contain fillers.
   - If DIP switch 1 is set to "|" (full bus mode), choose any slots for disk modules or fillers. In full bus mode, the SCSI address 7 is reserved for the host bus adapter. If more than one host bus adapter connects the disk system to other hosts, then a disk module must be removed from the slot whose SCSI address corresponds to the SCSI address of the additional host bus adapter. The most host bus adapters supported on this disk system is two.
   - If DIP switch 1 is set to "0" (split bus mode), the left BCC is on the high numbered bank (with disk slots 8, 9, 10, 11,12, 13, and 14) and the right BCC is on the low numbered bank (with disk slots 0, 1, 2, 3, 4, 5, and 6) of disk slots.
   - At least one disk module must be installed.
2. Put on the ESD strap and attach the other end to ground.

Caution Disk modules are fragile. Handle carefully. Be careful to grasp the disk module by its handle and avoid touching exposed circuitry.

3. Verify that the disk module extraction handle (A in Figure 46) is open by placing a finger behind the extraction handle and pushing the latch tab toward your finger.
4. Align and insert the disk module into its slot.
5. Push the disk module as far as it will go into the selected slot.

Note Install disks left to right for easier insertion.

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

Caution Every slot must contain either a disk module or filler panel for proper cooling.

Step 8: 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 drives. Doing so could cause an overcurrent fault, requiring a power cycle to recover.

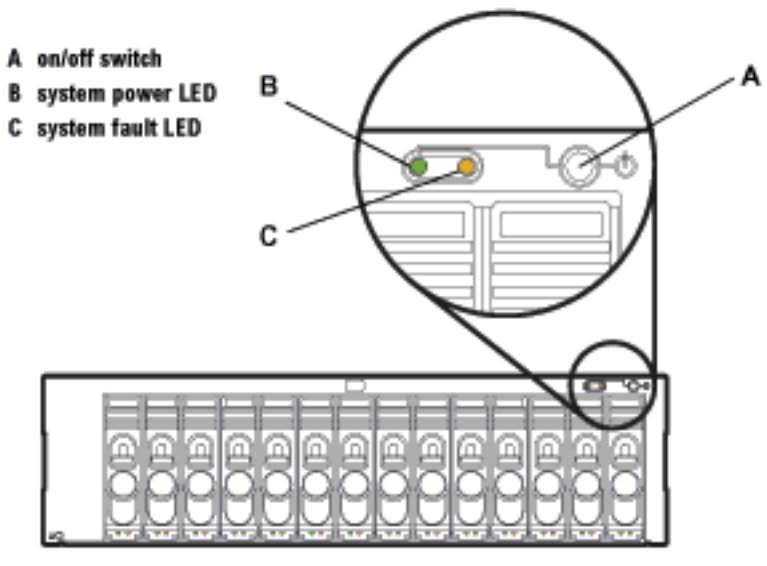
Press in the power/standby switch with the retracted tip of a pen or pencil to power-on the array (see Figure 47). Allow 2 minutes for the disk drives and controllers to complete their self-tests.

1. Press the power switch (A in Figure 47) to turn on the disk system.
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.

Figure 47. On/Off Switch and System LEDs



Step 9: Verify Devices on the Host

On an HP-UX host run IOSCAN (ioscan -f) and verify that the disks and BCC(s) are listed in IOSCAN output. If the displayed “S/W State” is not “claimed,” begin troubleshooting (see Chapter 4).

Sample IOSCAN

The example shows a fully loaded disk system. The BCC card is at hardware path `0/1/0/0.15.0`

```
Class       I  H/W Path        Driver    S/W State   H/W Type     Description
============================================================================
ext_bus     5  0/3/0/0         c8xx      CLAIMED     INTERFACE    SCSI C1010 Ultra160
                                                                  Wide LVD A6828-60001
target     22  0/3/0/0.0       tgt       CLAIMED     DEVICE
disk       51  0/3/0/0.0.0     sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     23  0/3/0/0.1       tgt       CLAIMED     DEVICE
disk       52  0/3/0/0.1.0     sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     24  0/3/0/0.2       tgt       CLAIMED     DEVICE
disk       53  0/3/0/0.2.0     sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     25  0/3/0/0.3       tgt       CLAIMED     DEVICE
disk       54  0/3/0/0.3.0     sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     26  0/3/0/0.4       tgt       CLAIMED     DEVICE
disk       55  0/3/0/0.4.0     sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     27  0/3/0/0.5       tgt       CLAIMED     DEVICE
disk       56  0/3/0/0.5.0     sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     28  0/3/0/0.6       tgt       CLAIMED     DEVICE
disk       57  0/3/0/0.6.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318406LC
target     21  0/3/0/0.7       tgt       CLAIMED     DEVICE
ctl        25  0/3/0/0.7.0     sctl      CLAIMED     DEVICE       Initiator
target     29  0/3/0/0.15      tgt       CLAIMED     DEVICE
ctl        21  0/3/0/0.15.0    sctl      CLAIMED     DEVICE       HP      A6491A
ba          4  0/4             lba       CLAIMED     BUS_NEXUS    Local PCI Bus
                                                                  Adapter (782)
ext_bus     9  0/4/2/0         c8xx      CLAIMED     INTERFACE    SCSI C1010 Ultra160
                                                                  Wide LVD A6829-60001
target     30  0/4/2/0.7       tgt       CLAIMED     DEVICE
ctl        26  0/4/2/0.7.0     sctl      CLAIMED     DEVICE       Initiator
target     22  0/4/2/0.8       tgt       CLAIMED     DEVICE
disk       51  0/4/2/0.8.0     sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     23  0/4/2/0.9       tgt       CLAIMED     DEVICE
disk       52  0/4/2/0.9.0     sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     24  0/4/2/0.10      tgt       CLAIMED     DEVICE
disk       53  0/4/2/0.10.0    sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     25  0/4/2/0.11      tgt       CLAIMED     DEVICE
disk       54  0/4/2/0.11.0    sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     26  0/4/2/0.12      tgt       CLAIMED     DEVICE
disk       55  0/4/2/0.12.0    sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     27  0/4/2/0.13      tgt       CLAIMED     DEVICE
disk       56  0/4/2/0.13.0    sdisk     CLAIMED     DEVICE       HP 36.4GST336706LC
target     28  0/4/2/0.14      tgt       CLAIMED     DEVICE
disk       57  0/4/2/0.14.0    sdisk     CLAIMED     DEVICE       HP 18.2GST318406LC
target     29  0/4/2/0.15      tgt       CLAIMED     DEVICE
ctl        21  0/4/2/0.15.0    sctl      CLAIMED     DEVICE       HP      A6491A
```

The “descriptions” in this example represent some of the valid disk modules. Valid disk descriptions include:

- ST318404LC18-Gbyte 10K rpm LVD disk module
  ST318406LC
- ST336704LC36-Gbyte 10K rpm LVD disk module
  ST336706LC
- ST373405LC73-Gbyte 10K rpm LVD disk module
- ST318452LC18-Gbyte 15K rpm LVD disk module
  MAM3184MC
- ST336752LC36-Gbyte 15K rpm LVD disk module
  MAM3367MC

Where do you go from here?

For operating system and application configuration information, refer to the documentation for your particular server’s operating system.

Configuration

3

Viewing a Disk System in IOSCAN

An IOSCAN (example below) shows each BCC (0/1/0/0.15.0) and disk in the disk system.

Sample IOSCAN

Type the command: ioscan -f

```
Class       I  H/W Path        Driver    S/W State   H/W Type     Description
=============================================================================
ext_bus     4  0/1/0/0         c8xx      CLAIMED     INTERFACE    SCSI C1010 Ultra160
                                                                  Wide LVD A6828-60001
target      6  0/1/0/0.0       tgt       CLAIMED     DEVICE
disk       34  0/1/0/0.0.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318406LC
target      7  0/1/0/0.1       tgt       CLAIMED     DEVICE
disk       35  0/1/0/0.1.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318406LC
target      8  0/1/0/0.2       tgt       CLAIMED     DEVICE
disk       36  0/1/0/0.2.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318406LC
target      9  0/1/0/0.3       tgt       CLAIMED     DEVICE
disk       24  0/1/0/0.3.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318406LC
target     10  0/1/0/0.4       tgt       CLAIMED     DEVICE
disk       37  0/1/0/0.4.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     11  0/1/0/0.5       tgt       CLAIMED     DEVICE
disk       42  0/1/0/0.5.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     11  0/1/0/0.6       tgt       CLAIMED     DEVICE
disk       42  0/1/0/0.6.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     12  0/1/0/0.7       tgt       CLAIMED     DEVICE
ctl        24  0/1/0/0.7.0     sctl      CLAIMED     DEVICE       Initiator
target     13  0/1/0/0.8       tgt       CLAIMED     DEVICE
disk        8  0/1/0/0.8.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     14  0/1/0/0.9       tgt       CLAIMED     DEVICE
disk       18  0/1/0/0.9.0     sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     15  0/1/0/0.10      tgt       CLAIMED     DEVICE
disk       19  0/1/0/0.10.0    sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     16  0/1/0/0.11      tgt       CLAIMED     DEVICE
disk       22  0/1/0/0.11.0    sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     17  0/1/0/0.12      tgt       CLAIMED     DEVICE
disk       20  0/1/0/0.12.0    sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     18  0/1/0/0.13      tgt       CLAIMED     DEVICE
disk       23  0/1/0/0.13.0    sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     19  0/1/0/0.14      tgt       CLAIMED     DEVICE
disk       21  0/1/0/0.14.0    sdisk     CLAIMED     DEVICE       HP 18.2GST318452LC
target     20  0/1/0/0.15      tgt       CLAIMED     DEVICE
ctl        18  0/1/0/0.15.0    sctl      CLAIMED     DEVICE       HP      A6491A
```

Setting DIP Switches

Two DIP switches on left slot BCC determine bus architecture and some bus behavior. If that BCC is removed, then the DIP switches on the other BCC define the bus. See Table 8 for a description of switch settings.

Table 8. DIP Switch Settings

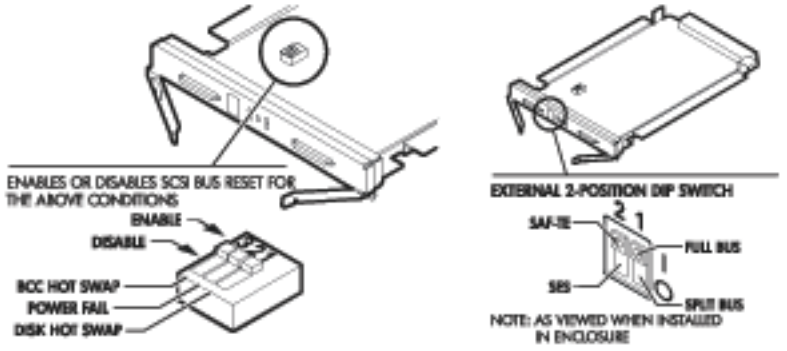
Switch Bank 1	Off - |	ON = 0
1 Full Bus	Creates a single bus of up to 14 disk drives	Splits the bus into two buses, up to 7 disk drives each
2 SES/SAF-TE	SAF-TE Mode (SAF-TE mode is the default. For HP-UX using EMS, set to SES)	SES mode
Switch Bank 2	**Off - |**	**ON = 0**
1 Bus Reset: Hot Swap Disk	Automatically issues a SCSI bus reset when a disk is removed or inserted	Lets the host detect change and determine action
2 Bus Reset: Power Fail	Issues a SCSI reset when the power supply/fan module indicates it will go offline	
3 Bus Reset: Hot Swap BCC	Automatically issues a SCSI bus reset when a BCC is removed or inserted	Lets the host detect change and determine action

Note

The switch settings on both BCCs must match. If the disk system is being connected to an HP-UX system, the switch should be set to SES mode. If the disk system is being connected to a Netserver, the switch should be set to SAF-TE mode.

If the BCC self-test detects any discrepancy, the buzzer sounds 4 or 5 times, and the BCC fault and system fault LEDs flash. If the system is starting up, the disks do not spin up. If the system is operating, the disks and second BCC continue to operate.

Figure 48. DIP Switches



Rationale

Sites choose DIP switch options according to their priorities and preferences. High availability sites, for example, may want automatic bus reset on whereas high performance sites may choose to turn it off. The following table gives some of the typical reasons for choosing specific DIP switch settings.

Table 9. DIP Switch Usage

Switch 1	Reasons to Set OFF (|)	Reasons to Set ON (0)
1. Full Bus	a. Full-bus mode is the only way to access all 14 disks with one BCC. b. With two BCCs, full-bus mode allows two external connections to the bus. c. Full-bus mode with two BCCs gives redundant environmental services.	a. Split buses allow you to mirror disks within the disk system. b. Split-bus mode uses fewer IDs on the bus, improving bus performance.
2. SES/ SAF-TE	SAF-TE is required for NT.	SES is required for HP-UX .
Switch 2	**Reasons to Set OFF (|)**	**Reasons to Set ON (0)**
1. Bus Reset- Hot Swap Disk	Automatic bus reset reduces the chances of data corruption and saves the 30 to 60 seconds that the host would spend determining that a disk is unavailable. Bus reset signals the host to resend outstanding I/O requests.	a. No bus reset reserves bus control to the host. b. No bus reset avoids resetting the entire bus for one disk.
2. Bus Reset- Pwr Fail	SCSI bus is held in reset as power goes down, thus avoiding data corruption	Bus control is restricted to the host.
3. Bus Reset- Hot Swap BCC	Automatic SCSI bus reset reduces the chance of data corruption when a BCC is inserted or removed from the disk system.	a. No bus reset reserves bus control to the host. b. No bus reset avoids resetting the entire bus for one disk.

Disk Addressing

Each disk in the StorageWorks Disk System 2300 occupies a separate address (SCSI ID) on the SCSI bus. Disk addresses range from 0 to 6 and 8 to 14 in full-bus mode (DIP switch 1 set to “|”). In split bus mode (DIP switch 1 set to “0”), the left BCC (viewing the disk system from the rear) is on the high numbered bank (with disk slots 8, 9, 10, 11,12, 13, and 14) and the right BCC is on the low numbered bank (with disk slots 0, 1, 2, 3,4, 5, and 6) of disk slots. Address 7 is reserved for host bust adapter(s). The BCCs take address 15.

Table 10 shows all target SCSI IDs for full bus and split bus modes.

Table 10. Disk and BCC SCSI Addresses for Full and Split Bus Modes

Physical Disk Slot	SCSI ID		
	Full Bus	Split Bus (Right BCC)	Split Bus (Left BCC)
1	0	0	
2	1	1	
3	2	2	
4	3	3	
5	4	4	
6	5	5	
7	6	6	
8	8		8
9	9		9
10	10		10
11	11		11
12	12		12
13	13		13
14	14		14
Right BCC	15		15
Left BCC B	See Note	15	

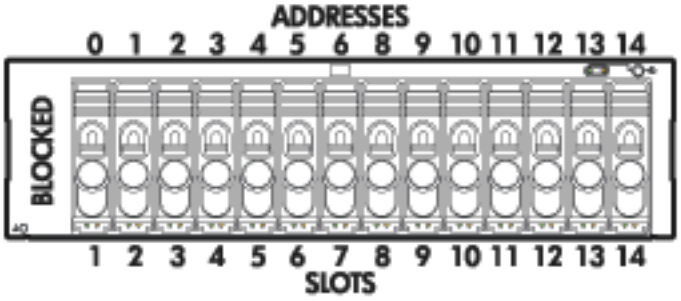
Note

In split bus mode, the enclosure monitor circuitry on each BCC utilizes SCSI address 15. This is allowable since each BCC is connected to a separate SCSI bus. However, when the enclosure configuration is in Full Bus mode, and the separate SCSI busses on the midplane are connected together and there are two BCCs in the enclosure, the secondary BCC does not connect to the SCSI bus.

Disk Slots and Addressing

The disk system has 14 available disk slots, SCSI addressing does not follow a “1-to-1” relationship between slot positions and SCSI addresses. Slot assignments and SCSI addresses are shown in Figure 49.

Figure 49. Disk Module Slots and SCSI Addresses



In full bus mode, the SCSI address 7 is reserved for the host bus adapter. If more than one host bus adapter connects the disk system to other hosts, then a disk module must be removed from the slot whose SCSI address corresponds to the SCSI address of the additional host bus adapter. The most host bus adapters supported on this disk system is two.

In split bus mode, the loading sequence is from slot 1 to the right to slot 7 and from slot 8 to the right to slot 14.

In full bus mode, begin loading the disk modules in slot 1 and continue installing disk modules toward the right.

Setting Up the Hardware Event Monitor

Separate monitors watch over the disks and the disk system. You need to install and configure the Disk Monitor (disk_em) and the High Availability Storage System Monitor (dm_ses_enclosure) for complete event notification.

To install and configure the required monitors, refer to the *EMS Hardware Monitors User's Guide*, which is included in Adobe Acrobat format on IPR Support Media. You can download a copy of Acrobat Reader without charge from *http://www.adobe.com/prodindex/acrobat/readstep.html*.

For specific information about setting up hardware event monitoring using HP CommandView SDM, see the *HP Commandview SDM Disk System Installation and User Guide, Version 1.04* (Part Number T1001-96006).

For specific information about setting up hardware event monitoring using HP TopTools 5.5, see the *HP TopTools 5.5 User Guide, Version 1.0* on the following URL:

http://www.hp.com/toptools/doc/manuals.html.

Aliasing Devices (HP-Qualified Only)

Using host-based software, you can "label" each disk system with any information that would be useful for the site. You might use this feature to assign an inventory number or to indicate the location of the product. The maximum length of the annotation is 256 characters. It appears in EMS event messages.

For specific information about annotating devices, see the *HP Commandview SDM Disk System Installation and User Guide*.

For specific information about annotating devices using HP TopTools 5.5, see the *HP TopTools 5.5 User Guide*.

Updating Firmware (HP-Qualified Only)

Obtain the latest disk or BCC firmware release from the support site before traveling to the customer site.

For specific information about updating firmware, see the *HP CommandView SDM Disk System Installation and User Guide, Version 1.04*.

For specific information about updating firmware using HP TopTools 5.5, see the *HP TopTools 5.5 User Guide*.

Command View SDM

This configuration tool is supported on three different operating systems:

- HP-UX
- Windows
- Linux Redhat

Installation varies depending on the chosen operating system. After installation, Command View SDM operation is virtually identical for all three operating systems.

The Command View SDM software provides both server and client applications. If you are operating as a client (on a host not directly connected to the array), you must be assigned access permission to the array from the server (host directly connected to the array) to access the array for Command View SDM management.

Note

Examples in this section occasionally identify a path. When only one path is shown, either Windows path separators "\" or UNIX/Linux path separators "/" will be used. If you use an example, use the path separators appropriate for your operating system.

Supported Operating Systems

The HP Command View SDM software is supported on the operating systems listed below. Both the HP Command View SDM software and the Upgrade License software products are supported on these operating systems. Minimum system requirements for each operating system are identified in this section, prior to the installation instructions for each operating system.

- HP-UX 11.00 (for most current Support Plus patches, see *HP-UX Installation*)
- HP-UX 11.11 (for most current Support Plus patches, see *HP-UX Installation*)
- Windows NT 4.0 (Service Pack 6a or greater)
- Windows 2000 (Service Pack 1 or greater)
- Linux Redhat 6.2 and 7.0

New product support is continually being added for HP disk systems, such as new operating system support, hardware configurations (Hosts/HBAs), firmware upgrades, plus additional software products. To obtain the most current support and product information, access the HP web site.

Installing CommandView SDM

For specific installation instructions for your operating system, see *HP Command View SDM Disk System Installation and User Guide Version 1.04*, part number T1001-96006.

For Windows 2000 installation only:

After the disk system is properly connected and Windows has been started, follow the procedure below after the “Found new Hardware” pop-up dialog appears:

1. Select "Search for drivers" and click “Next”.
2. Check the specify location check box, and click “Next”.
3. Click on the “Browse” button.
4. Use the file browser to locate and select the DS2300.inf file on the Command View SDM CD in the \drivers\win directory (i.e. d:\drivers\win\DS2300.inf). Click “OK”.
5. Click the next button to install the .inf file.

HP TopTools

HP TopTools is a web-based, device management tool that enables administrators and MIS managers to use a web browser to obtain information about devices on their network. It provides specific management to the following HP products:

- HP Vectra and Brio Desktops
- HP Kayak and Visualize Workstations
- HP Omnibook Notebooks
- HP Netservers
- HP Procurve and AdvanceStack networking devices
- HP LaserJet and JetDirect products
- HP Jornada PC Companions
- HP StorageWorks products
- HP Network Attached Storage (NAS) products
- Windows systems

Supported Operating Systems

HP TopTools is supported on the following operating systems:

- Windows NT 4.0 Service Pack 4, 5, or 6a. If none of these are installed, the TopTools installation will install Service Pack 6a.
- Window 2000 Professional or Server Editions

Installing HP TopTools 5.0

For specific installation instructions for your operating system, see *HP TopTools 5.5 User Guide*. It can be found on the following URL:

http://www.hp.com/toptools/doc/manuals.html

Troubleshooting

4

Overview

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

1. Gather information from all sources:
   - Hardware event notifications (page 97)
   - Disk system LED status (page 101)
   - Online information tools (page 104)
2. Isolate the cause of the problem (page 104).
3. Correct the problem (chapter 5, Removal and Replacement).
4. Verify operational status with IOSCAN or other host utilities.

Event Notification (HP-UX Systems)

The EMS hardware event monitor polls environmental services on the BCC and reports any changes in the status of monitored components. Depending on how the monitor is set up, you can receive messages at the console, in e-mail, in a log file, or through third-party applications. These messages are likely to be the first indication of a problem with a disk system.

Events are reported for changes in temperature, voltage, and the status of replaceable components.

Messages identify five levels of severity:

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.
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.
Major 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.
Minor Warning	An event that will not likely escalate to a severe condition if left uncorrected. Host system operation will not be interrupted and normal use of the disk system can continue. The problem can be repaired when convenient.
Information	An event that is expected as part of the normal operation of the hardware. No action is required.

Event messages (see Figure 50) contain the following:

- 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.
- Annotation – The user-defined annotation associated with the specific disk system

Figure 50. Sample Hardware Event Notification

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

yourserver sent Event Monitor notification information:

/storage/events/enclosures/ses_enclosure/8_0_1_0.15.0 is >=1.
Its current value is MAJORWARNING(3)

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    : dm_ses_enclosure
Event # : 402                         Event Class: I/O
Severity : MAJOR WARNING

Enclosure at hardware path 8/0/1/0.15.0: Hardware failure
Associated OS error log entry id(s): None

Description of Error:

     The enclosure services controllers have different versions of
     firmware.

Probable Cause / Recommended Action:

     The enclosure services controller cards have different versions
     of firmware. Update the controllers to the same version of
     firmware.

User Defined Annotation: Enclosure 37 BCC A.
```

HP Command View SDM

For specific information about using HP CommandView SDM for viewing the disk logs and for other functions, see the *HP CommandView SDM Disk System Installation and User Guide*. This document can be found at the following URL:

http://h200002.www2.hp.com/bc/docs/support/SupportManual/lpg29284/lpg29284.pdf

TopTools

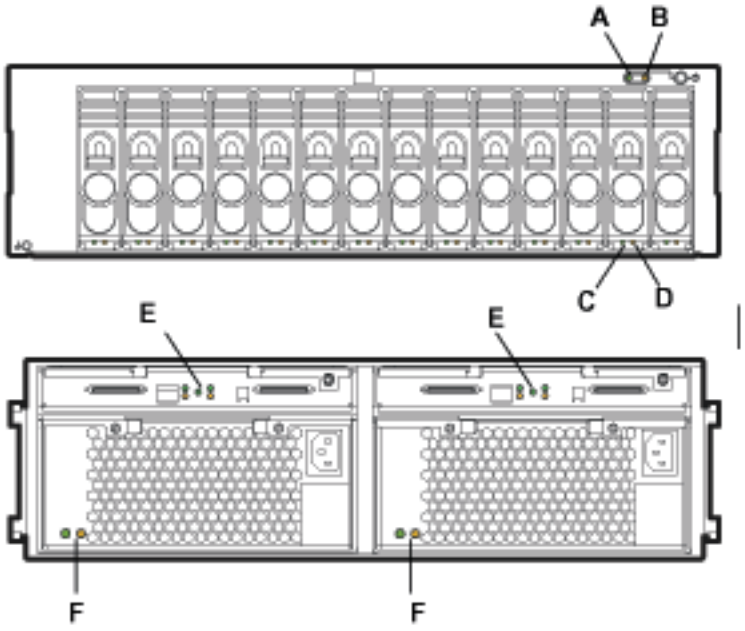
For specific information about using HP TopTools 5.5 for viewing disk logs and for other functions, see the HP TopTools Version 5.5 User Guide. This document can be found at the following URL:

http://www.hp.com/toptools/doc/manuals.pdf

Status LEDs

LEDs indicate the status of the disk system itself and each of its components (see Table 11). Green and amber system LEDs are visible on the front of the disk system. They show that power is on (green) and a fault has occurred (amber). Disk activity (green) LEDs are on the front of the disk modules at the bottom of each disk module. Other LEDs are on individual components in the back of the disk system.

Figure 51. LED Status Indicators



A system power LED
B system fault LED
C disk drive LED
D disk fault LED
E BCC LEDs
F power supply LEDs

LED states are described in Table 11:

Table 11. LED Functions

LED	State	Indication
System Power	Green	Power is on
	OFF	Power is off
System Fault	Amber	Self-test[1] / Problem[2]
	OFF	Normal operation
	Flashing	BCC A & B DIP switch settings do not match.
BCC Fault	Amber	Self-test[1] / Fault
	OFF	Normal operation
	Flashing	Peer BCC DIP switch settings do not match or BCC not installed properly
Term. Pwr.	Green	Termination power is available from the host.
	Flashing	Activity on the bus
	OFF	There is no termination power.
Full Bus	Green	Disks are on a single bus of 14 addresses.
	OFF	Disks are split between two buses, seven addresses each

1 Start-up and self-tests occur briefly when the unit is powered on.

2 A component has failed; temperature or voltage is out of normal range. See Isolating Faults on page 104

3 When a disk is installed with power on, its activity LED blinks on momentarily indicating a SCSI bus reset. When the disk is ready, the LED blinks once and turns off. Thereafter, it flashes when there is I/O to the disk.

Table 11. LED Functions (Continued)

LED	State	Indication
Power Supply/ Fan Module	Amber	Power Supply/Fan fault
	Amber Flashing	Host is identifying the power supply module.
	Green	Operating normally
	OFF	Power is off.
Disk Activity[3]	Green LED ON	Disk module installed and operating normally (Controlled by the disk drive)
	Green Flashing	Disk drive self-test in progress or I/O activity to/from disk (Controlled by the disk drive)
	Amber LED ON	Disk module fault (Controlled by host software)
	Amber LED flashing	Host is identifying the disk module (Controlled by host software)
	OFF	Not installed or not operating

1 Start-up and self-tests occur briefly when the unit is powered on.
2 A component has failed; temperature or voltage is out of normal range. See Isolating Faults on page 104
3 When a disk is installed with power on, its activity LED blinks on momentarily indicating a SCSI bus reset. When the disk is ready, the LED blinks once and turns off. Thereafter, it flashes when there is I/O to the disk.

Note An amber LED 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.

Isolating Faults

Table 12 lists the probable causes and solutions for problems you may detect on the disk system. When more than one problem applies to your situation, investigate the first description that applies. The table lists the most basic problems first and excludes them from subsequent problem descriptions.

Table 12. Troubleshooting Table

Problem Description	HW Event Category	LED State	STM Status	Probable Cause/Solution
Installed product does not power on	none	System power LED off	none	Neither power cord is plugged in. The power switch is not pressed. AC breaker is tripped. AC power source has failed. The PDU/PDRU is defective. Power switch is defective. A faulty component is causing power supplies to turn off. Remove all components and reinsert one at a time until the faulty component is isolated.
System fault LED is on	none	Power supply LED off	Power supply Not Available	One power supply is not functional. The PDU/PDRU or primary power source has failed.
	Critical	Part fault LED on	Critical	A component has failed. See problem descriptions below.
Audio alarm when BCC installed	none	BCC Fault flashing	Disk Not Available	BCC DIP switch settings do not match peer BCC switch settings. Reset switches. Improper cable/terminator connections
BCC Fault LED is on	Critical	BCC Fault on	Critical	BCC hardware is faulty. Replace the BCC.

Table 12. Troubleshooting Table (Continued)

Problem Description	HW Event Category	LED State	STM Status	Probable Cause/Solution
Power supply/ fan LED is amber	Critical	Amber	Critical	An incompatible or defective component caused a temporary fault. Power supply hardware is faulty. Unplug the power cord and wait for the LED to turn off. Reinsert the power cord. If fault persists, replace the power supply.
IOSCAN lists BCC and disks as NO_HW	Critical	All normal	none	SCSI cable is unplugged or loose at either end. SCSI cable is damaged. Replace with another cable to test. HBA is faulty. Check status and correct any problem.
		All off	none	Disk system is powered off. Enclosure Monitor Switch is set on SAF-TE mode.
IOSCAN lists disk as NO_HW	none	On or off	(See STM Disk Tool)	Disk is faulty. Replace. midplane is faulty. Replace.

Table 12. Troubleshooting Table (Continued)

Problem Description	HW Event Category	LED State	STM Status	Probable Cause/Solution
Temperature is over limit	Critical	none	Critical Temp is >54.5º C	A fan is faulty. Check status and correct. Airflow is obstructed; vents are blocked. One or more slots are empty. Power supply is faulty. Check status and correct. Room temperature is too high. If ambient temperature cannot be reduced in a reasonable time, turn off product to prevent shortened life. Temperature sensor is faulty. Compare temperature reported by peer BCC.
	Major Warning	none	Non-critical Temp is >36º C	
Temperature sensors are on the BCC and are independent of power supplies. Investigate temperature warnings immediately, before power supplies sense critical temperature and turn off.				
Temperature is under limit	Critical	none	Critical Temps <9.5º C	– Room temperature is too low. – Temperature sensor is faulty. Compare temperature reported by peer BCC.
	Major Warning	none	Non-critical Temps <15.5º C	
Voltage is over limit	Critical	none	Critical	Power supply is faulty. Check status and correct.
	Major Warning	none	Non-critical	
Voltage is under limit	Critical	none	Critical	Either power supply is faulty. Check status and correct.
	Major Warning	none	Non-critical	
Peer BCC status, temperature and voltage are Not Available	Major Warning	none	Both BCCs: Non-critical	Firmware on BCC A and BCC B are different versions.
		none	Not Available	Internal bus is faulty. Contact HP technical support to replace midplane.

Removal and Replacement

5

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

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

Figure 52. Disk System Field Replaceable Units (FRUs)

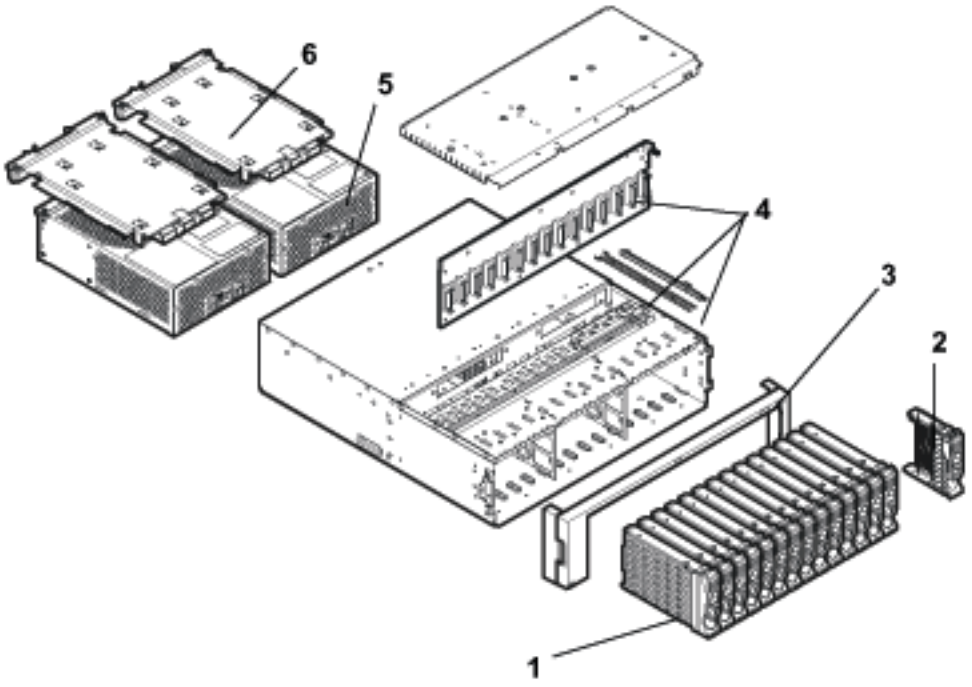


Table 13. JBOD Enclosure Field Replaceable Units

Fig. 24 Item	Part No.	FRU Description	Exch/ Repl. Part	FRU Type
1	A6537-69001	18GB 10k rpm LVD disk module	E/R	CRU
1	A6538-69001	36GB 10k rpm LVD disk module	E/R	CRU
1	A6539-69001	73GB 10k rpm LVD disk module	E/R	CRU
1	A6540-69001	18GB 15k rpm LVD disk module	E/R	CRU
1	A6541-69001	36GB 15k rpm LVD disk module	E/R	CRU
2	A6198-67014	Disk Drive Filler Panel	R	CRU
3	A6214-67003	Enclosure Bezel	R	CRU
4	A6490-96002	Midplane Assembly (includes: midplane PCA, T-15 driver, ESD kit, 8 x T-15 x 6/32 x 7/16” long screws, 3 x T-10 x 6mm long screws, 1 x power/standby switch shaft, 1 x lightpipe)	R	HP
5	A6250-69001	Power Supply/Fan Module	E	CRU
6	A6491-69001	Bus Controller Card	E/R	CRU

Disk Module

Add or replace disks to increase storage capacity or eliminate faults. (See Chapter 4 for troubleshooting procedures.) Disks must be Ultra-3 SCSI (LVD) and 3.5 inches wide 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 or filler.

Preparation (HP-UX 11.XX)

Removing or replacing a disk has consequences for the file systems and logical volumes located on the disk. Before removing or replacing a disk, complete the appropriate system administration for your environment and configuration. Instructions for determining physical volume status and reducing and recreating mirrored extents follow. For additional information, refer to your HP-UX guide, *How HP-UX Works: Concepts for the System Administrator.*

The LVM commands in the following instructions assume the following:

- All of the extents of the disk in use belong to mirrored logical volumes created with the strict (-s) option.
- The replacement disk is of the same or greater capacity as the disk being replaced.

The correct set of instructions depends on whether the mirrored volume is active and attached, or unattached. First, follow the instructions to determine the volume status; then follow the instructions to replace the volume depending on whether the volume is attached or unattached.

To Determine If a Volume Group or Physical Volume Group Is Active

At the host console, enter:

vgdisplay <VG name>

For example:

#vgdisplay /dev/vg00

If the volume group is not active, the host will display:

```
# vgdisplay: volume group not activated.
# vgdisplay: cannot display volume group  /dev/vg00
```

The following messages will appear if the disk is defective:

```
VGDISPLAY: WARNING: COULDN'T QUERY PHYSICAL VOLUME "/dev/dsk/c2t4d0"
THE SPECIFIED PATH DOES NOT CORRESPOND TO PHYSICAL VOLUME ATTACHED TO THE VOL-
UME GROUP
VGDISPLAY: WARNING: COULDN'T QUERY ALL OF THE PHYSICAL VOLUMES
```

If either of the above messages appears, follow the replacement instructions for unattached physical volumes (page 114).

Otherwise, follow the instructions to determine if the physical volume is attached.

To Determine If the Physical Volume Is Attached

Enter the vgchange command to activate the volume group.

The physical volume is unattached if a message similar to the following appears:

```
VGCHANGE: WARNING: COULDN'T ATTACH TO THE VOLUME GROUP PHYSICAL VOLUME
"/dev/dsk/c2t4d0"
THE PATH OF THE PHYSICAL VOLUME REFERS TO A DEVICE THAT DOES NOT EXIST, OR IS
NOT CONFIGURED INTO THE KERNEL.
```

Continue with the appropriate replacement instructions as follows:

- If the physical volume is unattached, follow the instructions for replacing unattached physical volumes (page 114).
- If the physical volume is attached, follow the instructions for replacing attached physical volumes (page 112).

To Replace Attached Physical Volumes

Use the following commands to reduce any logical volumes that have mirror copies on the faulty disk and to recreate the mirror extents once the disk has been replaced. Commands to recover from a host failure are included with most steps.

Note The way that mirrors span several disks may not be duplicated exactly. For cases where the original mirror layout must be preserved, consider deactivating the volume group with the vgchange command and using the procedure for replacing unattached physical volumes.

1 Enter the following command to reduce the mirror:

```
# lvreduce -m <mirror_copies> -A n <LV name> <physical volume path>
```

For example, to reduce a two-way mirror:

```
# lvreduce -m 0 -A n /dev/vg00/lvol4  /dev/dsk/c2t4d0
```

or, for a three-way mirror:

```
# lvreduce -m 1 -A n /dev/vg00/lvol5  /dev/dsk/c2t4d0
```

If the host fails during this step, execute an lvdisplay command to determine if the lvreduce command succeeded. If the command did not succeed, execute the command again. Perform any other lvreduce commands that were not executed before the system failed. Then proceed.

Note An important effect of the lvreduce command is that the LVM configuration backup file used by the vgcfgrestore command is updated. If this replacement procedure is being performed now on another host system and there is no need to execute any lvreduce commands, then the configuration file is not updated. The LVM configuration is correct on the physical volumes, however, so the configuration file can be updated with the vgcfbackup command.

2 Physically replace the disk (see page 115).

3 Execute ioscan to verify that the new disk drive is accessible and a proper replacement.

4 Enter the following command to restore the LVM configuration/headers to the replaced disks from the backup of the LVM configuration:

```
# vgcfgrestore -n <volume group name> <physical volume path>
```

For example:

```
# vgcfgrestore -n /dev/vg00  /dev/rdsk/c2t4d0
```

If the host fails, repeat the step to ensure all configuration data is written to the new disk.

Note — If this replacement procedure is being performed now on another host system and there is no need to execute any lvreduce commands, then the configuration file can be updated with the vgcfbackup command.

5 Enter the following command to attach the replaced disk to the active volume group:

```
# vgchange -a y <volume group name>
```

For example:

```
# vgchange -a y  /dev/vg00
```

6 Enter the lvextend command to transfer the mirrors onto the replaced disk. It will take time to copy all of the original data to the mirrored extents. The logical volumes are accessible to users' applications for two-way mirroring during this command.

```
# lvextend -m <mirror_copies> <LV name> physical volume path
```

For example, for two-way mirroring:

```
# lvextend -m 1  /dev/vg00/lvol4  /dev/dsk/c2t4d0
```

For three-way mirroring:

```
# lvextend -m 2 /dev/vg00/lvol5  /dev/dsk/c2t4d0
```

If the host fails during step 6, execute an lvdisplay command to determine if the lvextend command was successful. If the command did not successfully execute, reissue the command. Perform any other lvextend commands that were not executed before the system failed.

At this point, the system should be fully functioning.

To Replace Unattached Physical Volumes

Follow these instructions if the volume group is not active or if the physical volume is unattached.

1. Replace the disk (see page 115).
2. Execute IOSCAN to verify that the replaced disk is accessible and a proper replacement disk.
3. Enter the vgcfgrestore command to restore the LVM configuration/headers to the replaced disk from the backup of the LVM configuration.

   # vgcfgrestore -n <volume group name> character device file

   For example:

   # vgcfgrestore -n /dev/vg00 /dev/rdsk/c2t4d0
4. Enter the vgchange command to attach the new disk to the active volume group:

   # vgchange -a y <volume group name>

   For example:

   # vgchange -a y /dev/vg00

NT

1. After installing the disk module, execute the “Disk Administrator” utility to configure the new disk module.
2. To execute select Start -> Programs -> Administrative Tools -> Disk Administrator.
3. The new drive detection wizard will detect the new devices and will write a signature to each device. Choose yes at the prompts questioning these actions.
4. From the list of drives, choose the first unconfigured drive by right clicking on the free space. Choose create to create a new volume, then choose to use the entire available disk space.
5. Then right-click on the unformatted volumes and select commit changes now and press ok to the update emergency repair disk notice.
6. Right-click once again and choose format. Choose quick format and press ok to continue.
7. Once formatted, repeat the process for each of the remaining drives.

8 Exit the “Disk Administrator” utility and execute explorer (right-click start and choose explorer).

9 View the newly created drives and ensure all drives are shown.

Windows 2000

Note The following instructions are for the configuration of a new disk module. They should not be followed to add a disk module with data to an existing disk system.

1 After installing the disk module, execute the “Disk Management” utility to configure the disk module.

2 To execute the utility: select Start –> Programs –> Administrative Tools –> Computer Management.

3 Select “Disk Management”.

4 Your new disk module should be seen by the “Disk Management” utility and a Disk Configuration Wizard pop-up will appear on the screen. Follow the wizard’s directions to write a signature to the disk module and to configure the drive type.

5 Create partitions or physical volumes and specify the name, drive letter, and size of each.

6 Specify the format type of the partition(s) or physical volume(s) and proceed with the format.

7 After the format and wizard have completed, the disk module should be ready for use.

Tools

ESD wrist strap (no hand tools are required to perform this procedure). Whenever possible, follow ESD procedures.

Procedure

Caution Whenever possible, follow standard ESD procedures and avoid touching exposed circuitry.

Do not remove a disk 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 Release the disk from the slot by squeezing the latch tab (B) and pulling it toward you.

Caution Spinning disks generate heat and gyroscopic force.

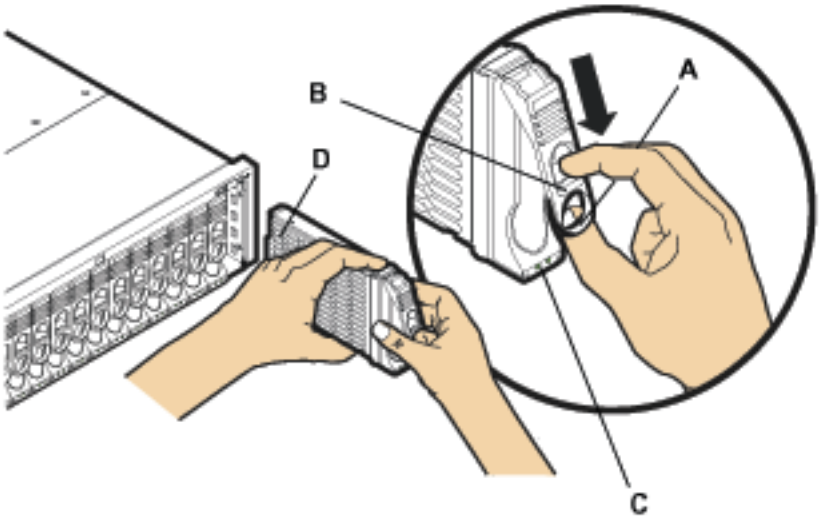
Wait for a spinning disk to slow down and cool off before removing it from the product.

WARNING High current available. Avoid touching the midplane or adjacent drive electronics when removing and inserting disk modules.

2 Pull the disk out of the slot, using the latch until you can get your hand around the handle (C). Support the disk module with your other hand around the enclosed side.

Note Removing disk modules and fillers from right to left improves access to successive disk modules.

Figure 53. Disk Module Removal



A extraction handle
B cam latch
C Leds
D carrier

Caution Replace the disk module or filler immediately (see next step).

Caution Touching the disk circuit board can cause high energy discharge and permanently damage the disk.

Disk modules are fragile. Handle carefully.

3 Remove the replacement disk module from its ESD bag, being careful to grasp the disk module by its extraction handle (see Figure 53). (Fillers are not in ESD bags.)

4 Press the cam latch (B) toward the end of the extraction handle to loosen the extraction handle.
When you are installing a disk module filler, align the disk filler guides with the chassis rails and insert the filler. Push the filler in until it stops. When it is fully inserted, it will be flush with the rest of the disk modules/disk module fillers.

5 Slide the disk module, capacity label up (C), into the empty slot.

6 Press the extraction handle to seat the disk module firmly on the midplane. An audible click indicates the disk module is fully seated.

7 If you are installing a disk module (as opposed to a filler), monitor the LED (D). It should be on while the disk spins up and then turn off. The LED will blink with I/O activity to the disk. If you observe different results, refer to Chapter 4, Troubleshooting, for probable causes.

8 Run IOSCAN on the host and verify that the replacement disk module is “claimed.”

9 Restore file systems and data as needed (see Preparation (HP-UX 11.XX) on page 110).

BCC

Replace a BCC when troubleshooting shows that the card is faulty (see “Isolating Faults” in Chapter 4).

There is no need to turn off the disk system to remove and replace a BCC. In full bus mode with two BCCs, there is also no need to stop I/O to the disks. In other configurations, however, the host must be notified that all disks on the affected bus will be unavailable for I/O. Refer to Preparation (HP-UX 11.XX) on page 110.

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

Tools

ESD wrist strap (no hand tools are required to perform this procedure). Whenever possible, follow ESD procedures.

Procedure

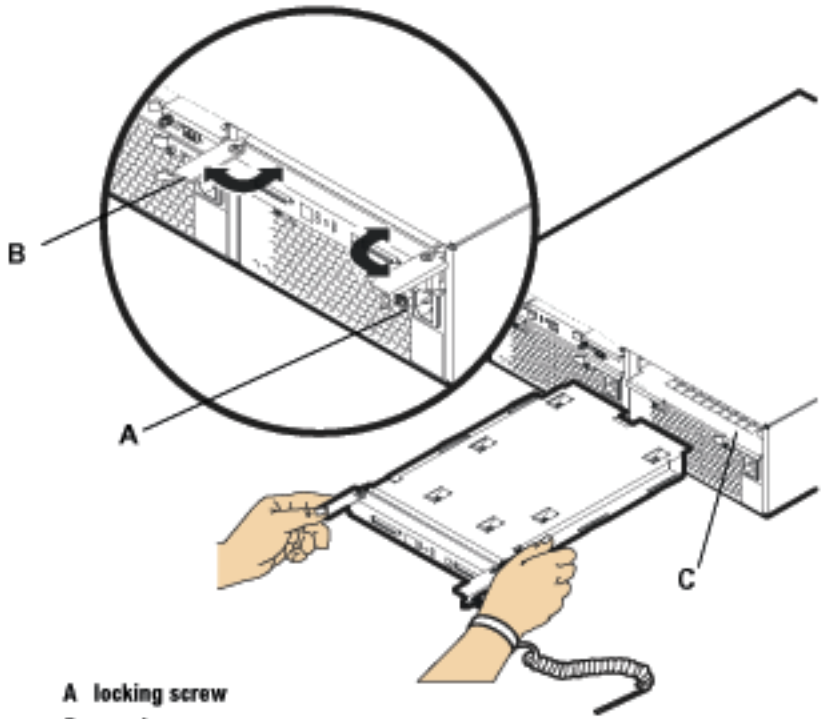
Caution Do not remove a BCC from an operating product until you have the replacement BCC and are ready to install it. An empty slot will cause uneven cooling and eventual overheating.

1. Remove the cables and/or terminators from the failed BCC.
2. Loosen the locking thumbscrew (A in Figure 54) until it clears the BCC bulkhead. The screw stays in the ejector handle.
3. Open the cam levers (B) by pulling them away from the center of the card. This disconnects the BCC pins from the midplane.
4. Pull the BCC out of the slot (C).

   Replace the BCC immediately if the product is in use (see next step).
5. Attach the clip end of your ESD wrist strap to the ground stud at the top of the rack.

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

Figure 54. BCC Removal and Replacement



6 Remove the replacement BCC from its ESD bag.

Caution Switches must have the same settings on both BCCs.

7 Open the cam levers (see Figure 54) of the replacement BCC by pulling them away from the center of the card.

8 Insert the BCC in the empty slot.

9 Push the cam levers flat against the center of the card to seat the BCC pins firmly on the midplane.

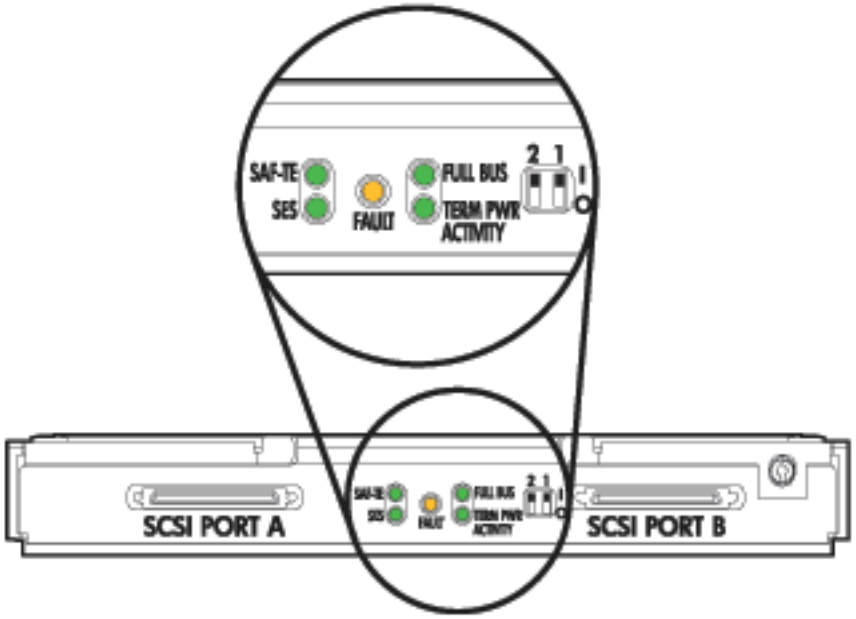
10 Watch the BCC Fault LED (B in Figure 55). It should come on briefly and then turn off. If the LED stays on and a buzzer sounds, the switch settings do not match the settings on the peer BCC. For other solutions to a BCC fault, see “Isolating Causes” in Chapter 4.

11 Tighten the locking screws (B in Figure 54).

12 Reattach the SCSI cable and terminator.

Caution The BCC must be replaced or a filler panel installed in the open slot to ensure proper cooling for the disk system.

Figure 55. BCC DIP Switches



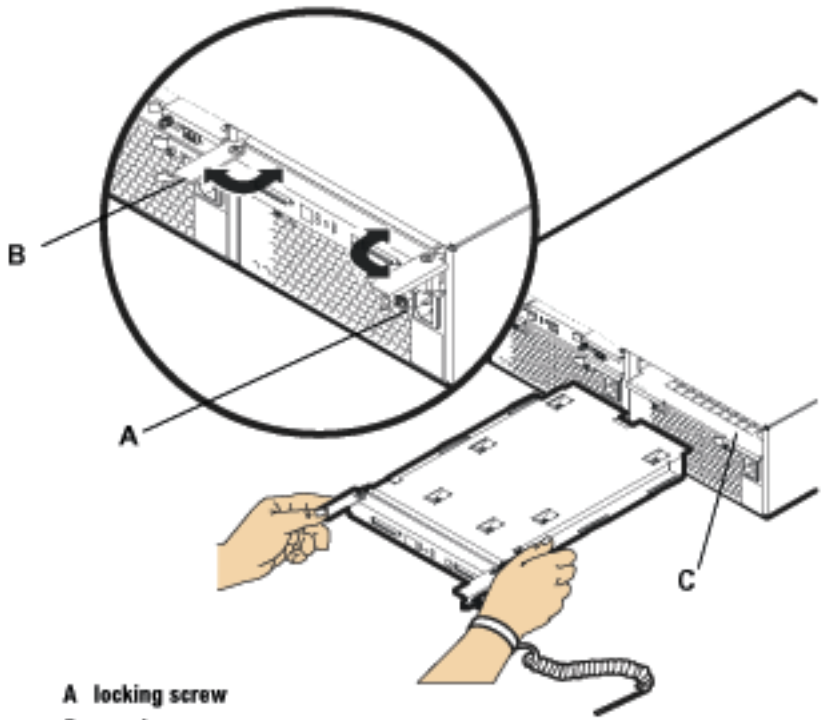
BCC Filler Panel

If a BCC is removed and a new one is not available, the BCC slot must be filled to ensure proper cooling for the disk system. This is done with a BCC filler panel.

For removal instructions for the BCC, see page 119.

Caution Do not remove the malfunctioning BCC until you have available either a BCC filler panel or a replacement BCC.

Figure 56. BCC Filler Panel Installation



A locking screw
B cam lever
C BCC slot

Power Supply

Replace a power supply as soon as possible when troubleshooting indicates a power supply failure (see “Isolating Causes” in Chapter 4). If a power supply fails, the remaining power supply provides proper voltage to the disk system. However, if the remaining power supply fails before the first power supply is replaced, the disk system will turn off.

The power supply fan may continue to operate even when a power supply fails.

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

Follow ESD procedures whenever possible.

Tools

ESD wrist strap (no hand tools are required to perform this procedure). Whenever possible, follow ESD procedures.

Procedure

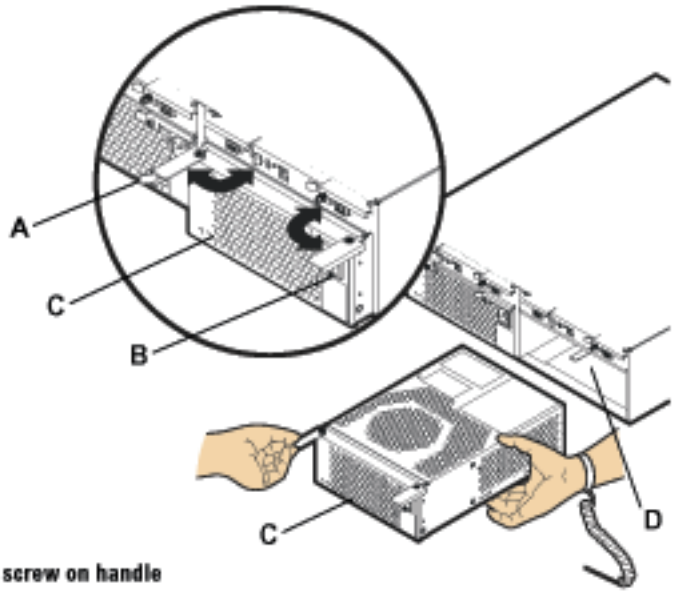
Caution Do not remove a power supply from an operating product until you have the replacement and are ready to install it. An empty slot will cause uneven cooling and eventual overheating.

The power supply may be hot to touch. 

1. Disconnect the power cord from the power supply.
2. Loosen the thumbscrews on the power supply handles (A and B in Figure 57).
3. Rotate the handles out to disengage the power supply from the midplane.
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.

   Replace the power supply immediately if the product is in use (see next step).

Figure 57. Power Supply Removal and Replacement



A locking screw on handle
B locking screw on handle
C power supplies
D power supply slot

5 Slide the replacement power supply into the empty slot (D in Figure 57). The power supply begins to engage the midplane with 3/8 inch (8mm) still exposed.

6 Rotate the handles back toward the center of the power supply module to draw the power supply the last 3/8 inch into the chassis and firmly seat the power supply on the midplane. The power supply should be flush with the edge of the chassis.

7 Tighten the thumbscrews on the power supply handles (A and B). It is recommended that you use a screwdriver to ensure proper seating.

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 move or remove and replace the disk system in the rack. For example, you must remove the disk system from the rack in order to replace the midplane or power switch assembly. 24 inches of vertical space is required in the rack if these units are to be replaced without removing the disk system from the rack.

The disk system must be turned off in this procedure.

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

Tools

The tools you need to install the disk system hardware are:

- Torx T25 screwdriver
- Torx T15 screwdriver
- Small flat-blade screwdriver
- ESD wrist strap. Whenever possible, follow ESD procedures.

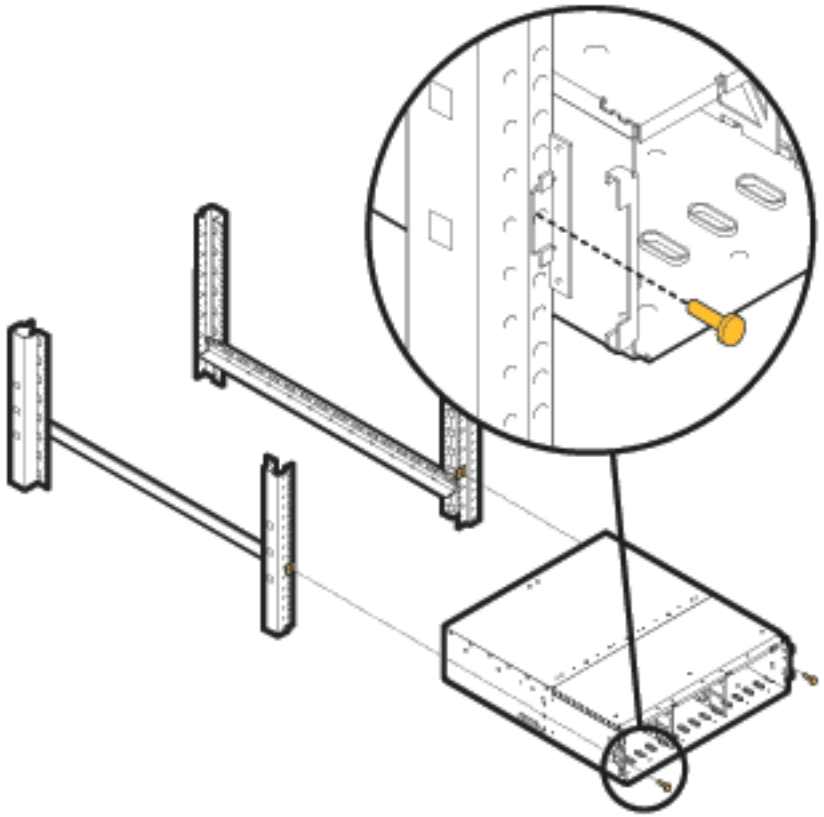
Procedure

1. Determine the file systems that will be inaccessible for I/O operations while the disk system is turned off, and perform necessary system administration. (See the HP-UX guide, *How HP-UX Works: Concepts for the System Administrator.)*
2. Push and release the power button to turn off the disk system.
3. Remove the disk modules from the chassis and set them aside on an anti-static surface. Label the disk modules so they can be reinstalled in the same disk slots from which they were removed.
4. Remove the power supply/fan modules and set them aside on an anti-static surface.
5. Disconnect power and SCSI cables from the back of the disk system.
6. Remove the BCCs from the chassis and set them aside on an anti-static surface.

7 Remove screws from the mounting ears (see detail in Figure 58).

WARNING An empty storage device weighs approximately 54 pounds (without disk modules installed) (24.5 kg). To avoid personal injury, it is recommended that two people install the storage device in the rack.

Figure 58. Disk System Removal and Replacement



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

9 When you are ready to replace the disk system, push the chassis back into the rack.

10 Insert and tighten the front mounting screws.

11 Reinstall the power supply/fan module(s).

12 Reinstall the disk modules in the slots from which they were removed.

13 Reconnect SCSI cables and power cords.

14 Push the power button in to turn on the disk system.

15 Perform necessary system administration to return file systems to service.

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 power switch assembly, light pipes, or the midplane.

You will need to turn the power off to perform this procedure.

Tools

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

Procedure

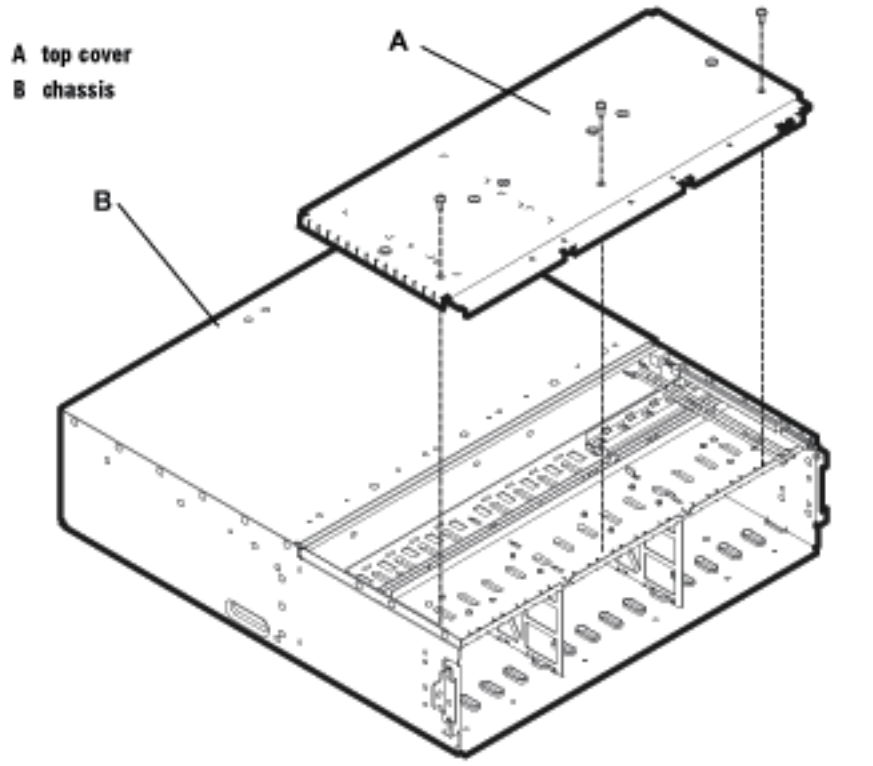
Caution Disk slots must be empty before removing the top cover.

1. Remove disk modules and fillers and place them on an appropriate anti-static surface. See page 110.
2. Disconnect all power and SCSI cables.
3. Remove the power supply/fan modules. See page 123.
4. Remove the disk system retention screws. See page 126.
5. Remove the disk system from the rack and place it on an appropriate anti-static surface. See page 125.

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

6. Remove the three flathead screws from the top of the top cover (A in Figure 59).
7. Rotate the cover upward; then lift it away from the disk system.

Figure 59. Top Cover Assembly



To reinstall the top cover:

1. Insert the edge of the top cover under the outer sheet metal of the chassis.
2. Slide the cover toward the middle of the chassis, making sure to rotate the top cover down to align with the edges of the chassis.
3. Insert the three Torx T10 screws through the holes as shown in Figure 59.
4. Tighten the three Torx T10 screws.
5. Reinstall the disk system in the rack. See page 125.
6. Reinstall the disk system retention screws to secure the disk system.
7. Reinstall the power supply/fan modules.

8 Reinstall the power and SCSI cables.

9 Reinstall disks and fillers. See page 110.

Midplane (HP-Qualified Only)

The midplane board is replaceable by HP-qualified personnel only.

Replace the midplane based on troubleshooting results (see “Isolating Causes” in Chapter 4). Disks, BCCs, fans, and power supplies connect to the midplane.

The power must be OFF (out) and the top cover removed in order to remove and replace the midplane 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

Procedure

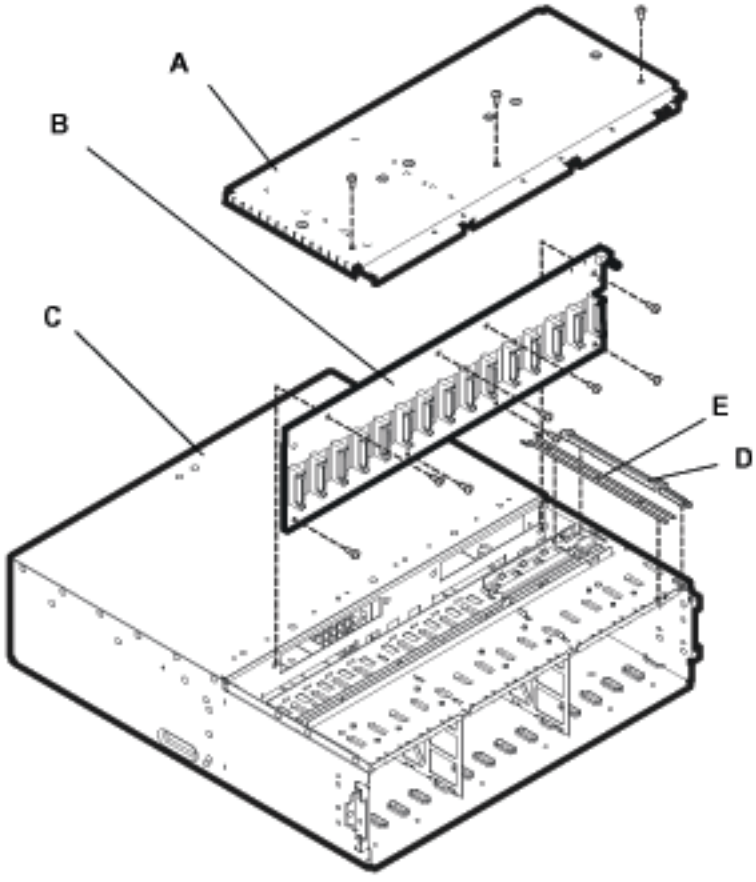
1 Remove the top cover. See page 128.

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 midplane.

3. To remove the midplane:
   a. Loosen the cam handle locking screws and pull power supplies free of the midplane (see page 123).
   b. Loosen the cam handle locking screws and pull the BCCs free of the midplane.
   c. Remove the disk modules and fillers from the chassis.
   d. Remove the light pipes (see Figure 60 on page 132) from the chassis.
   e. Remove the power switch extender arm.
   f. Remove the eight Torx T15 screws along the top and bottom edges of the midplane (see Figure 60).
   g. Pull the midplane forward to clear alignment pins and lift it up and out of the disk system.
4. To replace the midplane:
   a. Stand the new midplane inside the chassis and push it over the alignment pins. Adjust the final position of the midplane as necessary for optimal connections to power supply/fan modules, BCCs, and disk modules.
   b. Insert and tighten eight screws into the midplane and chassis.
   c. Replace the light pipes.
   d. Replace the power switch extender arm.
5. Replace the top cover. See page 128.
6. Reseat and secure the BCCs (see page 119).
7. Reseat and secure the power supplies (see page 123).
8. Reinstall the disk modules and fillers.

Figure 60. Midplane Assembly



A top cover
B midplane
C chassis
D power switch extender arm
E light pipes

Deskside Base/External Covers (HP-Qualified Only)

The deskside base and external covers must be removed from the chassis before the top cover, the midplane, the light pipes, or the power switch extender arm can be replaced.

Follow the procedures below to remove and replace the deskside conversion kit:

Powering Down the Disk System

1. Complete the appropriate system administration tasks for taking this storage device offline for your operating system.
2. Power down the disk system.
3. Disconnect the power cord(s) and SCSI cable(s).
4. Remove the power supplies and place them on an anti-static surface.
5. Remove the disk modules and carefully place them on an anti-static surface. Be sure to note the slots from which the disk modules were removed to replace them in the same slots.

Removing the deskside base and external covers from the disk system

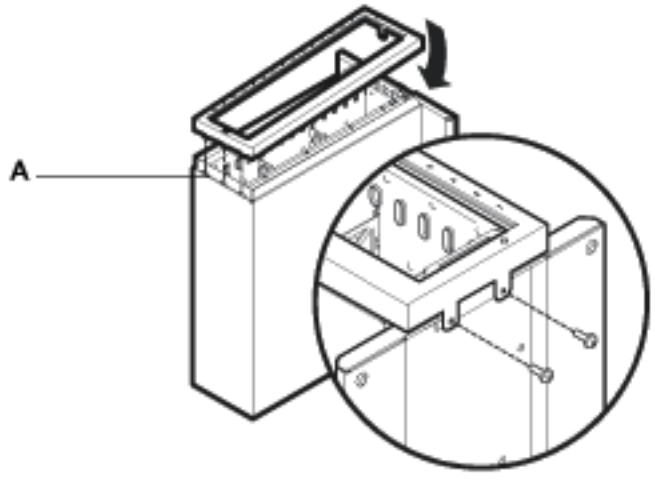
Tools

- Torx T25 driver
- ESD strap

Procedure

1. Rotate the disk system and place it on its end with the end cap facing up.
2. Remove the two M5 end cap retaining screws from the bottom of the disk system using a Torx T25 driver. See Figure 61.
3. Rotate the end cap off the bottom of the disk system.
4. Pull the end cap away from the disk system.

Figure 61. End Cap Removal and Replacement

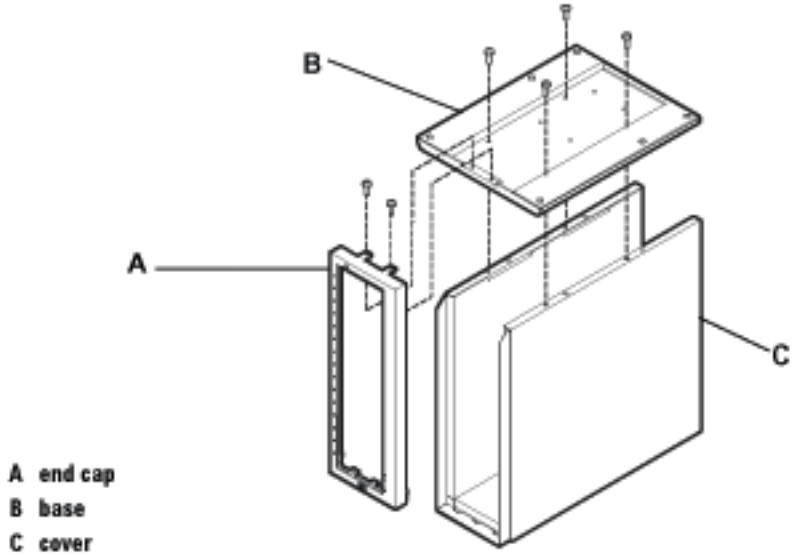


A end cap slots

5 Rotate the disk system and place it on its top.

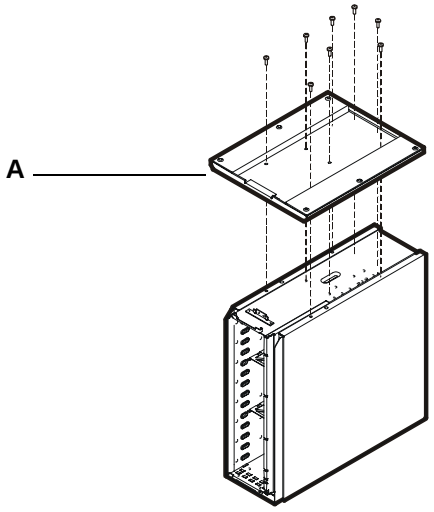
6 Remove the four M5 screws from the array chassis using a Torx T25 driver. They are the four screws that are closest to the center of the base. See Figure 62.

Figure 62. Base Removal and Replacement



7 Remove the four M5 screws from the cover using a Torx T25 driver. They are the four screws that are closest to the edges of the base.

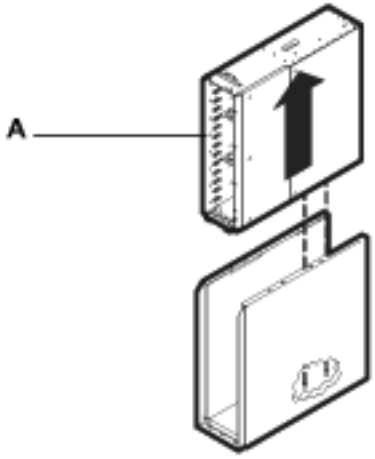
Figure 63. Base Removal from Chassis



A base

8 Lift the disk system chassis off the alignment pins and out of the cover.

Figure 64. Removal from Cover

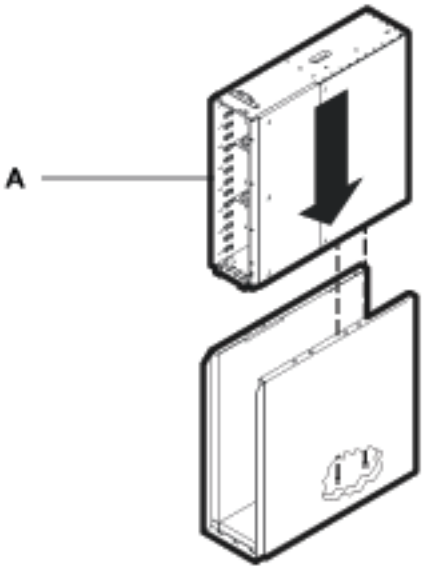


A disk system chassis

Reinstalling the deskside base and external covers on the disk system.

1. Place the deskside external cover on its top, on a sturdy surface.
2. Lift the disk system chassis into the cover, onto the alignment pins. The disk system should be installed into the cover with the power switch down (toward the closed part of the cover).

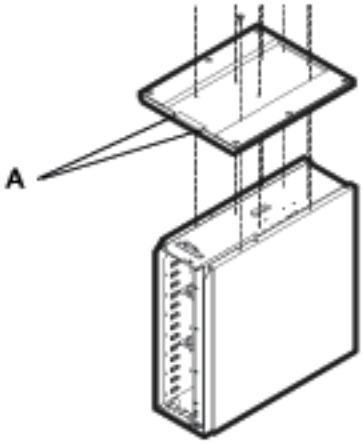
Figure 65. Installing Disk System into Cover



A disk system chassis

3. Secure the base to the cover using four M5 screws. Tighten the screws using a Torx T25 driver. They are the four screws that are closest to the edges of the base.
4. Secure the base to the chassis using four M5 screws. Tighten the screws using a Torx T25 driver. They are the four screws that are closest to the edges of the base.

Figure 66. Installing Base to Cover and Chassis



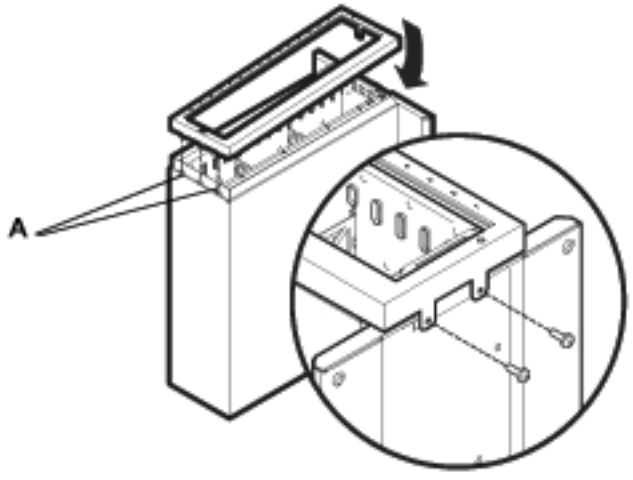
A front slots in base

5 Rotate the disk system and place it on the back end of the disk system. The empty disk module slots should be facing up.

6 Align the end cap tabs into the appropriate slots at the top of the disk system.

7 Rotate the end cap down over the base, aligning the small tabs at the top of the end cap with the end cap slots. Insert and tighten the M5 retaining screws using the Torx T25 driver. Be sure the retaining screw holes are aligned (see Figure 67).

Figure 67. End Cap Replacement



A end cap slots

Reference

6

Product Models

Two models of the disk system are available:

- A6490A and A6490AV field-racked (by HP-qualified service engineers)
- A6490AE empty field rack disk system
- A6490AD deskside disk system
- A6490ED empty deskside disk system
- A6490AZ factory-racked disk system

Upgrade Products

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

Table 14. Upgrade Products

Order No.	Description
A6537A	18-Gbyte 10K rpm LVD disk module
A6538A	36-Gbyte 10K rpm LVD disk module
A6539A	73-Gbyte 10K rpm LVD disk module
A6540A	18-Gbyte 15K rpm LVD disk module
A6541A	36-Gbyte 15K rpm LVD disk module
A6491A	Bus Control Card
C2362B	2.5-meter SCSI VHDTS68/HDTS68 M/M Multimode Cable (NT support only)
C2363B	10-meter SCSI VHDTS68/HDTS68 M/M Multimode Cable (NT support only)
C2365B	5-meter SCSI VHDTS68/HDTS68 M/M Multimode Cable (NT support only)
C2373A	2-meter VHDCI Ultra SCSI cable
C2374A	5-meter VHDCI Ultra SCSI cable
C2375A	10-meter VHDCI Ultra SCSI cable
A6244A	Rail kit for HP C2785A, C2786A, C2787A, A1896A, and A1897A
A6209A	Rail kit for HP Rack Systems/E
A5672A	Rittal Rack Rail Kit
A6498A	2-Post Rack Kit

PDU/PDRU Products

Table 15. PDU/PDRU Products

Order No.	Description
E7676A	19-inch, 100-240 V, 16 Amp, 1 C20 inlet, 10 C13 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 & 8 C13 outlets, switch accessory
E4452A	36-inch, 200-240 V, 16 Amp, L6-20P plug, 6 IEC-320 outlets
E4453A	36-inch, 200-240 V, 16 Amp, L6-20P plug, 6 IEC outlets
E5933A	36-inch, 110-240 V, 16 Amp, UPS, IEC-320, 6 IEC-320 outlets
E4456A/B	60-inch, 220 V, 16 Amp, power cord w/IEC-320 plug, 6 IEC outlets
E4457A/B	60-inch, 200-240 V, 16 Amp, L6-20P plug, 10 IEC-320 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 16. Replacement and Exchange Part Numbers

Replacement Part Number	Exchange Part Number	Description
8120-6514		Power cord (North America Only)
5021-1121		Terminator
A6490-67001		Front Bezel
A6250-67001	A6250-69001	Power supply/Fan module
A6490-67005		Midplane Assembly
A6491-67001	A6491-69001	Bus Control Card (BCC)
A6490-67002		BCC Filler Panel
A6198-67002		Disk Filler Panel
A6537-67001	A6537-69001	18 GB 10k rpm LVD disk module
A6538-67001	A6538-69001	36 GB 10k rpm LVD disk module
A6539-67001	A6539-69001	73 GB 10k rpm LVD disk module
A6540-67001	A6540-69001	18 GB 15k rpm LVD disk module
A6541-67001	A6541-69001	36 GB 15k rpm LVD disk module

Specifications

Dimensions

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

- Height: 13.0 cm (5.10 in.)
- Width: 44.8 cm (17.60 in.)
- Depth: 50.5 cm (19.90 in.)
- Weight: 27.3 - 36.4 kg (60 - 80 lbs) depending on configuration

The maximum dimensions of the deskside version are:

- Height: 49.1 cm (19.3 in)
- Width: 31.7 (base): cm (12.5 in)
- Depth: 60.7 cm (23.9 in)
- Weight: 37.3 - 46.4 kg (82 - 102 lbs) depending on configuration

Weight

A fully loaded disk system weighs approximately 77 pounds. Component weights are shown in Table 17.

Table 17. Product Weights

Component	Weight of Each (lbs)	Quantity	Subtotal (lbs)
Disk Module (LP)	1.6	14	22.4
Power Supply/Fan Module	9.5	2	19
BCC	3	2	6
Midplane	6	1	6
Chassis	23	1	23
		Approx. Total	76.4 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 4.8 amps over the low voltage range and 2.0 amps over the high voltage range. Average power consumption with medium load (14 disks running idle) is 345 watts.

DC Power Output

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

Heat Output

1600 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: 5º C to 38º C (41º F to 100º F)
  Recommended: 20º C to 25.5º C (68º F to 78º F)
- Storage temperature: -40º C to 70º C (-40º F to 158º F)
- Maximum gradient: 20º C per hour (36º F per hour)
- Relative humidity:10% to 80% noncondensing, max. wetbulb at 28º 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: -40º C to 70º C (-40º F to 158º F)
- Maximum gradient:24º C per hour (43.2º F per hour)
- Relative humidity:15% to 90% noncondensing
- Altitude:4600 m (15,000 ft.)

Acoustics

- Sound power: 6.7 Bels
- Sound pressure at operator’s position: 51.6 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 151)

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 = 51.6 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

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

declares, that the product

Product Name: Disk System 2300

Product Number(s): A6490A, A6490AZ, A6490AE, A6490AD, A6490ED, A6490AV

Regulatory Model: RSVLB-0101

Product Options: All

conforms to the following Product Specifications:

Safety: IEC 60950:1991 + A1, A2, A3, A4 / EN 60950:1992 + A1, A2, A3, A4, A11
GB 4943-1995

EMC: CISPR 22:1997 / EN 55022:1998 Class A[1]
GB 9254-1988
CISPR 24:1997 / EN 55024:1998
IEC 61000-3-2:1995 / EN 61000-3-2:1995 + A14
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.

The Product was tested in a typical configuration with a Hewlett-Packard computer system and peripherals.

Roseville, November 19th, 2001

George E. Barrett, Regulatory 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

For the most current information about the HP StorageWorks Disk System 2300, visit the support Web site located at *http://www.hp.com*.

Related Documents

The following manuals explain how to use the system software interfaces to the StorageWorks Disk System 2300:

- *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

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