HP SureStore E Disk System SC10

User and Service Guide

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Safety Notices

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

Components bearing this symbol may be hot to touch.

Components bearing this symbol are fragile. Handle with care.

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

Operation

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

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

Service

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

Format Conventions

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

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1 PRODUCT DESCRIPTION

General Description

Hewlett-Packard's SureStore E Disk System SC10 (referred to in this guide as the disk system) is a high-availability Ultra2 SCSI storage product. Dual SCSI ports on dual bus controllers provide LVD connections to the host. Ten slots accept high-speed, high-capacity LVD/SE SCSI disks connected to a SE backplane. Data throughput is 40 Mbytes/sec. Eleven disk systems fill a 2-meter System/E rack. Filled with 9-Gbyte disks, the 2-meter Rack System/E yields 99 Terabytes of storage; with 18-Gbyte disks, 1.98 Terabytes of storage.

Modular and redundant components are easy to upgrade and maintain. Disks, fans, power supplies, and bus control cards (BCCs) are replaceable parts that plug into individual slots in the front and back of the disk system. Redundant fans, power supplies, 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 Event Monitoring System (EMS) reports any changes in environmental status to user-defined locations, including email accounts and a system console. Standard HP-UX diagnostic utilities also report environmental data for enhanced troubleshooting.

Features

The disk system occupies 3.5 EIA units in a standard 19-inch rack. Disk drives mount in the front of the system. Redundant power supplies, fans, and BCCs mount in the back. A lockable front door shields the environment from RFI and provides access to the disk drives and power button. See Figure 1, below, and Figure 2 on page 16.

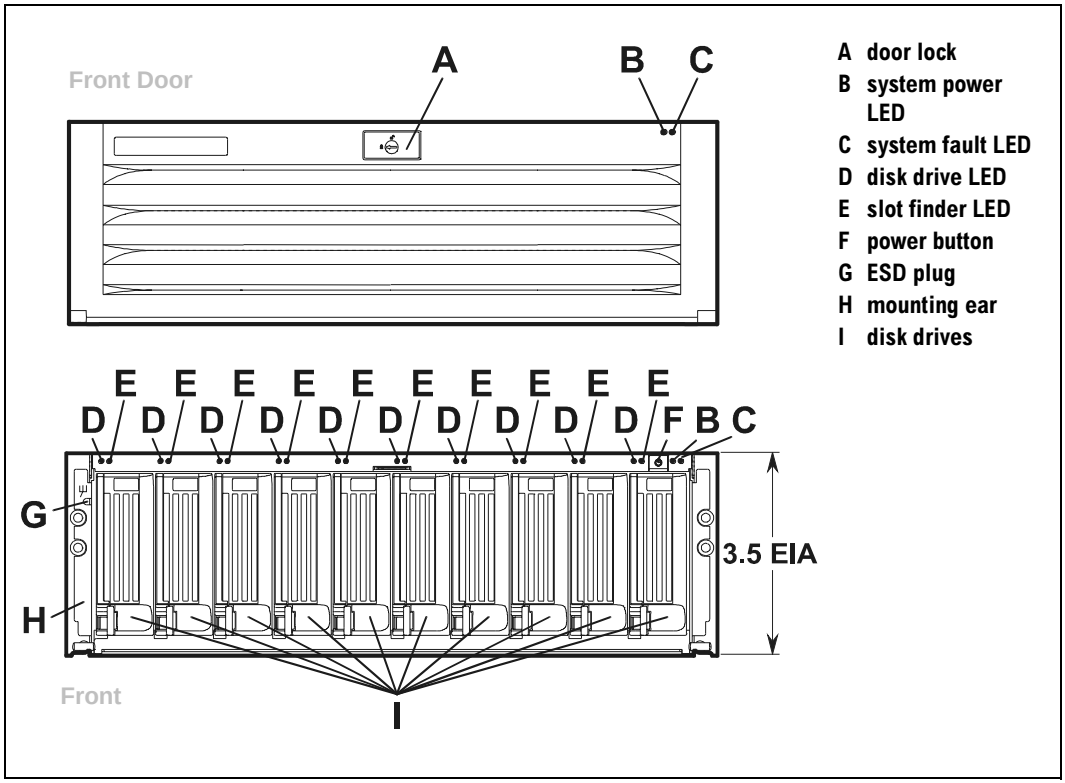


Figure 1 Disk System Front Views

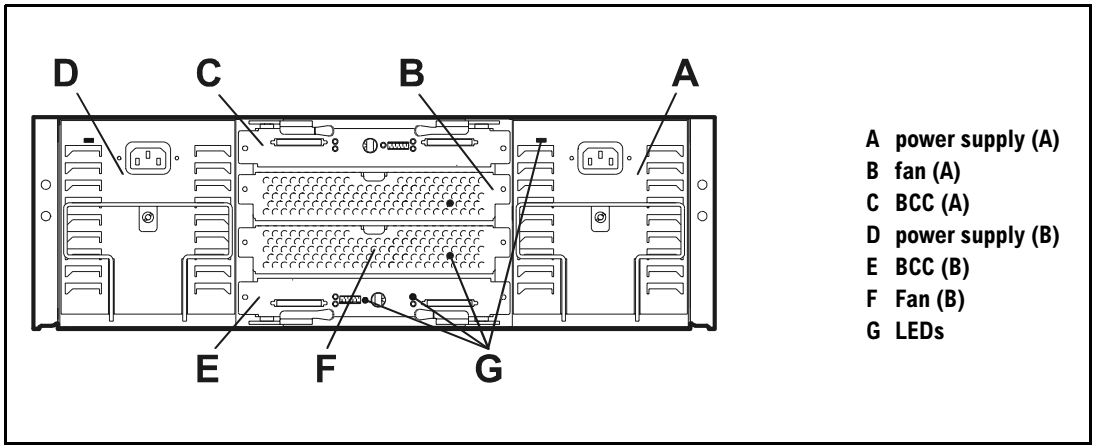


Figure 2 Disk System Back View

Status Indicators

LEDs on the disk system enable you to detect and replace failed components and thereby 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.
- Above each disk slot, the left LED (D in Figure 1) indicates the presence of I/O activity on the disk.
- The second LED above each disk slot (E in Figure 1) can be flashed to help a service engineer locate the disk for physical inspection or removal.

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

Power Switch

Located in the upper right corner behind the disk system door, the power switch (F in Figure 1) interrupts power from the power supplies to the BCCs and other internal components. 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 fans, power supplies, and BCCs
- Support for mirrored disks in the HP-UX environment
- Online firmware upgrades
- Hardware event monitoring and real-time error reporting

Upgradability

You can increase disk system storage capacity by:

- Replacing disk drives with higher-capacity disk drives
- Adding disks in unused slots
- Adding another disk system (to fill a bus)

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 automated download function.

Environmental Services

Environmental services circuitry monitors the following elements:

- Fan rotation
- Fan status
- Power supply output
- Power supply status
- Disk drive status, except fault condition
- 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
- Fans
- Power supplies

Disks and Disk Fillers

Disks, shown in Figure 3, are 3.5-inch Low Profile or Half Height disks in open metal carriers. Disks are multimode, meaning they are LVD capable and SE compatible; they adjust to the lowest signal speed detected.

The open carrier design requires careful handling to avoid disk damage by breakage and static electricity and to avoid personal contact with hot surfaces and static electricity.

WARNING **Touching exposed circuits can cause electrical discharge and disable the disk. Disks require careful handling and ESD precautions.**

The plastic parts of the disk are safe to touch:

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

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

The initial disk options for this product are 36-GByte, 18-GByte, and 9-GByte 10 K RPM drives. A label (G) 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.

Disk fillers occupy unused slots to balance the air flow.

Caution Fillers must be installed in unused slots in order to maintain even cooling around the remaining slots.

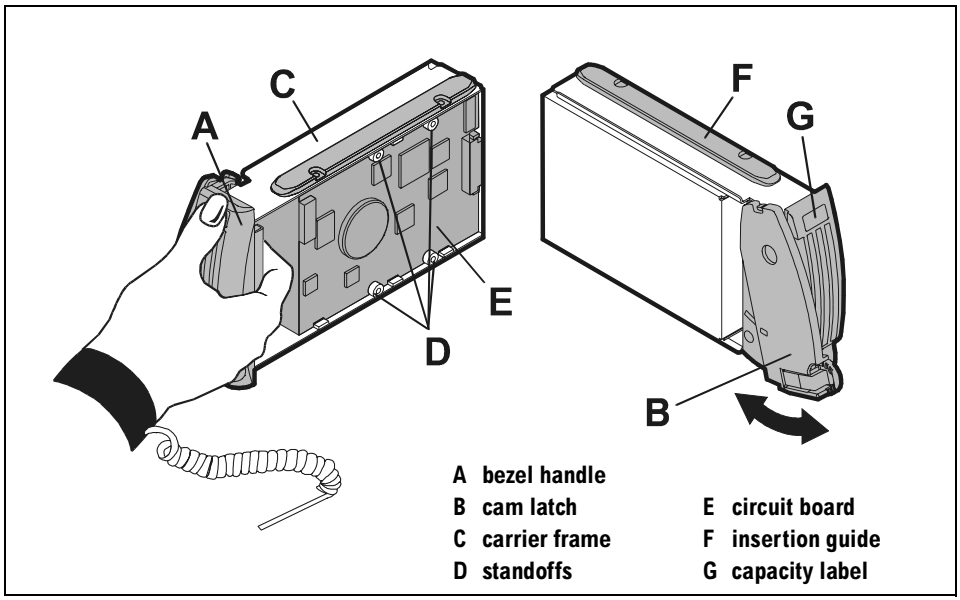


Figure 3 Disk

BCCs and BCC Fillers

BCCs (Bus Control Cards) plug into two slots in the back of the disk system. The BCC in the top slot is BCC A, and in the bottom slot BCC B. Each BCC is connected to one of two SE (single-ended) buses inside the disk system. In full bus mode (DIP switch 1 set to "I"), both BCCs are on the same bus with all ten disks. 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"), BCC A is on one bus with the even-numbered disk slots (0, 2, 4, 6, 8) and BCC B is on another bus with the odd-numbered disk slots (1, 3, 5, 7, 9).

Two SCSI ports (B in Figure 4) on each BCC provide dual LVD (low voltage differential) connections to the same or separate hosts. In single bus mode, the second port can be daisy chained to another disk system. If a cable is installed in one of the BCC ports, a cable or LVD terminator must be installed in the second port.

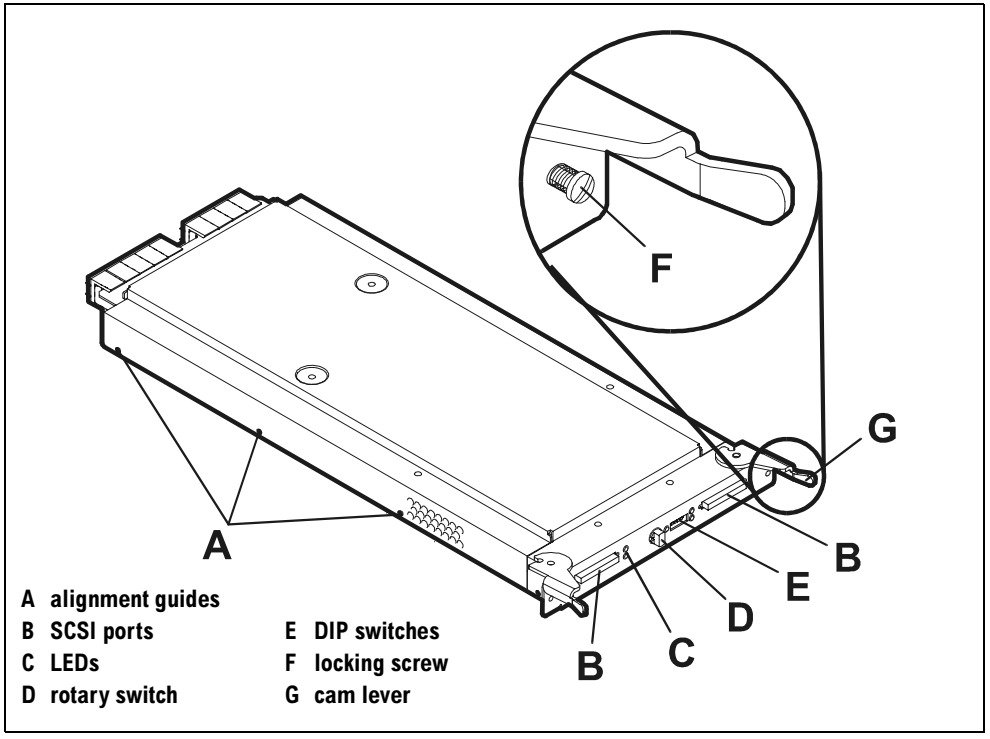


Figure 4 BCC

Other features of the BCC are:

- LEDs (C) indicating BCC status and bus configuration
- Rotary switch (D), not used for this product
- Five DIP switches (E):

  1.Full Bus

  2.JBOD

  3.Bus Reset - Power Fail

  4.Address High

  5.Bus Reset - Hot Swap

- Locking screws (F)
- Cam levers (G)

BCC circuitry provides the following functions:

- Bus configuration (see “Setting DIP Switches” in chapter 3)
- Bus expansion (LVD to SE)
- SCSI environmental services (see page 18)
- Memory management
- System fault detection
- Disk address generation

A BCC filler (Figure 5) replaces the second BCC when redundancy is not required. The filler is installed in the bottom slot.

Caution The BCC filler maintains even cooling inside the disk system when the second BCC is not present.

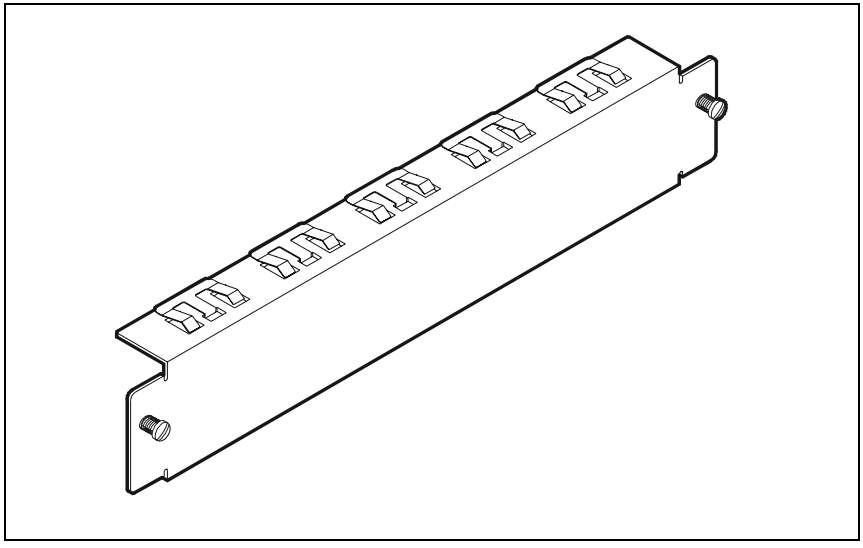


Figure 5 BCC Filler

Fans

Redundant, hot-pluggable fans blow cooling air over system components. Each fan has two internal high-speed blowers (A in Figure 6), an LED (B), a pull tab (C), and two locking screws (D).

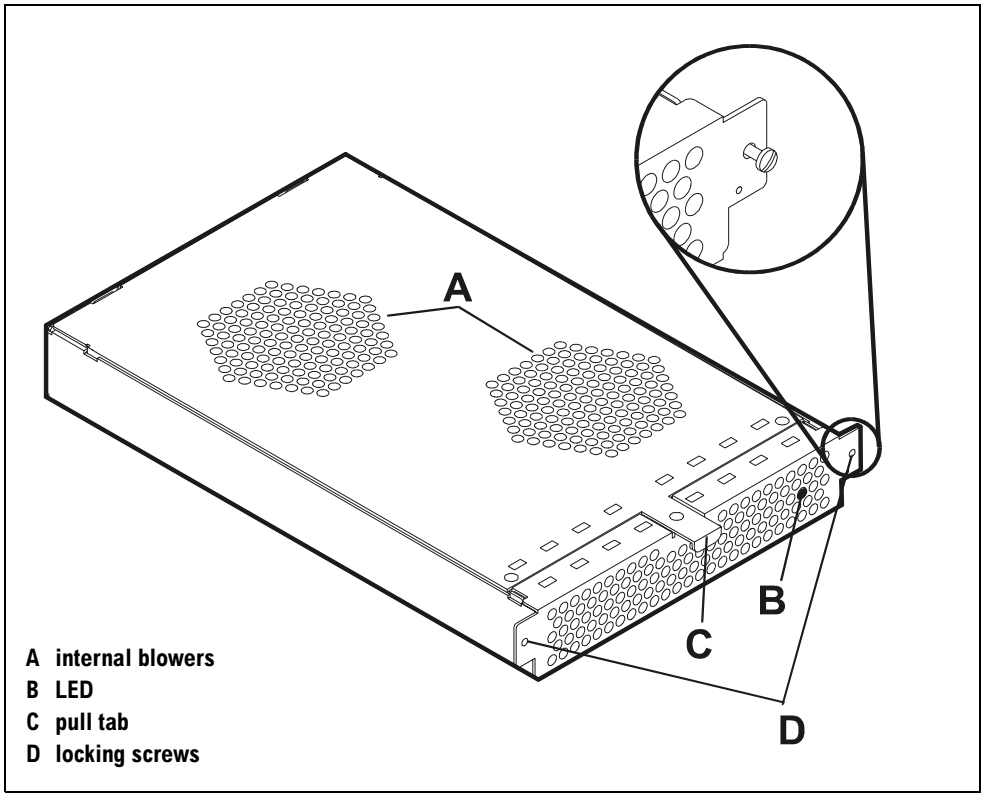


Figure 6 Fan

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

Power Supplies

Redundant, hot-pluggable 450-watt power supplies convert wide-ranging AC voltage from an external main to stable DC output and deliver it to the backplane. Each power supply has two internal blowers, an AC receptacle (A in Figure 7), a cam handle (B) with locking screw, and an LED (C). Internal control prevents the rear DC connector from becoming energized when the power supply is removed from the disk system.

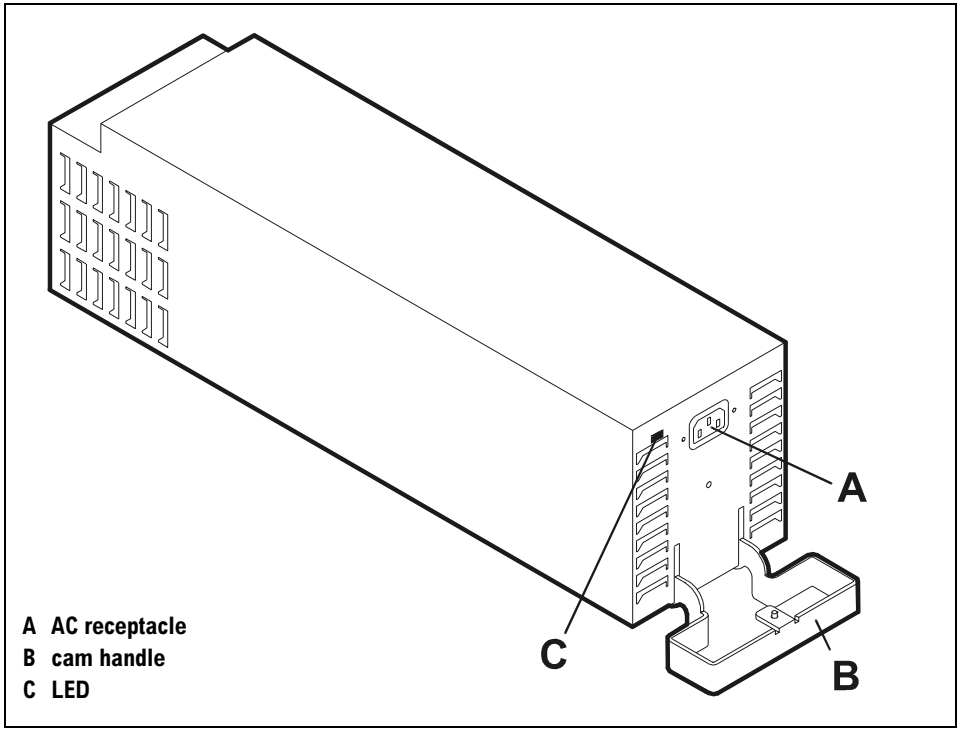


Figure 7 Power Supply

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 an internal fan or other part fails. At the same time, the LED turns amber, and, if enabled, the hardware event monitor sends an event message. Power supply fans remain on if other parts fail in order to maintain cooling air flow through the system. If a fan fails, the power supply shuts down.

Hardware/Software Requirements

The disk system is supported on the following operating systems:

- HP-UX 11.0 or greater with IPR 9906 or greater
- HP-UX 10.20 or greater (A180 and A180C only) with IPR 9906 or greater

The disk system is supported on the following Hewlett-Packard host systems:

- A-class (A180 and A180C)
- N-class (N4000)
- V-class (V2500)

The following Ultra2 PCI LVD SCSI adapters (HBAs) must be installed in the host:

- A5149A, Single ported (in all supported hosts)
- A5150A, Dual ported (in N-class hosts only)

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. Mirroring inside a disk system is not a high availability solution to the extent that a backplane failure would necessitate downtime.

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

Redundant Hosts, One Disk System

Connecting both BCCs in one disk system to redundant hosts achieves high availability at the system level. In Figure 8, a single host bus adapter (HBA) in each host is connected to a different port on each BCC in the disk system. With the disk system in full bus mode (switch 1 set to "|"), all four hosts can reach all ten disks. If BCC A fails in this topology, there are still two paths to the disks through BCC B. All connections from the host to the disk system are SCSI LVD cables.

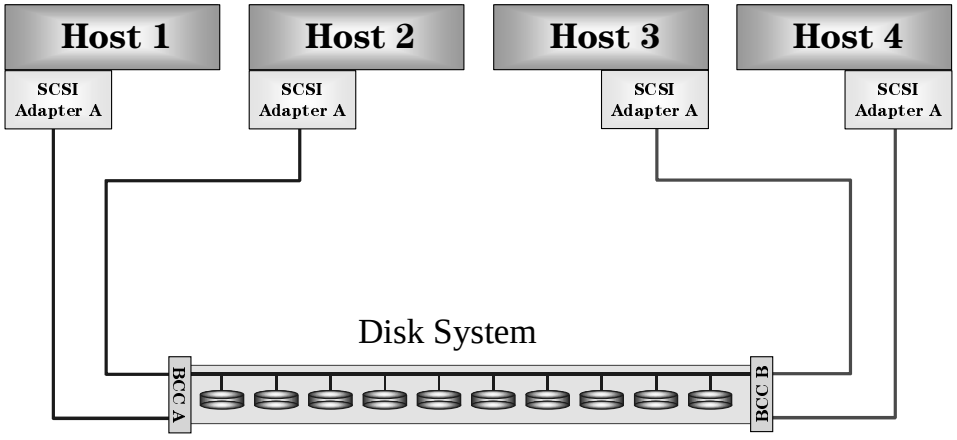


Figure 8 Four Initiators and One Disk System

Redundant Hosts, Mirrored Disk Systems

Connecting mirrored disk systems to redundant hosts achieves high availability at the disk and system levels. In Figure 9, dual host bus adapters (HBA) in each host are connected to mirrored disk systems. With the disk systems in full bus mode (switch 1 set to “I”), each host can reach all ten disks in both disk systems. If one of the disk systems fails in this topology, all four hosts still have access to the data on the mirrored system. All connections from the host to the disk system are SCSI LVD cables.

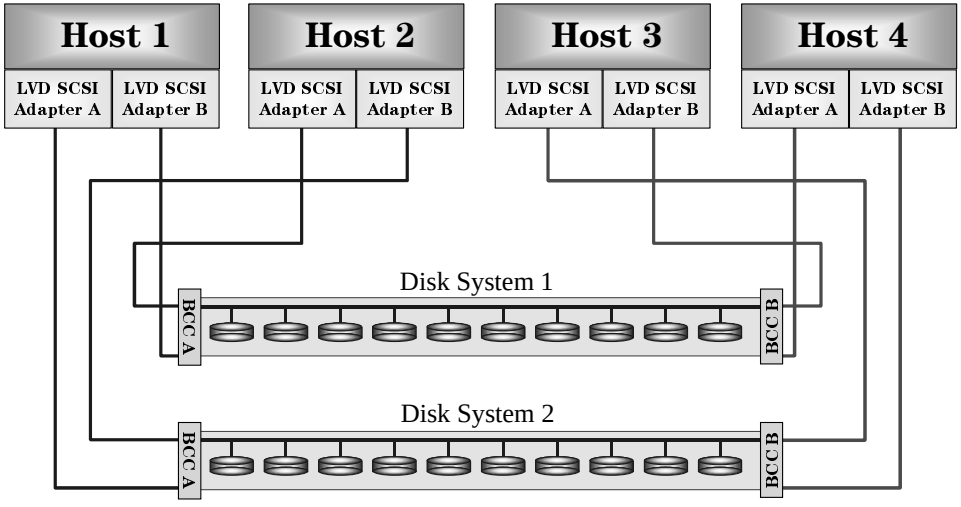


Figure 9 Four Initiators and Mirrored Disk Systems

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 that are addressed individually by the host.

LVD

LVD (Low Voltage Differential) is a type of SCSI signalling that filters out common mode noise by taking the difference of two low-voltage signals. LVD supports cable lengths up to 12 meters and clock speeds of 20 MHz. 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.

SE

SE (Single Ended) is a simple type of SCSI signalling that uses one wire per signal. SE supports cable lengths up to 6 meters. The disk system's internal connections to the disks are SE.

Ultra2 SCSI

Ultra2 is a SCSI interface that transfers 40 Mbytes/sec for 8-bit versions and 80 Mbytes/sec for 16-bit versions. The disk system throughput is 40 Mbytes/sec.

2 INSTALLATION (HP-QUALIFIED ONLY)

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 following inrush and steady state currents:

Table 1 Inrush (Surge) Current and Duration

No. of Disk Systems on Circuit	Inrush Current and Duration
1	20 amps declining over 10 to 12 cycles
2	40 amps declining over 10 to 12 cycles
3	60 amps declining over 10 to 12 cycles
4	80 amps declining over 10 to 12 cycles

Table 2 Maximum Operating Current

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

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

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

Table 3 Recommended European Circuit Breakers

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

* Data assumes no other devices share the circuit breaker.

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

Choosing PDUs

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

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

- **Redundant power source.** To connect redundant power supplies to separate PDUs, install redundant PDUs.
- **Number of cords to the AC source**. Using 30-amp PDRUs instead of 16-amp PDUs reduces the number of cords to the wall.
- **Future needs**. Installing surplus PDU capacity allows you to add disk 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 4 and Figure 5.

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

No. of Disk Systems	1.1 meter (21 U)	1.6 meter (32 U)	2.0 meter (41 U)
1 – 4	2 3-foot/16-amp PDUs* ***or*** 2 19-inch/16-amp PDUs	2 5-foot/16-amp PDUs* ***or*** 2 19-inch/16-amp PDUs	
5 – 8	NA**	2 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 5 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*	
9 – 11	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 10 and Figure 11. 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 11.)

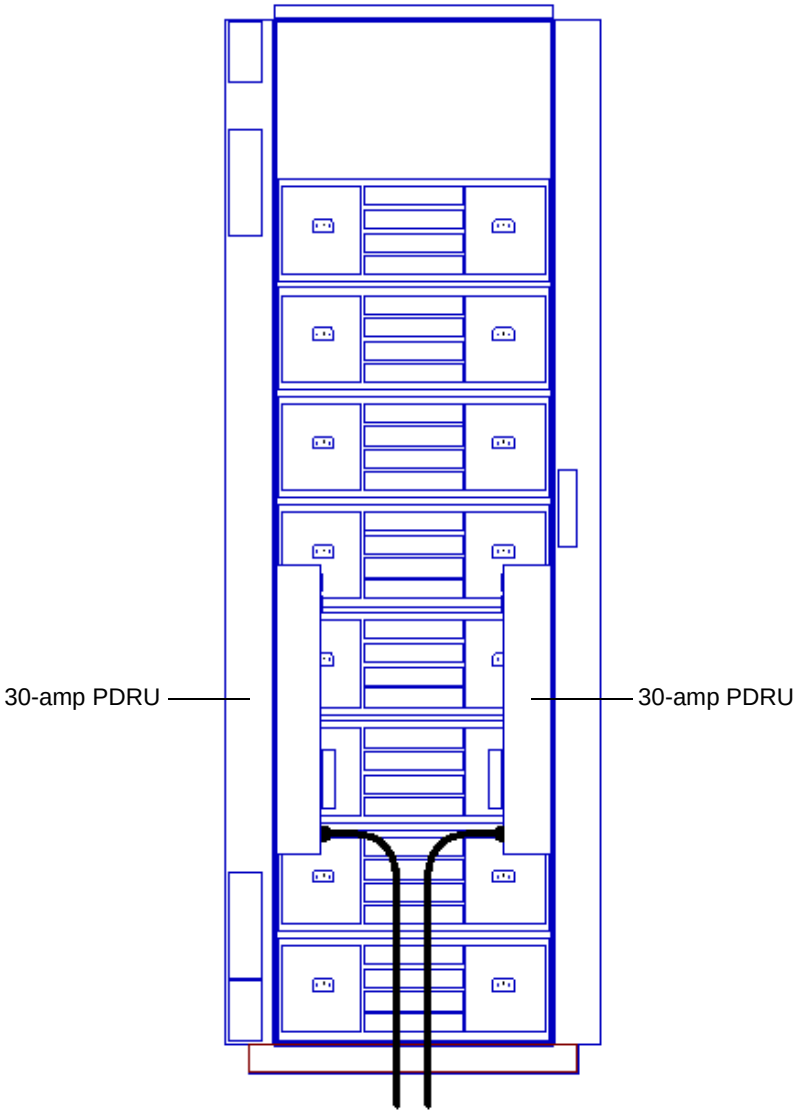


Figure 10 PDRU Placement in 1.6-Meter Rack

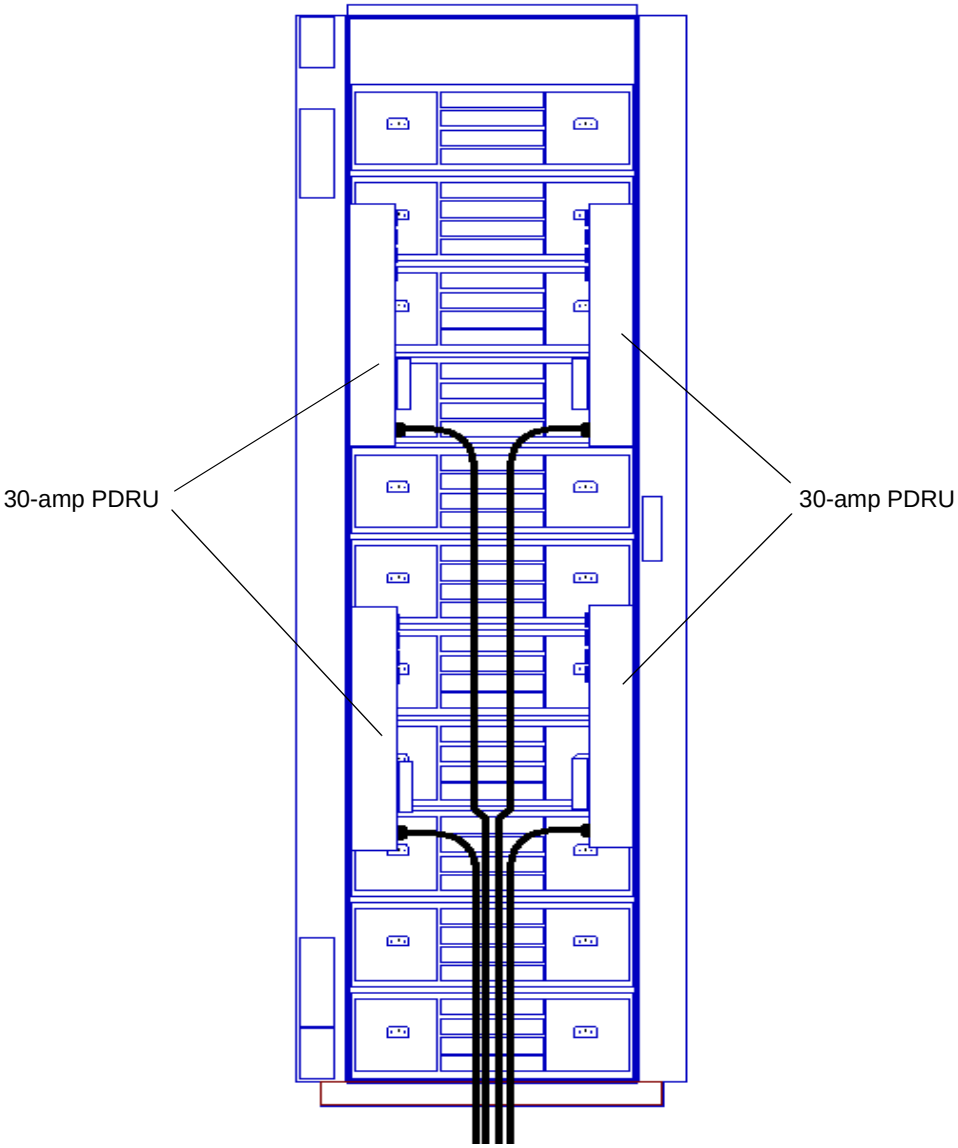


Figure 11 PDRU Placement in 2.0-Meter Rack

Software Requirements

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

1. At the host console, enter **swlist | grep XSW** and look for the following extension software according to the installed HP-UX revision:
   - `XSWHWCR1100 B.11.00.45`, or greater, on HP-UX 11.0
   - `XSW800HWCR1020 B.10.20.45`, or greater, on HP-UX 10.20
2. Enter **swlist | grep Online** and look for the following online diagnostics according to the installed HP-UX revision:
   - `Online Diags B.11.00.09.09`, or greater, on HP-UX 11.0
   - `Online Diags B.10.20.14.08`, or greater, on HP-UX 10.20
3. If swlist does not report the specified releases, install them from the IPR CD-ROM (part no. B6191-10027). (The XR45 CD-ROM, part no. B3782-10418, also contains this software.)

Note For the latest software information, consult the internal web site *http://essd/boi.hp.com/products/JBOD/A5272A/*

Auto-Termination (V-Class Only)

The factory ships V-class systems with auto-termination disabled on host bus adapters. If you are connecting the disk system to a V-class server, make sure that auto-termination is enabled. The disk system's SCSI cables do not provide in-line 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 12.

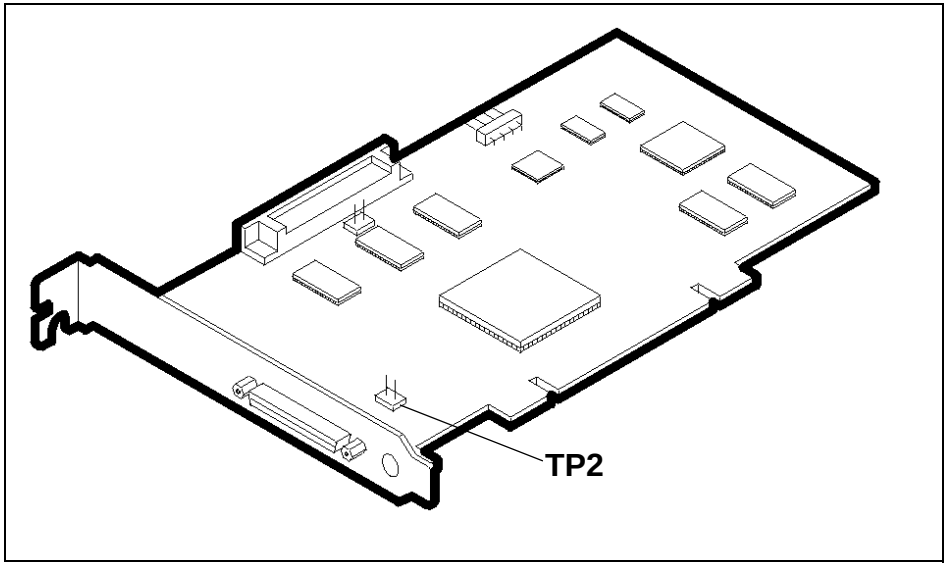


Figure 12 Host Bus Adapter HP A5149A

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 6 and Figure 13.

Table 6 Disk System Accessories

Figure Label	Part (part number)
A	User guide (A5272-96002)
B	Quick installation guide (A5272-96001)
C	ESD strap (9300-2170)
D	Rack filler panel (5183-6369)
E	LVD terminator (5021-1121)
F	BCC (A5272-60001)
G	BCC filler (A5272-67006)
H	Rail kit (A5250A)
I	Rail kit (A5251A)
J	Pack of 10 disks and/or fillers (A5276A or A5282A)
–	VHDCI Ultra SCSI cable(s) (not shown)

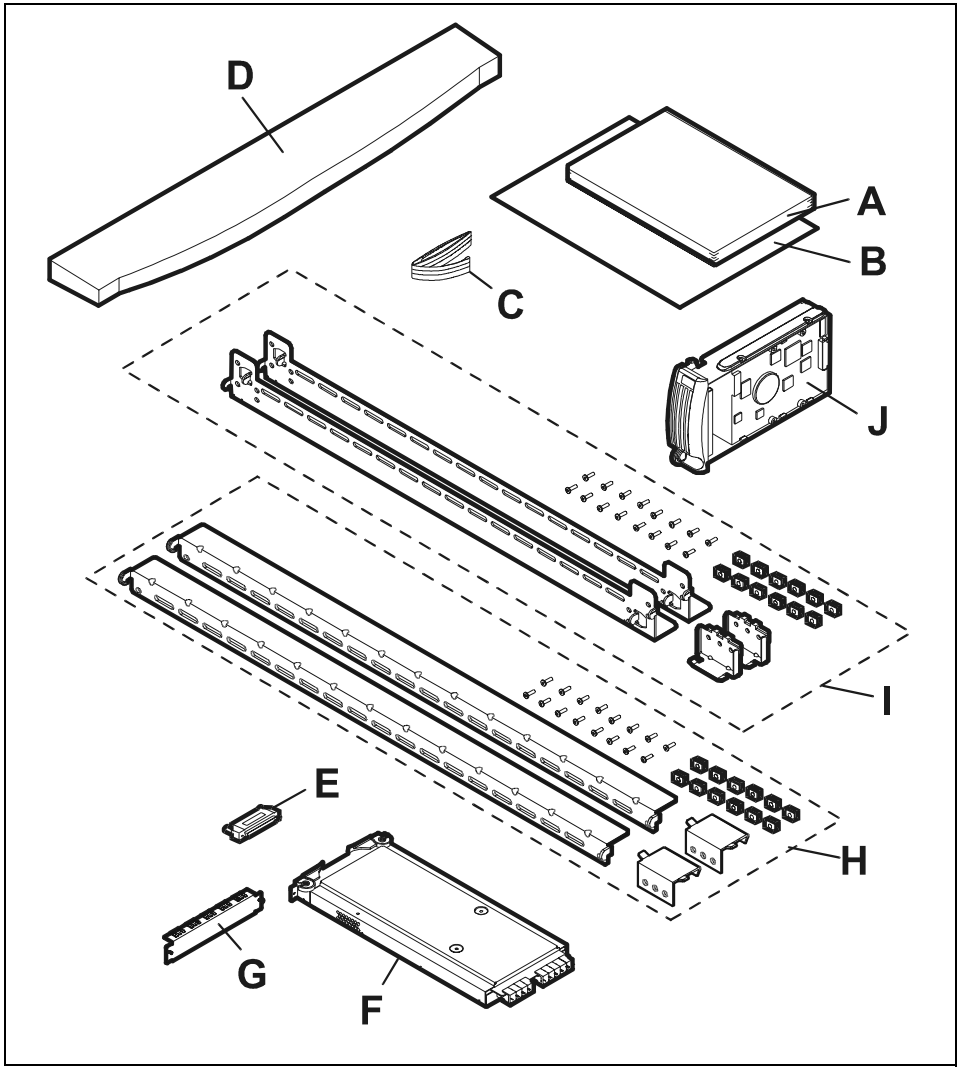


Figure 13 Disk System Accessories

2. Lift off the accessories box and the top of the under box, and verify the contents shown Figure 7 and Figure 14.

Table 7 Disk System Contents

Figure Label	Part (part number)
J	Disk system chassis with pre-installed fans and power supplies
K	Two power cords (8120-6514)

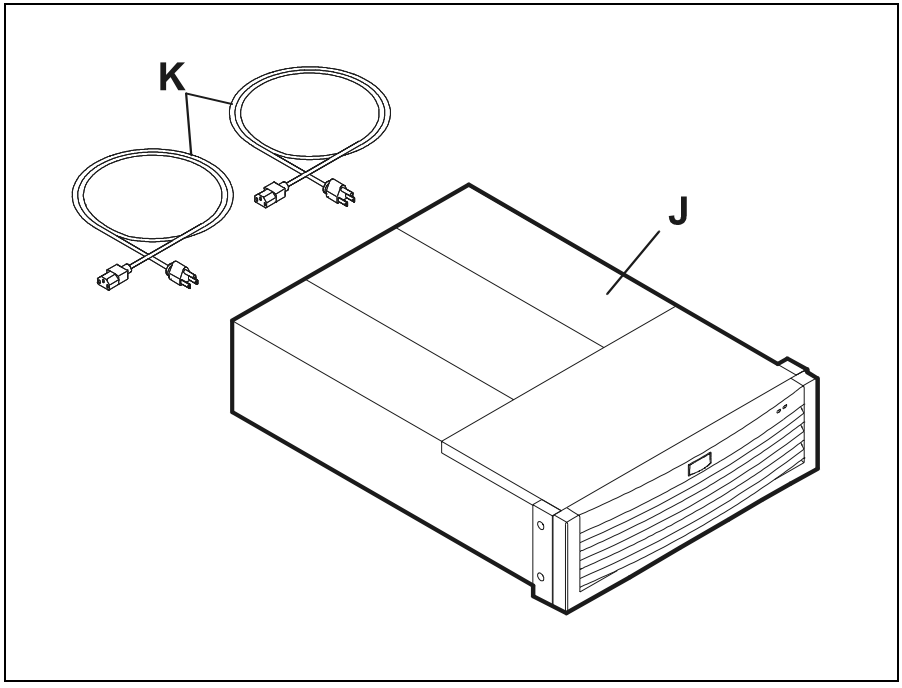


Figure 14 Disk System Contents

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

Step 3: Install Rails

This step is divided into two parts:

- If you are installing the disk system in an HP rack product C2785A, C2786A, C2787A, A1896A, or A1897A, follow the instructions in Part A: HP Legacy Racks (page 46).
- If you are installing the disk system in an HP Rack System/E, follow the instructions in Part B: HP Rack Systems/E (page 50).

Part A: HP Legacy Racks

1. Unpack rail kit HP A5250A and verify the contents shown in Figure 8 and Figure 15.

Table 8 Rail Kit HP A5250A Contents

Label	Part
A	2 rail clamps
B	2 rails
C	16 M5 16mm screws (includes extras)
D	12 sheet metal nuts (includes extras)
E	Rack mount guide

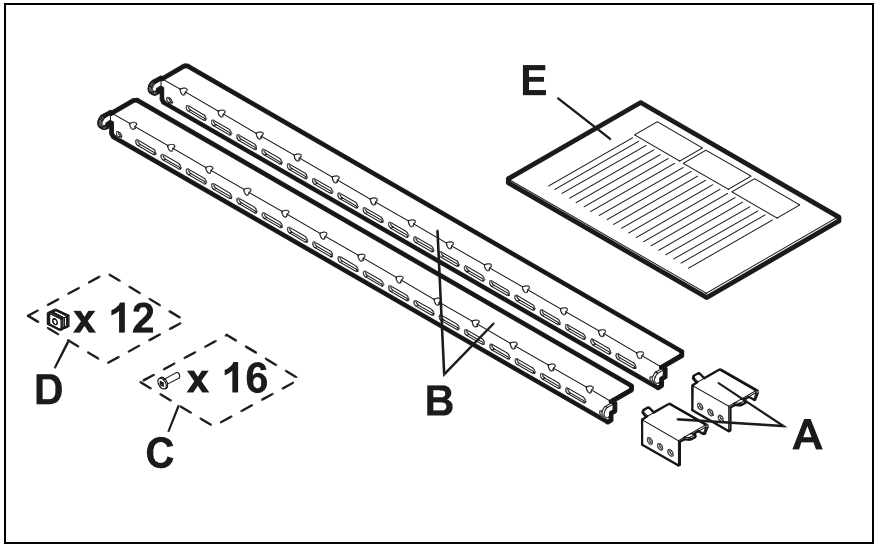


Figure 15 Rail Kit HP A5250A Contents

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

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

   The disk system consumes 4 EIA Units (U) in an HP original rack, 3.5 for the product and .5 for the rail. Select an empty 4 U and install a sheet metal nut (B in Figure 16) on the bottom hole.

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

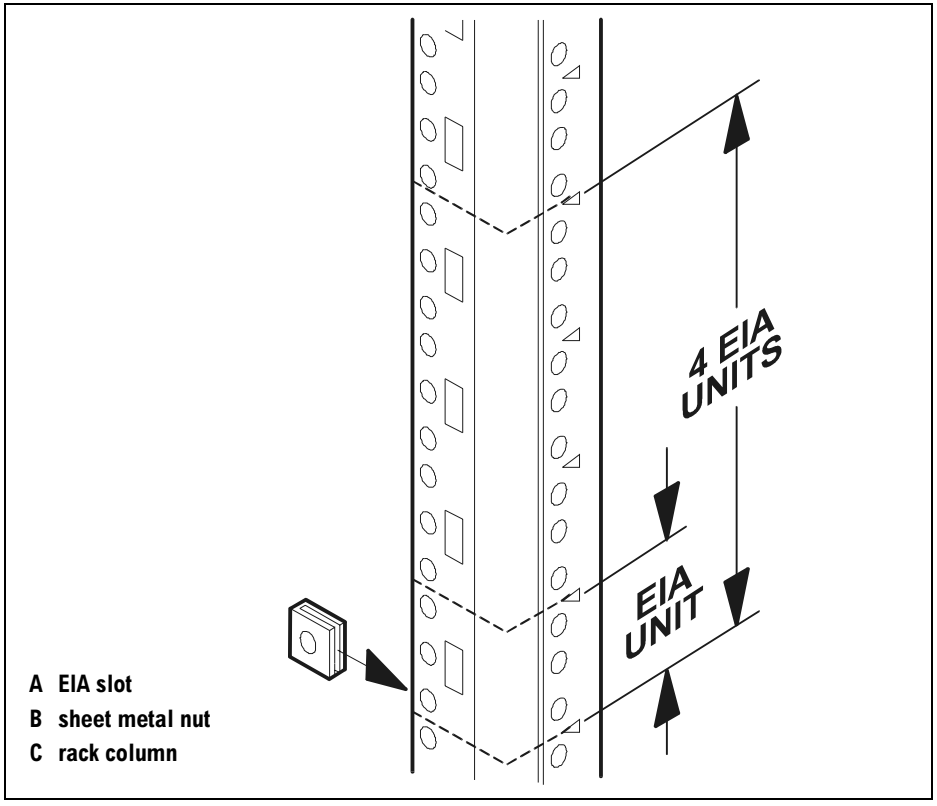


Figure 16 Rack Column Detail – HP Legacy Racks

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

4. Attach rails to rack.

   a. Insert rail tabs (A in Figure 17) into the bottom slots (B) of the selected space on the right front and back columns. Make sure that the rail is level and rail holes align with the sheet metal nuts you just installed on the rack column.

   b. Insert one screw through the rail and prepared rack column holes. Tighten screws with a Torx T25 screwdriver.

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

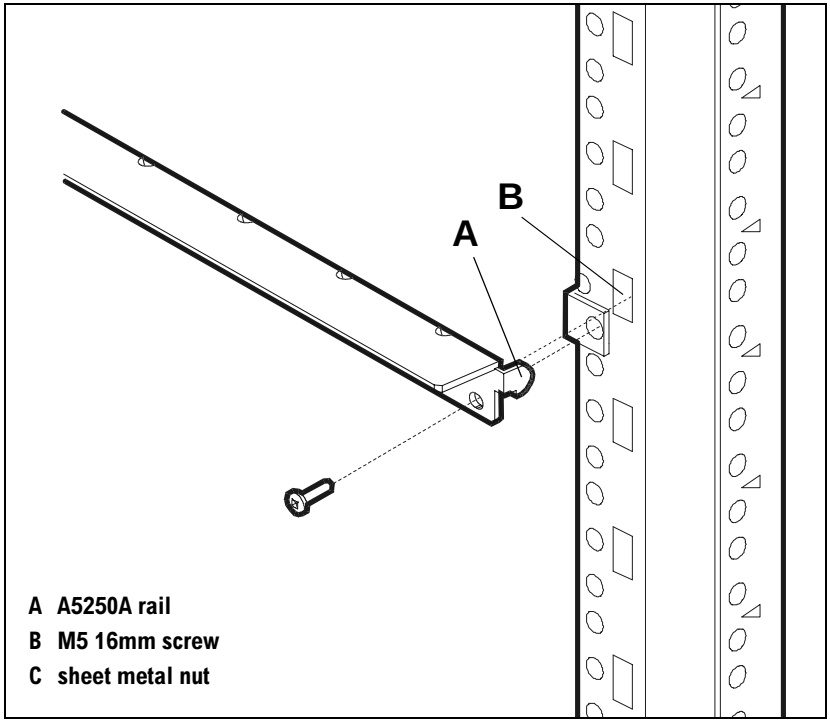


Figure 17 Rail Assembly – HP Legacy Racks

Part B: System/E Racks

If you are installing the disk system in an HP Rack System/E, complete the following instructions. For other HP racks, see Part A: Legacy Racks.

1. Unpack the rail kit A5251A and verify the contents shown in Figure 9 and Figure 18.

Table 9 Rail Kit HP A5251A Contents

Figure Label	Part
A	2 rails
B	2 rail clamps
C	16 M5 16mm screws (includes extras)
D	12 sheet metal nuts (includes extras)
E	Rack mount guide and template

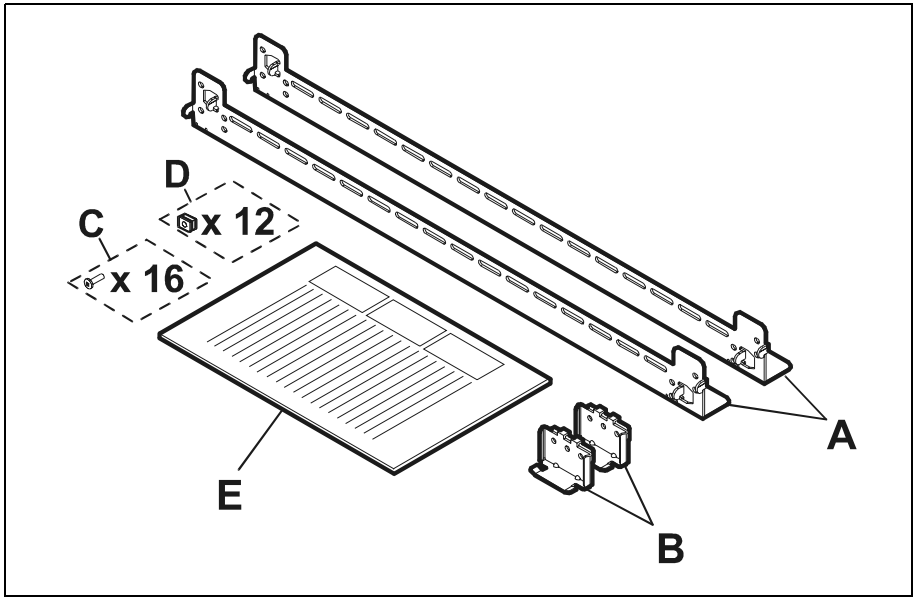


Figure 18 Rail Kit HP A5251A Contents

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

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

Note In a Rack System/E, each disk system occupies exactly 3.5 EIA Units. You can rack multiple disk systems without gaps by alternating rails between full and half Unit positions. (EIA Units are numbered on the column.)

   – If the bottom of the selected rack space falls at the Unit number, insert the lower rail tabs (C in Figure 19) in the adjacent slot (B).

   – If the bottom of the selected rack space falls between Unit numbers, insert the upper rail tabs (C in Figure 20) in the higher slot (B).

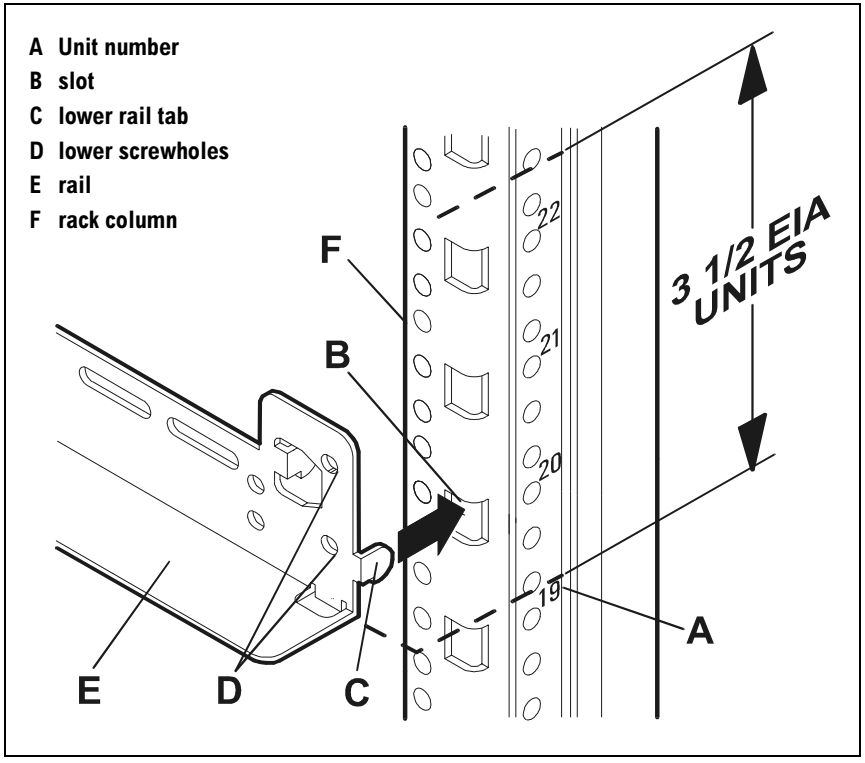


Figure 19 Unit Rail Position

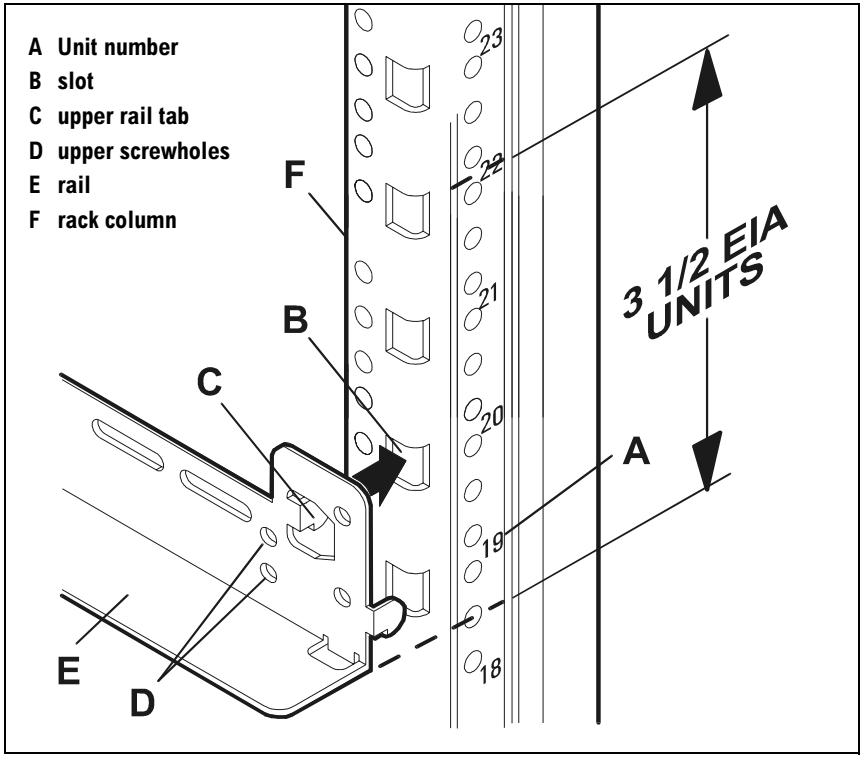


Figure 20 Half-Unit Rail Position

Note Because the horizontal relationship between upper and lower tabs is reversed on opposite ends of the rail, the rail on one side of the rack sits farther back in the rack than its mate on the other side.

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

Table 10 Rail Positions for Sequential Disk Systems

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

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

3. Install sheet metal nuts (C in Figure 21) as follows on all four columns.

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

Note Hole patterns vary at opposite ends of the rail.

4. Insert two screws (A in Figure 21) through each rail end and prepared rack column. Use a Torx T25 screwdriver to tighten the screws securely.

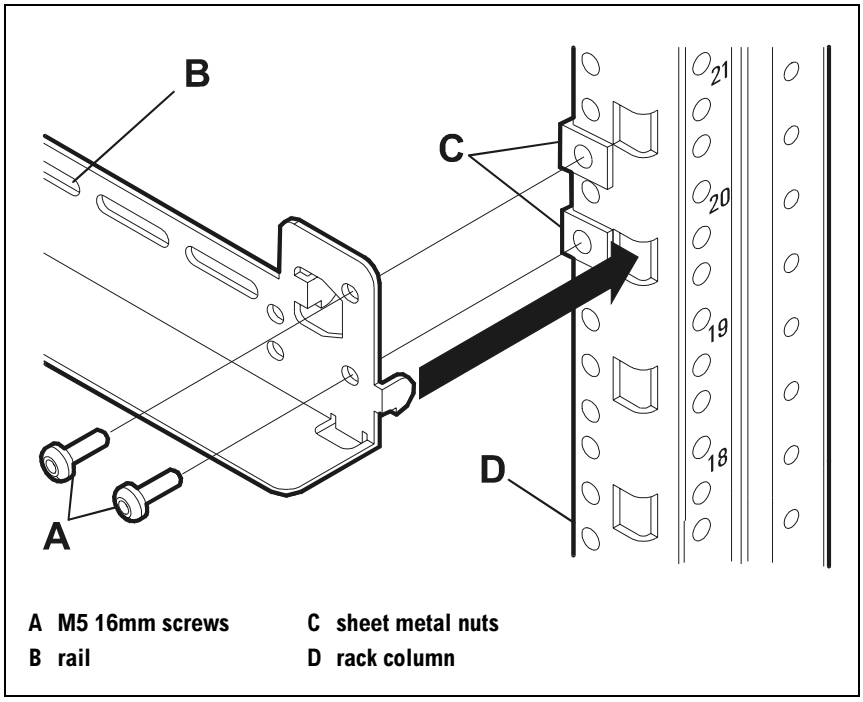


Figure 21 Rail Assembly – HP Rack Systems/E

Step 4: Prepare Rack Front

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

- On HP legacy racks (HP C2785A, C2786A, C2787A, A1896A, and A1897A), count six holes (4 inches) up from the rail ledge.
- In HP Rack Systems/E:
  - If the bottom of the rail (A in Figure 22) is at the EIA Unit number, count six holes up from the rail ledge and install the sheet metal nut.
  - If the bottom of the rail (A in Figure 23) lies between EIA Units, count seven holes up from the rail ledge and install the sheet metal nut.

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

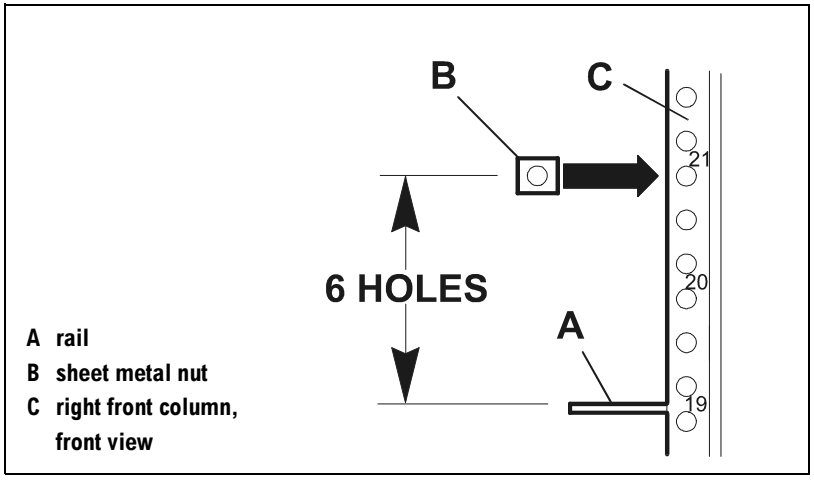


Figure 22 Rack Front Preparation: Unit Rail Position

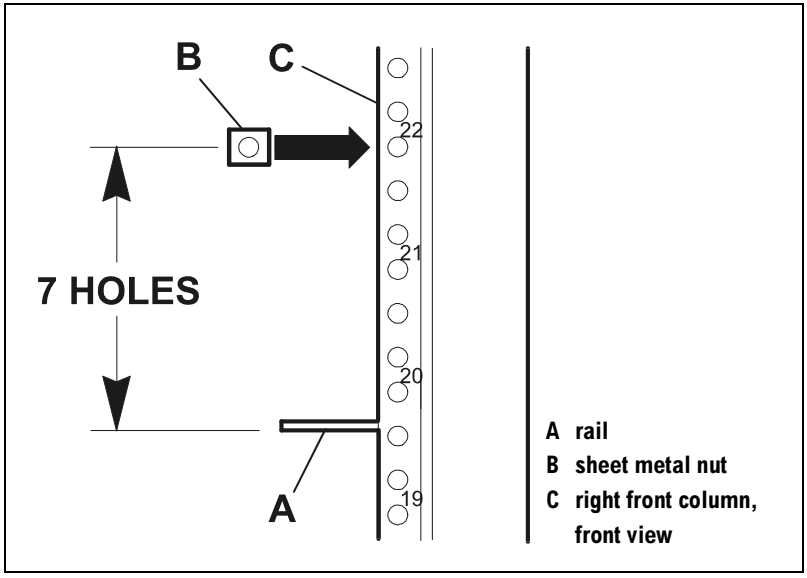


Figure 23 Rack Front Preparation: Half-Unit Rail Position

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

Step 5: Install the Disk System

Caution Do not try to lift the disk system using the power supply handles.

1. (Optional) Remove the power supplies to prepare the disk system for lifting:
   a. With the chassis still in the box, loosen the screw in the handle of each power supply.
   b. Pull the cam handle down to disengage the power supply from the backplane and pull each power supply out of the chassis. Support the far end of the supply with your free hand as it clears the chassis.
   c. Set the power supplies aside 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 50 pounds.**

2. With another person or using a lift device, carry the disk system to the front of the rack and slide the back end onto the rails (Figure 24). Push the disk system into the rack as far as it will go.

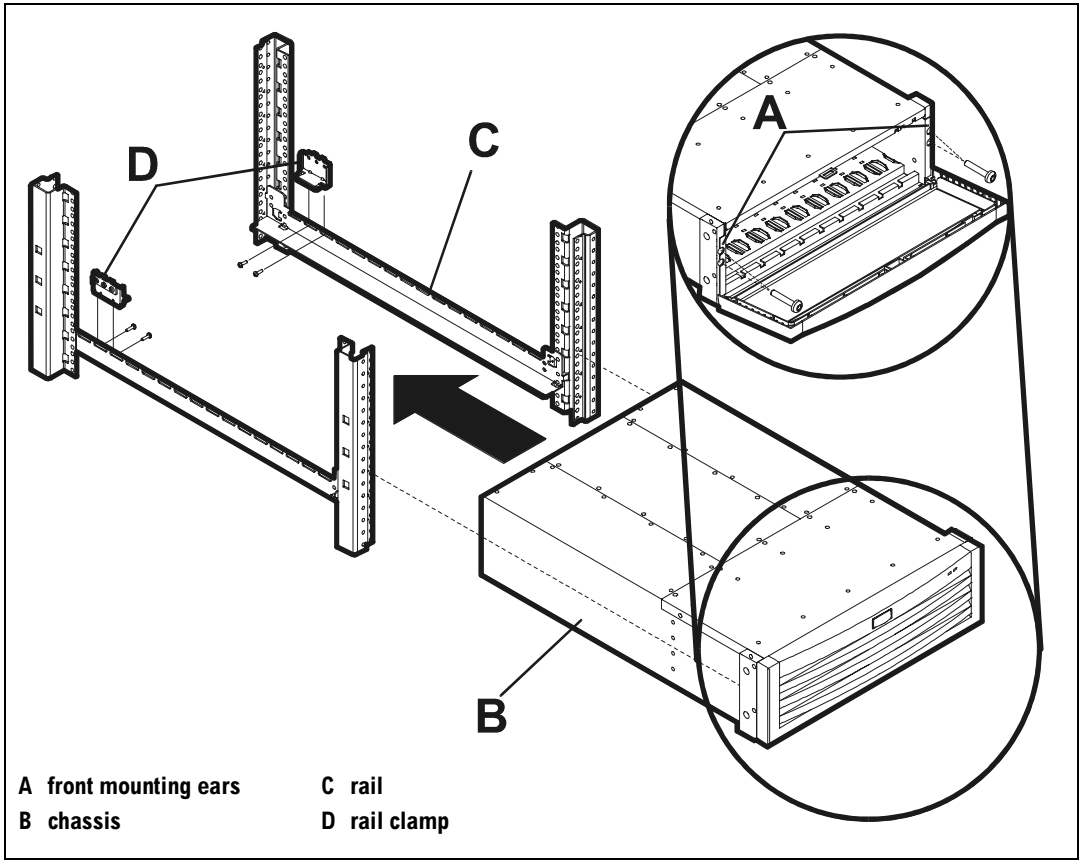


Figure 24 Mounting the Disk System (Rack System/E Shown)

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

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

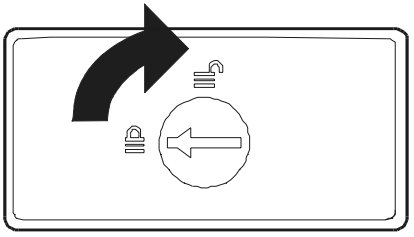


Figure 25 Door Lock

4. Ensure that one hole in each mounting ear (A in Figure 24) aligns with the sheet metal nuts previously installed on the rack front columns.
   - In legacy racks, the upper holes should align with the rack column holes.
   - In Rack Systems/E, the upper or lower holes will align with the rack depending on the Unit position of the rail.
5. Insert two screws through the matching holes in the disk system mounting ears and rack front columns. Tighten screws.
6. Close the door.
7. Fasten the back of the disk system to the rails using the clamps from the rail kit.
   a. If you are installing the disk system in an HP legacy rack, set the clamp (A in Figure 26) on top of the rail (B) so that the tabs point up and the screw holes are on the slotted side of the rail. Skip to substep c.
   b. If you are installing the disk system in an HP Rack System/E, set the clamp (E in Figure 24) inside the rail so that the holes in the clamp meet the slots in the rail.
   c. Push the clamp tight against the back of the disk system. The raised tab of the clamp should overlap the bottom edge of the disk system chassis.
   d. Insert and tighten two M5 16mm screws through each clamp and rail.

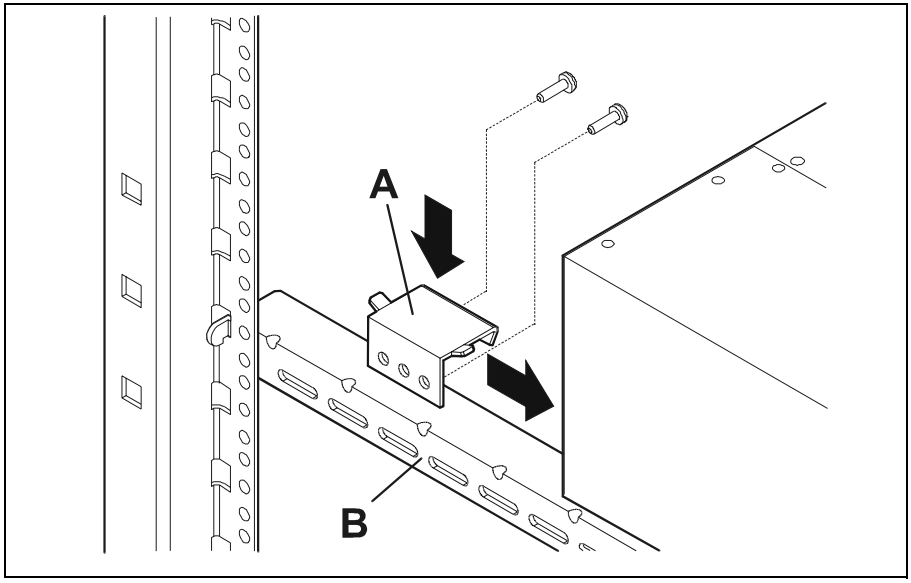


Figure 26 Legacy Rack Rail Clamp

8. If you previously removed the power supplies, reinstall them now.
9. Install half-Unit rack filler panel(s) as needed. A half-Unit gap exists between products in HP legacy racks and when an odd number of disk systems are installed in the Rack System/E.

Step 6: 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 bottom BCC slot.

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

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

3. Open the BCC cam latches (C in Figure 27) by pulling them away from the center.
4. Align the BCC guide screws (E) with the slot notches, and insert the BCC into the top slot at the back of the disk system. Stop pushing when the BCC meets the backplane.
5. 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 backplane.
6. Use a Torx T15 or flat-blade screwdriver to tighten the locking screws (D).

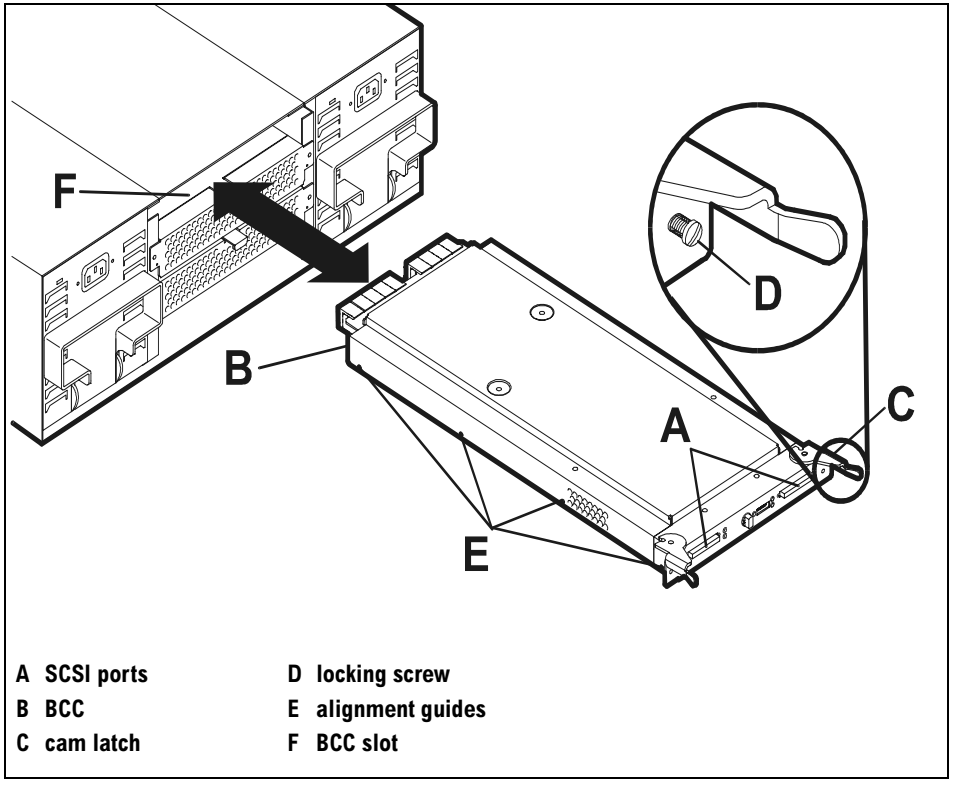


Figure 27 BCC Installation

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

Note The top-bottom orientation of the BCC is reversed in the bottom slot.

8. 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 screws with slot screw holes, and insert the filler into the bottom slot.
    c. Tighten the locking screws.

Step 7: Set DIP Switches

BCCs are shipped from the factory with all DIP switches (A in Figure 28) in the "I" 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 disks will not spin up.

1. Make sure that switch 2 (B in Figure 28) is in the "I" position (JBOD operation). This position configures the disk system to be connected to a host.
2. Set other switches as needed. See chapter 3, Configuration, for switch definitions and guidelines.

Note The rotary switch is not used for this product.

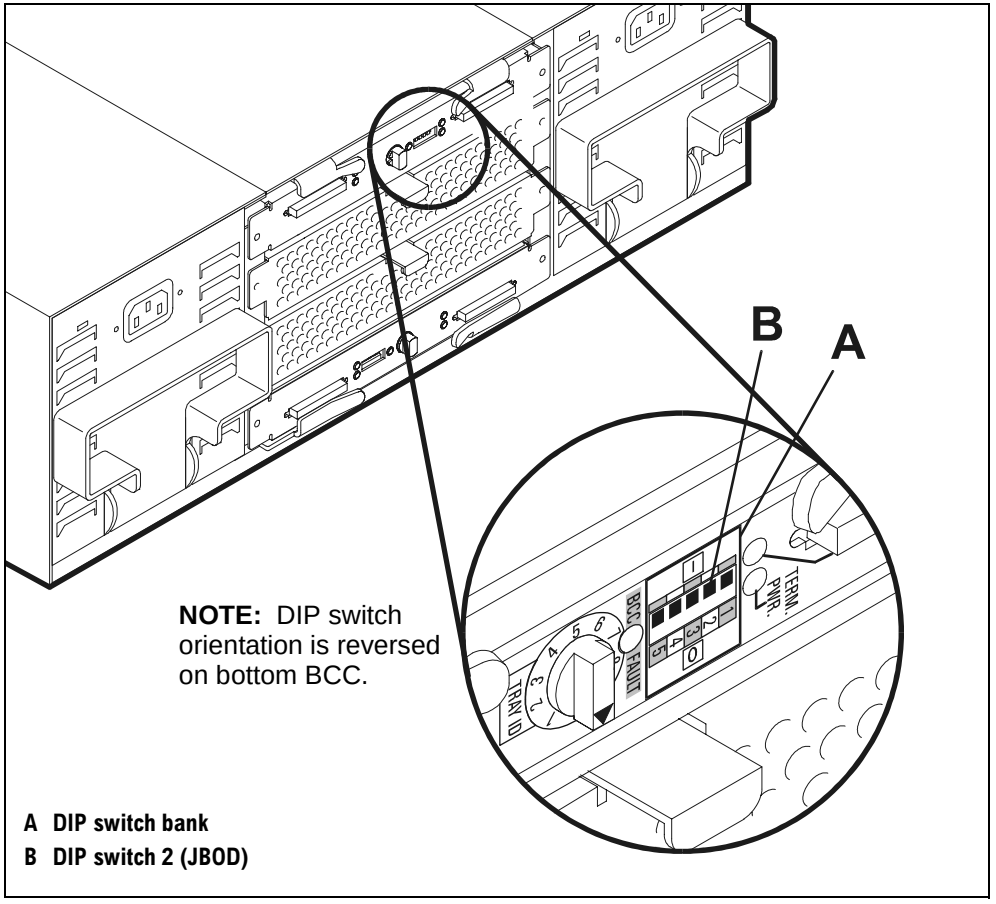


Figure 28 BCC DIP Switches

Step 8: Connect SCSI and Power Cables

1. Attach an LVD SCSI cable to SCSI port A or B, or both, on one or both BCCs. (Sample topologies appear in chapter 1. For additional supported topologies, refer to the internal document *HP 9000 Enterprise Servers Configuration Guide*.)
2. Attach the other end of each SCSI cable to a host bus adapter or, in split bus mode, optionally to the SCSI port of another disk system. (See bus configuration options in chapter 3.)

Note The SCSI cables shipped with this product are not self-terminating. If you are connecting the disk system to a factory-integrated host bus adapter in a V-class server, make sure that auto-termination is enabled.(See page 40.)

3. Attach an LVD terminator to any empty SCSI port that is on a BCC with a cable attached.
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 29 and Figure 30 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 29 and Figure 30 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.

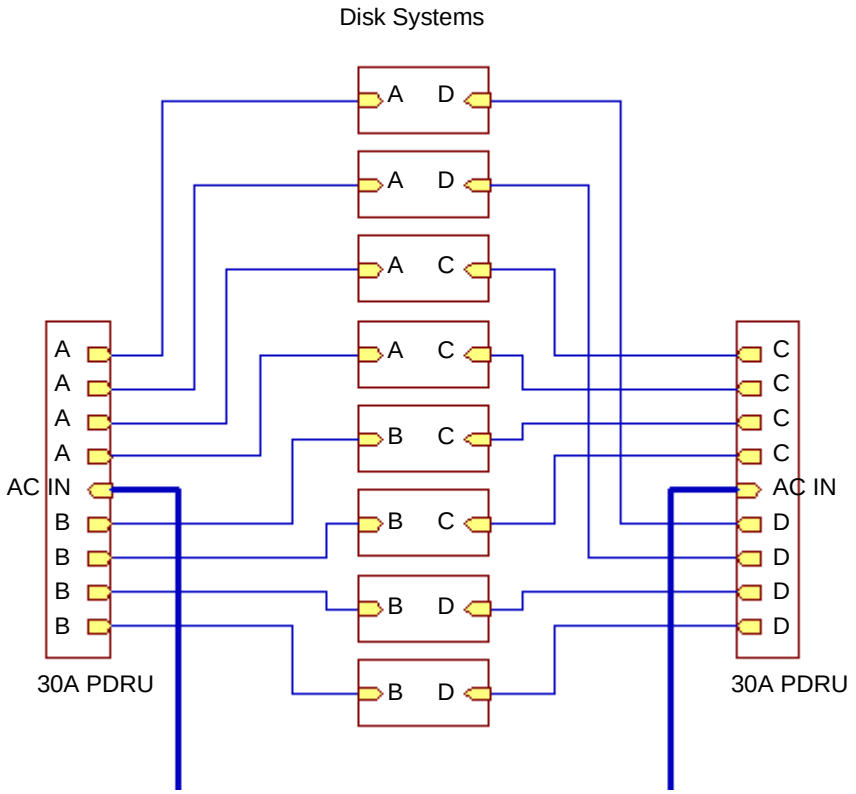


Figure 29 Wiring Scheme for 1.6-Meter Rack

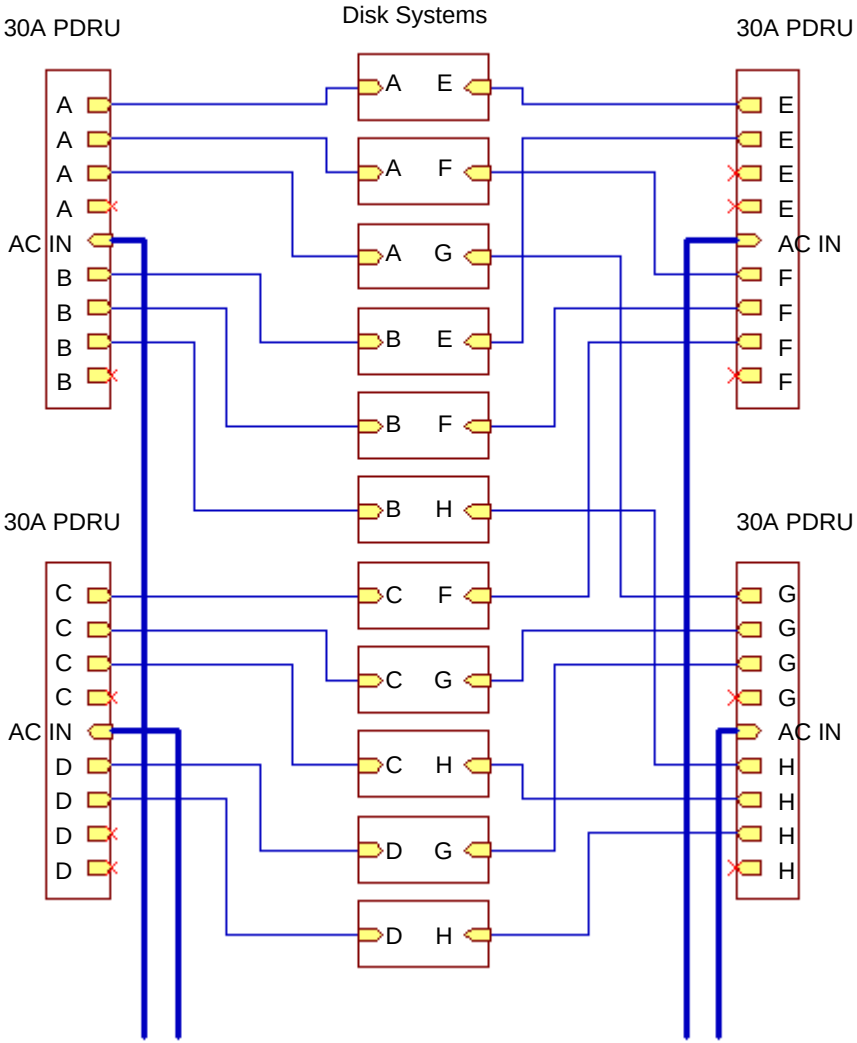


Figure 30 Wiring Scheme for 2.0-Meter Rack

Step 9: Install Disks

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

Disks are fragile and ESD sensitive. Dropping one end of the disk 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 31) and carriers (D), and follow strict ESD procedures.

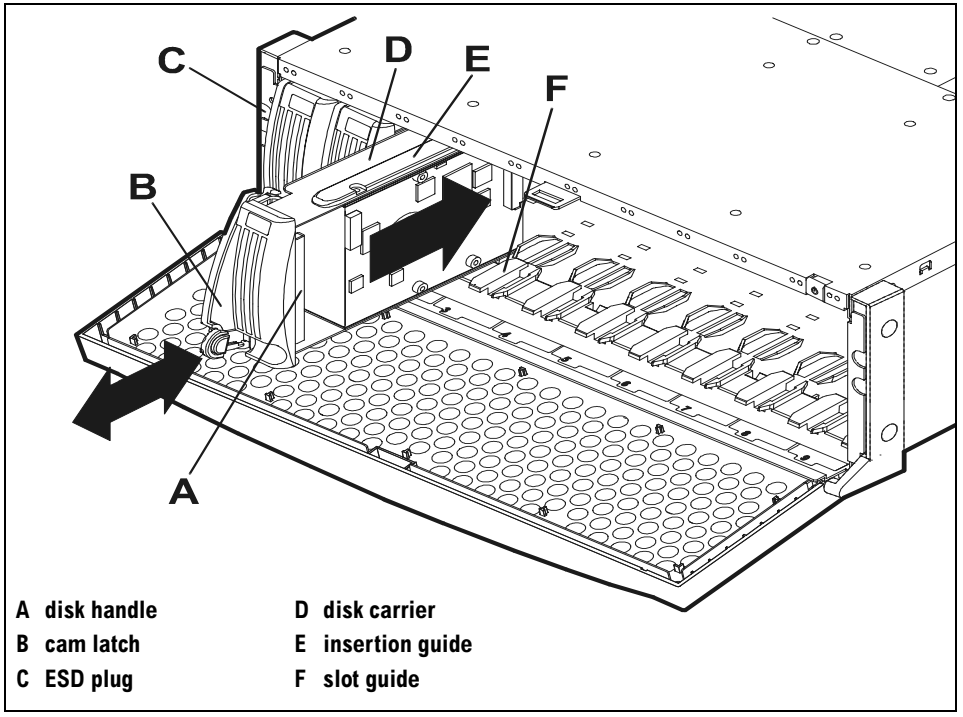


Figure 31 Disk Installation

1. Open the disk system door.
2. Determine which slots, 0 through 9, will contain disks and which will contain fillers.
   - If DIP switch 1 is set to "I" (full bus mode), choose any slots for disks or fillers.
   - If DIP switch 1 is set to "0," the even-numbered slots are on a bus with BCC A and odd-numbered slots are on a different bus with BCC B.
   - At least four slots must contain disks.
3. Put on the ESD strap and insert the metal end into the ESD plug-in (C in Figure 31) on the front of the disk system.

Caution Disks are fragile. Handle carefully.

Caution Be careful to grasp the disk by its handle and avoid touching exposed circuitry.

4. Remove a disk from the disk pack and its ESD bag.
5. Open the disk cam latch (C) by pulling the tab toward you.
6. Push the disk as far as it will go into the selected slot.

Note Install disks left to right for easier insertion.

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

Caution Every slot must contain either a disk or filler.

Step 10: Turn on the Disk System

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

1. Press the power switch (A in Figure 32) 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 seconds, a fault has been detected.

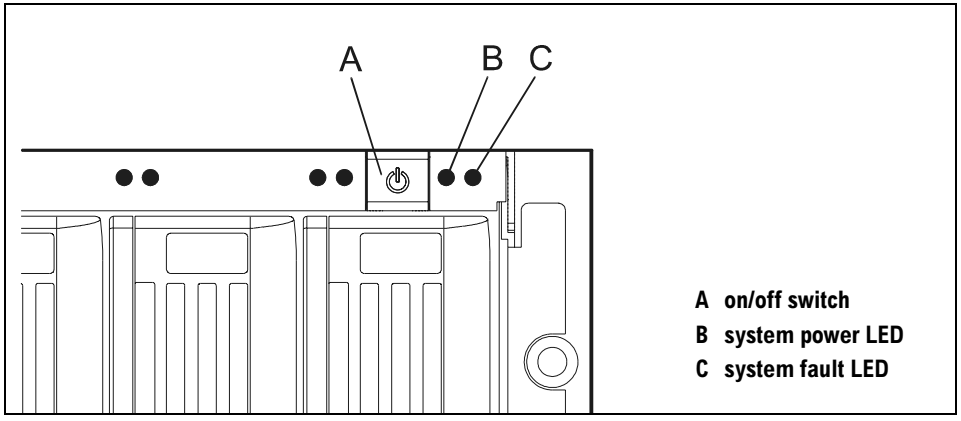


Figure 32 On/Off Switch and System LEDs

3. Close and lock the disk system door.

Step 11: Verify Devices on the Host

On the 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

Each BCC (`ctl`) or disk appears as a separate target in IOSCAN output. The following example shows a disk system with split buses and low addressing (switch 4 set to "0"). Both BCCs use address 15.

```
Class     I   H/W Path           Driver       S/W State  H/W Type     Description
=============================================================================================
bc        0                      root         CLAIMED    BUS_NEXUS
bc        1   8                  bc           CLAIMED    BUS_NEXUS    Pseudo Bus Converter
ba        0   8/0                GSCtoPCI     CLAIMED    BUS_NEXUS    PCI Bus Bridge-GSCtoPCI
ext_bus   0   8/0/1/0            c720         CLAIMED    INTERFACE    Ultra2 Wide SCSI
target    0   8/0/1/0.0          tgt          CLAIMED    DEVICE
disk      1   8/0/1/0.0.0        sdisk        CLAIMED    DEVICE       SEAGATE ST118202LC
target    1   8/0/1/0.1          tgt          CLAIMED    DEVICE
disk      2   8/0/1/0.1.0        sdisk        CLAIMED    DEVICE       SEAGATE ST118202LC
target    2   8/0/1/0.2          tgt          CLAIMED    DEVICE
disk      3   8/0/1/0.2.0        sdisk        CLAIMED    DEVICE       SEAGATE ST39102LC
target    3   8/0/1/0.3          tgt          CLAIMED    DEVICE
disk      4   8/0/1/0.3.0        sdisk        CLAIMED    DEVICE       SEAGATE ST39102LC
target    4   8/0/1/0.6          tgt          CLAIMED    DEVICE
ctl       5   8/0/1/0.6.0        sctl         CLAIMED    DEVICE       Initiator
target    5   8/0/1/0.13         tgt          CLAIMED    DEVICE
disk      5   8/0/1/0.13.0       sdisk        CLAIMED    DEVICE       SEAGATE ST39102LC
target    6   8/0/1/0.15         tgt          CLAIMED    DEVICE
ctl       3   8/0/1/0.15.0       sctl         CLAIMED    DEVICE       HP A5272A
ext_bus   1   8/0/2/0            c720         CLAIMED    INTERFACE    Ultra2 Wide SCSI
target    7   8/0/2/0.0          tgt          CLAIMED    DEVICE
```

```
disk      6   8/0/2/0.0.0       sdisk       CLAIMED    DEVICE       SEAGATE ST118202LC
target    8   8/0/2/0.1         tgt         CLAIMED    DEVICE
disk      7   8/0/2/0.1.0       sdisk       CLAIMED    DEVICE       SEAGATE ST118202LC
target    9   8/0/2/0.2         tgt         CLAIMED    DEVICE
disk      8   8/0/2/0.2.0       sdisk       CLAIMED    DEVICE       SEAGATE ST118202LC
target   10   8/0/2/0.3         tgt         CLAIMED    DEVICE
disk      9   8/0/2/0.3.0       sdisk       CLAIMED    DEVICE       SEAGATE ST39102LC
target   11   8/0/2/0.5         tgt         CLAIMED    DEVICE
ctl       6   8/0/2/0.5.0       sctl        CLAIMED    DEVICE       Initiator
target   12   8/0/2/0.13        tgt         CLAIMED    DEVICE
disk     10   8/0/2/0.13.0      sdisk       CLAIMED    DEVICE       SEAGATE ST39102LC
target   13   8/0/2/0.15        tgt         CLAIMED    DEVICE
ctl       4   8/0/2/0.15.0      sctl        CLAIMED    DEVICE       HP A5272A
```

3 CONFIGURATION

Setting DIP Switches

Five DIP switches on BCC A (top slot) determine bus architecture, addressing, and some bus behavior. If BCC A is removed, then the DIP switches on BCC B define the bus. See Table 11 for a description of switch settings. An extendible card attached to the top of the disk system illustrates the switch positions on each BCC.

Table 11 DIP Switch Settings

Switch	ON = |	OFF = 0
1 Full Bus	Creates a single bus of 10 addresses	Splits the bus into two buses, 5 addresses each
2 JBOD	Sets disk-to-host configuration	For use with array product
3 Bus Reset: Pwr Fail	Automatically resets the bus when power fails	Lets the host detect change and determine action
4 Address High	Assigns high SCSI addresses (8-12) to disks on split bus	Assigns low SCSI addresses (0-3, 13) to disks on split bus
5 Bus Reset: Hot Swap	Automatically resets the bus when a disk is removed or inserted	Lets the host detect change and determine action

Basic Rules

A few rules govern the setting of these switches.

1. The switch settings on BCC A must match the switch settings on BCC B.

   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.

2. When switch 1 (full bus) is "|", switch 4 (Address High) has no effect.

3. When switch 1 (full bus) is "0" and a split bus is daisy-chained to another disk system, switch 4 (Address High) must be "|" for one of the disk systems and "0" for the other.

Note High and low addresses are not supported in the same disk system.

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 12 DIP Switch Usage

Switch	Reasons to Set ON (|)	Reasons to Set OFF (0)
1. Full Bus	a. Full-bus mode is the only way to access all ten disks with one BCC. b. With two BCCs, full-bus mode allows four 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. JBOD	Required for disk system.	N/A for this product.
3. Bus Reset-Pwr Fail	Automatic bus reset reduces the chances of data corruption and saves the 30 to 60 seconds that the host would spend determining that the disk system is unavailable. Bus reset signals the host to resend outstanding I/O requests.	Bus control is restricted to the host.
4. Address High	High addresses give disks high priority on the bus, saving access time.	High addresses are needed for other devices on the bus.
5. Bus Reset-Hot Swap	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.

Disk Addressing

Each disk in the SC10 disk system occupies a separate address (SCSI ID) on the SCSI bus. Disk addresses range from 0 to 3 and 8 to 13 in full-bus mode. In split-bus mode, disks are addressed according to the Address High switch setting: 0, 1, 3, and 13 when Address High is “0”; 8, 9, 10, 11, 12, and 15 when Address High is “l”. Addresses 4, 5, 6, and 7 are reserved for host bus adapters. The BCCs take addresses 14 and 15.

BCC A generates all bus addresses, in full-bus and split-bus modes. If BCC A is removed, then BCC B generates the bus addresses. BCC A resumes the addressing function as soon as it is reinstalled.

Figure 13 shows all target SCSI IDs for full bus and split bus modes and for low and high addressing.

Table 13 Disk and BCC SCSI Addresses for Full and Split Bus Modes

Slot	Full Bus	Split Bus	
		Addr High = 0	Addr High = |
0	0	0	8
2	1	1	9
4	2	2	10
6	3	3	11
8	13	13	12
BCC A	14	15	15
1	8	0	8
3	9	1	9
5	10	2	10
7	11	3	11
9	12	13	12
BCC B	15	15	15

NOTE: Values assume JBOD mode, i.e., DIP switch 2 is set to "|". See Setting DIP Switches on page 76 for additional information.

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*.

Annotating 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 and in the STM (Support Tools Manager) Information Tool.

Annotating devices is a password-protected function of STM. Use the System menu License option to install the HP-Only license before you select the annotate function.

1. Run STM and install the HP-Only license.
2. Select the desired BCC.
3. Select **Expert Tool > Run** from the Tools menu. An Expert Tool window opens.
4. Select **Write Label** from the Info menu. The user Defined Annotation window displays the existing label in an edit field.

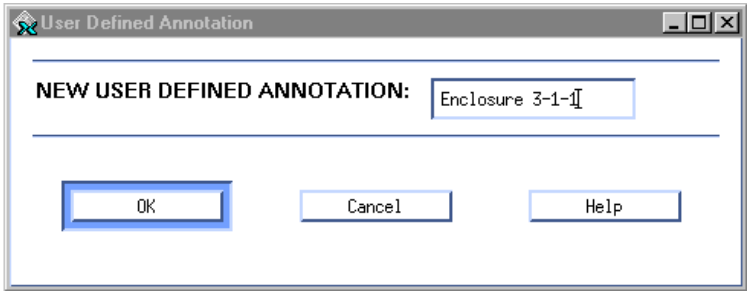


Figure 33 Annotate Device Using STM

5. Type the desired text in the New User Defined Annotation field. Click **OK**. The new label will replace the existing label.

To view the annotation of a selected disk system, select **Read Label** from the Expert Tool Info menu.

Updating Firmware (HP-Qualified Only)

Obtain the latest disk or BCC firmware release from the support site before traveling to the customer site. When you arrive at the site:

1. Save the firmware file on the customer's system, preferably in the default firmware directory: /var/tmp
2. If you want to run STM in graphic mode, make sure the DISPLAY variable is exported.
3. Start STM by typing **xstm&** on the HP-UX command line. This command starts the graphic version of STM and keeps the X window open when you quit STM.
4. Select **License** from the System menu and install the password-protected HP-Only license.
5. In the device display, select the device to receive the new firmware.
6. Select **Firmware Update > Run** from the Tools menu. A tool window opens, displaying the current firmware version and instructions for updating. A second window (Figure 34) lists the available firmware files in the var/tmp directory.

   If there are no firmware files in the default directory, a popup window instructs you to select an optional path and STM displays a list of directories. Enter the directory path you used to save the firmware file (in step 1) and click **OK**.
7. Select the firmware file from the list of files displayed in the default or specified directory. Click **OK**.
8. Select **Start Update...** from the Update menu. STM prompts you to confirm or cancel the firmware update (see Figure 35).

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

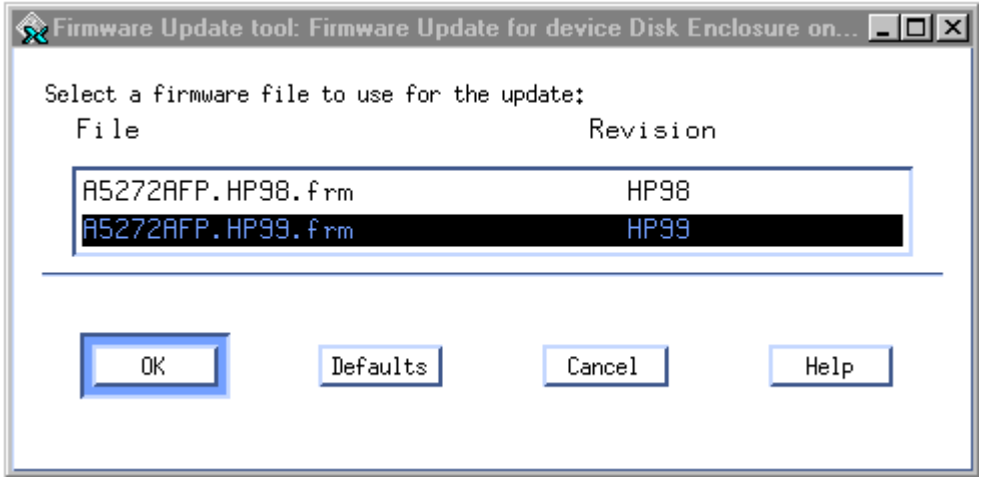


Figure 34 Firmware File Selection Window

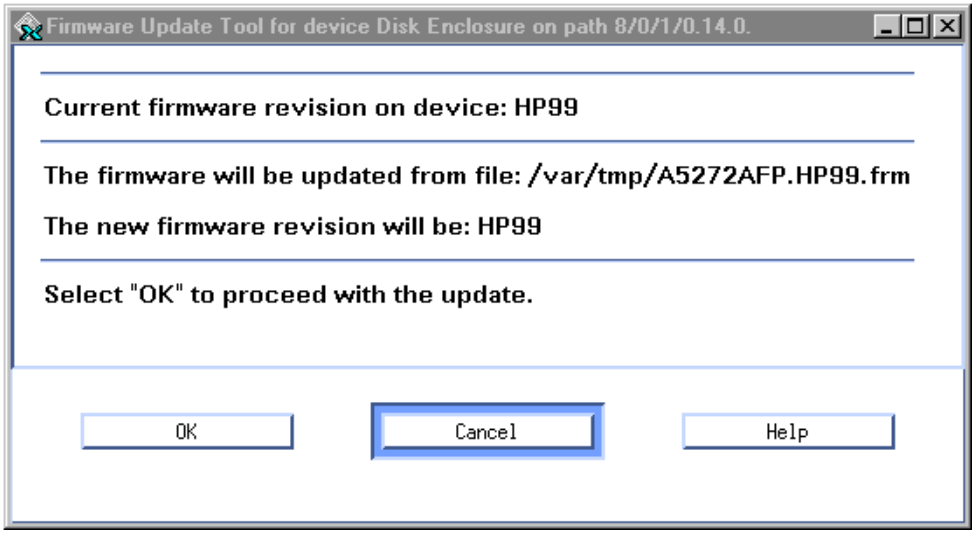


Figure 35 Firmware Download Confirmation Window

4 TROUBLESHOOTING

Overview

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

1. Gather information from all sources:
   - Hardware event notifications (page 87)
   - Disk system LED status (page 89)
   - Online information tools (page 92)
2. Isolate the cause of the problem (page 99).
3. Correct the problem (chapter 5, Removal and Replacement).
4. Verify operational status with IOSCAN or other host utilities.

Event Notification

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 36) contain the following:

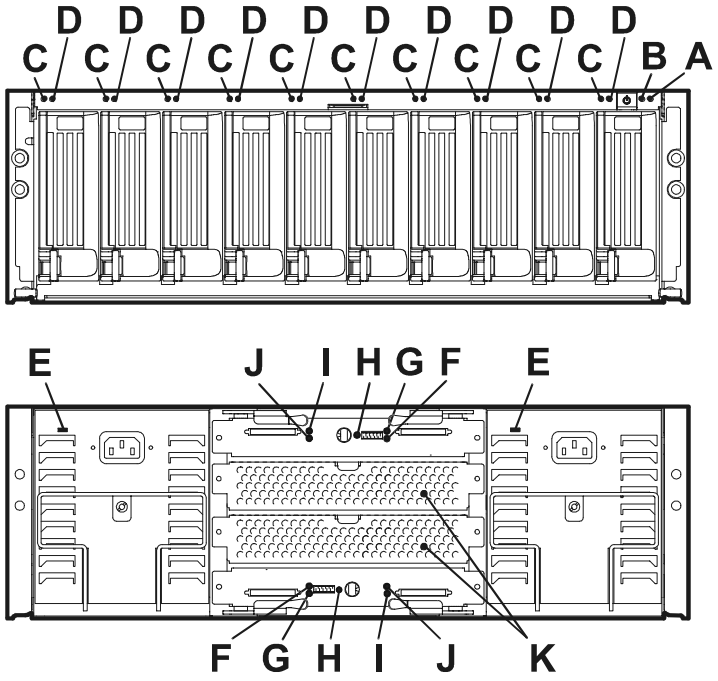
- Message Data – Date and time the message was sent, the source and destination of the message, and the severity level
- Event Data – Date and time of the event, the host, event ID, name of the monitor, event number, event class, severity level, hardware path, associated OS error log entry ID
- Error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

```
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.
```

Figure 36 Sample Hardware Event Notification

Status LEDs

LEDs indicate the status of the disk system itself and each of its components (see Table 14). Green and amber system LEDs are visible on the front of the disk system with the door closed. They show that power is on (green) and a fault has occurred (amber). Disk activity (green) LEDs are on the front of the disk system above each disk drive. Other LEDs are on individual components in the back of the disk system.



A system fault LED
B system power LED
C disk activity LED
D slot finder LED
E power supply LED
F Term. Pwr. LED
G Full Bus LED
H BCC Fault LED
I Bus Active LED
J LVD LED
K fan LED

Figure 37 LED Status Indicators

LED states are described in Table 14:

Table 14 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
LVD	Green	Bus operating in LVD mode
	OFF	Bus operating in SE mode
Term. Pwr.	Green	Termination power is available from the host.
	OFF	There is no termination power.
Full Bus	Green	Disks are on a single bus of ten addresses.
	OFF	Disks are split between two buses, five addresses each
Bus Active	Green	Bus is available for use[4].
	OFF	Isolator chip is disabled and bus is not available.
Fan	Amber	Start-up[1] / Fault
	Green	Normal operation
	OFF	Power is off.

1 Start-up and self-tests occur briefly when the unit is powered on.
2 A component has failed; temperature or voltage is out of normal range. See Isolating Faults on page 99
3 When a disk is installed with power on, its activity LED stays on until the disk has spun up. When the disk is ready, the LED turns off. Thereafter, it flashes when there is I/O to the disk.
4 If there is no term power supplied by a host connect, the isolator chip will be disabled to prevent noise on the backplane. Bus active LED should go on when term power is present.

Table 14 LED Functions (cont'd)

LED	State	Indication
Power Supply	Amber	Start-up[1] / Fault
	Green	Operating
	OFF	Power is off.
Disk Activity[3]	ON	Installed and spinning up. If the LED is still on 3 minutes after power is engaged, the disk may be faulty.
	Flashing	There is input/output activity to the disk.
	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 99
3 When a disk is installed with power on, its activity LED stays on until the disk has spun up. When the disk is ready, the LED turns off. Thereafter, it flashes when there is I/O to the disk.
4 If there is no term power supplied by a host connect, the isolator chip will be disabled to prevent noise on the backplane. Bus active LED should go on when term power is present.

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

Using STM to View Status and Flash LEDs

Support Tools Manager (STM) runs on the HP-UX host and displays status and descriptive information about the disk system and its components. You can also use STM to flash the LED of a disk that you want to physically locate.

Viewing the STM Information Log

STM generates Information and Activity logs for a selected disk system. Execute STM in an X window and run the Information tool as follows.

1. At the system prompt, type **xstm&**
2. Select the desired disk system (HPA5272A).
3. Select **Information** from the Tools menu.
4. To generate a current log, select **Run**.
5. To view log output, select **Information** from the Tools menu.
6. Select **Information Log.**
7. Select **Done** when you have finished viewing the information.

The contents of the STM Information Log are as follows:

Log creation time	The date and time the Information Tool was last run for the selected disk system
Hardware path	The physical path from the host to the reporting BCC; for example,8/0/1/0.15.0.
Product ID	A5272A, the HP product number of the disk system
Controller Identification	The hardware path, serial number, firmware revision, and annotation of the reporting BCC.

Bus Mode	State of the Full Bus switch on the reporting BCC: Full (single bus, 10 addresses) or Split (two buses, 5 addresses each).
Disk Modules	Status and SCSI ID for each disk slot. Possible status values are NA (not available), NIN (not installed), and OPC (status is owned by peer BCC).
Controller Status	The reported status of the upper (A) and lower (B) BCCs in the selected disk system. Possible values are OK, critical, noncritical, not installed, or not available. The reporting BCC is indicated.
Fan Status	The status of the upper (A) and lower (B) fans in the selected disk system. Possible values are OK, critical, not installed, or not available.
Power Supply Status	The status of the left (A) and right (B) power supplies in the selected disk system. Possible values are OK, critical, not installed, or not available.
SCSI Port Transceivers Status and Mode	The status and mode of the bus converter/isolator chip on each BCC. Possible values are OK, Not Available, Not Installed, Unknown. Possible modes are LVD, SE, and No Cable Connected.
Voltage Sensors Voltage and Status	The voltage detected and status of three voltage sensors—3.3V, 5.0V, and 12V—on each BCC. Possible status values are OK, critical, noncritical, not installed, unknown, and not available.
Temp Sensors Temperature and Status	The temperature detected and status of four sensors. Possible status values are OK, critical, noncritical, not installed, unknown, or not available.

A sample Information Log appears in Figure 38.

```
    Information Tool Log for Disk Enclosure on path 8/0/1/0.15.0
.... swerve.rose.hp.com  :  15.43.213.13 ....

-- Information Tool Log for Disk Enclosure on path 8/0/1/0.15.0 --

Log creation time: Wed Feb 24 13:10:40 1999

Hardware path: 8/0/1/0.15.0

Product ID:  A5272A

Controller B
------------
    Hardware Path: 8/0/1/0.15.0
        Serial No: R8CGC1128471
     Firmware Rev.: HP01

        Annotation: My First Megatron

Enclosure Status
----------------
Bus Mode: Split

Disk Modules
------------

       ------------------------------------------------------------
SLOT   |  0  |  1  |  2  |  3  |  4  |  5  |  6  |  7  |  8  |  9  |
BUS ID |  0  |  0  |  1  |  1  |  2  |  2  |  3  |  3  |  13 |  13 |
STATUS | OPC | OK  | OPC | OK  | OPC | OK  | OPC | OK  | OPC | OK  |
       ------------------------------------------------------------

 OPC - The disk device status is not available. The disk slot status
       reporting is owned by the peer controller.

Controllers     Status
-----------     -------------
   A:           OK
   B:           OK                 (Reporting Controller)

Fan Modules     Status
-----------     -------------
   A:           OK
   B:           OK
```

Figure 38 Sample STM Information Log

```
Power Supplies     Status
--------------     -------------
   A:              OK
   B:              OK

SCSI Port
Transceivers       Status          Mode
-----------------  -------------   ----
   Controller A:   OK              SE
   Controller B:   OK              SE

Voltage Sensors    Voltage      Status
----------------   --------     -------------
   Controller A
   ------------
      3.3v:            3.34     OK
      5.0v:            5.12     OK
       12v:           12.08     OK

   Controller B
   -------------
      3.3v:            3.34     OK
      5.0v:            5.08     OK
       12v:           12.08     OK

Temp Sensors       Temperature     Status
------------       -----------     -------------
   Sensor 1:       31 (Celsius)    OK
   Sensor 2:       32 (Celsius)    OK
   Sensor 3:       29 (Celsius)    OK
   Sensor 4:       30 (Celsius)    OK
```

Figure 38 Sample STM Information Log (Continued)

Interpreting Status Values

STM common status terms have specific indications for various components. See the table below.

Table 15 Status Indications by Component

Component/ Status	Disks	BCCs	Fans, Power Supplies	Sensors	Port Transceivers
OK	Component is installed and no error conditions are known.				
Critical	N/A	Hardware has failed.		Voltage/ temperature exceeds critical limit.	N/A
Noncritical	N/A	BCC A and B have different firmware versions.	N/A	Voltage/ temperature exceeds warning limit.	N/A
Not Installed	Component is not installed.				
Unknown	N/A	N/A	N/A	Sensor has failed or status is not available.	
Not Available	Component is installed without known errors, but has not been turned on or set into operation; or the controller that owns reporting has failed.				
Owned by Peer Controller	Reporting is owned by peer controller.	N/A	N/A	N/A	N/A

Flashing LEDs

STM's Expert Tool includes an option to flash the LED associated with specific disk slots. Use this feature to help you locate a specific disk in a cabinet. Enter the password to install the HP-Only license before using the Expert Tool.

Flash the desired LED as follows:

1. With the HP-Only license installed, select the desired disk system.

2. Select **Expert Tool > Run** from the Tools menu. An Expert Tool window opens.

3. Select **Disk LED On** from the Utility menu. STM displays a numbered list including the bus ID and status of the disk slots (see Figure 39).

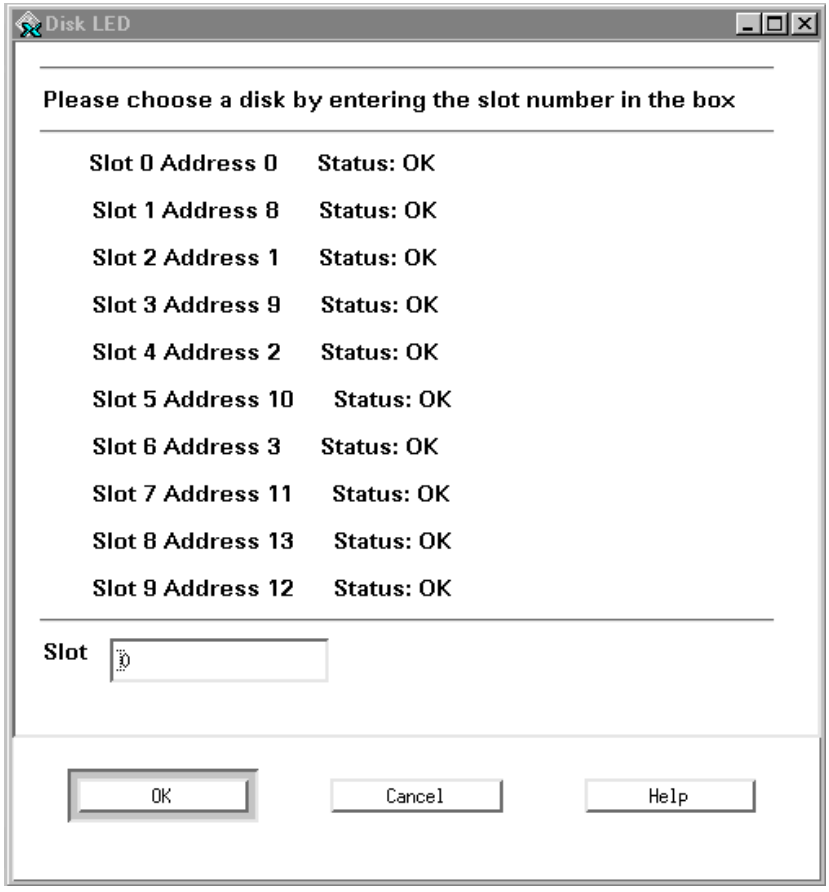


Figure 39 STM Disk LED Window

4. Type the slot number (0–9) in the Slot field and click **OK**. The amber LED associated with the slot begins flashing at a slow steady rate. If the LED is already on, it remains on.

Turn off the flashing LED as follows:

1. If the Expert Tool is no longer running:
   a. Select the desired disk system.
   b. Select **Expert Tool > Run** from the Tools menu.
2. Select **Disk LED Off** from the Utility menu. STM displays the numbered list (Table 39) of disk slots.
3. Type the slot number (0–9) in the Slot field and click **OK**. The LED turns off. If it was already off, it remains off.

Isolating Faults

Table 16 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 16 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	– The power supply is not plugged in. – 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.
BCC Fault LED is on	Critical	BCC Fault on	Critical	BCC hardware is faulty. Replace the BCC.
Fan LED is amber	Critical	Amber	Critical	Fan has slowed or stopped. Replace the fan.

Table 16 Troubleshooting Table (cont'd)

Problem Description	HW Event Category	LED State	STM Status	Probable Cause/Solution
Power supply 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. – Prior unit in the daisy chain is powered off. – HBA is faulty. Check status and correct any problem.
		All off	none	Disk system is powered off.
IOSCAN lists disk as NO_HW	none	On or off	(See STM Disk Tool)	– Disk is faulty. Replace. – Backplane is faulty. Replace.
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.				

Table 16 Troubleshooting Table (cont'd)

Problem Description	HW Event Category	LED State	STM Status	Probable Cause/Solution
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 backplane.

5 REMOVAL AND REPLACEMENT

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.

Disk

Add or replace disks to increase storage capacity or eliminate faults. (See chapter 4 for troubleshooting procedures.) Disks must be Ultra-2 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

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.
- You have a current volume group configuration backup file. In version 10.20, the backup is created by default each time an LVM command changes the LVM configuration.
- 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 VOLUME 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 109).

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 VOL-
UME "/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 109).

- If the physical volume is attached, follow the instructions for replacing attached physical volumes (page 107).

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 110).
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 110).
2. Execute IOSCAN to verify that the replaced disk is accessible and a proper replacement.
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

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

Tools

- Small flat-blade screwdriver
- ESD wrist strap

Procedure

Caution To prevent damage from static electricity, 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. Unlock and open the disk system door.
2. Insert the plug end of your ESD wrist strap in the disk system ESD inlet (A in Figure 40). (This step is not required for adding a filler.)
3. Release the disk from the slot by squeezing the latch tab (B) and pulling it toward you.

Caution Spinning disks generate heat and gyratory 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 backplane or adjacent drive electronics when removing and inserting disks.**

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

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

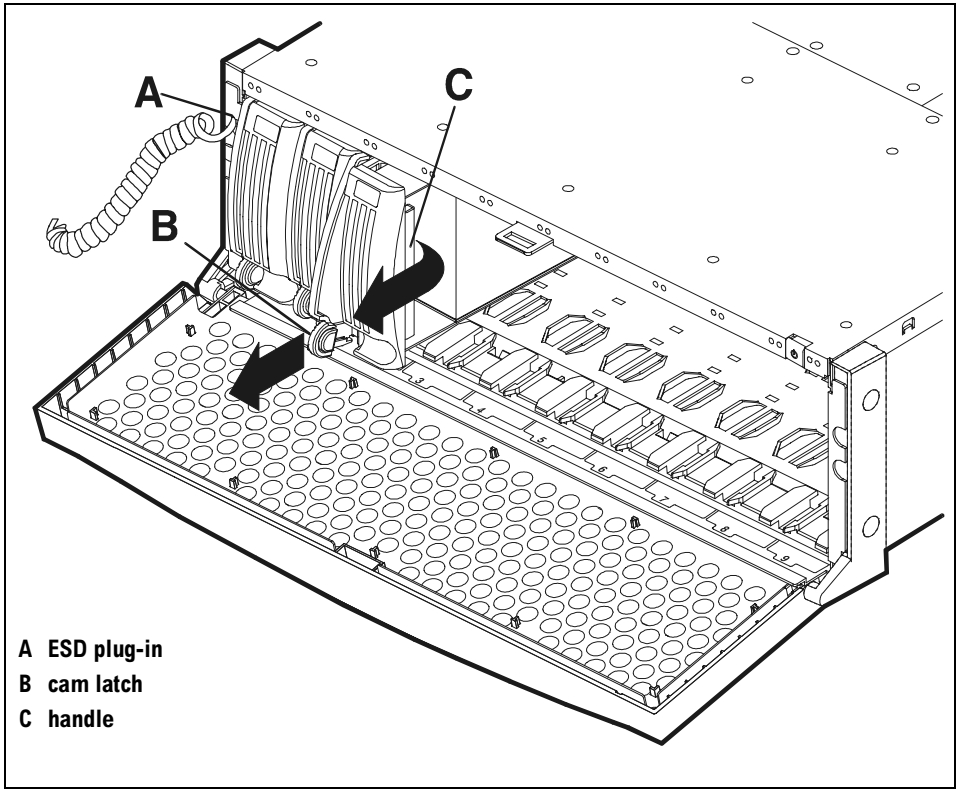


Figure 40 Disk Removal

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

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

Disks are fragile. Handle carefully.

5. Remove the replacement disk from its ESD bag, being careful to grasp the disk by its handle (A in Figure 41). (Fillers are not in ESD bags.)
6. Pull the cam latch (B) away from the disk.

Note For safe insertion, use both hands to hold the disk — one on the handle and the other on the carrier frame.

7. Slide the disk, capacity label up (C), into the empty slot.
8. Close the cam latch to seat the disk firmly on the backplane. An audible click indicates the latch is closed.
9. If you are installing a disk (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.
10. Unplug your ESD strap and close and lock the disk system door.
11. Run IOSCAN on the host and verify that the replacement disk is “claimed.”
12. Restore file systems and data as needed (see Preparation on page 105).

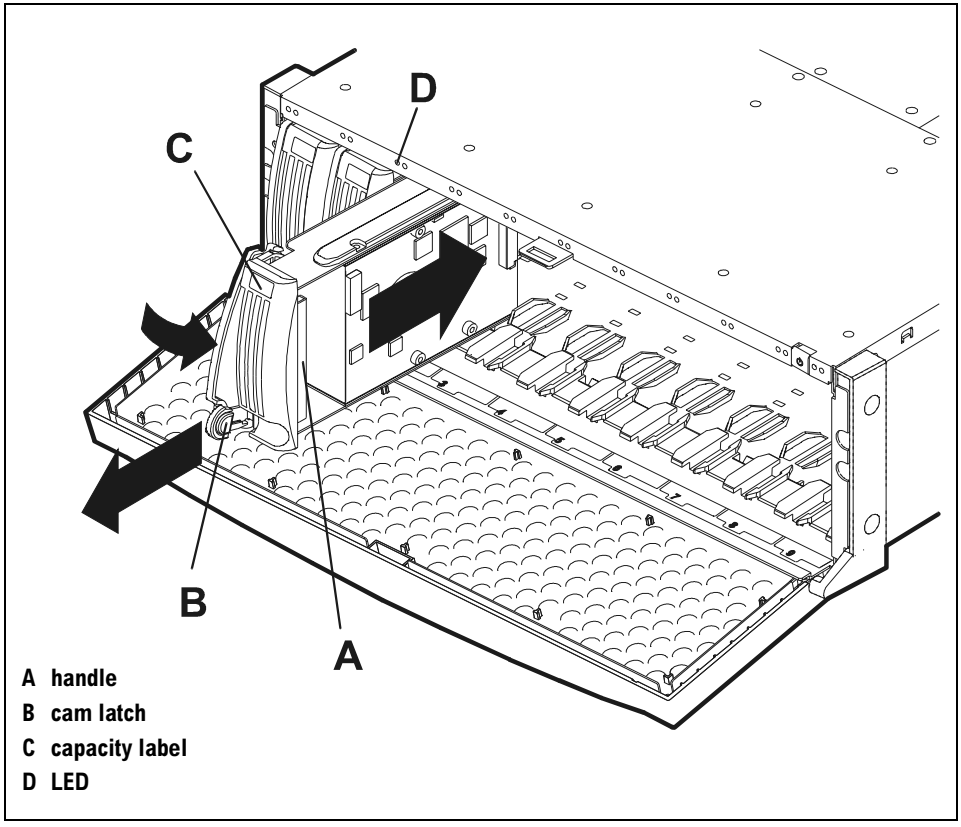


Figure 41 Disk Installation

BCC

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

There is no need to turn off the disk system to remove and replace a BCC. 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 on page 105.

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

Tools

- Torx T15 or flat-blade screwdriver
- ESD wrist strap

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 two locking screws (A in Figure 42) until they clear the disk system chassis. The screws stay in the card.

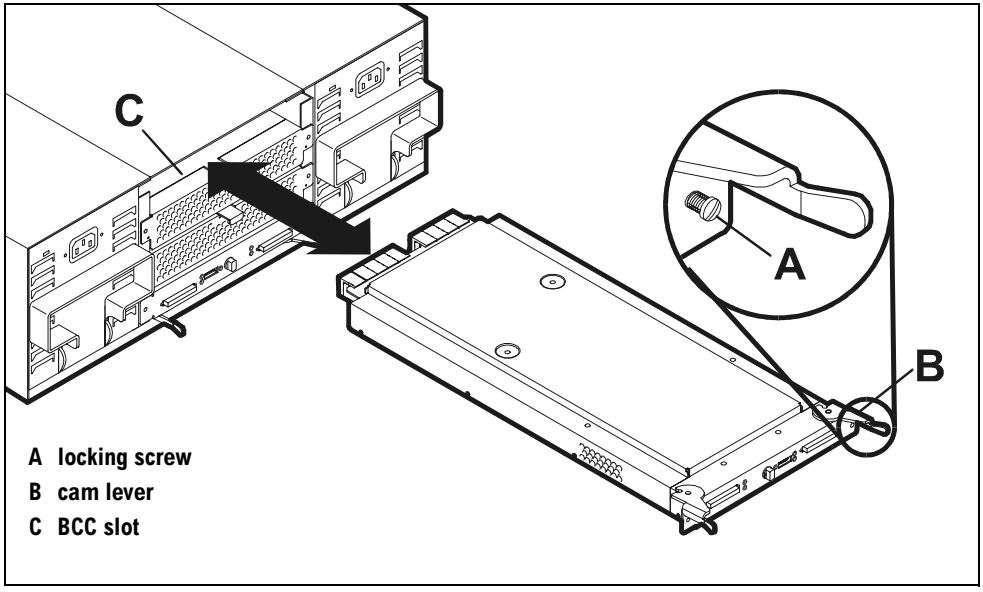


Figure 42 BCC Removal and Replacement

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

6. Remove the replacement BCC from its ESD bag.

7. Set DIP switches on the new BCC to match settings on the peer BCC:
   - **Full Bus.** On (1) creates a single bus of ten addresses. Off (0) leaves separate buses of five addresses each.
   - **JBOD**. On (1) puts the disk system in JBOD mode, which is the correct mode for this product. Off (0) converts the disk system to back-end storage for an array processor.
   - **Bus Reset-Power Fail**. On (1) resets the bus automatically when both power supplies fail. Off (0) allows bus activity to continue as usual.
   - **Address High**. On (1) selects high SCSI addresses (8 - 12) for the associated bus. Off (0) selects low addresses (0 - 3 and 13). This switch has no effect in full bus mode (the full bus switch is on).
   - **Bus Reset-Hot Swap**. On (1) resets the bus automatically whenever a disk or BCC is removed or inserted. Off (0) allows bus activity to continue as usual.

   The rotary switch is used for array support only.

Caution In JBOD mode, switches must have the same settings on both BCCs.

8. Open the cam levers (see Figure 42) by pulling them away from the center of the card.
9. Insert the BCC in the empty slot. The perforated side of the card faces down in the top slot, up in the bottom slot.
10. Push the cam levers flat against the center of the card to seat the BCC pins firmly on the backplane.
11. Watch the BCC Fault LED (B in Figure 43). 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.
12. Tighten the locking screws (B in Figure 42).
13. Reattach the SCSI cables and/or terminator.

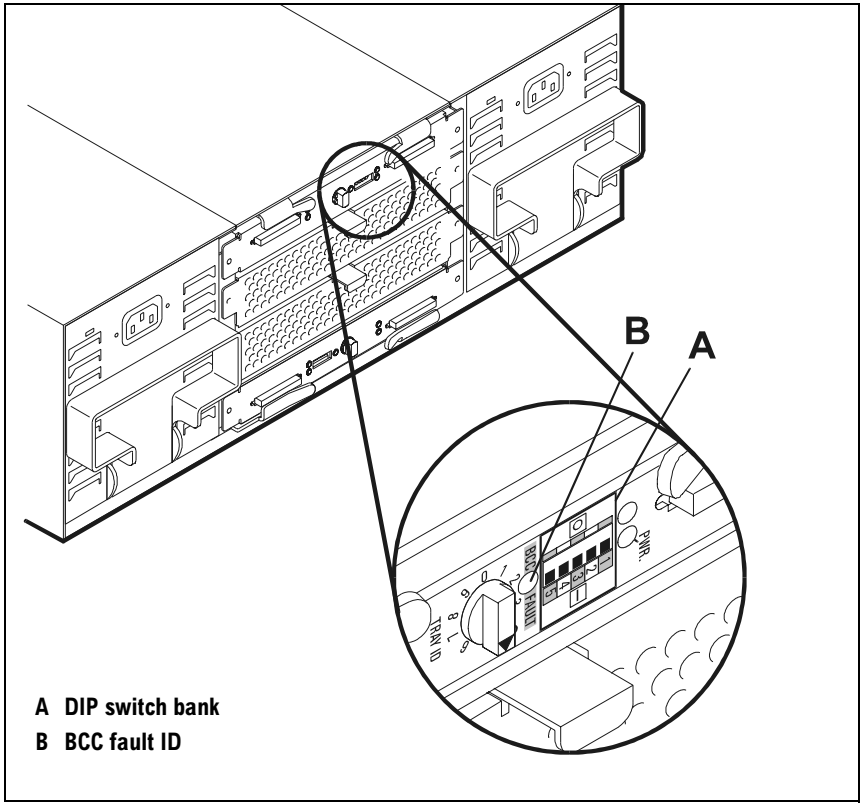


Figure 43 BCC DIP Switches

Fan

Replace a fan as soon as possible upon determining a fan failure (see chapter 4, Troubleshooting). Fans are redundant so that when one fan fails, the other fan maintains proper cooling. However, if the remaining fan fails before the first fan is replaced, the disk system must be turned off to prevent heat damage.

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

Tools

- Torx T15 or flat-blade screwdriver

Procedure

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

1. Loosen the two locking screws (A in Figure 44) until they clear the disk system chassis. The screws stay with the fan.
2. Pull the fan out of the chassis by the metal tab (B).

   Replace the fan immediately if the product is in use (procedure follows).
3. Insert the replacement fan into the empty slot (C in Figure 44).
4. Monitor the fan LED. It should flash amber and then turn green. If the LED is not green, refer to chapter 4, Troubleshooting.
5. Tighten the locking screws (A).

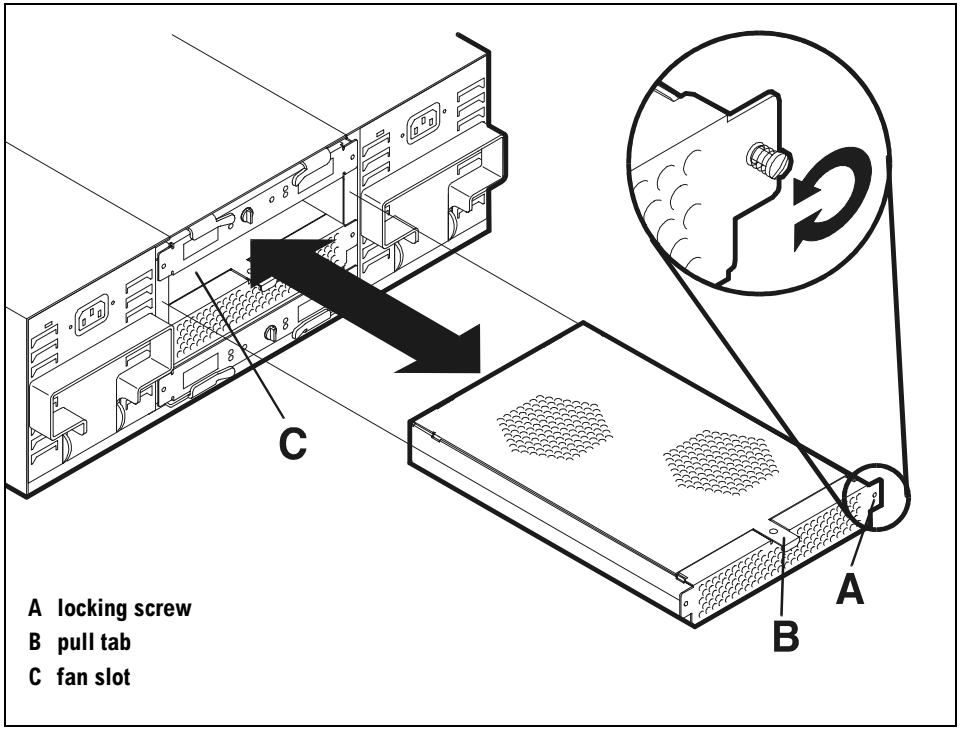


Figure 44 Fan Removal and Replacement

Power Supply

Replace a power supply as soon as possible when troubleshooting indicates a power supply failure (see “Isolating Causes” in chapter 4). When 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.

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

Tools

- Torx T15 or flat-blade screwdriver

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.

Caution Power supply may be hot to touch. 

1. Disconnect the power cord from the power supply.
2. Loosen the screw (B in Figure 45) from the power supply handle (A).
3. Pull the handle down to disengage the power supply from the backplane.
4. Pull the power supply out of the chassis. Support the far end of the supply with your free hand as it clears the chassis.

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

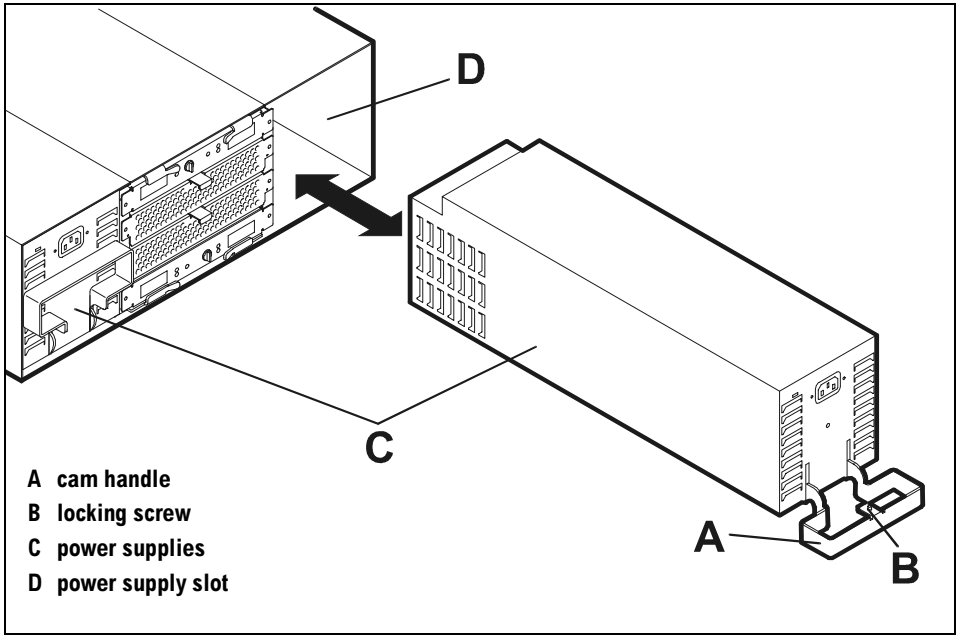


Figure 45 Power Supply Removal and Replacement

5. With the handle down, slide the replacement power supply into the empty slot (D in Figure 45). The power supply begins to engage the backplane with 3/8 inch (8mm) still exposed.
6. Rotate the handle up to draw the power supply the last 3/8 inch into the chassis and firmly seat the power supply on the backplane. The power supply should be flush with the edge of the chassis.
7. Tighten the screw (B) in the power supply handle (A).
8. Plug the power cord into the power supply and electrical source.
9. Monitor the power supply LED. It should turn green. If the LED is dark or stays amber, see chapter 4, Troubleshooting.

Disk System

Use this procedure if you need to move or remove and replace the disk system in the rack. For example, you must move the disk system forward on the rails in order to replace the door, backplane, or power switch assembly.

The disk system will 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

- Torx T25 screwdriver
- Small flat-blade screwdriver

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. Use a flat-blade screwdriver to unlock and open the disk system door (see Figure 46).

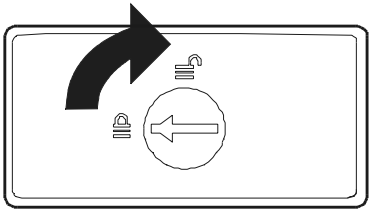


Figure 46 Door Lock

3. Push and release the power button to turn off the disk system.
4. Remove screws from the mounting ears (E in Figure 47).
5. Close and lock the door.
6. Disconnect power and SCSI cables from the back of the disk system.

WARNING **Product is heavy (~80 lbs. without disks). If you choose to remove the disk system from the rack, use two people or a lift device.**

7. Push the disconnected disk system forward or lift it completely out of the rack, as needed.
8. When you are ready to replace the disk system, push the chassis back into the rack.
9. Unlock and open the door.
10. Insert and tighten the front mounting screws.
11. Reconnect SCSI cables and power cords.
12. Push the power button in to turn on the disk system.
13. Close and lock the door
14. Perform necessary system administration to return file systems to service.

Door

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

You will need to turn off the disk system in order to remove and replace the door. Turning the power off and disconnecting power and SCSI cables eliminates the possibility of inadvertently pulling out live cables and causing an unplanned shutdown when you move the product forward in the rack.

Tools

- Torx T25 screwdriver
- Small flat-blade screwdriver

Procedure

1. Move the disk system forward 2 to 3 inches in the rack. See page 122.
2. With the door closed, remove two screws from each hinge block (C in Figure 47).
3. Pull the hinge blocks straight out from the sides of the product, letting the latch hold the door in place.
4. Supporting the door with one hand, unlock and remove the door.
5. To replace the door, insert the bottom flange (D) of the disk system between the gasket and bottom edge of the new door.
6. Close and lock the door, letting the latch hold the door.
7. Insert the right and left hinge blocks behind the disk system mounting ears (E), aligning all holes and inserting the hinge arm (F) over the pin on the bottom of the door.
8. Insert and tighten two screws through each hinge block and disk system chassis.
9. Reattach the disk system to the rack. See page 122.

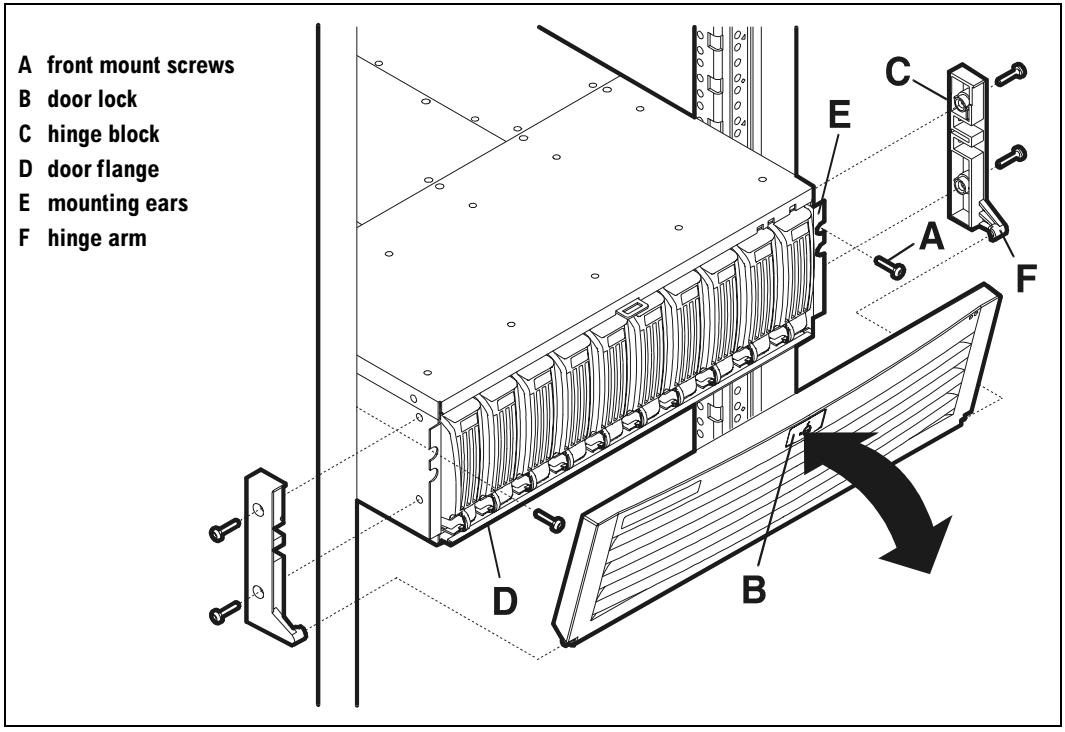


Figure 47 Door Removal and Replacement

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, the backplane, or the mezzanine board.

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 disks and fillers. See page 105.
2. Push the disk system 10 inches forward on the rails. See page 122.

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

3. Remove the nine Torx T10 screws from the back and side edges of the cover plate (A in Figure 48). Screws are marked by a star pattern in the sheet metal.
4. Slide the cover forward about one inch; then lift up and out of the product.
5. When you are ready to replace the cover, set the cover on the chassis so that the tabs (C in Figure 48) settle into the slots in the upper edge of the chassis.

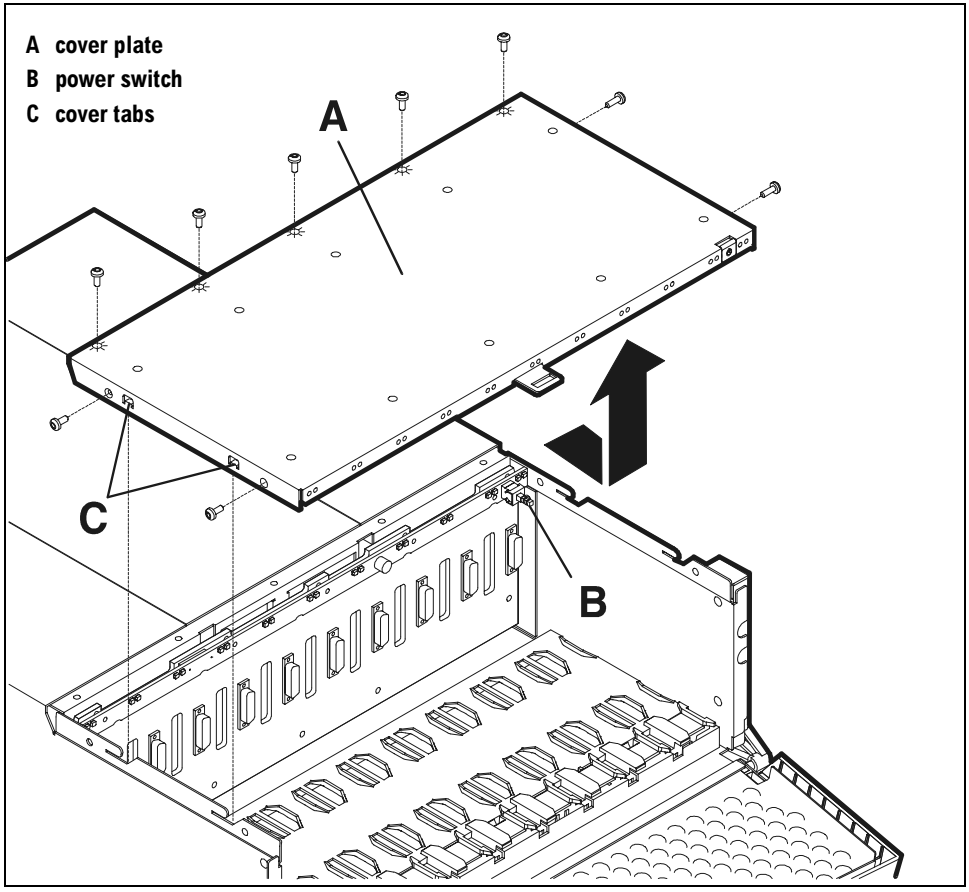


Figure 48 Top Cover Assembly

6. Slide the cover to the middle of the chassis. The push rod automatically engages the internal switch (B).
7. Insert and tighten the Torx T10 screws along the back and side edges of the cover.
8. Reconnect the disk system. See page 122.
9. Reinstall disks and fillers. See page 105.

Backplane/Mezzanine (HP-Qualified Only)

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

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

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

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

Tools

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

Procedure

1. Remove the top cover. See page 126.
2. Put on your ESD strap and attach the free end to the ESD plug on the disk system.

Caution Static discharge can destroy functional components on the backplane.

3. If you are removing only the mezzanine:

   a. Remove the five Torx T10 screws securing the mezzanine to the backplane (see Figure 49).

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

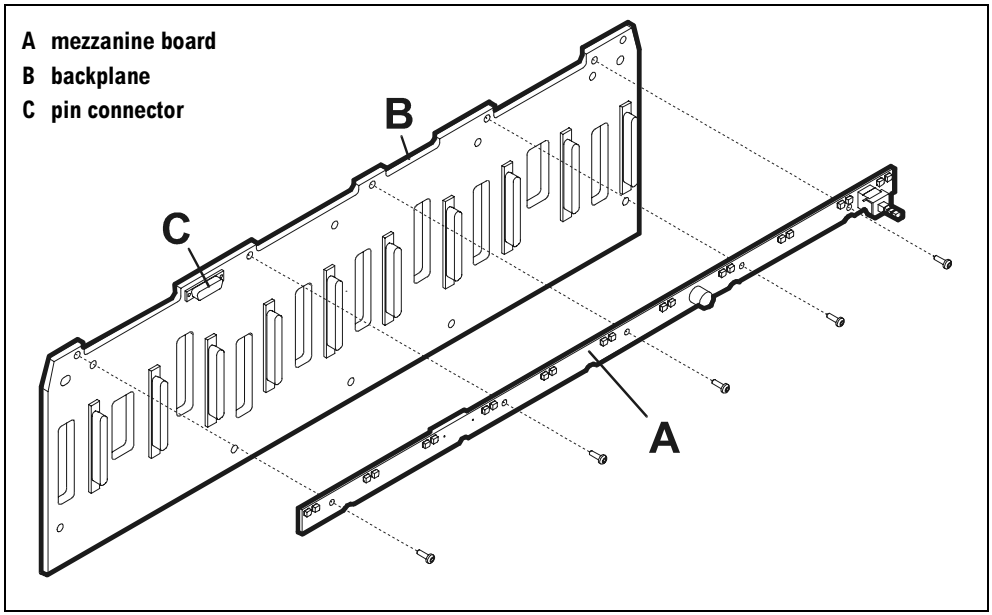


Figure 49 Mezzanine Assembly

4. If you are removing the backplane:

   a. Remove locking brackets and pull power supplies free of the backplane (see page 120).

   b. Loosen locking screws, open extractors, and pull BCCs free of the backplane (see page 114).

Note There is no need to loosen the fans.

c. Remove the ten Torx T15 screws along the top and bottom edges of the backplane (see Figure 50).

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

5. To replace the backplane:

   a. Stand the new backplane inside the chassis and push it over the alignment pins (B in Figure 50). Connectors automatically align with floating fan connectors inside the chassis.

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

6. To replace the mezzanine:

   a. Attach the new mezzanine to the backplane connector (C in Figure 49).

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

7. Replace the top cover. See page 126.

8. Reseat and secure the BCCs (see page 114).

9. Reseat and secure the power supplies (see page 120).

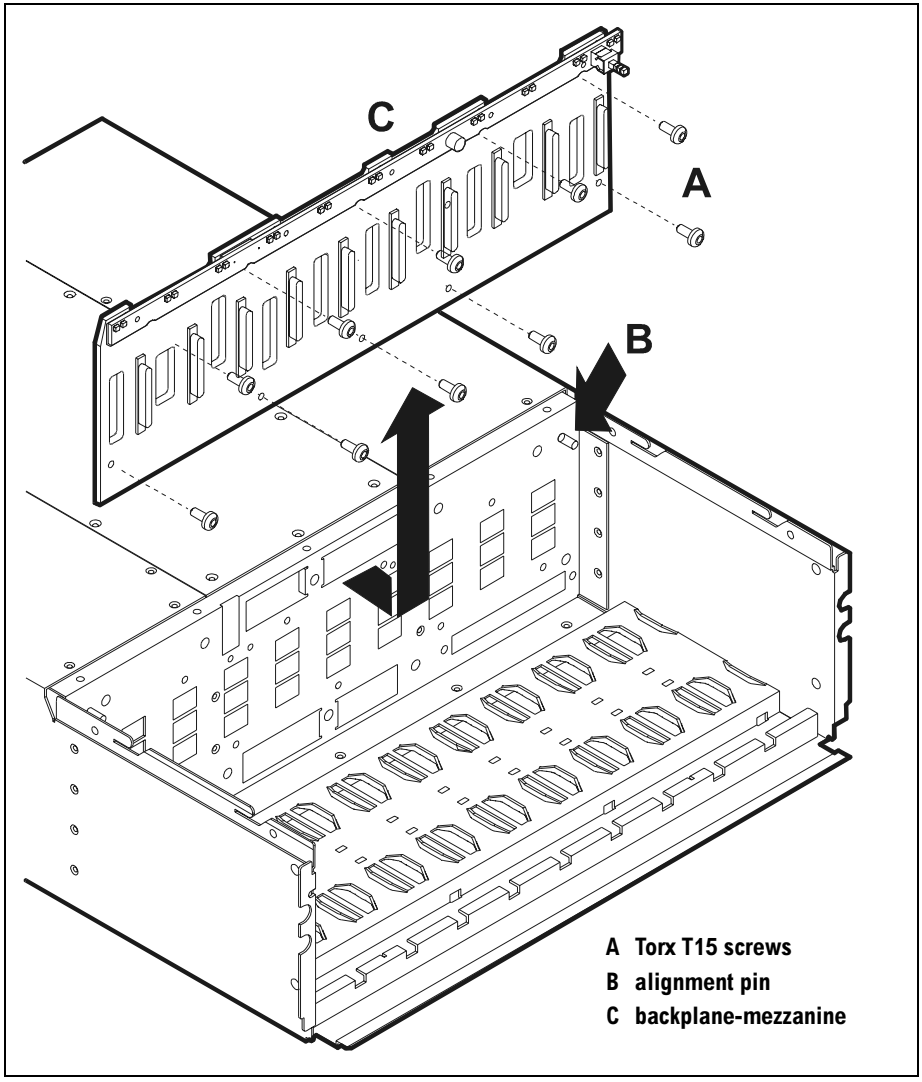


Figure 50 Backplane Assembly

Disk Carrier (HP-Qualified Only)

Disk carriers are replaceable by HP-qualified personnel only.

Replace the disk carrier when the bezel, frame, latch, or insertion guides are damaged or broken but the disk drive is sound.

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

Disks are fragile. Handle carefully.

Tools

- Torx T10 screwdriver
- ESD strap
- ESD mat

Procedure

If the disk is still in the disk system, refer to page 110 to remove the disk.

1. Put the ESD strap on your wrist and attach the free end to appropriate ground.

Caution Failure to protect against ESD can result in the loss of all current data as well as the ability to store any future data on the disk.

2. Set the disk, circuit-side down, on an ESD mat. Standoffs (E in Figure 51) keep circuits away from the table surface.

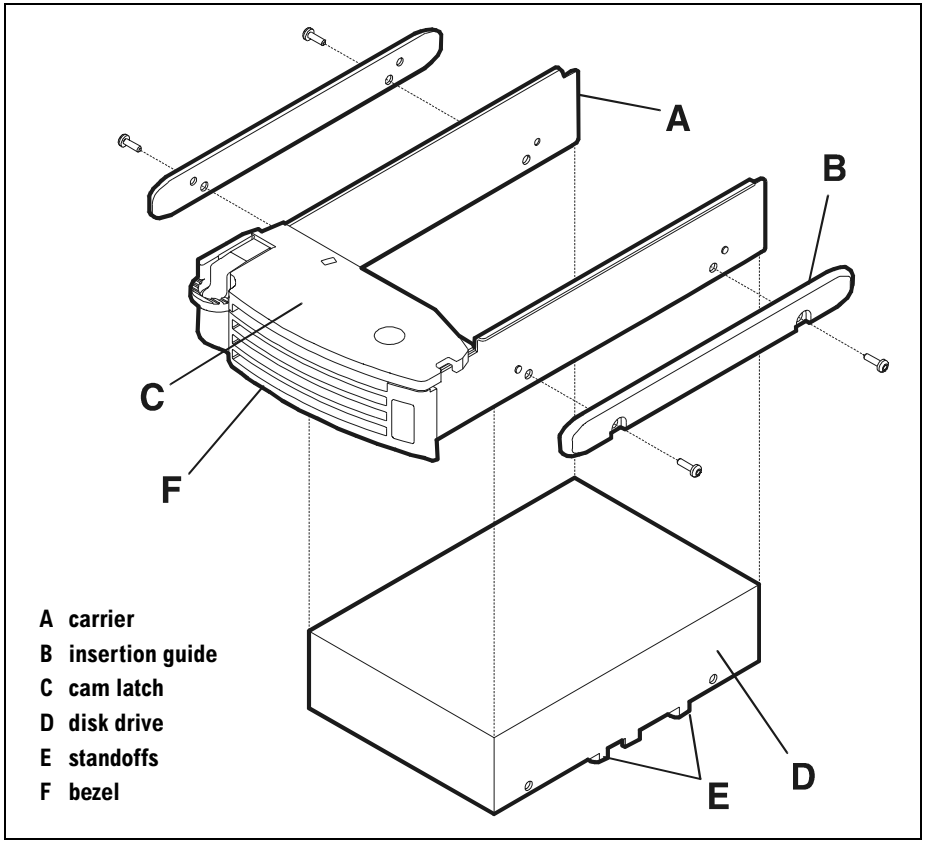


Figure 51 Disk Carrier Assembly

3. Remove the four screws holding the insertion guides (B) and carrier (A) to the disk.

Note Working near the edge of the table improves the angle of the screwdriver.

4. Lift off the carrier.
5. Verify that the label on the replacement carrier matches the characteristics of the disk drive.

6. With the latch (C in Figure 51) facing up and opposite the pin end of the disk drive, set the carrier around the disk drive.
7. Align the holes in the carrier with the holes in the disk drive. Properly installed, there is about ½ inch between the inside edge of the latch and the disk drive.
8. Set the insertion guides (B) on the sides of the carrier, aligning holes in the guide with holes in the carrier and disk drive. Nubs on the carrier fit dimples on the guides and help to hold the guides in position on the carrier.
9. Insert and tighten two screws and washers through the guide, carrier, and drive on each side.

Note Working near the edge of the table improves the angle of the screwdriver.

To reinstall the disk, see page 110.

6 REFERENCE

Product Models and Options

Two models of the disk system are available:

- A5272A field-racked (by HP-qualified service engineers)
- A5272AZ factory-racked

Options, shown in Table 17, include 9 and 18-Gbyte disk packs and various cables.

Table 17 Product Options

Option	Description
001	Second Bus Controller Card
104	4 9-Gbyte 10K rpm LVD disk drives
108	8 9-Gbyte 10K rpm LVD disk drives
110	10 9-Gbyte 10K rpm LVD disk drives
202	2 18-Gbyte 10K rpm LVD disk drives
204	4 18-Gbyte 10K rpm LVD disk drives
208	8 18-Gbyte 10K rpm LVD disk drives
210	10 18-Gbyte 10K rpm LVD disk drives
304	4 36-Gbyte 10K rpm LVD disk drives
308	8 36-Gbyte 10K rpm LVD disk drives
310	10 36-Gbyte 10K rpm LVD disk drives
860	2-meter VHDCI Ultra SCSI cable
861	5-meter VHDCI Ultra SCSI cable

Upgrade Products

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

Table 18 Upgrade Products

Order No.	Description
A5276A	9-Gbyte 10K rpm LVD disk drive
A5282A	18-Gbyte 10K rpm LVD disk drive
A5273A	Bus Control Card
A5306A	2-meter VHDCI Ultra SCSI cable
A5307A	5-meter VHDCI Ultra SCSI cable
A5250A	Rail kit for HP C2785A, C2786A, C2787A, A1896A, and A1897A
A5251A	Rail kit for HP Rack Systems/E

PDU/PDRU Products

Table 19 PDU/PDRU Products

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

Replaceable Parts

Table 20 Replacement and Exchange Part Numbers

Replacement Part Order No.	Exchange Part Order No.	Part Description
0588-001MH		20 top cover screws 6-32x3/16 T10
8120-6514		Power cord
5021-1121		VHDCI LVD/SE terminator
A5236-60003		Fan
A5272-67014		Door assembly
A5236-60023	A5236-69023	Power supply
A5272-67003		Backplane and mezzanine assembly
A5236-60021		Mezzanine board
A5272-67006	A5272-69006	Bus Control Card (BCC)
J1525-60001		Half-U rack filler panel
A5236-60009		Disk filler assembly
A5276-67001	A5276-69001	9GB LP disk
A5282-67001	A5282-69001	18 GB HH or LP disk
A5595-67001	A5595-69001	36 GB HH disk
A5236-60006		HDD carrier assembly

Specifications

Dimensions

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

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

Weight

A fully loaded disk system weighs approximately 110 pounds. Component weights are shown in Table 21.

Table 21 Product Weights

Component	Weight of Each (lbs)	Quantity	Subtotal (lbs)
Disk Drive (HH)	2.8	10	28
Fan	3.3	2	7
Power Supply	10.6	2	22
BCC	4.5	2	9
Midplane-Mezzanine	6	1	6
Door	2	1	2
Chassis	35	1	35
		Approx. Total	110 lbs

AC Power Input

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

DC Power Output

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

Heat Output

- 2200 BTU/hr.

Environment

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

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

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

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

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

Acoustics

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

Safety Certifications

UL listed, UL 1950:1995 – 3rd Edition

CSA certified, C22.2 No. 950:1989

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

CE mark (see G. Declaration of Conformity on page 147)

EMC Compliance

Australia: AS/NZS 3548, Class A

Canada: ICES-003, Class A

China: CB9254-88

European Union: EN55022 Class A, EN50082-1

Japan: VCCI Class A

Taiwan: CNS 13438, Class A

US: 47 CFR Parts 2 & 15, Class A

Regulatory Statements

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

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

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

B. IEC Statement (Worldwide)

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

C. Spécification ATI Classe A (France)

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

Cher Client,

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

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

– Préfecture du département du lieu d'exploitation

Le formulaire à utiliser est disponible auprès des préfectures.

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

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

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

D. Product Noise Declaration (Germany)

Schalldruckpegel Lp = 58.8 dB(A)

Am Arbeitsplatz (operator position)

Normaler Betrieb (normal operation)

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

E. VCCI Statement (Japan)

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

Harmonics Conformance (Japan)

高調波ガイドライン適合品

F. BCIQ EMC Statement (Taiwan)

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

G. Declaration of Conformity

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

Manufacturer's Name:	Hewlett-Packard Company Enterprise Storage Solutions Division
Manufacturer's Address:	8000 Foothills Blvd. Roseville, CA 95747 USA

declares, that the product

Product Name:	SureStore E Disk System SC10.
Model Number(s):	A5272 & A5294 with or without suffixes.
Product Options:	All

conforms to the following Product Specifications:

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

EMC: CISPR 22:1993 + A1,A2 / EN 55022:1994 + A1,A2 - Class A[1]
GB 9254-1988
EN 50024:1998

IEC 61000 -4- 2: 1995, EN 61000 -4- 2 1995
IEC 61000- 4- 3 1995, EN 61000 -4- 3 1996
IEC 61000- 4- 4: 1995, EN 61000 -4- 4 1995
IEC 61000- 4- 5: 1995, EN 61000 -4- 5 1995
IEC 61000- 4- 6: 1996, EN 61000 -4- 6 1996
IEC 61000- 4- 11: 1994, EN 61000 -4- 11 (1994)
EN 61000-3-2:1995+A1,A2 / IEC 1000-3-2:1995
EN 61000-3-3:1995 / IEC 1000-3-3:1994 /

Supplementary Information:

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

1) The Product was tested in a typical configuration with the HP 9000 Class A Server – Product A5182A – Model A180.

Roseville, May 6th, 1999.

Frank L. Sindelar, ESSD Quality Mgr.

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

Product Web Site

This guide is available in Adobe® Acrobat® format on the HP Customer Care web site for enterprise storage (*http://www.hp.com/essd/*). The complete URL is *http://www.hp.com/essd/hass/A5272A_documentation.htm*

Related Documents

The following manuals explain how to use the system software interfaces to the SureStore E Disk System SC10:

- *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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W

Reader Comment Sheet

Hewlett-Packard SureStore E Disk System SC10 User and Service Guide

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

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

Comments_____

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Enterprise Storage Solutions Division
8000 Foothills Boulevard
Roseville, CA 95747-9987

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