

HP ProLiant DL380 Generation 3 Server Maintenance and Service Guide



January 2004 (Sixth Edition)
Part Number 291916-006

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Audience Assumptions

This guide is for an experienced service technician. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazards in products with hazardous energy levels and are familiar with weight and stability precautions for rack installations.

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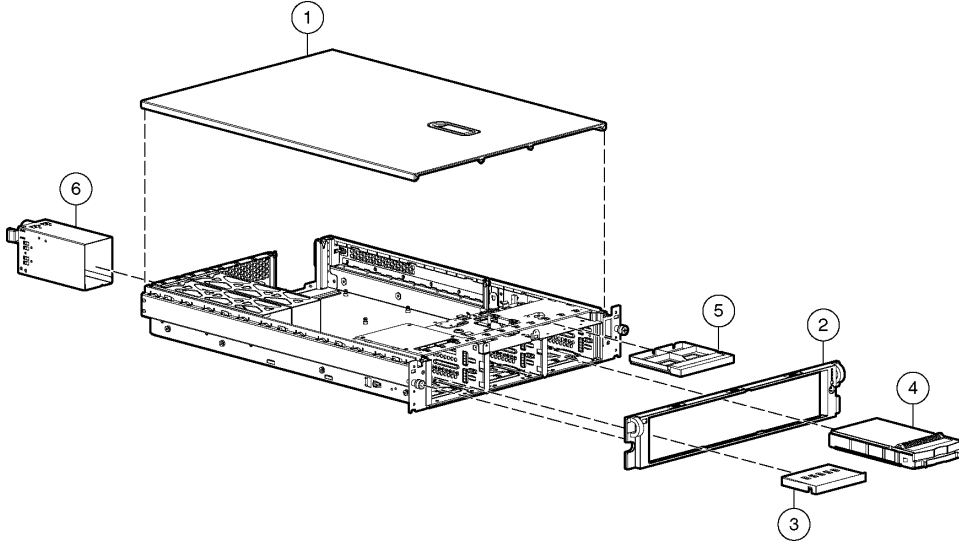
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Illustrated Parts Catalog

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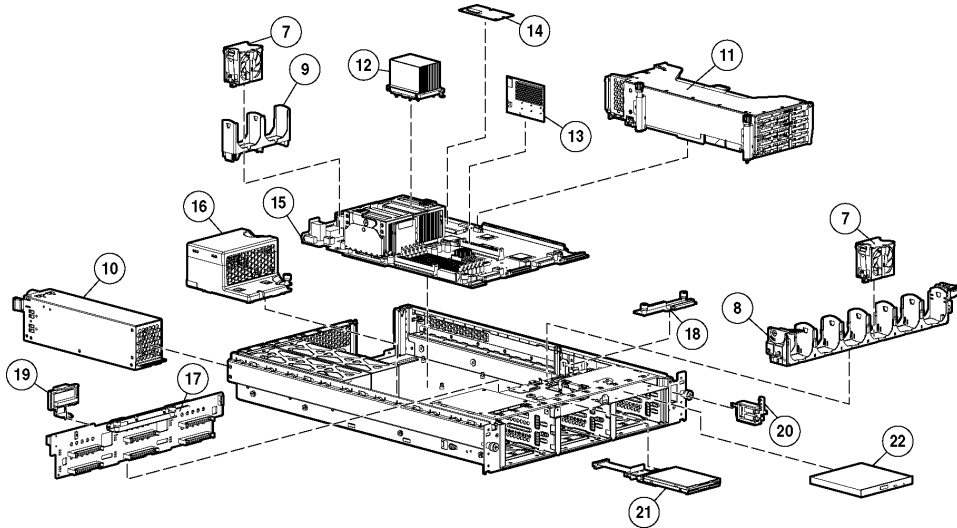
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Mechanical Components



| Item | Description | Assembly Part Number | Spare Part Number |
|------|--------------------|----------------------|-------------------|
| 1 | Access panel | 279043-001 | 289548-001 |
| 2 | Front bezel | 292488-001 | 289546-001 |
| 3 | Tape drive blank | 218512-001 | 228498-001 |
| 4 | Hard drive blank | 349448-002 | 319602-001 |
| 5 | CD blank | 229567-001 | 228500-001 |
| 6 | Power supply blank | 279033-001 | 289559-001 |

System Components



| Item | Description | Assembly Part Number | Spare Part Number |
|--------------------------|--|----------------------|-------------------|
| System Components | | | |
| 7 | Hot-plug fan, 60 mm | 279036-001 | 289544-001 |
| 8 | Front fan bracket, 6 bay | 279037-001 | 289553-001 |
| 9 | Rear fan bracket, 2 bay | 279060-001 | 289558-001 |
| 10 | Hot-plug power supply, 400 W | 194989-002 | 313299-001 |
| 11 | PCI riser cage, with PCI Hot Plug and riser boards | 279034-001 | 289561-001 |
| 12 | Processor assemblies | 261668-004 | 290558-001 |
| | a) Intel® 2.4-GHz Xeon 512-KB L2 cache | 261668-004 | 290558-001 |
| | b) Intel® 2.8-GHz Xeon 512-KB L2 cache | 261668-006 | 307103-001 |
| | c) Intel® 2.8-GHz Xeon 1-MB L3 cache | 336417-004 | 359650-001 |
| | d) Intel® 3.06-GHz Xeon 512-KB L2 cache | 288599-007 | 314669-001 |

| Item | Description | Assembly Part Number | Spare Part Number |
|------|--|----------------------|-------------------|
| | e) Intel® 3.06-GHz Xeon 1-MB L3 cache | 336417-001 | 336856-001 |
| | f) Intel® 3.20-GHz Xeon 1-MB L3 cache | 336417-002 | 347406-001 |
| | g) Intel® 3.20-GHz Xeon 2-MB L3 cache | 354750-001 | 356534-001 |
| | Boards | | |
| 13 | PPM, 12 V, 81 A | 292718-001 | 289564-001 |
| 14 | Smart Array 5i Plus memory module | 011665-001 | 260741-001 |
| 15 | System board, with processor cages and system battery | | |
| | a) 2.4-GHz and 2.8-GHz 512-KB cache models (primary spare) | 011656-001 | 289554-001 |
| | b) 2.8-GHz 1-MB cache and 3.06-GHz and above models | 011986-002 | 314670-001 |
| 16 | Power converter module | | |
| | a) 2.4-GHz and 2.8-GHz 512-KB cache models | 266240-001 | 289560-001 |
| | b) 2.8-GHz 1-MB cache and 3.06-GHz and above models | 309629-001 | 316052-001 |
| 17 | SCSI backplane, 6 bay | 011659-001 | 289552-001 |
| 18 | Universal Media Bay adapter board | 010984-001 | 228504-001 |
| 19 | SCSI terminator | 011730-001 | 289563-001 |
| 20 | Power button/LED board | 010963-001 | 228503-001 |
| | Media Devices | | |
| 21 | Diskette drive, slimline, 1.44 MB | 279983-001 | 289550-001 |
| 22 | CD-ROM drive, removable slimline, IDE, 24X | 222837-001 | 228508-001 |
| 23 | DVD-ROM drive, removable slimline, 8X * | 264007-B21 | 268795-001 |
| | Cables | | |
| 24 | SCSI cable kit * | | 289567-001 |
| | a) SCSI cable, short, 68 pin | 199606-019 | — |
| | b) SCSI cable, long, 68 pin | 166298-038 | — |
| | c) System cable, SCSI, 50 pin | 279161-001 | — |
| 25 | Signal cable kit * | — | 228518-001 |

| Item | Description | Assembly Part Number | Spare Part Number |
|-------------|--|-----------------------------|--------------------------|
| | a) Power button/LED board cable, 14 pin | 219048-001 | — |
| | b) PCI Hot Plug LED board cable | 219049-002 | — |
| | c) Universal Media Bay cable, 50 pin | 314014-006 | — |
| 26 | Miscellaneous cable kit * | — | 289569-001 |
| | a) Diskette drive cable | 235183-001 | — |
| | b) Smart Array 5i Plus memory module interface cable | 262695-006 | — |
| | Rack Mounting Hardware | | |
| 27 | Rack mounting hardware kit * | — | 289570-001 |
| | Miscellaneous | | |
| 28 | Hardware kit * | — | 228527-001 |
| | a) Screws, T-15, flathead | 228213-001 | — |
| | b) Expansion slot cover | 228072-001 | — |
| | c) Screws, 6-32 | 192308-009 | — |
| 29 | Plastics kit * | — | 289555-001 |
| | a) PCI slot release lever | 228194-001 | — |
| | b) PCI lightpipe, rear | 279061-001 | — |
| | c) PCI lightpipe, cover | 218518-001 | — |
| | d) PCI riser cage door latch | 279062-001 | — |
| | e) Thumbscrew with molded cap, PCI slot 1 | 179333-003 | — |
| | f) Battery-Backed Write Cache Enabler bracket | 266643-001 | — |
| 30 | AC power cord * | 163719-002 | 187335-001 |
| 31 | DC power cord with pigtail * | 262608-001 | 316051-001 |
| 32 | CD ejector assembly * | 233905-001 | 237158-001 |
| 33 | PCI expansion board ejector/divider * | 279035-001 | 289547-001 |
| 34 | Battery, 3.3 V, lithium * | 334149-001 | 179322-001 |
| 35 | Country kit * | 284756-001 | 289566-001 |

| Item | Description | Assembly Part Number | Spare Part Number |
|------|--|----------------------|-------------------|
| 36 | Return kit, pack box, and cushions * | — | 289545-001 |
| | Memory | | |
| 37 | DIMM, 256 MB, registered DDR SDRAM * | 261583-031 | 300699-001 |
| 38 | DIMM, 512 MB, registered DDR SDRAM * | 261584-041 | 300700-001 |
| 39 | DIMM, 1 GB, registered DDR SDRAM * | 261585-041 | 300701-001 |
| 40 | DIMM, 2 GB, registered DDR SDRAM * (Compatible with item 15b only) | 261586-051 | 300702-001 |
| | Options | | |
| 41 | Round-hole rack rail mounting kit * | 293052-B21 | 289572-001 |
| 42 | Battery-Backed Write Cache Enabler * | 011668-001 | 260740-001 |
| 43 | DC hot-plug power supply, -48 V * | 251942-001 | 274401-001 |
| 44 | SCSI Ultra320 universal hot-plug hard drive* | | |
| | a) 36.4-GB 10K rpm | 286713-B22 | 289041-001 |
| | b) 72.8-GB 10K rpm | 268714-B22 | 289042-001 |
| | c) 146.8-GB 10K rpm | 286716-B22 | 289044-001 |
| | d) 18.2-GB 15K rpm | 286775-B22 | 289240-001 |
| | e) 36.4-GB 15K rpm | 286776-B22 | 289241-001 |
| | f) 72.8-GB 15K rpm | 289788-B22 | 289243-001 |
| | *Not shown | | |

Removal and Replacement Procedures

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Required Tools

You need the following items for some procedures:

- Torx T-15 screwdriver (provided inside the server)
- Diagnostics Utility

Safety Considerations

Before performing service procedures, review all the safety information.

Preventing Electrostatic Discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.

- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

Server Warnings and Cautions

Before installing a server, be sure that you understand the following warnings and cautions.



WARNING: To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electric outlet that is easily accessible at all times.
- Unplug the power cord from the power supply to disconnect power to the equipment.
- Do not route the power cord where it can be walked on or pinched by items placed against it. Pay particular attention to the plug, electric outlet, and the point where the cord extends from the server.



WARNING: To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.



CAUTION: Do not operate the server for long periods without the access panel. Operating the server without the access panel results in improper airflow and improper cooling that can lead to thermal damage.

Preparation Procedures

To access some components and perform certain service procedures, you must perform one or more of the following procedures:

- Extend the server from the rack ("Extending the Server from the Rack" on page [16](#)).

If you are performing service procedures in a Compaq branded rack, telco rack, or third-party rack cabinet, you can use the locking feature of the rack rails to support the server and gain access to internal components.

For more information about telco rack solutions, refer to the RackSolutions.com website (<http://www.racksolutions.com/hp>).

- Power down the server.

If you must remove a server from a rack or a non-hot-plug component from a server, power down the server.

- Remove the server from the rack ("Removing the Server from the Rack" on page [18](#)).

If the rack environment, cabling configuration, or the server location in the rack creates awkward conditions, remove the server from the rack.

Extending the Server from the Rack

1. Loosen the thumbscrews that secure the server faceplate to the front of the rack.
2. Extend the server on the rack rails until the server rail-release latches engage.

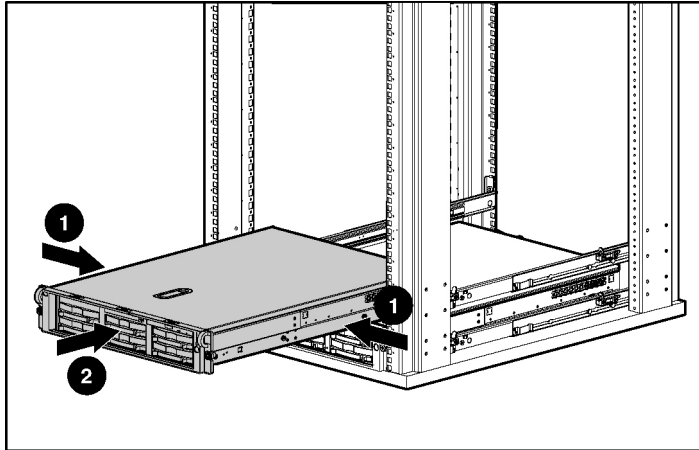


WARNING: To reduce the risk of personal injury or equipment damage, be sure that the rack is adequately stabilized before extending a component from the rack.



WARNING: To reduce the risk of personal injury, be careful when pressing the server rail-release latches and sliding the server into the rack. The sliding rails could pinch your fingers.

3. After performing the installation or maintenance procedure, slide the server back into the rack:
 - a. Press the server rail-release latches and slide the server fully into rack.



- b. Secure the server by tightening the thumbscrews.

Powering Down the Server

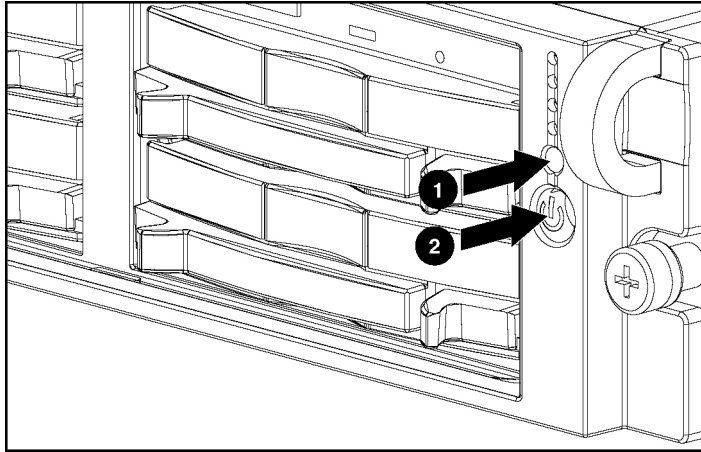


WARNING: To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to remove power from the . The front panel Power On/Standby button does not completely shut off system power. Portions of the power supply and some internal circuitry remain active until AC power is removed.

IMPORTANT: If installing a hot-plug device, it is not necessary to power down the server.

1. Back up the server data.
2. Shut down the operating system as directed by the operating system documentation.
3. If the server is installed in a rack, press the UID LED button on the front panel (1). Blue LEDs illuminate on the front and rear panels of the server.

4. Press the Power On/Standby button to place the server in standby mode (2). When the server activates standby power mode, the system power LED changes to amber.



5. If the server is installed in a rack, locate the server by identifying the illuminated rear UID LED button.
6. Disconnect the power cords.

The system is now without power.

Removing the Server from the Rack

To remove the server from a Compaq branded, telco, or third-party rack:

1. Power down the server.
2. Loosen the front panel thumbscrews that secure the server faceplate to the front of the rack.
3. Disconnect the cabling and remove the server from the rack. Reverse the server installation steps in the documentation that ships with the rack-mounting option.
4. Place the server on a sturdy, level surface.

Removing the Access Panel



WARNING: To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.



CAUTION: Do not operate the server for long periods without the access panel. Operating the server without the access panel results in improper airflow and improper cooling that can lead to thermal damage.

1. Power down the server if performing a non-hot-plug installation or maintenance procedure.
2. Extend the server from the rack, if applicable ("Extending the Server from the Rack" on page [16](#)).
3. Lift up on the hood latch handle and remove the access panel.

Hot-Plug SCSI Hard Drive

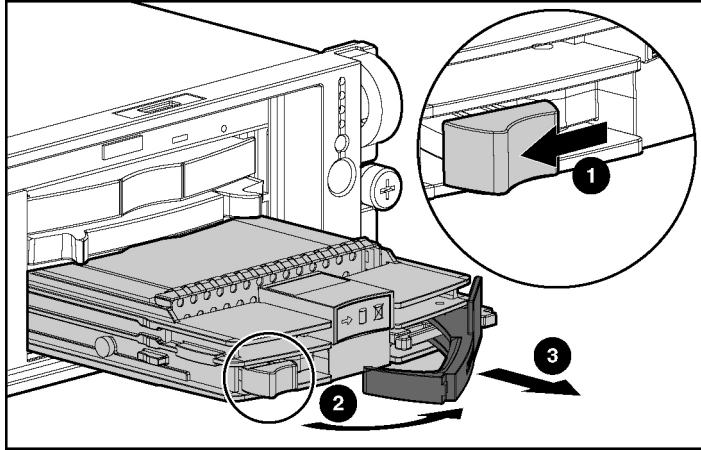
To remove the component:



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

1. Determine the status of the hard drive from the hot-plug hard drive LEDs ("Hot-Plug SCSI Hard Drive LEDs" on page [95](#)).
2. Back up all server data on the hard drive.

3. Remove the hard drive.



To replace the hot-plug SCSI hard drive:

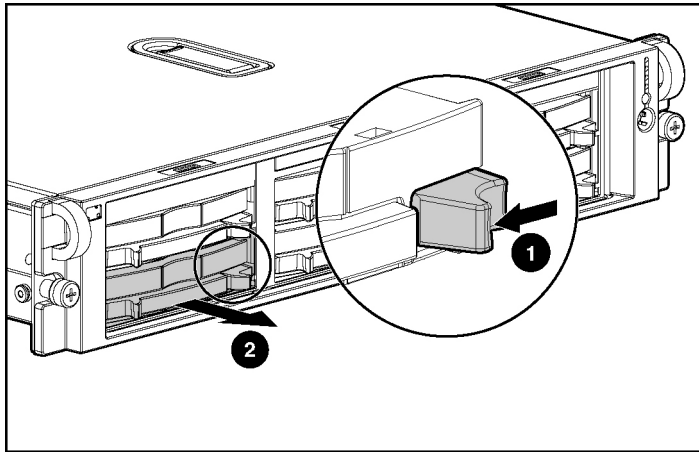
1. Slide the drive into the cage until it clicks, locking the drive into place.
2. Close the lever.

Hard Drive Blank

To remove the component:



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.



To replace the blank, slide the blank into the bay until it locks into place.

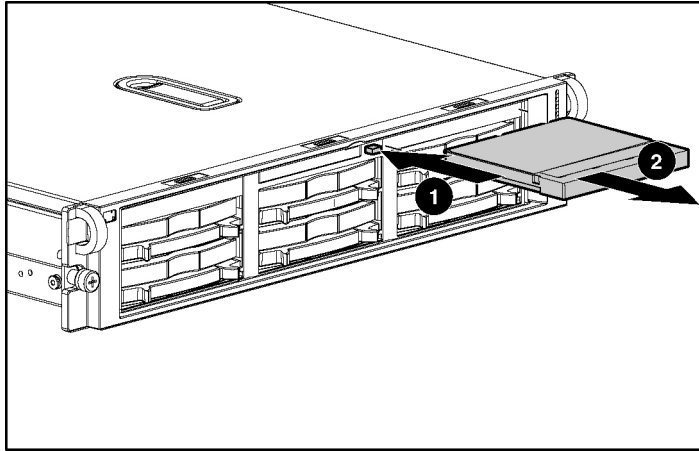
CD-ROM Drive Blank

To remove the component:



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

IMPORTANT: The ejector button is recessed to prevent accidental ejection; it may be helpful to use a pen or similar shaped object to access the button.



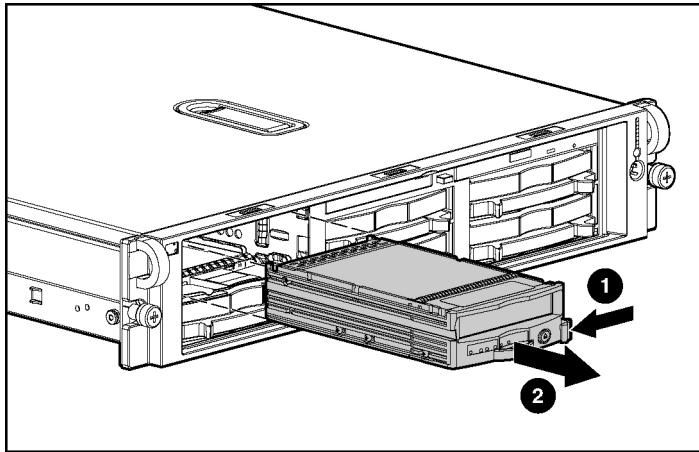
To replace the blank, slide the blank into the bay until it locks into place.

Universal Hot-Plug Tape Drive

To remove the component:



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.



To replace the Universal Hot-Plug tape drive, slide the drive into the bay until it locks into place.

Tape Drive Blank

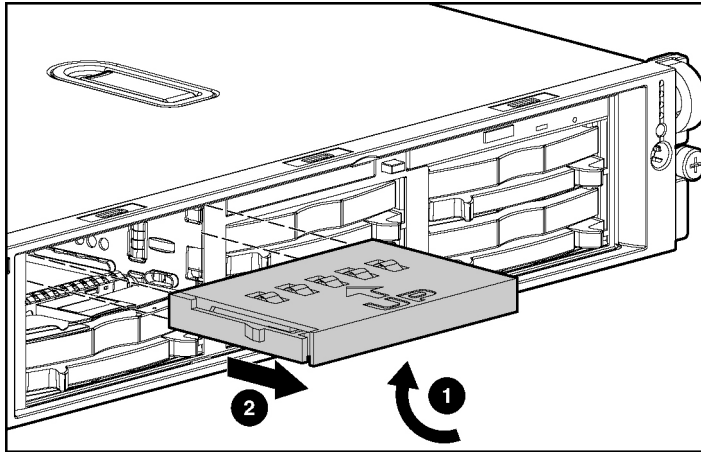
To remove the component:

1. Remove the hot-plug SCSI hard drive, if one is installed, below the tape drive blank ("Hot-Plug SCSI Hard Drive" on page [19](#)).
2. Remove the hard drive blank, if one is installed, below the tape drive blank ("Hard Drive Blank" on page [21](#)).



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

3. Remove the tape drive blank.
 - a. Reach underneath and squeeze the middle of the tape drive blank (1).
 - b. Pull the blank out of the bay (2).



To replace the blank, slide the blank into the bay until it locks into place.

Hot-Plug Power Supply

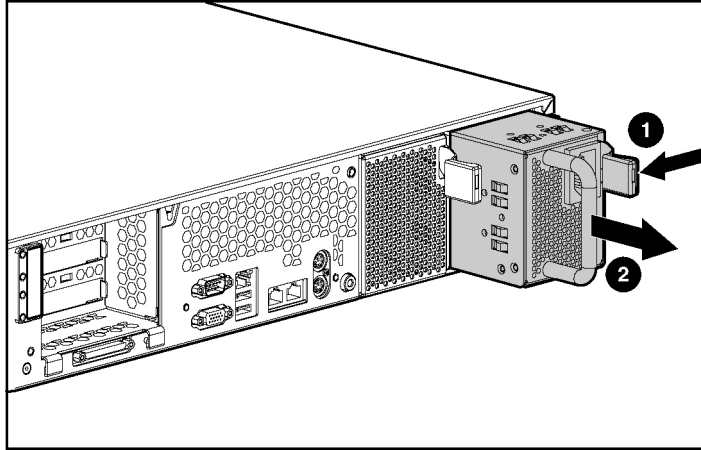
To remove the component:

1. Unlock the hinge on the cable management arm and swing the arm away from the power supply area.
2. Determine how many hot-plug power supplies are installed:
 - If only one hot-plug power supply is installed, power down and remove the power cord from the server.
 - If more than one hot-plug power supply is installed, continue with the next step.



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

3. Remove the hot-plug power supply.

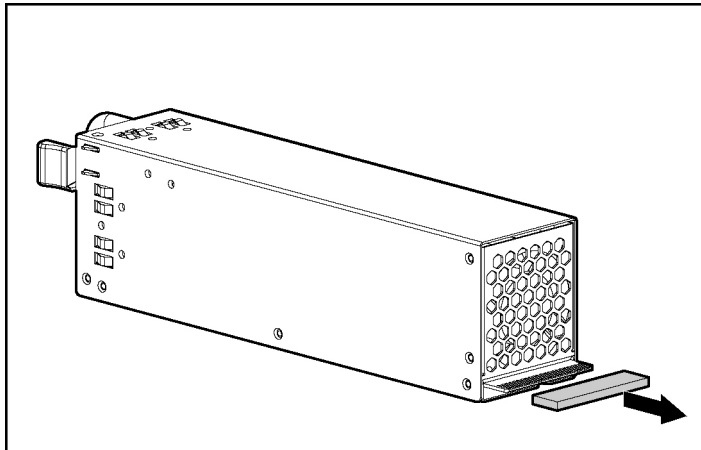


To replace a hot-plug power supply:

1. Remove the protective cover from the connector pins on the power supply.



WARNING: To reduce the risk of electric shock or damage to the equipment, do not connect the power cord to the power supply until the power supply is installed.



2. Slide the power supply into the power supply bay.

3. Connect the power cord to the power supply.
4. Route the power cord through the cable management arm or power cord anchor.

NOTE: If using the power cord anchor, be sure to leave enough slack in the power cord so that the redundant power supply can be removed without disconnecting the power cord from the primary power supply.

5. Lock the cable management arm into the operating position.

Power Supply Blank

To remove the component:

1. Unlock the hinge on the cable management arm and swing the arm away from the power supply area.

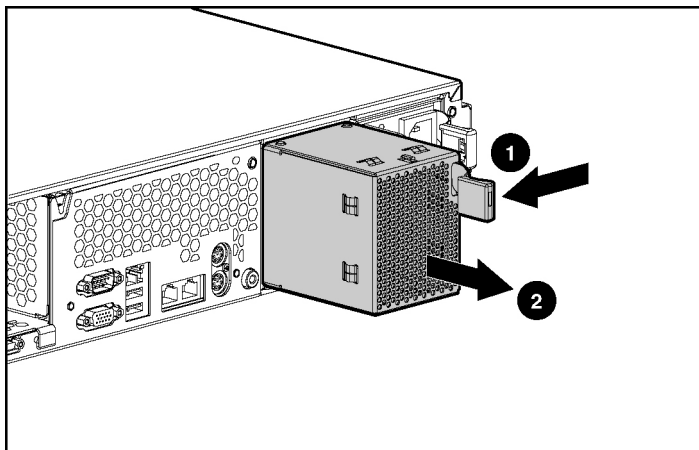


CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

2. Remove the power supply blank.



WARNING: To reduce the risk of personal injury from hot surfaces, allow the power supply or power supply blank to cool before touching it.



To replace a power supply blank:

1. Slide the power supply blank into the bay until it locks into place.
2. Swing the cable management arm into place and lock it.

Hot-Plug Fan

The server supports redundant hot-plug fans to provide proper airflow to the system if a primary fan fails. The server airflow is divided into three zones: processor, I/O, and power supply. Shared fans 4 and 7 each provide airflow for two zones. If a shared fan fails, the failure is experienced in both zones.

In the standard configuration, five fans cool the server: fans 2, 4, 5, 6, and 7 in the processor zone; fan 4 in the I/O zone; and fan 7 in the power supply zone.

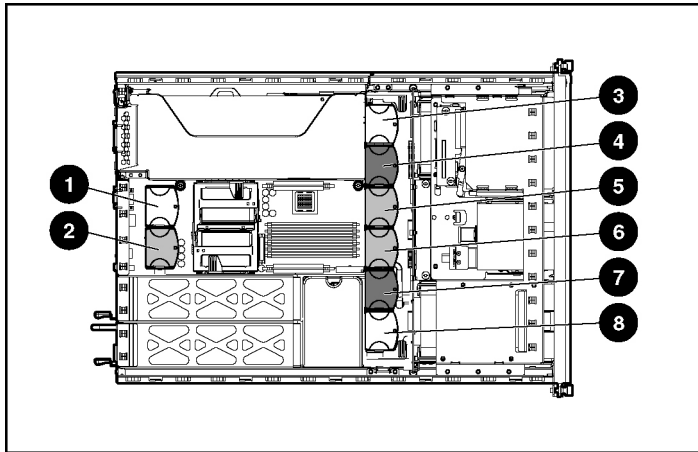
For the redundant configuration, fans 1, 3, and 8 (one fan per zone) are added to cool the server. This allows the server to continue operation in non-redundant mode if only one fan fails per zone.

The server shuts down in the following scenarios:

- At POST:
 - The BIOS suspends the server for 5 minutes if it detects a cautionary temperature level. If the cautionary temperature level is still detected after 5 minutes, the BIOS performs an orderly shutdown and then restarts. This process repeats until the cautionary temperature level is no longer detected.
 - The BIOS performs an orderly shutdown if the following minimum requirements are not met: one working fan in the I/O zone, five working fans in the processor zone, and one working fan in the power supply zone.
 - The server performs an immediate shutdown if it detects a critical temperature level.
IMPORTANT: An immediate shutdown is a hardware-controlled function and it overrides any firmware or software actions.
- In the operating system:

- With the Health Driver loaded and Thermal Shutdown enabled in RBSU, the Health Driver performs an orderly shutdown if it detects a cautionary temperature level. If the server detects a critical temperature level before the orderly shutdown occurs, the server performs an immediate shutdown. Additionally, the Health Driver performs an orderly shutdown if the following minimum requirements are not met: one working fan in the I/O zone, five working fans in the processor zone, and one working fan in the power supply zone.
- With the Health Driver loaded and Thermal Shutdown disabled in RBSU, the server performs an immediate shutdown if it detects a critical temperature level.
- Without Health Driver loaded, the server performs an immediate shutdown if it detects a critical temperature level.

IMPORTANT: An immediate shutdown is a hardware-controlled function and it overrides any firmware or software actions.

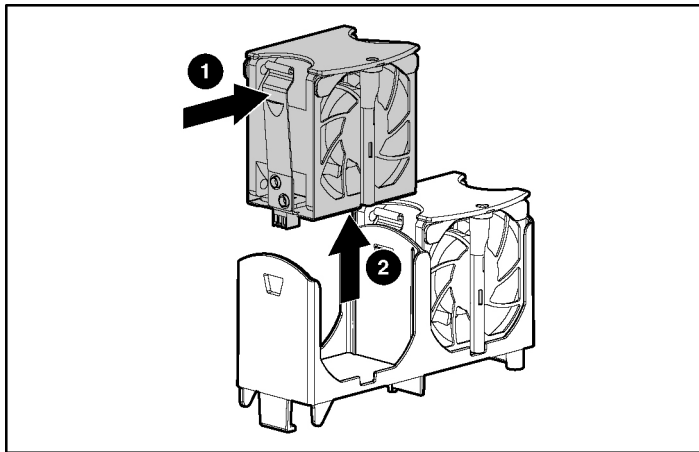


| Item | Description | Zone | Configuration |
|------|-------------|-------------------|------------------|
| 1 | Fan 1 | Processor | Redundant |
| 2 | Fan 2 | Processor | Primary |
| 3 | Fan 3 | I/O | Redundant |
| 4 | Fan 4 | I/O and processor | Primary (shared) |
| 5 | Fan 5 | Processor | Primary |

| Item | Description | Zone | Configuration |
|------|-------------|----------------------------|------------------|
| 6 | Fan 6 | Processor | Primary |
| 7 | Fan 7 | Power supply and processor | Primary (shared) |
| 8 | Fan 8 | Power supply | Redundant |

To remove the component:

1. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
2. Remove the access panel ("Removing the Access Panel" on page [19](#)).
3. Use the fan LEDs ("Hot-Plug Fan LED" on page [101](#)) and fan locations table to identify if the fan zone is redundant:
 - If the fan zone is not operating with redundancy, power down the server.
 - If the fan zone is operating with redundancy, continue with the next step.
4. Remove the fan.



CAUTION: Do not operate the server for long periods without the access panel. Operating the server without the access panel results in improper airflow and improper cooling that can lead to thermal damage.

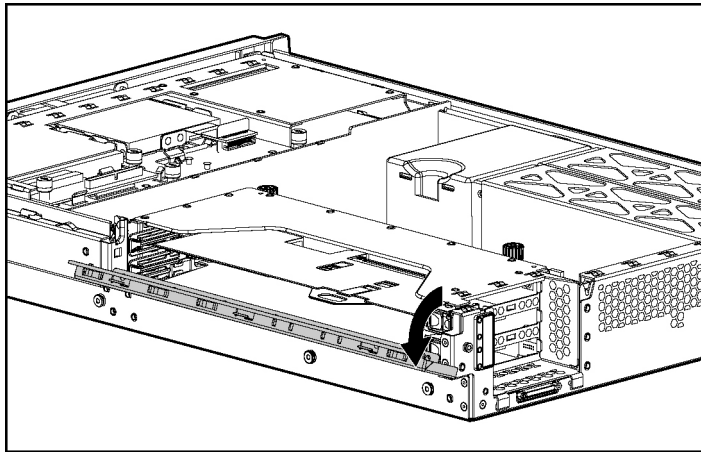
IMPORTANT: For optimum cooling, install fans in all primary fan locations. For more information, refer to the previous fan locations table.

To replace the component, reverse the removal procedure.

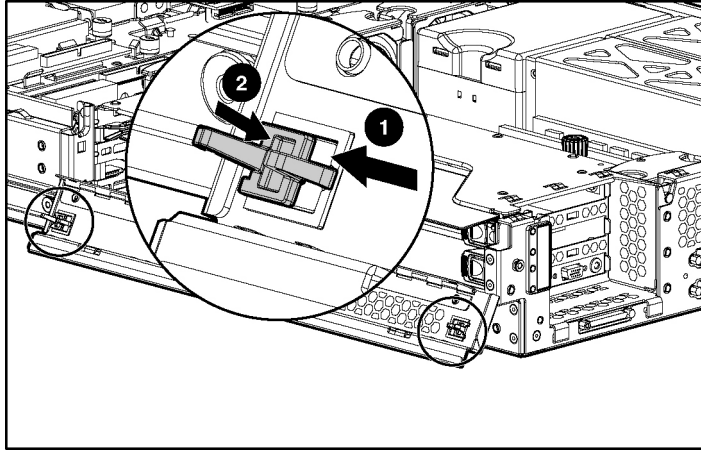
PCI Riser Cage Door Latch

To remove the component:

1. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
2. Remove the access panel ("Removing the Access Panel" on page [19](#)).
3. Open the PCI riser cage door.



4. Remove the PCI riser cage door latch.



Expansion Board (Slots 2 and 3)

IMPORTANT: Be sure that the proper drivers for PCI Hot Plug functionality are installed. Refer to the Documentation CD for more information.

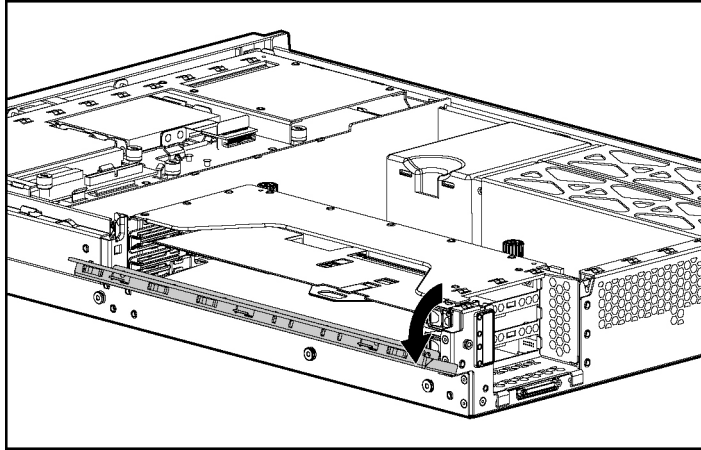
To remove the component:



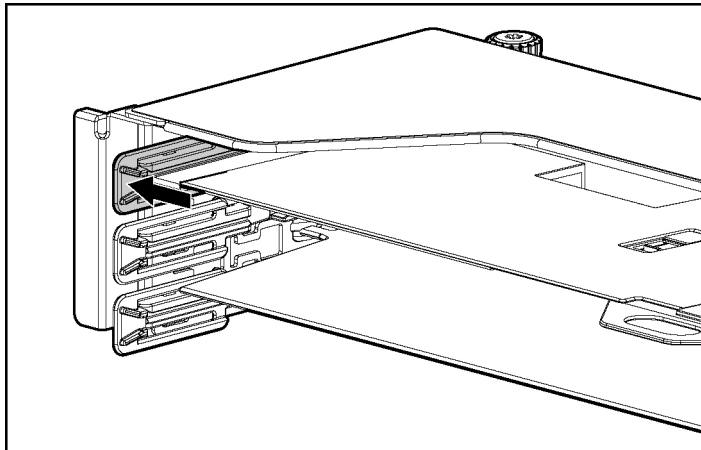
CAUTION: If the operating system installed on the server does not support PCI Hot Plug functionality, power down the server before removing expansion boards.

1. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
2. Remove the access panel ("Removing the Access Panel" on page [19](#)).

3. Open the PCI riser cage door.

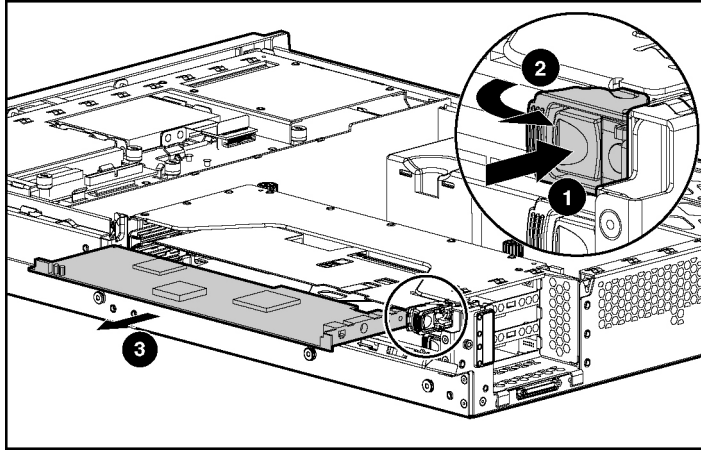


4. Press the PCI Hot Plug button to remove power from the slot. When the green power LED on the slot stops flashing, power has been removed from the slot.
5. Unlock the PCI retaining clip.



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all PCI slots have either an expansion slot cover or an expansion board installed.

6. Remove the expansion board.



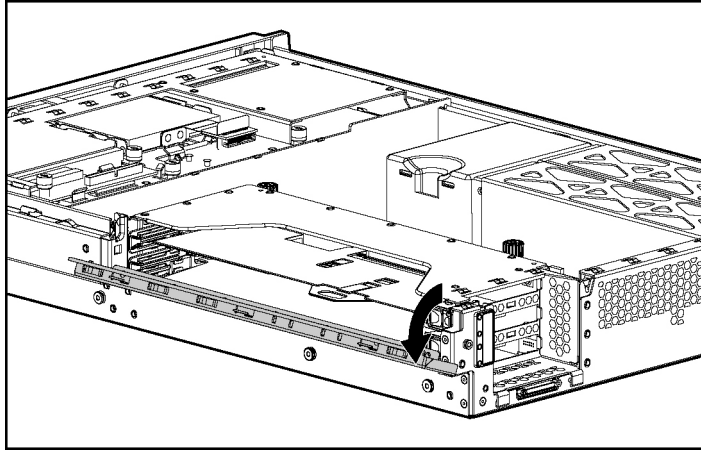
To replace the component, reverse the removal procedure.

Expansion Slot Cover (Slots 2 and 3)

To remove the component:

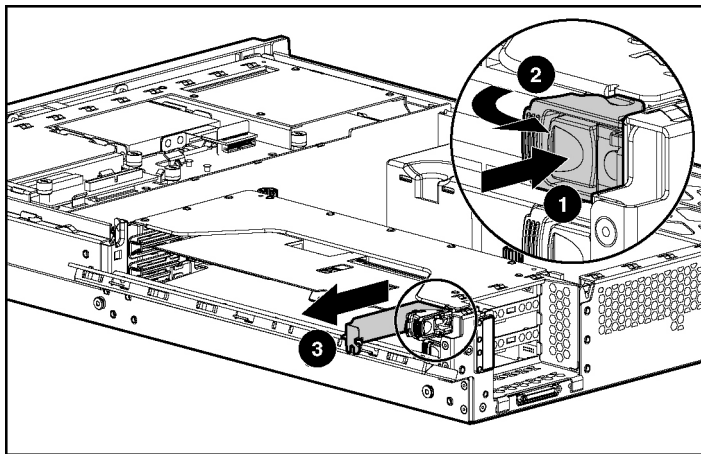
1. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
2. Remove the access panel ("Removing the Access Panel" on page [19](#)).

3. Open the PCI riser cage door.



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all PCI slots have either an expansion slot cover or an expansion board installed.

4. Press the PCI Hot Plug button to remove power from the slot. When the green power LED on the slot stops flashing, power has been removed from the slot.
5. Remove the expansion slot cover.

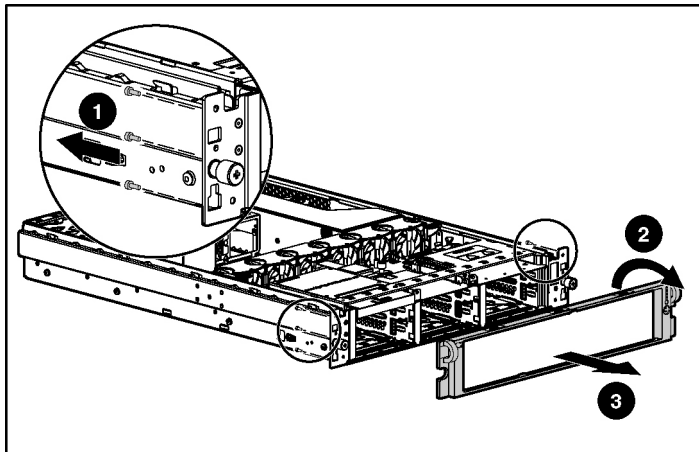


To replace the component, reverse the removal procedure.

Front Bezel

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the six screws and detach the front bezel.



To replace the component, reverse the removal procedure.

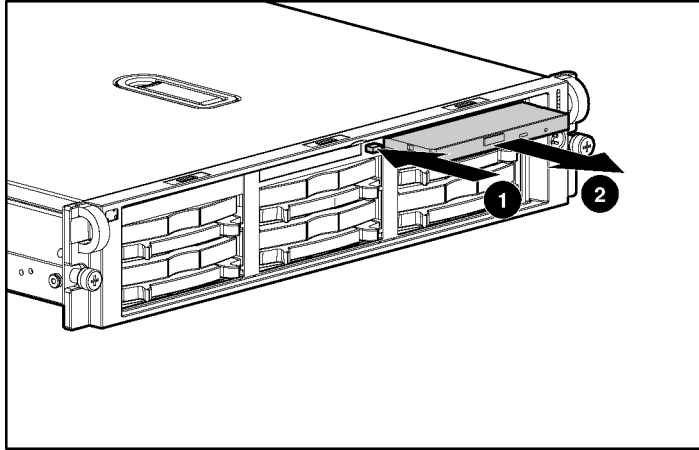
CD-ROM Drive

To remove the component:

1. Power down the server.

IMPORTANT: The ejector button is recessed to prevent accidental ejection; it may be helpful to use a pen or similar shaped object to access the button.

2. Remove the CD-ROM drive.



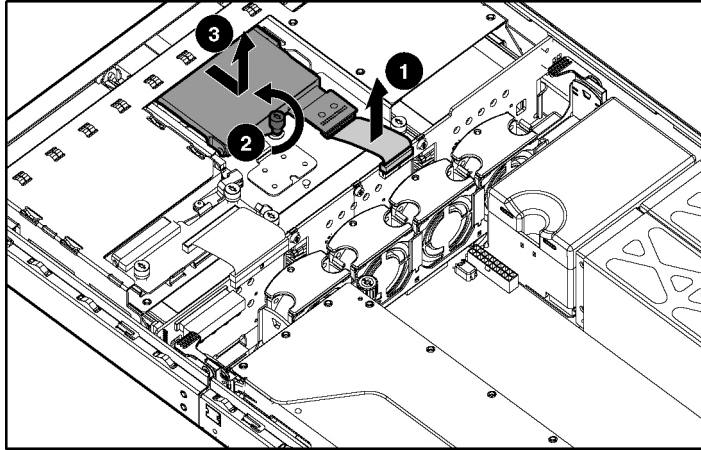
To replace the CD-ROM drive, slide the drive into the bay until the drive is fully seated.

Diskette Drive

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).

4. Remove the diskette drive.



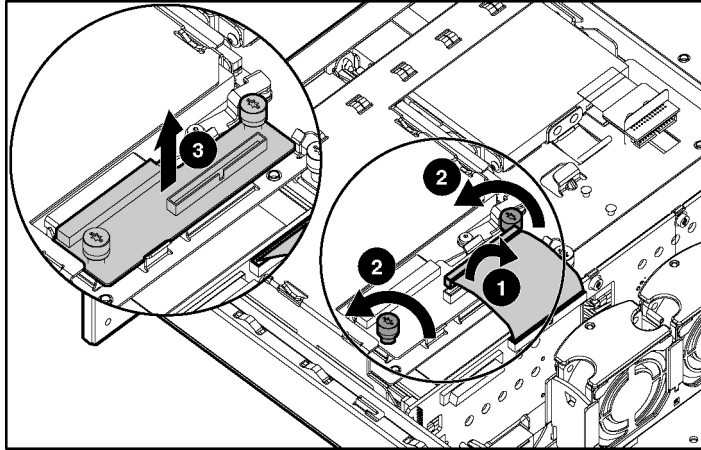
To replace the component, reverse the removal procedure.

Universal Media Bay Adapter Board

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the CD-ROM drive, if installed ("CD-ROM Drive" on page [35](#)).
5. Remove the CD-ROM drive blank, if installed ("CD-ROM Drive Blank" on page [21](#)).

6. Remove the Universal Media Bay adapter board.



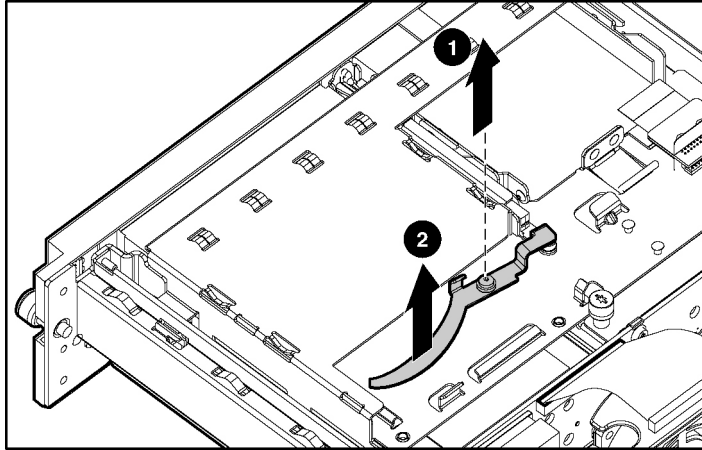
To replace the component, reverse the removal procedure.

CD Ejector Assembly

To remove the component:

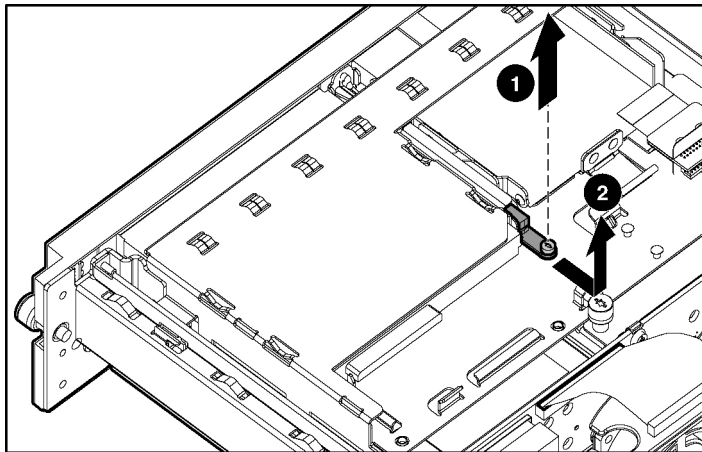
1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the CD-ROM drive, if installed ("CD-ROM Drive" on page [35](#)).
5. Remove the CD-ROM drive blank, if installed ("CD-ROM Drive Blank" on page [21](#)).
6. Remove the diskette drive ("Diskette Drive" on page [36](#)).
7. Remove the Universal Media Bay adapter board ("Universal Media Bay Adapter Board" on page [37](#)).

8. Remove the CD ejector lever.



9. Press and hold the ejection button.

10. Remove the CD ejector assembly.

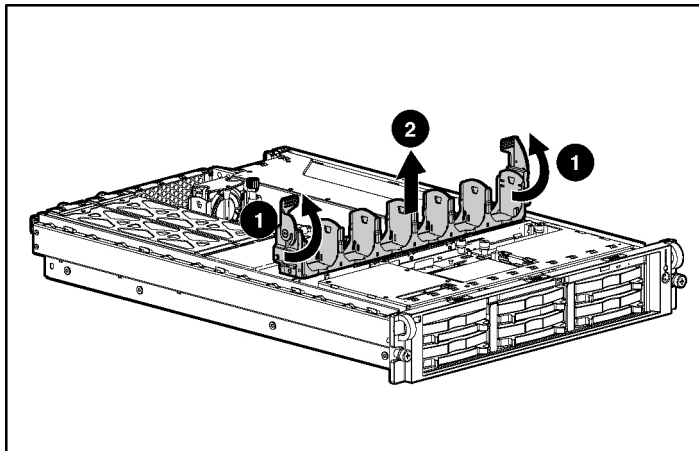


To replace the component, reverse the removal procedure.

Front Fan Bracket

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the front bracket.



5. Remove all hot-plug fans from the front fan bracket.

To replace the front fan bracket, reverse the removal steps and press down on the top of each fan to be sure it is seated properly.

SCSI Terminator

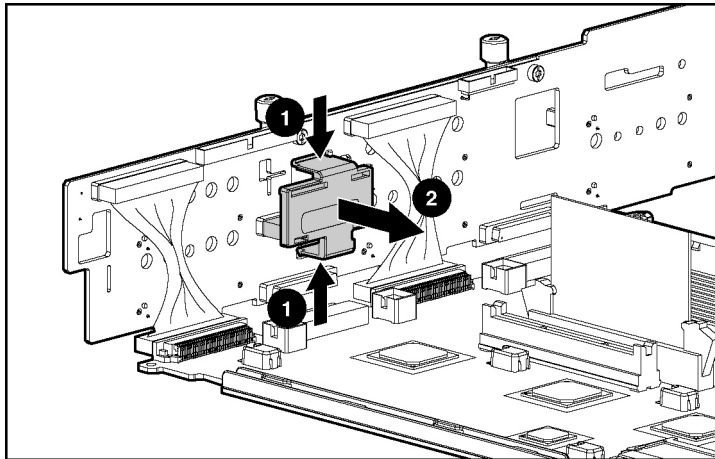
To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).

4. Remove the front fan bracket ("Front Fan Bracket" on page [40](#)).

IMPORTANT: For this procedure, you do not need to remove the hot-plug fans from the front fan bracket. When reinstalling the front fan bracket, press the top of each fan to be sure it seats securely.

5. Remove the SCSI terminator.



To replace the component, reverse the removal procedure.

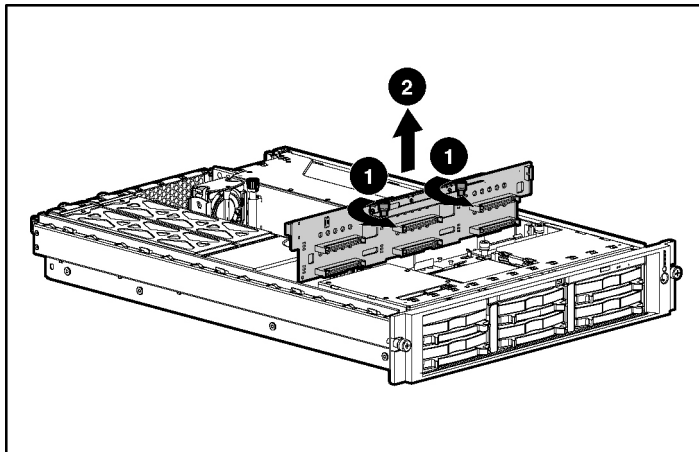
SCSI Backplane

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove all hot-plug SCSI hard drives ("Hot-Plug SCSI Hard Drive" on page [19](#)).
5. Remove the tape drive, if installed ("Universal Hot-Plug Tape Drive" on page [23](#)).
6. Remove the front fan bracket ("Front Fan Bracket" on page [40](#)).

IMPORTANT: For this procedure, you do not need to remove the hot-plug fans from the front fan bracket. When reinstalling the front fan bracket, press the top of each fan to be sure it seats securely.

7. Remove the SCSI terminator, if installed.
8. Disconnect any cables connected to the SCSI backplane.
9. Remove the SCSI backplane.



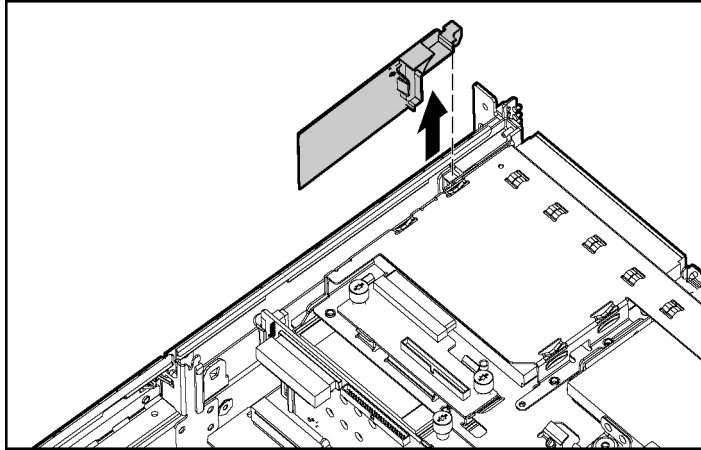
To replace the component, reverse the removal procedure.

Battery-Backed Write Cache Enabler Bracket

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).

4. Remove the battery module bracket.



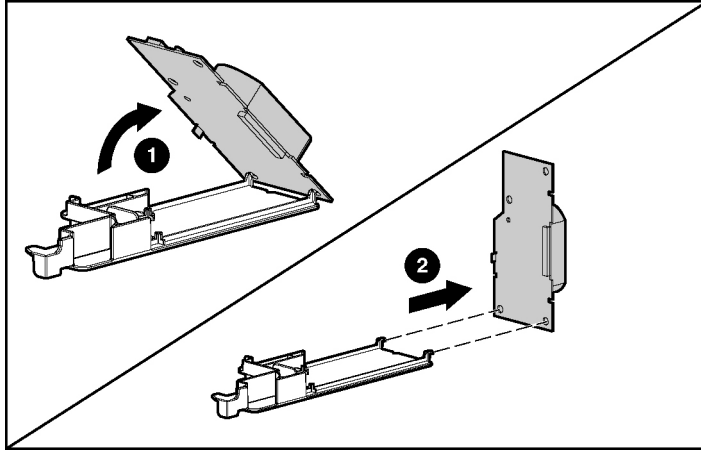
To replace the component, reverse the removal procedure.

Battery-Backed Write Cache Enabler

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the Battery-Backed Write Cache Enabler bracket ("Battery-Backed Write Cache Enabler Bracket" on page [42](#)).
5. Disconnect the cable from the Battery-Backed Write Cache Enabler.

6. Remove the battery module from the bracket.



To replace the component, reverse the removal procedure.

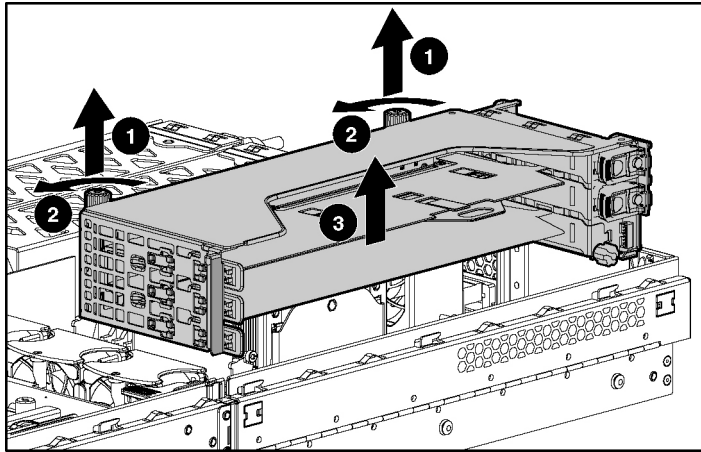
PCI Riser Cage

To remove the component:



CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

1. Power down the server.
2. Extend the server from the rack, if applicable ("Extending the Server from the Rack" on page [16](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Disconnect any internal or external cables connected to any existing expansion boards.
5. Lift the PCI riser cage thumbscrews (1) and turn them counter-clockwise (2).
6. Remove the PCI riser cage (3).



To replace the component, reverse the removal procedure.

Expansion Board (Slot 1)

To remove the component:

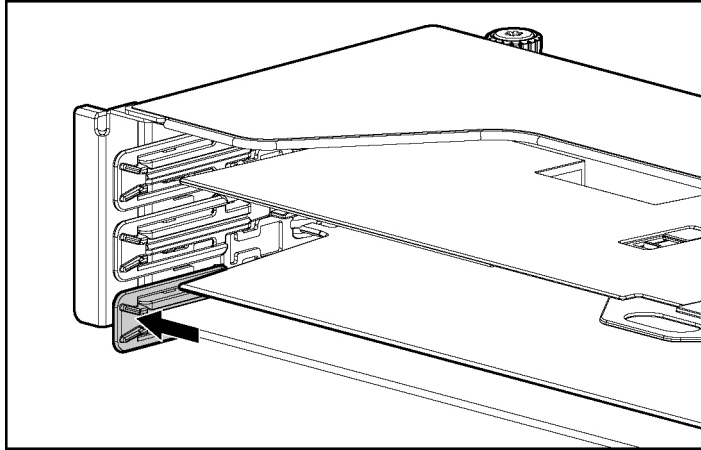
1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the PCI riser cage ("PCI Riser Cage" on page [44](#)).



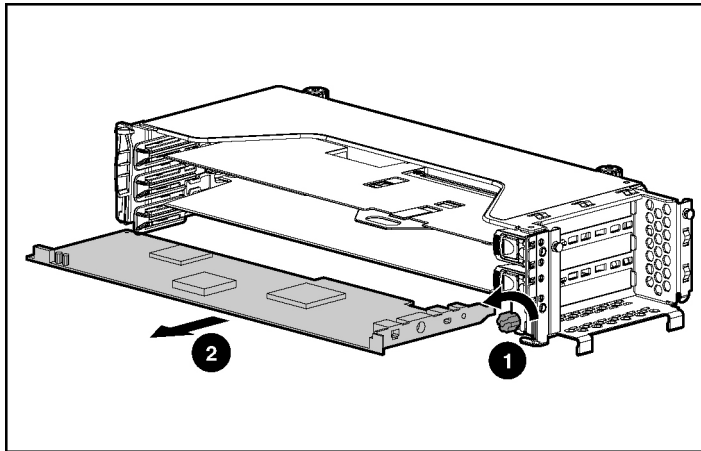
CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

5. Disconnect any cables connecting the expansion board to the PCI riser cage.

6. Unlock the PCI retaining clip.



7. Remove the expansion board.



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all PCI slots have either an expansion slot cover or an expansion board installed.

To replace the component, reverse the removal procedure.

Expansion Slot Cover (Slot 1)

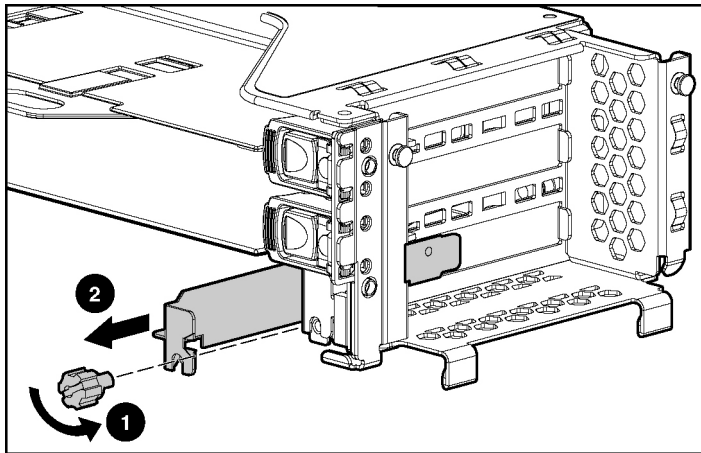
To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the PCI riser cage ("PCI Riser Cage" on page [44](#)).



CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

5. Remove the expansion slot cover.



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all PCI slots have either an expansion slot cover or an expansion board installed.

To replace the component, reverse the removal procedure.

Expansion Board Ejector/Divider

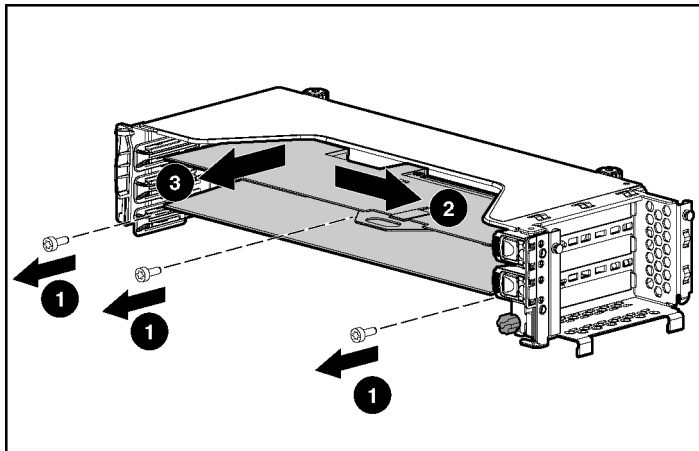
To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the PCI riser cage ("PCI Riser Cage" on page [44](#)).



CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

5. Remove the expansion board ejector/divider.



CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all PCI slots have either an expansion slot cover or an expansion board installed.

To replace the component, reverse the removal procedure.

PCI Slot Release Lever (Slots 2 and 3)

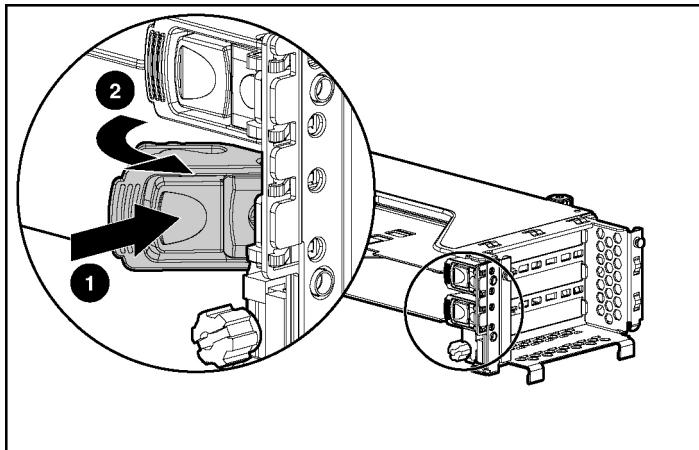
To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the expansion board from the slot, if installed ("Expansion Board (Slots 2 and 3)" on page [31](#)).
5. Remove the expansion slot cover from the slot, if installed ("Expansion Slot Cover (Slots 2 and 3)" on page [33](#)).
6. Remove the PCI riser cage ("PCI Riser Cage" on page [44](#)).

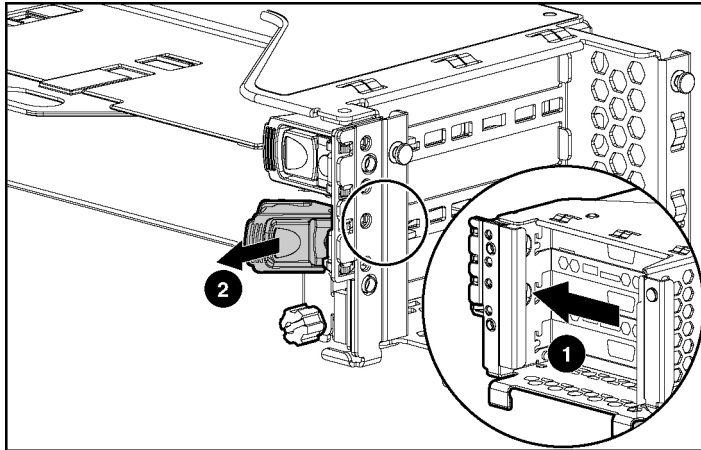


CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

7. Open the PCI slot release lever.



8. Remove the PCI slot release lever.



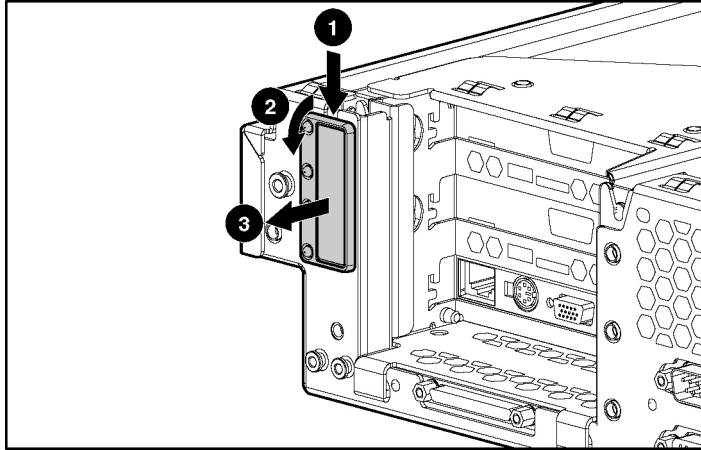
To replace the component, reverse the removal procedure.

PCI Lightpipe and Cover

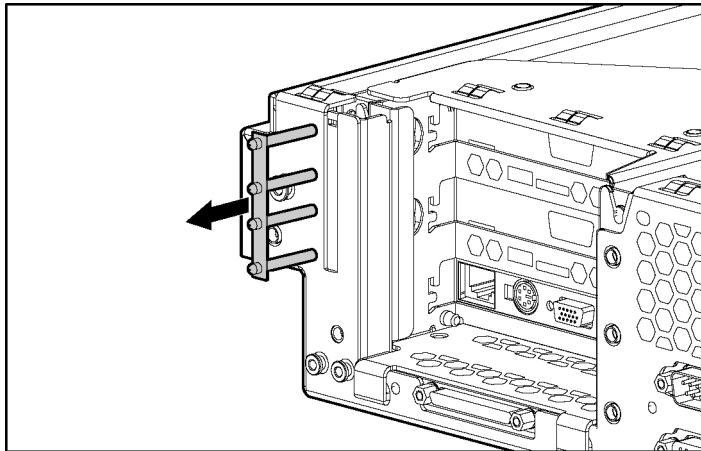
To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).

4. Remove the PCI lightpipe cover.



5. Slide the lightpipe out of the chassis.



To replace the component, reverse the removal procedure.

Power Converter Module

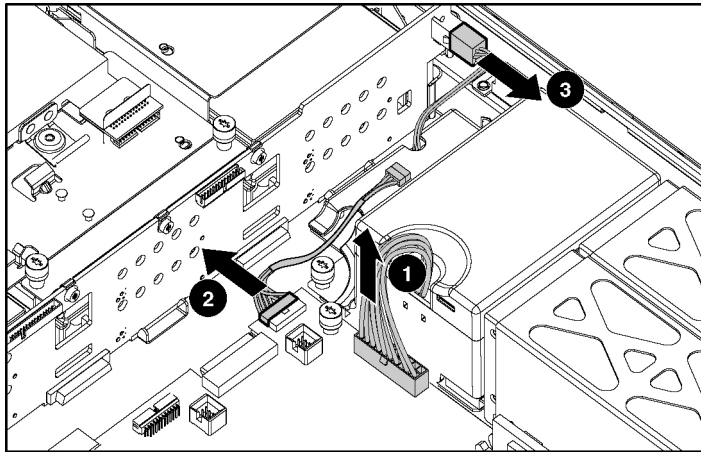
To remove the component:

1. Power down the server.

2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the front fan bracket ("Front Fan Bracket" on page [40](#)).

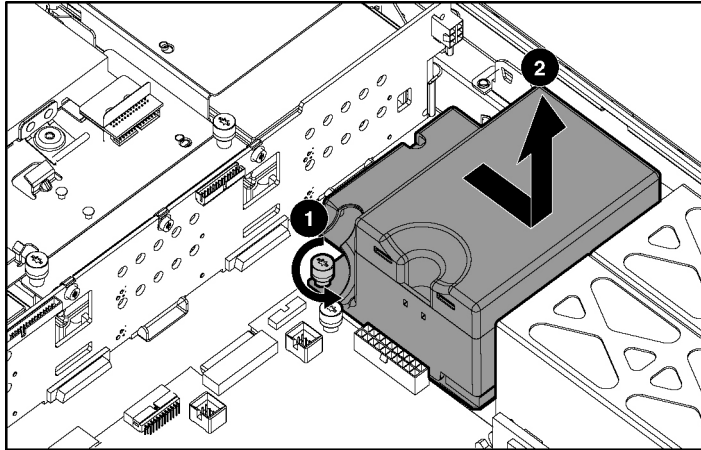
IMPORTANT: For this procedure, you do not need to remove the hot-plug fans from the front fan bracket. When reinstalling the front fan bracket, press the top of each fan to be sure it seats securely.

5. Remove all hot-plug power supplies ("Hot-Plug Power Supply" on page [24](#)).
6. Disconnect all power cables.



7. Remove the power converter module.

NOTE: Cables are removed for clarity.



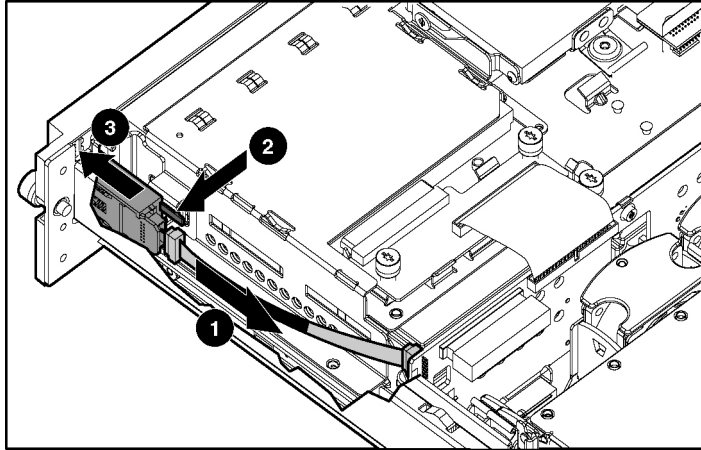
To replace the component, reverse the removal procedure.

Power Button/LED Board

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Lift the Battery-Backed Write Cache Enabler bracket out of the chassis.

5. Remove the power button/LED board.



To replace the component, reverse the removal procedure.

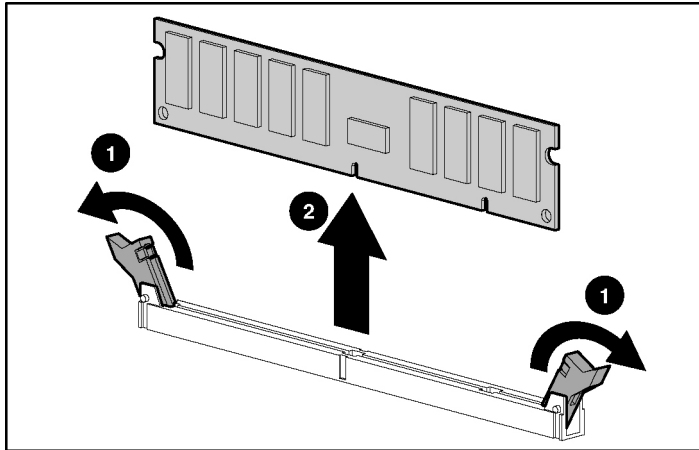
DIMMs

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).

NOTE: The server ships with at least two DIMMs installed in DIMM slots 1A and 2A.

4. Remove the DIMM.



CAUTION: Be sure to install DIMMs in the proper configuration. Refer to the Documentation CD.



CAUTION: Use only Compaq branded or HP DIMMs. DIMMs from other sources may adversely affect data integrity.

IMPORTANT: DIMMs do not seat fully if turned the wrong way.

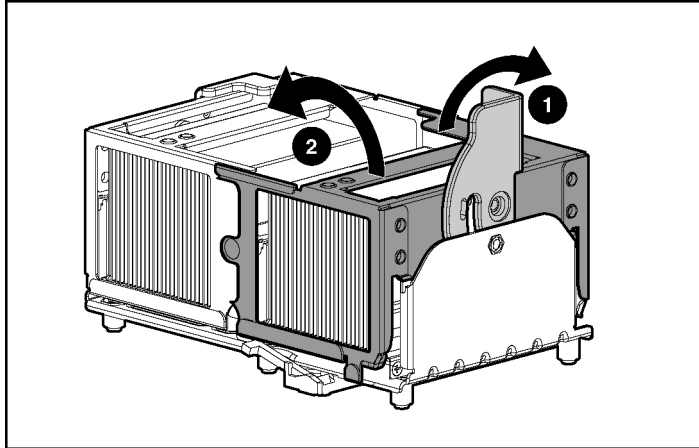
To replace a DIMM, align the DIMM with the slot and insert the DIMM firmly. When fully seated, the DIMM slot latches lock into place.

Processor

To remove the component:

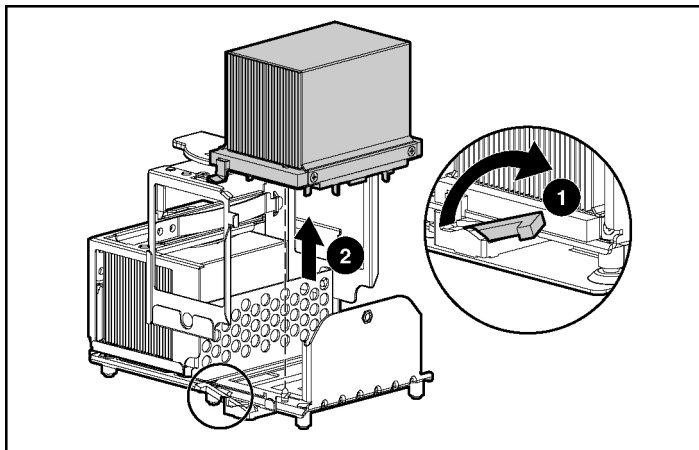
1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).

4. Open the processor retaining bracket.



CAUTION: To prevent thermal instability and damage to the server, do not separate the processor from the heatsink. The processor, heatsink, and retaining clip make up a single assembly.

5. Remove the processor and heatsink assembly.



CAUTION: Failure to open the processor locking lever completely prevents the processor from seating during installation, leading to hardware damage.



CAUTION: When installing a processor, be sure to secure the processor using the processor socket lever before closing the processor retaining bracket. Failure to do so will result in physical damage to the processor and server.



CAUTION: To prevent possible server malfunction and damage to the equipment, do not mix processors of different types.



CAUTION: To prevent possible server malfunction or damage to the equipment, be sure to align the processor pins with the corresponding holes in the socket.

IMPORTANT: Processor socket 1 and PPM slot 1 must be populated at all times or the server will not function properly.

IMPORTANT: PPM slots must be populated when processors are installed. If PPM slots are not populated, the server does not boot or halts during POST.

IMPORTANT: If you replace a failed processor or processors, clear the status log in RBSU after powering up the server. For RBSU procedures, refer to the Documentation CD.

To replace the component, reverse the removal procedure.



CAUTION: To prevent possible server malfunction or damage to the equipment, be sure to completely close the processor locking lever.

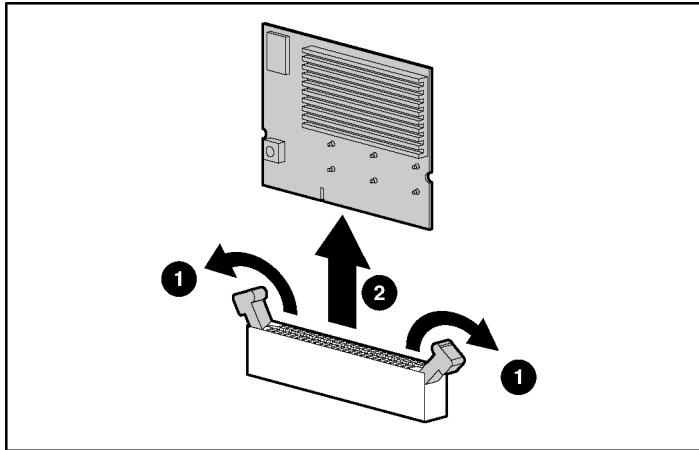
PPM

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).

NOTE: The appearance of compatible PPMs may vary.

4. Remove the PPM.



IMPORTANT: PPM slots must be populated when processors are installed. If PPM slots are not populated, the server does not boot or halts during POST.

To replace the component, reverse the removal procedure.

Smart Array 5i Plus Memory Module

To remove the component:

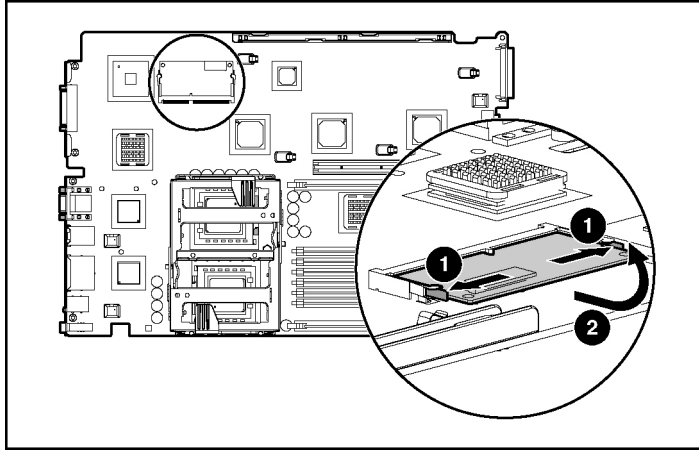
1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the PCI riser cage ("PCI Riser Cage" on page [44](#)).



CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

5. Disconnect and remove the Smart Array 5i Plus memory module cable.

6. Remove the Smart Array 5i Plus memory module.



To replace the component, reverse the removal procedure.



CAUTION: To prevent damage to the memory module during installation, be sure the memory module is fully inserted before pressing down.

Battery

If the server no longer automatically displays the correct date and time, you may need to replace the battery that provides power to the real-time clock. Under normal use, battery life is 5 to 10 years.



WARNING: The computer contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. A risk of fire and burns exists if the battery pack is not properly handled. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose the battery to temperatures higher than 60°C (140°F).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace only with the spare designated for this product.

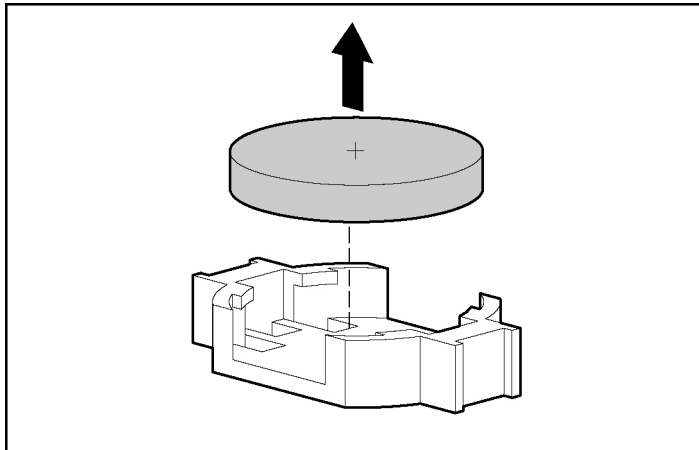
To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the PCI riser cage ("PCI Riser Cage" on page [44](#)).



CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

5. Remove the battery.



IMPORTANT: Replacing the system board battery resets the system ROM to its default configuration. After replacing the battery, reconfigure the system through RBSU.

To replace the component, reverse the removal procedure.

For more information about battery replacement or proper disposal, contact your authorized reseller or your authorized service provider.

System Board

To remove the component:

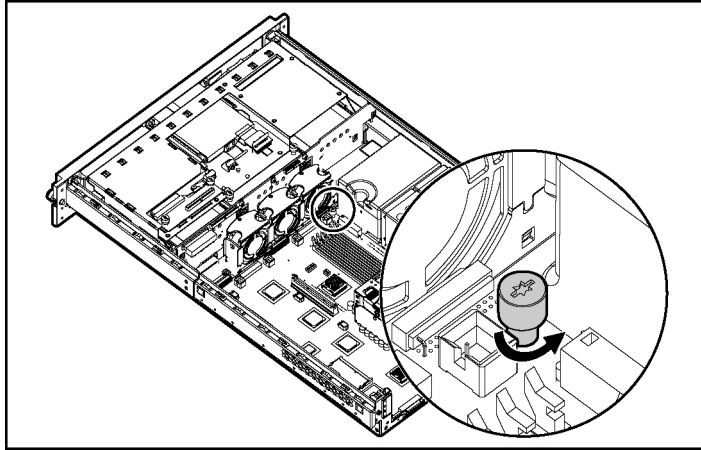
1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the PCI riser cage ("PCI Riser Cage" on page [44](#)).



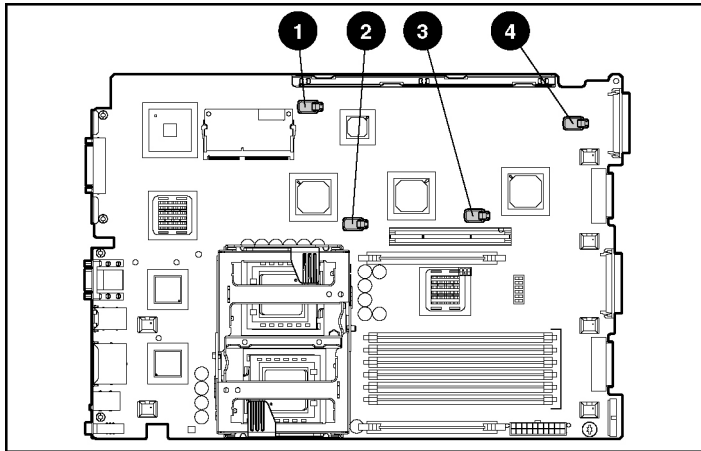
CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

5. Remove the front fan bracket ("Front Fan Bracket" on page [40](#)).
IMPORTANT: For this procedure, you do not need to remove the hot-plug fans from the front fan bracket. When reinstalling the front fan bracket, press the top of each fan to be sure it seats securely.
6. Remove the hot-plug fans from the rear fan bracket.
7. Remove any DDR SDRAM DIMMs ("DIMMs" on page [54](#)).
8. Remove the processors ("Processor" on page [55](#)).
9. Remove the PPMs ("PPM" on page [57](#)).
10. Remove the Smart Array 5i Plus memory module ("Smart Array 5i Plus Memory Module" on page [58](#)).
11. Disconnect all cables connected to the system board.

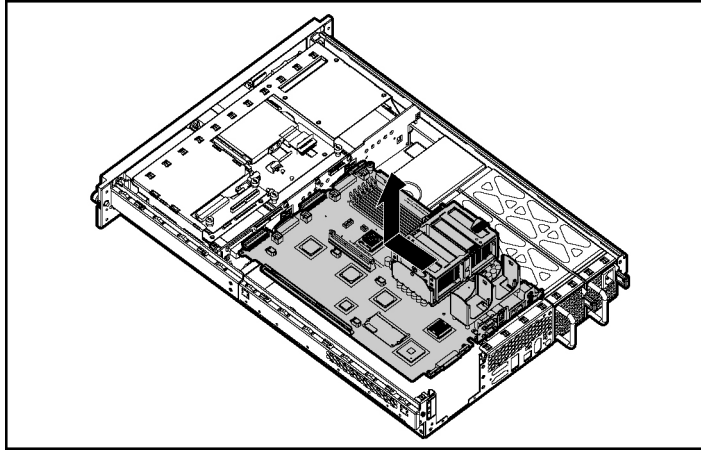
12. Loosen the system board thumbscrew.



13. Identify the alignment keys and keyhole locations, 1 through 4.



14. Remove the system board.



15. Remove the rear fan bracket ("Rear Fan Bracket" on page [64](#)).

IMPORTANT: If replacing the system board or clearing NVRAM, you must re-enter the server serial number through RBSU ("Re-Entering the Server Serial Number" on page [63](#)).

To replace the component, reverse the removal procedure.

Re-Entering the Server Serial Number

After you replace the system board or clear NVRAM, you must re-enter the server serial number.

1. During the server startup sequence, press the **F9** key to access RBSU.
2. Select the **System Options** menu.
3. Select **Serial Number**. The following warning is displayed:

```
WARNING! WARNING! WARNING! The serial number is loaded
into the system during the manufacturing process and
should NOT be modified. This option should only be used
by qualified service personnel. This value should always
match the serial number sticker located on the chassis.
```

4. Press the **Enter** key to clear the warning.
5. Enter the serial number and press the **Enter** key.

6. Press the **Escape** key to close the menu.
7. Press the **Escape** key to exit RBSU.
8. Press the **F10** key to confirm exiting RBSU. The server will automatically reboot.

Rear Fan Bracket

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the PCI riser cage ("PCI Riser Cage" on page [44](#)).



CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

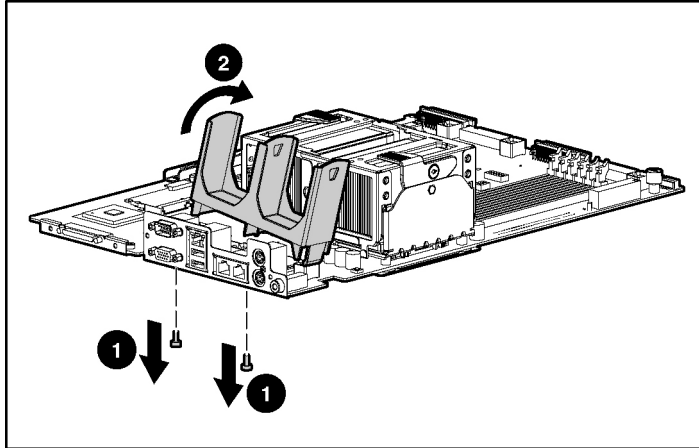
5. Remove the front fan bracket ("Front Fan Bracket" on page [40](#)).

IMPORTANT: For this procedure, you do not need to remove the hot-plug fans from the front fan bracket. When reinstalling the front fan bracket, press the top of each fan to be sure it seats securely.

6. Remove the hot-plug fans from the rear fan bracket.
7. Remove the system board.

NOTE: When removing the system board, you may leave the DIMMs, the processors, the PPMs, the Smart Array 5i memory module, and the system battery on the system board, unless you are replacing them as failed items.

8. Remove the rear fan bracket.



To replace the component, reverse the removal procedure.

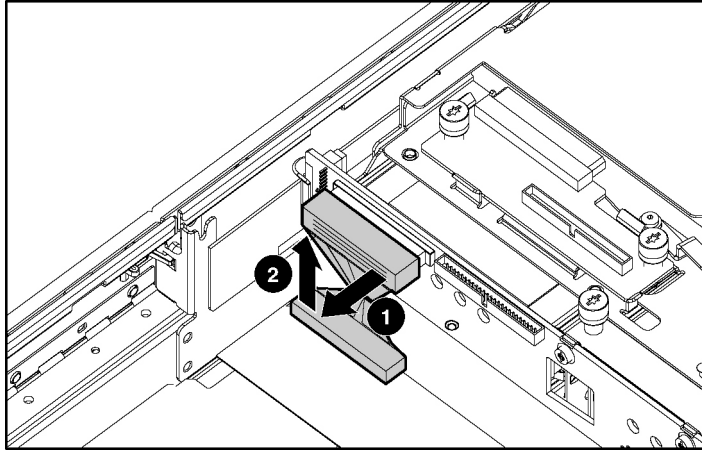
Short SCSI Cables

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the front fan bracket ("Front Fan Bracket" on page [40](#)).

IMPORTANT: For this procedure, you do not need to remove the hot-plug fans from the front fan bracket. When reinstalling the front fan bracket, press the top of each fan to be sure it seats securely.

5. Disconnect and remove the cable.



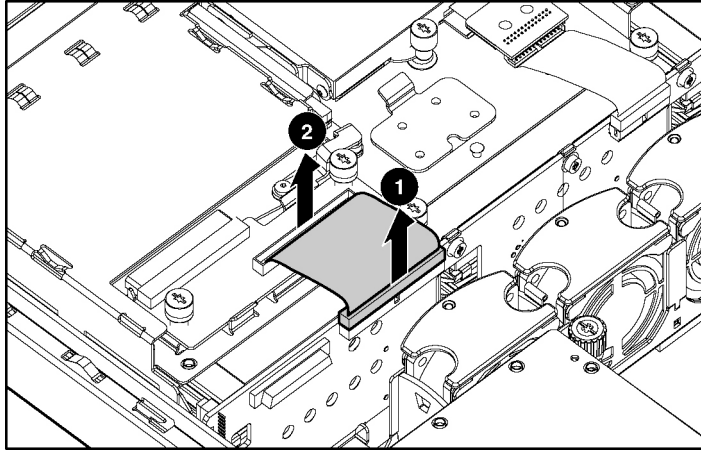
To replace the component, reverse the removal procedure.

Universal Media Bay Cable

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).

4. Disconnect and remove the cable.



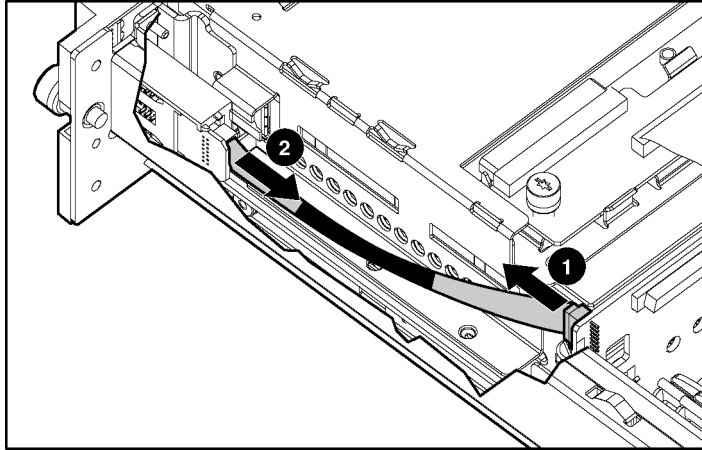
To replace the component, reverse the removal procedure.

Power Button/LED Cable

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Lift the Battery-Backed Write Cache Enabler bracket out of the chassis.

5. Disconnect and remove the cable.



To replace the component, reverse the removal procedure.

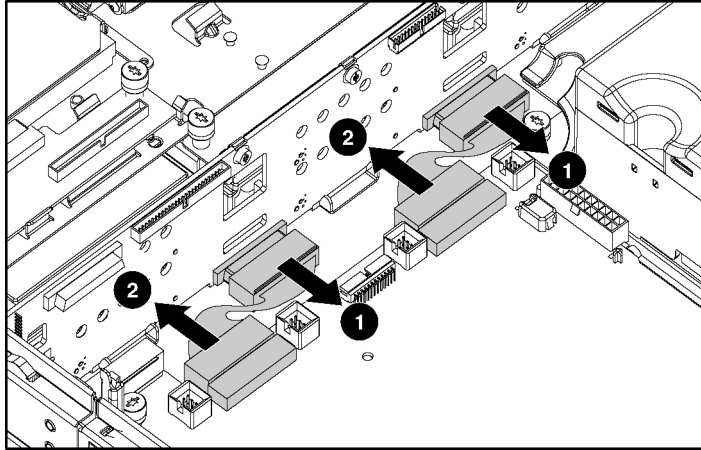
CD-ROM and Diskette Drive System Cables

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the front fan bracket ("Front Fan Bracket" on page [40](#)).

IMPORTANT: For this procedure, you do not need to remove the hot-plug fans from the front fan bracket. When reinstalling the front fan bracket, press the top of each fan to be sure it seats securely.

5. Disconnect and remove the cable.



To replace the component, reverse the removal procedure.

PCI Hot Plug Backplane Cable

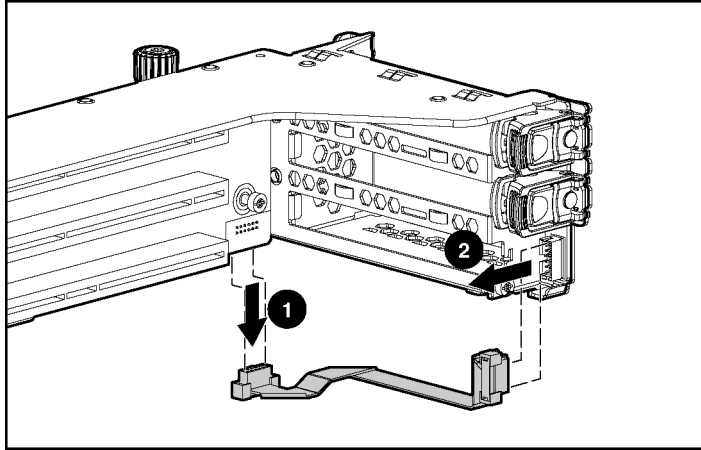
To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Remove the PCI riser cage ("PCI Riser Cage" on page [44](#)).



CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

5. Disconnect and remove the cable.



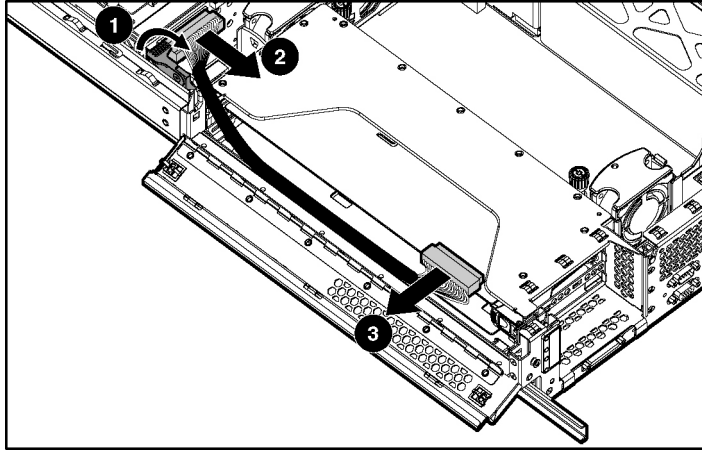
To replace the component, reverse the removal procedure.

Optional Long SCSI Cable

To remove the component:

1. Power down the server.
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page [16](#), "Removing the Server from the Rack" on page [18](#)).
3. Remove the access panel ("Removing the Access Panel" on page [19](#)).
4. Open the locking latch on the front fan bracket.

5. Disconnect and remove the cable.



To replace the component, reverse the removal procedure.

Diagnostic Tools

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| Option ROM Configuration for Arrays | 75 |
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| ROMPaq Utility..... | 76 |
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Automatic Server Recovery

ASR is a feature that causes the system to restart when a catastrophic operating system error occurs, such as a blue screen, ABEND (abnormal end), or panic. A system fail-safe timer, the ASR timer, starts when the System Management driver, also known as the Health Driver, is loaded. When the operating system is functioning properly, the system periodically resets the timer. However, when the operating system fails, the timer expires and restarts the server.

ASR increases server availability by restarting the server within a specified time after a system hang or shutdown. At the same time, the Insight Manager 7 console notifies you by sending a message to a designated pager number that ASR has restarted the system. You can disable ASR from the Insight Manager 7 console or through RBSU.

Insight Manager 7

Insight Manager 7 is a Web-based application that allows system administrators to accomplish normal administrative tasks from any remote location, using a Web browser. Insight Manager 7 provides device management capabilities that consolidate and integrate management data from HP and third-party devices.

IMPORTANT: You must install and use Insight Manager 7 to benefit from the Pre-Failure Warranty for processors, hard drives, and memory modules.

For additional information, refer to the Management CD in the *HP ProLiant Essentials Foundation Pack*.

Integrated Management Log

The IML records hundreds of events and stores them in an easy-to-view form. The IML timestamps each event with 1-minute granularity.

You can view recorded events in the IML in several ways, including the following:

- From within Insight Manager 7
- From within Survey Utility
- From within operating system-specific IML viewers
 - For NetWare: IML Viewer
 - For Windows®: Event Viewer or IML Viewer
 - For Linux: IML Viewer Application
- From within HP Insight Diagnostics

For more information, refer to the Management CD in the *HP ProLiant Essentials Foundation Pack*.

Integrated Lights-Out Technology

Integrated Lights-Out is a standard component of selected ProLiant servers that provides server health and remote server manageability. The iLO subsystem includes an intelligent microprocessor, secure memory, and a dedicated network interface. This design makes iLO independent of the host server and its operating system. The iLO subsystem provides remote access to any authorized network client, sends alerts, and provides other server management functions.

Using iLO, you can:

- Remotely power up, power down, or reboot the host server.
- Send alerts from iLO regardless of the state of the host server.
- Access advanced troubleshooting features through the iLO interface.
- Diagnose iLO using Insight Manager 7 through a Web browser and SNMP alerting.

For more information about iLO features, refer to the *Integrated Lights-Out User Guide* on the Documentation CD or on the HP website (<http://www.hp.com/servers/lights-out>).

Option ROM Configuration for Arrays

Before installing an operating system, you can use the ORCA utility to create the first logical drive, assign RAID levels, and establish online spare configurations.

The utility provides support for the following functions:

- Configuring one or more logical drives using physical drives on one or more SCSI buses
- Viewing the current logical drive configuration
- Deleting a logical drive configuration

If you do not use the utility, ORCA will default to the standard configuration.

For more information about array controller configuration, refer to the *Smart Array Si Plus Controller and Battery-Backed Write Cache Enabler User Guide*, or the *HP ROM-Based Setup Utility User Guide* on the Documentation CD or the HP website (<http://www.compaq.com/support/techpubs/whitepapers>).

ProLiant Essentials Rapid Deployment Pack

The ProLiant Essentials Rapid Deployment Pack software is the preferred method for rapid, high-volume server deployments. The Rapid Deployment Pack software integrates two powerful products: Altiris eXpress Deployment Server and the ProLiant Integration Module.

The Altiris eXpress Deployment Server console's intuitive graphical user interface provides simplified point-and-click and drag-and-drop solutions that enable you to deploy target servers remotely, perform imaging or scripting functions, and maintain software images.

For more information about the ProLiant Essentials Rapid Deployment Pack, refer to the documentation that ships on the ProLiant Essentials Rapid Deployment Pack CD or refer to the HP website (<http://www.hp.com/servers/rdp>).

ROM-Based Setup Utility

RBSU performs a wide range of configuration activities including the following:

- Configuring system devices and installed options
- Displaying system information
- Selecting the operating system
- Selecting the primary boot controller
- Configuring online spare memory

For more information on RBSU, refer to the HP ROM-Based Setup Utility User Guide on the Documentation CD or the white paper on the HP website (<ftp://ftp.compaq.com/pub/products/servers/management/rbsu-whitepaper.pdf>).

ROMPaq Utility

Flash ROM enables you to upgrade the firmware (BIOS) with system or option ROMPaq utilities. To upgrade the BIOS, insert a ROMPaq diskette into the diskette drive and boot the system.

The ROMPaq utility checks the system and provides a choice (if more than one exists) of available ROM revisions. This procedure is the same for both system and option ROMPaq utilities.

For more information about the ROMPaq utility, refer to the HP website (<http://www.hp.com/servers/manage>).

System Online ROM Flash Component Utility

The Online ROM Flash Component Utility enables system administrators to efficiently upgrade system or controller ROM images across a wide range of servers and array controllers. This tool has the following features:

- Works offline and online
- Supports Microsoft® Windows NT®, Windows® 2000, Windows Server™ 2003, Novell Netware, and Linux operating systems

IMPORTANT: This utility supports operating systems that may not be supported by the server. For operating systems supported by the server, refer to the HP website (<ftp://ftp.compaq.com/pub/products/servers/os-support-matrix-310.pdf>).

- Integrates with other software maintenance, deployment, and operating system tools
- Automatically checks for hardware, firmware, and operating system dependencies, and installs only the correct ROM upgrades required by each target server

To download the tool and for more information, refer to the HP website (<http://www.>).

SmartStart Software

SmartStart software is a CD-based, single-server method for installing system software, thereby achieving a well-integrated server and ensuring maximum dependability and supportability. The SmartStart CD contains tools that diagnose problems with the server, configure storage arrays, and update the system ROM.

SmartStart software enables you to:

- Install selected server operating systems using packaged product CDs.
- Install the latest optimized drivers.
- Create and copy standard server configuration scripts using the SmartStart Scripting Toolkit (on page [79](#)) and Configuration Replication Utility.

- Test server hardware using the Insight Diagnostics Utility ("HP Insight Diagnostics" on page [79](#)).
- Update the latest system or option ROM using the ROM Update Utility.
- Install software drivers directly from the CD. With systems that have internet connection, the SmartStart Autorun Menu (on page [78](#)) provides access to the complete list of ProLiant System Software on the website.
- Access ACU, ADU, and Erase Utility

For more information about SmartStart software, refer to the ProLiant Essentials Foundation Pack or the HP website (<http://www.hp.com/servers/smartstart>).

SmartStart Autorun Menu

The SmartStart autorun menu, available on the SmartStart CD ("SmartStart Software" on page [77](#)), enables access to the latest ProLiant support software. The SmartStart autorun menu enables the user to:

- Install the latest ProLiant Support Packs.
- Browse the SmartStart CD and select software for creating diskettes.

The SmartStart autorun menu mimics the support software download pages from the HP website (<http://www.hp.com>), and enables access to the following software, depending on the ProLiant server supported:

- ProLiant Support Packs, which includes software drivers, utilities and management agents
- System and Option ROMPaq diskettes
- Configuration utilities

To access additional software not found on the SmartStart autorun menu, refer to the HP website (<http://www.hp.com/servers/smartstart>) and select **Download Software and Drivers** in the left frame menu.

The SmartStart autorun menu runs on systems with one of the following configurations:

- Microsoft® Windows NT® 4.0 with Microsoft® Internet Explorer 5.5 or later
- Microsoft® Windows® 2000 with Microsoft® Internet Explorer 5.0 or later

To launch the SmartStart autorun menu, insert the SmartStart CD into the CD-ROM drive. The SmartStart autorun menu automatically runs.

- To install drivers, click **Install Software**.
- To access support software to create software diskettes, click **Browse CD**.

SmartStart Scripting Toolkit

The SmartStart Scripting Toolkit is a set of Microsoft® MS-DOS®-based utilities that enables you to configure and deploy servers in a customized, predictable, and unattended manner. These utilities provide scripted server and array replication for mass server deployment and duplicate the configuration of a source server onto target systems with minimum user interaction.

For more information, and to download the SmartStart Scripting Toolkit, refer to the HP website (<http://www.hp.com/servers/sstoolkit>).

HP Insight Diagnostics

The HP Insight Diagnostics utility displays information about the server hardware and tests the system to be sure it is operating properly. You can access the utility from the SmartStart CD or from the HP website (<http://www.hp.com/servers/manage>).

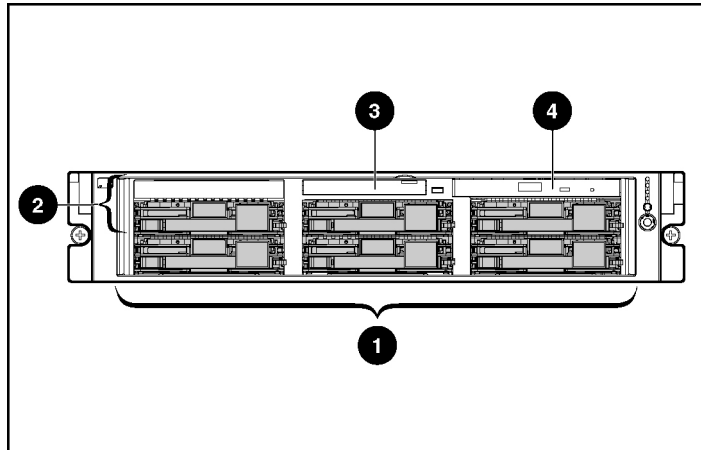
For more information, refer to the Management CD in the *HP ProLiant Essentials Foundation Pack*.

Server Component Identification

In This Section

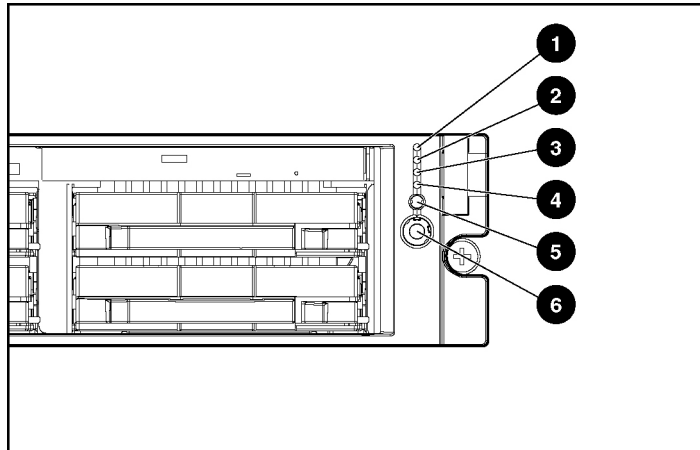
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Front Panel Components



| Item | Description |
|------|---|
| 1 | Hard drive bays |
| 2 | Bay for tape drive or hard drive and tape drive blank |
| 3 | Diskette drive |
| 4 | CD-ROM drive |

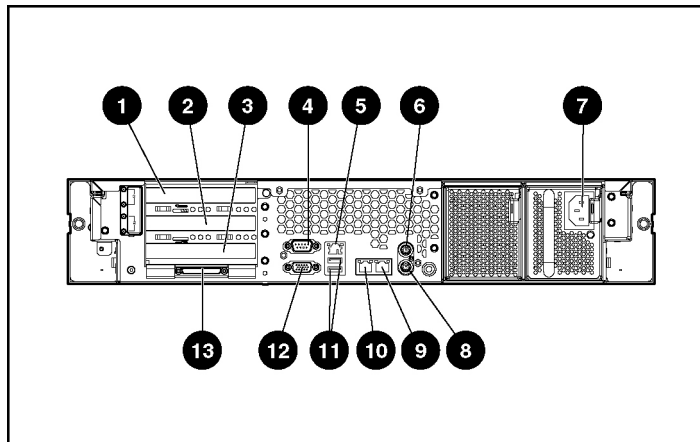
Front Panel LEDs and Buttons



| Item | Description | Status |
|------|------------------------------------|--|
| 1 | Internal health LED | Green = Normal Amber = System degraded. Refer to system board LEDs to identify component in degraded state. Red = System critical. Refer to system board LEDs to identify component in critical state. |
| 2 | External health LED (power supply) | Green = Normal Amber = Power redundancy failure Red = Critical power supply failure |
| 3 | NIC 1 link/activity LED | Green = Network link Flashing = Network link and activity Off = No link to network. If power is off, view the rear panel RJ-45 LEDs for status. |
| 4 | NIC 2 link/activity LED | Green = Network link Flashing = Network link and activity Off = No link to network. If power is off, view the rear panel RJ-45 LEDs for status. |

| Item | Description | Status |
|------|--|---|
| 5 | UID LED button | Blue = Activated Flashing = System remotely managed Off = Deactivated |
| 6 | Power On/Standby button/system power LED | Green = System on Amber = System shut down, but power still applied Off = Power cord not attached or power supply failure |

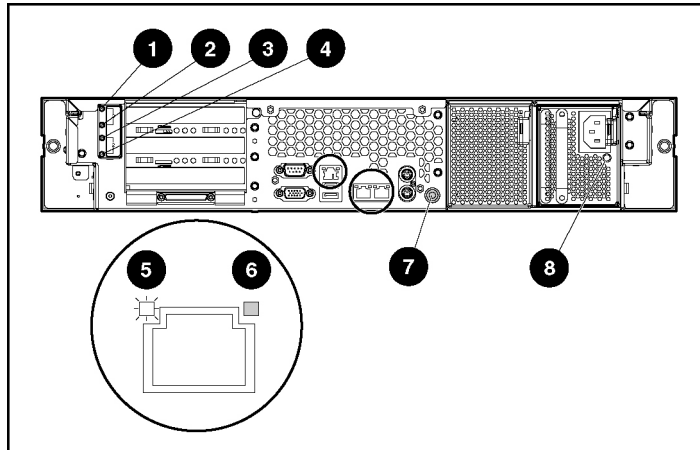
Rear Panel Components



| Item | Description | Connector Color |
|------|--|-----------------|
| 1 | Hot-plug PCI-X expansion slot 3 (bus 6) 64-bit/100-MHz 3.3V | N/A |
| 2 | Hot-plug PCI-X expansion slot 2 (bus 6) 64-bit/100-MHz 3.3V | N/A |
| 3 | Non-hot-plug PCI-X expansion slot 1 (bus 3) 64-bit/133-MHz 3.3V | N/A |
| 4 | Serial connector | Teal |
| 5 | iLO connector | N/A |

| Item | Description | Connector Color |
|------|-------------------------------|-----------------|
| 6 | Mouse connector | Green |
| 7 | Power cord connector | N/A |
| 8 | Keyboard connector | Purple |
| 9 | NIC 1 connector | N/A |
| 10 | NIC 2 connector | N/A |
| 11 | USB connectors | Black |
| 12 | Video connector | Blue |
| 13 | VHDCI SCSI connector (port 1) | N/A |

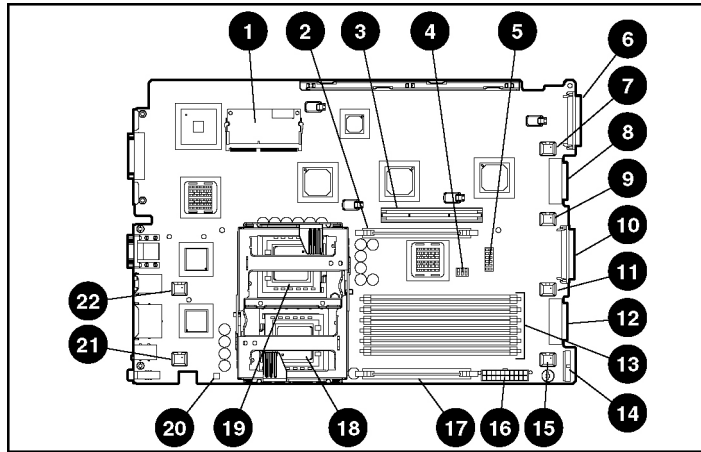
Rear Panel LEDs and Buttons



| Item | Description | LED Color | Status |
|------|---------------------------------|-----------|--|
| 1 | PCI Hot Plug fault LED (slot 3) | Amber | On = Expansion board failed Off = Normal |
| 2 | PCI Hot Plug power LED (slot 3) | Green | On = Power is applied to the slot Flashing = Power is cycling Off = Power is not applied to the slot |

| Item | Description | LED Color | Status |
|------|---------------------------------|-----------|--|
| 3 | PCI Hot Plug fault LED (slot 2) | Amber | On = Expansion board failed Off = Normal |
| 4 | PCI Hot Plug power LED (slot 2) | Green | On = Power is applied to the slot Flashing = Power is cycling Off = Power is not applied to the slot |
| 5 | RJ-45 link LED | Green | On = Linked to network Off = Not linked to network |
| 6 | RJ-45 activity LED | Green | On or flashing = Network activity Off = No network activity |
| 7 | UID LED button | Blue | On = Activated Flashing = System remotely managed Off = Deactivated |
| 8 | Power supply LED | Green | On = Power turned on and power supply functioning properly Off = One or more of the following conditions exists: <ul style="list-style-type: none"> • AC power unavailable • Power supply failed • Power supply in standby mode • Power supply exceeded current limit |

System Board Components



| Item | Description | Item | Description |
|------|-----------------------------------|------|---------------------------------|
| 1 | Smart Array 5i Plus Memory Module | 12 | Diskette drive system connector |
| 2 | PPM 2 slot | 13 | DIMM slots (1-6) |
| 3 | PCI riser cage connector | 14 | Power supply signal connector |
| 4 | Chassis ID switch | 15 | Fan 6 connector |
| 5 | System maintenance switch | 16 | System power connector |
| 6 | SCSI connector (port 2) | 17 | PPM 1 slot |
| 7 | Fan 3 connector | 18 | Processor 1 socket |
| 8 | CD-ROM drive system connector | 19 | Processor 2 socket |
| 9 | Fan 4 connector | 20 | NMI switch |
| 10 | SCSI connector (port 1) | 21 | Fan 2 connector |
| 11 | Fan 5 connector | 22 | Fan 1 connector |

System Maintenance Switch

| Position | Default | Function |
|---|---------|---|
| S1 | Off | Off = iLO security is enabled. On = iLO security is disabled. |
| S2 | Off | Off = System configuration can be changed. On = System configuration is locked. |
| S3 | Off | Reserved |
| S4 | Off | Off = Booting from diskette is controlled by RBSU. On = Booting from diskette is enabled and RBSU is overridden. |
| S5 | Off | Off = Power-on password is enabled. On = Power-on password is disabled. |
| S6 | Off | Off = No function On = Clear NVRAM.* |
| * If you clear NVRAM, you must re-enter the server serial number through RBSU ("Re-Entering the Server Serial Number" on page 63). | | |

NMI Switch

The NMI switch allows administrators to perform a memory dump before performing a hard reset. Crash dump analysis is an essential part of eliminating reliability problems, such as hangs or crashes in operating systems, device drivers, and applications. Many crashes freeze a system, requiring you to do a hard reset. Resetting the system erases any information that would support root cause analysis.

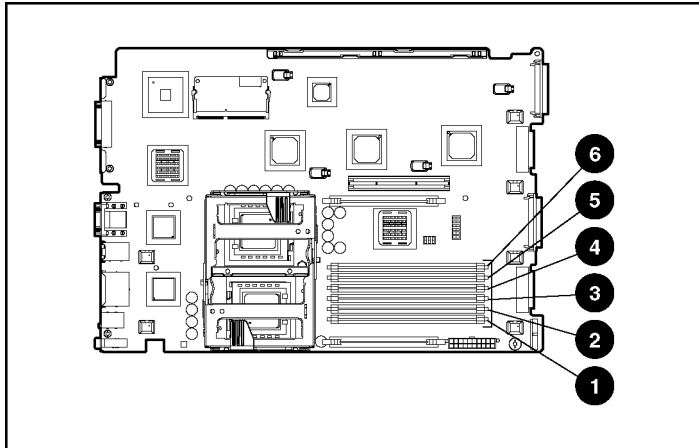
Systems running Microsoft® Windows® operating systems experience a blue screen trap when the operating system crashes. When this happens, Microsoft® recommends that system administrators perform an NMI event by pressing a dump switch. The NMI event enables a hung system to become responsive again.

Chassis ID Switch

The chassis ID switch on the system board is reserved for use by authorized technicians only. Do not modify the switch setting.

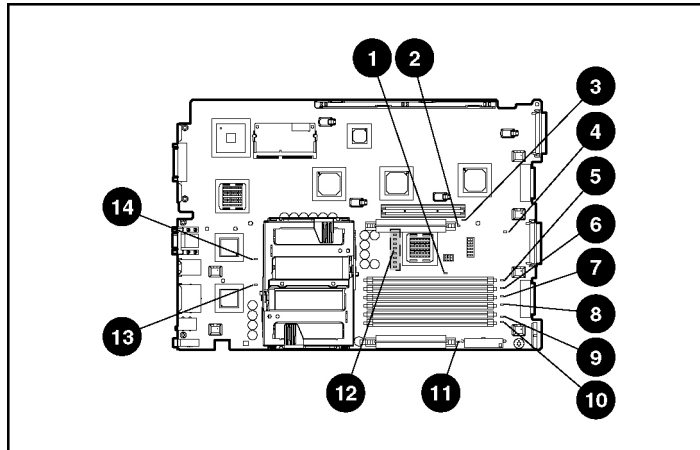
DIMM Slots

DIMM slots are numbered sequentially (1 through 6) and the paired banks are identified by the letters A, B, and C.



| Item | Description |
|------|--------------|
| 1 | DIMM slot 1A |
| 2 | DIMM slot 2A |
| 3 | DIMM slot 3B |
| 4 | DIMM slot 4B |
| 5 | DIMM slot 5C |
| 6 | DIMM slot 6C |

System Board LEDs



| Item | LED Description | Status |
|------|---------------------|---|
| 1 | Online spare memory | Amber = Failover, online spare memory in use Green = Enabled, but not in use Off = Disabled |
| 2 | PPM 2 failure | Amber = PPM failed Off = Normal |
| 3 | Riser interlock | Amber = PCI riser cage not seated Off = PCI riser cage is seated |
| 4 | Overtemperature | Amber = Cautionary or critical temperature level detected Off = Temperature OK |
| 5 | DIMM 6C failure | Amber = Memory failed Off = Normal |
| 6 | DIMM 5C failure | Amber = Memory failed Off = Normal |
| 7 | DIMM 4B failure | Amber = Memory failed Off = Normal |

| Item | LED Description | Status |
|------|---------------------|--|
| 8 | DIMM 3B failure | Amber = Memory failed Off = Normal |
| 9 | DIMM 2A failure | Amber = Memory failed Off = Normal |
| 10 | DIMM 1A failure | Amber = Memory failed Off = Normal |
| 11 | PPM 1 failure | Amber = PPM failed Off = Normal |
| 12 | iLO diagnostic LEDs | Refer to the <i>HP Integrated Lights-Out User Guide</i> on the Documentation CD. |
| 13 | Processor 1 failure | Amber = Processor failed Off = Normal |
| 14 | Processor 2 failure | Amber = Processor failed Off = Normal |

System LEDs and Internal Health LED Combinations

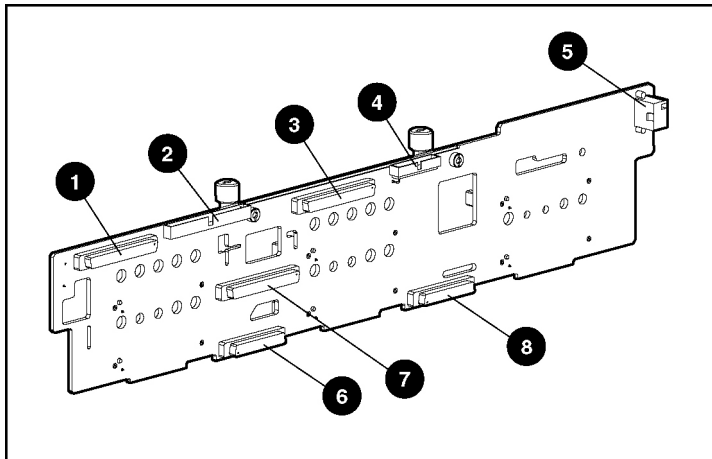
When the internal health LED on the front panel illuminates either amber or red, the server is experiencing a health event. Combinations of illuminated system LEDs and the internal health LED indicate system status.

The front panel health LEDs indicate only the current hardware status. In some situations, Insight Manager 7 may report server status differently than the health LEDs because the software tracks more system attributes.

| System LED and Color | Internal Health LED Color | Status |
|---|---------------------------|--|
| Processor failure, socket X (Amber) | Red | One or more of the following conditions may exist: <ul style="list-style-type: none"> • Processor in socket X has failed. • Processor in socket X failed over to the offline spare. • Processor X is not installed in the socket. • Processor X is unsupported. • ROM detects a failed processor during POST. |
| | Amber | Processor in socket X is in a pre-failure condition. |
| Processor failure, both sockets (Amber) | Red | Processor types are mismatched. |
| PPM failure, slot X (Amber) | Red | <ul style="list-style-type: none"> • PPM in slot X has failed. • PPM is not installed in slot X, but the corresponding processor is installed. |
| DIMM failure, slot X (Amber) | Red | <ul style="list-style-type: none"> • DIMM in slot X has failed. • DIMM in slot X is an unsupported type, and no valid memory exists in another bank. |
| | Amber | <ul style="list-style-type: none"> • DIMM in slot X has reached single-bit correctable error threshold. • DIMM in slot X is in a pre-failure condition. • DIMM in slot X is an unsupported type, but valid memory exists in another bank. |
| DIMM failure, all slots in one bank (Amber) | Red | No valid or usable memory is installed in the system. |
| Overtemperature (Amber) | Red | <ul style="list-style-type: none"> • The Health Driver has detected a cautionary temperature level. • The server has detected a hardware critical temperature level. |
| Riser interlock (Amber) | Red | PCI riser cage is not seated. |
| Online spare memory (Amber) | Amber | Bank X failed over to the online spare memory bank. |
| Power converter module (Amber) | Red | Power converter module has failed. |

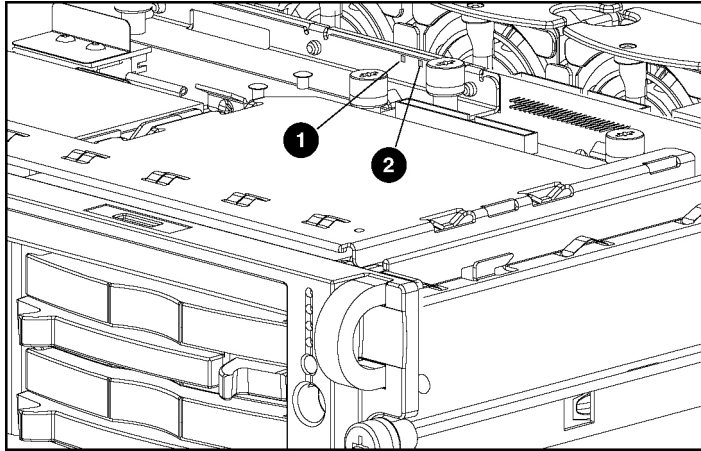
| System LED and Color | Internal Health LED Color | Status |
|----------------------------------|---------------------------|--|
| Fan (Amber) | Amber | Redundant fan has failed. |
| | Red | The minimum fan requirements are not being met. One or more fans have failed or are missing. |
| SCSI configuration error (Amber) | Red | SCSI cabling or terminator configuration is incorrect for SCSI backplane. |

SCSI Backplane Components



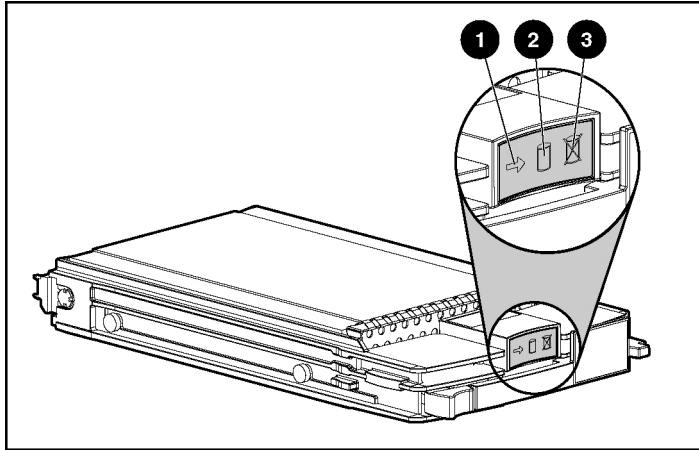
| Item | Description |
|------|---|
| 1 | SCSI connector (port 2) |
| 2 | CD-ROM drive connector |
| 3 | SCSI connector (port 1) |
| 4 | Diskette drive connector |
| 5 | Power connector |
| 6 | CD-ROM drive system connector |
| 7 | SCSI connector (used with a jumper or terminator board) |
| 8 | Diskette drive system connector |

SCSI Backplane LEDs



| Item | LED Description | Status |
|------|--------------------------|---|
| 1 | SCSI configuration | On = Simplex Off = Duplex |
| 2 | SCSI configuration error | On = SCSI cabling or terminator configuration is incorrect Off = SCSI cabling or terminator configuration is correct |

Hot-Plug SCSI Hard Drive LEDs

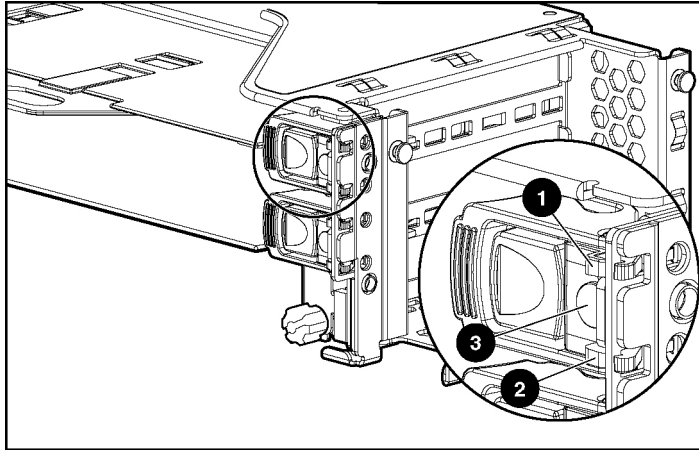


| Item | LED Description | Status |
|------|-----------------|---|
| 1 | Activity status | On = Drive activity Flashing = High activity on the drive or drive is being configured as part of an array. Off = No drive activity |
| 2 | Online status | On = Drive is part of an array and is currently working. Flashing = Drive is actively online. Off = Drive is offline. |
| 3 | Fault status | On = Drive failure Flashing = Fault-process activity Off = No fault-process activity |

Hot-Plug SCSI Hard Drive LED Combinations

| Activity LED (1) | Online LED (2) | Fault LED (3) | Interpretation |
|----------------------|----------------|---------------|---|
| On, off, or flashing | On or off | Flashing | A predictive failure alert has been received for this drive. Replace the drive as soon as possible. |
| On, off, or flashing | On | Off | The drive is online and is configured as part of an array. If the array is configured for fault tolerance and all other drives in the array are online, and a predictive failure alert is received or a drive capacity upgrade is in progress, you may replace the drive online. |
| On or flashing | Flashing | Off | Do not remove the drive. Removing a drive may terminate the current operation and cause data loss. The drive is rebuilding or undergoing capacity expansion. |
| On | Off | Off | Do not remove the drive. The drive is being accessed, but (1) it is not configured as part of an array; (2) it is a replacement drive and rebuild has not yet started; or (3) it is spinning up during the POST sequence. |
| Flashing | Flashing | Flashing | Do not remove the drive. Removing a drive may cause data loss in non-fault-tolerant configurations. Either (1) the drive is part of an array being selected by an array configuration utility; (2) Drive Identification has been selected in Insight Manager; or (3) drive firmware is being updated. |
| Off | Off | On | The drive has failed and been placed offline. You may replace the drive. |
| Off | Off | Off | Either (1) the drive is not configured as part of an array; (2) the drive is configured as part of an array, but it is a replacement drive that is not being accessed or being rebuilt yet; or (3) the drive is configured as an online spare. If the drive is connected to an array controller, you may replace the drive online. |

Internal PCI Hot Plug LEDs and Button



| Item | Description | Status |
|------|---------------------|---|
| 1 | Fault LED (Amber) | On = Expansion board failed. Off = Normal |
| 2 | Power LED (Green) | On = Power is applied to the slot. Flashing = Power is cycling. Off = Power is not applied to the slot. |
| 3 | PCI Hot Plug button | N/A |

PCI Hot Plug LED Status Combinations

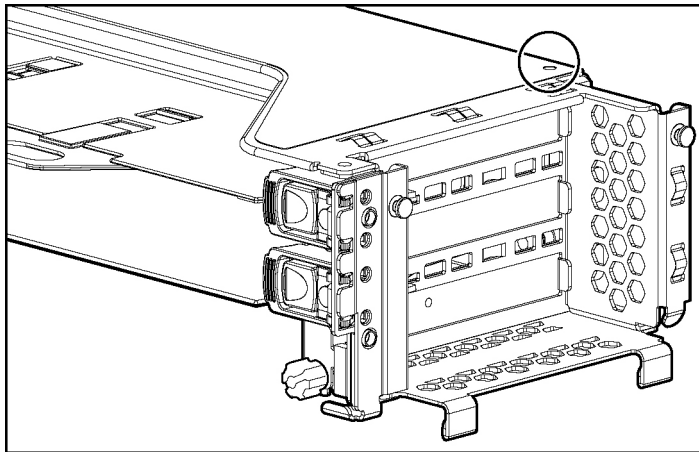
| Power LED (Green) | Fault LED (Amber) | OK to open? | Slot Status |
|-------------------|-------------------|-------------|---|
| On | Off | No | The power to the slot is on and the slot is functioning normally. Do NOT open the slot release lever. |

| Power LED (Green) | Fault LED (Amber) | OK to open? | Slot Status |
|-------------------|-------------------|-------------|--|
| On | On | No | The power to the slot is on, but the slot needs attention for a possible problem with the slot, board, or driver. DO NOT open the slot release lever. Examine the logs and Insight Manager 7. If the expansion board is faulty, remove or replace the board. |
| Flashing | On or off | No | The power to the slot is being turned off or on, which may take several seconds. DO NOT open the slot release lever. To cancel the operation, press the PCI Hot Plug button. |
| Off | On | Yes | The power to the slot is off, but the slot needs attention for a possible problem with the slot, board, or driver. |
| Off | Off | Yes | The power to the slot is off. |

PCI Riser Cage LED



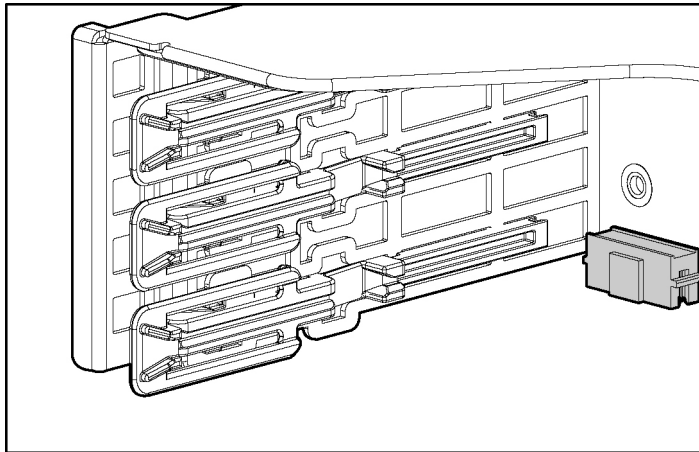
CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.



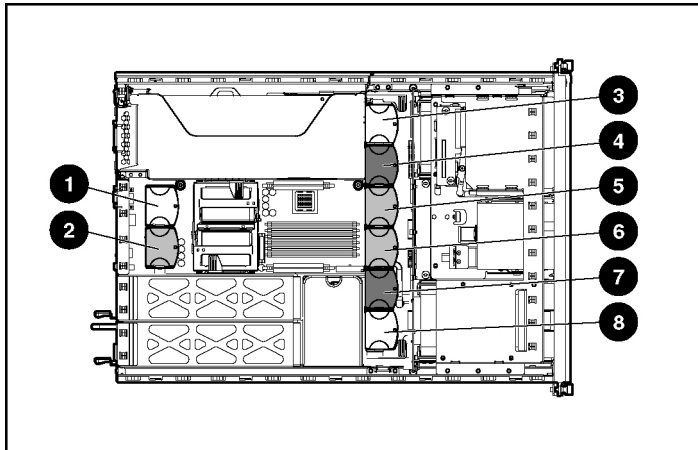
| |
|-----------------------------|
| Status |
| On = AC power connected |
| Off = AC power disconnected |

Remote Management Connector

The 30-pin remote management connector, located on the PCI riser cage, is used to cable the Remote Insight Lights-Out Edition II option. For more information, refer to "RILOE II Cabling" in the user guide or the *Remote Insight Lights-Out Edition II User Guide* on the Documentation CD.

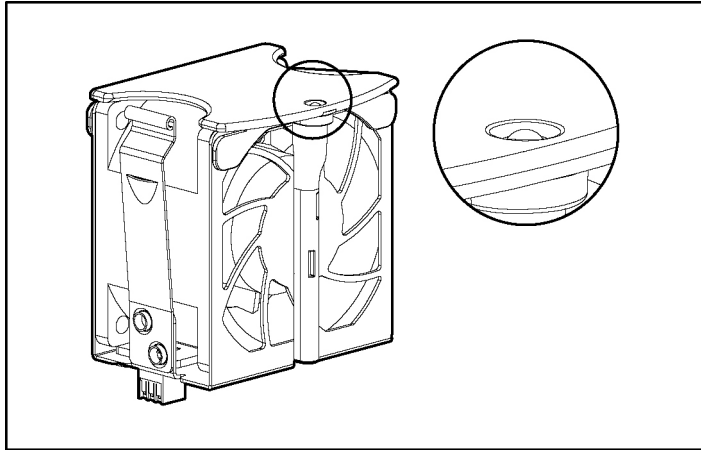


Identifying Hot-Plug Fans



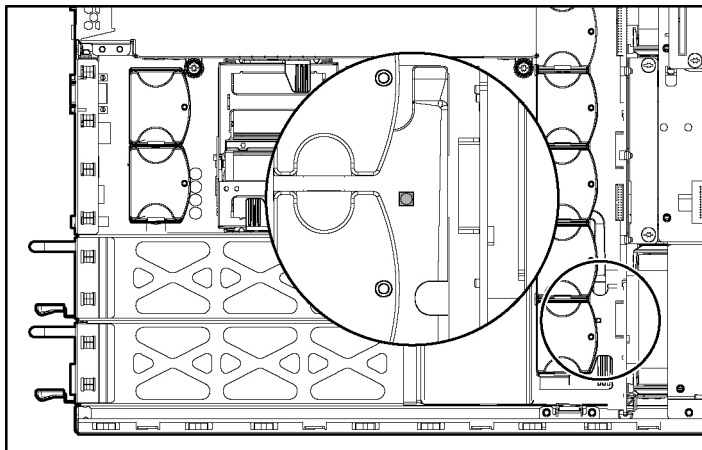
| Item | Description | Zone | Configuration |
|------|-------------|----------------------------|------------------|
| 1 | Fan 1 | Processor | Redundant |
| 2 | Fan 2 | Processor | Primary |
| 3 | Fan 3 | I/O | Redundant |
| 4 | Fan 4 | I/O and processor | Primary (shared) |
| 5 | Fan 5 | Processor | Primary |
| 6 | Fan 6 | Processor | Primary |
| 7 | Fan 7 | Power supply and processor | Primary (shared) |
| 8 | Fan 8 | Power supply | Redundant |

Hot-Plug Fan LED



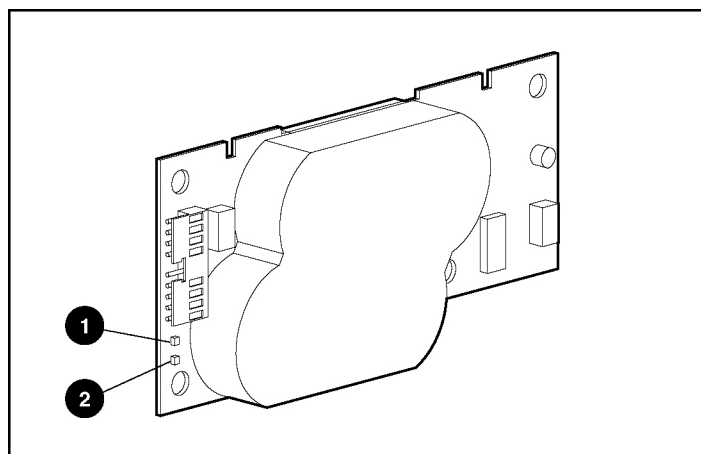
| Status |
|----------------------------|
| Green = Operating normally |
| Amber = Failed |
| Off = No power |

Power Converter Module LED



| |
|--------------------------|
| Status |
| Amber = Failed |
| Off = Operating normally |

Battery-Backed Write Cache Enabler LEDs



| Item | LED Color |
|------|-----------|
| 1 | Amber |
| 2 | Green |

For LED status information, refer to "Battery-Backed Write Cache Enabler LED Statuses (on page [103](#))."

Battery-Backed Write Cache Enabler LED Statuses

| Server Status | LED Status | Battery Module Status |
|--|-----------------------------------|--|
| Server is on and has normal run time | Green = On | Fast charging |
| | Green = Off | Trickle charging |
| | Amber = On | A short exists in the connection of one or more of the four button cells within the battery module |
| | Amber = Blinking | An open exists in the circuit between the positive and negative terminals of the battery module |
| | Amber = Off | Normal |
| Server is on and is in the first 30 seconds after power up | Green = On Amber = On | Temporary lock-out state; data was lost due to cable being detached |
| Server is off and is in data retention mode | Amber = Blinking every 15 seconds | User data held in write cache is being backed up |

Specifications

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Server Specifications

| Dimensions | |
|------------------------------|----------------------------|
| Height | 8.59 cm (3.38 in) |
| Depth | 65.41 cm (25.75 in) |
| Width | 44.45 cm (17.50 in) |
| Weight (maximum) | 27.22 kg (60 lb) |
| Weight (no drives installed) | 20.41 kg (47.18 lb) |
| Input requirements | |
| Rated input voltage | 100 VAC to 240 VAC |
| Rated input frequency | 50 Hz to 60 Hz |
| Rated input current | 6 A (110 V) to 3 A (220 V) |
| Rated input power | 600 W |
| BTUs per hour | 2050 |
| Power supply output | |
| Rated steady-state power | 400 W |
| Maximum peak power | 400 W |

Environmental Specifications

| Temperature range | |
|---|--------------------------------|
| Operating | 10°C to 35°C (50°F to 95°F) |
| Shipping | -40°C to 70°C (-40°F to 158°F) |
| Maximum wet bulb temperature | 28°C (82.4°F) |
| NOTE: All temperature ratings shown are for sea level. An altitude derating of 1°C per 300 m (1.8°F per 1,000 ft) to 3048 m (10,000 ft) is applicable. No direct sunlight allowed. | |
| Relative humidity (noncondensing) | |
| Operating | 10% to 90% |
| Non-operating | 5% to 95% |
| NOTE: Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage corresponds to a pressure minimum of 70 KPa. | |

Hot-Plug Power Supply Calculations

For hot-plug power supply specifications and calculators to determine electrical and heat loading for the server, refer to the HP Enterprise Configurator website (<http://h30099.www3.hp.com/configurator/>).

DDR SDRAM DIMM Specifications

| Item | Description |
|--|---|
| Size | 256 MB, 512 MB, 1 GB, 2 GB |
| Width | 72 bits |
| Upgrade requirement | Any combination of like-paired DDR SDRAM DIMMs that provide a minimum of 512 MB |
| Note: Use only 256-, 512-MB, 1-GB, or 2-GB, 72-bit wide, 2.5-V, PC2100 Registered ECC DDR SDRAM. Use Compaq branded or HP DDR SDRAM only. | |

1.44-MB Diskette Drive Specifications

| Item | Description |
|----------------------------------|------------------|
| Dimensions | |
| Height | 12.7 mm (0.5 in) |
| Width | 96 mm (3.8 in) |
| Depth | 130 mm (5.1 in) |
| LEDs (front panel) | Green = On |
| Read/write capacity per diskette | |
| High density | 1.44 MB |
| Low density | 720 KB |
| Drives supported | 1 |
| Drive height | One-third height |
| Drive rotation | 300 rpm |
| Transfer rate | |
| High | 500 Kb/s |
| Low | 250 Kb/s |
| Bytes/sector | 512 |
| Sectors per track (high/low) | 18/9 |
| Tracks per side (high/low) | 80/80 |
| Access times | |
| Track-to-track (high/low) | 3 ms/6 ms |
| Average (high/low) | 169 ms/94 ms |
| Setting time | 15 ms |
| Latency average | 100 ms |
| Cylinders (high/low) | 80/80 |
| Read/write heads | 2 |

CD-ROM Drive Specifications

| Item | Description |
|------------------------|---|
| Applicable disk | CD-ROM (modes 1 and 2); mixed mode (audio and data combined); CD-DA; Photo CD (single/multiple-session), CD-XA ready; CDi ready |
| Capacity | 550 MB (mode 1, 12 cm) |
| | 640 MB (mode 2, 12 cm) |
| Block size | 2368, 2352 bytes (mode 0) |
| | 2352, 2340, 2336, 2048 bytes (mode 1) |
| | 2352, 2340, 2336, 2048 bytes (mode 2) |
| Dimensions | |
| Height | 12.7 mm (0.50 inch) |
| Depth | 132.08 mm (5.20 inch) |
| Width | 132.08 mm (5.20 inch) |
| Weight | 0.34 kg (0.75 lb) |
| Data transfer rate | |
| Sustained | 150 KB/s (sustained 1X), 1500/3600 KB/s (10X to 24X) |
| Burst | 16.6 MB/s |
| Access times (typical) | |
| Full stroke | 300 ms |
| Random | 140 ms |
| Diameter | 12 cm, 8 cm (4.70 inch, 3.15 inch) |
| Thickness | 1.2 mm (0.05 inch) |
| Track pitch | 1.6 μm (6.3×10^{-7} inch) |
| Cache/buffer | 128 KB |
| Startup time | < 10 s |
| Stop time | < 5 s (single); < 30 s (multisession) |
| Laser parameters | |
| Type | Semiconductor laser GaAs |

| Item | Description |
|----------------------|-----------------------------|
| Wave length | 700 ± 25 nm |
| Divergence angle | 53.5° ± 1.5° |
| Output power | 0.14 mW |
| Operating conditions | |
| Temperature | 5°C to 45°C (41°F to 118°F) |
| Humidity | 5% to 90% |

Wide Ultra3 SCSI Hard Drive Specifications

| Item | 9-GB SCSI Drive | 18-GB SCSI Drive | 36-GB SCSI Drive | 72-GB SCSI Drive |
|---|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Capacity | 9100.0 MB | 18,209.8 MB | 36,419.6 MB | 72,839.2 MB |
| Height | One-third, 1.0 in | One-third, 1.0 in | One-third, 1.0 in | One-third, 1.0 in |
| Size | 3.5 in | 3.5 in | 3.5 in | 3.5 in |
| Interface * | Wide Ultra3 | Wide Ultra3 | Wide Ultra3 | Wide Ultra3 |
| Transfer rate | 160 MB/sec | 160 MB/sec | 160 MB/sec | 160 MB/sec |
| Rotational speed | 10,000 rpm | 10,000 rpm | 10,000 rpm | 10,000 rpm |
| Bytes per sector | 512 | 512 | 512 | 512 |
| Logical blocks | 17,773,524 | 35,566,080 | 71,132,000 | 142,264,000 |
| Operating temperature | 10°C to 35°C (50°F to 95°F) | 10°C to 35°C (50°F to 95°F) | 10°C to 35°C (50°F to 95°F) | 10°C to 35°C (50°F to 95°F) |
| * The server also supports Ultra2 SCSI hard drives. | | | | |

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