HP ProLiant ML370 Generation 3 Server Maintenance and Service Guide

January 2004 (Sixth Edition)
Part Number 281778-006

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Contents

Index

About This Guide

This maintenance and service guide is a troubleshooting guide that can be used for reference when servicing the HP ProLiant ML370 Generation 3 server.

WARNING: To reduce the risk of personal injury from electric shock and hazardous energy levels, only authorized service technicians should attempt to repair this equipment. Improper repairs can create conditions that are hazardous.

Audience Assumptions

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

Technician Notes

WARNING: Only authorized technicians trained by HP should attempt to repair this equipment. All troubleshooting and repair procedures are detailed to allow only subassembly/module-level repair. Because of the complexity of the individual boards and subassemblies, no one should attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.

WARNING: To reduce the risk of personal injury from electric shock and hazardous energy levels, do not exceed the level of repairs specified in these procedures. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create conditions that are hazardous.

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

- **Disconnect power from the system by unplugging all power cords from the power supplies.**
- **Do not disable the power cord grounding plug. The grounding plug is an important safety feature.**
- **Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.**

CAUTION: To properly ventilate the system, you must provide at least 7.6 cm (3.0 in) of clearance at the front and back of the server.

CAUTION: The computer is designed to be electrically grounded (earthed). To ensure proper operation, plug the AC power cord into a properly grounded AC outlet only.

NOTE: Any indications of component replacement or printed wiring board modifications may void any warranty.

Where to Go for Additional Help

In addition to this guide, the following information sources are available:

- User documentation
- *Service Quick Reference Guide*
- Service training guides
- Service advisories and bulletins
- QuickFind information services
- Insight Manager software

Integrated Management Log

The server includes an integrated, nonvolatile management log that contains fault and management information. The contents of the Integrated Management Log (IML) can be viewed with Insight Manager.

Telephone Numbers

For the name of the nearest HP authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.

For HP technical support:

- In the United States and Canada, call 1-800-652-6672.
- Outside the United States and Canada, refer to

  www.hp.com

1

Illustrated Parts Catalog

This chapter provides the illustrated parts breakdown and a spare parts list for ProLiant ML370 Generation 3 servers. Figure 1-1 shows the mechanical components. Figure 1-2 shows the system components. Refer to Table 1-1 for the names of referenced spare parts.

Mechanical Components

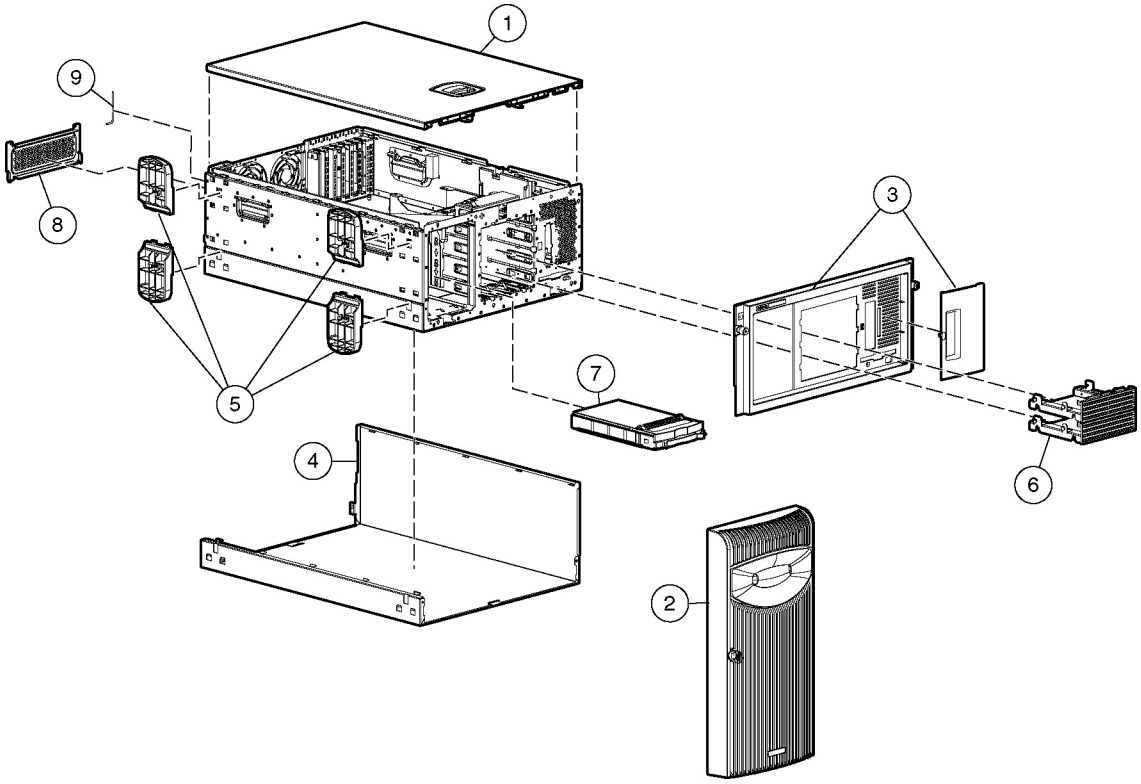


Figure 1-1: Mechanical components

System Components

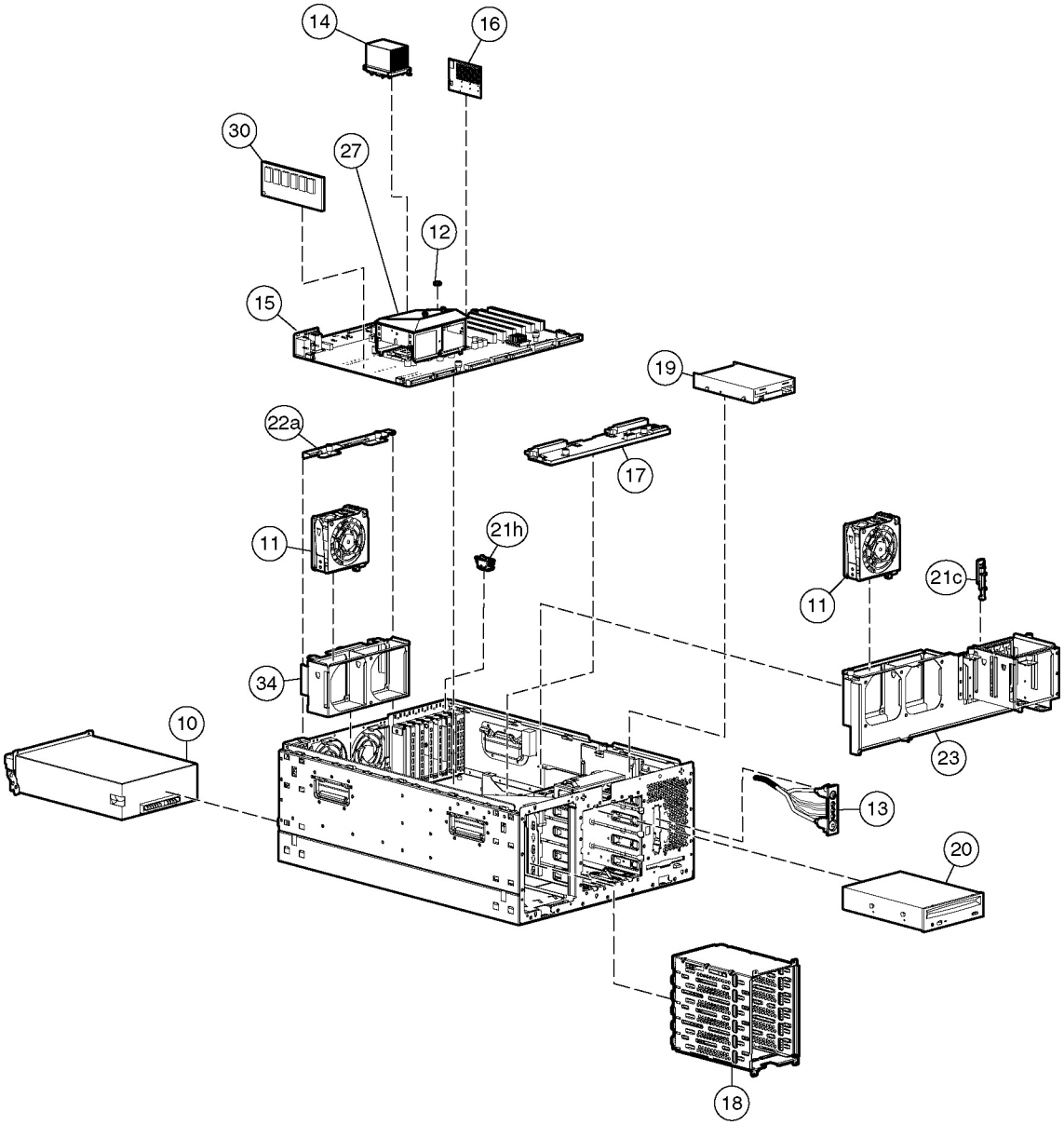


Figure 1-2: System components

Mechanical and System Spare Parts List

Table 1-1: Mechanical and System Spare Parts List

Item	Description	Assembly Number	Spare Part Number
Mechanical Components			
1	Access panel (top cover)	224969-001	230985-001
2	Front bezel (tower model only)		
	a) 2.4-GHz and 2.8-GHz models	224991-001	230996-001
	b) 3.06-GHz and above models	224991-002	319600-001
3	Rack bezel (rack model only)		
	a) 2.4-GHz and 2.8-GHz models	224992-002	230997-001
	b) 3.06-GHz and above models	224992-003	319601-001
4	Tower hood cover	224954-001	233410-001
5	Feet (tower model only) (part of Plastics kit #21)	228148-001	
6	Removable media blanks	141289-002	231212-001
7	Hard drive blank	302531-002	313046-001
8	Power supply blank	224955-001	233601-001
9	Torx T-15 tool	249476-001	290557-001
System Components			
10	Power supply, 500 W	216068-002	230993-001
11	Fans, 92 mm	224994-001	231213-001
12	3.3-V lithium battery	334149-001	179322-001
13	Power button/switch with cable	225034-001	230986-001
14	Processor with heatsink		
	a) Intel® Xeon™ 2.4-GHz 512-KB L2 cache	261668-004	290558-001
	b) Intel Xeon 2.8-GHz 512-KB L2 cache	261668-006	307103-001
	c) Intel Xeon 2.8-GHz 1-MB L3 cache	336417-004	359650-001
	d) Intel Xeon 3.06-GHz 512-KB L2 cache	288599-007	314669-001
	e) Intel Xeon 3.06-GHz 1-MB L3 cache	336417-001	336856-001
	f) Intel Xeon 3.2-GHz 1-MB L3 cache	336417-002	347406-001
	g) Intel Xeon 3.2-GHz 2-MB L3 cache	354750-001	356534-001

continued

Table 1-1: Mechanical and System Spare Parts List *continued*

Item	Description	Assembly Number	Spare Part Number
Boards			
15	System board with processor cage		
	a) 2.4-GHz and 2.8-GHz models	011653-001	290559-001
	b) 3.06-GHz and above models	011945-002	316864-001
16	Processor power module (PPM)	292718-001	289564-001
17	Power supply backplane	011080-001	230982-001
18	SCSI Backplane with 6 x 1-inch drive cage		262171-001
Mass Storage Devices			
19	Diskette drive, 3-mode, 1.44-MB	233327-001	233409-001
20	CD-ROM drive, IDE, 48X	266072-001	288894-001
Miscellaneous			
21	Plastics kit		230979-001
	a) Foot, stone (refer to item number 5)*	228148-001	
	b) Receptacle, door snap, stone*	148525-003	
	c) Retainer, card guide, PCI	233614-004	
	d) Fastener, 0.15-inch plastic standoff*	225249-001	
	e) Fastener, 0.202-inch plastic standoff*	225250-001	
	f) Clip, cable, adhesive, 1.77-inch*	241347-007	
	g) Clip, retainer, 0.125-inch diameter*	115151-007	
	h) Assembly, PCI latch and base	228194-002	
22	Hardware kit		230980-001
	a) Bracket, rear, removable	224965-001	
	b) Bracket, diskette tray*	224953-001	
	c) Bracket, diskette retainer*	228189-001	
	d) Cover, slot, PCI expansion*	306348-001	
	e) Bracket, blank, option board, PCI latch*	228072-001	
23	Wall, center	224949-002	230999-001
24	Rack mounting kit*	232192-001	230994-001
25	Country kit*	282311-002	320753-001
26	Return kit, packing box and cushions*		230990-001
27	Processor air baffle	270593-001	290556-001

* Not shown

continued

Table 1-1: Mechanical and System Spare Parts List *continued*

Item	Description	Assembly Number	Spare Part Number
Cables			
28	Miscellaneous data cable kit*		292229-001
	a) IDE hard drive/CD-ROM drive data cable	108950-041	
	b) Diskette drive cable	271946-001	
	c) Point-to-point SCSI cable	166298-037	
	d) 3-device SCSI cable	148785-006	
29	Miscellaneous power cable kit*		230987-001
	a) Diskette and CD-ROM drive power cable	224997-001	
	b) Power supply cable, 24-pin	224996-001	
	c) Fan cage cable	224998-001	
Memory			
30	256-MB DDR DIMM PC2100, 1.2-in	261583-031	300699-001
31	512-MB DDR DIMM PC2100, 1.2-in*	261584-041	300700-001
32	1-GB DDR DIMM PC2100, 1.2-in*	261585-041	300701-001
33	2-GB DDR DIMM PC2100, 1.2-in*	261586-051	300702-001
Options			
34	Rear fan cage	224956-001	230984-001
35	Telco rack mounting kit*	233752-001	236856-001
36	Third-party rack mounting kit*	232336-001	236857-001
37	Two-bay, hot-plug drive cage*	236894-001	253761-001
38	Keyboard*	296433-005	311059-001
39	Mouse*	103179-165	311060-001
40	AC power cord*	163719-002	187335-001
41	SCSI Ultra320 universal hot-plug hard drive*		
	a) 36.4-GB 10K rpm	286713-B22	289041-001
	b) 72.8-GB 10K rpm	286714-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	286778-B22	289243-001

* Not shown

2

Removal and Replacement Procedures

This chapter provides subassembly/module-level removal and replacement procedures for the server. After completing all necessary removal and replacement procedures, run the Diagnostics program to verify that all components operate properly.

You may need the following:

- Torx T-15 tool (ships standard with the server)
- Diagnostics Utility—The Diagnostics utility tests the operation of server hardware and isolates failed parts, whenever possible. Diagnostic error codes are generated when the Diagnostics utility recognizes a problem. These error codes help identify defective components. A Diagnostics diskette can be made by running the Server Diagnostics file available for download from the following website:

  www.hp.com/servers/manage/

Safety Considerations

Before performing service procedures, review the following safety information.

Electrostatic Discharge

A discharge of static electricity can damage static-sensitive devices or microcircuitry. Proper packaging and grounding techniques are necessary precautions to prevent damage. To prevent electrostatic damage, observe the following precautions:

- Transport products in static-safe containers such as conductive tubes, bags, or boxes.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free stations.
- Cover workstations with approved static-dissipating material. Use a wrist strap connected to the work surface and properly grounded tools and equipment.
- Keep work area free of nonconductive materials such as ordinary plastic assembly aids and foam packing.
- Always be properly grounded when touching a static-sensitive component or assembly.
- Avoid touching pins, leads, or circuitry.
- Always place drives PCB assembly-side down.

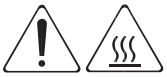
Symbols on Equipment

up to 34 kg

up to 75 lb

Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

WARNING: To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manual material handling.



Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or a hot component.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching it.

Any surface or area of the equipment marked with these symbols indicates the presence of electric shock hazards. The enclosed area contains no operator serviceable parts.

WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure.

Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

WARNING: To reduce the risk of electric shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

This label or equivalent is located on the surface of the CD-ROM drive. This label indicates that the product is classified as a Class 1 Laser Product.

Rack Warnings and Cautions

WARNING: To reduce the risk of personal injury or damage to the equipment, adequately stabilize the rack before extending a component outside the rack. Extend only one component at a time. A rack may become unstable if more than one component is extended.

WARNING: To reduce the risk of personal injury or equipment damage, be sure that:

- **The leveling jacks are extended to the floor.**
- **The full weight of the rack rests on the leveling jacks.**
- **The stabilizers are attached to the rack for single-rack installation.**
- **The racks are installed together in multiple-rack installations.**

WARNING: When installing the server in a telco rack, adequately secure the rack frame to the building structure at the top and bottom.

WARNING: To reduce the risk of personal injury or damage to the equipment, use two or more people to safely unload the rack from the pallet. An empty 42U rack weighs 115 kg (253 lb), is over 2.1 m (7 ft) tall, and may become unstable when moved on its casters. Handle the rack from both sides as it rolls down the ramp from the pallet. Do not stand in front of the rack.

CAUTION: Always begin by mounting the heaviest item on the bottom of the rack. Continue to populate the rack from the bottom to the top.

Server Warnings and Cautions

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

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) electrical outlet that is easily accessible at all times.**
- **Unplug the power cord from each power supply to disconnect power to the equipment.**

WARNING: Because the rack allows you to stack server components in a vertical rather than a horizontal plane, you must take precautions to provide for rack stability and safety to protect both personnel and property. Heed all cautions and warnings throughout the installation instructions that came with the server.

CAUTION: Protect the server from power fluctuations and temporary interruptions with a regulating uninterruptible power supply (UPS). This device protects the hardware from damage caused by power surges and voltage spikes and keeps the system in operation during a power failure.

CAUTION: Do not operate the server for extended 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 do one or more of the following:

- Extend the server from the rack.

  If you are performing service procedures in an HP, Compaq branded, or round-hole rack cabinet, you can use the locking feature of the rack rails to support the server and gain access to internal components.

- Power down the server.

  If you must remove the server from a rack or a non-hot-plug component from the server, power down the server and disconnect the power cables before removal.

- Remove the server from the rack.

  If the rack environment, cabling configuration, or the server location in the rack creates unmanageable conditions, remove the server from the rack. If the server is installed in a telco rack, you must remove the server from the rack to access internal components.

Extending the Server from the Rack

To extend the server from the rack:

1. Loosen the thumbscrews that secure the front bezel to the front of the rack (1).
2. Extend the server on the sliding rack rails until the spring-load rail lock engages (2).

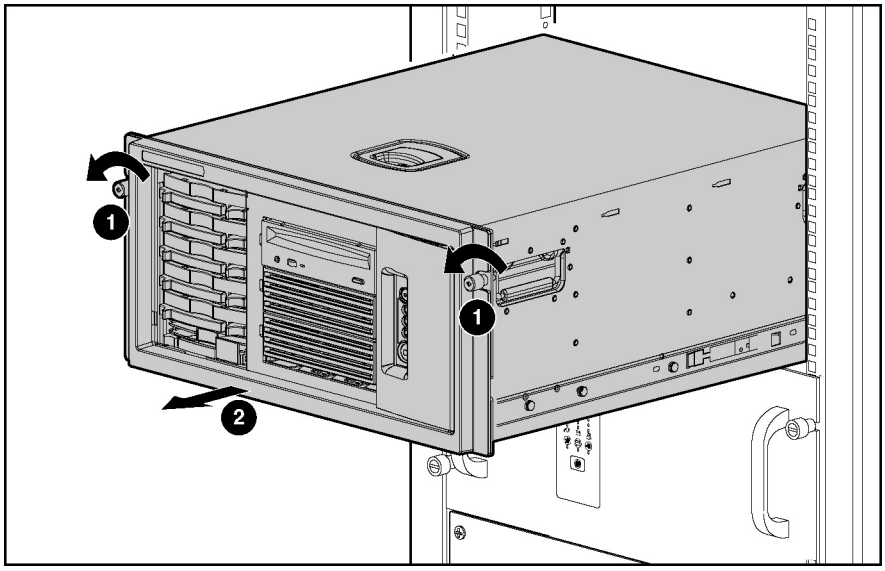


Figure 2-1: Extending the server from the rack

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

After performing the installation or maintenance procedure:

1. Press the tabs on the ends of both sliding server rails and slide the server back into the rack.

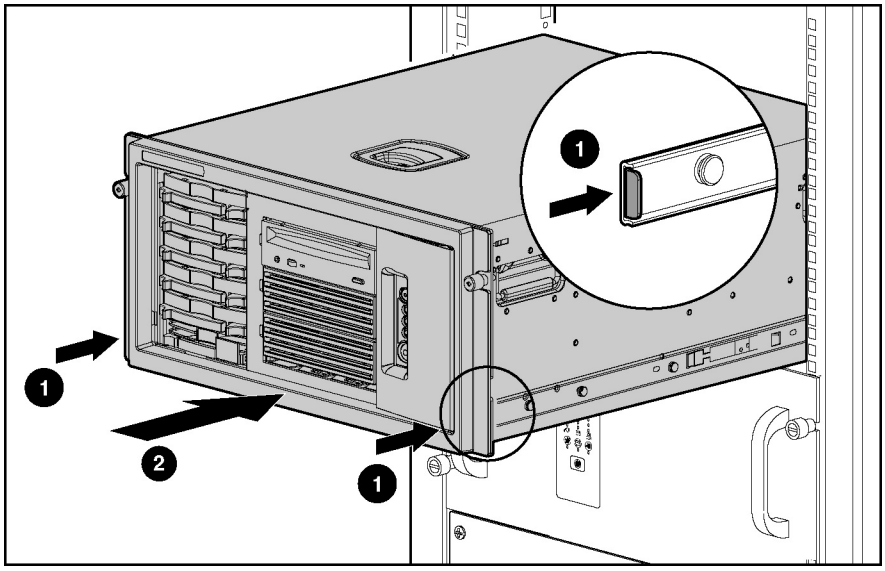
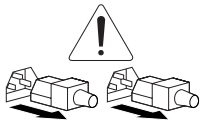


Figure 2-2: Server rails tab locations

2. Tighten the thumbscrews to secure the server in the rack.

Powering Down the Server

System power for the server does not completely shut off with the front panel Power On/Standby button. The button toggles between on and standby modes, rather than on and off. The standby position removes power from most electronics and the drives, but portions of the power supply and some internal circuitry remain active. To completely remove all power from the system, you must disconnect all power cords from the server.



WARNING: To reduce the risk of injury from electric shock, remove the power cords to completely disconnect power from the system.

CAUTION: Electrostatic discharge can damage electronic components. Be sure you are properly grounded before beginning any installation procedure. For more information, refer to the "Electrostatic Discharge" section in this chapter.

Rack Server

To power down the rack server:

1. Back up the server data.
2. Shut down the operating system as directed in the operating system instructions.
3. Press the Power On/Standby button.

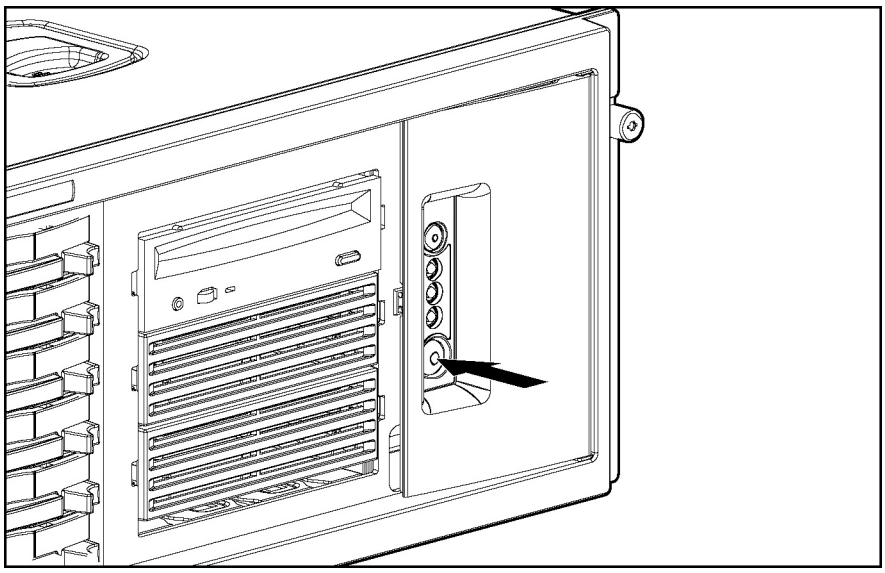


Figure 2-3: Pressing the Power On/Standby button (rack server)

4. Be sure that the system power LED on the front panel, near the Power On/Standby button, is amber and that the fan noise stops.
5. Disconnect all AC power cords from the AC outlets and then from the server.

6. Disconnect all external peripheral devices from the server.
7. Place the server on a sturdy, level surface.

Tower Server

To power down the tower server:

1. Back up the server data.
2. Shut down the operating system as directed in the operating system instructions.
3. Open the front bezel.
4. Press the Power On/Standby button.

WARNING: Setting the server Power On/Standby button to the off position removes power from most areas of the server; this process may take 30 seconds. Portions of the power supply and some internal circuitry remain active until the AC power cord is disconnected.

If the server has multiple power supplies installed, it is necessary to remove all power cords to remove all power from the system.

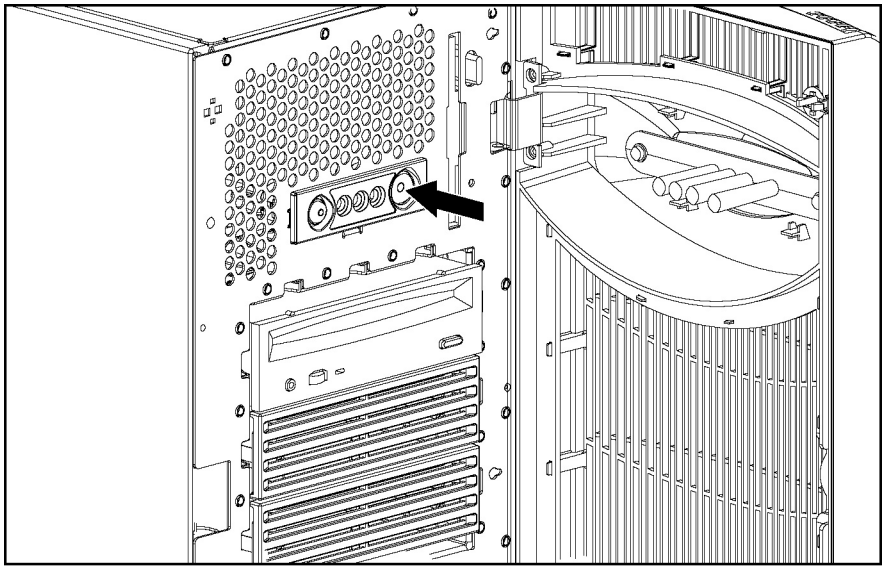


Figure 2-4: Pressing the Power On/Standby button (tower server)

5. Be sure that the system power LED on the front panel, near the Power On/Standby button, is amber and that the fan noise stops.
6. Disconnect all AC power cords from the AC outlets and then from the server.
7. Disconnect all external peripheral devices from the server.
8. Place the server on a sturdy, level surface.

Removing the Server from the Rack

You need to remove the server from the rack when performing non-hot-plug removal and replacement procedures. To remove the server from the rack:

1. Power down the server. Refer to "Powering Down the Server" in this chapter.
2. Disconnect all AC power cords from the AC outlets and then from the server.

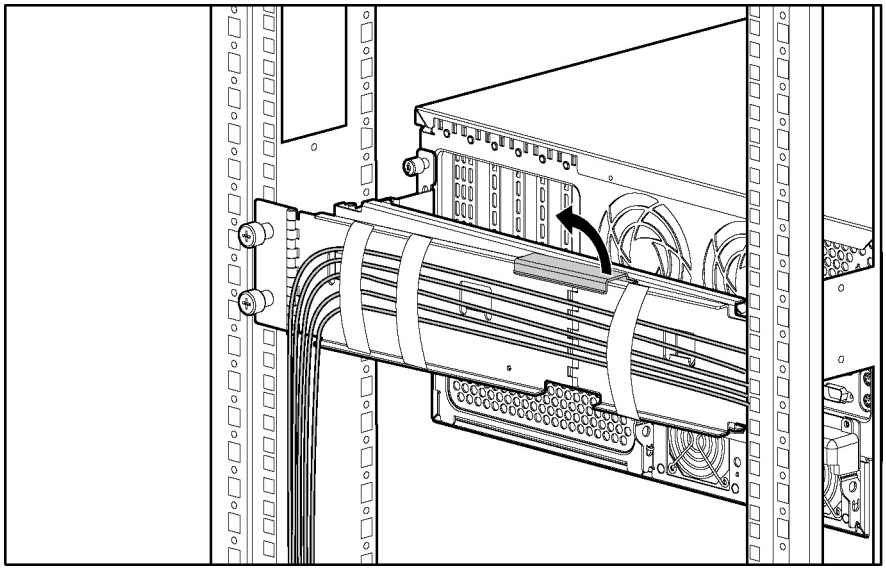


Figure 2-5: Unlocking the cable management arm hinge

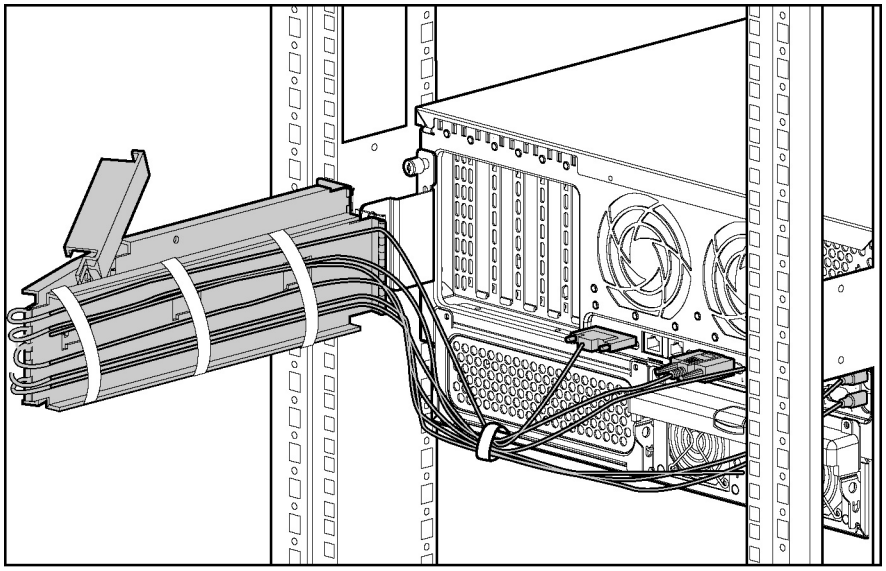


Figure 2-6: Swinging open the cable management arm to access the cables

3. Disconnect all external peripheral devices from the server.
4. Remove the cable management arm from the server.

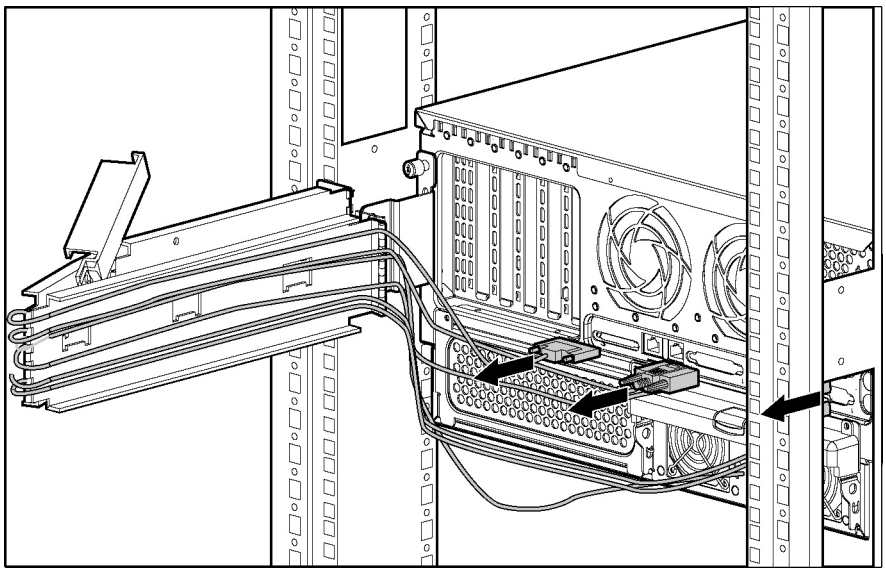


Figure 2-7: Disconnecting all cables from the server

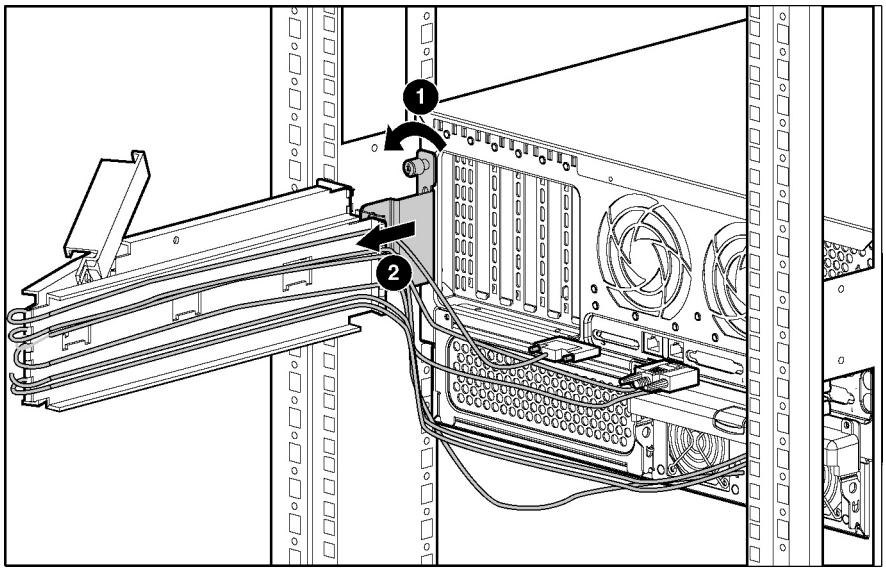


Figure 2-8: Removing the cable management arm from the server

NOTE: You may leave the cables attached to the cable management arm.

5. Loosen the thumbscrews that secure the front bezel to the front of the rack.
6. Slide the server out of the rack.
7. Place the server on a sturdy, level surface.

Hot-Plug Procedures

You can perform hot-plug procedures without powering down the server. Before performing hot-plug procedures, observe the following guidelines:

- For hot-plug fan procedures, be sure that the fan zone is fully populated.
- For hot-plug power supply procedures, be sure that a redundant power supply is installed.
- For hot-plug drive procedures, determine whether the drive is part of an array. For guidelines on hot-plug SCSI hard drive replacement, refer to the *HP ProLiant Servers Troubleshooting Guide*.

Feet

NOTE: This procedure applies to tower servers only.

To remove the feet:

1. Place the server on its side.
2. Press down on the tab on the foot (1).
3. Slide the foot out of the locking slot and pull it off the chassis (2).

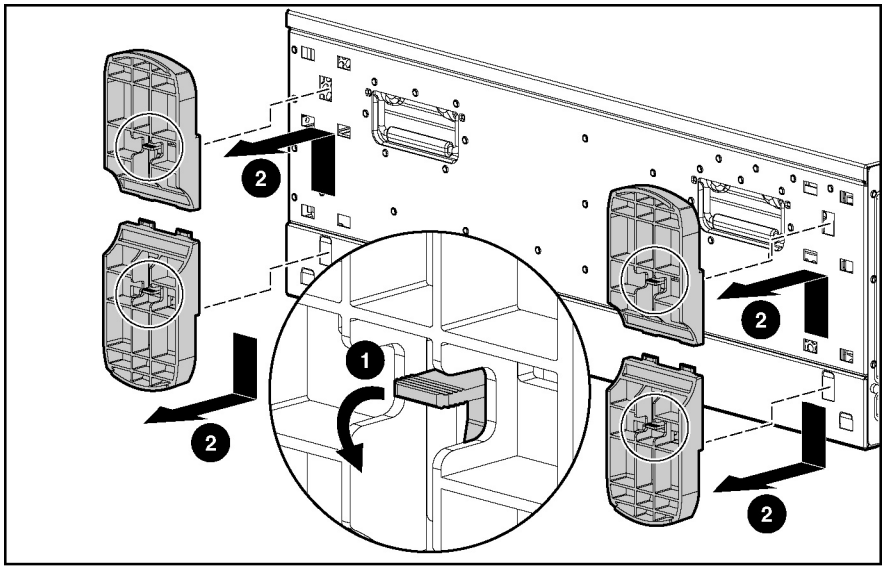


Figure 2-9: Removing the feet

4. Repeat steps 2 and 3 for the other feet.

To replace a foot, slide it back onto the locking slot. Be sure that the foot snaps securely into the holder. Repeat with the remaining feet.

Front Bezel

NOTE: This procedure applies to tower servers only.

To remove the front bezel:

1. Unlock and open the front bezel.
2. Lift the front bezel and remove it from the chassis.

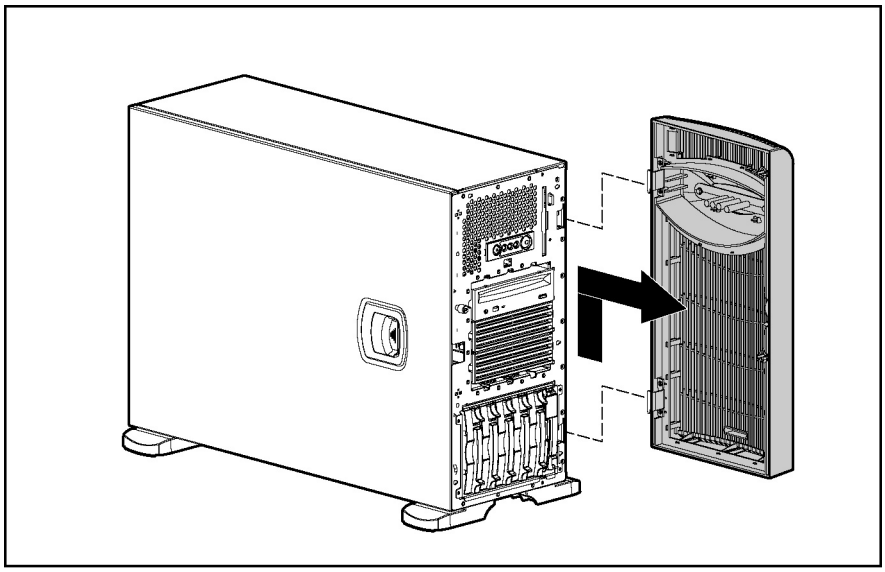


Figure 2-10: Removing the front bezel (tower server)

To replace the front bezel, reverse steps 1 and 2.

Access Panel

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

To remove the access panel:

IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

1. Push the release latch securing the access panel to the chassis (1).
2. While holding the release latch down, slide the access panel back about 1.5 cm (0.6 in), and then pull it away from the chassis (2).

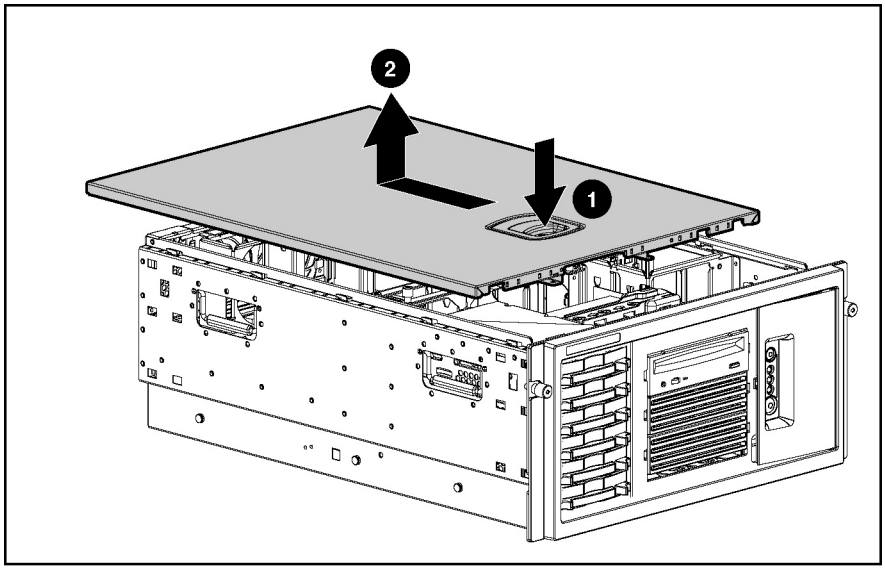


Figure 2-11: Removing the access panel (rack server)

To replace the access panel, reverse step 2. When the release latch snaps into place, the access panel is secure.

Rack Bezel

NOTE: This procedure applies to rack servers only.

To remove the rack bezel:

1. Remove the access panel. Refer to "Access Panel" in this chapter.
2. Loosen the internal rack bezel thumbscrews.

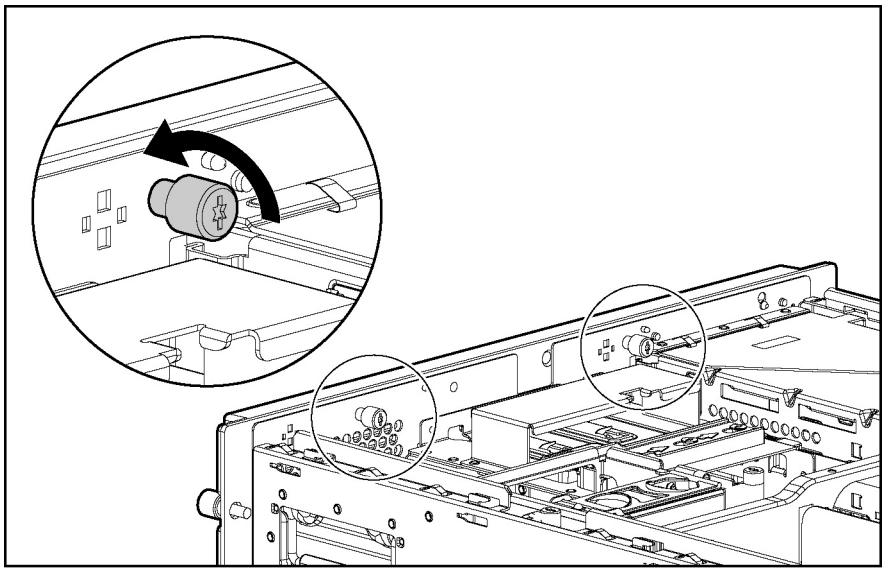


Figure 2-12: Loosening the rack bezel thumbscrews

3. Slide the bezel up to release the spools from the keyholes and pull it away from the server.

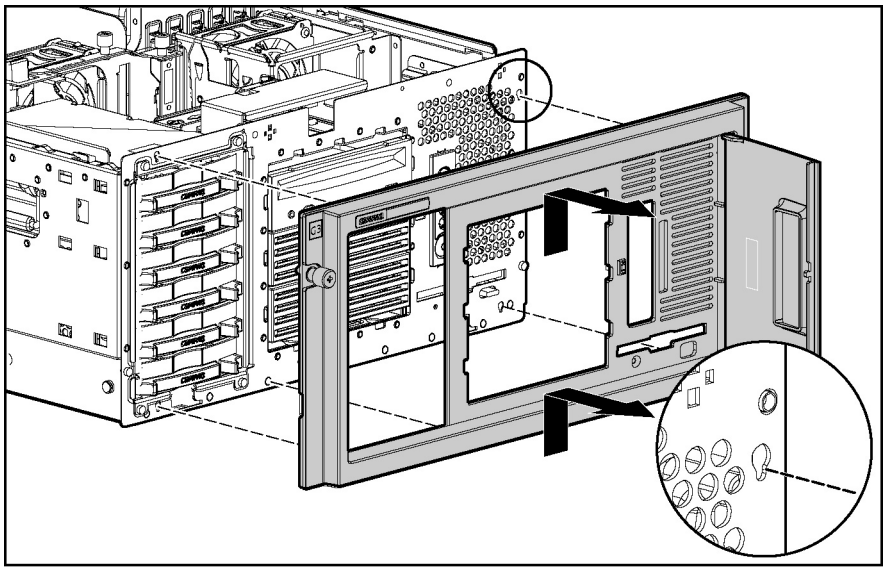


Figure 2-13: Removing the rack bezel

To replace the rack bezel, reverse steps 2 and 3.

Rack Rails

NOTE: This procedure applies to rack servers only.

To remove the rack rails:

1. Use the Torx T-15 tool to push in the release key (1).

   NOTE: The Torx T-15 tool is clipped to the rear panel of the server to the right of the right-most fan grating.

2. Press the rail against the side of the chassis and slide it to the front of the server to release the rails (2).
3. Align the four keyholes above the four spools on the side of the chassis and remove the rail (3).

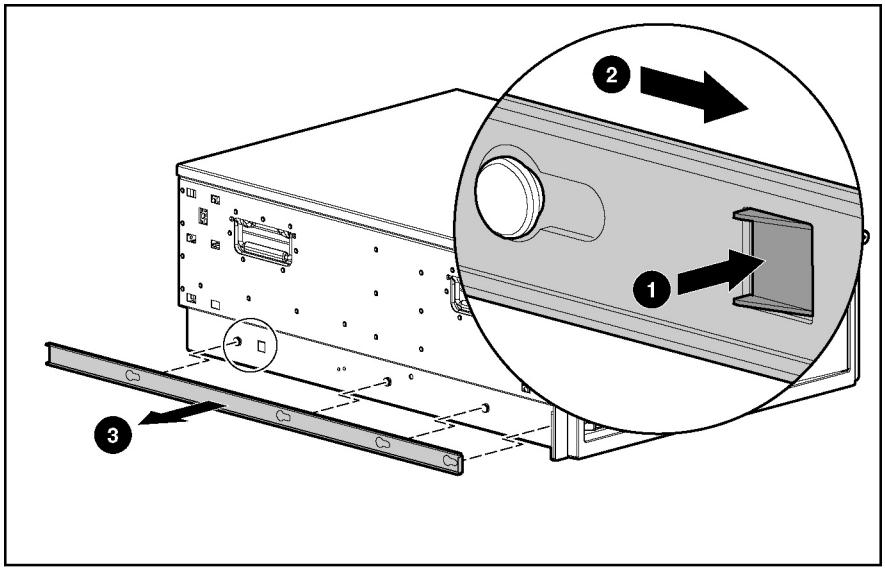


Figure 2-14: Pressing the release key

4. Repeat steps 1 through 3 to remove the other rail.

To replace the rack rails, reverse steps 2 and 3.

Power Supply Blank

To remove a power supply blank:

1. Remove the two screws with the Torx T-15 tool (1).

   NOTE: The Torx T-15 tool is clipped to the rear panel of the server to the right of the right-most fan grating.

2. Remove the power supply blank (2).

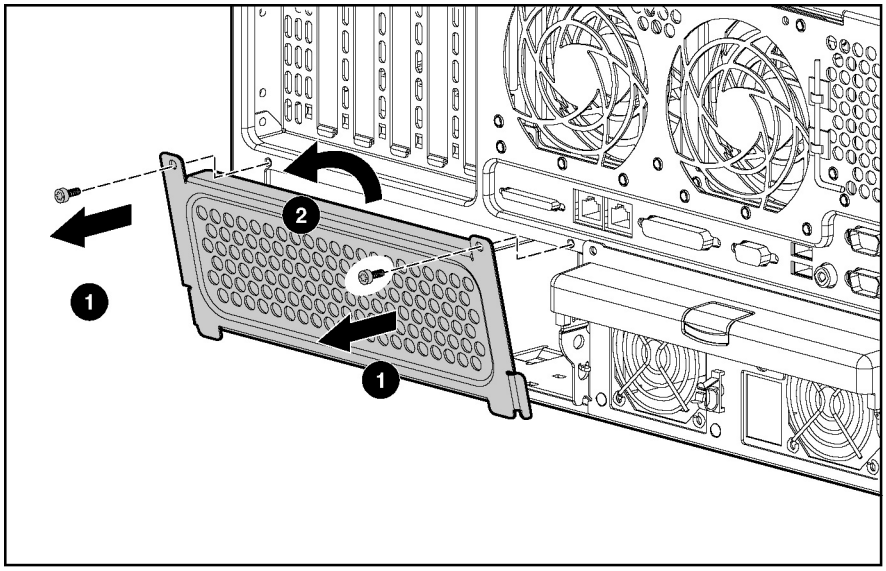


Figure 2-15: Removing a power supply blank

To replace the power supply blank, reverse steps 1 and 2.

WARNING: Populate bays with either a power supply or a blank. Proper airflow can only be maintained when the bays are populated. Unpopulated power supply bays can lead to improper cooling and thermal damage.

To replace the blank with a redundant power supply, refer to "Hot-Plug Power Supply" in this chapter.

Hot-Plug Power Supply

WARNING: To reduce the risk of electric shock, do not disassemble the power supply or attempt to repair it. Replace it only with the specified spare part.

CAUTION: Do not attempt to remove and replace a power supply as a hot-plug procedure unless both bays are populated with power supplies.

To remove the hot-plug power supply:

1. Remove the power cord from the unit to be removed.
2. Use the Torx T-15 tool to remove the shipping screws securing the handle.

   NOTE: The Torx T-15 tool is clipped to the rear panel of the server to the right of the right-most fan grating.

3. Press the port-colored button on the power supply handle to release the latch (1) and pull the handle down (2).
4. Slide the hot-plug power supply out of the chassis (3).

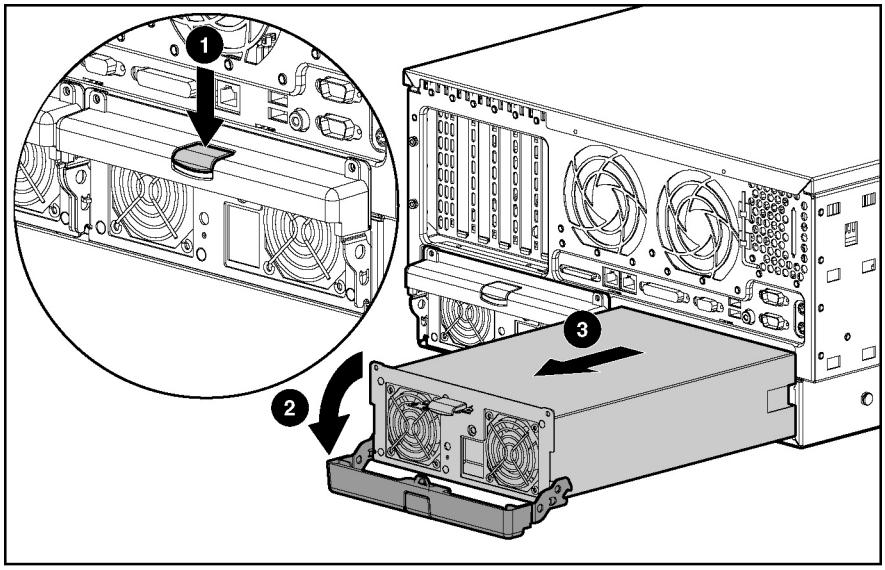


Figure 2-16: Removing the hot-plug power supply

CAUTION: Always populate power supply bays with either a power supply or blank. Operating the server without installing a power supply or blank results in improper airflow and improper cooling that can lead to thermal damage.

To replace the hot-plug power supply:

1. Slide the power supply into the bay.
2. Raise the handle and press it against the chassis to lock the power supply into the bay.

Hard Drive Blank

IMPORTANT: A device or blank must occupy each bay during operation.

To remove a hard drive blank:

1. Unlock and open the front bezel door (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

2. Squeeze in the tabs (1) and pull the blank out of the hard drive cage (2).

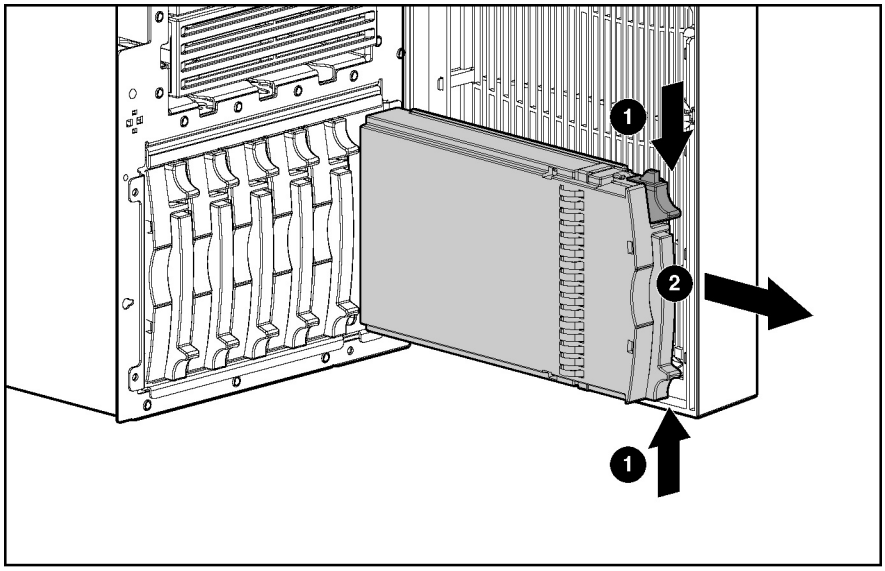


Figure 2-17: Removing a hard drive blank

CAUTION: Always populate drive bays with either a hard drive or blank. Operating the server without installing a hard drive or blank results in improper airflow and improper cooling that can lead to thermal damage.

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

Hot-Plug SCSI Hard Drive

To remove a hot-plug SCSI hard drive:

1. Unlock and open the front bezel door (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

2. Press the port-colored release button (1) and swing the locking latch outward (2).
3. Pull the hot-plug SCSI hard drive out of the bay (3).

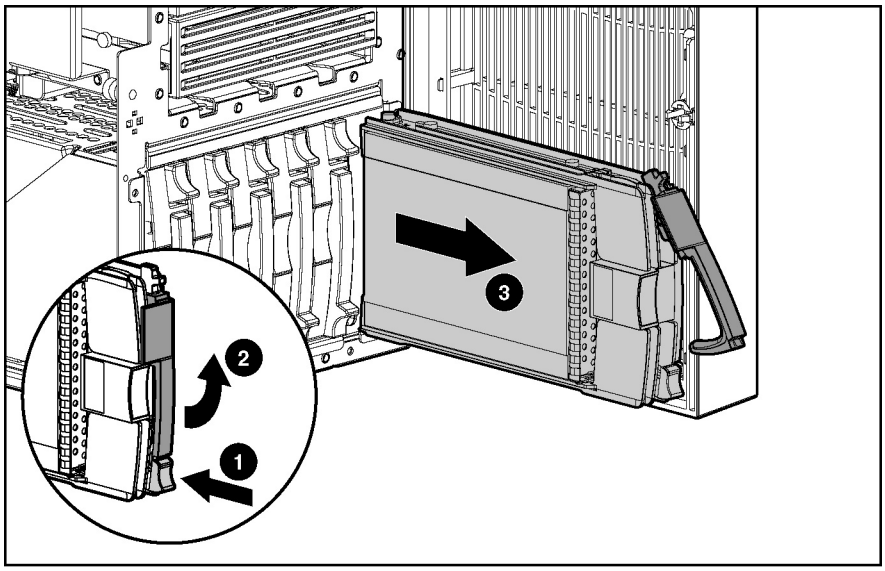


Figure 2-18: Removing a hot-plug SCSI hard drive

CAUTION: Always populate drive bays with either a hard drive or blank. Operating the server without a hard drive or blank results in improper airflow and improper cooling that can lead to thermal damage.

IMPORTANT: Always populate hard drive bays starting with the lowest SCSI ID.

To replace the hot-plug SCSI hard drive:

1. Insert the hard drive into the available drive bay. Be sure that the drive seats firmly into the connector on the SCSI backplane.
2. Press the locking latch in to secure the drive in the drive cage.

Removable Media Blanks

NOTE: HP recommends that you remove or extend the CD-ROM drive to ease removable media blank removal.

To remove the removable media blanks:

1. Remove the front bezel (tower server only). Refer to "Front Bezel" in this chapter.
2. Remove the access panel. Refer to "Access Panel" in this chapter.
3. Slide the media latch to release the blanks (1) while pushing out the removable media blanks (2) from behind.

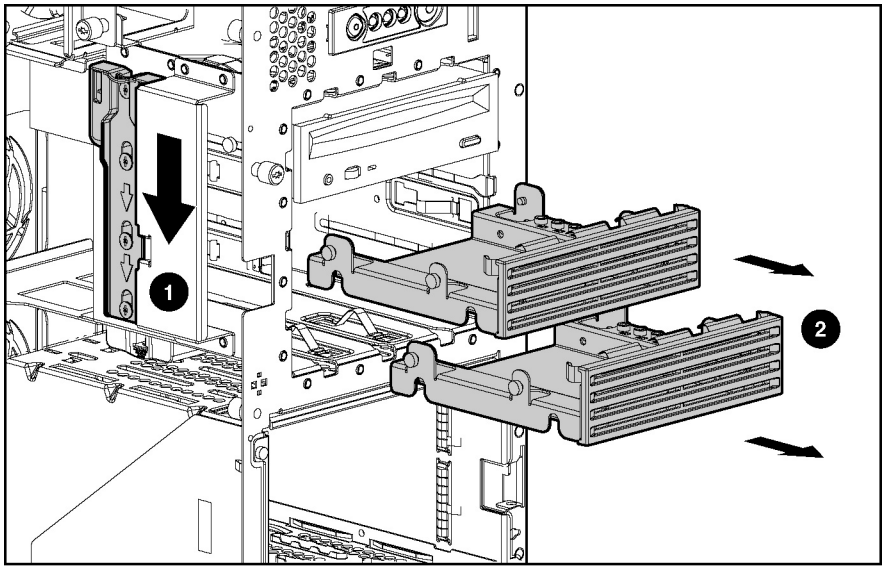


Figure 2-19: Removing the removable media blanks

CAUTION: Always populate drive bays with either a hard drive or blank. Operating the server without installing a hard drive or blank results in improper airflow and improper cooling that can lead to thermal damage.

To replace a removable media blank, slide it back into the chassis.

System Fans

The server supports redundant hot-plug fans to provide proper airflow to the system. In the standard configuration, three fans cool the system. If any one of the primary fans fails, the system monitors the fan status and shuts down to prevent any thermal damage to components. When the system is powered up, POST displays an error message.

In the redundant configuration, six fans cool the system. If any one of the primary fans fails, the system detects the paired redundant fan and continues to operate without any interruption or downtime.

WARNING: To reduce the risk of personal injury from hazardous energy or of damage to the equipment when working on energized servers:

- **Remove all watches, rings, and any other loose fitting jewelry.**
- **Avoid the use of conductive tools inside the server that could bridge live parts.**

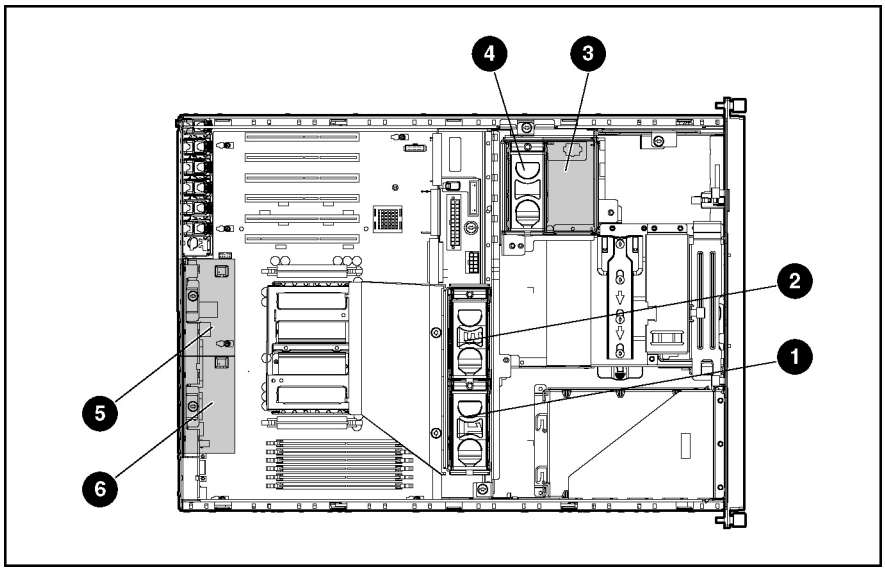


Figure 2-20: System fan locations

NOTE: Fan locations are labeled in the chassis and on the system configuration labels attached to the access panel.

Table 2-1: System Fan Locations

Item	Description	Item	Description
1	Processor fan 1	4	I/O fan 5
2	Processor fan 3	5	Redundant processor fan 4
3	Redundant I/O fan 6	6	Redundant processor fan 2

Fan failure is indicated by amber LEDs located on each hot-plug fan and by the front panel internal health LED. For fan failures, the internal health LED shows red in nonredundant mode and amber in redundant mode.

For additional information, refer to the *HP ProLiant ML370 Generation 3 Server Setup and Installation Guide*.

All fans are identical. This procedure can be used for any one of the six fan positions. To remove the fans:

1. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

2. Remove the access panel. Refer to "Access Panel" in this chapter.
3. Grasp the plastic handle at the top of the fan and pull upward (1).
4. Lift the hot-plug fan out of the fan cage (2).

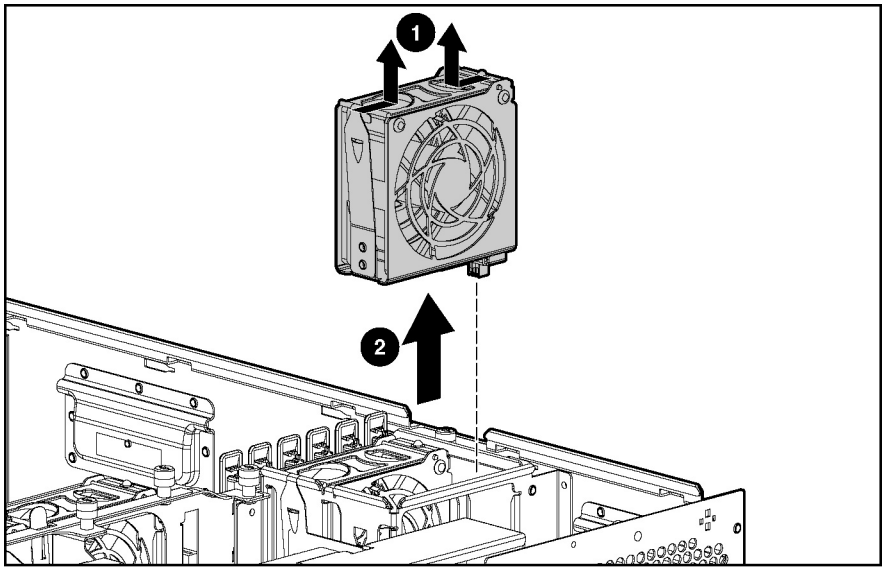


Figure 2-21: Removing a system fan

To replace the hot-plug system fan, slide it into a fan cage slot and press down until the fan is seated securely. Be sure that the LED on the fan is green indicating that it is working.

Non-Hot-Plug Procedures

CAUTION: To avoid the risk of damage to the system or non-hot-plug expansion boards, disconnect all AC power cords before installing or removing non-hot-plug expansion boards. Moving the Power On/Standby button to the Off position still provides auxiliary power to the PCI-X expansion slot and may damage the board or other system components.

You must power down and remove power from the server to perform non-hot-plug removal and replacement procedures. The procedures in this section are for non-hot-plug service items, regardless of rack type or environment.

Redundant Fan Cage

To remove the optional redundant fan cage:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the fans from the redundant fan cage. Refer to "System Fans" in this chapter.
5. Loosen the two thumbscrews securing the redundant fan cage retaining bracket to the chassis (1).
6. Remove the bracket from the chassis (2).

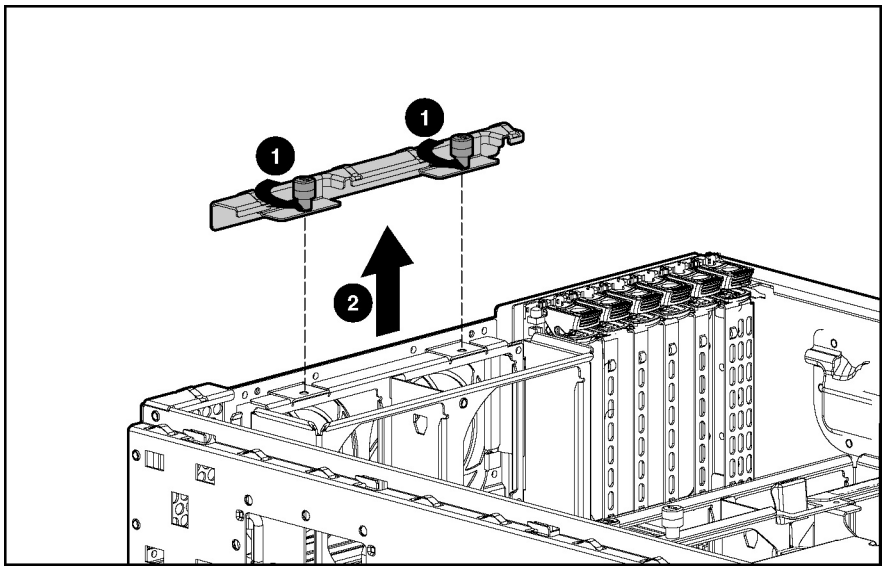


Figure 2-22: Removing the redundant fan cage retaining bracket

7. Remove the redundant fan cage from the chassis.

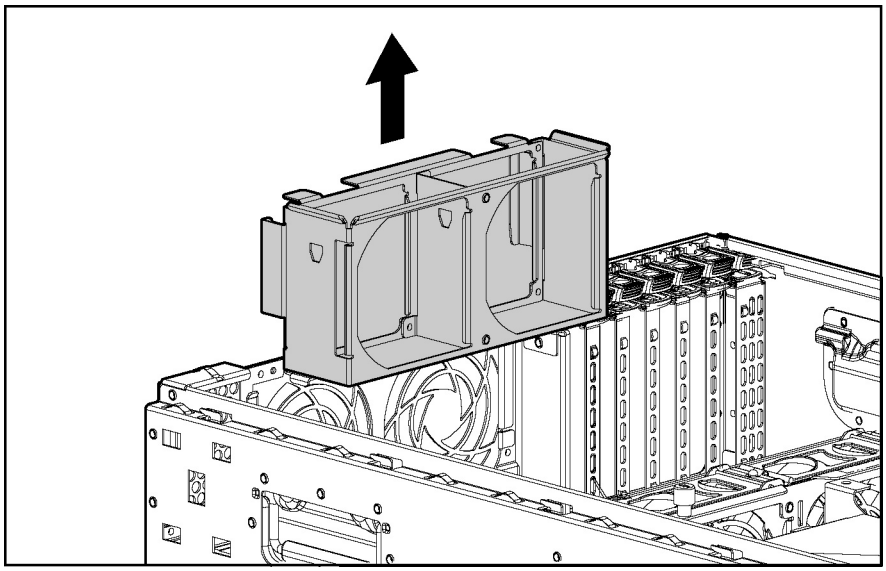


Figure 2-23: Removing the redundant fan cage

To replace the redundant fan cage, reverse steps 4 through 7.

Hard Drive Cage

To remove the hard drive cage:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Remove the tower or rack front bezel. Refer to "Front Bezel" or "Rack Bezel" in this chapter.
3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove all hard drives and blanks. Refer to "Hard Drive Blank" and "Hot-Plug SCSI Hard Drive" in this chapter.
5. Disconnect the point-to-point SCSI cable from the SCSI hard drive backplane (1).
6. Disconnect the power cable from the SCSI hard drive backplane (2).

NOTE: The center wall is removed from Figure 2-24 for clarity.

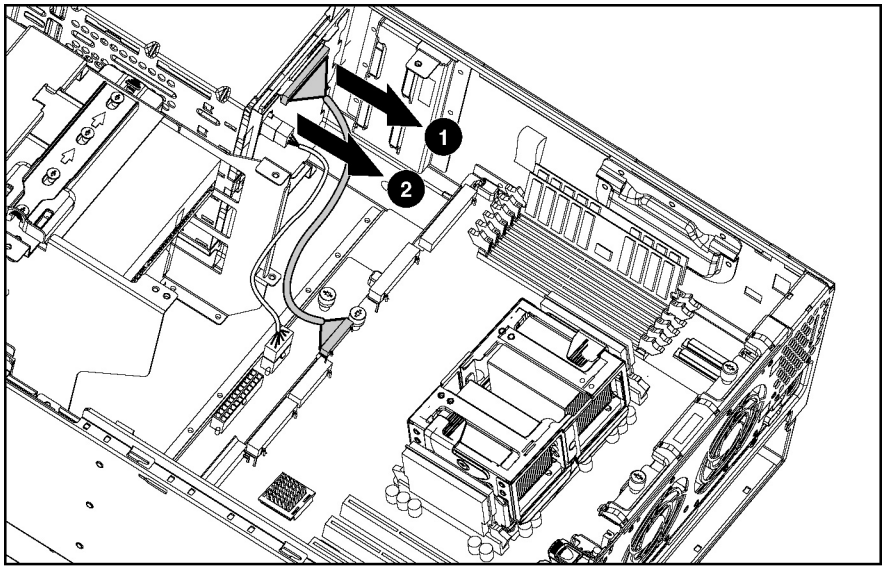


Figure 2-24: Disconnecting the SCSI and power cables

7. Remove the four T-15 screws securing the hard drive cage to the chassis (1).
8. Slide the hard drive cage out through the front of the chassis (2).

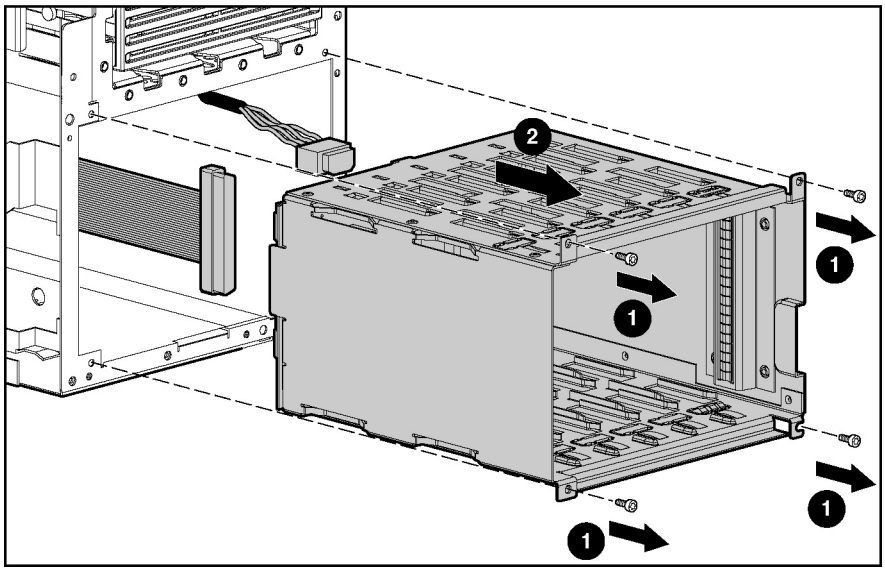


Figure 2-25: Removing the hard drive cage

To replace the hard drive cage, reverse steps 5 through 8.

CAUTION: When routing cables, be sure that the cables are not located where they can be pinched or crimped.

IMPORTANT: Be sure that all power and signal cables to the hard drive cage are reconnected properly.

PCI-X Expansion Board Slots

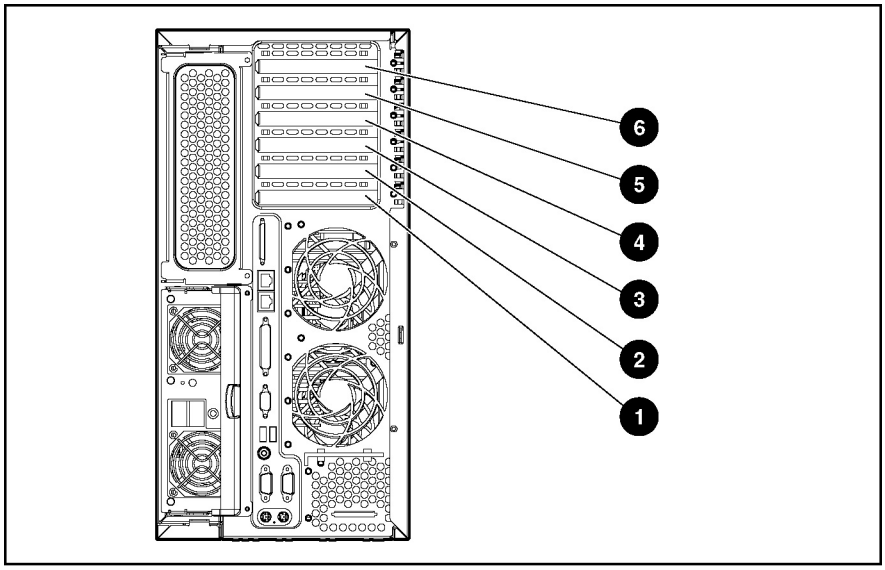


Figure 2-26: PCI-X expansion board slots

Table 2-2: PCI-X Expansion Board Slots

Item	Description
1	PCI-X bus expansion slot 1(bus 2) (64-bit, 100-MHz)
2	PCI-X bus expansion slot 2 (bus 2) (64-bit, 100-MHz)
3	PCI-X bus expansion slot 3 (bus 10) (64-bit, 100-MHz)
4	PCI-X bus expansion slot 4 (bus 10) (64-bit, 100-MHz)
5	PCI-X bus expansion slot 5 (bus 6) (64-bit, 100-MHz)
6	PCI-X bus expansion slot 6 (bus 6) (64-bit, 100-MHz)

PCI-X Expansion Slot Cover

To remove a PCI-X expansion slot cover:

1. Power down the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Press down on the top of the PCI-X slot release lever (1) and swing the release lever upward (2).
5. Lift the expansion slot cover out of the server (3).

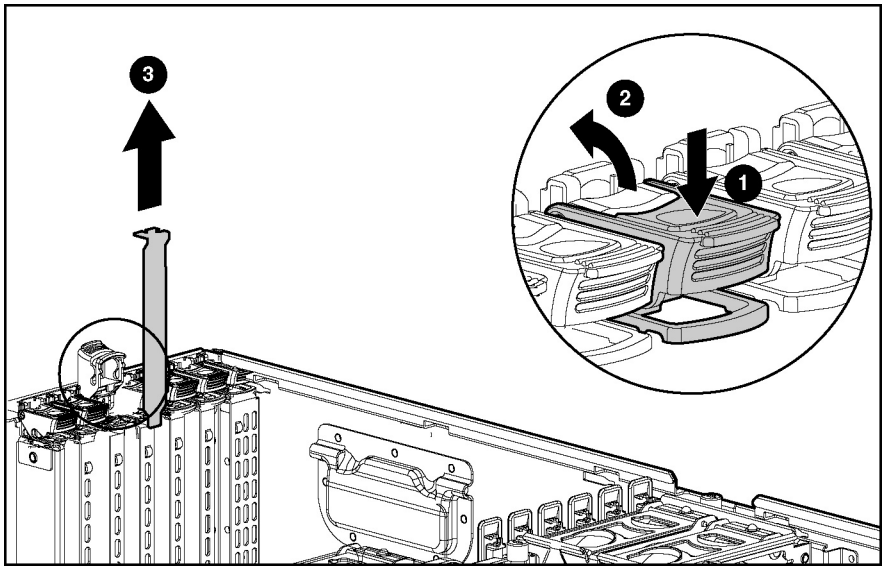


Figure 2-27: Removing a PCI-X expansion slot cover

IMPORTANT: Retain the slot cover for later use. PCI-X expansion slots must be populated with either an expansion board or a slot cover to maintain proper temperature conditions.

To replace a PCI-X expansion slot cover, reverse steps 4 and 5.

PCI-X Expansion Boards

CAUTION: To avoid the risk of damage to your system or expansion boards, disconnect all AC power cords before installing or removing expansion boards. Moving the Power On/Standby button to the off position still provides auxiliary power to the PCI-X expansion slot and may damage the board or other system components.

CAUTION: Do not remove an expansion slot cover unless you are installing a PCI-X expansion board. Operating the server without an expansion board or an expansion slot cover installed results in improper airflow and improper cooling, which can lead to thermal damage.

To remove a PCI-X expansion board:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).
3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Disconnect any cables attached to the expansion board.
5. Release the PCI-X guide clip.

NOTE: The dividers and divider base are removed from Figure 2-28 for clarity.

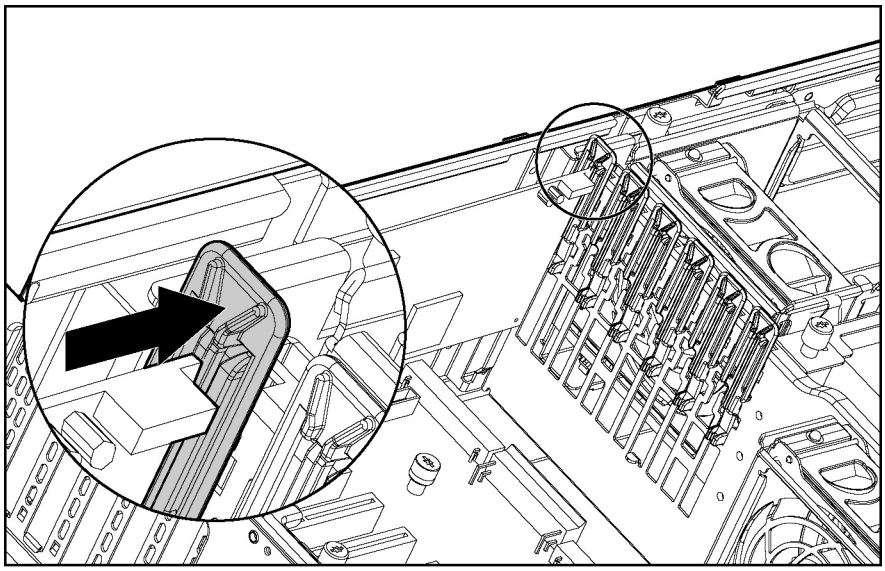


Figure 2-28: Releasing the PCI guide clip

6. Press the PCI-X slot release lever (1) and swing the slot release lever upward (2).
7. Lift the expansion board out of the server (3).

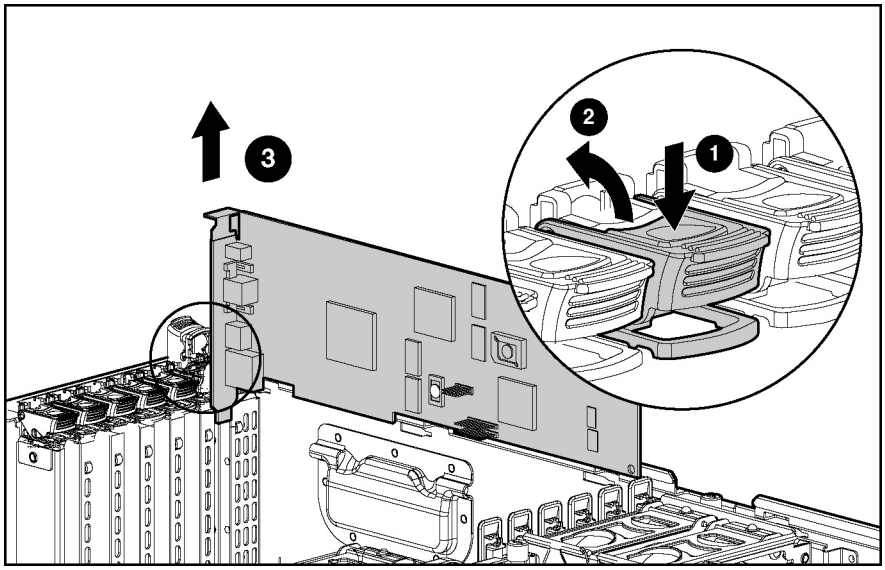


Figure 2-29: Removing a PCI-X expansion board

IMPORTANT: Make note of board locations. Be sure to install replacements in the same slots.

To replace a PCI-X expansion board:

1. Position the expansion board above the expansion slot and slide the board into the slot, using the PCI-X guide to align the board with the slot.
2. Press down on the expansion board to seat it in the slot.
3. Press the PCI-X slot release lever down until it clicks into place to lock the slot.
4. If the PCI-X guide clip does not snap forward to secure the board, pull it into a locked position manually.

PCI-X Slot Release Lever

To remove a PCI-X slot release lever:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the expansion slot cover. Refer to "PCI-X Expansion Slot Cover" in this chapter.
5. From behind the chassis, push up on the lever locking tab (1).
6. Pull the release lever forward to disengage the rear tabs from the server wall (2).

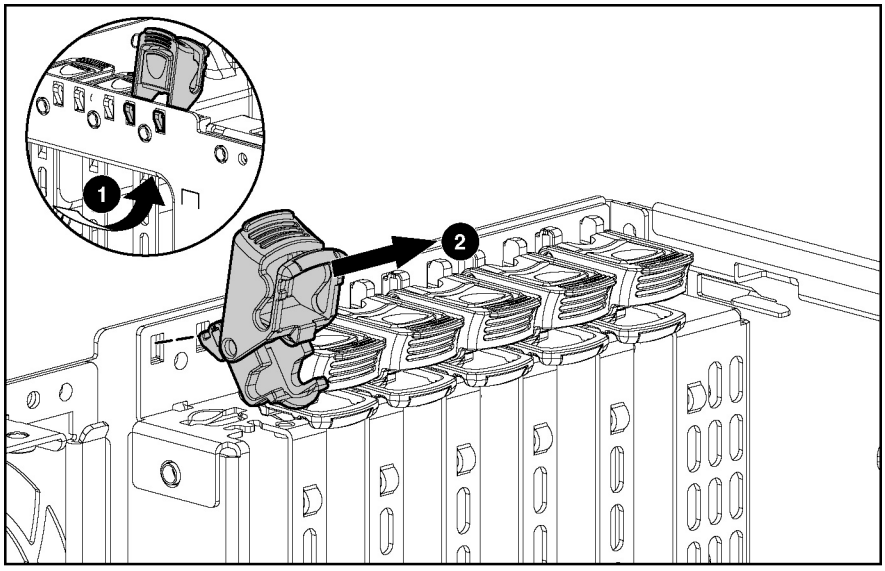


Figure 2-30: Removing a PCI-X slot release lever

7. Remove the slot release lever from the chassis.
8. Repeat steps 5 through 7 to remove other slot release levers.

To replace slot release levers, reverse steps 5 through 7.

IMPORTANT: Be sure that the lever locking tab is locked into place. If it is not, it does not retain the expansion boards properly.

PCI-X Guide Clips

To remove a PCI-X guide clip:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the PCI-X expansion boards. Refer to "PCI-X Expansion Boards" in this chapter.
5. Pull the bottom of the clip out (1) while pushing down on the top of the guide clip (2).
6. When the tabs align with the slots, pull the guide clip away from the center wall (3).

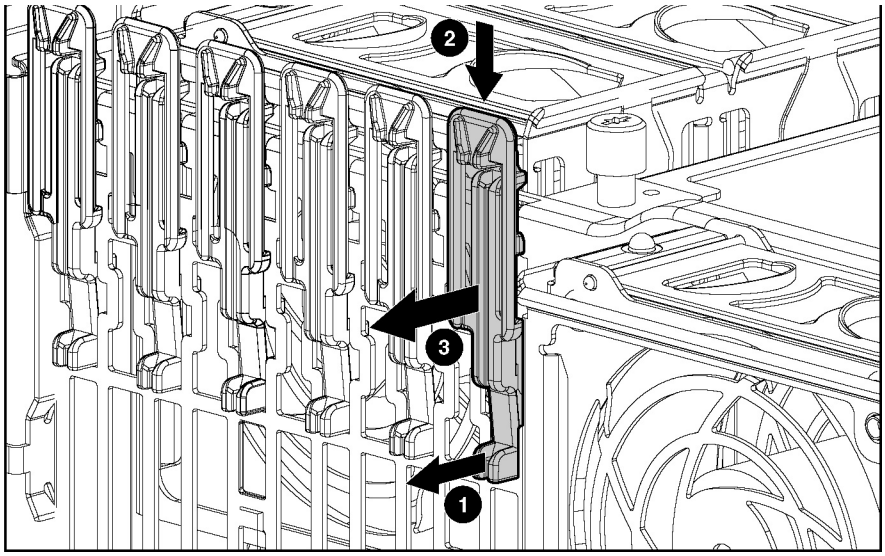


Figure 2-31: Removing a PCI-X guide clip

7. Remove the guide clip from the server.

To replace a PCI-X guide clip, reverse steps 5 through 7.

Processor Air Baffle

To remove the processor air baffle:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Loosen the two thumbscrews that secure the air baffle to the center wall (1).
5. Lift the air baffle up and out of the server (2).

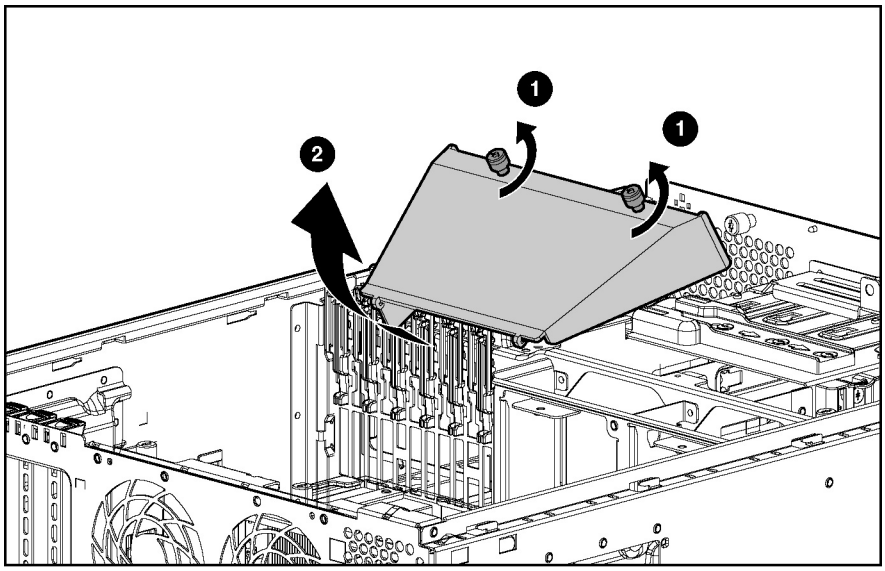


Figure 2-32: Removing the processor air baffle

To replace the processor air baffle, reverse steps 4 and 5.

Center Wall

To remove the center wall:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the PCI-X expansion boards. Refer to "PCI-X Expansion Boards" in this chapter.
5. Remove the processor air baffle. Refer to "Processor Air Baffle" in this chapter.
6. Loosen the four thumbscrews (1) and lift the wall up enough to reach the fan cable (2).

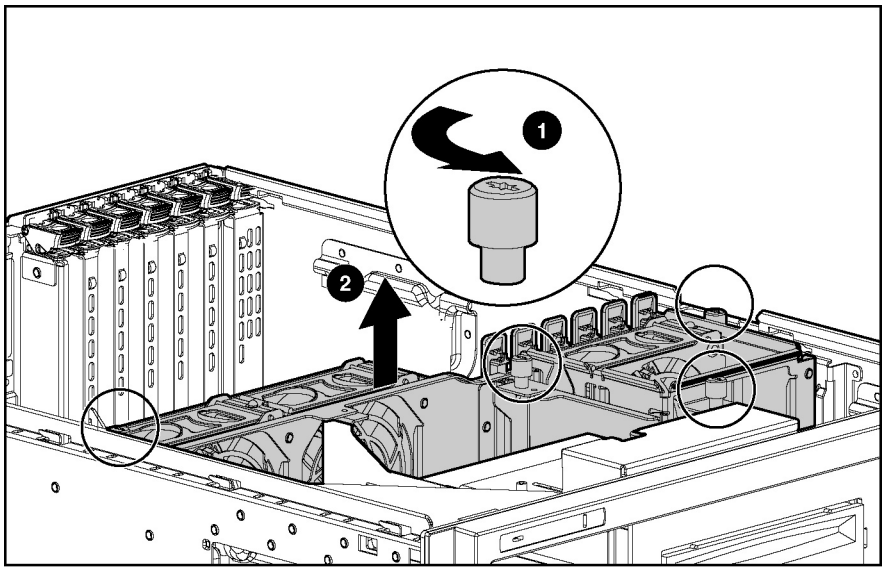


Figure 2-33: Lifting the center wall

7. Disconnect the fan cable from the system board.

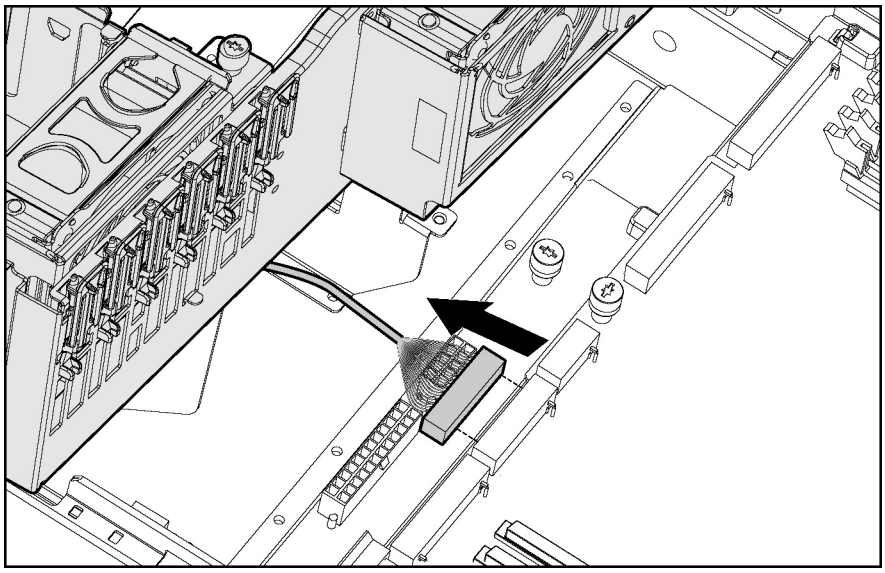


Figure 2-34: Disconnecting the fan cable

8. Lift the center wall away from the chassis.

To replace the center wall, reverse steps 6 through 8.

IDE CD-ROM Drive

To remove the IDE CD-ROM drive:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Slide the media latch to release the drive (1) while pushing the CD-ROM drive from inside the chassis slightly out of the bay (2). To remove the drive in a rack configuration, press down on the media latch located on the side of the drive cage.

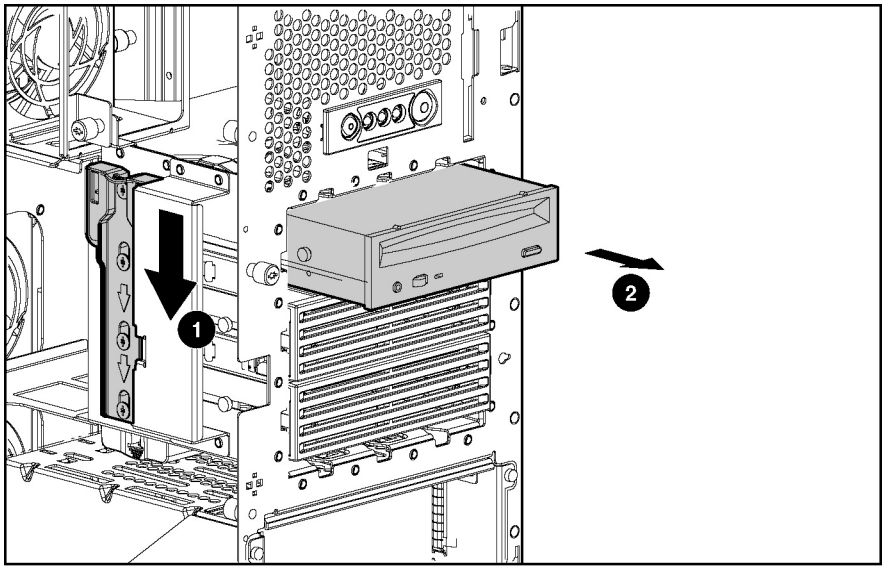


Figure 2-35: Partially removing the CD-ROM drive

CAUTION: Always populate the CD-ROM drive bay with either a CD-ROM drive or a removable media blank. Operating the server without installing a CD-ROM drive or a removable blank results in improper airflow and improper cooling that can lead to thermal damage.

5. Disconnect the IDE cable from the CD-ROM drive (1).
6. Disconnect the power cable from the CD-ROM drive (2).

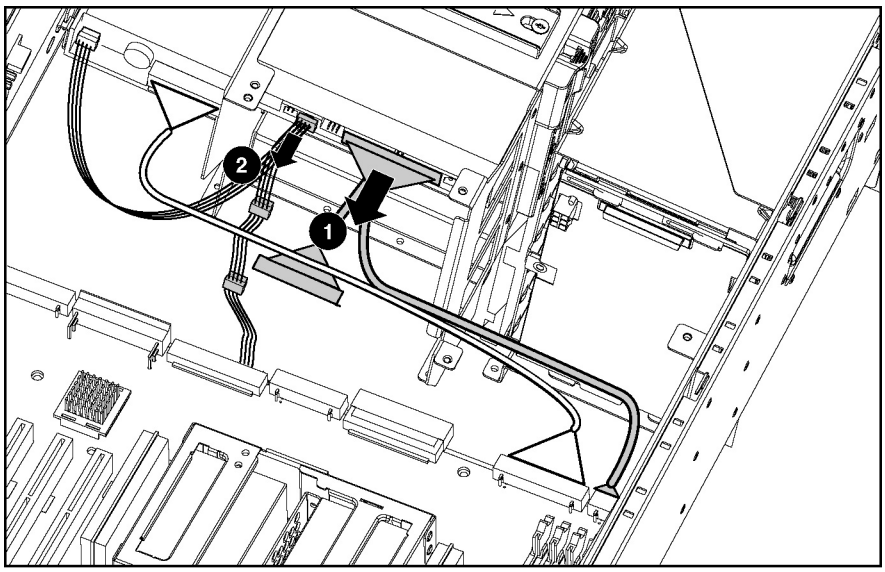


Figure 2-36: Disconnecting CD-ROM cables

7. Remove the CD-ROM drive from the chassis.

To replace the CD-ROM drive:

1. Slide the drive halfway into the bay.
2. Connect any required cables to the drive.
3. Slide the CD-ROM drive fully into the bay until it is seated securely.

CAUTION: When routing cables, be sure that the cables are not located where they can be pinched or crimped.

Power Button/LED Assembly

To remove the power button/LED assembly:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the processor air baffle. Refer to "Processor Air Baffle" in this chapter.
5. Remove the PCI-X expansion boards. Refer to "PCI-X Expansion Boards" in this chapter.
6. Remove the center wall. Refer to "Center Wall" in this chapter.
7. Disconnect the power button/LED assembly cable from the system board and the power supply backplane.

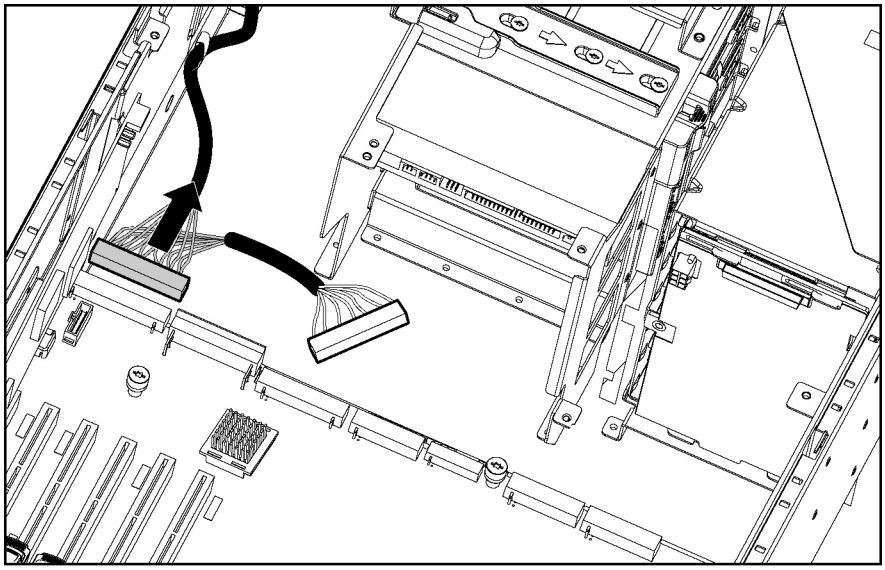


Figure 2-37: Disconnecting the power button/LED assembly cable

8. Release the cable from the clip on the chassis wall.

9. Squeeze the two tabs from the inside (1) and slide the power button/LED assembly through the front of the server (2).

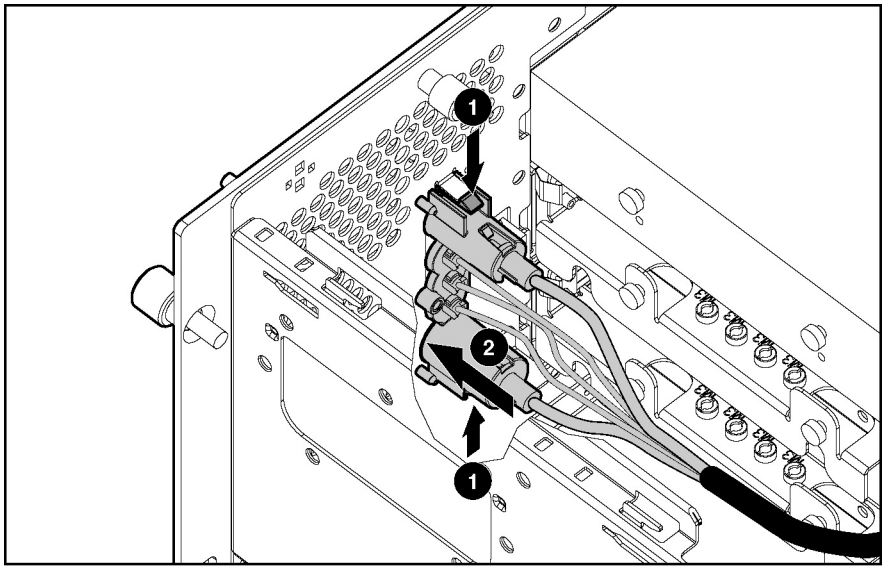


Figure 2-38: Removing the power button/LED assembly

10. Remove the assembly from the chassis.

To replace the power button/LED assembly, push the assembly and the cables through the front of the server. Be sure that the assembly is seated securely.

Diskette Drive

To remove the diskette drive:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the PCI-X expansion boards. Refer to "PCI-X Expansion Boards" in this chapter.
5. Remove the processor air baffle. Refer to "Processor Air Baffle" in this chapter.
6. Remove the center wall. Refer to "Center Wall" in this chapter.
7. Remove the power button/LED assembly. Refer to "Power Button/LED Assembly" in this chapter.
8. Disconnect the diskette drive cable from the diskette drive (1).
9. Disconnect the power cable from the diskette drive (2).

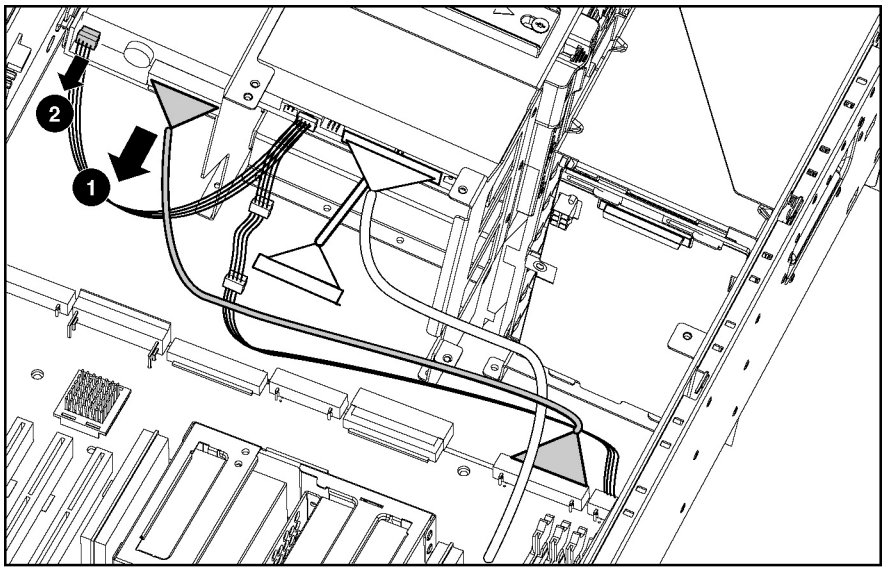


Figure 2-39: Disconnecting cables from the diskette drive

10. Loosen the thumbscrew that secures the retaining bracket to the diskette chassis (1).
11. Pull the diskette retaining bracket forward to disengage the tabs and lift the bracket from the chassis (2).
12. Pull the diskette drive backward about 1 cm (0.4 in) and lift up to clear the base (3).

NOTE: The drive cage is removed for clarity in Figure 2-40.

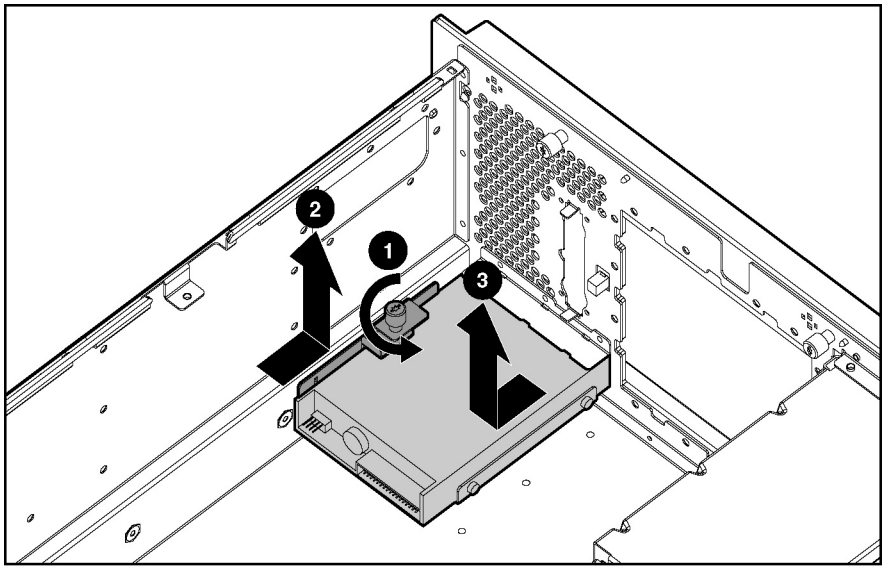


Figure 2-40: Removing the diskette drive

13. Remove the diskette drive from the chassis.

To replace the diskette drive:

1. Place the diskette drive back into the chassis, flush with the front of the server.
2. Slide the diskette retaining bracket into place.
3. Secure the thumbscrew.
4. Reconnect the diskette drive cable to the diskette drive and the system board.
5. Reconnect the power cable to the diskette drive.

Processor Assembly

CAUTION: Be sure that you have the current version of the system ROM. Failure to flash your ROM with the correct version before installing or replacing the processor causes system failure. For the most current version of the ROM, go to:

www.hp.com/servers/manage/

CAUTION: The processor, heatsink, and retaining clip comprise a single assembly. Separating the processor from the heatsink causes thermal instability and damage to the server.

To remove a processor assembly:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the processor air baffle. Refer to "Processor Air Baffle" in this chapter.
5. Open the processor cage.
6. Lift the processor retaining bracket lever to release the processor retaining bracket.

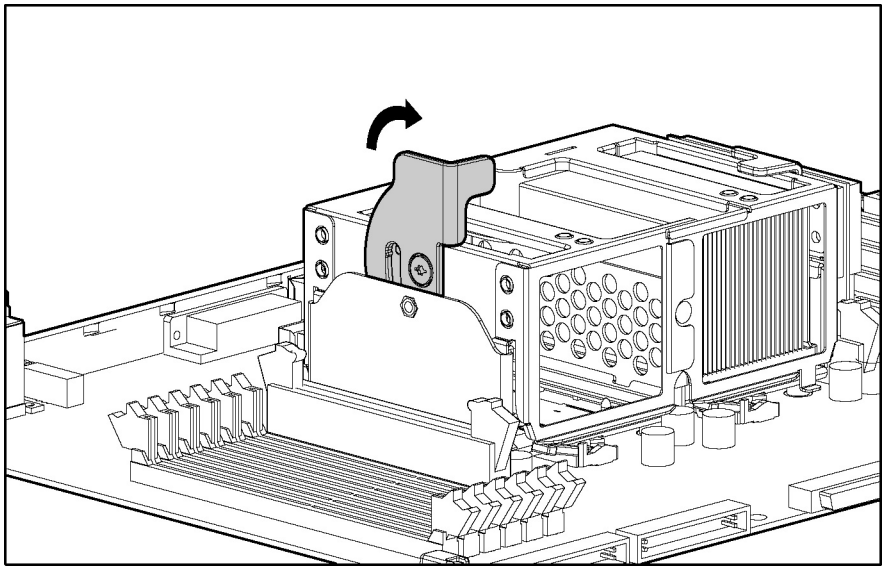


Figure 2-41: Lifting the processor retaining bracket lever

7. Lift the processor retaining bracket (1).
8. Release the processor locking lever (2).

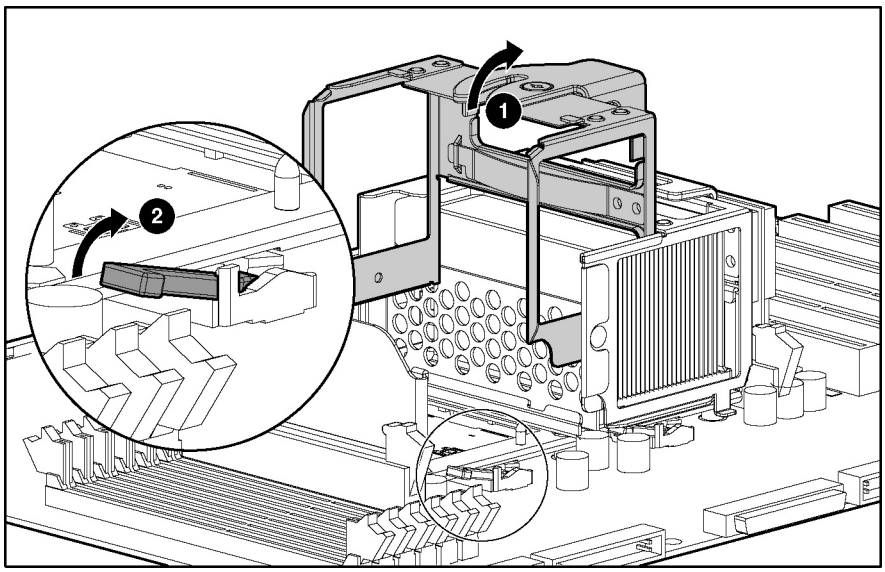


Figure 2-42: Lifting the processor retaining bracket and releasing the processor locking lever

9. Remove the processor/heatsink assembly.
10. Repeat steps 5 through 8 to remove a second processor assembly, if necessary.

To replace the processor assembly:

1. Open the processor retaining bracket
2. Install the processor/heatsink assembly into the available processor socket:
   a. Determine the correct processor orientation by observing the three guide pins on the processor retaining bracket and the three corresponding guide holes on the processor/heatsink assembly.

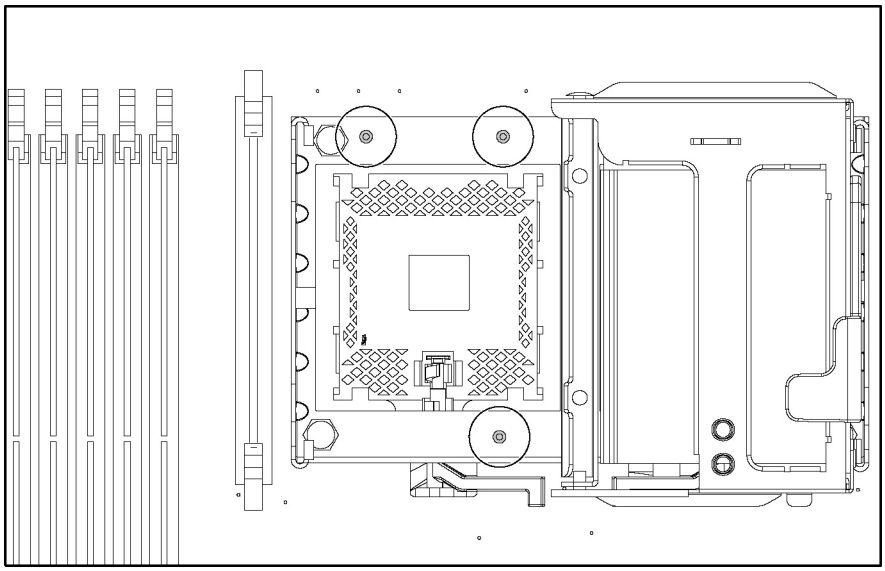


Figure 2-43: Aligning the processor for installation

   b. Be sure the processor locking lever is open.
   c. Insert the processor/heatsink assembly into the processor socket (1).
   d. Close the processor locking lever (2).

IMPORTANT: If the processor locking lever is not secured, the processor retaining bracket will not close properly.

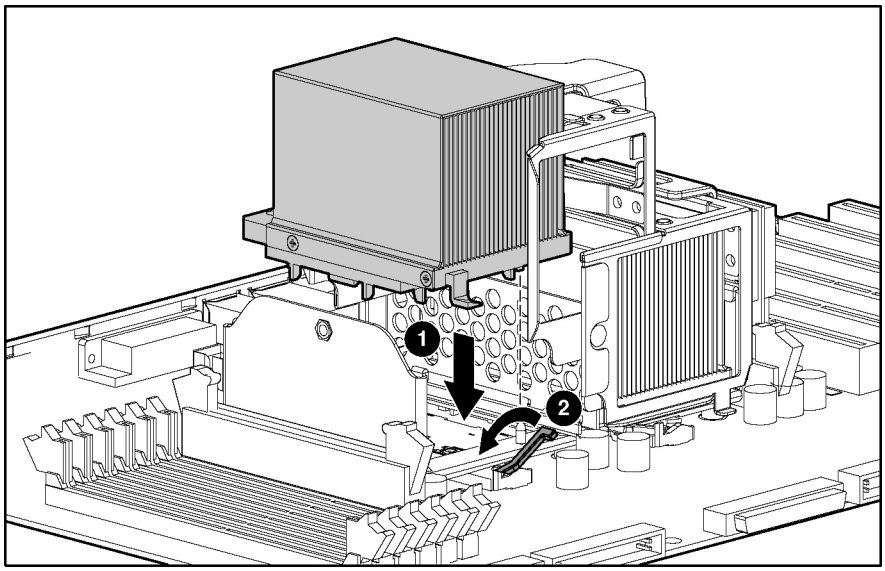


Figure 2-44: Installing the processor/heatsink assembly and securing the processor locking lever

3. Lower the processor retaining bracket into position over the processor.

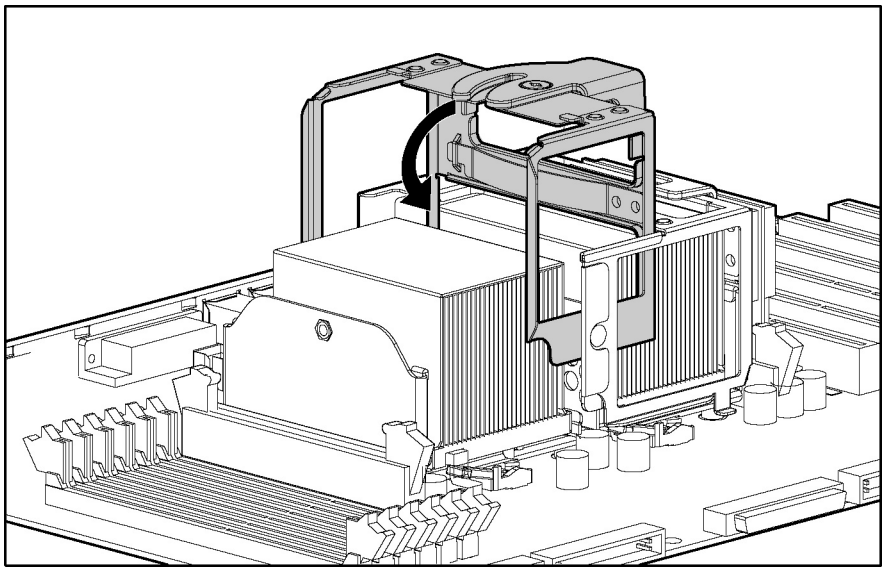


Figure 2-45: Closing the processor retaining bracket

4. Press the processor retaining bracket lever down to secure the processor retaining bracket.

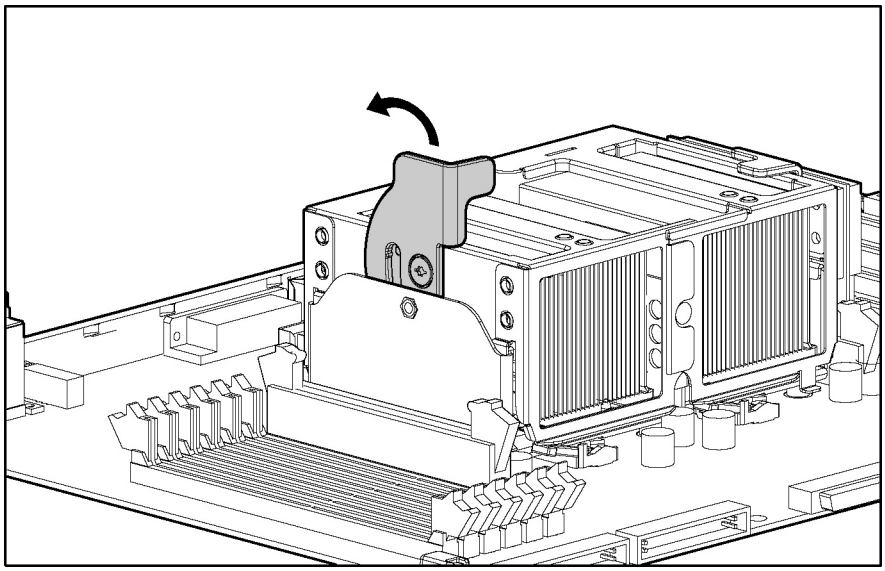


Figure 2-46: Securing the processor retaining bracket lever.

CAUTION: Before closing the processor retaining bracket, be sure that the processor locking lever is closed. Forcing the bracket shut may damage the processor or the processor socket.

NOTE: When replacing a failed processor, run the ROM-Based Setup Utility (RBSU) after replacing the new processor to mark the failed processor as repaired. Refer to the *HP ProLiant ML370 Generation 3 Server Setup and Installation Guide* or the *HP ROM-Based Setup Utility User Guide* for more detailed information on RBSU.

Processor Power Module

To remove a Power Processor Module (PPM):

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the processor air baffle. Refer to "Processor Air Baffle" in this chapter.
5. Press outward on the latches at each end of the PPM socket (1).
6. Lift the PPM out of the slot (2).

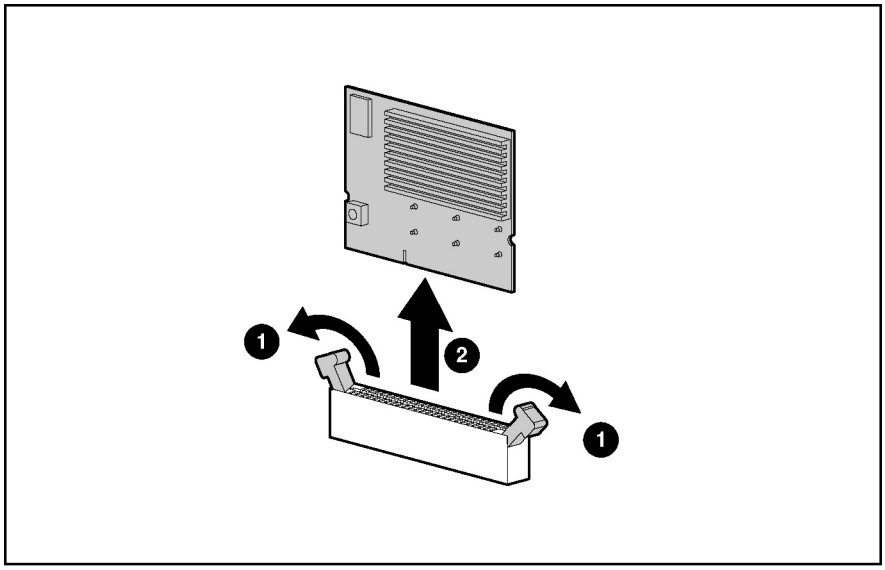


Figure 2-47: Removing a PPM

NOTE: The PPM on the server may look different from Figure 2-47.

CAUTION: Only install a PPM if the processor is installed. Both the PPM and the processor must be installed together, otherwise the system does not boot.

IMPORTANT: PPMs do not seat if turned the wrong way.

To replace a PPM:

1. Position the PPM above the slot. The PPM is keyed to fit only one way in the slot.
2. Press evenly on the PPM to insert it into the slot until latches snap up to secure the module. The clips on the PPM snap into a locked position automatically when the module is fully seated in the slot. The module is keyed to be sure it is aligned correctly.

Memory

Use Figure 2-48 and Table 2-3 to identify DIMM slots on the server system board. The slots are numbered sequentially (1 through 6), and the paired banks are identified by the letters A, B, and C, as shown in Table 2-3. Follow all installation guidelines listed in this chapter. Memory banks must be populated in pairs.

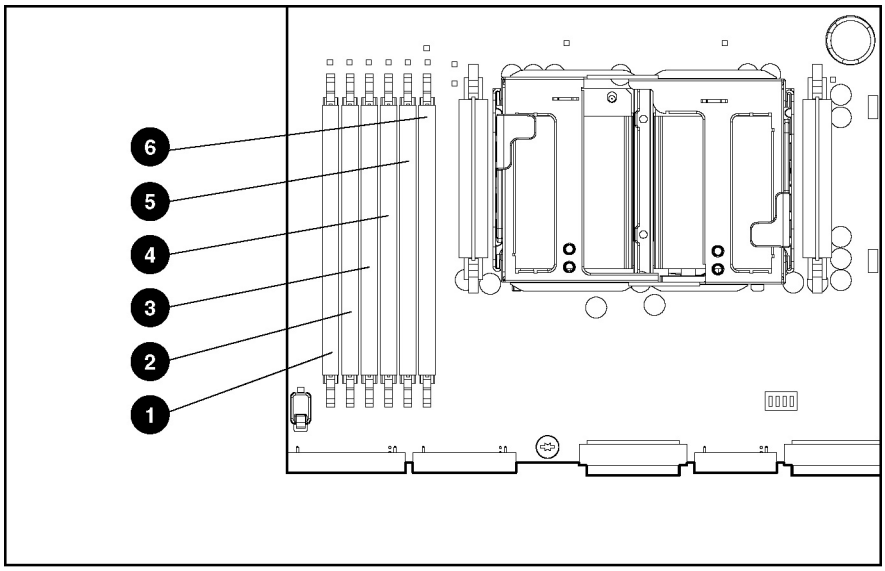


Figure 2-48: DIMM slots

Table 2-3: ECC DDR DIMM Slot Locations

Item	Description
1	ECC DDR DIMM slot 1A
2	ECC DDR DIMM slot 2A
3	ECC DDR DIMM slot 3B
4	ECC DDR DIMM slot 4B
5	ECC DDR DIMM slot 5C
6	ECC DDR DIMM slot 6C

CAUTION: Use only HP or Compaq branded DIMMs from the supported kits. DIMMs from other sources are known to adversely affect data integrity.

DIMM Installation Guidelines

The following guidelines **must** be followed when installing or replacing memory:

- Always install memory in pairs of two identical DIMMs.
- DIMMs installed in the server must be registered ECC DDR, 2.5 volts, 72 bits wide.
- Install each pair of DIMMs into both slots within a single bank (1A with 2A; 3B with 4B; 5C with 6C). DIMMs must be installed in order, starting with bank A, B, and then C. **Do not skip over banks or skip DIMMs**. The system will not function if not populated properly.

Removing DIMMs

To remove a DIMM:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the processor air baffle. Refer to "Processor Air Baffle" in this chapter.
5. Press both DIMM slot release latches outward (1).
6. Lift the DIMM module out of the slot (2).

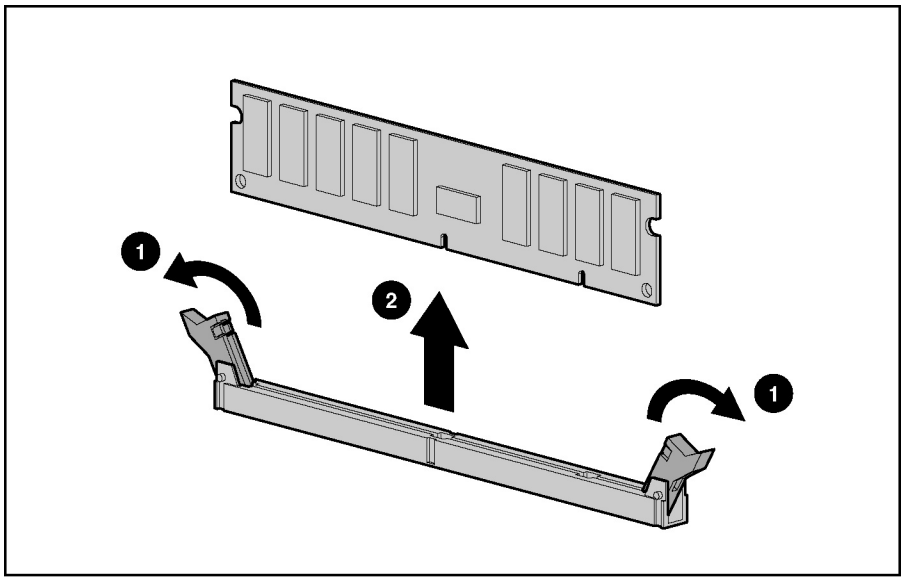


Figure 2-49: Removing a DIMM

7. Repeat steps 5 and 6 to remove other DIMMs.

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

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

To replace the DIMMs:

1. Align the key slot on the bottom edge of the DIMM with the tab on the slot.
2. Press down evenly on the DIMM until it is seated securely in the slot and the latches close.

Power Supply Backplane

To remove the power supply backplane from the chassis:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove any hot-plug power supplies. Refer to "Hot-Plug Power Supply."
5. Remove the PCI-X expansion boards. Refer to "PCI-X Expansion Boards" in this chapter.
6. Remove the processor air baffle. Refer to "Processor Air Baffle" in this chapter.
7. Remove the center wall. Refer to "Center Wall" in this chapter.
8. Disconnect the diskette drive/CD-ROM power cable (1), the power supply backplane cable (2), and the power supply signal cable (3) from the backplane.

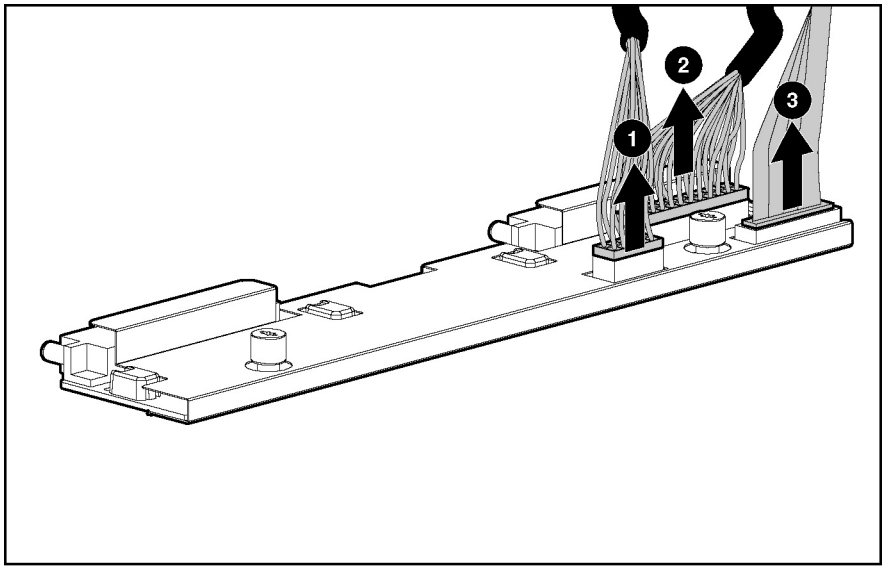


Figure 2-50: Disconnecting cables from the power supply backplane

9. Loosen the two thumbscrews securing the backplane to the chassis (1).
10. Grasp the backplane, pulling toward the rear of the server to release it from the four retaining guides.
11. Lift the backplane away from the server (2).

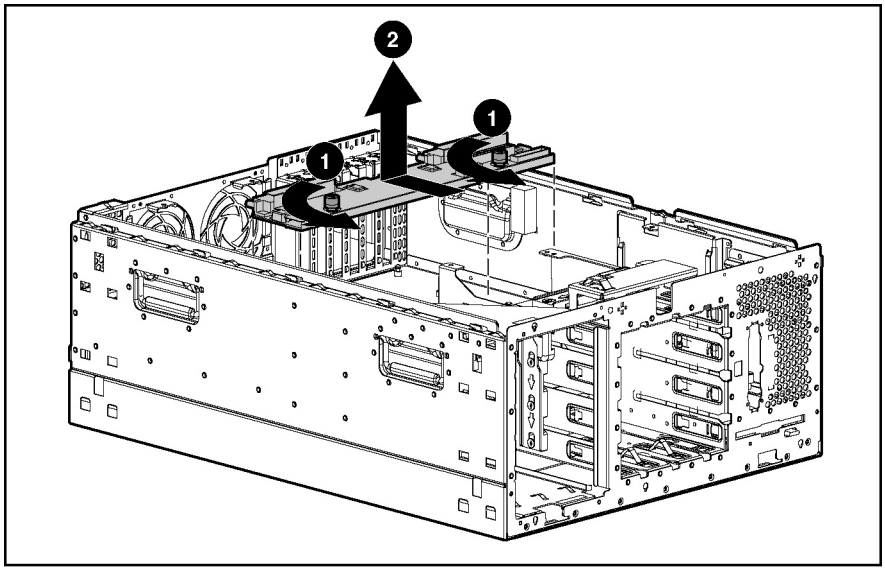


Figure 2-51: Removing the power supply backplane

To replace the power supply backplane, reverse steps 8 through 11.

NOTE: Be sure that you align the four retaining guides on the chassis with the holes on the power supply backplane when replacing it.

System Board

IMPORTANT: You must re-enter the server serial number through RBSU if you replace the system board. Refer to "Re-entering the Server Serial Number" in this chapter.

To remove the system board:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the redundant fan cage, if installed. Refer to "Redundant Fan Cage" in this chapter.
5. Remove all expansion boards. Refer to "PCI-X Expansion Boards" in this chapter.
6. Remove the processor air baffle. Refer to "Processor Air Baffle" in this chapter.
7. Remove the center wall. Refer to "Center Wall" in this chapter.
8. Disconnect all cables.
9. Loosen the two thumbscrews securing the system board to the chassis (1).
10. Slide the system board toward the front of the chassis to release it from the six retaining guides (2).
11. Lift the system board out of the chassis and tilt it to one side to clear the cable guide (3).

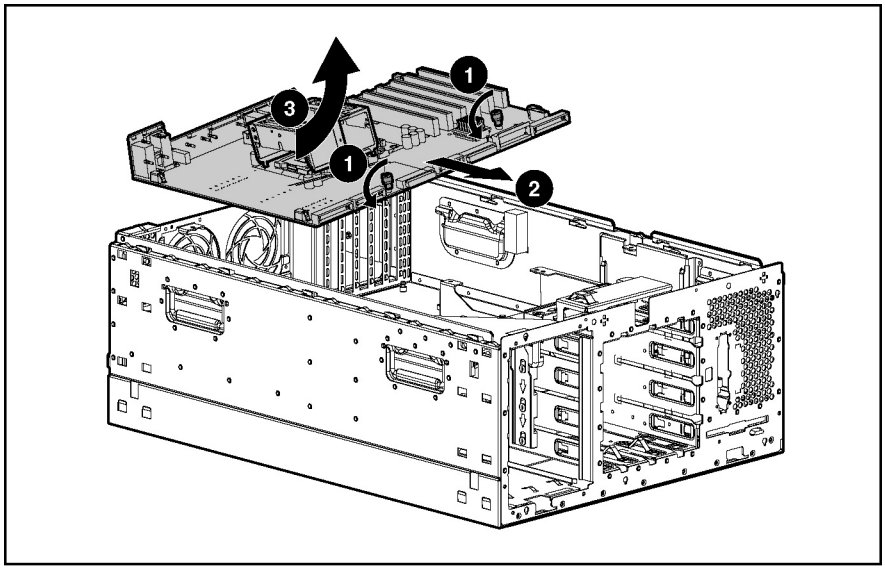


Figure 2-52: Removing the system board

To replace the system board and all components connected to it, reverse steps 4 through 11.

NOTE: Be sure that you align the six retaining guides on the chassis with the holes on the system board when replacing it.

Processor Cage Assembly

To remove the processor cage assembly:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock the front bezel (tower server only).
3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Remove the processor air baffle. Refer to "Processor Air Baffle" in this chapter.
5. Remove the expansion boards. Refer to "PCI-X Expansion Boards" in this chapter.
6. Remove the center wall. Refer to "Center Wall" in this chapter.
7. Disconnect all cables.
8. Remove the system board. Refer to "System Board" in this chapter.
9. Remove the processor. Refer to "Processor Assembly" in this chapter.
10. Remove the PPM. Refer to "Processor Power Module" in this chapter.
11. Remove all DIMMs. Refer to "Removing DIMMs" in this chapter.
12. Remove the six processor cage screws using the Torx T-15 tool.

NOTE: The Torx T-15 tool is clipped to the rear panel of the server to the right of the right-most fan grating.

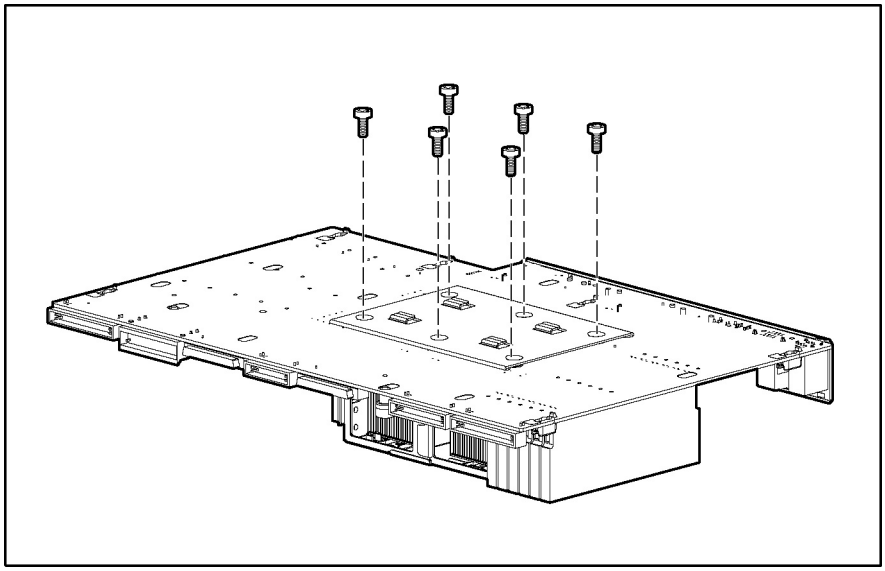


Figure 2-53: Removing the processor cage screws

13. Remove the processor cage and the processor plate.

To replace the processor cage, reverse steps 9 through 12.

IMPORTANT: When installing the processor cage, be sure that the processor cage plate and the processor cage are facing the correct direction. The processor cage should be placed so that the two pin guide posts on the processor cage are toward the rear of the I/O panel (refer to Figure 2-43).

The processor cage plate should be placed so that the clip opening is facing the rear of the server (refer to Figure 2-53).

Battery

When 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 usually about 5 to 10 years. Use a 540-milliampere, lithium, 3-volt replacement battery (P/N 179322-001).

WARNING: To remove all power from the server, unplug the power cord from either the electrical outlet or the server or other product. If there is more than one power cord, all cords must be unplugged before all power is removed from the server.

WARNING: This server contains an internal lithium manganese dioxide or vanadium pentoxide battery. There is risk of fire and burns if the battery pack is not handled properly. To reduce the risk of personal injury:

- **Do not attempt to recharge the battery.**
- **Do not expose 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 server.**

CAUTION: Do not dispose of batteries, battery packs, and accumulators with general household waste. Use the public collection system, or return them to your authorized partners or their agents for recycling.

CAUTION: Loss of BIOS settings occurs when the battery is removed. BIOS settings must be reconfigured whenever the battery is replaced.

To remove the battery:

1. Power down and remove power from the server. Refer to "Powering Down the Server" in this chapter.
2. Unlock and open the front bezel (tower server only).

   IMPORTANT: You must unlock the tower bezel before removing the access panel. Refer to "Front Bezel" in this chapter.

3. Remove the access panel. Refer to "Access Panel" in this chapter.
4. Locate the battery and remove it from the system board.

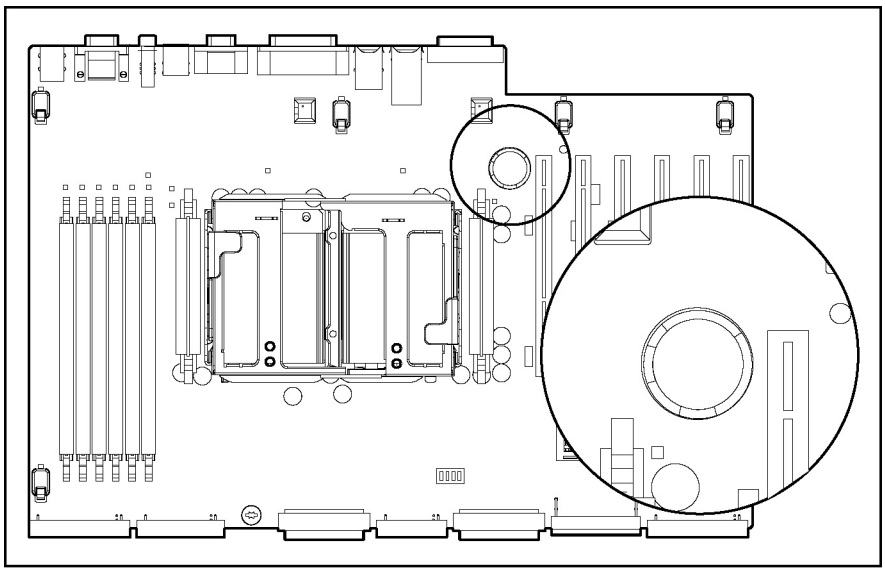


Figure 2-54: Battery location

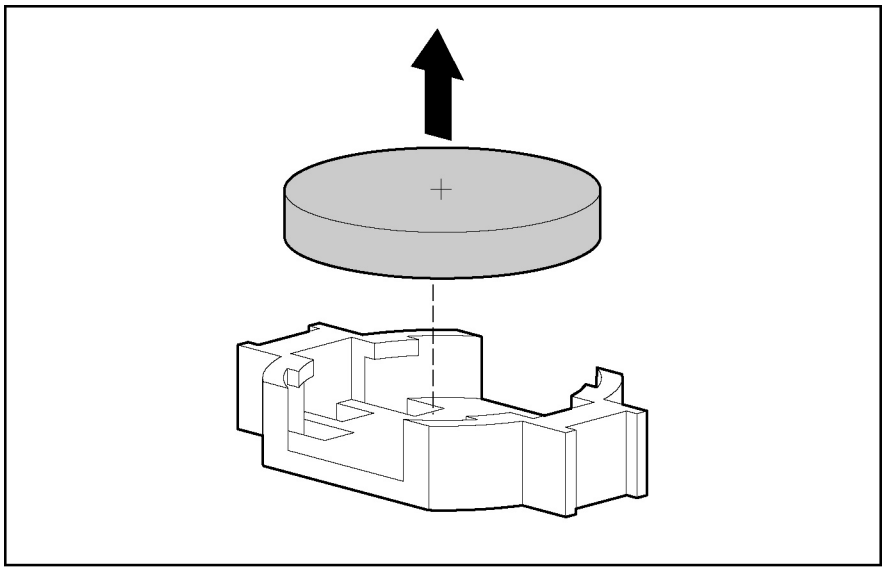


Figure 2-55: Removing the battery

To replace the battery, reverse step 4.

Run RBSU to configure the system after replacing the battery. Refer to the *HP ROM-Based Setup Utility User Guide* for more information.

Re-entering the Server Serial Number

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

During the server startup sequence, press the **F9** key to access RBSU.

1. Select the **System Options** menu.
2. 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.
   ```

   Press the **Enter** key to clear the warning.
3. Enter the serial number and press the **Enter** key.
4. Press the **Escape** key to close the menu.
5. Press the **Escape** key to exit RBSU.
6. Press the **F10** key to confirm exiting RBSU. The server will automatically reboot.

3

Diagnostic Tools

This chapter is an overview of software and firmware diagnostic tools that are available for configuring, monitoring, and managing the server.

Diagnostic Tools Overview

Use the following tools to diagnose problems, test hardware, and monitor and manage server operations.

Table 3-1: Diagnostic Tools

Tool	Description	How to run the tool
Array Diagnostics Utility (ADU)	ADU is a Microsoft® Windows® operating system-based tool designed to run on all systems that support HP or Compaq branded array controllers. ADU collects information about the array controllers in the system and generates a list of detected problems.	For a list of servers that support ADU, go to: www.hp/products/servers/platforms For a complete list of ADU error messages, refer to the *HP ProLiant Servers Troubleshooting Guide*.
Automatic Server Recovery (ASR)	ASR automatically restarts the server after a catastrophic operating system failure. With ASR, you have multiple recovery options: • Available Recovery provides software error recovery and environmental recovery. • Unattended Recovery logs the error information to the Integrated Management Log (IML), resets the server, and tries to restart the operating system.	Run RBSU and enable ASR.
Diagnostics	Diagnostics tests and verifies operation of server hardware. If Diagnostics finds a hardware failure, it isolates the replaceable part, if possible.	Access Diagnostics when POST detects a system configuration error. For a complete list of POST error messages, refer to the *HP ProLiant Servers Troubleshooting Guide.*
Insight Manager 7	Insight Manager 7 is a client/server application used to remotely manage server hardware in a network environment. The Insight Manager application reports hardware fault conditions (both failure and pre-failure) and collects data for reporting and graphing.	For more information on viewing and printing the event list, refer to the Management CD, the *Insight Manager User Guide,* or the *HP ProLiant ML370 Generation 3 Server Setup and Installation Guide.*

continued

Table 3-1: Diagnostic Tools *continued*

Tool	Description	How to run the tool
SmartStart Software	SmartStart software is the intelligent way to set up the server. The SmartStart CD includes the ROMPaq Utility, driver updates, and assistance installing operating systems.	Use the information provided in the ProLiant Essentials Foundation Pack.
Survey Utility	Survey Utility gathers critical hardware and software information on servers running Microsoft Windows NT® or Novell NetWare. If a significant change occurs between data-gathering intervals, the Survey Utility marks the previous information and overwrites the survey text files to reflect the latest changes in the configuration.	Install the Survey Utility from the SmartStart CD, the Integration Maintenance Utility, or the Management CD.
Integrated Management Log (IML)	The IML is a log of system events such as system failures or nonfatal error conditions. View events in the IML from within: • Insight Manager 7 • Survey Utility • Operating system-specific IML utilities	The IML requires operating system-dependent drivers. Refer to the SmartStart CD for instructions on installing the appropriate drivers.
ROM-Based Setup Utility (RBSU)	RBSU configures the hardware installed in or connected to the server. Specifically, it can: • Configure ports and IRQ, if required • Manage memory installation, processor upgrades, and mass storage devices • Store configuration information in nonvolatile memory • Assist in installing an operating system	Run RBSU by pressing the **F9** key during POST.

continued

Table 3-1: Diagnostic Tools *continued*

Tool	Description	How to run the tool
ROMPaq Utility	The ROMPaq Utility checks the system and provides a choice of available ROM revisions and controller firmware.	Run this utility from the SmartStart CD included with the server.
System Firmware Update Utility	The System Firmware Update Utility updates system firmware on remote servers from a central location (used in conjunction with the Remote Deployment Utility Console)	Latest maintenance ROM executable file can be downloaded from: www.hp/products/servers/platforms
SmartStart Diskette Builder	The SmartStart Diskette Builder is a utility that uses data stored on the SmartStart CD to create support diskettes. You can create support diskettes for specific configuration needs or for software that cannot be used directly from the SmartStart CD.	Run the diskette builder tool from the SmartStart CD.

4

LED Indicators and Switches

This chapter provides information about locating and using system LEDs and switches in the server. For additional information about troubleshooting procedures, refer to the *HP ProLiant ML370 Generation 3 Server Setup and Installation Guide*.

System LEDs

The server contains several sets of LEDs that indicate the status and settings of hardware components. This chapter discusses the following types and locations of LEDs:

- Front panel
- Hot-plug SCSI hard drive
- RJ-45 connector
- Rear unit identification LED switch
- Hot-plug power supply
- Hot-plug fan
- System board

Information at the end of this section discusses the interactions between external and system board LEDs in troubleshooting or assessing system status.

Front Panel LEDs

The set of five LEDs on the front of the server indicates system health. Figure 4-1 and Table 4-1 identify and describe the location and function of each LED.

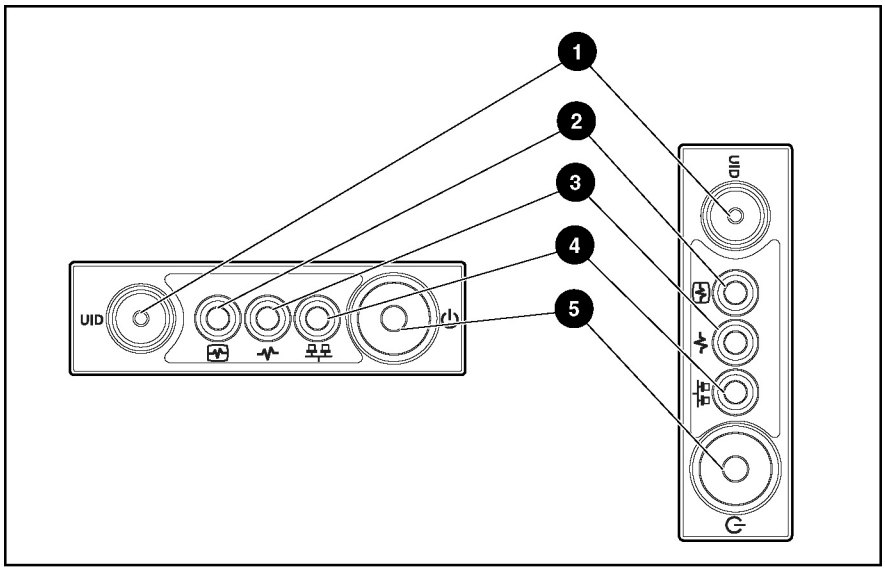


Figure 4-1: Front panel LEDs (rack and tower servers)

Table 4-1: Front Panel LEDs

Item	Description	Status
1	Unit identification (UID) switch and LED	Blue = System activated Blue flashing = System being managed remotely Off = System deactivated
2	Internal health LED*	Green = Normal (system on) Amber = System degraded Red = System critical Off = Normal (system off)
3	External health (power supply) LED	Green = Normal (system on) Amber = Redundant power supply failed Red = Critical power supply failed Off = Normal (system off)
4	Network LED (embedded NIC only)	Green = Network link Blinking = Network link/activity Off = No network connection
5	Power On/Standby button and LED	Amber = Power off (auxiliary power only) Green = Power on Off = Power cord not attached to the server or the power supply failed

* The internal health LED identifies service events for internal components in a pre-failure or failed condition. Internal components include fans, processors, PPMs, memory, and overtemperature conditions. For a list of these events, refer to the *HP ProLiant ML370 Generation 3 Server Setup and Installation Guide*.

Hot-Plug SCSI Hard Drive LEDs

Each hot-plug SCSI hard drive has three LEDs located on the front of the drive. They provide activity, online, and fault status for each corresponding drive when configured as a part of an array and attached to an active Smart Array Controller. LED behaviors may vary, depending on the status of other drives in the array. Figure 4-2 and Table 4-2 and Table 4-3 identify LED locations and analyze the status of each hot-plug SCSI hard drive.

WARNING: For hot-plug hard drive replacement guidelines, refer to the *HP ProLiant Servers Troubleshooting Guide* before removing the hard drive.

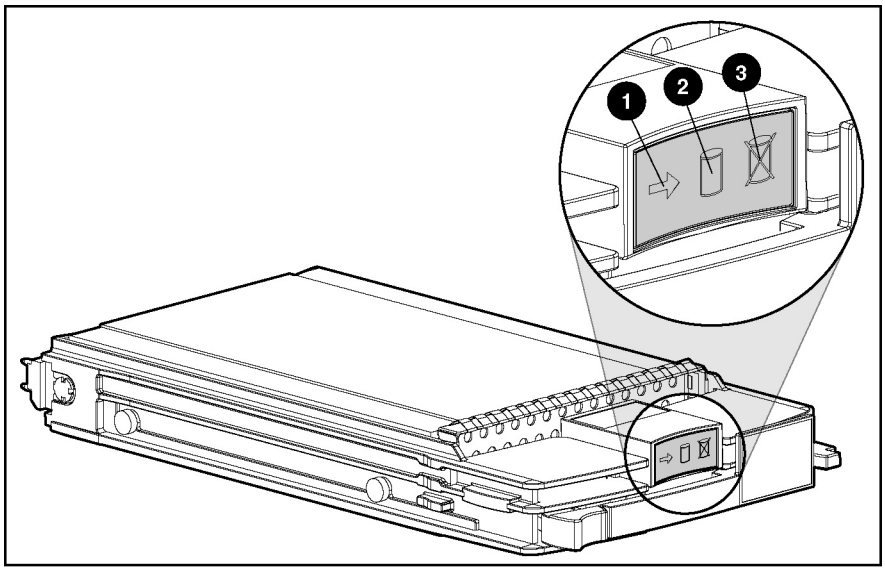


Figure 4-2: Hot-plug SCSI hard drive LEDs

Table 4-2: Hot-Plug SCSI Hard Drive LEDs

Item	Description	Status
1	Drive activity	On = Drive activity
		Off = No drive activity
2	Online status	Flashing = Online activity
		Off = No online activity
3	Fault status	Flashing = Fault-process activity
		Off = No fault-process activity

Table 4-3: Hot-Plug SCSI Hard Drive LED Combinations

Activity LED	Online LED	Fault LED	Status
On	Off	Off	**Do not remove the drive. Removing a drive during this process causes data loss.** The drive is being accessed and is not configured as part of an array.
On	Flashing	Off	**Do not remove the drive. Removing a drive during this process causes data loss.** The drive is rebuilding or undergoing capacity expansion.
Flashing	Flashing	Flashing	**Do not remove the drive. Removing a drive during this process causes data loss.** The drive is part of an array being selected by the Array Configuration Utility. -Or- The Options ROMPaq is upgrading the drive.
Off	Off	Off	OK to replace the drive online if a predictive failure alert is received and the drive is attached to an array controller. The drive is not configured as part of an array. -Or- If this drive is part of an array, a powered-on controller is not accessing the drive. -Or- The drive is configured as an online spare.
Off	Off	On	OK to replace the drive online. The drive has failed and has been placed offline.
Off	On	Off	OK to replace the drive online if a predictive failure alert is received, provided that the array is configured for fault tolerance and all other drives in the array are online. The drive is online and configured as part of an array.
On or flashing	On	Off	OK to replace the drive online if a predictive failure alert is received, provided that the array is configured for fault tolerance and all other drives in the array are online. The drive is online and being accessed.

RJ-45 Connector LEDs

The RJ-45 connector on the server rear panel has two LEDs. Figure 4-3 and Table 4-4 identify the LED locations and status.

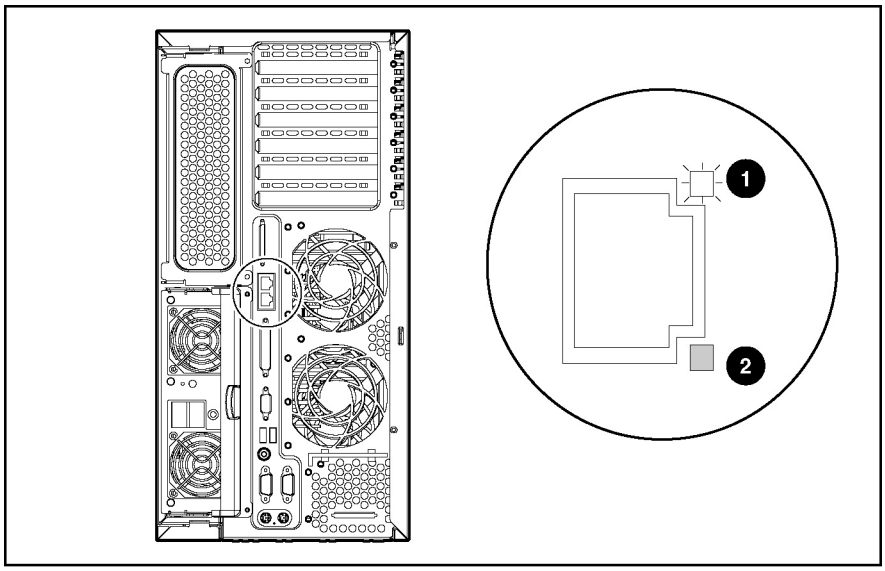


Figure 4-3: RJ-45 connector LEDs

Table 4-4: RJ-45 Connector LEDs

Item	Description	Status
1	Activity	On or flashing = Network activity
		Off = No network activity
2	Link	On = Linked to network
		Off = No network link

Rear Unit Identification LED Switch

The server includes unit identification (UID) LEDs with switches on both the front and rear panels. The UIDs indicate activity status and can be toggled on and off by the front or rear hardware push button or by the Insight Manager 7 application.

The rear UID identifies the location of an individual server in a rack of servers. It also contains an integrated button to activate or deactivate the LED.

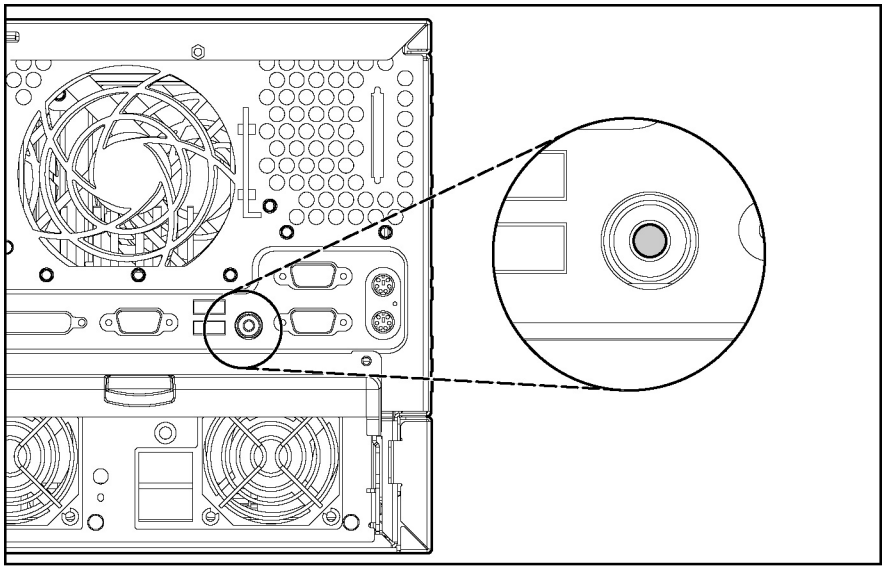


Figure 4-4: Rear UID and switch (rack model)

The rear UID indicates the following states:

- Blue on = The switch is activated.
- Blue flashing = The system is being monitored remotely.
- Off = The switch is deactivated.

Hot-Plug Power Supply LEDs

Determine the hot-plug power supply status by noting the color of the power supply LED located adjacent to the AC inlet.

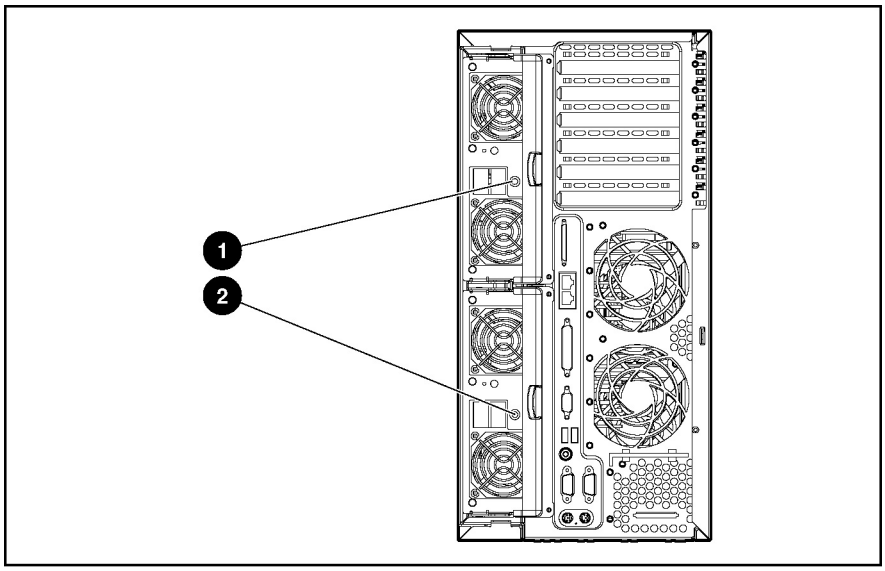


Figure 4-5: Hot-plug power supply LEDs

Table 4-5: Hot-Plug Power Supply LEDs

Item	Description
1	Secondary (redundant) power supply
2	Primary power supply

When the power supply LED is off, the following conditions may exist:

- No AC power is available.
- The power supply has failed.
- The power supply is in standby mode.
- The power supply has exceeded current limit.

When the power supply LED is green, the power is turned on and the power supply is functioning properly.

Hot-Plug Fan LEDs

Each hot-plug fan contains a dual-color LED.

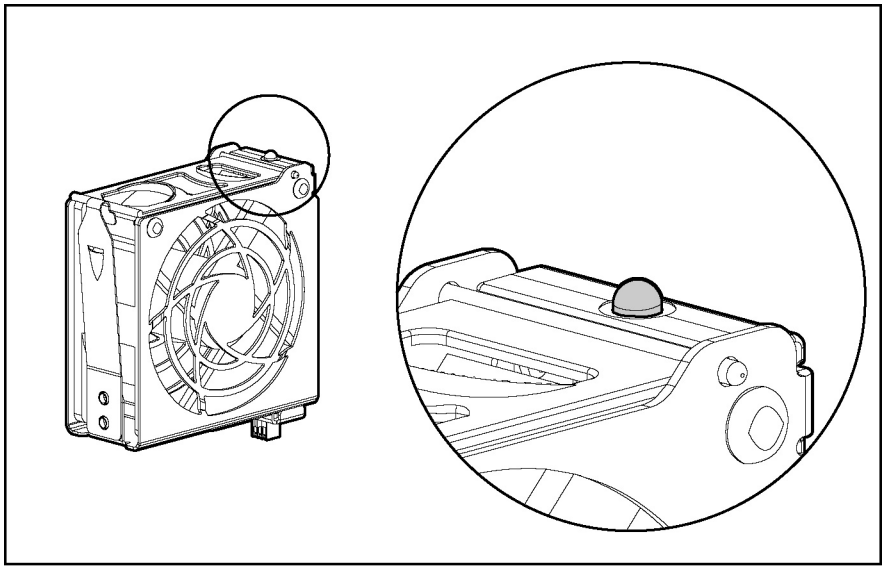


Figure 4-6: Hot-plug fan LED

The hot-plug fan LED indicates the following conditions:

- Green = The fan is operating normally.
- Amber = The fan has failed.
- Off = The fan is not powered or is not seated.

System Board LEDs

The following LEDs are located on the system board:

- Processor status
- PPM status
- Memory status
- System overtemperature
- Online spare memory (OSM) status
- iLO Diagnostic

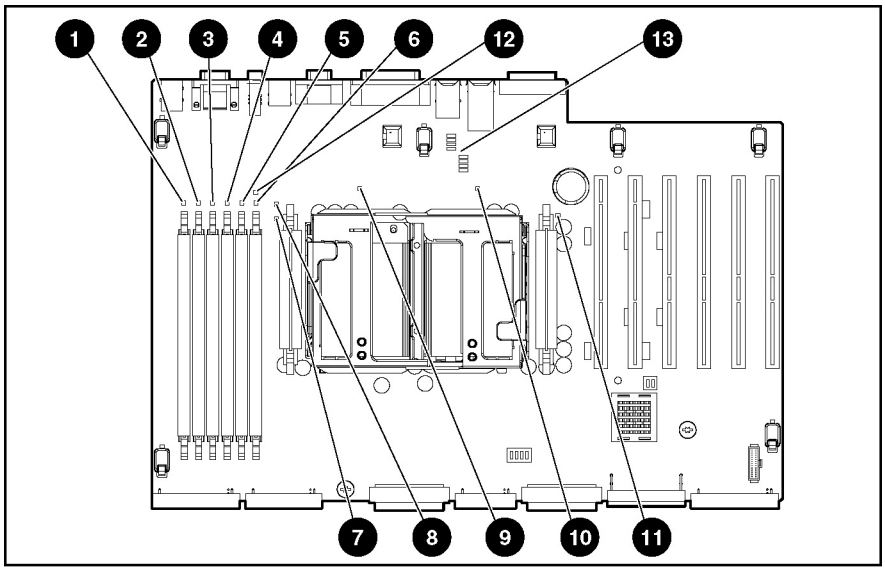


Figure 4-7: System board LEDs

Table 4-6: System Board LEDs

Item	Description	Status
1	Memory status 1A	
2	Memory status 2A	
3	Memory status 3B	Amber = Memory failed
4	Memory status 4B	Off = Normal
5	Memory status 5C	
6	Memory status 6C	

continued

Table 4-6: System Board LEDs *continued*

Item	Description	Status
7	PPM 2	Amber = Processor or PPM failed Off = Normal
8	OSM status	Green = OSM enabled Amber = PSM failed over Off = Normal memory configuration
9	Processor 2	Amber = Processor or PPM failed Off = Normal
10	Processor 1	
11	PPM 1	
12	System overtemperature	Amber = System overtemperature event Off = Normal
13	iLO Diagnostic LEDs	Refer to the iLO User's Guide on the Documentation CD

External Health LED

Table 4-7: External Health LED

System LED and Color	External Health LED Color	Status
Power supply (off)	Red	Primary power supply or both power supplies have failed.
	Amber	Secondary power supply has failed.

System LEDs and Internal Health LED Status Combinations

When the internal health LED on the front panel illuminates either amber or red, the server is experiencing a health event. The combinations of illuminated system LEDs and the internal health LED in Table 4-8 indicate system status.

NOTE: The system management driver must be installed in order for the internal health LED to provide pre-failure and system conditions.

The internal health LEDs on the front panel indicate the current hardware status and are used to assist in initial troubleshooting. Note that in some situations, Insight Manager 7 reports server status differently than the health LEDs because it tracks more system attributes.

Table 4-8: System LEDs and Internal Health LED Status Combinations

System LED and Color	Internal Health LED Color	Status
Processor failure, socket *X* (amber)	Red	• Processor in socket *X* has failed. • Processor has failed over to offline spare. • Processor is not installed in socket *X*. • ROM detects a failed processor during POST.
	Amber	• Processor in socket *X* is in pre-failure condition. • Processors are missing (PPM installed without processor).
Processor failure, both sockets (amber)	Red	Processor types do not match.
DIMM failure, slot *X* (amber)	Red	• DIMM in slot *X* has failed. • DIMM has experienced a multi-bit error.
	Amber	• DIMM has reached single-bit correctable error threshold. • DIMM in slot *X* is in pre-failure condition.
DIMM failure, all slots in one bank (amber)	Red	• Interleaving error: The bank is not populated entirely or DIMMs do not all match within the bank. • DIMMs are not populated in correct order.
DIMM failure, all slots (amber)	Red	• No valid or usable memory is installed in the system. • The banks are not populated in the correct order.

continued

Table 4-8: System LEDs and Internal Health LED Status Combinations *continued*

System LED and Color	Internal Health LED Color	Status
System overtemperature (amber)	Red	System has exceeded operating system cautionary level or critical hardware level.
	Green	Normal.
Fan (amber)	Red	A required fan has failed.
	Amber	A redundant fan has failed.

System Board Switches

Some server operations, including adding or removing a component, changing a security feature, or reconfiguring the server from tower to rack, require that you reconfigure a system switch. If the system configuration is incorrect, the computer may not work properly and you may receive error messages on the screen.

This section discusses the following system board switches:

- Non-maskable interrupt
- System identification
- System maintenance

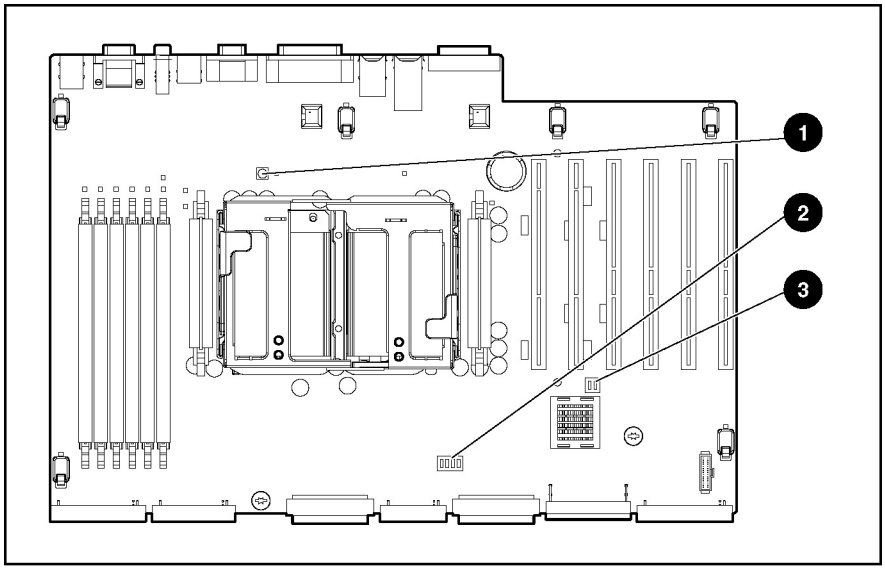


Figure 4-8: System board switches

Table 4-9: System Board Switches

Item	Switch Type
1	Non-maskable interrupt switch (SW4)
2	System identification switch (SW1)
3	System maintenance switch (SW2)

Non-Maskable Interrupt Switch

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 supports root cause analysis.

Systems running the Microsoft Windows NT operating system experience a blue screen trap when the operating system crashes. When this happens, Microsoft recommends that system administrators perform a non-maskable interrupt (NMI) event by pressing a dump switch. The NMI event allows a hung system to once again become responsive.

The NMI switch, or SW4, is used **only** in the event of a service emergency that requires a complete data dump in preparation for recovering the system from a blue screen or other catastrophic event.

NOTE: Pressing the NMI switch during normal operation will crash the server.

System Identification Switch

The system identification switch (SW2) is a three-position switch that identifies the operational configuration of the server. This switch is set to the correct configuration for the server by default. Table 4-10 shows the switch settings and positions.

CAUTION: Do not alter the default setting for the server. Doing so causes improper server operation.

Table 4-10: System Identification Switch (SW2)

Position	Description	Settings for 2.4-GHz and 2.8-GHz models	Settings for 3.06-GHz and above models
1	ID0	Off	Off
2	ID1	Off	Off
3	ID2	Off	On

System Maintenance Switch

The system maintenance switch (SW1) is a six-position switch that is used for system configuration. The default setting for all six positions is off. For the proper system maintenance switch settings, refer to the labels attached to the inside of the server access panel or refer to Table 4-11.

Table 4-11: System Maintenance Switch (SW1)

Position	Description	On/Off Function
1	iLO Security enable indicator	Off = iLO security enabled. On = iLO security disabled
2	Configuration lock indicator	Off = System configuration can be changed. On = System configuration is locked and cannot be changed.
3	Rack mount indicator	Off = System is in a tower configuration. On = System is in a rack-mounted configuration.
4	Enable diskette boot indicator	Off = Booting from diskette is controlled by RBSU. On = Booting from diskette is enabled and RBSU setting is overridden.
5	Password disable indicator	Off = Power-on password works normally. On = Power-on password is disabled.
6	Invalidate configuration indicator	Off = No function is available. On = ROM treats system configuration as invalid.

System Configuration Settings

It may be necessary at some time to clear and reset system configuration settings. When the system maintenance switch position 6 is set to the on position, the system is prepared to erase all system configuration settings from both CMOS and NVRAM. For additional information about locating the switch and switch settings, refer to "System Maintenance Switch" in this chapter. The default setting for all positions is off.

IMPORTANT: Clearing CMOS and/or NVRAM deletes your configuration information. Refer to the *HP ProLiant ML370 Generation 3 Server Setup and Installation Guide* for complete instructions on configuring the server.

IMPORTANT: You must re-enter the server serial number through RBSU after you clear NVRAM. Refer to "Re-entering the Server Serial Number" in Chapter 2.

To erase all system configuration settings:

1. Power down the server.
2. Open the front bezel (tower only).
3. Remove the access panel.
4. Remove the processor air baffle.
5. Set the position 6 lever to the on position.
6. Power up the server. All configuration settings are now erased and all system operations halt.
7. Power down the server.
8. Reset the position 6 lever to the default off position.
9. Power up the server.
10. Press the **F9** key to run RBSU and reset all system configuration settings.

NOTE: For instructions on using RBSU to reset system configuration settings, refer to the *HP ProLiant ML370 Generation 3 Server Setup and Installation Guide* or the *HP ROM-Based Setup Utility User Guide*.

ROMPaq Disaster Recovery Mode

A corrupted system ROM requires that you recreate the ROM BIOS by flashing the ROM. This operation can be accomplished only when the system is in disaster recovery (emergency repair boot) mode. If both sides of the redundant ROM are corrupted, the system automatically enters the disaster recovery mode and the server emits three extended beeps.

To perform ROMPaq disaster recovery:

1. After hearing the three beeps, insert a ROMPaq diskette with the latest system ROM from SmartStart.

   IMPORTANT: The ROMPaq flashes both sides of the redundant ROM. This process may take up to ten minutes.

2. Wait until the server emits three rising beeps, indicating the completion of the ROM flash process.
3. Restart the system.

5

Specifications

This chapter provides operating and performance specifications for the server and optional hardware, including the following:

- Tower server
- Rack server
- Memory modules
- 1.44-MB diskette drive
- IDE CD-ROM drive
- Wide Ultra3 hot-plug SCSI hard drive

Tower Server

Table 5-1: Tower Server Specifications

Feature	Metric Units	English Units
Dimensions		
Height		
Without feet	44.45 cm	17.50 in
With feet	46.89 cm	18.46 in
Depth		
Without bezel	63.50 cm	25.00 in
With bezel	71.12 cm	28.00 in
Width	22.07 cm	8.69 in
Weight (no drives installed)	33.95 kg	74.70 lb
Power supply input		
Rated input voltage		90 to 264 VAC
Rated input frequency		47 to 63 Hz
Rated input current		7.3 A (110 V) / 3.6 A (220 V)
Rated input power		800 W
BTUs per hour		2732
Power supply output		
Rated steady-state power		500 W (max)
Maximum peak power		550 W for up to 2 minutes
Rated output voltages		+5, +3.3, +12, -12 (VDC)
Rated auxiliary voltage		+5 VDC
Temperature range		
Operating	5° to 35°C	41° to 95°F
Shipping	-40° to 85°C	-40° to 185°F
Relative humidity (noncondensing)		
Operating	5% to 95%	5% to 95%
Non-operating	5% to 95%	5% to 95%
Maximum wet bulb temperature	38.7°C	101.7°F

Rack Server

Table 5-2: Rack Server Specifications

Feature	Metric Units	English Units
Dimensions		
Height	22.07 cm	8.69 in
Depth	65.41 cm	25.75 in
Width	48.26 cm	19.0 in
Weight		
No drives installed	33.39 kg	73.46 lb
Power supply input		
Rated input voltage		90 to 264 VAC
Rated input frequency		47 to 63 Hz
Rated input current		7.3 A (110 V) / 3.6 A (220 V)
Rated input power		800 W
BTUs per hour		2732
Power supply output		
Rated steady-state power		500 W
Height	22.07 cm	8.69 in
Maximum peak power		550 W for up to 2 minutes
Rated output voltages		+5, +3.3, +12, -12 (VDC)
Rated auxiliary voltage		+5 VDC
Temperature range		
Operating	5° to 35°C	41° to 95°F
Shipping	-40° to 85°C	-40° to 185°F
Relative humidity (noncondensing)		
Operating	5% to 95%	5% to 95%
Non-operating	5% to 95%	5% to 95%
Maximum wet bulb temperature	38.7°C	101.7°F

Memory Modules

Table 5-3: Memory Module Specifications

Feature	Description
DIMM sizes	256 MB, 512 MB, 1 GB, or 2 GB
Maximum memory	12 GB maximum (8 GB with online spare support)
Type configuration	Registered ECC DDR DIMM (2 × 1 interleaving)
Module type	PC2100, 1.2-in DIMMs

1.44-MB Diskette Drive

Table 5-4: 1.44-MB Diskette Drive Specifications

Feature	Description
Size	8.89 cm (3.5 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
Settling time	15 ms
Latency average	100 ms
Cylinders (high/low)	80/80
Read/write heads	2

CD-ROM Drive

Table 5-5: CD-ROM Drive Specifications

Feature	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	540 MB (mode 1, 12 cm)
	650 MB (mode 2, 12 cm)
Block size	2048 bytes (mode 1)
	2336 bytes (mode 2)
	2352 bytes (CD-DA)
	2328 bytes (CD-XA)
Dimensions	
Height	42.9 mm (1.68 in)
Depth	150.1 mm (5.85 in)
Width	208.0 mm (8.11 in)
Weight	0.950 kg (2.09 lb)
Data transfer rate	
Sustained	150 KB/s (sustained 1X), 1500-4800 KB/s (10X to 48X)
Burst	4.0 MB/s
Access times (typical)	
Full stroke	350 ms
Random	150 ms
Diameter	12 cm, 8 cm (4.70 in, 3.15 in)
Thickness	1.2 mm (0.05 in)
Track pitch	1.6 μm (6.3 x 10^{-7} in)
Cache/buffer	128 KB
Startup time	< 7 s
Stop time	< 4 s (single); < 30 s (multisession)
Laser parameters	
Type	Semiconductor laser GaAs
Wave length	700 $\pm$ 25 nm
Divergence angle	53.5° $\pm$ 1.5°
Output power	0.14 mW

continued

Table 5-5: CD-ROM Drive Specifications *continued*

Feature	Description
Operating conditions	
Temperature	5° to 45°C (41° to 113°F)
Humidity	5% to 90%

Wide Ultra3 Hot-Plug SCSI Hard Drive

Table 5-6: Wide Ultra3 Hot-Plug SCSI Hard Drive Specifications

Feature	9-GB 15K RPM	18-GB 15K RPM	36-GB 10K RPM	72-GB 10K RPM
Capacity	9,100.0 MB	18,209.8 MB	36,419.6 MB	72,839.2 MB
Height	One-third, 2.54 cm (1.0 in)	One-third, 2.54 cm (1.0 in)	One-third, 2.54 cm (1.0 in)	One-third, 2.54 cm (1.0 in)
Size	8.89 cm (3.5 in)	8.89 cm (3.5 in)	8.89 cm (3.5 in)	8.89 cm (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	15,000 RPM	15,000 RPM	10,000 RPM	10,000 RPM
Physical configuration				
Bytes per sector	512	512	512	512
Logical blocks	17,773,524	35,566,080	71,132,000	142,264,000
Operating temperature				
Celsius	10° to 35°C	10° to 35°C	10° to 35°C	10° to 35°C
Fahrenheit	50° to 95°F	50° to 95°F	50° to 95°F	50° to 95°F

Index

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W