HP ProLiant DL320 Generation 3 Server Maintenance and Service Guide

March 2005 (Second Edition)
Part Number 373044-002

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About This Guide

This maintenance and service guide can be used for reference when servicing an HP ProLiant DL320 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:

- *HP ProLiant DL320 Generation 3 Server User Guide*
- *Server Quick Reference Guide*
- *Server training guides*
- *Server advisories and bulletins*
- *QuickFind information services*
- *HP Systems Insight Manager software (HP SIM)*
- *HP ProLiant Servers Troubleshooting Guide*
- *HP ROM-Based Setup and Utility User Guide*
- *HP Integrated Lights-Out User Guide*
- *QuickSpecs*

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 HP SIM.

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.
- In other locations, refer to the HP website.

For HP technical support:

- In North America:
  - Call 1-800-HP-INVENT (1-800-474-6836). This service is available 24 hours a day, 7 days a week. For continuous quality improvement, calls may be recorded or monitored.
  - If you have purchased a Care Pack (service upgrade), call 1-800-633-3600. For more information about Care Packs, refer to the HP website.
- Outside North America, call the nearest HP Technical Support Phone Center. For telephone numbers for worldwide Technical Support Centers, refer to the HP website

  www.hp.com

1

Illustrated Parts Catalog

This chapter provides the illustrated parts breakdown and spare parts list for the HP ProLiant DL320 Generation 3 Server. Table 1-1 in this chapter provides names and ordering numbers for all referenced spare parts.

Customer Self Repair

HP's customer self-repair program offers you the fastest service under either warranty or contract. It enables HP to ship replacement parts directly to you so that you can replace them. Using this program, you can replace parts at your own convenience.

A convenient, easy-to-use program:

- An HP support specialist will diagnose and assess whether a replacement part is required to address a system problem. The specialist will also determine whether you can replace the part.
- Replacement parts are express-shipped. Most in-stock parts are shipped the very same day you contact HP. You may be required to send the defective part back to HP, unless otherwise instructed.
- Available for most HP products currently under warranty or contract. For information on the warranty service, refer to the HP website (http://h18004.www1.hp.com/products/servers/platforms/warranty/index.html).

For more information about HP's customer self-repair program, contact your local service provider. For the North American program, refer to the HP website (http://www.hp.com/go/selfrepair).

Customer replaceable parts are identified in the following tables.

Mechanical Parts Exploded View

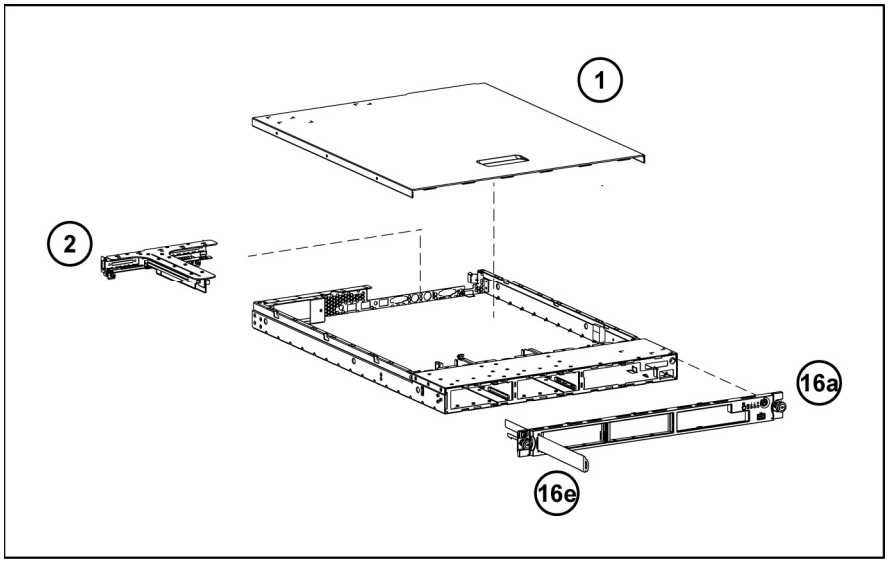

Figure 1-1: Mechanical parts exploded view

System Components Exploded View

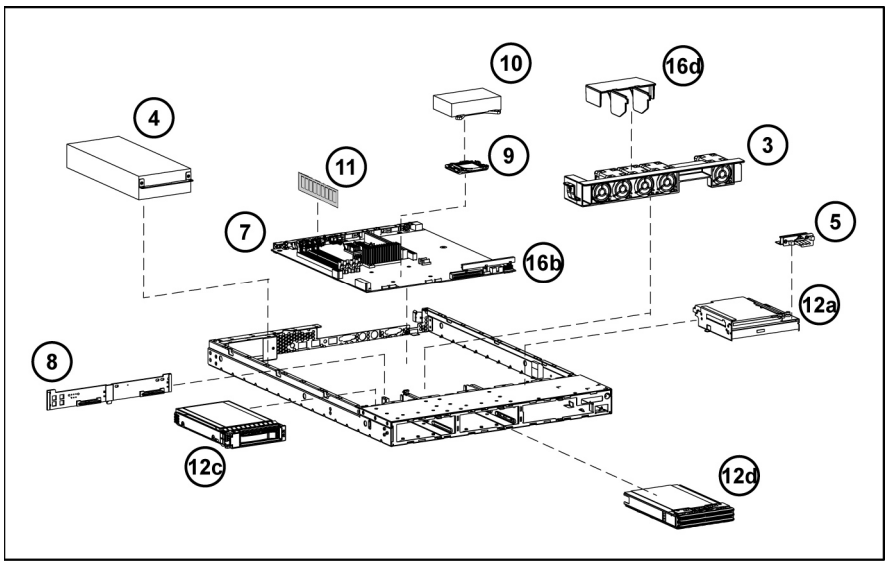

Figure 1-2: System components exploded view

Mechanical Parts and System Components Spares List

Table 1-1: Mechanical and System Spare Parts List

Item	Description	Spare Part Number	Customer Self Repair
	Mechanical Components		
1	Access panel	378631-001	Yes
2	PCI-X riser board assembly	361387-001	Yes
3	Fan assembly	378701-001	Yes
	Power		
4	500-Watt power supply	378630-001	Yes
	Boards		
5	LED/PWR switch board	378627-001	Yes
6	PCI Express board*	378626-001	Yes
7	System board	378623-001	Yes
8	SATA Backplane	378625-001	Yes
	Processor		
9	a) 2.93-GHz Intel® Celeron® processor	378619-001	Yes
	b) 3.4-GHz Intel Pentium® 4 processor 1MB*	378620-001	Yes
	c) 3.4-GHz Intel Pentium 4 processor 2 MB *	384787-001	Yes
	d) 3.6-GHz Intel Pentium 4 processor 1 MB*	378621-001	Yes
10	Heatsink	378622-001	Yes
	Memory		
11	a) PC3200 DDR ECC Registered DIMM 512 MB	351657-001	Yes
	b) PC3200 DDR ECC Registered DIMM 1 GB*	351658-001	Yes
	Mass Storage Devices		
12	Optical devices/diskette assembly		
	a) CD-ROM	390629-001	Yes
	b) DVD-ROM *	383981-001	Yes
	c) SCSI hard drive		
	1. SCSI 18-GB U320 HD	1. 289240-001	Yes
	2. SCSI 36-GB U320 HD	2. 289241-001	Yes
	3. SCSI 72-GB U320 HD	3. 289243-001	Yes
	d) SATA hard drive		
	1. SATA 80-GB HD	1. 353042-001	Yes
	2. SATA 160-GB HD	2. 353043-001	Yes
	3. SATA 250-GB HD	3. 353044-001	Yes
	e) Diskette drive assembly*	390530-001	Yes

* Not shown

continued

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

Item	Description	Spare Part Number	Customer Self Repair
	Miscellaneous		
13	Replacement battery, 3-V lithium*	234556-001	Yes
14	SATA cable kit*	378629-001	Yes
15	Cable kit*	378628-001	Yes
	a) hard drive cable*		Yes
	b) Optical device/diskette assembly drive cable*		Yes
	c) USB*		Yes
16	Miscellaneous plastics kit	378632-001	Yes
	a) Bezel		Yes
	b) PCI card guide		Yes
	c) Bezel screws*		Yes
	d) Air baffle		Yes
	e) Pull tab		Yes
17	Return kit*	378633-001	Yes
18	Country kit*	378675-001	Yes
	Option Kit Spares		
19	Rack mounting hardware kit*	360104-001	Yes
20	**Cable management arm Kit***	360105-001	Yes

* Not shown

2

Removal and Replacement Procedures

This chapter provides subassembly and module-level removal and replacement procedures for HP ProLiant DL320 Generation 3 Servers. After completing all necessary removal and replacement procedures, run the diagnostics program to verify that all components operate properly.

Required Tools and Software

You may need the following items for some procedures:

- Phillips screwdriver
- T-15/T-10 Torx screwdriver
- SmartStart CD
  - ROM-Based Setup Utility (RBSU)
  - Array Diagnostics Utility (ADU)
  - Diagnostics software
- Wrist strap

Safety Considerations

- Before performing any service procedure, review all safety information.

Electrostatic Discharge Information

An electrostatic discharge (ESD) can damage static-sensitive devices or microcircuitry. Proper packaging and grounding techniques are required to prevent damage. To prevent damage due to ESD, 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 as well as properly grounded tools and equipment.
- Keep the work area free of nonconductive materials such as ordinary plastic assembly aids and foam packing.

- Ensure proper grounding before touching a static-sensitive component or assembly.
- Avoid touching pins, leads, or circuitry.
- Always place drives with the Printed Circuit Board (PCB) assembly-side down.
- Use conductive field service tools.

Symbols on Equipment

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

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

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

WARNING: 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.

This symbol indicates the presence of electric shock hazards. The enclosed area contains no user or field-serviceable parts. Do not open for any reason.

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 or DVD-ROM drive. This label indicates that the product is classified as a Class 1 Laser Product.

Rack Warnings

WARNING: To reduce the risk of personal injury or damage to equipment, always be sure that the rack is adequately stabilized before extending a component from the rack. A rack may become unstable if more than one component is extended for any reason. Extend only one component at a time.

WARNING: To reduce the risk of personal injury or damage to the equipment, 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, if it is a single rack installation.**
- **The racks are coupled together in multiple rack installations.**

WARNING: When installing the server in a telco rack, make certain that the rack frame is adequately secured to the building structure at the top and bottom.

WARNING: To reduce the risk of personal injury or damage to the equipment, at least two people are needed 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 being moved on its casters. Do not stand in front of the rack as it rolls down the ramp from the pallet. Handle the rack from both sides.

Server Warnings and Precautions

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 them.

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 the power supply to disconnect power to the equipment.

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: The server must always be operated with the system access panel closed. Proper cooling is not achieved if the system access panel is removed.

Removal and Replacement Procedures

Use the procedures in this section to perform service events on the ProLiant DL320 G3 Server.

Powering Down the Server

The server does not completely power down when the front panel power button is pressed. The button toggles server power between On and Standby. In Standby, the server removes power from most electronics and drives, portions of the power supply and some internal circuitry remain active. To completely remove all power from the system, disconnect the power cord from the server.

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

WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that only one component is extended at a time. A rack may become unstable if more than one component is extended at the same time.

WARNING: Because the rack allows you to stack computer 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 come with the server.

WARNING: To reduce the risk of personal injury or damage to the equipment, place the server on a sturdy table or workbench whenever it is removed from the rack for device accessibility. Refer to the *HP ProLiant DL320 Generation 3 Server User Guide* for further information on working with racks.

CAUTION: Moving the Power On/Off switch to the Off position does not completely remove system power. Some portions of the power supply and some internal circuitry remain active. Disconnect all power cords from the server to remove all power from the system.

CAUTION: ESD can damage electronic components. Be sure you are properly grounded before beginning any installation procedure. For more information, see “Electrostatic Discharge Information” in this chapter.

NOTE: Microsoft® Windows NT® users may use the Power Down Manager to power down the server. For information on this system utility, refer to the NTREADME.HLP file on the NT Software Support Diskettes.

To power down the server:

1. Press the power button to toggle the server to standby. The power LED on the power button changes from green to amber.
2. Listen for the fan noise to stop to indicate that the server is powered down.
3. Disconnect the power cord first from the AC outlet and then from the server. The power LEDs turn off.
4. Disconnect all remaining cables on the server rear panel, including cables extending from external connectors on expansion boards.
5. Remove the server from the rack and position it securely on a workbench or other solid surface for stability and safety.

Access Panel

To access the system board, processor, memory modules, expansion slot, and other internal components, remove the access panel. Observe the following warnings and cautions.

WARNING: The front panel Power On/Off switch does not completely shut off all system power. Portions of the power supply and some internal circuitry remain active until AC power is removed.

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

CAUTION: Do not operate the server without the access panel installed. The access panel is required for proper airflow. Operating the server without the access panel prevents proper airflow and results in improper cooling and possible thermal damage.

CAUTION: Before removing the server access panel, be sure that the server is powered down and that the power cord is disconnected from the server and the electrical outlet.

CAUTION: To avoid the risk of damage to the system or expansion boards, remove all power cords before installing or removing expansion boards. When the Power On/Off switch is in the Off position, auxiliary power is still connected to the PCI expansion slot and may damage the card.

CAUTION: ESD can damage electronic components. Ensure proper grounding before beginning any installation procedure.

To remove the access panel:

1. Power down the server. See “Powering Down the Server” in this chapter.
2. Loosen rear thumbscrew by using the T-15/T-10 Torx screwdriver or the flat screwdriver.
3. Slide the access panel approximately 1.25 cm (0.5 in) toward the rear of the unit and lift the panel to remove it.

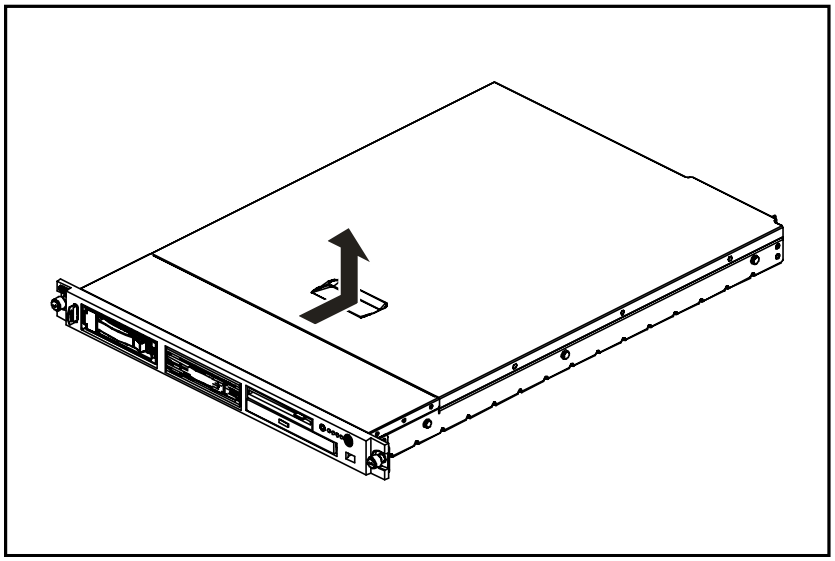

Figure 2-1: Removing the access panel

To replace the access panel, reverse steps 1 through 3.

Drive Assembly

The server contains a removable media drive assembly including one LED/PWR switch board, one optical drive, and one diskette drive.

To remove the drive assembly:

1. Power down the server. See "Powering Down the Server" in this chapter.
2. Remove the access panel. See "Access Panel" in this chapter.
3. Disconnect the LED/PWR switch board cable from the system board.
4. Disconnect the diskette drive cable from the diskette drive.
5. Disconnect the two optical drive cables from the optical drive.
6. Remove the fan module.
7. Loosen the one thumbscrew of the drive assembly (1).
8. Slide the drive assembly gently toward the back of the server (2).

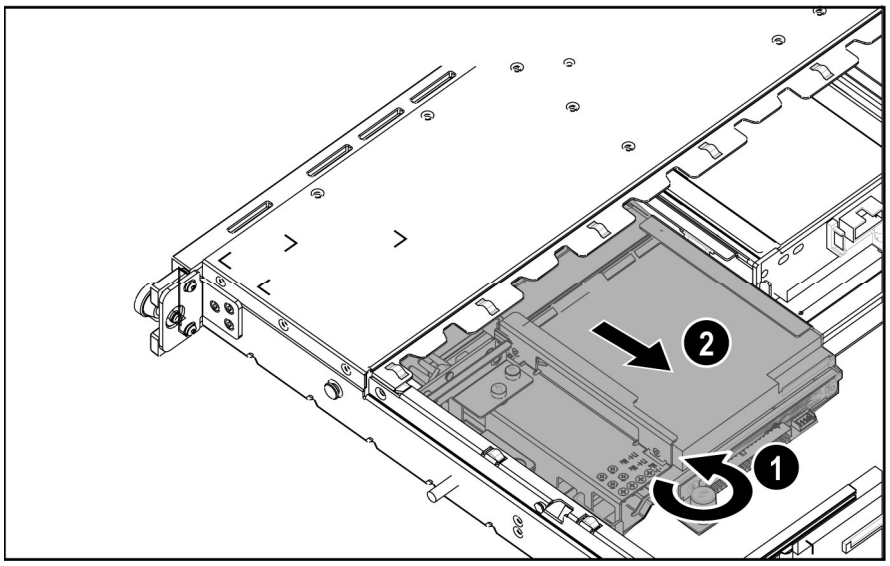

Figure 2-2: Loosen the thumbscrew and slide the assembly toward the back of the server

IMPORTANT : Carefully remove the LED/PWR switch board to avoid damaging the LEDs.

Reverse steps 1 through 8 to replace the drive assembly.

LED/PWR Switch Board

To remove the LED/PWR switch board:

1. Power down the server. See "Powering Down the Server" in this chapter.

2. Remove the access panel. See “Access Panel” in this chapter.
3. Disconnect the drive assembly cables. See “Drive Assembly” in this chapter.
4. Unscrew both LED/PWR switch board screws from the drive assembly (1) and remove the LED/PWR switch board (2).

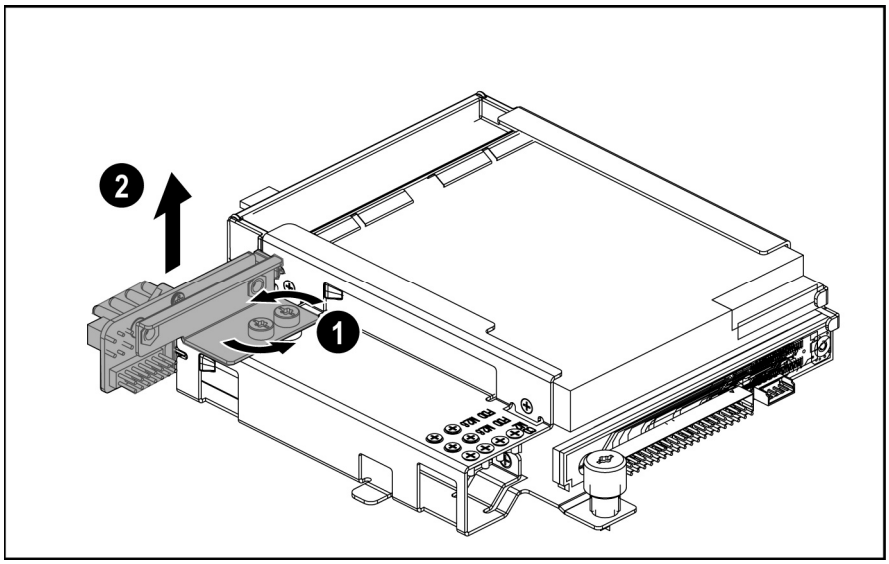

Figure 2-3: Removing the LED/PWR switch board

IMPORTANT: Carefully remove the LED/PWR switch board to avoid damaging the LEDs.

Reverse steps 1 through 4 to replace the LED/PWR switch board.

Diskette Drive

To remove the diskette drive:

1. Power down the server. See “Powering Down the Server” in this chapter.
2. Remove the access panel. See “Access Panel” in this chapter.
3. Disconnect the drive assembly cables. See “Drive Assembly” in this chapter.
4. Remove the LED/PWR switch board. See “LED/PWR Switch Board” in this chapter.
5. Remove the 4 screws holding diskette drive (1) and slide the drive out of the assembly (2).

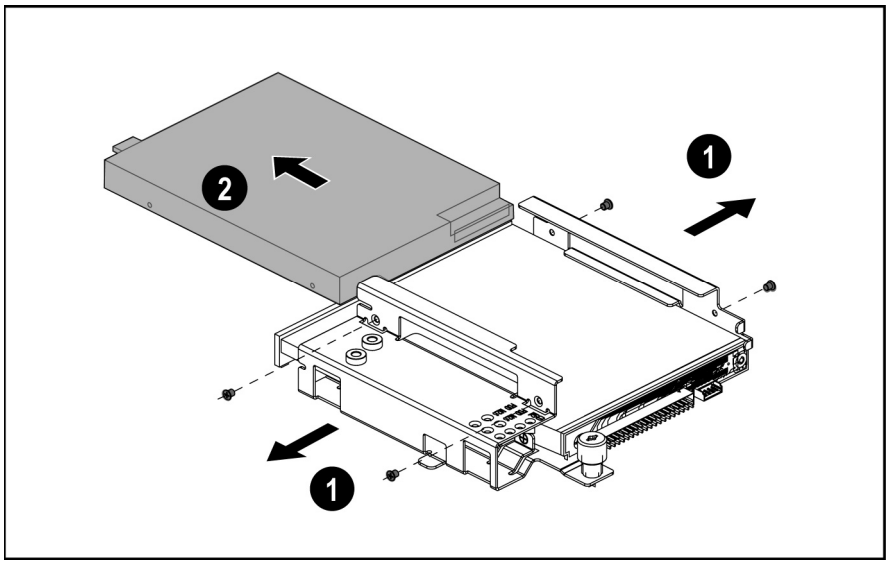

Figure 2-4: Remove the diskette drive

To replace the diskette drive, reverse steps 1 through 5.

NOTE: See the *HP ProLiant DL320 Generation 3 Server User Guide* for instructions on installing the diskette drive.

NOTE: If the diskette drive must be replaced due to failure, the diskette drive cable must be removed from the failed drive and installed on the replacement. See Chapter 1, "Illustrated Parts Catalog," for illustrations.

Optical Drive

To remove the optical drive:

1. Power down the server. See "Powering Down the Server" in this chapter.
2. Remove the access panel. See "Access Panel" in this chapter
3. Disconnect the drive assembly cables. See "Drive Assembly" in this chapter.
4. Remove 4 screws holding optical drive (1) and slide the drive out of the assembly (2).

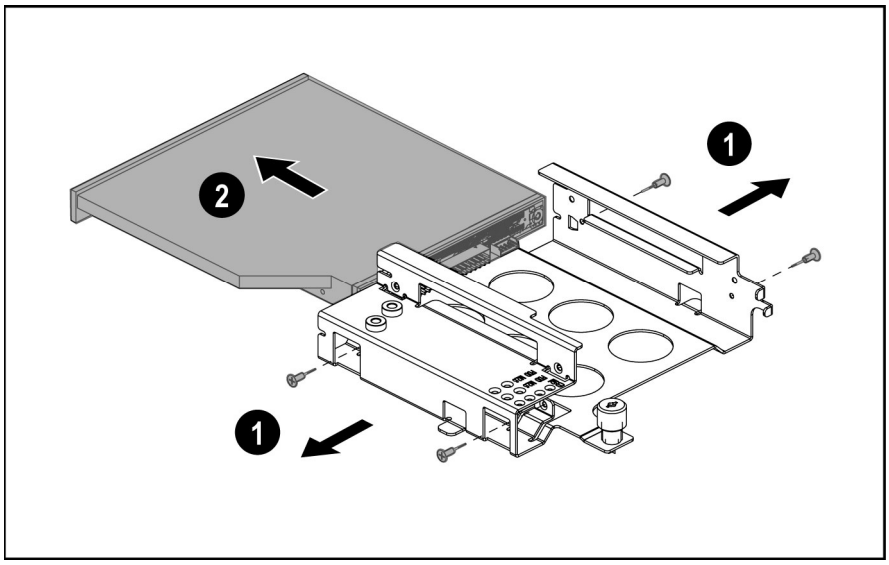

Figure 2-5: Remove the Optical drive

To replace the optical drive, reverse steps 1 through 4.

NOTE: See the *HP ProLiant DL320 Generation 3 Server User Guide* for instructions on installing the optical drive.

NOTE: If the drive must be replaced due to failure, the optical drive backplane must be removed from the failed drive and installed on the replacement. See Chapter 1, "Illustrated Parts Catalog," for illustrations.

Hard Drive Overview

The server contains two drive bays for SATA hard drives or non-hot pluggable SCSI hard drives. Two individual SATA channels exist, one for each of the hard drives. The server ships standard with two 1-inch drive trays for use with two 1-inch pluggable SATA hard drives. The following sections provide general guidelines and installation procedures for installing or upgrading hard drives.

Guidelines for Installing SATA Hard Drives

When installing SATA hard drives in the server, observe the following general guidelines:

- Populate hard drive bays starting with the lowest SATA device number. Device 0 serves as the primary boot drive.
- Set the jumpers on both SATA drives to Cable-Select mode.
- Do not add more than two SATA drives in the DL320 G3 server.

IMPORTANT: SATA hard drives must be configured to the Cable-Select mode.

NOTE: SATA drives are set to Cable-Select mode by default.

NOTE: Refer to the documentation shipped with the hard drive to determine how to set the jumpers on the SATA hard drives to Cable-Select mode, if they are not already set in Cable-Select mode.

Guidelines for Installing SCSI Hard Drives

Each SCSI hard drive installed in the server must be configured with a unique SCSI ID number. Unique identification allows the system to search for the lowest numbered drive to use as a bootable partition. By default, the jumpers on SCSI hard drives are set to ID 0 and may need to be reset when the drive is installed as an optional or replacement drive in the server.

CAUTION: Before removing the server access panel, be sure that the server is powered down and that the power cord is disconnected from the server and the electrical outlet.

NOTE: SCSI drives are set to Cable-Select mode by default.

Hard Drive Identification Numbers

The servers include two 1-inch hard drive trays. Hard drives installed in the server are labeled as Device 1 and Device 2 in Figure 2-6 for clarification.

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

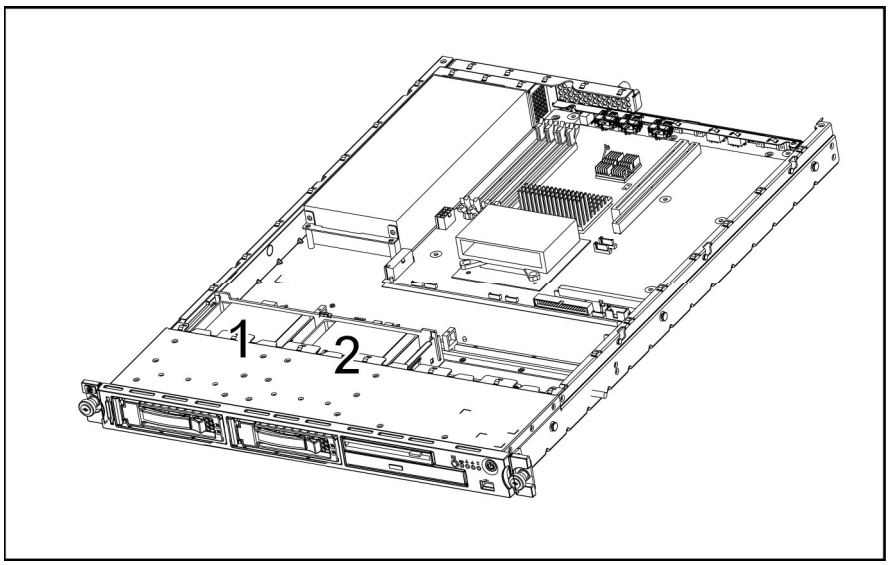

Figure 2-6: SATA device numbers

SATA Hard Drives

To remove a hard drive from the hard drive bay:

1. Power down the server. See "Powering Down the Server" in this chapter.
2. Flip open the tray lever to release the hard drive tray (1), and then slide the tray out of the chassis (2).

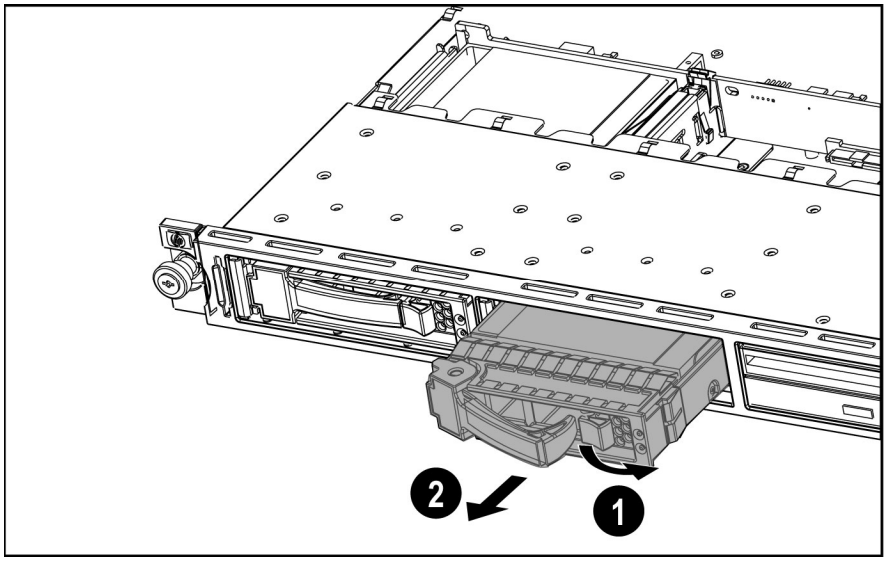

Figure 2-7: Removing the SATA hard drive tray from the chassis

3. Remove the four screws that secure the hard drive to the hard drive tray (1).
4. Remove the hard drive from the hard drive tray (2).

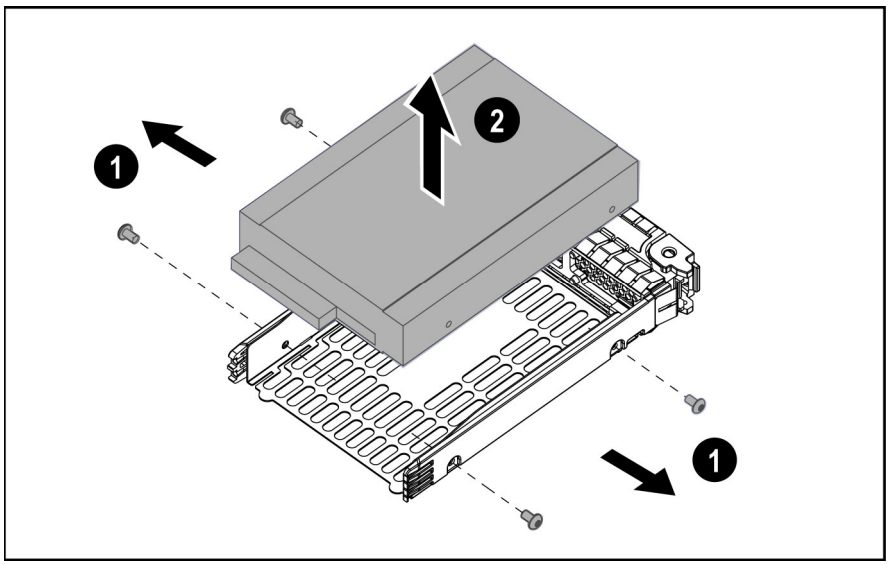

Figure 2-8: Removing the SATA hard drive from a hard drive tray

To replace the SATA hard drive, reverse steps 1 through 4.

IMPORTANT: While replacing the drive, make sure that the LED light pipes of the tray are seated properly in their slots.

SCSI Hard Drives

To remove a hard drive from the hard drive bay:

1. Power down the server. See “Powering Down the Server” in this chapter.
2. Remove the access panel. See “Access Panel” in this chapter.
3. Disconnect the SCSI cables from the hard drives.
4. Disconnect the power cables from the hard drives.
5. Loosen the thumbscrew that secures the hard drive tray to the chassis (1).
6. Slide the tray toward the front of the server and lift the tray out of the chassis (2).

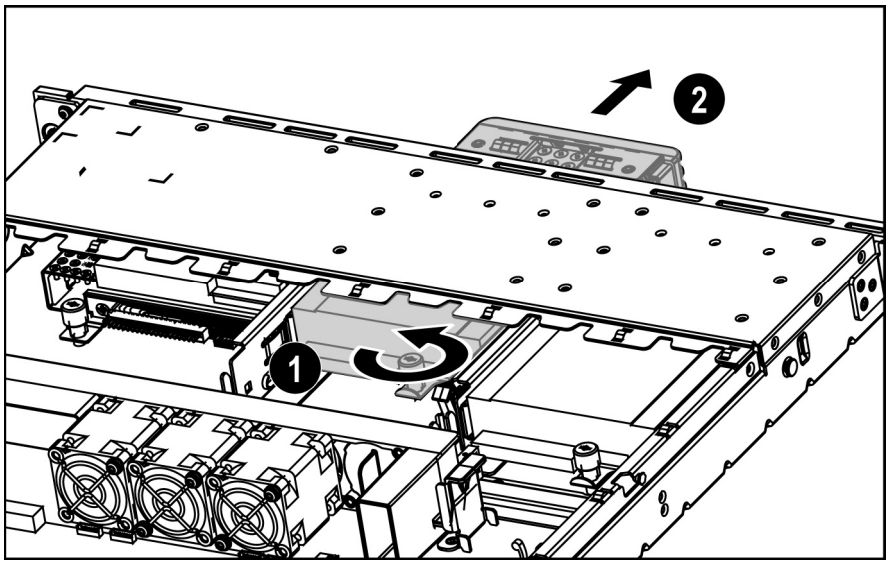

Figure 2-9: Removing the SCSI hard drive tray from the chassis

7. Remove the four screws at the bottom side that secure the hard drive to the hard drive tray (1).
8. Remove the hard drive from the hard drive tray (2).

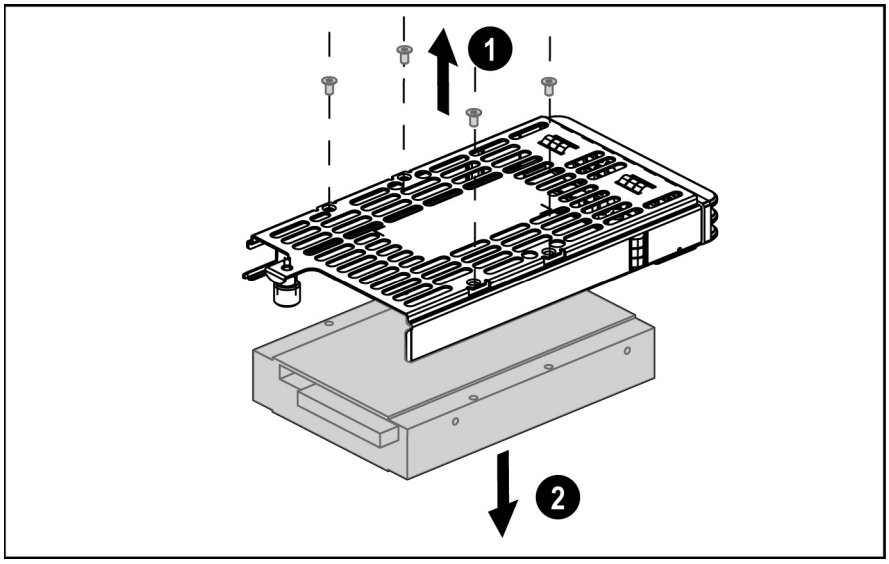

Figure 2-10: Removing the SCSI hard drive from a hard drive tray

CAUTION: Review "Guidelines for SCSI Hard Drives" in this chapter to ensure proper jumper settings and hard drive configuration.

CAUTION: When connecting the power cable to the hard drives, ensure that the connectors are installed so that the red wire faces right when viewed from the front of the server.

IMPORTANT: Ensure that the hard drives are installed with the data and power connectors along the bottom of the tray, facing away from the front vent holes..

To replace the SCSI hard drive, reverse steps 1 through 8.

PCI Riser Board Assembly

To remove the PCI riser board assembly:

1. Power down the server. See "Powering Down the Server" in this chapter.
2. Remove the access panel. See "Access Panel" in this chapter.
3. Disconnect any cables connecting an existing expansion board to the system board.
4. Unscrew the 2 thumbscrews on rear of chassis (1).
5. Lift and remove the PCI riser board from the server chassis (2).

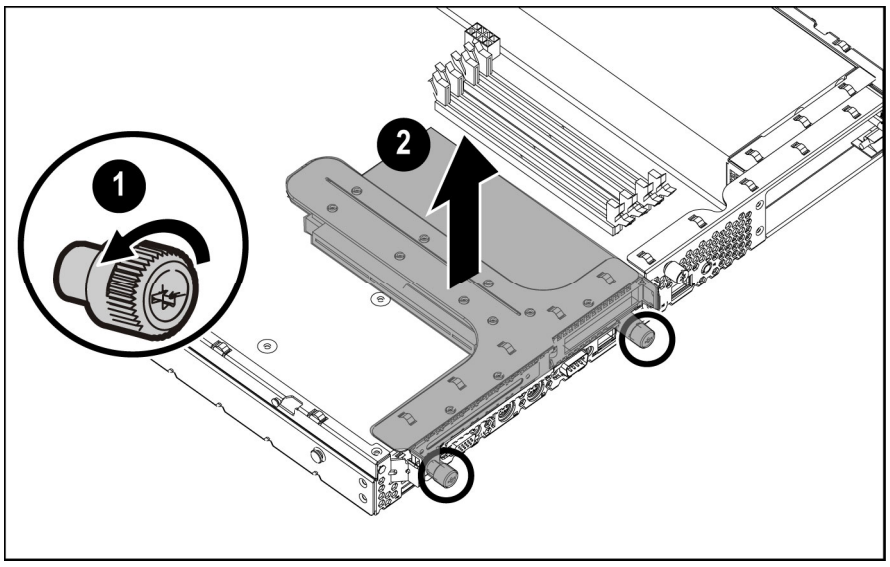

Figure 2-11: Removing the PCI riser board

CAUTION: When removing the PCI riser board assembly, be careful to avoid damaging to the system cables.

CAUTION: Be careful to remove the large PCI expansion board, if it is present in the assembly, since it is guided and supported with a bracket at its end.

When replacing an expansion board, refer to "Expansion Board" following this procedure.

IMPORTANT: Do not replace the PCI riser board assembly in the chassis unless all installation and cabling procedures are complete.

Reverse steps 1 through 5 to replace the PCI riser board assembly, ensuring that the assembly seats properly in the retainers on the rear of the chassis and the guide located on the system board.

Expansion Board

To remove an expansion board:

CAUTION: To avoid the risk of damage to the system or expansion boards, remove all power cords before installing or removing an expansion board. When the front panel power switch is off, auxiliary power is still connected to the PCI expansion slot and may damage the card.

1. Power down the server. See "Powering Down the Server" in this chapter.
2. Remove the access panel. See "Access Panel" in this chapter.
3. Disconnect all cables from the expansion board.
4. Remove the PCI riser board assembly. See "PCI Riser Board Assembly" in this chapter.
5. Apply even pressure to pull the expansion board out of its socket in the PCI riser board assembly.

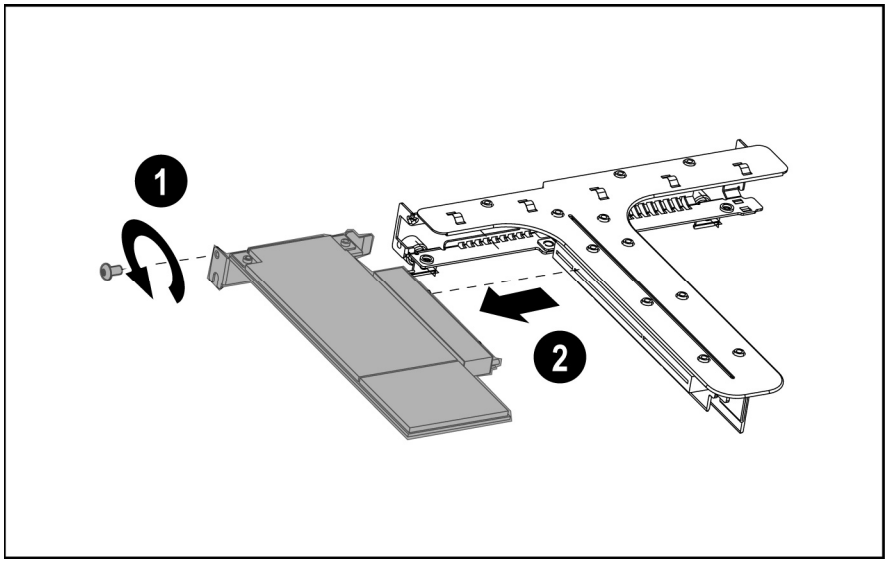

Figure 2-12: Removing an expansion board from the PCI riser board assembly

Reverse steps 1 through 5 to replace an expansion board. Use the PCI card guide on the assembly to position the board in the socket.

IMPORTANT: Be sure that the expansion board is seated securely in the expansion slot before replacing the PCI riser board assembly and access panel.

Single Channel Wide Ultra320 SCSI Adapter

To remove a single channel wide ultra320 SCSI adapter:

1. Locate the PCI-X slot 1 riser connector. See Figure 4-2 in the Chapter 4 Connectors, Switches, and LED Indicators.
2. Remove the PCI riser board assembly. See "PCI riser board assembly" in this chapter.
3. Remove a single channel-wide ultra320 SCSI adapter. See "Expansion Board" in this chapter.

Reverse steps 2 through 3 to replace a single channel-wide ultra320 SCSI adapter. Use the PCI card guide on the assembly to position the adapter in the socket.

Integrated SATA RAID Controller Module

To remove an integrated SATA RAID controller module:

1. Locate the PCI-X slot 1 riser connector. See Figure 4-2 in the Chapter 4 Connectors, Switches, and LED Indicators.
2. Remove the PCI riser board assembly. See "PCI riser board assembly" in this chapter.
3. Remove an integrated SATA RAID controller module. See "Expansion Board" in this chapter.

Reverse steps 2 through 3 to replace an integrated SATA RAID controller module. Use the PCI card guide on the assembly to position the module in the socket.

Fan Assembly

To remove the fan assembly:

1. Power down the server. See "Powering Down the Server" in this chapter.
2. Remove the access panel. See "Access Panel" in this chapter.
3. Lift the air baffle from the server chassis.

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

4. Disconnect the fan assembly power cables (1 to 4) from the fan connectors on the system board.

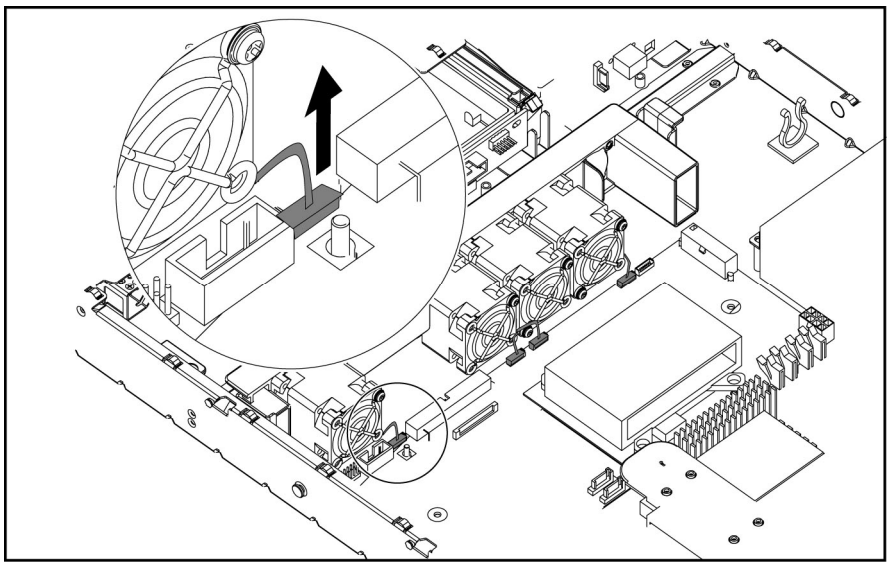

Figure 2-13: Disconnecting the fan assembly power cables (processor heatsink removed for clarity)

5. Push in and hold the fan assembly tab to unlock the fan assembly from the chassis (1)
6. Lift the fan assembly out of the chassis (2)

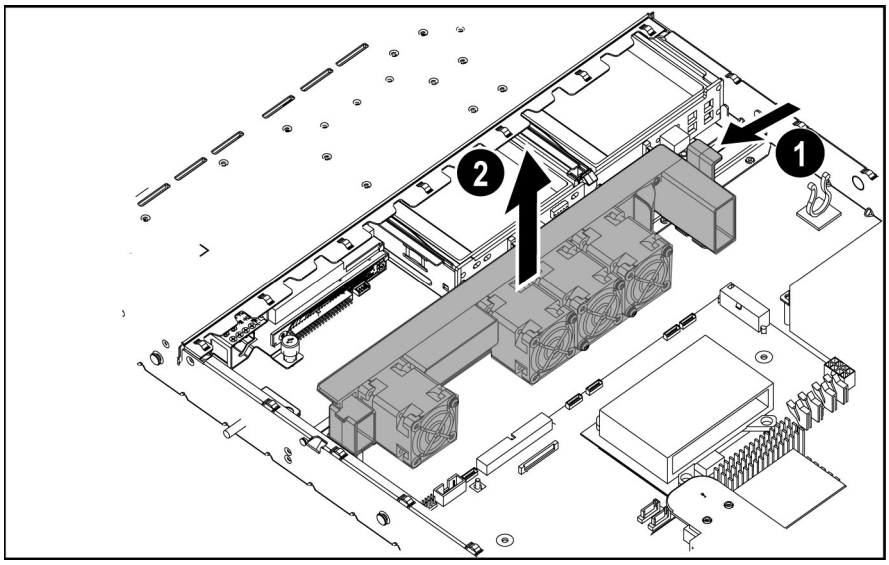

Figure 2-14: Lifting the fan assembly out of the chassis

Reverse steps 1 through 6 to replace the fan assembly.

IMPORTANT: See the server hood label or "System Board Connector," in Chapter 4, "Connectors, Switches, and LED Indicators," for correct fan cable connections.

Fans

The server contains four system fans. The fans are located on the fan assembly. Use Figure 2-15 and Table 2-1 to locate the system fans.

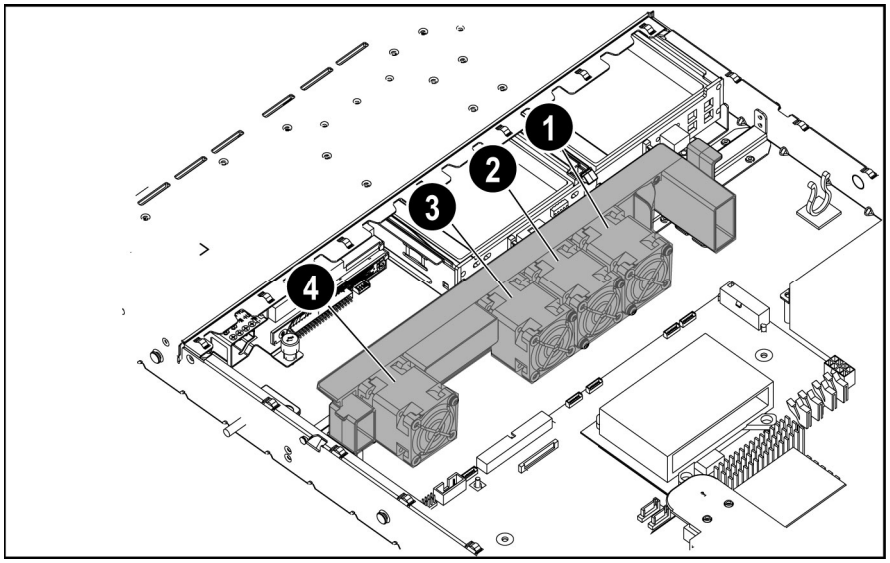

Figure 2-15: Locating the system fans

NOTE: Fans are spared and replaced individually. Each fan listed in Table 2-1 is a separate spare.

Table 2-1: System Fans

Item	Component
1	Fan 1
2	Fan 2
3	Fan 3
4	Fan 4

To remove one fan from the fan assembly:

1. Loosen the screws (1)
2. Slide the fan out of the assembly (2).

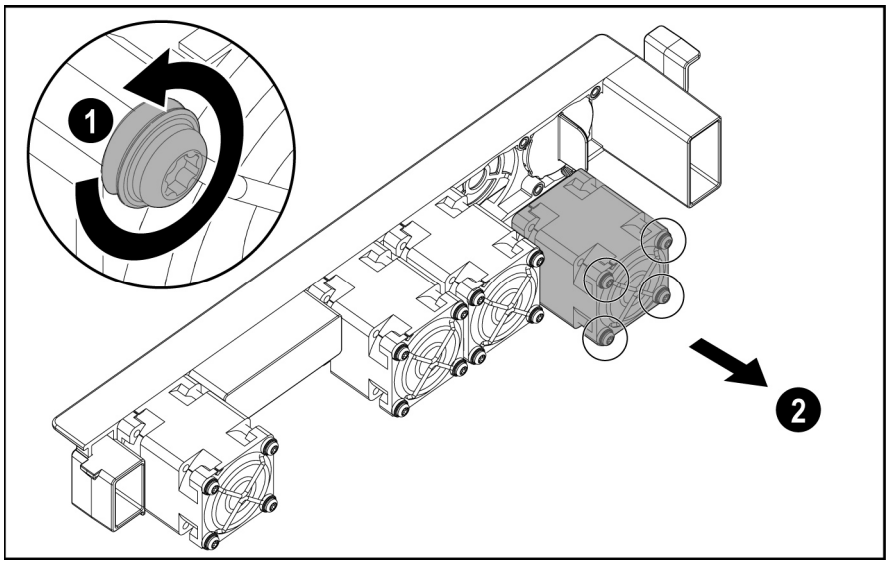

Figure 2-16: Removing one fan from the fan assembly

Reverse steps 1 and 2 to replace the fan.

Cables

This section contains removal and replacement procedures for SATA drive cables that ship with the server.

SATA Drive Cables

To remove the SATA drive cables:

1. Power down the server. See “Powering Down the Server” in this chapter.
2. Remove the access panel. See “Access Panel” in this chapter.
3. Remove the fan assembly. See “Fan Assembly” in this chapter.
4. Disconnect the following cables:
   a. The system board (1) (4)
   b. The hard drive(s) (2) from the backplane
   c. The power cables (3) (7)
   d. The diskette drive (5)
   e. The optical drive (6)

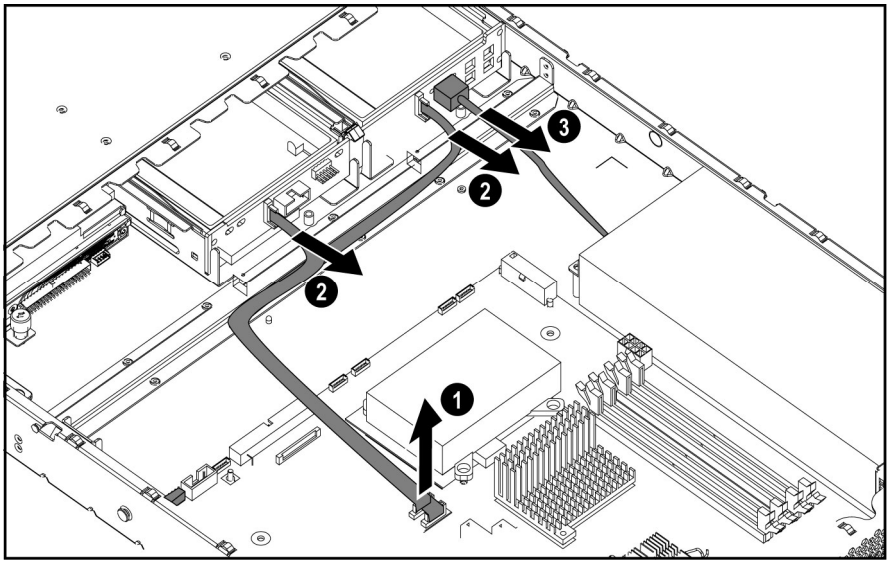

Figure 2-17: Disconnecting the SATA cables

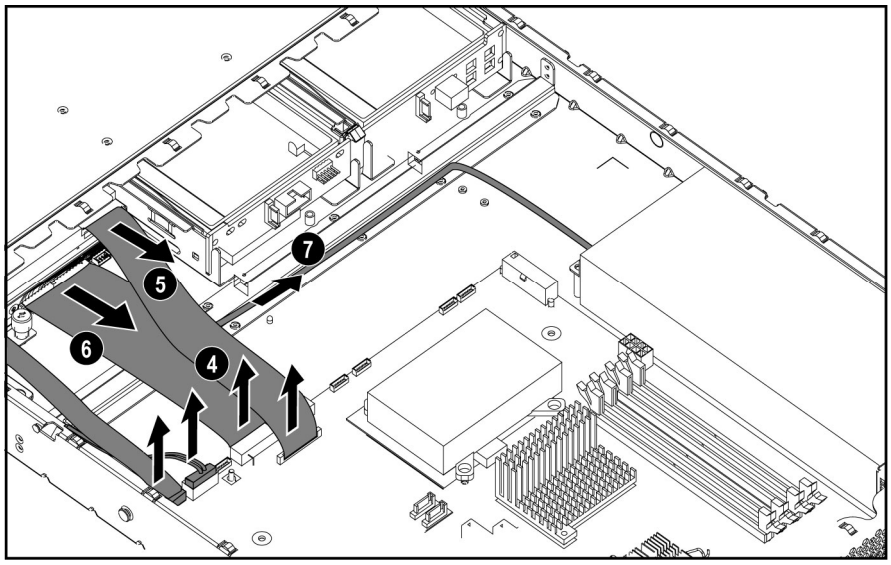

Figure 2-18: Disconnecting the drive assembly cables

Reverse steps 1 through 6 to replace the cables.

Power Supply

To remove the power supply:

1. Power down the server. See “Powering Down the Server” in this chapter.
2. Remove the access panel. See “Access Panel” in this chapter.
3. Disconnect the removable media and hard drive power cables (1)
4. Disconnect the auxiliary power supply cable (2) and the main power supply cable (3) from the power supply connector on the system board by pressing each locking tab on the side of the connector and pulling upwards.
5. Remove the four screws that secure the power supply unit to the chassis (4).
6. Lift the power supply from the server (5).

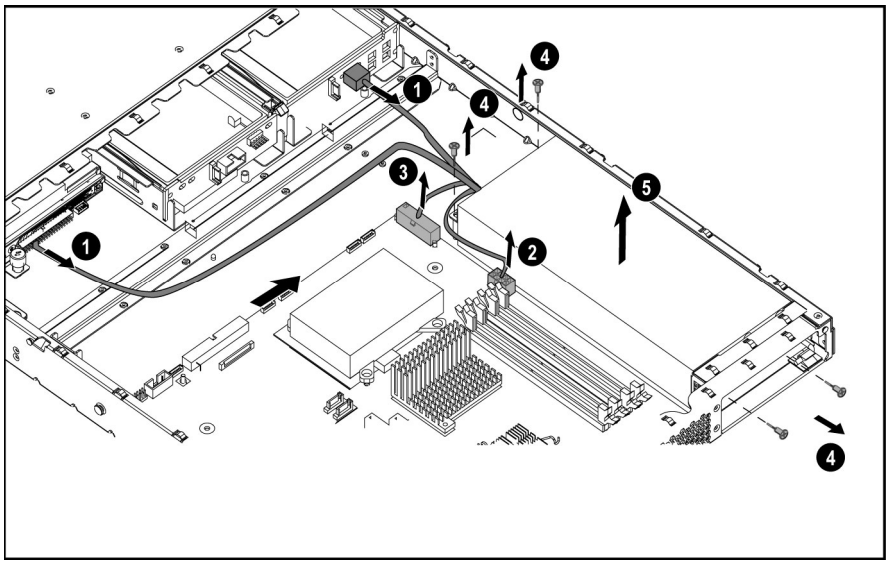

Figure 2-19: Removing the power supply

Reverse steps 1 through 6 to replace the power supply.

Battery

If the server no longer automatically displays the correct date and time, check the battery that provides power to the real-time clock. If necessary, replace a used battery with a CR2032 lithium battery. Under normal use, battery life is at least 5 years.

WARNING: This server contains either an internal lithium manganese dioxide, or a vanadium pent oxide battery. A risk of fire and burns exist if the battery pack is not handled properly. To reduce the risk of personal injury:

- **Do not attempt to recharge.**
- **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 product.**

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

CAUTION: Batteries, battery packs, and accumulators should not be disposed of together with general household waste. Use the public collection system or return used batteries to the authorized partners or their agents for proper recycling and disposal.

To remove the battery:

1. Power down the server. See “Powering Down the Server” in this chapter.
2. Remove the access panel. See “Access Panel” in this chapter.
3. Locate the battery on the system board.
4. If necessary, remove the PCI riser board assembly to access the battery location. See “PCI Riser Board Assembly” in this chapter.
5. Press the battery release lever away from the battery (2).
6. Lift the battery on the lever side and pull it out of the holder (3).

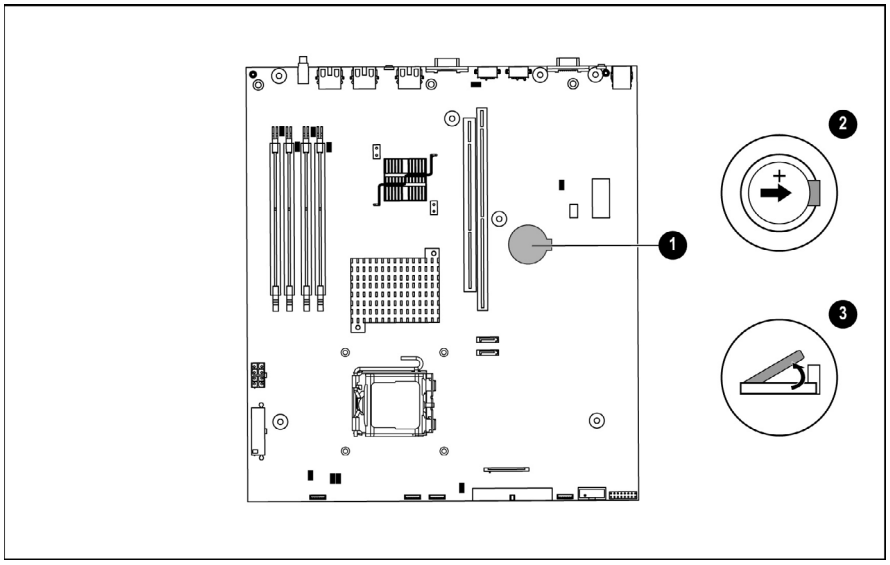

Figure 2-20: Locating and removing the system battery

IMPORTANT: Do not bend the retaining clip during battery replacement. For proper operation, the clip must maintain a position of contact with the battery.

Reverse steps 1 through 6 to replace the battery, ensuring that the new battery is installed with the positive side up.

Memory Modules

The server supports up to four PC3200 DDR ECC unbuffered SDRAM DIMMs installed in four sockets on the system board.

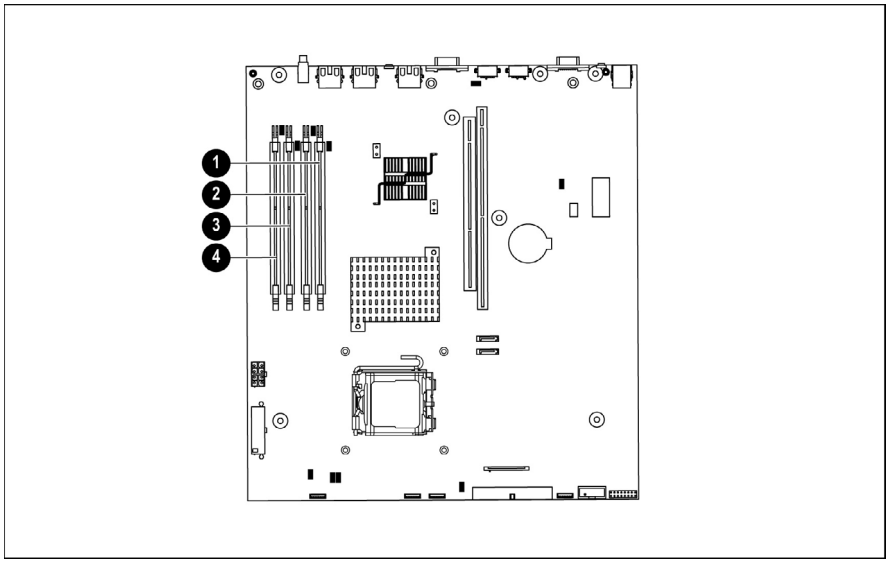

Figure 2-21: Identifying DIMM sockets on the system board

Table 2-2: DIMM Socket Identification

Item	Description
1	DIMM socket 1A
2	DIMM socket 2A
3	DIMM socket 3B
4	DIMM socket 4B

Observe the following guidelines when installing additional memory:

- DIMMs must be industry-standard, 512-MB or 1-GB, 3-cm (1.2-in), 184-pin PC3200, 400-MHz DDR ECC memory unbuffered DIMMs. The DDR memory DIMMs must support CAS Latency 2, where CL=2 or greater. They must also contain the mandatory Joint Electronic Device Engineering Council (JEDEC) Serial Presence Detect (SPD) information.
- DIMMs installed in the server must be unbuffered DDR1/400, 2.5 volts and 64-bits wide.
- Do not mix ECC and non-ECC DIMMs or DIMMs of different speeds. If different types of DIMMs are mixed, the system will not function properly.

- If only one DIMM is installed, HP recommends installing it in slot 1A.
- All DIMMs installed must be of the same speed (DDR PC3200).
- For best performance the amount of memory in bank A should equal to the amount in bank B.

IMPORTANT: A DIMM can be installed only one way. Be sure to match the key slots on the module with the tabs on the memory slot. Push the module down into the slot until it is fully inserted and properly seated. The system will not recognize improperly aligned or seated DIMMs.

To remove a DIMM from the system board:

1. Power down the server. See "Powering Down the Server" in this chapter.

CAUTION: ESD can damage electronic components. Ensure that you are properly grounded before beginning any installation procedure. Refer to "Electrostatic Discharge Information" in this chapter.

2. Remove the access panel. See "Access Panel" in this chapter.
3. Press both DIMM socket latches outward (1). This action releases the DIMM and partially lifts it out of the socket.
4. Lift out the DIMM (2).
5. Align the key slot in the bottom edge of the DIMM with the tab in the expansion socket.

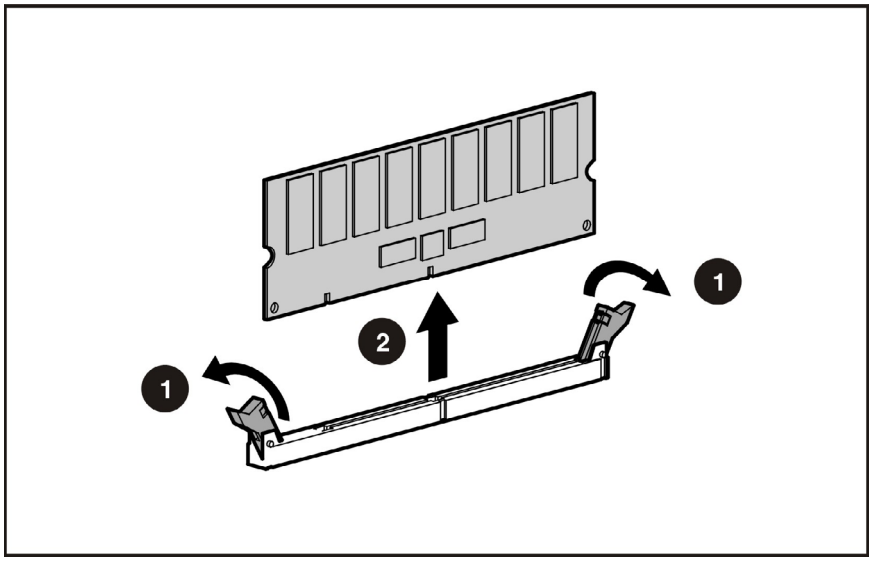

Figure 2-22: Removing a DIMM from a DIMM socket

To install a DIMM:

1. Gently push the DIMM into the socket on the system board (1). When the DIMM is properly seated, the latches close (2).

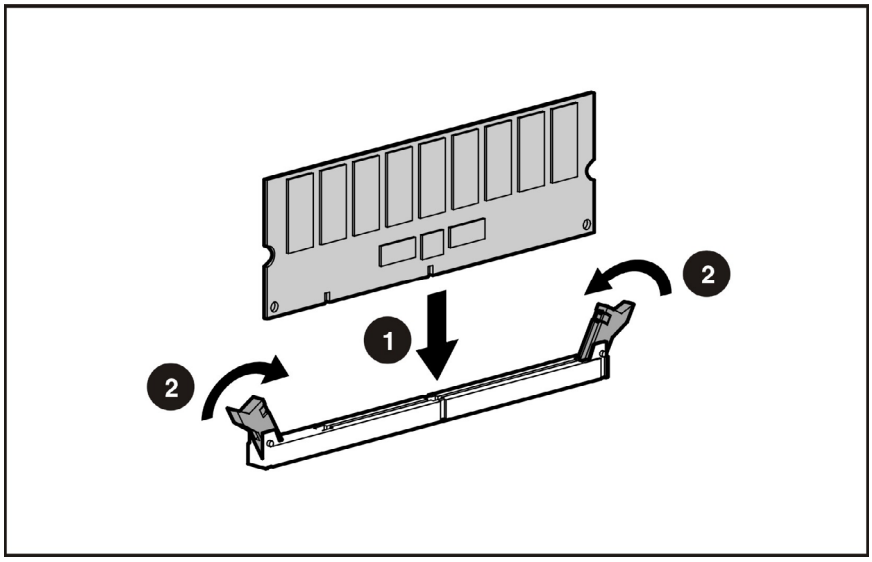

Figure 2-23: Installing a DIMM in a DIMM socket

CAUTION: Use only HP supplied DIMMs. DIMMs from other sources can adversely affect data integrity.

2. Press down firmly on the DIMM while pushing the latches inward until the latches snap into place.

Processor

CAUTION: Always use a new heatsink when replacing processors. Failure to use new components can cause damage to the processor.

To remove the processor:

1. Power down the server. See "Powering Down the Server" in this chapter.
2. Remove the access panel. See "Access Panel" in this chapter.
3. Locate the processor on the system board.
4. Remove the air baffle.

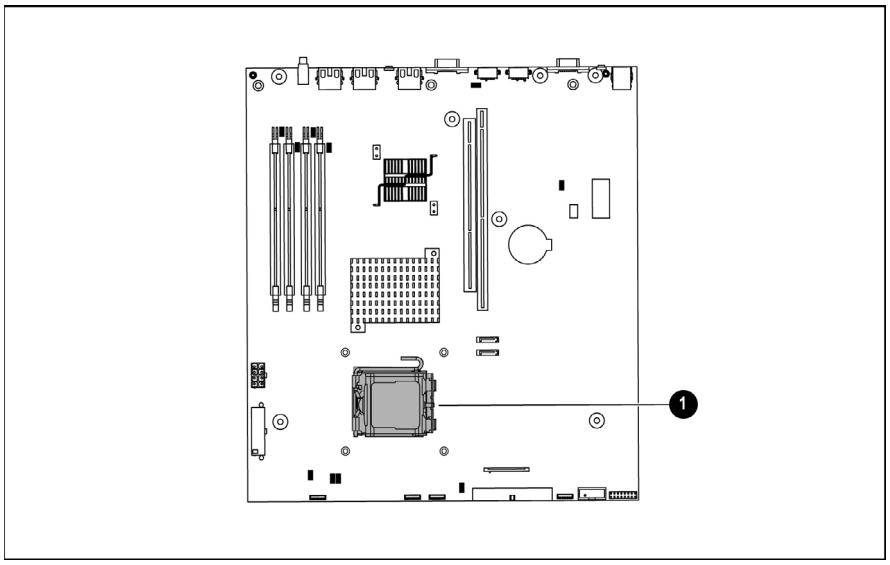

Figure 2-24: Locating the processor on the system board

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

5. Loosen the four screws securing the heatsink:
   a. Loosen each screw three or four turns in the order shown in the illustration.
   b. Fully loosen the screws to free the heatsink, being careful not to remove the screw assemblies from the heat sink.

CAUTION: Heatsink retaining screws should be tightened or loosened in diagonally opposite pairs (in an "X" pattern). Do not over tighten the screws as this may damage the board, connectors, or screws. Using the wrench supplied with the system will reduce the possibility of over tightening the screws.

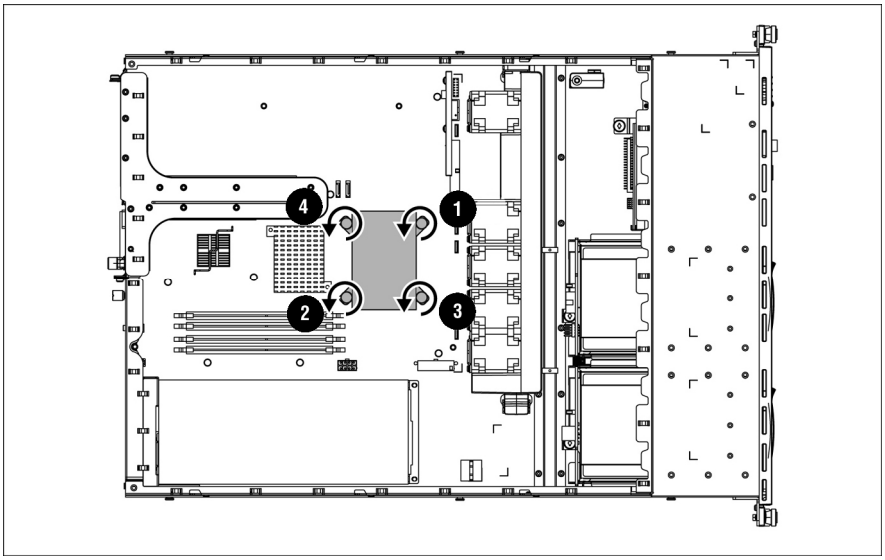

Figure 2-25: Loosening screws on the heatsink and removing the heatsink

6. Remove the heatsink from the top of the processor.
7. Lift the processor locking lever (1) and the cover (2)
8. Lift the processor from the socket (3).

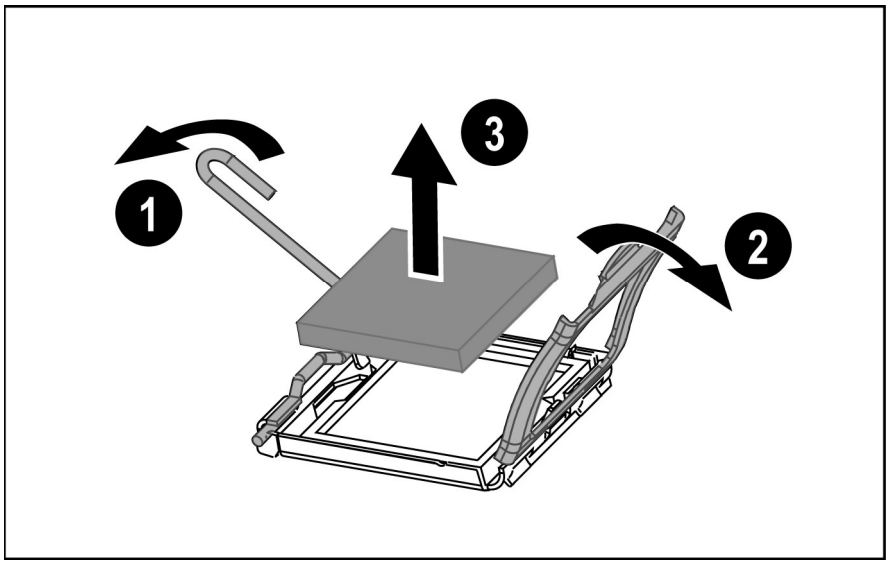

Figure 2-26: Removing the processor from the system board

Reverse steps 1 through 8 to reinstall the processor and heatsink. Care should be taken to install the processor in its right orientation.

CAUTION: Heatsink retaining screws should be tightened or loosened in diagonally opposite pairs (in an "X" pattern). Do not over tighten the screws as this may damage the board, connectors, or screws. Using the wrench supplied with the system will reduce the possibility of over tightening the screws.

CAUTION: Always use a new heatsink when replacing processors. Failure to use new components may result in damage to the processor.

System Board

To remove the system board:

1. Power down the server. See “Powering Down the Server” in this chapter.
2. Remove the access panel. See “Access Panel” in this chapter.
3. Remove the PCI riser board assembly. See “PCI Riser Board Assembly” in this chapter.
4. Remove any DIMMs. See “Memory Modules” in this chapter.
5. Disconnect the fan cables. See “Fans” in this chapter.
6. Remove the fan assembly. See “Fan Assembly” in this chapter.
7. Disconnect power supply cables from the system board, the hard drive backplane, and the optical drive backplane. See “Power Supply” in this chapter.
8. Disconnect the SATA drive cables. See “Cables” in this chapter.
9. Disconnect the diskette drive cable. See “Cables” in this chapter.
10. Disconnect the optical drive cable. See “Cables” in this chapter.

11. Disconnect the LED/PWR switch board cable. See “Cables” in this chapter.
12. Remove the processor. See “Processor” in this chapter.

CAUTION: Always use a new heatsink when replacing processors on the system. Failure to use new components may result in damage to the processor. See “Processor” in this chapter.

13. Remove all screws that secure the system board to the chassis (1).
14. Lift the system board up and away from the standoffs (2).

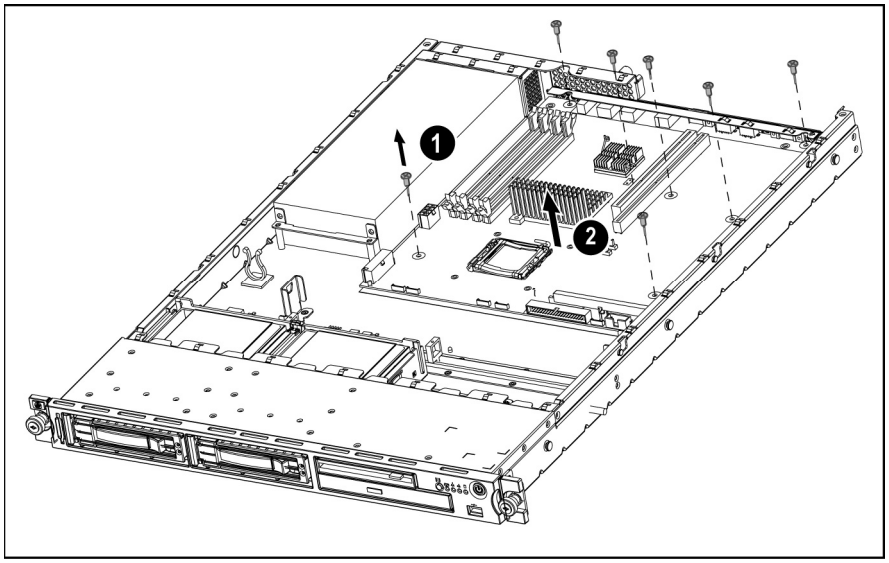

Figure 2-27: Removing the system board

Reverse steps 1 through 14 to replace the system board.

3

Diagnostic Tools

This chapter provides an overview of the software and firmware diagnostic tools available for HP ProLiant DL320 Generation 3 Servers.

SmartStart Software

SmartStart is a collection of software that optimizes single-server setup, providing a simple and consistent way to deploy server configuration. SmartStart has been tested on many ProLiant server products, resulting in proven, reliable configurations.

SmartStart assists the deployment process by performing a wide range of configuration activities, including:

- Configuring hardware using embedded configuration utilities, such as RBSU and ORCA.
- Preparing the system for installing "off-the-shelf" versions of leading operating system software
- Installing optimized server drivers, management agents and utilities automatically with every assisted installation
- Testing server hardware using the Insight Diagnostics Utility.
- Installing software drivers directly from the CD. With systems that have internet connection, the SmartStart Autorun Menu provides access to a complete list of ProLiant system software.
- Enabling access to the Array Configuration Utility, Array Diagnostics Utility, and Erase Utility

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

SmartStart Scripting Toolkit

The SmartStart Scripting Toolkit is a server deployment product that delivers an unattended automated installation for high-volume server deployments. The SmartStart Scripting Toolkit is designed to support ProLiant BL, ML, and DL servers. The toolkit includes a modular set of utilities and important documentation that describes how to apply these new tools to build an automated server deployment process.

Using SmartStart technology, the Scripting Toolkit provides a flexible way to create standard server configuration scripts. These scripts are used to automate many of the manual steps in the server configuration process. This automated server configuration process cuts time from each server deployed, making it possible to scale server deployments to high volumes in rapid fashion.

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

HP Instant Support Enterprise Edition

ISEE is a proactive remote monitoring and diagnostic tool to help manage your systems and devices, a feature of HP support. ISEE provides continuous hardware event monitoring and automated notification to identify and prevent potential critical problems. Through remote diagnostic scripts and vital system configuration information collected about your systems, ISEE enables fast restoration of your systems. Install ISEE on your systems to help mitigate risk and prevent potential critical problems.

For more information on ISEE, refer to the HP website (http://www.hp.com/servers/smartstart).

To download HP ISEE, visit the HP website (http://www.hp.com/servers/smartstart).

For installation information, refer to the *HP ISEE Client Installation and Upgrade Guide*.

ROM-Based Setup Utility

RBSU, an embedded configuration utility, performs a wide range of configuration activities that may include:

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

For more information on RBSU, refer to the *HP ROM-Based Setup Utility User Guide* on the Documentation CD or the HP website (http://www.hp.com/servers/smartstart).

NOTE: Enable the SATA SW RAID option under the Advanced Options menu to enable RAID capability for the server.

ROMPaq Utility

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

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

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

System Online ROM Flash Component Utility

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

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

  IMPORTANT: This utility supports operating systems that may not be supported by the server. For operating systems supported by the server, refer to the HP website (http://www.hp.com/go/supportos).

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

To download the tool and for more information, refer to the HP website (http://h18000.www1.hp.com/support/files/index.html).

Integrated Management Log

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

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

- From within HP SIM
- From within Survey Utility
- From within operating system-specific IML viewers
  - For NetWare: IML Viewer
  - For Windows: IML Viewer
  - For Linux: IML Viewer Application

- From within HP Insight Diagnostics

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

Integrated Lights-Out Technology

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

Using iLO, you can:

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

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

Automatic Server Recovery

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

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

HP Systems Insight Manager

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

IMPORTANT: You must install and use HP SIM to benefit from the Pre-Failure Warranty for processors, hard drives, and memory modules

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

HP Insight Diagnostics

The HP Insight Diagnostics utility displays information about the server hardware and tests the system to be sure it is operating properly. The utility has online help and can be accessed using the SmartStart CD. Online Diagnostics for Microsoft Windows is available for download from the HP website (http://www.hp.com/support).

USB Support

HP provides both standard USB support and legacy USB support. Standard support is provided by the operating system through the appropriate USB device drivers. HP provides support for USB devices before the operating system is loaded through legacy USB support, which is enabled by default in the system ROM. HP hardware supports USB version 1.1 or 2.0, depending on the version of the hardware.

Legacy USB support provides USB functionality in environments where USB support is normally not available. Specifically, HP provides legacy USB functionality for:

- POST
- RBSU
- Diagnostics
- DOS
- Operating environments which do not provide native USB support

For more information on ProLiant USB support, refer to the HP website (http://h18004.www1.hp.com/products/servers/platforms/usb-support.html).

Internal USB Functionality

An internal USB connector is available for use with USB devices. The internal connector is on a dedicated bus and is separate from the front USB port. This solution provides for use of a permanent boot drive from a USB drive key installed in the front internal connector, avoiding issues of clearance on the front of the rack and physical access to secure data.

For additional security, you can disable the internal, front or rear USB connectors through RBSU.

An internal USB connector is available for use with USB drive keys only. The internal connector shares the same bus with the front external USB connector, and connecting a device to both the front internal and front external USB connectors is not supported. This solution provides for use of a permanent boot drive from a USB drive key installed in the front internal connector, avoiding issues of clearance on the front of the rack and physical access to secure data.

For additional security, you can individually disable the front, rear, and internal USB connectors through RBSU. Disabling the rear USB connectors in RBSU disables both rear USB ports.

4

Component Identifications

This chapter contains illustrations and tables identifying and describing components, connectors, switches, and LED indicator locations on the front panel, rear panel, system board, and hard drives for the HP ProLiant DL320 Generation 3 server.

Rear Panel Components

Figure 4-1 and Table 4-1 show the components and connectors on the rear panel of the server.

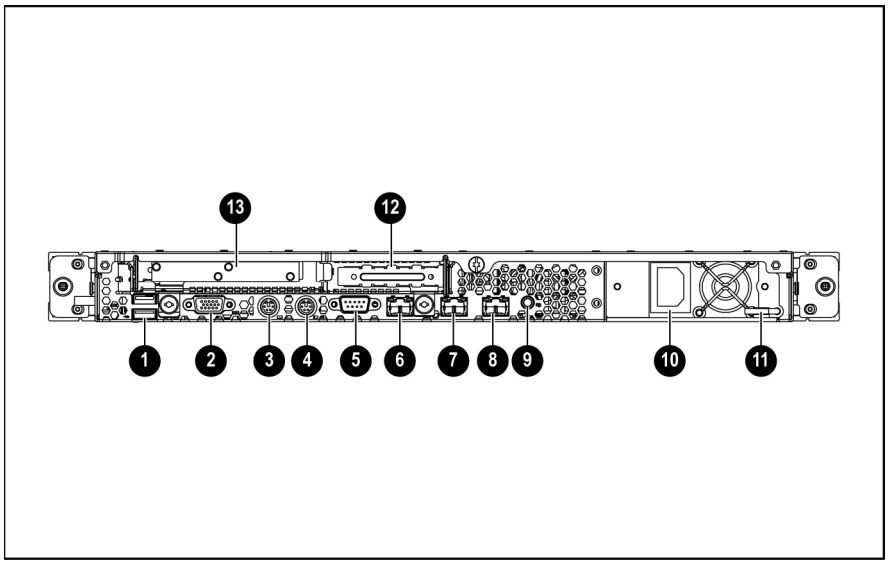

Figure 4-1: Rear panel components

Table 4-1: Rear Panel Components

Item	Description
1	Rear USB connectors 1 & 2
2	Video connector
3	Mouse connector
4	Keyboard connector
5	Serial connector
6	iLo management port
7	10/100/1000 NIC 1
8	10/100/1000 NIC 2
9	UID button/LED
10	Power connector
11	T-15/T-10 Torx screwdriver
12	PCI-X expansion slot 1, low-profile half-length 64 bit/100 MHz 3.3 V
13	PCI-X expansion slot 2, full-length 64 bit/133 MHz 3.3 V (Optional PCI Express slot 1, x8)

Expansion Slot Component

Figure 4-2 and Table 4-2 shows the PCI expansion board slot connector and expansion board slot cover.

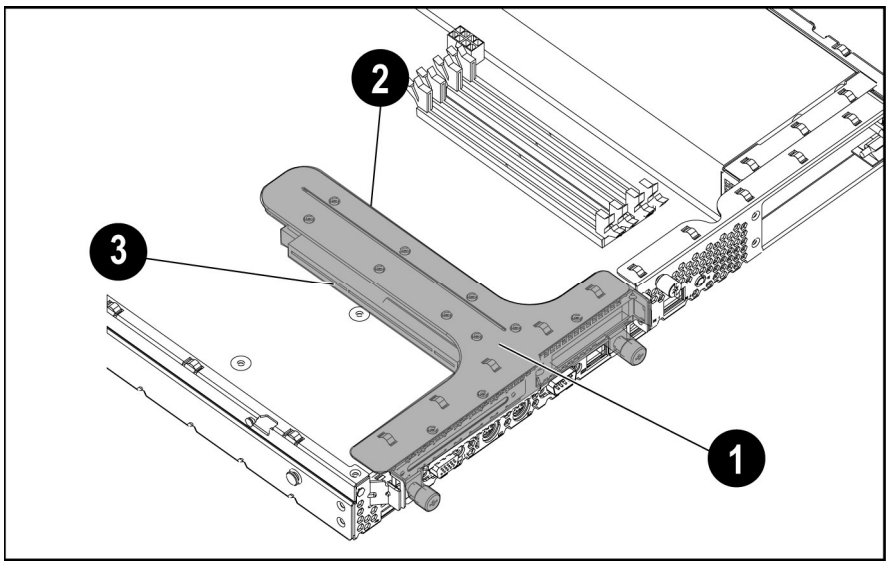

Figure 4-2: Expansion slot component

Table 4-2: Expansion Slot Component

Item	Description
1	PCI riser board assembly
2	PCI-X slot 1 riser connector
3	PCI-X/PCI Express slot 2 riser connector

System Board Components

Figure 4-3 and Table 4-3 show system board connectors on the system board.

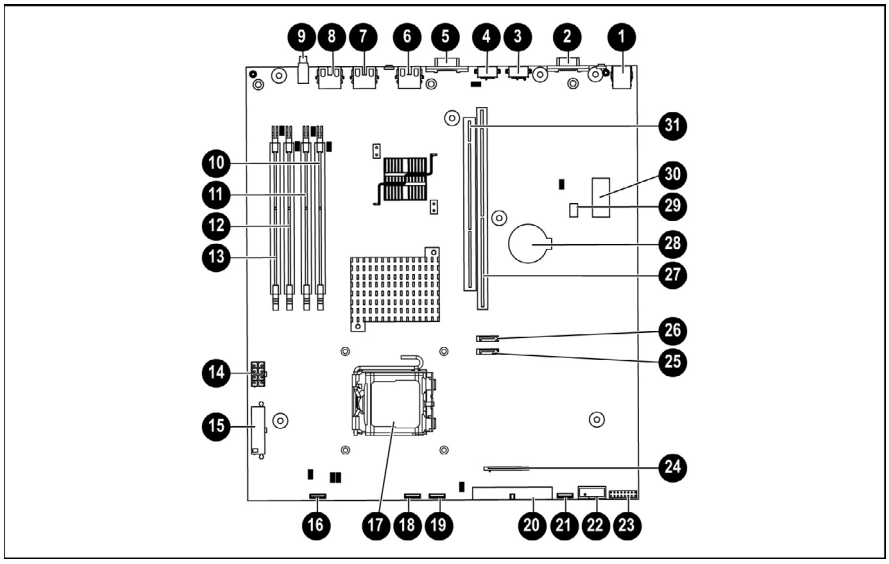

Figure 4-3: System board components

Table 4-3: System Board Components

Item	Description	Item	Description
1	Rear USB connectors (2)	17	Processor socket
2	Video connector	18	Fan 2 connector
3	Mouse connector	19	Fan 3 connector
4	Keyboard connector	20	IDE connector
5	Serial connector	21	Fan 4 connector
6	iLO management port	22	Front USB cable connector
7	10/100/1000 NIC 1	23	Front panel LED board connector
8	10/100/1000 NIC 2	24	Diskette drive connector
9	Rear UID button/LED	25	SATA hard drive connector 2
10	DIMM slot 1 (Bank A)	26	SATA hard drive connector 1
11	DIMM slot 2 (Bank A)	27	PCI-X/PCI Express slot 2 riser connector*
12	DIMM slot 3 (Bank B)	28	System Battery
13	DIMM slot 4 (Bank B)	29	NMI button (SW3)
14	Power connector	30	System maintenance switch (SW1)
15	Power connector	31	PCI-X slot 1 riser connector*
16	Fan 1 connector		

* Designations if the optional PCI riser board is installed.

System Switches

The server has a switch bank (SW1) for system configuration and a non-maskable interrupt switch (NMI button/SW3) that is used in the event of a service emergency that requires a complete data dump before restarting the operating system.

Refer to the labels on the inside of the server access panel or to the following sections for the proper switch settings. Figure 4-4 and Table 4-4 show the location of the system switches.

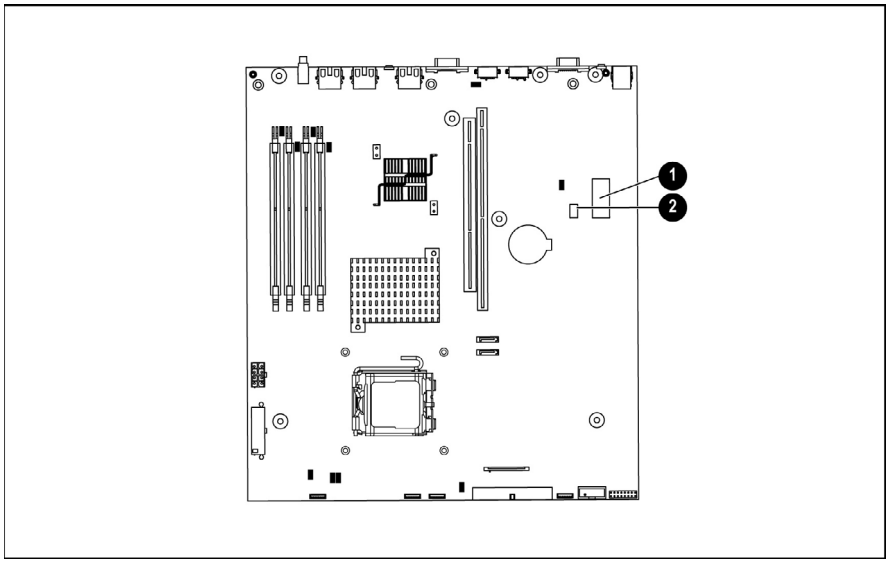

Figure 4-4: System switches

Table 4-4: System Switches

Item	Description
1	System maintenance switch (SW1)
2	NMI button (SW3)

System Maintenance Switch (SW1)

The SW1 (eight-position switch) on the system board is used to implement the various protections and override functions. All eight switches will have the off position as the default configuration (defaults also shown in bold). This switch is also used to control a multiplexer to switch between port 84/85 and iLO diagnostic LEDs. The use of this switch to control the multiplexer is for debug purposes only. The shipping setting also controls the multiplexer so that the iLO diagnostic LEDs will be on (see Table 4-5).

Table 4-5: System Maintenance Switch (SW1) Settings

Position/Function	Setting	Description
1 Security Jumper	**Off**	OFF=iLO Security is enabled ON=iLO Security is disabled
2 Configuration Lock	**Off**	OFF=System configuration can be changed ON=System configuration is locked and cannot be changed
3 RESERVED	**Off**	OFF=Normal ON=Reserved
4 ROM_DEBUG	**Off**	OFF=System is in normal mode ON=System is in ROM DEBUG mode
5 Password Disable	**Off**	OFF=Power-On password works normally ON=Power-On password is disabled
6 Invalidate Configuration	**Off**	OFF=Normal ON=ROM treats system configuration as invalid
7 LED MUX select 1	**Off**	OFF=Normal ON=Reserved
8 LED MUX select 2	**Off**	OFF=Normal ON=Reserved

Non-Maskable Interrupt Switch (NMI button/SW3)

When an operating system crashes, system administrators can initiate a non-maskable interrupt (NMI) event by pressing a dump switch. The NMI event enables a hung system to once again become responsive.

The NMI switch is used **only** in the event of a service emergency that requires a complete data dump in preparation for recovering the system from a catastrophic failure.

Front Panel Buttons and LEDs

Front panel status LEDs allow constant monitoring of basic system functions while the server is operating. Figure 4-5 and Table 4-6 provide the LED locations and functions.

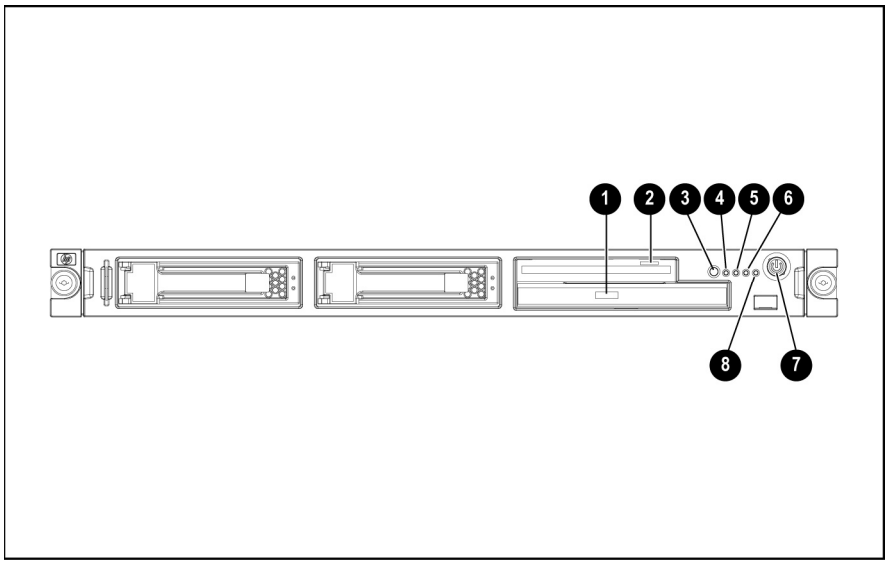

Figure 4-5: Front panel LEDs

Table 4-6: Front Panel LEDs

Item	LED Description	Status
1	Optical CD-ROM drive activity LED	Amber = Activity. Off = No activity.
2	Diskette drive activity LED	Green = Activity. Off = No activity.
3	Front UID button/LED	Blue = Identification is activated. Flashing blue = System is being remotely managed. Off = Identification is deactivated.
4	Internal Health LED	Off = Normal (When system is in standby). Green = Normal (When system is powered on). Amber = System degraded (in standby or power on). Red = System critical (In standby or powered on).
5	NIC 1 activity LED	Green = Linked to network. Off = No activity. Flashing Green = Network activity.
6	NIC 2 activity LED	Green = Linked to network. Off = No activity. Flashing Green = Network activity.
7	Power On/Standby button/System power LED	Green = System has AC power and is powered on. Off = No AC power to the system.
8	HDD activity LED	Flashing Green = Drive activity. Off = No drive activity.

NOTE: Hard drive LEDs function only when connected to an optional HP smart array PCI storage card.

Rear Panel LEDs

The server rear panel contains three LEDs that allow monitoring of network activity and server identification. Figure 4-6 and Table 4-7 provide the LED locations and functions.

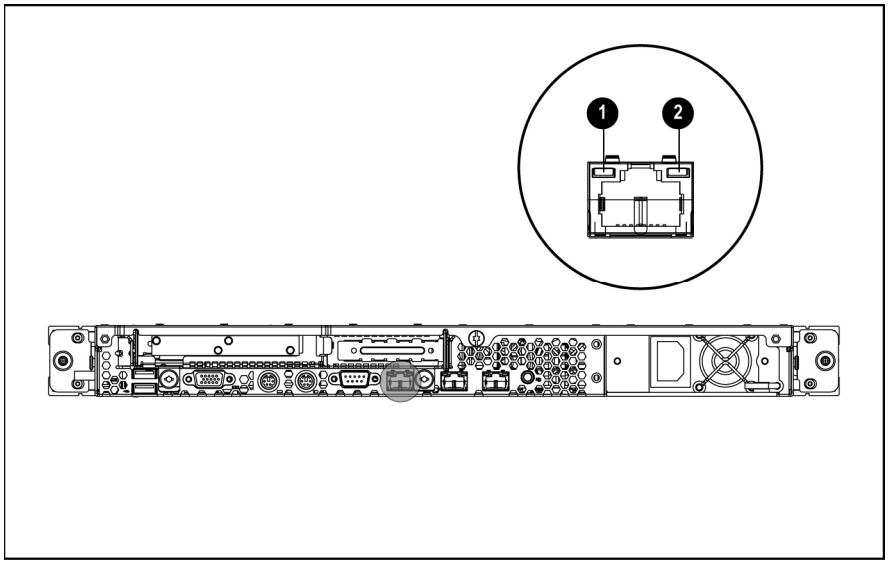

Figure 4-6: Rear panel LEDs

Table 4-7: Rear Panel LEDs

Item	Description	Status
1	NIC 1 link/activity	Green = Linked to network Off = Not linked to network Flashing Amber = Network activity
2	NIC 2 link/activity	Green = Linked to network Off = Not linked to network Flashing Amber = Network activity

System Board LEDs

The system board contains internal status LEDs for use during troubleshooting operations. The LEDs will stay latched to maintain their information when the system is powered off, with the exception of internal status LEDs. All LEDs will be cleared and restored to normal state after power cycle.

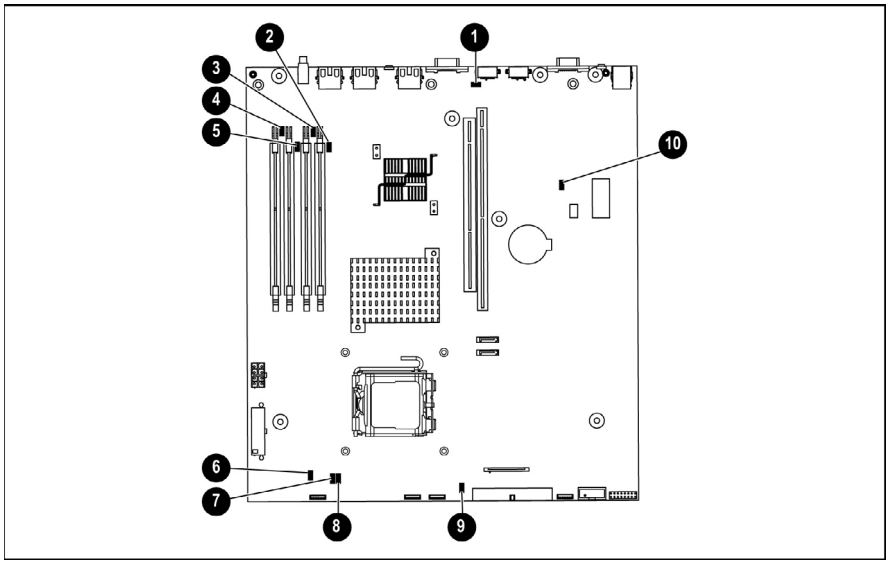

Figure 4-7: System board status LEDs

Table 4-8: System board status LEDs

Item	Description
1	Interlock Failure LED
2	DIMM 1A Failure LED
3	DIMM 2A Failure LED
4	DIMM 4B Failure LED
5	DIMM 3B Failure LED
6	VRD Failure LED
7	Processor Failure LED
8	Over Temperature LED
9	System Fan Single/Multi Failure LED (not install)
10	Power Supply Power Good LED

5

Specifications

This chapter provides operating and performance specifications for HP ProLiant DL320 Generation 3 server components and optional hardware.

System Unit

Table 5-1: System Unit Specifications

Item	Description
Height	4.32 cm (1.70 in)
Depth	60.96 cm (24 in)
Width	42.62 cm (16.78 in)
Weight (maximum)	12.27 Kg (27 lbs)
Weight (no drives installed)	10.91 Kg (24 lbs)
U.S. and international input voltage requirements	
Rated input voltage	100 VAC to 240 VAC
Rated input frequency	50 Hz to 60 Hz
Rated input current	6.0 A (110 VAC) / 3.0 A (220 VAC)
Rated input power	580 W
BTUs per hour	1990
Rated steady-state power	350 W
Temperature range[1]	
Operating	10 °C to 35 °C (50 °F to 95 °F)
Shipping	-40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity (non-condensing)[2]	
Operating	10 % to 90 %
Non-operating	5 % to 95 %
Maximum wet-bulb temperature	28 °C (82.4 °F)

[1]All temperature ratings shown are for sea level. An altitude derating of 1°C per 300 m (1.8°F per 1,000 ft) to 3048 m (10,000 ft) is applicable. No direct sunlight allowed.

[2]Storage maximum humidity of 95 percent based on maximum temperature of 45 °C (113 °F). Altitude minimum for storage is 70 KPa.

Power Supply

Table 5-2: Power Supply Specifications

Item	Description
Input characteristics	
Rated input voltage	100 VAC to 240 VAC
Rated input line	110 VAC / 220 VAC
Frequency range	50 to 60 Hz

continued

Table 5-3: Power Supply Specifications *continued*

Item	Description
Rated input power	580 W
Rated input current	6 A (110 V) to 3 A (220 V)
Output characteristics	
Rated steady-state power	350 W
Maximum peak power	422 W for 15 seconds.
Ambient temperature range	
Operating	10 °C to 48 °C (50 °F to 118 °F)
Non-operating	-40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity (non-condensing)	
Operating	5 % to 85 %
Non-operating	5 % to 95 %
Dielectric voltage withstand	
Input to output	1800 VAC/second
Input to ground	1800 VAC/second
Maximum wet-bulb temperature	41.3 °C

Memory

Table 5-4: SDRAM DIMM Specifications

Item	Description
Size	64 MB and 4 GB
Speed	400 MHz
Width	72 bits
Type	PC3200 ECC unbuffered DDR SDRAM DIMMs

Note: DIMMs must be industry-standard 184-pin PC3200 DDR DIMMs. The DDR DIMMs must support CAS Latency 2, or greater. They must also contain the mandatory JEDEC SPD. Use HP supplied DIMMs only.

Optical CD-ROM Drive

Table 5-5: Optical CD-ROM Drive Specifications

Item	Description
Applicable disk formats	CD-DA, CD-ROM (mode 1 and 2); CD-XA (mode 2, Form 1 and 2), CD-1 Ready; CD-Extra; Video CD, Photo CD (single and multiple session)
Capacity	550 MB (mode 1, 12 cm) 640 MB (mode 2, 12 cm)
Block size	2638, 2352 bytes (mode 0); 2352, 2340, 2336, 2048 bytes (mode 1); 2352, 2340, 2336, 2048, bytes (mode 2)
Dimensions	(Bezel Included)
Height	1.27 cm (0.5 in)
Depth	13.17 cm (5.39 in)
Width	13.26 cm (5.22 in)
Weight	<340 g (<11.98 oz)
Data transfer rate	
Sustained	150 KBps (sustained 1X)
	3.6 Mbytes/s (sustained, 24X Outer Diameter)
Burst	16.6 Mbytes/s (burst)
Access times (typical)	
Full stroke	300 ms (average)
Random	140 ms (average)
Disc diameter	12 cm, 8 cm (4.7 in, 3.15 in)
Disc thickness	0.12 cm
Track pitch	1.6 μm
Cache/buffer	128 KB
Startup time	<10 s
Stop time	<4 s (single); <30s (multi-session)
Laser parameters	
Type	Semiconductor Laser
Wave length	795 nm
Output power	<0.25 mW
Operating conditions	
Temperature	5 °C to 55 °C (41 °F to 131 °F)
Humidity	10 % to 80 %

Integrated Intel ICH6A SATA Controller

Table 5-6: Intel ICH6A SATA Controller Specifications

Item	Description
Simultaneous drive transfer channels	2 channels
Transfer rate synchronous (Max)	100 MBps
Data transfer method	32-bit PCI bus master
Drive support	Ultra ATA, EIDE & Fast ATA-2
PCI bus transfer rate (maximum)	266 MBps
Data transfer modes	UDMA Modes 5/4/3/2/1/0, DMA Modes 2/1/0, PIO Modes 4/3/2/1/0
Protocol	ATA/100 compatible
Feature	CRC (Cyclical Redundancy Check)
Buffer size	128 byte

Optional Hard Drives

SATA Hard Drives

Table 5-7: SATA Hard Drive Specifications

Item	Description
Formatted capacity	80,026 MB
Height	Third, 2.54 cm (1.0 in)
Size	8.89 cm (3.5 in)
Interface	ATA/100
Transfer rate synchronous (max)	100 MBps
Single track	0.8 ms
Average	9.0 ms
Full stroke	17.0 ms
Rotational speed	7,200 rpm
Bytes/sector	512
Logical blocks	160,086,528
Operating temperature	
Celsius	5° to 55°
Fahrenheit	41° to 131°

Integrated Broadcom 10/100/1000 Gigabit Server Auto-Switching Network Interface Controller (NIC)

Table 5-8: Integrated NC7782 10/100/1000 Gigabit Server Auto-Switching NIC Specifications (WOL and PXE capable)

Item	Description
Network interface	10Base-T/100Base-TX/1000Base-T Ethernet
Compatibility	IEEE 802.3
Data transfer method	64-bit, 100MHz PCI(X)1.0
Network transfer rate	10/100/1000 Mbps
Connector	RJ-45
I/O address and interrupt	Plug and Play PCI
Emissions standards	FCC class B

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