HP ProLiant DL145 Generation 2 Server Maintenance and Service Guide

HP ProLiant DL145 Generation 2 Server Maintenance and Service Guide

Audience Assumptions

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

Contents

1

Illustrated Parts Catalog

This chapter provides the illustrated parts breakdown and spare parts lists for the
HP ProLiant DL145 Generation 2 server. Information for contacting HP is also provided.

Customer Self Repair (CSR)

What is 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 under the CSR program are identified in Table 1-1and Table 1-2.

  NOTE: Table items marked with an asterisk (*) are not shown in the figures.

Mechanical Parts Exploded View
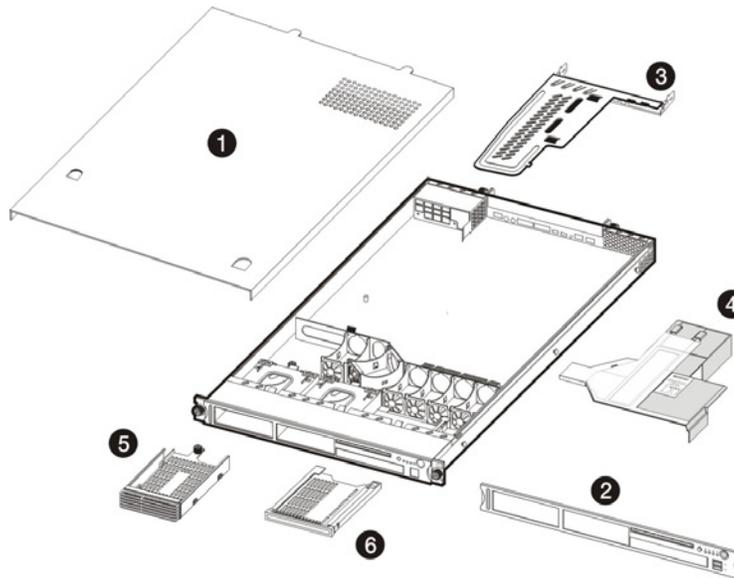
Figure 1-1: Mechanical parts exploded view

Table 1-1: Mechanical Spare Parts List

Item	Description	Original Spare Part Number	Modified Spare Part Number	Customer Self Repair
1	Top cover	—	—	—
2	Front bezel	389312-001	—	Yes
3	PCI riser board assembly	389313-001	408292-001	Yes
4	Air duct	390980-001	—	Yes
5	Hard disk drive (HDD) carrier	—	—	—
6	IDE CD-ROM drive carrier	—	—	—

REQUIREMENT: For customers in the EU only. The use of the Original Spare part is regulated by RoHS legislation*. If your unit contains a part that is labeled with the Modified Spare number, the Modified Spare must be ordered as the replacement part in the EU. If your unit contains a part that is labeled with the Original Spare number, please order the Original Spare as the replacement part in the EU. In this case either the Original Spare or the Modified Spare may be shipped which will not affect performance or functionality of the unit.

*Directive 2002/95/EC restricts the use of lead, mercury, cadmium, hexavalent chromium, PBBs and PBDEs in electronic products.

System Components Exploded View
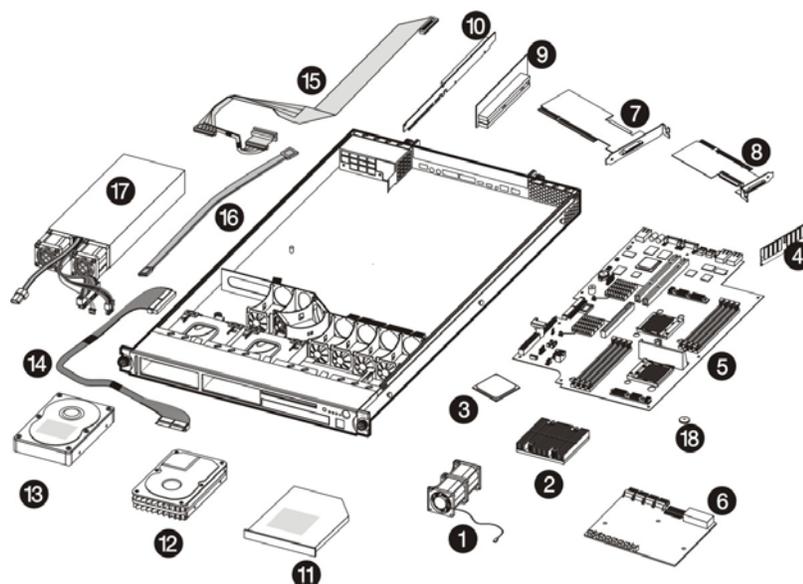
Figure 1-2: System components exploded view

Table 1-2: System Components Spare Parts List

Item	Description	Original Spare Part Number	Modified Spare Part Number	Customer Self Repair
1	System fan module	389321-001	408285-001	Yes
2	Processor heat sink	389311-001	408296-001	Yes
3	**Processor**			Yes
	Single-core processors			
	a) AMD Opteron Processor 246 (2.0 GHz)	—	390283-001	
	b) AMD Opteron Processor 248 (2.2 GHz) *	—	390284-001	
	c) AMD Opteron Processor 252 (2.6 GHz) *	—	382043-005	
	d) AMD Opteron Processor 254 (2.8 GHz) *	—	—	
	Dual-core processors			
	a) AMD Opteron Processor 265 (1.8 GHz) *	395811-005	—	
	b) AMD Opteron Processor 270 (2.0 GHz) *	—	395812-005	
	c) AMD Opteron Processor 275 (2.2 GHz) *	—	395813-005	
	d) AMD Opteron Processor 280 (2.4 GHz) *	403407-001	—	
	e) AMD Opteron Processor 286 (2.6 GHz) *	—	411263-001	

continued

Table 1-2: System Components Spare Parts List *continued*

Item	Description	Original Spare Part Number	Modified Spare Part Number	Customer Self Repair
4	**Memory**			
	a) 512-MB PC3200 ECC registered DIMM	378913-005	—	Yes
	b) 1-GB PC3200 ECC registered DIMM*	378914-005	—	Yes
	c) 2-GB PC3200 ECC registered DIMM*	378915-005	—	Yes
	Boards			
5	System board	389340-001	408297-001	No
6	Front panel board	389319-001	408291-001	Yes
7	64-bit/133 MHz SCSI controller board (with low profile bracket)	391742-001	—	Yes
8	64-bit/133 MHz low profile SCSI controller board	389324-001	—	Yes
9	64-bit/133 MHz PCI-X riser board assembly	389313-001		Yes
	a) Standard height PCI-X riser board*		408292-001	
	b) Low-profile PCI-X riser board		408293-001	
10	PCI Express riser board	391845-001	408294-001	Yes
	Mass storage devices			
11	Optical media drive			Yes
	a) IDE CD-ROM drive (24X)	390535-001	—	
	b) DVD-ROM drive (8X)	383981-005	—	
12	Non-hot-plug SCSI hard drive			Yes
	a) 36 GB	372659-005	—	
	b) 72 GB	332934-005	—	
	c) 146 GB			
	- Drive module only	375873-B21	—	
	- Drive module with carrier	375872-B21	—	
	d) 500 GB			
	- Drive module only	403254-B21	—	
	- Drive module with carrier	395473-B21	—	
13	Non-hot-plug SATA hard drive			Yes
	a) 80 GB	373311-005	—	
	b) 160 GB	373312-005	—	
	c) 250 GB	373313-005	—	

continued

Table 1-2: System Components Spare Parts List *continued*

Item	Description	Original Spare Part Number	Modified Spare Part Number	Customer Self Repair
	Signal cable kit*			
14	IDE data cable assembly	390494-001	—	Yes
15	SCSI cable assembly	390491-001	—	Yes
16	SATA cable assembly	390492-001	—	Yes
	Power			
17	500W power supply unit	389322-001	408286-001	Yes
18	3V 200-mAh internal lithium battery for system board	234556-001	—	Yes
19	SATA RAID ASR2120 controller board (with low profile bracket)*	391610-001	—	Yes
20	Processor mounting frame*	390399-001	408299-001	No
21	USB floppy disk drive*	336780-005	—	Yes
22	Return kit*	391824-001	—	—
	Miscellaneous signal cable kits*			
23	Front panel board cable assembly*	390493-001	—	Yes
24	SCSI LED cable assembly*	382156-001	—	Yes
25	USB port 2.0 cable assembly*	389326-001	408287-001	Yes
	Network Interface Card (NIC) options*			
26	10/1000BCM VD PCI-X board	268794-001	—	Yes
27	PCI Gigabit switch adapter	366603-001	—	Yes
28	10/100/1000-T PCI NIC board	353446-001	—	Yes
29	PCI Express Gigabit NIC board	366605-001	—	Yes
30	PCI-X Gigabit DP UTP board	313586-001	—	Yes
31	PCI Express dual port 4x IB adapter board	374931-001	—	Yes
32	PCI Express dual port 4x IB controller board	374932-001	—	Yes

REQUIREMENT: For customers in the EU only. The use of the Original Spare part is regulated by RoHS legislation*. If your unit contains a part that is labeled with the Modified Spare number, the Modified Spare must be ordered as the replacement part in the EU. If your unit contains a part that is labeled with the Original Spare number, please order the Original Spare as the replacement part in the EU. In this case either the Original Spare or the Modified Spare may be shipped which will not affect performance or functionality of the unit.

*Directive 2002/95/EC restricts the use of lead, mercury, cadmium, hexavalent chromium, PBBs and PBDEs in electronic products.

HP Contact Information

For the name of the nearest HP authorized reseller:

- In the United States, see the HP US service locator webpage (http://www.hp.com/service_locator).

- In other locations, see the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/us/en/wwcontact.html).

For HP technical support:

- In the United States, for contact options see the Contact HP United States webpage (http://welcome.hp.com/country/us/en/contact_us.html). To contact HP by phone:

- 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 (http://www.hp.com).

- In other locations, see the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/us/en/wwcontact.html).

Before You Contact HP

Be sure to have the following information available before you call HP:

- Technical support registration number (if applicable)

- Product serial number

- Product model name and number

- Applicable error messages

- Add-on boards or hardware

- Third-party hardware or software

- Operating system type and revision level

2

Removal and Replacement Procedures

This chapter provides subassembly/module-level removal and replacement procedures for the HP ProLiant DL145 Generation 2 server.

Review the specifications of a new component before installing it to make sure it is compatible with the server. When you integrate new components into the system, record its model and serial number, and any other pertinent information for future reference. After completing any removal or replacement procedure, run the diagnostics program to verify that all components operate properly.

Hardware Configuration Tools

In performing any hardware configuration procedure you may need the following tools:

- T-15 Torx screwdriver
- Flat-blade screwdriver

The following references and software tools may also be used:

- HP ProLiant DL145 Generation 2 Server Support CD
- IPMI Event Log
- Diagnostics software

NOTE: The figures used in this chapter to illustrate procedural steps are labeled numerically (i.e., 1, 2…). When these figures are used in substep items, the alphabetically labeled instructions correspond to the numbered labels on the related figure (i.e., Label 1 corresponds to step a, label 2 corresponds to step b, etc.).

NOTE: The procedures described in this chapter assume that the server is out of the rack and is positioned on a flat, stable surface.

Hardware Configuration Warnings

Read the following sections before performing any servicing or troubleshooting procedure.

> **WARNING:** Only authorized technicians trained by HP should attempt to repair this equipment. 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.

> **CAUTION:** Whenever installing hardware or performing maintenance procedures requiring access to internal components, it is recommended that all server data be backed up to avoid loss.

Symbols on Equipment

These symbols may be located on equipment in areas where hazardous conditions may exist.

> **WARNING:** This symbol, in conjunction with any of the following symbols, indicates the presence of a potential hazard. The potential for injury exists if warnings are not observed. Consult your documentation for specific details.

> This symbol indicates the presence of hazardous energy circuits or electric shock hazards. Refer all servicing to qualified personnel.
>
> **WARNING:** To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades, and servicing to qualified personnel.

> This symbol indicates the presence of electric shock hazards. The 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

> This symbol on an RJ-45 receptacle 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 symbol indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.
>
> **WARNING:** To reduce the risk of injury from a hot component, allow the surface to cool before touching.

These symbols, on power supplies or systems, indicate that the equipment is supplied by multiple sources of power.

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

This symbol indicates that the component exceeds the recommended weight for one individual to handle safely.

Weight in kg
Weight in lb

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.

Rack Warnings

CAUTION: This ProLiant server is intended for rack-mount operation. The server bezel is made from glossy material. For safety purposes, do not place the server in the visual field of users to prevent any accidents arising from light bouncing off the bezel's surface.

ACHTUNG: Entsprechend der Bildschirmabeitsplatzverordnung, darf das Gerät nicht im Gesichtsfeld des Bedieners aufgestellt werden, da das Gehäuse eine glänzende Front aufweist.

WARNING: To reduce the risk of personal injury or damage to equipment, always ensure that the rack is adequately stabilized before extending a component outside 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: Hazardous voltages are present inside the server. Always disconnect AC power from the server and other associated assemblies while working inside the unit. Serious injury may result if this warning is not observed.**

⚠ **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.**
- **Disconnect all power cords to completely remove power from the system.**

⚠ **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 top cover closed. Proper cooling is not achieved if the system top cover is removed.

Hardware Configuration Information

Electrostatic Discharge Information

An electrostatic discharge (ESD) 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 (earthed) tools and equipment.
- Keep work area free of nonconductive materials, such as ordinary plastic assembly aids and foam packing.

- Make sure that you are always properly grounded (earthed) when 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.

Pre-installation Procedures

Perform the steps below before you open the server or before you remove or replace any component:

⚠ **WARNING: Failure to properly turn off the server before you open the server or before your start installing/ removing components may cause serious damage as well as bodily harm.**

1. Turn off the server and all the peripherals connected to it.

   Refer to the "Powering Down the Server" section on the next page for detailed instructions on how to completely power down the server.

2. Disconnect the AC power cord from the power supply cable socket located on the server rear panel to eliminate the risk of electrical shock.

3. Remove the top cover according to the instructions described on page 2-7.

4. Follow the ESD precautions listed in the previous page when handling a server component.

IMPORTANT: To streamline the configuration process, read through the entire installation/removal procedure first and make sure you understand them before you before you begin.

Post-installation Procedures

Perform the steps below after installing or removing a server component:

1. Be sure all components are installed according to the described step-by-step instructions.

2. Check to make sure you have not left loose tools or parts inside the server.

3. Reinstall any expansion board(s), peripheral(s), board cover(s), bracket (s) and system cable(s) that have previously been removed.

4. If you have removed the air duct and/or the PCI riser board bracket, reinstall it.

5. Reinstall the top cover.

6. Connect all external cables and the AC power cord to the system.

7. Press the power button ⏻ on the front panel to turn on the server.

Powering Down the Server

The server does not completely power down when the power button ⏻ is pressed. The button toggles between On and Standby. The standby position removes power from most electronics and the drives, but some internal circuitry remains active. To completely remove all power from the system, disconnect all power cords from the server.

To power down the server:

1. Shut down server as directed by the OS documentation.

2. Press the power button ⏻ to toggle to Standby.

   This places the server in standby mode changing the power LED indicator to amber. In this mode, the main power supply output is disabled. Standby does not completely disable or remove power from the system.

3. Disconnect the AC power cord from the AC outlet and then from the server.

4. Be sure that the power LED indicator is turned off and that the fan noise has stopped.

5. Disconnect all external peripheral devices from the server.

Opening the Server

The top cover is detachable. You need to remove this cover before you can remove or replace a server component.

To remove the top cover:

1. Perform steps 1 and 2 of the pre-installation procedures described on page 2-5.

2. Detach the top cover from the chassis:

   a. Loosen the captive thumbscrew on the rear panel.

   b. Slide the cover approximately 1.25 cm (0.5 in) toward the rear of the unit, then lift the cover to detach it from the chassis.
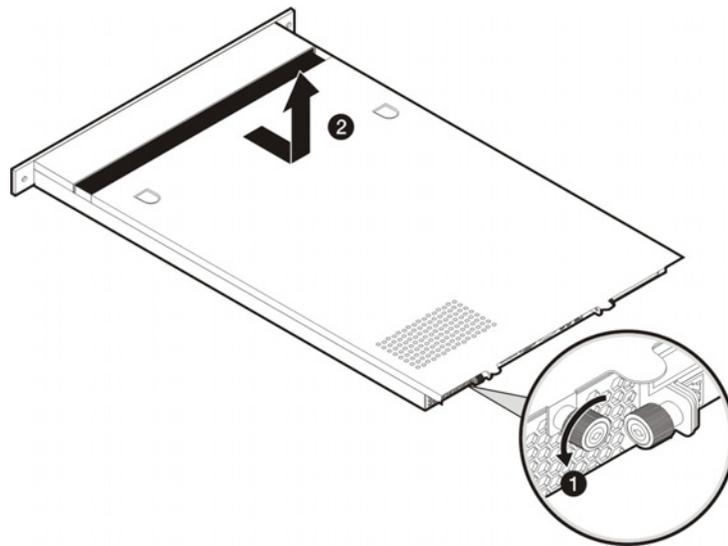
Figure 2-1: Removing the top cover

3. Place the top cover in a safe place for reinstallation later.

To reinstall the top cover:

1. Perform steps 1 through 4 of the post-installation procedures described on the previous page.

2. Reinstall the top cover:

   a. Align the cover to the chassis and then slide it towards the front panel to position it into place.

   b. Once the cover is attached to the chassis, secure it by tightening the captive thumbscrew on the rear panel.
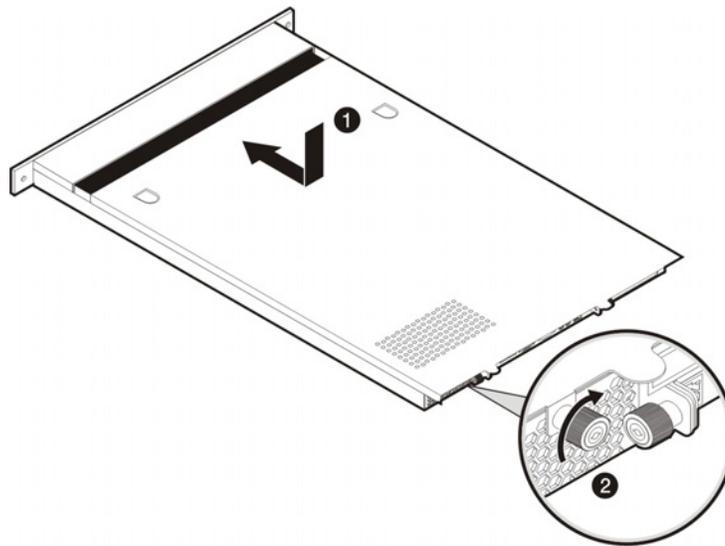
Figure 2-2: Reinstalling the top cover

3. Perform steps 6 and 7 of the post-installation procedures.

Drive Bay Configuration

The server supports three drive bays— two drive bays for 1-inch hard disk drives and one drive bay for a slim-type optical media drive.

Go to the HP website at http://www.hp.com/ and refer to the options list for this server model for the latest information on supported hard drives and optical media drives.

Figure 2-3: Drive bay configuration

Item	Description
1	1-inch hard disk drive bays (two)
2	Optical media device bay

Cable Routing Diagrams

Figure 2-4 to Figure 2-6 show the cable routing for the optional optical media drive, as well as for both SCSI and SATA hard drives. For detailed cable routing procedures for each type of drive, refer to the corresponding step(s) in the drive configuration sections later in this chapter.

> ⚠ **CAUTION:** Route the drive cables neatly. If necessary, secure them using the pre-installed cable clips located on the chassis base. The cables should be routed in a position where they will not be pinched or crimped by the top cover, nor should they hamper proper airflow inside the chassis.

Optical Media Drive Cable Routing
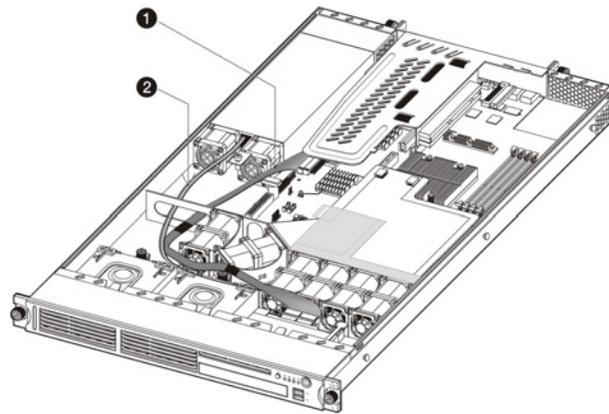
Figure 2-4: Optical media drive cable routing

Item	Description
1	IDE data cable
2	Optical media drive power cable

Hard Drive Cable Routing

SCSI Hard Drive Cable Routing
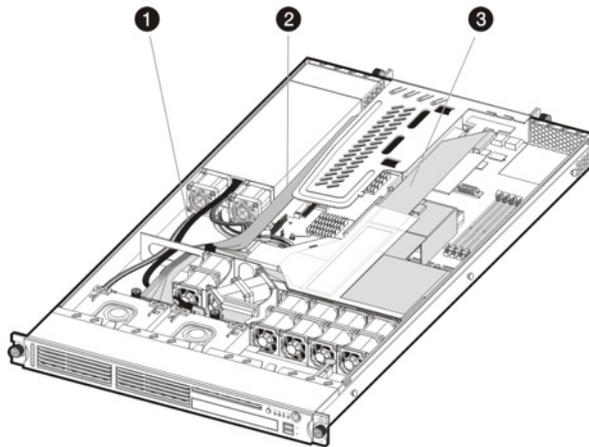
Figure 2-5: SCSI hard drive cable routing

No.	Description
1	SCSI drive power cables
2	SCSI drive data cable when the controller card is installed in the standard height/full-length PCI-X riser board slot.
3	SCSI drive data cable when the controller card is installed in the low profile PCI-X riser board slot

SATA Hard Drive Cable Routing
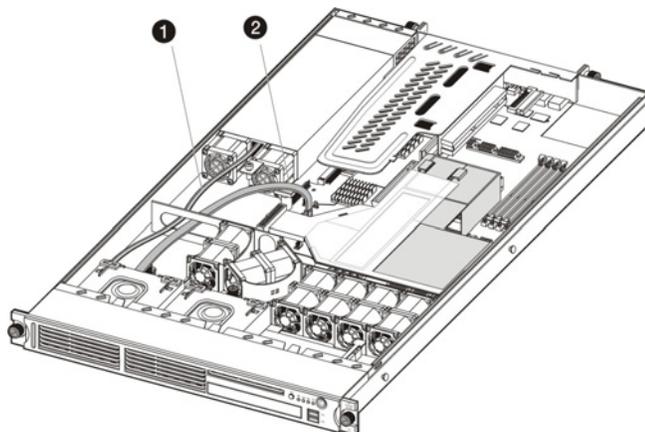
Figure 2-6: SATA hard drive cable routing when

No.	Description
1	SATA drive power cable
2	SATA drive data cable

Optical Media Drive

The optical media device bay supports the installation of a slim-type CD-ROM or DVD-ROM drive. Go to the HP website at http://www.hp.com/ and refer to the options list for this server model for a list of supported optical media drives.

To install a CD or DVD drive:

1. Perform the pre-installation procedures described on page 2-5.

2. Prepare the optical media device bay for installation:

   a. Pull up the optical media device bay release lever, then push the drive carrier partially out through the front of the chassis.

   b. Pull the drive carrier out of the chassis.

   c. Remove the screw securing the drive carrier bezel.

   d. Detach the drive carrier bezel.

   Store the drive carrier bezel (with its screw) for reassembly later.

   ⚠ **CAUTION:** Do not discard the drive carrier bezel. If the optical drive is removed in the future, this bezel must be reinstalled in the chassis for the proper cooling of the system.
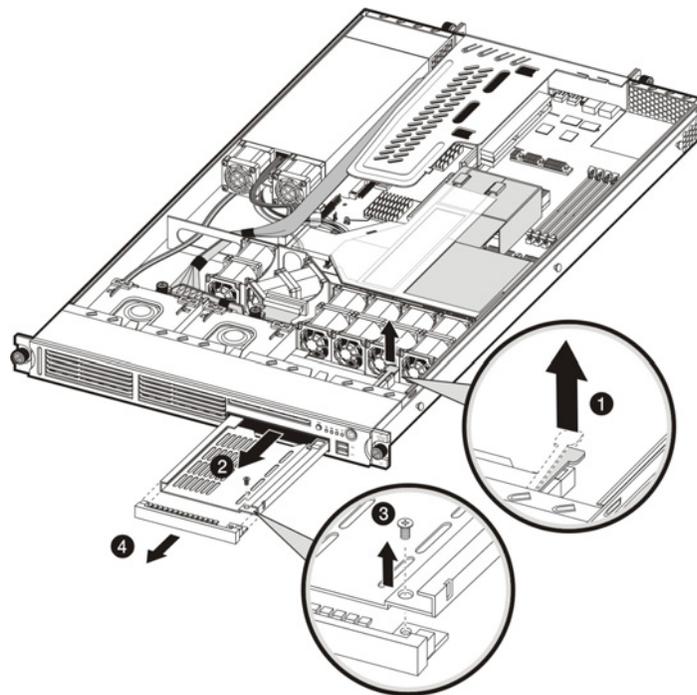
Figure 2-7: Preparing the optical media device bay for installation

3. Remove the new optical drive from its protective packaging.

    The optical drive option kits include mounting screws for drive installation.

4. Install the new optical drive in its carrier:

    a. Align the optical drive in the carrier.

    b. Secure the drive with two mounting screws.
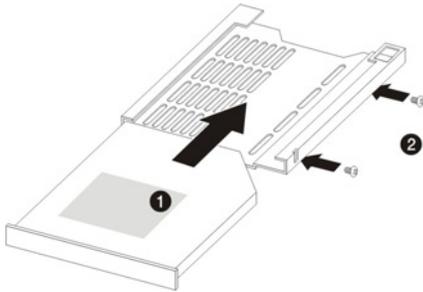
Figure 2-8: Installing the optical media drive in its carrier

5. Install the new optical drive into the chassis:

    a. Slide the CD-ROM drive assembly into the chassis until the media device bay release lever snaps into place.

    b. Route the optical drive's power cables through the cable management opening of the chassis' partition wall.

    c. Connect the IDE data and power cables to their corresponding connectors on the rear of the drive.
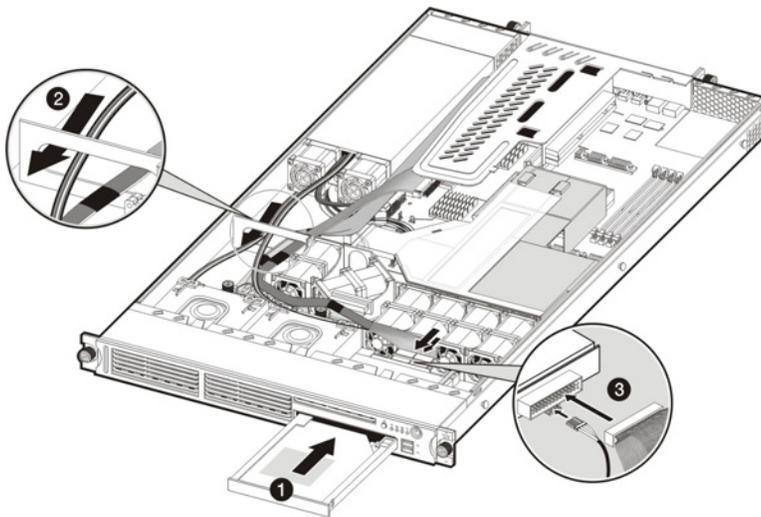
Figure 2-9: Installing the CD-ROM drive assembly in the chassis

6. Perform the post-installation procedures described on page 2-6.

Hard Drives

The server's two 1-inch hard disk drive bays support both non-hot-plug SCSI and SATA drives. Hard drives installed in the server are labeled as Device 0 and Device 1 from left to right when viewed from the front of the server. Refer to Figure 2-10 for related illustration.
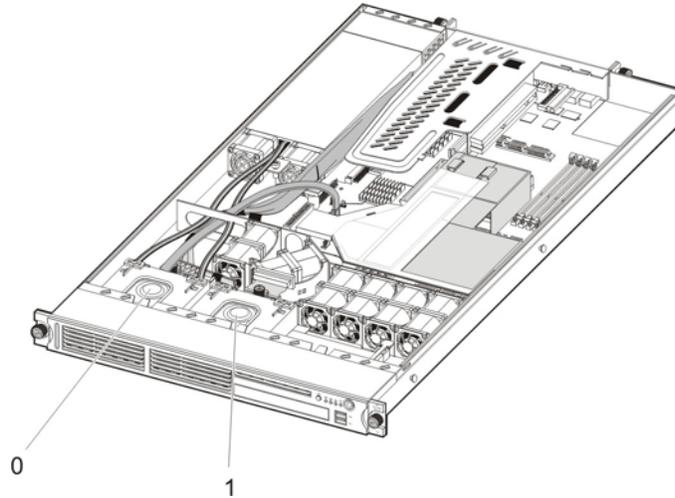
Figure 2-10: Hard drive device numbers

Hard Drive Support

The default system comes with a single hard drive, the type and capacity of which varies based on the server model. Your ProLiant server currently supports the following drive capacities:

- SCSI HDD
  - 36 GB
  - 72 GB

- SATA HDD
  - 80 GB
  - 160 GB
  - 250 GB

The SCSI drive and the 80 GB SATA drive options include only the hard disk. Use the HDD carriers and mounting screws included with your server to install these drives.

The 160- and 250-GB SATA drive options come with a hot-plug HDD carrier. You need to remove the drives from their default carriers before installing them in the server. Use the HDD carriers and mounting screws included with your server to install these drives.

Guidelines for Installing Hard Drives

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

- Install only hard drive models specified for your ProLiant server. Installing unsupported hard drives may damage the system by consuming power and generating heat in excess of the server's operating tolerance. This condition may result in a loss of system and/or data integrity.

- Install hard disks in the drive carriers included with the server chassis using four of the six HDD mounting screws pre-installed in each of the two HDD carriers.
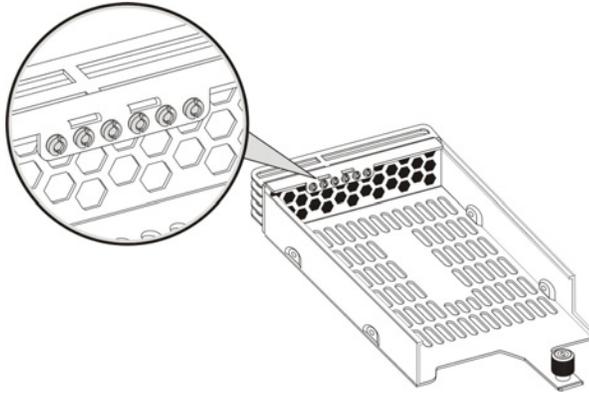
Figure 2-11: HDD mounting screws

Removing a Hard Drive

Instructions on how to remove a currently installed hard drive are described in the next section.

To remove a hard drive:

1. Perform the pre-installation procedures described on page 2-5.

2. Disconnect the data and power cables from the rear of the hard drive.

3. Remove the hard drive from the chassis:

   a. Loosen the screw that secures the HDD carrier to the chassis.

   b. Push the HDD carrier towards the front of the chassis, then slide it out completely.
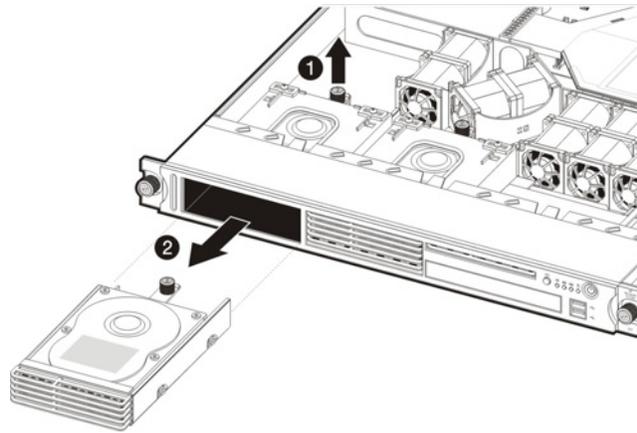
Figure 2-12: Removing the hard drive from the chassis

4. Remove the hard drive from its carrier:

   a. Remove the four mounting screws that secure the hard drive to the carrier.

   b. Remove the hard drive from its carrier.
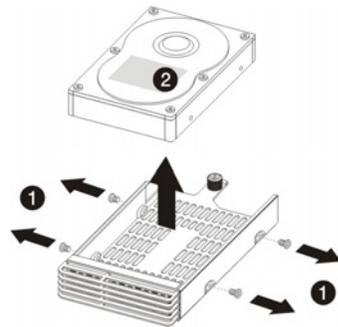
Figure 2-13: Removing the hard drive from its carrier

> **IMPORTANT:** If you removed a hard drive without plans of installing a new one, you must reinstall the mounting screws at their pre-installed location for future use, then reinstall the HDD carrier in the chassis for the proper cooling of the system.

Configuring a SCSI Hard Drive:

The steps listed below give an overview of the SCSI hard drive configuration procedure:

1. Install the SCSI hard drive.

2. Install the SCSI controller board.

3. Route the SCSI drive cables.

4. Set up the SCSI configuration.

   Refer to the documentation that came with the SCSI controller board for detailed procedures.

To install a SCSI hard drive:

1. Perform the pre-installation procedures described on page 2-5.

2. Select which drive bay you will use to install the new hard drive.

   If the desired drive bay is occupied, remove the currently installed drive following the procedures described on page 2-14.

   If the desired drive bay is empty, perform step 3 of the "To remove a hard drive" section on page 2-15, then remove four mounting screws from the HDD carrier. You will use these screws to install the new drive.

3. Install the new SCSI hard drive in its carrier:

   If you are installing the new drive in a previously occupied drive bay, use the HDD carrier and mounting screws you removed from the old drive.

   If you are installing the new drive in an empty drive bay, use the HDD carrier and mounting screws you removed from that drive bay.

   a. Align the new hard drive on the carrier.

   b. Secure the hard drive assembly with the four mounting screws.

   c. Slide the hard drive assembly into the chassis.
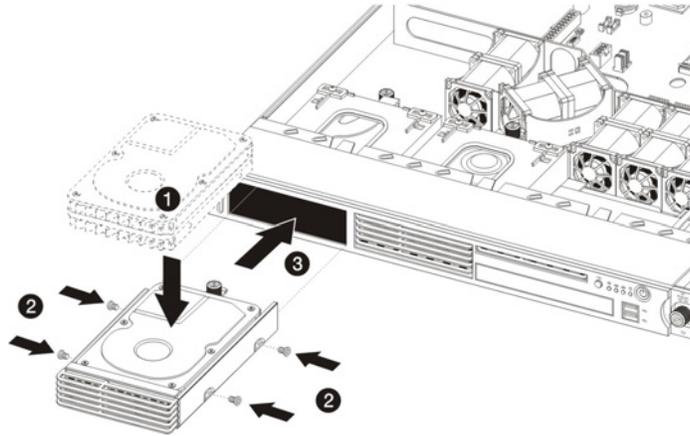
Figure 2-16: Installing a SCSI hard drive

Proceed to the next section for instructions on how to install the SCSI controller board.
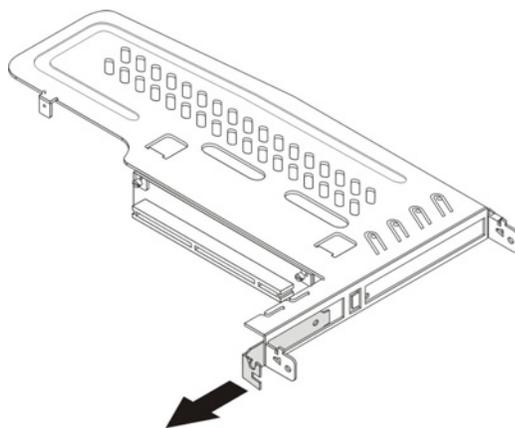
To install the SCSI controller board:

The SCSI controller card can be installed in the low profile 64-bit/133 MHz PCI-X riser board slot or in the standard height/full-length 64-bit/133 MHz PCI-X riser board slot.

1. Remove the PCI riser board assembly following the procedures described on page 2-37.

2. Identify the slot that is compatible with the SCSI controller board you intend to install.

3. Pull out the slot cover from the selected slot.

   Store it for reassembly later.

   ⚠ **CAUTION:** Do not discard the slot cover. If the expansion board is removed in the future, the slot cover must be reinstalled to maintain proper cooling.

Figure 2-17: Removing the cover of the low–profile expansion slot
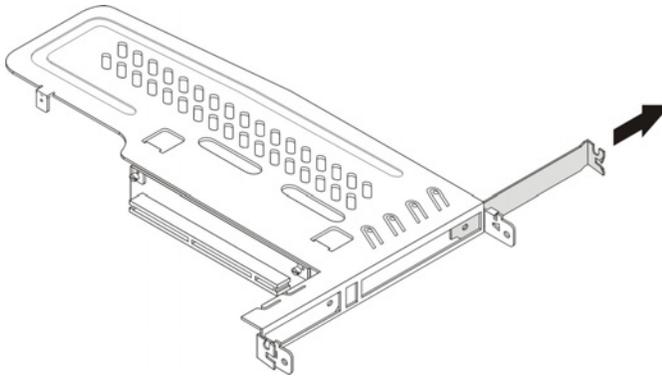
Figure 2-18: Removing the cover of the standard height/full-length expansion slot

4. Remove the SCSI controller board from its protective packaging, handling it by the edges.

    Some controller boards can only be installed in one slot but other boards can be configured to fit in either slot by replacing the default bracket (attached to the board) with a different sized one. The different sized bracket and instructions on how to attach it to the board is included in the option kit.

5. Verify that the board's default bracket is compatible with the configuration of the selected slot.

    If it is not compatible, replace the bracket with one that is compatible.

6. Slide the SCSI controller board into the slot.

    Firmly press the board to seat it properly on the slot.
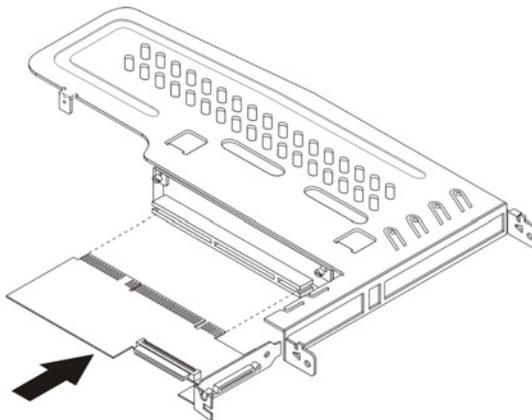
Figure 2-19: Installing the SCSI controller board in the low–profile expansion slot

In Figure 2-20, the plane section of the PCI riser board assembly is dimmed out for clarity.
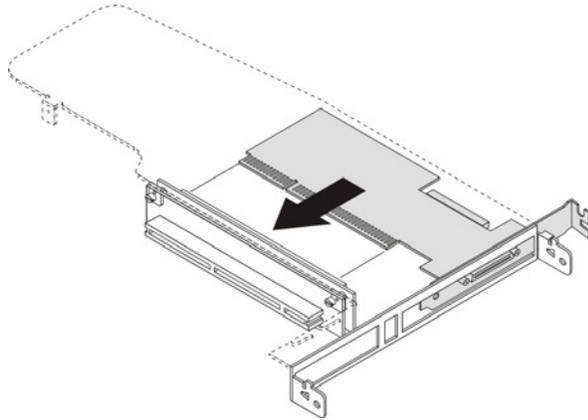
Figure 2-20: Installing the SCSI controller board in the standard height/full-length expansion slot

Proceed to the next section for instructions on how to route the SCSI drive cables.

To route the SCSI drive cables:

Cable routing for SCSI hard drive varies depending on which expansion slot you installed the SCSI controller board—in the low–profile slot or in the standard height/full-length slot, and to a certain extent, to the location of the cable connectors on the SCSI controller board you installed.
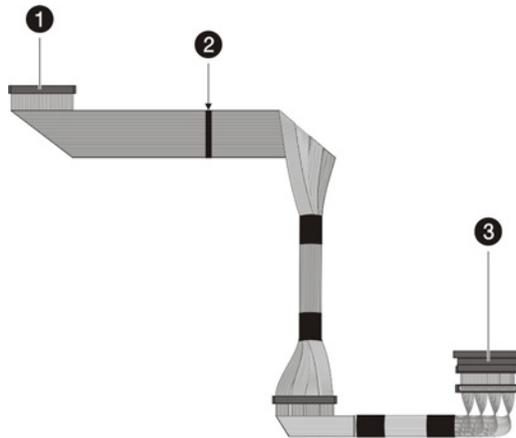
Figure 2-21: SCSI cable parts

Item	Description
1	Connector end
2	240 mm location
3	Terminator end

To route the SCSI drive cables when the controller board is installed in the low-profile expansion slot:

1. Reinstall the PCI riser board assembly following the procedures described on page 2-40.

2. Route the SCSI cable towards the SCSI hard drive:

   a. Connect the cable to the corresponding connector on the SCSI controller board.

   b. Fold the connector end of the SCSI cable in the manner illustrated in the following figure, then route the cable towards the air duct.

   The marked side of the cable should be facing down.
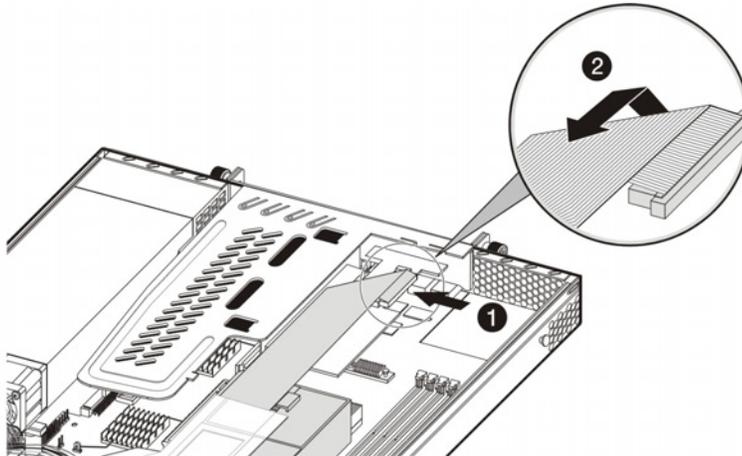
Figure 2-22: SCSI cable routing for low-profile controller boards phase 1

   c. Use the two retainer tabs on the air duct to secure the cable.

   d. Open the protective mylar sheet on the air duct.

   e. Lay the cable flat in the slot on the air duct surface.
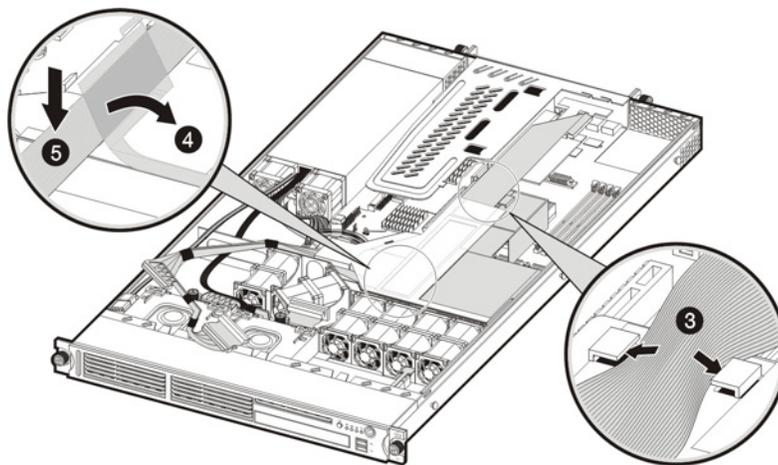
Figure 2-23: SCSI cable routing for low-profile controller boards phase 2

f. Fold the terminated end of the SCSI cable in the manner illustrated in the following figure.

g. Reattach the mylar sheet over the cable back to the air duct surface.

h. Route the SCSI cable through the cable management opening of the chassis' partition wall.
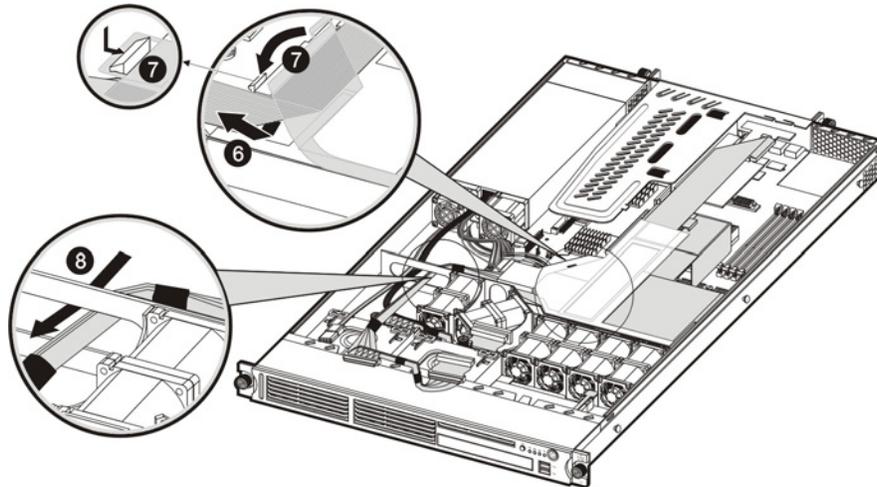
Figure 2-24: SCSI cable routing for low-profile controller boards phase 3

i. Route the power cable through the cable management opening of the chassis' partition wall.

j. Connect the SCSI and power cables to their corresponding connectors on the rear of the new drive.

Make sure the terminated end of the SCSI cable is positioned in the manner illustrated in Figure 2-25.

k. Check that all cables are clear of the hard drive carrier and are properly routed to their corresponding connectors, then tighten the screw that secures the hard drive assembly to the chassis.
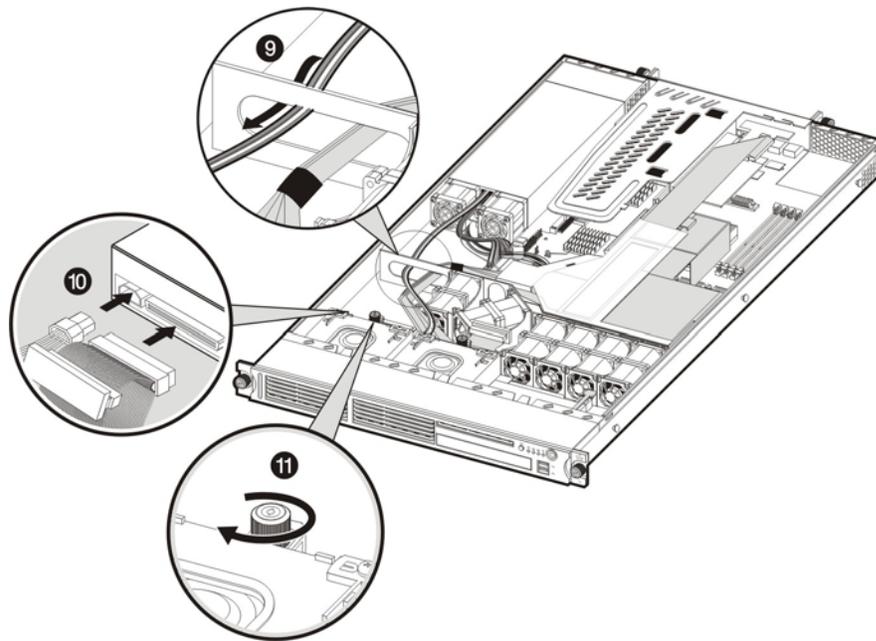
Figure 2-25: SCSI cable routing for low-profile controller boards phase 4

3. Perform the post-installation procedures described on page 2-6

4. Set up the SCSI configuration.

   Refer to the documentation that came with the SCSI controller board for detailed procedures.

To route the SCSI drive cables when the controller board is installed in the standard height/full-length expansion slot:

1. Connect the SCSI cable to the SCSI controller board:

    a. Connect the cable to the corresponding connector on the SCSI controller board.

    b. Fold the connector end of the SCSI cable in the manner illustrated in the following figure.

    c. Attach a tie wrap (included in the SCSI cable option kit) in the 240 mm location of the cable.
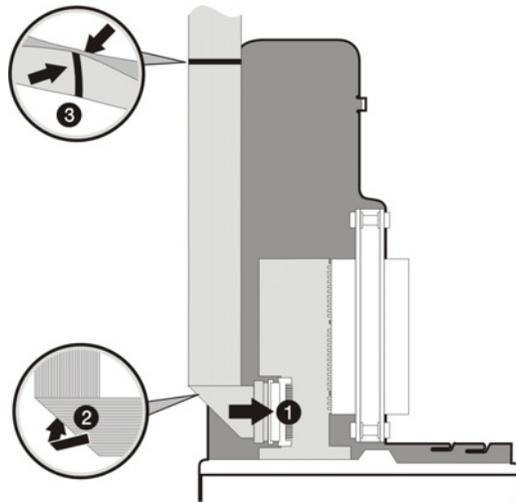
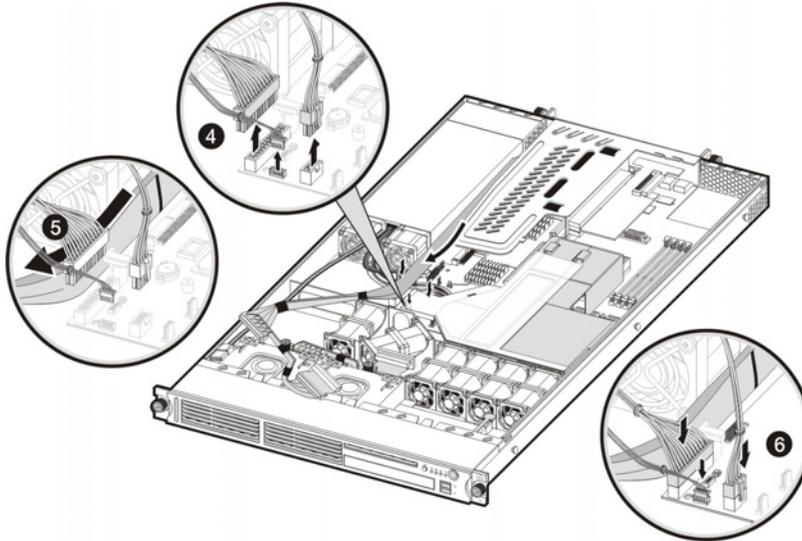**Figure 2-26: SCSI cable routing for standard height/full-length controller boards phase 1**

2. Route the SCSI cable towards the SCSI hard drive:

    a. Align the assembly with the system board expansion slots, then press it down to ensure full connection to the system board.

    b. Tighten the two captive thumbscrews to secure the assembly to the chassis.

    c. Route the SCSI cable between the IDE data cable and the power supply unit making sure it lays flat between this space.
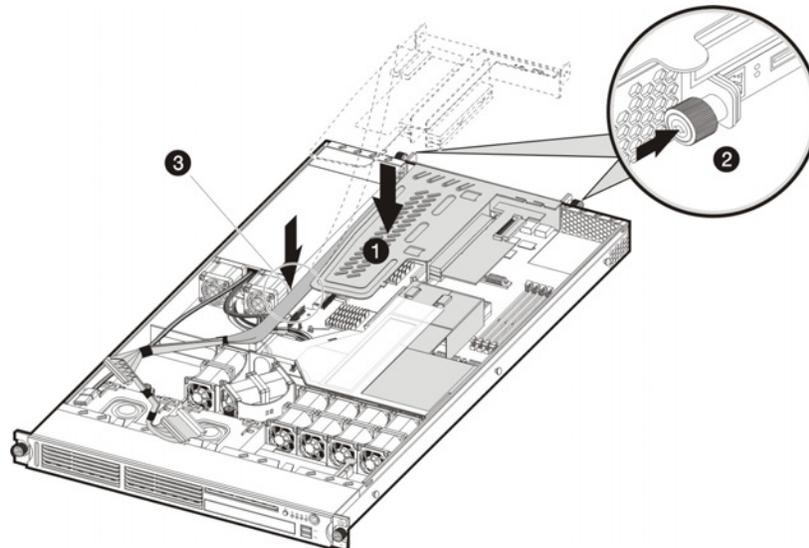
Figure 2-27: SCSI cable routing for standard height/full-length controller boards phase 2

    d. Disconnect the following cables from their system board connectors— the 8-pin ATX processor power cable, the 24-pin ATX system board power cable, and the 4-pin I^{2}C PSU cable.

e. Route the SCSI cable underneath the three cables you disconnected in the previous step.

f. Arrange the ATX processor power cable, the ATX system board power cable, and the I^{2}C PSU cable over the routed SCSI cable, then reconnect them to their corresponding system board connectors.
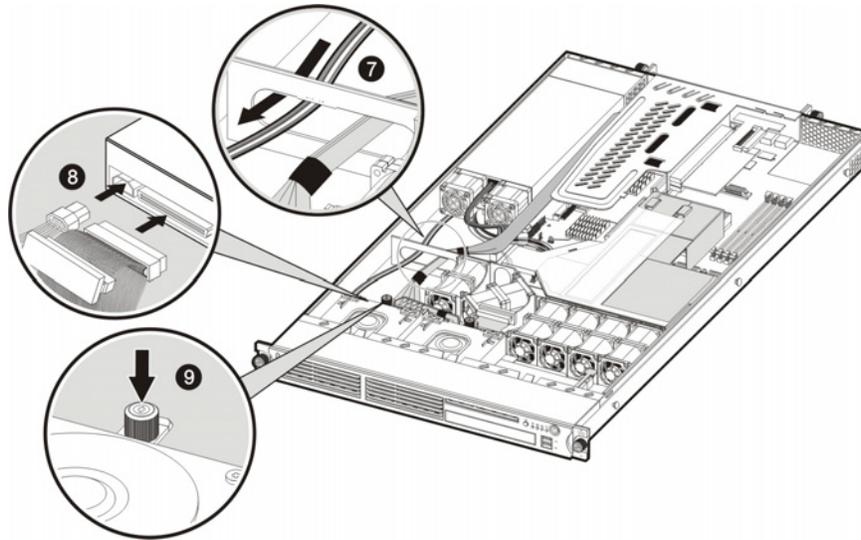

Figure 2-28: SCSI cable routing for standard height/full-length controller boards phase 3

g. Route the SCSI and power cables through the cable management opening of the chassis' partition wall.

h. Connect the SCSI and power cables to their corresponding connectors on the rear of the new drive.

   Make sure the terminated end of the SCSI cable is positioned in the manner illustrated Figure 2-29.

i. Check that all cables are clear of the hard drive carrier and are properly routed to their corresponding connectors, then tighten the screw that secures the hard drive assembly to the chassis.

Figure 2-29: SCSI cable routing for standard height/full-length controller boards phase 4

3. Perform the post-installation procedures described on page 2-6.

4. Set up the SCSI configuration.

    Refer to the documentation that came with the SCSI controller board for detailed procedures.

Configuring a SATA Hard Drive:

Configuring a SATA hard drive is a two-step process that includes:

1. Install the SATA hard drive.

2. Set up the SATA configuration.

    For detailed procedures, refer to the *Server Support CD* or to the operating system documentation.

To install a SATA hard drive:

1. Install the SATA hard drive following the procedures described in the "To install a SCSI hard drive" section on page 2-16.

2. Route the SATA drive cables:

   a. Route the SATA and power cables through the cable management opening of the chassis' partition wall.

   b. Connect the SATA and power cables to their corresponding connectors on the rear of the new drive.

   c. Check that all cables are clear of the hard drive carrier and are properly routed to their corresponding connectors, then tighten the screw that secures the hard drive assembly to the chassis.
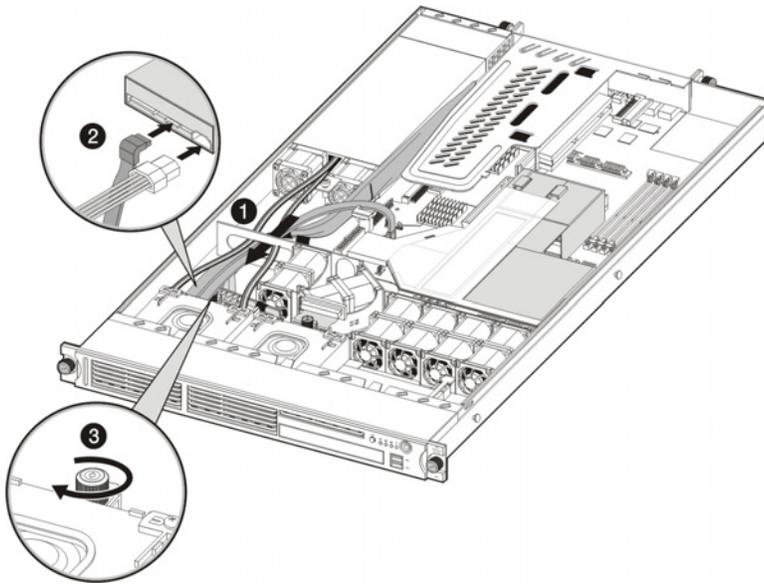
Figure 2-30: Routing the SATA drive cables

3. Perform the post-installation procedures described on page 2-6.

4. Set up the SATA configuration.

   For detailed procedures, refer to the *Server Support CD* or to the operating system documentation.

System Board Configuration

Refer to the following sections for instructions on how to remove or replace the processors, the memory modules, the expansion boards, and the system battery.

Processor

The server's two 940-pin processor sockets support single- and dual-core AMD Opteron processors. The location of the server's two processor sockets (U11 and U22) is shown in Figure 2-31.
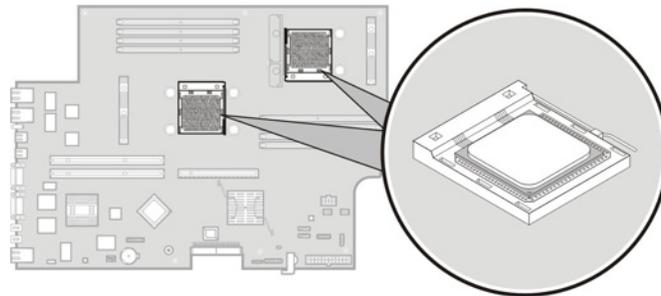

Figure 2-31: AMD Opteron processor sockets

Guidelines for Installing a Processor

When installing a processor in the server, observe the following important guidelines:

- Processor socket 1 (U22) must always be populated. If no processor is installed in this socket, the system will fail to boot and halt during POST. This error prevents the system from functioning properly.

  The default system comes with a single processor installed in the processor socket 1. The empty processor socket 2 is protected by an air baffle.
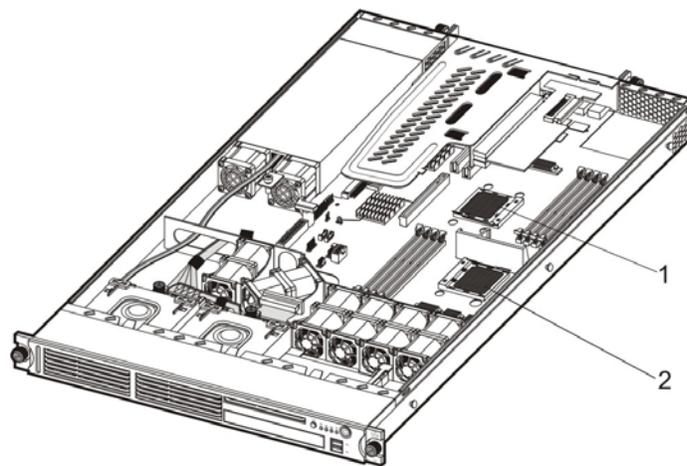

Figure 2-32: Processor socket numbers

- Handle the processor and heat sink with care. Damage to either may affect processor performance.

- The pins beneath the processor are very fragile. Do not bend or damage them.

- Always use a new heat sink when replacing processors. Failure to use new components can cause damage to the processor.

- Be sure that the server has the most recent ROM version. Failure to flash the ROM before installing processors can cause system failure.

- To prevent the heat sink from tilting to one side during installation/removal procedures, observe a diagonally opposite pattern (an "X" pattern) when loosening and tightening the four spring-loaded screws.
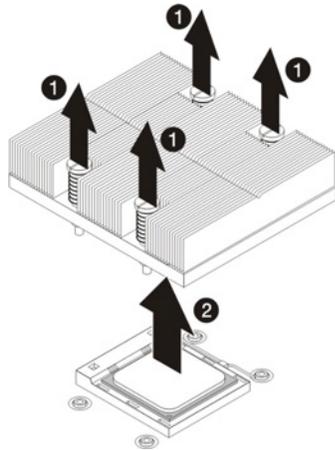
To remove a processor:

1. Perform the pre-installation procedures described on page 2-5.

2. If necessary, remove any accessory boards or cables that prevent access to the air duct.

3. Lift the air duct away from the processor sockets.

   Keep it for reinstallation later.
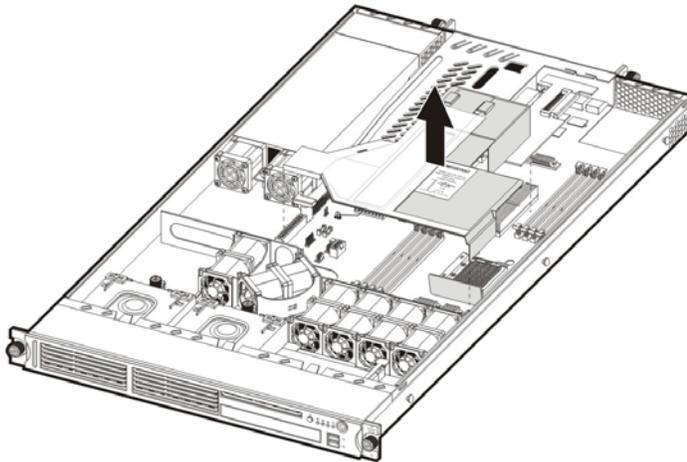

Figure 2-33: Removing the air duct

4. Locate the processor you want to remove.

5. Remove the heat sink:

   a. Loosen the four spring-loaded screws a few threads out, observing a diagonally opposite pattern, then loosen them completely to release the heat sink from the processor base.

   b. Lift the heat sink away from the system board.

Figure 2-34: Removing the heat sink

6. Remove the processor:

   a. Disengage the socket retention lever from the processor base.

   b. Grasp the processor by its edges and lift it out of its socket.
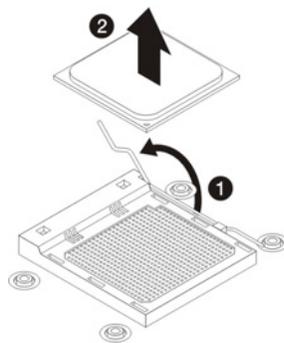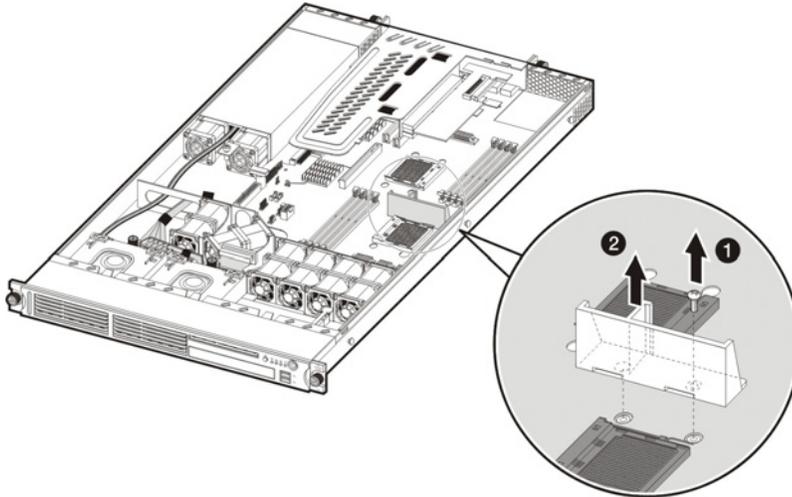

Figure 2-35: Removing the processor

7. Place the processor on a static-dissipating work surface or inside an anti-static bag.

To install a processor:

1. Perform steps 1 through 3 of the "To remove a processor" section on page 2-28.

2. Locate an empty processor socket.

3. If you intend to install the new processor in processor socket 2—creating a dual-processor configuration—remove the processor air baffle first.

   a. Remove the screw securing the processor air baffle to the system board.

   b. Lift the processor air baffle away from the system board.


Figure 2-37: Removing the processor air baffle

⚠ **CAUTION:** Do not discard the processor air baffle. If the processor in processor socket 1 is removed in the future, the air baffle must be reinstalled to maintain proper cooling.

4. Disengage the socket retention lever from the processor base.

5. Install the processor:

   a. Hold the processor by its edges and align it over the empty processor socket.

      Make sure that pin 1 of the processor (indicated by the gold triangle on the corner) is properly aligned with hole 1 of the socket (indicated by a notch). The pins are keyed in such a way that you cannot install the processor in the wrong orientation without bending the pins. Refer to Figure 2-34 for related illustration.

   b. Insert the processor into the socket.

   c. Engage the socket retention lever back into place.
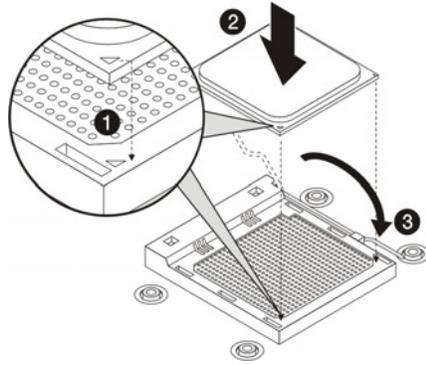
Figure 2-36: Installing a processor

A heat sink must be installed for the processor to function properly. The heat sink model for your ProLiant server already has a thermal interface material pre-applied on the bottom protected by a plastic cover. Make sure that this material has no scratches or gaps. If it does have any scratches or gaps, contact your HP Customer Support provider for replacement.

△ **CAUTION:** To prevent overheating or a possible system crash, use only a heat sink model specified for the HP ProLiant DL145 Generation 2 server.

6. Remove and discard the plastic cover protecting the thermal interface material.

    Be careful not to touch or scratch the thermal interface material.

7. Install the heat sink:

    a. Align then insert the heat sink on top of the processor.

    △ **CAUTION:** Do not over tighten the heat sink's spring-loaded screws to prevent them from breaking off. A maximum torque of 6 in-lb is set for the system.

    b. Tighten the four spring-loaded screws a few threads in, observing a diagonally opposite pattern, then tighten them completely to secure the heat sink to the processor base.
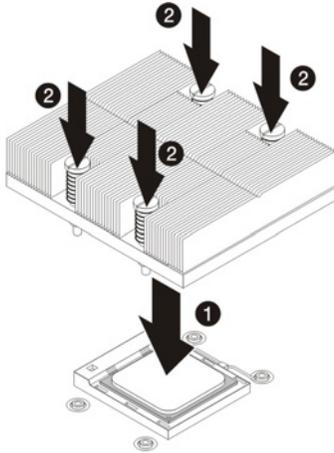
Figure 2-37: Installing the heat sink

IMPORTANT: If the heat sink is removed for any reason, it is critical that more thermal interface material be applied to the processor's integrated heat spreader in order to ensure proper thermal bonding between the processor and the heat sink. Clean the contact surface of both the processor and heat sink with an alcohol pad, and re-apply a thin layer of an HP approved thermal interface material before re-installing the processor. HP recommends using ShinEtsu G751 thermal grease compound for your ProLiant server.
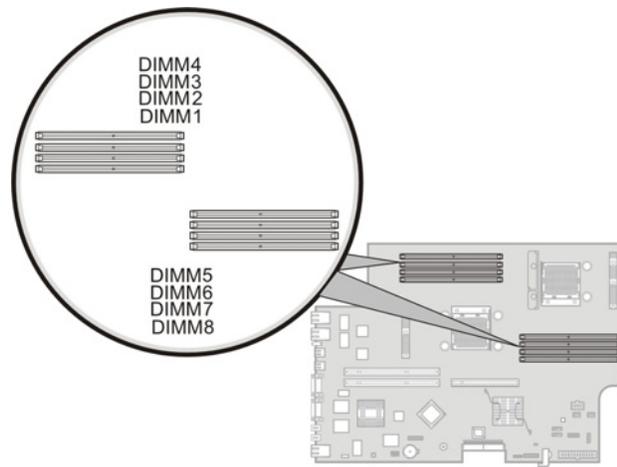
8. Reinstall the air duct in its place.
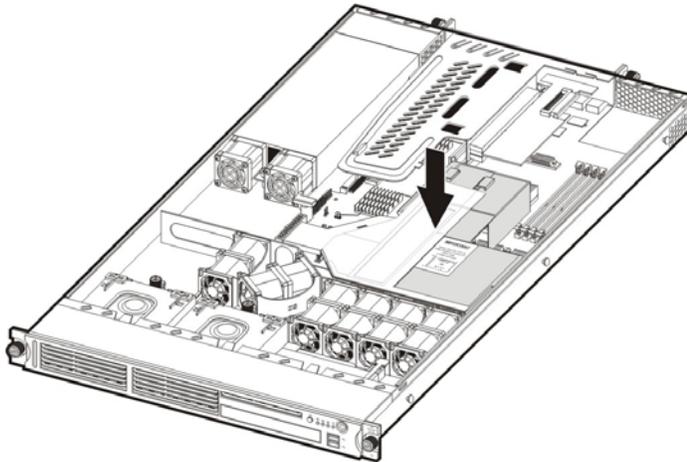
Figure 2-38: Reinstalling the air duct

9. Perform the post-installation procedures described on page 2-6.

Memory

The system has eight DIMM slots that support up to 16 GB maximum system memory (2 GB in each of the eight DIMM slots).

Figure 2-39: DIMM slots

The eight DIMM slots are divided into two banks which in turn are assigned to one processor. Together they make up one node.

- DIMM1 to DIMM 4 – Assigned to the CPU 1 socket (U22, the boot node)

- DIMM5 to DIMM8 – Assigned to the CPU 2 socket (U11)

IMPORTANT: For the system to function, DIMMS must be installed in pairs of the same size following the slot sequence listed below:

- Processor 1 socket (U22) DIMM slots: Populate DIMM3 and DIMM4 first, then DIMM1 and DIMM2

- Processor 2 socket (U11) DIMM slots: Populate DIMM7 and DIMM8 first, then DIMM5 and DIMM6

Guidelines for Installing Memory Modules

Observe the following important guidelines when installing memory modules:

- Use only HP supported PC3200 (400 MHz) registered ECC DIMMs in 512 MB, 1 GB, or 2 GB capacities

    IMPORTANT: Use only HP supplied DIMMs. DIMMs from other sources can adversely affect data integrity. The integrated 128-bit DDR memory controller of the AMD Opteron processor does not work with unregistered DIMMs.

• Install memory modules in pairs of the same size following the population order illustrated in the Table 2-1.

Table 2-1: DIMM Population Guidelines

DIMM Configuration	DIMM Slot Label							
	DIMM1	DIMM2	DIMM3	DIMM4	DIMM5	DIMM6	DIMM7	DIMM8
Single processor								
2-DIMM configuration			✓	✓				
4-DIMM configuration	✓	✓	✓	✓				
Dual-processor								
4-DIMM configuration			✓	✓			✓	✓
6-DIMM configuration	✓	✓	✓	✓			✓	✓
8-DIMM configuration	✓	✓	✓	✓	✓	✓	✓	✓

To remove a memory module:

1. Perform the pre-installation procedures described on page 2-5.

2. If you intend to remove a memory module from the DIMM5 to DIMM8 slots, lift the air duct away from the chassis first.

3. If necessary, remove any accessory boards, cables, or that prevent access to the DIMM slots.

4. Locate the memory module you want to remove.

5. Remove the selected memory module:

   a. Completely open the holding clips securing the module.

      This forces the module up in the slot and makes it easier to remove.

   b. Gently pull the memory module upward to remove it from its slot.
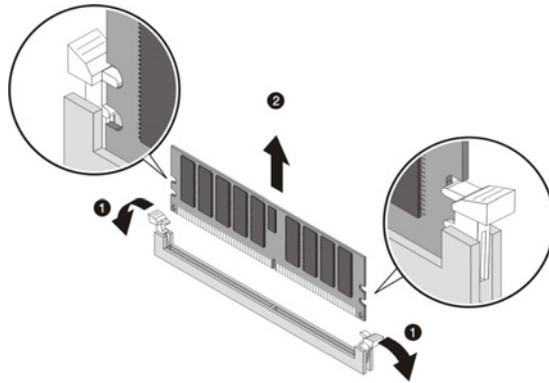
Figure 2-40: Removing a memory module

6.   Place the memory module on a static-dissipating work surface or inside an anti-static bag.
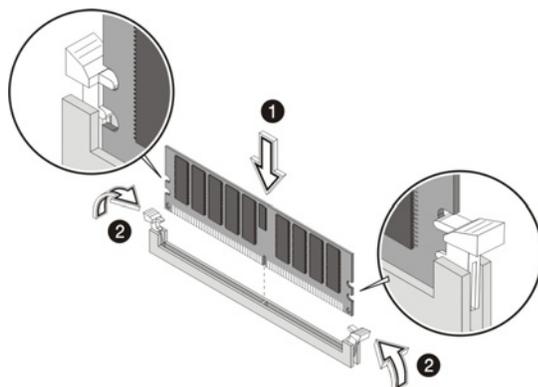
To install a memory module:

1.   Perform steps 1 through 3 of the "To remove a memory module" section.

2.   Locate an empty DIMM slot on the system board.

3.   If necessary, open the holding clips of the selected DIMM slot.

4.   Remove the memory module from its protective packaging, handling it by the edges.

5.   Install the memory module:

   a.   Orient the module so that the notch on its bottom edge aligns with the keyed surface of the DIMM slot, and then press it fully into the slot.

   The DIMM slots are structured to ensure proper installation. If you insert a memory module but it does not fit easily into the slot, you may have inserted it incorrectly. Reverse the orientation of the module and insert it again.

   b.   Firmly press the holding clips inward to secure the memory module in place.

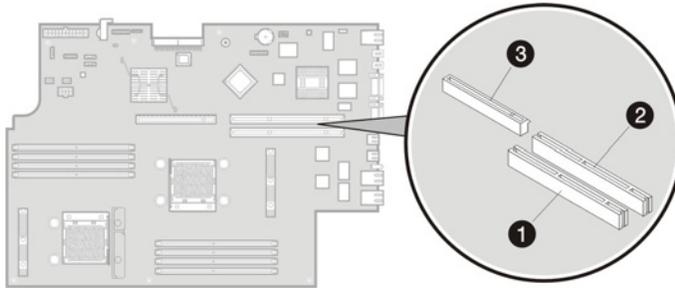   If the holding clips do not close, the module is not inserted correctly.

Figure 2-40: Installing a memory module

6.   Perform the post-installation procedures described on page 2-6.

PCI Expansion Boards

System Board PCI Expansion Slots

There are three PCI expansion slots on the system board. Figure 2-41 shows the location of these slots.

Figure 2-41: System board PCI expansion slots

Item	Component Code	Component	Function
1	CN7	64-bit/133 MHz PCI-X slot	Supports a low profile 64-bit/ 133 MHz PCI-X riser board
2	CN8	64-bit/133 MHz PCI-X slot	Supports a standard height/ full-length 64-bit/ 133 MHz PCI-X riser board
3	U42	PCI Express x16 slot	Supports a full-length PCI Express x16 riser board

PCI Riser Board Expansion Slots

The two PCI-X riser boards attached to the PCI riser board assembly convert the functionality of the system board expansion slots to a pair of slots positioned at a 90° angle from the system board. Figure 2-42 shows the PCI-X riser boards.
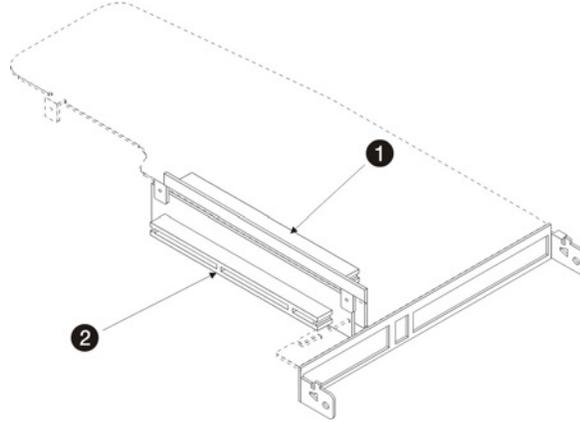
**Figure 2-42: System default PCI-X riser boards**

Item	Component
1	Standard height/full-length 64-bit/133 MHz PCI-X riser board
	Users have the option to replace this riser board with a PCI Express model using the PCI Express riser board option kit. This will allow support for PCI Express x16 expansion boards.
2	Low profile 64-bit/133 MHz PCI-X riser board

PCI Riser Board Assembly

The following sections described procedures on how to remove and reinstall the PCI riser board assembly, as well as instructions on how to install the optional PCI Express riser board.

To remove the PCI riser board assembly:

1. Perform the pre-installation procedures described on page 2-5.

2. Disconnect all cables connecting an existing expansion board to the system board.

3. Remove the PCI riser board assembly:

    a. Loosen the two captive thumbscrews that secure the assembly to the chassis.
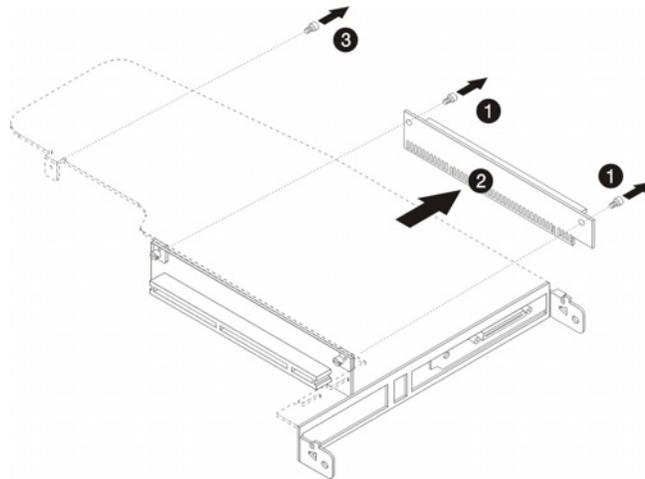
    b. Lift the assembly away from the chassis.
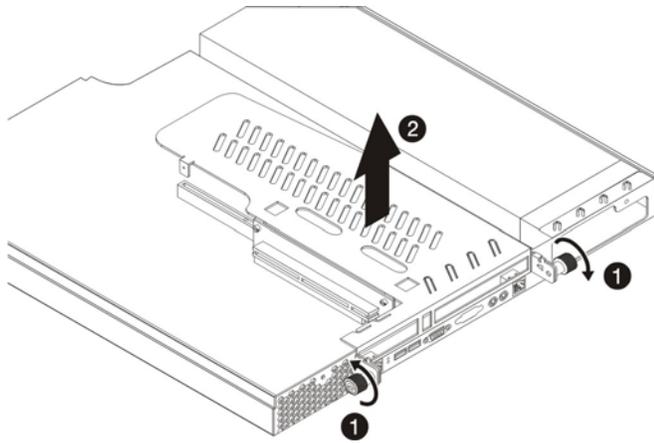
Figure 2-43: Removing the PCI riser board assembly

To install the PCI Express riser board:

Installing the PCI Express riser board option allows the use of high bandwidth-intensive peripherals in your ProLiant server.

NOTE: For ease of reading, the PCI riser board assembly will simply be referred to as "assembly" in the succeeding sections. Furthermore, in some figures, the plane section of the PCI riser board assembly is dimmed out for clarity.

1. Remove the PCI riser board assembly following the procedures described on page 2-37.

2. Remove the default standard height/full-length PCI-X riser board from the assembly:

    Keep the three screws you removed in this step for installing the PCI Express riser board later.

    a. Remove the two screws securing the riser board to the assembly.

    b. Pull the riser board away from the assembly.

    c. Remove the spare screw located on the third tab of the assembly (from the slot cover side).

Figure 2-44: Removing the default standard height/full-length PCI-X riser board

3. Remove the PCI Express riser board from its protective packaging.

4. Install the PCI Express riser board on the assembly:

    a. Align the riser board on the full-length bracket side of the assembly.

    b. Secure the riser board to the assembly using the three screws you removed in step 2.

    c. Align the assembly with the system board expansion slots, then press it down to ensure full connection to the system board.

    d. Tighten the two captive thumbscrews to secure the assembly to the chassis.
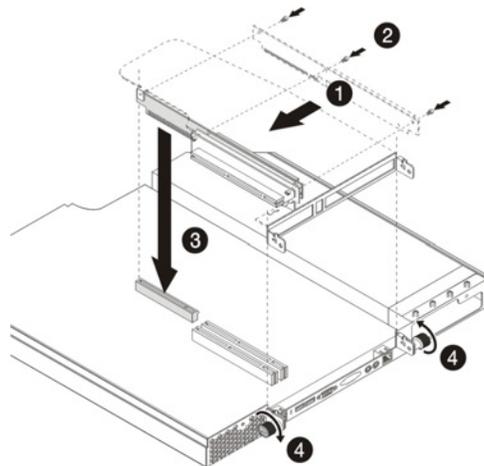
Figure 2-45: Installing the PCI Express riser board

> **NOTE:** When a standard height/full-length expansion board is installed on the PCI Express riser board slot, make sure that the corner of the expansion board is engaged to the PCI retainer bracket located on the system board. :

5. Perform the post-installation procedures described on page 2-6.

To reinstall the PCI riser board assembly:

1. Align the assembly with the system board expansion slots, then press it down to ensure full connection to the system board.

2. Tighten the two captive thumbscrews to secure the assembly to the chassis.
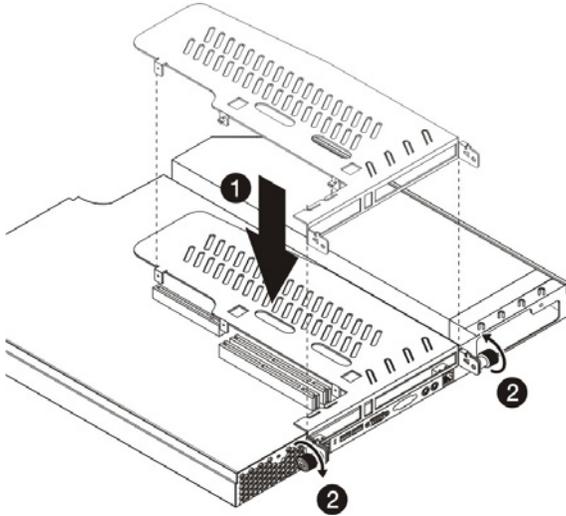
Figure 2-46: Reinstalling the PCI riser board assembly

3. Perform the post-installation procedures described on page 2-6.

Installing a PCI Expansion Board

Guidelines for Installing PCI Expansion Boards

The system supports up to two expansion boards at a time. Use only HP supported expansion boards that meet the following specifications:

*   PCI or PCI-X compliant

    — Connector: 32 or 64 bits wide, 3.3 V

    — Speed

        ▪ PCI board speed: 66 MHz

        ▪ PCI-X board speed: 100 or 133 MHz

    — Form factor: low profile or standard height/full-length boards

*   PCI Express x16 compliant (available only when the optional PCI Express riser board is installed)

To install a PCI expansion board:

1. Install the PCI expansion board following the procedures described in the "To install the SCSI controller board" section on page 2-17.

2. Connect the necessary cable(s) to the board.

   Refer to the documentation that came with the board.

3. Perform the post-installation procedures described on page 2-6.

System Battery

The HP ProLiant server uses nonvolatile memory that requires a battery to retain system information when power is removed. The battery, a 3 V 200-mAh internal lithium battery, is located on the system board (BT1).
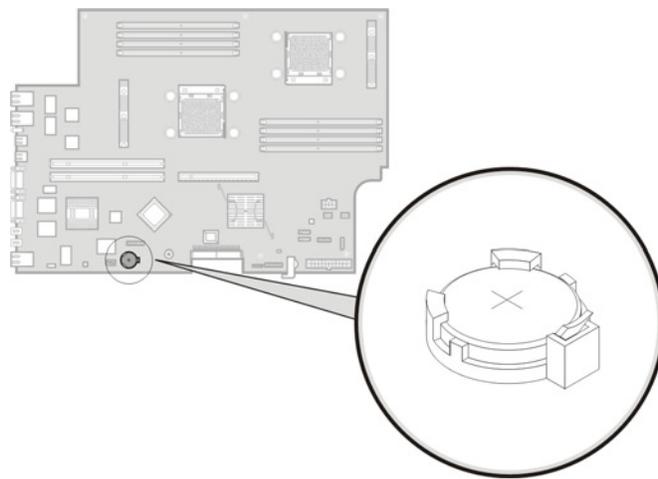
Figure 2-47: System battery

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

> **WARNING: Note the following reminders when replacing the system battery.**
>
> - **Replace the battery with the same type as the battery recommended by HP. Use of another battery may present a risk of fire or explosion.**
>
> - **A risk of fire and chemical burn exists if the battery is not handled properly. Do not disassemble, crush, puncture, or short external contacts, or expose the battery to temperatures higher than 60°C (140°F).**
>
> - **Do not dispose of used battery in water or fire. Dispose of used batteries according to manufacturer's instructions.**

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

To replace the system battery:

1. Remove the PCI riser board assembly following the procedures described on page 2-37.

2. If necessary, remove any accessory boards or cables that prevent access to the battery socket.

3. Replace the battery:

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

   a. Insert a small flat-blade screwdriver or a similar tool between the battery and spring latch to dislodge the battery from its socket.

   b. Lift up the old battery to remove it.

   c. Insert a new battery with the positive polarity (+ side) facing up, and ensure that it is seated completely.

   Ensure the spring latch is in place, and that it holds the battery firmly.
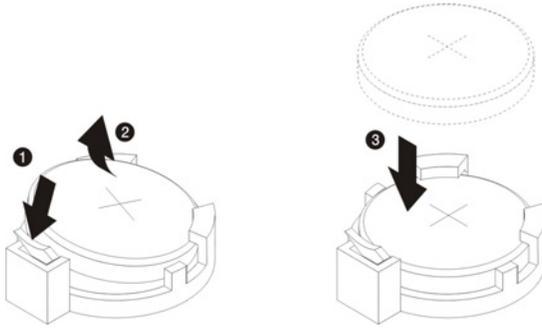
Figure 2-48: Replacing the battery

4. Perform the post-installation procedures described on page 2-6.
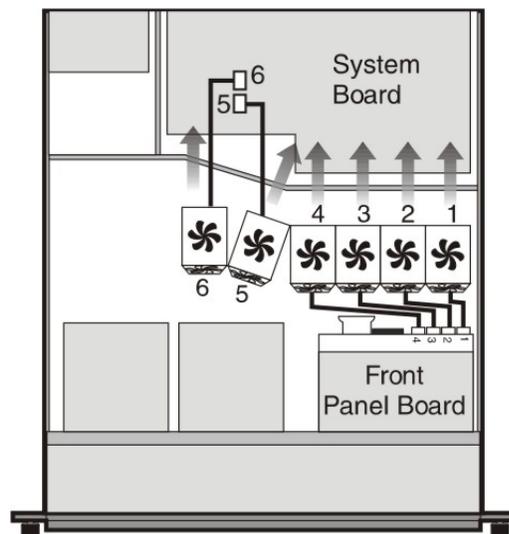
System Fans

The server has six system fans located on the chassis' center wall. Refer to Figure 2-49 for the location of these system fans.
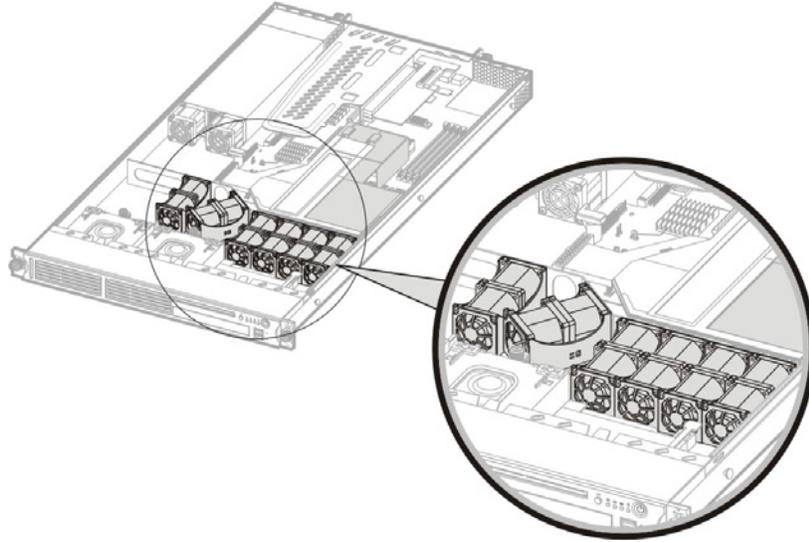
Figure 2-49: System fans

System Fan Connections

Figure 2-50 and Table 2-2 identifies the system fans by their device number and shows their corresponding cable connectors.

Figure 2-50: System fan connections

Table 2-2: System Fan Connections

Device Number	Connector
System fan 1 to 4	CN1 to CN4 on the front panel board
System fan 5	FAN5 on the system board
System fan 6	FAN6 on the system board

Note: System fans 1 to 5 are for the memory modules and processors, while system fan 6 is for the PCI slots and system chipsets.

To replace a system fan:

A new system fan can be installed to allow the server to operate properly in case a default system fan becomes defective.

1. Perform the pre-installation procedures described on page 2-5.

2. Locate the system fan you want to replace.

3. Remove the system fan you want to replace:

   a. Disconnect the fan cable from its corresponding board connector.

      If you are replacing system fan 1 – 4, release the fan cable from the cable clips securing it to the base of the chassis.

      If you are replacing system fan 5 or 6, pull the fan cable through the opening in the center wall

   b. Tug the fan cable upward to release the fan from its bracket, then pull the fan away from the bracket.
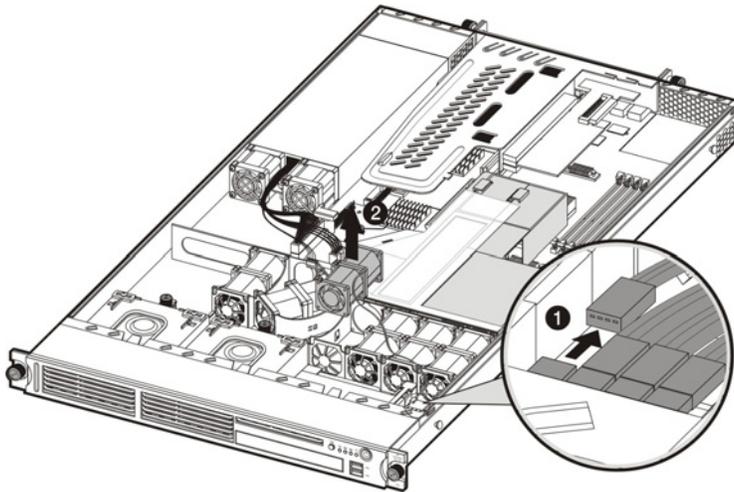
Figure 2-50: Removing a system fan from the chassis

4. Install a new system fan:

   a. Insert the new fan into the vacated fan bracket.

   b. Connect the fan cable to its corresponding board connector.

      If you are replacing system fan 1 – 4, connect the fan cable to the corresponding connector on the front panel board, then secure it through its fastener on the base of the chassis.

      If you are replacing system fan 5 or 6, route the fan cable through the opening in the center wall, then connect them to their corresponding connectors on the system board.
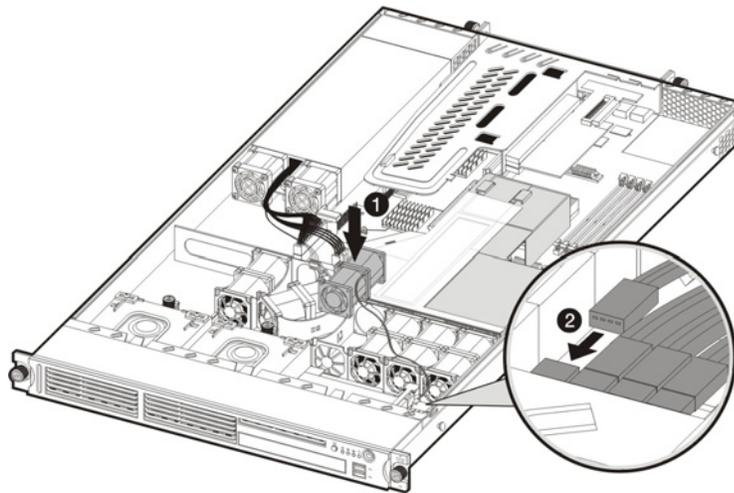
Figure 2-51: Installing a new system fan

5. Perform the post-installation procedures described on page 2-6.

Power Supply Unit (PSU)

Located on the rear panel of the server is a single standard autoranging 500-watts PSU with PFC (power factor correction) function.
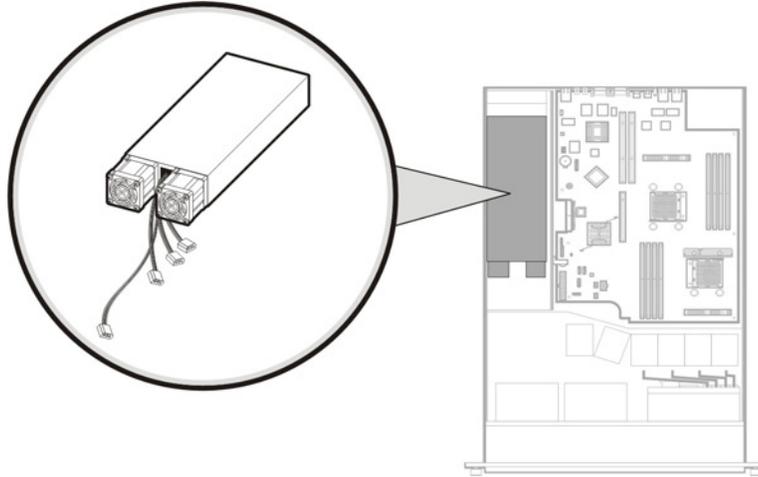
**Figure 2-52: Power supply unit**

> ⚠ **WARNING: Take note of the following reminders to reduce the risk of personal injury from electric shock hazards and/or damage to the equipment.**
>
> - **Installation of power supply units should be referred to individuals who are qualified to service server systems and are trained to deal with equipment capable of generating hazardous energy levels.**
>
> - **DO NOT open the power supply unit. There are no serviceable parts inside it.**

To replace the PSU:

1. Perform the pre-installation procedures described on page 2-5.

2. Remove the default PSU:

   Keep the three screws you removed in this step for installing the new PSU later.

   a. Disconnect the processor power cable, the system board power cable, and the PSU I²C cable from the system board (CN12, CN22, and CN21 respectively), then disconnect the power cables of all installed drives from the PSU.

   b. Remove the PSU mounting screw located between the PSU fans.

   c. Remove the two PSU mounting screws located in the rear panel.

   d. Lift the PSU away from the chassis.
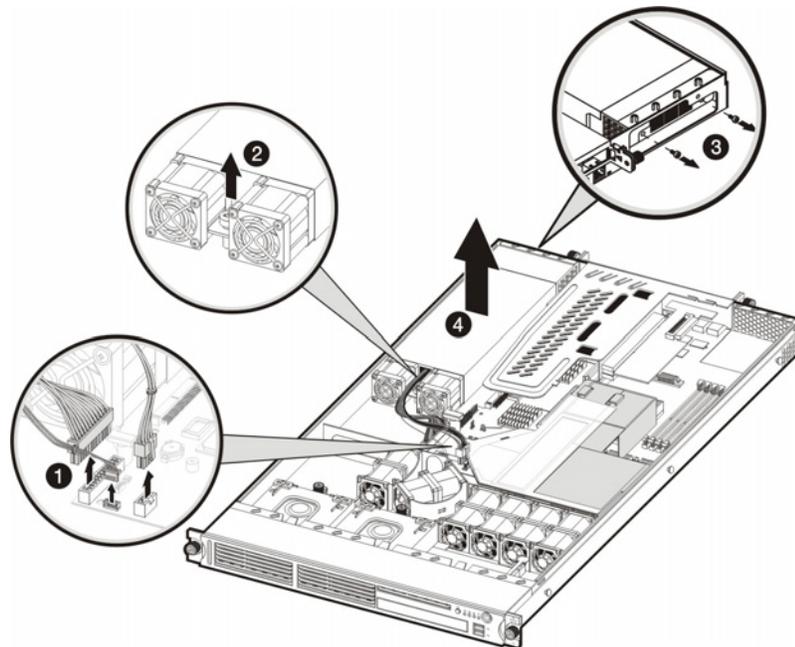
**Figure 2-53: Removing the PSU**

3.   Install the new PSU:

> ⚠ **CAUTION:** Do not over tighten the PSU's screws to prevent them from breaking off. A
> maximum torque of 7 ± 1 is set for the system.

a.   Position the new PSU in the PSU section of the chassis.

b.   Insert the PSU mounting screw located between the PSU fans.

    c. Insert the two PSU mounting screws located in the rear panel.

    d. Reconnect the processor power cable, the system board power cable, and the PSU I²C cable to their respective system board connectors, then reconnect the power cables of all installed drives to the PSU.
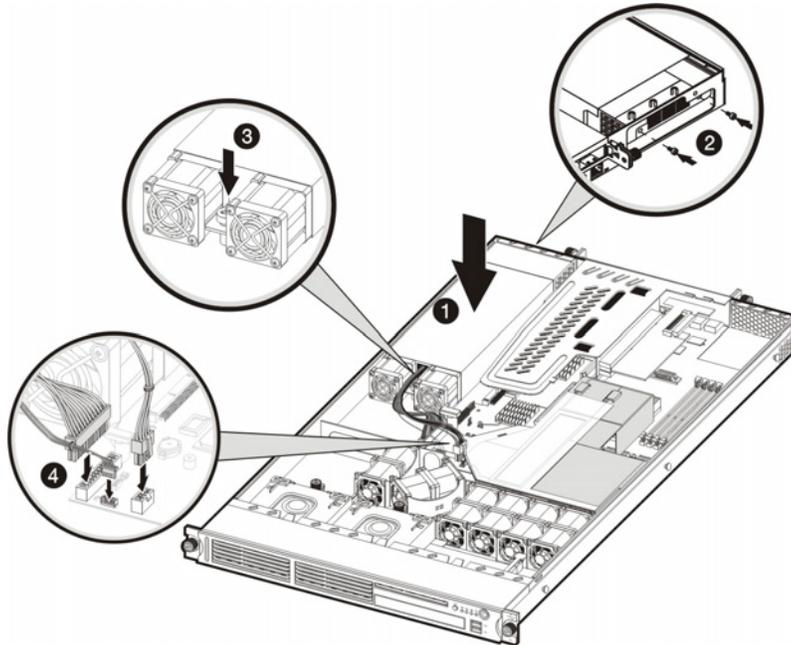
Figure 2-54: Installing a PSU

4. Perform the post-installation procedures described on page 2-6.

3

Diagnostic Tools

This chapter gives an overview of the diagnostics tools supported by HP ProLiant DL145 Generation 2 server. It also describes the basics of using *Phoenix*BIOS Software.

Overview of Available Diagnostic Tools

The following utilities assist in diagnosing problems, testing hardware, and monitoring and managing server operations.

Table 3-1: Diagnostic Tools

Tool	What it is	How to run it
User Diagnostics	A tool to assist testing and/or verifying operation of hardware. If problems are found, the diagnostics package isolates failures down to the replaceable part, whenever possible.	Diagnostics and utilities must be accessed when a system configuration error is detected during Power-On Self-Test (POST). Check the HP website at www.hp.com for the most recent version of the HP ProLiant DL145 Generation 2 User Diagnostics.
IPMI Event Log	The IPMI Event Log is a log that is generated by the management controller (U45) when it detects significant or critical system management events. This includes messages for events such as 'temperature threshold exceeded', 'voltage threshold exceeded', 'power fault', etc.	To view the IPMI event log: 1. Access the *Phoenix*BIOS Setup Utility. 2. In the Advanced menu screen, select the **Server** field, then press **Enter.** 3. Select **System Event Log**, then press **Enter.**
*Phoenix*BIOS Setup Utility	A hardware configuration program used to manage memory, processor, and system settings.	Run BIOS Setup directly by pressing the **F10** key during POST. Refer to the "*Phoenix*BIOS Setup Utility" section on page 3-3 for more information.

continued

Table 3-1: Diagnostic Tools *continued*

Tool	What it is	How to run it
HP ROMPaq Utility	A utility that upgrades the current system ROM.	Run this utility from the HP ROMPaq Utility bootable floppy after powering up the server.
		Check the HP website at www.hp.com for the most recent version of the HP ProLiant DL145 Generation 2 ROM.

Note: For more information about the diagnostic tools described in this table, and other tools available for your server, refer to the Servers Troubleshooting Guide located inside the *HP ProLiant DL145 Generation 2 Server Support CD*. For the most recent version of this guide, go to www.hp.com.

*Phoenix*BIOS Software

*Phoenix*BIOS software is a ROM BIOS-based diagnostic tool that monitors system activity and performs constant hardware testing to ensure proper system operation. ROM BIOS is a set of programs permanently stored in an EEPROM chipset (U74) located on the system board. These programs micro-manage the hardware devices installed on your computer.

The *Phoenix*BIOS software serves three functions:

- Configure the system settings via the *Phoenix*BIOS Setup Utility

  Using the Setup program, you can install, configure, and optimize the hardware devices on your system (clock, memory, disk drives, etc.).

- Initialize hardware at boot via POST routines

  At power-on or reset, the software performs Power-On Self Test (POST) routines to test system resources and run the operating system.

- Perform run-time routines

  Using the software, perform basic hardware routines that can be called from DOS and Windows applications.

*Phoenix*BIOS Setup Utility

NOTE: For ease of reading, *Phoenix*BIOS Setup Utility will be simply referred to as "Setup" or "Setup Utility" in this guide.

NOTE: The screenshots used in this guide display default system values. These values may not be the same those in your server.

*Phoenix*BIOS Setup Utility is a hardware configuration program built into your system's Basic Input/Output System (BIOS). Since most systems are already properly configured and optimized, there is normally no need to run this utility.

You will need to run this utility under the following conditions:

- When changing the system configuration including:
  — Setting the system time and date
  — Configuring the hard drives
  — Specifying the boot device sequence
  — Configuring the power management modes
  — Setting up system passwords or making other changes to the security setup
- When a configuration error is detected by the system and you are prompted ("Run Setup" message) to make changes to the BIOS settings.

NOTE: If you repeatedly receive "Run Setup" messages, the battery located on the system board (BT1) may be defective. In this case, the system cannot retain configuration values in CMOS. Ask a qualified technician for assistance.

The Setup Utility loads the configuration values in a battery-backed nonvolatile memory called CMOS RAM. This memory area is not part of the system RAM, which allows configuration data to be retained when power is turned off. The values take effect when the system is booted. POST uses these values to configure the hardware. If the values and the actual hardware do not agree, POST generates an error message. You must run this utility to change the BIOS settings from the default or current configuration.
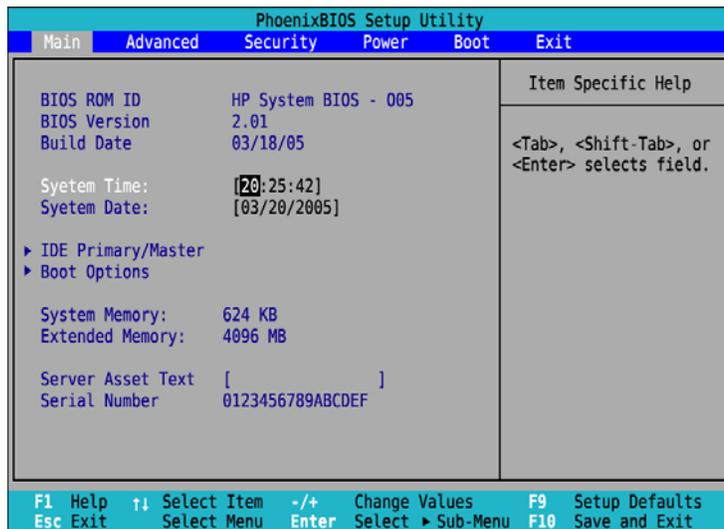
Accessing the Setup Utility

1. Turn on the monitor and the server.

   If the server is already turned on, save your data and exit all open applications, then restart the server.

2. During POST, press **F10**.

   If you fail to press **F10** before POST is completed, you will need to restart the server.

   The first page to be displayed will be the <u>Main</u> menu showing the Setup Utility's menu bar. Use the left ($\leftarrow$) and right ($\rightarrow$) arrow keys to move between selections on the menu bar.

```
                    PhoenixBIOS Setup Utility
   Main      Advanced     Security     Power     Boot      Exit

                                                Item Specific Help
   BIOS ROM ID          HP System BIOS - 005
   BIOS Version         2.01
   Build Date           03/18/05             <Tab>, <Shift-Tab>, or
                                             <Enter> selects field.
   Syetem Time:         [20:25:42]
   Syetem Date:         [03/20/2005]

   ▸ IDE Primary/Master
   ▸ Boot Options

   System Memory:       624 KB
   Extended Memory:     4096 MB

   Server Asset Text    [             ]
   Serial Number        0123456789ABCDEF



   F1  Help    ↑↓ Select Item   -/+    Change Values    F9   Setup Defaults
   Esc Exit       Select Menu   Enter  Select ▸ Sub-Menu F10  Save and Exit
```

Figure 3-1: Setup Utility's Main menu

Navigating Through the Setup Utility

Use the keys listed in the legend bar on the bottom of the Setup screen to work your way through the various menu and submenu screens of the Setup Utility. Table 3-2 lists these legend keys and their respective functions.

Table 3-2: Setup Utility's Navigation Keys

Key	Function
← and →	To move between selections on the menu bar.
↑ and ↓	To move the cursor to the field you want.
	The currently selected field will be highlighted. The right side of each menu screen displays a field help panel—Item Specific Help panel. This panel displays the help text for the currently selected field. It updates as you move the cursor to each field.
+ and -	To select a value for the currently selected field (only if it is user-configurable).
	Press the (+) or (-) keys repeatedly to display each possible entry, or the **Enter** key to choose from a pop-up menu.
	A parameter that is enclosed in square brackets [ ] is user-configurable.
	Grayed-out parameters are not user-configurable for one of the following reasons:
	• The field value is auto-configured or auto-detected.
	• The field value is informational only.
	• The field is password-protected.
Enter	To select a field value or display a submenu screen.
►	Indicates a submenu field.
	To view a submenu screen, use the ↑ and ↓ keys to move the cursor to the submenu you want, then press **Enter**.
Esc	If you press this key:
	• On one of the primary menu screens, the Exit menu displays.
	• On a submenu screen, the previous screen displays.
	• When you are making selections from a pop-up menu, closes the pop-up without making a selection.
F1 or Alt-H	To bring up the General Help window.
	The General Help window describes other Setup navigation keys that are not displayed on the legend bar.
F9	Press to load default system values.
F10	Press to save changes and close the Setup Utility.

Setup Utility Primary Menus

The Setup Utility's menu bar displays the six primary menu selections. Table 3-3 lists these menus and their corresponding functions.

Table 3-3: Setup Utility's Primary Menus

Menu	Function
Main	Use this menu to:
	• View BIOS information including ROM ID, version number and build date.
	• Set the system time and date.
	• Configure drive settings for available IDE devices.
	• Select which options to run during system boot-up.
	• View the amount of available conventional and extended memory detected during boot-up.
	• Set the server asset text and view the system serial number.
Advanced	Use this menu to:
	• Clear all configuration data in a section of memory for ESCD (Extended System Configuration Data) which stores the configuration settings for non-PnP plug-in devices.
	• Enable or disable support for the legacy USB bus.
	• Enable or disable RAID (Redundant Array of Inexpensive Disks) function for SATA devices.
	• Select which LAN port will be used for IPMI-related functions. By default, the system uses the 10/100 Mbps LAN port (LAN1).
	• View the MAC (Media Access Control) address of each of the three LAN port.
	• Configure settings for available memory related performance options.
	• Enable or disable the USB host controller.
	• Configure settings for available PCI devices, as well as other PCI-related options.
	• Configure settings for the serial port.
	• Configure console redirection settings to allow the system to be displayed on a remote terminal for online server management.
	• View the specification version for the IPMI and BMC firmware.
	• Configure LAN-related settings.
	• View and/or clear the event log.
	• Enable or disable the hardware watchdog timer.
	• View real-time system temperature and voltage data.
	CAUTION: Be cautious in setting field values in this menu as any incorrect value may cause the system to malfunction.
	Note: The SATA RAID option will be available in future release of the *Phoenix*BIOS. Visit our HP website for updates on the BIOS with this feature enabled.

continued

Table 3-3: Setup Utility's Primary Menus *continued*

Menu	Function
Security	Use this menu to safeguard and protect the system from unauthorized use by setting up access passwords. For more information on using this menu, go to the "System Passwords" section on page 3-9.
Boot	Use this menu to set the preferred drive sequence in which the Setup Utility attempts to boot the operating system. By default, the server searches for boot devices in the following order: 1. IDE CD-ROM drive 2. Removable devices 3. Hard drive 4. PXE (Preboot Execution Environment, remote boot)
Power	Use this menu to: • Enable or disable the power-saving options (they are NOS dependent). • Enable or disable the modem ring power-up function. • Enable or disable system wake-up at a preset time. • Enable or disable the WOL (Wake-On-LAN) function of the onboard LAN controller (U82) • Set the mode of operation if a power loss occurs.
Exit	Use this menu to select an exit option to quit from the Setup Utility. Options include: • Exit Saving Changes - Saves changes made and close the Setup Utility. Keyboard shortcut: **F10** • Exit Discarding Changes - Discards changes made and close the Setup Utility. • Load Setup Defaults - Loads the factory-default settings for all Setup parameters. Keyboard shortcut: **F9** • Discard Changes - Discards all changes made to the Setup Utility and loads previous configuration settings. • Save Changes - Saves all changes made to the Setup Utility.

Note: A USB CD-ROM drive connected to the server will not be considered a bootable device. It will not be displayed in the <u>Boot</u> menu.

Boot-time Diagnostic Screen

The boot-time diagnostic screen displays basic and important information about the current server configuration and is necessary for troubleshooting and may be required when asking for technical support. These information include:

- Processor specifications
- System BIOS version and release date
- BMC firmware version
- Size of the system and video memory, as well as the memory size allotted for the cache RAM and option ROM
- Status of the wake-on LAN function

- Serial port IO address
- PS/2 mouse connection
- Available SATA drives and PCI devices
- MAC address of each of the three LAN ports
- Server asset text and system serial number

It is recommended that you check this screen during the initial system setup and each time you install, remove, or upgrade accessories.

To view the boot-time diagnostic screen:

You first need to enable the display of the diagnostic screen during bootup. Follow the steps below.

1. In the <u>Main</u> menu screen, select **Boot Options.**

2. Select the **Boot-time Diagnostic Screen** field.

3. Press the plus (+) or minus (-) key to set the field to **Enabled**.

4. Press **F10** to save the changes you made and close the Setup Utility.

5. Reboot the server.

   The diagnostic screen is displayed briefly at the end of POST.

```
                     PhoenixBIOS Setup Utility

  CPU Type       : AMD
  CPU Speed      : 1800 MHz      BIOS Version : 2.01T0
  CPU ID         : 0F10h         Build Date   : 03/22/05
  HT Link        : 1000 MHz      BMC Firmware : 0.07.00000000

  System Memory: : 384 MB        Wake-On LAN  : Enabled
  Cache Ram      : 1024 KB       COM Port     : 03F8
  Video Memory   : 8 MB          PS/2 Mouse   : Installed
  Option ROM     : 53 KB

  Hard Disk 0    : IDE Removable  Asset Tag            :
  PCI-X Slot A   : None           Serial Number        : 0123456789ABCDEF
  PCI-X Slot B   : Installed      NIC 1 MAC Address    : 00.0A.E4.79.33.98
  PCI-EXPRESS Slot: None          NIC 2 MAC Address    : 00.0A.E4.79.33.85
                                  Dedicated NIC MAC    : 00.E0.8B.01.02.03


  Press Any Key to Continue
```

Figure 3-2: System Summary Screen

6. Press the **Pause/Break** key to continue displaying the screen until another key is pressed.

7. Press any key to continue with the system bootup.

System Passwords

The Security menu lets you set system passwords that would provide different levels of protection for the server. There are three types of passwords that you can set:

* Supervisor password

  Entering this password will allow the user to access and change all settings in the Setup Utility.

* User password

  Entering this password will restrict a user's access to the Setup menus. A user can only access and modify the following fields:

  — Main menu: System Time and System Date

  — Security menu: Set User password

* Power-on password

  When the **Password on Boot** field is enabled, a password will be required to boot up the server. To enable or disable this field, a supervisor password must first be set.

To set a system password:

NOTE: A Supervisor password should be set first before a User password can be defined.

1. In the Security menu screen, select a set password field—**Set User Password** or **Set Supervisor Password**, then press **Enter**.
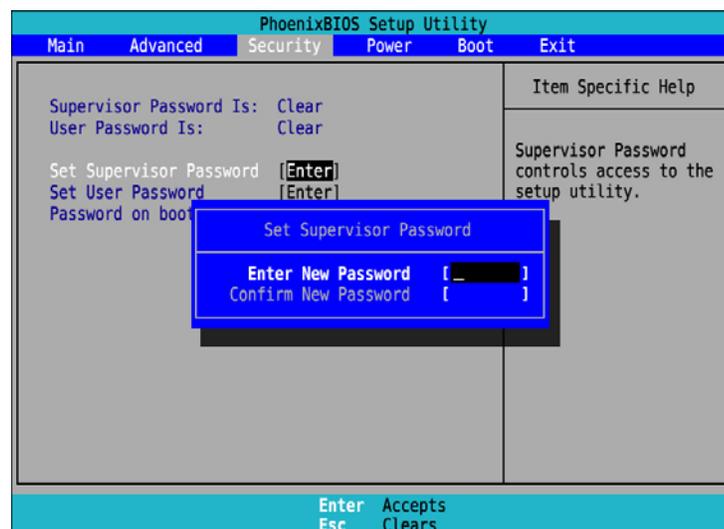
Figure 3-3: Setup window for setting a system password

2. Type a new password in the password box.

   The password may consist of up to eight alphanumeric characters (A-Z, a-z, 0-9).

3. Retype the password to verify the first entry, then press **Enter**.

4. Press **F10** to save the password and close the Setup Utility.

   After setting the password, Setup automatically sets the selected password field to **Enabled**.

To change a system password:

1. In the Security menu screen, select a set password field—**Set User Password** or **Set Supervisor Password**, then press **Enter**.

```
                      PhoenixBIOS Setup Utility
   Main     Advanced    Security    Power    Boot    Exit

                                                 Item Specific Help

   Supervisor Password Is:  Set
   User Password Is:        Set
                                                 Supervisor Password
   Set Supervisor Password   [Enter]             controls access to the
   Set User Password         [Enter]             setup utility.
   Password on boot
                      Set Supervisor Password

          Enter Current Password    [        ]
              Enter New Password    [        ]
            Confirm New Password    [        ]




                      Enter   Accepts
                      Esc     Exit
```
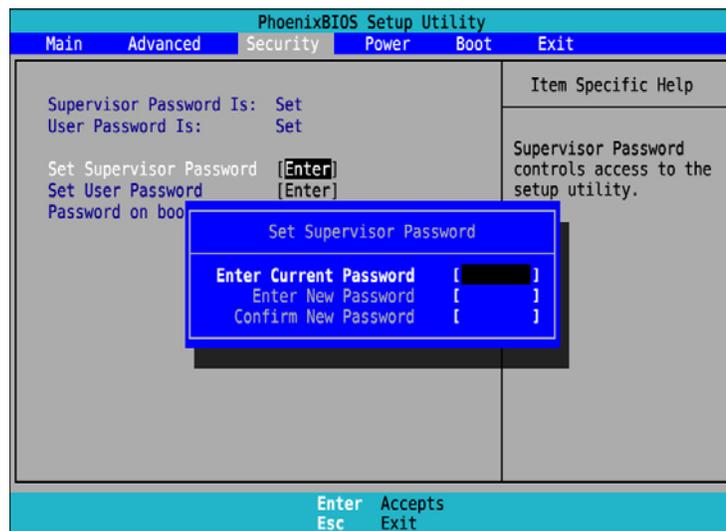
Figure 3-4: Setup window for changing a system password

2. Type the original password in the password box.

3. Type a new password then press **Enter**.

4. Retype the new password to verify the first entry then press **Enter** again.

5. Press **F10** to save the password and close the Setup Utility.

To remove a system password:

1. In the Security menu screen, select a set password field—**Set User Password** or **Set Supervisor Password**, then press **Enter**.

2. Type the original password then press **Enter**.

3. Press **Enter** twice without entering anything in the new and confirm password fields.

4. Press **F10** to save the changes you made and close the Setup Utility.

   Setup automatically sets the selected password field to **Clear**.

To reset a system password:

If you have forgotten the user password or the supervisor password, the server will continue to function normally but you will not be able to access the Setup Utility.

If you have enabled the Password on Boot field and have forgotten both the user password and the supervisor password, you will not be able to reboot the server.

If you have forgotten the user password, you can use the supervisor password to reset it. However, if it is the supervisor password that you have forgotten, you need to clear the CMOS and reset the BIOS settings.

Recording Custom Setup Values

Write down the settings in the Setup Utility and keep them in a safe place. If the custom values ever need restoring (after a CMOS clear, for example), you must run the Setup Utility and enter these custom settings again. A record of these custom settings will make this much easier.

Loading System Defaults

If your system fails after you make changes in the Setup menus, reboot the server, enter Setup and load the system default settings to correct the error. These default settings have been selected to optimize your server's performance.

To load the system defaults:

1. Reboot the server in a normal manner.

2. During POST, press **F10** to access the Setup Utility.

3. Press **F9** to load the default values.

4. Press **F10** to save the changes you made and close the Setup Utility.

Clearing CMOS

You may need to clear the Setup configuration values (CMOS) if the configuration has been corrupted, or if incorrect settings made in the Setup Utility have caused error messages to be unreadable. Clearing the CMOS data remove all system passwords.

The clear CMOS switch is switch 2 of the system configuration switch (SW1). Refer to page 4-7 for the location of this switch.

To clear CMOS:

1. Remove the PCI riser board assembly following the procedures described on page 3-37.

2. If necessary, remove any accessory boards or cables that prevent access to the system configuration switch.

3. Locate the system configuration switch (SW2) on the system board.

4. Identify SW2-2 of the switch.

   By default, SW2-2 is set to the **Off** position.

5. Set SW2-2 to the **On** position.

   This will clear the CMOS memory.

6. Switch SW2-2 back to its default **Off** position.

7. Perform the post-installation procedures described on page 3-6.

8. During POST, press **F10** to access the Setup Utility.

9. Press **F9** to load the system default values.

10. Press **F10** to save the changes you made and close the Setup Utility.

Power-On Self Test (POST)

When the server boots up, a series of tests are displayed on the screen. This is referred to as Power–On Self–Test or POST. POST is a series of diagnostic tests that checks firmware and assemblies to ensure that the server is properly functioning. This diagnostic function automatically runs each time the server is powered on.

These diagnostics, which reside in the BIOS ROM, isolate server-related logic failures and indicate the board or component that needs to be replaced, as indicated by the error messages. Most server hardware failures will be accurately isolated during POST. The number of tests displayed depends on the configuration of the server.

POST Error Indicators

When POST detects a system failure, it either:

- Displays a POST error message, or
- Emits a series of beep codes

Recoverable POST Errors

Whenever a non-fatal error occurs during POST, an error message describing the problem appears onscreen. These text messages are displayed in normal video (white text on black background). It shows the details of the error. The following is an example of a POST error message:

```
Error message 1 of 1:  Error code 0103
Keyboard not detected - Keyboard error
```

In some cases an error message may include recommendations for troubleshooting or require that you press the **Enter** key to display recommendations. Follow the instructions on the screen.

Table 3-4 lists down the most common POST error messages with their corresponding troubleshooting recommendation. It is recommended that you correct the error before proceeding, even if the server appears to boot successfully.

If your system displays one of the messages marked below with an asterisk (*), write down the code and message and contact your HP Customer Support provider.

When no POST error message is displayed but the server stops during POST, listen for beep codes.

Table 3-4: POST Error Messages

Error code	Error message	Description/corrective action
0200	Failure Fixed Disk	Fixed disk is not working or not configured properly.
		1. Run Setup and check if the fixed-disk type is correctly identified.
		2. Check to see if fixed disk is attached properly.
0210	Stuck key	Stuck key on keyboard.
		1. Locate the stuck key on your keyboard and release it.
		2. Reboot the server.
	Mouse error	Mouse not working.
		Verify the mouse cable is securely connected to the mouse port (not the keyboard port) on the rear panel of the server.
		If the problem persists, replace the mouse or contact your HP Customer Support provider.
0211	Keyboard error	Keyboard not working.
		Verify that the keyboard cable is securely connected to the keyboard port (not the mouse port) on the rear panel of the server.
		If the problem persists, replace the keyboard or contact your HP Customer Support provider.

continued

Table 3-4: POST Error Messages *continued*

Error code	Error message	Description/corrective action
0212	Keyboard Controller Failed *	Keyboard controller failed test.
0220	Monitor type does not match CMOS - Run SETUP	The attached monitor cannot be correctly identified in by Setup. Run Setup and check if the monitor type is correctly identified.
0250	System battery is dead - Replace and run SETUP	The CMOS clock battery indicator shows the system battery is dead. 1. Replace the system battery following the procedures on page 3-42. 2. Run Setup to reconfigure the system.
0251	System CMOS checksum bad - Default configuration used	The settings in the Setup Utility have been corrupted or modified incorrectly, perhaps by an application program that changes data stored in CMOS. You can either: • Load the system default values following the procedures on page 3-11. • Access Setup and enter your own custom values. If the error persists, check the system battery or contact your HP Customer Support provider.
0260	System timer error *	The timer test failed. Requires repair of the system board.
0270	Real time clock error *	Real-Time Clock (RTC) fails BIOS hardware test. May require board repair.
0271	Check date and time settings	BIOS found date or time out of range and reset the RTC. May require setting legal date (1991-2099). Access Setup and check the values in the System Time and System Date fields of the Main menu.
02D0	System cache error - Cache disabled *	RAM cache failed and BIOS disabled the cache.
	Invalid System Configuration Data	Problem with the CMOS data. You can do any of the following: • Load the system default values following the procedures on page 3-11. • Access Setup and enter your own custom values. • Clear the CMOS memory then restart the server. For instructions, refer to the "Clearing CMOS" section on page 3-11. If the error persists, check the system battery or contact your HP Customer Support provider.

continued

Table 3-4: POST Error Messages *continued*

Operating system not found	Operating system cannot be located on any of the boot drives.
	• Verify that the priority boot drive has power and that its IDE or SCSI cable is connected properly.
	• Verify that the desired boot drive has power and its SCSI cable is connected.
	• Verify that the IDE or SCSI cable is securely plugged into their respective system board connector.
	• Verify that the boot device is enabled in the Setup Utility.
	• Verify that the boot device has an operating system installed.
	• If you have a diskette drive installed, verify that there is no non-bootable floppy present in it.
	If the problem persists, contact your HP Customer Support provider.

Terminal POST Errors

There are several POST routines that issue a POST terminal error and shut down the system if they fail. Before shutting down the system, the terminal-error handler issues a beep code signifying the test point error, writes the error to port 80h, attempts to initialize the video, and writes the error in the upper left corner of the screen (using both mono and color adapters).

POST Beep Codes

The POST routines cannot display messages when an error occurs if any of the following are present:

- The error occurs before the video display is initialized.

- The video configuration fails, either there's no graphics card installed or the one installed is faulty.

- An external ROM module does not properly checksum to zero.

- The system memory cannot be initialized.

During these instances the server unit emits a buzzing sound followed by a series of audible beeps. An external ROM module (e.g. VGA) can also issue audible errors, usually consisting of one long tone followed by a series of short tones. If you get a blank screen on boot, but hear beeps, count the beeps and refer to the following table for their corresponding meaning. If you miss the beep code:

1. Turn off the server by pressing the power button for five seconds or more.

2. Restart the server by pressing the power button.

3. Listen for the signal again.

The routine derives the beep code from the test point error as follows:

1. The 8-bit error code is broken down to four 2-bit groups (Discard the most significant group if it is 00).

2. Each group is made one-based (1 through 4) by adding 1.

3. Short beeps are generated for the number in each group.

   Example:

   Test point 01Ah = 00 01 10 10 = 1-2-3-3 beeps

Table 3-5 lists the checkpoint codes written at the start of each test and the beep codes issued for terminal errors.

Table 3-5: POST Beep Codes

Code	Beep	Description
02h		Verify real mode
03h		Disable non-maskable interrupts
04h		Get processor type
06h		Initialize system hardware
07h		Disable shadow and execute code from the ROM
08h		Initialize chipset with initial POST values
09h		Set IN POST flag
0Ah		Initialize processor registers
0Bh		Enable processor cache
0Ch		Initialize caches to initial POST values
0Eh		Initialize I/O component
0Fh		Initialize the local bus IDE
10h		Initialize power management
11h		Load alternate registers with initial POST values
12h		Restore processor control word during warm boot
13h		Initialize PCI bus mastering devices
14h		Initialize keyboard controller
16h	1-2-2-3	BIOS ROM checksum
17h		Initialize cache before memory auto size
18h		8254 timer initialization
1Ah		8237 DMA controller initialization

continued

Table 3-5: POST Beep Codes *continued*

Code	Beep	Description
1Ch		Reset programmable interrupt controller
20h	1-3-1-1	Test DRAM refresh
22h	1-3-1-3	Test 8742 keyboard controller
24h		Set ES segment register to 4 GB
28h		Auto size DRAM
29h		Initialize POST Memory Manager (PMM)
2Ah		Clear 512 KB base RAM
2Ch	1-3-4-1	RAM failure on address line xxxx
2Eh	1-3-4-3	RAM failure on data bits xxxx of low byte of memory bus
2Fh		Enable cache before system BIOS shadow
32h		Test processor bus-clock frequency
33h		Initialize Phoenix Dispatch Manager
36h		Warm start shut down
38h		Shadow system BIOS ROM
3Ah		Auto size cache
3Ch		Advanced configuration of chipset registers
3Dh		Load alternate registers with CMOS values
41h		Initialize extended memory for ROM pilot
42h		Initialize interrupt vectors
45h		POST device initialization
46h	2-1-2-3	Check ROM copyright notice
47h		Initialize I20 support
48h		Check video configuration against CMOS
49h		Initialize PCI bus and devices
4Ah		Initialize all video adapters in system
4Bh		Quiet boot start (optional)
4Ch		Shadow video BIOS ROM
4Eh		Display BIOS copyright notice
4Fh		Initialize multi-boot
50h		Display processor type and speed
51h		Initialize EISA board
52h		Test keyboard

continued

Table 3-5: POST Beep Codes *continued*

Code	Beep	Description
54h		Set key click if enabled
55h		Enable USB devices
58h	2-2-3-1	Test for unexpected interrupts
59h		Initialize POST display service
5Ah		Display prompt "Press F2 to enter SETUP"
5Bh		Disable processor cache
5Ch		Test RAM between 512 and 640 KB
60h		Test extended memory
62h		Test extended memory address lines
64h		Jump to user patch 1
66h		Configure advanced cache registers
67h		Initialize multiprocessor APIC
68h		Enable external and processor caches
69h		Setup System Management Mode (SMM) area
6Ah		Display external L2 cache size
6Bh		Load custom defaults (optional)
6Ch		Display shadow-area message
6Eh		Display possible high address for UMB recovery
70h		Display error messages
72h		Check for configuration errors
76h		Check for keyboard errors
7Ch		Set up hardware interrupt vectors
7Dh		Initialize Intelligent System Monitoring (ISM)
7Eh		Initialize coprocessor if present
80h		Disable onboard super I/O ports and IRQs
81h		Late POST device initialization
82h		Detect and install external RS232 ports
83h		Configure non-MCD IDE controllers
84h		Detect and install external parallel ports
85h		Initialize PC-compatible PnP ISA devices
86h		Re-initialize onboard I/O ports.

continued

Table 3-5: POST Beep Codes *continued*

Code	Beep	Description
87h		Configure system board configurable devices (optional)
88h		Initialize BIOS data area
89h		Enable non-maskable interrupts
8Ah		Initialize extended BIOS data area
8Bh		Test and initialize PS/2 mouse
8Ch		Initialize floppy controller
8Fh		Determine number of ATA drives (optional)
90h		Initialize hard-disk controllers
91h		Initialize local-bus hard-disk controllers
92h		Jump to user patch 2
93h		Build MP table for multi-processor boards
95h		Install CD-ROM for boot
96h		Clear huge ES segment register
97h		Fix up MP table
98h	1-2	Search for option ROMs. One long, two short beeps on checksum failure
99h		Check for SMART drive (optional)
9Ah		Shadow option ROMs
9Ch		Set up power management
9Dh		Initialize security engine (optional)
9Eh		Enable hardware interrupts
9Fh		Determine number of ATA and SCSI drives
A0h		Set time of day
A2h		Check key lock
A4h		Initialize typematic rate
A8h		Erase F2 prompt
AAh		Scan for F2 key stroke
ACh		Enter Setup
AEh		Clear boot flag
B0h		Check for errors
B1h		Inform ROM pilot about the end of POST.
B2h		POST done, prepare to boot operating system

continued

Table 3-5: POST Beep Codes *continued*

Code	Beep	Description
B4h	1	One short beep before boot
B5h		Terminate quiet boot (optional)
B6h		Check password (optional)
B7h		Initialize ACPI BIOS
B9h		Prepare boot
BAh		Initialize SMBIOS
BBh		Initialize PnP option ROMs
BCh		Clear parity checkers
BDh		Display multiboot menu
BEh		Clear screen (optional)
BFh		Check virus and backup reminders
C0h		Try to boot with INT 19
C1h		Initialize POST Error Manager (PEM)
C2h		Initialize error logging
C3h		Initialize error display function
C4h		Initialize system error handler
C5h		PnP and dual CMOS (optional)
C6h		Initialize note dock (optional)
C7h		Initialize note dock late
C8h		Force check (optional)
C9h		Extended checksum (optional)
CAh		Redirect Int 15h to enable remote keyboard
CBh		Redirect Int 13h to memory technologies devices such as ROM, RAM, PCMCIA, and serial disk
CCh		Redirect Int 10h to enable remote serial video
CDh		Re-map I/O and memory for PCMCIA
CEh		Initialize digitizer and display message
D2h		Unknown interrupt
The following are for boot block in flash ROM.		
E0h		Initialize the chipset
E1h		Initialize the bridge
E2h		Initialize the processor

continued

Table 3-5: POST Beep Codes *continued*

Code	Beep	Description
E3h		Initialize system timer
E4h		Initialize system I/O
E5h		Check force recovery boot
E6h		Checksum BIOS ROM
E7h		Go to BIOS
E8h		Set huge segment
E9h		Initialize multiprocessor
EAh		Initialize OEM special code
EBh		Initialize PIC and DMA
ECh		Initialize memory type
EDh		Initialize memory size
EEh		Shadow boot block
EFh		System memory test
F0h		Initialize interrupt vectors
F1h		Initialize runtime clock
F2h		Initialize video
F3h		Initialize System Management Manager (SSM)
F4h		Output one beep
F5h		Clear huge segment
F6h		Boot to mini DOS
F7h		Boot to full DOS

POST-related Troubleshooting

Perform the following procedures when POST fails to run or display error messages or emit beep codes.

If the POST failure is during a routine bootup, check the following:

- All external cables and power cables should be firmly plugged in.

- The power outlet to which the server is connected is working.

- The server and monitor are both turned on. The bicolor status LED indicator on the front panel must be lit up green.

- The monitor's contrast and brightness settings are correct.

- All internal cables are properly connected and all boards firmly seated.

- The processor is fully seated in its socket on the system board.

- The heat sink is properly installed on top of the processor.

- Verify that the all memory modules are properly installed.

If the POST failure occurs after installing an accessory, check the following:

1. Remove the PCI riser board assembly following the procedures described on page 3-37.

2. If necessary, remove any accessory boards or cables that prevent access to the system components.

3. Check the following:

   - If you have installed a PCI accessory board, verify that the board is firmly seated in its slot and any switches or jumpers on the board are properly set.

     Refer to the documentation provided with the accessory board.

   - All internal cabling and connections are in their proper order.

   - If you have changed any switches on the system board, verify that each one is properly set.

4. Perform the post-installation procedures described on page 3-6.

5. Turn on the monitor.

6. If the server still does not work, repeat steps 1 and 2.

7. Remove all accessories, except the primary boot hard disk drive.

8. Repeat steps 4 and 5.

If the server now works, replace the boards and accessories one at a time to determine which one is causing the problem.

4

Connectors, Switches, and LEDs

This chapter contains illustrations and tables identifying and describing the connectors, switches, buttons, and LED indicators located on the front panel, rear panel, system board, front panel board and hard drives of the HP ProLiant DL145 Generation 2 server.

Connectors and Components

This section contains illustrations and tables identifying connectors and components on the server's front and rear panels, as well as those located on the system and front panel boards.

Front Panel Components

Figure 4-1 and Table 4-1 show and describe the components on the front panel of the server.
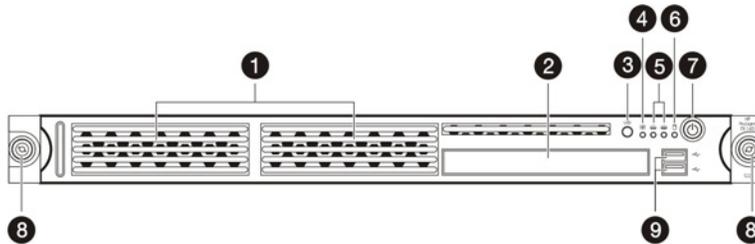
Figure 4-1: Front panel components

Table 4-1: Front Panel Components

Item	Icon	Component
1		Hard disk drive (HDD) bays
		The server supports both SATA and SCSI hard drives.
2		Optical media device bay
3	UID	Unit identification (UID) button with LED indicator (blue)
		Press to illuminate the UID LED indicators on the front and rear panels. This is to mark a particular unit within a server group for purpose of identification during servicing or maintenance procedures.
4		System health LED indicator (amber)
5		Activity/link status LED indicators for NIC 1 and NIC 2 (green)
6		HDD activity LED indicator (green)
7		Power status LED indicator (green/amber)
		• Powers up the server.
		• Places the server in standby mode.
		• Powers down the server.
8		Thumbscrews for the front bezel
9		USB 2.0 ports

Rear Panel Components

Figure 4-2 and Table 4-2 show and describe the components on the rear panel of the server.
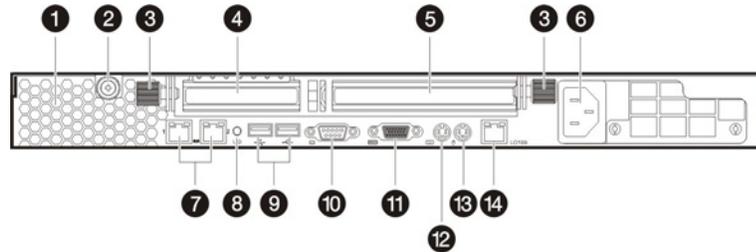
Figure 4-2: Rear panel components

Table 4-2: Rear Panel Components

Item	Icon	Component
1		Ventilation holes
2		Thumbscrew for the top cover
3		Thumbscrews for the PCI riser board assembly
4		Low profile 64-bit/133 MHz PCI-X riser board slot cover
5		Standard height/ full-length 64-bit/133 MHz PCI-X riser board slot cover Users can convert the PCI-X functionality of this slot to PCI Express using the PCI Express riser board option kit.
6		Power supply cable socket
7	🖧	GbE LAN ports for NIC 1 and NIC 2 (RJ-45)
8	UID	UID button with LED indicator (blue) This button mirrors the function of the UID button located on the front panel.
9	⛌	USB 2.0 ports (black)
10	▭	Video port (blue)
11	[o|o]	Serial port (teal)
12	▭	PS/2 keyboard port (purple)
13	🖰	PS/2 mouse port (green)
14	LO100i	10/100 Mbps LAN port for IPMI management (RJ-45)

Note: The three LAN ports each has its own LED indicators for activity/link status and network speed.

System Board Components

Figure 4-3 and Table 4-3 show and describe the system board components on the server.
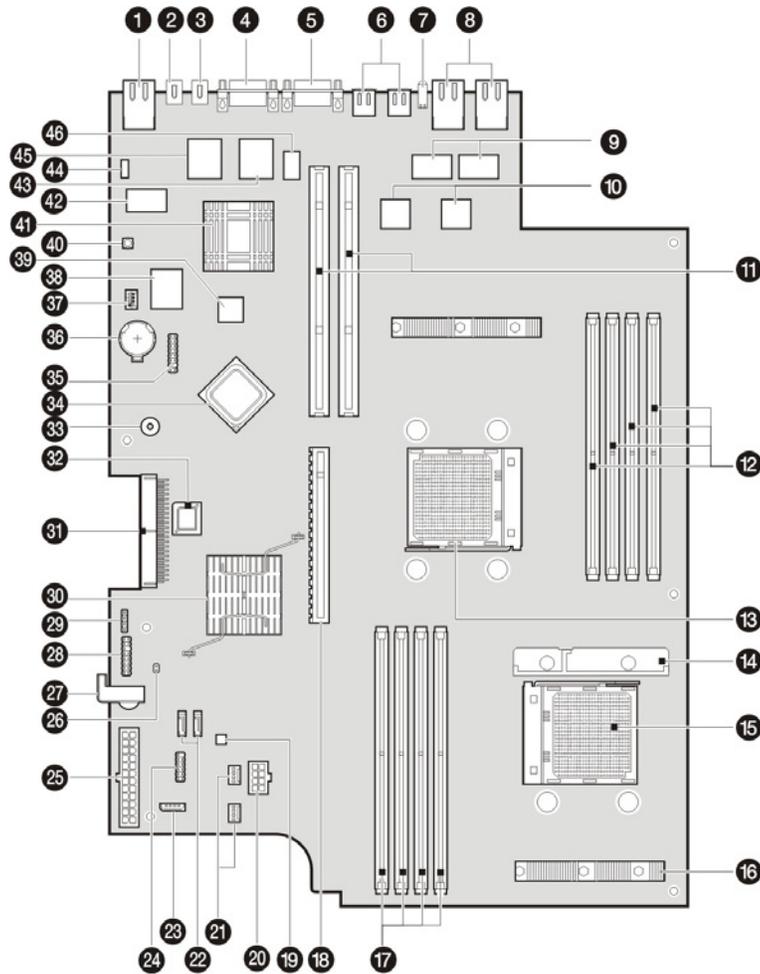
Figure 4-3: System board components

Table 4-3: System Board Components

Item	Component Code	Component
1	RJ1	10/100 Mbps LAN port for IPMI management
2	JK2	PS/2 mouse port
3	JK1	PS/2 keyboard port
4	CN13	Serial port
5	CN9	Video port

continued

Table 4-3: System Board Components *continued*

Item	Component Code	Component
6	USB1 and USB2	USB 2.0 ports
7	SW3	UID button with LED indicator (blue)
8	LAN1 and LAN2	GbE LAN ports for NIC 1 and NIC 2
9	U20 and U27	Pulse H5007 XFORM 10/100 Base-T transformer modules
10	U23 and U30	Broadcom BCM5721 NetXtreme Gigabit Ethernet controllers A and B
11	CN7 and CN8	64-bit/133 MHz 3.3 V PCI-X slots
12	DIMM1 to DIMM4	Processor 1 socket (U22) DIMM slots
13	U22	AMD Opteron 940-pin processor 1 socket
14	—	Processor air baffle
15	U11	AMD Opteron 940-pin processor 2 socket
16	—	Airflow regulator for system fans 1 through 4
17	DIMM5 to DIMM8	Processor 2 socket (U11) DIMM slots
18	U42	PCI Express x16 slot
19	U46	Analog Devices ADM1026 hardware monitor chipset
20	CN12	8-pin ATX processor power connector
21	FAN5 and FAN6	4-pin system fan connectors
22	SATA1 and SATA2	7-pin 150-MBps SATA connectors
23	CN21	4-pin I^{2}C connector for PSU
24	CN28	9-pin connector for the front USB 2.0 ports
25	CN22	24-pin ATX system board power connector
26	JP5	System reset
27	—	PCI retainer bracket
28	CN26	Front panel board connector
29	CN29	4-pin SCSI cable LED connector
30	U54	NVIDIA Crush K8-04 Professional MCP (Media and Communications Processor)
31	CN27	IDE data cable connector
32	U74	BIOS flash EEPROM (Electrically Erasable Programmable Read-Only Memory)
33	BUZ1	Internal speaker
34	U55	AMD-8132 HyperTransport PCI-X 2.0 tunnel
35	CN25	LPC debug connector

continued

Table 4-3: System Board Components *continued*

Item	Component Code	Component
36	BT1	3 V internal lithium system battery
37	SW2	System configuration switch (dip switch)
38	U79	SMSC LPC47M192 Super I/O chipset
39	U60	16 MB DDR SDRAM
40	SW1	NMI (non-maskable interrupt) switch
41	U56	NVIDIA GeForce2 MX400 GPU (Graphics Processor Unit)
42	U82	SMSC LAN91C113I-NC LAN controller (10/100 Mbps)
43	U52	BMC flash EEPROM
44	CN23	BMC debug port
45	U67	QLogic Zircon UL BMC (Baseboard Management Controller)
46	U47	IC61LV25616-10T BMC SRAM

System Switches

The two system switches—SW1 and SW2— are located on the system board.

NMI Switch

If the system crashes or stops operating properly, you can use the NMI switch (SW1) to mechanically force the server to issue a non-maskable interrupt. This will perform a memory dump—writing the contents of the server's CPU registers and RAM to a network server or to diskettes. This memory dump can later be analyzed to determine the cause of the problem.

The NMI switch is recessed beneath a small button on the system board. Figure 4-4 show the location use of this switch. By the default the NMI switch is always enabled.
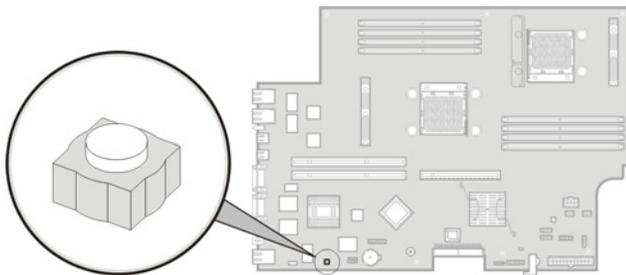
Figure 4-4: NMI switch

NOTE: Use of the NMI switch is not supported in all NOS. As of the present, NMI implementation is not available for systems running on Solaris and Linux operating systems.

System Configuration Switch

Figure 4-5 and Table 4-4 show and describe the use of the system configuration switch (SW2). In the table, the switch status indicated in **bold text** is the default setting.
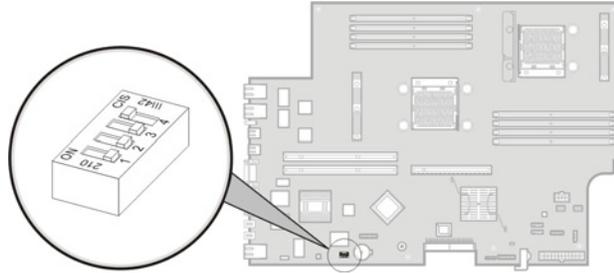
Figure 4-5: System configuration switch

Table 4-4: System Configuration Switch Settings

Switch	Status	Function
SW2-1	On	Boot block enabled
	Off	Normal boot
SW2-2	On	Clear CMOS settings and restore system defaults
	Off	Normal CMOS settings
SW2-3	—	Reserved
SW2-4	—	Reserved

Front Panel Board Components

Figure 4-6 and Table 4-5 show and describe the components on the server's front panel board. This board is linked to the system board through the front panel board connector (CN26).
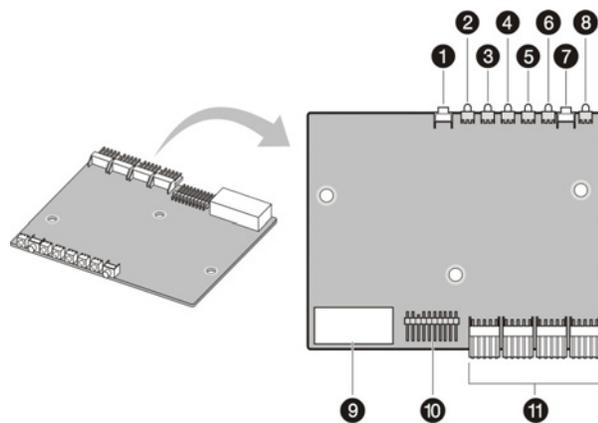
Figure 4-6: Front panel board components

Table 4-5: Front Panel Board Components

Item	Component Code	Component
1	SW2	Power button
2	LED6	Front UID LED indicator
3	LED5	System health indicator
4	LED4	Activity/link status LED indicator for NIC 1
5	LED3	Activity/link status LED indicator for NIC 2
6	LED2	Hard drive activity LED indicator
7	SW1	Front UID button
8	LED1	Power status LED indicator
9	JP1	Front panel board power connector
10	CN9	Front panel board connector
11	CN1 to CN4	4-pin system fan connectors

Front Panel Board Cable Routing

Figure 4-7 and Table 4-6 show the routing of the cables connected to the front panel board.
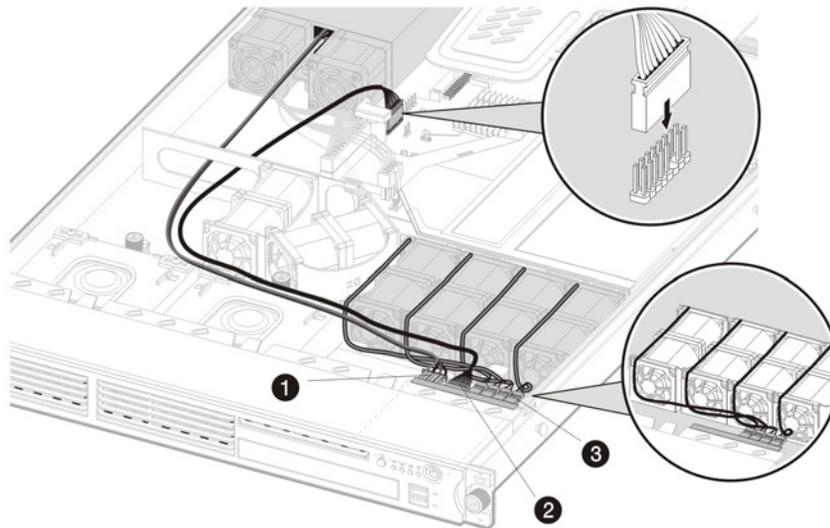
Figure 4-7: Front panel board cable routing

Table 4-6: Front Panel Board Cable Routing

Item	Component Code	Component
1	JP1	Front panel board power connector
		Connects to the PSU.
2	CN9	Front panel board system board connector
		Connects to CN26 on the system board
3	CN1 to CN4	4-pin system fan connectors
		Connects to the system fans 1 to 4.

To route the front panel board cables:

NOTE: For ease of reading, front panel board will be simply referred to as "FPB" in the following procedures.

> **CAUTION:** Route the FPB cables neatly. If necessary, secure them using the pre-installed cable clips located on the chassis base. The cables should be routed in a position where they will not be pinched or crimped by the top cover, nor should they hamper proper airflow inside the chassis.

1. Perform the pre-installation procedures described on page 4-5.
2. Remove the PCI riser board assembly following the procedures described on page 4-38.
3. Connect the FPB system board cable to the CN26 connector on the system board.
4. Route the FPB power and system board cables through the cable management opening of the chassis' partition wall.
5. Disconnect the drive and power cables of the available hard drives.
6. Route the FPB power and system board cables underneath the hard drive cables you disconnected in the previous step.
7. Arrange the drive and power cables of the available hard drives over the routed FPB cables, then reconnect them to their corresponding connectors on the rear of the drives.
8. Connect the FPB cables to their FBP connectors.
   a. Connect the FPB power cable to the JP1 connector.
   b. Connect the FPB system board cable to the CN9 connector.
   c. Connect the FPB fan cables to their corresponding connectors, then secure it through their fasteners on the base of the chassis.

      Refer to Figure 2-50 on page 2-44 for an illustration of the system fan cable connections.
9. Perform the post-installation procedures described on page 4-6.

Status LED Indicators

This section contains illustrations and descriptions of the internal and external status LED indicators located on the:

- Front panel
- Rear panel
- System board

These LED indicators aid in problem diagnosis by indicating the status of system components and operations of the server.

Front Panel LED Indicators

The set of status LED indicators on the front panel allows constant monitoring of basic system functions while the server is operating. These LEDs are mounted on the front panel board. Figure 4-8 and Table 4-7 show and describe the function of these LEDs.
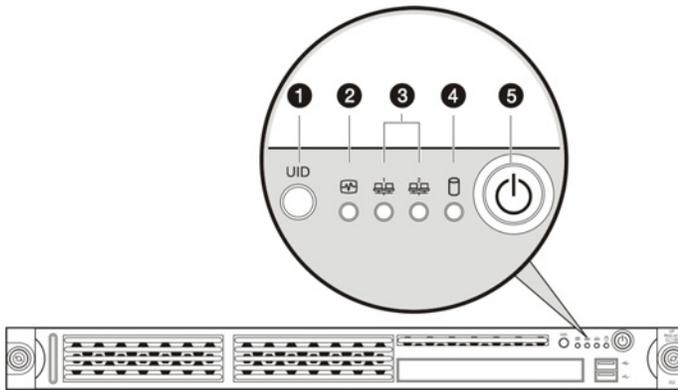
Figure 4-8: Front panel LED indicators

Table 4-7: Front Panel LED Indicators Status

Item	Icon	Component	Status	Description
1	UID	UID LED indicator (recessed underneath the UID button)	Blue	A UID button has been pressed

Table 4-7: Front Panel LED Indicators Status *continued*

Item	Icon	Component	Status	Description
2	〰	System health LED indicator	Off	System health is normal.
			Amber	A system threshold has been breached. This may be any of the following:
				• At least one fan failure (system fan or processor fan)
				• At least one of the temperature sensors reached critical level (system or processor thermal sensors)
				A power supply unit error has occurred.
3	🖳 🖳	Activity/link status LED indicators for NIC 1 and NIC 2	Solid green	An active network link exists.
			Flashing green	An ongoing network data activity exists.
			Off	The server is off-line.
4	⬓	HDD activity LED indicator	Flashing green	Ongoing drive activity
			Off	No drive activity
5	⏻	Power status LED indicator (recessed underneath the power button)	Green	The server has AC power and is powered on.
			Amber	The server has AC power and is in standby mode.
			Off	The server is powered off (AC power disconnected).

Rear Panel LED Indicators

The set of status LED indicators located on the rear panel facilitates monitoring of network activity and aid in unit identification. Figure 4-9 and Table 4-8 show and describe the function of these LEDs.
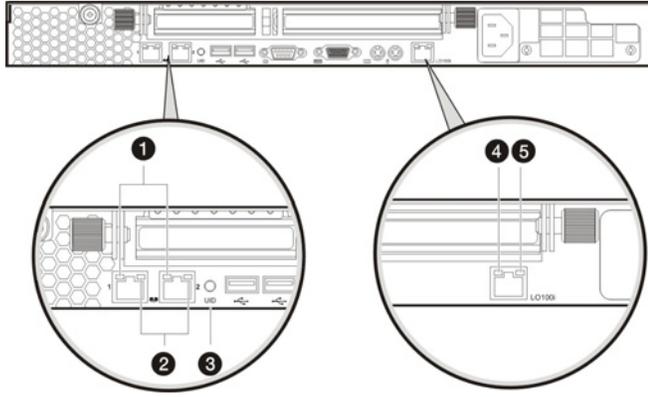
Figure 4-9: Rear panel LED indicators

Table 4-8: Rear Panel LED Indicators Status

Item	Component	Status	Description
1	NIC activity/link status LED indicators	Solid green	An active network link exists.
		Flashing green	An ongoing network data activity exists.
		Off	The server is off-line
2	NIC network speed LED indicators	Steady amber	The LAN connection is using a GbE link.
		Steady green	The LAN connection is using a 100 Mbps link.
		Off	The LAN connection is using a 10 Mbps link.
3	UID LED indicator (recessed beneath the UID button)	Blue	A UID button has been pressed.
4	Link status LED indicator for the 10/100 Mbps LAN port	Green	A network link exists.
		Off	No network link exists.
5	Activity status LED indicator for the 10/100 Mbps LAN port	Flashing green	Network activity exists.
		Off	No network activity exists.

System Board LED Indicators

There are several internal LEDs located on the system board. Figure 4-10 and Table 4-9 show and describe the function of these LEDs.
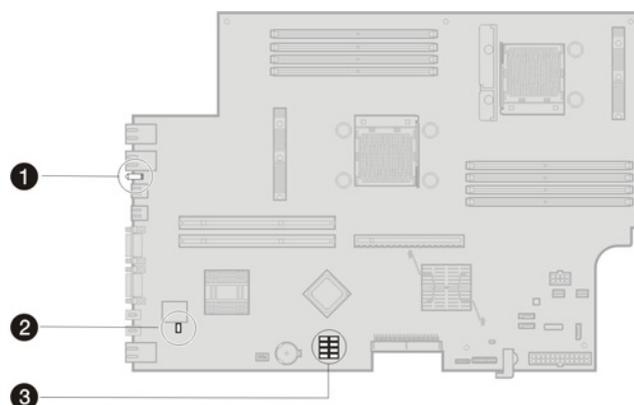
Figure 4-10: System board LED indicators

Table 4-9: System Board Power LED Indicators

Item	Component Code	Function	Status	Description
1	SW3	Rear UID LED indicator (recessed beneath the rear UID button, blue)	On	A UID button has been pressed.
2	LED2	BMC heartbeat LED indicator	On	BMC is functional.
3	LED5 to LED12	POST (Power-On Self Test) LED indicators (green)	On/Off	Indicate the status of the ongoing POST routine.

5

Physical and Operating Specifications

This chapter provides physical and operating specifications for the HP ProLiant DL145 Generation 2 server. The specifications for the following items are provided:

- System unit
- Memory
- Processor
- IDE CD-ROM drive
- Non-hot-plug hard drive
    — SCSI hard drive
    — SATA hard drive
- SATA and Ultra ATA/133 controller
- Gigabit Ethernet controller

System Unit

Table 5-1: Hardware Specifications

Item	Description
Processor socket	Dual AMD 940-pin socket
Processor support	AMD Opteron processor
Core logic chipset	AMD-8132 HyperTransport PCI-X 2.0 tunnel
	NVIDIA Crush K8-04 Professional MCP
Super I/O chipset	SMSC LPC47M192
Hardware monitoring chipset	Analog Devices ADM1026
Baseboard management controller	QLogic Zircon UL
Gigabit Ethernet controller	Broadcom BCM5721 NetXtreme (two)
Onboard 10/100 Mbps LAN controller	SMSC LAN91C113I-NC LAN
Memory controller	Integrated in the AMD Opteron processor
Storage controller	Integrated in the NVIDIA Crush K8-04 Professional MCP
VGA controller	NVIDIA GeForce2 MX400 GPU
I/O subsystem	Three system board level PCI expansion slots:
	• CN7 – Supports a low profile 64-bit/ 133 MHz PCI-X riser board
	• CN8 – Supports a standard height/ full-length 64-bit/ 133 MHz PCI-X riser board
	• U42 – Supports a full-length PCI Express x16 riser board
	Two PCI-X riser boards attached to the PCI riser board assembly supports installation of two expansion boards at a time:
	• Low profile 64-bit/133 MHz PCI-X riser board
	• Standard height/full-length 64-bit/133 MHz PCI-X riser board
	Users have the option to replace this riser board with a PCI Express x16 model using the PCI Express riser board option kit.

continued

Table 5-1: Hardware Specifications *continued*

Item	Description
Memory	Eight DDR-400 DIMM slots, 4 DIMMs per processor
	Maximum system memory capacity: 16 GB (2 GB per DIMM)
Media storage	• Two HDD bays for 1-inch SATA or SCSI drives
	• Optical media device bay for slim-type CD-ROM or DVD-ROM drive
I/O ports	PS/2 keyboard port, PS/2 mouse port, USB 2.0 ports (two on the front panel, two on the rear panel), video port, serial port, and LAN ports (three, rear panel)
Status LED indicators	Front panel:
	• Unit identification
	• System health status
	• Activity/link status for NIC 1 and NIC 2
	• Hard drive activity
	• Power status
	Rear panel:
	• LAN activity/link status *
	• LAN network speed *
	• Unit identification **
	* For all three LAN ports.
	** Mounted in the system board.
	System board
	• Unit identification (recessed underneath the rear UID button)
	• POST status
	• BMC heartbeat
Power supply unit (PSU)	1U 500-watts PSU
System management function	IPMI 2.0 compliant with dedicated 10/100 Mbps LAN port for online system health monitoring
Thermal solution	• Five system fans for the memory modules and processors
	• One system fan for the PCI slots and system chipsets
	• Two PSU fans

Table 5-2: Physical Dimensions

Item	Description
System board platform	EATX (Extended Advanced Technology eXtended)
System board dimensions	
Length	295 mm (11.6 in.)
Width	412 mm (16.2 in.)
Server dimensions	
Height	43.2 mm (1.7 in)
Width	426.36 mm (16.79 in)
Depth	679.5 mm (26.75 in)
Server weight (maximum configuration)	15.87 kg (35 lb)

Table 5-3: Environmental Specifications

Item	Description
Temperature	
Operating	10° to 35°C (50° to 95°F)
Non-operating (unpacked)	0° to 50°C (32° to 122°F)
Storage (unpacked)	5° to 40°C (41° to 104°F)
Shipping (packed)	-40° to 70°C (-40° to 158°F)
Relative humidity (non-condensing)	
Operating	10% to 90% RH
Non-operating	5% to 95% RH

Note: Operating temperature has an altitude derating of 1°C per 300 M to 3000 M.

Table 5-4: Power Supply Requirements

Item	Description
Model	Delta DPS-500GB H
PSU type	1U 500-watts
Input type	AC

Table 5-4: Power Supply Requirements *continued*

Item	Description
Input requirements	
Input voltage range	90 VAC to 264 VAC (wide range, single phase)
Normal voltage range	100 VAC to 240 VAC
Input frequency range	47 Hz to 63 Hz.
Inrush current	40 A max; 60 A peak for 1 ms
Maximum input current	8.2 A at 100 VAC; 4.1 A at 200 VAC
Maximum wet-bulb temperature	28°C (82.4°F)

Memory

Table 5-5: Memory Specifications

Item	Description
Size	512 MB, 1 GB, and 2 GB
Speed	PC3200
Type	DDR-400 registered ECC DIMMs

Processor

The server's two 940-pin processor sockets support single- and dual-core AMD Opteron processors in the ceramic Micro Pin Grid Array (mPGA) package.

- Operating frequency: 1.8, 2.0, 2.2, 2.4, 2.6, and 2.8 GHz

- Process Technology: 130 nm SOI (silicon-on-insulator)

IDE CD-ROM Drive

Table 5-6: IDE CD-ROM Drive Specifications

Item	Description
Dimensions	
Height	12.7 mm (0.5 in)
Width	128 mm (5.04 in)
Depth	137.2 mm (5.4 in)
Weight	<.34 kg (<.75 lb)
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)
Disk diameter	120 mm, 80 mm (4.7 in, 3.15 in)
Disk thickness	1.2 mm (.047 in)
Capacity	550 MB (mode 1, 120 mm)
	640 MB (mode 2, 120 mm)
Block size	Mode 0 – 2352 and 2638 bytes
	Mode 1 and 2 – 2048, 2336, 2340, and 2352 bytes
Data transfer rates	
Sustained	• 1x – 150 KB/s • 24x (outer side) – 3.6 MB/s
Burst	16.6 MB/s
Access times (typical)	
Full stroke	300 ms
Random	140 ms
Track pitch	1.6 μm
Cache/buffer	128 KB
Startup time	<10s
Stop time	
Single session	<4s
Multi-session	<30s

Table 5-6: IDE CD-ROM Drive Specifications *continued*

Item	Description
Laser parameters	
Type	Semiconductor laser
Wave length	795 nm
Output power	<0.25 mW
Operating conditions	
Temperature	5° to 55°C (41° to 131°F)
Humidity	10% to 90% RH

Non-hot-plug Hard Drives

SCSI Hard Drive

Table 5-7: SCSI Hard Drive Specifications

Item	36 GB	72 GB
Model	HP SCSI Ultra320 Hard Drive	
Capacity	36419.2 MB	72837.2 MB
Interface	Ultra320 SCSI	Ultra320 SCSI
Physical dimensions		
Height	25.4 mm (1.0 in)	25.4 mm (1.0 in)
Width	101.6 mm (4.0 in)	101.6 mm (4.0 in)
Seek time (typical reads, including settling)		
Single track	0.4 ms	0.55 ms
Average	3.8 ms	4.9 ms
Full-stroke	8 ms	10 ms
Rotational Speed	15,000 rpm	10,000 rpm
Maximum transfer rate (synchronous)	320 MB/s	320 MB/s
Physical configuration		
Bytes per sector	512	512
Logical blocks	71,132,000	142,264,000
Operating temperature	10° to 35°C (50° to 95°F)	10° to 35°C (50° to 95°F)

SATA Hard Drive

Table 5-8: SATA Hard Drive Specifications

Item	80 GB	160 GB	250 GB
Model	HP Serial-ATA (SATA) Hard Drive		
Capacity	80,000 MB	160,000 MB	250,000 MB
Interface	Serial ATA	Serial ATA	Serial ATA
Physical dimensions			
Height	26.11 mm (1.028 in)	26.11 mm (1.028 in)	26.11 mm (1.028 in)
Width	101.6 mm (4.0 in)	101.6 mm (4.0 in)	101.6 mm (4.0 in)
Seek time (typical reads, including settling)			
Single track	0.9 ms	0.9 ms	1.0 ms
Average	9.0 ms	9.0 ms	10 ms
Full-stroke	17.0 ms	17.8 ms	18.0 ms
Rotational Speed	7,200 rpm	7,200 rpm	7,200 rpm
Maximum transfer rate (synchronous)	1.5 GB/s	1.5 GB/s	1.5 GB/s
Physical configuration			
Bytes per sector	512	512	512
Logical blocks	156,301,488	312,581,808	488,397,168
Operating temperature	5° to 55°C (41° to 131°F)	5° to 55°C (41° to 131°F)	5° to 55°C (41° to 131°F)

SATA and Ultra ATA/133 controller

Table 5-9: SATA and Ultra ATA/133 Controller Specifications

Item	Description
Model	Integrated with NVIDIA Crush K8-04 Professional MCP
Connector	7-pin SATA connector
Protocol	SATA and Ultra ATA/133 compatible • 2 channel Ultra ATA/133 • 2 channel SATA
Features	• 1 GHz HyperTransport link to the AMD Opteron processor • Flexible 20-lane PCI Express interface • PCI Rev 2.3 compliant power management logic

Gigabit Ethernet Controller

Table 5-10: Gigabit Ethernet Controller Specifications

Item	Description
Model	Broadcom BCM5721 NetXtreme
Network interface	10/100/1000Base-T Ethernet
Media interface controller (MAC)	Triple speed, IEEE 802.3 compliant
System interface	Single lane 4-pin PCI-X
Connector	RJ-45
Industry-compliant manageability features	• IPMI 1.5 support • Standards-compliant WOL
Package	15 x 15 mm

Index