HP ProLiant DL360 Generation 4p Server (SAS Model)
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

Illustrated parts catalog

In this section

Customer self repair

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 are identified in the following tables.

Mechanical components
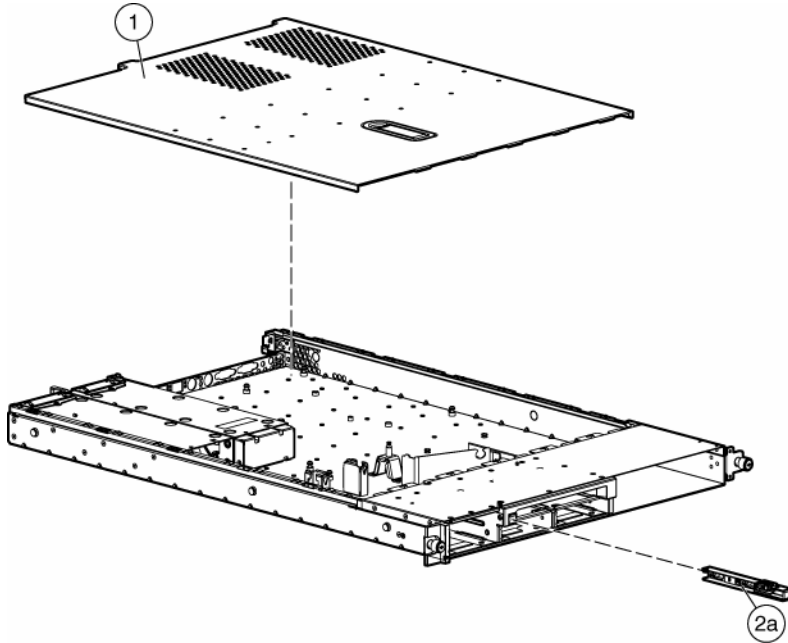
Item	Description	Original spare part number	Modified spare part number	Customer self repair (on page 5)
1	Access panel	392012-001 ‡ See requirement	409697-001	Yes
2	Plastics kit	392016-001 ‡ See requirement	409701-001	—
	a) Optical drive ejector assembly	—	—	Yes
	b) PCI card guide *	—	—	Yes
	c) Diskette blank *	—	—	Yes
	d) Optical device blank *	—	—	Yes
3	Hardware kit	361397-001	—	—
	a) Screws, 6-32X0.25, T-10 (4) *	—	—	Yes
	b) Screw, 6-32X0.187, T-15 (4) *	—	—	Yes
	c) Screw, M3X0.5X4, T-10 (4) *	—	—	Yes
	d) Expansion slot covers (2) *	—	—	Yes
4	Power supply blank *	398027-001 ‡ See requirement	409702-001	Yes
	Rack mounting hardware			
5	Rack mounting hardware kit *	360104-001	—	Yes
6	Cable management arm *	360105-001	—	Yes

*Not shown

‡**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 labelled 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 labelled 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
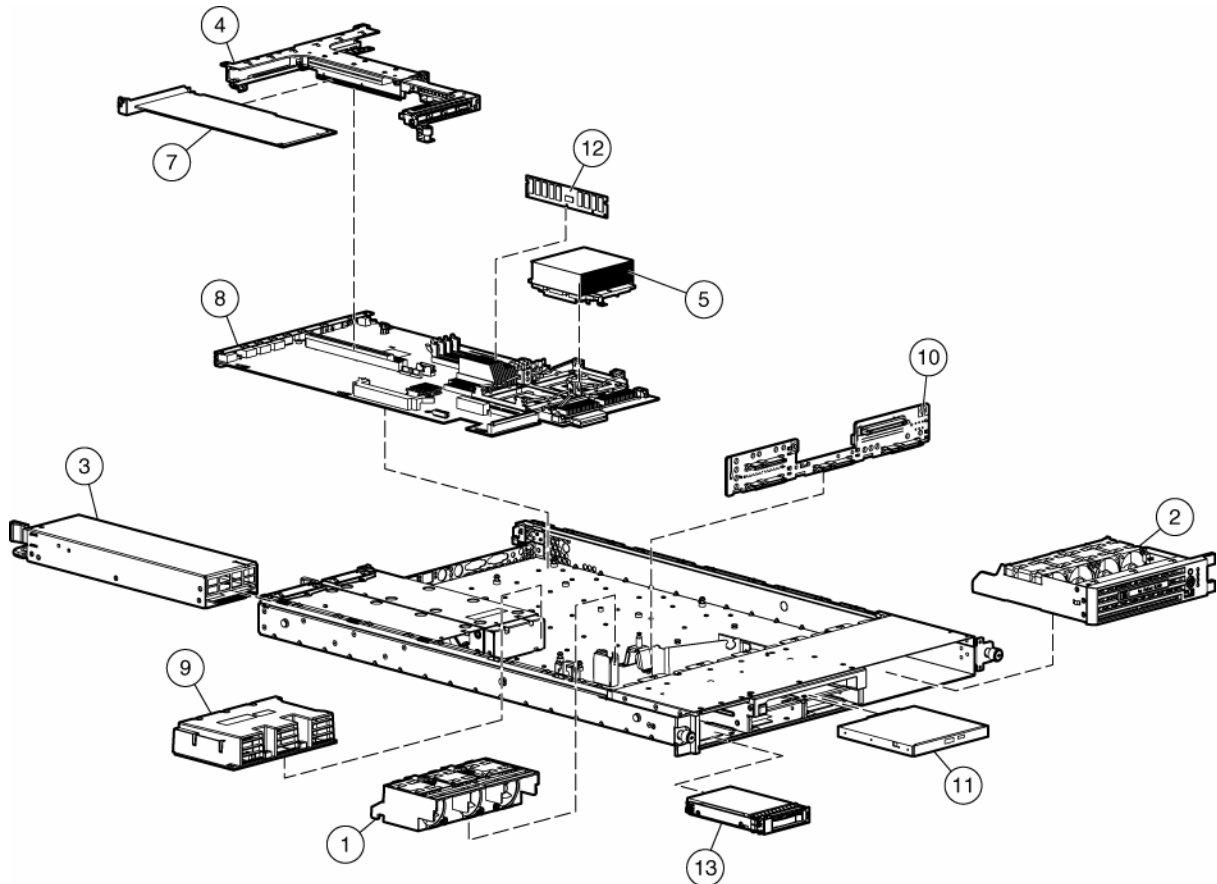
Item	Description	Original spare part number	Modified spare part number	Customer self repair (on page 5)
	System components			
1	Power supply fan assembly	361399-001 ‡ See requirement	412902-001	Yes
2	Processor fan assembly	361390-001 ‡ See requirement	412954-001	Yes
3	Hot-plug power supply, 535-W	389997-001	—	Yes
4	PCI riser bracket, with PCI riser boards	361387-001 ‡ See requirement	412901-001	Yes

Item	Description	Original spare part number	Modified spare part number	Customer self repair (on page 5)
5	Processor/heatsink assembly	—	—	—
	a) 3.00-GHz Intel® Xeon™ 2-MB L2 cache *	381801-001	—	Yes
	b) 3.20-GHz Intel® Xeon™ 2-MB L2 cache *	382523-001	—	Yes
	c) 3.40-GHz Intel® Xeon™ 2-MB L2 cache *	381800-001	—	Yes
	d) 3.60-GHz Intel® Xeon™ 2-MB L2 cache *	381799-001	—	Yes
	e) 3.80-GHz Intel® Xeon™ 2-MB L2 cache 800-MHz FSB *	381798-001	—	Yes
	f) 3.00-GHz Intel® Xeon™ 2-MB L2 cache LV *	397864-001	—	Yes
	g) 2.80-GHz Intel® Xeon™ 2-MB L2 cache *	403625-001	—	Yes
	h) Dual-Core Intel® Xeon™ 2.80-GHz, 2-MB cache, 800-MHz FSB (for use with dual-core processor SAS system board 409488-001 only) * **	409490-001	—	Yes
6	3.6-V 500-mAh NiMh battery *	307132-001	—	Yes
	Boards			
7	SAS controller, single-channel, PCI-X, 266-MHz	370855-001	—	Yes
8	System board	—	—	—
	a) System board, with processor cages and system battery	383698-001 ‡ See requirement	409740-001	Yes
	b) System board, dual-core processor support, SAS, with processor cages and system battery (for use with Dual-Core Intel® Xeon™ processor only) *	409488-001	—	Yes
9	Power converter module	—	—	—
	a) Power converter module, single-core processor	389998-001 ‡ See requirement	433936-001	Yes
	b) Power converter module, for use with dual-core processor SAS system board 409488-001 only)	409335-001	—	Yes
10	Multi-bay/SAS media backplane	392013-001	—	Yes
	Media devices			
11	Multi-bay drives	—	—	—
	a) CD-ROM drive, removable multi-bay, IDE, 24X *	228508-001	—	Yes
	b) DVD-ROM drive, removable multi-bay, 8X *	268795-001	—	Yes
	c) Diskette drive, removable multi-bay *	289550-001	—	Yes
	Memory			
12	DIMM, PC2-3200 registered DDR2 SDRAM	—	—	—
	a) 512-MB *	359241-001 ‡ See requirement	413384-001	Yes
	b) 1-GB *	359242-001 ‡ See requirement	413385-001	Yes

Item	Description	Original spare part number	Modified spare part number	Customer self repair (on page 5)
	c) 2-GB (single-rank) *	359243-001 ‡ See requirement	413386-001	Yes
	d) 2-GB (dual-rank) *	378021-001 ‡ See requirement	413387-001	Yes
	Hard drives			
13	SAS hard drives	—	—	—
	a) 36-GB 10,000-rpm *	376596-001	—	Yes
	b) 72-GB 10,000-rpm *	376597-001	—	Yes
	Miscellaneous			
14	Cable, CD-ROM/diskette *	392015-001	—	Yes
15	Cable, SAS *	392014-001	—	Yes
16	Cable assembly, SAS, side connector *	389952-001	—	Yes
17	AC power cord *	187335-001	—	Yes
18	Battery, 3.3 V, lithium *	234556-001	—	Yes
19	Country kit *	361401-001	—	Yes
20	Return kit, pack box, and cushions *	371695-001	—	Yes

*Not shown

** Do not mix single- and dual-core processors or processors with different speeds or cache sizes.

‡**REQUIREMENT:**
For Customers in the EU only.
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If your unit contains a part that is labelled 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 labelled 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.
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Removal and replacement procedures

In this section

Required tools

You need the following items for some procedures:

- T-10 Torx screwdriver
- T-15 Torx screwdriver
- Diagnostics Utility

Safety considerations

Before performing service procedures, review all the safety information.

Preventing electrostatic discharge

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

To prevent electrostatic damage:

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

Server warnings and cautions

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

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

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

⚠ **CAUTION:** Do not operate the server for long periods with the access panel open or removed. Operating the server in this manner results in improper airflow and improper cooling that can lead to thermal damage.

Preparation procedures

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

- Extend the server from the rack ("Extending the server from the rack" on page 12).

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

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

- Power down the server ("Powering down the server" on page 11).

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

- Remove the server from the rack ("Removing the server from the rack" on page 13).

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

Powering down the server

⚠ **WARNING: To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to remove power from the server. The front panel**

Power On/Standby button does not completely shut off system power. Portions of the power supply and some internal circuitry remain active until AC power is removed.

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

1. Back up the server data.
2. Shut down the operating system as directed by the operating system documentation.
3. If the server is installed in a rack, press the UID LED button on the front panel. Blue LEDs illuminate on the front and rear panels of the server.
4. Press the Power On/Standby button to place the server in standby mode. When the server activates standby power mode, the system power LED changes to amber.
5. If the server is installed in a rack, locate the server by identifying the UID LED button.
6. Disconnect the power cords.

The system is now without power.

Extending the server from the rack

📝 **NOTE:** If the optional cable management arm option is installed, you can extend the server without powering down the server or disconnecting peripheral cables and power cords. These steps are only necessary with the standard cable management solution.

1. Power down the server ("Powering down the server" on page 11).
2. Disconnect all peripheral cables and power cords from the server rear panel.
3. Loosen the thumbscrews that secure the server faceplate to the front of the rack.
4. Extend the server on the rack rails until the server rail-release latches engage.

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

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

5. After performing the installation or maintenance procedure, slide the server back into the rack:
    a. Slide the server fully into the rack.

b. Secure the server by tightening the thumbscrews.

6. Reconnect the peripheral cables and power cords.

Accessing the product rear panel

NOTE: To access some components, you may need to remove the cable management arm.

To open the arm:
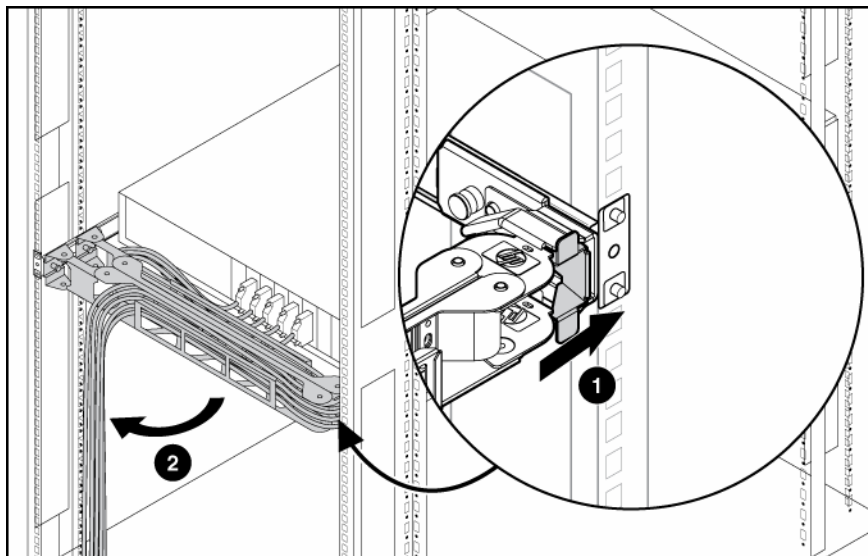
To close the arm:
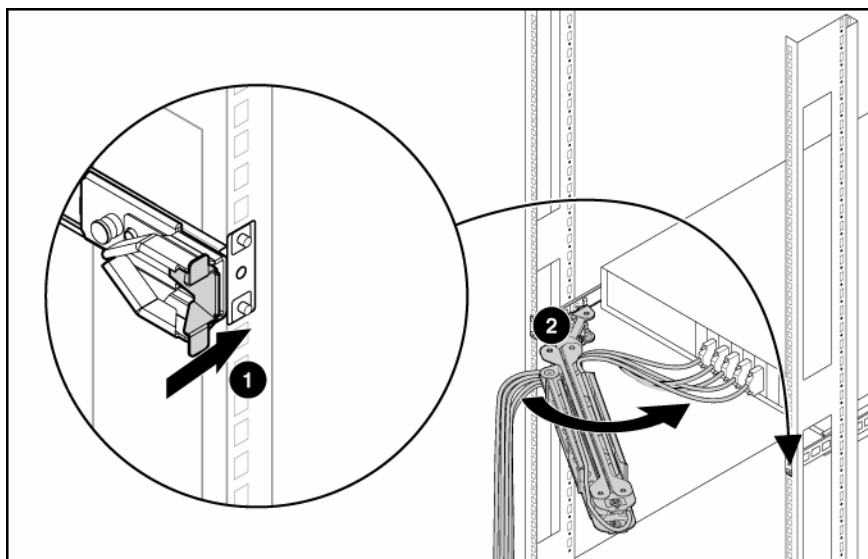
Removing the server from the rack

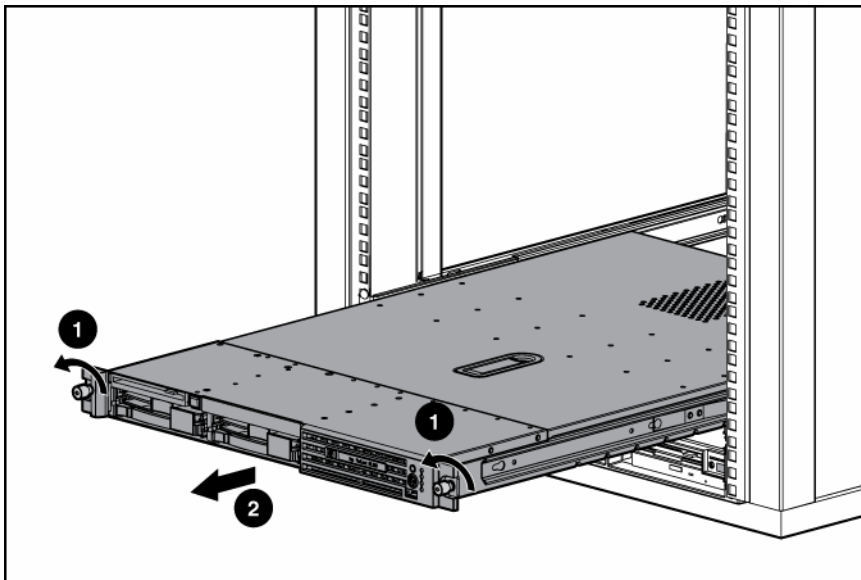To remove the server from an HP, Compaq branded, telco, or third-party rack:

1. Power down the server ("Powering down the server" on page 11).

2. Disconnect all peripheral cables and power cords from the server rear panel.

3. Disconnect the cable management arm, if necessary. For more information, refer to the documentation that ships with the cable management arm.

4. Loosen the thumbscrews that secure the server faceplate to the front of the rack.

5. Extend the server from the rack ("Extending the server from the rack" on page 12).

6. Disengage the server from the rack. For more information, refer to the documentation that ships with the rack mounting option.

7. Place the server on a sturdy, level surface.

Access panel

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

△ **CAUTION:** Do not operate the server for long periods with the access panel open or removed. Operating the server in this manner results in improper airflow and improper cooling that can lead to thermal damage.

1. To remove the component:

2. Power down the server if the standard cable management solution is installed ("Powering down the server" on page 11).

📝 **NOTE:** If the optional cable management arm is installed, you can extend the server and perform hot-plug installation or maintenance procedures without powering down the server.

3. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 12).

4. Lift up on the hood latch handle and remove the access panel.

To replace the component, reverse the removal procedure.

Hard drive blank

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

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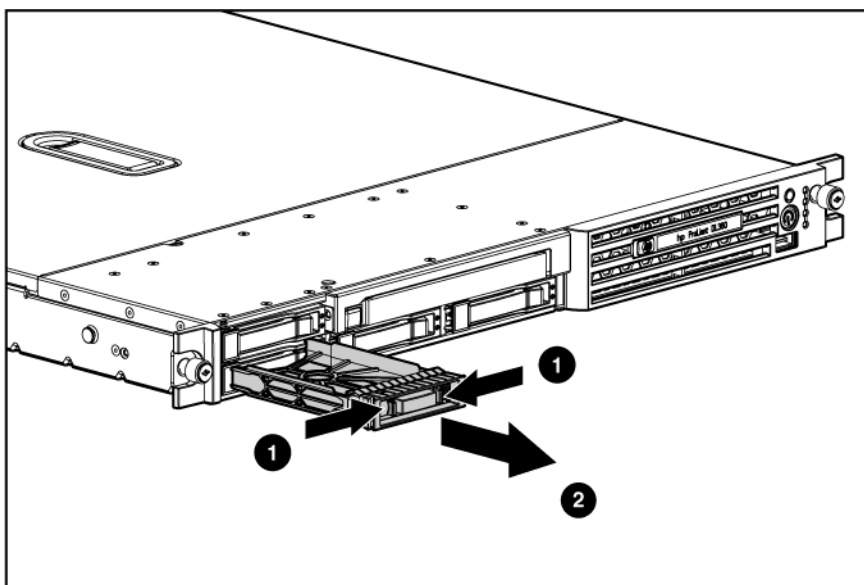
To replace the blank, slide the blank into the bay until it locks into place.

Hard drive

⚠ **CAUTION:** Always power down the server if the boot partition resides on the drive you are replacing or if you are replacing the only drive in the server.

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

To remove the component:

1. Determine the status of the hard drive from the hot-plug hard drive LEDs ("Identifying the status of a hard drive" on page 47).

2. Back up all server data on the hard drive.

3. Remove the SAS hard drive.
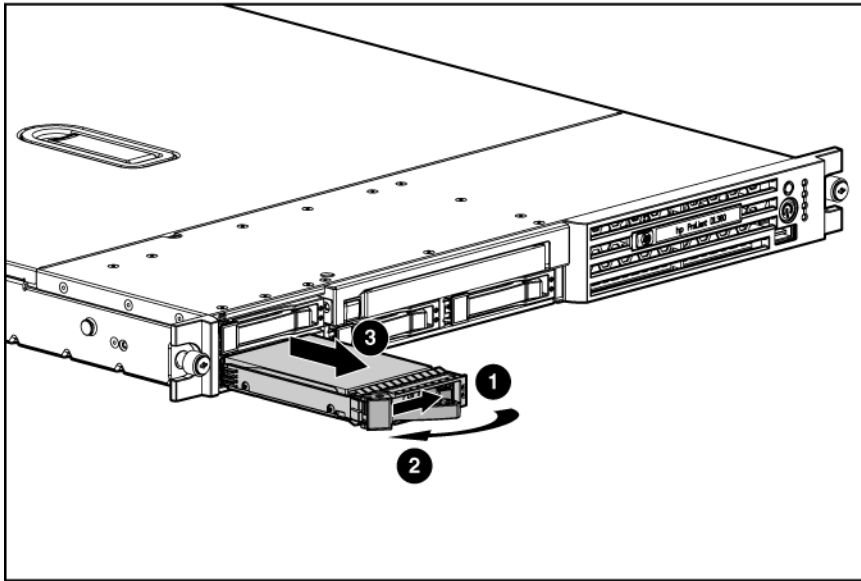
To replace the drive, slide the drive into the bay until the latch mechanism engages the server chassis, then close the latch handle to lock the drive in the server chassis.

Multi-bay blank or device

To remove the component:

1. Power down the server ("Powering down the server" on page 11).

2. Press the ejector button.

3. Remove the multi-bay blank.
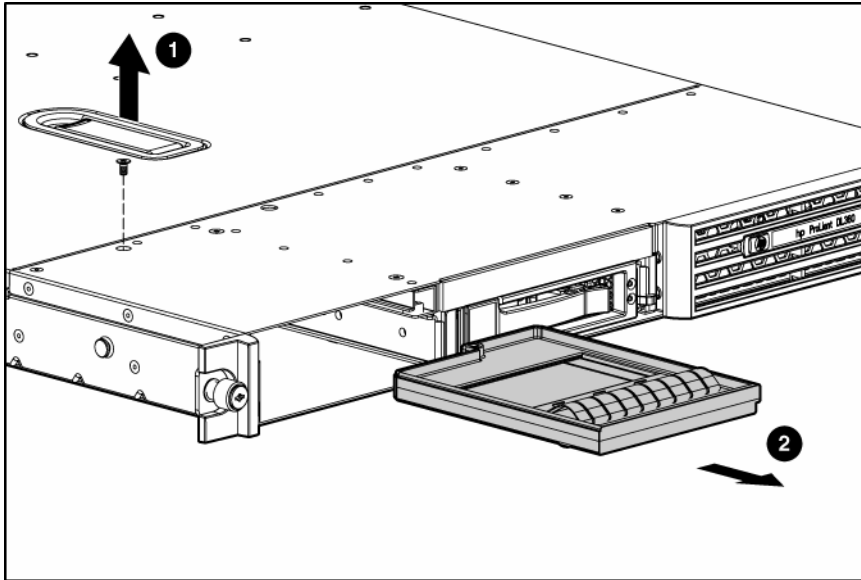
To replace the component, reverse the removal procedure.

DVD/CD-ROM/diskette drive

To remove the component:

1. Power down the server ("Powering down the server" on page 11).

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

2. Press the ejector button.

3. Remove the multi-bay blank, diskette drive, or multi-bay device.

To replace the drive, slide the drive into the bay until it clicks.

Multi-bay device ejector

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Eject the multi-bay device or multi-bay device blank ("Multi-bay blank or device" on page 15).
3. Extend or remove the server from the rack ("Extending the server from the rack" on page 12).
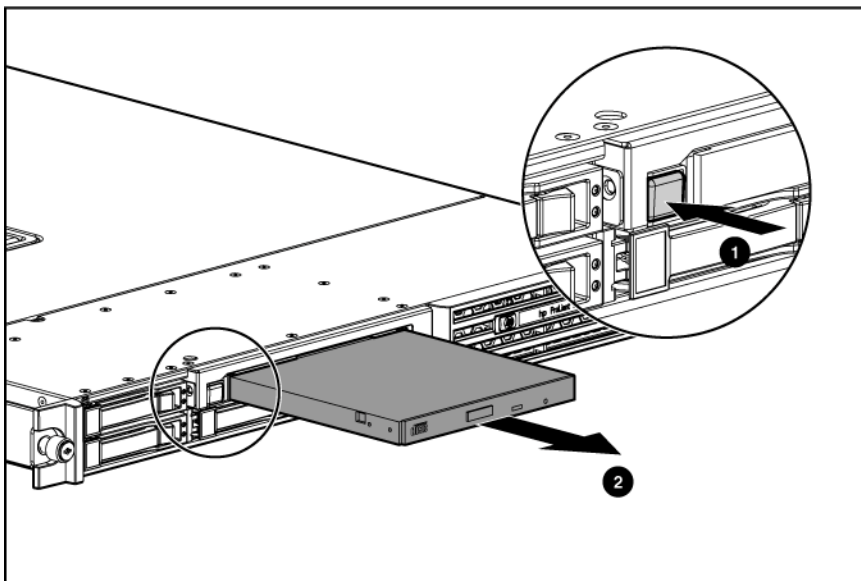4. Use a T-10 Torx screwdriver to remove the screws that secure the multi-bay device ejector to the server chassis.
5. Press the tab on the side of the multi-bay device ejector to release it from the chassis.
6. Remove the multi-bay device ejector.
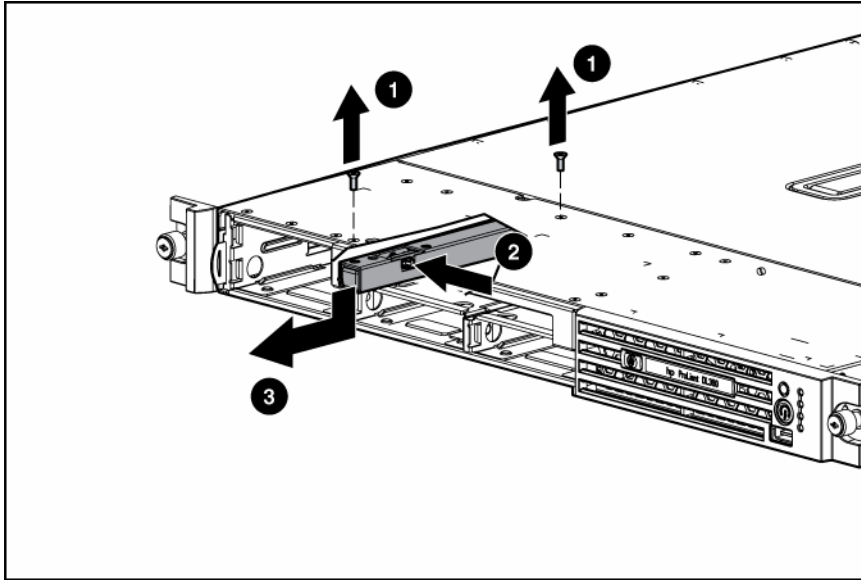
To replace the component, reverse the removal procedure.

Hot-plug AC power supply

This procedure assumes that the server is configured with two power supplies.

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

To remove the component:

1. Perform one of the following:
   - If a conventional cable management solution is in place, unfasten the cable management solution to access the power supply bays.
   - If the cable management arm is in place, access the rear panel ("Accessing the product rear panel" on page 13).
2. Disconnect the power cord.

3. Press the power supply release lever, then pull the power supply from the server.
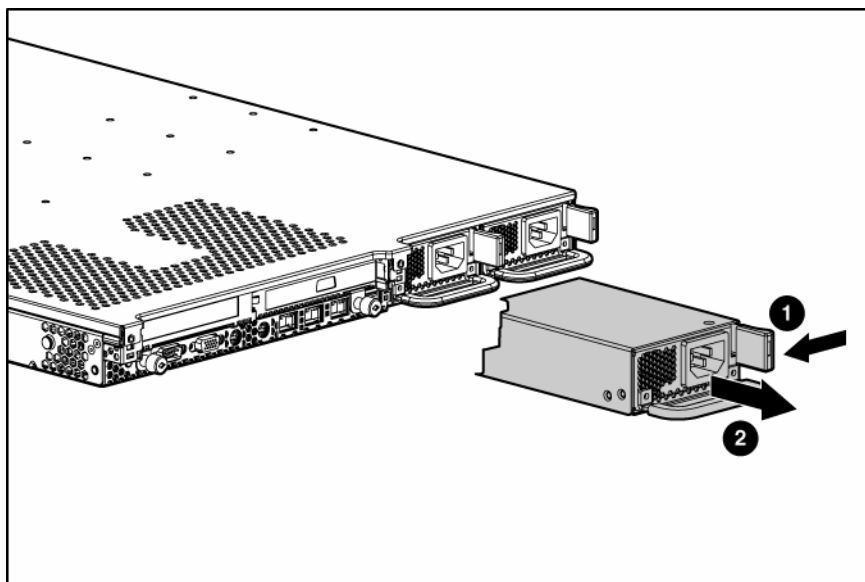
To replace the component, reverse the removal procedure.

Power supply fan assembly

⚠ **CAUTION:** Do not operate the server for long periods with the access panel open or removed. Operating the server in this manner results in improper airflow and improper cooling that can lead to thermal damage.

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Extend or remove the server from the rack ("Extending the server from the rack" on page 12).
3. Remove the access panel ("Access panel" on page 14).
4. Press the latches and lift to release the power supply fan assembly from the server.
5. Remove the component from the server.

⚠ **CAUTION:** When replacing the component, be sure the power converter module is properly seated in the server chassis.
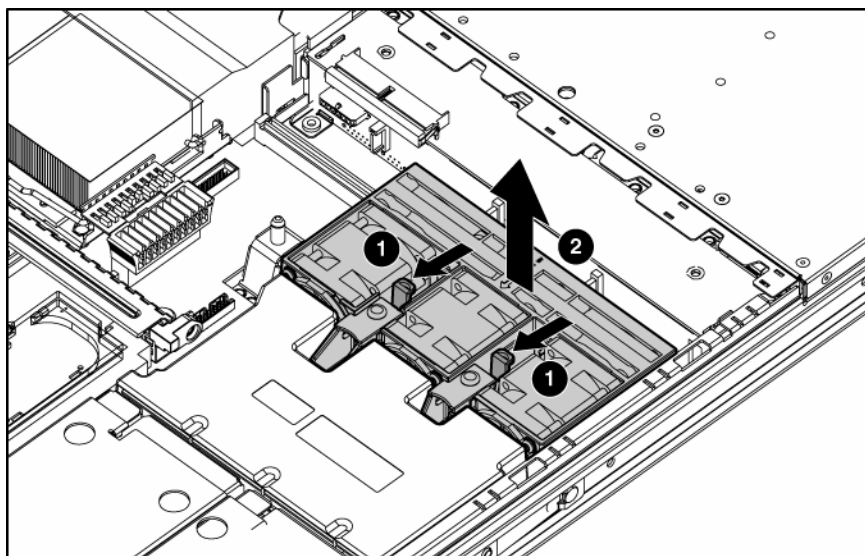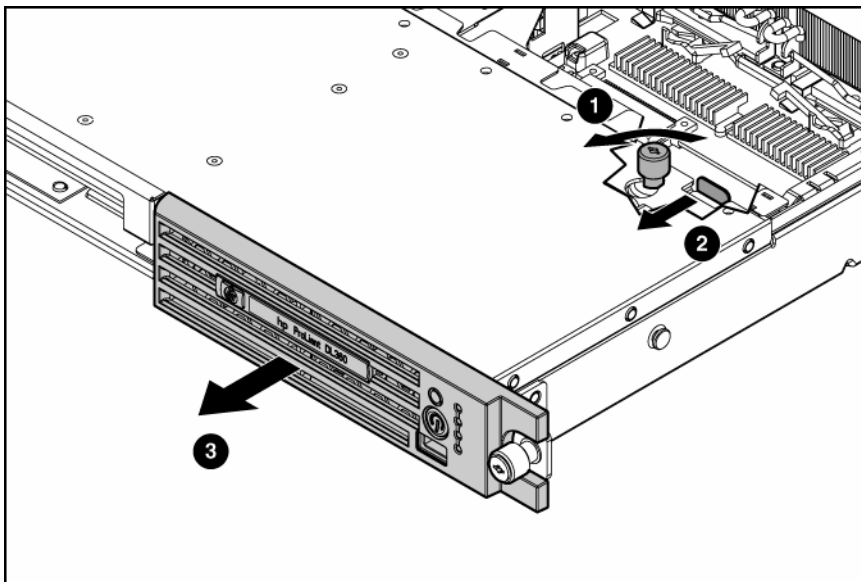
To replace the component, reverse the removal procedure.

Processor fan assembly

⚠ **CAUTION:** Do not operate the server for long periods with the access panel open or removed. Operating the server in this manner results in improper airflow and improper cooling that can lead to thermal damage.

To remove the component:

1. Extend or remove the server from the rack ("Extending the server from the rack" on page 12).
2. Remove the access panel ("Access panel" on page 14).
3. Loosen the thumbscrew that secures the processor fan assembly to the server.
4. Push on the sheet metal tab near the thumbscrew to separate the fan tray connector from the system board connector.
5. Remove the component from the server.

To replace the component, reverse the removal procedure.

Multi-bay/SAS backplane

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Remove all SAS/SATA hard drives ("Hard drive" on page 15).
3. Extend or remove the server from the rack ("Extending the server from the rack" on page 12).
4. Remove the access panel ("Access panel" on page 14).
5. Remove the power supply fan module ("Processor fan assembly" on page 19).
6. Disconnect the cable from the optical device and diskette drive interface board.
7. Eject the multi-bay device or multi-bay device blank ("Multi-bay blank or device" on page 15).
8. Remove the multi-bay from the server ("Multi-bay device ejector" on page 17).

9. Remove the multi-bay release latch screw with a T-15 Torx screwdriver.
10. Remove the multi-bay release latch.
11. Remove the two screws that fasten the multi-bay/SAS backplane to the chassis.
12. Remove the component from the server.
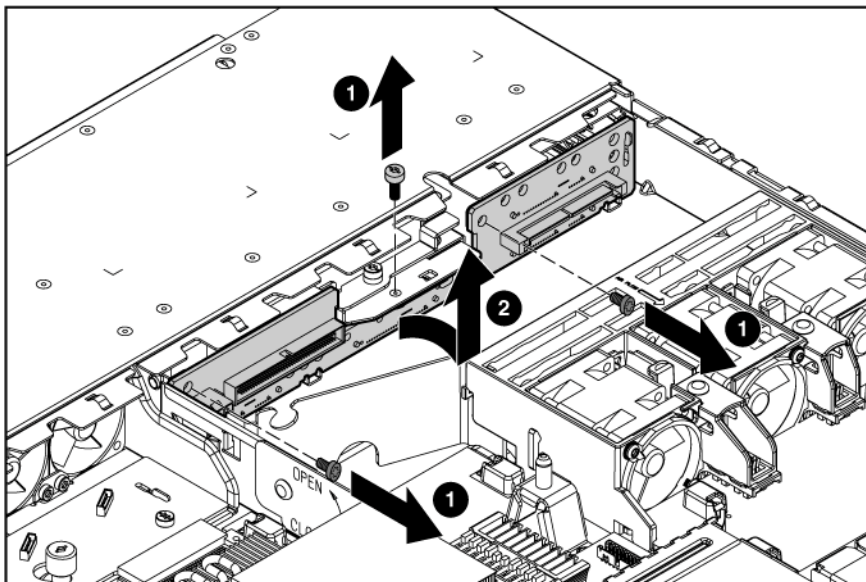
To replace the component, reverse the removal procedure.

PCI riser board assembly

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

📝 **IMPORTANT:** Be sure that all DIMM slot latches are closed to provide adequate clearance before removing the PCI riser board assembly with a half-length expansion board.

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 12).
3. Remove the access panel ("Access panel" on page 14).
4. Remove the PCI riser board assembly:
   a. Disconnect any internal or external cables connected to any existing expansion boards.
   b. Loosen the four PCI riser board assembly thumbscrews.

c. Lift the front of the assembly slightly and unseat the riser boards from the PCI riser board connectors.
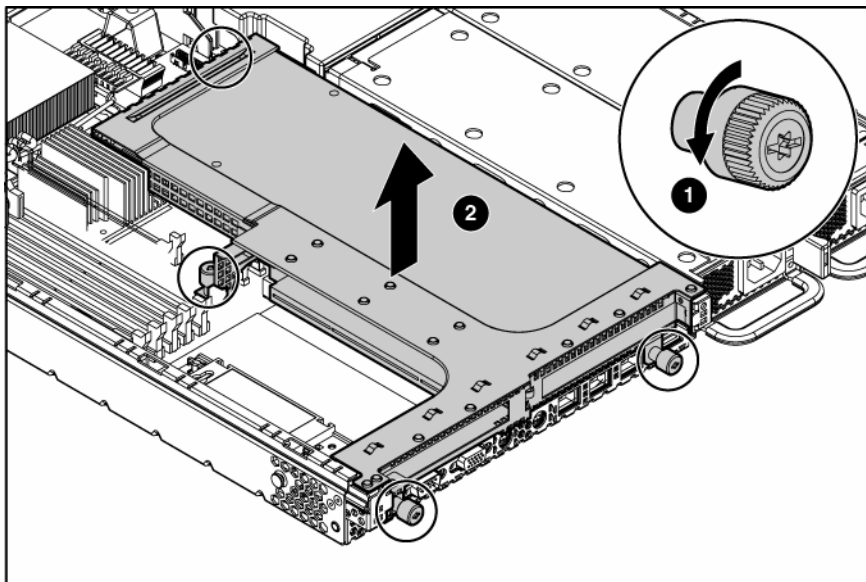
To replace the component, reverse the removal procedure.

PCI expansion slot definitions

Slot*	Board Size	Connector	Interconnect
PCI-X expansion slot 1	Half-length	133 MHz, 3.3 V	64-bit
PCI-X expansion slot 2	Full-length	133 MHz, 3.3 V	64-bit
PCI Express expansion slot 1 (optional)	Half-length	x8	x1, x4, or x8
PCI Express expansion slot 2 (optional)	Full-length	x8	x1, x4, or x8

* Depending on the model of the server, slot 1 or slot 2 will be pre-populated with a storage controller. If the expansion slot is populated with the standard PCI-X storage controller card, it should not be converted to PCI Express.

PCI-X or PCI Express expansion board

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 12).
3. Remove the access panel ("Access panel" on page 14).
4. Remove the PCI riser board assembly ("PCI riser board assembly" on page 20).

5. Remove any expansion board installed in the assembly.
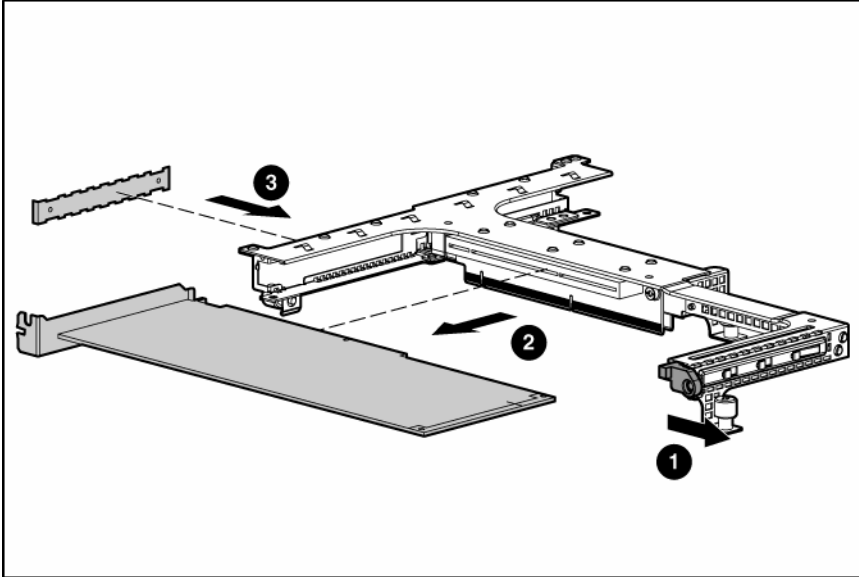
To replace the component, reverse the removal procedure.

PCI riser board

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 12).
3. Remove the access panel ("Access panel" on page 14).
4. Remove the PCI riser board assembly ("PCI riser board assembly" on page 20).
5. Remove any expansion board installed in the assembly ("PCI-X or PCI Express expansion board" on page 21).
6. Remove the applicable PCI riser boards from the assembly:

IMPORTANT: When removing the two parts of the riser board, pay attention to the orientation of the slots on each side. This information is important for subsequent procedures.

a. Remove the riser board with the slot for full-length expansion boards.
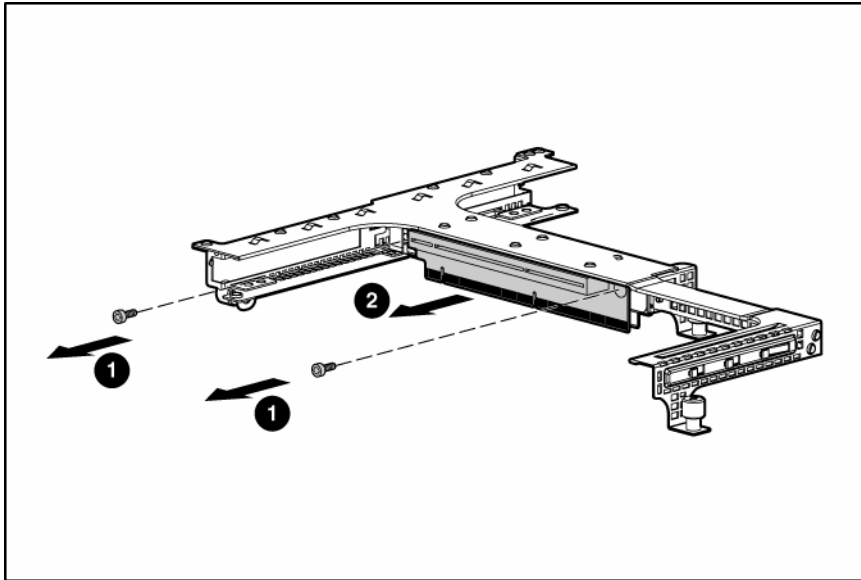
b. Repeat the previous step for the riser board with the slot for half-length expansion boards, if needed.

To replace the component, reverse the removal procedure.

Power converter module

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Remove all hot-plug power supplies ("Hot-plug AC power supply" on page 17).
3. Extend or remove the server from the rack ("Extending the server from the rack" on page 12).
4. Remove the access panel ("Access panel" on page 14).
5. Disconnect all internal power cables.
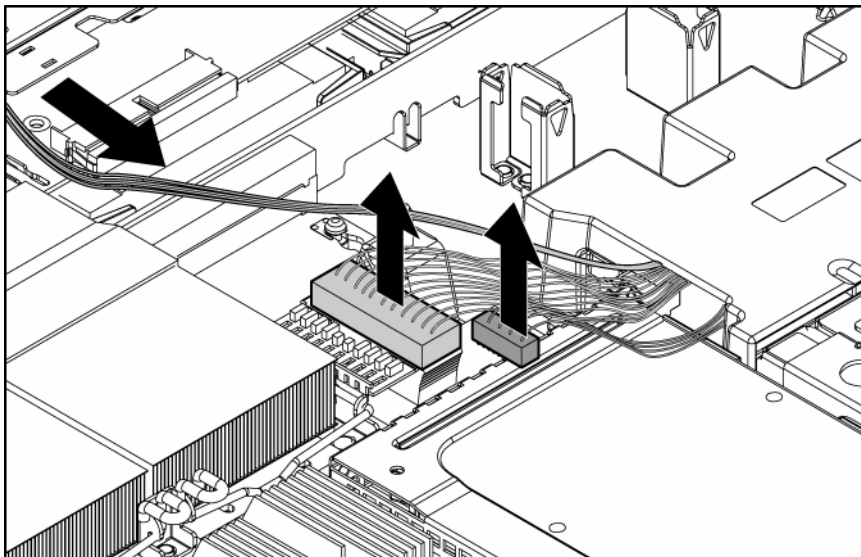
6. Remove the fan module ("Processor fan assembly" on page 19).

7. Slide the power converter module toward the back of the server, then lift the power converter module from the server.

NOTE: Cables are removed for clarity.

To replace the component, reverse the removal procedure.

Memory options

You can expand server memory by installing PC2-3200 DDR2 SDRAM DIMMs. The system supports up to six ECC Registered DDR2 SDRAM DIMMs.

NOTE: The Advanced Memory Protection option in RBSU provides additional memory protection beyond Advanced ECC. By default, the server is set to **Advanced 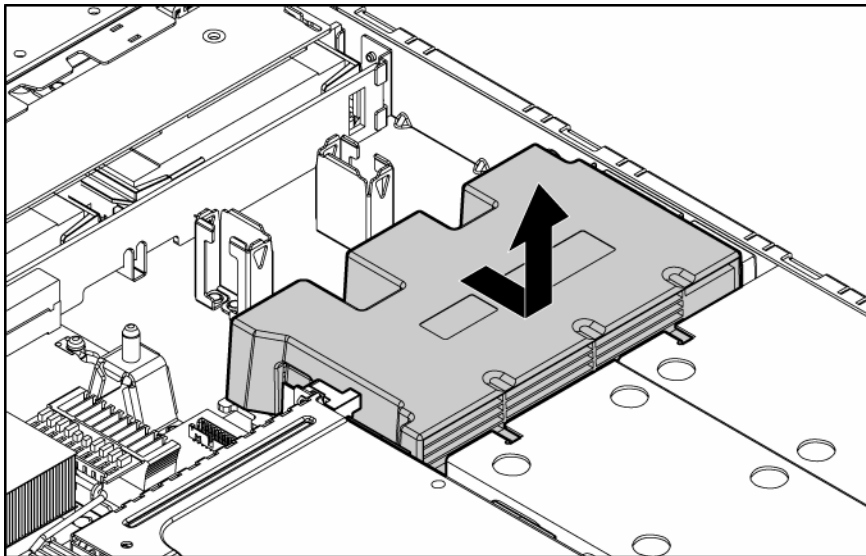ECC Support**. Refer to "HP ROM-Based Setup Utility (on page 34) (on page 48 ("HP ROM-Based Setup Utility" on page 34))," or on the Documentation CD, for more information.

The server supports two types of memory configurations:

- Standard memory configuration for maximum performance with up to 12-GB of active memory (six 2-GB memory modules)
- Online spare memory configuration for maximum availability with up to 6-GB of active memory while simultaneously supporting up to 6-GB of online spare memory

NOTE: When configuring the memory sub-system to run in Online Spare mode, only single rank DIMMs can be installed in the system. Online Spare Mode will not work with dual rank DIMMs installed in the system.

DIMM installation guidelines

You must observe the following guidelines when installing additional memory:

- DIMMs installed in the server must be Registered DDR2 DRAM, 2.5 volts, 64 bits wide, and ECC.
- DIMMs in slots 1A and 2A must match and must be installed as a pair.
- DIMMs in slots 3B and 4B must match and must be installed as a pair.
- DIMMs in slots 5C and 6C must match and must be installed as a pair.

- All DIMMs installed must be the same speed. Do not install DIMM modules supporting different speeds.
- Install DIMMs into both slots within a single bank. DIMMs must be installed in order. Upgrade memory by installing DIMM pairs into banks in sequential bank order, starting with bank B.

Single- and dual-rank DIMMs

PC2-3200 DIMMs can either be single- or dual-rank. While it is not normally important for you to differentiate between these two types of DIMMs, certain DIMM configuration requirements are based on these classifications.

Certain configuration requirements exist with single- and dual-rank DIMMs that allow the architecture to optimize performance. A dual-rank DIMM is similar to having two separate DIMMs on the same module. Although only a single DIMM module, a dual-rank DIMM acts as if it were two separate DIMMs. The primary reason for the existence of dual-rank DIMMs is to provide the largest capacity DIMM given the current DIMM technology. If the maximum DIMM technology allows for creating 2-GB single-rank DIMMs, a dual-rank DIMM using the same technology would be 4-GB.

DIMM

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Extend or remove the server from the rack ("Extending the server from the rack" on page 12).
3. Remove the access panel ("Access panel" on page 14).

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

4. If necessary, remove the PCI riser board assembly ("PCI riser board assembly" on page 20).
5. Remove the DIMM.

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

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

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

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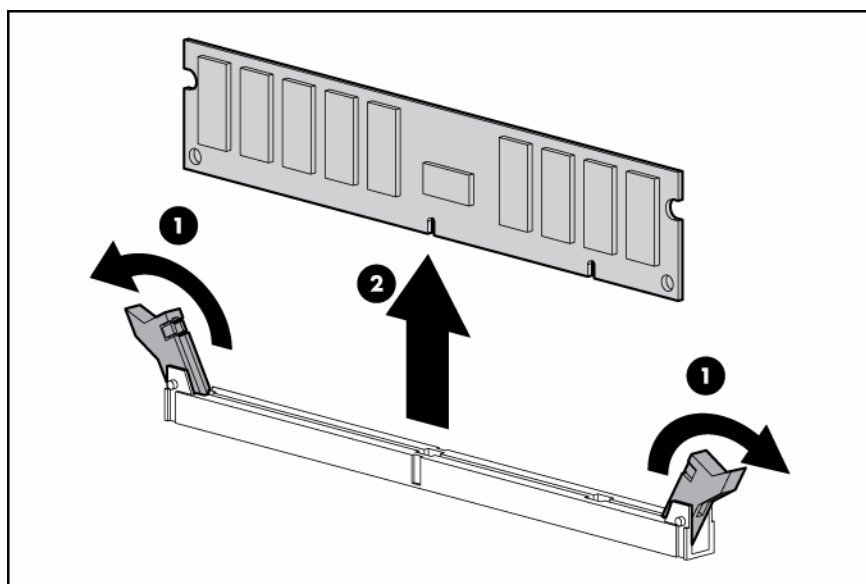
Processor

To remove a processor:

1. Power down the server ("Powering down the server" on page 11).
2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 12).
3. Remove the access panel ("Access panel" on page 14).
4. Rotate the baffle upward.
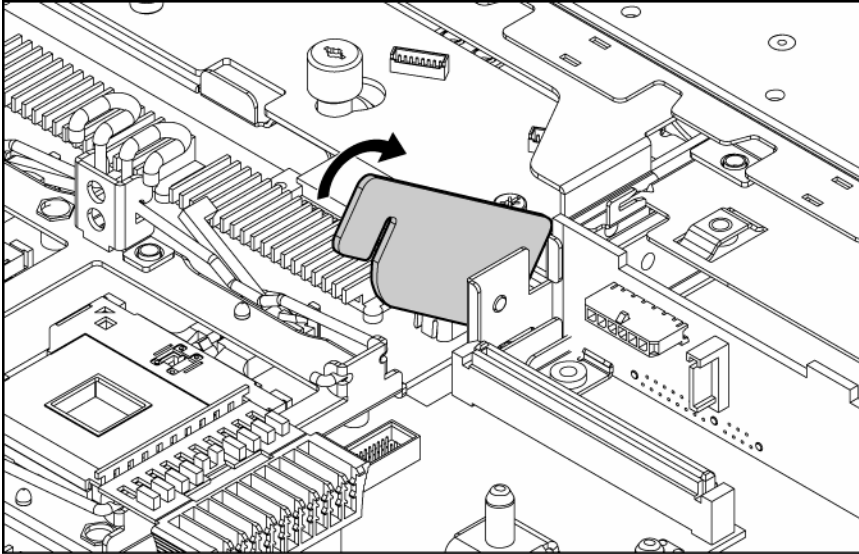
5. Release the processor retaining clips and processor locking lever.
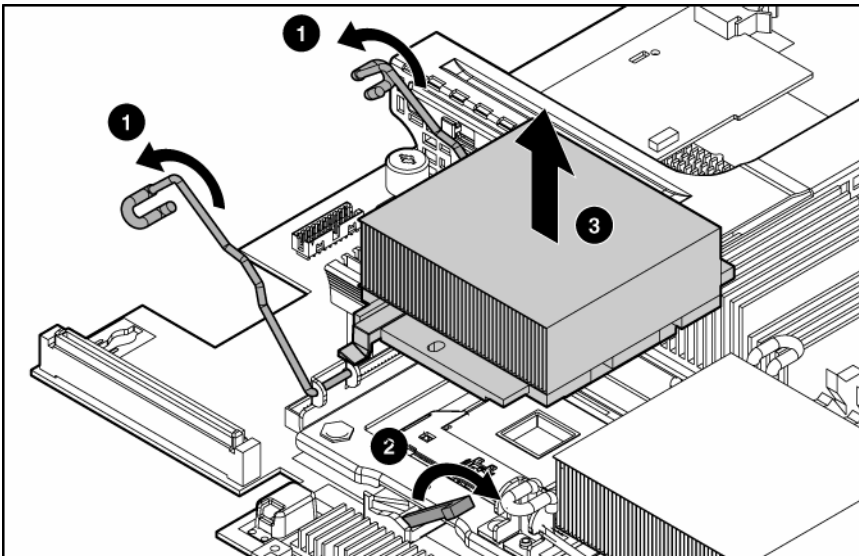
6. Lift the heatsink and processor from the server.

To install the processor:

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

△ **CAUTION:** To prevent possible server malfunction and damage to the equipment, do not mix single- and dual-core processors or processors with different speeds or cache sizes.

1. Remove the protective cover from the processor.
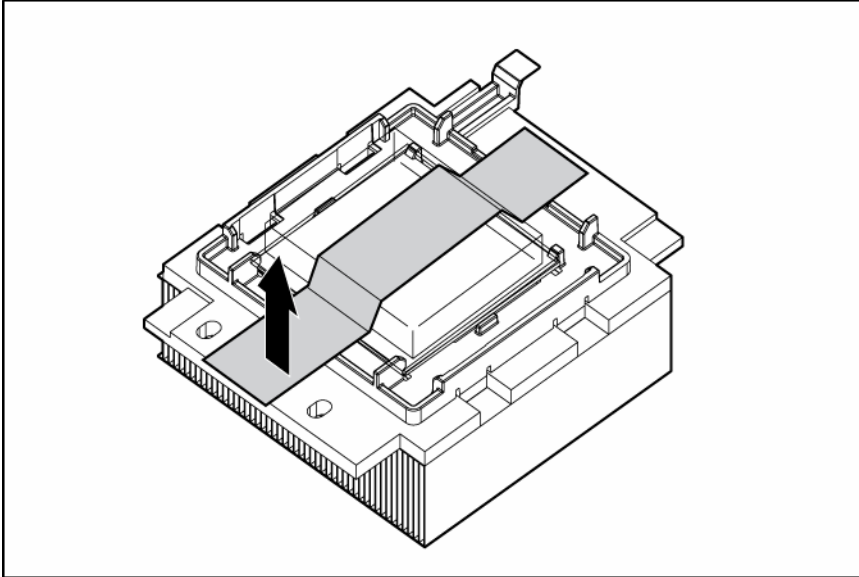
2. Align the holes in the heatsink with the guiding pegs on the processor cage.

△ **CAUTION:** To prevent possible server malfunction or damage to the equipment, be sure to align the processor pins with the corresponding holes in the socket.
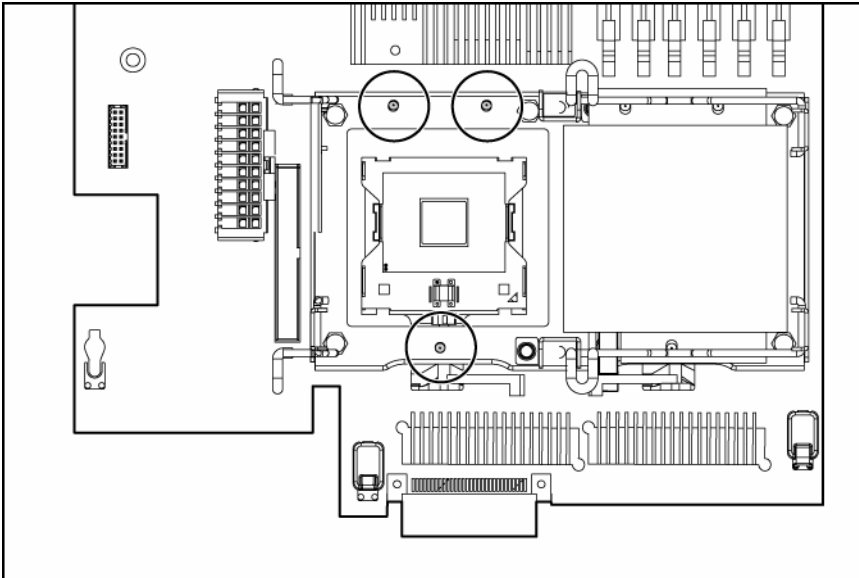
3. Install the processor and close the processor locking lever and processor retaining clips.

4. Rotate the baffle into position.
5. Install the access panel ("Access panel" on page 14).

Battery

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

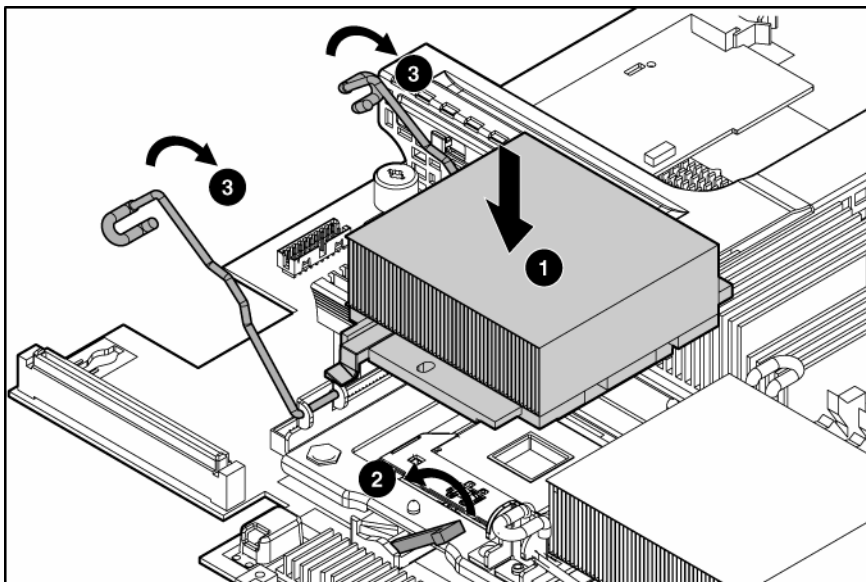⚠ **WARNING: The computer contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. A risk of fire and burns exists if the battery pack is not properly handled. To reduce the risk of personal injury:**
- **Do not attempt to recharge the battery.**
- **Do not expose the battery to temperatures higher than 60°C (140°F).**
- **Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.**
- **Replace only with the spare designated for this product.**

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Extend or remove the server from the rack ("Extending the server from the rack" on page 12).
3. Remove the access panel ("Access panel" on page 14).
4. Remove the PCI riser board assembly ("PCI riser board" on page 22).

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

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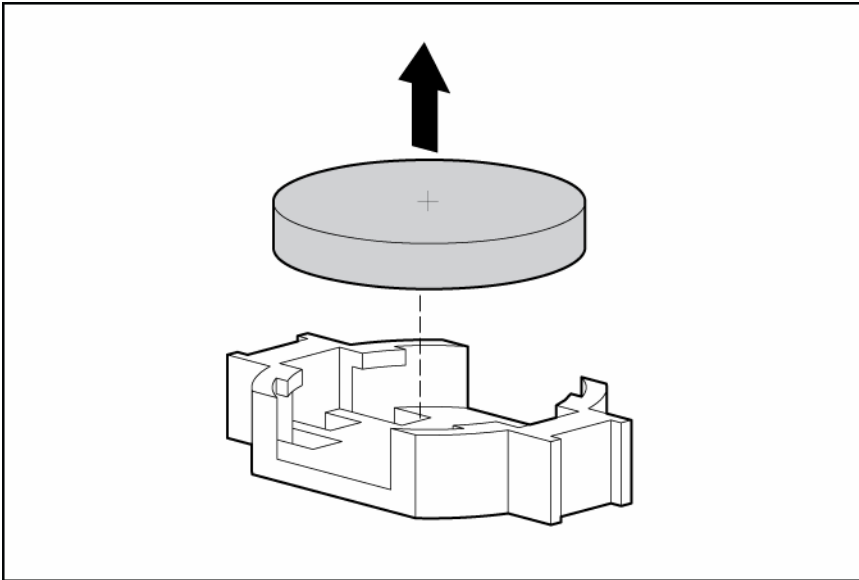
📝 **IMPORTANT:** Replacing the system board battery resets the system ROM to its default configuration. After replacing the battery, reconfigure the system through RBSU.

To replace the component, reverse the removal procedure.

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

System board

To remove the component:

1. Power down the server ("Powering down the server" on page 11).
2. Extend or remove the server from the rack ("Extending the server from the rack" on page 12).
3. Remove the access panel ("Access panel" on page 14).
4. Remove the PCI riser board assembly ("PCI riser board assembly" on page 20).

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

5. Remove the processor fan module ("Processor fan assembly" on page 19).
6. Remove any DIMMs ("Single- and dual-rank DIMMs" on page 25).
7. Remove the processors ("Processor" on page 26).
8. Disconnect all cables connected to the system board. For additional information, refer to "Server cabling (on page 31)."

9. Remove the system board.
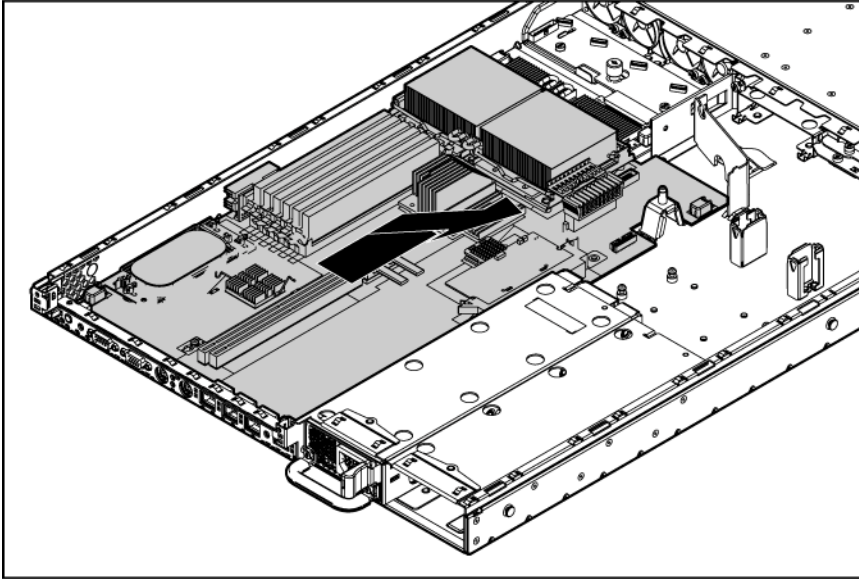
IMPORTANT: If replacing the system board or clearing NVRAM, you must re-enter the server serial number through RBSU.

To replace the component, reverse the removal procedure.

Re-entering the server serial number and product ID

After you replace the system board, you must re-enter the server serial number and the product ID.

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

2. Select the **Advanced Options** menu.

3. Select **Serial Number**. The following warning is displayed:

```
Warning: The serial number should ONLY be modified by qualified service
personnel. This value should always match the serial number located on
the chassis.
```

4. Press the **Enter** key to clear the warning.

5. Enter the serial number.

6. Select **Product ID**. The following warning is displayed.

```
Warning: The Product ID should ONLY be modified by qualified service
personnel. This value should always match the Product ID located on the
chassis.
```

7. Enter the product ID and press the **Enter** key.

8. Press the **Esc** key to close the menu.

9. Press the **Esc** key to exit RBSU.

10. Press the **F10** key to confirm exiting RBSU. The server will automatically reboot.

Server cabling

In this section

Cabling overview

This section provides guidelines that help you make informed decisions about cabling the server and hardware options to optimize performance.

For information on cabling peripheral components, refer to the white paper on high-density deployment at the HP website (http://www.hp.com/products/servers/platforms).

Server cable routing

⚠ **CAUTION:** When routing cables, always be sure that the cables are not in a position where they can be pinched or crimped.
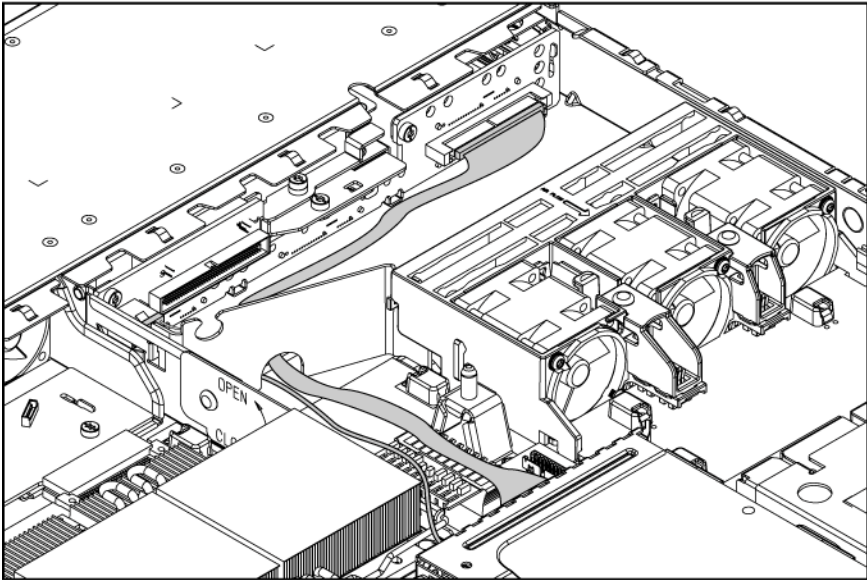
Server cable routing for SAS HBA

⚠ **CAUTION:** When routing cables, always be sure that the cables are not in a position where they can be pinched or crimped.

Diagnostic tools

In this section

SmartStart software

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

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

- Configuring hardware using embedded configuration utilities, such as RBSU and ORCA
- Preparing the system for installing "off-the-shelf" versions of leading operating system software
- Installing optimized server drivers, management agents, and utilities automatically with every assisted installation
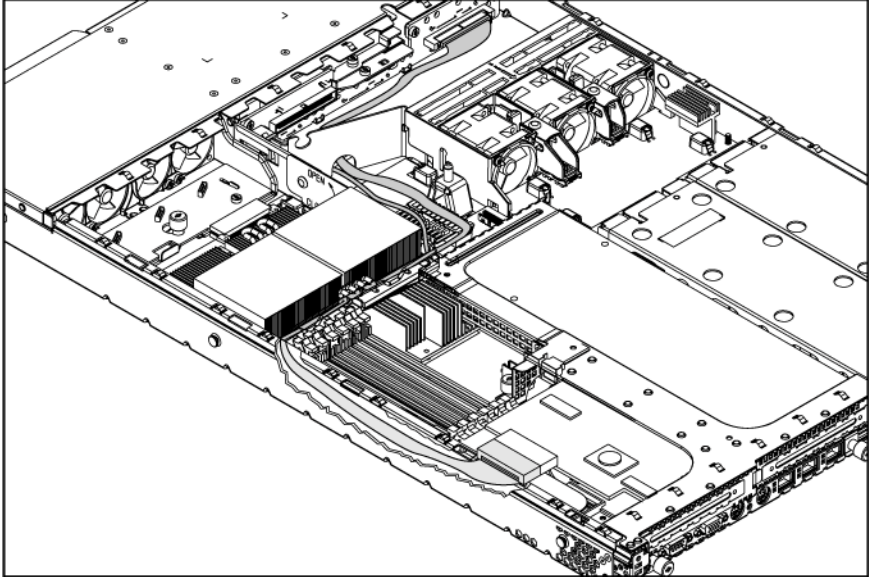- Testing server hardware using the Insight Diagnostics Utility ("HP Insight Diagnostics" on page 36)
- Installing software drivers directly from the CD. With systems that have internet connection, the SmartStart Autorun Menu provides access to a complete list of ProLiant system software.
- Enabling access to the Array Configuration Utility, Array Diagnostic Utility, and Erase Utility

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

SmartStart Scripting Toolkit

The SmartStart Scripting Toolkit is a server deployment product that delivers an unattended automated installation for high-volume server deployments. The SmartStart Scripting Toolkit is designed to support

ProLiant BL, ML, and DL servers. The toolkit includes a modular set of utilities and important documentation that describes how to apply these new tools to build an automated server deployment process.

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

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

HP Instant Support Enterprise Edition

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

For more information on ISEE, refer to the HP website (http://www.hp.com/hps/hardware/hw_enterprise.html).

To download HP ISEE, visit the HP website (http://www.hp.com/hps/hardware/hw_downloads.html).

For installation information, refer to the HP ISEE Client Installation and Upgrade Guide (ftp://ftp.hp.com/pub/services/hardware/info/isee_client.pdf).

Option ROM Configuration for Arrays

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

The utility also provides support for the following functions:

- Reconfiguring one or more logical drives
- Viewing the current logical drive configuration
- Deleting a logical drive configuration
- Setting the controller to be the boot controller

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

For more information regarding array controller configuration, refer to the controller user guide.

For more information regarding the default configurations that ORCA uses, refer to the *HP ROM-Based Setup Utility User Guide* on the Documentation CD.

HP ROM-Based Setup Utility

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

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

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

ROMPaq utility

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

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

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

Integrated Management Log

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

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

- From within HP SIM ("HP Systems Insight Manager" on page 36)
- From within Survey Utility
- From within operating system-specific IML viewers
    - For NetWare: IML Viewer
    - For Windows®: IML Viewer
    - For Linux: IML Viewer Application
- From within the iLO user interface
- From within HP Insight Diagnostics (on page 36)

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

System Online ROM flash component utility

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

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

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

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

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

Integrated Lights-Out technology

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

Using iLO, you can:

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

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

Automatic Server Recovery

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

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

HP Systems Insight Manager

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

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

For additional information, refer to the Management CD in the HP ProLiant Essentials Foundation Pack or the HP SIM website (http://www.hp.com/go/hpsim).

HP Insight Diagnostics

HP Insight Diagnostics is a proactive server management tool, available in both offline and online versions, that provides diagnostics and troubleshooting capabilities to assist IT administrators who verify server installations, troubleshoot problems, and perform repair validation.

HP Insight Diagnostics Offline Edition performs various in-depth system and component testing while the OS is not running. To run this utility, launch the SmartStart CD.

HP Insight Diagnostics Online Edition is a web-based application that captures system configuration and other related data needed for effective server management. Available in Microsoft® Windows® and Linux versions, the utility helps to ensure proper system operation.

For more information or to download the utility, refer to the HP website
(http://www.hp.com/servers/diags).

USB support

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

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

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

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

Internal USB functionality

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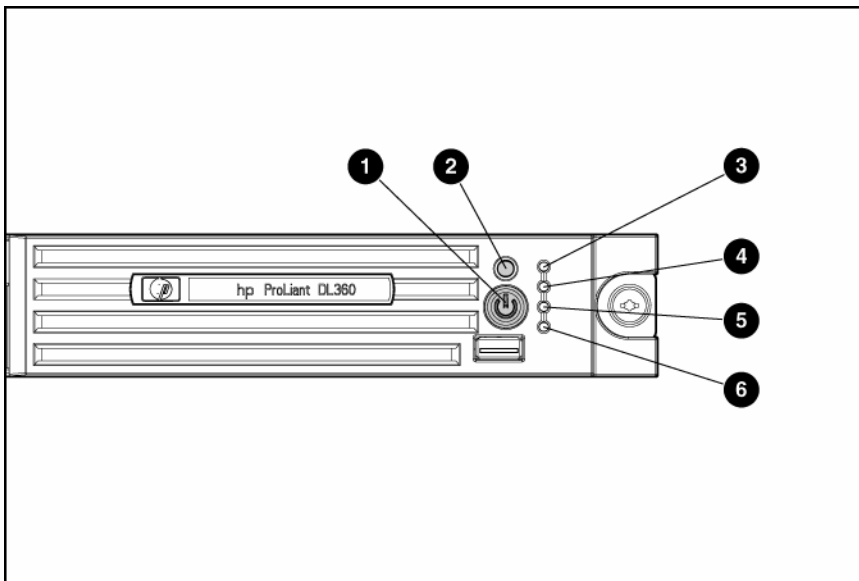the rack and physical access to secure data.

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

Server component identification

In this section

Front panel LEDs and buttons

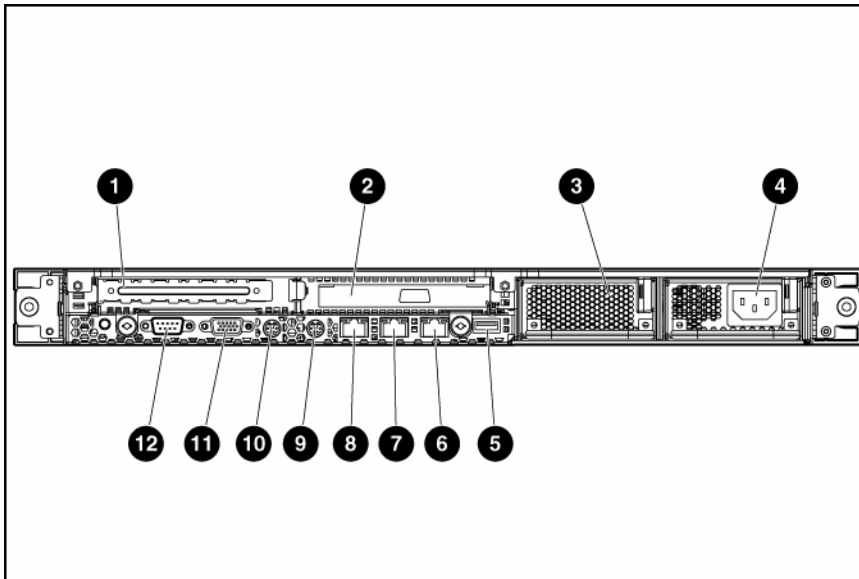| Item	Description	Status
1	Power On/Standby button and system power LED	Green = System is on. Amber = System is shut down, but power is still applied. Off = Power cord is not attached, power supply failure has occurred, no power supplies are installed, facility power is not available, or the DC-to-DC converter is not installed.

Item	Description	Status
2	UID button/LED	Blue = Identification is activated.
		Flashing blue = System is being remotely managed.
		Off = Identification is deactivated.
3	Internal health LED	Green = System health is normal.
		Amber = System is degraded. To identify the component in a degraded state, refer to "System board LEDs (on page 43)."
		Red = System critical. To identify the component in a critical state, refer to "System board LEDs (on page 43)."
		Off = System health is normal (when in standby mode).
4	External health LED (power supply)	Green = Power supply health is normal.
		Amber = Power redundancy failure occurred.
		Off = Power redundancy failure has occurred. When the server is in standby mode, power supply health is normal.
5	NIC 1 link/activity LED	Green = Network link exists.
		Flashing green = Network link and activity exist.
		Off = No link to network exists.
		If power is off, view the LEDs on the RJ-45 connector for status by referring to the rear panel LEDs ("Rear panel LEDs and buttons" on page 41).
6	NIC 2 link/activity LED	Green = Network link exists.
		Flashing green = Network link and activity exist.
		Off = No link to network exists.
		If power is off, the front panel LED is not active. View the LEDs on the RJ-45 connector for status by referring to the rear panel LEDs ("Rear panel LEDs and buttons" on page 41).

Front panel components
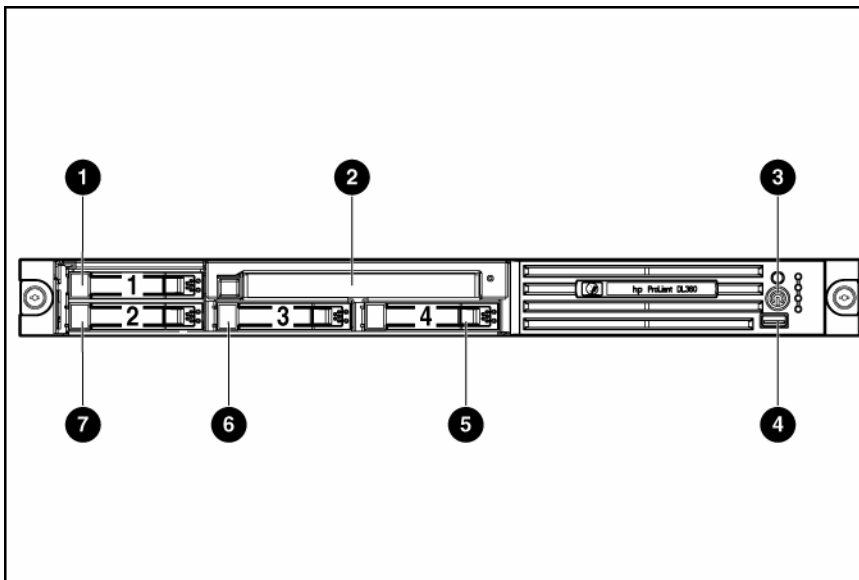
Item	Description
1	Hard drive bay 1
2	Multi-bay (DVD/CD/Diskette) drive
3	Power On/Standby button and system power LED
4	Front USB port
5	Hard drive bay 4
6	Hard drive bay 3
7	Hard drive bay 2

# Rear panel components

Item	Description
1*	PCI-X expansion slot 1, 64-bit/133-MHz 3.3V (optional PCI Express slot 1, x8)
2*	PCI-X expansion slot 2, 64-bit/133-MHz 3.3V (optional PCI Express slot 2, x8)
3	Power supply bay 2
4	Power supply bay 1 (populated)
5	Rear USB connector
6	10/100/1000 NIC 2
7	10/100/1000 NIC 1
8	iLO management port
9	Mouse connector
10	Keyboard connector
11	Video connector
12	Serial connector

* Depending on the model of the server, slot 1 or slot 2 will be pre-populated with a storage controller. If the expansion slot is populated with the standard PCI-X storage controller card, it should not be converted to PCI Express.

Rear panel LEDs and buttons
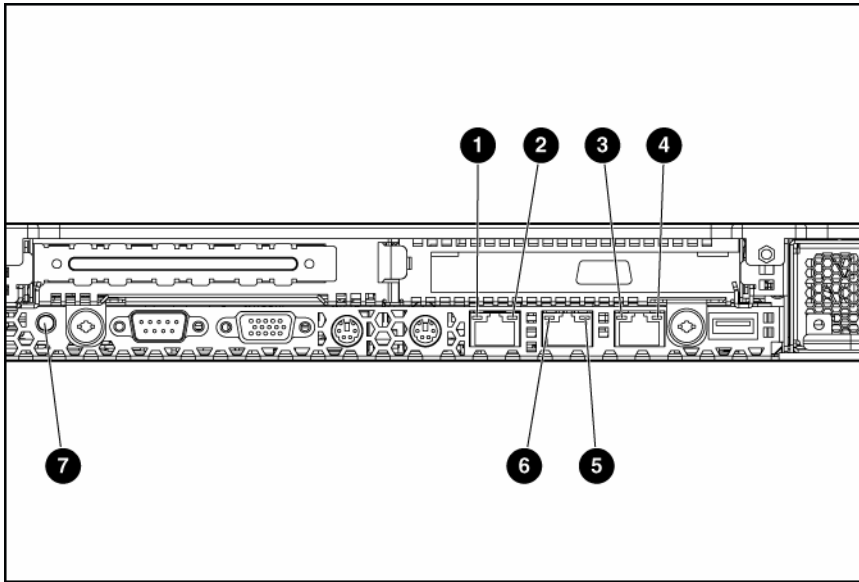
Item	Description	Status
1	iLO activity	Green = Activity exists. Flashing green = Activity exists. Off = No activity exists.
2	iLO link	Green = Link exists. Off = No link exists.
3	10/100/1000 NIC 2 activity	Green = Link exists. Flashing green = Activity exists. Off = No link exists.
4	10/100/1000 NIC 2 link	Green = Link exists. Off = No link exists.
5	10/100/1000 NIC 1 link	Green = Link exists. Off = No link exists.
6	10/100/1000 NIC 1 activity	Green = Activity exists. Flashing green = Activity exists. Off = No activity exists.
7	Unit Identification button/LED	Blue = Identification is activated. Flashing blue = System is being managed remotely. Off = Identification is deactivated.

System board components
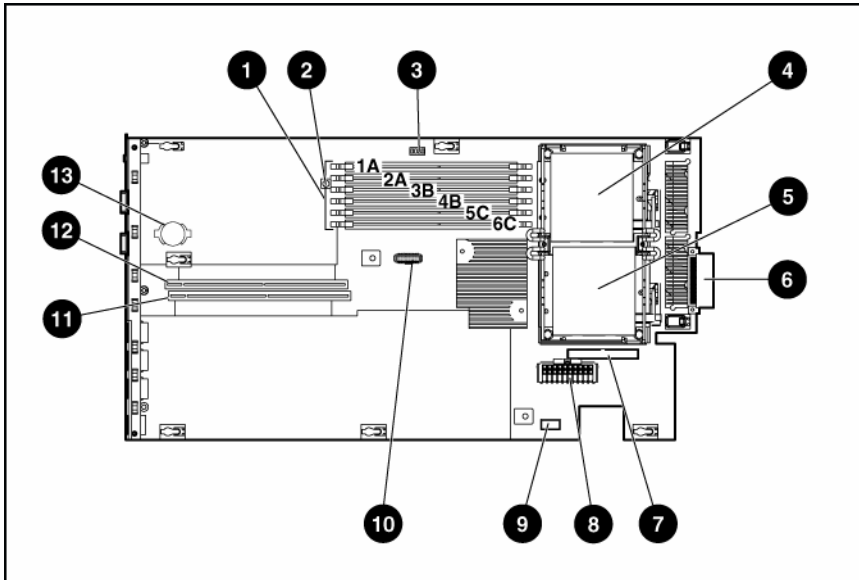
Item	Description
1	DIMM slots (1-6)
2	NMI switch
3	System maintenance switch (SW2)
4	Processor socket 1
5	Processor socket 2
6	Processor zone fan module connector
7	Optical device/multi-bay connector
8	Power supply connector
9	Power supply signal connector
10	Remote management connector
11	PCI riser board assembly connector (for slot 2 riser board)
12	PCI riser board assembly connector (for slot 1 riser board)
13	System battery

System maintenance switch

| Position	Default	Function
S1	Off	Off = iLO security is enabled. On = iLO security is disabled.
S2	Off	Off = System configuration can be changed. On = System configuration is locked.
S3	Off	Reserved
S4	Off	Reserved

Position	Default	Function
S5	Off	Off = Power-on password is enabled. On = Power-on password is disabled.
S6	Off	Off = No function On = ROM treats the system configuration as invalid.
S7, S8	Off, Off	Debug LEDs

NMI switch

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

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

System board LEDs
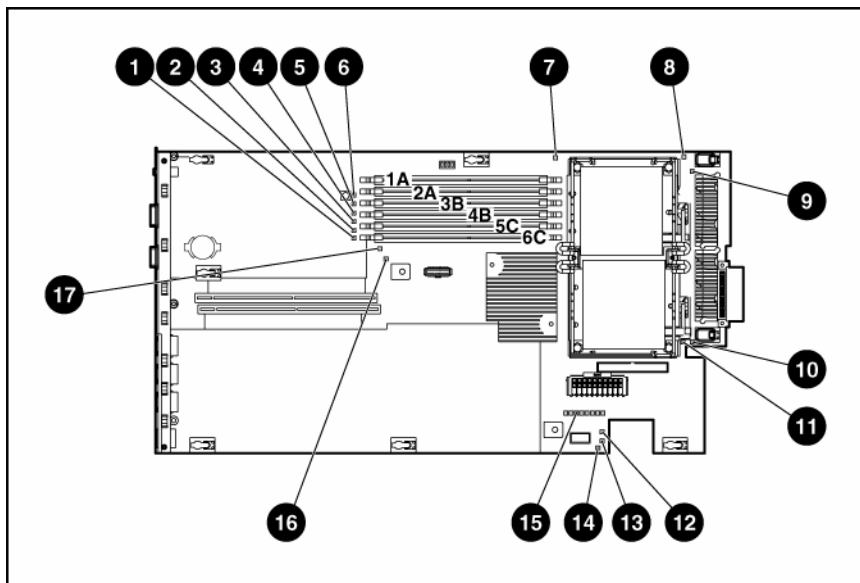
Item	LED description	Status
1	DIMM 6C failure	Amber = DIMM has failed. Off = DIMM is operating normally.
2	DIMM 5C failure	Amber = DIMM has failed. Off = DIMM is operating normally.
3	DIMM 4B failure	Amber = DIMM has failed. Off = DIMM is operating normally.

| Item	LED description	Status
4	DIMM 3B failure	Amber = DIMM has failed. Off = DIMM is operating normally
5	DIMM 2A failure	Amber = DIMM has failed. Off = DIMM is operating normally.
6	DIMM 1A failure	Amber = DIMM has failed. Off = DIMM is operating normally
7	Overtemperature	Amber = System has reached cautionary or critical temperature level. Off = Temperature is OK.
8	Processor 1 failure	Amber = Processor has failed. Off = Processor is operating normally.
9	PPM 1 failure	Amber = PPM has failed. Off = PPM is operating normally.
10	PPM 2 failure	Amber = PPM has failed. Off = PPM is operating normally
11	Processor 2 failure	Amber = Processor has failed. Off = Processor is operating normally.
12	Power supply signal connector interlock failure	Amber = Power supply signal cable is not connected. Off = Power supply signal cable is connected.
13	Standby power good	Green = Auxiliary power is applied. Off = Auxiliary power is not applied.
14	Power supply fan module failure	Amber = One fan in this module has failed. Red = Multiple fans in this module have failed. Off = All fans in this module are operating normally.
15	System diagnostic	Refer to the *HP Remote Lights-Out Edition II User Guide* on the Documentation CD.
16	Online spare memory	Amber = Failover has occurred. Online spare memory is in use. Green = Online spare memory is enabled, but not in use. Off = Online spare memory is disabled.
17	Riser interlock	Amber = PCI riser assembly is not seated. Off = PCI riser assembly is seated.

System LEDs and internal health LED combinations

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

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

| System LED and color	Internal Health LED color	Status
Processor failure, socket X (amber)	Red	One or more of the following conditions may exist: • Processor in socket X has failed. • Processor in socket X failed over to the offline spare. • Processor X is not installed in the socket. • Processor X is unsupported. • ROM detects a failed processor during POST.
	Amber	Processor in socket X is in a pre-failure condition.
Processor failure, both sockets (amber)	Red	Processor types are mismatched.
PPM failure (amber)	Red	PPM has failed.
DIMM failure, slot X (amber)	Red	• DIMM in slot X has failed. • DIMM in slot X is an unsupported type, and no valid memory exists in another bank.
	Amber	• DIMM in slot X has reached single-bit correctable error threshold. • DIMM in slot X is in a pre-failure condition. • DIMM in slot X is an unsupported type, but valid memory exists in another bank.
DIMM failure, all slots in one bank (amber)	Red	No valid or usable memory is installed in the system.
Overtemperature (amber)	Amber	The health driver has detected a cautionary temperature level.
	Red	The server has detected a hardware critical temperature level.
Riser interlock (amber)	Red	The PCI riser board assembly is not seated.
Online spare memory (amber)	Amber	Bank X failed over to the online spare memory bank.
Power converter module interlock (amber)	Red	The power converter module is not seated.
Fan module (amber)	Amber	A redundant fan has failed.
Fan module (red)	Red	The minimum fan requirements are not being met in one or more of the fan modules. One or more fans have failed or are missing.
Power supply signal interlock (amber)	Red	The power supply signal cable is not connected to the system board.

Internal USB connector

The front internal USB connector is located in the processor zone fan module.
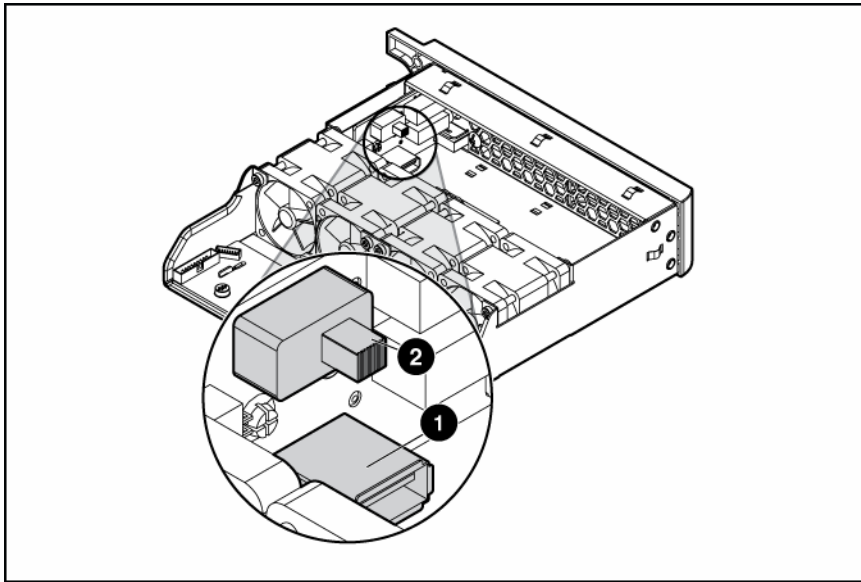
| Item	Description
1	USB connector
2	Front internal/external selector switch

For more information, refer to "Internal USB functionality (on page 37)."

SAS and SATA device numbers
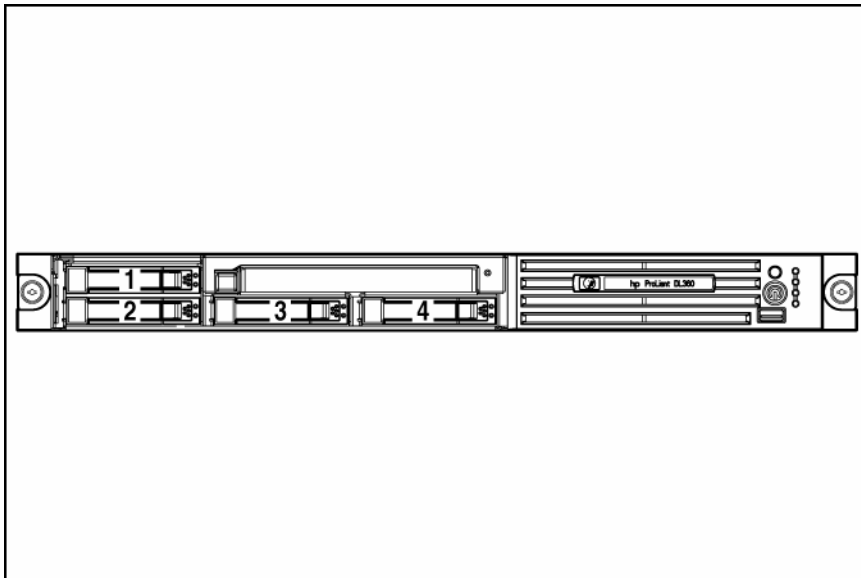
Identifying the status of a hard drive

When a drive is configured as a part of an array and connected to a powered-up controller, the condition of the drive can be determined from the illumination pattern of the hard drive status lights (LEDs).
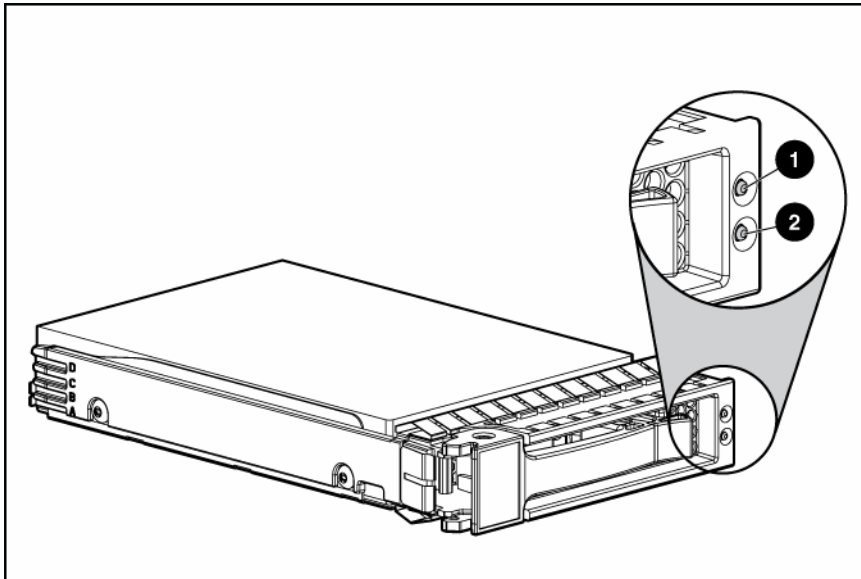
SAS and SATA hard drive LED combinations

1 - Fault/UID LED (amber/blue)	2 - Online/Activity LED (green)	Interpretation
Flashing amber and blue	On, off, or flashing	The drive has failed, or a predictive failure alert has been received for this drive; it also has been selected by a management application.
Blue	On, off, or flashing	The drive is operating normally, and it has been selected by a management application.
Flashing amber	On	A predictive failure alert has been received for this drive. Replace the drive as soon as possible.
Off	On	The drive is online, but it is not active currently.
Flashing amber	Flashing	**Do not remove the drive. Removing a drive may terminate the current operation and cause data loss.** The drive is part of an array that is undergoing capacity expansion or stripe migration, but a predictive failure alert has been received for this drive. To minimize the risk of data loss, do not replace the drive until the expansion or migration is complete.
Off	Flashing	**Do not remove the drive. Removing a drive may terminate the current operation and cause data loss.** The drive is rebuilding, or it is part of an array that is undergoing capacity expansion or stripe migration.
Flashing amber	Flashing	The drive is active, but a predictive failure alert has been received for this drive. Replace the drive as soon as possible.

1 - Fault/UID LED (amber/blue)	2 - Online/Activity LED (green)	Interpretation
Off	Flashing	The drive is active, and it is operating normally.
Amber	Off	A critical fault condition has been identified for this drive, and the controller has placed it offline. Replace the drive as soon as possible.
Flashing amber	Flashing	A predictive failure alert has been received for this drive. Replace the drive as soon as possible.
Off	Off	The drive is offline, a spare, or not configured as part of an array.

Fan module locations
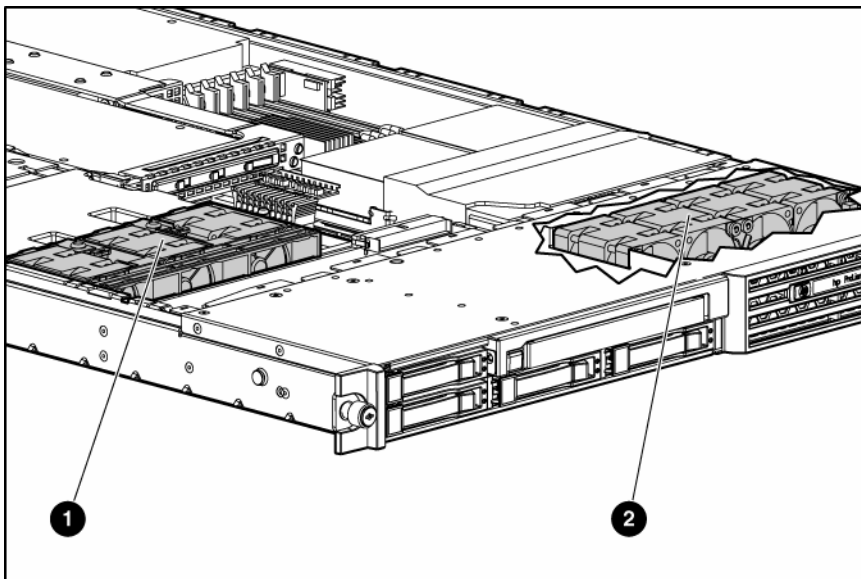
Item	Description
1	Power supply zone fan module
2	Processor zone fan module

Processor zone fan module LED
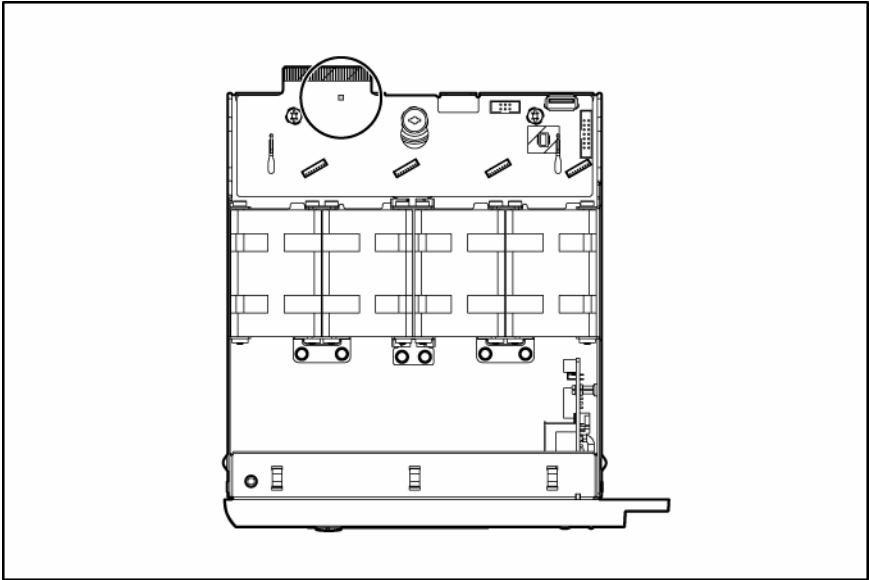
Status
Amber = One fan in this module has failed.
Red = Multiple fans in this module have failed.
Off = All fans in this module are operating normally.

For power supply zone fan module LED information, refer to "System board LEDs (on page 43)."

Specifications

In this section

Server specifications

NOTE: The Intel® Low Voltage Xeon™ processor requires 55 W instead of 110 W as required by standard Intel® Xeon™ processors.

Specification	Value
Dimension	
Height	4.32 cm (1.70 in)
Depth	69.22 cm (27.25 in)
Width	42.62 cm (16.78 in)
Weight (maximum)	16.78 kg (37 lb)
Weight (no drives installed)	12.47 kg (27.5 lb)
Input requirement	
Rated input voltage	100 VAC to 240 VAC
Rated input frequency	50 Hz to 60 Hz
Rated input current	6.0 A (110 V) to 3.0 A (220 V)
Rated input power	580 W
BTUs per hour	1990
Power supply output	
Rated steady-state power	460 W

Environmental specifications

Specification	Value
Temperature range*	
Operating	10°C to 35°C (50°F to 95°F)
Shipping	-40°C to 70°C (-40°F to 158°F)

Specification	Value
Maximum wet bulb temperature	28°C (82.4°F)
Relative humidity (noncondensing)**	
Operating	10% to 90%
Non-operating	5% to 95%

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

** Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage corresponds to a pressure minimum of 70 KPa.

Hot-plug power supply calculations

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

DDR2 SDRAM DIMM specifications

📝 **NOTE:** Use only 256-MB, 512-MB, 1-GB, or 2-GB; 72-bit wide; 2.5-V; PC2-3200 Registered ECC DDR2 SDRAM. Use HP DDR2 SDRAM only.

Item	Description
Size	256 MB, 512 MB, 1 GB, 2 GB
Width	72 bits
Upgrade requirement	Any combination of like-paired DDR2 SDRAM DIMMs that provide a minimum of 512 MB

1.44-MB diskette drive specifications

Specification	Value
Dimensions	
Height	12.7 mm (0.5 in)
Width	96 mm (3.8 in)
Depth	130 mm (5.1 in)
LEDs (front panel)	Green = On
Read/write capacity per diskette	
High density	1.44 MB
Low density	720 KB
Drives supported	1
Drive height	One-third height
Drive rotation	300 rpm
Transfer rate	
High	500 Kb/s

Specification	Value
Low	250 Kb/s
Bytes/sector	512
Sectors per track (high/low)	18/9
Tracks per side (high/low)	80/80
Access times	
Track-to-track (high/low)	3 ms/6 ms
Average (high/low)	169 ms/94 ms
Setting time	15 ms
Latency average	100 ms
Cylinders (high/low)	80/80
Read/write heads	2

CD-ROM drive specifications

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

Specification	Value
Type	Semiconductor laser GaAs
Wave length	700 ± 25 nm
Divergence angle	53.5° ± 1.5°
Output power	0.14 mW
Operating conditions	
Temperature	5°C to 45°C (41°F to 118°F)
Humidity	5% to 90%

DVD-ROM drive specifications

Specification	Value
Disk formats	DVD (single and double layer), DVD-5, DVD-9, DVD-10, DVD-R, CD-ROM Mode 1 & 2, CD-DA, CD-XA (Mode 2, Form 1 & 2), CD-I (Mode 2, Form 1 & 2), CD-I ready, CD-Bridge, CD-R, PhotoCD (single and multi-session)
Capacity	4.7 GB (DVD-5), 8.5 GB (DVD-9), 9.4 GB (DVD10), 550 Mb (Mode 1, 12 cm), 640 Mb (Mode 2, 12 cm), 180 Mb (8 cm)
Block size	2352 bytes (mode 0) 2352, 2340, 2336, 2048 bytes (mode 1) 2352, 2340, 2336, 2048 bytes (mode 2) 2048 bytes (DVD)
Dimensions	
Height	12.7 mm (0.50 in)
Depth	132.08 mm (5.20 in)
Width	132.08 mm (5.20 in)
Weight	0.34 kg (0.75 lb)
Data transfer rate	
Sustained	4463 - 10,800 KB/s (8X CAV DVD mode), 150 KB/s (sustained 1X CD-ROM), 1552 3600 KB/s (24X CAV CD-ROM)
Burst	16.6 MB/s with DMA support
Access times (typical)	
Full stroke	<200 ms CD <300 ms DVD
Random	<110 ms CD <180 ms DVD
Diameter	12 cm, 8 cm (4.70 in, 3.15 in)
Thickness	1.2 mm (0.05 in)
Track pitch	0.74 μm (3.15 $\times 10^{-7}$ in) DVD-ROM 1.6 μm (6.3 $\times 10^{-7}$ in) CD-ROM
Cache/buffer	128 KB
Startup time	< 10 s
Stop time	< 5 s (single); < 30 s (multisession)
Laser parameters	

Specification	Value
Type	Semiconductor laser GaAs
Wave length	700 ± 25 nm
Divergence angle	53.5° ± 1.5°
Output power	0.14 mW
Operating conditions	
Temperature	5°C to 45°C (41°F to 118°F)
Humidity	5% to 90%

SAS and SATA hard drive specifications

Item	36-GB SAS drive	72-GB SAS drive	60-GB SATA drive
Capacity	36,420 MB	73,408 MB	60,022 MB
Height	15 mm	15 mm	9 mm
Interface	SAS	SAS	Serial ATA
Transfer rate	3 GB/sec	3 GB/sec	1.5 GB/sec
Rotational speed	10,000 rpm	10,000 rpm	5,400 rpm
Bytes per sector	512	512	512
Logical blocks	71,132,960	143,374,737	117,231,408
Operating temperature	10°C to 35°C (50°F to 95°F)	10°C to 35°C (50°F to 95°F)	10°C to 35°C (50°F to 95°F)

Acronyms and abbreviations

ABEND

abnormal end

ASR

Automatic Server Recovery

DDR

double data rate

iLO

Integrated Lights-Out

IML

Integrated Management Log

NIC

network interface controller

NVRAM

non-volatile memory

ORCA

Option ROM Configuration for Arrays

PCI Express

peripheral component interconnect express

PCI-X

peripheral component interconnect extended

POST

Power-On Self Test

PPM

processor power module

RBSU

ROM-Based Setup Utility

SAS

serial attached SCSI

SDRAM

synchronous dynamic RAM

SIM

Systems Insight Manager

UID

unit identification

USB

universal serial bus

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V