HP ProLiant DL580 Generation 4 Server User Guide

Audience assumptions

This document is for the person who installs, administers, and troubleshoots servers and storage systems. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazards in products with hazardous energy levels.

Contents

Server component identification

In this section

Front panel components

Item	Description
1	Memory board or blank
2	Video connector
3	USB connectors (two)
4	Optional multibay drive or blank

Item	Description
5	DVD/CD-ROM drive
6	Hard drive bay
7	Processor module

Front panel LEDs and buttons
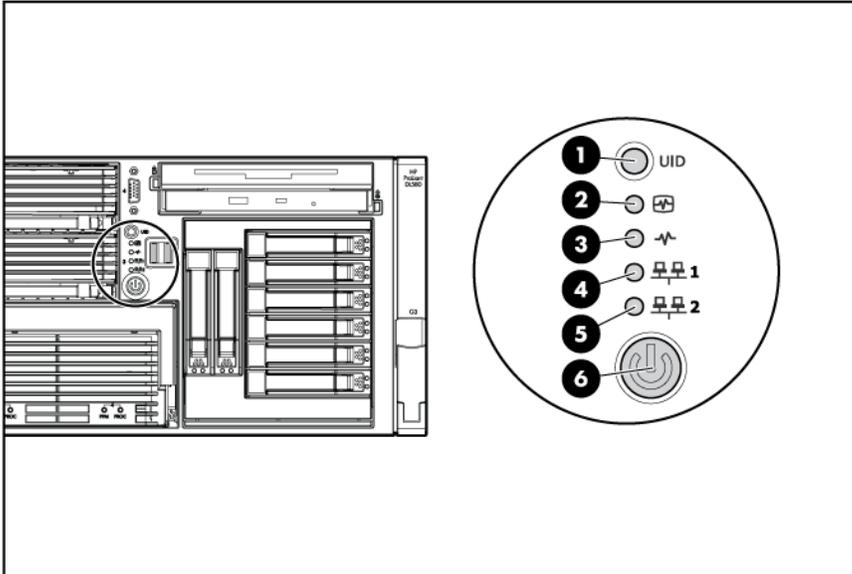
Item	Description	Status
1	UID switch and LED	Blue = Activated Flashing blue = Server being managed remotely Off = Deactivated
2	Internal system health LED	Green = Normal (system on) Flashing amber = System health is degraded Flashing red = System health is critical Off = Normal (system off)
3	External system health LED	Green = Normal (system on) Flashing amber = System health is degraded Flashing red = System health is critical Off = Normal (system off)
4	NIC 1 link/activity LED	Green = Linked to network Flashing green = Linked with activity on the network Off = No network connection
5	NIC 2 link/activity LED	Green = Linked to network Flashing green = Linked with activity on the network Off = No network connection
6	Power on/Standby button and LED	Amber = System has AC power and is in standby mode Green = System has AC power and is turned on Off = System has no AC power

Memory board components and LEDs

Error indicators remain illuminated when the system is powered off so that the status of the LEDs can still be seen. This behavior matches the behavior of all the other error indicators in the server.

The indicators are only cleared in the following situations:

- If the locking switch is locked after the board is reinstalled
- If the server is rebooted
- If the board is removed from the server

⚠ **CAUTION:** When the memory board locking switch is unlocked in a mode that does not support hot-add or hot-replace capabilities, audio alarms and visual alerts occur. Removing the memory board at this point causes server failure.

To end the audio alarms and visual alerts, move the memory board locking switch back to the locked position. This action does not result in data corruption or server failure.

If removal of a single memory board is required and it is the only memory board, power down the server and make the necessary memory changes.
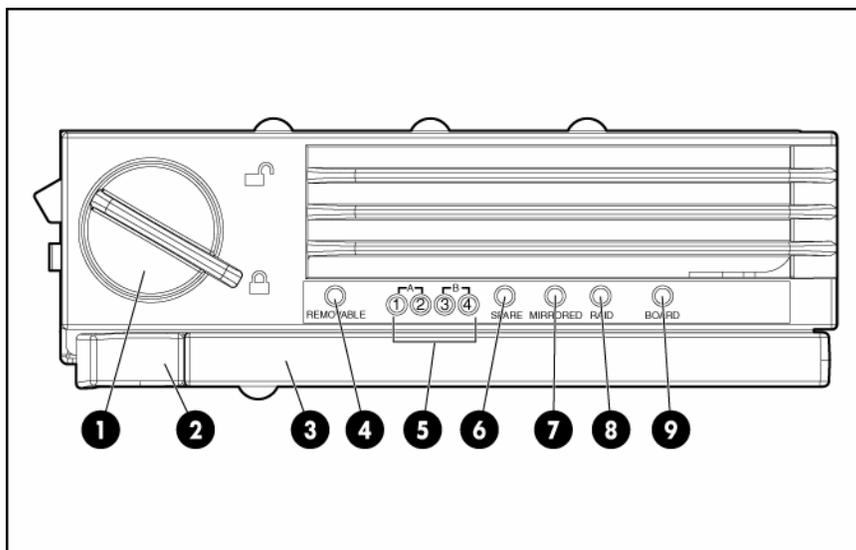
Item	Description	Status
1	Locking switch	N/A
2	Release latch	N/A
3	Ejector lever	N/A
4	Removable	Off = Do not remove memory board if server is powered on Green = Memory board can be safely removed
5	DIMM LEDs (1–4)	Off = Normal or DIMM not installed Amber = Uncorrectable error detected or correctable error threshold reached Flashing amber = DIMM configuration error

Item	Description	Status
6	Spare	Off = Board not online or board not configured for Online Spare Memory mode
		Amber = Correctable error threshold reached; server is in degraded Online Spare Memory mode
		Flashing amber = Memory configuration error*
		Green = Online Spare Memory mode
7	Mirrored	Off = Board not online or board not configured for Hot-Plug Mirrored Memory mode
		Amber = Server is in degraded Hot-Plug Mirrored Memory mode
		Flashing amber = Memory configuration error*
		Green = Hot-Plug Mirrored Memory mode
8	RAID	Off = Board not online or board not configured for Hot-Plug RAID Memory mode
		Amber = Server is in degraded Hot-Plug RAID Memory mode
		Flashing amber = Memory configuration error*
		Green = Hot-Plug RAID Memory mode
9	Board	Off = Power off or locking switch unlocked
		Amber = Memory error detected
		Flashing amber = Memory configuration error*
		Flashing green = Board is rebuilding
		Green = Normal

* AMP configuration errors occur when the current memory configuration is not valid for the configured AMP mode:

- If the mode selected is the desired mode, modify the DIMM or board configuration to support the desired mode. For more information, refer to "Memory options (on page 64, "Memory overview" on page 64)."
- If the mode selected is not the desired mode, run RBSU and change the AMP mode. For more information, refer to the section "HP ROM-Based Setup Utility (on page 84)."

NOTE: If the Spare, Mirrored, and RAID LEDs are off, the server is in Advanced ECC mode. Refer to "HP ROM-Based Setup Utility (on page 84)" for more information.

Processor module LEDs
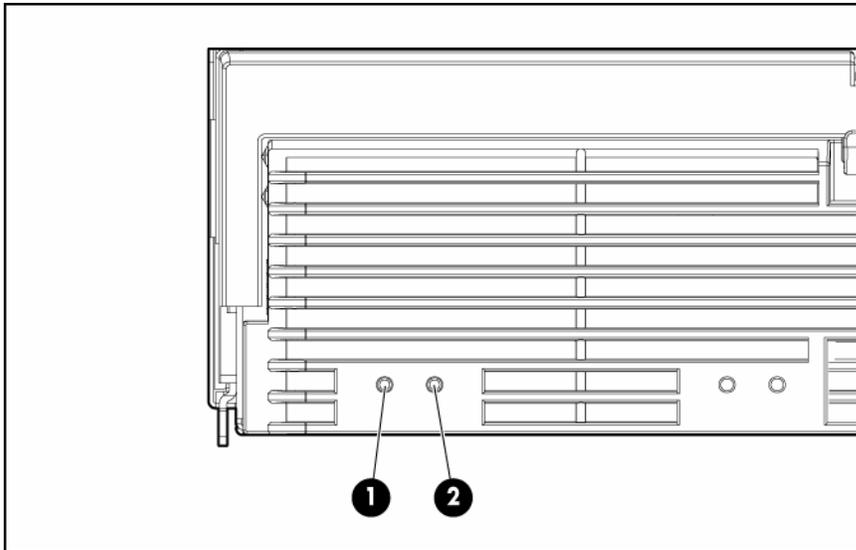
PPM LED (1)	Processor LED (2)	External health LED	Description
Off	Off	Off	One of the following conditions exist: • No AC power present • Normal
Off	Amber	Flashing amber	Pre-failure error threshold exceeded; LEDs will clear after the next reboot
Off	Amber	Flashing red	One or more of the following conditions exist: • The processor was replaced and the LEDs will clear after the next reboot • Processor failed
Off	Flashing amber	Flashing red	Processor configuration error detected
Amber	Off	Flashing red	PPM failed
Flashing amber	Off	Flashing red	One or more of the following conditions exist: • PPM not installed • PPM configuration error detected

Rear panel components
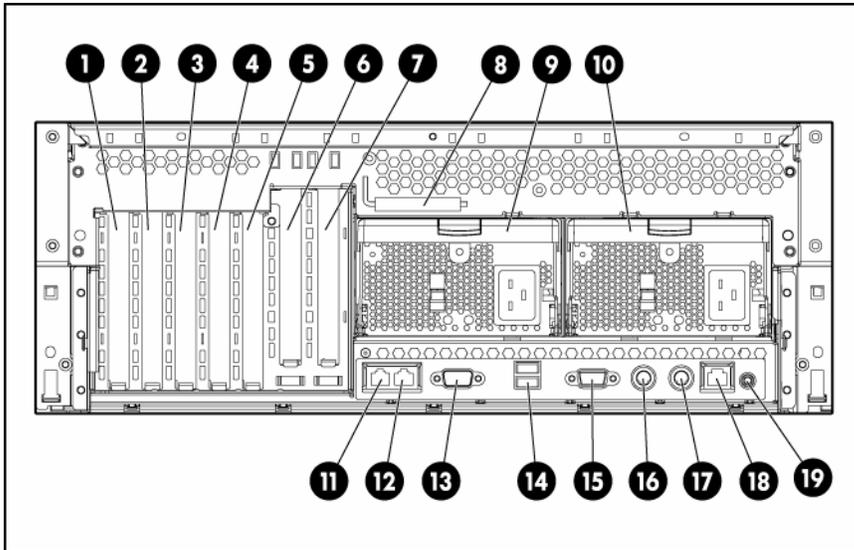
Item	Description	Item	Description
1	PCI Express non-hot-plug expansion slot 7	11	NIC connector 2
2	PCI Express non-hot-plug expansion slot 6	12	NIC connector 1
3	PCI Express non-hot-plug expansion slot 5	13	Serial connector
4	PCI Express non-hot-plug expansion slot 4	14	USB connectors
5	PCI-X non-hot-plug slot 3, 64-bit/133-MHz	15	Video connector
6	Optional PCI-X Hot Plug or optional PCI Express non-hot-plug expansion slot 2	16	Keyboard connector
7	Optional PCI-X Hot Plug or optional PCI Express non-hot-plug expansion slot 1	17	Mouse connector
8	T-15 Torx screwdriver	18	iLO 2 NIC
9	Optional power supply (redundant)	19	UID
10	Power supply (primary)	—	—

Rear panel LEDs and buttons
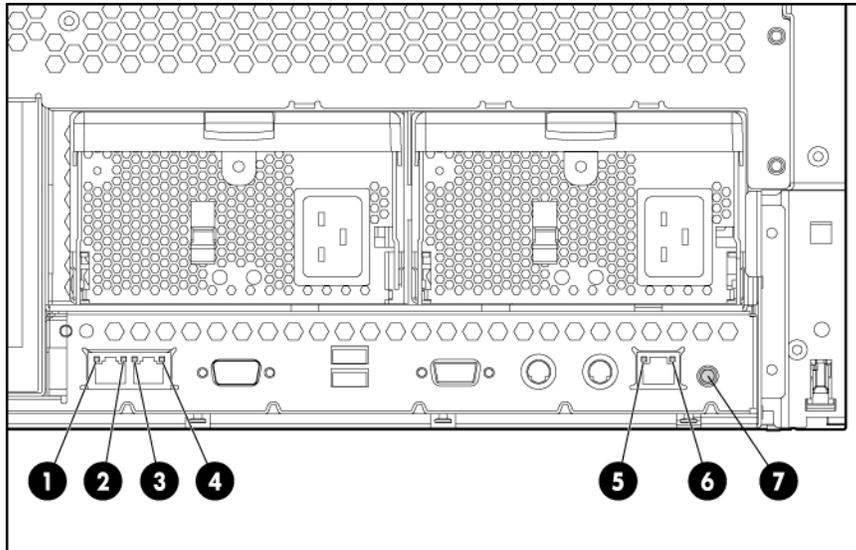
Item	Description	LED color	Status
1	NIC 1 Activity LED	Green	On or flashing = Network activity Off = No network activity
2	NIC 1 Link LED	Green	On = Linked to network Off = Not linked to network
3	NIC 2 Activity LED	Green	On or flashing = Network activity Off = No network activity
4	NIC 2 Link LED	Green	On = Linked to network Off = Not linked to network
5	iLO 2 NIC Activity LED	Green	On or flashing = Network activity Off = No network activity
6	iLO 2 NIC Link LED	Green	On = Linked to network Off = Not linked to network
7	UID LED	Blue	On = Activated Flashing = Server remotely managed Off = Deactivated

Power supply LEDs
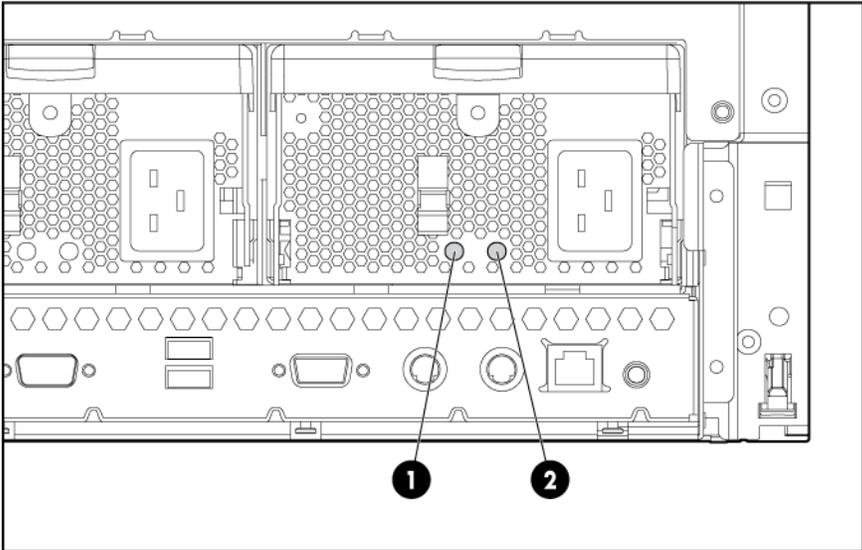
Fail LED 1 (amber)	Power LED 2 (green)	Description
Off	Off	No AC power to any power supply
Flashing	Off	Power supply failure (over current)
On	Off	No AC power to this power supply
Off	Flashing	• AC power present • Standby mode
Off	On	Normal

System board components
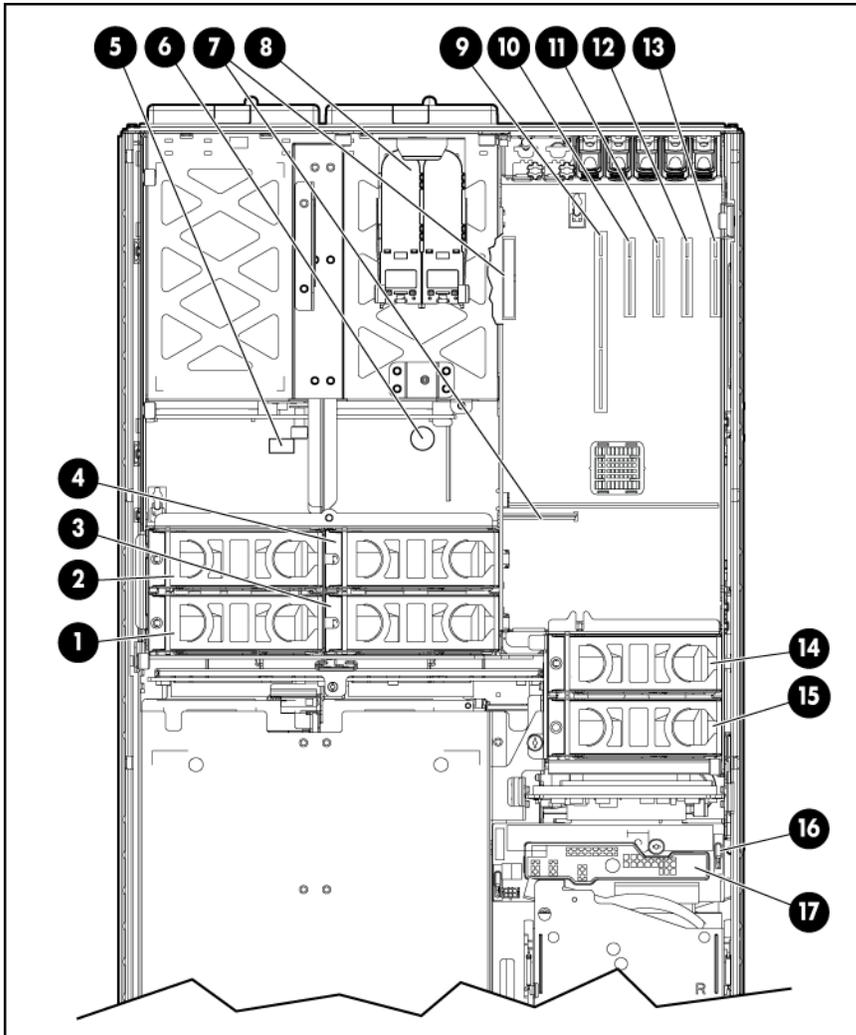
Item	Description	Item	Description
1	Fan 1	10	PCI Express non-hot-plug expansion slot 4
2	Fan 2	11	PCI Express non-hot-plug expansion slot 5
3	Fan 3	12	PCI Express non-hot-plug expansion slot 6
4	Fan 4	13	PCI Express non-hot-plug expansion slot 7
5	System maintenance switch	14	Fan 6
6	System battery	15	Fan 5

Item	Description	Item	Description
7	Connectors for one of the following: • PCI-X Hot Plug mezzanine option • PCI Express x4 mezzanine option • PCI Express x8 mezzanine option	16	Boot device selector switch (default = FLP TOP)
8	Battery packs and connectors for BBWC (optional)	17	Systems Insight Display
9	PCI-X non-hot-plug expansion slot 3, 64-bit/133-MHz	—	—

System maintenance switch

The system maintenance switch (SW1) is an eight-position switch that is used for system configuration. The default position for all eight positions is Off.

Position	Description	Function
S1	iLO 2 Security	Off = iLO 2 security is enabled On = iLO 2 security is disabled
S2	Configuration lock	Off = System configuration can be changed On = System configuration is locked
S3	Reserved	Reserved
S4	Reserved	Reserved
S5	Password protection override	Off = No function On = Clears power-on password and administrator password
S6	Invalidate configuration	Off = Normal On = Clears NVRAM
S7	Reserved	Reserved
S8	Reserved	Reserved

Boot device selector switch

The boot device selector switch setting determines the device access order of the multibay drives in the server. The default setting for the boot device selector switch is FLP TOP.

When the boot device selector switch is set to FLP TOP, the optical drive in the bottom bay is designated as the primary optical drive. The diskette drive in the top bay is bootable. The server cannot boot from a diskette drive in the bottom bay when the boot device selector switch is set to FLP TOP.

When the boot device selector switch is set to FLP BOT, the optical drive in the top bay is designated as the primary optical drive. The diskette drive in the bottom bay is bootable. The server cannot boot from a diskette drive in the top bay when the boot device selector switch is set to FLP BOT.

NOTE: If two optical drives are installed in the server, the server will first attempt to boot from the primary optical drive ("Boot device selector switch" on page 16). The boot device selector switch setting determines which drive is the primary optical drive.

Switch setting	Description
FLP TOP (default)	Diskette drive in top bay is bootable
	Primary optical drive in bottom bay is bootable
FLP BOT	Primary optical drive in top bay is bootable
	Diskette drive in bottom bay is bootable

Systems Insight Display LEDs

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

The amber Systems Insight Display LEDs are located on the media board. In normal operations, all of the LEDs are off unless one of the components fails.

NOTE: The system management driver must be installed for the internal health LED to provide pre-failure and warranty conditions.
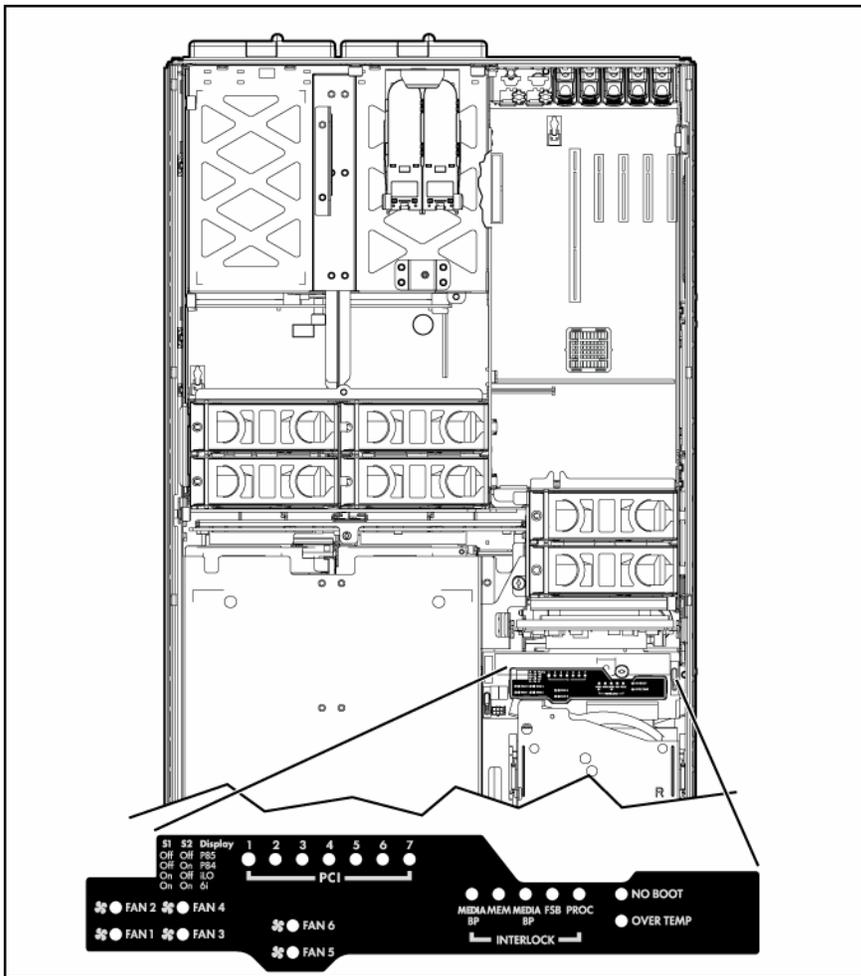
LED	Description
Fan X	One or more of the following conditions exist: • A fan is missing or not properly installed. • A fan failed.
PCI X	One or more of the following conditions exist: • A PCI address parity error was detected on the numbered PCI slot. • A PCI data parity error was detected on the numbered PCI slot.
MEDIA BP	The media backplane is missing or not properly installed.
MEM	A memory board is not properly installed.
MEM BP	A memory backplane is missing or not properly installed.
FSB	One or more of the following conditions exist: • A processor or PPM is missing or not properly installed. • An FSB configuration error was detected.
PROC	A processor is missing or not properly installed.
OVER TEMP	The internal temperature has exceeded operating levels.
NO BOOT	A "no boot" condition was detected.
P84	Switch set to display port 84 codes.

LED	Description
P85	Switch set to display port 85 codes.

see the *HP ProLiant DL580 Generation 4 Maintenance and Service Guide* on the Documentation CD for more information about troubleshooting using port 85 codes.

DIMM slot locations
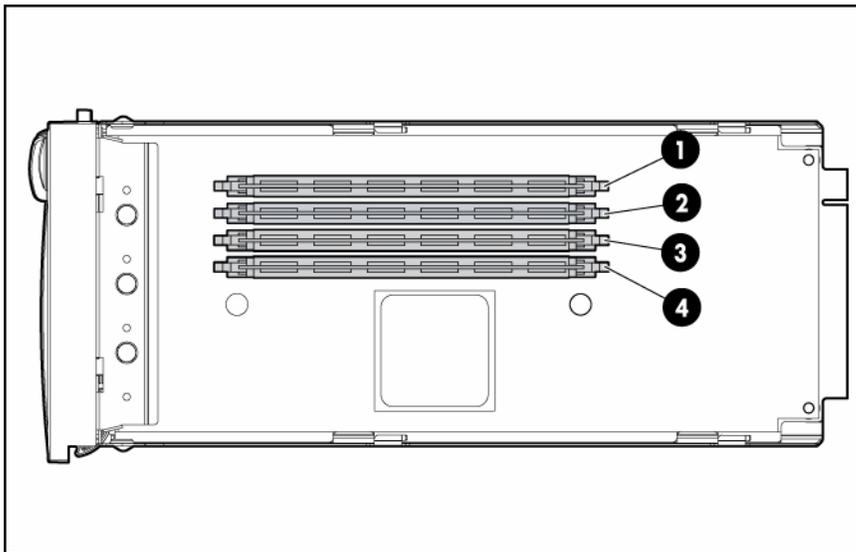
Item	Description	Bank
1	DIMM slot 1	A
2	DIMM slot 2	A
3	DIMM slot 3	B
4	DIMM slot 4	B

SATA or SAS drive numbers
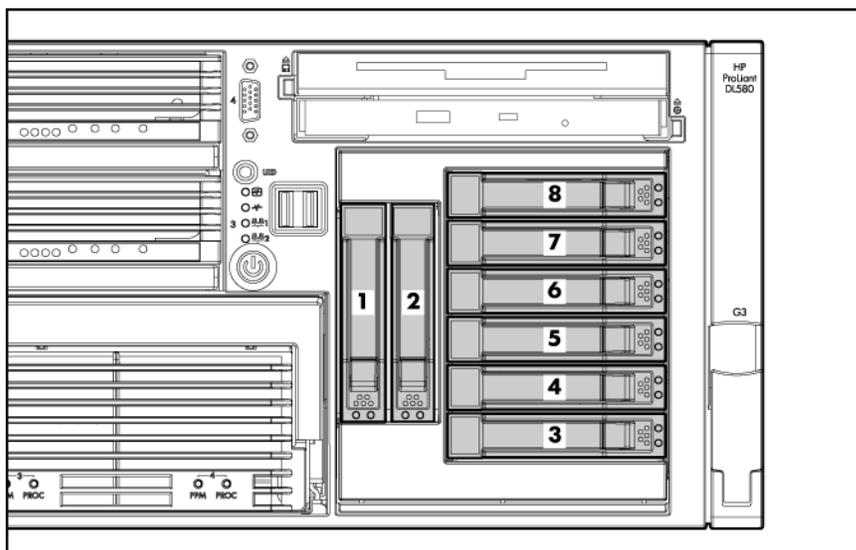
The server supports eight SAS or SATA hot-plug hard drives. See "SAS and SATA hard drive guidelines (on page)" for information about installing the hard drives.

SATA or SAS hard drive LEDs
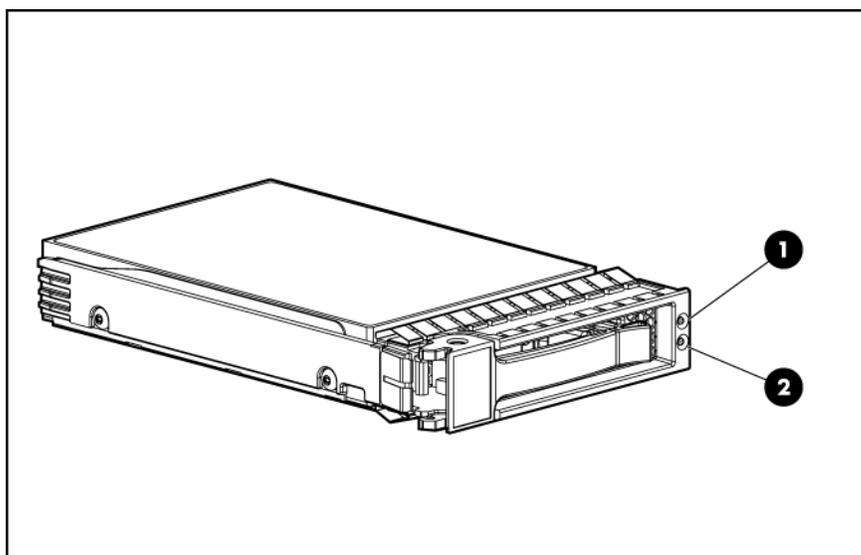
Item	LED description	Status
1	Fault/UID status	Amber = Drive failure
		Flashing amber = Fault-process activity
		Blue = Unit identification is active
		Off = No fault-process activity
2	Online/Activity status	Green = Drive activity
		Flashing green = High activity on the drive or drive is being configured as part of an array
		Off = No drive activity

SAS and SATA hard drive LED combinations

Online/activity LED (green)	Fault/UID LED (amber/blue)	Interpretation
On, off, or flashing	Alternating amber and blue	The drive has failed, or a predictive failure alert has been received for this drive; it also has been selected by a management application.
On, off, or flashing	Steadily blue	The drive is operating normally, and it has been selected by a management application.
On	Amber, flashing regularly (1 Hz)	A predictive failure alert has been received for this drive. Replace the drive as soon as possible.
On	Off	The drive is online, but it is not active currently.

Online/activity LED (green)	Fault/UID LED (amber/blue)	Interpretation
Flashing regularly (1 Hz)	Amber, flashing regularly (1 Hz)	**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.
Flashing regularly (1 Hz)	Off	**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 irregularly	Amber, flashing regularly (1 Hz)	The drive is active, but a predictive failure alert has been received for this drive. Replace the drive as soon as possible.
Flashing irregularly	Off	The drive is active, and it is operating normally.
Off	Steadily amber	A critical fault condition has been identified for this drive, and the controller has placed it offline. Replace the drive as soon as possible.
Off	Amber, flashing regularly (1 Hz)	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 locations

The server is shipped with six system fans. Each fan is hot-swappable and independently controlled. The fans are distributed into two zones to control thermal conditions within the server.

- Zone 1 contains four fans (three, plus one redundant) to control the temperature in the processor module area.
- Zone 2 contains two fans (one, plus one redundant) to control the temperature in the hard drive bay area.

This fan configuration allows the server to continue operating in non-redundant mode if a single fan fails in either zone. If the system detects two fan failures in the same zone, the server shuts down to avoid thermal damage.
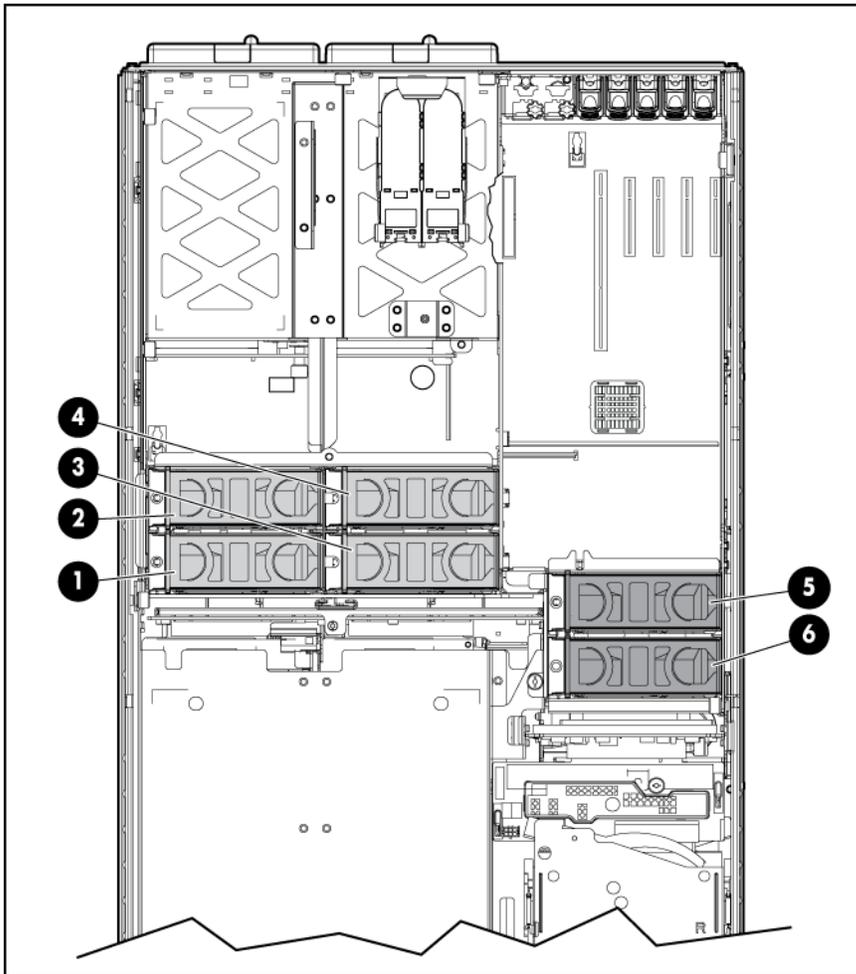
Item	Description	Zone
1	Fan 1	1
2	Fan 2	1
3	Fan 3	1
4	Fan 4	1
5	Fan 5	2
6	Fan 6	2

Hot-plug fan LEDs
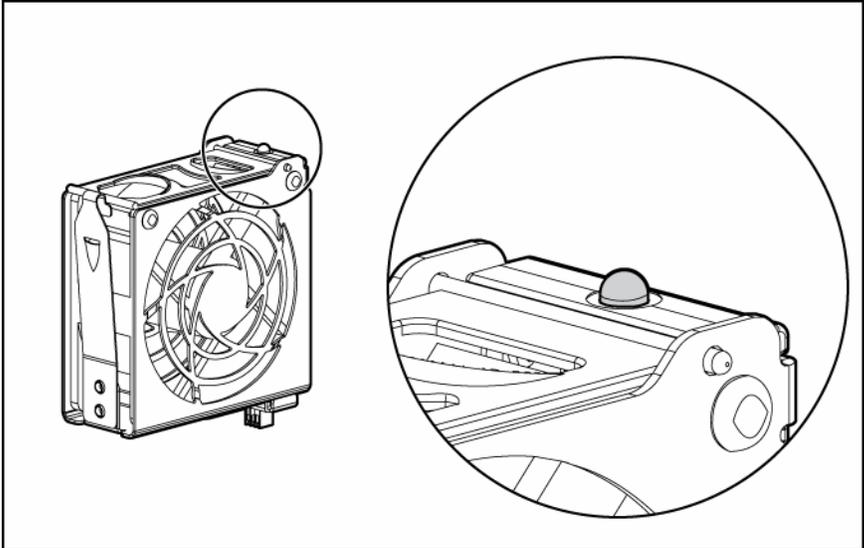
Status
Green = Operating normally
Amber = Failed
Off = No power

Server operations

In this section

Power up the server

To power up the server, press the Power On/Standby button.

Power 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. Shut down the OS as directed by the OS documentation.
2. Press the Power On/Standby button to place the server in standby mode. When the server enters standby power mode, the system power LED changes to amber.
3. Disconnect the power cords.

The system is now without power.

Extending the server from the rack

The design of the server enables you to access several components through the front of the server. Installing or accessing the following components will not require extending the server from the rack:

- Processors
- PPMs
- Memory boards
- DIMMs
- DVD drive
- Diskette drive
- Hard drives

To extend the server from the rack:

1. Release the two levers on the lower outside corners of the rack.
2. If the server is in a rack and in the shipping configuration, remove the two shipping screws directly behind the levers.
3. Extend the server on the rack rails until the server rail-release latches engage.

📝 **NOTE:** The release latches will lock into place when the rails are fully extended.
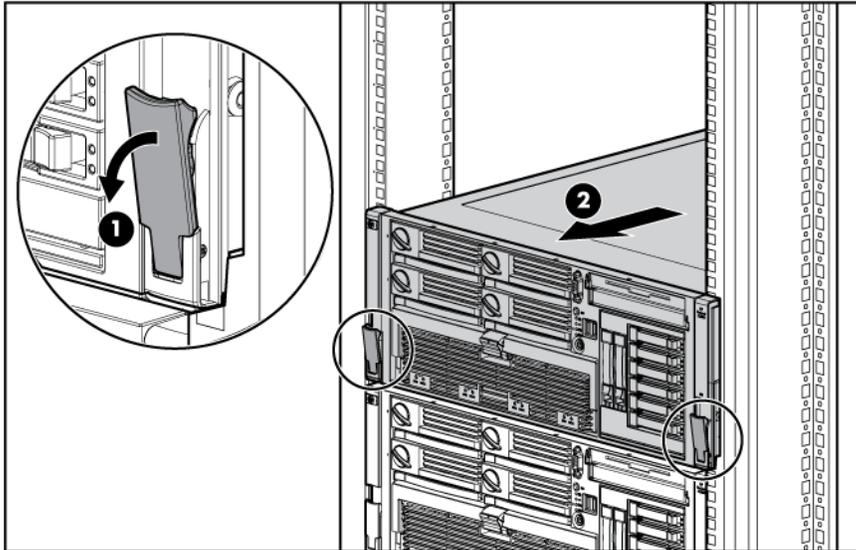
⚠ **WARNING: To reduce the risk of personal injury or equipment damage, be sure that the rack is adequately stabilized before extending a component from the rack.**

⚠ **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.**

4. After performing the installation or maintenance procedure, slide the server back into the rack by pressing the server rail-release latches.
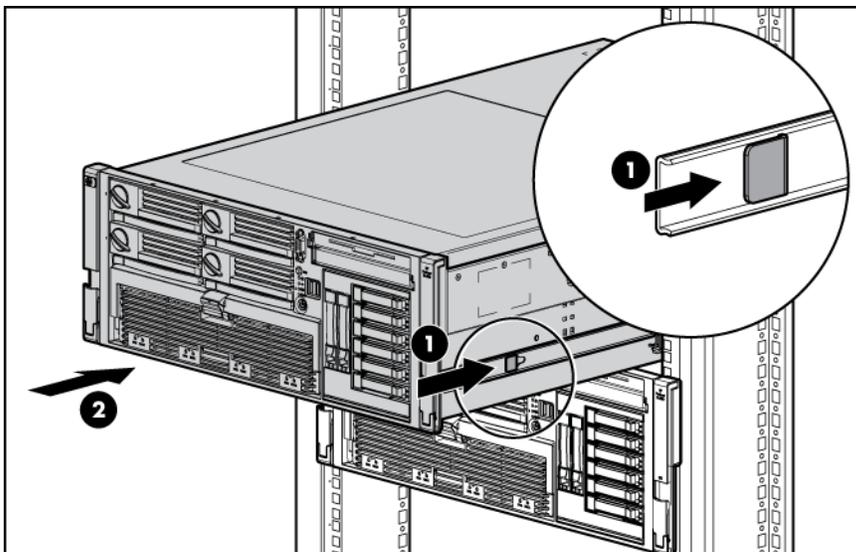
Removing the access panel

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

⚠ **CAUTION:** Do not operate the server for long periods 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.

📝 **IMPORTANT:** When removing the access panel to view the Systems Insight Display LEDs (on page 17), leave the server powered on. The Systems Insight Display LEDs are cleared when the server is powered off.

1. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 24).
2. If the locking latch is locked, use a Torx T-15 screwdriver to unlock the latch.

📝 **NOTE:** The T-15 Torx screwdriver is shipped with the server and can be located on the rear panel ("Rear panel components" on page 12).

3. Lift up on the hood latch, and remove the access panel.
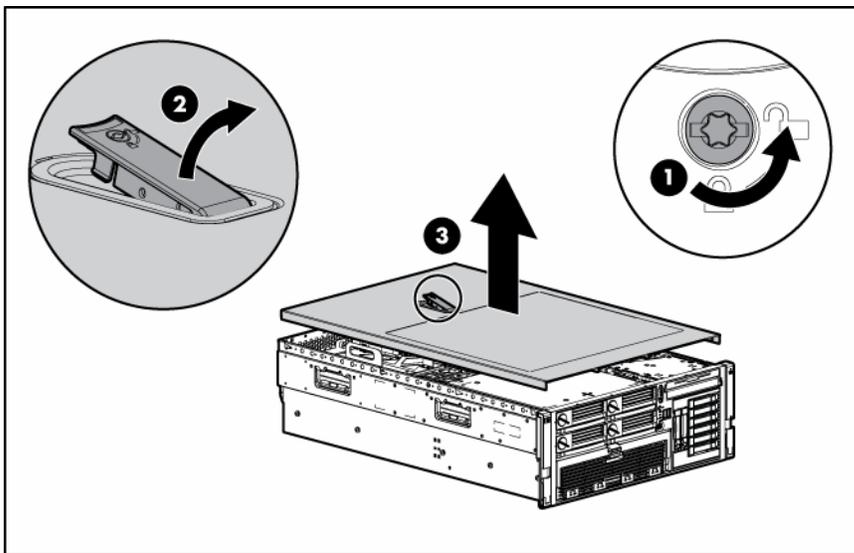
4. After installing hardware options, replace the access panel. Be sure that the panel is securely locked into place before powering up the server.

Replacing hot-plug fans

The server supports redundant hot-plug fans ("Fan locations" on page 21) to provide proper airflow to the server if a primary fan fails.

⚠ **WARNING: To prevent personal injury from hazardous energy:**
- **Remove watches, rings, or other metal objects.**
- **Use tools with insulated handles.**
- **Do not place tools or metal parts on top of batteries.**

📝 **IMPORTANT:** Remove and replace one fan at a time. If the system detects two fan failures in the same zone, the server shuts down to avoid thermal damage.

1. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 24).
2. Remove the access panel ("Removing the access panel" on page 26).
3. Remove the malfunctioning hot-plug fan from the server.

4. Install the replacement fan.
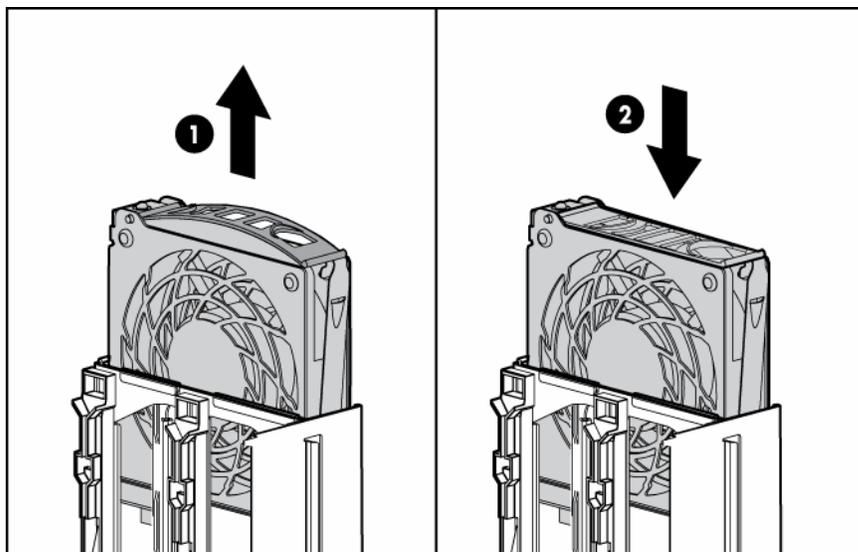
5. Repeat to replace additional fans as needed.
6. Observe the LED on each installed fan to be sure it is illuminated green ("Hot-plug fan LEDs" on page 23).
7. Observe the internal system health LED on the front panel to be sure it is illuminated green ("Front panel LEDs and buttons" on page 8).

📝 **NOTE:** If the front panel internal system health LED is not green after you install hot-plug fans, reseat the hot-plug fan or refer to the troubleshooting section.

Removing the system cage

Installing or accessing some options in the server might require removing the system cage. See the instructions for each individual option to determine if removing the system cage is necessary.

To remove the system cage:

1. Power down the server (on page 24).
2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 24).
3. Remove the access panel ("Removing the access panel" on page 26).
4. Remove all hot-plug power supplies.
5. Remove all system fans ("Replacing hot-plug fans" on page 26).
6. Remove all expansion boards ("Removing a PCI-X Hot Plug expansion board" on page 62).
7. Remove the expansion slot cover.
8. Remove the PCI-X Hot Plug basket, if installed.
9. Remove the PCI-X Hot Plug mezzanine or the PCI Express mezzanine, if applicable.
10. Loosen the thumbscrews, and lift the system cage from the server.

NOTE: The T-15 Torx screwdriver can be used to loosen the thumbscrews. The T-15 Torx screwdriver is shipped with the server and can be located on the rear panel ("Rear panel components" on page 12).
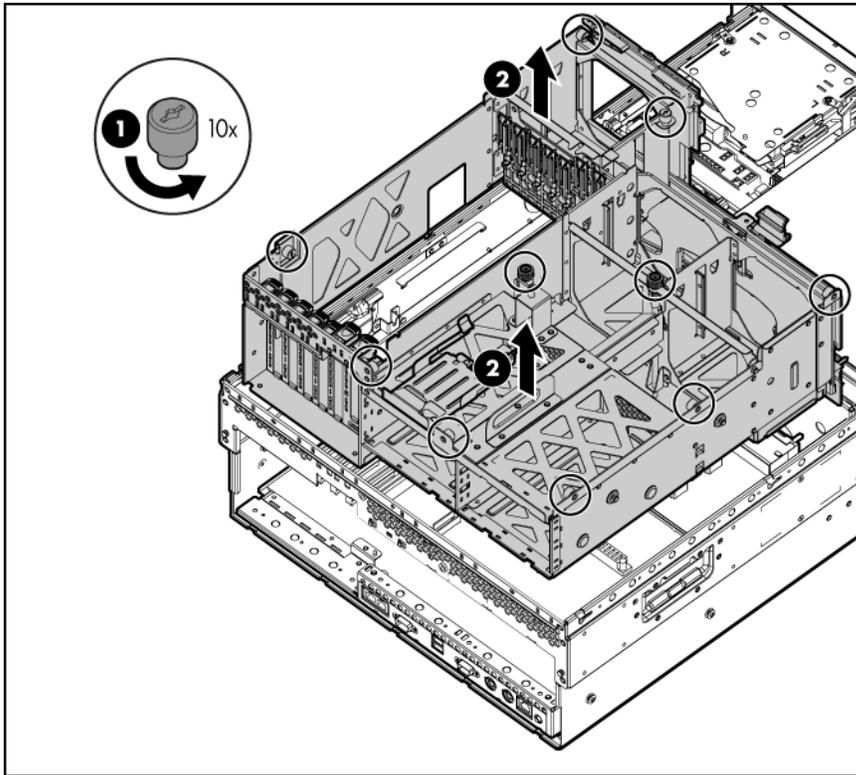
Accessing the Systems Insight Display

1. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 24).
2. Remove the access panel ("Removing the access panel" on page 26).

IMPORTANT: When removing the access panel to view the Systems Insight Display LEDs (on page 17), leave the server powered on. The Systems Insight Display LEDs are cleared when the server is powered off.

3. Locate the Systems Insight Display.
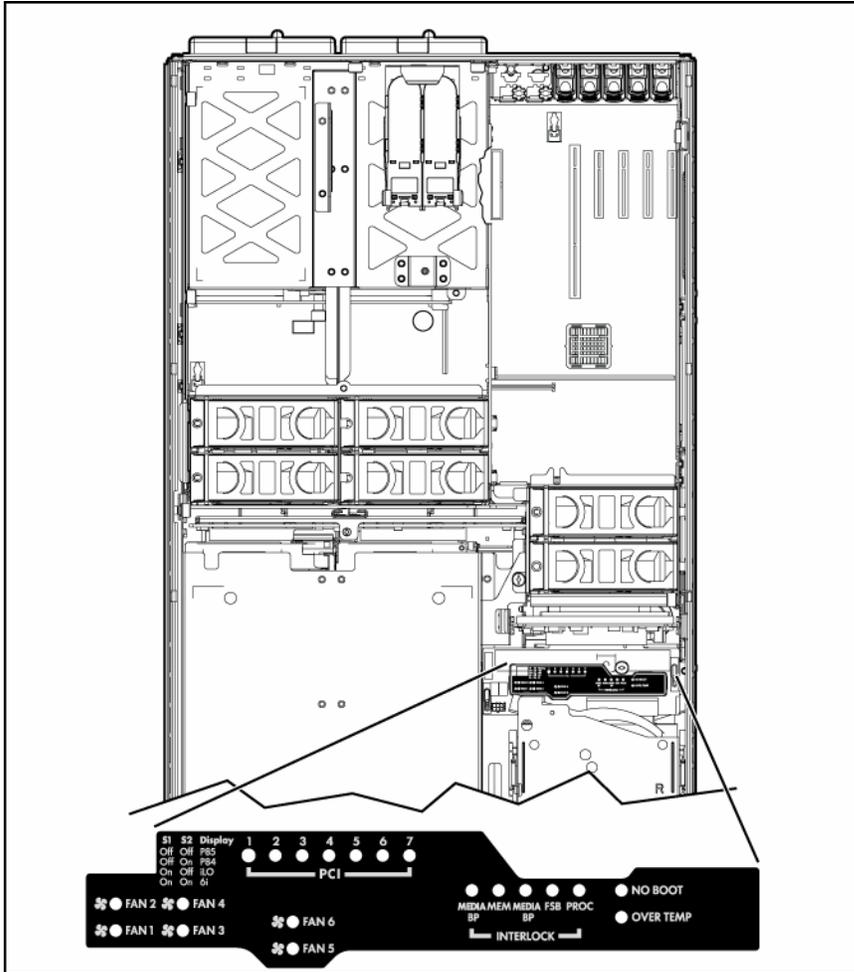
Battery

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 (on page 24).
2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 24).
3. Remove the access panel ("Removing the access panel" on page 26).
4. Remove any hardware that will interfere with accessing the battery.

5. Remove the battery.
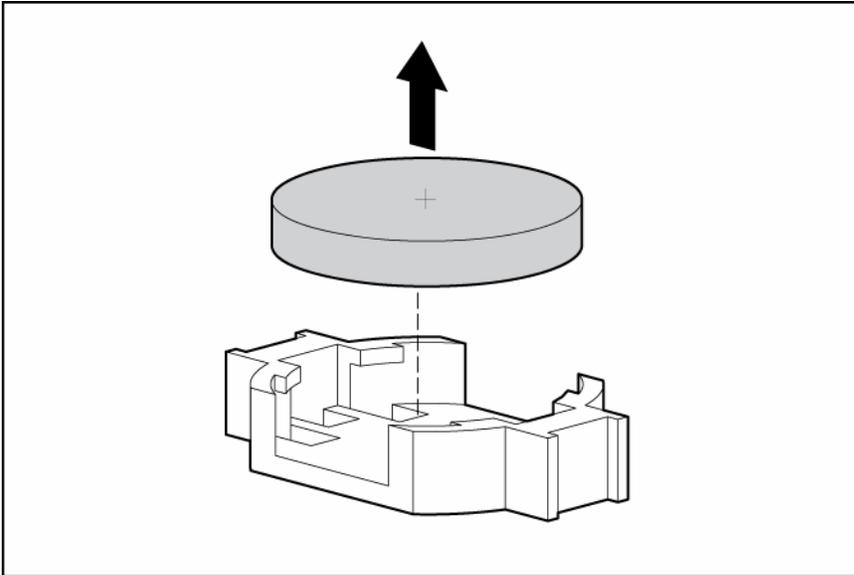
To replace the component, reverse the removal procedure.

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

Server setup

In this section

Optional installation services

Delivered by experienced, certified engineers, HP Care Pack services help you keep your servers up and running with support packages tailored specifically for HP ProLiant systems. HP Care Packs let you integrate both hardware and software support into a single package. A number of service level options are available to meet your needs.

HP Care Pack Services offer upgraded service levels to expand your standard product warranty with easy-to-buy, easy-to-use support packages that help you make the most of your server investments. Some of the Care Pack services are:

- Hardware support
  - 6-Hour Call-to-Repair
  - 4-Hour 24x7 Same Day
  - 4-Hour Same Business Day
- Software support
  - Microsoft®
  - Linux
  - HP ProLiant Essentials (HP SIM and RDP)
  - VMWare
- Integrated hardware and software support
  - Critical Service
  - Proactive 24
  - Support Plus
  - Support Plus 24
- Startup and implementation services for both hardware and software

For more information on Care Packs, refer to the HP website (http://www.hp.com/hps/carepack/servers/cp_proliant.html).

Rack planning resources

The rack resource kit ships with all HP branded or Compaq branded 9000, 10000, and H9 series racks. For more information on the content of each resource, refer to the rack resource kit documentation.

If you intend to deploy and configure multiple servers in a single rack, refer to the white paper on high-density deployment at the HP website (http://www.hp.com/products/servers/platforms).

Optimum environment

When installing the server, select a location that meets the environmental standards described in this section.

Space and airflow requirements

To allow for servicing and adequate airflow, observe the following space and airflow requirements when deciding where to install a rack:

- Leave a minimum clearance of 63.5 cm (25 in) in front of the rack.
- Leave a minimum clearance of 76.2 cm (30 in) behind the rack.
- Leave a minimum clearance of 121.9 cm (48 in) from the back of the rack to the back of another rack or row of racks.

HP servers draw in cool air through the front door and expel warm air through the rear door. Therefore, the front and rear rack doors must be adequately ventilated to allow ambient room air to enter the cabinet, and the rear door must be adequately ventilated to allow the warm air to escape from the cabinet.

⚠ **CAUTION:** To prevent improper cooling and damage to the equipment, do not block the ventilation openings.

When vertical space in the rack is not filled by a server or rack component, the gaps between the components cause changes in airflow through the rack and across the servers. Cover all gaps with blanking panels to maintain proper airflow.

⚠ **CAUTION:** Always use blanking panels to fill empty vertical spaces in the rack. This arrangement ensures proper airflow. Using a rack without blanking panels results in improper cooling that can lead to thermal damage.

The 9000 and 10000 Series Racks provide proper server cooling from flow-through perforations in the front and rear doors that provide 64 percent open area for ventilation.

⚠ **CAUTION:** When using a Compaq branded 7000 Series rack, you must install the high airflow rack door insert [P/N 327281-B21 (42U) or P/N 157847-B21 (22U)] to provide proper front-to-back airflow and cooling.

⚠ **CAUTION:** If a third-party rack is used, observe the following additional requirements to ensure adequate airflow and to prevent damage to the equipment:

- Front and rear doors—If the 42U rack includes closing front and rear doors, you must allow 5,350 sq cm (830 sq in) of holes evenly distributed from top to bottom to permit adequate airflow (equivalent to the required 64 percent open area for ventilation).
- Side—The clearance between the installed rack component and the side panels of the rack must be a minimum of 7 cm (2.75 in).

Temperature requirements

To ensure continued safe and reliable equipment operation, install or position the system in a well-ventilated, climate-controlled environment.

The maximum recommended ambient operating temperature (TMRA) for most server products is 35°C (95°F). The temperature in the room where the rack is located must not exceed 35°C (95°F).

⚠ **CAUTION:** To reduce the risk of damage to the equipment when installing third-party options:
- Do not permit optional equipment to impede airflow around the server or to increase the internal rack temperature beyond the maximum allowable limits.
- Do not exceed the manufacturer's TMRA.

Power requirements

Installation of this equipment must comply with local and regional electrical regulations governing the installation of information technology equipment by licensed electricians. This equipment is designed to operate in installations covered by NFPA 70, 1999 Edition (National Electric Code) and NFPA-75, 1992 (code for Protection of Electronic Computer/Data Processing Equipment). For electrical power ratings on options, refer to the product rating label or the user documentation supplied with that option.

⚠ **WARNING: To reduce the risk of personal injury, fire, or damage to the equipment, do not overload the AC supply branch circuit that provides power to the rack. Consult the electrical authority having jurisdiction over wiring and installation requirements of your facility.**

⚠ **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.

When installing more than one server, you may need to use additional power distribution devices to safely provide power to all devices. Observe the following guidelines:
- Balance the server power load between available AC supply branch circuits.
- Do not allow the overall system AC current load to exceed 80 percent of the branch circuit AC current rating.
- Do not use common power outlet strips for this equipment.
- Provide a separate electrical circuit for the server.

Electrical grounding requirements

The server must be grounded properly for proper operation and safety. In the United States, you must install the equipment in accordance with NFPA 70, 1999 Edition (National Electric Code), Article 250, as well as any local and regional building codes. In Canada, you must install the equipment in accordance with Canadian Standards Association, CSA C22.1, Canadian Electrical Code. In all other countries, you must install the equipment in accordance with any regional or national electrical wiring codes, such as the International Electrotechnical Commission (IEC) Code 364, parts 1 through 7. Furthermore, you must be sure that all power distribution devices used in the installation, such as branch wiring and receptacles, are listed or certified grounding-type devices.

Because of the high ground-leakage currents associated with multiple servers connected to the same power source, HP recommends the use of a PDU that is either permanently wired to the building's branch circuit or includes a nondetachable cord that is wired to an industrial-style plug. NEMA locking-style plugs or those complying with IEC 60309 are considered suitable for this purpose. Using common power outlet strips for the server is not recommended.

Rack warnings and cautions

⚠ **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 stabilizing feet are attached to the rack if it is a single-rack installation.
- The racks are coupled together in multiple-rack installations.
- Only one component is extended at a time. A rack may become unstable if more than one component is extended for any reason.

⚠ **WARNING:** To reduce the risk of personal injury or equipment damage when unloading a rack:
- At least two people are needed to safely unload the rack from the pallet. An empty 42U rack can weigh as much as 115 kg (253 lb), can stand more than 2.1 m (7 ft) tall, and may become unstable when being moved on its casters.
- Never stand in front of the rack when it is rolling down the ramp from the pallet. Always handle the rack from both sides.

⚠ **WARNING:** When installing a server in a telco rack, be sure that the rack frame is adequately secured to the top and bottom of the building structure.

⚠ **WARNING:** This server is very heavy. 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.
- Get help to lift and stabilize the product during installation or removal, especially when the product is not fastened to the rails. When the server weighs more than 22.5 kg (50 lb), at least two people must lift the server into the rack together. A third person may be required to help align the server if the server is installed higher than chest level.
- Use caution when installing the server in or removing the server from the rack; it is unstable when not fastened to the rails.

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

⚠ **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.

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

⚠ **CAUTION:** Do not operate the server for 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.

Identifying rack server shipping carton contents

Unpack the server shipping carton and locate the materials and documentation necessary for installing the server. All the rack mounting hardware necessary for installing the server into the rack is included with the rack or the server.

The contents of the server shipping carton include:

- Server
- Power cord
- Hardware documentation, Documentation CD, and software products
- Rack-mounting hardware

In addition to the supplied items, you may need:

- Hardware options
- Operating system or application software
- PDU

Installing hardware options

Install any hardware options before initializing the server. For options installation information, refer to the option documentation. For server-specific information, refer to "Hardware options installation (on page 37)."

Installing the server into the rack

Refer to the installation instructions that ship with the rack kit to install the server into the rack.

Installing the cable management arm

Refer to the installation instructions that ship with the rack kit to install the cable management arm.

Powering up and configuring the server

To power up the server, press the Power On/Standby button.

While the server boots, RBSU is automatically configured to prepare the server for operating system installation.

To manually configure the utilities, press the **F9** key when prompted during the boot process to change the server settings using RBSU. The system is set up by default for the English language.

📝 **NOTE:** If an array controller has been added or is embedded in the system, the ORCA utility provides a default RAID configuration based on the size and number of hard drives installed.

For more information on the automatic configuration, refer to the *HP ROM-Based Setup Utility User Guide* located on the Documentation CD.

Installing the operating system

To operate properly, the server must have a supported operating system. For the latest information on supported operating systems, refer to the HP website (http://www.hp.com/go/supportos).

Two methods are available to install an operating system on the server:

- SmartStart assisted installation—Insert the SmartStart CD into the CD-ROM drive and reboot the server.
- Manual installation—Insert the operating system CD into the CD-ROM drive and reboot the server. This process may require you to obtain additional drivers from the HP website (http://www.hp.com/support).

Follow the on-screen instructions to begin the installation process.

For information on using these installation paths, refer to the SmartStart installation poster in the HP ProLiant Essentials Foundation Pack, included with the server.

Registering the server

To register the server, refer to the HP Registration website (http://register.hp.com).

Hardware options installation

In this section

Introduction

If more than one option is being installed, read the installation instructions for all the hardware options and identify similar steps to streamline the installation process.

⚠ **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:** To prevent damage to electrical components, properly ground the server before beginning any installation procedure. Improper grounding can cause electrostatic discharge.

Review "Electrostatic Discharge (on page 92)" before installing hardware options into the server.

Processor options

The server supports up to four processors. Processor socket 1 and PPM slot 1 must be populated at all times or the server will not function properly.

Server PPMs provide the proper power to each processor. Each PPM must be installed in the slot adjacent to its processor.

Removing the processor module

The processors are stored in a module at the front of the server. Access to the processor module is provided through the front panel, eliminating the need to extend the server from the rack to install new or replace existing processors.

To remove the processor module:

1. Power down the server (on page 24).

2. Release the latches to unlock the processor module.
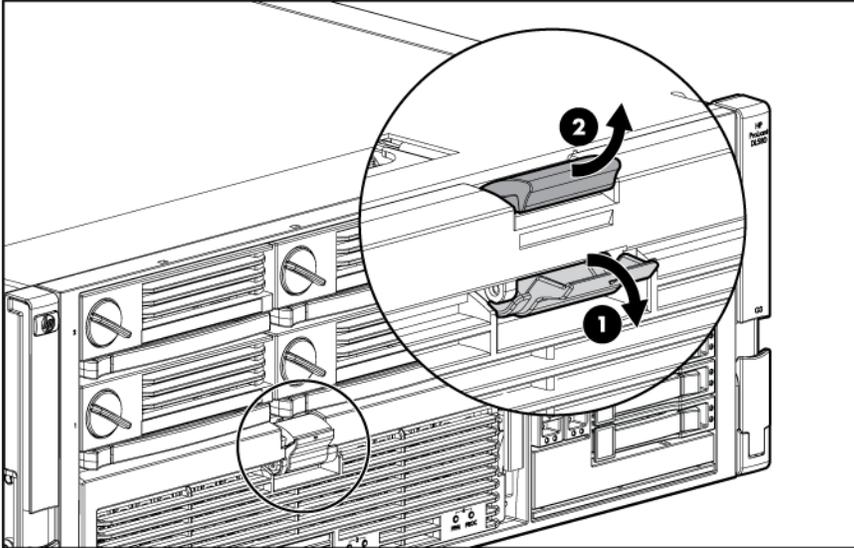
3. Lower the processor module lever, and pull the module out of the server.
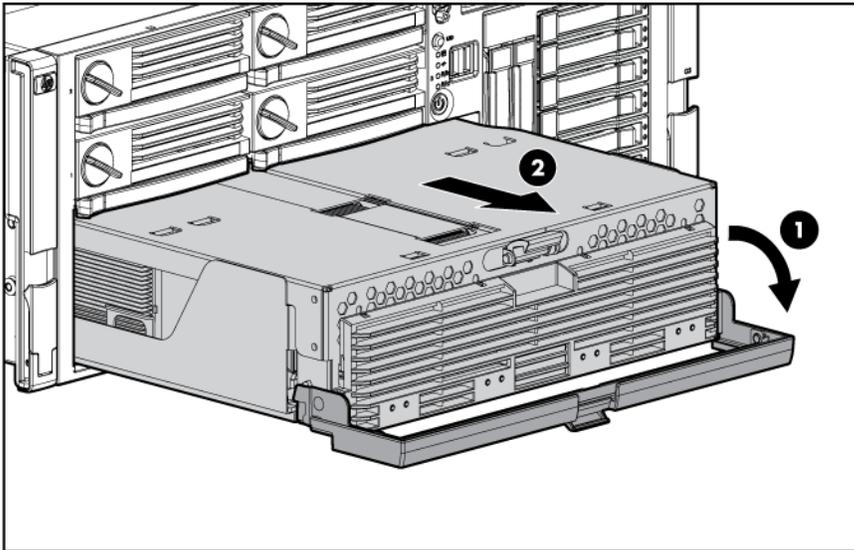
4. Release the latch, and open the cover to expose the processors.
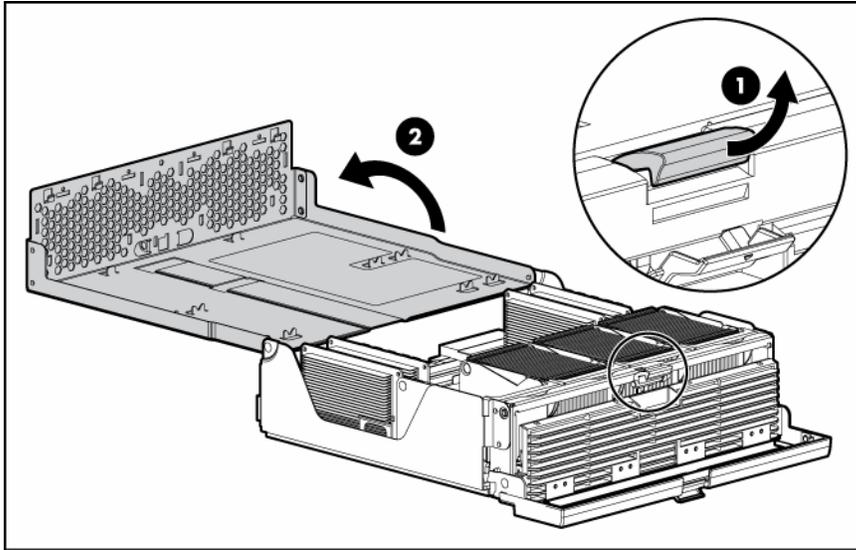
Installing a processor

Processors must be installed in the following order: processor 1, processor 2, processor 4, and processor 3.

Server PPMs provide the proper power to each processor. Each PPM must be installed in the slot adjacent to its 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.

⚠ **CAUTION:** To prevent thermal damage, do not operate a server with dual-core processors installed unless all processor sockets have either a processor or processor blank installed.

When installing a processor, use the following guidelines:

- If upgrading processor speed or adding additional processors, update the system ROM before installing the processor.
- Processor socket 1 and PPM slot 1 must be populated at all times, or the server will not function properly.
- Always install a PPM when you install a processor. The system fails to boot if the PPM is missing.

To install a processor:

1. Power down the server (on page 24).
2. Remove the processor module ("Removing the processor module" on page 37).

3. Unlock the processor retaining bracket.
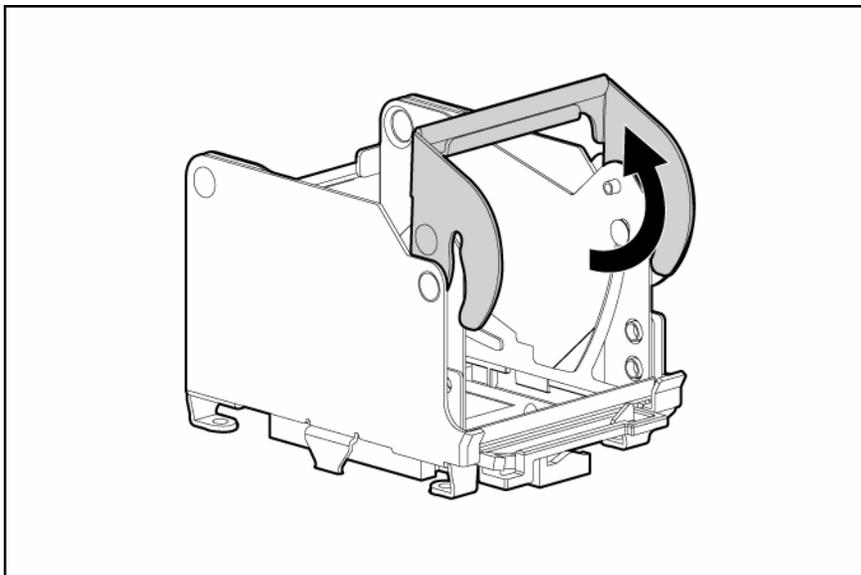
4. Open the processor retaining bracket.

5. Open the processor locking lever.

⚠ **CAUTION:** Failure to completely open the processor locking lever prevents the processor from seating during installation, leading to hardware damage.
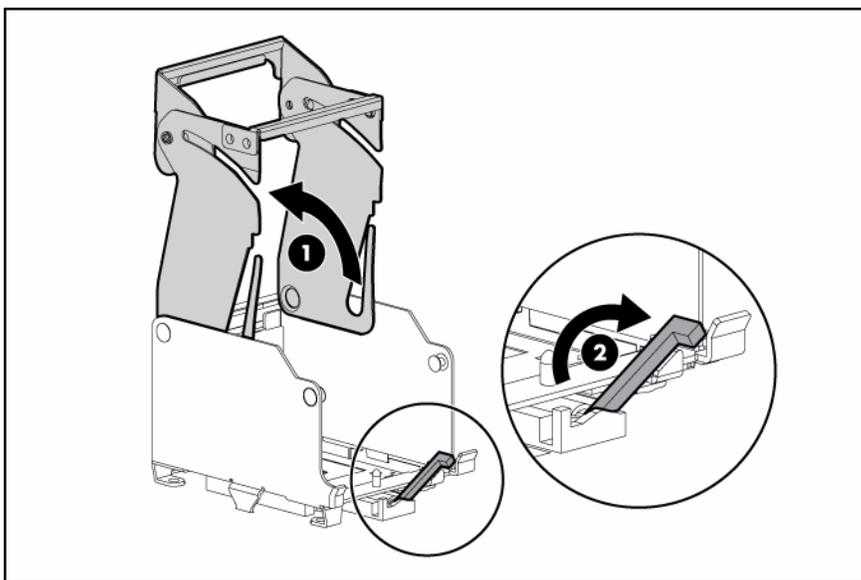
6. If installed, remove the processor blank by lifting the processor blank from the processor socket.
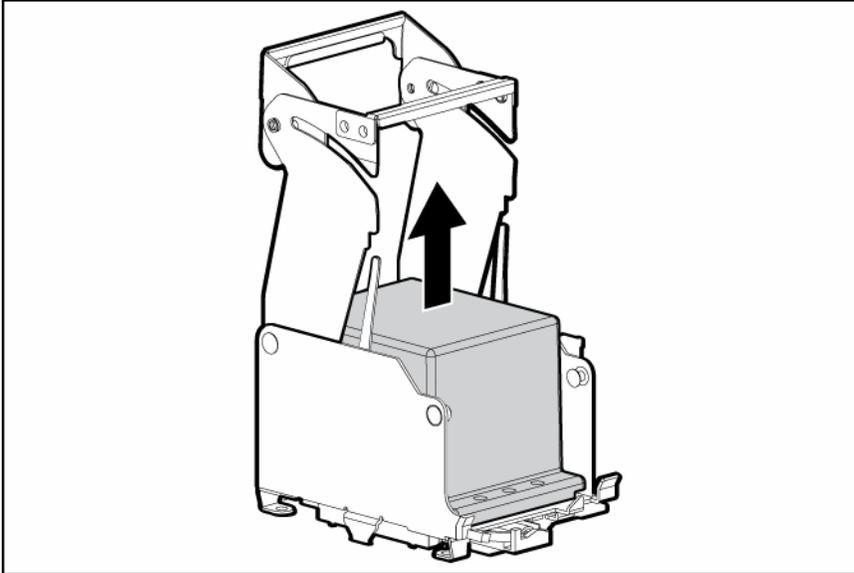
7. Determine the correct processor orientation, and install the processor assembly into the processor socket.

🖉 **IMPORTANT:** Determine the correct processor orientation by observing the guide pins on the base of the processor retaining bracket and the three corresponding guide slots on the processor assembly.
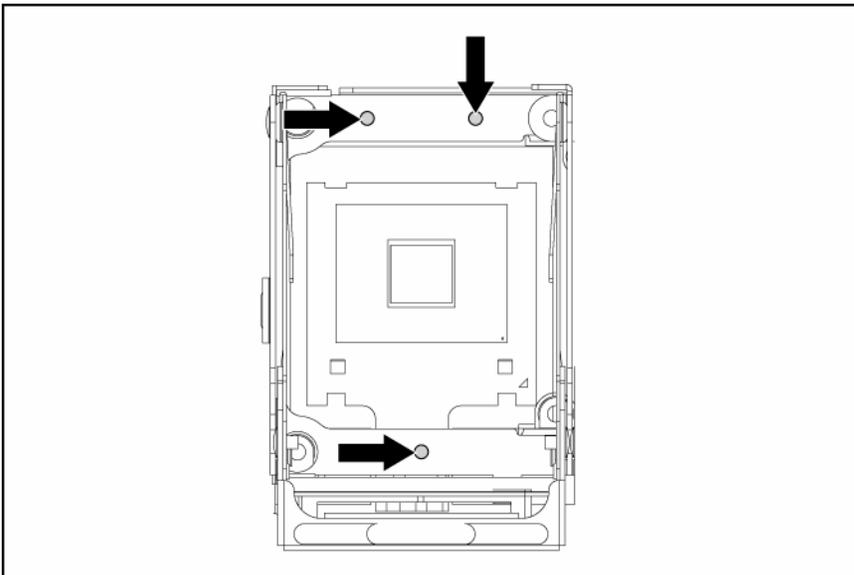
8. Insert the processor assembly into the processor socket, and close the locking lever.

⚠ **CAUTION:** To prevent possible server malfunction or damage to the equipment, be sure to completely close the processor locking lever.
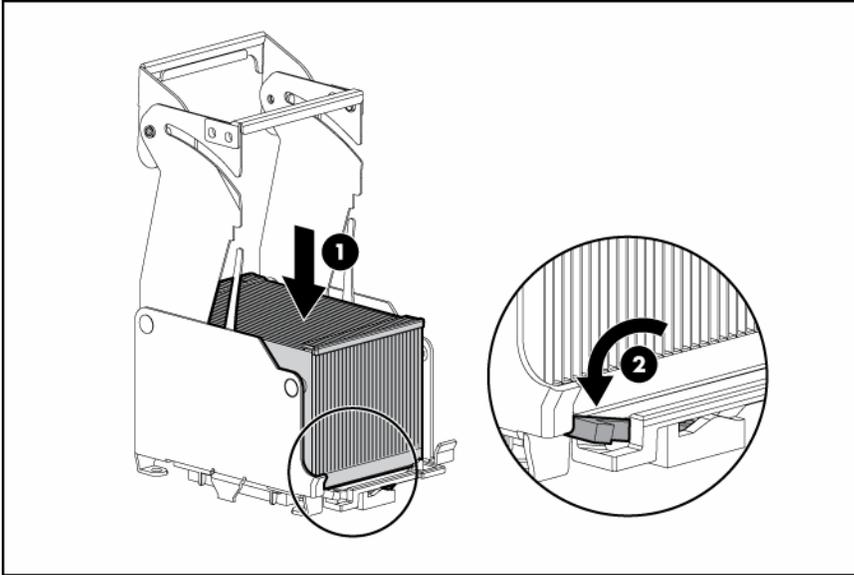
9. Close and lock the processor retaining bracket.
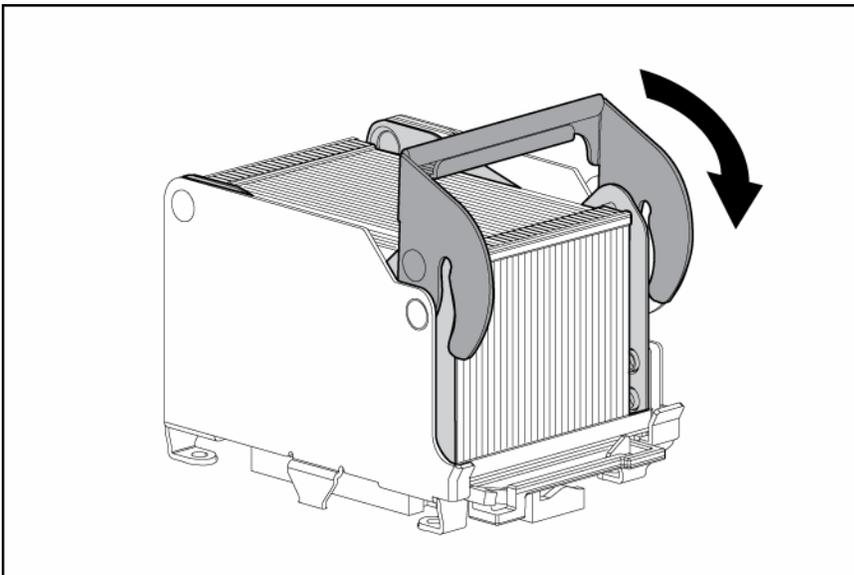
10. Install the PPM.

IMPORTANT: Always install a PPM when you install a processor. The system fails to boot if the corresponding PPM is missing.
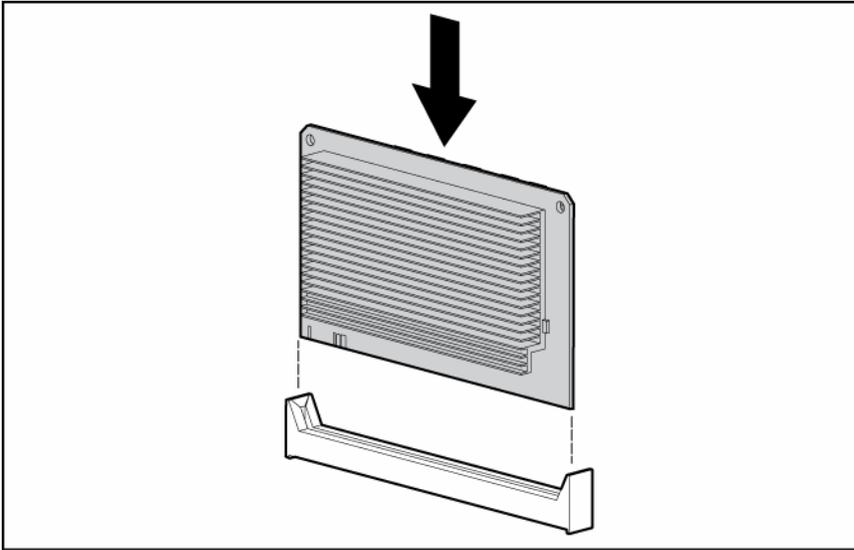
NOTE: The appearance of compatible PPMs may vary.

11. Close the cover, and replace the processor module.

SAS and SATA hard drive guidelines
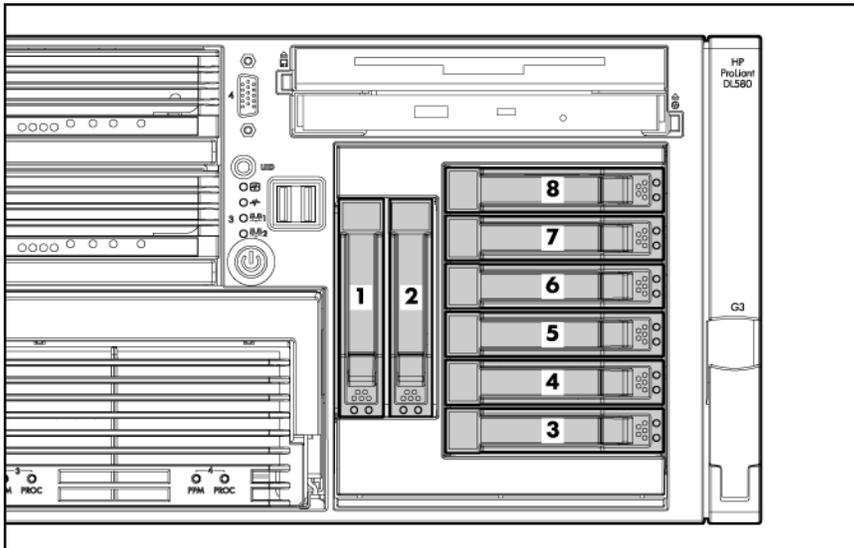
When adding SAS or SATA hard drives to the server, observe the following general guidelines:

- The server supports eight SAS or SATA hot-plug hard drives.
- The system automatically sets all drive numbers.
- If only one hard drive is used, install it in the bay with the lowest number.
- Hard drives must be SFF types.
- Drives must be the same capacity to provide the greatest storage space efficiency when drives are grouped together in the same drive array.

NOTE: ACU does not support mixing SAS and SATA drives in the same logical volume.

Installing a hot-plug SAS hard drive

1. Remove the hard drive blank.
2. Prepare the SAS hard drive.
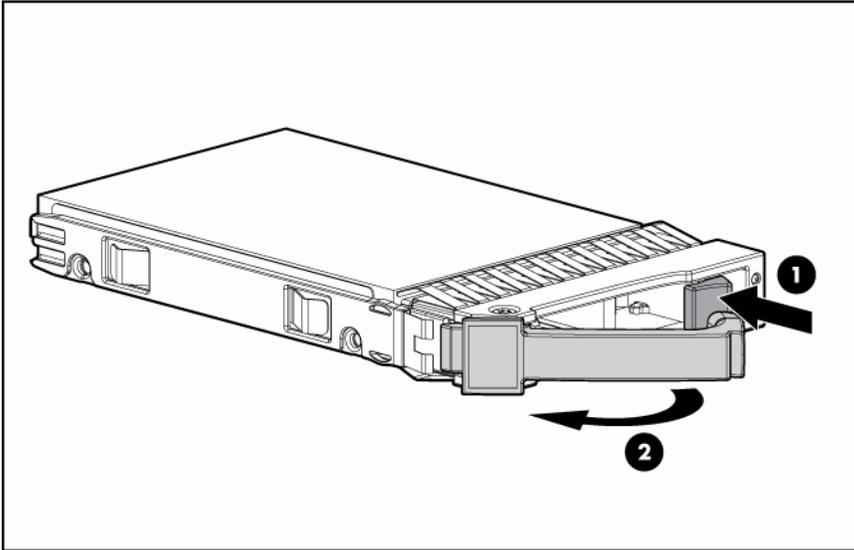
3. Install the hard drive.
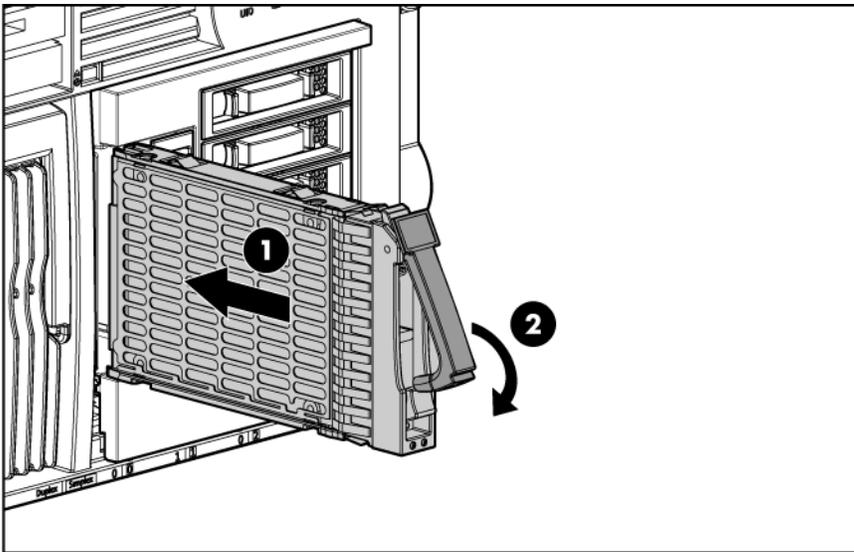
4. Determine the status of the hard drive from the hot-plug SAS hard drive LED combinations ("SAS and SATA hard drive LED combinations" on page 20).

Redundant hot-plug power supply

The server supports a second hot-plug power supply to provide redundant power to the server in the event of a failure in the primary power supply. You can install or replace a second hot-plug power supply without powering down the server.

⚠ **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.**

⚠ **CAUTION:** If only one power supply is installed, do not remove the power supply unless the server has been powered down. Removing the only operational power supply will cause an immediate power loss.

📝 **NOTE:** If you remove or replace the primary hot-plug power supply, use the T-15 Torx screwdriver provided with the server to remove the shipping screw. It is located just under the port-colored plastic handle of the power supply unit.

1. Remove the power supply blank.
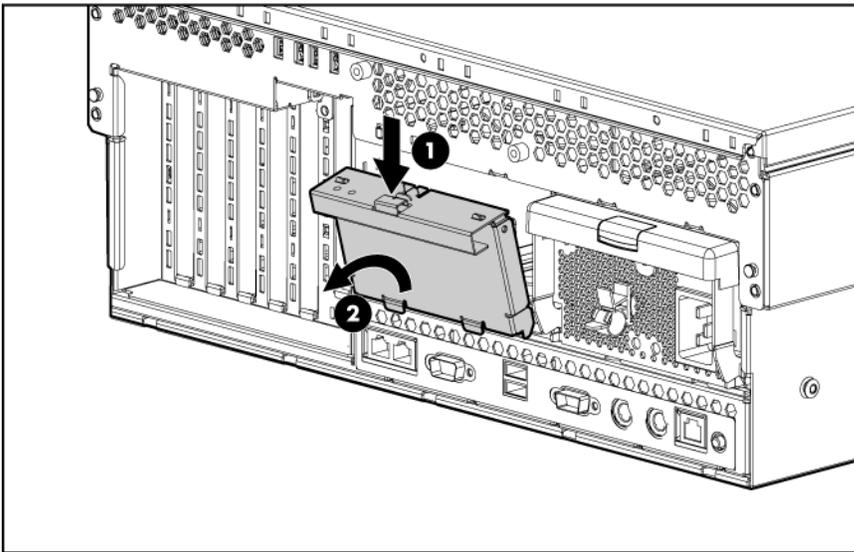
2. Install the hot-plug power supply, and lock the lever.
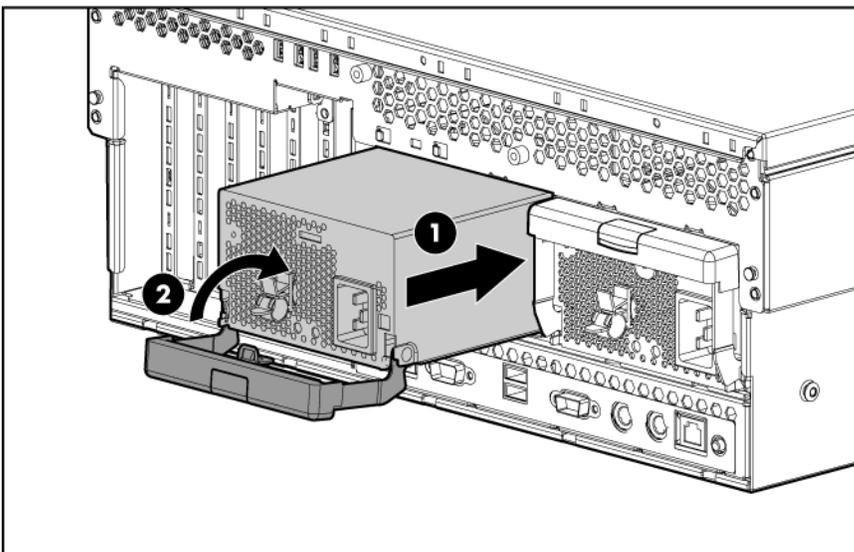
3. Connect the power cord to the redundant power supply.

4. Secure the power cords to the retaining clip.

5. Connect the power cord to the power source.

6. Be sure that the power supply LED is green ("Power supply LEDs" on page 14).

7. Be sure that the front panel external health LED is green ("Front panel LEDs and buttons" on page 8).

📝 **IMPORTANT:** For maximum server availability, be sure that the two power supplies are powered by separate AC power sources.

📝 **NOTE:** If the server will be shipped to another location after configuration, install a shipping screw into each power supply.

Battery-backed write cache

The server supports the following battery-backed options:

- 256-MB BBWC cache option
- 512-MB BBWC cache option

The BBWC consists of two parts: a battery pack and a storage cache module. The 512-MB BBWC cache option requires two battery packs for operation.

Along with the cache module, the battery pack provides transportable data protection, increases overall controller performance, and maintains any cached data for up to 72 hours after the server loses power. The NiMH batteries in the battery pack are continuously recharged through a trickle-charging process whenever the system power is on.

⚠ **CAUTION:** To prevent a server malfunction or damage to the equipment, do not add or remove the battery pack while an array capacity expansion, RAID level migration, or stripe size migration is in progress.

⚠ **CAUTION:** After the server is powered down, wait 15 seconds and then check the amber LED before unplugging the cable from the cache module. If the amber LED blinks after 15 seconds, do not remove the cable from the cache module. The cache module is backing up data, and data is lost if the cable is detached.

📝 **IMPORTANT:** The battery pack might have a low charge when installed. In this case, a POST error message is displayed when the server is powered up, indicating that the battery pack is temporarily disabled. No action is necessary on your part. The internal circuitry automatically recharges the batteries and enables the battery pack. This process might take up to four hours. During this time, the cache module functions properly, but without the performance advantage of the battery pack.

📝 **NOTE:** The data protection and the time limit also apply if a power outage occurs. When power is restored to the system, an initialization process writes the preserved data to the hard drives.

To install the BBWC option:

1. Power down the server (on page 24).

2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 24).

3. Remove the access panel ("Removing the access panel" on page 26).

4. Remove the system cage ("Removing the system cage" on page 27).

5. Install the battery pack into the server. If installing the 512-MB cache option, install two battery packs.
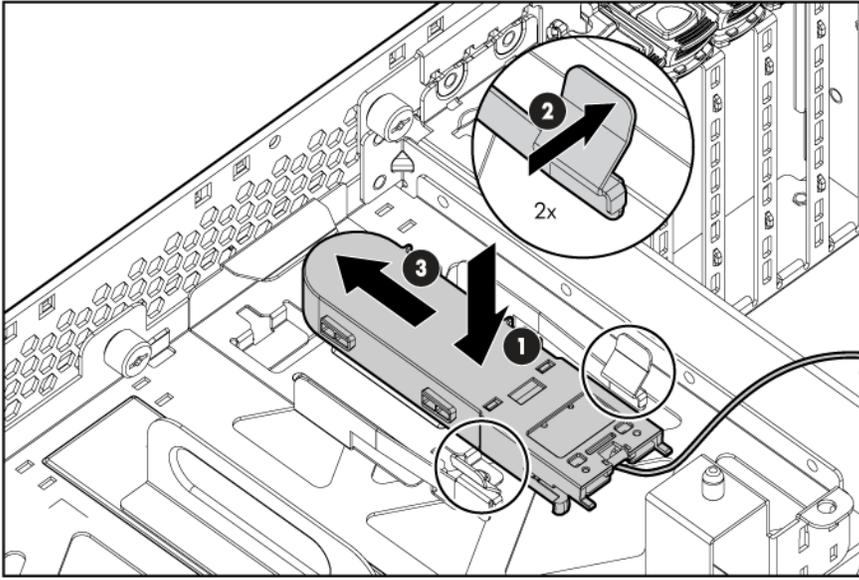
6. Install the controller into expansion slot 4 ("Expansion slot overview" on page 50), if applicable.

📝 **NOTE:** In most configurations, the server ships with the controller installed in expansion slot 4.
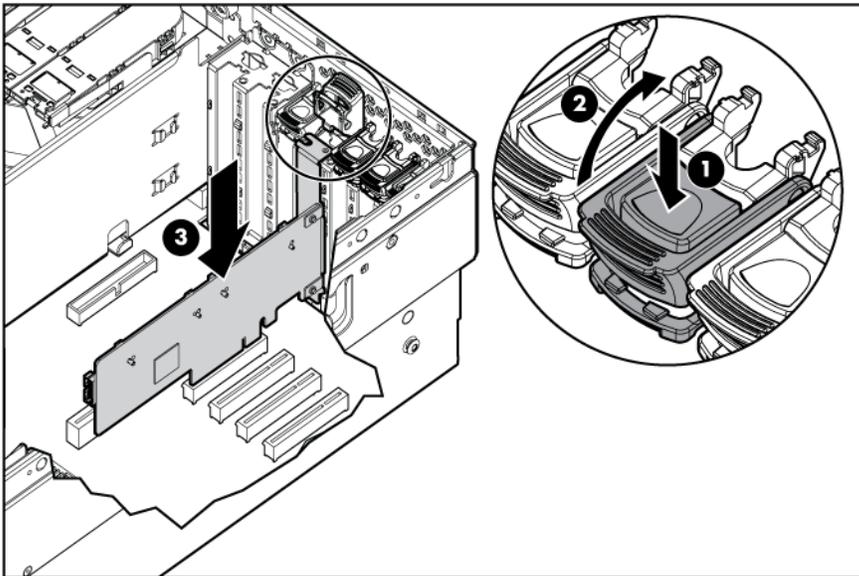
7. Install the cache module onto the controller.
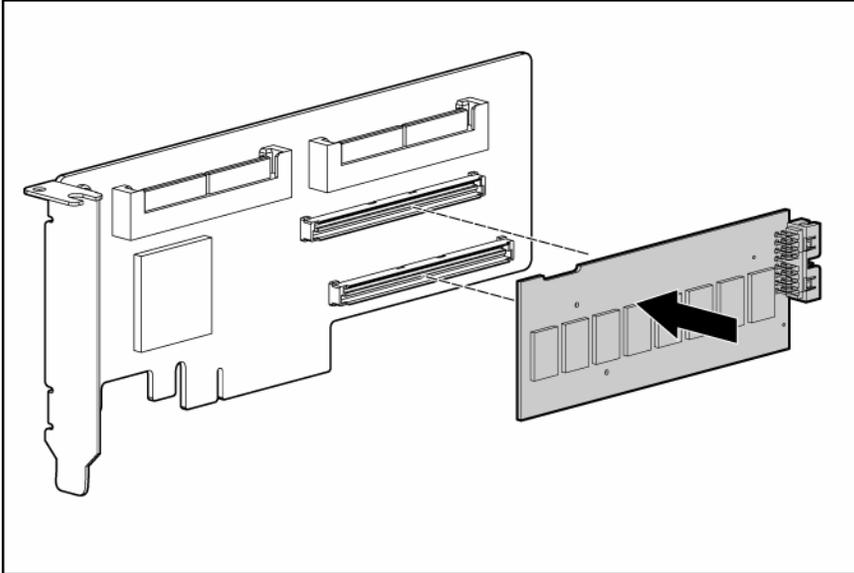
8. Route the cable, and connect the battery pack cables to the cache module. If installing the 512-MB option, be sure to connect the cables to both battery packs.
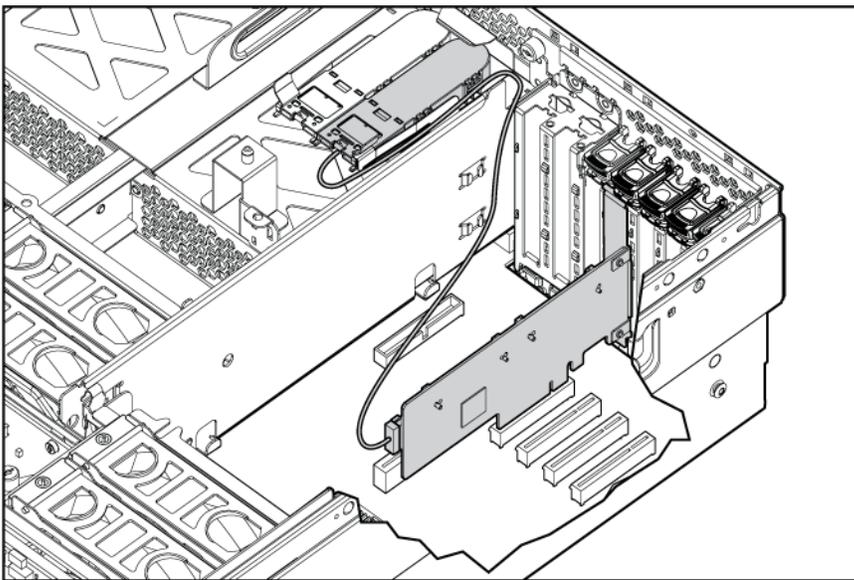
To reinstall all components, reverse the removal procedures.

DVD, diskette, and CD-RW drives

The server is shipped with one DVD drive. You can install an optional DVD drive, 3.5-inch diskette drive, or CD-RW drive.

To install an optional media drive:

1. Power down the server (on page 24).

2. Use the T-15 Torx screwdriver to eject the drive blank, and pull the drive blank out of the server.

NOTE: The T-15 Torx screwdriver is shipped with the server and can be located on the rear panel ("Rear panel components" on page 12).
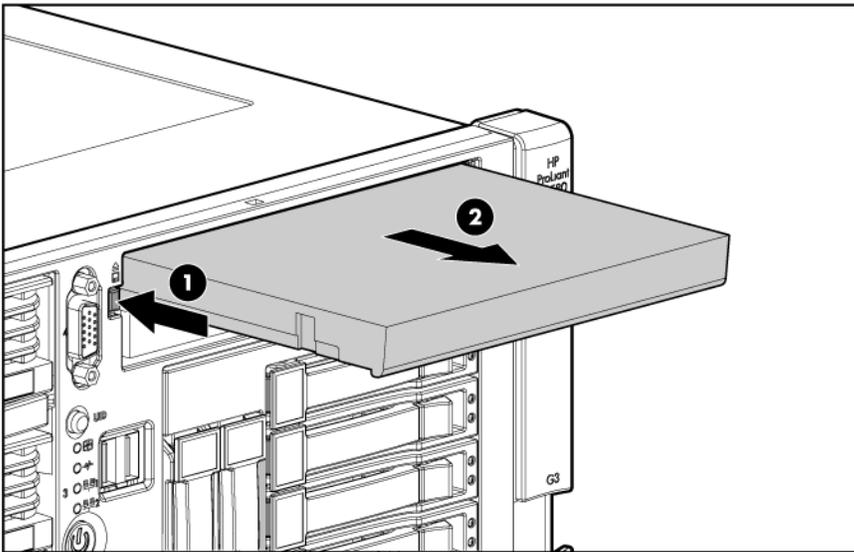
3. Install the media drive into the server.
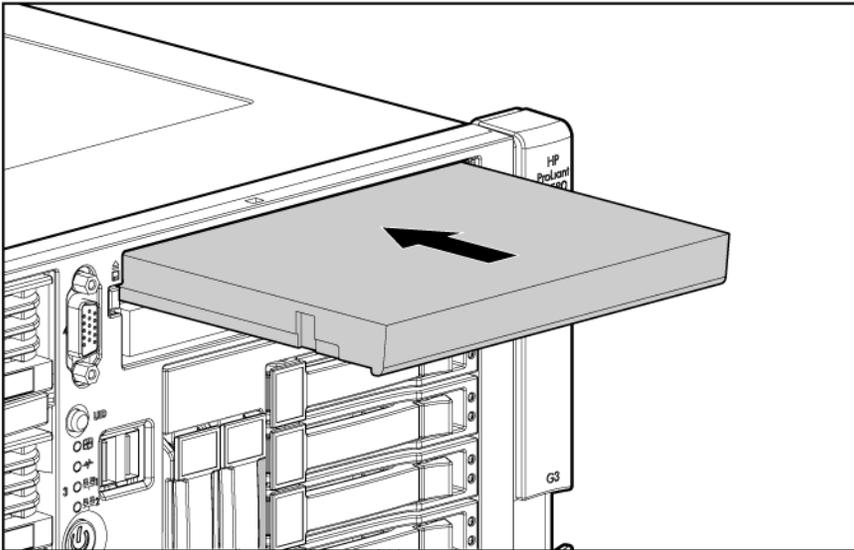
CAUTION: Always populate each media bay with either a device or a blank. Proper airflow can only be maintained when the bays are populated. Unpopulated drive bays can lead to improper cooling and thermal damage.

IMPORTANT: By default, the DVD drive is installed in the lower drive bay. To boot from a DVD or CD-RW drive in the upper drive bay or to boot from a diskette drive in the lower bay, change the boot device selector switch to FLP BOT ("Boot device selector switch" on page 16).

NOTE: If two DVD or CD-RW drives are installed in the server, the server will first attempt to boot from the primary drive ("Boot device selector switch" on page 16). The boot device selector switch setting determines which drive is the primary drive.

4. Power up the server (on page 24).

Expansion board options

In this section

Expansion slot overview

The server supports up to seven expansion slots. When the server is shipped, it is equipped with five expansion slots (slots 3 through 7) and two connectors to add two optional expansion slots (slots 1 and 2).

To support the optional expansion slots, install one of the following into the server:

- PCI-X Hot Plug mezzanine option (on page 51)—Adds two optional PCI-X Hot Plug expansion slots
- PCI Express x4 mezzanine option ("PCI Express mezzanine options" on page 52)—Adds two optional PCI Express x4 expansion slots
- PCI Express x8 mezzanine option ("PCI Express mezzanine options" on page 52)—Adds one optional PCI Express x8 expansion slot

NOTE: Only one mezzanine option can be installed in the server.
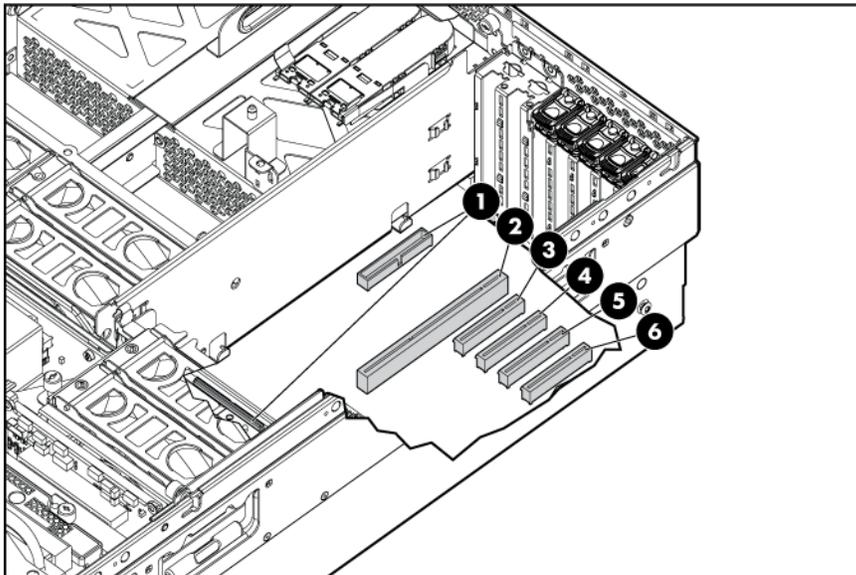
Item	Slot	Description
1	1–2	Connectors for one of the following: • Optional PCI Express x4 mezzanine board • Optional PCI Express x8 mezzanine board • Optional PCI-X Hot Plug mezzanine board
2	3	PCI-X non-hot-plug expansion slot, 64-bit/133-MHz
3	4	PCI Express x4 non-hot-plug expansion slot *
4	5	PCI Express x4 non-hot-plug expansion slot
5	6	PCI Express x4 non-hot-plug expansion slot *
6	7	PCI Express x4 non-hot-plug expansion slot

* Installing the x4–x8 PCI Express bus expander into expansion slot 5 converts expansion slot 4 to PCI Express x8. Installing the x4–x8 PCI Express bus expander into expansion slot 7 converts expansion slot 6 to PCI Express x8. Refer to "x4–x8 PCI Express bus expander ("Installing a x4–x8 PCI Express bus expander" on page 60)" for installation instructions.

PCI-X Hot Plug Mezzanine Option

The PCI-X Hot Plug Mezzanine Option adds support for two optional PCI-X Hot Plug expansion slots.
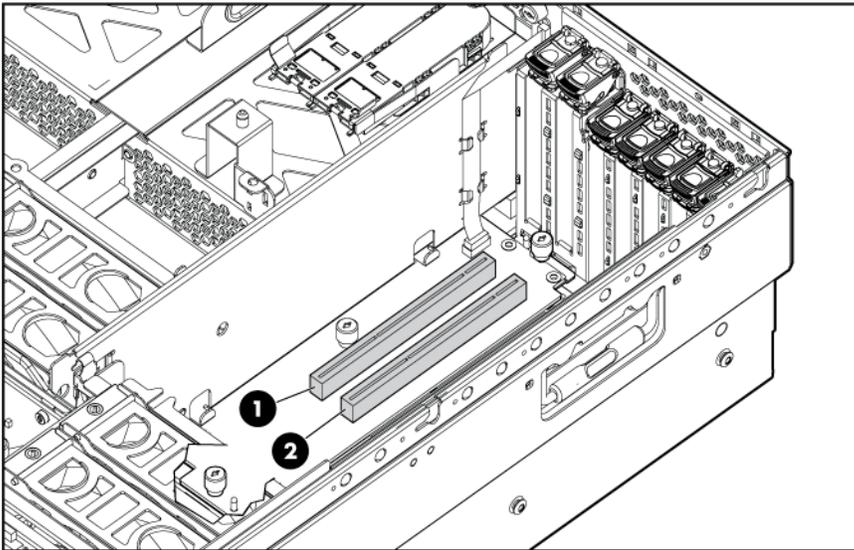
Item	Description
1	PCI-X Hot Plug expansion slot 1, 64-bit/133-MHz
2	PCI-X Hot Plug expansion slot 2, 64-bit/133-MHz

PCI Express mezzanine options

The PCI Express x4 mezzanine option adds support for two optional PCI Express x4 non-hot-plug expansion slots in slots 1 and 2.
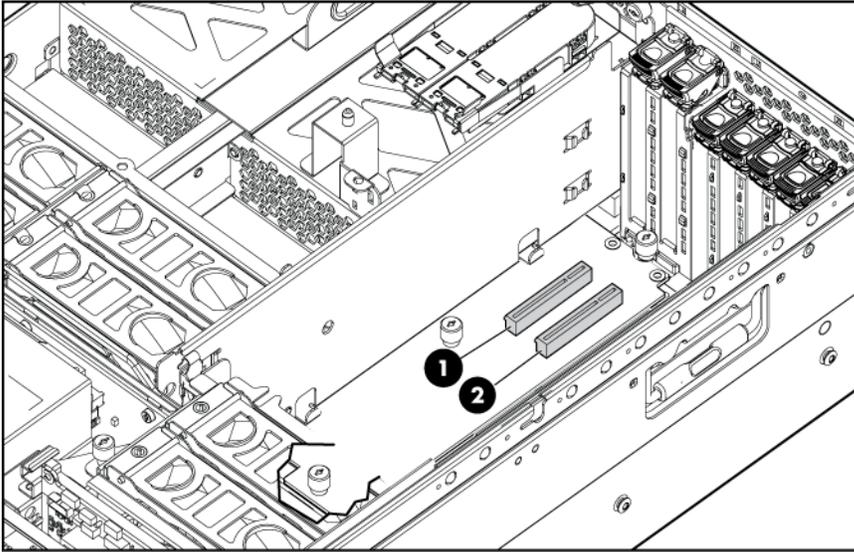
Item	Description
1	PCI Express x4 non-hot-plug expansion slot 1
2	PCI Express x4 non-hot-plug expansion slot 2

The PCI Express x8 mezzanine option adds support for one optional PCI Express x8 non-hot-plug expansion slot in slot 1.
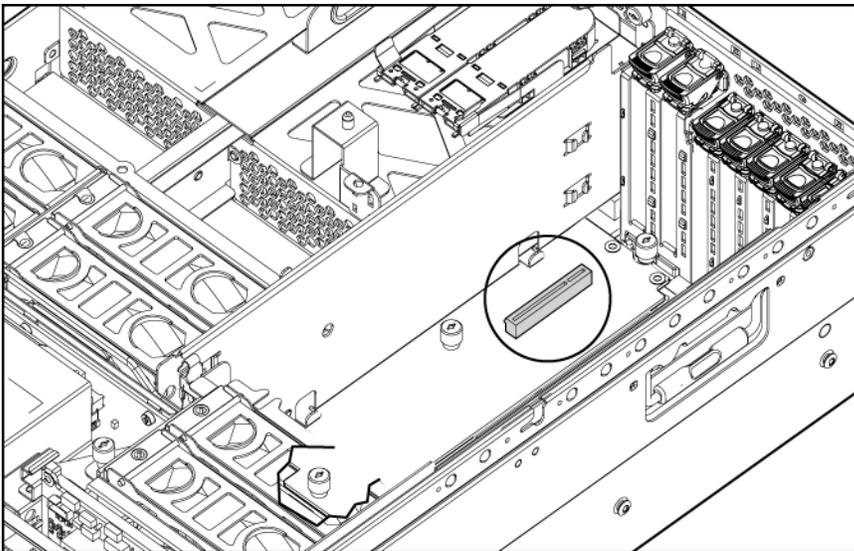
Installing the PCI-X Hot Plug Mezzanine Option

1. Power down the server (on page 24).
2. Extend or remove the server from the rack ("Extending the server from the rack" on page 24).
3. Remove the access panel ("Removing the access panel" on page 26).

4. Adhere the PCI-X Hot Plug label to the power supply cover.
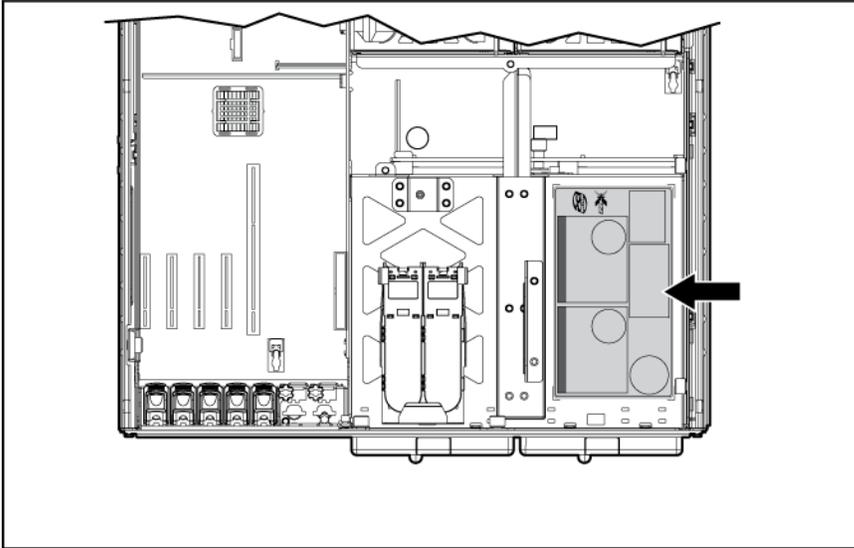
5. Remove the expansion boards from slots 3 and 4, if installed, to gain access to the mezzanine connectors.

6. Remove the expansion slot covers from slots 1 and 2.
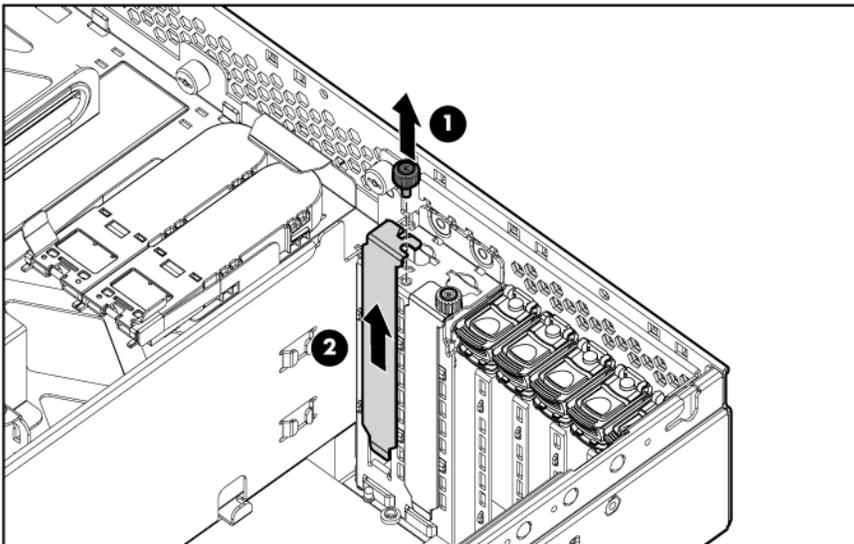
7. Connect the hot-plug cable to the mezzanine board.

NOTE: The cable connector is keyed at pin 1 for alignment.
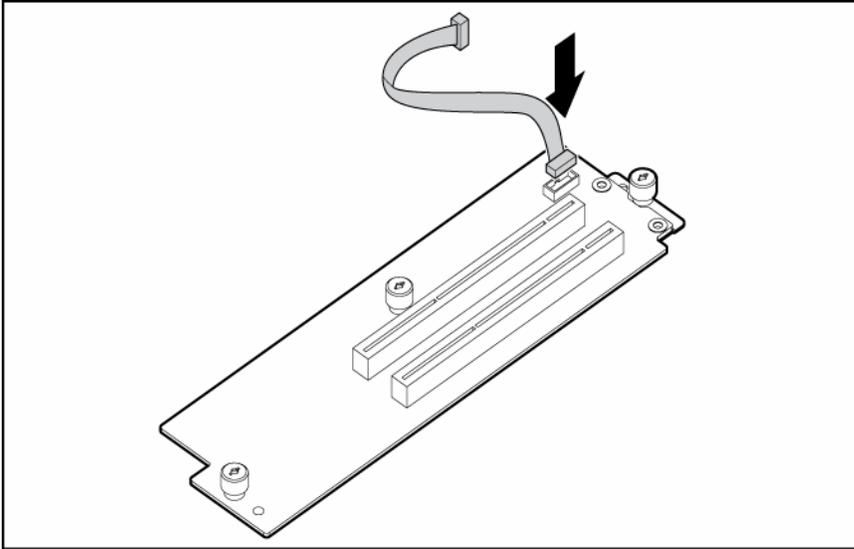
8. Use the guide pins to align the mezzanine board, and seat the mezzanine board onto the system board.

9. Tighten the three thumbscrews to secure the mezzanine board.
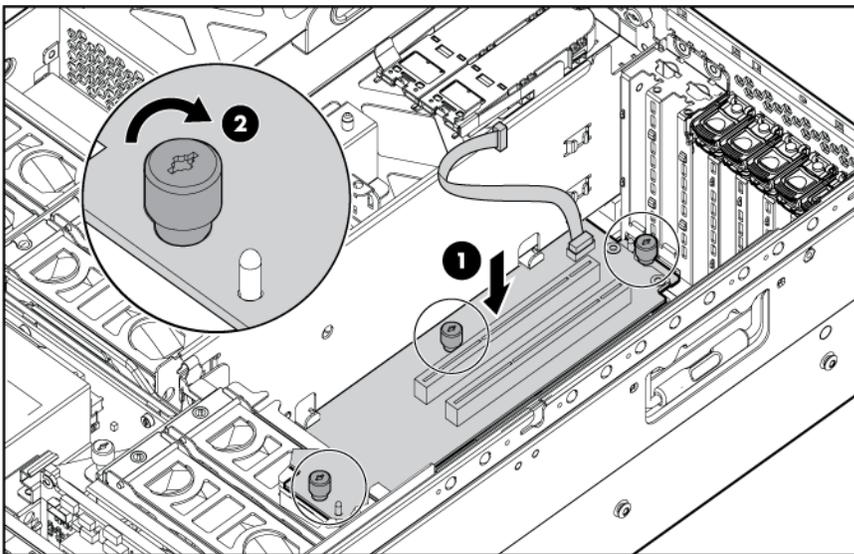
10. Install the PCI-X Hot Plug board.
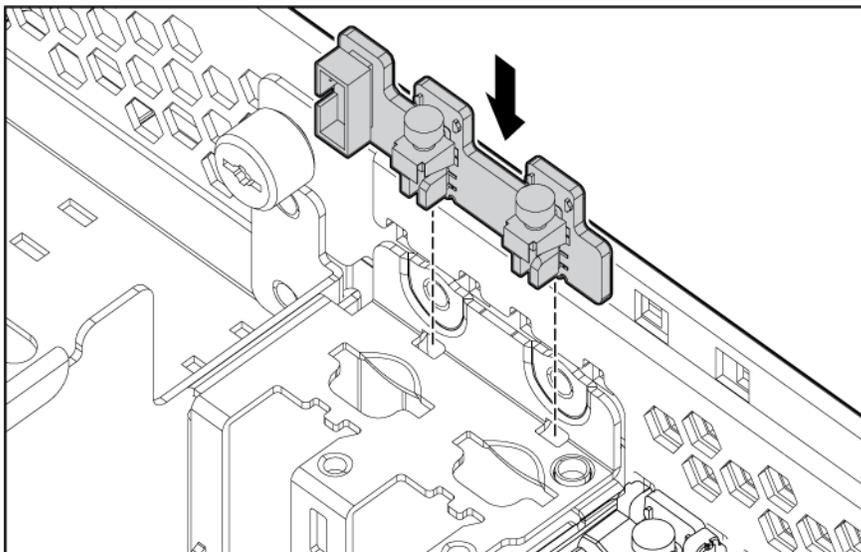
11. Route the cable from the mezzanine board to the hot-plug board, and connect the cable.
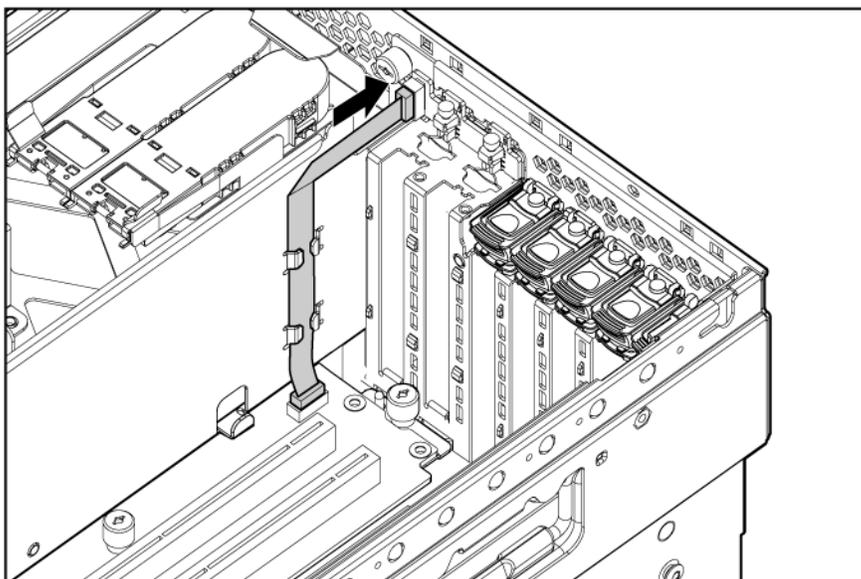
12. Attach the latch to the chassis, and press down until it snaps into place.
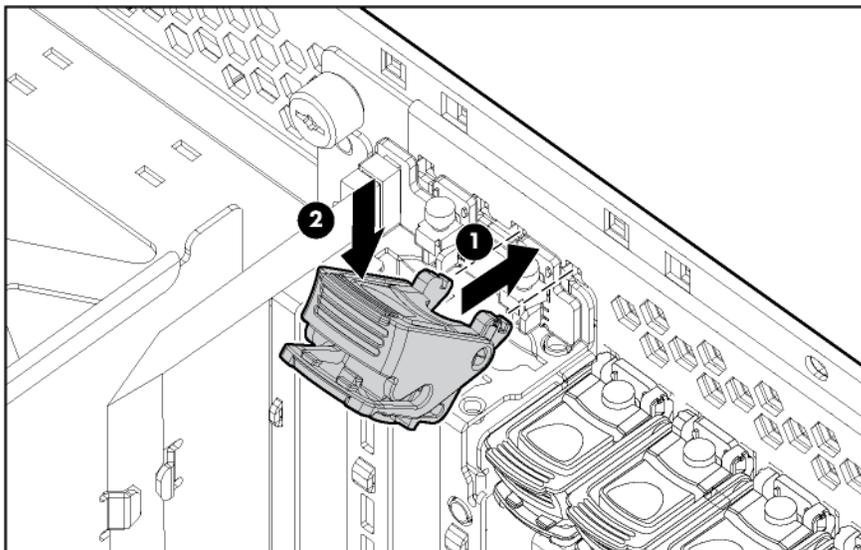
13. Install the retaining clips.
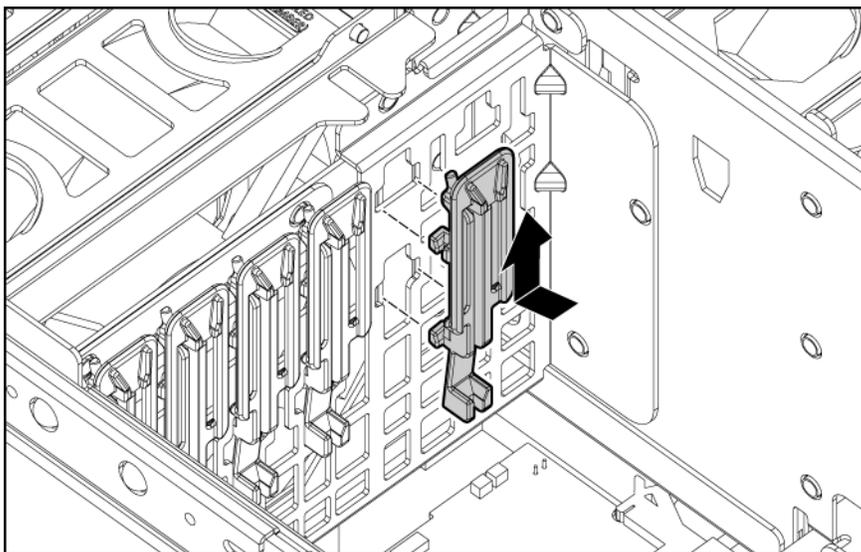
14. Install the expansion slot divider.
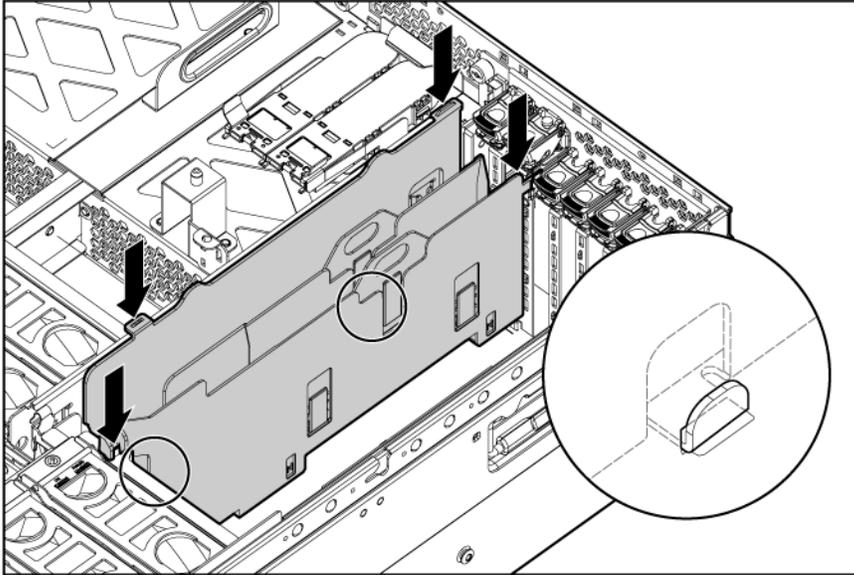
15. Install the PCI-X Hot Plug expansion boards. If the server is powered off, use non-hot-plug procedures ("Installing non-hot-plug expansion boards" on page 60) to install the expansion boards. If the server is running, install PCI-X Hot Plug expansion boards using hot-plug procedures ("Installing hot-plug expansion boards" on page 61).

16. Reinstall any expansion boards removed to install the PCI-X Hot Plug Mezzanine Option.

17. Place the expansion slot covers over any remaining empty expansion slots, and close the latches.

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

18. Replace the access panel ("Removing the access panel" on page 26).

19. Slide the server back into the rack ("Extending the server from the rack" on page 24).

20. Power up the server (on page 24).

Installing the PCI Express mezzanine options

1. Power down the server (on page 24).

2. Extend or remove the server from the rack ("Extending the server from the rack" on page 24).

3. Remove the access panel ("Removing the access panel" on page 26).

4. Remove the expansion boards from slots 3 and 4, if installed, to gain access to the mezzanine connectors.

5. Remove the expansion slot covers from slots 1 and 2.
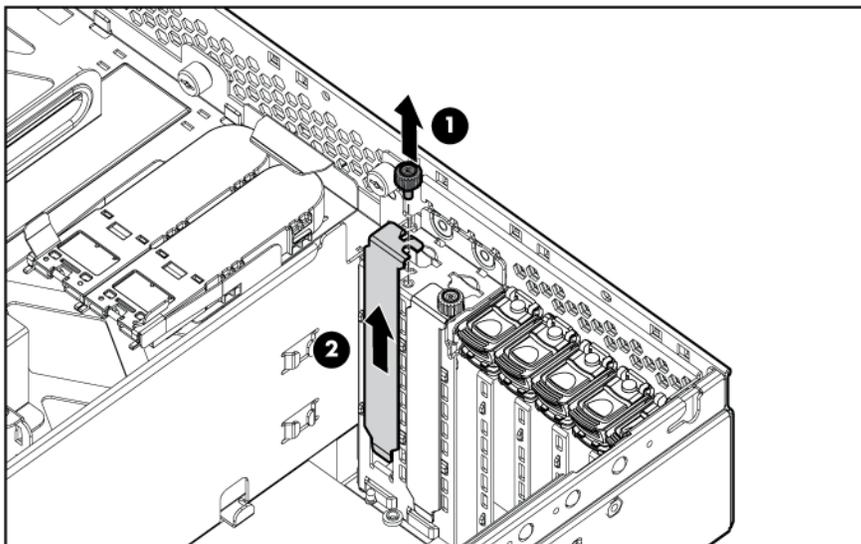
6. Use the guide pins to align the mezzanine board, and seat the mezzanine board onto the system board.

7. Tighten the three thumbscrews to secure the mezzanine board.

NOTE: The PCI Express x8 mezzanine board is shown.
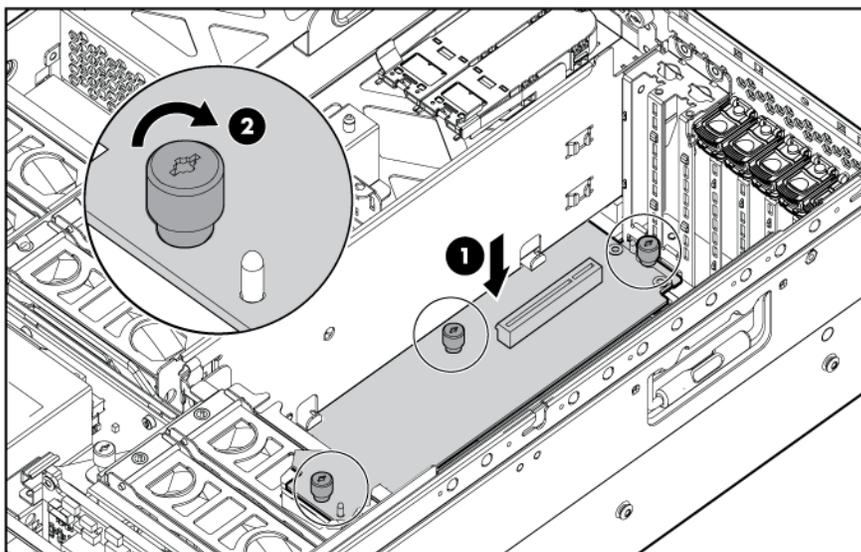
8. Attach the latch to the chassis, and press down until it snaps into place.
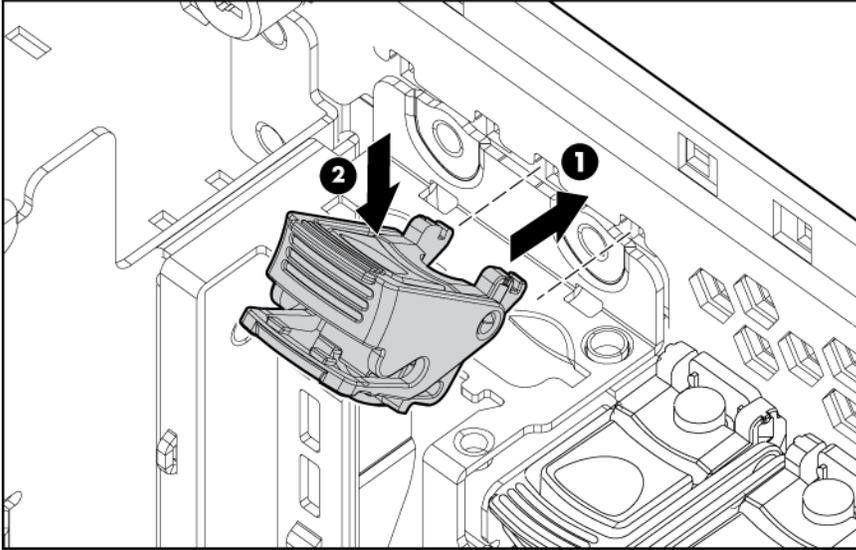
9. Install the retaining clip.
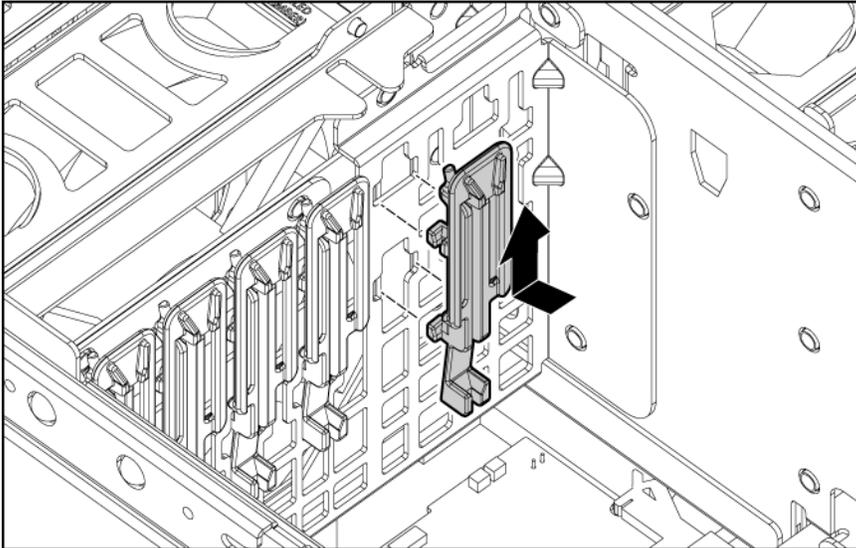
10. Install the PCI Express x8 non-hot-plug expansion board ("Installing non-hot-plug expansion boards" on page 60) into slot 1, if installing the PCI Express x8 mezzanine option. Install the PCI Express x4 non-hot-plug expansion boards into slots 1 and 2, if installing the PCI Express x4 mezzanine option.

11. Place expansion slot covers over any remaining empty slots, and close the latches.

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

12. Replace the access panel ("Removing the access panel" on page 26).

13. Slide the server back into the rack.

14. Power up the server (on page 24).

Installing a x4–x8 PCI Express bus expander

The x4–x8 PCI Express bus expander is a half-length expansion board. When installed into a x4 PCI Express expansion slot, the x4–x8 PCI Express bus expander converts the adjacent x4 PCI Express expansion slot into a x8 PCI Express expansion slot.

The server can support up to two x4–x8 PCI Express bus expander cards. The x4–x8 PCI Express bus expander can only be installed in expansion slots 5 and 7. Installing the x4–x8 PCI Express bus expander into expansion slot 5 converts expansion slot 4 to PCI Express x8. Installing the x4–x8 PCI Express bus expander into expansion slot 7 converts expansion slot 6 to PCI Express x8.

1. Power down the server (on page 24).
2. Extend or remove the server from the rack ("Extending the server from the rack" on page 24).
3. Remove the access panel ("Removing the access panel" on page 26).
4. Remove the expansion boards from the adjacent expansion slots, if installed.
5. Open the PCI latch, and install the x4–x8 PCI Express bus expander.
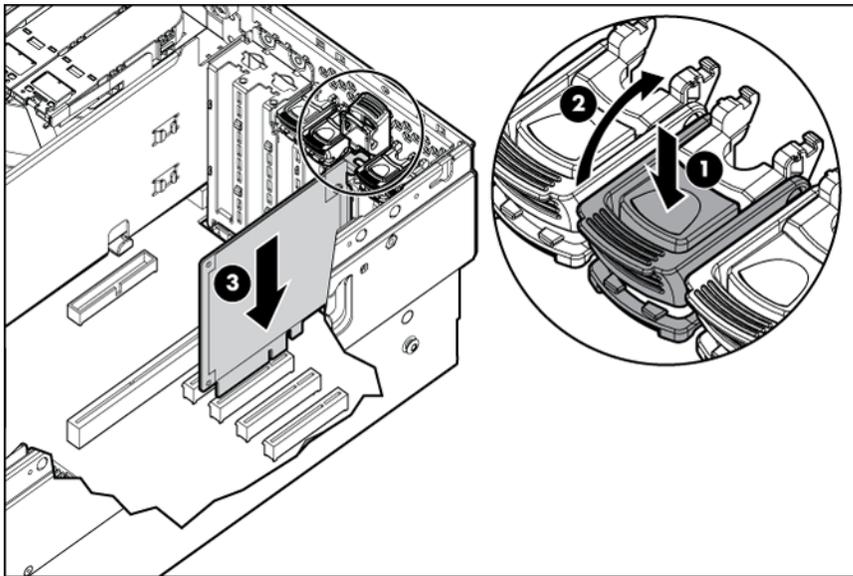
6. Close the PCI latch, and install a x8 PCI Express expansion board into the appropriate adjacent expansion slot.
7. Replace the access panel ("Removing the access panel" on page 26).
8. Replace or slide the server back into the rack.
9. Power up the server (on page 24).

Installing non-hot-plug expansion boards

⚠ **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.

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

1. Power down the server (on page 24).
2. Extend or remove the server from the rack ("Extending the server from the rack" on page 24).
3. Remove the access panel ("Removing the access panel" on page 26).
4. Open the latch, and remove the expansion slot cover.

5. Unlock the retaining clip (for full-length expansion boards), and install the non-hot-plug expansion board.
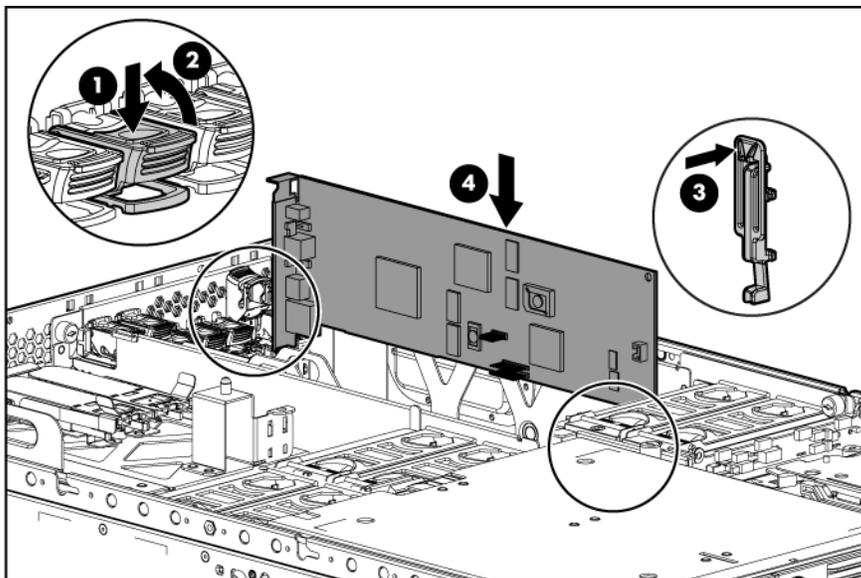
6. Lock the retaining clip (for full-length expansion boards), and close the latch.
7. Connect any required internal or external cables to the expansion board.
8. Replace the access panel, and resume normal server operations.

To remove a non-hot-plug expansion board, reverse the installation procedures.

Installing hot-plug expansion boards

For hot-plug capability, the PCI-X Hot Plug Mezzanine Option (on page 51) must be installed before installing PCI-X Hot Plug expansion boards in the server.

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

1. Extend or remove the server from the rack ("Extending the server from the rack" on page 24).
2. Remove the access panel ("Removing the access panel" on page 26).
3. Press the PCI-X Hot Plug button to remove power from the slot. When the green power LED on the slot stops flashing, power has been removed from the slot.

4. Open the latch, and remove the expansion slot cover.
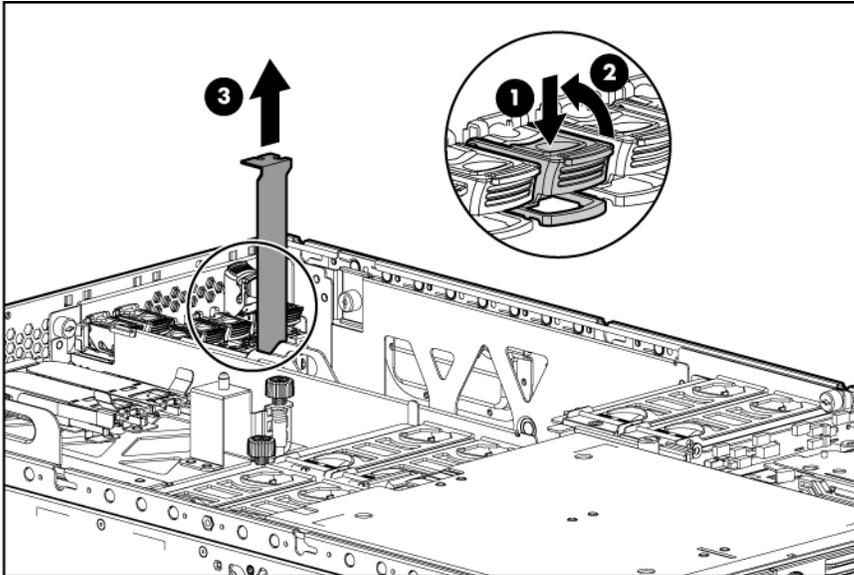
5. Unlock the retaining clip (for full-length expansion boards), and install the PCI-X Hot Plug expansion board.
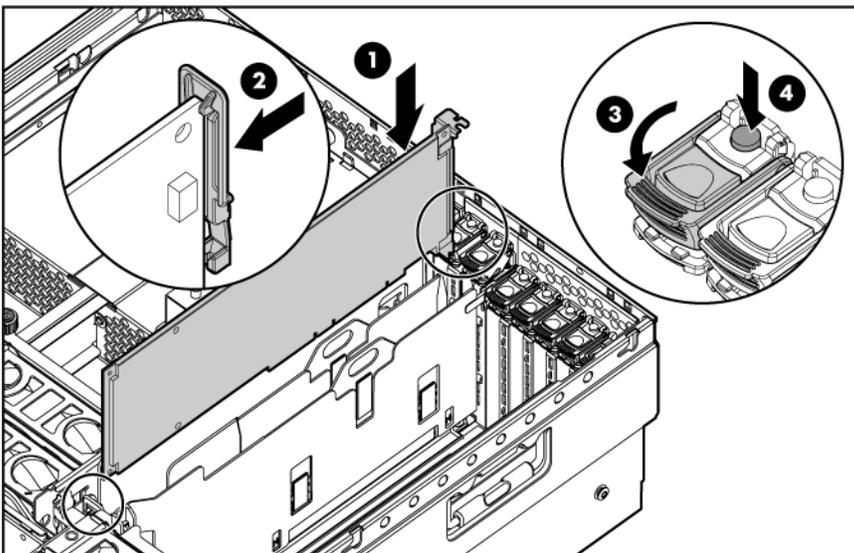
6. Lock the retaining clip (for full-length expansion boards), and close the latch.

7. Connect any required internal or external cables to the expansion board.

8. Press the PCI-X Hot Plug button, and wait for the power LED to illuminate green without flashing.

9. Replace the access panel, and resume normal server operations.

Removing a PCI-X Hot Plug expansion board

1. Extend or remove the server from the rack ("Extending the server from the rack" on page 24).

2. Remove the access panel ("Removing the access panel" on page 26).

3. Press the PCI-X Hot Plug button to remove power from the slot. When the green power LED on the slot stops flashing, power has been removed from the slot.

4. Unlock the retaining clip (for full-length expansion boards).

5. Lift the latch, and remove the board from the server.
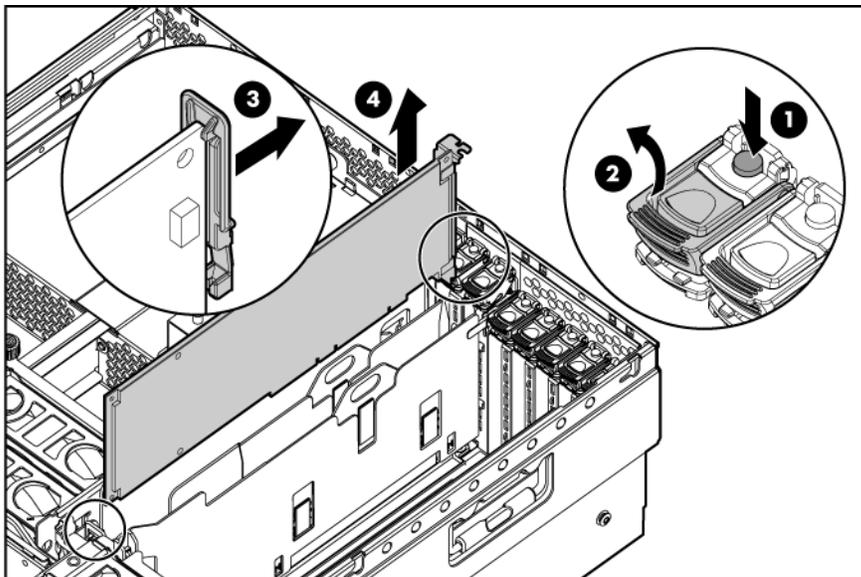
⚠ **CAUTION:** To prevent improper cooling and thermal damage, do not operate the server unless all expansion slots have either an expansion slot cover or an expansion board installed.

To replace the component, reverse the removal procedure.

Memory options

In this section

Memory overview

This server supports up to four memory boards. Each memory board contains four DIMM slots for a total of 16 DIMM slots in the server. Memory can be expanded by installing PC2-3200R Registered DDR2 DRAM DIMMs.

The server supports a host of AMP options to optimize server availability:

- Advanced ECC ("Advanced ECC memory" on page 65)

- Online spare memory (on page 66)

- Hot-plug mirrored memory (dual- and quad-board) ("Hot-plug mirrored memory" on page 67)

- Hot-plug RAID memory (on page 68)

Hot-plug operations can be hot-add or hot-replace. Hot-add makes additional memory resources available to the operating system. Hot-replace allows failed or degraded DIMMs to be replaced while the server is running.

The maximum supported total memory for this server is 64 GB using four memory boards. The maximum supported memory per memory board is 16 GB using four 4-GB DIMMs.

For an overview of single- and dual-rank DIMMs, refer to "Single- and dual-rank DIMMs (on page 65)."

For DIMM slot locations and bank assignments, refer to "DIMM slot locations (on page 19)."

General memory configuration requirements

The following configuration requirements apply regardless of the AMP mode.

- DIMMs must be installed in pairs.

- DIMM pairs within a memory bank must contain DIMMs with the same part number.

- Always populate the DIMMs in sequential order per bank: Bank A and then Bank B.

- Always populate the memory boards in sequential order: Board 1, Board 2, Board 3, and Board 4. Any deviation from this requirement results in the server defaulting to Advanced ECC ("Advanced ECC memory" on page 65) on the next reboot.

- Dual-rank DIMMs ("Single- and dual-rank DIMMs" on page 65) must be populated before single-rank DIMMs (dual-rank DIMMs must be in the lower bank).

- The following table lists all valid combinations of single- and dual-rank DIMM configurations for a memory board. "Single" indicates a bank of single-rank DIMMs. "Dual" indicates a bank of dual-rank DIMMs.

📝 **NOTE:** A bank contains two DIMMs.

Configuration	Bank A	Bank B
1	Single	—
2	Single	Single
3	Dual	—
4	Dual	Single
5	Dual	Dual

- The server can be configured for any AMP mode in RBSU. RBSU displays a warning message if the selected AMP mode is not supported by the current DIMM configuration. However, if the DIMM configuration at POST does not match the AMP mode selected in RBSU, the server defaults to Advanced ECC ("Advanced ECC memory" on page 65). When this occurs, a message displays during POST and the status LED for the configured AMP mode flashes amber.
- Unpopulated memory boards (those without any installed DIMMs) can be installed in the server for storing extra memory boards.
- If your server contains more than 4 GB of memory, consult your operating system documentation for additional requirements.

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.

Advanced ECC memory

Advanced ECC is the default memory protection mode for this server. In Advanced ECC, the server is protected against correctable memory errors. The server will provide notification if the level of correctable errors exceeds a predefined threshold rate. The server does not fail because of correctable memory errors.

Advanced ECC provides additional protection over Standard ECC in that it is possible to correct certain memory errors that would otherwise be uncorrectable and result in a server failure. Whereas Standard ECC can correct single-bit memory errors, Advanced ECC can correct single-bit memory errors and multi-bit memory errors if all failed bits are on the same DRAM device on the DIMM.

The following guidelines apply to Advanced ECC memory:

- All general memory requirements apply.
- Advanced ECC mode is supported with one to four memory boards.
- Board insertions do not convert the AMP mode while the server is running. A server cannot be converted from Advanced ECC to another AMP mode by inserting a board while the server is

running. Board insertions in Advanced ECC are solely for making additional memory resources available to the operating system.

- Advanced ECC is the only mode in which hot-add operations are supported, and is the only mode in which the amount of memory available to the operating system can be increased without a reboot.
- If a memory board (which contains DIMMs) is unlocked while in Advanced ECC mode, audio alarms and visual alerts occur.

The following rules apply to hot-add operations. Hot-add is performed by adding a memory board while the server is running, and the additional memory is made available to the operating system without a reboot.

- Boards must be inserted sequentially.
- Multiple hot-add board insertions can be performed one at a time on the same server. For example, if a server has three empty memory board slots, three hot-add board insertions can be performed.
- If multiple hot-add operations are performed, allow one board insertion operation to complete (as indicated by the memory board LEDs ("Memory board components and LEDs" on page 9) and operating system logs) before inserting another memory board.

△ **CAUTION:** When the memory board locking switch is unlocked in a mode that does not support hot-add or hot-replace capabilities, audio alarms and visual alerts occur. Removing the memory board at this point causes server failure.

To end the audio alarms and visual alerts, move the memory board locking switch back to the locked position. This action does not result in data corruption or server failure.

If removal of a single memory board is required and it is the only memory board, power down the server and make the necessary memory changes.

Online spare memory

Online spare memory provides a higher level of memory protection than Advanced ECC ("Advanced ECC memory" on page 65). With online spare memory, the probability of a server failing because of uncorrectable memory errors is reduced.

In this mode, degraded memory that is receiving a high rate of correctable memory errors is automatically disengaged and a replacement set of memory is used in its place. Because DIMMs that are receiving a high rate of correctable memory errors have an increased probability of receiving an uncorrectable memory error (which results in a server failure), the server experiences higher availability. The degraded memory can be replaced during scheduled downtime and poses no additional risk to the server.

Online spare memory is supported with one to four memory boards installed. On this server, each installed memory board is protected by its own spare memory. No operating system support is required.

The following guidelines apply to online spare memory:

- All general memory requirements apply.
- Online spare memory supports 1, 2, 3, or 4 memory boards.
- Each board must have a valid online spare configuration. No dependencies exist for the configuration between different memory boards.
- Each memory board includes its own online spare bank. All boards will operate in online spare memory mode independently. Each board can failover to its online spare bank independent of the other memory boards. Some boards can be in degraded online spare mode while others are still in operational online spare memory mode.
- The minimum valid online spare configuration for a memory board requires at least one bank of dual-rank DIMMs or two banks of single-rank DIMMs. If the server does not meet these requirements,

an error message appears during POST and the server defaults to Advanced ECC ("Advanced ECC memory" on page 65).

- The server automatically configures the optimal online spare solution.
- Hot-plug operations are not supported.

HP recommends the following configurations. These configurations result in optimal use of memory. Other configurations are valid, but do not result in the maximum amount of installed memory being available to the operating system.

- If only single-rank DIMMs are used on a memory board, all DIMMs should be of the same size on that memory board.
- If only dual-rank DIMMs are used on a memory board, all DIMMs should be of the same size on that memory board.
- If a mixture of single- and dual-rank DIMMs are used on a memory board, the dual-rank DIMMs should be twice the size of any single-rank DIMM.

After installing DIMMs, use RBSU to configure the server ("Configuring the memory" on page 75) for online spare memory support.

Hot-plug mirrored memory

Hot-plug mirrored memory provides a higher level of memory protection than either Advanced ECC ("Advanced ECC memory" on page 65) or online spare memory (on page 66). With hot-plug mirrored memory, the server is protected against uncorrectable memory errors that would otherwise result in server failure. Hot-plug mirrored memory allows the server to keep two copies of all memory data on separate memory boards.

If an uncorrectable error is encountered, the proper data is retrieved from the memory board that did not fail. In addition, hot-plug mirrored memory allows failed or degraded DIMMs to be replaced while the server is running without requiring server downtime. The memory board with the failed DIMMs can be removed, failed DIMMs replaced, and the board re-inserted into the server without any interruption to the operating system.

Hot-plug mirrored memory is supported with either two or four memory boards installed. No operating system support is required.

Hot-plug mirrored memory has two configurations: dual-board and quad-board. Single-board mirrored memory is not supported. For either mode, choose "Mirrored Memory with Advanced ECC" in RBSU.

The following guidelines apply to hot-plug mirrored memory:

- All general memory requirements apply.
- Hot-plug mirrored memory is supported with two or four memory boards.
- Memory boards 1 and 2 are populated for dual-board hot-plug mirrored memory. Boards 1, 2, 3, and 4 are populated for quad-board hot-plug mirrored memory. Any deviation from these guidelines results in the server defaulting to Advanced ECC ("Advanced ECC memory" on page 65).
- Memory boards 1 and 2 form a mirrored pair for dual-board hot-plug mirrored memory. For quad-board hot-plug mirrored memory, memory boards 3 and 4 also form a mirrored pair.
- Memory boards within a mirrored pair must have the same amount of total memory. However, each board of the mirrored pair may have different DIMM configurations as long as they have equal total size. For example, memory boards 1 and 2 could each contain 2 GB of physical memory per board with board 1 containing two 1-GB DIMMs and board 2 containing four 512-MB DIMMs.
- The amount of memory between mirrored pairs can be different in quad-board Hot-Plug Mirrored Memory mode. For example, memory pair 1 (boards 1 and 2) can contain 2 GB each while memory pair 2 (boards 3 and 4) contain 4 GB each.

- In quad-board hot-plug mirrored memory, the two pairs of memory boards operate independently. One of the pairs of memory boards can be degraded while the other pair of memory boards can still be fully mirrored.
- Hot-add operations are not supported. Board removals and insertions in Hot-Plug Mirrored Memory mode are solely for the purpose of hot-replace operations.
- For hot-replace to function properly, the memory board must be re-inserted into the location from which it was removed. If the board is placed into the incorrect slot (for example, if board 2 is removed in dual-board mode and re-inserted into memory slots 3 or 4), a configuration error occurs. Attempting to insert a board into the improper position results in audio alarms and visual alerts.
- Replace only one board at a time. That is, if memory boards 2 and 4 both contain memory errors, remove board 2, correct the error, and replace board 2. Wait for the board status LED to stop flashing before proceeding to board 4.
- If a board is inserted into a valid memory slot but with an invalid DIMM configuration (including too much or too little memory), a DIMM configuration error occurs and a visual alert occurs (refer to Memory Board Components and LEDs (on page 9)).
- If you remove a board while the server is running and do not replace the board, the server defaults to Advanced ECC ("Advanced ECC memory" on page 65) on the next reboot.

Hot-plug RAID memory

Hot-plug RAID memory provides a similar level of memory protection as hot-plug mirrored memory (on page 67) but obtains this protection using less total memory. Hot-plug RAID memory protects the server against uncorrectable memory errors that would otherwise result in a server failure.

Although hot-plug mirrored memory keeps two copies of all memory data, hot-plug RAID memory keeps only one copy of all memory data and additional parity information. If an uncorrectable memory error is encountered, the server can create the proper data using the parity information and the information from the other memory boards that contain no failures. In a hot-plug RAID memory configuration, 25% of the installed memory is not available to the operating system. In a hot-plug mirrored memory configuration, however, 50% of the installed memory is not available to the operating system.

As with hot-plug mirrored memory, hot-plug RAID memory allows failed or degraded DIMMs to be replaced while the server is running without requiring server downtime. The memory board with the failed DIMMs can be removed, failed DIMMs replaced, and the board re-inserted into the server without any interruption to the operating system.

Hot-plug RAID memory is only supported if all four memory boards are installed. No operating system support is required.

The following guidelines apply to hot-plug RAID memory:

- All general memory requirements apply.
- Hot-plug RAID memory is only supported with four memory boards.
- All four memory boards must have the same amount of total memory. However, each board can have different DIMM configurations as long as they have equal total size. Any deviation from this rule results in the server defaulting to Advanced ECC ("Advanced ECC memory" on page 65).
- Hot-replace operations are supported.
- If you remove a board while the server is running and do not replace it, the server defaults to Advanced ECC on the next reboot.

Memory boards and DIMMs

Memory board and DIMM installation, removal, and replacement procedures can be either hot-plug or non-hot-plug procedures, depending on how the server is configured. Hot-plug operations can be hot-add or hot-replace. Hot-add makes additional memory resources available to the operating system. Hot-replace allows failed or degraded DIMMs to be replaced while the server is running. Hot-add is only supported with Microsoft® Windows® 2003 or later. Hot-replace has no operating system requirements.

The following table illustrates what AMP mode supports hot-plug features.

Advanced memory protection mode	Hot-replace supported	Hot-add supported
Advanced ECC		X
Online spare memory		
Hot-plug mirrored memory	X	
Hot-plug RAID memory	X	

When the server is configured for hot-plug mirrored memory or hot-plug RAID memory, you can perform a hot-replacement procedure in the following manner without powering down the server or experiencing server downtime:

1. Remove a memory board.
2. Replace failed or degraded DIMMs.
3. Reinstall the memory board in the slot from which it was removed.

The replacement procedures in this section apply to both hot-plug and non-hot-plug memory procedures, except as noted.

IMPORTANT: Be sure to power down the server when performing board removal procedures in a server that is not configured for Advanced ECC, hot-plug mirrored memory, or hot-plug RAID memory.

Observe the following warnings when performing a hot-plug replacement procedure.

WARNING: Always comply with all electrostatic and thermal guidelines to prevent bodily injury and ensure a properly functioning system when performing hot-plug operations.

WARNING: To prevent personal injury from hazardous energy:
- **Remove watches, rings, or other metal objects.**
- **Use tools with insulated handles.**
- **Do not place tools or metal parts on top of batteries.**

Removing a memory board blank

To remove the memory board blank, squeeze the levers and pull the blank out of the server.
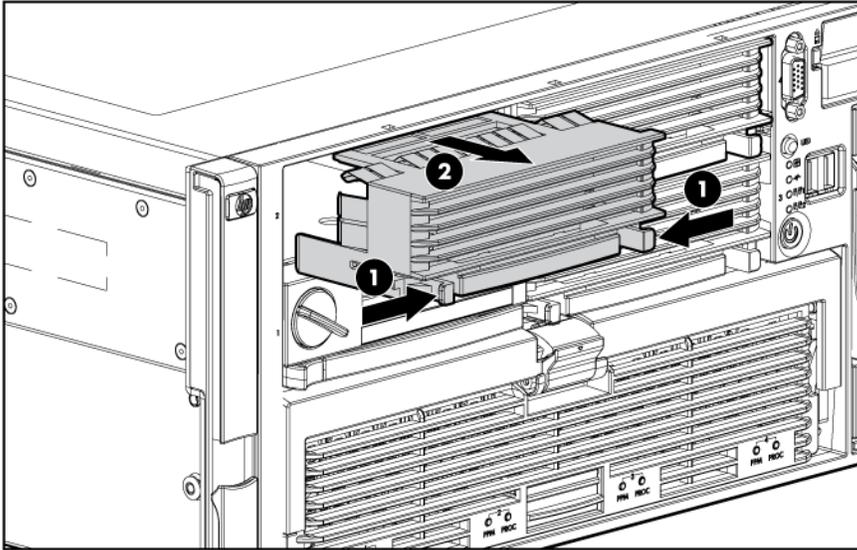
Removing and installing a memory board while the server is running

Memory boards can be installed while the server is running in the following scenarios:

- Memory boards can be hot-added if the server is configured for Advanced ECC and hot-add is enabled in RBSU.
- Memory boards can be hot-replaced if the server is configured for hot-plug mirrored memory or hot-plug RAID memory.

IMPORTANT: Be sure to power down the server when performing board removal procedures in a server that is not configured for Advanced ECC, hot-plug mirrored memory, or hot-plug RAID memory.

1. Unlock the locking switch, and open the release latch.

CAUTION: Only memory boards with a green Removable LED can be removed. Do not attempt to remove any memory board with the Removable LED off.

CAUTION: To prevent server failure during a hot-plug removal procedure, do not remove the memory board from the server until the board status LED stops flashing.

2. Use the ejector lever to pull the memory board out of the server.
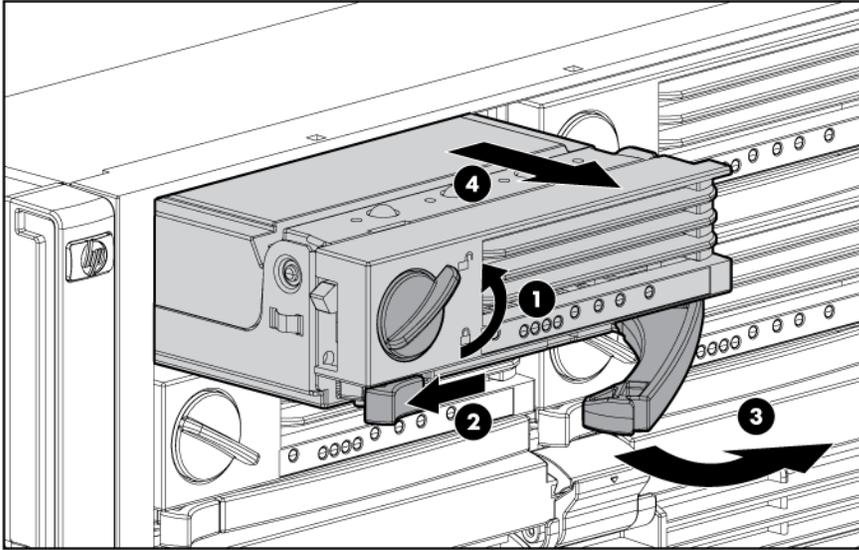
📝 **NOTE:** While the memory board with the failed or degraded DIMM is being replaced, the server continues to read and write from the operational memory board.

3. Open the memory board.
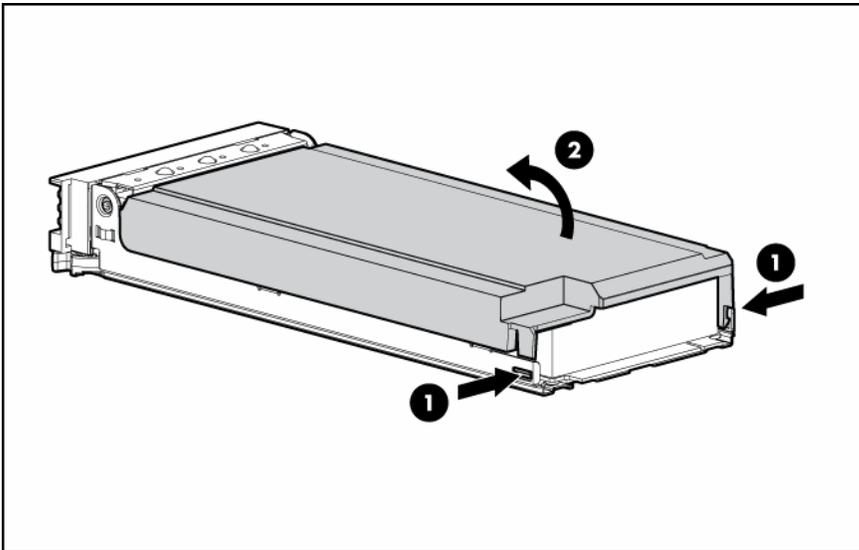
4. Remove or install the DIMM.
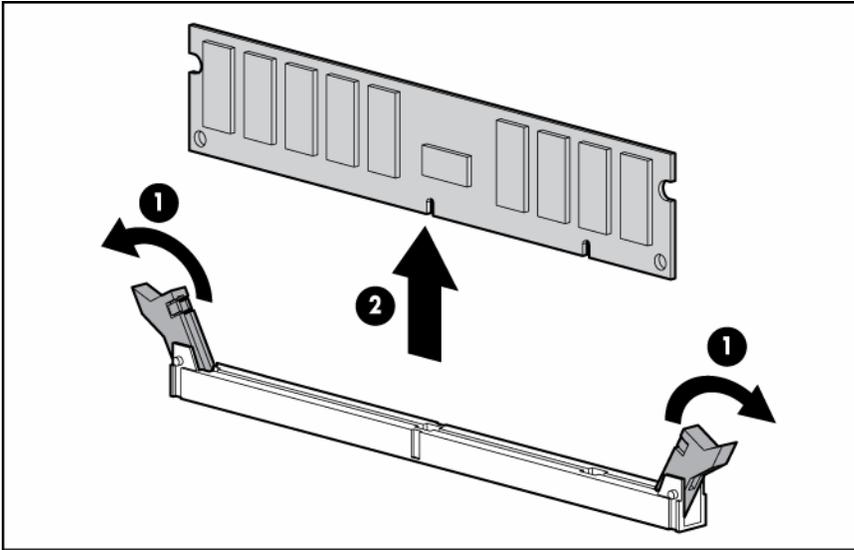
📝 IMPORTANT: Be sure to observe all DIMM installation requirements for the desired memory mode.

📝 IMPORTANT: DIMMs do not seat fully if turned the wrong way.
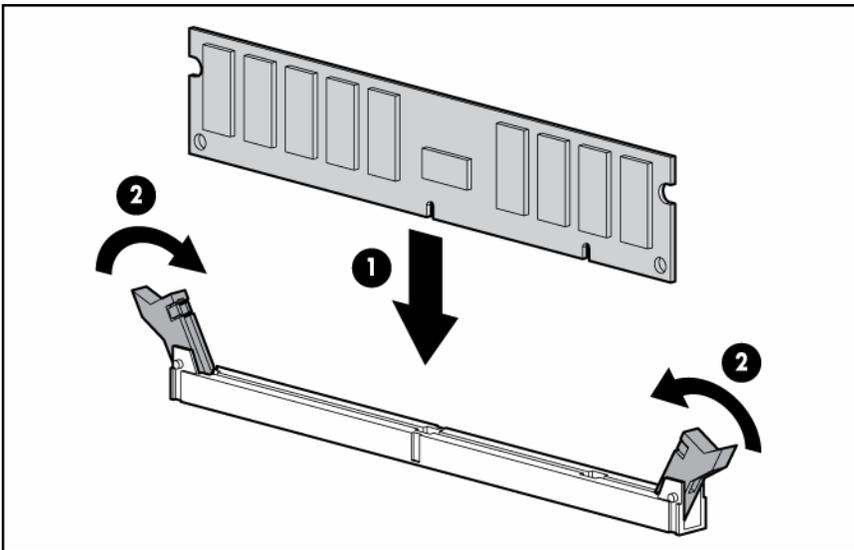
5. Close the memory board.

📝 IMPORTANT: Be sure that the locking switch is unlocked. The memory board will not seat in the server if the locking switch is locked.

6. Install the memory board.

7. Close the ejector lever, and lock the locking switch.
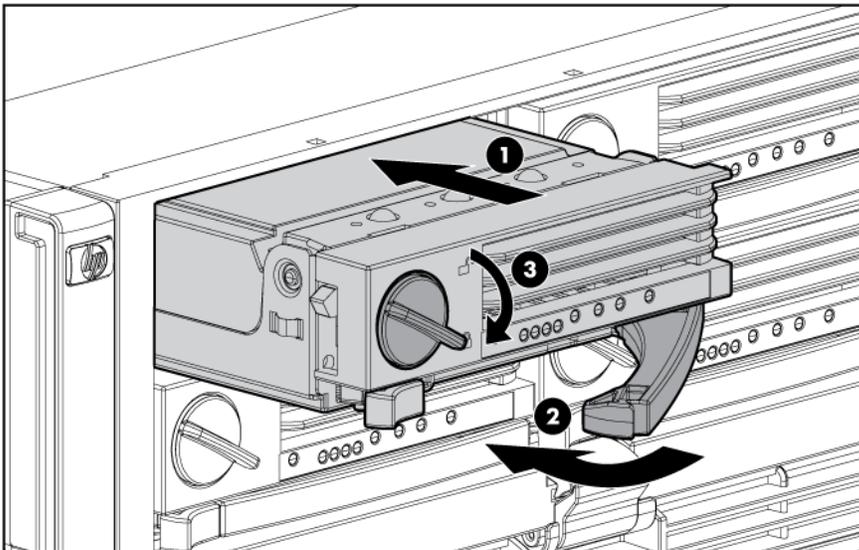
📝 **NOTE:** The board status LED might flash green for several minutes while the board is rebuilding.

8. Configure the memory ("Configuring the memory" on page 75), if applicable.
9. Reference the memory board LEDs ("Memory board components and LEDs" on page 9) to be sure that the memory board is functioning properly.

Removing and installing a memory board (non-hot-plug)

1. Power down the server (on page 24).
2. Unlock the locking switch, and open the release latch.
3. Use the ejector lever to pull the memory board out of the server.
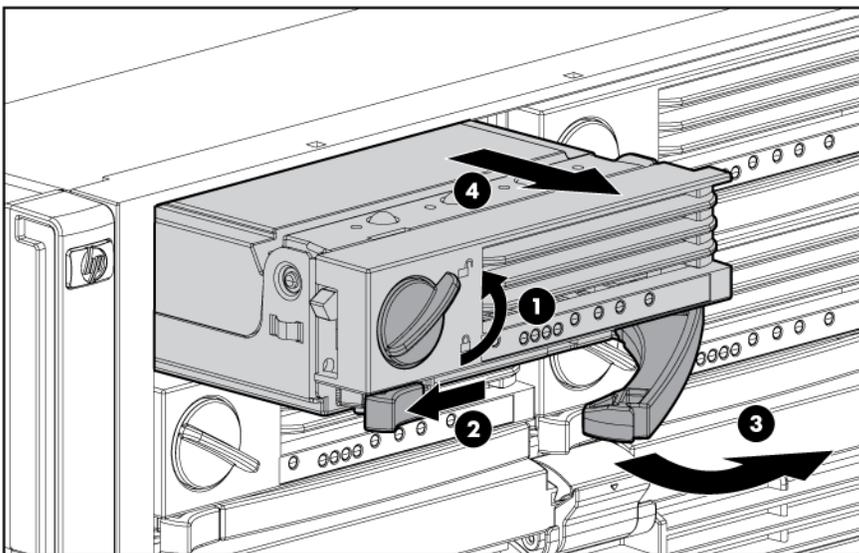
4. Open the memory board.
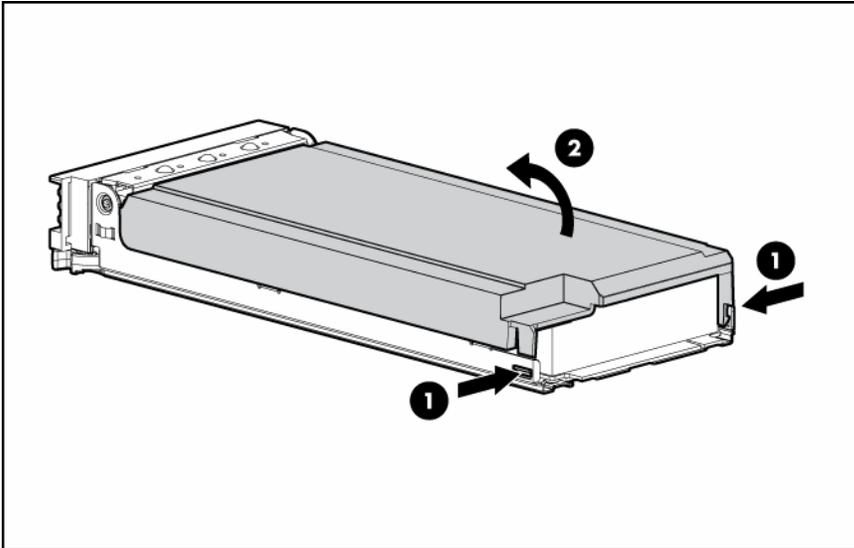
5. Remove or install the DIMM.
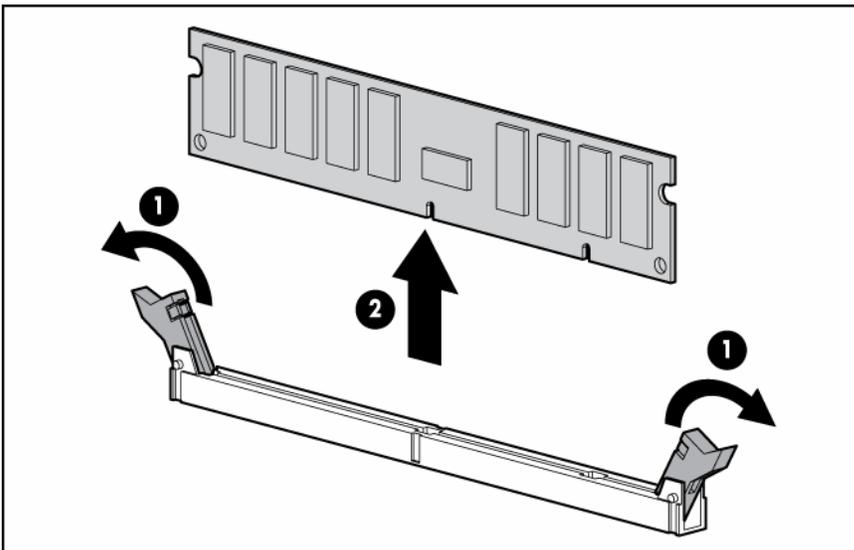
![notes icon] **IMPORTANT:** Be sure to observe all DIMM installation requirements for the desired memory mode.

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

6. Close the memory board.

IMPORTANT: Be sure that the locking switch is unlocked. The memory board will not seat in the server if the locking switch is locked.

7. Install the memory board.
8. Close the ejector lever, and lock the locking switch.
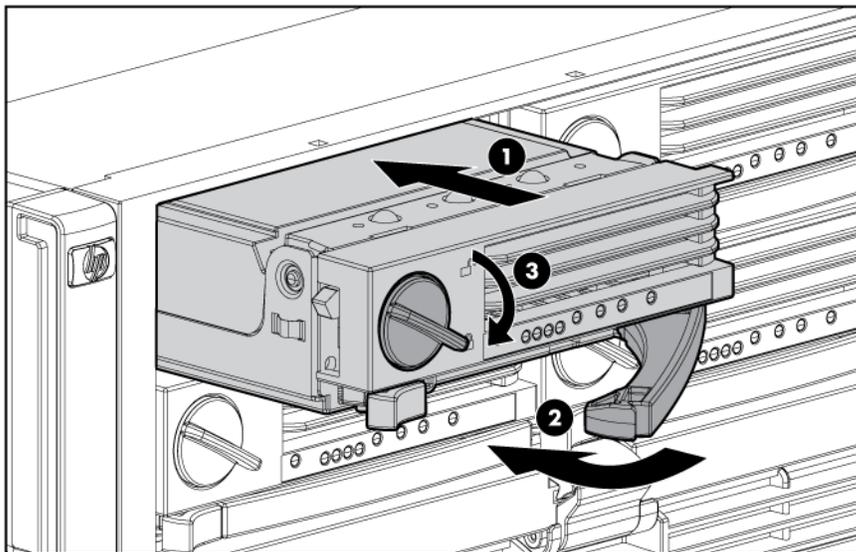
9. Power up the server (on page 24).
10. Configure the memory ("Configuring the memory" on page 75).
11. Look at the memory board LEDs ("Memory board components and LEDs" on page 9) to be sure that the memory board is functioning properly.

Configuring the memory

Configuring the memory system of the server requires configuring both hardware and software.

To configure the memory:

1. Install the correct amount of memory for the desired AMP mode. For a list of AMP options, refer to "Memory options (on page 64, "Memory overview" on page 64)." For more information, refer to "General memory configuration requirements (on page 64)."

2. Test the DIMMs for all AMP modes, except Advanced ECC, before configuring the AMP mode in RBSU. The two testing methods are:
   - POST memory test (on page 76)
   - ROM-Based Diagnostics test ("ROM-based diagnostics" on page 76)

NOTE: If the total amount of memory has changed, the POST memory test will run automatically. Additional memory testing is not necessary.

3. Select the AMP mode ("Selecting the AMP mode" on page 76).

POST memory test

1. Power on the server ("Power up the server" on page 24).
2. Press the **F9** key, when prompted, to enter RBSU.
3. Select **Advanced Options.**
4. Change POST Speed Up to **Disable.**
5. Press any key to return to the RBSU main menu.
6. Press the **F10** key, when prompted, to exit RBSU. The server reboots and tests all memory in the system.
7. Once the memory has been tested, re-enable POST Speed Up for faster system boot, if desired.

ROM-based diagnostics

1. Power up the server (on page 24).
2. Press the **F10** key, when prompted, to enter the System Maintenance menu.
3. Select **Diagnostics.**
4. Run the **Memory Diagnostics.**
5. After the memory has been tested, exit the utility and reboot.
6. Select the AMP mode ("Selecting the AMP mode" on page 76).

Selecting the AMP mode

1. Upon reboot, press the **F9** key, when prompted, to enter RBSU.
2. Select **System Options.**
3. Select **Advanced Memory Protection.**
4. Select the desired memory mode.
   - Advanced ECC (hot-add enabled)
   - Advanced ECC (hot-add disabled)
   - Online Spare Memory with Advanced ECC
   - Hot-Plug Mirrored Memory with Advanced ECC
   - Hot-Plug RAID Memory with Advanced ECC
5. Press the **Escape** key twice to go back to the main RBSU menu.
6. Press the **F10** key, when prompted, to exit RBSU. The server reboots and tests all memory in the system.

IMPORTANT: To reconfigure the memory mode after initial setup, you must reboot the system, enter RBSU, and select an AMP mode.

Server cabling

In this section

Storage device cabling guidelines

△ **CAUTION:** To prevent damage to the equipment, be sure that the server is powered down, all cables are disconnected from the back of the server, and the power cord is disconnected from the grounded (earthed) AC outlet before installing devices.

△ **CAUTION:** To prevent damage to electrical components, properly ground the server before beginning any installation procedure. Improper grounding can cause electrostatic discharge.

PCI-X Hot Plug mezzanine cabling

The server supports an optional PCI-X Hot Plug mezzanine board that provides hot-plug capability for two expansion slots. A ribbon cable connects the PCI-X Hot Plug button to the PCI-X Hot Plug mezzanine board.

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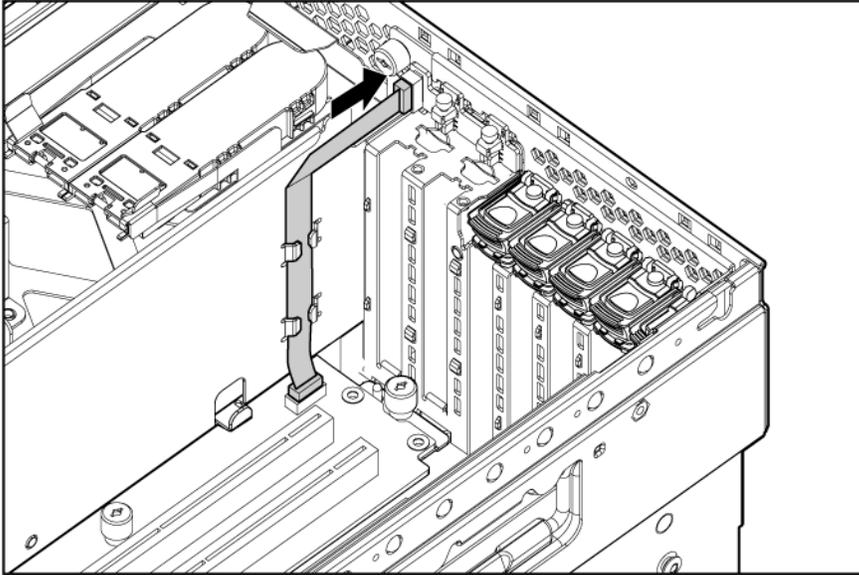
BBWC cabling

CAUTION: When routing cables, always be sure that the cables are not in a position where they can be pinched or crimped.
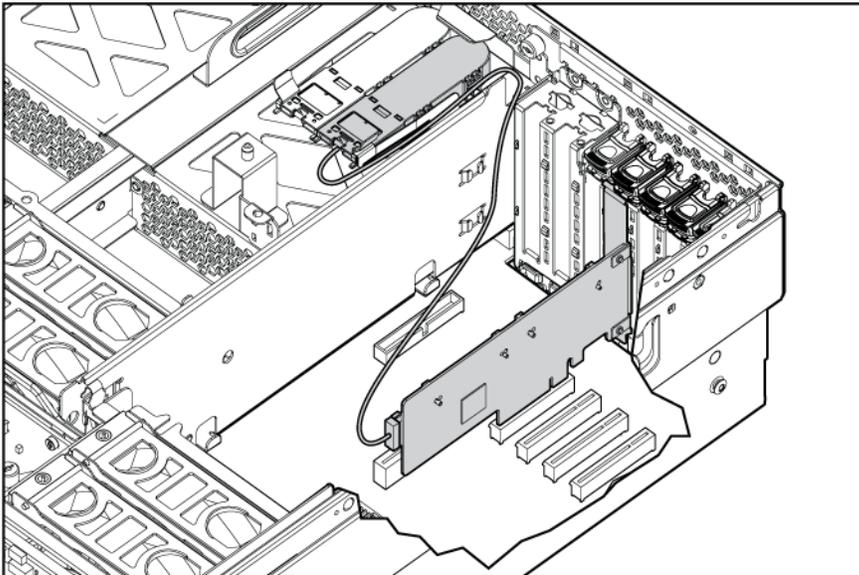
Hot-plug SAS and SATA hard drive cabling

CAUTION: When routing cables, always be sure that the cables are not in a position where they can be pinched or crimped.
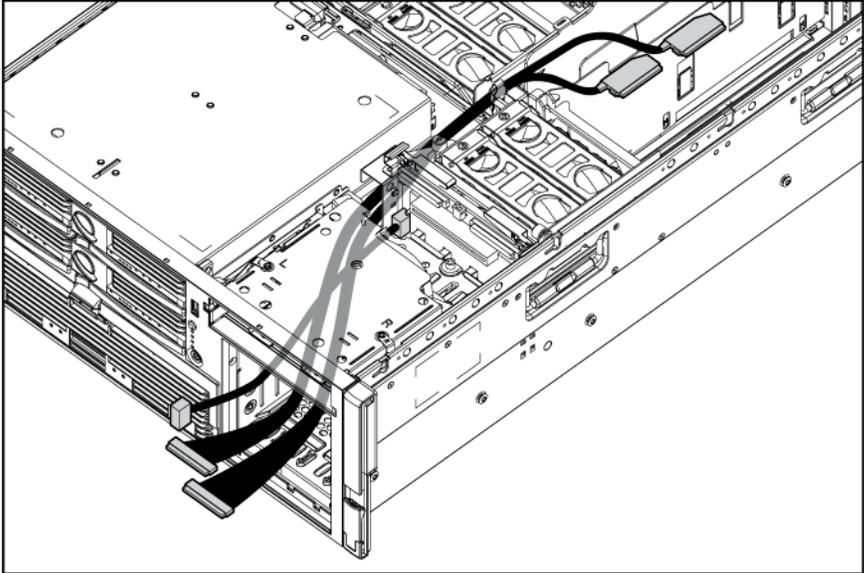
NOTE: Port 1 supports hard drives 1 through 4. Port 2 supports hard drives 5 through 8. If you are using a single channel SAS controller, connect the cable to port 1.
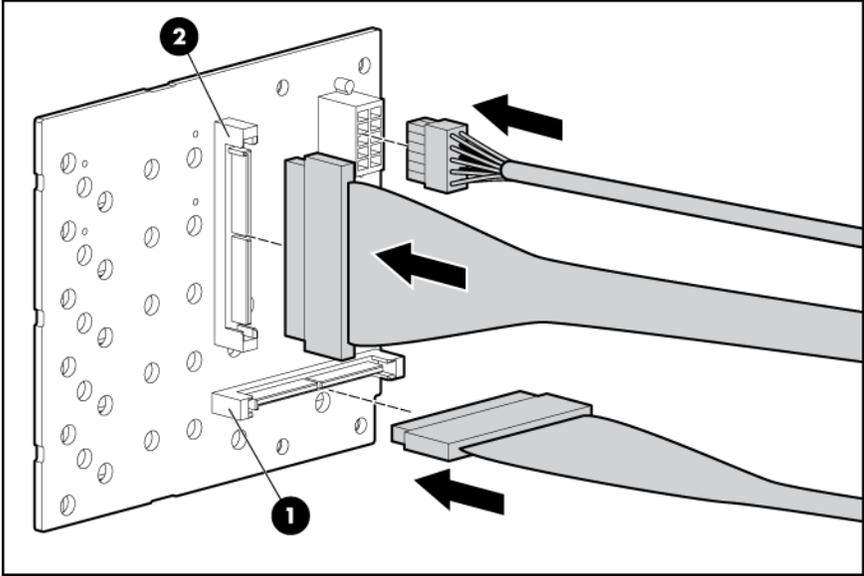
Front panel USB connector cable assembly

The USB cable connects the front panel USB connector to the media backplane.
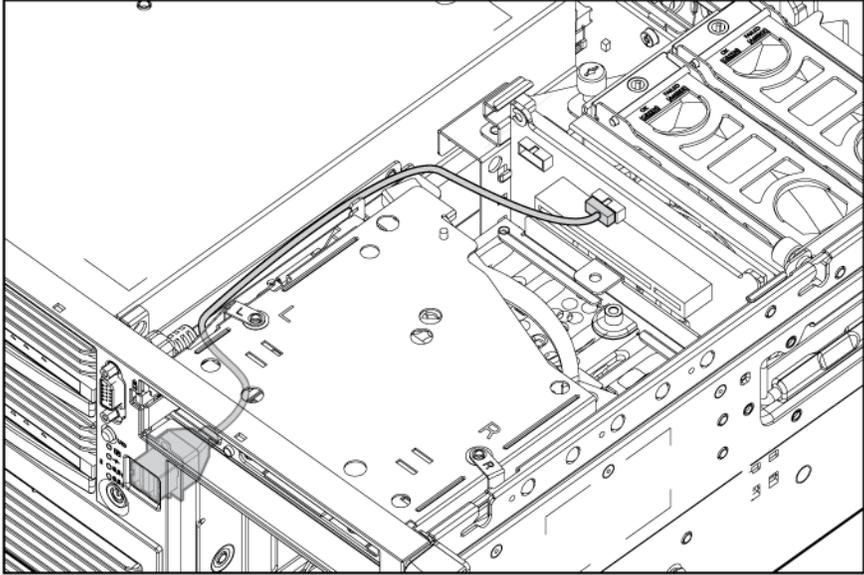
Power switch cable assembly
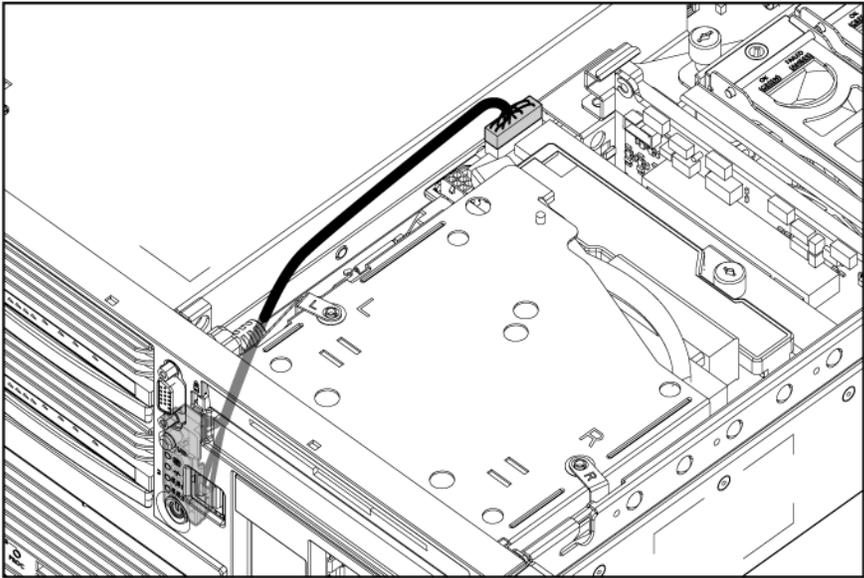
Front panel video connector cabling
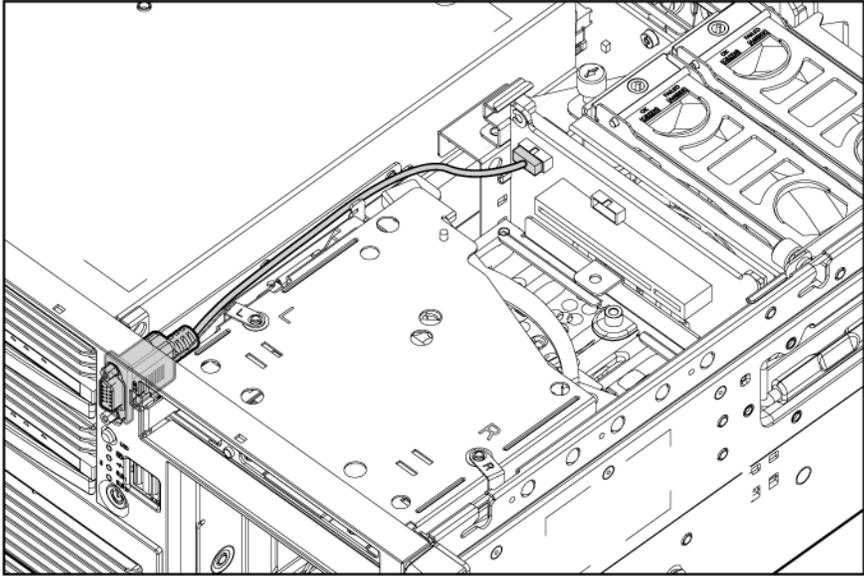
Server software and configuration utilities

In this section

Configuration tools

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 89)
- 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 (on page 86), Array Diagnostic Utility (on page 90), 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 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).

Using RBSU

The first time you power up the server, the system prompts you to enter RBSU and select a language. Default configuration settings are made at this time and can be changed later. Most of the features in RBSU are not required to set up the server.

To navigate RBSU, use the following keys:

- To access RBSU, press the **F9** key during power up when prompted in the upper right corner of the screen.
- To navigate the menu system, use the arrow keys.
- To make selections, press the **Enter** key.

IMPORTANT: RBSU automatically saves settings when you press the **Enter** key. The utility does not prompt you for confirmation of settings before you exit the utility. To change a selected setting, you must select a different setting and press the **Enter** key.

Auto-configuration process

The auto-configuration process automatically runs when you boot the server for the first time. During the power-up sequence, the system ROM automatically configures the entire system without needing any intervention. During this process, the ORCA utility, in most cases, automatically configures the array to a default setting based on the number of drives connected to the server.

NOTE: The server may not support all the following examples.

NOTE: If the boot drive is not empty or has been written to in the past, ORCA does not automatically configure the array. You must run ORCA to configure the array settings.

Drives installed	Drives used	RAID level
1	1	RAID 0
2	2	RAID 1
3, 4, 5, or 6	3, 4, 5, or 6	RAID 5

Drives installed	Drives used	RAID level
More than 6	0	None

To change any ORCA default settings and override the auto-configuration process, press the **F8** key when prompted.

By default, the auto-configuration process configures the system for the English language. To change any default settings in the auto-configuration process (such as the settings for language, operating system, and primary boot controller), execute RBSU by pressing the **F9** key when prompted. After the settings are selected, exit RBSU and allow the server to reboot automatically.

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

Boot options

After the auto-configuration process completes, or after the server reboots upon exit from RBSU, the POST sequence runs, and then the boot option screen is displayed. This screen is visible for several seconds before the system attempts to boot from a diskette, CD, or hard drive. During this time, the menu on the screen allows you to install an operating system or make changes to the server configuration in RBSU.

BIOS Serial Console

BIOS Serial Console allows you to configure the serial port to view POST error messages and run RBSU remotely through a serial connection to the server COM port. The server that you are remotely configuring does not require a keyboard and mouse.

For more information about BIOS Serial Console, refer to the *BIOS Serial Console User Guide* on the Documentation CD or the HP website (http://www.hp.com/servers/smartstart).

HP ProLiant Essentials Rapid Deployment Pack

The RDP software is the preferred method for rapid, high-volume server deployments. The RDP software integrates two powerful products: Altiris Deployment Solution and the HP ProLiant Integration Module.

The intuitive graphical user interface of the Altiris Deployment Solution console provides simplified point-and-click and drag-and-drop operations that enable you to deploy target servers, including server blades, remotely. It enables you to perform imaging or scripting functions and maintain software images.

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

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.

Array Configuration Utility

ACU is a browser-based utility with the following features:

- Runs as a local application or remote service
- Supports online array capacity expansion, logical drive extension, assignment of online spares, and RAID or stripe size migration
- Suggests the optimum configuration for an unconfigured system
- Provides different operating modes, enabling faster configuration or greater control over the configuration options
- Remains available any time that the server is on
- Displays on-screen tips for individual steps of a configuration procedure

For optimum performance, the minimum display settings are 800 × 600 resolution and 256 colors. Servers running Microsoft® operating systems require Internet Explorer 5.5 (with Service Pack 1) or later. For Linux servers, refer to the README.TXT file for additional browser and support information.

For more information, refer to the *HP Array Configuration Utility User Guide* on the Documentation CD or the HP website (http://www.hp.com).

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 **Escape** key to close the menu.
9. Press the **Escape** key to exit RBSU.
10. Press the **F10** key to confirm exiting RBSU. The server will automatically reboot.

Management tools

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.

ROMPaq utility

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

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

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

System Online ROM flash component utility

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

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

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

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

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

Remote Insight Lights-Out Edition II

RILOE II enables browser access to servers through a hardware-based, OS-independent graphical remote console. Some of the features include virtual diskette drive and power button, server management through any standard browser, dedicated LAN connectivity, automatic network configuration, external power backup, group administration, and functions available with the Remote Insight Board.

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

Integrated Lights-Out 2 technology

The iLO 2 subsystem is a standard component of selected ProLiant servers that provides server health and remote server manageability. The iLO 2 subsystem includes an intelligent microprocessor, secure memory, and a dedicated network interface. This design makes iLO 2 independent of the host server and its operating system. The iLO 2 subsystem provides remote access to any authorized network client, sends alerts, and provides other server management functions.

Using iLO 2, you can:

- Remotely power up, power down, or reboot the host server.
- Send alerts from iLO 2 regardless of the state of the host server.
- Access advanced troubleshooting features through the iLO 2 interface.
- Diagnose iLO 2 using HP SIM through a web browser and SNMP alerting.

For more information about iLO 2 features, refer to the iLO 2 documentation on the Documentation CD or on the HP website (http://www.hp.com/servers/lights-out).

StorageWorks library and tape tools

HP StorageWorks L&TT provides functionality for firmware downloads, verification of device operation, maintenance procedures, failure analysis, corrective service actions, and some utility functions. It also provides seamless integration with HP hardware support by generating and emailing support tickets that deliver a snapshot of the storage system.

For more information, and to download the utility, refer to the StorageWorks L&TT website (http://h18006.www1.hp.com/products/storageworks/ltt).

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).

Management Agents

Management Agents provide the information to enable fault, performance, and configuration management. The agents allow easy manageability of the server through HP SIM software, and third-party SNMP management platforms. Management Agents are installed with every SmartStart assisted installation or can be installed through the HP PSP. The Systems Management homepage provides status and direct access to in-depth subsystem information by accessing data reported through the Management Agents. For additional information, refer to the Management CD in the HP ProLiant Essentials Foundation Pack or the HP website (http://www.hp.com/servers/manage).

Redundant ROM support

The server enables you to upgrade or configure the ROM safely with redundant ROM support. The server has a 4-MB ROM that acts as two, separate 2-MB ROMs. In the standard implementation, one side of the ROM contains the current ROM program version, while the other side of the ROM contains a backup version.

NOTE: The server ships with the same version programmed on each side of the ROM.

Safety and security benefits

When you flash the system ROM, ROMPaq writes over the backup ROM and saves the current ROM as a backup, enabling you to switch easily to the alternate ROM version if the new ROM becomes corrupted for any reason. This feature protects the existing ROM version, even if you experience a power failure while flashing the ROM.

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).

Diagnostic tools

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).

Survey Utility

Survey Utility, a feature within HP Insight Diagnostics (on page 89), gathers critical hardware and software information on ProLiant servers.

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).

If a significant change occurs between data-gathering intervals, the Survey Utility marks the previous information and overwrites the Survey text files to reflect the latest changes in the configuration.

Survey Utility is installed with every SmartStart-assisted installation or can be installed through the HP PSP ("ProLiant Support Packs" on page 91).

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 88)
- From within Survey Utility (on page 89)
- From within operating system-specific IML viewers
  - For NetWare: IML Viewer
  - For Windows®: IML Viewer
  - For Linux: IML Viewer Application
- From within the iLO 2 user interface
- From within HP Insight Diagnostics (on page 89)

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

Array Diagnostic Utility

ADU is a tool that collects information about array controllers and generates a list of detected problems. ADU can be accessed from the SmartStart CD ("SmartStart software" on page 83) or downloaded from the HP website (http://www.hp.com).

Remote support and analysis tools

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).

Keeping the system current

Drivers

The server includes new hardware that may not have driver support on all operating system installation media.

If you are installing a SmartStart-supported operating system, use the SmartStart software (on page 83) and its Assisted Path feature to install the operating system and latest driver support.

NOTE: If you are installing drivers from the SmartStart CD or the Software Maintenance CD, refer to the SmartStart website (http://www.hp.com/servers/smartstart) to be sure that you are using the latest version of SmartStart. For more information, refer to the documentation provided with the SmartStart CD.

If you do not use the SmartStart CD to install an operating system, drivers for some of the new hardware are required. These drivers, as well as other option drivers, ROM images, and value-add software can be downloaded from the HP website (http://www.hp.com/support).

IMPORTANT: Always perform a backup before installing or updating device drivers.

Resource Paqs

Resource Paqs are operating system-specific packages of tools, utilities, and information for HP servers running certain Microsoft® or Novell operating systems. The Resource Paqs include utilities to monitor performance, software drivers, customer support information, and white papers on the latest server integration information. Refer to the Enterprise Partnerships website (http://h18000.www1.hp.com/partners), select **Microsoft** or **Novell**, depending on the operating system, and follow the link to the appropriate Resource Paq.

ProLiant Support Packs

PSPs represent operating system-specific bundles of ProLiant optimized drivers, utilities, and management agents. Refer to the PSP website (http://h18000.www1.hp.com/products/servers/management/psp.html).

Operating system version support

Refer to the operating system support matrix (http://www.hp.com/go/supportos).

Change control and proactive notification

HP offers Change Control and Proactive Notification to notify customers 30 to 60 days in advance of upcoming hardware and software changes on HP commercial products.

For more information, refer to the HP website (http://h18023.www1.hp.com/solutions/pcsolutions/pcn.html).

Natural language search assistant

The natural language search assistant (http://www.hp.com/support/natural_language_search) is a search engine that finds information on HP products, including ProLiant servers. The search engine responds to queries entered in question form.

Care Pack

HP Care Pack Services offer upgraded service levels to extend and expand standard product warranty with easy-to-buy, easy-to-use support packages that help you make the most of your server investments. Refer to the Care Pack website (http://www.hp.com/hps/carepack/servers/cp_proliant.html).

Electrostatic discharge

In this section

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.

Grounding methods to prevent electrostatic discharge

Several methods are used for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm ±10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an authorized reseller install the part.

For more information on static electricity or assistance with product installation, contact an authorized reseller.

Troubleshooting

In this section

Troubleshooting resources

The *HP ProLiant Servers Troubleshooting Guide* provides simple procedures for resolving common problems as well as a comprehensive course of action for fault isolation and identification, error message interpretation, issue resolution, and software maintenance.

To obtain the guide, refer to any of the following sources and then select the *HP ProLiant Servers Troubleshooting Guide:*

- The server-specific Documentation CD

- The Business Support Center on the HP website (http://www.hp.com/support). Navigate to the server technical support page. Under self-help resources, select **ProLiant Troubleshooting Guide**.

- The Technical Documentation website (http://www.docs.hp.com). Select **Enterprise Servers, Workstations and Systems Hardware,** and then the appropriate server.

Pre-diagnostic steps

⚠ **WARNING: To avoid potential problems, ALWAYS read the warnings and cautionary information in the server documentation before removing, replacing, reseating, or modifying system components.**

📝 **IMPORTANT:** This guide provides information for multiple servers. Some information may not apply to the server you are troubleshooting. Refer to the server documentation for information on procedures, hardware options, software tools, and operating systems supported by the server.

1. Review the important safety information (on page 93).
2. Gather symptom information (on page 95).
3. Prepare the server for diagnosis (on page 96).
4. Use the Start diagnosis flowchart (on page 97) to begin the diagnostic process.

Important safety information

Familiarize yourself with the safety information in the following sections before troubleshooting the server.

⚠ Important safety information

Before servicing this product, read the *Important Safety Information* document provided with the server.

Symbols on equipment

The following symbols may be placed on equipment to indicate the presence of potentially hazardous conditions.

⚠⚡	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.
⚠ 63.5 kg 140 lb	This symbol indicates that the component exceeds the recommended weight for one individual to handle safely. **WARNING:** To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manual material handling.
⚠	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.

Warnings and cautions

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

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

- **The leveling feet are extended to the floor.**
- **The full weight of the rack rests on the leveling feet.**
- **The stabilizing feet are attached to the rack if it is a single-rack installation.**
- **The racks are coupled together in multiple-rack installations.**
- **Only one component is extended at a time. A rack may become unstable if more than one component is extended for any reason.**

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.**

63.5 kg

140 lb

WARNING: To reduce the risk of personal injury or damage to the equipment:

- Observe local occupation health and safety requirements and guidelines for manual handling.
- Obtain adequate assistance to lift and stabilize the chassis during installation or removal.
- The server is unstable when not fastened to the rails.
- When mounting the server in a rack, remove the power supplies and any other removable module to reduce the overall weight of the product.

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

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

Symptom information

Before troubleshooting a server problem, collect the following information:

- What events preceded the failure? After which steps does the problem occur?
- What has been changed since the time the server was working?
- Did you recently add or remove hardware or software? If so, did you remember to change the appropriate settings in the server setup utility, if necessary?
- How long has the server exhibited problem symptoms?
- If the problem occurs randomly, what is the duration or frequency?

To answer these questions, the following information may be useful:

- Run HP Insight Diagnostics (on page 89) and use the survey page to view the current configuration or to compare it to previous configurations.
- Refer to your hardware and software records for information.
- Refer to server LEDs and their statuses.

Prepare the server for diagnosis

1. Be sure the server is in the proper operating environment with adequate power, air conditioning, and humidity control. Refer to the server documentation for required environmental conditions.

2. Record any error messages displayed by the system.

3. Remove all diskettes and CDs from the media drives.

4. Power down the server and peripheral devices if you will be diagnosing the server offline. Always perform an orderly shutdown, if possible. This means you must:

   a. Exit any applications.

   b. Exit the operating system.

   c. Power down the server (on page 24).

5. Disconnect any peripheral devices not required for testing (any devices not necessary to power up the server). Do not disconnect the printer if you want to use it to print error messages.

6. Collect all tools and utilities, such as a Torx screwdriver, loopback adapters, ESD wrist strap, and software utilities, necessary to troubleshoot the problem.

   - You must have the appropriate Health Drivers and Management Agents installed on the server.

NOTE: To verify the server configuration, connect to the System Management homepage and select **Version Control Agent**. The VCA gives you a list of names and versions of all installed HP drivers, Management Agents, and utilities, and whether they are up to date.

   - HP recommends you have access to the SmartStart CD for value-added software and drivers required during the troubleshooting process.

   - HP recommends you have access to the server documentation for server-specific information.

Loose connections

Action:

- Be sure all power cords are securely connected.

- Be sure all cables are properly aligned and securely connected for all external and internal components.

- Remove and check all data and power cables for damage. Be sure no cables have bent pins or damaged connectors.

- If a fixed cable tray is available for the server, be sure the cords and cables connected to the server are correctly routed through the tray.

- Be sure each device is properly seated.

- If a device has latches, be sure they are completely closed and locked.

- Check any interlock or interconnect LEDs that may indicate a component is not connected properly.

- If problems continue to occur, remove and reinstall each device, checking the connectors and sockets for bent pins or other damage.

Service notifications

To view the latest service notifications, refer to the HP website (http://www.hp.com/go/bizsupport). Select the appropriate server model, and then click the **Troubleshoot a Problem** link on the product page.

Troubleshooting flowcharts

To effectively troubleshoot a problem, HP recommends that you start with the first flowchart in this section, "Start diagnosis flowchart (on page 97)," and follow the appropriate diagnostic path. If the other flowcharts do not provide a troubleshooting solution, follow the diagnostic steps in "General diagnosis flowchart (on page 98)." The General diagnosis flowchart is a generic troubleshooting process to be used when the problem is not server-specific or is not easily categorized into the other flowcharts.

The available flowcharts include:

- Start diagnosis flowchart (on page 97)
- General diagnosis flowchart (on page 98)
- Server power-on problems flowchart (on page 100)
- POST problems flowchart (on page 103)
- OS boot problems flowchart (on page 104)
- Server fault indications flowchart (on page 106)

Start diagnosis flowchart

Use the following flowchart to start the diagnostic process.

Item	Refer to
1	"General diagnosis flowchart (on page 98)"
2	"Power-on problems flowchart ("Server power-on problems flowchart" on page 100)"
3	"POST problems flowchart (on page 103)"
4	"OS boot problems flowchart (on page 104)"
5	"Server fault indications flowchart (on page 106)"
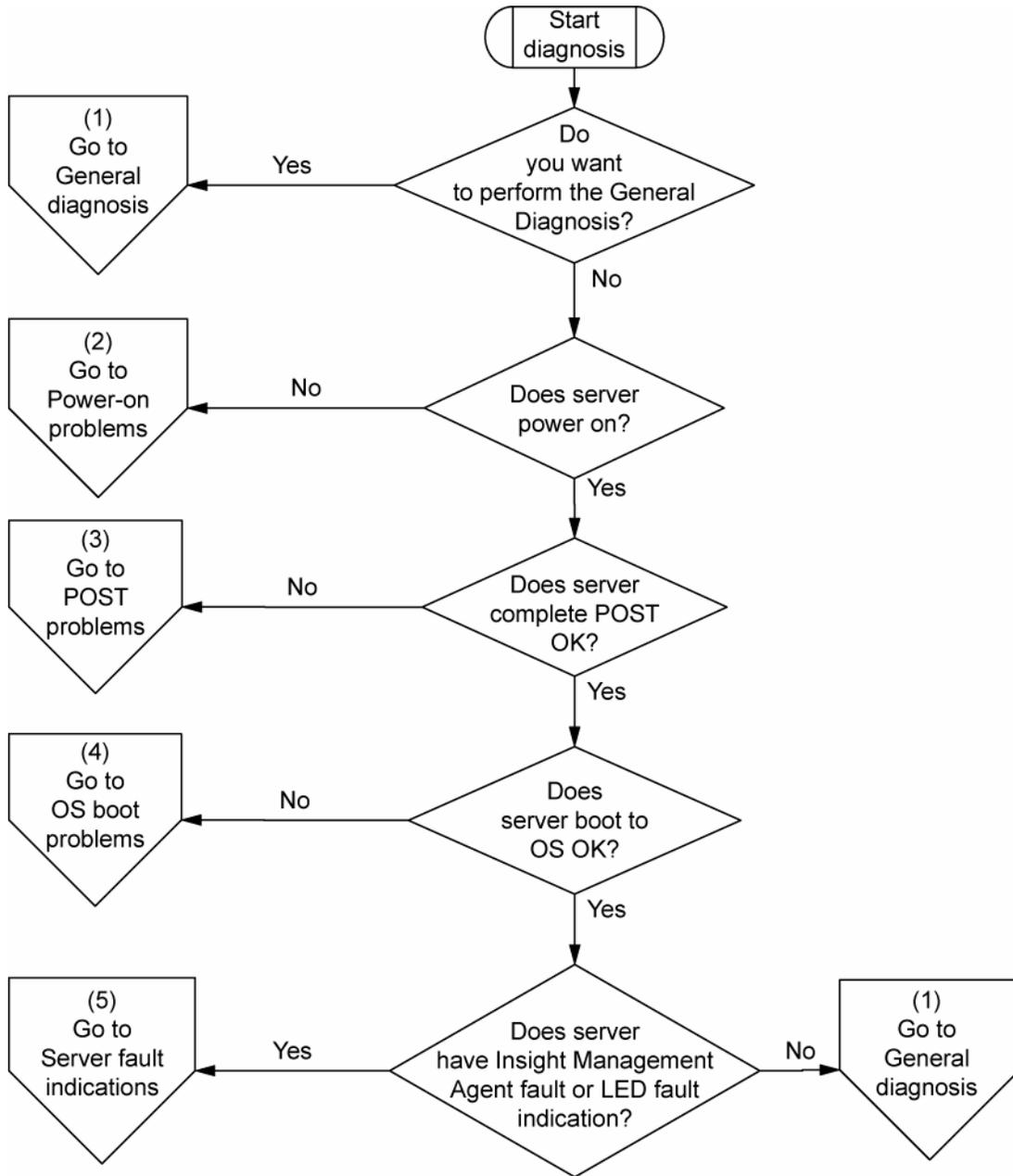
General diagnosis flowchart

The General diagnosis flowchart provides a generic approach to troubleshooting. If you are unsure of the problem, or if the other flowcharts do not fix the problem, use the following flowchart.

Item	Refer to
1	"Symptom information (on page 95)"
2	"Loose connections (on page 96)"
3	"Service notifications (on page 96)"

Item	Refer to
4	The most recent version of a particular server or option firmware is available on the following websites: • HP Support website (http://www.hp.com/support) • HP ROM-BIOS/Firmware Updates website (http://h18023.www1.hp.com/support/files/server/us/romflash.html)
5	"General memory problems are occurring" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
6	Server maintenance and service guide, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/platforms)
7	• Server maintenance and service guide, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/platforms) • "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
8	• "Server information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) • "Operating system information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
9	"HP contact information (on page 119)"
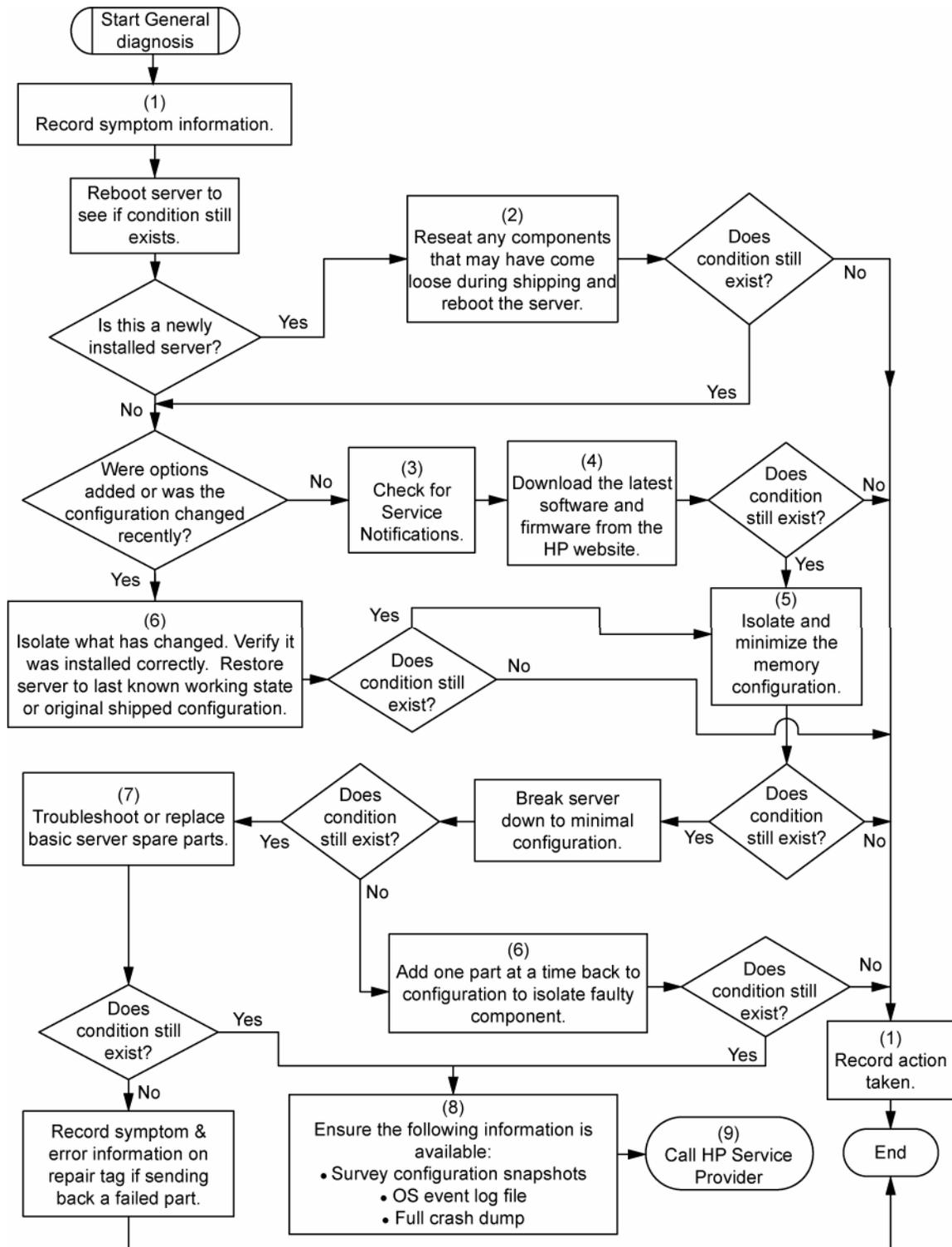
Server power-on problems flowchart

Symptoms:

- The server does not power on.
- The system power LED ("Systems Insight Display LEDs" on page 17) is off or amber.
- The external health LED ("Systems Insight Display LEDs" on page 17) is red or amber.

- The internal health LED ("Systems Insight Display LEDs" on page 17) is red or amber.

📝 **NOTE:** For the location of server LEDs and information on their statuses, refer to the server documentation.

Possible causes:

- Improperly seated or faulty power supply
- Loose or faulty power cord
- Power source problem
- Power on circuit problem
- Improperly seated component or interlock problem ("Systems Insight Display LEDs" on page 17)
- Faulty internal component

Item	Refer to
1	"Component identification ("Server component identification" on page 7)"
2	"HP Insight Diagnostics (on page 89)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
3	"Loose connections (on page 96)"
4	Server maintenance and service guide, located on the Documentation CD, or the HP website (http://www.hp.com/products/servers/platforms)
5	"Integrated Management Log" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
6	"Power source problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
7	• "Power supply problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) • Server maintenance and service guide, located on the Documentation CD, or the HP website (http://www.hp.com/products/servers/platforms)
8	"System open circuits and short circuits" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)

```
                    ┌──────────────┐
                    │ Start Power- │
                    │ on problems  │
                    └──────┬───────┘
                           │
              ◇────────────────◇                  ◇────────────────◇              ┌──────────────┐
   No         │      (1)       │      Yes         │      (1)       │     No       │     (2)      │
◄─────────────│ Is the internal│─────────────────►│ Are any compon-│─────────────►│ Use mainte-  │
              │  health LED    │                  │ ent health     │              │ nance tools to│
              │  red or amber? │                  │ LEDs on?       │              │ identify the │
              ◇────────────────◇                  ◇────────────────◇              │  problem.    │
```

(1) Is the internal health LED red or amber? — No / Yes

(1) Are any component health LEDs on? — No → (2) Use maintenance tools to identify the problem.

(1) What color is the system power LED? — Amber or Green / Off

(2) Use maintenance tools to identify the problem.

Yes → (3) Reseat indicated component. Check for loose connections.

(3) Reseat indicated component. Check for loose connections. → (4) If condition still exists, replace indicated component.

(4) If condition still exists, replace indicated component. → (5) Mark the corresponding IML entry as repaired, if present.

Off → Check for loose power cords.

Press Power-On Standby button

No → Press Power-On Standby button

(1) Is the external health LED red or amber? — No / Yes

Check for loose power cords. — Off → (6) Check for power source problems.

(6) Check for power source problems. → (7) Reseat or replace power supply.

Is this a single power supply system and the external health LED is red? — No / Yes

No → Press Power-On Standby button

Press Power-On Standby button → (1) Is external health LED red or amber?

(1) Is external health LED red or amber? — Yes → (7) Replace power supply that does not have a green LED on. Check for loose power cord.

No → Failing condition is no longer present. Check for loose power cord on one of the redundant power supplies.

Yes → (7) Replace power supply.

(7) Reseat or replace power supply. → Does condition still exist? — Yes → (8) Check for possible power-on circuit problem.

Does condition still exist? — No → End

(5) Mark the corresponding IML entry as repaired, if present.

(7) Replace power supply. → End

(8) Check for possible power-on circuit problem.

Failing condition is no longer present. Check for loose power cord on one of the redundant power supplies. → End

(7) Replace power supply that does not have a green LED on. Check for loose power cord. → End

POST problems flowchart
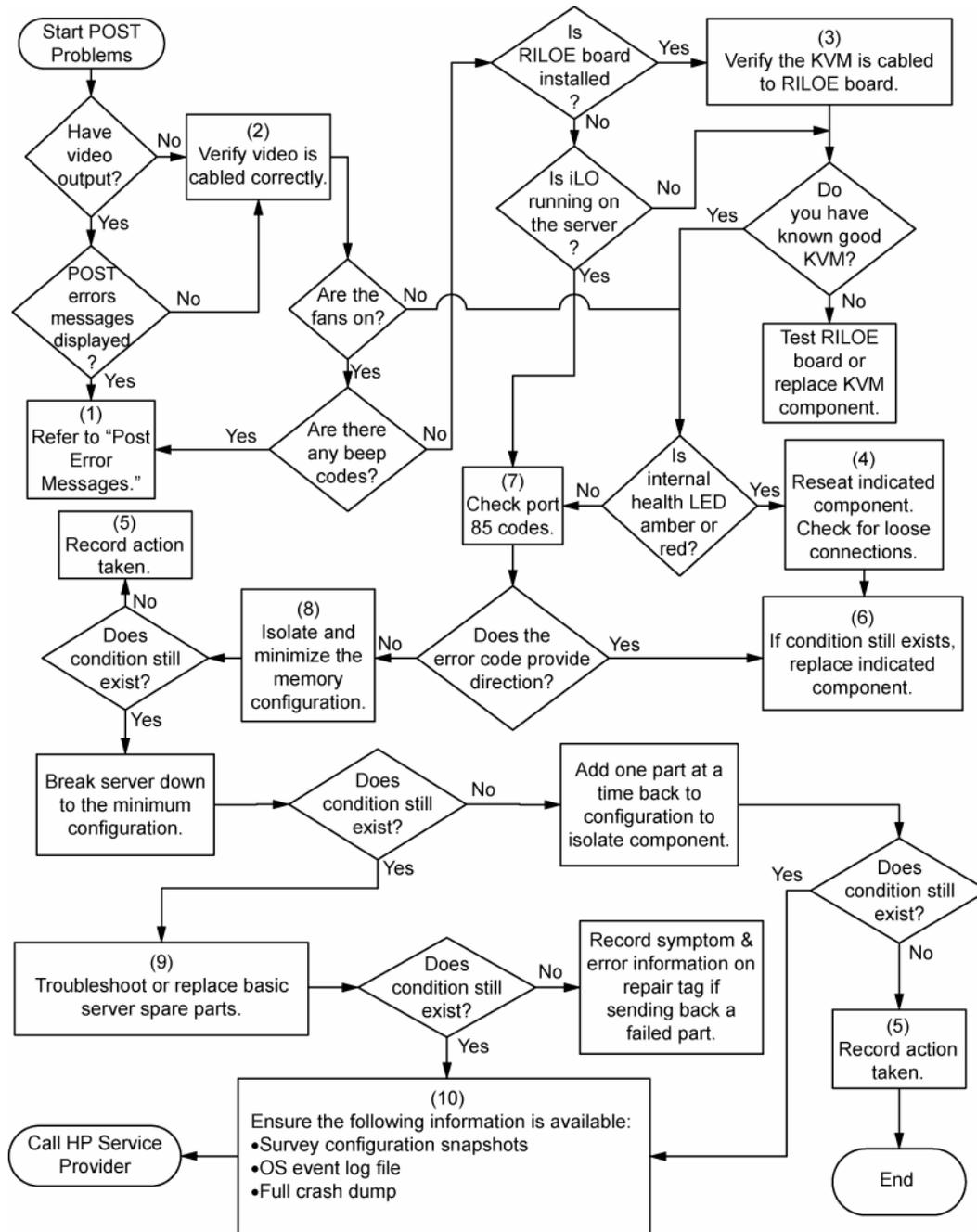
Symptoms:

- Server does not complete POST

NOTE: The server has completed POST when the system attempts to access the boot device.

- Server completes POST with errors

Possible problems:

- Improperly seated or faulty internal component
- Faulty KVM device
- Faulty video device

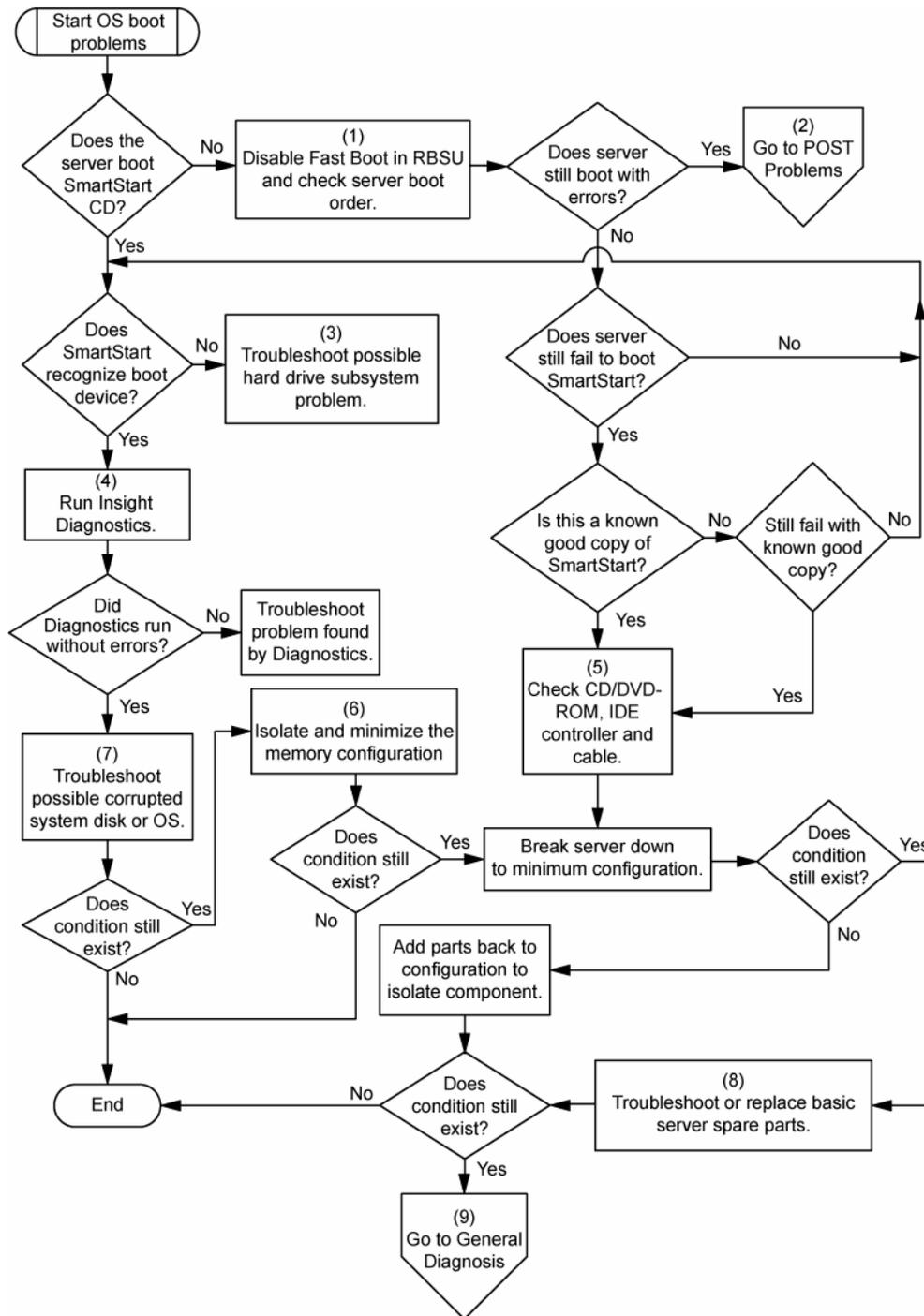| Item	Refer to
1	"POST error messages and beep codes (on page 108)"
2	"Video problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
3	KVM or iLO 2 documentation
4	"Loose connections (on page 96)"
5	"Symptom information (on page 95)"
6	Server maintenance and service guide, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/platforms)
7	"Port 85 and iLO messages" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
8	"General memory problems are occurring" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
9	"Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) - Server maintenance and service guide, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/platforms)
10	"Server information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) "Operating system information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)

OS boot problems flowchart

Symptoms:

- Server does not boot a previously installed operating system
- Server does not boot SmartStart

Possible causes:

- Corrupted operating system
- Hard drive subsystem problem
- Incorrect boot order setting in RBSU

Item	Refer to
1	*HP ROM-Based Setup Utility User Guide* (http://www.hp.com/servers/smartstart)
2	"POST problems flowchart (on page 103)"
3	• "Hard drive problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) • Controller documentation
4	"HP Insight Diagnostics (on page 89)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
5	• "CD-ROM and DVD drive problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) • Controller documentation • "Loose connections (on page 96)"
6	"General memory problems are occurring" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
7	• "Operating system problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) • "HP contact information (on page 119)"
8	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) • Server maintenance and service guide, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/platforms)
9	"General diagnosis flowchart (on page 98)"

Start OS boot problems

Does the server boot SmartStart CD? — No → (1) Disable Fast Boot in RBSU and check server boot order. → Does server still boot with errors? — Yes → (2) Go to POST Problems

Does server still boot with errors? — No

Does the server boot SmartStart CD? — Yes

Does SmartStart recognize boot device? — No → (3) Troubleshoot possible hard drive subsystem problem.

Does SmartStart recognize boot device? — Yes → (4) Run Insight Diagnostics.

Does server still fail to boot SmartStart? — No

Does server still fail to boot SmartStart? — Yes → Is this a known good copy of SmartStart? — No → Still fail with known good copy? — No

Still fail with known good copy? — Yes → (5) Check CD/DVD-ROM, IDE controller and cable.

Is this a known good copy of SmartStart? — Yes → (5) Check CD/DVD-ROM, IDE controller and cable.

Did Diagnostics run without errors? — No → Troubleshoot problem found by Diagnostics.

Did Diagnostics run without errors? — Yes → (7) Troubleshoot possible corrupted system disk or OS.

(6) Isolate and minimize the memory configuration → Does condition still exist? — Yes → Break server down to minimum configuration. → Does condition still exist? — Yes

Does condition still exist? — No → Add parts back to configuration to isolate component.

Does condition still exist? (after break down) — No → Add parts back to configuration to isolate component.

(7) Troubleshoot possible corrupted system disk or OS. → Does condition still exist? — Yes → (6) Isolate and minimize the memory configuration

Does condition still exist? — No → End

Add parts back to configuration to isolate component. → Does condition still exist? — No → End

Does condition still exist? — Yes → (9) Go to General Diagnosis

(8) Troubleshoot or replace basic server spare parts.

Server fault indications flowchart

Symptoms:

- Server boots, but a fault event is reported by Insight Management Agents (on page 88)
- Server boots, but the internal health LED, external health LED, or component health LED is red or amber
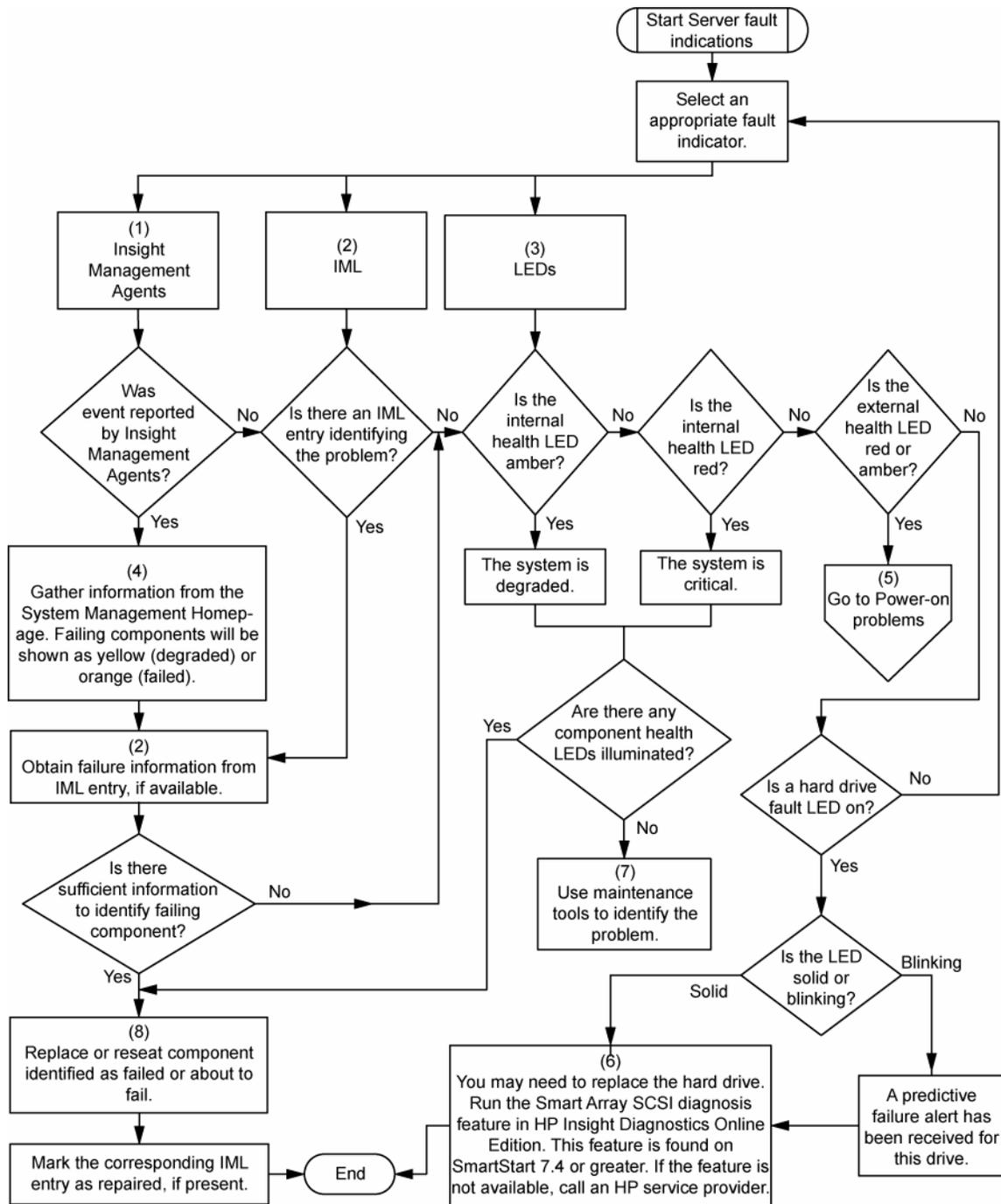
NOTE: For the location of server LEDs and information on their statuses, refer to the server documentation.

Possible causes:

- Improperly seated or faulty internal or external component
- Unsupported component installed
- Redundancy failure
- System overtemperature condition

Item	Refer to
1	"Management agents (on page 88)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
2	• "Integrated Management Log" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) • "Event list error messages" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
3	"Component identification ("Server component identification" on page 7)"
4	System Management Homepage (https://localhost:2381)
5	"Power-on problems flowchart ("Server power-on problems flowchart" on page 100)"
6	• "Smart Array SCSI Diagnosis feature" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) • Server maintenance and service guide, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/platforms) • "HP contact information (on page 119)"
7	"HP Insight Diagnostics (on page 89)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support)
8	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support) • Server maintenance and service guide, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/platforms)

Flowchart:

Start Server fault indications
→ Select an appropriate fault indicator.

(1) Insight Management Agents
Was event reported by Insight Management Agents? — No → Is there an IML entry identifying the problem?
Yes ↓

(4) Gather information from the System Management Homepage. Failing components will be shown as yellow (degraded) or orange (failed).

(2) Obtain failure information from IML entry, if available.

Is there sufficient information to identify failing component? — No →
Yes ↓

(8) Replace or reseat component identified as failed or about to fail.

Mark the corresponding IML entry as repaired, if present. → End

(2) IML
Is there an IML entry identifying the problem? — No →
Yes ↓

(3) LEDs
Is the internal health LED amber? — No → Is the internal health LED red? — No → Is the external health LED red or amber? — No →
Yes ↓ The system is degraded.
Yes ↓ The system is critical.
Yes ↓ (5) Go to Power-on problems

Are there any component health LEDs illuminated? — Yes / No → (7) Use maintenance tools to identify the problem.

Is a hard drive fault LED on? — No / Yes ↓

Is the LED solid or blinking? — Solid / Blinking

(6) You may need to replace the hard drive. Run the Smart Array SCSI diagnosis feature in HP Insight Diagnostics Online Edition. This feature is found on SmartStart 7.4 or greater. If the feature is not available, call an HP service provider.

A predictive failure alert has been received for this drive.

POST error messages and beep codes

Introduction to POST error messages

The error messages and codes in this section include all new messages generated by this server. Some messages are informational and do not indicate an error. A server generates only the codes that are applicable to its configuration and options.

For a complete listing of error messages, refer to the "POST error messages" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or on the HP website (http://www.hp.com/support).

⚠ **WARNING: To avoid potential problems, ALWAYS read the warnings and cautionary information in the server documentation before removing, replacing, reseating, or modifying system components.**

Processor Reduced Power Mode Enabled in RBSU

Description: Processors clocked down

Action: If you select the reduced power mode in RBSU, the processor are displayed as their reduced speed during POST. This message indicates that the RBSU reduced power mode has been enabled and also indicates the maximum speed for the installed processors.

Processor Not Started (Processor Stalled)

Description: If processor fails to launch or fails after being launched but before completing its initialization, the processor is not started and this message is displayed. This is likely a defective processor.

Processor Not Started (Stepping Does Not Match)

Description: If a processor has a stepping different than the bootstrap processor, the processor is not started, and this message is displayed.

Processor Not Started (Unsupported Processor Stepping)

Description: If a processor has an unsupported stepping, it is not started, and this message is displayed.

Processor Not Supported (Unsupported Core Speed)

Description: If a processor has a core speed that is incompatible with the other installed processors, the processor is not started, and this message is displayed.

This system only supports 667 MHz Front Side Bus Speed Processors. One or more 800 MHz Front Side Bus Speed Processors have been initialized at 667 MHz. System Halted!

Audible beeps: 1 long, 1 short

Possible cause: One or more 800-MHz front side bus speed processors have been initialized at 667-MHz.

Action: Correct the processor configuration.

Unsupported PCI Card Detected Remove PCI Card from Slot

Audible beeps: 2 short

Possible cause: The PCI card installed in the slot referenced in the message is strictly not supported on this system.

Action: Remove the card from the slot reported in the message.

Unsupported Processor Configuration (Processor Required in Slot #1)

Description: Processor required in slot 1.

Action: If you do not install a supported processor in slot 1, this message is displayed, and the system halts.

WARNING - Mixed Feature Processors Were Detected

Description: Mixed feature processors were detected. The server will boot using the lowest featured processor.

If you install supported processors with different features in the same system, this informational message is displayed.

WARNING - Mixed Stepping Processors were detected. System cannot proceed.

Audible beeps: 1 long, 1 short

Possible cause: One or more 800-MHz front side bus speed processors have been initialized at 667-MHz.

Action: Correct the processor configuration.

WARNING - Resetting Corrupted CMOS

Description: This informational message displays when the ROM detects that CMOS is corrupted. The default values are restored. This message does not display if a user has intentionally invalidated the configuration through RBSU by erasing NVRAM.

WARNING - Resetting Corrupted NVRAM

Description: This informational message displays when the ROM detects that NVRAM is corrupted. The default values are restored. This message does not display if a user has intentionally invalidated the configuration through RBSU by erasing NVRAM.

WARNING - Resetting Corrupted System Environment

Description: This informational message is displayed when the System Environment Variables are corrupted. The default values are restored. This message does not display if a user has intentionally invalidated the configuration through RBSU by erasing NVRAM.

WARNING - Restoring Default Configurations as Requested

Description: If, on the subsequent power up, you select the option to erase NVRAM in RBSU, this informational message is displayed.

Regulatory compliance notices

In this section

Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, this product has been assigned a unique regulatory model number. The regulatory model number can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this regulatory model number. The regulatory model number is not the marketing name or model number of the product.

Federal Communications Commission notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

FCC rating label

The FCC rating label on the device shows the classification (A or B) of the equipment. Class B devices have an FCC logo or ID on the label. Class A devices do not have an FCC logo or ID on the label. After you determine the class of the device, refer to the corresponding statement.

Class A equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Class B equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit that is different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

Declaration of conformity for products marked with the FCC logo, United States only

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding this product, contact us by mail or telephone:

- Hewlett-Packard Company
  P. O. Box 692000, Mail Stop 530113
  Houston, Texas 77269-2000
- 1-800-HP-INVENT (1-800-474-6836). (For continuous quality improvement, calls may be recorded or monitored.)

For questions regarding this FCC declaration, contact us by mail or telephone:

- Hewlett-Packard Company
  P. O. Box 692000, Mail Stop 510101
  Houston, Texas 77269-2000
- 1-281-514-3333

To identify this product, refer to the part, series, or model number found on the product.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Mouse compliance statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian notice (Avis Canadien)

Class A equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Class B equipment

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union regulatory notice

This product complies with the following EU Directives:

- Low Voltage Directive 73/23/EEC
- EMC Directive 89/336/EEC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.

This compliance is indicated by the following conformity marking placed on the product:

$\mathsf{C}\mathsf{E}$

This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g. Bluetooth).

CE(xxxx*)①

This marking is valid for EU non-harmonized Telecom products.

*Notified body number (used only if applicable—refer to the product label)

Japanese notice

ご使用になっている装置にVCCIマークが付いていましたら、次の説明文を
お読み下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準
に基づくクラスB情報技術装置です。この装置は、家庭環境で使用すること
を目的としていますが、この装置がラジオやテレビジョン受信機に近接して
使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

VCCIマークが付いていない場合には、次の点にご注意下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に
基づくクラスA情報技術装置です　この装置を家庭環境で使用すると電波
妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ず
るよう要求されることがあります。

BSMI notice

警告使用者:

這是甲類的資訊產品，在居住的
環境中使用時，可能會造成射頻
干擾，在這種情況下，使用者會
被要求採取某些適當的對策。

Korean notice

Class A equipment

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니
판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약
잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기
바랍니다.

Class B equipment

B급 기기 (가정용 정보통신기기)

이 기기는 가정용으로 전자파적합등록을 한 기기로서
주거지역에서는 물론 모든지역에서 사용할 수 있습니다.

Laser compliance

This product may be provided with an optical storage device (that is, CD or DVD drive) and/or fiber optic transceiver. Each of these devices contains a laser that is classified as a Class 1 Laser Product in accordance with US FDA regulations and the IEC 60825-1. The product does not emit hazardous laser radiation.

Each laser product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated May 27, 2001; and with IEC 60825-1:1993/A2:2001.

⚠ **WARNING: Use of controls or adjustments or performance of procedures other than those specified herein or in the laser product's installation guide may result in hazardous radiation exposure. To reduce the risk of exposure to hazardous radiation:**

- **Do not try to open the module enclosure. There are no user-serviceable components inside.**
- **Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.**
- **Allow only HP Authorized Service technicians to repair the unit.**

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States.

Battery replacement notice

⚠ **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.**

Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. To forward them to recycling or proper disposal, please use the public collection system or return them to HP, an authorized HP Partner, or their agents.

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

Taiwan battery recycling notice

The Taiwan EPA requires dry battery manufacturing or importing firms in accordance with Article 15 of the Waste Disposal Act to indicate the recovery marks on the batteries used in sales, giveaway or promotion. Contact a qualified Taiwanese recycler for proper battery disposal.

廢電池請回收

Power cord statement for Japan

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

Server specifications

In this section

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)
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.

Server specifications

Specification	Value
Dimension	—
Height	17.6 cm (6.94 in)
Depth	67.3 cm (26.5 in)
Width	46.3 cm (19.0 in)
Weight (maximum)	47.6 kg (105 lb)
Weight (no drives installed)	36.3 kg (80 lb)
Input requirement	—
Rated input voltage	100–127 VAC 200–240 VAC
Rated input frequency	50–60 Hz
Rated input current	@ 100 VAC–12A @ 200 VAC–8A
Rated input power	@100 VAC–1161 W @200 VAC–1598 W

Specification	Value
BTUs per hour	@100 VAC–3960 BTU
	@200 VAC–5450 BTU
Power supply output	—
Power supply output	910 W (low line)
	1300 W (high line)

Technical support

In this section

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

HP contact information

For the name of the nearest HP authorized reseller:

- In the United States, refer to the HP US service locator webpage (http://www.hp.com/service_locator).
- In other locations, refer to the HP website (http://www.hp.com).

For HP technical support:

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

Customer Self Repair

HP products are designed with many Customer Self Repair (CSR) parts to minimize repair time and allow for greater flexibility in performing defective parts replacement. If during the diagnosis period HP (or HP service providers or service partners) identifies that the repair can be accomplished by the use of a CSR part, HP will ship that part directly to you for replacement. There are two categories of CSR parts:

- **Mandatory**—Parts for which customer self repair is mandatory. If you request HP to replace these parts, you will be charged for the travel and labor costs of this service.
- **Optional**—Parts for which customer self repair is optional. These parts are also designed for customer self repair. If, however, you require that HP replace them for you, there may or may not be additional charges, depending on the type of warranty service designated for your product.

NOTE: Some HP parts are not designed for customer self repair. In order to satisfy the customer warranty, HP requires that an authorized service provider replace the part. These parts are identified as "No" in the Illustrated Parts Catalog.

Based on availability and where geography permits, CSR parts will be shipped for next business day delivery. Same day or four-hour delivery may be offered at an additional charge where geography permits. If assistance is required, you can call the HP Technical Support Center and a technician will help you over the telephone. HP specifies in the materials shipped with a replacement CSR part whether a defective part must be returned to HP. In cases where it is required to return the defective part to HP, you must ship the defective part back to HP within a defined period of time, normally five (5) business days. The defective part must be returned with the associated documentation in the provided shipping material. Failure to return the defective part may result in HP billing you for the replacement. With a customer self repair, HP will pay all shipping and part return costs and determine the courier/carrier to be used.

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).

Réparation par le client (CSR)

Les produits HP comportent de nombreuses pièces CSR (Customer Self Repair = réparation par le client) afin de minimiser les délais de réparation et faciliter le remplacement des pièces défectueuses. Si pendant la période de diagnostic, HP (ou ses partenaires ou mainteneurs agréés) détermine que la réparation peut être effectuée à l'aide d'une pièce CSR, HP vous l'envoie directement. Il existe deux catégories de pièces CSR:

- **Obligatoire** - Pièces pour lesquelles la réparation par le client est obligatoire. Si vous demandez à HP de remplacer ces pièces, les coûts de déplacement et main d'œuvre du service vous seront facturés.
- **Facultatif** - Pièces pour lesquelles la réparation par le client est facultative. Ces pièces sont également conçues pour permettre au client d'effectuer lui-même la réparation. Toutefois, si vous demandez à HP de remplacer ces pièces, l'intervention peut ou non vous être facturée, selon le type de garantie applicable à votre produit.

REMARQUE: Certaines pièces HP ne sont pas conçues pour permettre au client d'effectuer lui-même la réparation. Pour que la garantie puisse s'appliquer, HP exige que le remplacement de la pièce soit effectué par un Mainteneur Agréé. Ces pièces sont identifiées par la mention "Non" dans le Catalogue illustré.

Les pièces CSR sont livrées le jour ouvré suivant, dans la limite des stocks disponibles et selon votre situation géographique. Si votre situation géographique le permet et que vous demandez une livraison le jour même ou dans les 4 heures, celle-ci vous sera facturée. Pour bénéficier d'une assistance téléphonique, appelez le Centre d'assistance technique HP. Dans les documents envoyés avec la pièce de rechange CSR, HP précise s'il est nécessaire de lui retourner la pièce défectueuse. Si c'est le cas, vous devez le faire dans le délai indiqué, généralement cinq (5) jours ouvrés. La pièce et sa documentation doivent être retournées dans l'emballage fourni. Si vous ne retournez pas la pièce défectueuse, HP se réserve le droit de vous facturer les coûts de remplacement. Dans le cas d'une pièce CSR, HP supporte l'ensemble des frais d'expédition et de retour, et détermine la société de courses ou le transporteur à utiliser.

Pour plus d'informations sur le programme CSR de HP, contactez votre Mainteneur Agrée local. Pour plus d'informations sur ce programme en Amérique du Nord, consultez le site Web HP (http://www.hp.com/go/selfrepair).

Riparazione da parte del cliente

Per abbreviare i tempi di riparazione e garantire una maggiore flessibilità nella sostituzione di parti difettose, i prodotti HP sono realizzati con numerosi componenti che possono essere riparati direttamente dal cliente (CSR, Customer Self Repair). Se in fase di diagnostica HP (o un centro di servizi o di assistenza HP) identifica il guasto come riparabile mediante un ricambio CSR, HP lo spedirà direttamente al cliente per la sostituzione. Vi sono due categorie di parti CSR:

- **Obbligatorie** – Parti che devono essere necessariamente riparate dal cliente. Se il cliente ne affida la riparazione ad HP, deve sostenere le spese di spedizione e di manodopera per il servizio.

- **Opzionali** – Parti la cui riparazione da parte del cliente è facoltativa. Si tratta comunque di componenti progettati per questo scopo. Se tuttavia il cliente ne richiede la sostituzione ad HP, potrebbe dover sostenere spese addizionali a seconda del tipo di garanzia previsto per il prodotto.

NOTA: alcuni componenti HP non sono progettati per la riparazione da parte del cliente. Per rispettare la garanzia, HP richiede che queste parti siano sostituite da un centro di assistenza autorizzato. Tali parti sono identificate da un "No" nel Catalogo illustrato dei componenti.

In base alla disponibilità e alla località geografica, le parti CSR vengono spedite con consegna entro il giorno lavorativo seguente. La consegna nel giorno stesso o entro quattro ore è offerta con un supplemento di costo solo in alcune zone. In caso di necessità si può richiedere l'assistenza telefonica di un addetto del centro di supporto tecnico HP. Nel materiale fornito con una parte di ricambio CSR, HP specifica se il cliente deve restituire dei componenti. Qualora sia richiesta la resa ad HP del componente difettoso, lo si deve spedire ad HP entro un determinato periodo di tempo, generalmente cinque (5) giorni lavorativi. Il componente difettoso deve essere restituito con la documentazione associata nell'imballo di spedizione fornito. La mancata restituzione del componente può comportare la fatturazione del ricambio da parte di HP. Nel caso di riparazione da parte del cliente, HP sostiene tutte le spese di spedizione e resa e sceglie il corriere/vettore da utilizzare.

Per ulteriori informazioni sul programma CSR di HP contattare il centro di assistenza di zona. Per il programma in Nord America fare riferimento al sito Web **HP** (http://www.hp.com/go/selfrepair).

Customer Self Repair

HP Produkte enthalten viele CSR-Teile (Customer Self Repair), um Reparaturzeiten zu minimieren und höhere Flexibilität beim Austausch defekter Bauteile zu ermöglichen. Wenn HP (oder ein HP Servicepartner) bei der Diagnose feststellt, dass das Produkt mithilfe eines CSR-Teils repariert werden kann, sendet Ihnen HP dieses Bauteil zum Austausch direkt zu. CSR-Teile werden in zwei Kategorien unterteilt:

- **Zwingend –** Teile, für die das Customer Self Repair-Verfahren zwingend vorgegeben ist. Wenn Sie den Austausch dieser Teile von HP vornehmen lassen, werden Ihnen die Anfahrt- und Arbeitskosten für diesen Service berechnet.

- **Optional –** Teile, für die das Customer Self Repair-Verfahren optional ist. Diese Teile sind auch für Customer Self Repair ausgelegt. Wenn Sie jedoch den Austausch dieser Teile von HP vornehmen lassen möchten, können bei diesem Service je nach den für Ihr Produkt vorgesehenen Garantiebedingungen zusätzliche Kosten anfallen.

HINWEIS: Einige Teile sind nicht für Customer Self Repair ausgelegt. Um den Garantieanspruch des Kunden zu erfüllen, muss das Teil von einem HP Servicepartner ersetzt werden. Im illustrierten Teilekatalog sind diese Teile mit „No" bzw. „Nein" gekennzeichnet.

CSR-Teile werden abhängig von der Verfügbarkeit und vom Lieferziel am folgenden Geschäftstag geliefert. Für bestimmte Standorte ist eine Lieferung am selben Tag oder innerhalb von vier Stunden gegen einen Aufpreis verfügbar. Wenn Sie Hilfe benötigen, können Sie das HP technische Support Center anrufen und sich von einem Mitarbeiter per Telefon helfen lassen. Den Materialien, die mit einem CSR-Ersatzteil geliefert werden, können Sie entnehmen, ob das defekte Teil an HP zurückgeschickt werden muss. Wenn es erforderlich ist, das defekte Teil an HP zurückzuschicken, müssen Sie dies innerhalb eines vorgegebenen Zeitraums tun, in der Regel innerhalb von fünf (5) Geschäftstagen. Das defekte Teil muss mit der zugehörigen Dokumentation in der Verpackung zurückgeschickt werden, die im Lieferumfang enthalten ist. Wenn Sie das defekte Teil nicht zurückschicken, kann HP Ihnen das Ersatzteil in Rechnung stellen. Im Falle von Customer Self Repair kommt HP für alle Kosten für die Lieferung und Rücksendung auf und bestimmt den Kurier-/Frachtdienst.

Weitere Informationen über das HP Customer Self Repair Programm erhalten Sie von Ihrem Servicepartner vor Ort. Informationen über das CSR-Programm in Nordamerika finden Sie auf der HP Website unter (http://www.hp.com/go/selfrepair).

Reparaciones del propio cliente

Los productos de HP incluyen muchos componentes que el propio usuario puede reemplazar (*Customer Self Repair*, CSR) para minimizar el tiempo de reparación y ofrecer una mayor flexibilidad a la hora de realizar sustituciones de componentes defectuosos. Si, durante la fase de diagnóstico, HP (o los proveedores o socios de servicio de HP) identifica que una reparación puede llevarse a cabo mediante el uso de un componente CSR, HP le enviará dicho componente directamente para que realice su sustitución. Los componentes CSR se clasifican en dos categorías:

- **Obligatorio:** componentes para los que la reparación por parte del usuario es obligatoria. Si solicita a HP que realice la sustitución de estos componentes, tendrá que hacerse cargo de los gastos de desplazamiento y de mano de obra de dicho servicio.

- **Opcional:** componentes para los que la reparación por parte del usuario es opcional. Estos componentes también están diseñados para que puedan ser reparados por el usuario. Sin embargo, si precisa que HP realice su sustitución, puede o no conllevar costes adicionales, dependiendo del tipo de servicio de garantía correspondiente al producto.

NOTA: Algunos componentes no están diseñados para que puedan ser reparados por el usuario. Para que el usuario haga valer su garantía, HP pone como condición que un proveedor de servicios autorizado realice la sustitución de estos componentes. Dichos componentes se identifican con la palabra "No" en el catálogo ilustrado de componentes.

Según la disponibilidad y la situación geográfica, los componentes CSR se enviarán para que lleguen a su destino al siguiente día laborable. Si la situación geográfica lo permite, se puede solicitar la entrega en el mismo día o en cuatro horas con un coste adicional. Si precisa asistencia técnica, puede llamar al Centro de asistencia técnica de HP y recibirá ayuda telefónica por parte de un técnico. Con el envío de materiales para la sustitución de componentes CSR, HP especificará si los componentes defectuosos deberán devolverse a HP. En aquellos casos en los que sea necesario devolver algún componente a HP, deberá hacerlo en el periodo de tiempo especificado, normalmente cinco días laborables. Los componentes defectuosos deberán devolverse con toda la documentación relacionada y con el embalaje de envío. Si no enviara el componente defectuoso requerido, HP podrá cobrarle por el de sustitución. En el caso de todas sustituciones que lleve a cabo el cliente, HP se hará cargo de todos los gastos de envío y devolución de componentes y escogerá la empresa de transporte que se utilice para dicho servicio.

Para obtener más información acerca del programa de Reparaciones del propio cliente de HP, póngase en contacto con su proveedor de servicios local. Si está interesado en el programa para Norteamérica, visite la página web de HP siguiente (http://www.hp.com/go/selfrepair).

Customer Self Repair

Veel onderdelen in HP producten zijn door de klant zelf te repareren, waardoor de reparatieduur tot een minimum beperkt kan blijven en de flexibiliteit in het vervangen van defecte onderdelen groter is. Deze onderdelen worden CSR-onderdelen (Customer Self Repair) genoemd. Als HP (of een HP Service Partner) bij de diagnose vaststelt dat de reparatie kan worden uitgevoerd met een CSR-onderdeel, verzendt HP dat onderdeel rechtstreeks naar u, zodat u het defecte onderdeel daarmee kunt vervangen. Er zijn twee categorieën CSR-onderdelen:

- **Verplicht:** Onderdelen waarvoor reparatie door de klant verplicht is. Als u HP verzoekt deze onderdelen voor u te vervangen, worden u voor deze service reiskosten en arbeidsloon in rekening gebracht.

- **Optioneel:** Onderdelen waarvoor reparatie door de klant optioneel is. Ook deze onderdelen zijn ontworpen voor reparatie door de klant. Als u echter HP verzoekt deze onderdelen voor u te vervangen, kunnen daarvoor extra kosten in rekening worden gebracht, afhankelijk van het type garantieservice voor het product.

OPMERKING: Sommige HP onderdelen zijn niet ontwikkeld voor reparatie door de klant. In verband met de garantievoorwaarden moet het onderdeel door een geautoriseerde Service Partner worden vervangen. Deze onderdelen worden in de geïllustreerde onderdelencatalogus aangemerkt met "Nee".

Afhankelijk van de leverbaarheid en de locatie worden CSR-onderdelen verzonden voor levering op de eerstvolgende werkdag. Levering op dezelfde dag of binnen vier uur kan tegen meerkosten worden aangeboden, indien dit mogelijk is gezien de locatie. Indien assistentie gewenst is, belt u een HP Service Partner om via de telefoon technische ondersteuning te ontvangen. HP vermeldt in de documentatie bij het vervangende CSR-onderdeel of het defecte onderdeel aan HP moet worden geretourneerd. Als het defecte onderdeel aan HP moet worden teruggezonden, moet u het defecte onderdeel binnen een bepaalde periode, gewoonlijk vijf (5) werkdagen, retourneren aan HP. Het defecte onderdeel moet met de bijbehorende documentatie worden geretourneerd in het meegeleverde verpakkingsmateriaal. Als u het defecte onderdeel niet terugzendt, kan HP u voor het vervangende onderdeel kosten in rekening brengen. Bij reparatie door de klant betaalt HP alle verzendkosten voor het vervangende en geretourneerde onderdeel en kiest HP zelf welke koerier/transportonderneming hiervoor wordt gebruikt.

Neem contact op met een Service Partner voor meer informatie over het Customer Self Repair programma van HP. Informatie over Service Partners vindt u op de **HP website** (http://www.hp.nl/services/servicepartners).

Reparo feito pelo cliente

Os produtos da HP são projetados com muitas peças para reparo feito pelo cliente (CSR) de modo a minimizar o tempo de reparo e permitir maior flexibilidade na substituição de peças com defeito. Se, durante o período de diagnóstico, a HP (ou fornecedores/parceiros de serviço da HP) concluir que o reparo pode ser efetuado pelo uso de uma peça CSR, a peça de reposição será enviada diretamente ao cliente. Existem duas categorias de peças CSR:

- **Obrigatória** – Peças cujo reparo feito pelo cliente é obrigatório. Se desejar que a HP substitua essas peças, serão cobradas as despesas de transporte e mão-de-obra do serviço.

- **Opcional** – Peças cujo reparo feito pelo cliente é opcional. Essas peças também são projetadas para o reparo feito pelo cliente. No entanto, se desejar que a HP as substitua, pode haver ou não a cobrança de taxa adicional, dependendo do tipo de serviço de garantia destinado ao produto.

OBSERVAÇÃO: Algumas peças da HP não são projetadas para o reparo feito pelo cliente. A fim de cumprir a garantia do cliente, a HP exige que um técnico autorizado substitua a peça. Essas peças estão identificadas com a marca "No" (Não), no catálogo de peças ilustrado.

Conforme a disponibilidade e o local geográfico, as peças CSR serão enviadas no primeiro dia útil após o pedido. Onde as condições geográficas permitirem, a entrega no mesmo dia ou em quatro horas pode ser feita mediante uma taxa adicional. Se precisar de auxílio, entre em contato com o Centro de suporte técnico da HP para que um técnico o ajude por telefone. A HP especifica nos materiais fornecidos com a peça CSR de reposição se a peça com defeito deve ser devolvida à HP. Nos casos em que isso for necessário, é preciso enviar a peça com defeito à HP dentro do período determinado, normalmente cinco (5) dias úteis. A peça com defeito deve ser enviada com a documentação correspondente no material de transporte fornecido. Caso não o faça, a HP poderá cobrar a reposição. Para as peças de reparo feito pelo cliente, a HP paga todas as despesas de transporte e de devolução da peça e determina a transportadora/serviço postal a ser utilizado.

Para obter mais informações sobre o programa de reparo feito pelo cliente da HP, entre em contato com o fornecedor de serviços local. Para o programa norte-americano, visite o site da HP (http://www.hp.com/go/selfrepair).

顧客自己修理保証サービス

修理時間を短縮し、故障部品の交換における高い柔軟性を確保するために、HP製品には多数の顧客自己修理（CSR）部品があります。診断の際に、CSR部品を使用すれば修理ができるとHP（HPまたはHP正規保守代理店）が判断した場合、HPはその部品を直接、お客様に発送し、お客様に交換していただきます。CSR部品には以下の2通りがあります。

- 必須 - 顧客自己修理が必須の部品。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、その修理サービスに関する交通費および人件費がお客様に請求されます。

- 任意 - 顧客自己修理が任意である部品。この部品も顧客自己修理用です。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、お買い上げの製品に適用される保証サービス内容の範囲内においては、別途費用を負担していただくことなく保証サービスを受けることができます。

注： HP製品の一部の部品は、顧客自己修理用ではありません。製品の保証を継続するためには、HPまたはHP正規保守代理店による交換作業が必須となります。部品カタログには、当該部品が顧客自己修理除外品である旨が記載されています。

部品供給が可能な場合、地域によっては、CSR部品を翌営業日に届くように発送します。また、地域によっては、追加費用を負担いただくことにより同日または4時間以内に届くように発送することも可能な場合があります。サポートが必要なときは、HPの修理受付窓口に電話していただければ、技術者が電話でアドバイスします。交換用のCSR部品または同梱物には、故障部品をHPに返送する必要があるかどうかが表示されています。故障部品をHPに返送する必要がある場合は、指定期限内（通常は5営業日以内）に故障部品をHPに返送してください。故障部品を返送する場合は、届いた時の梱包箱に関連書類とともに入れてください。故障部品を返送しない場合、HPから部品費用が請求されます。顧客自己修理の際には、HPは送料および部品返送費を全額負担し、使用する宅配便会社や運送会社を指定します。

客户自行维修

HP 产品提供许多客户自行维修 (CSR) 部件，以尽可能缩短维修时间和在更换缺陷部件方面提供更大的灵活性。如果在诊断期间 HP（或 HP 服务提供商或服务合作伙伴）确定可以通过使用 CSR 部件完成维修，HP 将直接把该部件发送给您进行更换。有两类 CSR 部件：

- **强制性的** — 要求客户必须自行维修的部件。如果您请求 HP 更换这些部件，则必须为该服务支付差旅费和人工费用。

- **可选的** — 客户可以选择是否自行维修的部件。这些部件也是为客户自行维修设计的。不过，如果您要求 HP 为您更换这些部件，则根据为您的产品指定的保修服务类型，HP 可能收取或不再收取任何附加费用。

注：某些 HP 部件的设计并未考虑客户自行维修。为了满足客户保修的需要，HP 要求授权服务提供商更换相关部件。这些部件在部件图解目录中标记为"否"。

CSR 部件将在下一个工作日发运（取决于备货情况和允许的地理范围）。在允许的地理范围内，可在当天或四小时内发运，但要收取额外费用。如果需要帮助，您可以致电 HP 技术支持中心，将会有技术人员通过电话为您提供帮助。HP 会在随更换的 CSR 部件发运的材料中指明是否必须将有缺陷的部件返还给 HP。如果要求您将有缺陷的部件返还给 HP，那么您必须在规定期限内（通常是五 (5) 个工作日）将缺陷部件发给 HP。有缺陷的部件必须随所提供的发运材料中的相关文件一起返还。如果未能送还有缺陷的部件，HP 可能会要求您支付更换费用。客户自行维修时，HP 将承担所有相关运输和部件返回费用，并指定快递商/承运商。

有关 HP 客户自行维修计划的详细信息，请与您当地的服务提供商联系。有关北美地区的计划，请访问 HP 网站 (http://www.hp.com/go/selfrepair)。

客戶自行維修

HP 產品設計了許多「客戶自行維修」(CSR) 的零件以減少維修時間，並且使得更換瑕疵零件時能有更大的彈性。如果在診斷期間 HP（或 HP 服務供應商或維修夥伴）辨認出此項維修工作可以藉由使用 CSR 零件來完成，則 HP 將直接寄送該零件給您作更換。CSR 零件分為兩種類別：

- **強制的** — 客戶自行維修所使用的零件是強制性的。如果您要求 HP 更換這些零件，HP 將會向您收取此服務所需的外出費用與勞動成本。

- **選購的** — 客戶自行維修所使用的零件是選購的。這些零件也設計用於客戶自行維修之用。不過，如果您要求 HP 為您更換，則可能需要也可能不需要負擔額外的費用，端視針對此產品指定的保固服務類型而定。

備註：某些 HP 零件沒有消費者可自行維修的設計。為符合客戶保固，HP 需要授權的服務供應商更換零件。這些零件在圖示的零件目錄中，被標示為「否」。

基於材料取得及環境允許的情況下，CSR 零件將於下一個工作日以快遞寄送。在環境的允許下當天或四小時內送達，則可能需要額外的費用。若您需要協助，可致電「HP 技術支援中心」，會有一位技術人員透過電話來協助您。不論損壞的零件是否必須退回，HP 皆會在與 CSR 替換零件一起運送的材料中註明。若要將損壞的零件退回 HP，您必須在指定的一段時間內（通常為五 (5) 個工作天），將損壞的零件寄回 HP。損壞的零件必須與寄送資料中隨附的相關技術文件一併退還。如果無法退還損壞的零件，HP 可能要向您收取替換費用。針對客戶自行維修情形，HP 將負責所有運費及零件退還費用並指定使用何家快遞／貨運公司。

如需 HP 的「客戶自行維修」方案詳細資訊，請連絡您當地的服務供應商。至於北美方案，請參閱 HP 網站 (http://www.hp.com/go/selfrepair)。

고객 셀프 수리

HP 제품은 수리 시간을 최소화하고 결함이 있는 부품 교체 시 더욱 융통성을 발휘할 수 있도록 하기 위해 고객 셀프 수리(CSR) 부품을 다량 사용하여 설계되었습니다. 진단 기간 동안 HP(또는 HP 서비스 공급업체 또는 서비스 협력업체)에서 CSR 부품을 사용하여 수리가 가능하다고 판단되면 HP는 해당 부품을 바로 사용자에게 보내어 사용자가 교체할 수 있도록 합니다. CSR 부품에는 두 가지 종류가 있습니다.

- **고객 셀프 수리가 의무 사항인 필수 부품.** 사용자가 HP에 이 부품의 교체를 요청할 경우 이 서비스에 대한 출장비 및 작업비가 청구됩니다.

- **고객 셀프 수리가 선택 사항인 부품.** 이 부품들도 고객 셀프 수리가 가능하도록 설계되었습니다. 하지만 사용자가 HP에 이 부품의 교체를 요청할 경우 사용자가 구입한 제품에 해당하는 보증 서비스 유형에 따라 추가 비용 없이 교체가 가능할 수 있습니다.

참고: 일부 HP 부품은 고객 셀프 수리가 불가능하도록 설계되었습니다. HP는 만족스러운 고객 보증을 위해 공인 서비스 제공업체를 통해 부품을 교체하도록 하고 있습니다. 이러한 부품들은 Illustrated Parts Catalog에 "No"라고 표시되어 있습니다.

CSR 부품은 재고 상태와 지리적 조건이 허용하는 경우 다음 영업일 납품이 가능하도록 배송이 이루어집니다. 지리적 조건이 허용하는 경우 추가 비용이 청구되는 조건으로 당일 또는 4시간 배송이 가능할 수도 있습니다. 도움이 필요하시면 HP 기술 지원 센터로 전화하십시오. 전문 기술자가 전화로 도움을 줄 것입니다. HP는 결함이 발생한 부품을 HP로 반환해야 하는지 여부를 CSR 교체 부품과 함께 배송된 자료에 지정합니다. 결함이 발생한 부품을 HP로 반환해야 하는 경우에는 지정된 기간 내(통상 영업일 기준 5일)에 HP로 반환해야 합니다. 이 때 결함이 발생한 부품은 제공된 포장 재료에 넣어 관련 설명서와 함께 반환해야 합니다. 결함이 발생한 부품을 반환하지 않는 경우 HP가 교체 부품에 대해 비용을 청구할 수 있습니다. 고객 셀프 수리의 경우, HP는 모든 운송 및 부품 반환 비용을 부담하며 이용할 운송업체 및 택배 서비스를 결정합니다.

HP 고객 셀프 수리 프로그램에 대한 자세한 내용은 가까운 서비스 제공업체에 문의하십시오. 북미 지역의 프로그램에 대해서는 HP 웹 사이트(http://www.hp.com/go/selfrepair)를 참조하십시오.

Acronyms and abbreviations

ABEND

abnormal end

ACU

Array Configuration Utility

AMP

Advanced Memory Protection

ASR

Automatic Server Recovery

BBWC

battery-backed write cache

BIOS

Basic Input/Output System

BP

backplane

CSA

Canadian Standards Association

DDR

double data rate

DDR2

double data rate-2

DIMM

dual inline memory module

DRAM

dynamic random access memory

ECC

error checking and correcting

G3

Generation 3

IEC

International Electrotechnical Commission

iLO

Integrated Lights-Out

IML

Integrated Management Log

iSCSI

Internet small computer system interface

ISEE

Instant Support Enterprise Edition

KVM

keyboard, video, and mouse

LED

light-emitting diode

NEMA

National Electrical Manufacturers Association

NFPA

National Fire Protection Association

NIC

network interface controller

NiMH

nickel metal hydride

NVRAM

non-volatile memory

ORCA

Option ROM Configuration for Arrays

OS

operating system

PCI

peripheral component interface

PCI Express

peripheral component interconnect express

PCI-X

peripheral component interconnect extended

PDU

power distribution unit

POST

Power-On Self Test

PPM

processor power module

PSP

ProLiant Support Pack

RAID

redundant array of inexpensive (or independent) disks

RBSU

ROM-Based Setup Utility

RDP

Remote Desktop Protocol

RILOE II

Remote Insight Lights-Out Edition II

ROM

read-only memory

SAS

serial attached SCSI

SATA

serial ATA

SCSI

small computer system interface

SDRAM

synchronous dynamic RAM

SFF

small form-factor

SIM

Systems Insight Manager

SNMP

Simple Network Management Protocol

TMRA

recommended ambient operating temperature

UID

unit identification

UPS

uninterruptible power system

USB

universal serial bus

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