HP ProLiant ML570 Generation 3 Server User Guide

February 2006 (Fourth Edition)
Part Number 374178-004

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Audience assumptions

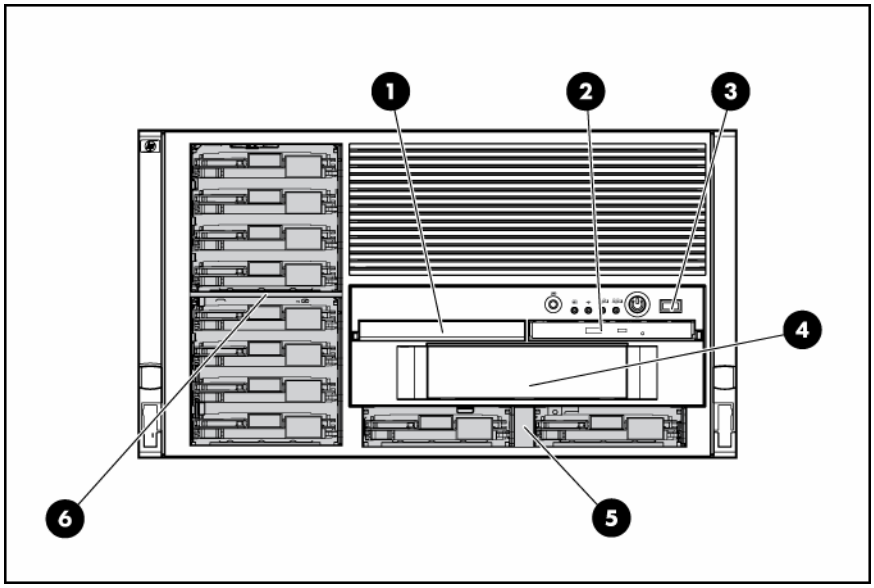
This document is for the person who installs, administers, and troubleshoots servers and storage systems. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazards in products with hazardous energy levels.

Contents

Server component identification

In this section

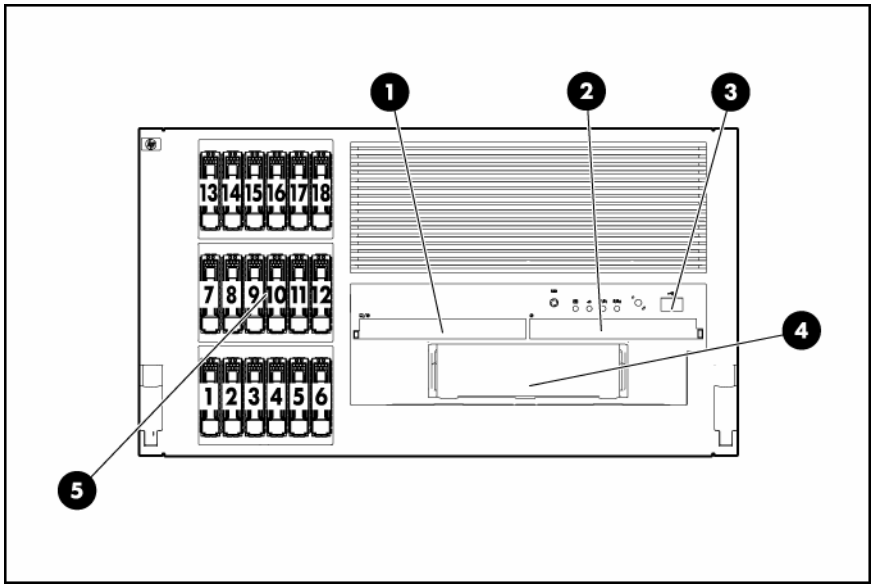
Front panel components (SCSI)



Item	Description
1	Diskette drive blank

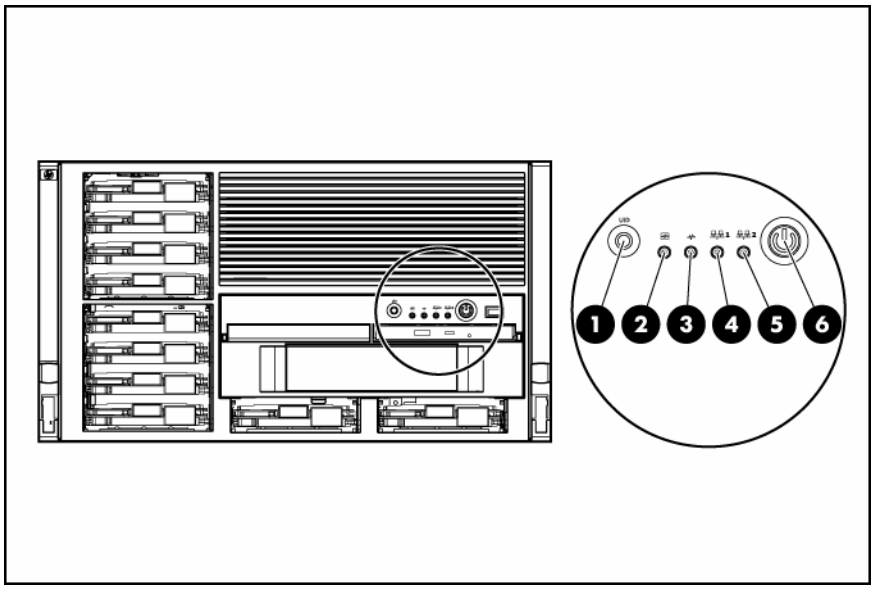
Item	Description
2	DVD-ROM drive
3	USB port
4	Tape drive blank
5	SCSI channel 2 (channels 0 and 1)
6	SCSI channel 1 (channels 0-7)

Front panel components (SAS)



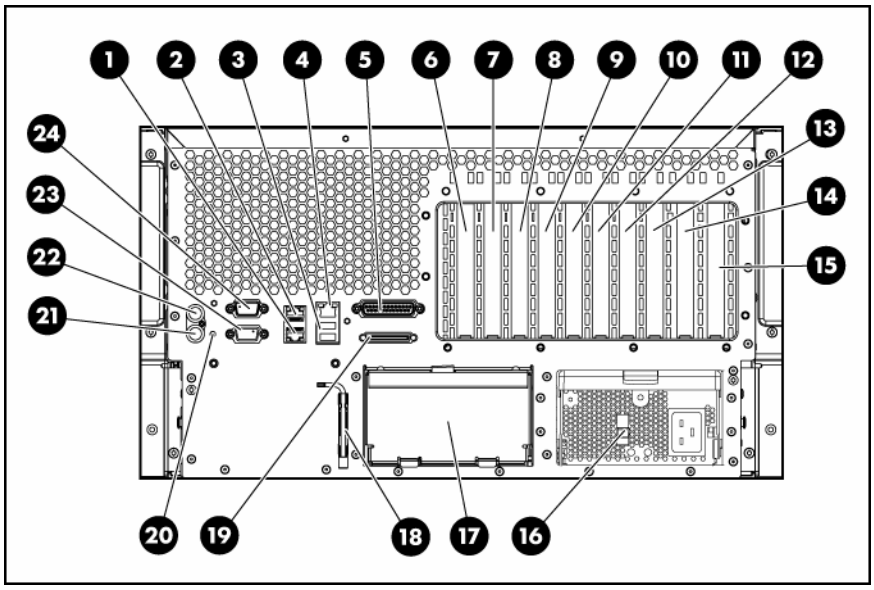
Item	Description
1	Diskette drive blank
2	DVD-ROM drive
3	USB port
4	Tape drive blank
5	SAS hard drives (SAS IDs 1 through 18)

Front panel LEDs and buttons



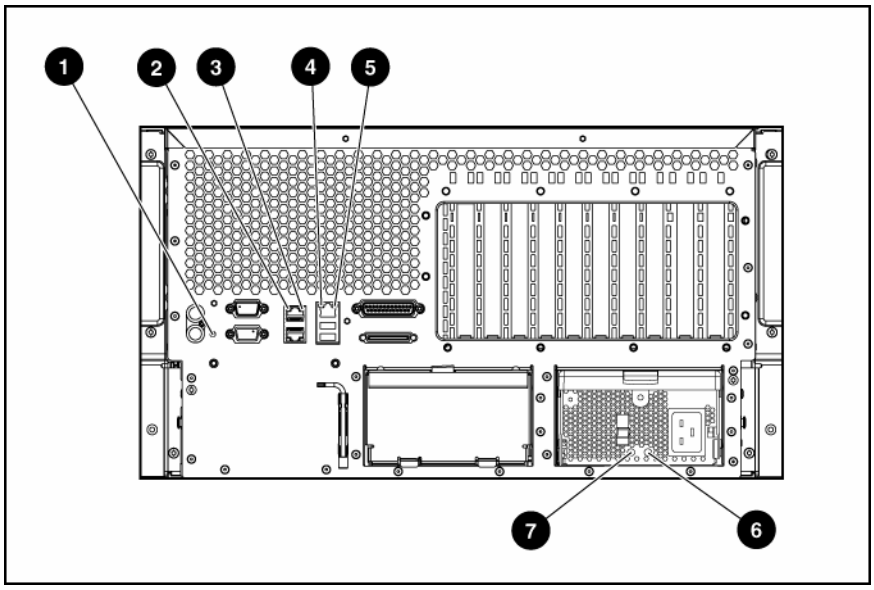
Item	Description	Status
1	UID switch and LED	Blue = Activated Flashing blue = System being managed remotely Off = Deactivated
2	Internal system health LED	Green = Normal (system on) Flashing Amber = System health is degraded Flashing Red = System health is critical
3	External system health (power supply) LED	Green = Normal (system on) Flashing Amber = Redundant power supply failure Flashing Red = Power supply failure. No operational power supplies.
4	NIC 1 link/activity LED (embedded NIC only)	Green = Linked to network Flashing green = Linked with activity on the network Off = No network connection
5	NIC 2 link/activity LED (embedded NIC)	Green = Linked to network Flashing green = Linked with activity on the network Off = No network connection
6	Power on/Standby button and LED	Green = System has AC power and is powered on Amber = System has AC power and is in standby mode Off = System has no AC power

Rear panel components



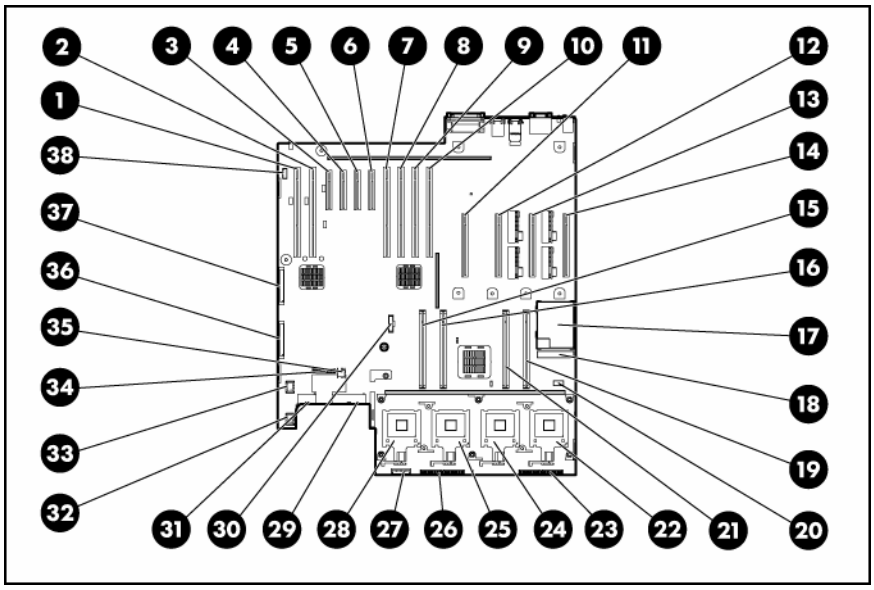
Item	Description
1	NIC 2
2	NIC 1
3	USB Ports
4	iLO
5	Parallel port
6	64-bit/100-MHz PCI-X slot 1
7	64-bit/100-MHz PCI-X slot 2
8	64-bit/100-MHz PCI-X slot 3
9	64-bit/100-MHz PCI-X slot 4
10	PCI Express x4 slot 5
11	PCI Express x4 slot 6
12	PCI Express x4 slot 7
13	PCI Express x4 slot 8
14	64-bit/133-MHz PCI-X hot-plug slot 9
15	64-bit/133-MHz PCI-X hot-plug slot 10
16	Power supply (primary)
17	Power supply blank
18	T-15 Torx screwdriver
19	External SCSI port
20	UID LED
21	Keyboard port
22	Mouse port
23	Video port
24	Serial port

Rear panel LEDs and buttons



Item	Description	LED color	Status
1	Unit ID LED	Blue	On = Activated Flashing = System remotely managed Off = Deactivated
2	NIC Activity LED (Integrated NC7782)	Green	On or flashing = Linked to network Off = Not linked to network
3	NIC Link LED (Integrated NC7782)	Green	On = Network activity Off = No network activity
4	iLO NIC Activity LED	Green	On or flashing = Network activity Off = No network activity
5	iLO NIC Link LED	Green	On = Linked to network Off = Not linked to network
6	Power supply LED (primary and redundant)	Green	Refer to Hot-plug Power Supply LEDs (on page 24)
7	Power supply LED (primary and redundant)	Amber	Refer to Hot-plug Power Supply LEDs (on page 24)

System board components



Item	Description
1	64-bit/133-MHz PCI-X Hot-Plug slot 10
2	64-bit/133-MHz PCI-X Hot-Plug slot 9
3	PCI Express x4 slot 8
4	PCI Express x4 slot 7
5	PCI Express x4 slot 6
6	PCI Express x4 slot 5
7	64-bit/100-MHz PCI-X slot 4
8	64-bit/100-MHz PCI-X slot 3
9	64-bit/100-MHz PCI-X slot 2
10	64-bit/100-MHz PCI-X slot 1
11	Memory board slot 1
12	Memory board slot 2
13	Memory board slot 3
14	Memory board slot 4
15	PPM slot 1
16	PPM slot 2
17	QuickFind diagnostic display
18	System maintenance switch (SW-2)
19	PPM slot 4
20	NMI jumper
21	PPM slot 3
22	Processor socket 4
23	Fan board signal connector
24	Processor socket 3
25	Processor socket 2

Item	Description
26	Fan board signal connector
27	Fan board power connector
28	Processor socket 1
29	Power connector
30	RILOE II connector
31	Power connector
32	Fan connector
33	Fan connector
34	Power supply signal connector
35	USB option connector
36	SCSI connector 2
37	SCSI connector 1
38	PCI hot-plug board connector

System maintenance switches

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

Position	Description	Function
1	Reserved	
2	Reserved	
3	Reserved	
4	Reserved	
5	Reserved	
6	Reserved	
7	Reserved	
8	Reserved	

The system maintenance switch (SW2) 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 Security	Off = iLO security is enabled On = iLO 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

Position	Description	Function
S6	Invalid configuration	Off = Normal On = ROM treats system configuration as invalid
S7	Reserved	
S8	Reserved	

When the system maintenance switch position 6 is set to the On position, the system is prepared to erase all system configuration settings from both CMOS and NVRAM.

CAUTION: Clearing CMOS and/or NVRAM deletes configuration information. Be sure to properly configure the server or data loss could occur.

System LEDs and internal health LED combinations

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

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

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

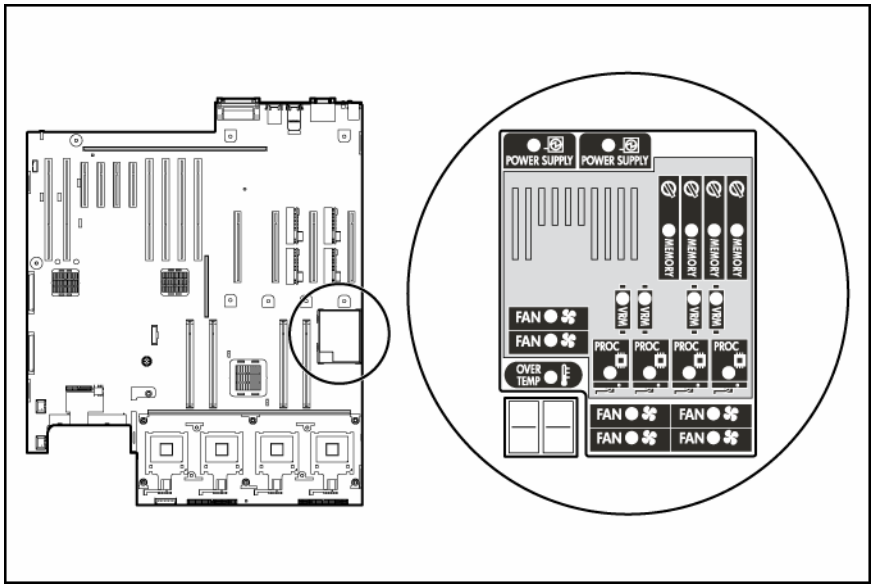
System LED and color	Internal health LED color	Status
Processor failure, socket *X* (amber)	Flashing red	One or more of the following conditions may exist: • Processor in socket *X* has failed. • Processor *X* is not installed in the socket. • ROM detected a failed processor during POST.
Processor failure, socket *X* (amber)	Flashing amber	Processor in socket *X* is in a pre-failure condition.
PPM failure, slot *X* (amber)	Flashing red	• PPM in slot *X* has failed. • PPM is not installed in slot *X*, but the corresponding processor is installed.
DIMM failure, slot *X* (amber)	Flashing red	• DIMM in slot *X* has failed. • DIMM has experienced a multi-bit error.
DIMM failure, slot *X* (amber)	Flashing amber	• DIMM in slot *X* has reached single-bit correctable error threshold. • DIMM in slot *X* is in a pre-failure condition.
DIMM bank error (all slots in one bank, amber)	Flashing red	The bank is not populated entirely or DIMMs do not all match within the bank.
DIMM failure (all slots, amber)	Flashing red	• No valid or usable memory is installed in the system. • The banks are not populated in the correct order.

System LED and color	Internal health LED color	Status
System temperature alert (amber)	Flashing red	System temperature has exceeded OS cautionary level or critical hardware level.
Fan (amber)	Flashing red	A required fan has failed.
Fan (amber)	Flashing amber	A redundant fan has failed.

System board LEDs and QuickFind Diagnostic display codes

In normal operations, all the LEDs are off unless one of the components fails. When a component fails, the LED illuminates amber.

The QuickFind Diagnostic Display codes provide more specific information for troubleshooting the server. The codes are shown in the following table.



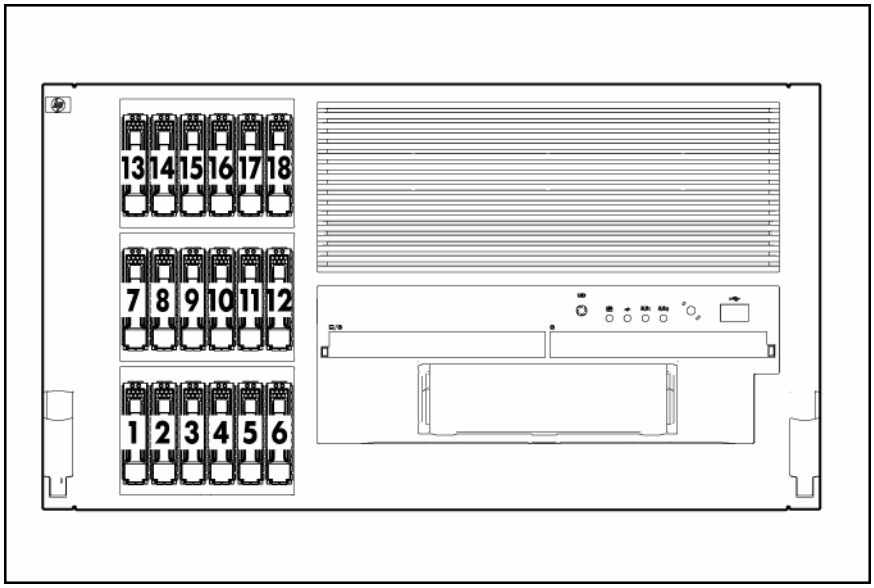
Code	Component	Explanation
01	Power supply cable(s)	System board to power supply cables: defective cables or cables not installed
04	Fan board cable(s)	Fan board power or signal cables are not installed.
05	Memory board	Base memory failure (memory board 1 is not installed or no valid memory configuration is present)
06	SCSI board power cable	SCSI board or cable is not present
07	PCI hot-plug switch board	PCI hot-plug switch board or cable is not present.
08	System interlock	Main system interlock catch-all. Indicates an interlock problem not flagged by codes 01 to 07.
f1	Processor 1 unsupported	Processor 1 unsupported. Replace with a supported processor.
t2	Processor 2 unsupported	Processor 2 unsupported. Replace with a supported processor.
t3	Processor 3 unsupported	Processor 3 unsupported. Replace with a supported processor.

Code	Component	Explanation
t4	Processor 4 unsupported	Processor 4 unsupported. Replace with a supported processor.
P1	Processor 1 is missing	Processor 1 is missing, and is required to boot. Install Processor 1. If processor 4 is installed and the system is booting up, the P1 code and Port 84/85 will be displayed for 1 second each to show the unit is booting.
U1	PPM1 is missing	Processor 1 is installed without PPM 1. Install PPM 1.
U2	PPM2 is missing	Processor 2 is installed without PPM 2. Install PPM 2.
U3	PPM3 is missing	Processor 3 is installed without PPM 3. Install PPM 3.
U4	PPM4 is missing	Processor 4 is installed without PPM 4. Install PPM 4.
A0	Pre POST code	Standby mode
P5	Power supply	No power from the power supply
_5	Power backplane	No 5-V power from the power supply backplane board
33	Power backplane	No 3.3-V power from the power supply backplane board
15	1.5-V Regulator	No 1.5-V power from the voltage regulator on the system board
Ut	VTT Regulator	No power from the VTT voltage regulator on the system
5U	PPM Failure	No power from the PPM
nb	No boot	Indicates a no-boot situation

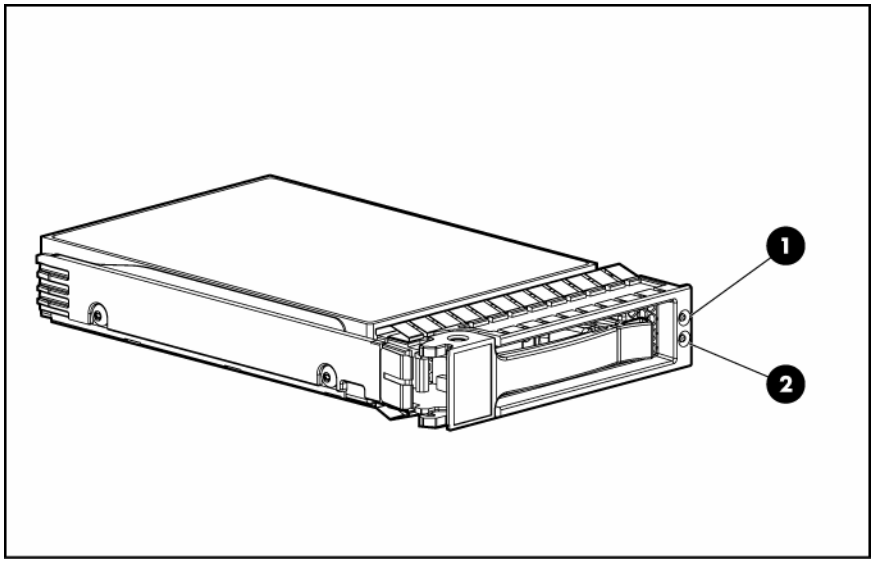
SAS-SATA device numbers

The server supports a combination of up to 18 SAS and SATA hard drives in the SAS-SATA hard drive cage. SAS-SATA devices are numbered 1 through 18.

HP recommends populating hard drive bays starting with the lowest SAS ID or device number.



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.
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.

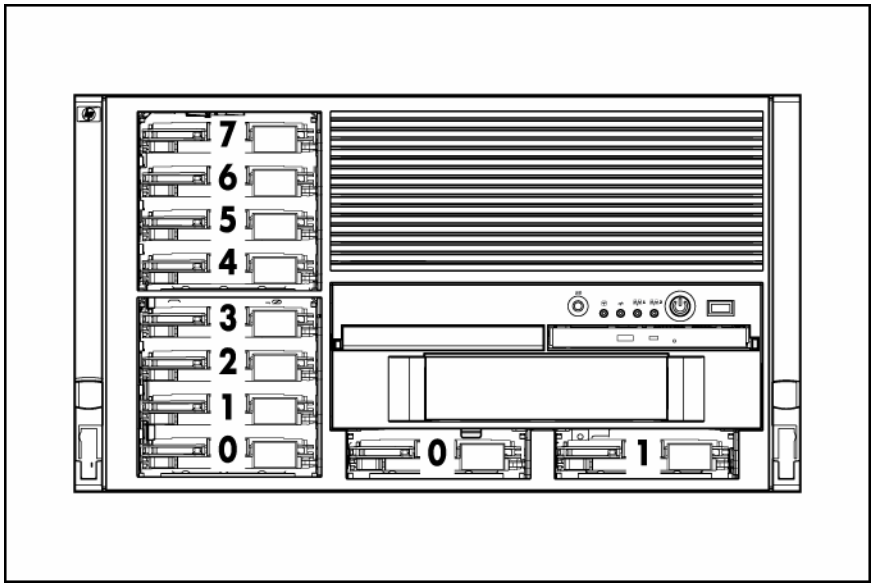
Online/activity LED (green)	Fault/UID LED (amber/blue)	Interpretation
Flashing regularly (1 Hz)	Off	**Do not remove the drive. Removing a drive may terminate the current operation and cause data loss.** The drive is rebuilding, or it is part of an array that is undergoing capacity expansion or stripe 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.

Hard drive bay numbering

The server supports two simplex SCSI channels:

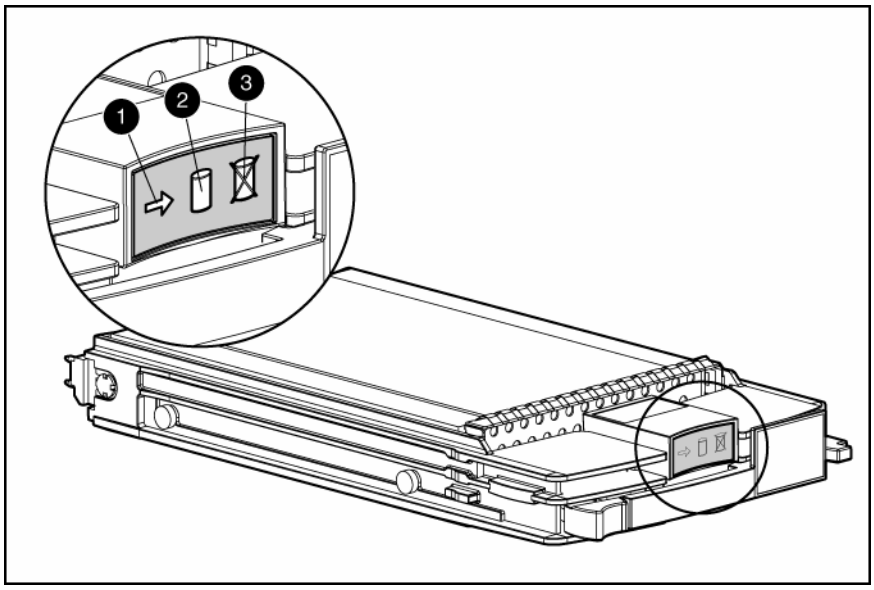
- Channel 1 supports up to eight drives (channels 0 to 7).
- Channel 2 supports up to two drives (channels 0 to 1).

The hard drive bay numbering for both channel configurations are illustrated. HP recommends populating hard drive bays starting with the lowest bay number.



NOTE: All hard drive bays except 6 and 7 represent hard drive SCSI IDs. Hard drive bays 6 and 7 represent SCSI IDs 8 and 9.

Hot-plug SCSI hard drive LEDs



Item	LED Description	Status
1	Activity status	On = Drive activity Flashing = High activity on the drive or drive is being configured as part of an array. Off = No drive activity
2	Online status	On = Drive is part of an array and is currently working. Flashing = Either (1) the drive is part of an array being selected by an array configuration utility; (2) Drive Identification has been selected in HP SIM; or (3) drive firmware is being updated. Off = Drive is offline.
3	Fault status	On = Drive failure Flashing = Fault-process activity Off = No fault-process activity

Hot-plug SCSI hard drive LED combinations

Activity LED (1)	Online LED (2)	Fault LED (3)	Interpretation
On, off, or flashing	On or off	Flashing	A predictive failure alert has been received for this drive. Replace the drive as soon as possible.
On, off, or flashing	On	Off	The drive is online and is configured as part of an array. If the array is configured for fault tolerance and all other drives in the array are online, and a predictive failure alert is received or a drive capacity upgrade is in progress, you may replace the drive online.

Activity LED (1)	Online LED (2)	Fault LED (3)	Interpretation
On or flashing	Flashing	Off	**Do not remove the drive. Removing a drive may terminate the current operation and cause data loss.** The drive is rebuilding or undergoing capacity expansion.
On	Off	Off	**Do not remove the drive.** The drive is being accessed, but (1) it is not configured as part of an array; (2) it is a replacement drive and rebuild has not yet started; or (3) it is spinning up during the POST sequence.
Flashing	Flashing	Flashing	**Do not remove the drive. Removing a drive may cause data loss in non-fault-tolerant configurations.** One or more of the following conditions may exist: • The drive is part of an array being selected by an array configuration utility • Drive Identification has been selected in HP SIM • The drive firmware is being updated
Off	Off	On	The drive has been placed offline due to hard disk drive failure or subsystem communication failure. You may need to replace the drive.
Off	Off	Off	One or more of the following conditions may exist: • The drive is not configured as part of an array • The drive is configured as part of an array, but it is a replacement drive that is not being accessed or being rebuilt yet • The drive is configured as an online spare If the drive is connected to an array controller, you may replace the drive online.

Memory board LEDs and components

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

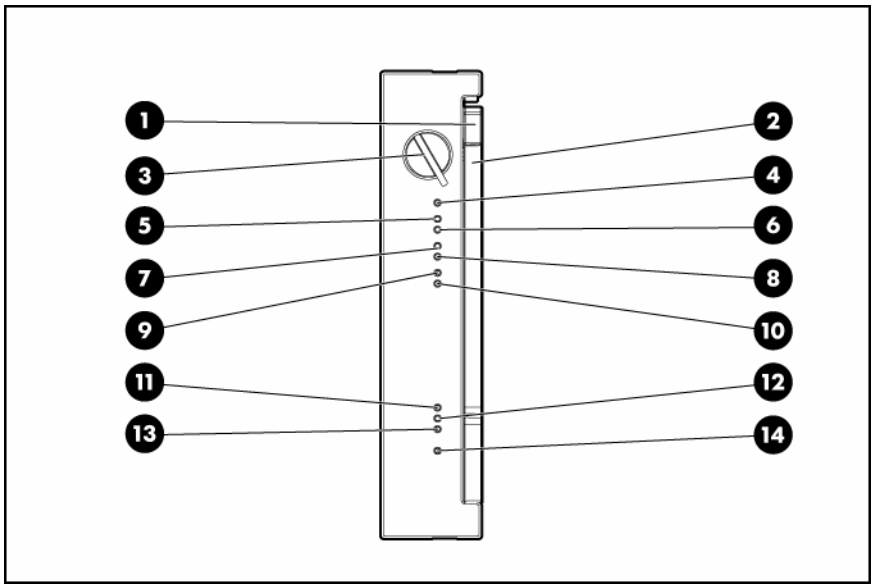
Error indicators will only be cleared if:

- The locking switch is locked after the board is reinstalled
- The system has been rebooted
- The board is removed from the system

△ **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	Release Latch	N/A
2	Ejector Lever	N/A
3	Locking Switch	N/A
4	Removable	Green = OK to remove the board Off = Do not remove if the system is on
5	DIMM 1 LED	Green = DIMM installed Amber = Failed or degraded DIMM Flashing amber = DIMM configuration error Off = No DIMM installed
6	DIMM 2 LED	Green = DIMM installed Amber = Failed or degraded DIMM Flashing amber = DIMM configuration error Off = No DIMM installed
7	DIMM 3 LED	Green = DIMM installed Amber = Failed or degraded DIMM Flashing amber = DIMM configuration error Off = No DIMM installed
8	DIMM 4 LED	Green = DIMM installed Amber = Failed or degraded DIMM Flashing amber = DIMM configuration error Off = No DIMM installed

Item	Description	Status
9	DIMM 5 LED	Green = DIMM installed Amber = Failed or degraded DIMM Flashing amber = DIMM configuration error Off = No DIMM installed
10	DIMM 6 LED	Green = DIMM installed Amber = Failed or degraded DIMM Flashing amber = DIMM configuration error Off = No DIMM installed
11	Online Spare LED	Green = Online spare mode Amber = Degraded online spare mode Flashing amber = Invalid AMP mode* Off = Not in Online Spare mode
12	Hot-Plug Mirrored LED	Green = Mirrored mode Amber = Degraded mirrored mode Flashing amber = Invalid AMP mode* Off = Not in Mirrored mode
13	Hot-Plug RAID LED	Green = RAID mode Amber = Degraded RAID mode Flashing amber = Invalid AMP mode* Off = Not in RAID mode
14	Board Status LED	Off = Power off - memory board locking switch not engaged or invalid memory configuration. Green = Normal operation Flashing green = Board is rebuilding Flashing amber = DIMM on this board encountered memory errors Amber Flashing = one of the following conditions: • Unlocking a memory board that should not be removed • Attempting to insert a memory board at runtime that fails

*The following applies to an invalid AMP error. This error occurs when the current memory configuration is not valid for the configured AMP mode:

- If the mode selected is the desired mode, modify the DIMM/board configuration to support the desired mode. Refer to the memory overview section.
- If the mode selected is not the desired mode, run RBSU and change the AMP mode. Refer to "HP ROM-Based Setup Utility ("HP ROM-Based Setup Utility" on page 87)" for more information.

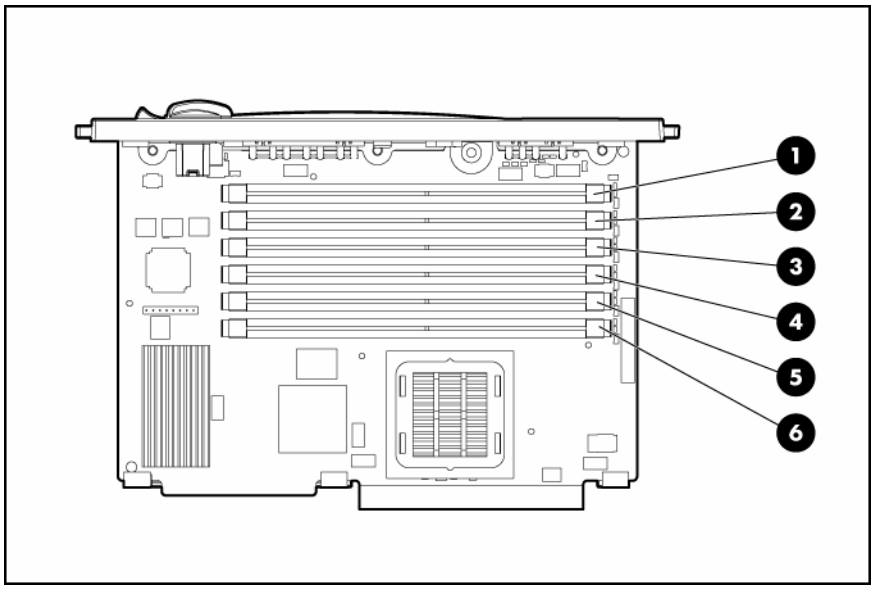
NOTE: If the Online Spare, Mirrored, and RAID LEDs are off, the server is in Advanced ECC mode. Refer to "HP ROM-Based Setup Utility (on page 87)" for more information.

The following table illustrates the different LED combinations for a correctly configured memory board.

LED	Advanced ECC Memory	Online Spare Memory	Hot-Plug Mirrored Memory	Hot-Plug RAID Memory
Board status	Green	Green	Green	Green

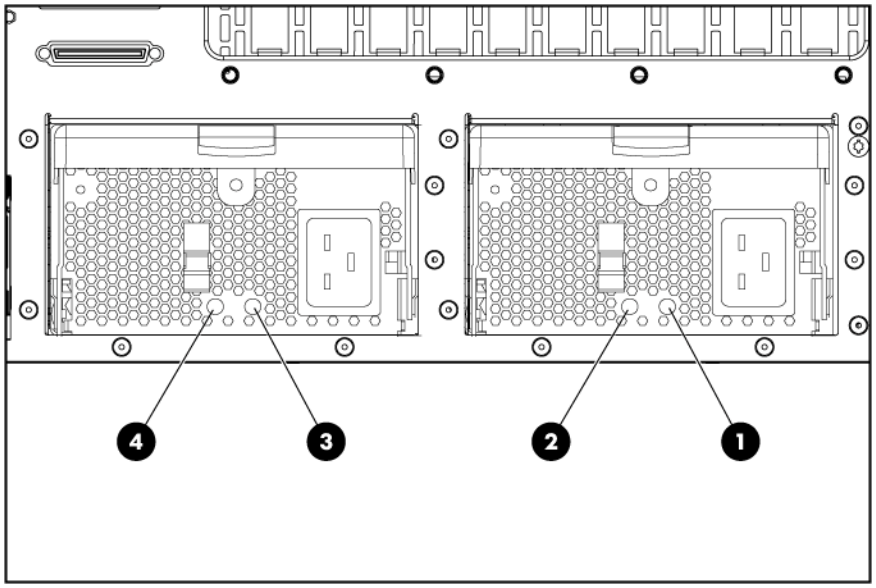
LED	Advanced ECC Memory	Online Spare Memory	Hot-Plug Mirrored Memory	Hot-Plug RAID Memory
DIMM 1 to 6, if populated	Green	Green	Green	Green
Online Spare status	Off	Green	Off	Off
Mirrored status	Off	Off	Green	Off
RAID status	Off	Off	Off	Green
Board Removable	Off	Off	Green	Green

DIMM slot locations



DIMM slot	Description	Bank
1	PC2-3200R DIMM slot	Bank A
2	PC2-3200R DIMM slot	Bank A
3	PC2-3200R DIMM slot	Bank B
4	PC2-3200R DIMM slot	Bank B
5	PC2-3200R DIMM slot	Bank C
6	PC2-3200R DIMM slot	Bank C

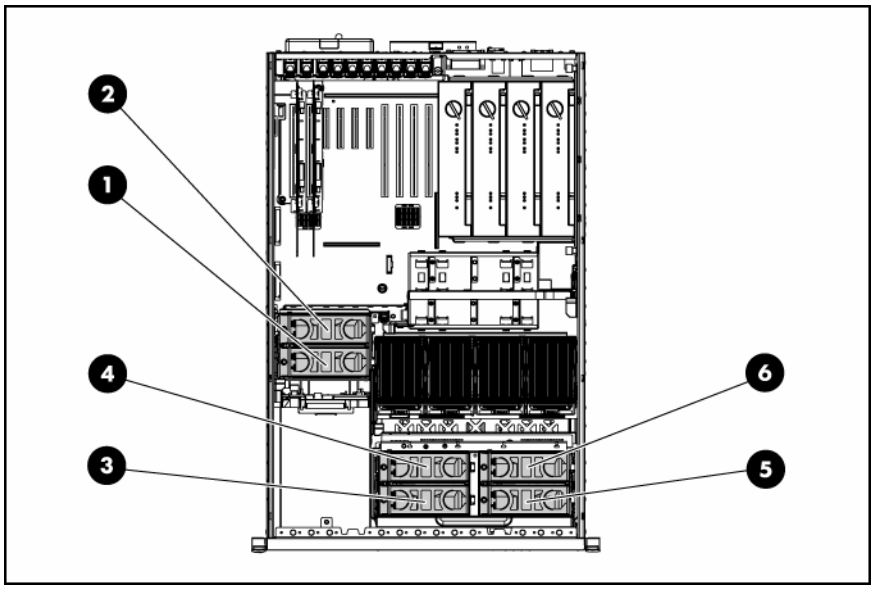
Hot-plug power supply LEDs



Item	Description
1	Primary power supply power LED (green)
2	Primary power supply fail LED (amber)
3	Redundant power supply power LED (green)
4	Redundant power supply fail LED (amber)

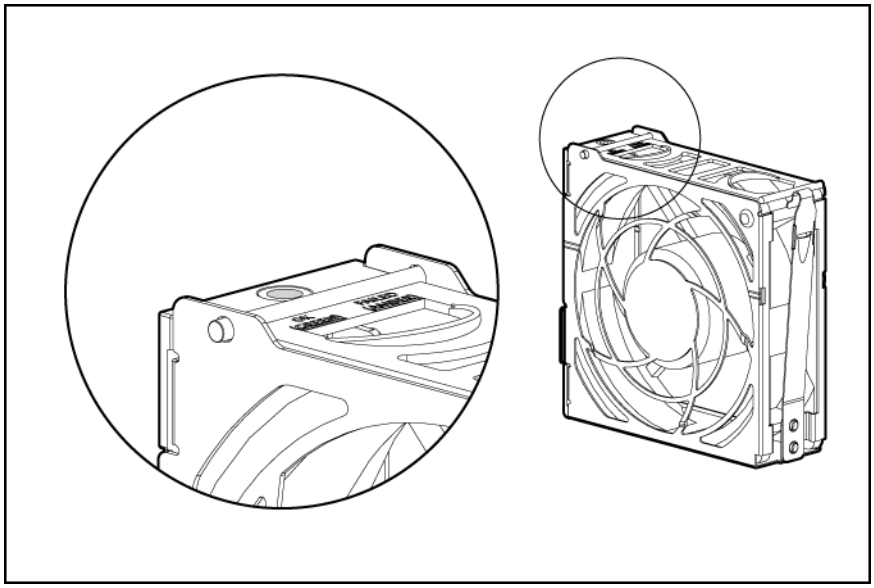
Power supply condition	Power LED (green)	Fail LED (amber)
No AC power to all power supply units	Off	Off
No AC power to this power supply unit only or power supply failure (includes over voltage and over temperature)	Off	On
AC present/Standby outputs on	Flashing	Off
Power supply DC outputs On and OK	On	Off
Power supply failure (current limit)	Off	Flashing

Fan locations



Item	Description	Configuration
1	Fan 1	Redundant
2	Fan 2	Primary
3	Fan 3	Redundant
4	Fan 4	Primary
5	Fan 5	Redundant
6	Fan 6	Primary

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.

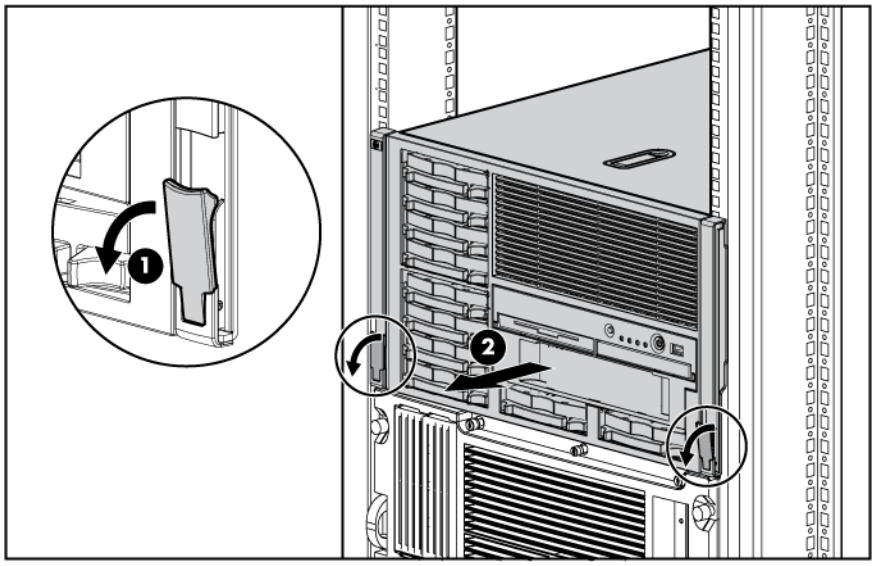
Extending the server from the rack

1. Release the two levers on the lower outside corners of the rack.

NOTE: If the server is in a rack and in the shipping configuration, remove the two shipping screws directly behind the levers.

IMPORTANT: If the server is installed in a telco rack, remove the server from the rack to access internal components.

2. Extend the server on the rack rails until the server rail-release latches engage.

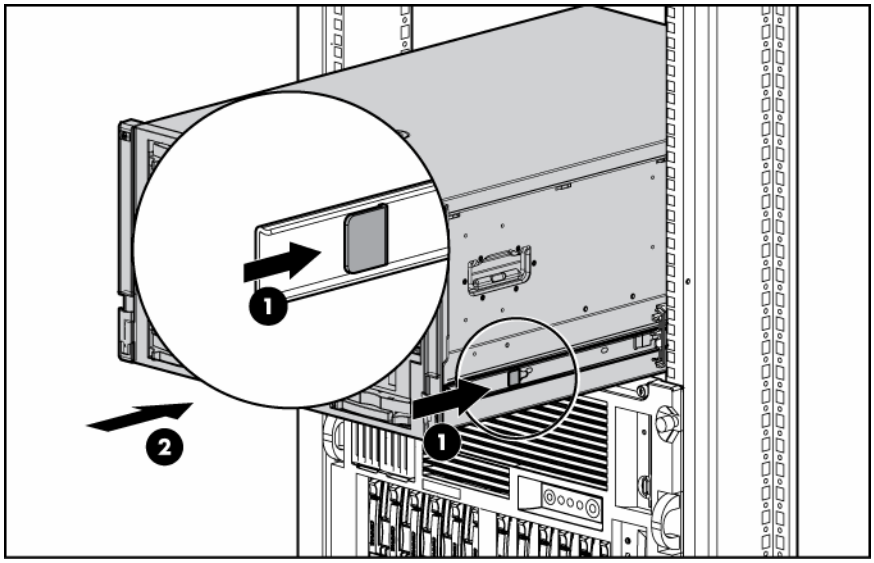


WARNING: To reduce the risk of personal injury or equipment damage, be sure that the rack is adequately stabilized before extending a component from the rack.

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

3. After performing the installation or maintenance procedure, slide the server back into the rack by pressing the server rail release latches.

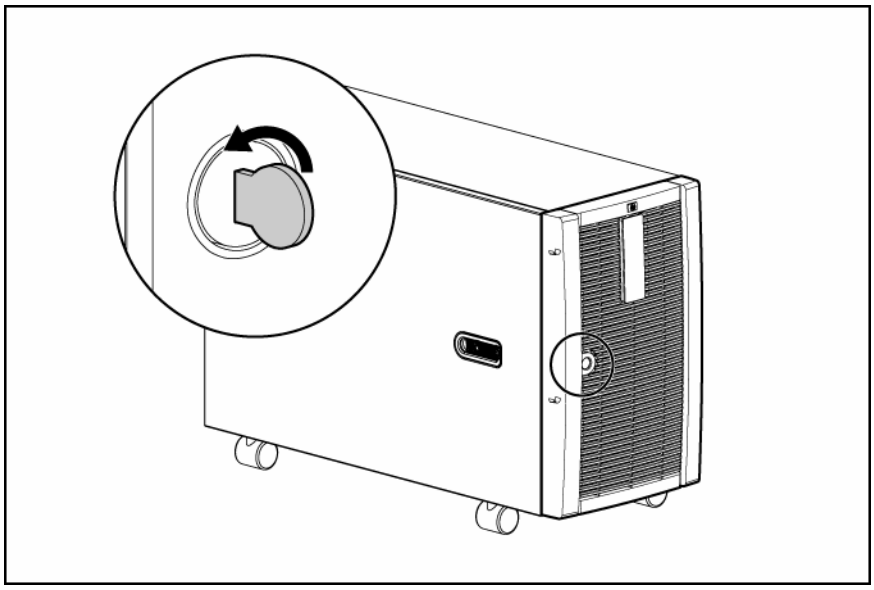
NOTE: The release latches will lock into place when the rails are fully extended.

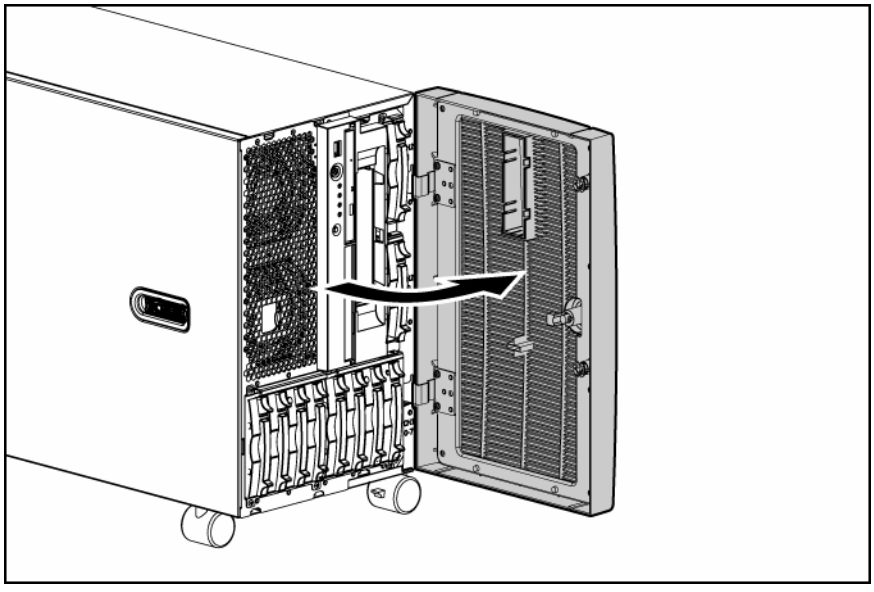


Unlocking and removing the tower bezel

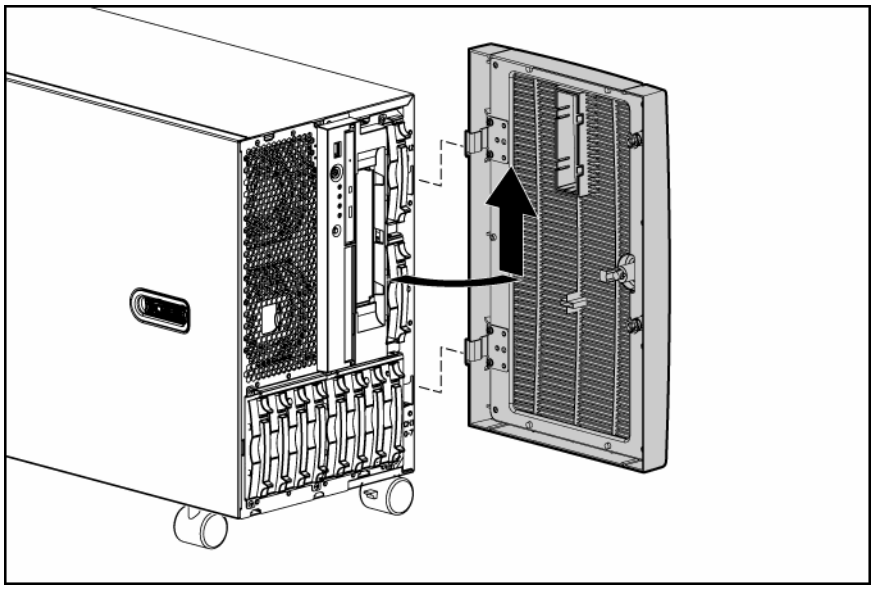
Tower servers have a bezel that must be unlocked and opened before accessing the hard drive cage, diskette drive, DVD drive, and the power switch. In addition, the bezel is also removable when converting from a tower server to a rack server.

To unlock the tower bezel, use the key provided with the server to unlock the bezel with a counterclockwise turn.





If necessary, remove the tower bezel.



Removing the rack bezel

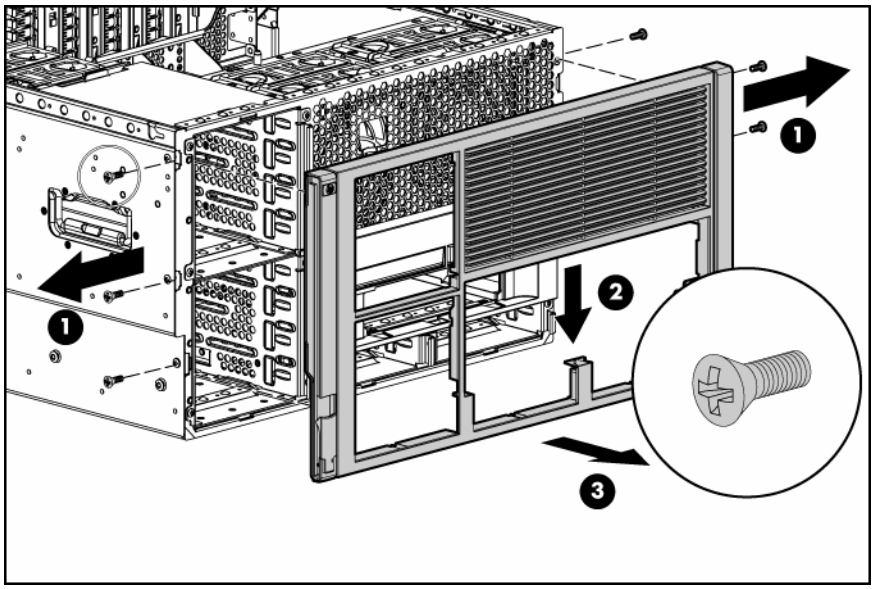
The rack bezel must remain installed during normal server operations. The rack bezel remains installed for all hardware options installations, except for the following situations:

- Removing or replace a SCSI hard drive cage
- Removing or replacing a SAS hard drive cage
- Converting the server from a rack model to a tower model

To remove the rack bezel:

1. Extend or remove the server from the rack ("Extending the server from the rack" on page 27).
2. Remove the tape drive blank or the tape drive ("Removing the tape drive blank" on page 55).
3. Using the Torx T-15 screwdriver, unscrew the three screws on each side of the rack bezel.
4. Push down on the snap and pull the rack bezel away from the chassis.

5. Release the snap at the base of the rack bezel and remove the rack bezel.



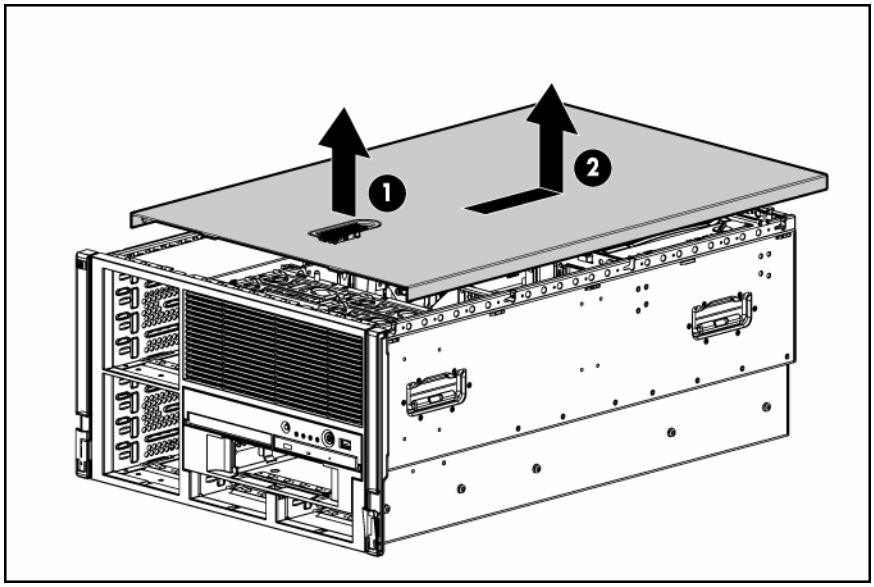
Access panel

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

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

1. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 27).
2. Open the locking latch, slide the access panel to the rear of the chassis, and remove the access panel.

NOTE: If the locking latch is locked, use a Torx T-15 screwdriver to unlock the latch.



After installing hardware options, replace the access panel. Be sure that the panel is securely locked into place before powering up the server.

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

Tower server

In a tower configuration, leave at least a 7.6-cm (3-in) clearance space at the front and back of the server for proper ventilation.

Rack server

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
- Keyboard
- Mouse

Identifying tower server shipping carton contents

Unpack the server shipping carton and locate the materials and documentation necessary for installing the server.

The contents of the server shipping carton include:

- Server
- Power cord
- Keyboard
- Mouse
- Hardware documentation, Documentation CD, and software products

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 39)."

Setting up a tower server

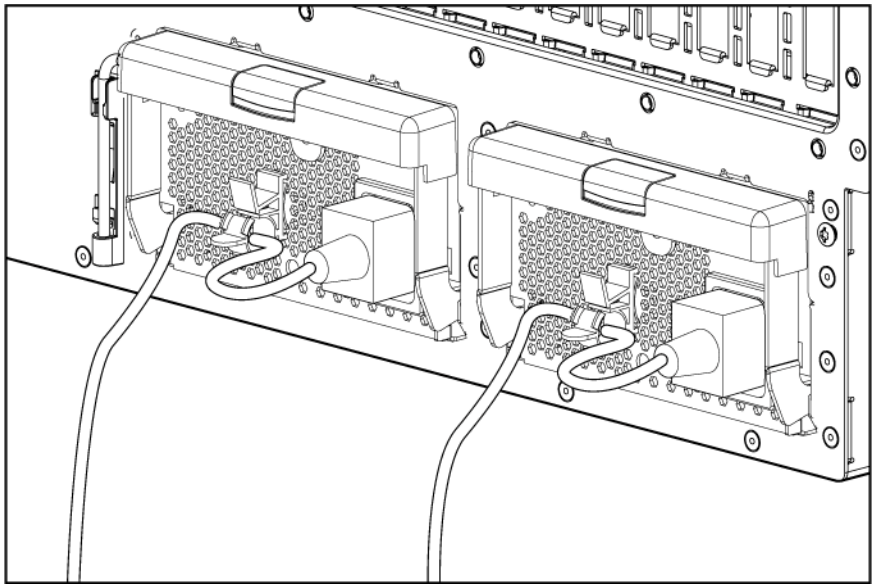
Follow these steps to set up a tower model server. If you are going to install the server into a rack, refer to the rack installation section ("Installing the server into the rack" on page 37).

1. Connect peripheral devices to the server.

WARNING: To reduce the risk of electric shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into RJ-45 connectors.

IMPORTANT: If the RILOE II board is installed in the server, be sure that you attach the video cable to the video connector on the rear of the RILOE II board. The standard video connector on the server rear panel is not used when the RILOE II board is installed. For more information, refer to the *HP Remote Insight Lights-Out Edition II User Guide*.

2. Connect the power cord to the power supply.
3. Open the power cord retaining clip and thread the power cord through the retaining clip.
4. Snap the tab into place to secure the power cord.



5. Connect the power cord to the AC power source.

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.**

Installing the server into the rack

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

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

Preparing the server for options installation

Most internal installation procedures involve either the system board or any of the four memory boards. Installing components onto these boards may require the following common preparatory tasks:

1. Power down the server (on page 27).
2. Unplug all AC power cords from the server.
3. Remove the access panel ("Access panel" on page 31).

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.

Processor options

The server supports up to four processors. With two or more processors installed, the server supports boot functions through the processor installed in processor socket 1.

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, do not mix processors of different speeds or cache sizes. Refer to the label on the processor heatsink for a description of the processor.

IMPORTANT: Populate the processors in the following order: 1, 2, 4, 3.

IMPORTANT: If upgrading processor speed or adding additional processors, update the system ROM before installing the processor.

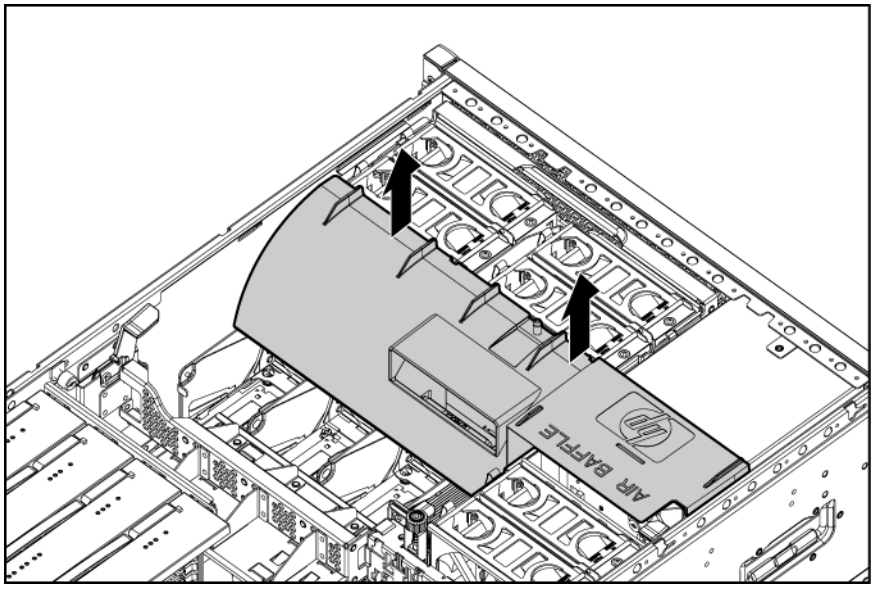
IMPORTANT: Processor socket 1 and PPM slot 1 must be populated at all times or the server does not function properly.

IMPORTANT: Always install a PPM when you install a processor. The system fails to boot if the PPM is missing.

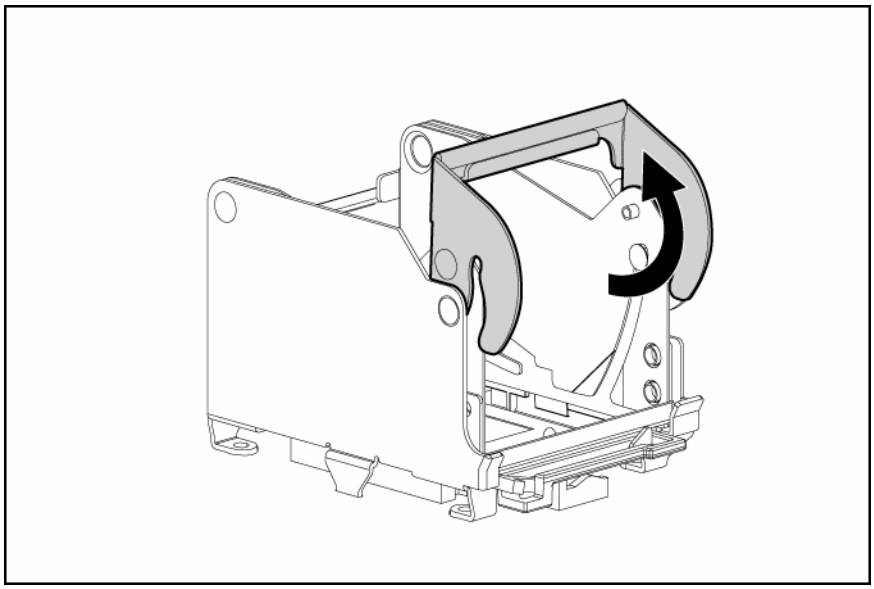
IMPORTANT: To ensure proper cooling, be sure the processor baffle is installed at all times.

To install a processor:

1. Power down the server (on page 27).
2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 27).
3. Remove the access panel ("Access panel" on page 31).
4. Remove the processor air baffle.

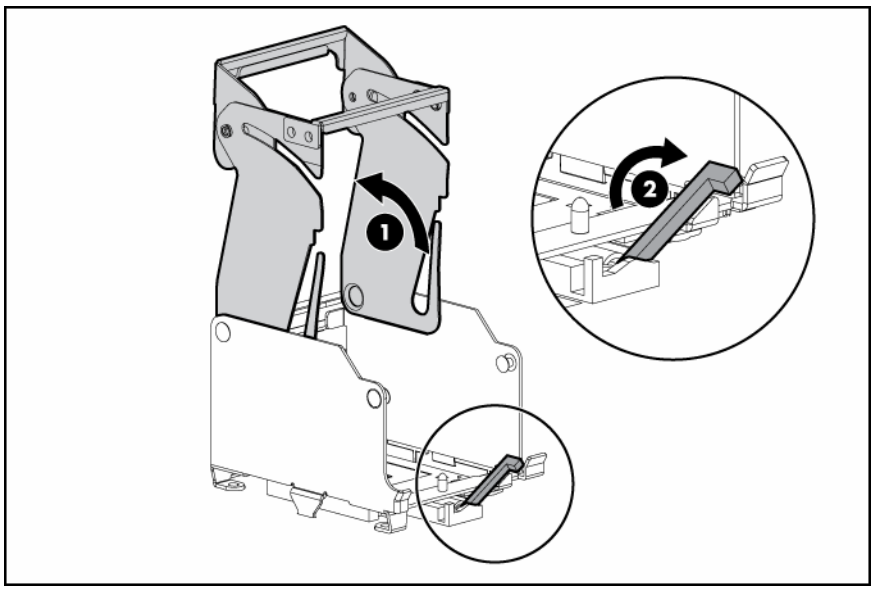


5. Unlock the processor retaining bracket.



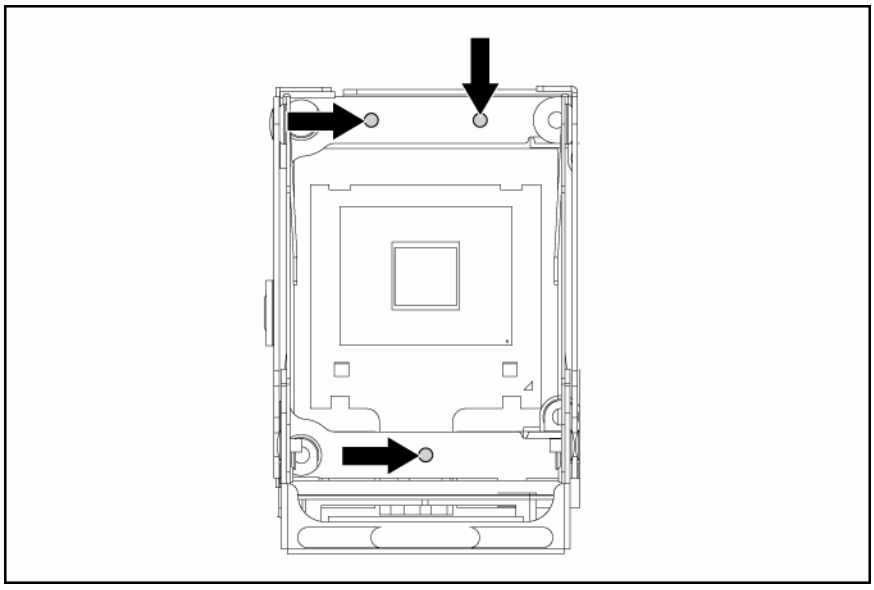
6. Open the processor retaining bracket.
7. Open the processor locking lever.

△ **CAUTION:** Failure to completely open the processor locking lever prevents the processor from seating during installation, leading to hardware damage.



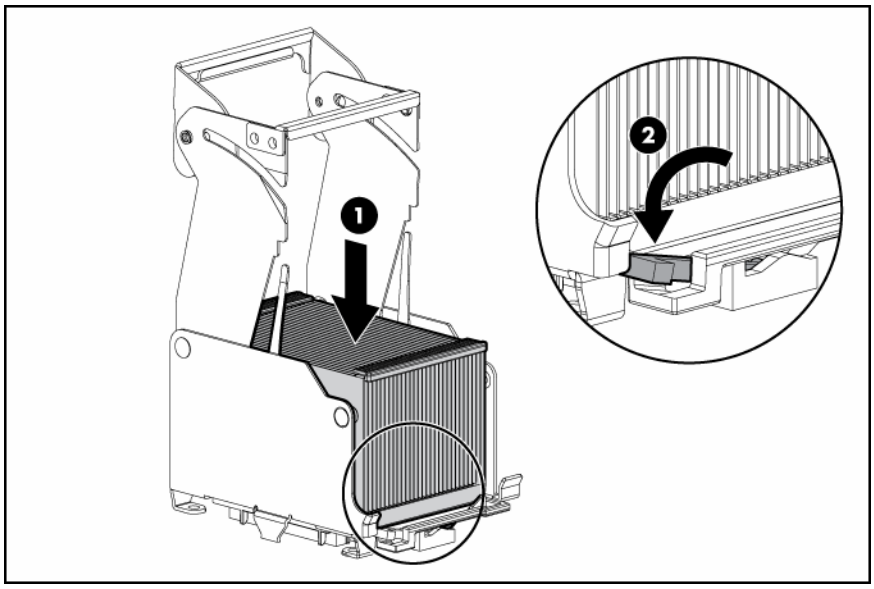
8. Install the processor assembly into the processor socket.

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.

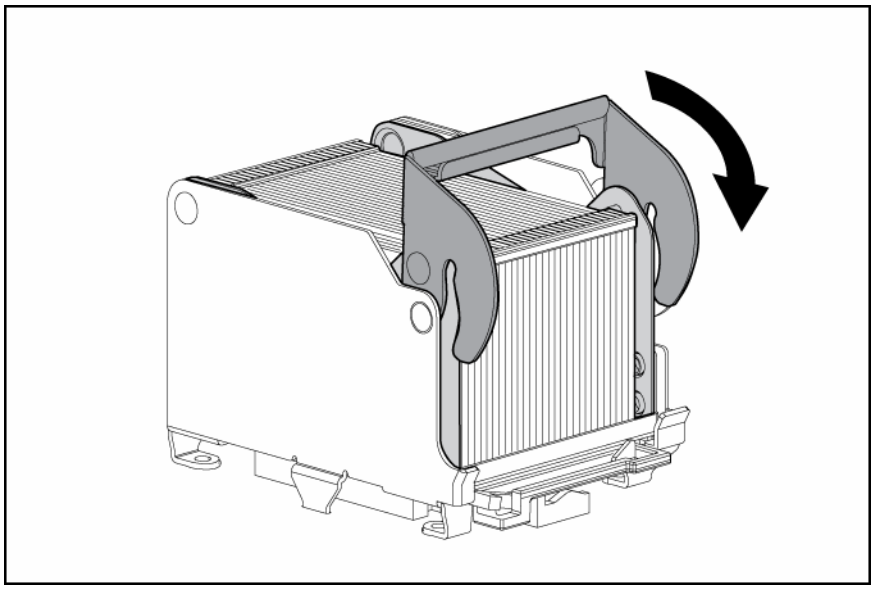


9. Close the processor locking lever.

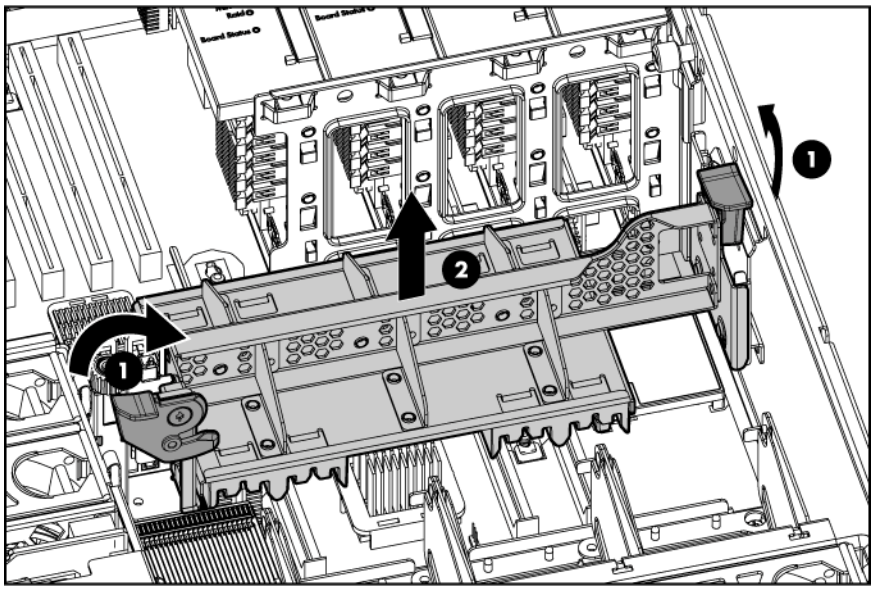
CAUTION: To prevent possible server malfunction or damage to the equipment, be sure to completely close the processor locking lever.



10. Close and lock the processor retaining bracket.

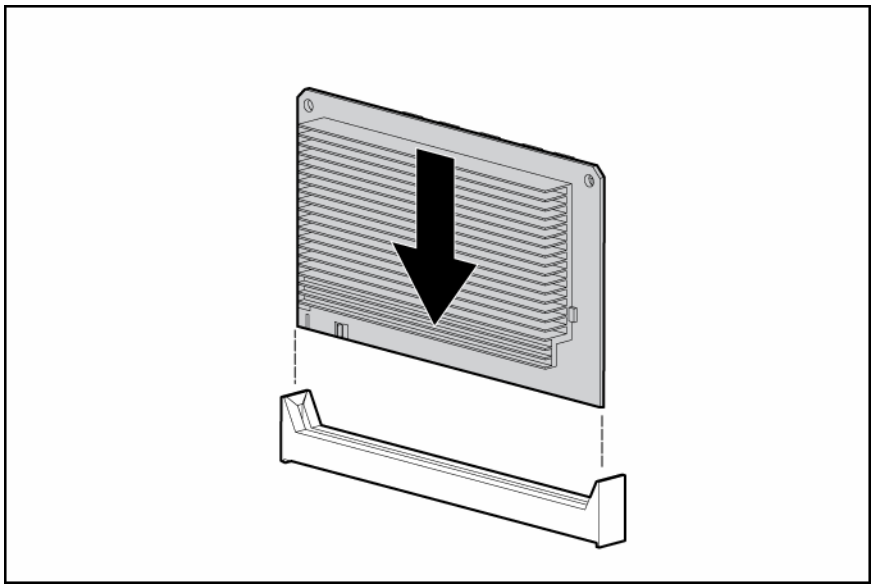


11. Open the latches on the PPM retaining bracket and remove the PPM retaining bracket.



12. 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.

13. Reinstall the PPM retaining bracket.
14. Reinstall the processor air baffle.
15. Reinstall the access panel ("Access panel" on page 31).

Hot-plug SCSI hard drive options

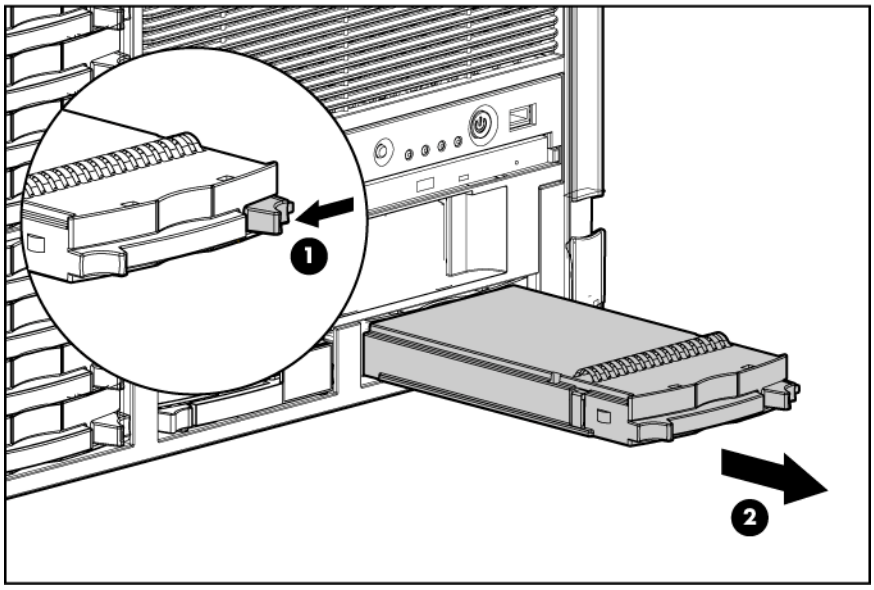
When adding SCSI hard drives to the server, observe the following general guidelines:

- Hot-plug hard drives must be Ultra320 SCSI drives for optimum performance. Mixing Ultra320 SCSI drives other drive types degrades the overall performance of the drive subsystem.
- When drives are groups together into the same drives array, drives must be the same capacity to provide the greatest storage space efficiency.

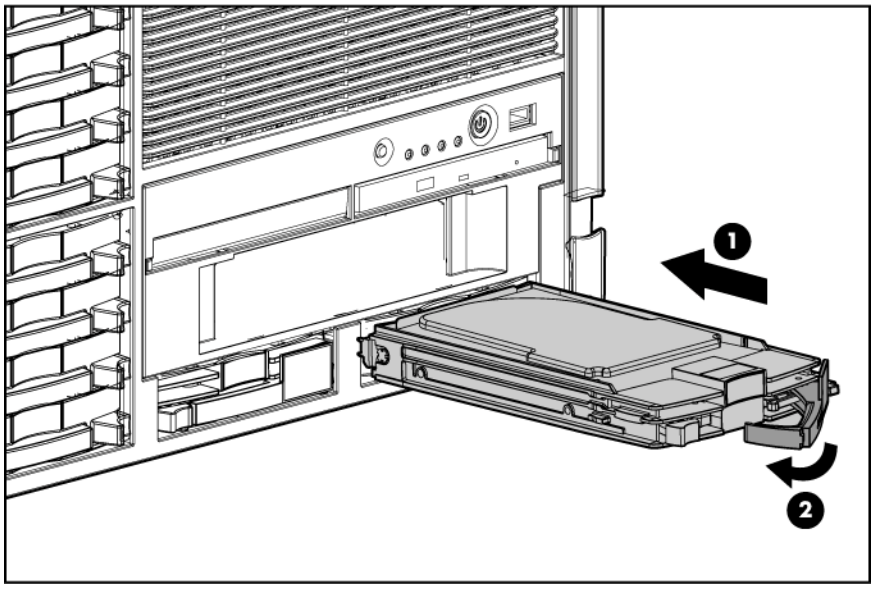
Installing hot-plug SCSI hard drives

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

1. Remove the hard drive blank.



2. Install the hard drive.



3. Determine the status of the hard drive from the hot-plug hard drive LEDs ("SATA or SAS hard drive LEDs" on page 17).
4. Resume normal server operations.

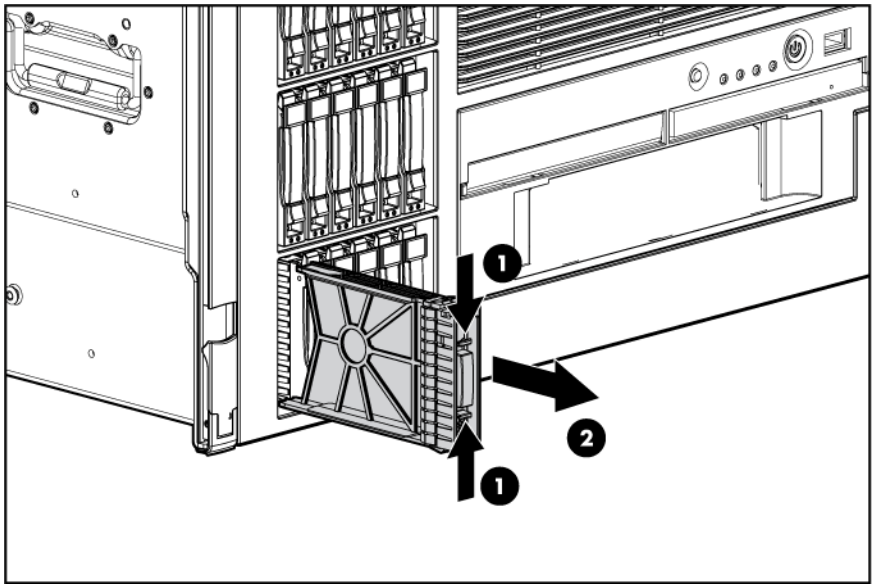
Hot-plug SAS hard drive options

When adding hard drives to the server, observe the following general guidelines:

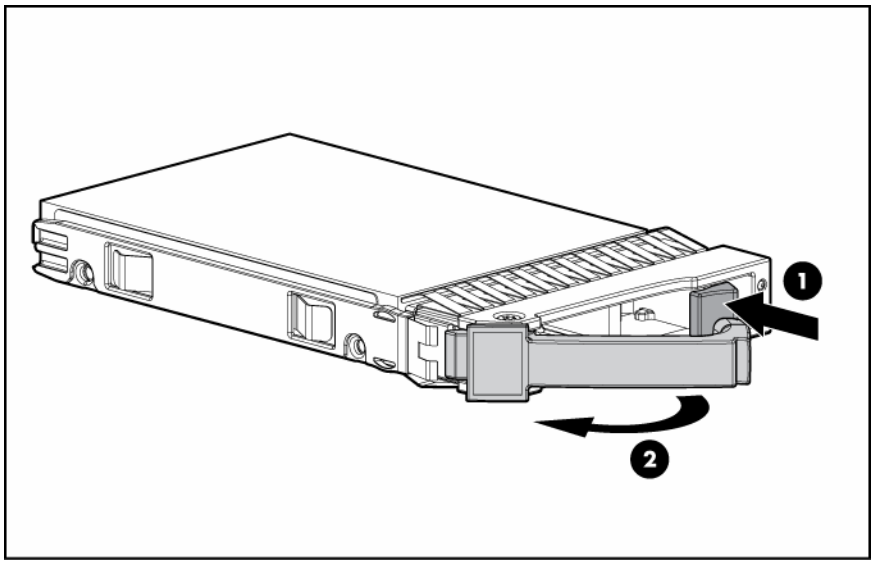
- The system automatically sets all device numbers.
- If only one hard drive is used, install it in the bay with the lowest device number ("SAS-SATA device numbers" on page 16).
- Hard drives must be SFF types.
- Drives should be the same capacity to provide the greatest storage space efficiency when drives are grouped together into the same drive array.

Installing a hot-plug SAS hard drive

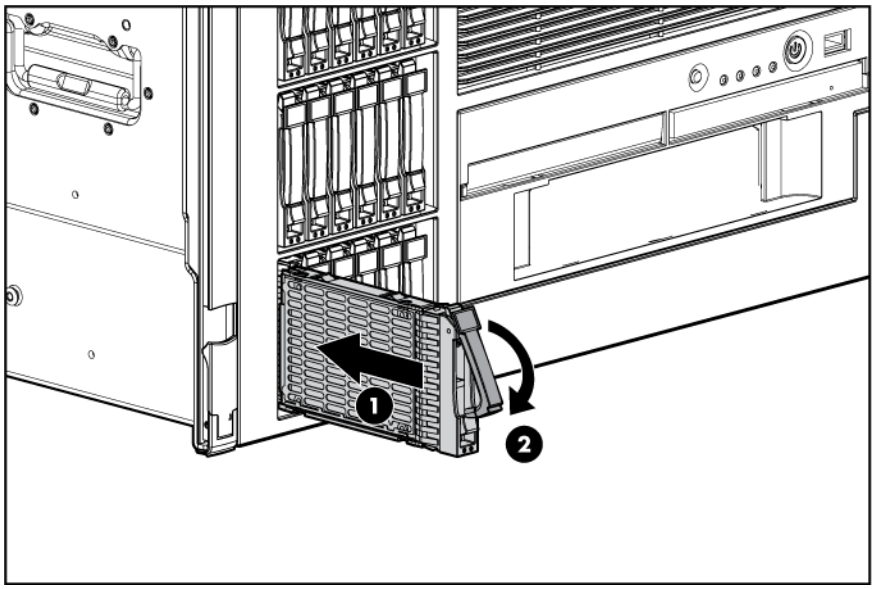
1. Remove the SAS hard drive blank.



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 17).

Redundant hot-plug fans

The server supports redundant hot-plug fans to provide proper airflow to the system if a primary fan fails.

In the standard configuration, primary fans 2, 4, and 6 cool the server.

For the redundant configuration, fans 1, 3, and 5 are added to back up the primary fans. This configuration allows the server to continue operation in non-redundant mode if a fan failure occurs.

For fan locations, refer to Hot-Plug Fan locations ("Fan locations" on page 25).

⚠ **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.**

Installing hot-plug fans

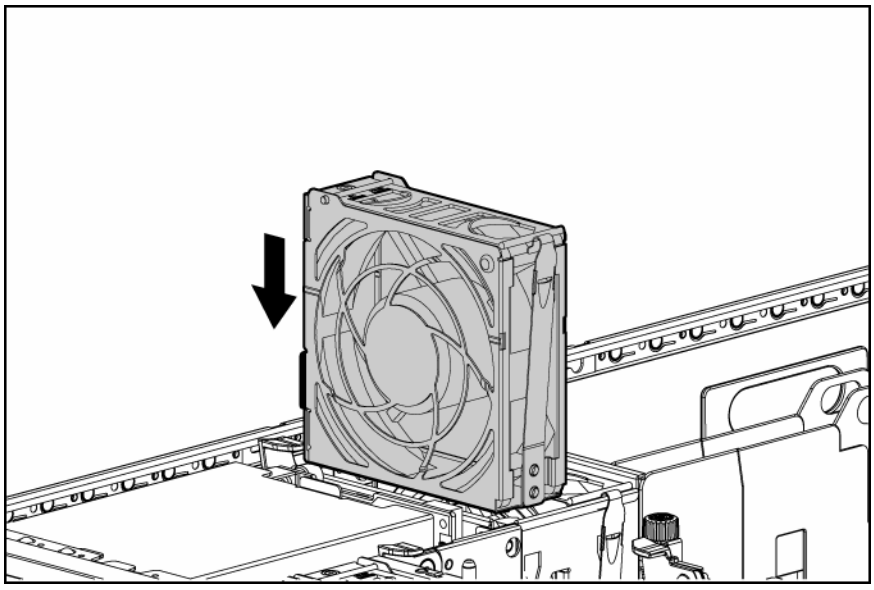
Redundant hot-plug fans can be inserted at any time, including when the server is operating.

For full redundancy, all fans must be installed.

For fan locations, refer to Fan Locations (on page 25).

1. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 27).
2. Remove the access panel ("Access panel" on page 31).
3. Install the fans:
   - One in the mid-fan cage
   - Two in the front fan cage

NOTE: Any hot-plug fan provided in the redundant hot-plug fan cage option kit can be installed in any of the hot-plug fan slots. Fans are keyed to fit only one way in the slot.



4. Observe the LED on each installed fan to be sure it is green.
5. Observe the internal system health LED on the front panel to be sure it is green ("Front panel LEDs and buttons" on page 9).

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.

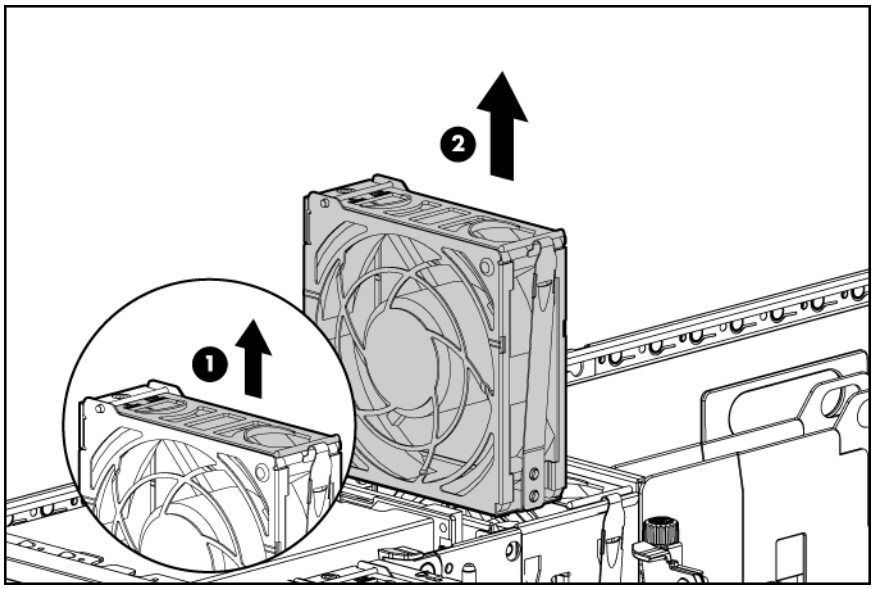
Replacing hot-plug fans

IMPORTANT: Remove and replace one fan at a time. If the system detects two fan failures while in full redundant mode, the server will shut down to avoid thermal damage.

When all redundant fans are installed, individual fans can be hot-swapped at any time.

1. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 27).
2. Remove the access panel ("Access panel" on page 31).

3. Remove the malfunctioning hot-plug fan.



4. Install a new hot-plug fan ("Installing hot-plug fans" on page 47).
5. Replace additional fans if needed.
6. Observe the internal system health LED on the front panel and the LEDs on each installed fan to be sure it is green.

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.

7. Reinstall the access panel ("Access panel" on page 31).

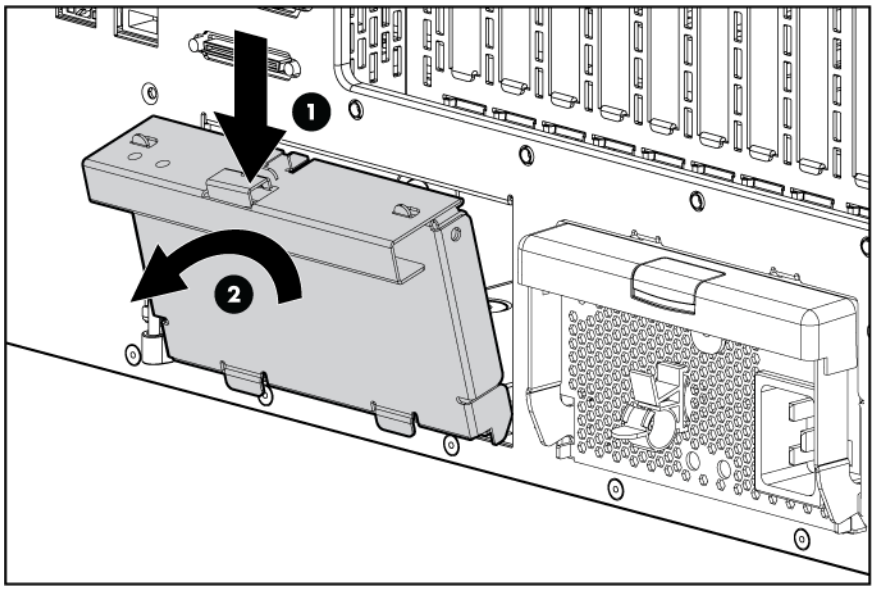
Redundant hot-plug power supply

The server supports a second hot-plug power supply to provide redundant power to the system 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.

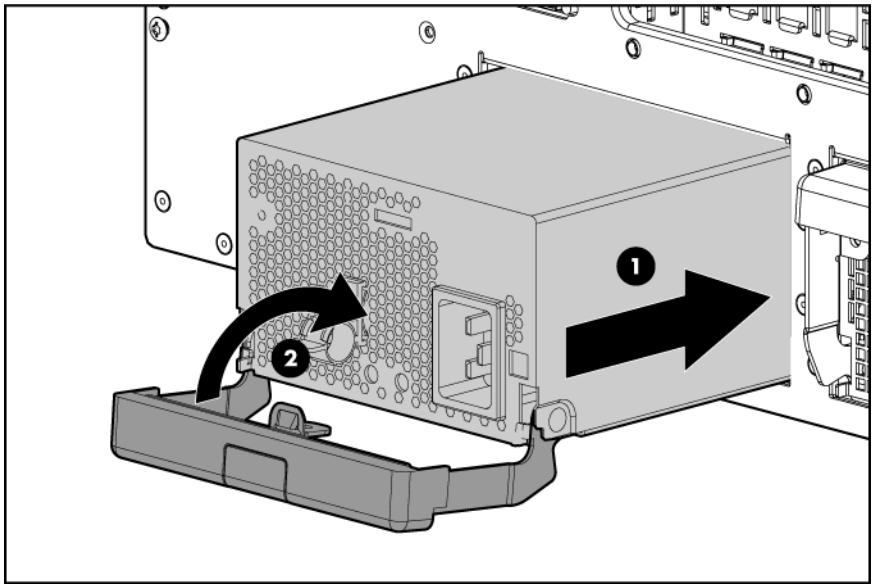
CAUTION: If only one power supply is installed, do not remove the power supply unless the server has been powered down. Removing the only operational power supply will cause an immediate power loss.

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 in the secondary hot-plug power supply bay.



2. Install the second hot-plug power supply.



3. Connect the power cord to the redundant power supply.
4. Secure the power cords to the retaining clip ("Setting up a tower server" on page 37).
5. Connect the power cord to the power source.
6. Be sure that the power supply LED is green.
7. Be sure that the front panel external health LED is green ("Front panel LEDs and buttons" on page 9).

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

To replace the component, reverse the removal procedure.

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

Expansion boards

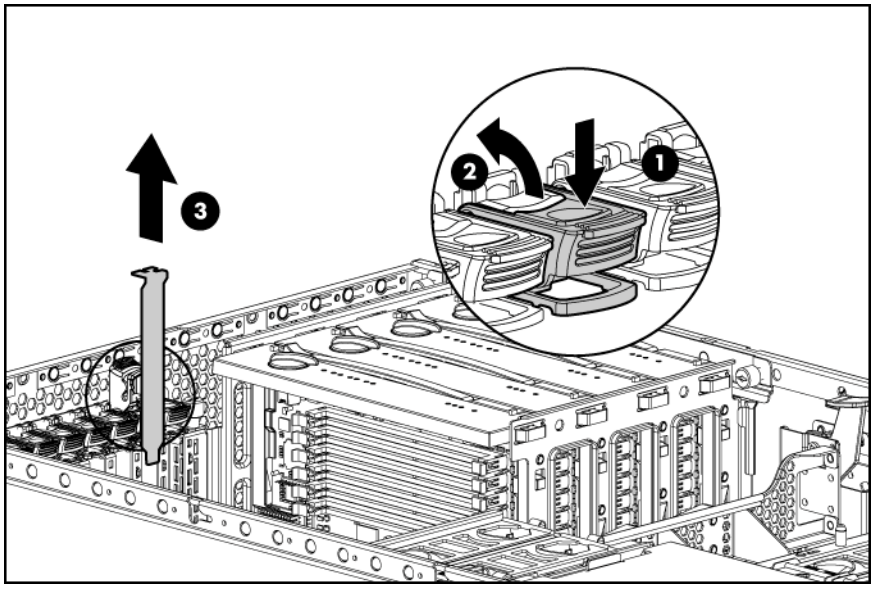
The server supports PCI-X, PCI Express, and hot-plug PCI-X expansion boards. For location, refer to Rear Panel Components (on page 10).

Slot	Expansion card type	Capable speed
1	PCI-X, non-hot-plug	100 MHz* (slots 1 and 2 share the same bus)
2	PCI-X, non-hot-plug	100 MHz* (slots 1 and 2 share the same bus)
3	PCI-X, non-hot-plug	100 MHz* (slots 3 and 4 share the same bus)
4	PCI-X, non-hot-plug	100 MHz* (slots 3 and 4 share the same bus)
5	PCI Express	x4
6	PCI Express	x4
7	PCI Express	x4
8	PCI Express	x4
9	Hot-plug PCI-X	133 MHz
10	Hot-plug PCI-X	133 MHz

*HP recommends that cards with speeds of at least 100 MHz be installed in these slots. If cards with lower bus speeds are installed, the bus speed will be reduced. However, server performance will not suffer if the speed on one bus is slower than the speed on a different bus.

Removing an expansion slot cover

1. Power down the server (on page 27).
2. Extend or remove the server from the rack ("Extending the server from the rack" on page 27).
3. Remove the access panel ("Access panel" on page 31).
4. Remove the expansion slot cover.

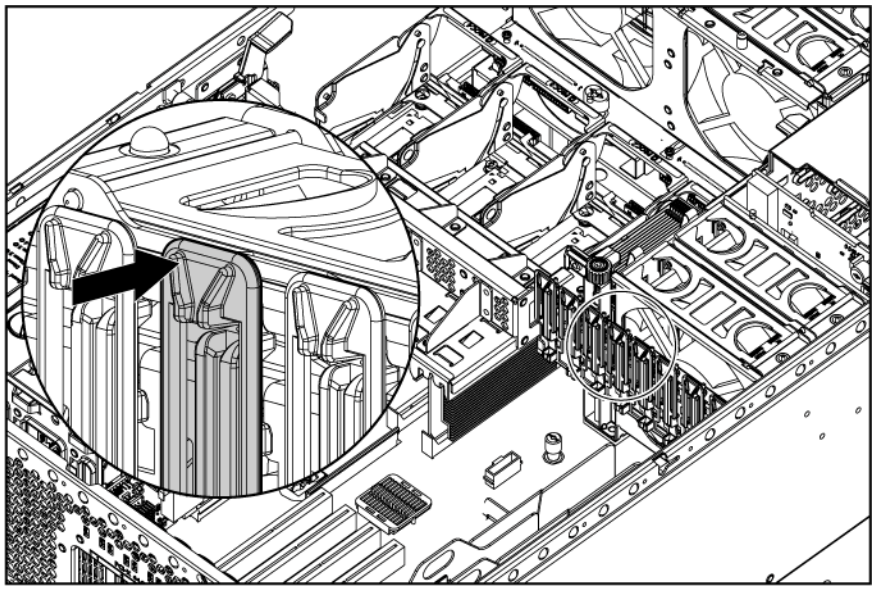


△ **CAUTION:** To prevent improper cooling and thermal damage, do not operate the server unless all PCI slots have either an expansion slot cover or an expansion board installed.

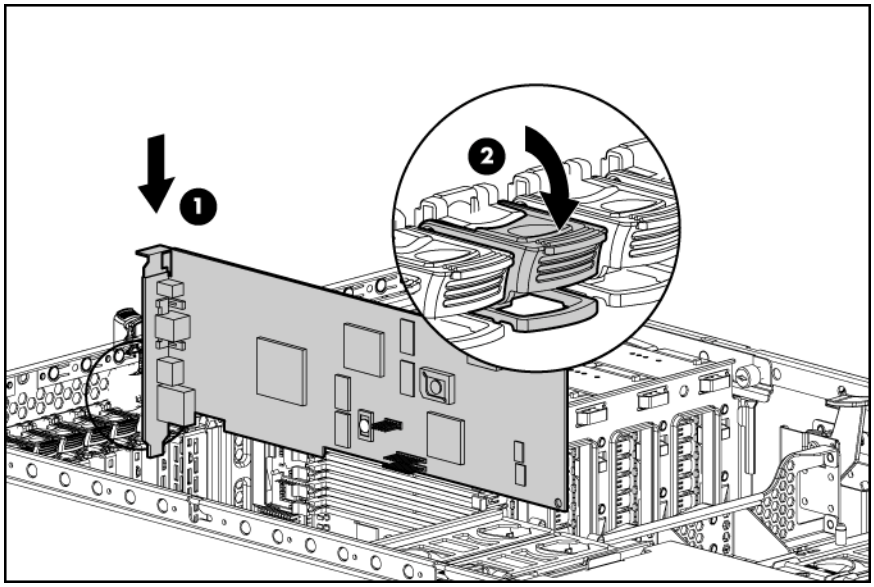
Installing expansion boards

CAUTION: To prevent damage to the server or expansion boards, do **not** remove or install expansion boards that are not hot-pluggable before powering down the server and disconnecting all AC power cords.

1. Remove the expansion slot cover ("Removing an expansion slot cover" on page 51).
2. Push back the retaining clip.



3. Install the expansion board.



4. Lock the PCI slot release lever and release the retaining clip if it does not automatically close and lock.
5. Connect any required internal or external cables to the expansion board. Refer to the documentation that ships with the expansion board for additional information.

RILOE II board

The server comes with iLO remote management capability embedded on the system board. The 30-pin remote management connector for the RILOE II board is provided to reduce external cabling. The 30-pin connector provides power, keyboard, mouse, and other peripheral signals directly to the system board; therefore, the external AC power adapter and keyboard/mouse loopback cable are not needed for normal operations.

The RILOE II board provides remote server manageability for ProLiant servers. It can be accessed from a network client using a standard web browser and it provides a keyboard, mouse, and video capability for a host server, regardless of the state of the host OS or host server. The RILOE II board features include a faster processor for increased performance, new user interface for easier browsing, integration with LDAP, Virtual Floppy, and Virtual CD for increased server manageability.

A built-in processor, memory, NIC, ROM, and standard external power supply make the RILOE II board independent of the host server and its OS. This design allows the RILOE II board to provide remote access to any authorized network client, to send alerts, and to perform other management functions.

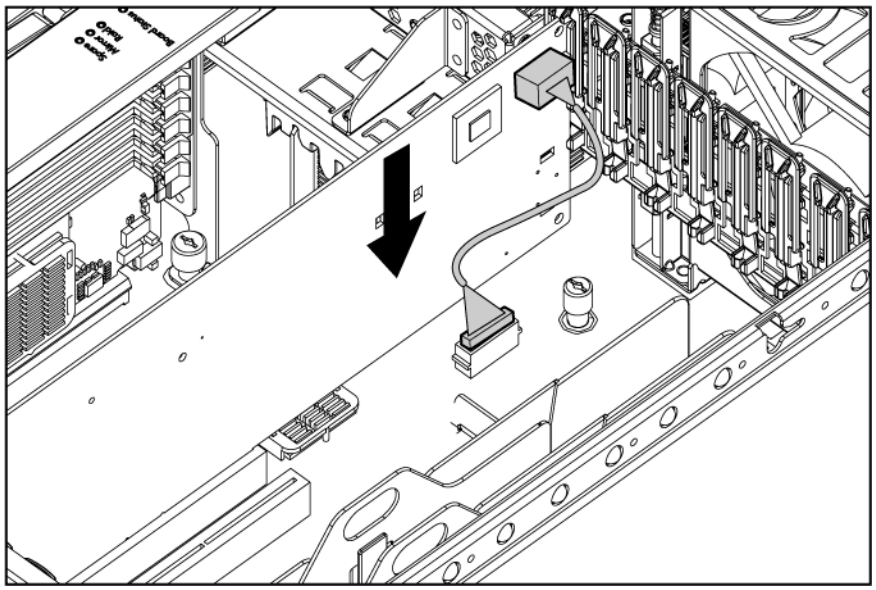
For information about iLO technology, refer to "Integrated Lights-Out Technology (on page 89)."

IMPORTANT: Install the RILOE II board into slot 3 or 4 for ease of cabling.

To install the RILOE board:

The 30-pin Remote Insight cable ships with the RILOE II cable kit.

IMPORTANT: Install the RILOE II board into slot 3 or 4 for ease of cabling.



Optional drives

The standard configuration for this server is one DVD drive (in the right drive bay) and one drive blank (in the left drive bay). An optional CDRW/DVD-ROM or diskette drive may be installed in the left drive bay.

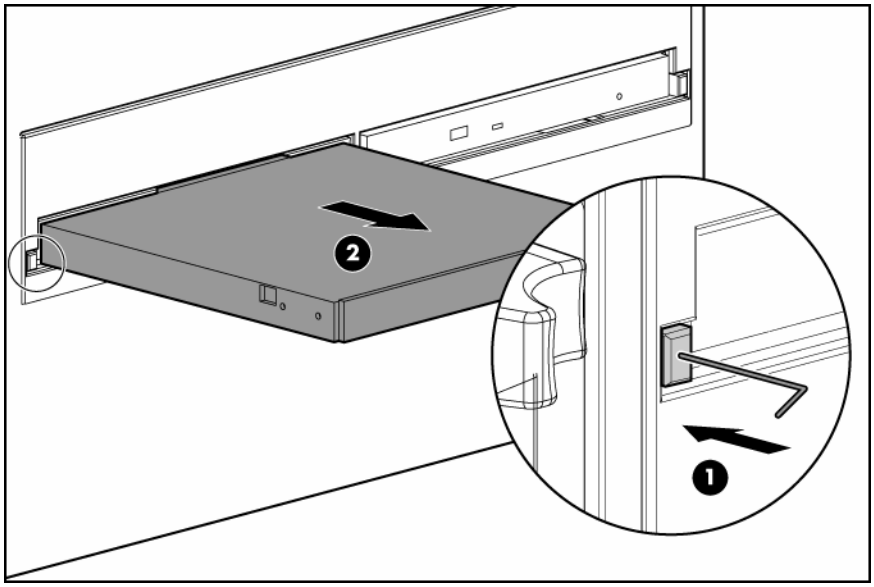
A diskette drive cannot be installed in the right drive bay.

IMPORTANT: By default, the DVD drive must be installed in the right drive bay.

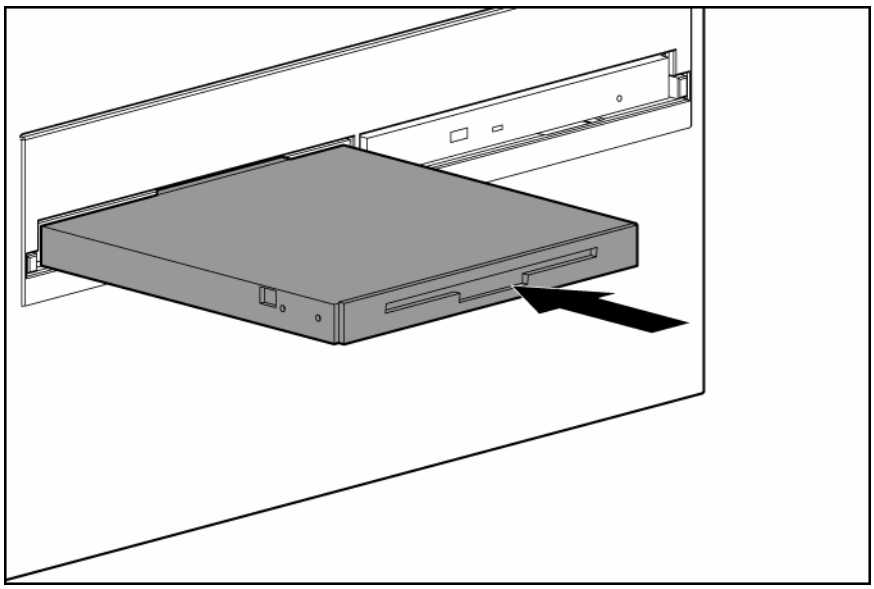
△ **CAUTION:** Always populate each media bay with either a device or a blank. Proper airflow can only be maintained when the bays are populated. Unpopulated drive bays can lead to improper cooling and thermal damage.

To install an optional drive:

1. Power down the server (on page 27).
2. Use a T-15 Torx screwdriver to eject the drive blank, and pull the drive blank out of the chassis.



3. Install the optional drive into the server.



Removable media devices

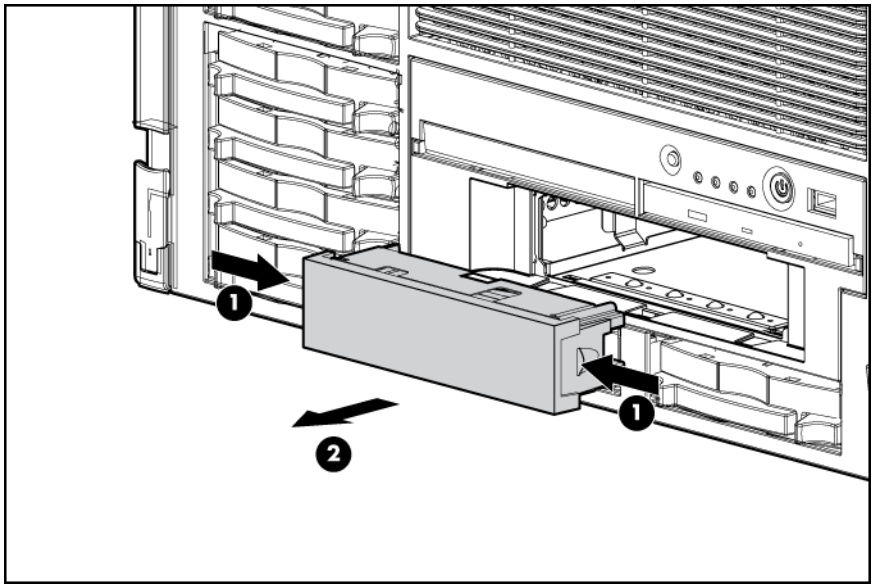
A half-height SCSI tape drive or a half-height USB tape drive may be installed in the removable media bay. A half-height CD-ROM, DVD-ROM, CD-R, or DVD-R drive is not supported.

Removing the tape drive blank

1. Unlock and open the tower bezel ("Unlocking and removing the tower bezel" on page 29) (tower servers only).

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.

2. Pull the tape drive blank out of the chassis.



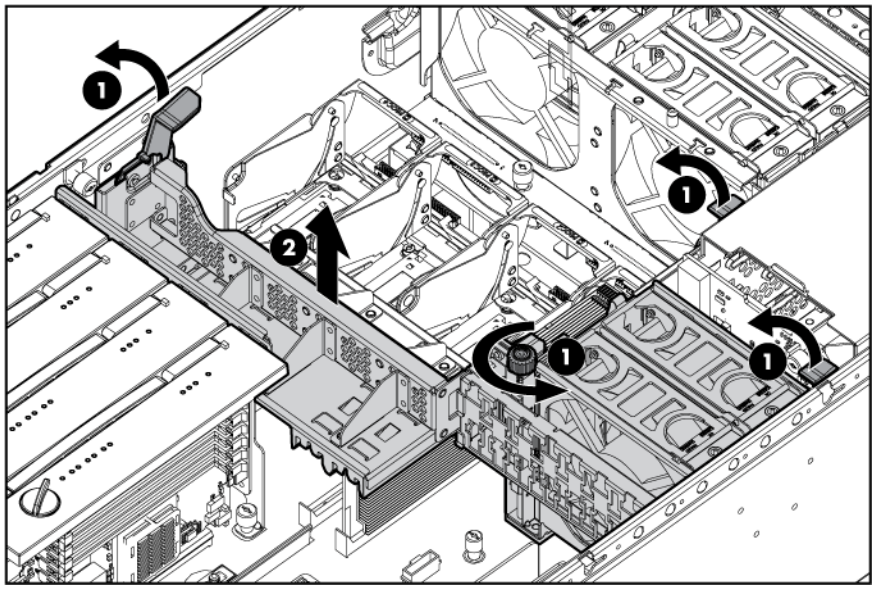
3. Store the blank for later use.

Installing a tape drive

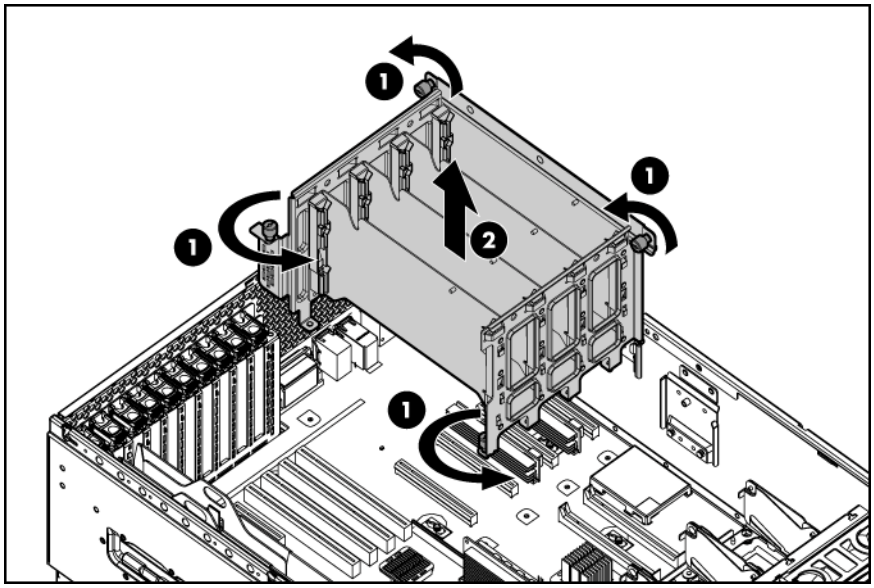
NOTE: If you are installing a USB tape drive, you do not have to remove the system board. You can omit steps 7, 8, and 10.

1. Power down the server (on page 27).
2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 27).
3. Unlock and open the tower bezel ("Unlocking and removing the tower bezel" on page 29) (tower servers only).
4. Remove the access panel ("Access panel" on page 31).
5. Remove the processor air baffle ("Processor options" on page 39).
6. Remove all expansion boards ("Expansion boards" on page 51).
7. Remove all memory boards.

8. Remove the center wall.

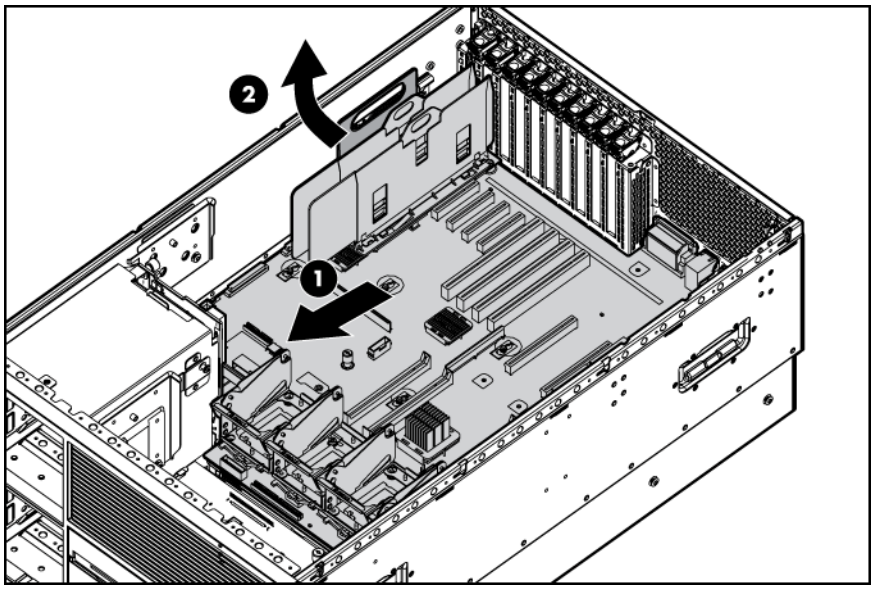


9. Remove the memory cage.



10. Disconnect all required cables from the system board.

11. Remove the system board.



12. Remove the tape drive blank ("Removing the tape drive blank" on page 55).

NOTE: Most devices have holes designed to correspond with the wire retainers that are installed in the upper slot of the guide clips. For devices that have holes designed to correspond to the lower slot of the guide clip, the wire retainer must be removed and reinstalled in the lower slot of the clip.

If the device has holes that correspond to the upper slot, proceed to step 14.

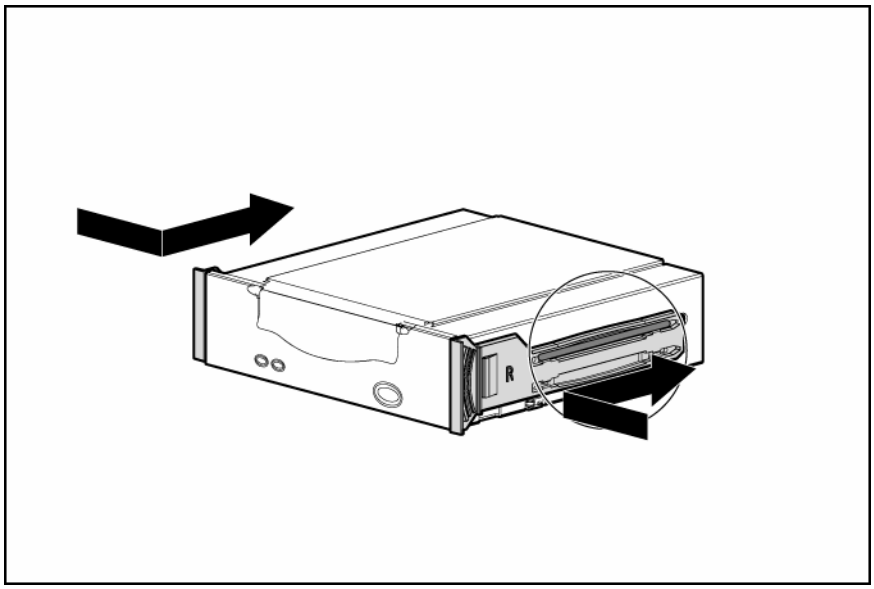
If the device has holes that correspond to the lower slot, proceed to step 13.

13. Adjust the wire retainers on both sides of the device:
    a. Push the wire retainer from behind to remove the wire retainer from the upper slot.
    b. Install the wire retainer in the lower slot. Be sure the wire retainer is snapped into place before installing on a media device.
14. Attach the plastic guides to the tape drive:

NOTE: The plastic clips and the wire retainers are located inside the tape drive blank. Each plastic clip is labeled with an "L" for left or an "R" for right.

    a. Align the left plastic clip to the drive.
    b. Insert the wire retainer into the hole closest to the front of the drive on the left side.
    c. Slide your finger along the wire retainer until the other side of the wire retainer snaps into place in the back of the tape drive.

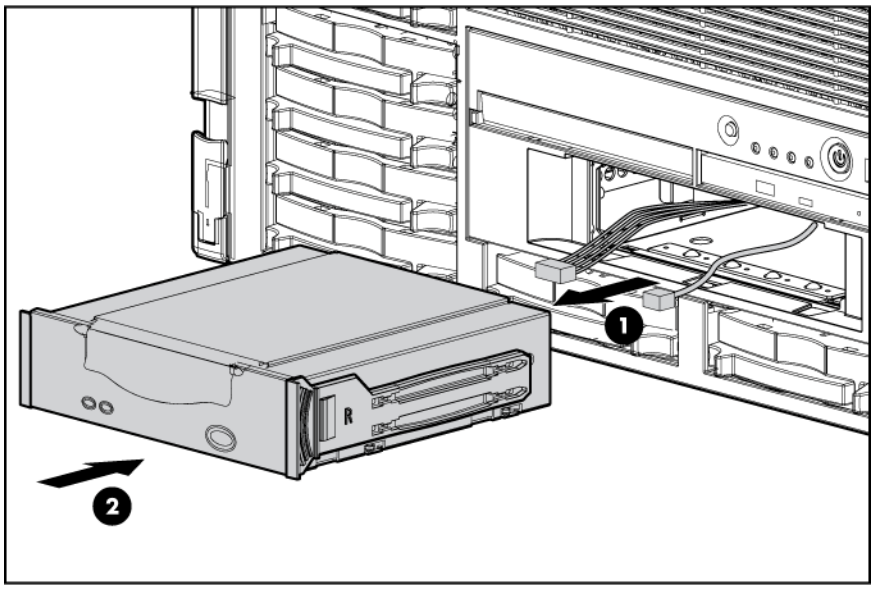
d. Repeat for the right plastic clip.



15. Connect the power cable from the server to the tape drive.
16. Connect one end of the data cable to the tape drive and thread the other end into the server through the tape drive bay.

IMPORTANT: Each SCSI device in the server must have a unique address. The server automatically sets all SCSI IDs for hot-plug drives, but you must set the SCSI IDs for devices installed in the media cage.

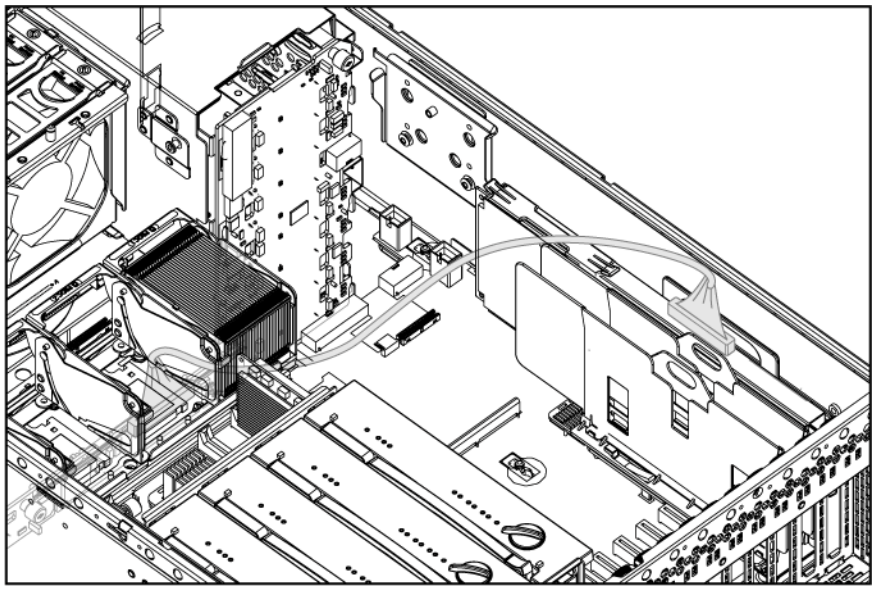
17. Slide the tape drive into the bay until it is seated securely.



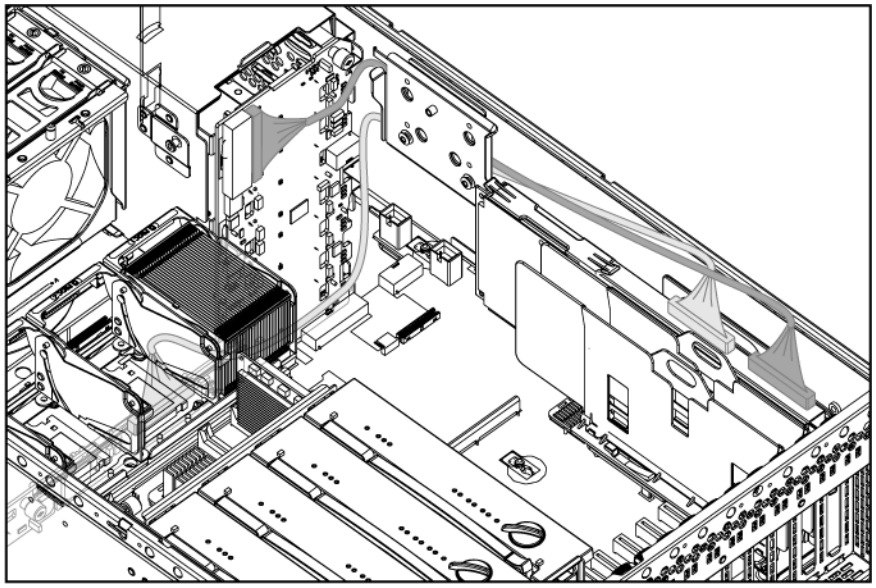
18. Connect the cables:

NOTE: The appropriate cables should ship in the individual option kits or with the device being installed.

- Standard SCSI tape drive cabling



- SCSI tape drive cabling to an expansion board



19. Reinstall the system board.
20. Reinstall the memory cage.
21. Reinstall the memory boards.
22. Reinstall any expansion boards.
23. Reinstall the center wall.
24. Reinstall the processor air baffle ("Processor options" on page 39).
25. Reinstall the access panel ("Access panel" on page 31).
26. Close the tower bezel (tower servers only) ("Unlocking and removing the tower bezel" on page 29).
27. Reinstall the server into the rack (rack servers only) ("Installing the server into the rack" on page 37).
28. Power up the server (on page 27).

Memory options

This server supports up to four memory boards. Each memory board contains six DIMM slots for a total of 24 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 (hot-add enabled) ("Advanced ECC Memory" on page 61)
- Advanced ECC (hot-add disabled) ("Advanced ECC Memory" on page 61)
- Online Spare Memory (on page 62)
- Hot-Plug Mirrored Memory (dual- and quad-board) ("Hot-plug mirrored memory" on page 63)
- Hot-Plug RAID Memory (on page 64)

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

The maximum supported memory per memory board is 16 GB using four 4-GB dual-rank DIMMs. Although six DIMM slots exist per board, the system architecture allows a maximum of only four dual-rank DIMMs per memory board to optimize performance.

For an overview of single- and dual-rank DIMMs, refer to "Single- and Dual-Rank DIMMs (on page 61)."

For DIMM slot locations and bank assignments, refer to "DIMM Slots ("DIMM slot locations" on page 23)."

General memory configuration requirements

The following configuration requirements apply regardless of the AMP mode.

- DIMMs must be installed in pairs.
- DIMM pairs in a memory bank must contain DIMMs with the same part number.
- 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 booting in Advanced ECC mode and Advanced ECC guidelines apply.
- Always populate the DIMMs in sequential order per bank: Bank A, Bank B, and Bank C.
- Dual-rank DIMMs ("Single- and Dual-rank DIMMs" on page 61) must be populated before single-rank DIMMs (see table).
- If dual-rank DIMMs are installed in Bank A and Bank B, no additional DIMMs may be installed in Bank C.
- The following table lists all seven 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	Bank C
1	Single		
2	Single	Single	
3	Single	Single	Single
4	Dual		
5	Dual	Single	
6	Dual	Single	Single

Configuration	Bank A	Bank B	Bank C
7	Dual	Dual	

- The system 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 configuration. However, if the DIMM configuration at POST does not meet the requirements for the AMP mode selected in RBSU, the server defaults to Advanced ECC. The system indicates this by displaying a message 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 the server contains more than 4 GB of memory, consult the OS documentation about accessing the full amount of installed memory.

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.

Understanding the existence of single- and dual-rank DIMMs is all that is necessary for understanding the memory population guidelines of this server.

Advanced ECC Memory

Advanced ECC Memory is the default memory protection mode for this server. In Advanced ECC, the server is protected against correctable memory errors. The server provides notification if the level of correctable errors exceeds a pre-defined 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 1, 2, 3, or 4 memory boards.
- Hot-add is always enabled for Advanced ECC.
- Board insertions do not convert the AMP mode while the server is running. A server cannot be converted from Advanced ECC to Online Spare Memory, mirrored memory, or Hot-Plug RAID memory by inserting a board while the server is running. Board insertions in Advanced ECC are solely for making additional memory resources available to the OS.
- Advanced ECC is the only mode in which hot-add operations are supported. This is the only mode in which the amount of memory available to the OS can be increased without a reboot.
- Hot-add is performed by adding a memory board while the server is running, and the additional memory is made available to the OS without a reboot. The following rules apply to hot-add operations:
  - Boards must be inserted sequentially.

- Multiple hot-add board insertions can be performed 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 and OS logs) before inserting another memory board.

- If a memory board (which contains DIMMs) is unlocked while in Advanced ECC mode, audio alarms and visual alerts occur.

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. With Online Spare Memory, the probability of a server failing because of uncorrectable memory errors is reduced.

In this mode, 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. Since 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 OS support is required.

The following guidelines apply to Online Spare Memory:

- All general memory requirements apply.
- Online Spare Memory is supported with 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 operate independently in Online Spare mode. Each board can failover to its Online Spare Bank independent of the other memory boards. Some boards can be in Online Spare degraded mode while others are still in operational Online Spare 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 ("Single- and Dual-rank DIMMs" on page 61). If the server does not meet these requirements, an error message is displayed during POST and the server defaults to Advanced ECC and Advanced ECC guidelines apply.
- The server automatically configures the optimal Online Spare solution.
- Online Spare Memory does not support any hot-plug operations.

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 OS.

- 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 two times the size of any single-rank DIMM.

After installing DIMMs, use RBSU to configure the system for online spare memory support.

Hot-plug mirrored memory

Hot-Plug mirrored memory (mirrored memory) provides a higher level of memory protection than either Advanced ECC or Online Spare Memory. With mirrored memory, the server is protected against uncorrectable memory errors that would otherwise result in server failure. 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 does not contain the error. In addition, 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 DIMM(s) can be removed, failed DIMMs replaced, and the board re-inserted into the server without any interruption to the OS.

Mirrored memory is supported with either two or four memory boards installed. No OS support is required.

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

The following guidelines apply to mirrored memory:

- All general memory requirements apply.
- Mirrored memory is supported with two or four memory boards.
- Memory boards 1 and 2 are populated for dual-board mirrored memory. Boards 1, 2, 3, and 4 are populated for quad-board mirrored memory. Any deviation from these guidelines results in the server booting in Advanced ECC mode and Advanced ECC guidelines apply.
- Memory boards 1 and 2 form a mirrored pair for dual-board mirrored memory. For quad-board mirrored memory, memory boards 3 and 4 form an additional 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 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 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 permitted. Board removals and insertions in mirrored memory 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 mirroring 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, replace the failed DIMMs, and replace board 2 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 LEDs ("Memory board LEDs and components" on page 20).

- If you remove a board while the server is running and do not replace the board, the next reboot results in the system defaulting to Advanced ECC and Advanced ECC guidelines apply.

Hot-plug RAID memory

Hot-plug RAID memory (RAID memory) provides a similar level of memory protection as mirrored memory but obtains this protection using less total memory. For example, in a RAID memory configuration, 25% of the installed memory is not available to the OS. In a mirrored memory configuration, however, 50% of the installed memory is not available to the OS. RAID memory protects the server against uncorrectable memory errors that would otherwise result in a server failure.

Although mirrored memory keeps two copies of all memory data, 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.

As with mirrored memory, 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 DIMM(s) can be removed, failed DIMMs replaced, and the board re-inserted into the server without any interruption to the OS.

RAID memory is only supported if all four memory boards are installed. No OS support is required.

The following guidelines apply to Hot-Plug RAID memory:

- All general memory requirements apply.
- RAID memory is only supported with four memory boards.
- All four memory boards must have the same amount of total memory. However, each board may have different DIMM configurations as long as they have equal total size. Any deviation from this rule results in the server booting in Advanced ECC mode and Advanced ECC guidelines apply.
- No hot-add operations are supported in RAID memory, only hot-replace.
- If you remove a board while the server is running and do not replace it, the next reboot results in the system reverting to Advanced ECC and Advanced ECC guidelines apply.

Memory boards and DIMMs

Memory board and DIMM installation, removal, and replacement procedures can be either hot-plug or non-hot-plug, 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 OS. 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 OS requirements.

The following table illustrates AMP modes that support 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 mirrored or 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 DIMM(s).

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 Mirrored 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.**

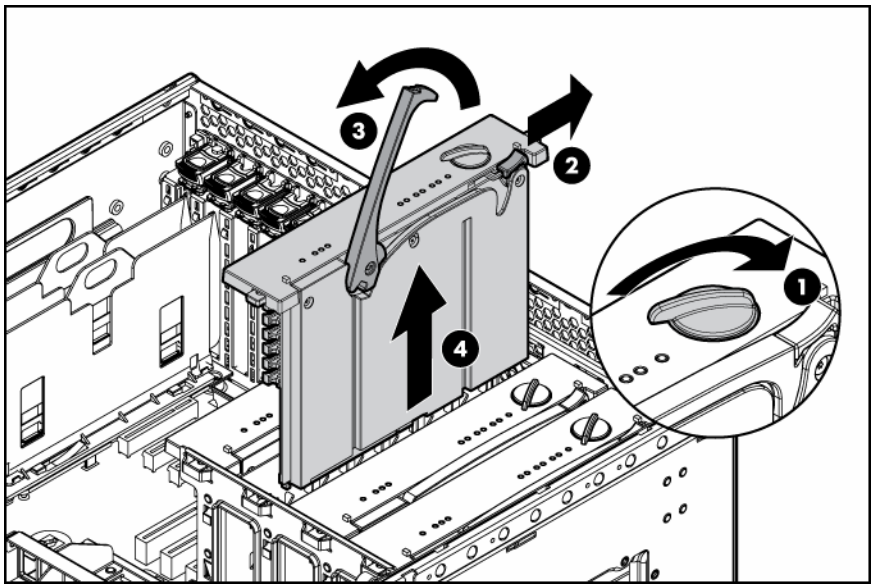
Removing and installing a memory board (hot-plug)

1. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 27).
2. Remove the access panel ("Access panel" on page 31).
3. Determine which memory board is to be removed by locating the memory board that displays an amber Board Status LED. The Board Removal LED must be green. Take note of the failed DIMM, if applicable.
4. Unlock the memory board locking switch.

CAUTION: Do not attempt to unlock the memory board in an operational server when the board removal LED is not green. This generates an audio alarm and causes the memory board LEDs to flash amber. Proceeding to remove the memory board causes server failure.

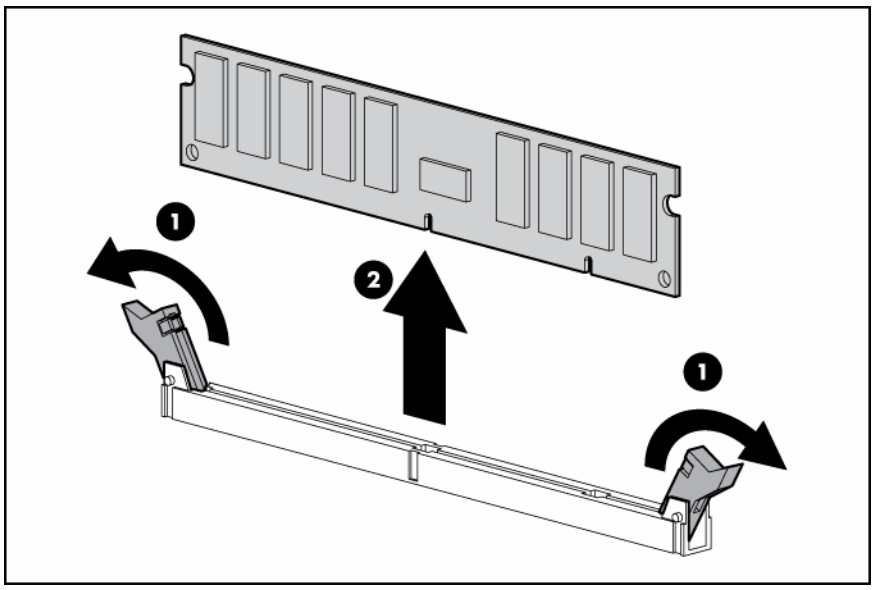
CAUTION: To prevent server failure during a hot-plug removal procedure, do not remove the memory board from the server until the board status LED stops flashing.

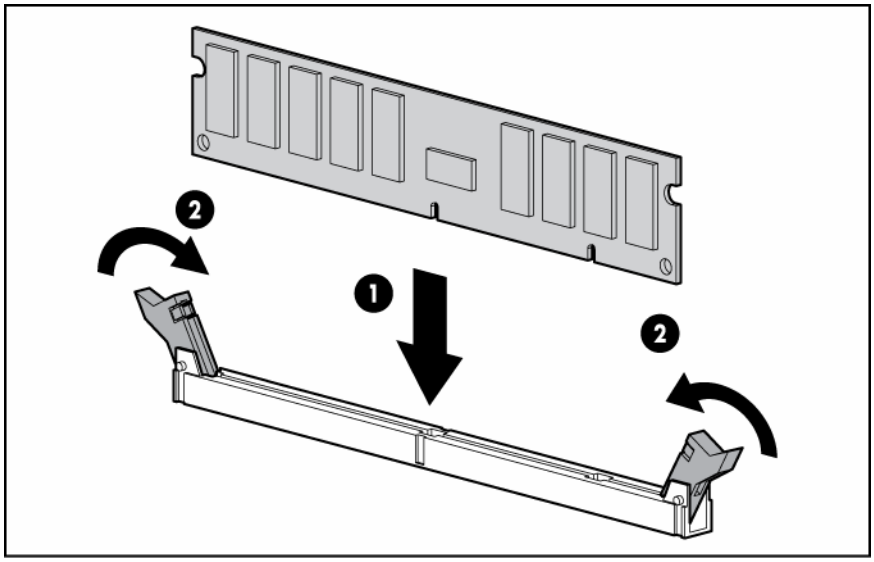
5. Unlock and open the memory board ejector lever.
6. Remove the memory board and place it on a flat surface.



NOTE: While the memory board with the failed or degraded DIMM is being removed, the system continues to read and write from the operational memory board(s).

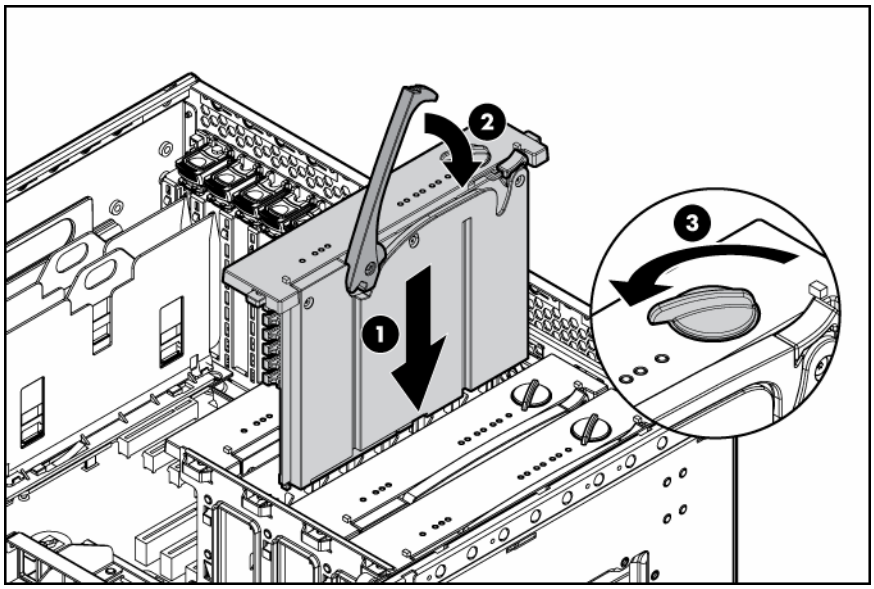
7. Remove or install the DIMM.





8. Align the memory board with the memory slot and memory board guide clips.
9. Install the memory board into the server and close the ejector lever.

10. Move the locking switch to the locked position.



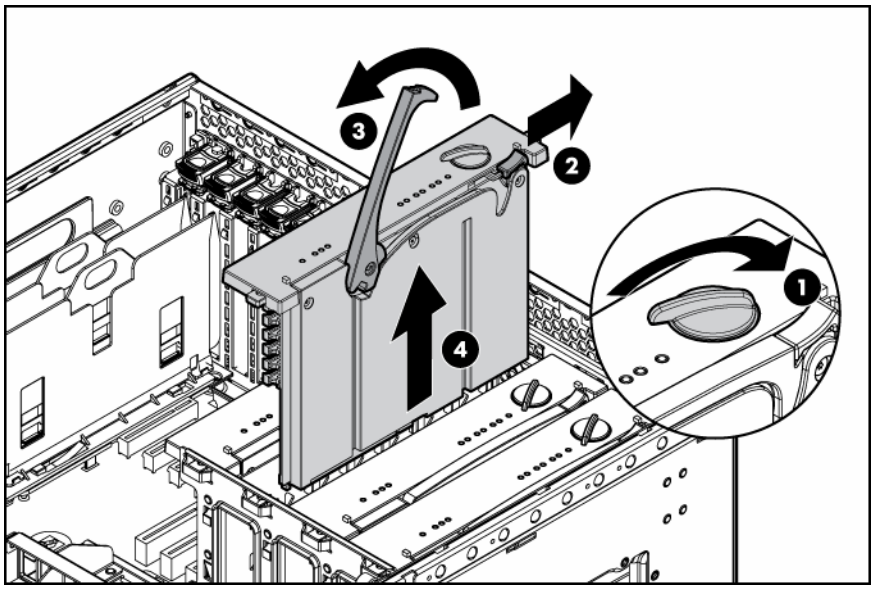
NOTE: In hot-plug procedures, all LEDs now turn off except the board status LED, which flashes green while the board is rebuilding. This process may take several minutes.

11. Observe the LEDs on the top of the memory board to be sure that the memory is functioning properly ("Memory board LEDs and components" on page 20). The LED states will be valid when the memory board has finished rebuilding.
12. Replace the access panel ("Access panel" on page 31).
13. Reinstall the server into the rack (rack servers only) ("Installing the server into the rack" on page 37).

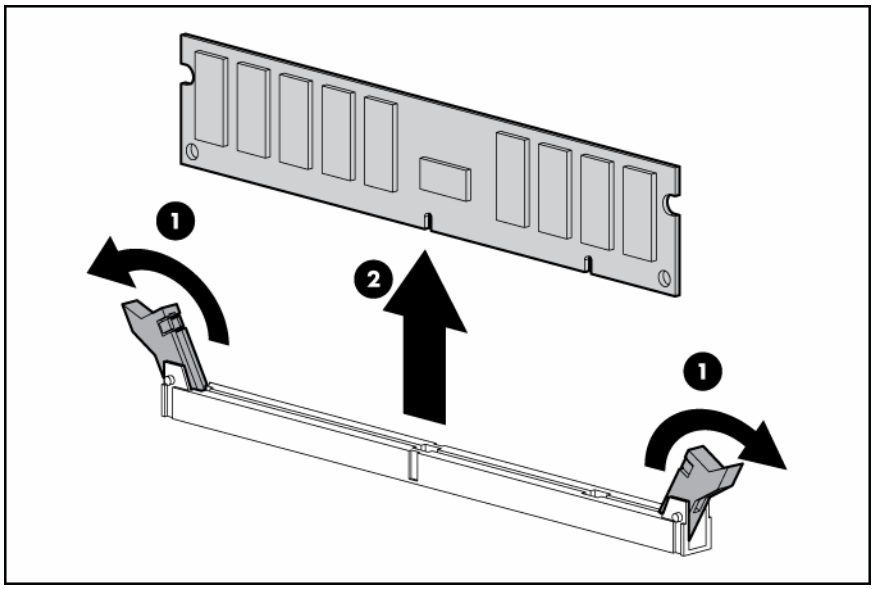
Removing and installing a memory board (non-hot-plug)

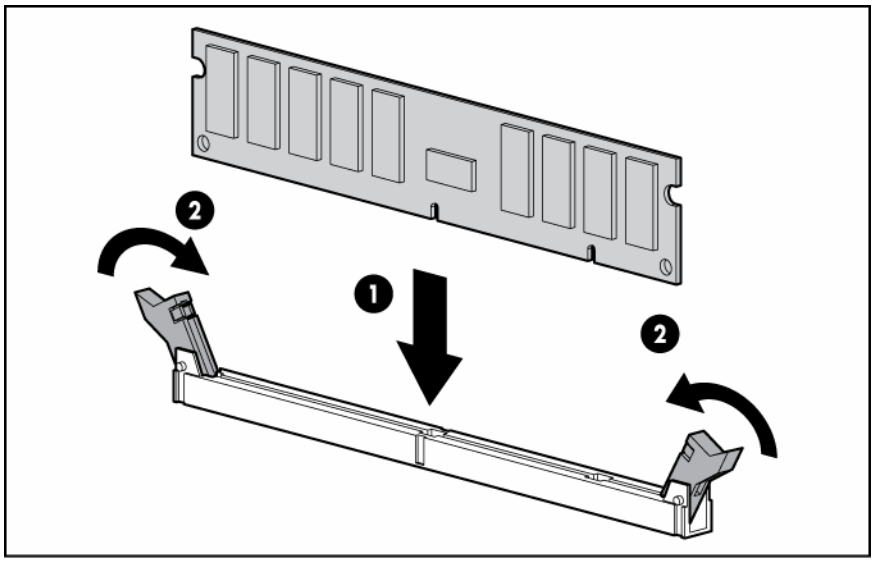
1. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 27).
2. Remove the access panel ("Access panel" on page 31).
3. Determine which memory board is to be removed by locating the memory board that displays an amber board status LED. Take note of the failed DIMM, if applicable.
4. Power down the server (on page 27).
5. Unlock the memory board locking switch.
6. Unlock and open the memory board ejector lever.

7. Remove the memory board and place on a flat surface.



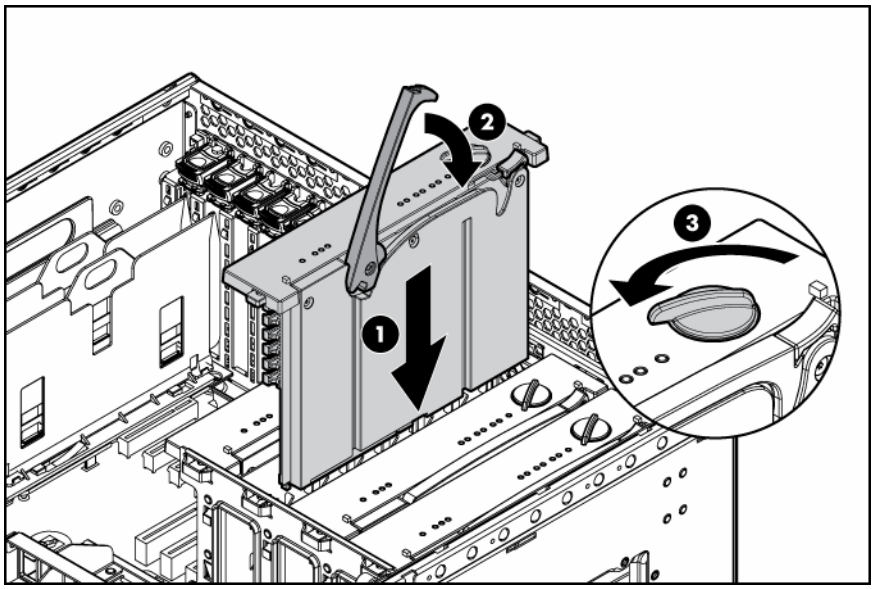
8. Remove or install the DIMM.





9. Align the memory board with the memory slot and the memory board guide clips.
10. Install the memory board into the server and close the ejector lever.

11. Move the locking switch to the locked position.



12. Configure the memory ("Configuring the memory" on page 70).
13. Replace the access panel ("Access panel" on page 31).
14. Reinstall the server into the rack (rack servers only) ("Installing the server into the rack" on page 37).

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 60, "Single- and Dual-rank DIMMs" on page 61)." For more information, refer to "General memory configuration requirements (on page 60)."
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 70)
   - ROM-Based Diagnostics test ("ROM-based diagnostics" on page 71)

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 71).

POST memory test

1. Power on the server ("Power up the server" on page 27).
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 27).
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 71).

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.

Tower-to-rack conversion

The tower-to-rack conversion kit includes all equipment required to convert the tower model server into a rack model server, and to install the server into most square- or round-hole racks.

The tower-to-rack conversion kit includes:

- Rack rail assemblies
- Server rails
- Cable management arm bracket
- Cable management arm support bracket (screw retaining plate)
- Installation screws
- Cable management arm
- Rack bezel assembly
- Tower-to-rack conversion installation instructions document

In addition to the items supplied in the conversion kit, the following items are also needed:

- Torx T-15 screwdriver (clipped to the rear panel of the server)

Before proceeding with the tower-to-rack conversion:

1. Power down the server (on page 27).
2. Remove all power supply cables from the server.

3. Remove all remaining external cables from the rear panel of the server, including any cables extending from external connectors on expansion boards.
4. Remove all hot-plug power supplies ("Redundant hot-plug power supply" on page 49).
5. Remove all hot-plug SCSI hard drives.
6. Remove the tower bezel ("Removing the tape drive blank" on page 55, "Unlocking and removing the tower bezel" on page 29).

Removing the casters

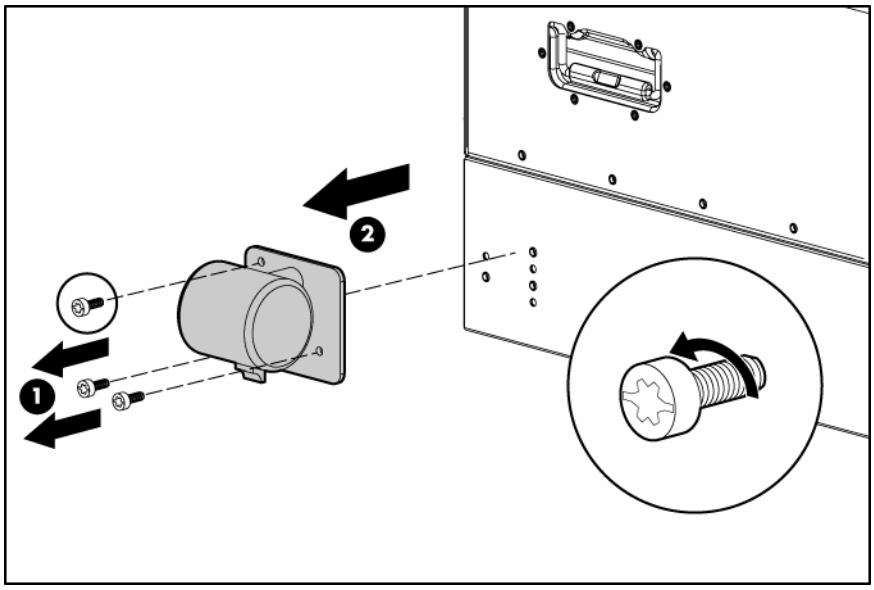
⚠ **WARNING: The server is very heavy, up to 63.5 kg (140 lb). To reduce the risk of personal injury or damage to the equipment:**

- **Remove all power supplies and hard drives to reduce the weight of the server before lifting it.**
- **Observe local occupational health and safety requirements and guidelines for manual material handling.**
- **Use more than one person to lift and stabilize the server.**

⚠ **CAUTION:** Be sure to lock the casters and have the access panel in place before turning or reorienting the server position.

To remove the casters:

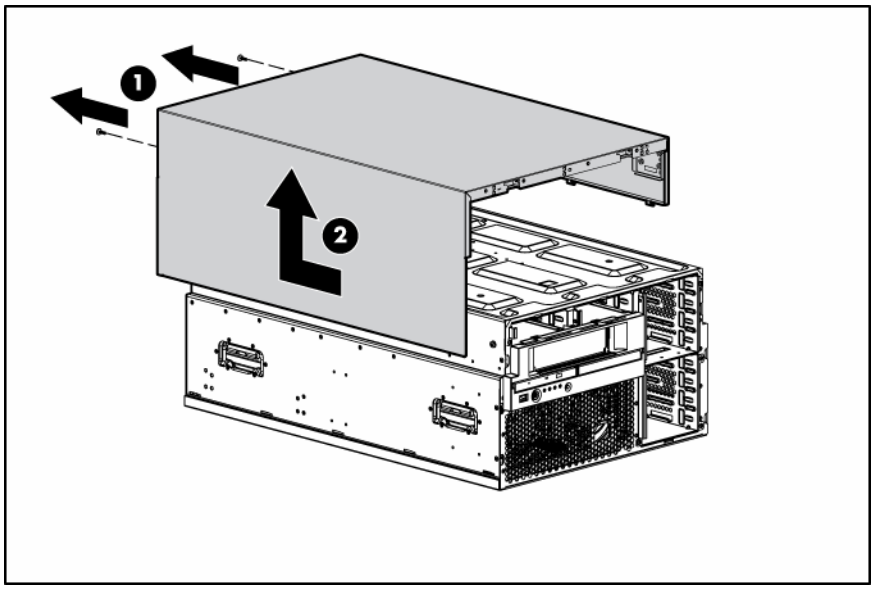
1. Place the server on a flat, level surface with the access panel down.
2. Unscrew the three T-15 Torx screws from each of the four casters and remove the casters.



Removing the tower cover

1. Loosen and remove the two (2) T-15 Torx screws located on the back of the chassis that attach the tower cover to the server.

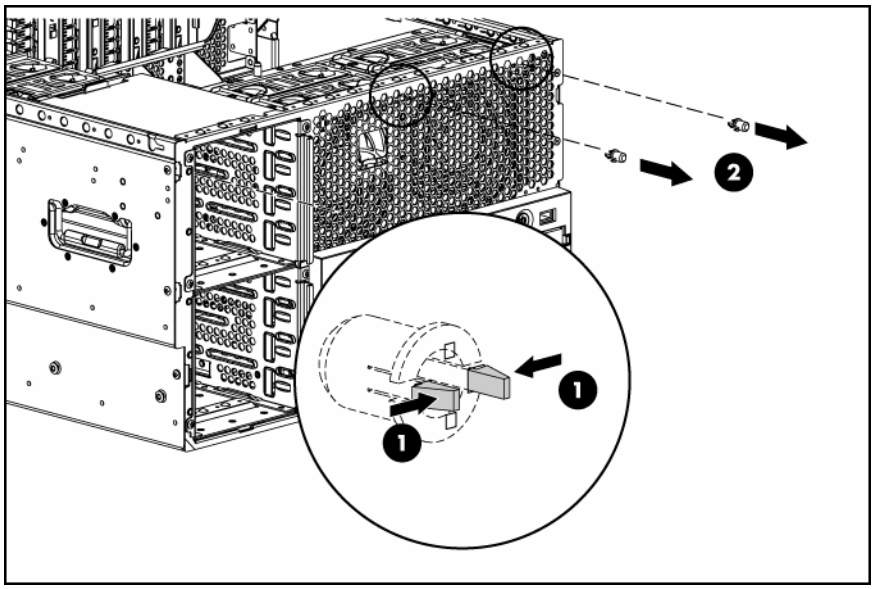
2. Slide the tower cover toward the rear of the server and pull the cover away from the chassis.



3. Turn the server over 180 degrees so that the access panel is on top.

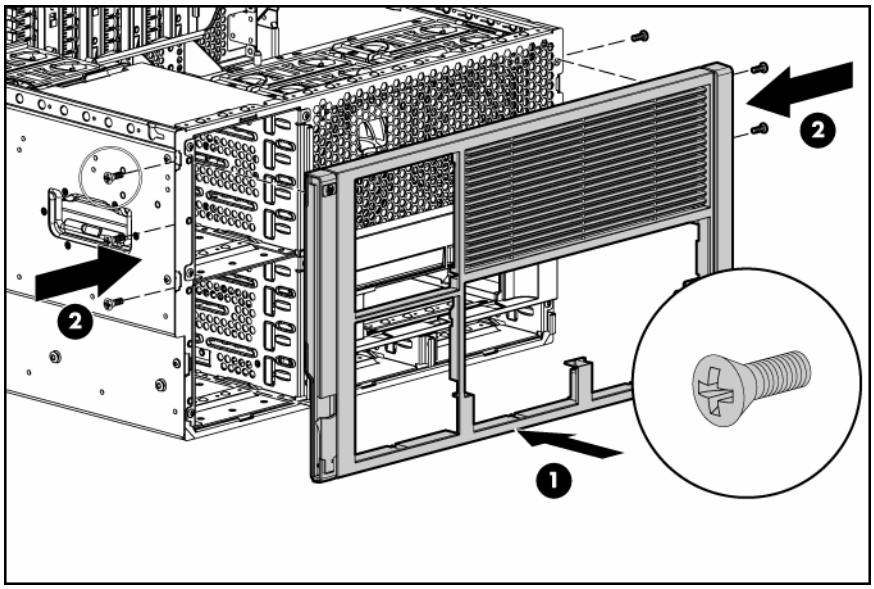
Installing the rack bezel

1. Remove the access panel ("Access panel" on page 31).
2. Remove the tower bezel retaining clips from the front panel of the chassis.



3. Align the three tabs on each side of the rack bezel with the corresponding slots in the chassis.
4. Secure the rack bezel to the server:
   a. Insert six 6-32 Torx T-15 screws (three per side) into the corresponding holes on the rack bezel.

b. Be sure the snap locks in place.



5. Install the server into the rack ("Installing the server into the rack" on page 37).

Rack-to-tower conversion

The rack-to-tower conversion kit includes all equipment required to convert the rack model server into a tower model server.

The rack-to-tower conversion kit includes:

- Tower bezel
- Painted tower top cover
- Casters (4)
- Tower bezel retention clips (2)
- Caster screws [8-32 Torx T-15 (12)]
- Tower cover screws [6-32 x 1/4 Torx T-15 (2)]
- Painted access panel

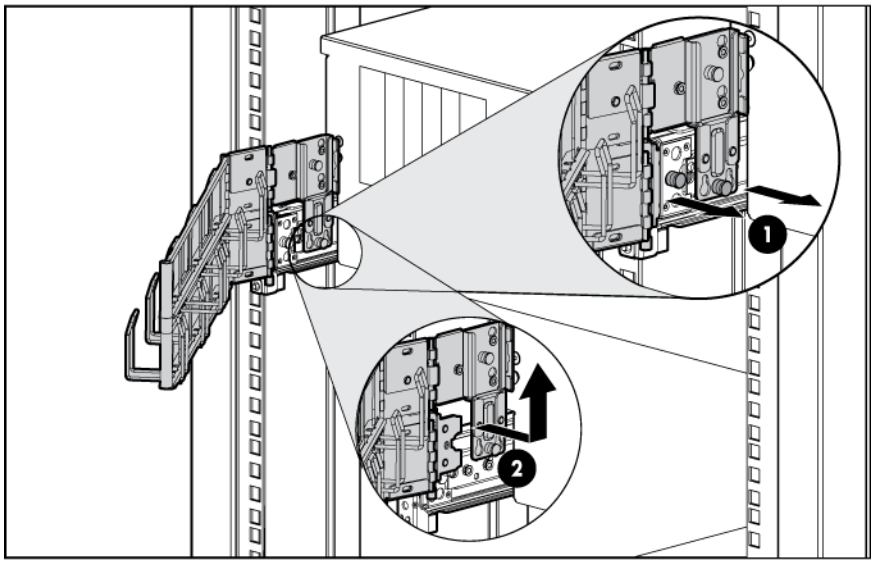
In addition to the items supplied in the conversion kit, you will also need a Torx T-15 screwdriver (clipped to the rear panel of the server)

Before proceeding with the rack-to-tower conversion:

1. Power down the server (on page 27).
2. Remove the power supply cables from the server ("Redundant hot-plug power supply" on page 49).
3. Remove all external cables from the rear panel of the server ("Rear panel components" on page 10).
4. Remove all cables from the cable management arm.
5. Remove all power supplies from the server (to decrease the weight) ("Redundant hot-plug power supply" on page 49).
6. Remove all hard drives from the server (to decrease the weight).

Removing the cable management arm

1. Pull the release pin and slide the cable management arm out from the inner rail.

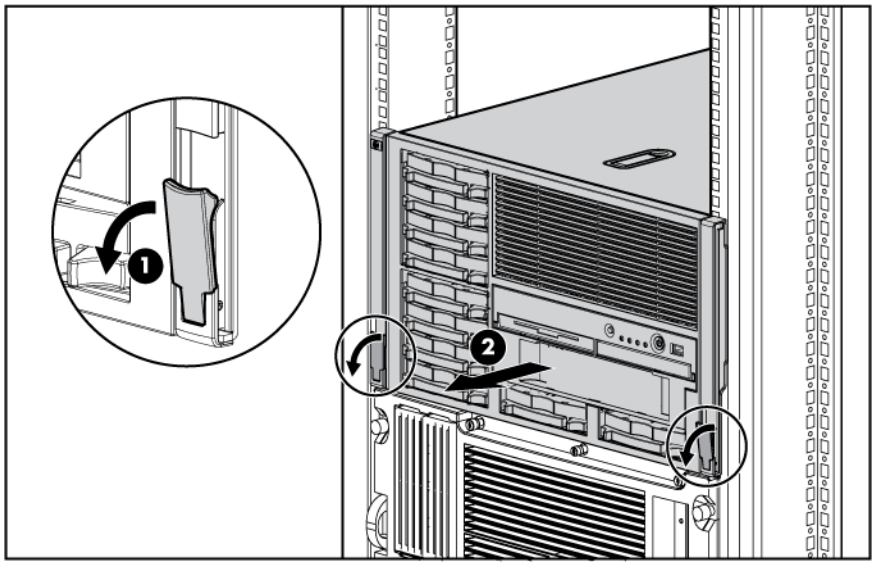


Removing the server from the rack

⚠ **WARNING: The server is very heavy, up to 63.5 kg (140 lb). To reduce the risk of personal injury or damage to the equipment:**

- **Remove all power supplies and hard drives to reduce the weight of the server before lifting it.**
- **Observe local occupational health and safety requirements and guidelines for manual material handling.**
- **Use more than one person to lift and stabilize the server.**

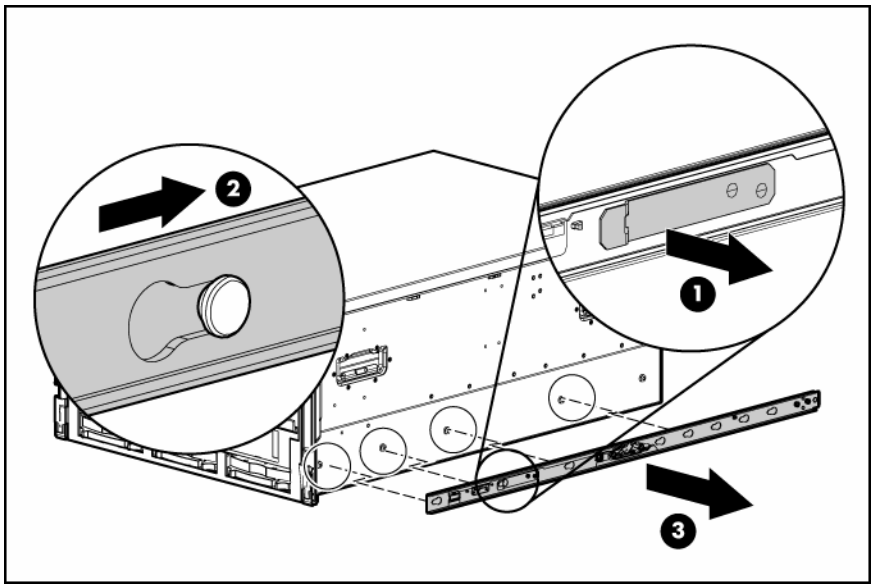
1. Extend the server on the rack rails until the server rail-release latches engage.



2. Pull the side release latch and extend the server until the server is free from the rack.
3. Remove the server from the rack.
4. Place the server on a flat, level surface with the access panel facing down.

Removing the server rails

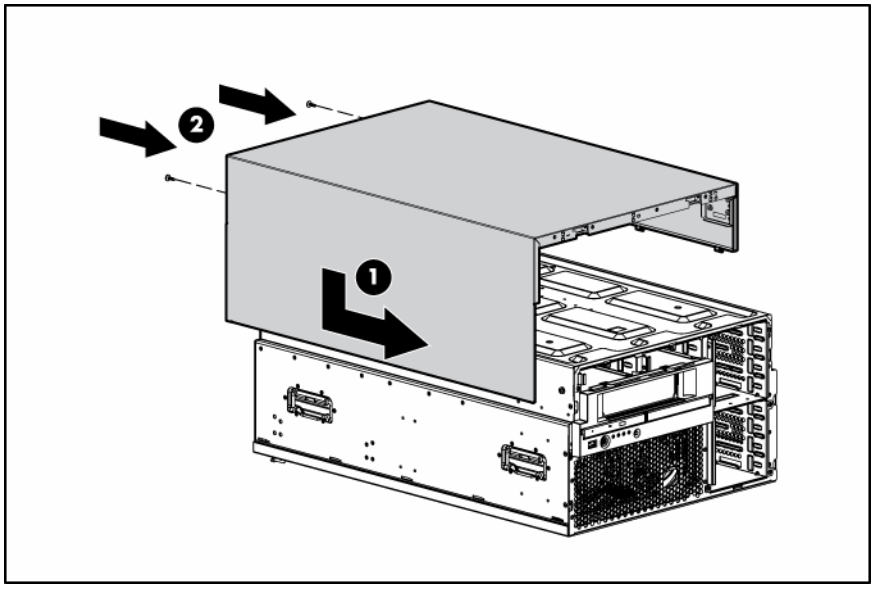
1. Release the snap while pressing the rail against the side of the chassis and slide the chassis toward the rear of the server, lining up the keys with the larger keyholes.
2. Remove the rail from the server.



3. Repeat steps 1 and 2 for the other rail.

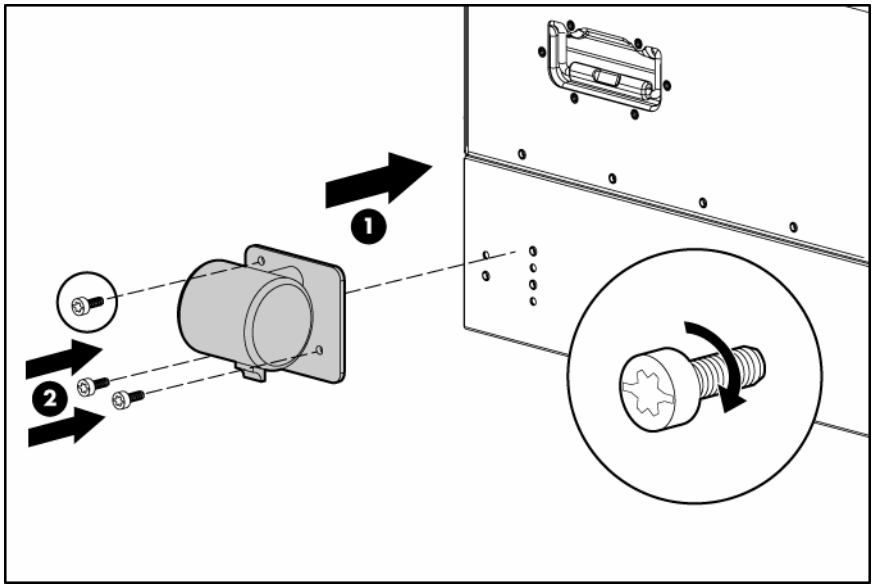
Installing the tower cover

1. Remove the rack bezel (rack servers only).
2. Place the tower cover onto the unit and slide it toward the front of the server.
3. Be sure the metal hooks on the inside of the cover engage with the chassis. There are five per side for a total of ten.
4. Using a T-15 Torx screwdriver, attach the two T-15 screws (in the back) to secure the tower cover to the server.



Installing the casters

1. Using a T-15 Torx screwdriver, install the three T-15 Torx screws into each of the four casters.

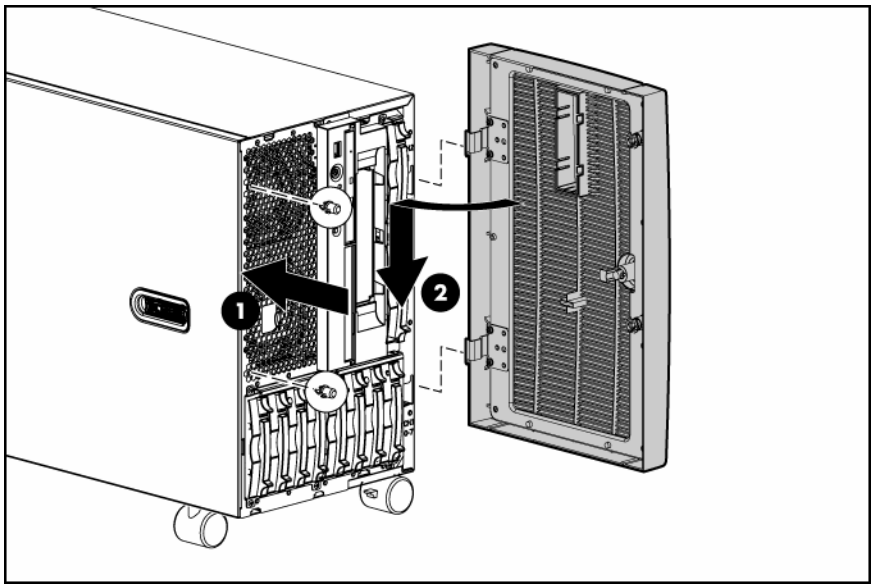


Attaching the tower bezel

1. Set the server in its upright tower position.

△ **CAUTION:** Be sure to lock the casters and have the access panel in place before turning or reorienting the server position.

2. Install the two retention clips to the front of the server chassis.
3. Line up the hinges on the tower bezel and slide the hinges into the corresponding slots.



4. Close the front bezel.
5. Reinstall the power supply, if applicable ("Redundant hot-plug power supply" on page 49).
6. Reinstall the hard drives, if applicable.
7. Plug in all cables ("Rear panel components" on page 10).

8. Power up the server (on page 27).

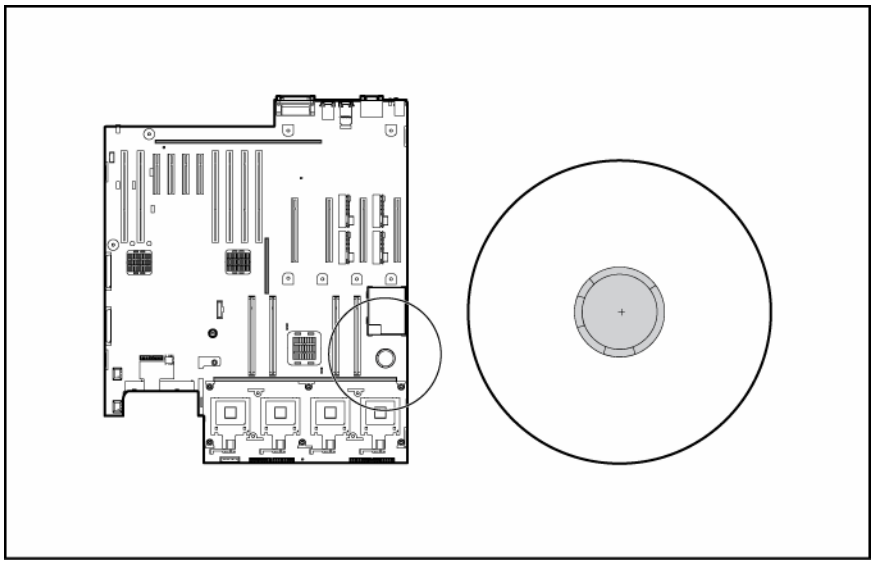
Battery

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.**

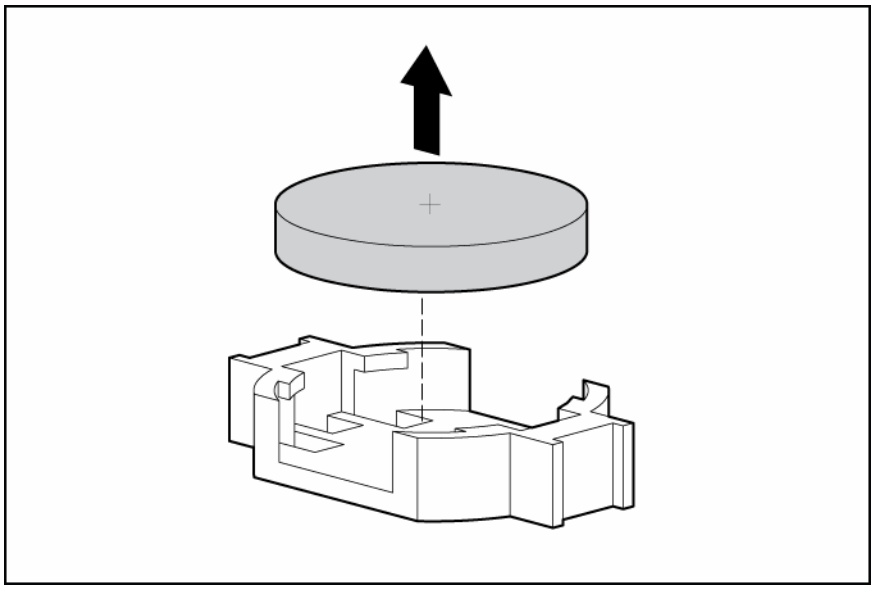
To locate the battery:



To remove the component:

1. Power down the server (on page 27).
2. Extend or remove the server from the rack ("Extending the server from the rack" on page 27).
3. Remove the access panel ("Access panel" on page 31).
4. Remove the PPM holddown ("Processor options" on page 39).

5. Remove the battery.



To replace the component, reverse the removal procedure.

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

Server cabling

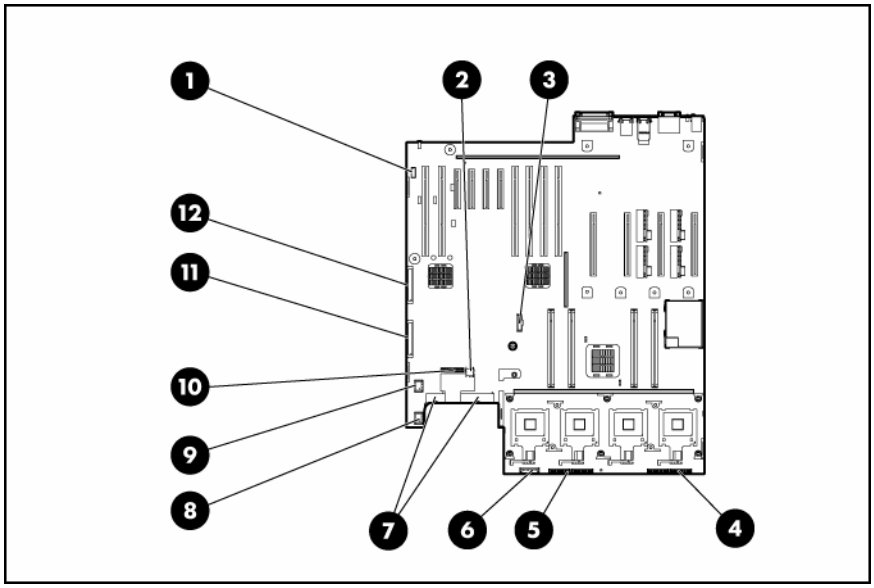
In this section

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.

Cable connector identification

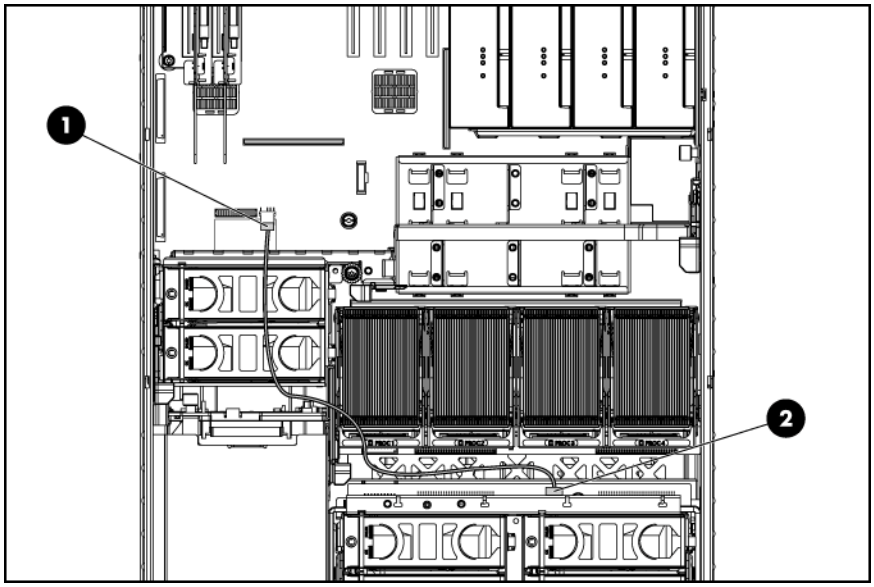


Item	Description
1	PCI Hot-Plug board
2	USB option
3	RILOE II
4	Fan board signal

Item	Description
5	Fan board signal
6	Fan board power
7	Power supply connectors
8	Fan connector
9	Fan connector
10	Power supply signal
11	SCSI 2
12	SCSI 1

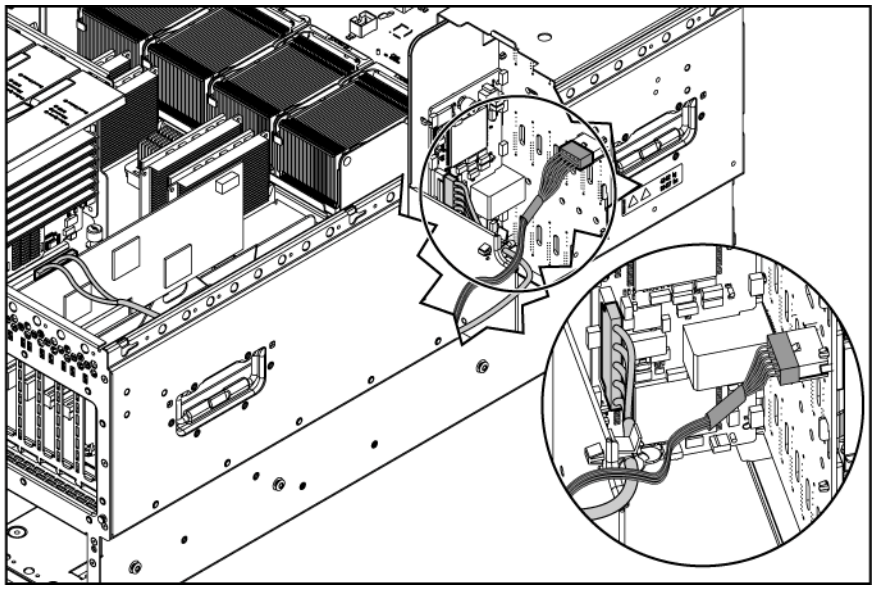
Tape drive cabling to the USB port

IMPORTANT: Route the USB cable under the mid fan cage.



Item	Description
1	USB connector on the system board
2	USB connector on the media device

SAS cabling



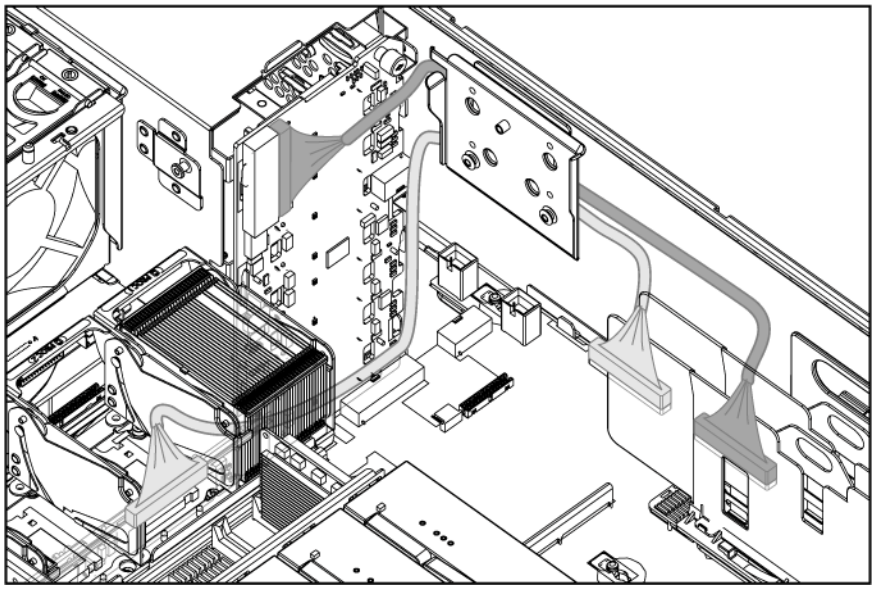
SCSI cabling

The following are the standard SCSI cabling configurations for this server:

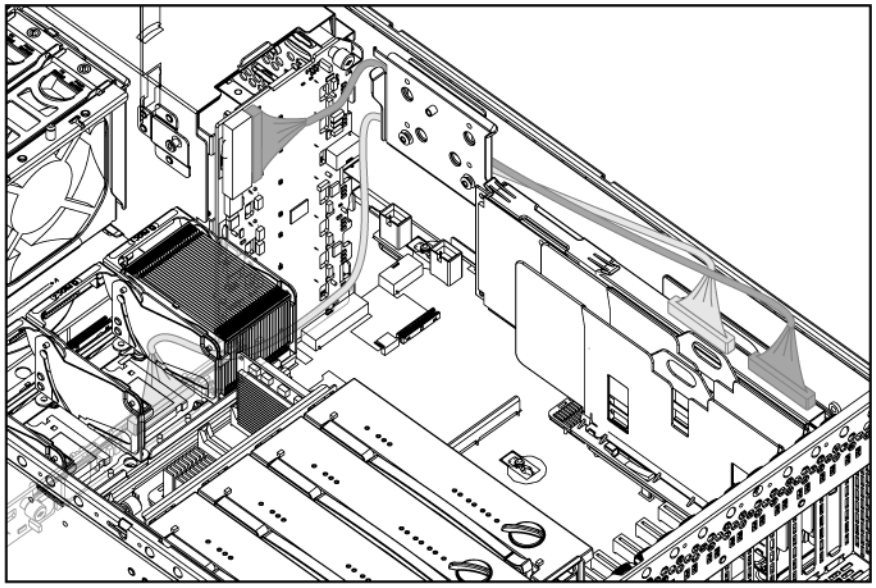
- Standard SCSI cabling to the SCSI ports (on page 82)
- Standard SCSI cabling to an expansion board (on page 83)
- Standard SCSI cabling to a tape drive (on page 83)
- Standard SCSI cabling to an external SCSI device (on page 83)

NOTE: The appropriate cables should ship in the individual option kits or with the device being installed.

Standard SCSI cabling to the SCSI ports



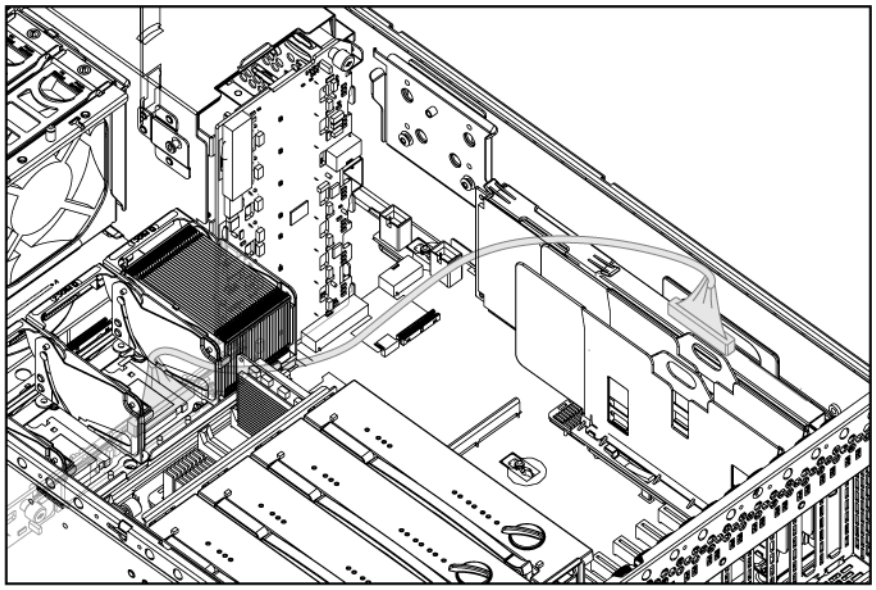
Standard SCSI cabling to an expansion board



NOTE: For some PCI slot locations, the SCSI cable routing may need to be altered. Placing cables either over or under the mid-fan cage is acceptable.

NOTE: It may be necessary to slide the SCSI cable service loop from under the system board.

Standard SCSI cabling to a tape drive



NOTE: For some PCI slot locations, the tape drive cable routing may need to be altered. Placing cables either over or under the mid-fan cage is acceptable.

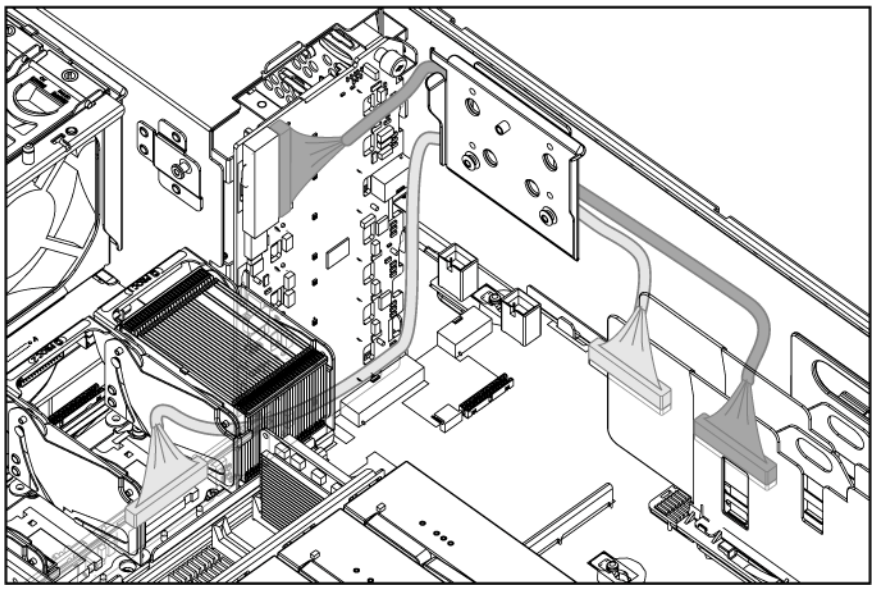
Standard SCSI cabling to an external SCSI device

In order to connect an external device to the server:

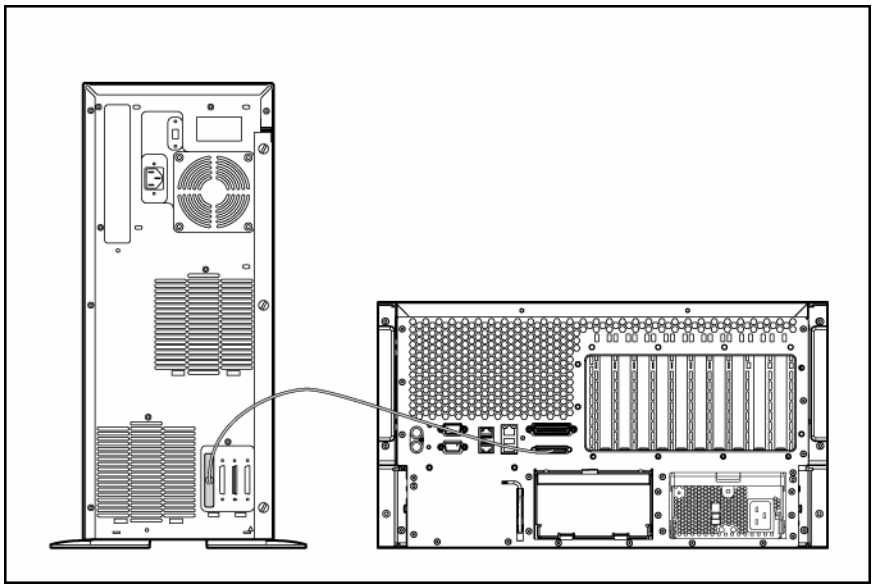
1. Reconfigure the internal SCSI cabling (to SCSI Port 2).

NOTE: It may be necessary to slide the SCSI cable service loop from under the system board.

NOTE: It may be necessary to run RBSU to assign boot order to SCSI Port 2.



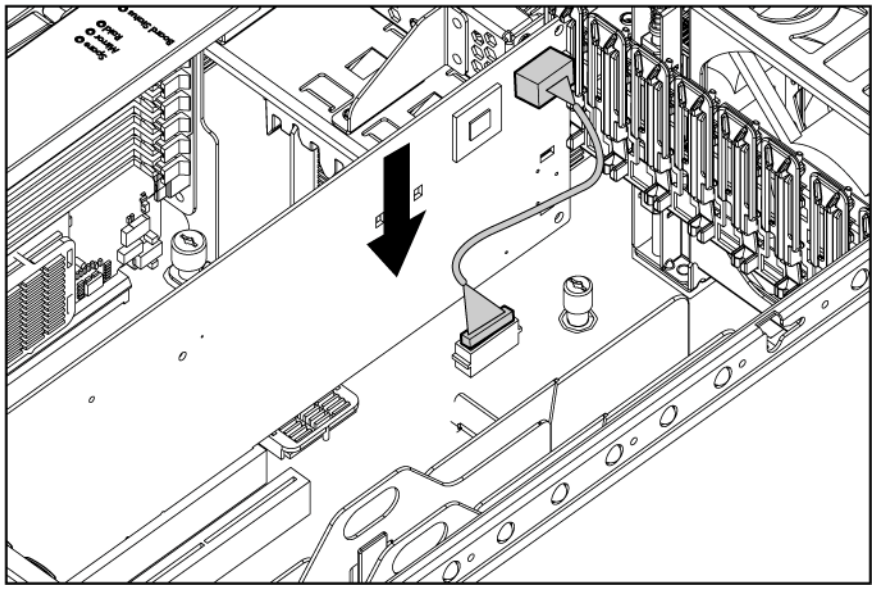
2. Connect the external device.



RILOE II cabling

The 30-pin Remote Insight cable ships with the RILOE II cable kit.

IMPORTANT: Install the RILOE II board into slot 3 or 4 for ease of 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 91)
- 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 88), Array Diagnostic Utility (on page 91), 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).

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).

Configuring memory

After installing the required DIMMs, configure the server memory:

1. To power up the server, press the Power On/Standby button.
2. Access RBSU by pressing the **F9** key during powerup when prompted.
3. Select **System Options.**
4. Select **Advanced Memory Protection.**
5. Select the appropriate mode:
   - Advanced ECC
   - Online spare
   - Mirrored memory
   - Hot-plug RAID memory
6. Press the **Enter** key.
7. Press the **Escape** key twice to return to the RBSU menu.
8. Press the **F10** key to exit RBSU.

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).

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).

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

   ```
   WARNING! WARNING! WARNING! The serial number is loaded into the system
   during the manufacturing process and should NOT be modified. This option
   should only be used by qualified service personnel. This value should
   always match the serial number sticker located on the chassis.
   ```

4. Press the **Enter** key to clear the warning.
5. Enter the serial number and press the **Enter** key.
6. Select **Product ID**.
7. Enter the product ID and press the **Enter** key.
8. Press the **Esc** key to close the menu.
9. Press the **Esc** key to exit RBSU.
10. Press the **F10** key to confirm exiting RBSU. The server will automatically reboot.

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).

Integrated Lights-Out technology

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

Using iLO, you can:

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

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

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.

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

- POST
- RBSU
- Diagnostics
- DOS
- Environments which do not support USB natively

For more information on ProLiant USB support, refer to the HP website (http://www.compaq.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).

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 90)
- From within Survey Utility
- From within operating system-specific IML viewers
  - For NetWare: IML Viewer
  - For Windows®: IML Viewer
  - For Linux: IML Viewer Application
- From within the iLO user interface
- From within HP Insight Diagnostics (on page 91)

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 86) 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 86) 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).

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).

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).

Troubleshooting

In this section

Additional information

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.

Server diagnostic steps

This section covers the steps to take in order to diagnose a problem quickly.

To effectively troubleshoot a problem, HP recommends that you start with the first flowchart in this section, "Start diagnosis flowchart (on page 98)," 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 99)." 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.

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.

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 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.

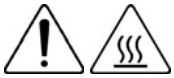
WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades, and servicing to qualified personnel.

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.

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

63.5 kg

140 lb

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

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.

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 27).

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.

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 91) 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.

Service notifications

To find out the latest service notifications, refer to the HP website (http://www.hp.com/products/servers/platforms). Select the appropriate server model, and then click the **Documentation** link on the product page.

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.

Diagnostic steps

To effectively troubleshoot a problem, HP recommends that you start with the first flowchart in this section, "Start diagnosis flowchart (on page 98)," 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 99)." 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:

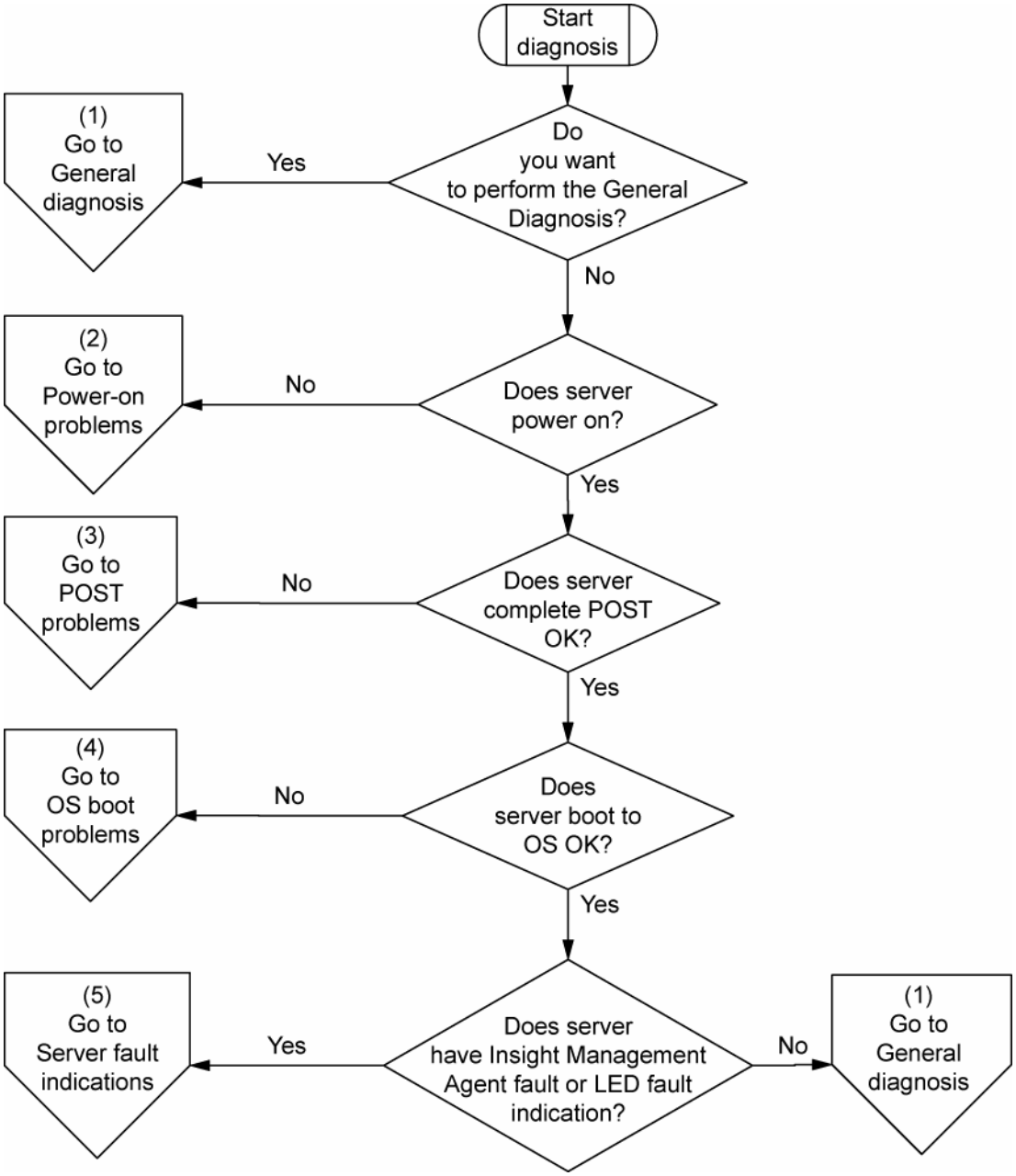
- Start diagnosis flowchart (on page 98)
- General diagnosis flowchart (on page 99)
- Power-on problems flowchart ("Server power-on problems flowchart" on page 101)
- POST problems flowchart (on page 104)
- OS boot problems flowchart (on page 105)
- Server fault indications flowchart (on page 107)

The number contained in parentheses in the flowchart boxes corresponds to a table with references to other detailed documents or troubleshooting instructions.

Start diagnosis flowchart

Use the following flowchart to start the diagnostic process.

Item	Refer to
1	"General diagnosis flowchart (on page 99)"
2	"Power-on problems flowchart ("Server power-on problems flowchart" on page 101)"
3	"POST problems flowchart (on page 104)"
4	"OS boot problems flowchart (on page 105)"
5	"Server fault indications flowchart (on page 107)"

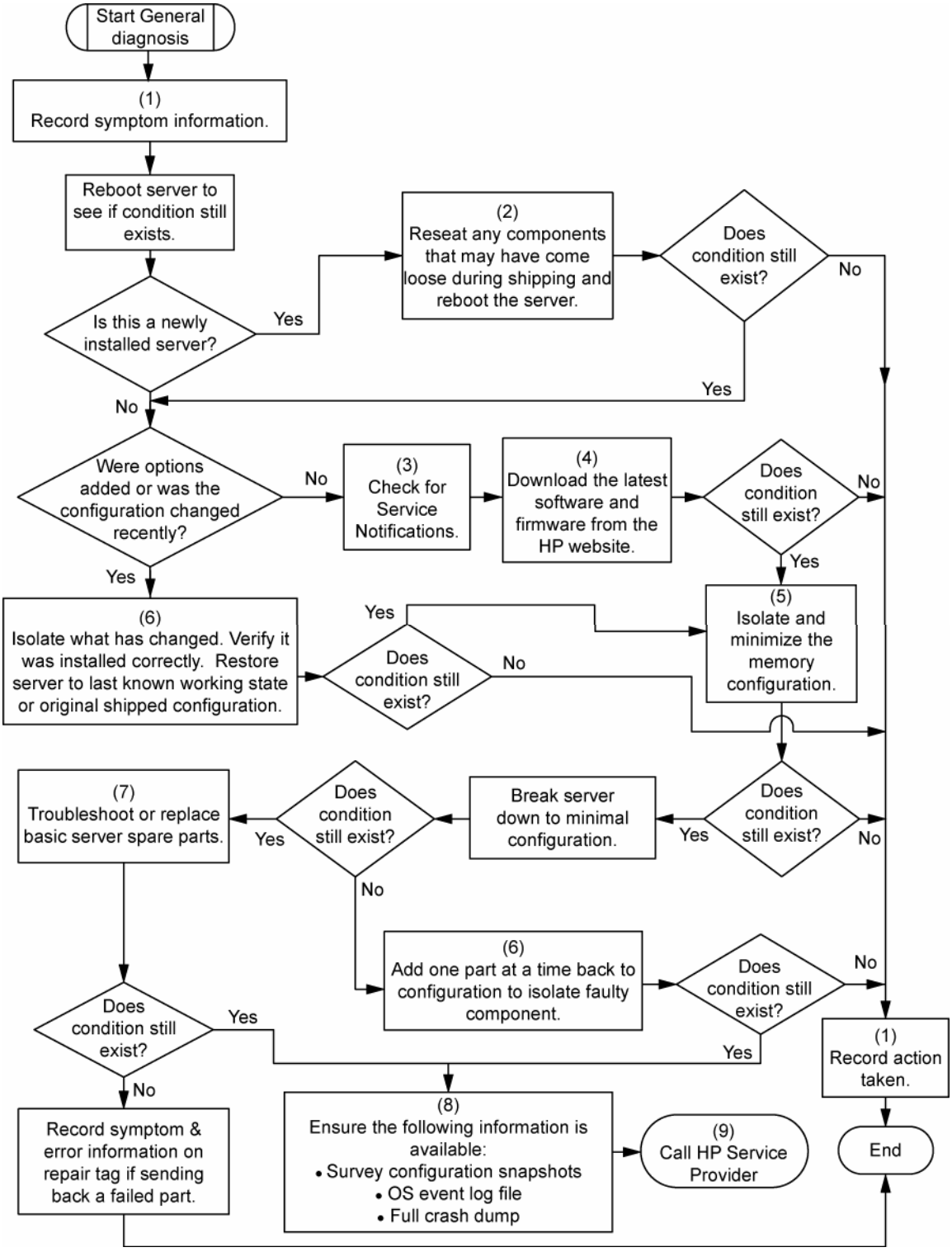


General diagnosis flowchart

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 97)"
2	"Loose connections (on page 97)"
3	"Service notifications (on page 97)"

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 122)"



Server power-on problems flowchart

Symptoms:

- The server does not power on.
- The system power LED is off or amber.
- The external health LED is red or amber.

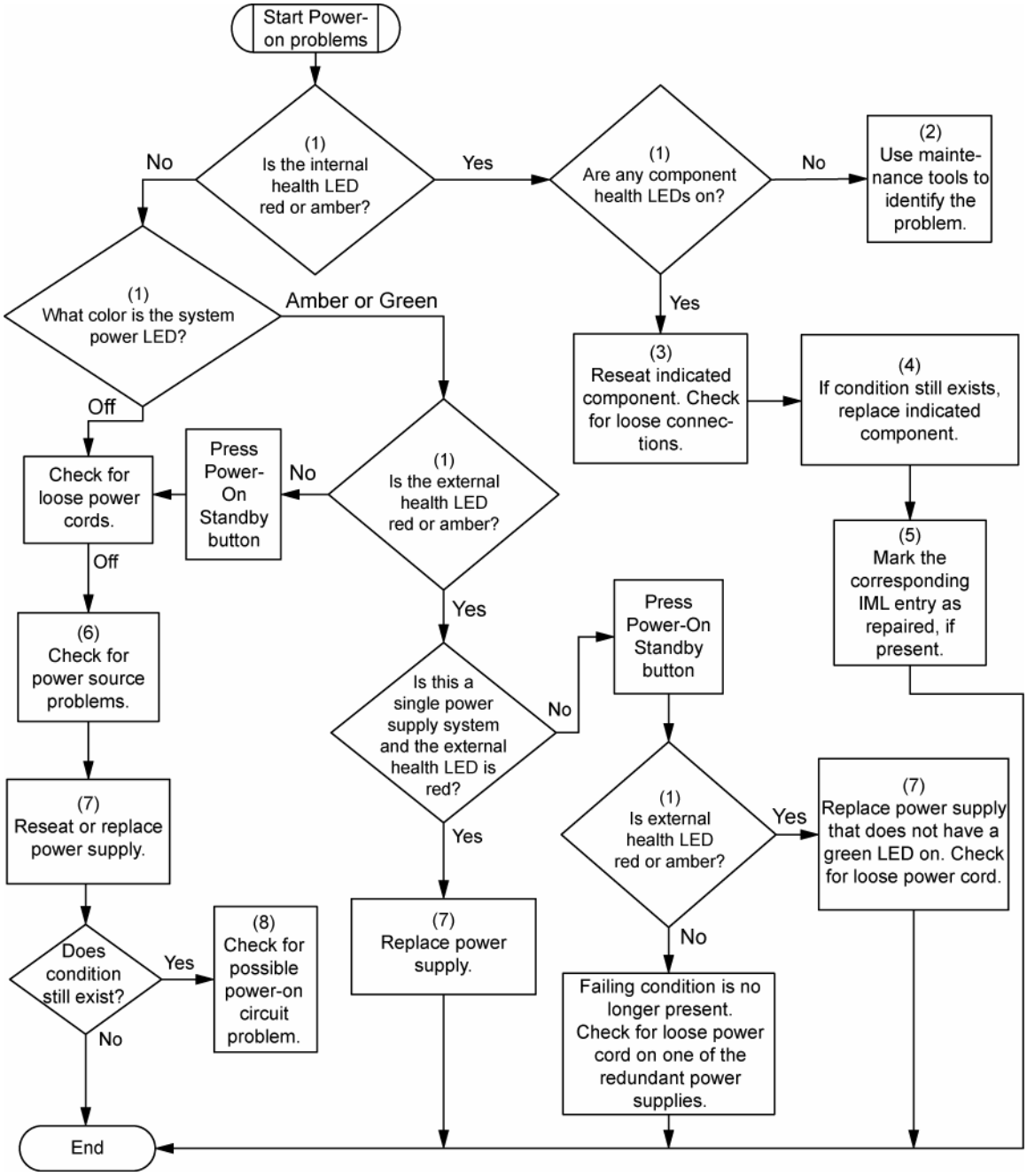
- The internal health LED is red or amber.

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

Possible causes:

- Improperly seated or faulty power supply
- Loose or faulty power cord
- Power source problem
- Power on circuit problem
- Improperly seated component or interlock problem
- Faulty internal component

Item	Refer to
1	"Component identification ("Server component identification" on page 7)"
2	"HP Insight Diagnostics (on page 91)" 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 97)"
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
(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.
Yes
(1) What color is the system power LED?
Amber or Green
Off
(3) Reseat indicated component. Check for loose connections.
(4) If condition still exists, replace indicated component.
(5) Mark the corresponding IML entry as repaired, if present.
(1) Is the external health LED red or amber?
No
Press Power-On Standby button
Check for loose power cords.
Off
Yes
(6) Check for power source problems.
Is this a single power supply system and the external health LED is red?
No
Press Power-On Standby button
(7) Reseat or replace power supply.
Yes
(7) Replace power supply.
(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
Does condition still exist?
Yes
(8) Check for possible power-on circuit problem.
No
Failing condition is no longer present. Check for loose power cord on one of the redundant power supplies.
End

POST problems flowchart

Symptoms:

- Server does not complete POST

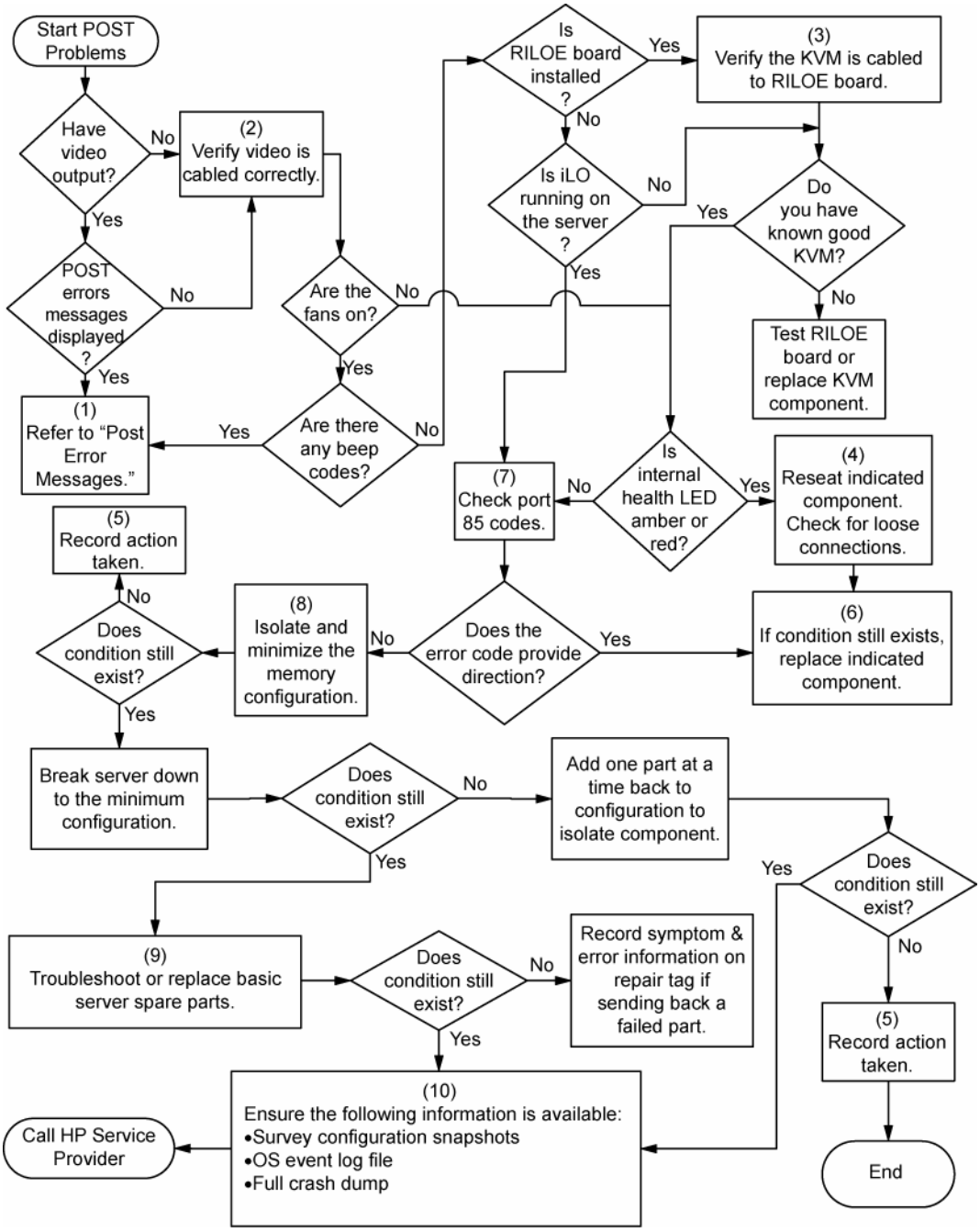
NOTE: The server has completed POST when the system attempts to access the boot device.

- 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 109)"
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 documentation
4	"Loose connections (on page 97)"
5	"Symptom information (on page 97)"
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

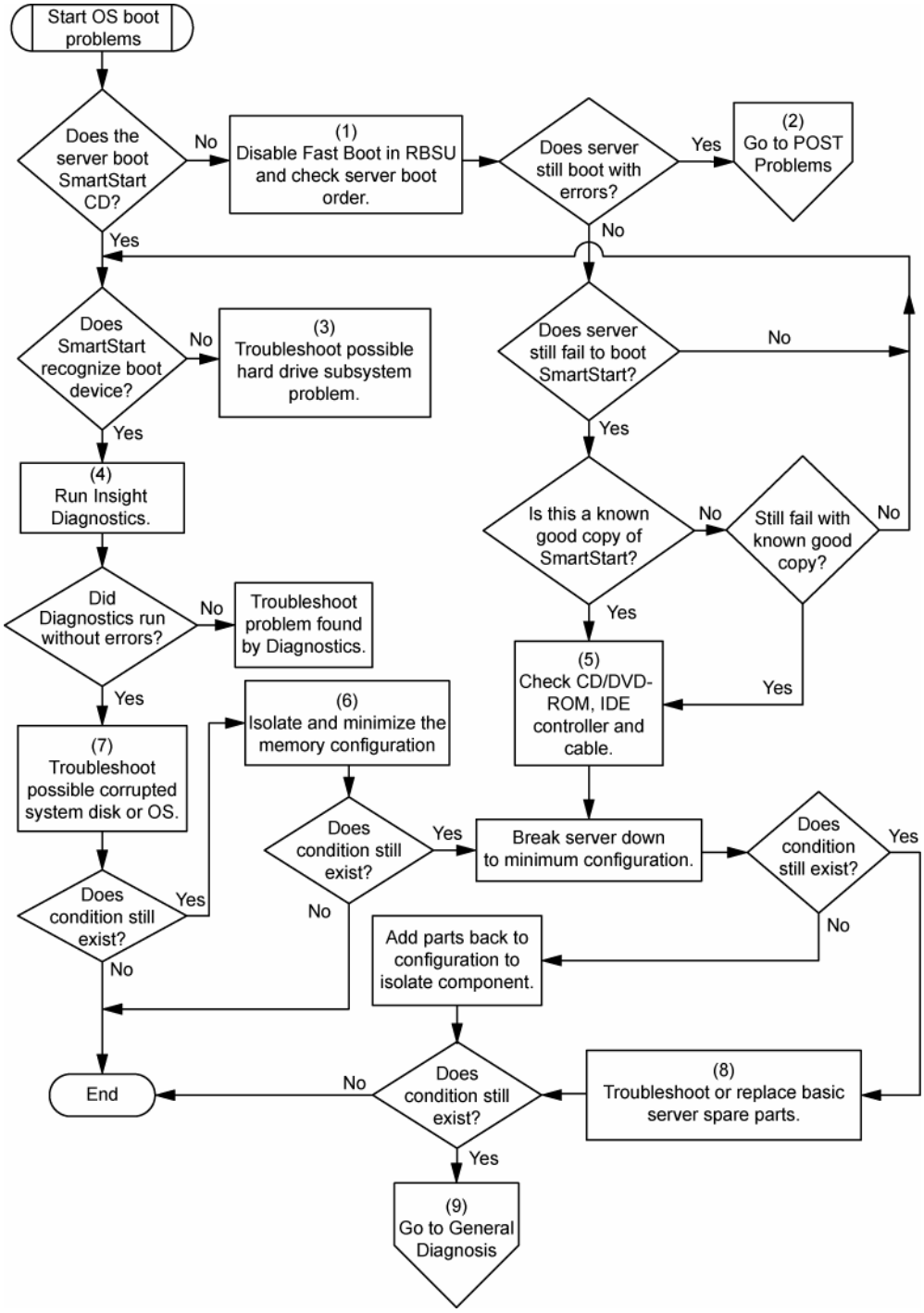
Symptoms:

- 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 104)"
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 91)" 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 97)"
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 122)"
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 99)"



Server fault indications flowchart

Symptoms:

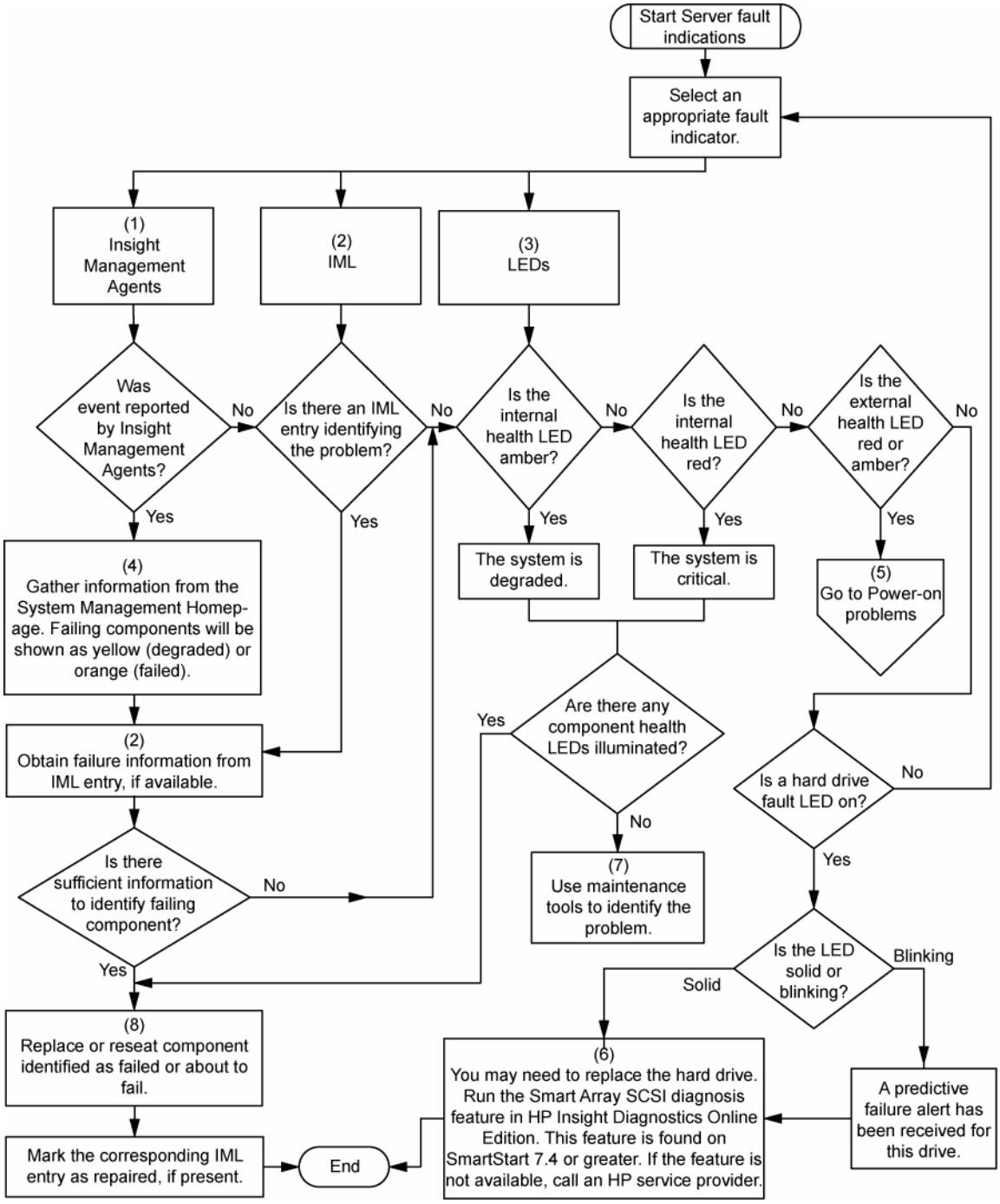
- Server boots, but a fault event is reported by Insight Management Agents (on page 90)
- Server boots, but the internal health LED, external health LED, or component health LED is red or amber

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 90)" 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 101)"
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 122)"
7	"HP Insight Diagnostics (on page 91)" 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)



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.**

209-Hot-add Memory Configuration - Boards must be installed sequentially

Action: Install or reinstall DIMMs to support hot-add memory configuration.

209-Mirror Memory Configuration - DIMMs on Both Boards do not Match

Audible Beeps: 1 long, 1 short

Possible Cause: Memory boards are not populated identically, or a memory board is missing.

Action: Be sure four memory boards are installed and DIMMs are populated correctly.

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.

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 - 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.

Other information resources

For additional troubleshooting information, refer to the *HP ProLiant Servers Troubleshooting Guide* on the Documentation CD.

For information on warranties and service and support upgrades (Care Pack services), refer to the HP website (http://www.hp.com/support).

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.

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

CE

This product complies with the following EU Directives:

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

CE Compliance of this product is valid only if powered with the correct HP-provided and CE marked AC adapter.

If this product has telecommunication functionality, it also complies with the essential requirements of:

- R&TTE Directive 1999/5/EC

CE(XXXX*)①

*For a notified body number refer to the product regulatory label.

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

The telecommunications functionality of this product may be used in the following EU and EFTA countries:

Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and United Kingdom.

Notice for use in France and Italy

Italy:

Per l'uso del prodotto, è necessaria una concessione ministeriale. Si consiglia di verificare con il distributore di fiducia o direttamente presso la Direzione Generale Pianificazione e Gestione Frequenze.

License required for use. Verify with your dealer or directly with General Direction for Frequency Planning and Management (Direzione Generale Pianificazione e Gestione Frequenze).

France:

L'utilisation de cet equipement (2.4GHz Wireless LAN) est soumise a certaines restrictions: Cet equipement peut etre utilise a l'interieur d'un batiment en utilisant toutes les frequences de 2400 a 2483.5MHz (Chaine 1-13). Pour une utilisation en environement exterieur, vous devez utiliser les frequences comprises entre 2454-2483.5MHz (Chaine 10-13). Pour les dernieres restrictions, voir http://www.art-telecom.fr.

For 2.4 GHz Wireless LAN operation of this product certain restrictions apply: This product may be used indoor for the entire 2400-2483.5 MHz frequency band (channels 1-13). For outdoor use, only 2454-2483.5 MHz frequency band (channels 10-13) may be used. For the latest requirements, see http://www.art-telecom.fr.

Notice for products incorporating 5GHz Wireless LAN devices

Frequency availability for 802.11a or 802.11h Wireless LAN is not currently harmonized throughout the European Union. For compliance requirements, users should verify with their supplier, local HP office or Telecommunications authority.

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.

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。

Disposal of waste equipment by users in private households in the European Union

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

Server specifications

In this section

Server specifications

The following information pertains to the rack configuration.

Specification	Value
Dimension	
Height	26.67 cm (10.5 in)
Depth	67.31 cm (26.5 in)
Width	44.45 cm (17.5 in)
Weight (maximum)	63.5 kg (140 lb)
Weight (no drives installed)	41.28 kg (91 lb)
Input requirement	
Rated input voltage	100-127 VAC 200 - 240 VAC
Rated input frequency	50 Hz - 60 Hz
Rated input current	@ 100VAC - 12 A @ 200VAC - 8 A
Rated input power	@100 VAC - 1161 W @200 VAC - 1598 W
BTUs per hour	@100 VAC - 3960 @200 VAC - 5450
Power supply output	
Power supply output	910 W (low line) 1300 W (high line)

* 100 to 127 VAC is required for 8 A; 200 to 240 VAC is required for 4 A.

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)

Specification	Value
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.

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

What is customer self repair?

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

A convenient, easy-to-use program:

- An HP support specialist will diagnose and assess whether a replacement part is required to address a system problem. The specialist will also determine whether you can replace the part.
- For specific information about customer replaceable parts, refer to the maintenance and service guide on the HP website (http://www.hp.com/support).

Acronyms and abbreviations

ABEND

abnormal end

ACU

Array Configuration Utility

AMP

Advanced Memory Protection

ASR

Automatic Server Recovery

DDR

double data rate

DU

driver update

EFS

Extended Feature Supplement

IEC

International Electrotechnical Commission

iLO

Integrated Lights-Out

IML

Integrated Management Log

IPL

initial program load

IRQ

interrupt request

MPS

multi-processor specification

NEMA

National Electrical Manufacturers Association

NFPA

National Fire Protection Association

NIC

network interface controller

NVRAM

non-volatile memory

ORCA

Option ROM Configuration for Arrays

PAE

personal address extensions

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

PXE

Preboot Execution Environment

RBSU

ROM-Based Setup Utility

RILOE II

Remote Insight Lights-Out Edition II

SAS

serial attached SCSI

SATA

serial ATA

SCSI

small computer system interface

SDRAM

synchronous dynamic RAM

SIM

Systems Insight Manager

SIMM

single inline memory module

SPM

system power module

SSD

support software diskette

TMRA

recommended ambient operating temperature

UID

unit identification

USB

universal serial bus

VCA

Version Control Agent

WOL

Wake-on LAN

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