HP ProLiant BL680c G7 Server Blade User Guide

Abstract

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.



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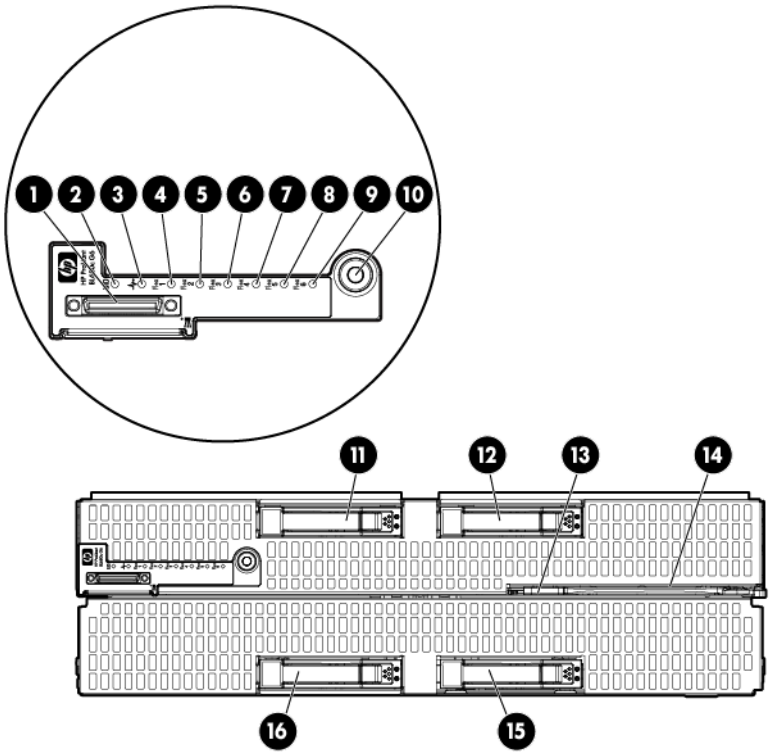
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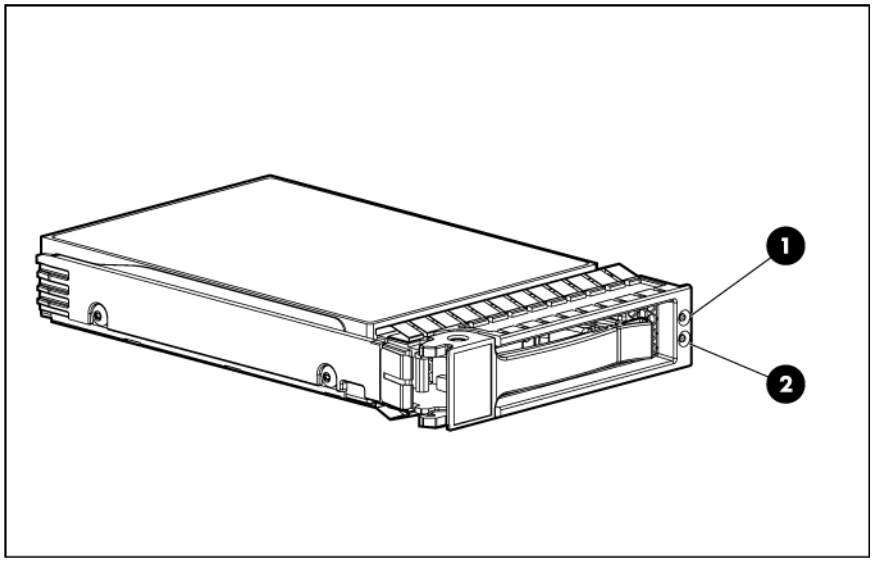
Component identification

Front panel components and LEDs



Item	Description
1	Local I/O connector
2	UID LED
3	Health LED
4	Flex 1 LED
5	Flex 2 LED
6	Flex 3 LED
7	Flex 4 LED
8	Flex 5 LED
9	Flex 6 LED
10	Power On/Standby button and system power LED
11	Hard drive bay 1
12	Hard drive bay 2
13	Server release lever button
14	Server release lever
15	Hard drive bay 4
16	Hard drive bay 3

SAS and SATA hard drive LEDs



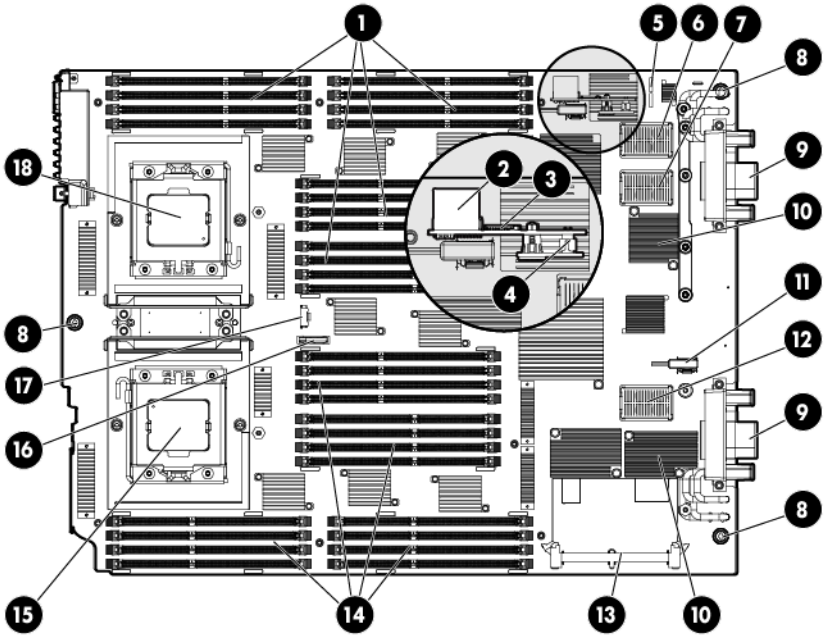
Item	Description
1	Fault/UID LED (amber/blue)
2	Online LED (green)

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.
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, erasing, 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.

Online/activity LED (green)	Fault/UID LED (amber/blue)	Interpretation
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.

System board components (A-side)

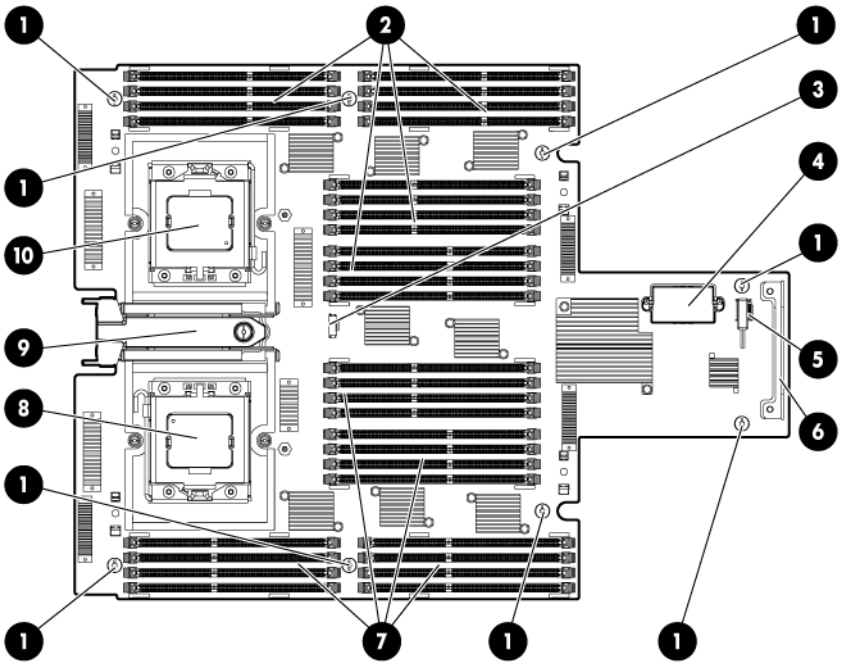


Item	Description
1	Processor 2 DIMM slots (16)
2	USB connector
3	Micro SDHC card connector
4	TPM connector
5	System maintenance switch
6	Mezzanine connector 2 (Type I or Type II)
7	Mezzanine connector 1 (Type I only)
8	System board thumbscrews (3)
9	Enclosure connectors (2)
10	Embedded FlexFabric adapter
11	SAS/SATA signal connector
12	Mezzanine connector 3 (Type I or Type II)
13	Cache module connector
14	Processor 1 DIMM slots (16)

Item	Description
15	Processor 1
16	System battery
17	SAS/SATA backplane power connector
18	Processor 2

The symbols correspond to the symbols located on the interconnect bays. For more information, see the *HP ProLiant BL680c G7 Server Blade Installation Instructions* that ship with the server blade.

System board components (B-side)



Item	Description
1	System board thumbscrews (8)
2	Processor 4 DIMM slots (16)
3	SAS/SATA backplane power connector
4	Interposer board connector
5	SAS/SATA signal connector
6	Lift handle
7	Processor 3 DIMM slots (16)
8	Processor 3
9	Ejector handle
10	Processor 4

System maintenance switch

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

Position	Description	Function
S1	iLO 3 security	Off = iLO 3 security is enabled. On = iLO 3 security is disabled.
S2	Configuration lock	Off = System configuration can be changed. On = System configuration is locked.
S3	Reserved	Reserved
S4	Reserved	Reserved
S5	Password protection override	Off = No function On = Clears power-on password and administrator password
S6	Invalidate configuration	Off = Normal On = Clears NVRAM
S7	Reserved	Reserved
S8	Reserved	Reserved

System maintenance switch procedures

When you perform troubleshooting steps, this guide may instruct you to perform the following procedures:

- Clear the system configuration ("Clearing the system configuration" on page 11).
- Access the redundant ROM ("Accessing the redundant ROM" on page 12).

To complete these procedures, you must change physical settings on the system maintenance switch.

Clearing the system configuration

RBSU can be used to restore the factory default configuration. For more information, see "HP ROM-Based Setup Utility (on page 82)." If the system is unable to boot into RBSU, use the following steps to clear the system configuration:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Remove the access panel.
4. Change position 6 of the system maintenance switch to on.
5. Install the access panel.
6. Install the server blade in the enclosure and power up the server blade.
7. Wait for the POST message that prompts you to change the switch setting:

   ```
   Maintenance switch detected in the "On" position.
   Power off the server and turn switch to the "Off" position.
   ```

8. Repeat steps 1 through 3.
9. Change position 6 of the system maintenance switch to off.

10. Repeat steps 5 and 6.

IMPORTANT: When the server blade boots after NVRAM is cleared, a delay of up to 2 minutes is normal. During this delay, the system appears non-functional. Do not attempt any procedures during the delay.

Accessing the redundant ROM

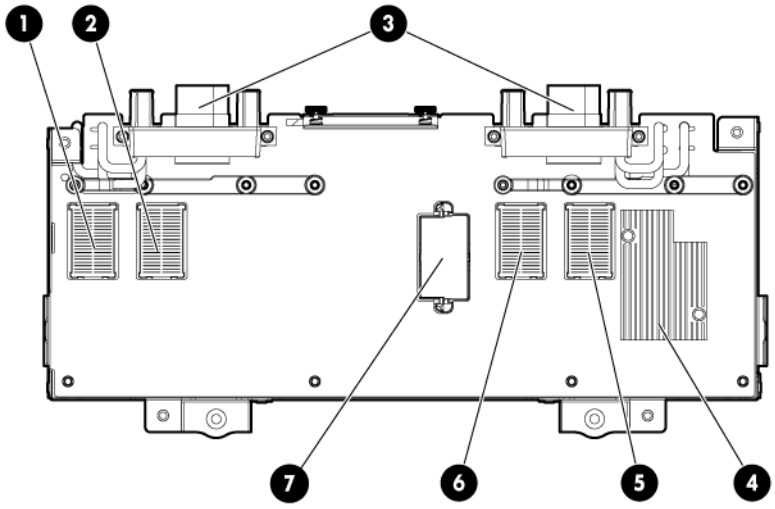
If the system ROM is corrupted, the system automatically switches to the redundant ROM in most cases. If the system does not automatically switch to the redundant ROM, perform the following steps:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Remove the access panel.
4. Change positions 1, 5, and 6 of the system maintenance switch to on.
5. Install the access panel.
6. Install the server blade in the enclosure and power up the server blade.
7. After the system beeps, repeat steps 1 through 3.
8. Change positions 1, 5, and 6 of system maintenance switch to off.
9. Repeat steps 5 and 6.

If both the current and backup versions of the ROM are corrupt, return the system board for a service replacement.

To switch to the backup ROM when the System ROM is not corrupt, use RBSU.

Interposer board components

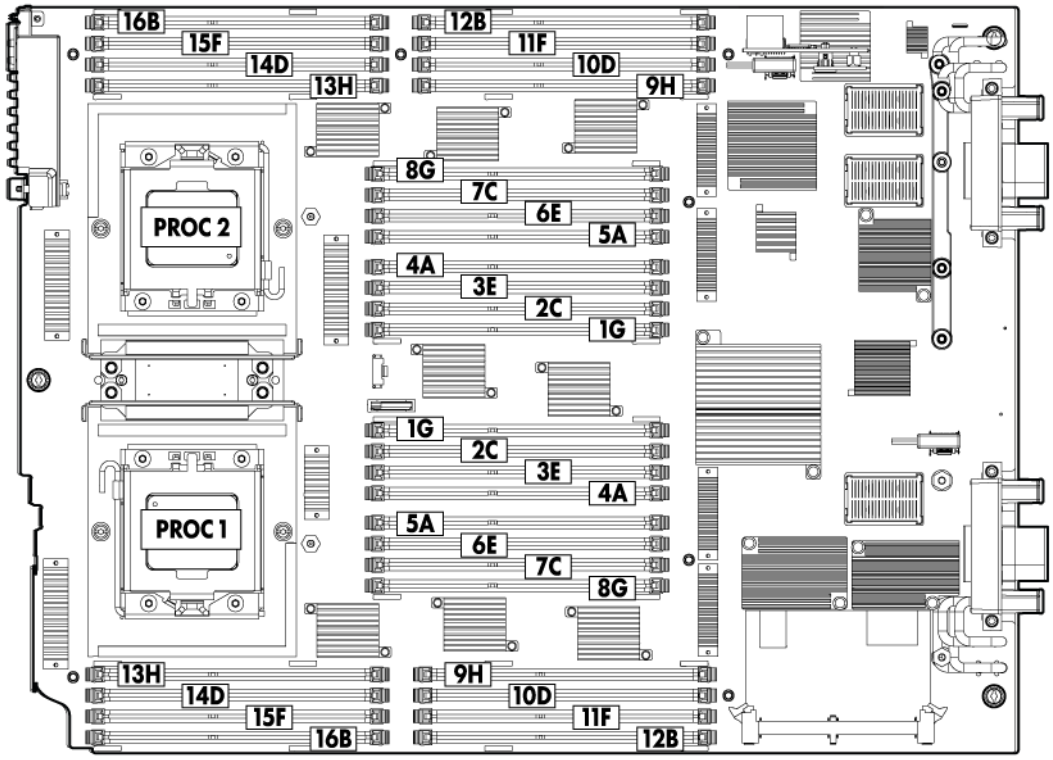


Item	Description
1	Mezzanine connector 6 (Type I dual-port Ethernet only)
2	Mezzanine connector 4 (Type I or II)

Item	Description
3	Enclosure connectors (2)
4	Embedded FlexFabric adapter
5	Mezzanine connector 5 (Type I only)
6	Mezzanine connector 7 (Type I or II)
7	B-side system board connector

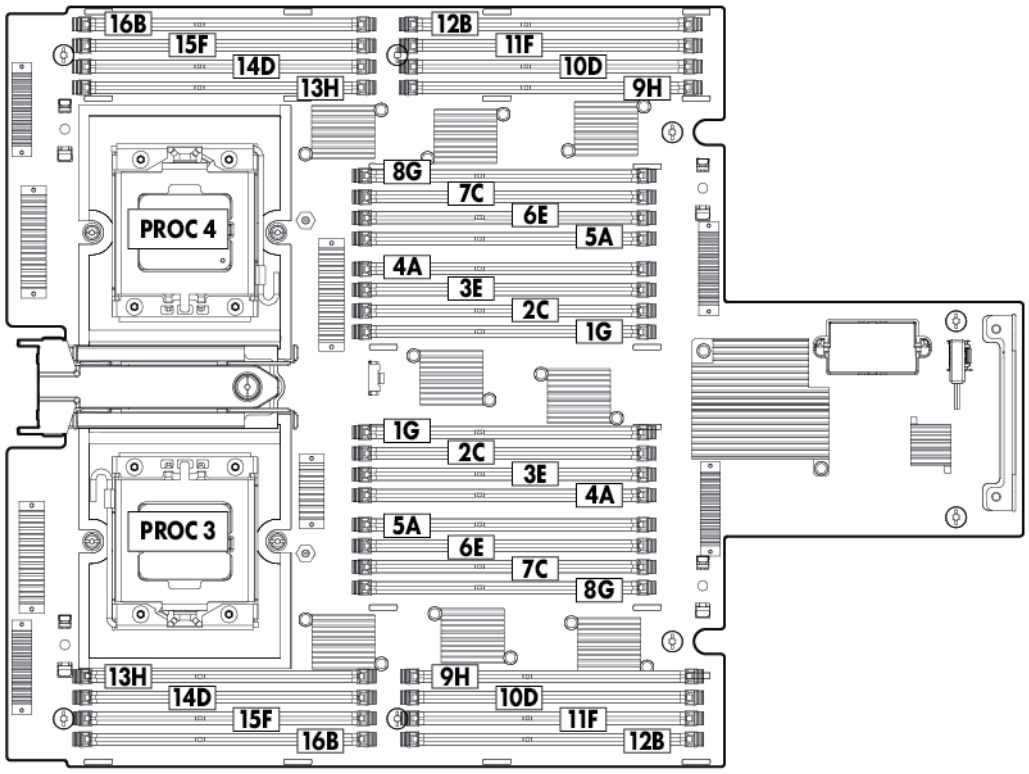
DIMM slot locations (A-side)

DIMM slots are numbered sequentially (1 through 16) for each processor. The supported AMP modes use the letter assignments for population guidelines.

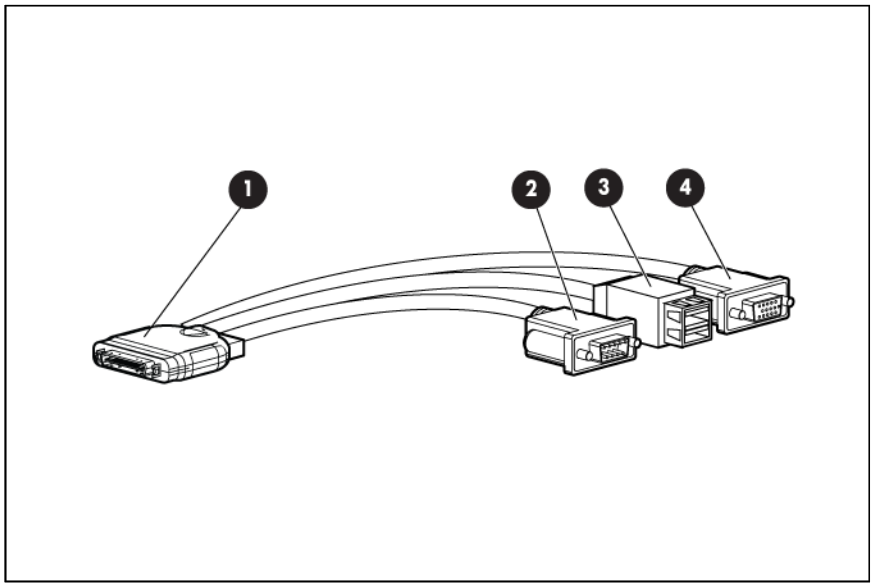


DIMM slot locations (B-side)

DIMM slots are numbered sequentially (1 through 16) for each processor. The supported AMP modes use the letter assignments for population guidelines.



HP c-Class Blade SUV Cable



Item	Connector	Description
1	Server blade	For connecting to the SUV connector on the server blade front panel
2	Video	For connecting a video monitor
3	USB	For connecting up to two USB devices
4	Serial	For trained personnel to connect a null modem serial cable and perform advanced diagnostic procedures

Operations

Power up the server blade

The Onboard Administrator initiates an automatic power-up sequence when the server blade is installed. If the default setting is changed, use one of the following methods to power up the server blade:

- Use a virtual power button selection through iLO 3.
- Press and release the Power On/Standby button.

When the server blade goes from the standby mode to the full power mode, the system power LED changes from amber to green.

For more information about the Onboard Administrator, see the enclosure setup and installation guide on the HP website (http://www.hp.com/support).

For more information about iLO 3, see "iLO 3 Standard Blade Edition technology (on page 86)."

Power down the server blade

Before powering down the server blade for any upgrade or maintenance procedures, perform a backup of critical server data and programs.

Depending on the Onboard Administrator configuration, use one of the following methods to power down the server blade:

- Use a virtual power button selection through iLO 3.

  This method initiates a controlled remote shutdown of applications and the OS before the server blade enters standby mode.
- Press and release the Power On/Standby button.

  This method initiates a controlled shutdown of applications and the OS before the server blade enters standby mode.
- Press and hold the Power On/Standby button for more than 4 seconds to force the server blade to enter standby mode.

  This method forces the server blade to enter standby mode without properly exiting applications and the OS. It provides an emergency shutdown method if an application stops responding.
- Execute one of the following commands using the Onboard Administrator CLI:

  ```
  poweroff server [bay number]
  ```

  or

  ```
  poweroff server [bay number] force
  ```

  The first command initiates a controlled shutdown of applications and the OS before the server blade enters standby mode. The second form of the command forces the server blade to enter standby mode without exiting applications and the OS. This emergency method forces a shutdown if an application stops responding.
- Use the Onboard Administrator GUI to initiate a shutdown:

a. Select the **Enclosure Information** tab, and then select the **Overall** checkbox in the Device Bays item.

b. Initiate a shutdown from the Virtual Power menu:

— Select **Momentary Press** to initiate a controlled shutdown of applications and the OS.

— Select **Press and Hold** to initiate an emergency shutdown of applications and the OS.

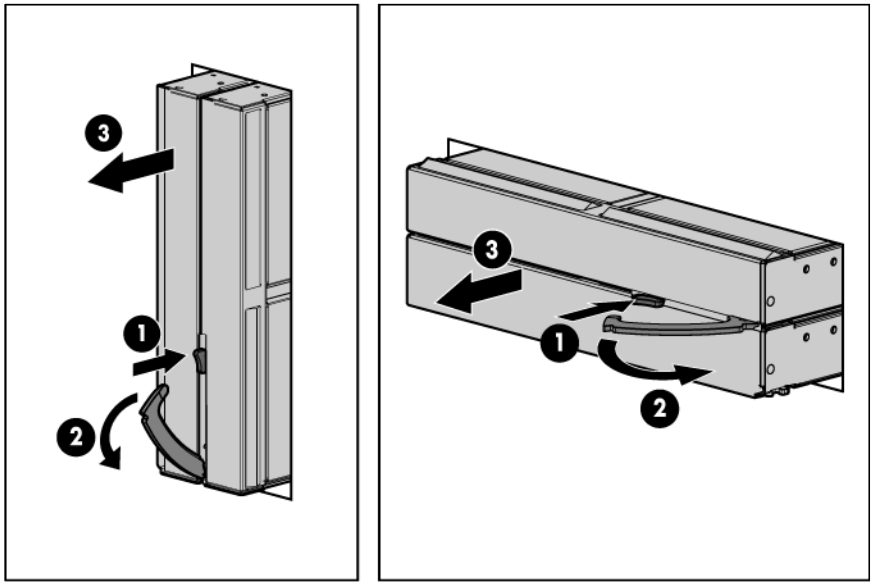
IMPORTANT: When the server blade is in standby mode, auxiliary power is still being provided. To remove all power from the server blade, remove the server blade from the enclosure.

After initiating a virtual power down command, be sure that the server blade is in standby mode by observing that the system power LED is amber.

Remove the server blade

CAUTION: Do not use the server blade release lever to lift or carry the server blade. Always support the weight of the server blade by handling the chassis directly. Improper use can damage the release lever and the server blade.

1. Identify the proper server blade.
2. Power down the server blade (on page 16).
3. Remove the server blade.



4. Place the server blade on a flat, level work surface.

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 blade before beginning any installation procedure. Improper grounding can cause ESD.

Remove the access panel (A-side)

To remove the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Press the access panel release button, and then slide the access panel to the rear.
5. Remove the access panel.

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

CAUTION: To prevent damage to electrical components, properly ground the server blade before beginning any installation procedure. Improper grounding can cause ESD.

Remove the access panel (B-side)

To remove the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Press the access panel release button, and then slide the access panel to the rear.
5. Remove the access panel.

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

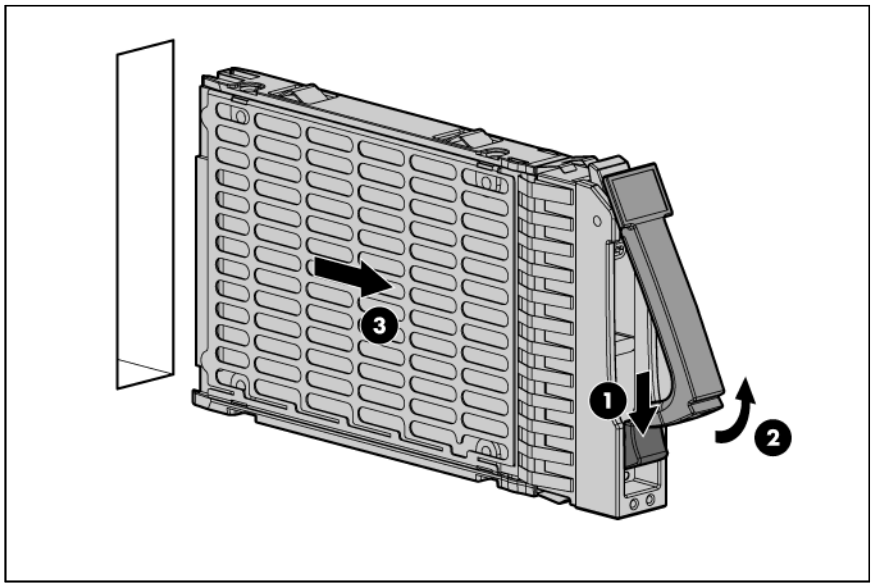
CAUTION: To prevent damage to electrical components, properly ground the server blade before beginning any installation procedure. Improper grounding can cause ESD.

Remove a hot-plug SAS or SATA hard drive

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

1. 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 8).
2. Back up all server data.

3. Remove the hard drive.



To replace the component, reverse the removal procedure.

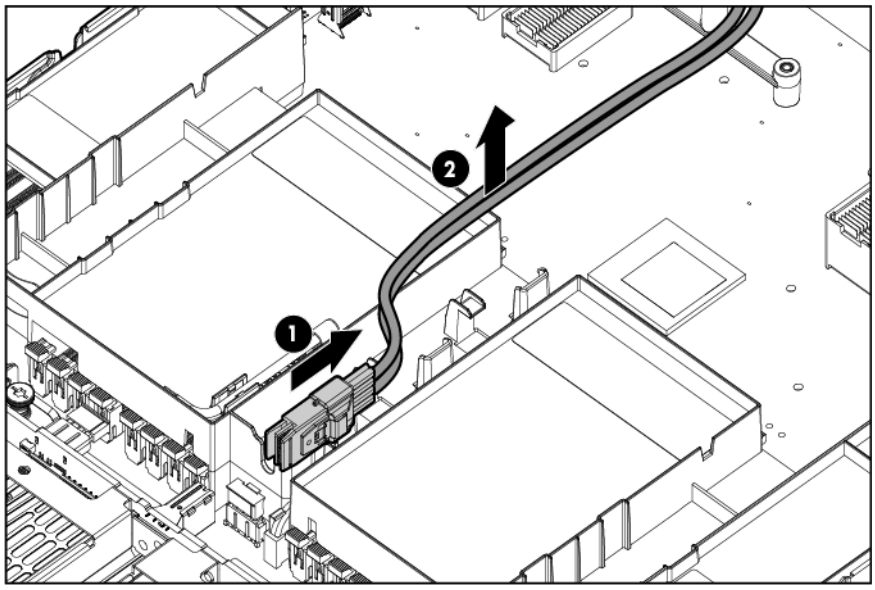
Remove the left DIMM baffle

To remove the component:

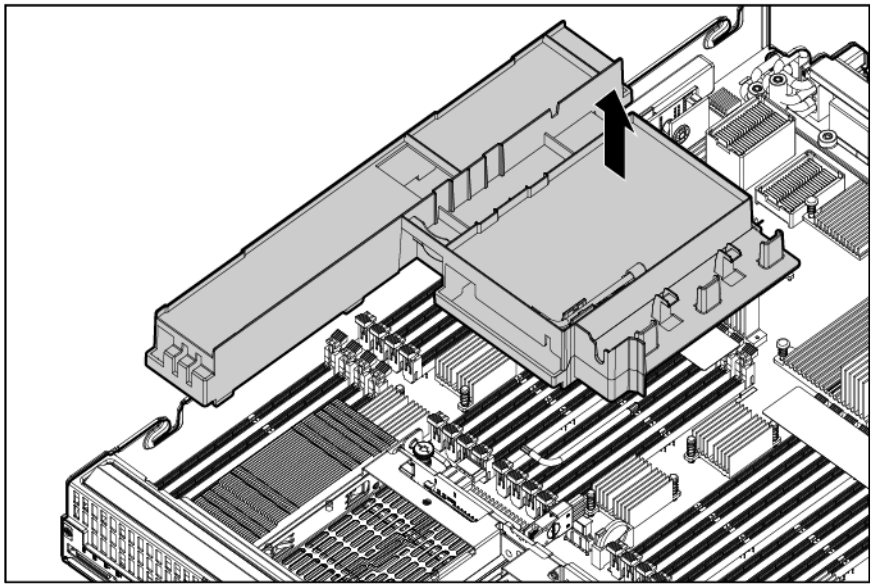
1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Remove the access panel (A-side) (on page 18).
5. If installed, remove the battery pack (on page 24).

   You do not need to disconnect the cable from the battery pack.
6. Disconnect the SAS/SATA signal cable from the SAS backplane.

7. Unroute the SAS/SATA cable.



8. Remove the left DIMM baffle.



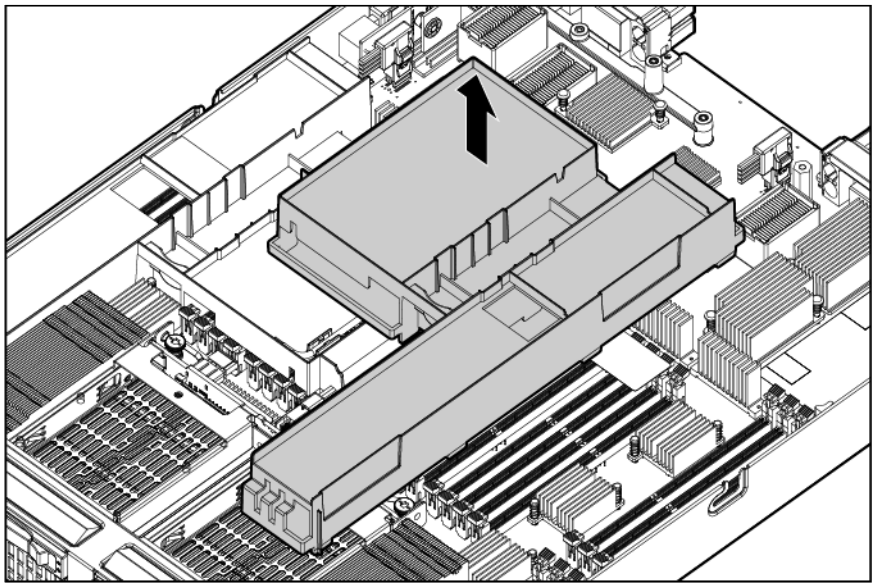
Remove the right DIMM baffle

To remove the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Remove the access panel (B-side) (on page 18).
5. If installed, remove the battery pack (on page 24).

   You do not have to disconnect the cable from the battery.

6. Remove the right DIMM baffle.

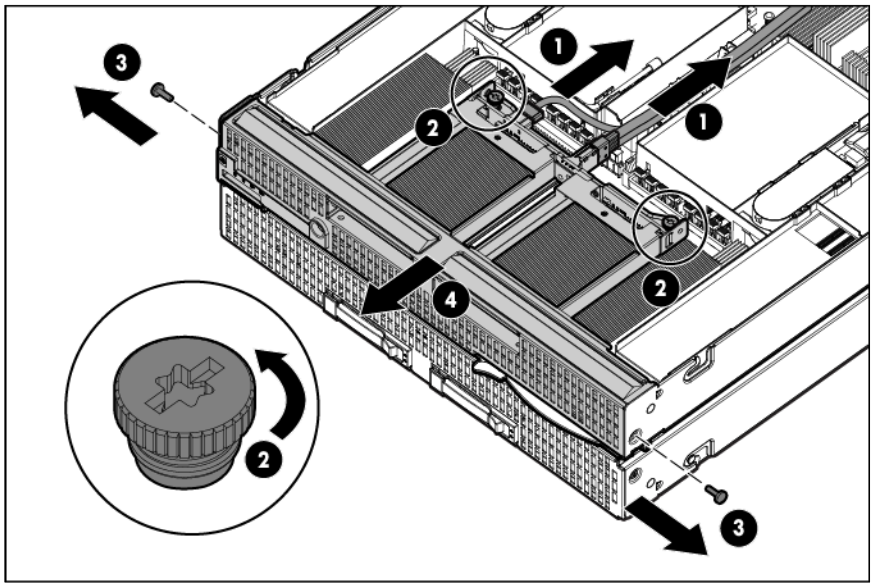


Remove the front panel/hard drive cage assembly (A-side)

To remove the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Remove the access panel (A-side) (on page 18).
5. Disconnect the signal cable and the power cable from the SAS backplane.
6. Loosen the thumbscrews.

7. Remove the front panel/hard drive cage assembly.

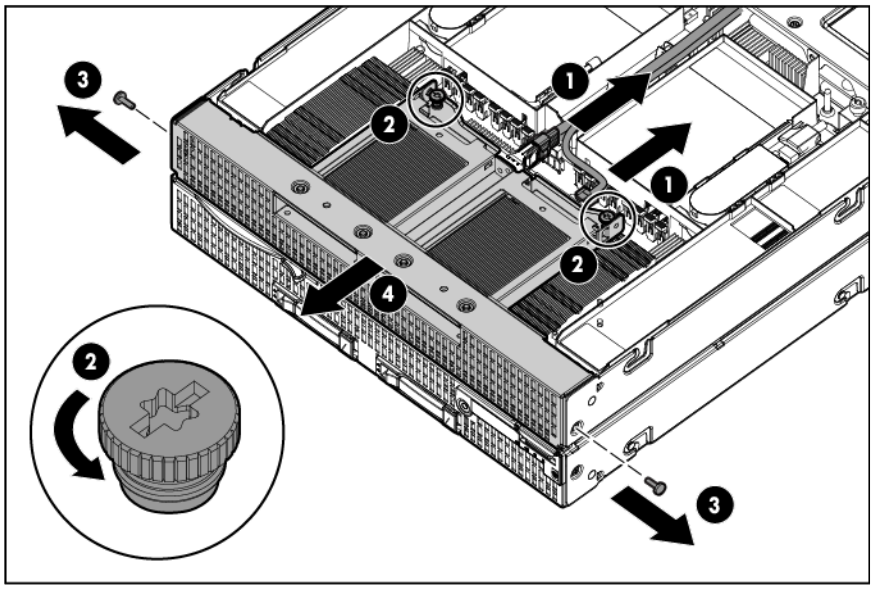


Remove the front panel/hard drive cage assembly (B-side)

To remove the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Remove the access panel (B-side) (on page 18).
5. Disconnect the signal cable and power cable from the SAS backplane.
6. Loosen the thumbscrews.

7. Remove the front panel/hard drive cage assembly.

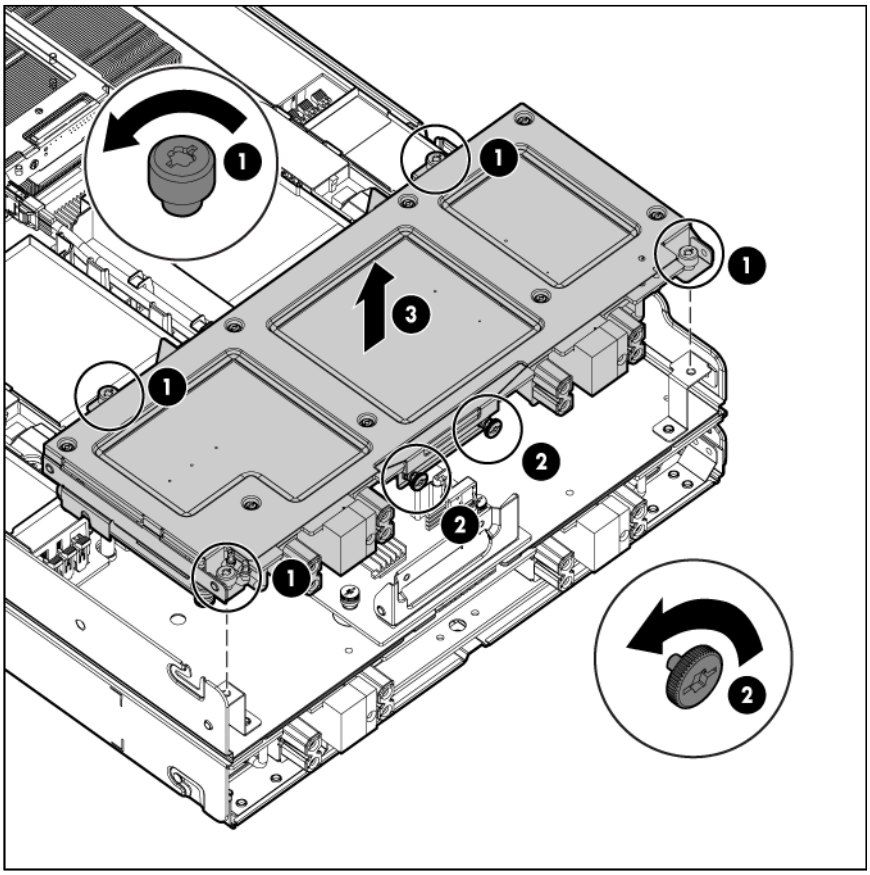


Remove the interposer board

To remove the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the B-side of the server blade facing up. To determine which side is the B-side, see the label attached to the access panel.
4. Remove the access panel (B-side) (on page 18).
5. Loosen the thumbscrews.

6. Remove the interposer board.



To install the interposer board, reverse the removal procedure.

Remove the battery pack

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

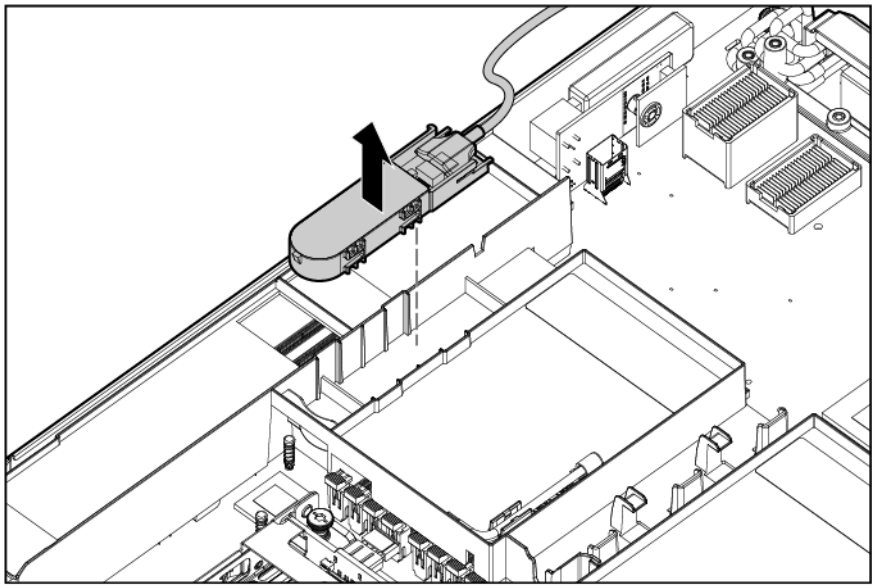
CAUTION: After the server blade is powered down, wait 15 seconds and then check the amber LED before unplugging the cable from the cache module. If the amber LED blinks after 15 seconds, do not remove the cable from the cache module. The cache module is backing up data, and data is lost if the cable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

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

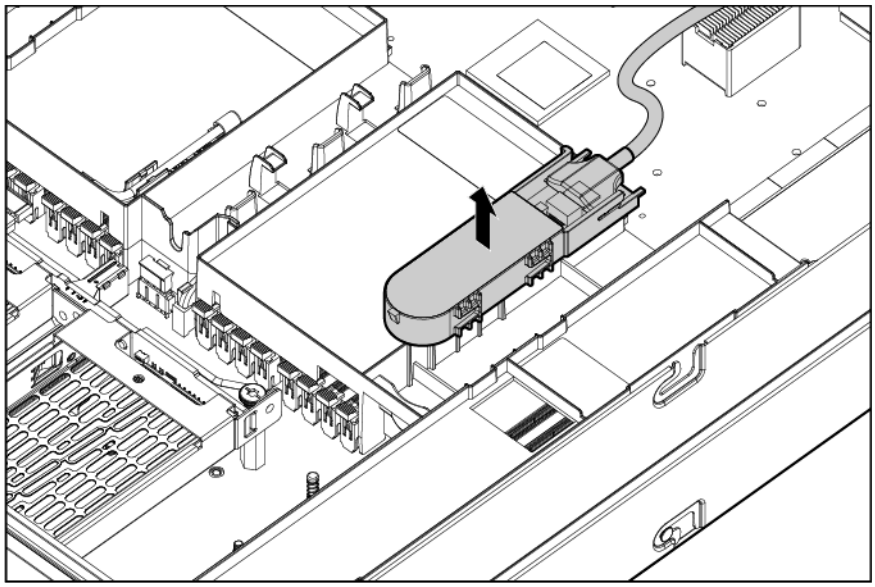
To remove the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).

3. Place the server blade on a flat, level surface with the A-side of the server blade facing up. To determine which side is the A-side, see the label attached to the access panel.
4. Remove the access panel (A-side) (on page 18).
5. Do one of the following:
   - Remove the battery pack from the left DIMM baffle.



   - Remove the battery pack from the right DIMM baffle.



Setup

Overview

Installation of a server blade requires the following steps:

1. Install and configure an HP BladeSystem c-Class enclosure.
2. Install any server blade options.
3. Install interconnect modules in the enclosure.
4. Connect the interconnect modules to the network.
5. Install a server blade.
6. Complete the server blade configuration.

Installing an HP BladeSystem c-Class enclosure

Before performing any server blade-specific procedures, install an HP BladeSystem c-Class enclosure.

The most current documentation for server blades and other HP BladeSystem components is available at the HP website (http://www.hp.com/go/bladesystem/documentation).

Documentation is also available in the following locations:

- Documentation CD that ships with the enclosure
- HP Business Support Center website (http://www.hp.com/support)

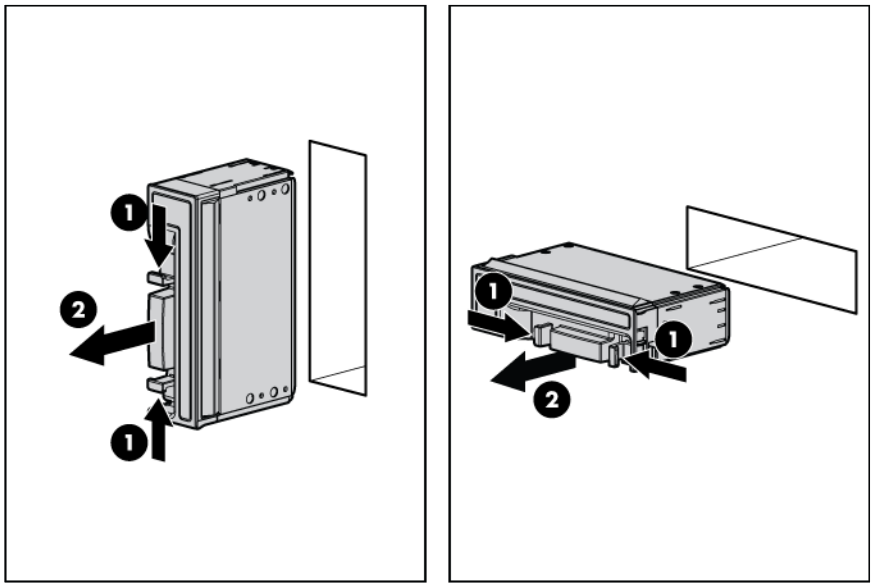
Preparing the enclosure

HP BladeSystem enclosures ship with device bay dividers to support half-height devices. To install a full-height device, remove the blanks and the corresponding device bay divider.

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

IMPORTANT: For optimal cooling and system performance, configure the c7000 enclosure with ten fans and configure the c3000 enclosure with six fans.

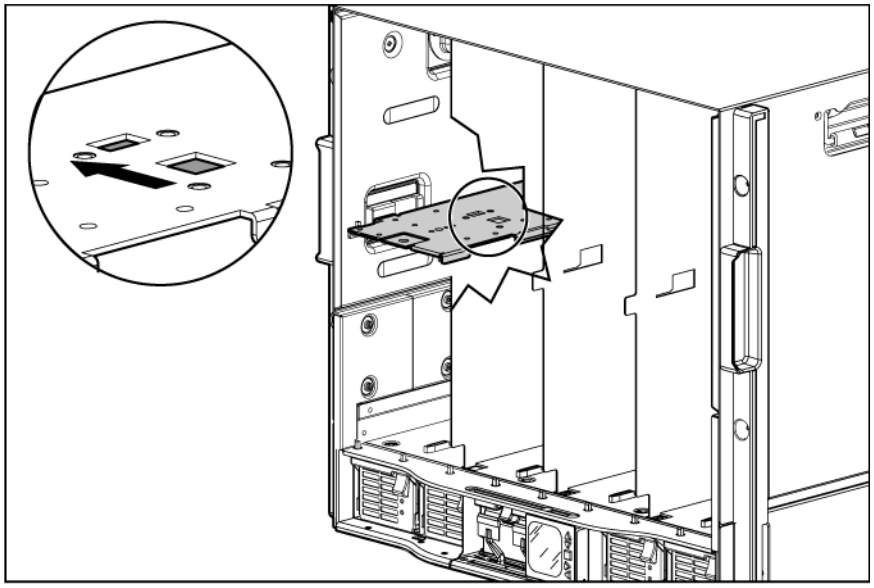
1. Remove the device bay blank.



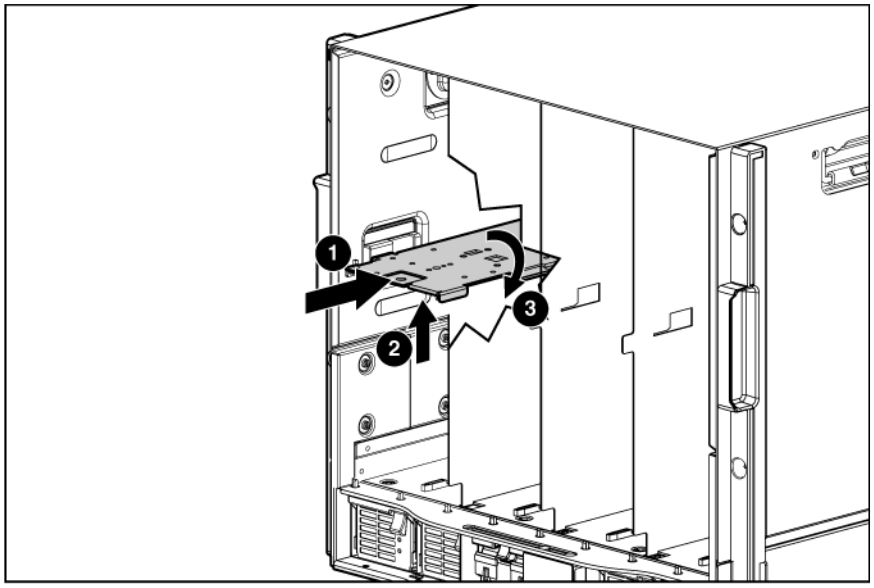
2. Remove the three adjacent blanks.

Removing a c7000 device bay divider

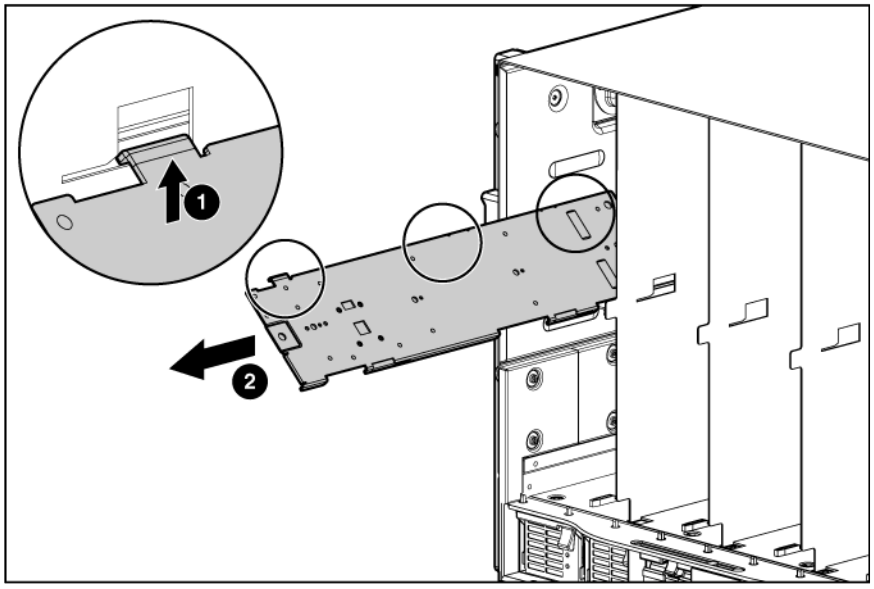
1. Slide the device bay shelf locking tab to the left to open it.



2. Push the device bay shelf back until it stops, lift the right side slightly to disengage the two tabs from the divider wall, and then rotate the right edge downward (clockwise).

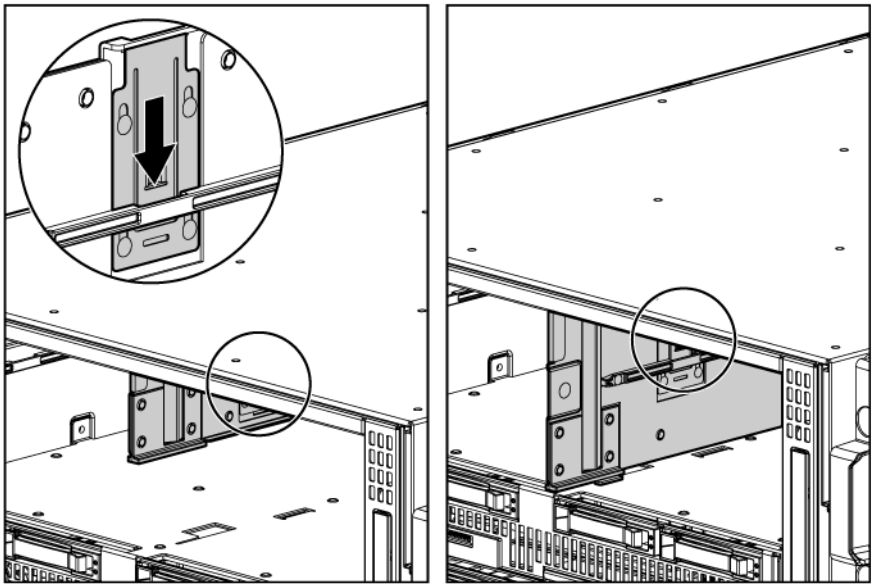


3. Lift the left side of the device bay shelf to disengage the three tabs from the divider wall, and then remove it from the enclosure.



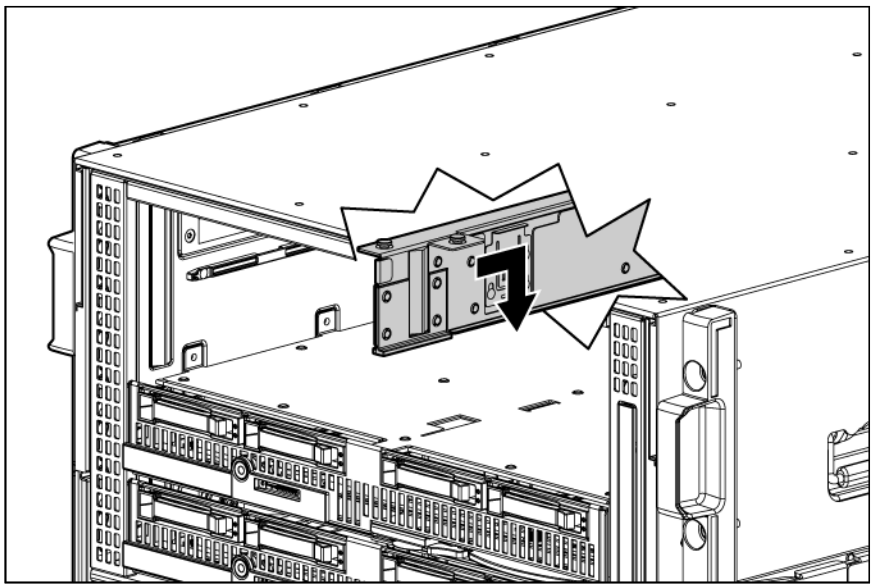
Removing a c3000 device bay mini-divider or device bay divider

1. Slide the locking tab down.



2. Remove the mini-divider or divider:
   - c3000 mini-divider:

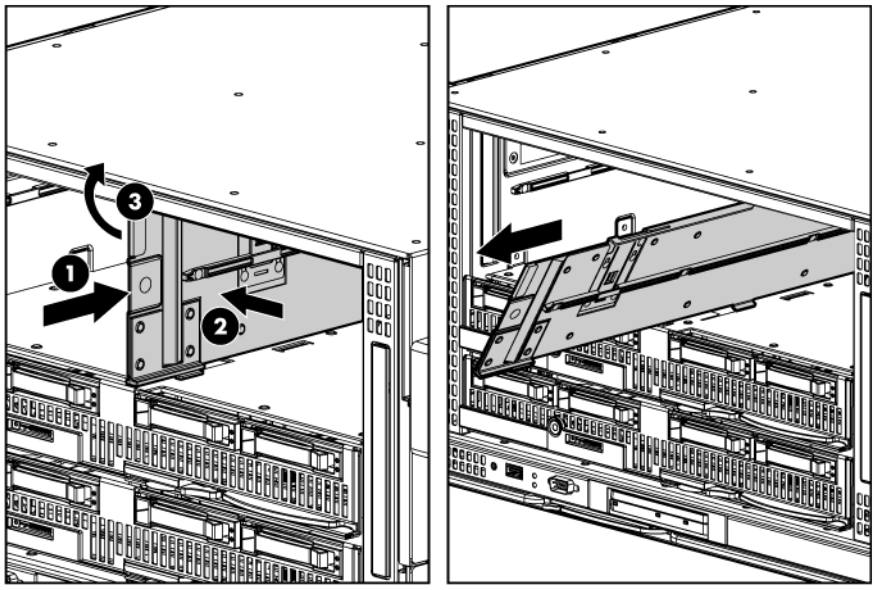
     Push the divider toward the back of the enclosure until the divider drops out of the chassis.



   - c3000 divider:

   a. Push the divider toward the back of the enclosure until it stops.
   b. Slide the divider to the left to disengage the tabs from the wall.
   c. Rotate the divider clockwise.

d. Remove the divider from the enclosure.

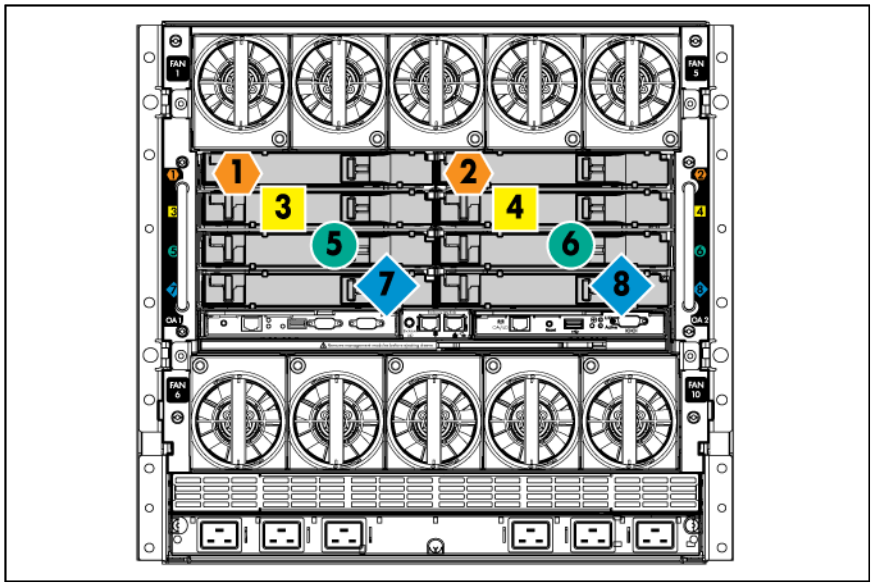


Installing interconnect modules

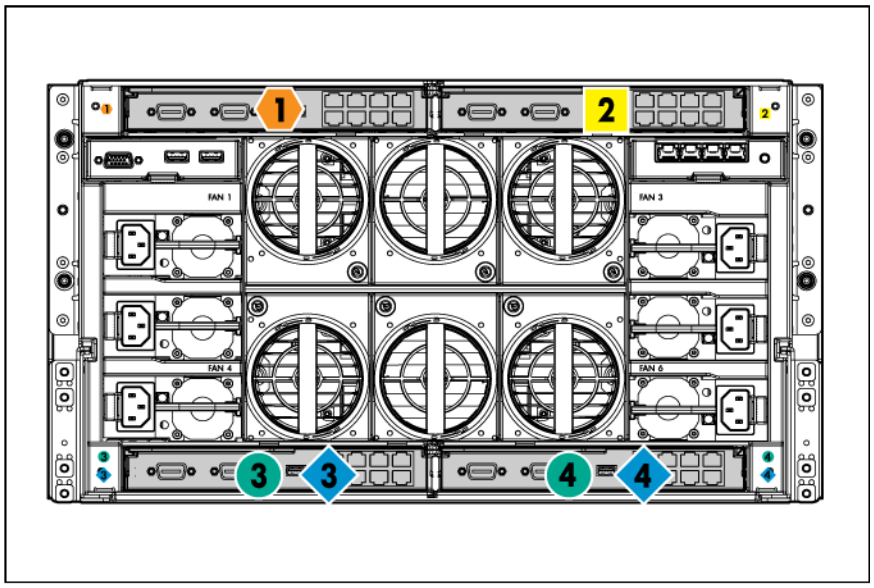
For specific steps to install interconnect modules, see the documentation that ships with the interconnect module.

Interconnect bay numbering and device mapping

- HP BladeSystem c7000 Enclosure



- HP BladeSystem c3000 Enclosure



To support network connections for specific signals, install an interconnect module in the bay corresponding to the embedded adapter or mezzanine signals.

Server blade signal	c7000 interconnect bay	c3000 interconnect bay	Interconnect bay labels
FlexFabric adapter 1 (Embedded)	1	1	⬢
FlexFabric adapter 2 (Embedded)	2	1	⬢
FlexFabric adapter 3 (Embedded)	1	1	⬢
FlexFabric adapter 4 (Embedded)	2	1	⬢
FlexFabric adapter 5 (Embedded)	1	1	⬢
FlexFabric adapter 6 (Embedded)	2	1	⬢
Mezzanine 1	3 and 4	2	■
Mezzanine 2	5 and 6*	3 and 4	●
	7 and 8**	3 and 4	◆
Mezzanine 3	5 and 6**	3 and 4	●
	7 and 8*	3 and 4	◆
Mezzanine 4	5 and 6**	3 and 4	●
	7 and 8*	3 and 4	◆
Mezzanine 5	3 and 4	2	■
Mezzanine 6	1 and 2†	1	⬢
Mezzanine 7	5 and 6*	3 and 4	●
	7 and 8**	3 and 4	◆

* Dual port mezzanine card ports and four-port mezzanine card ports 1 and 2
** Four-port mezzanine card ports 3 and 4

†Dedicated dual-port Ethernet mezzanine

For detailed port mapping information, see the HP BladeSystem enclosure installation poster or the HP BladeSystem enclosure setup and installation guide on the HP website (http://www.hp.com/go/bladesystem/documentation).

Connecting to the network

To connect the HP BladeSystem to a network, each enclosure must be configured with network interconnect devices to manage signals between the server blades and the external network.

Two types of interconnect modules are available for HP BladeSystem c-Class enclosures: Pass-Thru modules and switch modules. For more information about interconnect module options, see the HP website (http://www.hp.com/go/bladesystem/interconnects).

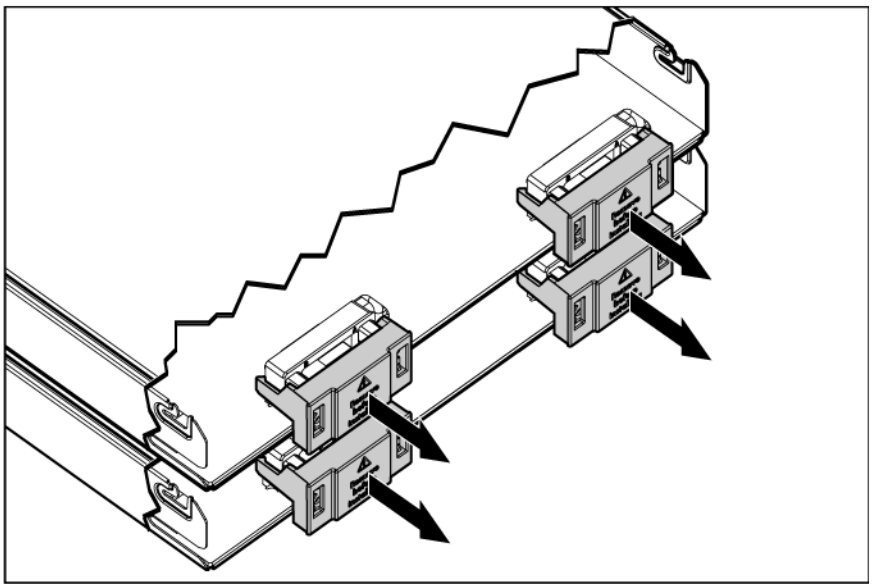
IMPORTANT: To connect to a network with a Pass-Thru module, always connect the Pass-Thru module to a network device that supports Gigabit speed.

Installing server blade options

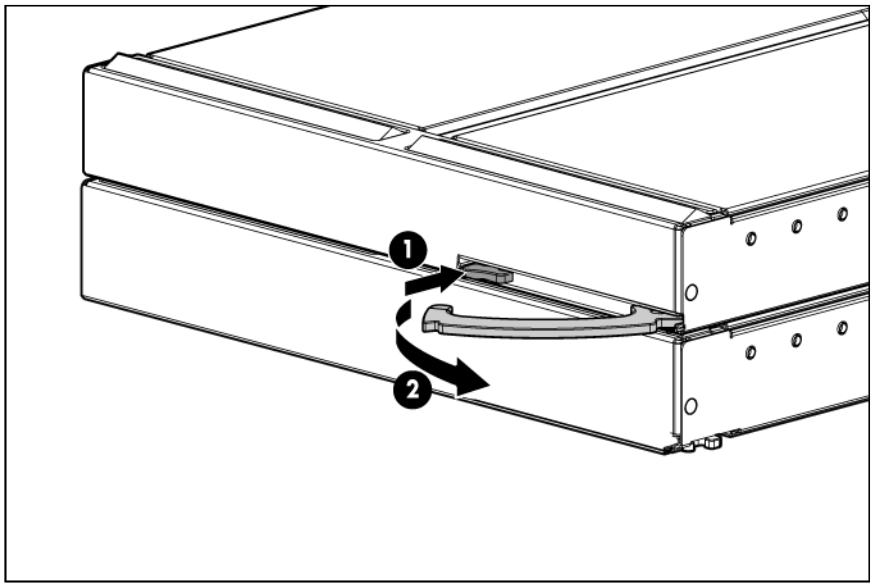
Before installing and initializing the server blade, install any server blade options, such as an additional processor, hard drive, or mezzanine card.

Installing a server blade

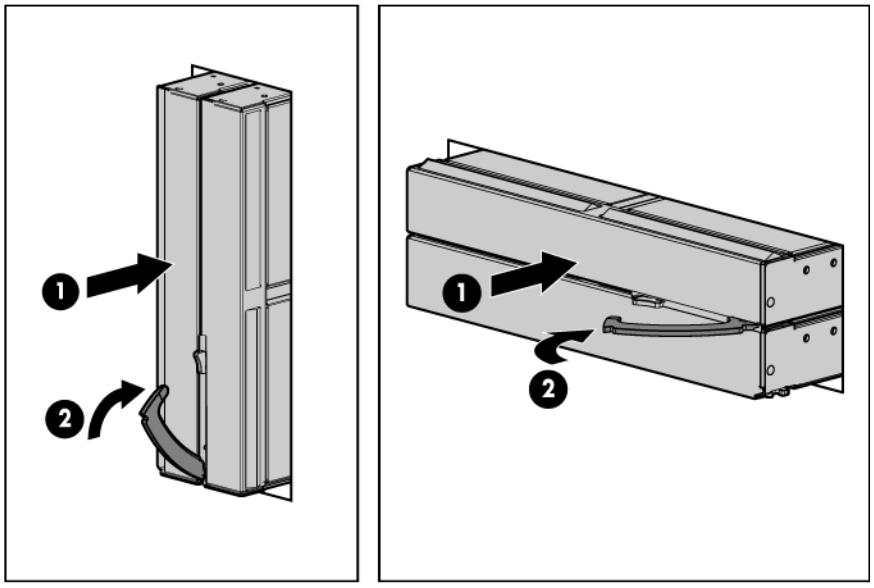
1. Remove the connector covers.



2. Prepare the server blade for installation.



3. Install the server blade.



Completing the configuration

To complete the server blade and HP BladeSystem configuration, see the overview card that ships with the enclosure.

Hardware options installation

Introduction

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

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

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

Processor option

The base configuration for an HP ProLiant BL680c G7 Server Blade is two processors, one installed in processor socket 1 (A-side) and one installed in processor socket 3 (B-side). When installing a third optional processor and heatsink, HP requires installing it in processor socket 2 (A-side).

The server blade ships with one of two different system boards that each support specific processors:

- Intel® Xeon® E7 family processors (E7-4800 family and the E7-8867L low-voltage processor)
- Intel® Xeon® 7500 series processors

A server blade that originally ships with Intel® Xeon® E7 family processors supports only Intel® Xeon® processor E7 family processors. A server blade that originally ships with Intel® Xeon® 7500 series processors supports only Intel® Xeon® 7500 series processors. All installed processors must be identical.

You can use one of four methods to determine what processor shipped with the server blade:

- Use HP Insight Control and the Systems Insight Manager management console configured with WBEM. For more information, see the documentation on the HP website (http://www.hp.com/go/foundationmgmt/docs).
- Use the operating system, for example, the System Properties for Windows®.
- View the server POST start-up screen data.
- Press **F10** at boot to run the Inspect Utility, and then view the system management BIOS page.

When installing two optional processors in a BL680c G7 Server Blade to create a four-processor configuration, observe the following guidelines:

- You must order two processor option kits.
- All processors must be identical.
- You must install the first optional processor in socket 2, and then install the second optional processor in socket 4.

HP recommends that all installed processors have at least two identical DIMMs installed in the associated DIMM sockets. For more information, see "DIMM installation guidelines (on page 49)."

Installing a processor option (A-side)

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

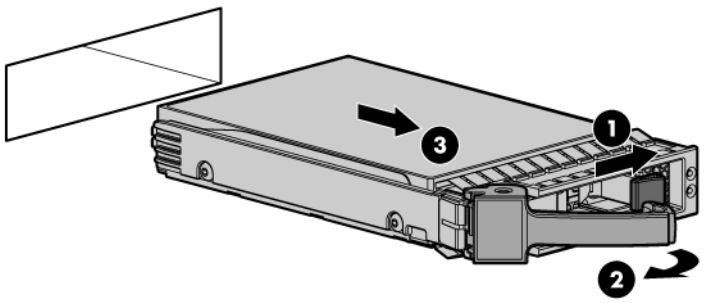
CAUTION: To prevent possible server blade malfunction and damage to the equipment, multiprocessor configurations must contain processors with the same part number.

CAUTION: The heatsink thermal interface media is not reusable and must be replaced if the heatsink is removed from the processor after it has been installed.

IMPORTANT: Processor socket 1 must be populated at all times or the server blade does not function.

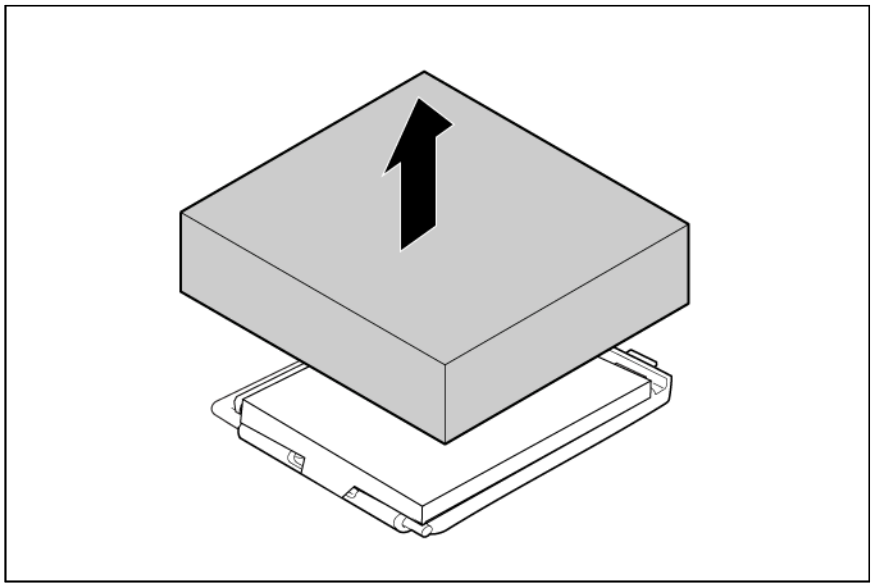
To install the component:

1. Locate and download the latest ROM version from the HP website (http://www.hp.com/support). Follow the instructions on the website to update the system ROM.
2. Power down the server blade (on page 16).
3. Remove the server blade (on page 17).
4. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
5. Remove the access panel (A-side) (on page 18).
6. Remove the hard drives.



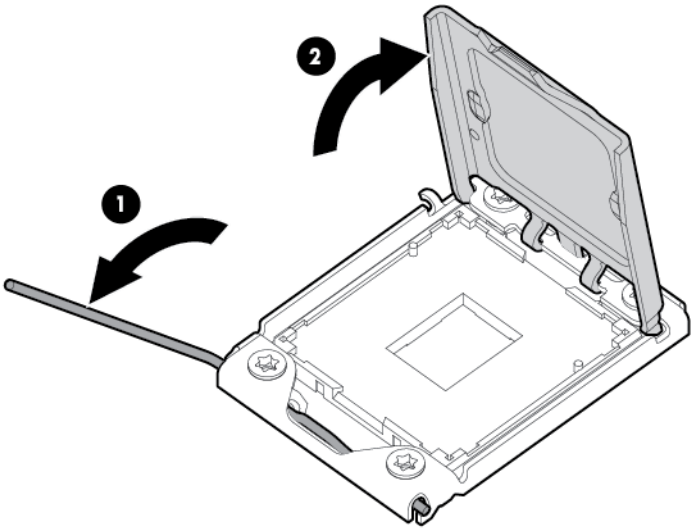
7. Remove the front panel/hard drive cage assembly (A-side) (on page 21).

8. Remove the heatsink blank.



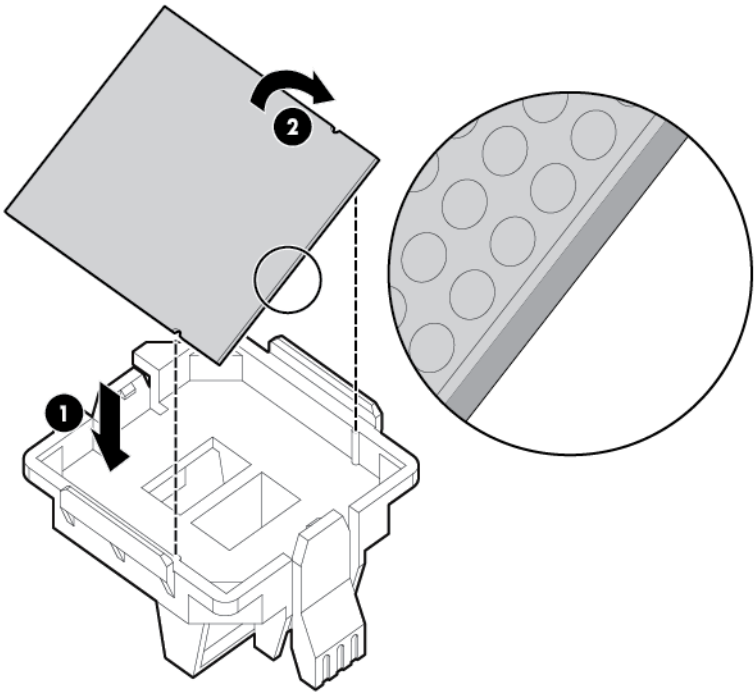
CAUTION: Failure to completely open the processor locking lever prevents the processor from seating during installation, leading to hardware damage.

9. Open the processor locking lever and the processor socket retaining bracket. **Do not remove the processor socket cover**.

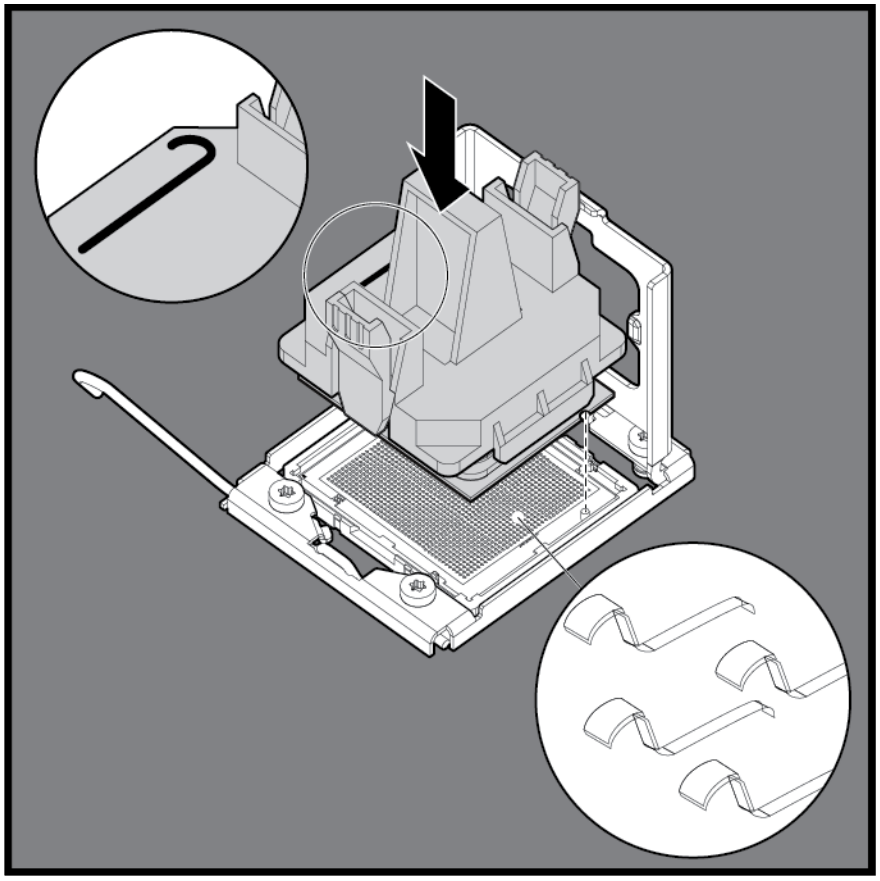


IMPORTANT: Be sure the processor remains inside the processor installation tool.

10. If the processor has separated from the installation tool, carefully re-insert the processor in the tool. Handle the processor by the edges only, and do not touch the bottom of the processor, especially the contact area.



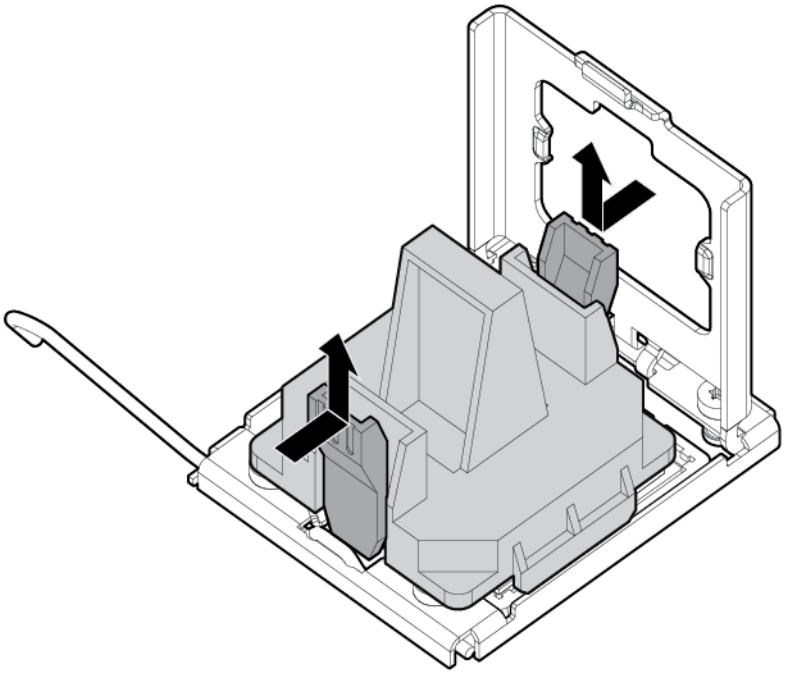
11. Align the processor installation tool with the socket, and then install the processor. **THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED**.



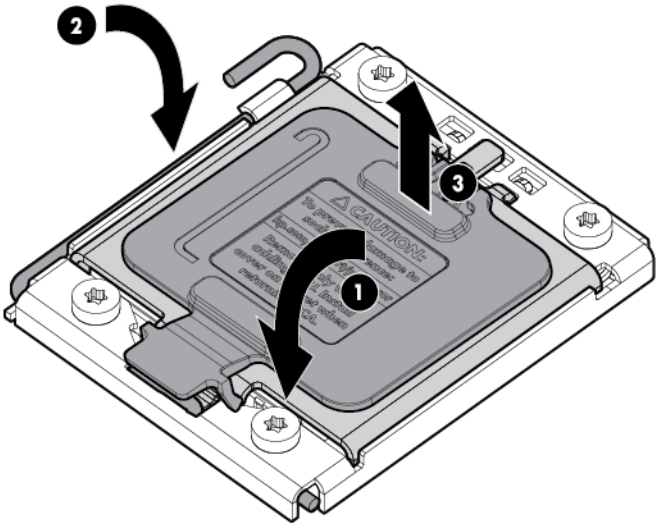
△ **CAUTION: THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED.** To avoid damage to the system board:

- Never install or remove a processor without using the processor installation tool.
- Do not touch the processor socket contacts.
- Do not tilt or slide the processor when lowering the processor into the socket.

12. Press the tabs on the processor installation tool to separate it from the processor, and then remove the tool.

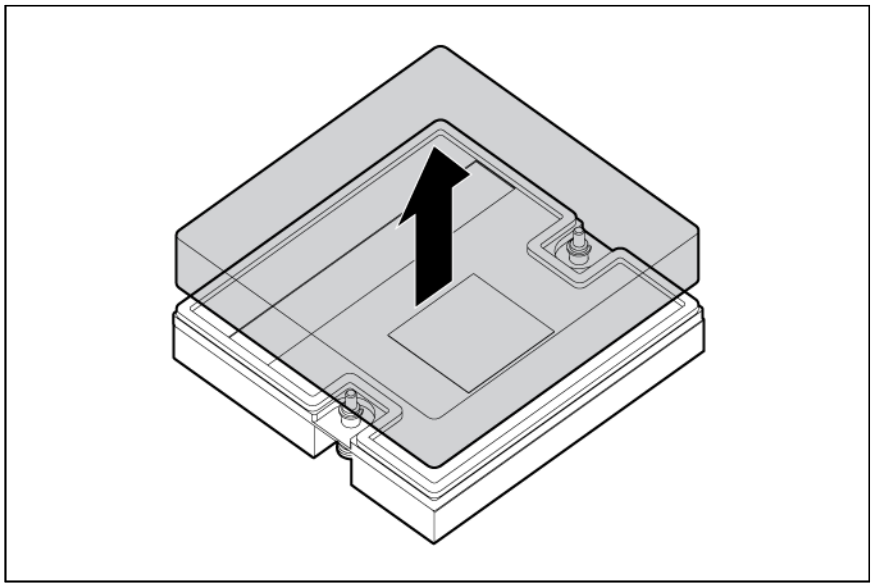


13. Close the processor socket retaining bracket and the processor locking lever. **The processor socket cover is automatically ejected**. Remove the cover.



△ **CAUTION:** Be sure to close the processor socket retaining bracket before closing the processor locking lever. The lever should close without resistance. Forcing the lever closed can damage the processor and socket, requiring system board replacement.

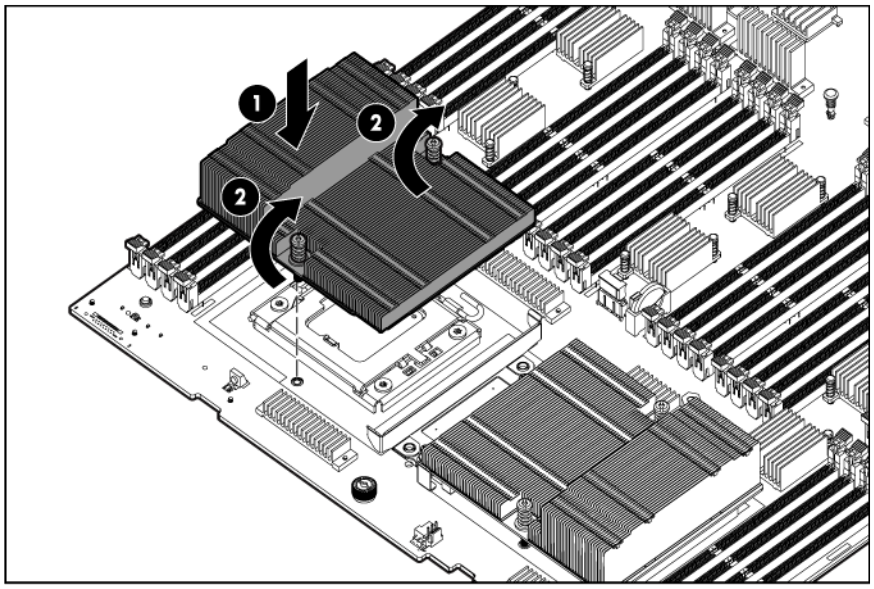
14. Remove the heatsink protective cover.



△ **CAUTION:** Orient the heatsink as indicated in the procedure. Otherwise, you cannot install the hard drive cage.

△ **CAUTION:** When tightening the heatsink screws, first tighten the front screw four to five turns, tighten the back screw completely, and then finish tightening the front screw.

15. Orient and install the heatsink as shown in the illustration.



16. Install the front panel/hard drive cage assembly (A-side).
17. Install the access panel (A-side).
18. Install the hard drives ("Hot-plug SAS or SATA hard drive option" on page 59).
19. Install the server blade ("Installing a server blade" on page 32).
20. Power up the server blade (on page 16).

Installing a processor option (B-side)

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

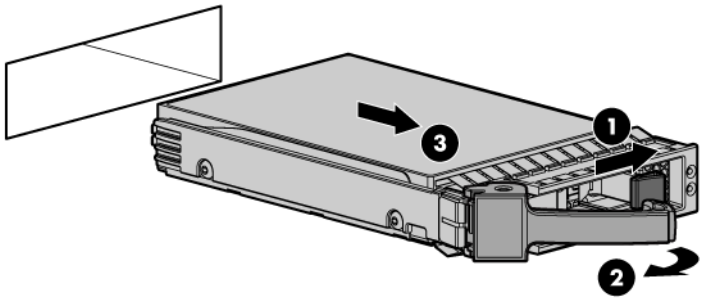
CAUTION: To prevent possible server blade malfunction and damage to the equipment, multiprocessor configurations must contain processors with the same part number.

CAUTION: The heatsink thermal interface media is not reusable and must be replaced if the heatsink is removed from the processor after it has been installed.

IMPORTANT: Processor socket 1 must be populated at all times or the server blade does not function.

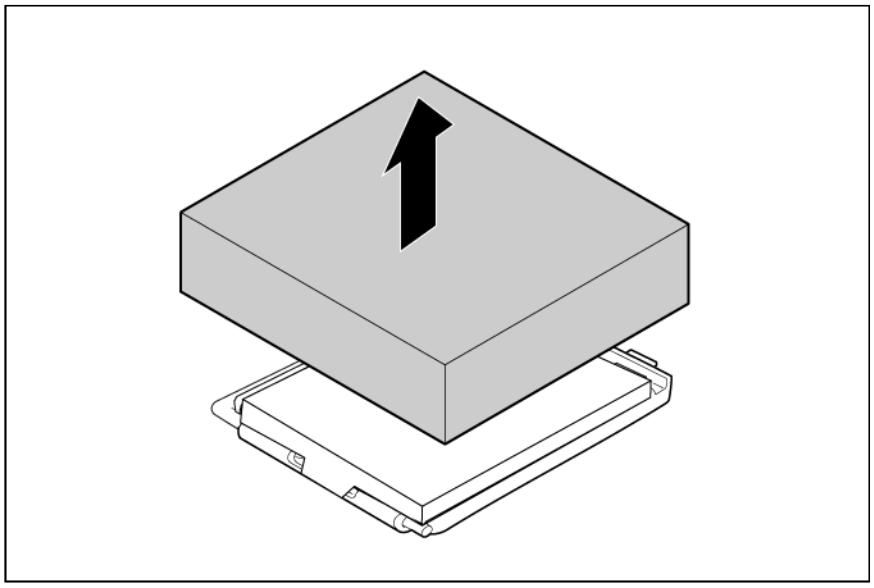
To install the component:

1. Locate and download the latest ROM version from the HP website (http://www.hp.com/support). Follow the instructions on the website to update the system ROM.
2. Power down the server blade (on page 16).
3. Remove the server blade (on page 17).
4. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
5. Remove the access panel (B-side) (on page 18).
6. Remove the hard drives.



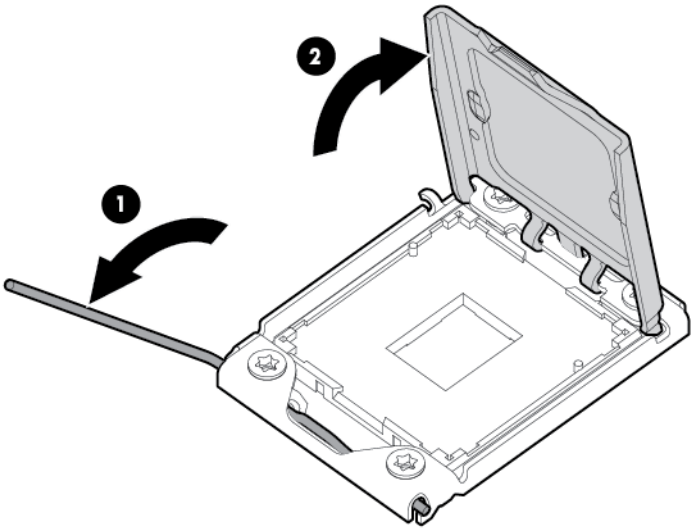
7. Remove the front panel/hard drive cage assembly (B-side) (on page 22).

8. Remove the heatsink blank.



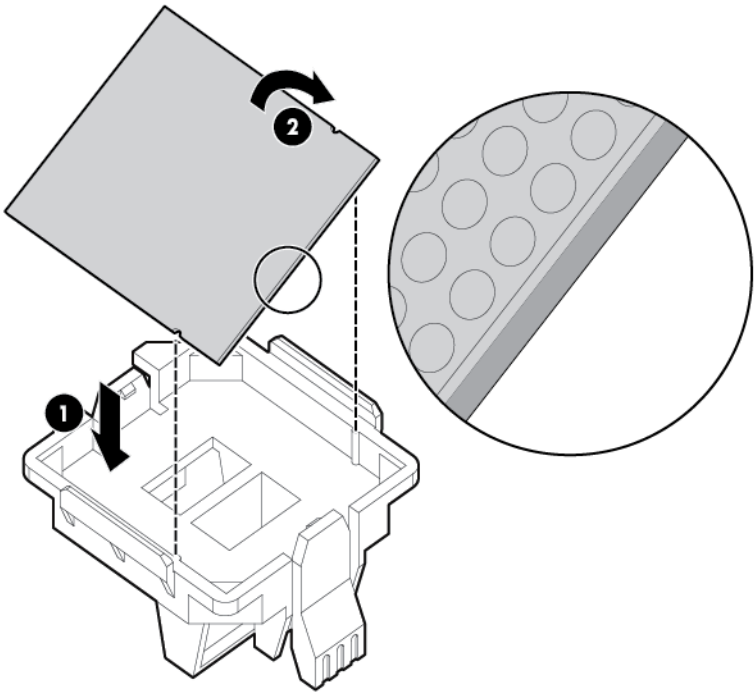
△ **CAUTION:** Failure to completely open the processor locking lever prevents the processor from seating during installation, leading to hardware damage.

9. Open the processor locking lever and the processor socket retaining bracket. **Do not remove the processor socket cover**.

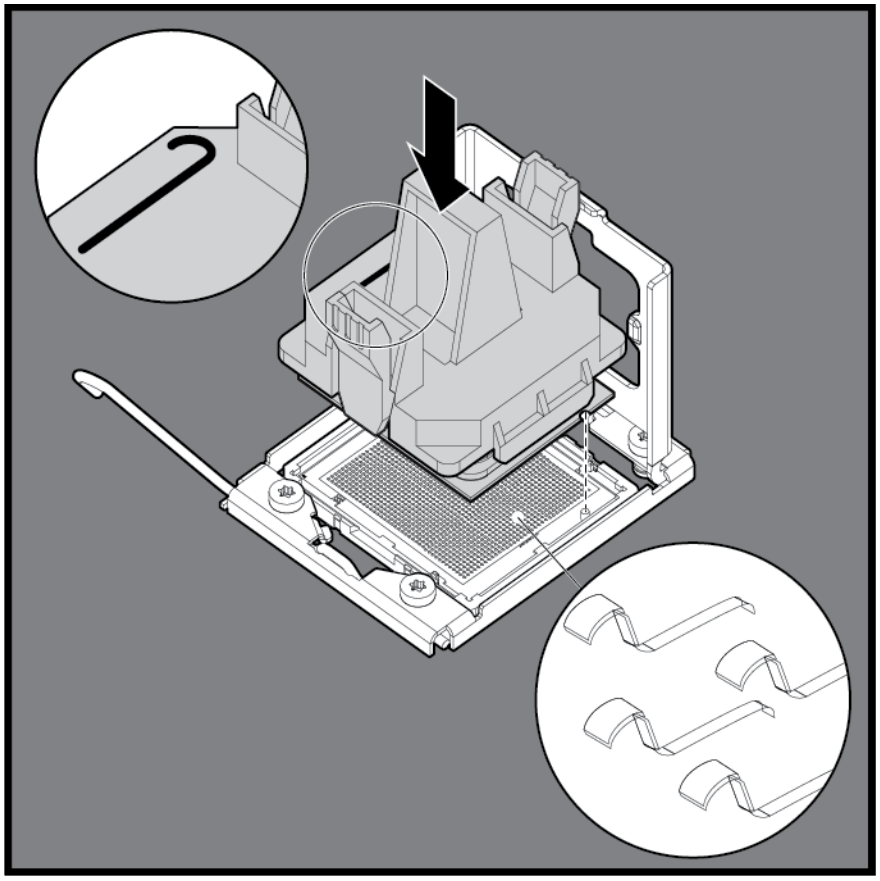


IMPORTANT: Be sure the processor remains inside the processor installation tool.

10. If the processor has separated from the installation tool, carefully re-insert the processor in the tool. Handle the processor by the edges only, and do not touch the bottom of the processor, especially the contact area.



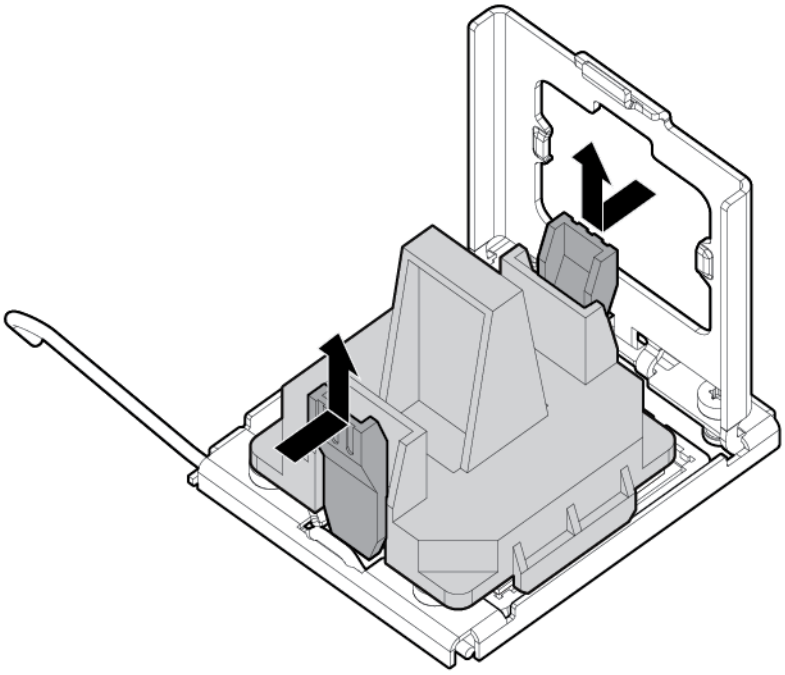
11. Align the processor installation tool with the socket, and then install the processor. **THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED**.



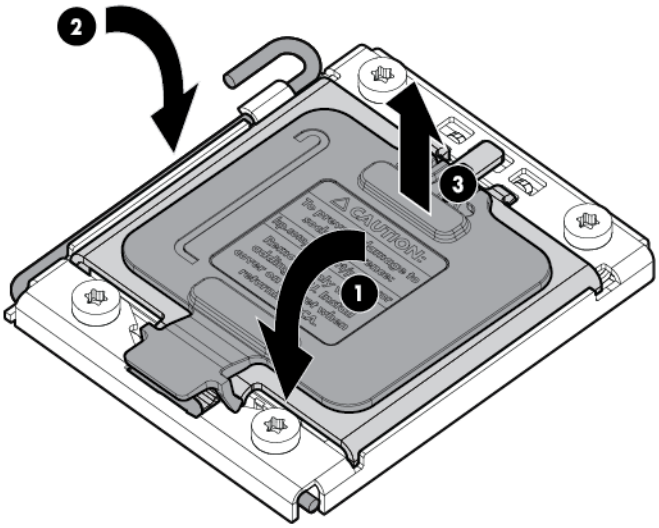
△ **CAUTION: THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED.** To avoid damage to the system board:

- Never install or remove a processor without using the processor installation tool.
- Do not touch the processor socket contacts.
- Do not tilt or slide the processor when lowering the processor into the socket.

12. Press the tabs on the processor installation tool to separate it from the processor, and then remove the tool.

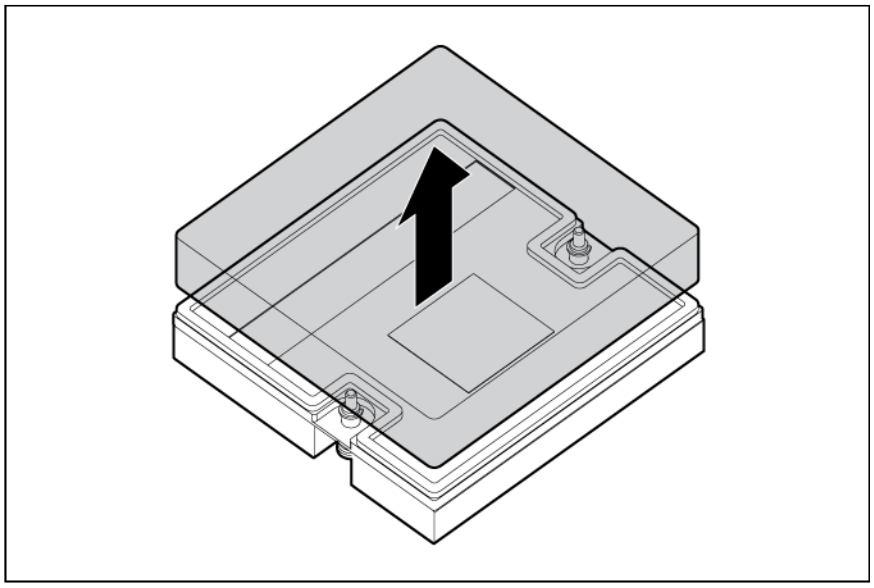


13. Close the processor socket retaining bracket and the processor locking lever. **The processor socket cover is automatically ejected**. Remove the cover.



△ **CAUTION:** Be sure to close the processor socket retaining bracket before closing the processor locking lever. The lever should close without resistance. Forcing the lever closed can damage the processor and socket, requiring system board replacement.

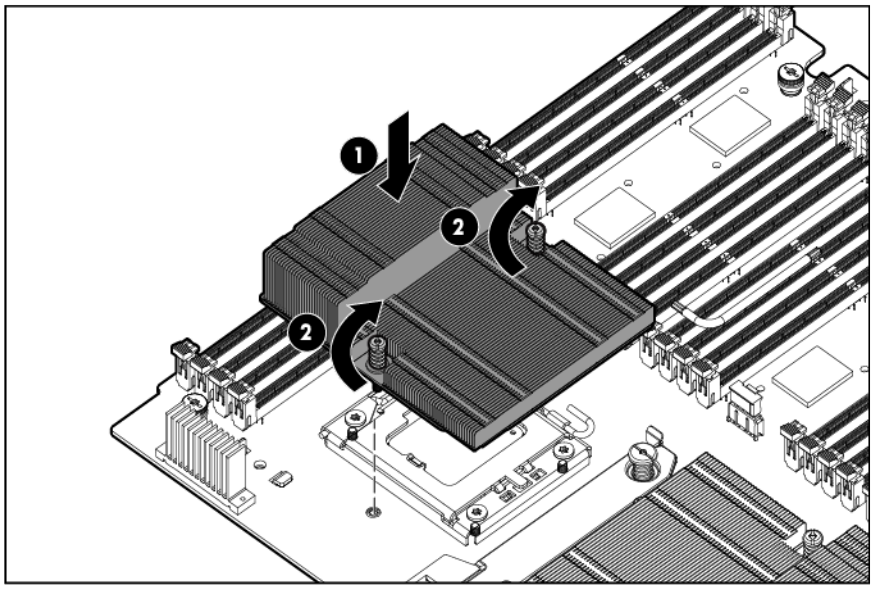
14. Remove the heatsink protective cover.



△ **CAUTION:** Orient the heatsink as indicated in the procedure. Otherwise, you cannot install the hard drive cage.

△ **CAUTION:** When tightening the heatsink screws, first tighten the front screw four to five turns, tighten the back screw completely, and then finish tightening the front screw.

15. Orient and install the heatsink as shown in the illustration.



16. Install the front panel/hard drive cage assembly (B-side).
17. Install the access panel (B-side).
18. Install the hard drives ("Hot-plug SAS or SATA hard drive option" on page 59).
19. Install the server blade ("Installing a server blade" on page 32).
20. Power up the server blade (on page 16).

Memory option

To expand server memory, install DDR3 RDIMMs. The server blade supports dual-rank and quad-rank DIMMs. Server blades using Intel® Xeon® E7 family processors support up to 2 TB of memory using 64 32-GB DIMMs (16 DIMMs per processor). Server blades using Intel® Xeon® 7500 series processors support up to 1 TB of memory using 64 16-GB DIMMs (16 DIMMs per processor).

The server blade supports the following DIMM speeds:

- Dual-rank PC3-10600 (DDR-1333) DIMMs operating up to 1066 MHz
- Quad-rank PC3-8500 (DDR-1067) DIMMs operating up to 1066 MHz

Depending on the processor model, the memory clock speed can be reduced to 978 or 800 MHz. For more information, see "Memory subsystem architecture (on page 50)."

NOTE: The Advanced Memory Protection option in RBSU provides additional memory protection beyond Advanced ECC. By default, the server is set to **Advanced ECC Support**. For more information, refer to "HP ROM-Based Setup Utility (on page 82)."

For DIMM slot locations, see the following:

- "DIMM slot locations (A-side) (on page 13)"
- "DIMM slot locations (B-side) (on page 14)"

Memory overview

The HP ProLiant BL680c G7 Server Blade is offered in two models, one that uses the Intel® Xeon® E7 family processors, and the other that uses the Intel® Xeon® 7500 series processor. The architecture of these processors departs radically from previous Intel® Xeon® front-side-bus-based architectures.

In front-side bus architectures, the memory controller was incorporated in the northbridge, which produced a common sharepoint for memory accesses for all processors. Similar to the dual-socket Intel® Xeon® 5500 processors, the Intel® Xeon® E7 family and 7500 series processors employ a NUMA architecture. This architecture incorporates QPI links for point-to-point connectivity between processors and provides dedicated local memory for each processor.

To enable greater memory expansion capability, the DIMMs are not directly connected to the processor through the memory controller. In the Intel® Xeon® E7 family and 7500 memory subsystems, each memory controller uses a dedicated Intel® SMI to connect to an Intel® SMB. The SMB is connected to two DDR3 memory channels that support four DIMM sockets.

To provide greater memory bandwidth over previous Intel® Xeon® multiprocessor architectures, each Intel® Xeon® E7 family and 7500 processor includes two integrated memory controllers. Each memory controller contains two SMIs. Therefore, four SMIs per processor connect to four memory buffers. Because each buffer supports 4 DIMM sockets, a single processor provides a total of 16 DIMMs. On server blades using Intel® Xeon® E7 family processors, each DIMM can be up to 32 GB for 512 GB per processor (16 DIMMs x 32 GB). On server blades using Intel® Xeon® 7500 series processors, each DIMM can be up to 16 GB for 256 GB per processor (16 DIMMs x 16 GB).

Low Voltage DIMMs

In addition to standard 1.5V DDR3 DIMMs, the HP ProLiant BL680c G7 Server Blade that uses the Intel® Xeon® E7 family processors also supports 1.35V LV DIMMs in 8 GB, 16 GB, and 32 GB options. The LV

DIMMs save up to 15 to 20 percent per DIMM compared to using the standard 1.5V DIMMs. This savings is made possible by the Model 7510 Intel® SMB included on the HP ProLiant BL680c G7 Server Blade model that supports the Intel® Xeon® E7 family processors. LV DIMMs are not supported on the HP ProLiant BL680c G7 Server Blade that uses the Intel Xeon 6500 and 7500 series processors.

Dual- and quad-rank DIMMs

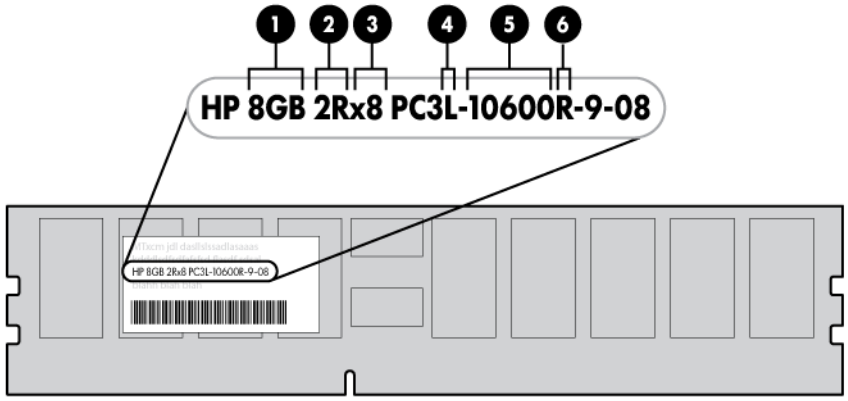
To understand and configure memory protection modes properly, an understanding of dual- and quad-rank DIMMs is helpful. Some DIMM configuration requirements are based on these classifications.

A single-rank DIMM has one set of memory chips that is accessed while writing to or reading from the memory. A dual-rank DIMM is similar to having two single-rank DIMMs on the same module, with only one rank accessible at a time. A quad-rank DIMM is, effectively, two dual-rank DIMMs on the same module. Only one rank is accessible at a time. The server blade memory control subsystem selects the proper rank within the DIMM when writing to or reading from the DIMM.

Dual- and quad-rank DIMMs provide the greatest capacity with the existing memory technology. For example, if current DRAM technology supports 2-GB single-rank DIMMs, a dual-rank DIMM would be 4-GB, and a quad-rank DIMM would be 8-GB.

DIMM identification

To determine DIMM characteristics, use the label attached to the DIMM and the following illustration and table.



Item	Description	Definition
1	Size	—
2	Rank	1R = Single-rank 2R = Dual-rank 4R = Quad-rank
3	Data width	x4 = 4-bit x8 = 8-bit
4	Voltage rating	L = Low voltage (1.35v) Blank or omitted = Standard

Item	Description	Definition
5	Memory speed	10600 = 1333-MHz 8500 = 1066-MHz
6	DIMM type	R = RDIMM (registered) E = UDIMM (unbuffered with ECC)

For the latest supported memory information, see the QuickSpecs on the HP website (http://www.hp.com).

DIMM installation guidelines

Each supported processor contains two memory controllers per processor. Each memory controller can support up to eight DDR3 1.5V RDIMMs and 1.35V LV DIMMs. LV DIMM support is limited to HP ProLiant BL680c G7 Server Blade models that support the Intel® Xeon® E7 family processors. Four memory controllers across four processors provide a total of 64 DIMMs per system.

When installing DIMMs, observe the following minimum guidelines:

- Install only HP DDR3-1333 DIMMs supported by the server blade.
- DIMMs must be installed for processor 1.
- Populate DIMM slots for a processor only if the processor is installed.
- To maximize performance in multi-processor configurations, distribute the total memory capacity between all processors as evenly as possible.
- The minimum configuration is two DIMMs installed on processor 1.
- DIMMs must be installed in pairs with identical characteristics. When possible, for configuration simplicity, HP recommends using DIMMs with identical part numbers throughout the system.
- No special socket requirements exist for regular 1.5 V DIMMs and 1.35V LV DIMMs. If both 1.5V and 1.35V DIMMs are used in the system, all DIMMs operate at 1.5V.
- For best performance, HP recommends that DIMM pairs be populated in sequence by letter designation. Install DIMM pair 4A/5A first, followed by DIMM pair 12B/16B, DIMM pair 2C/7C, DIMM pair 10D/14D, DIMM pair 3E/6E, DIMM pair 11F/15F, and DIMM pair 1G/8G.
- When installing mixed rank DIMMs for any processor, DIMMs with the highest number of ranks must be installed in the white DIMM connector locations. This guarantees proper electrical signaling on the DDR3 channel since DIMMs with higher rank counts present larger electrical loading on the DDR3 channel and must be populated at the end point of the channel.

  △ **CAUTION:** Failure to follow these guidelines may result in the inability to recognize memory, memory errors, or reduced memory performance.

  Examples:

  - If the configuration is eight quad-rank 8-GB DIMMs and eight dual-rank 8-GB DIMMs installed in a single-processor configuration, the quad-rank DIMMs must be installed in the white DIMM connectors 4A/5A, 12B/16B, 2C/7C, and 10D/14D. The dual-rank DIMMs must be installed in the black DIMM connectors 3E/6E, 11F/15F, 1G/8G, and 9H/13H. For illustrations of the connections between the processor, memory controllers, and DIMMs, see "Memory subsystem architecture (on page 50)."
  - If the configuration is six quad-rank 8-GB DIMMs and ten dual-rank 8-GB DIMMs in a single processor configuration, the quad-rank DIMMs can be located in any of the corresponding white

DIMM pairs (4A/5A, 12B/16B, 2C/7C, and 10D/14D), as long as they are installed at the end point of the DDR3 channel.

AMP modes Advanced ECC, DDDC, HP Memory Quarantine, Online Spare, and Mirrored Memory have further requirements beyond the ones listed here. For additional memory configuration requirements, see the corresponding AMP sections:

- Advanced ECC memory population guidelines (on page 55)
- Double Device Data Correction (on page 55)
- HP Memory Quarantine (on page 56)
- Online Spare memory population guidelines (on page 56)
- Mirrored Memory population guidelines (on page 57)

Memory subsystem architecture

The Intel® Xeon® E7 family and 7500 series processor memory architectures are designed to take advantage of multiple stages of memory interleaving to reduce latency and increase bandwidth.

Each Intel® Xeon® E7 family and 7500 series processor contains two memory controllers as shown in the illustration below. Each memory controller has two SMI buses operating in Lockstep mode. Each SMI bus connects to an SMB or buffer as shown in the illustration below. The buffer converts the SMI to DDR3 and expands the memory capacity of the system. Each buffer has two DDR3 channels and can support up to four DIMMs for a total of 16 DIMMs per processor, or 64 DIMMs per HP ProLiant BL680c G7 Server Blade with four processors installed.

Memory speed is not affected by number of DIMMs, ranks, or voltage. All DIMMs run at the highest possible speed for a given processor.

DDR3 memory speed is a function of the QPI bus speed supported by the processor:

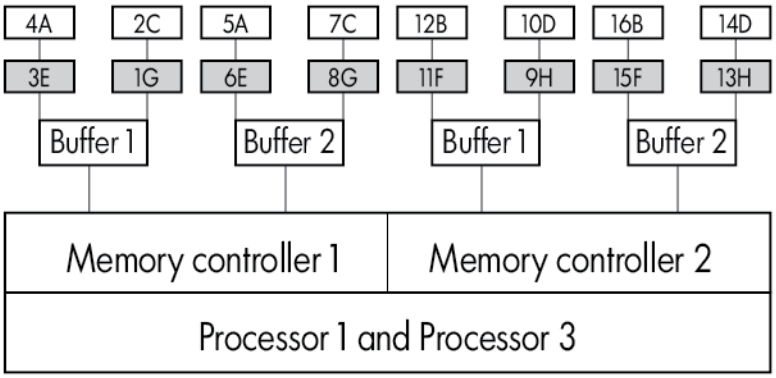
- Processors with a QPI speed of 6.4 GT/s run memory at 1066 MT/s.
- Processors with a QPI speed of 5.6 GT/s run memory at 978 MT/s.
- Processors with a QPI speed of 4.8 GT/s run memory at 800 MT/s.

Successive cache lines are interleaved between the DIMMs and the Lockstep SMI channels of the two memory controllers in the processor such that adjacent cache lines reside on different memory controllers, SMIs, DIMMs, and DIMM ranks for better performance. To take advantage of this feature, DIMMs should be populated evenly between all SMI channels. If an SMI channel pair has more DIMMs than others, the extra memory on that SMI channel pair does not benefit from the interleaving mechanism across memory controllers.

Memory architecture for processors 1 and 3

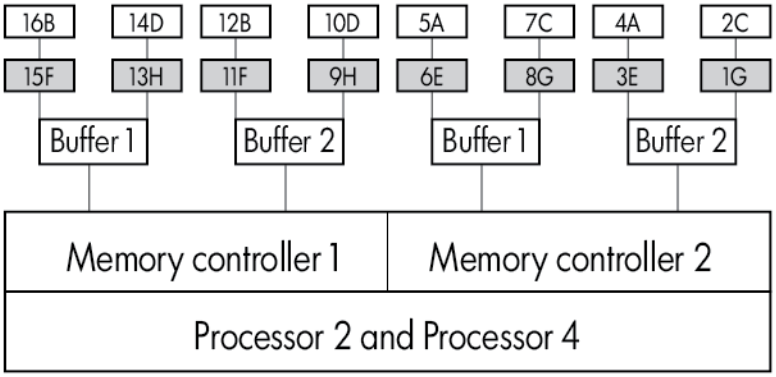
Channel	Slot	Slot number
1	A E	4 3
2	C G	2 1
3	A E	5 6
4	C G	7 8

Channel	Slot	Slot number
5	B F	12 11
6	D H	10 9
7	B F	16 15
8	D H	14 13



Memory architecture for processors 2 and 4

Channel	Slot	Slot number
1	B F	16 15
2	D H	14 13
3	B F	12 11
4	D H	10 9
5	A E	5 6
6	C G	7 8
7	A E	4 3
8	C G	2 1



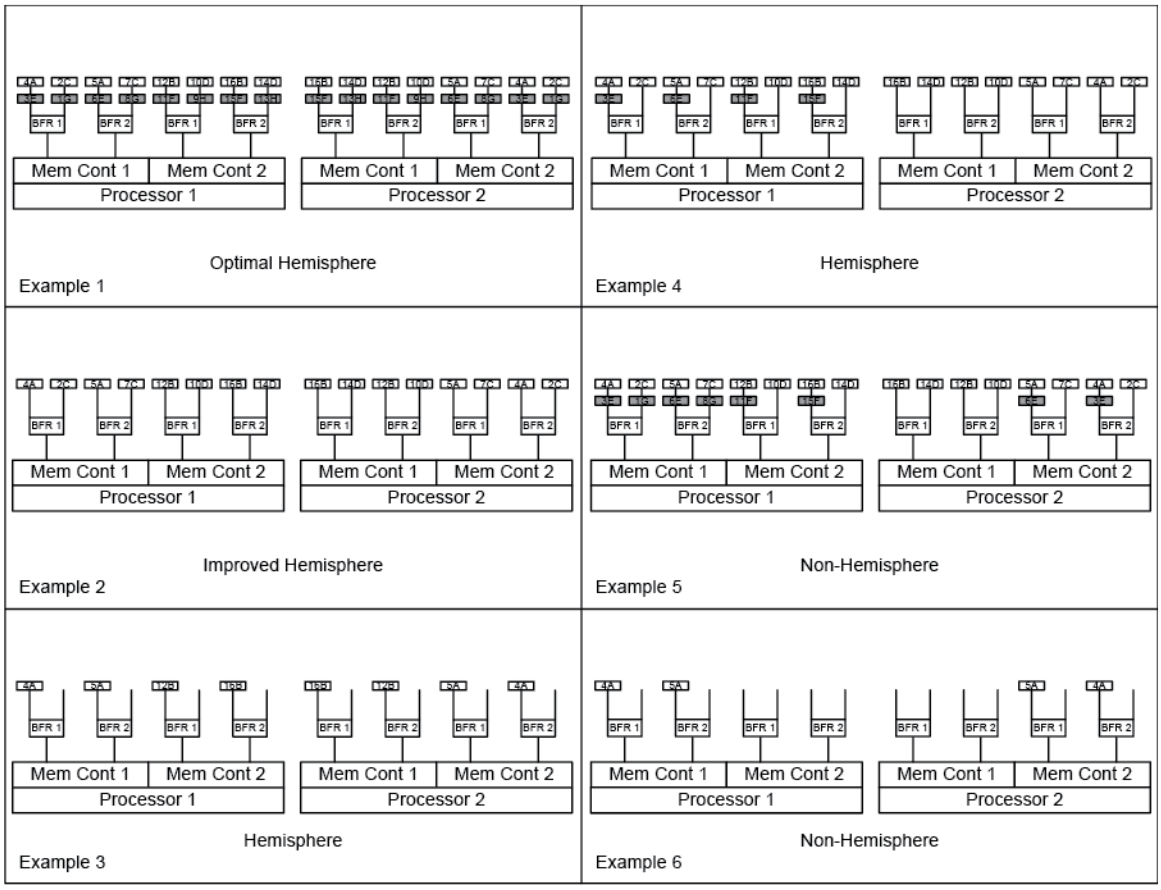
Hemisphere mode

The Intel® Xeon® E7 family and 7500 series processor architectures incorporate Hemisphere mode, a high-performance interleaving technology. Hemisphere mode combines the tracking resources of both memory controllers within each processor for a more aggressive cache line pipelining.

Hemisphere mode is enabled when processors in the system have identical DIMM populations behind both of their memory controllers. Observe the following guidelines:

- Hemisphere mode is controlled via an RBSU option, enabling the user to select either automatic (default) or disable.
- In automatic mode, the BIOS enables Hemisphere mode if the system memory configuration is compatible with Hemisphere mode.
- Hemisphere mode should produce the best overall performance for a variety of applications. However, Hemisphere mode can be disabled if it produces lower performance for a particular application.
- To enable each processor to enter Hemisphere mode, all memory controllers must be installed and populated with equal memory capacities based on the DIMM installation guidelines (on page 49).
- Greater performance is obtained when all memory controllers are populated with either four or eight dual- or quad-rank DIMMs.
- Mirrored Memory mode is not supported when Hemisphere mode is enabled.

The following illustration shows examples of Hemisphere mode and non-Hemisphere mode populations.



The two non-Hemisphere examples show the following:

- Each memory controller within a processor must have memory installed.
- The DIMM configurations of each memory controller of a processor must be identical.

Memory performance optimization

The HP ProLiant BL680c G7 Server Blade supports up to 64 DIMMs installed on four multi-core processors. Optimal performance is achieved when the DIMMs are populated to make best use of the Intel® Xeon® E7 family and 7500 series processor architectures.

To achieve the best performance for a given memory processor configuration, observe the following guidelines:

- The largest contributor to maximum memory bandwidth performance is to use both memory controllers that are integrated in each processor. To achieve maximum memory bandwidth performance, populate both memory controllers for each installed processor.
- The second largest contributor to performance is to populate each DDR3 channel for each installed processor. To achieve this, the minimum recommended DIMM count is eight DIMMs installed in DIMM pair locations A, B, C, and D on each installed processor.
- The third largest contributor to memory subsystem performance is the number of ranks per DIMM. Dual-rank DIMMs perform well, but quad-rank DIMMs offer a further performance boost.

- The best performance is obtained when all installed processors are enabled for Hemisphere mode. Hemisphere mode is optimum when four or eight DIMMs are installed per memory controller. Hemisphere mode can be achieved with two or six DIMMs per memory controller, but this configuration is not optimal for Hemisphere mode.
- Maximum throughput is achieved when all DIMM slots are fully populated with the maximum number of eight quad-rank DIMMs per memory controller.
- Memory speed is a function of the processor QPI bus speed. Selecting a processor that supports a higher QPI speed enables the memory to operate at a higher performance level:
  - Processors that support a QPI speed of 6.4 GT/s enable the memory to operate at 1066 MT/s, the maximum memory speed supported by the Intel® Xeon® 7500 processor.
  - Processors that support a QPI speed of 5.8 GT/s operate memory at 978 MT/s.
  - Processors that support a QPI speed of 4.8 GT/s operate memory at 800 MHz.
  - Memory performance degrades less when going from 1066 MHz to 984 MHz than it does when going from 978 MHz to 800 MHz.

Plan the memory configurations using identical DIMMs to achieve the memory size target, taking into account that 32- and 64-DIMM count configurations result in the highest performance. Using a four-processor configuration as an example, do the following:

- If the initial memory target is 64 GB, populate each processor with eight 2-GB DIMMs for a total of 32 DIMMs. The maximum expansion target using 2-GB DIMMs is 128 GB with 64 DIMMs.
- If the initial memory target is 128 GB, populate each processor with eight 4-GB DIMMs for a total of 16 DIMMs. The maximum expansion target using 4-GB DIMMs is 256 GB with 64 DIMMs.
- If the initial memory target is 256 GB, populate each processor with eight 8-GB DIMMs for a total of 16 DIMMs. The maximum expansion target using 8-GB DIMMs is 512 GB with 64 DIMMs.

The maximum system memory capability is 1 TB with 64 x 16-GB DIMMs (16 DIMMs per processor) or 2 TB with 64 x 32-GB DIMMs. 32-GB DIMMs are supported only on server blades that support Intel® Xeon® E7 family processors.

Memory RAS

The server supports the following AMP modes:

- Advanced ECC memory mode provides the greatest memory capacity for a given DIMM size and provides x4 and x8 SDDC. This mode is the default option for this server. For more information, see "Advanced ECC memory population guidelines (on page 55)."
- DDDC ready. The server blade will support this feature with a future planned firmware upgrade. DDDC is supported only on server models that support the Intel Xeon E7 family processors. DDDC extends the capability to withstand failures in two x4 DRAM devices. Systems supporting DDDC can fix both single- and double-DRAM device memory hard errors. This feature greatly extends system up-time. For more information, see "Double Device Data Correction (on page 55)."
- HP Memory Quarantine ready. The server blade will support this feature with a future planned firmware upgrade. The operating system must support this mode. HP Memory Quarantine works with the operating system to enable a server to recover from uncorrectable memory errors that would have otherwise caused a system crash. For more information, see "HP Memory Quarantine (on page 56)."

- Online Spare memory mode provides protection against persistent DRAM failure. Rank-sparing is more efficient than DIMM-sparing since only a portion of a DIMM is set aside for memory protection. For more information, see "Online Spare memory population guidelines (on page 56)."
- Mirrored Memory mode provides the maximum protection against failed DIMMs. Uncorrectable errors in the DIMMs of one memory controller are corrected by the DIMMs in the mirrored memory controller. The two memory controllers of each processor form a mirrored pair. For more information, see "Mirrored Memory population guidelines (on page 57)."

AMP modes are configured in RBSU. If the requested AMP mode is not supported by the installed DIMM configuration, the server boots in Advanced ECC mode. For more information, see "HP ROM-Based Setup Utility (on page 82)."

For the latest memory configuration information, see the QuickSpecs on the HP website (http://www.hp.com/go/ProLiant).

Advanced ECC memory population guidelines

Advanced ECC memory is the default memory protection mode for the server, with the following limits:

- On server blades using Intel® Xeon® 7500 series processors, up to 1 TB of active memory using 16-GB DIMMs is supported in this AMP mode.
- On server blades using Intel® Xeon® E7 family processors, up to 1 TB of active memory using 32-GB DIMMs is supported in this AMP mode.

Advanced ECC can correct single-bit and multi-bit memory errors on a single x8 or two adjacent x4 DRAM devices.

The server provides notification when correctable error events have exceeded a pre-defined threshold rate. When uncorrectable errors are detected using Advanced ECC, the server notifies the user and shuts down the operating system.

Double Device Data Correction

The server blade is DDDC ready. The server blade will support this feature with a future planned firmware upgrade. DDDC is supported only on systems that support Intel® Xeon® E7 family processors using x4 DIMMs only. For more information see the HP website (http://www.hp.com/go/bizsupport).

DDDC provides another layer of protection from memory errors, resulting in greater server up time. Unlike memory mirroring, DIMM sparing, or RAID memory, DDDC does not require extra DIMMs. Therefore, DDDC is a more efficient use of memory. DDDC can fix both single and double DRAM device memory hard errors. DDDC works only with x4 DRAM devices. DDDC reserves one x4 DRAM device in each rank as a spare device, ensuring data availability after hard failures within any two x4 DRAM devices.

The system must be in Advanced ECC mode to use DDDC. DDDC is disabled in the following configurations:

- The memory configuration includes a mix of x4 and x8 DIMMs.
- Online Spare Memory is enabled.
- Memory Mirroring is enabled.

HP Memory Quarantine

The server blade is HP Memory Quarantine ready. The server blade will support this feature with a future planned firmware upgrade. The operating system must support this mode. HP Memory Quarantine increases the system availability by enabling the server and the operating system to work together to enable a server to recover from uncorrectable memory errors that would have otherwise caused a system crash.

HP Memory Quarantine isolates the bad memory location before it affects other data. It does this by using a patrol scrubber that constantly inspects the memory for errors. If an error is found, the hardware attempts to correct it. If the hardware cannot correct the error, the operating system is notified. Then, the memory address is tagged as bad so that the operating system does not use this memory location.

Online Spare memory population guidelines

Online spare memory provides protection against persistent DRAM failure. It monitors DIMMs for excessive correctable errors and copies the content of an unhealthy rank to an available spare rank in advance of multi-bit or persistent single-bit failures that may result in uncorrectable faults. Rank-sparing is more efficient than DIMM-sparing since only a portion of a DIMM is set aside for memory protection.

When Online Spare memory is enabled, the first ranks of DIMM pair 4A/5A are set aside as the sparing ranks. Therefore, the available memory is reduced by the size of the first ranks of DIMM pair 4A/5A.

If a DIMM rank on either of the SMI buses exceeds its correctable ECC threshold, then the contents of the failing DIMM ranks are copied to the spare DIMM ranks. Once the copy is complete, all memory accesses to the previous failing DIMM ranks go to the spare DIMM ranks.

No performance penalty occurs for rank-sparing, other than the time it takes to copy the data from the failing rank to the spare rank upon an error condition.

The following population rules apply to each memory cartridge. Begin with the DIMM installation guidelines (on page 49) with these additional constraints:

- All installed processors must contain a valid sparing configuration.
- If installing mixed rank DIMMs in a memory controller, follow the mixed rank installation rules of the DIMM installation guidelines (on page 49).
- Rank sparing requires that the spare ranks of the DIMM pair 4A/5A be at least as large as any other DIMM rank on the DDR3 channels of a memory controller. To determine the size of a single rank in a DIMM, divide the total DIMM size by the number of ranks.

  For example, the rank size of a dual-rank 2-GB DIMM is 1 GB and the rank size of a dual-rank 4-GB DIMM is 2 GB. Therefore, it is possible to support rank sparing with mixed DIMM pair sizes on a memory controller if the 4A/5A pair is populated with the 4-GB DIMMs and the other pairs are populated with either the identical 4-GB or 2-GB DIMMs (all pairs on a memory controller are not required to be populated). In this case, the 2-GB rank size of the 4-GB DIMMs in the 4A/5A pair is equal to or greater than the rank size of the other installed DIMMs.

  However, the server cannot support DIMM sparing in this example if the 2-GB DIMMs are populated in the 4A/5A pair locations and the 4-GB DIMMs are populated in any of the remaining DIMM pair locations on the same memory controller. This configuration violates the rule requiring that the spare rank size of DIMM pair 4A/5A (1 GB) be equal to or larger than the single rank size of the other DIMM pair locations, since the rank size of a 4-GB DIMM in pairs B, C, D, E, F, or G would be larger (2 GB) than the spare rank size of the 2-GB DIMM pair in 4A/5A (1 GB).

Mirrored Memory population guidelines

Errors that are not corrected by ECC, SDDC, or DDDC cannot be corrected by Online Spare memory. By providing added redundancy in the memory sub-system, Mirrored Memory provides the greatest protection against memory failure beyond ECC, SDDC, DDDC, and Online Spare memory.

In Mirrored Memory mode, each Lockstep DIMM pair of a memory controller has a mirrored DIMM pair on the other memory controller of the same processor.

Upon detecting an uncorrectable memory error from a DIMM pair of a memory controller, the processor avoids a system crash by reading the mirrored DIMM pairs from the other memory controller. In this case, the system management routine disables the failed DIMM. Further memory reads and writes occur only on the mirrored DIMM pairs.

The exceptions to Mirrored Memory mode are the following:

- In Mirrored Memory mode, half of the memory is allocated to memory protection.
- The available memory bandwidth is reduced by up to 50% in this mode.
- Mirrored Memory mode, Online Spare mode, Hemisphere mode, and interleaving cannot be enabled simultaneously.

To configure memory for Mirrored Memory mode, observe these additional constraints:

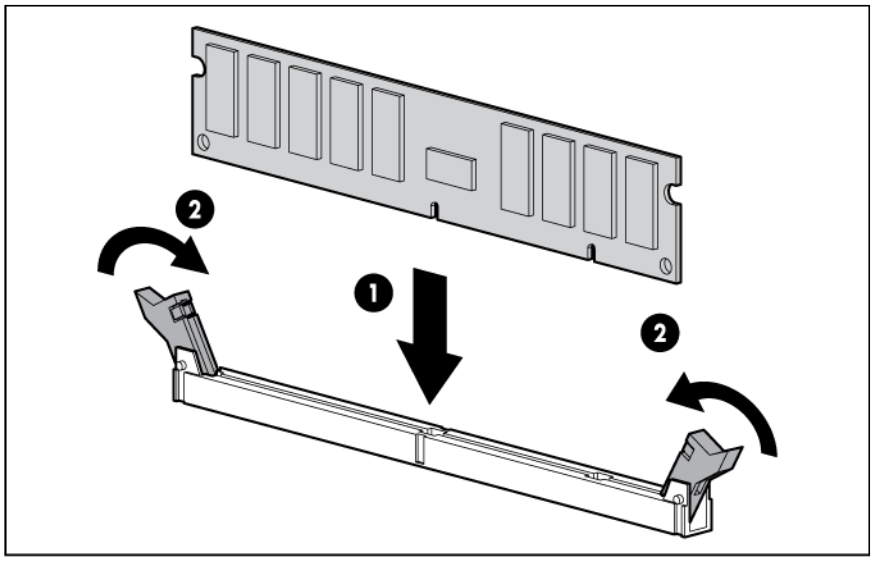
- For the server to support Mirrored Memory, all processors must have a valid mirroring configuration.
- The minimum allowable configuration is four DIMMs per processor.
- Both memory controllers for each processor must be populated with the same DIMM configurations.
- Although this configuration requirement is the same for Hemisphere mode and Mirrored Memory mode, only one of the two modes can be enabled at a given time.

Installing DIMMs (A-side)

To install the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Remove the access panel (A-side) (on page 18).
5. Do one of the following:
   - If installing processor 1 DIMMs, remove the right DIMM baffle (on page 20).
   - If installing processor 2 DIMMs, remove the left DIMM baffle (on page 19).
6. Open the DIMM slot latches.

7. Install the DIMM.



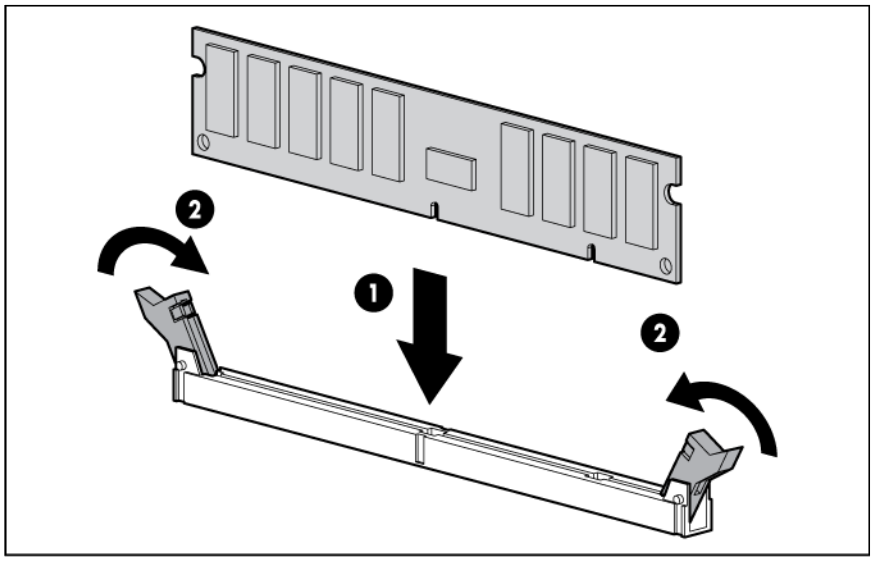
8. Do one of the following:
   - Install the right DIMM baffle.
   - Install the left DIMM baffle.
9. Install the access panel (A-side).
10. Install the server blade ("Installing a server blade" on page 32).
11. Power up the server blade (on page 16).

Installing DIMMs (B-side)

To install the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Remove the access panel (B-side) (on page 18).
5. Do one of the following:
   - If installing processor 3 DIMMs, remove the right DIMM baffle (on page 20).
   - If installing processor 4 DIMMs, remove the left DIMM baffle (on page 19).
6. Open the DIMM slot latches.

7. Install the DIMM.



8. Do one of the following:
   - Install the right DIMM baffle.
   - Install the left DIMM baffle.
9. Install the access panel (B-side).
10. Install the server blade ("Installing a server blade" on page 32).
11. Power up the server blade (on page 16).

Hot-plug SAS or SATA hard drive option

IMPORTANT: To avoid improper operation, install only hot-plug hard drives in this server blade.

IMPORTANT: The following configurations are not supported:
- Installation of both SAS and SATA hard drives in a single RAID volume
- Installation of SSD and rotating media hard drives in a single RAID volume

A Smart Array P410i controller supports either four hot-plug SAS or four hot-plug SATA hard drives. Hard drive activity is indicated by the hard drive LEDs on the hard drives.

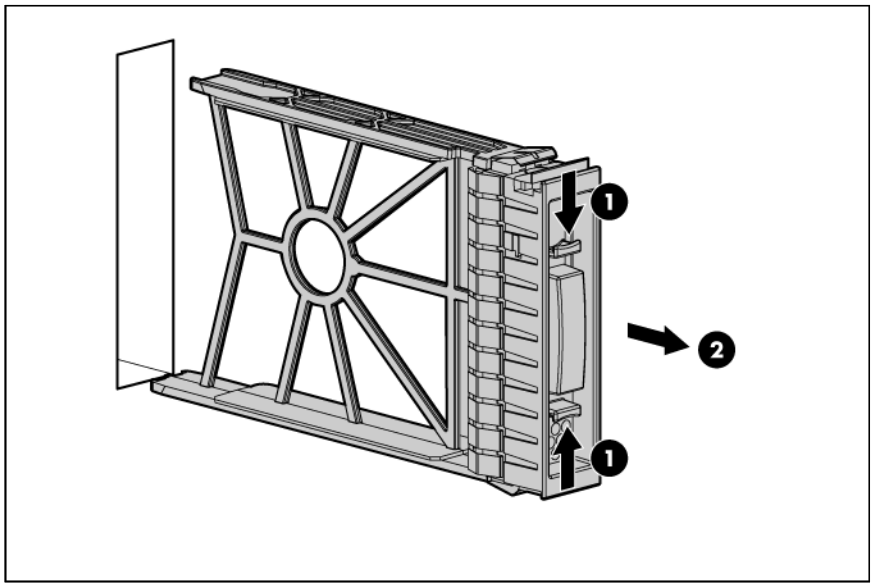
RAID 0 and 1 are supported and do not require a cache module to be installed.

RAID 1+0, 5, and 6 require a cache module. In addition, RAID 6 is supported by adding a cache option and the SmartArray Advanced Pack.

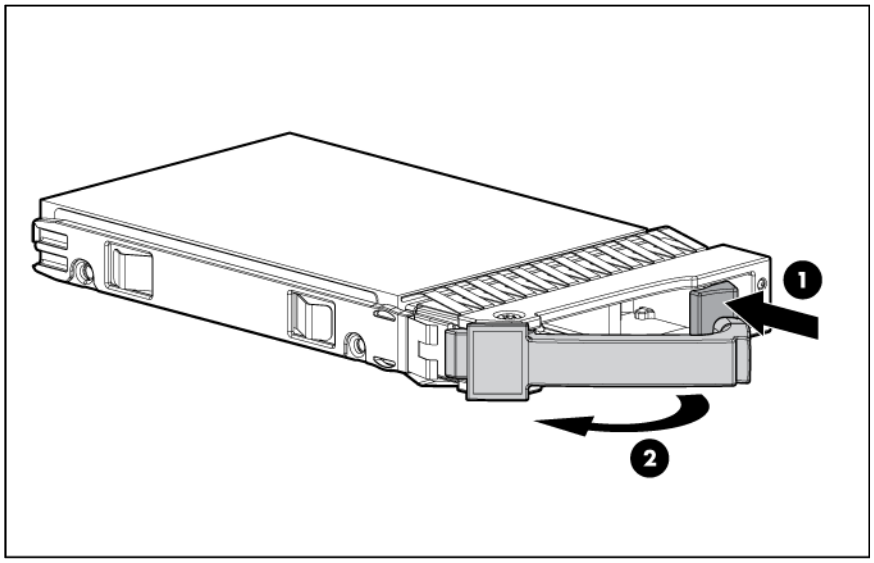
CAUTION: To prevent improper cooling and thermal damage, do not operate the server blade or the enclosure unless all hard drive and device bays are populated with either a component or a blank.

To install the component:

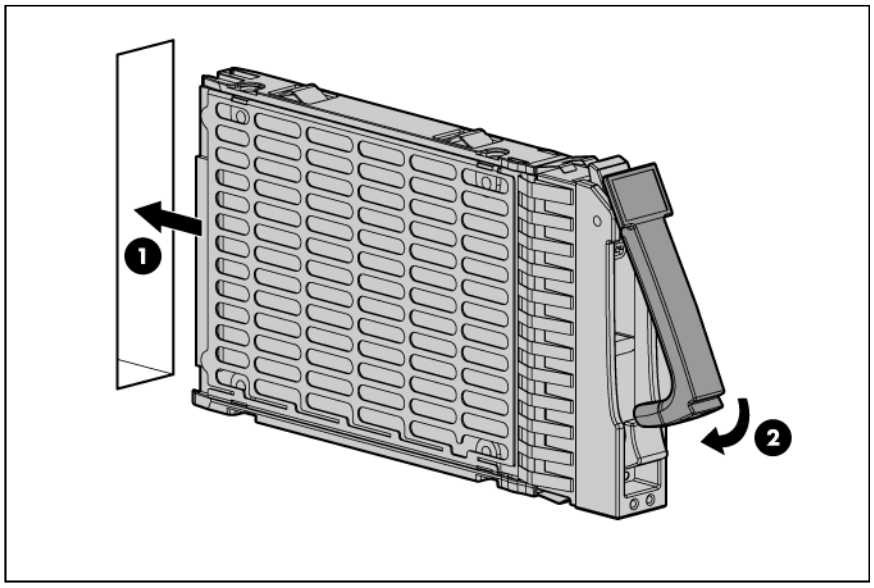
1. Remove the hard drive blank.



2. Prepare the hard drive.



3. Install the hard drive.



4. Determine the status of the hard drive from the hot-plug hard drive LEDs ("SAS and SATA hard drive LEDs" on page 8).
5. Resume normal server blade operations.

Mezzanine card option

Optional mezzanine cards provide additional network connectivity or provide Fibre Channel support.

- The A-side of the server blade contains mezzanine connectors 1, 2, and 3. For A-side mezzanine card locations, see "System board components (A-side) (on page 9)."
- The B-side of the server blade contains mezzanine connectors 4, 5, 6, and 7. For B-side mezzanine card locations, see "Interposer board components (on page 12)."

For mezzanine card signal mapping, see "Interconnect bay numbering and device mapping (on page 30)" and the installation instructions that ship with the server blade.

Optional mezzanine cards are classified as Type I mezzanine cards and Type II mezzanine cards. The card type determines where it can be installed in the server blade:

- Install a Type I mezzanine card on any mezzanine connector.
- Install a Type II mezzanine card on Mezzanine 2, 3, 4, and 6 connectors only.

Because mezzanine cards are supported on multiple server blade models, the mezzanine card may have captive screws that are not required to secure it to the server blade. When installing a mezzanine card in this server blade, only two captive screws are required.

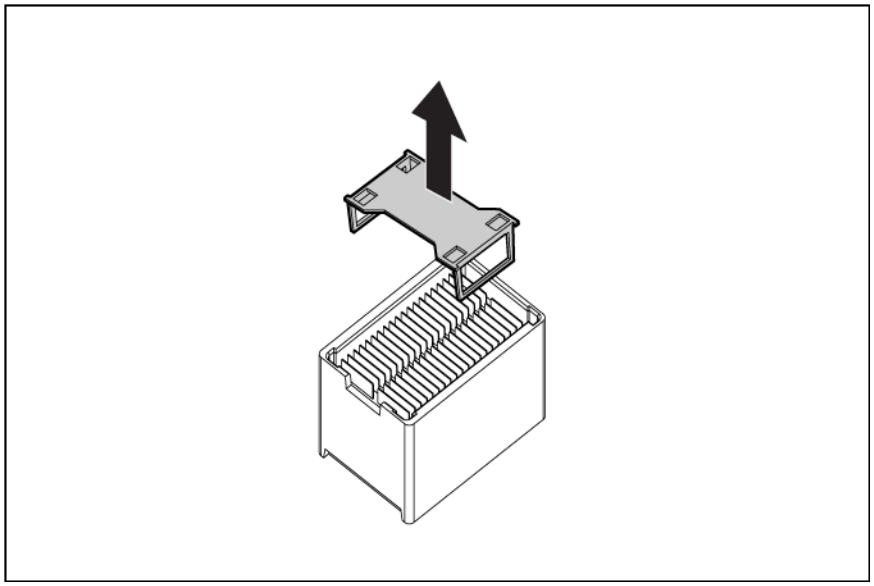
Installing a mezzanine card option (A-side)

⚠ **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: Always wear an antistatic wrist strap when working inside the server.

To install the component:

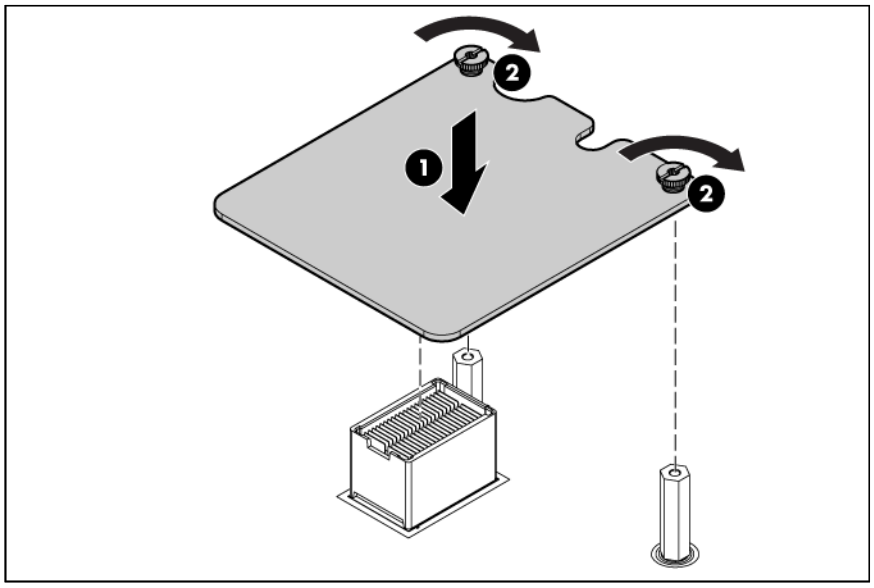
1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Remove the access panel (A-side).
5. Remove the mezzanine connector cover.



6. Align the mezzanine connector on the optional mezzanine card with the mezzanine connector on the system board.

CAUTION: To prevent damage to the server blade, apply pressure over the mezzanine connector when installing the mezzanine card. Do not apply pressure to the edges of the card.

7. Install the mezzanine card. Press down on the connector to seat the card.



8. Install the access panel (A-side).
9. Install the server blade ("Installing a server blade" on page 32).
10. Power up the server blade (on page 16).

Installing a mezzanine card option (B-side)

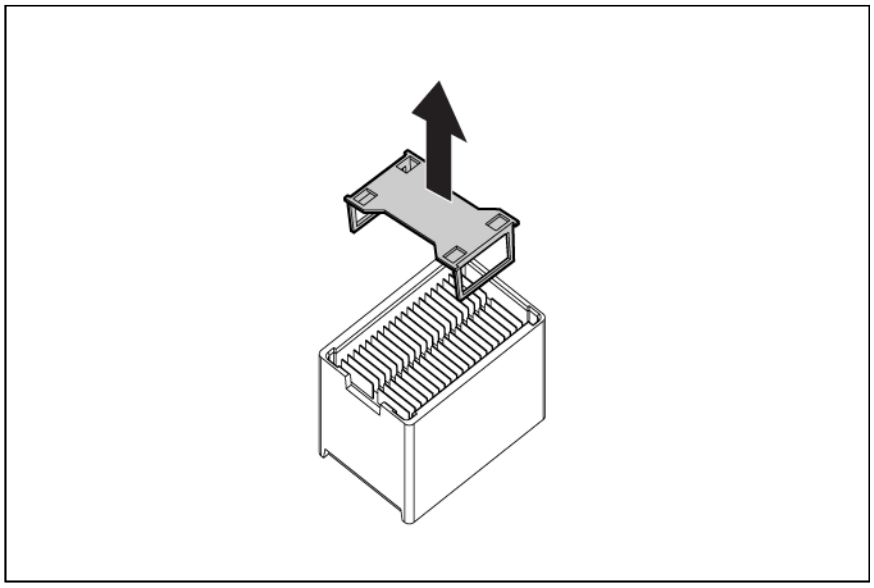
WARNING: To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

CAUTION: Always wear an antistatic wrist strap when working inside the server.

To install the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the correct side of the server blade facing up. To determine the correct side, see the label attached to the access panel.
4. Remove the access panel (B-side) (on page 18).
5. Remove the interposer board (on page 23).

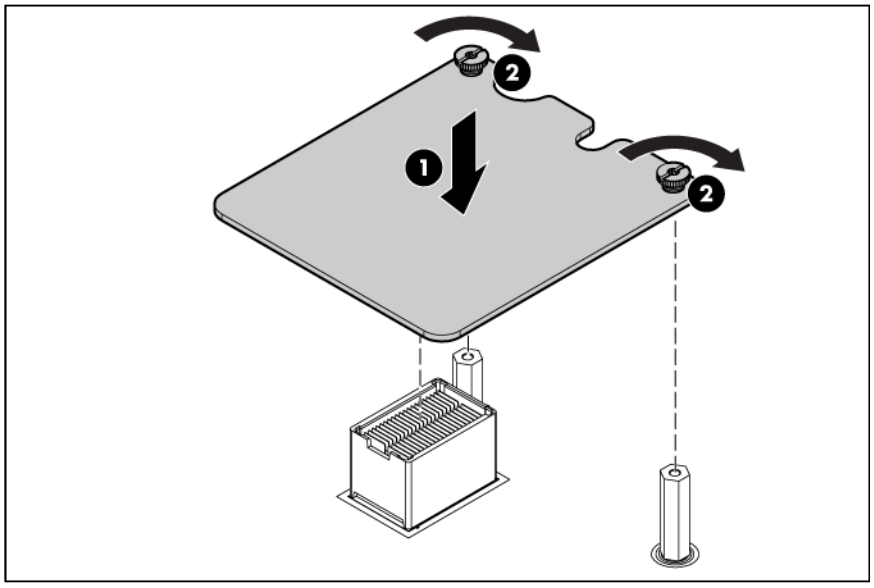
6. Remove the mezzanine connector cover.



7. Align the mezzanine connector on the optional mezzanine card with the mezzanine connector on the interposer board.

> **CAUTION:** To prevent damage to the server blade, apply pressure over the mezzanine connector when installing the mezzanine card. Do not apply pressure to the edges of the card.

8. Install the mezzanine card. Press down on the connector to seat the card.



9. Install the interposer board.
10. Install the access panel (B-side).
11. Install the server blade ("Installing a server blade" on page 32).
12. Power up the server blade (on page 16).

Controller options

The server blade ships with an embedded Smart Array P410i Controller. RAID 0 and 1 are supported and do not require a cache module to be installed. RAID 1+0, 5, and 6 require a cache module. In addition, RAID 6 is supported by adding a cache option and the SmartArray Advanced Pack. Upgrade options exist for the integrated array controller. For a list of supported options, see the QuickSpecs on the HP website (http://www.hp.com/support).

The server blade supports both of the following options. You can install up to two cache modules in any combination.

- Battery-backed write cache (BBWC) options

  BBWC consists of a cache module and a battery pack (also called a BBWC enabler). The DDR cache module buffers and stores data being written by the controller. When the system is powered on, the battery pack continuously recharges through a trickle-charging process lasting 15 minutes to 2 hours, depending on the original charge. In the event of system power failure, a fully charged battery pack can maintain the cached data for up to 72 hours. BBWC is available through optional Smart Array mezzanine controllers.

- Flash-backed write cache (FBWC) options

  FBWC consists of a cache module and a capacitor pack. The DDR cache module buffers and stores data being written by the controller. When the system is powered on, the capacitor pack charges fully in about 5 minutes. In the event of a system power failure, a fully charged capacitor pack provides power for up to 80 seconds. During that interval, the controller transfers the cached data from DDR memory to flash memory, where the data remains indefinitely or until a controller retrieves the data. FBWC is available as an optional upgrade to the embedded P410i Controller or through optional Smart Array mezzanine controllers.



CAUTION: Do not use this controller with cache modules designed for other controller models, because the controller can malfunction and you can lose data. Also, do not transfer this cache module to a different controller module, because you can lose data.



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



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



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

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

Installing a cache module

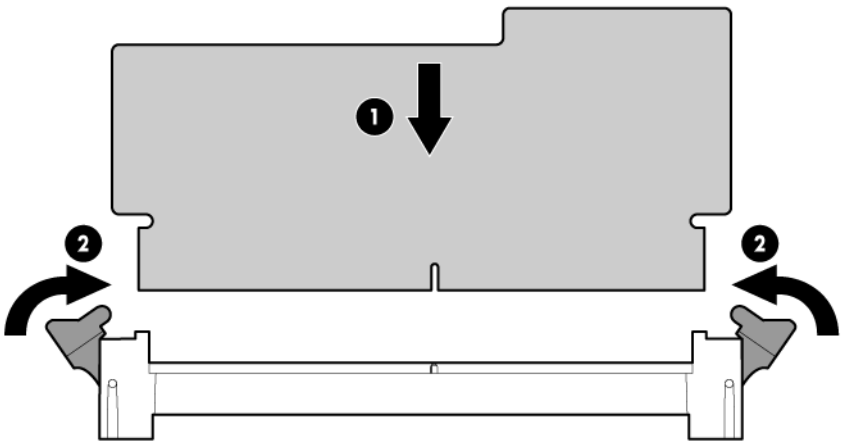
CAUTION: To prevent a server blade malfunction or damage to the equipment, do not add or remove the battery pack while an array capacity expansion, RAID level migration, or stripe size migration is in progress.

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

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

To install the component:

1. Close all applications, and power down the server blade (on page 16). This procedure flushes all data from the cache.
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the A-side of the server blade facing up. To determine which side is the A-side, see the label attached to the access panel.
4. Remove the access panel (A-side) (on page 18).
5. Locate the cache module connector ("System board components (A-side)" on page 9).
6. Install the cache module.



7. Install the capacitor pack ("Installing a capacitor pack" on page 67).
8. Install the access panel (A-side).
9. Install the server blade ("Installing a server blade" on page 32).
10. Power up the server blade (on page 16).

Installing a capacitor pack

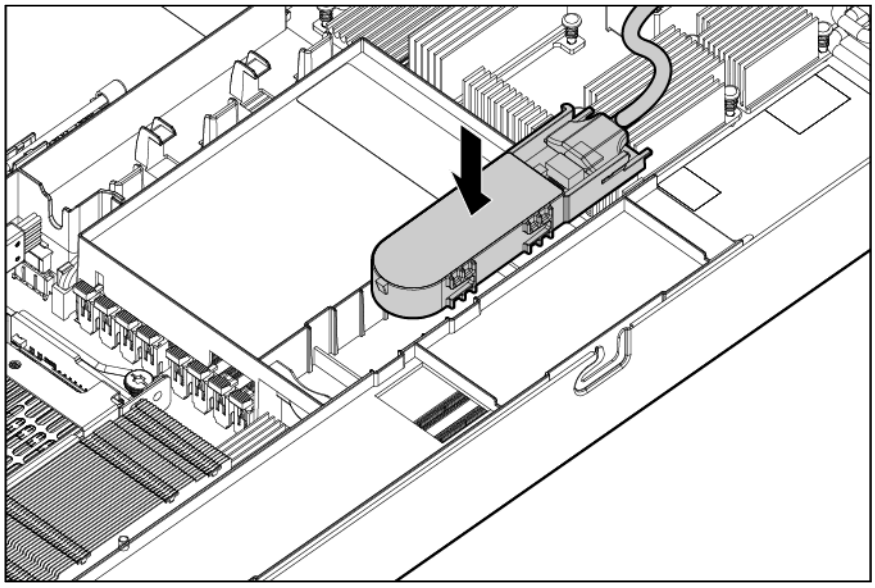
CAUTION: To prevent a server blade malfunction or damage to the equipment, do not add or remove the battery pack while an array capacity expansion, RAID level migration, or stripe size migration is in progress.

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

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

To install the component:

1. Close all applications, and power down the server blade (on page 16). This procedure flushes all data from the cache.
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the A-side of the server blade facing up. To determine which side is the A-side, see the label attached to the access panel.
4. Remove the access panel (A-side) (on page 18).
5. Install the cache module ("Installing a cache module" on page 66).
6. Install the capacitor pack.



7. Install the access panel (A-side).
8. Install the server blade ("Installing a server blade" on page 32).
9. Power up the server blade (on page 16).

HP Trusted Platform Module option

Use these instructions to install and enable a TPM on a supported server blade. This procedure includes three sections:

1. Installing the Trusted Platform Module board.
2. Retaining the recovery key/password (on page 69).
3. Enabling the Trusted Platform Module (on page 70).

   Enabling the TPM requires accessing the ROM-Based Setup Utility (RBSU) ("HP ROM-Based Setup Utility" on page 82). For more information about RBSU, see the HP website (http://www.hp.com/support/smartstart/documentation).

TPM installation requires the use of drive encryption technology, such as the Microsoft® Windows® BitLocker™ Drive Encryption feature. For more information on BitLocker™, see the Microsoft website (http://www.microsoft.com).

CAUTION: Always observe the guidelines in this document. Failure to follow these guidelines can cause hardware damage or halt data access.

When installing or replacing a TPM, observe the following guidelines:

- Do not remove an installed TPM. Once installed, the TPM becomes a permanent part of the system board.
- When installing or replacing hardware, HP service providers cannot enable the TPM or the encryption technology. For security reasons, only the customer can enable these features.
- When returning a system board for service replacement, do not remove the TPM from the system board. When requested, HP Service provides a TPM with the spare system board.
- Any attempt to remove an installed TPM from the system board breaks or disfigures the TPM security rivet. Upon locating a broken or disfigured rivet on an installed TPM, administrators should consider the system compromised and take appropriate measures to ensure the integrity of the system data.
- When using BitLocker™, always retain the recovery key/password. The recovery key/password is required to enter Recovery Mode after BitLocker™ detects a possible compromise of system integrity.
- HP is not liable for blocked data access caused by improper TPM use. For operating instructions, see the encryption technology feature documentation provided by the operating system.

Installing the Trusted Platform Module board

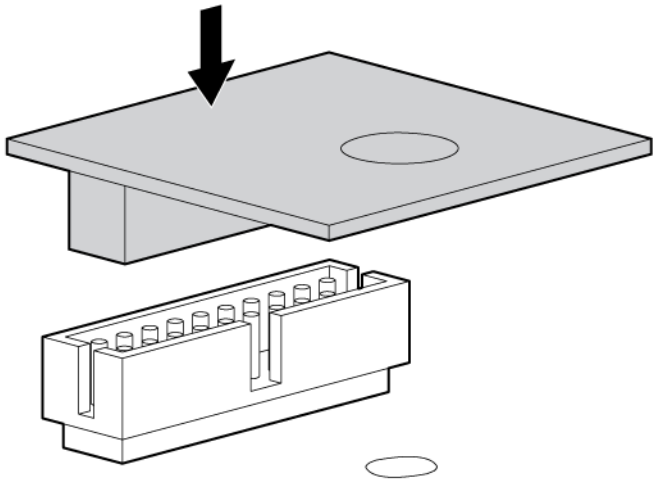
WARNING: To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

IMPORTANT: To avoid damage to the server blade, support the riser board when installing the TPM board and rivet.

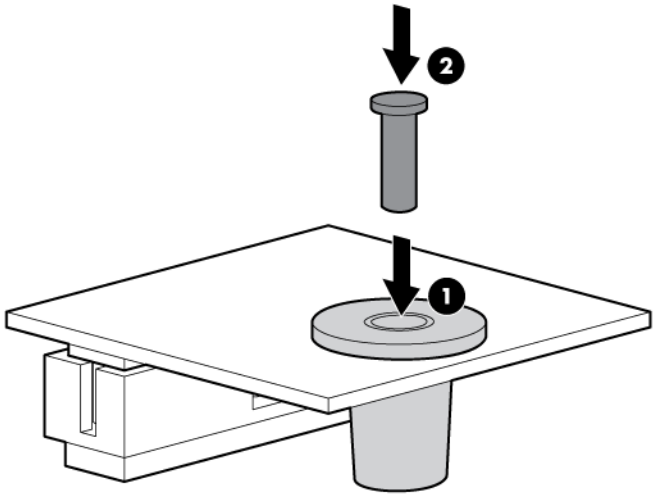
1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the A-side of the server blade facing up. To determine the A-side, see the label attached to the access panel.
4. Remove the access panel (A-side) (on page 18).

△ **CAUTION:** Any attempt to remove an installed TPM from the system board breaks or disfigures the TPM security rivet. Upon locating a broken or disfigured rivet on an installed TPM, administrators should consider the system compromised and take appropriate measures to ensure the integrity of the system data.

5. Install the TPM board. Press down on the connector to seat the board ("System board components (A-side)" on page 9).



6. Install the TPM security rivet by pressing the rivet firmly into the system board.



7. Install the access panel (A-side).
8. Install the server blade ("Installing a server blade" on page 32).
9. Power up the server blade (on page 16).

Retaining the recovery key/password

The recovery key/password is generated during BitLocker™ setup, and can be saved and printed after BitLocker™ is enabled. When using BitLocker™, always retain the recovery key/password. The recovery

key/password is required to enter Recovery Mode after BitLocker™ detects a possible compromise of system integrity.

To help ensure maximum security, observe the following guidelines when retaining the recovery key/password:

- Always store the recovery key/password in multiple locations.
- Always store copies of the recovery key/password away from the server blade.
- Do not save the recovery key/password on the encrypted hard drive.

Enabling the Trusted Platform Module

1. When prompted during the start-up sequence, access RBSU by pressing the **F9** key.
2. From the Main Menu, select **Server Security**.
3. From the Server Security Menu, select **Trusted Platform Module**.
4. From the Trusted Platform Module Menu, select **TPM Functionality**.
5. Select **Enable**, and then press the **Enter** key to modify the TPM Functionality setting.
6. Press the **Esc** key to exit the current menu, or press the **F10** key to exit RBSU.
7. Reboot the server blade.
8. Enable the TPM in the OS. For OS-specific instructions, see the OS documentation.

△ **CAUTION:** When a TPM is installed and enabled on the server blade, data access is locked if you fail to follow the proper procedures for updating the system or option firmware, replacing the system board, replacing a hard drive, or modifying OS application TPM settings.

For more information on firmware updates and hardware procedures, see the *HP Trusted Platform Module Best Practices White Paper* on the HP website (http://www.hp.com/support).

For more information on adjusting TPM usage in BitLocker™, see the Microsoft website (http://technet.microsoft.com/en-us/library/cc732774.aspx).

Server updates with an HP Trusted Platform Module and BitLocker™ enabled

When a TPM is installed and enabled in RBSU, and when the Microsoft® Windows® BitLocker™ Drive Encryption feature is enabled, always disable BitLocker™ before performing any of the following procedures:

- Restarting the computer for maintenance without a PIN or startup key
- Updating firmware
- Upgrading critical early boot components
- Upgrading the system board to replace or remove the TPM
- Disabling or clearing the TPM
- Moving a BitLocker™-protected drive to another server blade
- Adding an optional PCI device, such as a storage controller or network adapter

Additional TPM features

The following features are supported by Intel® Xeon® E7 family processors and require a TPM to be present:

- Intel AES-NI is a processor-assisted AES encryption, supported by Intel Xeon E7 family processors, that makes enabled encryption software faster and stronger, and offers better data protection. With this technology, the encryption and decryption times are greatly reduced. AES-NI is enabled by default and requires a TPM to be present.
- Intel TXT is a hardware solution, supported by Intel Xeon E7 family processors, that validates the behavior of key software within a server at startup. The server blade will support this feature with a future planned firmware upgrade. The server checks the hardware and software consistency behaviors at launch time against a known good sequence. Using this verification process, the server can quickly assess whether any attempts have been made to alter or tamper with the launch time environment. TXT is enabled by default, and requires a TPM to be present.

Cabling

Using the HP c-Class Blade SUV Cable

The HP c-Class Blade SUV Cable enables the user to perform server blade administration, configuration, and diagnostic procedures by connecting video and USB devices directly to the server blade. For SUV cable connectors, see "HP c-Class Blade SUV Cable (on page 14)."

Connecting locally to a server blade with video and USB devices

Use the local I/O cable to connect a monitor and any of the following USB devices:

- USB hub
- USB keyboard
- USB mouse
- USB CD/DVD-ROM drive
- USB diskette drive
- USB drive key

Numerous configurations are possible. This section offers two possible configurations. For more information, see "USB support and functionality (on page 87)."

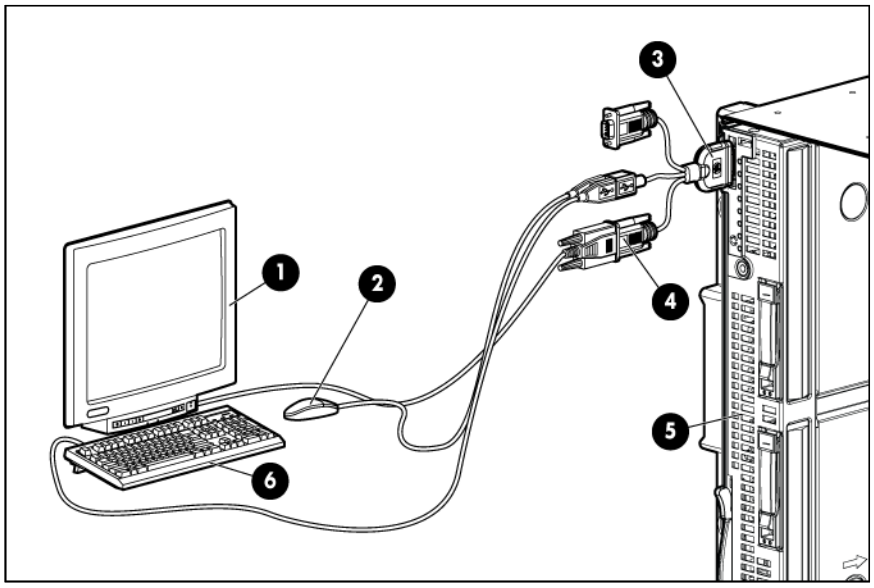
Accessing a server blade with local KVM

△ **CAUTION:** Before disconnecting the SUV cable from the connector, always squeeze the release buttons on the sides of the connector. Failure to do so can result in damage to the equipment.

NOTE: For this configuration, a USB hub is not necessary. To connect additional devices, use a USB hub.

1. Connect the SUV cable to the server blade.
2. Connect the video connector to a monitor.
3. Connect a USB mouse to one USB connector.

4. Connect a USB keyboard to the second USB connector.



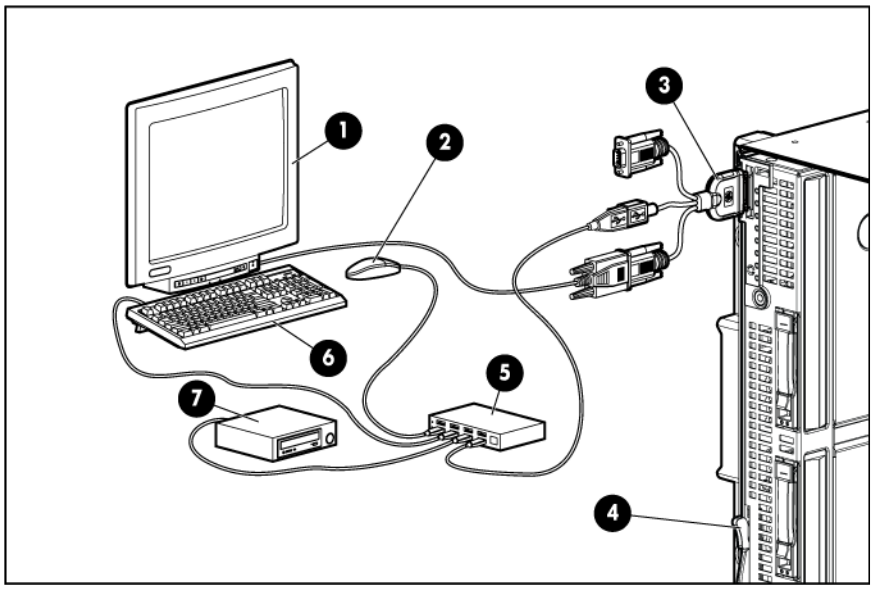
Item	Description
1	Monitor
2	USB mouse
3	HP c-Class Blade SUV Cable
4	Video connector
5	Server blade
6	USB keyboard

Accessing local media devices

Use the following configuration when configuring a server blade or loading software updates and patches from a USB CD/DVD-ROM or a USB diskette.

1. Connect the SUV cable to the server blade.
2. Connect the video connector to a monitor.
3. Connect a USB hub to one USB connector.
4. Connect the following to the USB hub:
   - USB CD/DVD-ROM drive
   - USB keyboard
   - USB mouse
   - USB diskette drive

NOTE: Use a USB hub when connecting a USB diskette drive and/or USB CD-ROM drive to the server blade. The USB hub provides additional connections.



Item	Description
1	Monitor
2	USB mouse
3	HP c-Class Blade SUV Cable
4	Server blade
5	USB hub
6	USB keyboard
7	USB CD/DVD-ROM drive or diskette drive

Software and configuration utilities

Server blade deployment tools

HP BladeSystem c-Class Advanced management

iLO 3 is a standard component of ProLiant c-Class server blades that provides server health and remote server blade manageability. Its features are accessed from a network client device using a supported web browser. In addition to other features, iLO 3 provides keyboard, mouse, and video (text and graphics) capability for a server blade, regardless of the state of the host OS or host server blade.

iLO 3 includes an intelligent microprocessor, secure memory, and a dedicated network interface. This design makes iLO 3 independent of the host server blade and its OS. iLO 3 provides remote access to any authorized network client, sends alerts, and provides other server blade management functions.

Using a supported web browser, you can:

- Remotely access the console of the host server blade, including all text mode and graphics mode screens with full keyboard and mouse controls.
- Remotely power up, power down, or reboot the host server blade.
- Remotely boot a host server blade to a virtual media image to perform a ROM upgrade or install an OS.
- Send alerts from iLO 3 regardless of the state of the host server blade.
- Access advanced troubleshooting features provided by iLO 3.
- Launch a web browser, use SNMP alerting, and diagnose the server blade with HP SIM.
- Configure static IP bay settings for the dedicated iLO 3 management NICs on each server blade in an enclosure for faster deployment.

To connect to the server blade using iLO 3, install the server blade in an enclosure. Onboard Administrator assigns an IP address to enable iLO 3 connectivity to the server blade.

The c-Class tab enables you to control specific settings for the HP BladeSystem. iLO 3 also provides web-based status for the HP BladeSystem configuration.

For detailed information about iLO 3, refer to the *HP Integrated Lights-Out User Guide* on the HP website (http://www.hp.com/servers/lights-out).

Network-based PXE deployment

PXE is a component of the Intel® WfM specification. The PXE model enables server blades to load and execute an NBP from a PXE server and to execute a pre-configured image. The image can be an OS image created by software utilities or a boot diskette image. This feature enables a user to configure a server blade and install an OS over a network.

Deployment overview

When a PXE-enabled target server blade boots, it obtains an IP address from a DHCP server. The target server blade obtains the name of the NBP from the appropriate boot server. Then, the target server blade uses TFTP to download the NBP from the boot server and executes the image.

IMPORTANT: To connect to a network with a Pass-Thru module, always connect the Pass-Thru module to a network device that supports Gigabit speed.

For each server blade being deployed, the PXE server must be connected to the NIC designated for PXE. The server blade defaults PXE functions to NIC 1, but any of the NC series NICs in the server blade can be designated for PXE in RBSU. For NIC connector locations, refer to the documentation included with the server blade.

NOTE: Actual NIC numeration depends on several factors, including the OS installed on the server blade.

To deploy an OS to multiple server blades, install a PXE deployment server on a network.

Deployment infrastructure

IMPORTANT: To connect to a network with a Pass-Thru module, always connect the Pass-Thru module to a network device that supports Gigabit speed.

To establish a network-based PXE deployment infrastructure, provide the following software and minimum hardware:

- Client PC (administrative workstation)
  - AMD Athlon™ XP processor (700 MHz or greater recommended), AMD Athlon™ 64 processor, or Intel® Pentium® III or higher processor (700 MHz or greater recommended)
  - 128 MB of RAM
  - Microsoft® Windows® 2000 Professional or Microsoft® Windows® XP OS
  - Microsoft® Internet Explorer 5.5 or above with 128-bit encryption
  - Ethernet NIC with 10/100 RJ-45 connector
  - TCP/IP networking and an IP address compatible with one of the following: the iLO 3 Diagnostic Port IP address or an assigned DHCP or static IP address
  - CD-ROM drive, CD/DVD-ROM drive, and/or diskette drive
  - Any of the following Java™ Runtime Environment versions:

    1.3.1_02

    1.3.1_07

    1.3.1_08

    1.4.1 for Windows® users only

    1.4.2 for Linux users only

    Access the Java™ Runtime Environment versions at the HP website (http://java.sun.com/products/archive/index.html).
- DHCP server (IP address assignment)
  - AMD Athlon™ XP processor (700 MHz or greater recommended), AMD Athlon™ 64 processor, or Intel® Pentium® or Pentium® II 200-MHz or faster processor

- 64 MB of RAM
- 64 MB of free hard drive space
- 10-Mb/s network adapter

- PXE deployment server (storing boot images)
  - AMD Athlon™ XP processor (700 MHz or greater recommended), AMD Athlon™ 64 processor, or Intel® Pentium® III or higher processor (500 MHz recommended)
  - 256 MB of RAM
  - 10-Mb/s network adapter
  - CD-ROM drive
- Windows® repository server (Windows® or Linux deployment)
  - Windows® 2000 or Windows Server® 2003 OS installed
  - Network connection
  - CD-ROM drive
  - 1.5 GB of available disk space
  - TCP/IP networking and an IP address compatible with one of the following: the iLO 3 Diagnostic Port IP address or an assigned DHCP or static IP address
  - CD-ROM drive and/or diskette drive
  - Any of the following Java™ Runtime Environment versions:

    1.3.1_02

    1.3.1_07

    1.3.1_08

    1.4.1 for Windows® users only

    1.4.2 for Linux users only

    Access the Java™ Runtime Environment versions at the HP website (http://java.sun.com/products/archive/index.html).
- Network server with an OS installed

Deployment methods

Four primary deployment methods are supported:



IMPORTANT: To deploy a server blade without the HP Insight Control server deployment, create a bootable diskette or image of a bootable diskette.

- PXE deployment (on page 78)
- CD-ROM deployment (on page 78)
- Diskette image deployment (on page 79)
- SAN configuration (on page 80)

PXE deployment

PXE enables server blades to load an image over the network from a PXE server, and then execute it in memory. The first NIC on the server blade is the default PXE boot NIC, but any of the other NC series NICs can be configured to boot PXE. For more information, see "Network-based PXE deployment (on page 75)."

Actual NIC numeration depends on several factors, including the OS installed on the server blade.

HP recommends using one of the following methods for PXE deployment:

- HP Insight Control server deployment (formerly Rapid Deployment Pack)

HP Insight Control is essential server management that unlocks the management capabilities built into HP ProLiant servers. Insight Control delivers powerful capabilities that enable customers to proactively manage ProLiant server health - whether physical or virtual, deploy ProLiant servers quickly, optimize power consumption, and control ProLiant servers from anywhere.

HP Insight Control server deployment is a key component of Insight Control which provides an automated, simple-to-use solution for bare-metal deployment and configuration of HP ProLiant servers with an operating system or virtualization platform. Insight Control server deployment includes an unaltered Altiris Deployment Solution while providing optimization for deployment of HP ProLiant servers using HP ProLiant Integration Module.

HP Insight Control facilitates the installation, configuration, and deployment of high-volumes of servers through an intuitive, comprehensive console, using either scripting or imaging technology. It makes deploying a server as easy as selecting one, a few, or hundreds of target servers, selecting predefined images or scripts, and clicking **Run**.

For more information about HP Insight Control, see the HP website (http://www.hp.com/go/insightcontrol).

- SmartStart Scripting Toolkit

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

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 deployment, making it possible to scale rapid, high-volume server deployments.

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

CD-ROM deployment

CD-ROM deployment involves using a bootable CD that executes scripts to configure the hardware and install the OS. After the OS is configured, the server blade can access the network to locate the scripts and files necessary for deployment. Before beginning the deployment process, connect the server blade to the network.

> **NOTE:** For more information about hardware and cabling configurations, see the documents that ship with the enclosure.

Two methods are available for CD-ROM deployment:

- iLO virtual CD-ROM (on page 79)

- USB CD-ROM (on page 79)

iLO virtual CD-ROM

To deploy with a boot CD:

1. Do one of the following:
   - Insert the boot CD into the client PC using the iLO 3 Remote Console.
   - Use iLO 3 to create an image file of the boot CD.
   - Copy the image of the boot CD to a location on the network or the client PC hard drive.
2. Remotely access the server blade through iLO 3. See "HP BladeSystem c-Class advanced management (on page 75)."
3. Open Integrated Remote console or Java Remote console.
4. Select the local CD-ROM or image file from the Virtual Drives menu, located at the top of the screen.
5. Connect the Virtual CD-ROM to the server blade.
6. Use the iLO 3 power switch feature to reboot the server blade.
7. After the server blade boots, follow the normal network installation procedure for the OS.

USB CD-ROM

This method uses SmartStart to facilitate loading the OS. However, SmartStart also allows for manual loading of the OS and drivers.

To deploy with a boot CD:

1. Use the HP c-Class Blade SUV Cable to connect a USB CD-ROM drive to the server blade. Refer to "Connecting locally to a server blade with video and USB devices (on page 72)."
2. Insert the boot CD into the USB CD-ROM drive.
3. Reboot the server blade.
4. After the server blade boots, follow the normal installation procedure for an OS.

Windows Server® 2003 cannot be installed from a USB CD-ROM on the HP c-Class Blade SUV Cable if the hard drive is completely blank (no partitions defined). To install Windows Server® 2003, use one of the following methods:

- Make a partition on the hard drive that Windows Server® 2003 will be loaded on.
- Use the SmartStart CD 7.60 or later.
- Use the Rapid Deployment Pack. For instructions, see the HP website (http://h18013.www1.hp.com/products/servers/management/rdp.html?jumpid=reg_R1002_USEN).

Diskette image deployment

To deploy with a diskette image, the user creates a DOS-based network-enabled boot diskette that executes a script that configures the hardware and installs the OS. The diskette enables the server blade to access the required deployment scripts and files on the network.

This method implies a deployment infrastructure that may include an administrator workstation, PXE server, Microsoft® Windows® file share, or a Linux file share. For more information, refer to "Deployment infrastructure (on page 76)."

Before beginning the deployment process, connect the server blade to the network.

NOTE: For more information about hardware and cabling configurations, see the documents that ship with the enclosure.

Two methods are available for diskette image deployment:

- iLO virtual floppy (on page 80)
- PXE ("PXE deployment" on page 78)

Creating a boot diskette

The SmartStart Scripting Toolkit provides the tools and information for creating a boot diskette. For details, refer to the *SmartStart Scripting Toolkit User Guide* and download the latest version of the software from the HP website (http://www.hp.com/servers/sstoolkit).

As an alternative method, configure the hardware manually with RBSU and the iLO 3 remote console. With this method, the disk is more generic and integrates with an existing network OS installation process. For more information, refer to "HP BladeSystem c-Class advanced management (on page 75)."

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

iLO virtual floppy

To deploy with a boot diskette:

1. Do one of the following:
   - Insert the boot diskette into the client PC using the iLO 3 Remote Console.
   - Use iLO 3 to create an image file of the boot diskette.
   - Copy the image of the boot diskette to a location on the network or the client PC hard drive.
2. Remotely access the server blade through iLO 3. See "HP BladeSystem c-Class advanced management (on page 75)."
3. Open Integrated Remote Console or Java Remote Console.
4. Select the local diskette or image file from the Virtual Drives menu, located at the top of the screen.
5. Connect the Virtual floppy to the server blade.
6. Use the iLO 3 power switch feature to reboot the server blade.
7. After the server blade boots, follow the normal network installation procedure for the OS.

SAN configuration

The server blade provides FC support for SAN implementations. This solution uses an optional FCA that offers redundant SAN connectivity and optimization for HP StorageWorks products. The server blade is also compatible with certain third-party SAN products. For more information, refer to the documentation that ships with the FCA option.

For optimal SAN connectivity, observe the following guidelines:

- The FCA option is installed correctly in the server blade. Refer to the documentation that ships with the FCA option.
- An FC-compatible interconnect is installed in the enclosure. Refer to the documentation that ships with the interconnect option.

- The server blade enclosure management module firmware is up-to-date. Refer to the HP Business Support Center website (http://www.hp.com/support).
- The server blade is cabled properly to a supported SAN.
- SAN storage drivers are loaded. Refer to supporting white papers and the HP website (http://www.hp.com/servers/rdp).

For SAN configuration information for the server blade, refer to the *HP StorageWorks SAN Design Reference Guide* on the HP website (http://h18000.www1.hp.com/products/storageworks/san/documentation.html).

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:

- 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 88)
- 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 84) and Erase Utility (on page 86)

SmartStart is included in the HP Insight Foundation suite for ProLiant. For more information about SmartStart software, see the HP Insight Foundation suite for ProLiant or the HP website (http://www.hp.com/go/foundation).

SmartStart Scripting Toolkit

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

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 deployment, making it possible to scale rapid, high-volume server deployments.

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

HP ROM-Based Setup Utility

RBSU is a configuration utility embedded in ProLiant servers that performs a wide range of configuration activities that can include the following:

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

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

Using RBSU

To use RBSU, use the following keys:

- To access RBSU, press the **F9** key during power-up when prompted.
- To navigate the menu system, use the arrow keys.
- To make selections, press the **Enter** key.
- To access Help for a highlighted configuration option, press the **F1** key.

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

Default configuration settings are applied to the server at one of the following times:

- Upon the first system power-up
- After defaults have been restored

Default configuration settings are sufficient for proper typical server operation, but configuration settings can be modified using RBSU. The system will prompt you for access to RBSU with each power-up.

Auto-configuration process

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

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

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

Drives installed	Drives used	RAID level
1	1	RAID 0
2	2	RAID 1
3, 4, 5, or 6	3, 4, 5, or 6	RAID 5
More than 6	0	None

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

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

Boot options

Near the end of the boot process, the boot options screen is displayed. This screen is visible for several seconds before the system attempts to boot from a supported boot device. During this time, you can do the following:

- Access RBSU by pressing the **F9** key.
- Access the System Maintenance Menu (which enables you to launch ROM-based Diagnostics or Inspect) by pressing the **F10** key.
- Access the boot menu by pressing the **F11** key.
- Force a PXE Network boot by pressing the **F12** key.

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, see the *BIOS Serial Console User Guide* on the Documentation CD or the HP website (http://www.hp.com/support/smartstart/documentation).

Configuring AMP modes

Not all ProLiant servers support all AMP modes. RBSU provides menu options only for the modes supported by the server. Advanced memory protection within RBSU enables the following advanced memory.

- Advanced ECC Mode—Provides memory protection beyond Standard ECC. All single-bit failures and some multi-bit failures can be corrected without resulting in system downtime.
- Online Spare Mode—Provides protection against failing or degraded DIMMs. Certain memory is set aside as spare, and automatic failover to spare memory occurs when the system detects a degraded DIMM. DIMMs that are likely to receive a fatal/uncorrectable memory error are removed from operation automatically, resulting in less system downtime.

  See the server-specific user guide for DIMM population requirements.
- Mirrored Memory Mode—Provides protection against uncorrectable memory errors that would otherwise result in system failure. In this mode, the system maintains two copies of all data. If an uncorrectable memory error occurs, the system automatically retrieves the good data from the mirrored copy. The system continues to operate normally without any user intervention. If the system supports hot-plug memory, the failed memory can be replaced while the system continues to operate.

- RAID Memory Mode—Provides protection levels similar to Mirrored Memory Mode, and it requires less memory allocation than full redundancy.

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
- Beginning with ACU version 8.28.13.0, provides diagnostic functionality on the Diagnostics tab (formerly known as Array Diagnostics Utility).

For optimum performance, the minimum display settings are 1024 × 768 resolution and 16-bit color. Servers running Microsoft® operating systems require one of the following supported browsers:

- Internet Explorer 6.0 or later
- Mozilla Firefox 2.0 or later

For Linux servers, see the README.TXT file for additional browser and support information.

For more information, see the *Configuring Arrays on HP Smart Array Controllers Reference Guide* on the Documentation CD or the HP website (http://www.hp.com).

Option ROM Configuration for Arrays

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

The utility also provides support for the following functions:

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

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

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

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

Re-entering the server serial number and product ID

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

1. During the server blade startup sequence, press the **F9** key to access RBSU.
2. Select the **Advanced Options** menu.
3. Select **Service Options**.
4. Select **Serial Number**. The following warnings appear:

   ```
   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.

   Warning: The serial number should ONLY be modified by qualified personnel. This value should always match the serial number located on the chassis.
   ```
5. Press the **Enter** key to clear the warning.
6. Enter the serial number and press the **Enter** key.
7. Select **Product ID**. The following warning appears:

   ```
   Warning: The Product ID should ONLY be modified by qualified personnel. This value should always match the Product ID on the chassis.
   ```
8. Enter the product ID and press the **Enter** key.
9. Press the **Esc** key to close the menu.
10. Press the **Esc** key to exit RBSU.
11. Press the **F10** key to confirm exiting RBSU. The server blade automatically reboots.

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

The ROMPaq utility enables you to upgrade the system firmware (BIOS). To upgrade the firmware, insert a ROMPaq USB Key into an available USB port and boot the system. In addition to ROMPaq, Online Flash Components for Windows and Linux operating systems are available for updating the system firmware.

The ROMPaq utility checks the system and provides a choice (if more than one exists) of available firmware revisions.

For more information, see the Download drivers and software page for the server blade. To access the server-specific page, enter the following web address into the browser:

http://www.hp.com/support/*<servername>*

For example:

http://www.hp.com/support/dl360g6

iLO 3 Standard Blade Edition technology

The iLO 3 subsystem is a standard component of selected ProLiant servers that provides server health and remote server manageability. The iLO 3 subsystem includes an intelligent microprocessor, secure memory, and a dedicated network interface. This design makes iLO 3 independent of the host server and its operating system.

In addition to remote management features, iLO 3 is also responsible for managing the health of the ProLiant server. The intelligence of iLO 3 manages the Sea of Sensors thermal control, directs the Dynamic Power Capping technology, and monitors the health of server components.

The iLO 3 subsystem provides secure remote access from any authorized network client. The enhancements to iLO 3 enable customers to get work done faster by providing turbo-charged remote access performance, a streamlined user experience, and enhanced standards support.

Using iLO 3, you can do the following:

- Access a high-performance and secure Remote Console to the server from anywhere in the world.
- Use the shared iLO 3 Remote Console to collaborate with up to six server administrators.
- Remotely mount high-performance Virtual Media devices to the server.
- Securely and remotely control the power state of the managed server.
- Send alerts from iLO 3 regardless of the state of the host server.
- Access advanced troubleshooting features through the iLO 3 interface.

For more information about iLO 3 features (which may require an iLO Advanced Pack or iLO Advanced for BladeSystem license), see the iLO 3 documentation on the Documentation CD or on the HP website (http://www.hp.com/go/ilo).

Erase Utility

△ **CAUTION:** Perform a backup before running the System Erase Utility. The utility sets the system to its original factory state, deletes the current hardware configuration information, including array setup and disk partitioning, and erases all connected hard drives completely. Refer to the instructions for using this utility.

Run the Erase Utility if you must erase the system for the following reasons:

- You want to install a new operating system on a server blade with an existing operating system.
- You encounter an error when completing the steps of a factory-installed operating system installation.

To access the Erase Utility, use the System Erase button on the home screen of the SmartStart CD ("SmartStart software" on page 81).

Redundant ROM support

The server blade enables you to upgrade or configure the ROM safely with redundant ROM support. The server blade has a single ROM that acts as two separate ROM images. 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 and functionality

USB support

HP provides both standard USB 2.0 support and legacy USB 2.0 support. Standard support is provided by the OS through the appropriate USB device drivers. Before the OS loads, HP provides support for USB devices through legacy USB support, which is enabled by default in the system ROM.

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

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

Internal USB functionality

An internal USB connector is available for use with security key devices and USB drive keys. This solution provides for use of a permanent USB key installed in the internal connector, avoiding issues of clearance on the front of the rack and physical access to secure data.

External USB functionality

HP provides external USB support to enable local connection of USB devices for server blade administration, configuration, and diagnostic procedures. For more information, see "Using the HP c-Class Blade SUV Cable (on page 72)."

For additional security, external USB functionality can be disabled through RBSU. Disabling external USB support in RBSU disables the USB connectors on the HP c-Class Blade SUV Cable.

Internal SD support

An internal SD connector is available for use with embedded Hypervisors. This solution provides for use of a permanently installed SD card in the internal connector, decreasing the possibility of tampering or loss.

Diagnostic tools

HP Insight Diagnostics

HP Insight Diagnostics is a proactive server blade management tool, available in both offline and online versions, that provides diagnostics and troubleshooting capabilities to assist IT administrators who verify server blade 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 blade 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).

HP Insight Diagnostics survey functionality

HP Insight Diagnostics (on page 88) provides survey functionality that gathers critical hardware and software information on ProLiant server blades.

This functionality supports operating systems that may not be supported by the server blade. For operating systems supported by the server blade, see the HP website (http://www.hp.com/go/supportos).

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

Survey functionality is installed with every SmartStart-assisted HP Insight Diagnostics installation, or it can be installed through the HP PSP ("ProLiant Support Packs" on page 90).

NOTE: The current version of SmartStart provides the memory spare part numbers for the server blade. To download the latest version, see the HP website (http://www.hp.com/support).

Integrated Management Log

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

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

- From within HP SIM
- From within Survey Utility
- From within operating system-specific IML viewers
  - For NetWare: IML Viewer
  - For Windows®: IML Viewer
  - For Linux: IML Viewer Application
- From within the iLO 3 user interface
- From within HP Insight Diagnostics (on page 88)

For more information, see the Management CD in the HP Insight Foundation suite for ProLiant.

Remote support and analysis tools

HP Insight Remote Support software

HP strongly recommends that you install HP Insight Remote Support software to complete the installation or upgrade of your product and to enable enhanced delivery of your HP Warranty, HP Care Pack Service, or HP contractual support agreement. HP Insight Remote Support supplements your monitoring 24 x 7 to ensure maximum system availability by providing intelligent event diagnosis, and automatic, secure submission of hardware event notifications to HP, which will initiate a fast and accurate resolution, based on your product's service level. Notifications may be sent to your authorized HP Channel Partner for on-site service, if configured and available in your country. The software is available in two variants:

- HP Insight Remote Support Standard: This software supports server and storage devices and is optimized for environments with 1–50 servers. Ideal for customers who can benefit from proactive notification but do not need proactive service delivery and integration with a management platform.
- HP Insight Remote Support Advanced: This software provides comprehensive remote monitoring and proactive service support for nearly all HP servers, storage, network, and SAN environments, plus selected non-HP servers that have a support obligation with HP. It is integrated with HP Systems Insight Manager. A dedicated server is recommended to host both HP Systems Insight Manager and HP Insight Remote Support Advanced.

Details for both versions are available on the HP website (http://www.hp.com/go/insightremotesupport).

To download the software, go to Software Depot (http://www.software.hp.com).

Select **Insight Remote Support** from the menu on the right.

Keeping the system current

Drivers

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

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

If you are installing a SmartStart-supported OS, use the SmartStart software (on page 81) and its Assisted Path feature to install the OS and latest driver support.

If you are installing drivers from the SmartStart CD, be sure that you are using the latest SmartStart version that your server blade supports. To verify that your server blade is using the latest supported version, see the HP website (http://www.hp.com/support). For more information, see the documentation provided with the SmartStart CD.

If you do not use the SmartStart CD to install an OS, 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).

To directly locate the OS drivers for a particular server blade, enter the following web address into the browser:

http://www.hp.com/support/<*servername*>

In place of *<servername>*, enter the server name.

For example:

http://www.hp.com/support/dl360g6 (http://www.hp.com/support/dl360g6)

Version control

The VCRM and VCA are Web-enabled Insight Management Agents tools that HP SIM uses to facilitate and schedule software update tasks to the entire enterprise.

- VCRM manages the repository for Windows and Linux PSPs as well as online firmware. Administrators can browse a graphical view of the PSPs or configure VCRM to automatically update the repository with Internet downloads of the latest software from HP.
- VCA compares installed software versions and available updates. Administrators can configure VCA to point to a repository managed by VCRM.

For more information about version control tools, see the *HP Systems Insight Manager Help Guide* and the *Version Control User Guide* on the HP Systems Insight Manager website (http://www.hp.com/go/hpsim).

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

For information about specific versions of a supported operating system, refer to the operating system support matrix (http://www.hp.com/go/supportos).

Firmware

The Smart Update Firmware DVD is an organized firmware collection for ProLiant servers and options powered by HP Smart Update Manager (on page 90). The Smart Update Firmware DVD combines the following resources on a single DVD:

- Firmware Maintenance CD
- HP BladeSystem Firmware Deployment Tool (FDT)
- The HP BladeSystem online firmware bundles
- The ProLiant BladeSystem Release Sets
- Offline, automatic mode for HP ProLiant BL, DL, ML, and 100 Series servers
- Firmware deployment support for HP ProLiant 100 Series servers

HP Smart Update Manager

The HP Smart Update Manager provides intelligent and flexible firmware and software deployment. This technology assists in reducing the complexity of provisioning and updating HP ProLiant Servers, options, and Blades within the datacenter. HP SUM is delivered on The Smart Update Firmware DVD, ProLiant Support Packs, and Easy Set-up CDs.

HP SUM enables system administrators to upgrade ROM images efficiently across a wide range of server blades and options. This tool has the following features:

- Enables GUI and a command-line, scriptable interface
- Enables scriptable, command-line deployment
- Requires no agent for remote installations
- Enables dependency checking, which ensures appropriate install order and dependency checking between components
- Deploys software and firmware on Windows and Linux operating systems
- Performs local or remote (one-to-many) online deployment
- Deploys firmware and software together
- Supports offline and online deployment
- Deploys necessary component updates only (except Linux RPMs)
- Downloads the latest components from Web (except Linux RPMs)
- Enables direct update of BMC firmware (iLO and LO100i)

For more information about HP Smart Update Manager and to access the *HP Smart Update Manager User Guide*, see the HP website (http://www.hp.com/go/foundation).

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://www.hp.com/go/pcn).

Care Pack

HP Care Pack Services offer upgraded service levels to extend and expand bundled services with easy-to-buy, easy-to-use support packages that help you make the most of your server investments. For more information, see the HP website (http://www.hp.com/services/carepack).

Troubleshooting

Troubleshooting resources

The *HP ProLiant Servers Troubleshooting Guide* provides procedures for resolving common problems and comprehensive courses of action for fault isolation and identification, error message interpretation, issue resolution, and software maintenance on ProLiant servers and server blades. This guide includes problem-specific flowcharts to help you navigate complex troubleshooting processes. To view the guide, select a language:

- English (http://www.hp.com/support/ProLiant_TSG_en)
- French (http://www.hp.com/support/ProLiant_TSG_fr)
- Italian (http://www.hp.com/support/ProLiant_TSG_it)
- Spanish (http://www.hp.com/support/ProLiant_TSG_sp)
- German (http://www.hp.com/support/ProLiant_TSG_gr)
- Dutch (http://www.hp.com/support/ProLiant_TSG_nl)
- Japanese (http://www.hp.com/support/ProLiant_TSG_jp)

The *HP BladeSystem c-Class Enclosure Troubleshooting Guide* provides procedures and solutions for troubleshooting HP BladeSystem c-Class enclosures. This guide explains how to use the Insight Display to troubleshoot enclosures, and it includes a flowchart to help you navigate the troubleshooting process. To view the guide, see the HP website (http://www.hp.com/support/BladeSystem_Enclosure_TSG_en).

Pre-diagnostic steps

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

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

1. Review the important safety information (on page 92).
2. Gather symptom information (on page 94).
3. Prepare the server for diagnosis (on page 94).
4. Use the Start diagnosis flowchart (on page 97) to begin the diagnostic process.

Important safety information

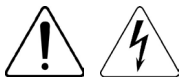
Familiarize yourself with the safety information in the following sections before troubleshooting the server.

Important safety information

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

Symbols on equipment

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



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



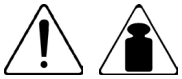
This symbol indicates the presence of electric shock hazards. The area contains no user or field serviceable parts. Do not open for any reason.
WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure.



This symbol on an RJ-45 receptacle indicates a network interface connection.
WARNING: To reduce the risk of electric shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.



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



21.8 kg
47.9 lb

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



These symbols, on power supplies or systems, indicate that the equipment is supplied by multiple sources of power.
WARNING: To reduce the risk of injury from electric shock, remove all power cords to completely disconnect power from the system.

Warnings

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.

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 88) and use the survey page to view the current configuration or to compare it to previous configurations.
- Refer to your hardware and software records for information.
- Refer to server LEDs and their statuses.

Prepare the server for diagnosis

1. Be sure the server is in the proper operating environment with adequate power, air conditioning, and humidity control. For required environmental conditions, see the server documentation.
2. Record any error messages displayed by the system.
3. Remove all diskettes, CD-ROMs, DVD-ROMs, and USB drive keys.
4. Power down the server and peripheral devices if you will be diagnosing the server offline. If possible, always perform an orderly shutdown:
   a. Exit any applications.
   b. Exit the operating system.
   c. Power down the server ("Power down the server blade" on page 16).
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.

     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 server documentation for server-specific information.
- HP recommends you have access to the SmartStart CD for value-added software and drivers required during the troubleshooting process. Download the current version of SmartStart from the HP website (http://www.hp.com/servers/smartstart).

Performing processor procedures in the troubleshooting process

Before performing any troubleshooting steps that involve processors, review the following guidelines:

- Be sure that only authorized personnel perform the troubleshooting steps that involve installing, removing, or replacing a processor.
- Always locate the documentation for your processor model before performing **any** steps that require installing, removing, or replacing a processor. If you cannot locate the hard copy of the instructions that shipped with the processor, see the processor ("Processor option" on page 34) instructions in this document.
- Some processor models require the use of a processor installation tool, and specific steps are documented to ensure that you do not damage the processor or processor socket on the system board. For server models that have pins inside the processor socket, remember that **THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED**. If you damage the socket, you must replace the system board.
- Depending on the server blade model, the contacts may be on the processor or they may be inside the processor socket. Never touch the contacts. **THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED**. If the contacts inside the processor socket are damaged, the system board must be replaced.
- Always complete all other troubleshooting procedures before removing or replacing a processor.

Breaking the server down to the minimum hardware configuration

During the troubleshooting process, you may be asked to break the server down to the minimum hardware configuration. A minimum configuration consists of only the components needed to boot the server and successfully pass POST.

When requested to break the server down to the minimum configuration, uninstall the following components, if installed:

- All additional DIMMs

  Leave only the minimum required to boot the server—either one DIMM or a pair of DIMMs. For more information, see the memory guidelines in the server user guide.
- All additional cooling fans, if applicable

  For the minimum fan configuration, see the server user guide.
- All additional power supplies, if applicable (leave one installed)
- All hard drives
- All optical drives (DVD-ROM, CD-ROM, and so forth)
- All optional mezzanine cards
- All expansion boards

Before removing the components, be sure to determine the minimum configuration for each component and follow all guidelines in the server user guide.

Always use the recommended minimum configuration above before removing any processors. If you are unable to isolate the issue with the configuration above, you will then remove all but one of the additional processors.

△ **CAUTION:** Before removing or replacing any processors, be sure to follow the guidelines provided in "Performing processor procedures in the troubleshooting process (on page 95)." Failure to follow the recommended guidelines can cause damage to the system board, requiring replacement of the system board.

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 routed correctly through the tray.
- Be sure each device is properly seated. Avoid bending or flexing circuit boards when reseating components.
- If a device has latches, be sure they are completely closed and locked.
- Check any interlock or interconnect LEDs that may indicate a component is not connected properly.
- If problems continue to occur, remove and reinstall each device, checking the connectors and sockets for bent pins or other damage.

Service notifications

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

Server health LEDs

Some server blades have an internal health LED and an external health LED, while other server blades have a single system health LED. The system health LED provides the same functionality as the two separate internal and external health LEDs. Depending on the model, the internal health LED and external health LED may either appear solid or they may flash. Both conditions represent the same symptom.

For the location of server blade LEDs and information on their statuses, see the server blade documentation on the HP website (http://www.hp.com/support).

Troubleshooting flowcharts

To effectively troubleshoot a problem, HP recommends that you start with the first flowchart in this section, "Start diagnosis flowchart (on page 97)," and follow the appropriate diagnostic path. If the other flowcharts

do not provide a troubleshooting solution, follow the diagnostic steps in "General diagnosis flowchart (on page 98)." The General diagnosis flowchart is a generic troubleshooting process to be used when the problem is not server-specific or is not easily categorized into the other flowcharts.

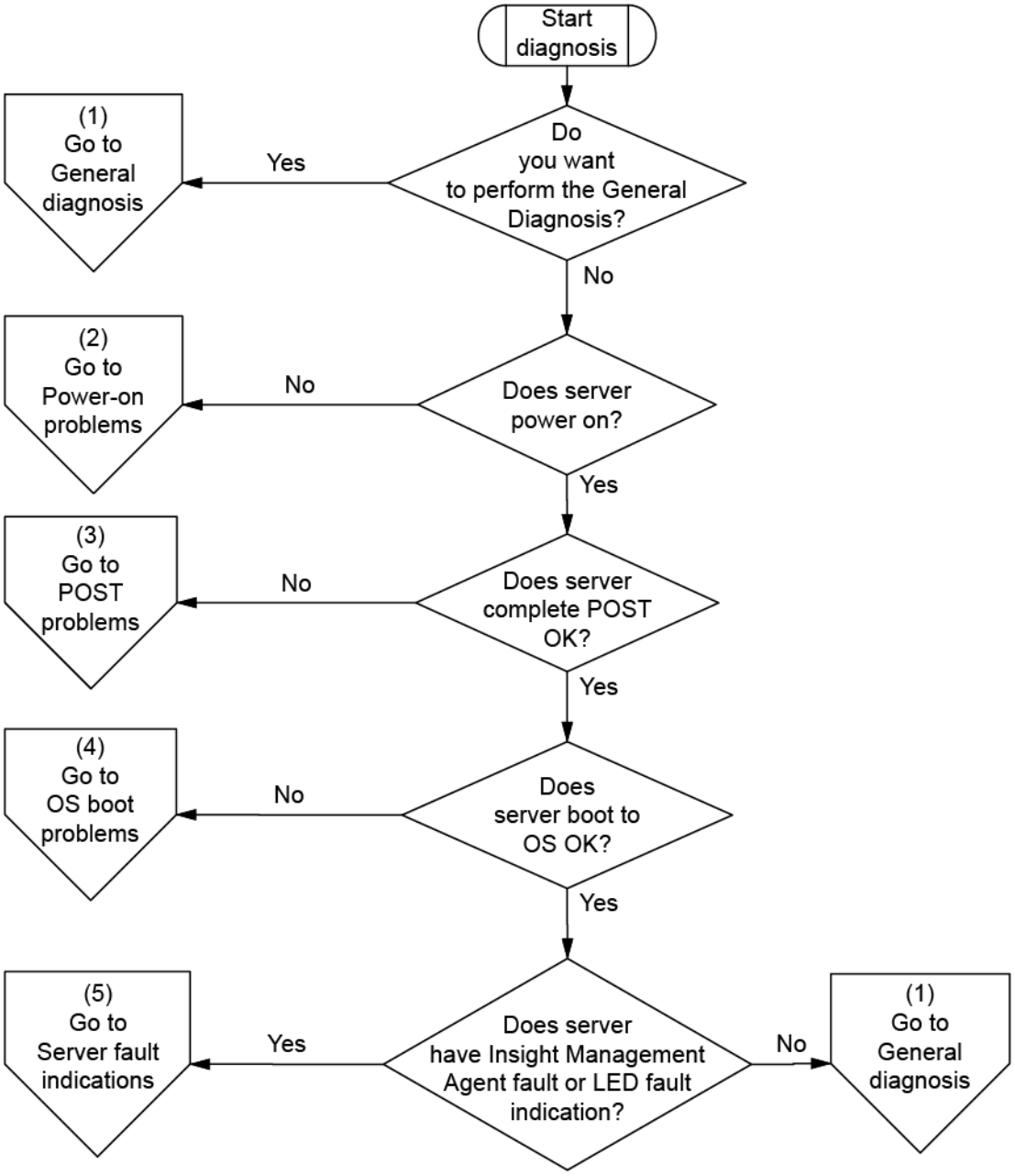
The available flowcharts include:

- Start diagnosis flowchart (on page 97)
- General diagnosis flowchart (on page 98)
- Server blade power-on problems flowchart (on page 100)
- POST problems flowchart (on page 102)
- OS boot problems flowchart (on page 104)
- Server fault indications flowchart (on page 106)

Start diagnosis flowchart

Use the following flowchart to start the diagnostic process.

Item	See
1	"General diagnosis flowchart (on page 98)"
2	"Power-on problems flowchart ("Server blade power-on problems flowchart" on page 100)"
3	"POST problems flowchart (on page 102)"
4	"OS boot problems flowchart (on page 104)"
5	"Server fault indications flowchart (on page 106)"

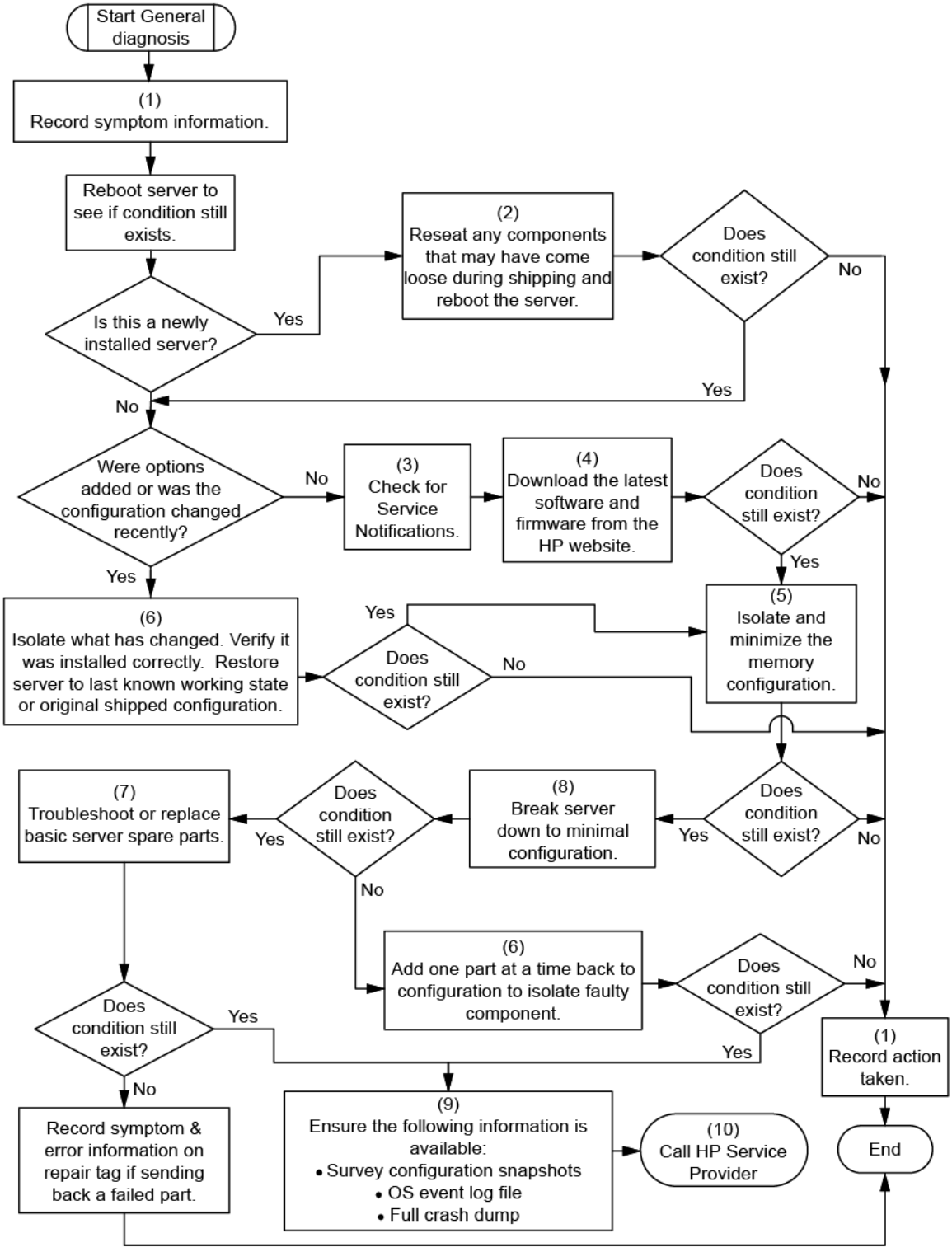


General diagnosis flowchart

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

Item	See
1	"Symptom information (on page 94)"
2	"Loose connections (on page 96)"
3	"Service notifications (on page 96)"

Item	See
4	The most recent version of a particular server blade or option firmware is available on the HP Support website (http://www.hp.com/support).
5	"General memory problems are occurring" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
6	• Maintenance and service guides for p-Class server blades, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/proliant-bl/p-class/info) • Maintenance and service guides for c-Class server blades, located on the Documentation CD or the HP website (http://www.hp.com/go/bladesystem/documentation)
7	• Maintenance and service guides for p-Class server blades, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/proliant-bl/p-class/info) • Maintenance and service guides for c-Class server blades, located on the Documentation CD or the HP website (http://www.hp.com/go/bladesystem/documentation) • "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
8	"Breaking the server down to the minimum hardware configuration (on page 95)" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
9	• "Server information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • "Operating system information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
10	"HP contact information (on page 120)"



Server blade power-on problems flowchart

Symptoms:

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

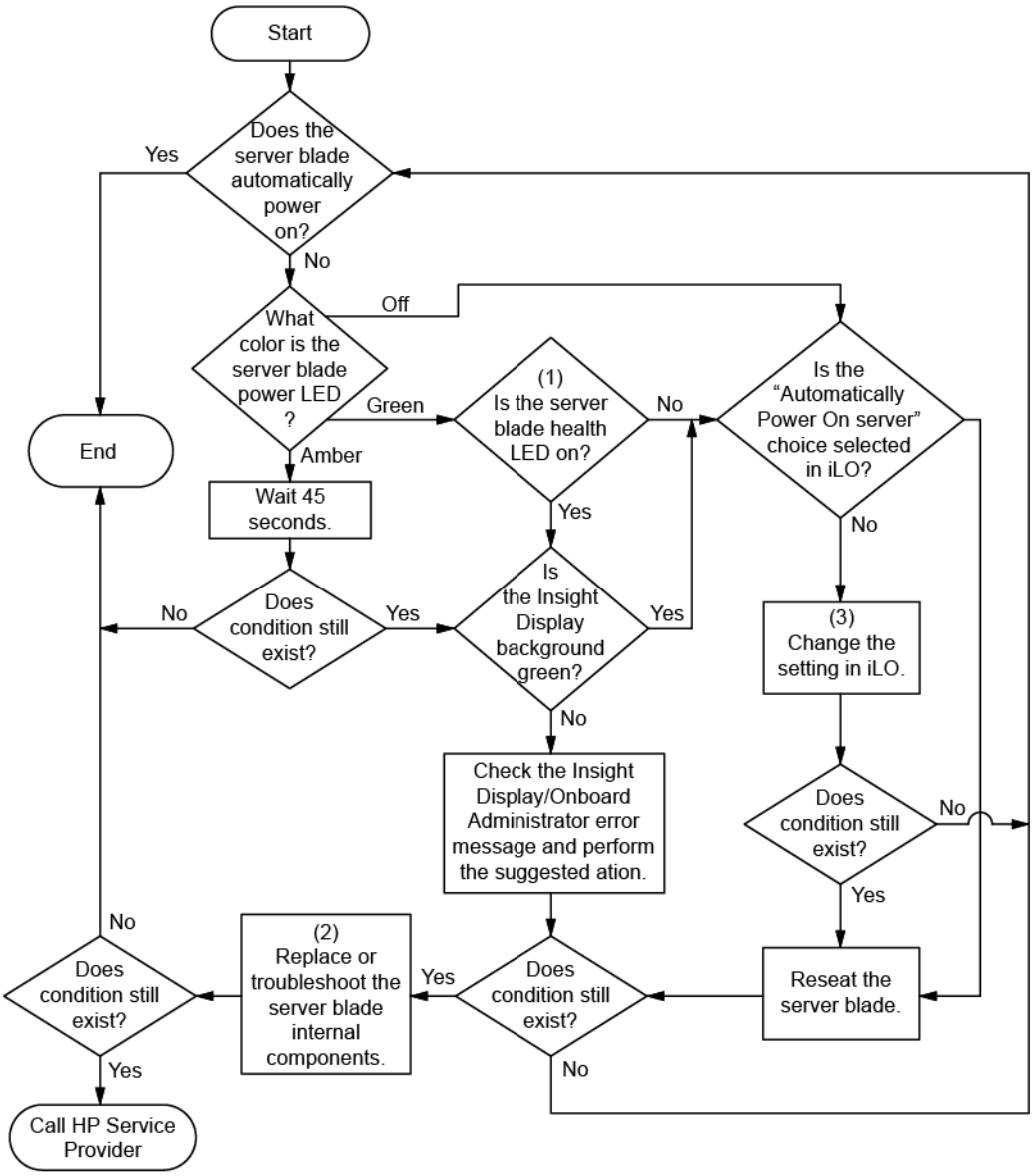
- The health LED is red or amber.

  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	See
1	"Component identification (on page 7)"
2	Maintenance and service guides for c-Class server blades, located on the HP website (http://www.hp.com/go/bladesystem/documentation)
3	*Integrated Lights-Out User Guide* located on the HP website (http://www.hp.com/servers/lights-out)



POST problems flowchart

Symptoms:

- Server does not complete POST

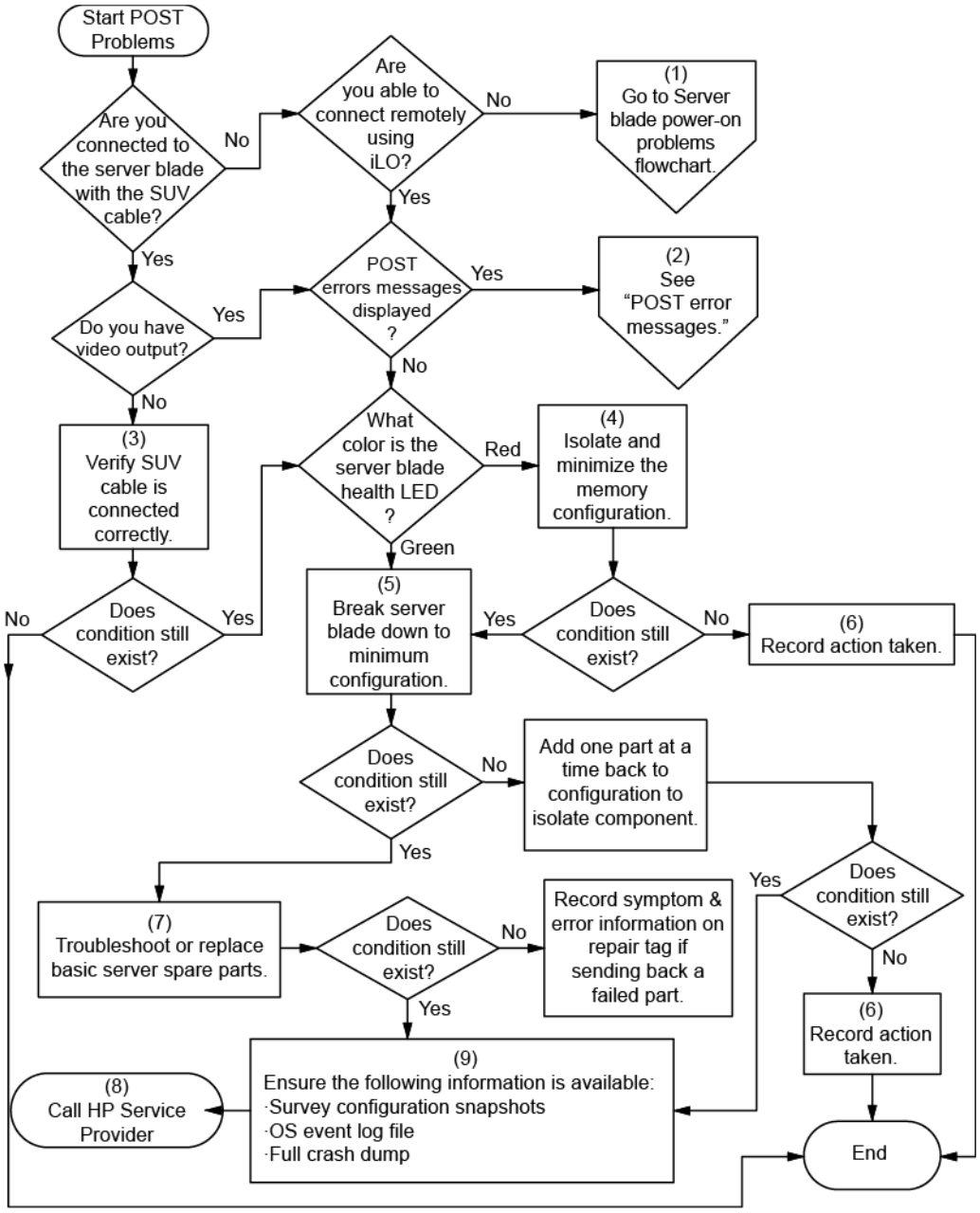
  NOTE: The server has completed POST when the system attempts to access the boot device.

- Server completes POST with errors

Possible problems:

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

Item	See
1	Server blade power-on problems flowchart (on page 100)
2	"POST error messages and beep codes (on page 108)"
3	"Video problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
4	"General memory problems are occurring" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
5	"Breaking the server down to the minimum hardware configuration (on page 95)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
6	"Symptom information (on page 94)"
7	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • Maintenance and service guides for c-Class server blades, located on the Documentation CD or the HP website (http://www.hp.com/go/bladesystem/documentation)
8	"HP contact information (on page 120)"
9	• "Server information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • "Operating system information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"



OS boot problems flowchart

There are two ways to use SmartStart when diagnosing OS boot problems on a server blade:

- Use iLO to remotely attach virtual devices to mount the SmartStart CD onto the server blade.
- Use a local I/O cable and drive to connect to the server blade, and then restart the server blade.

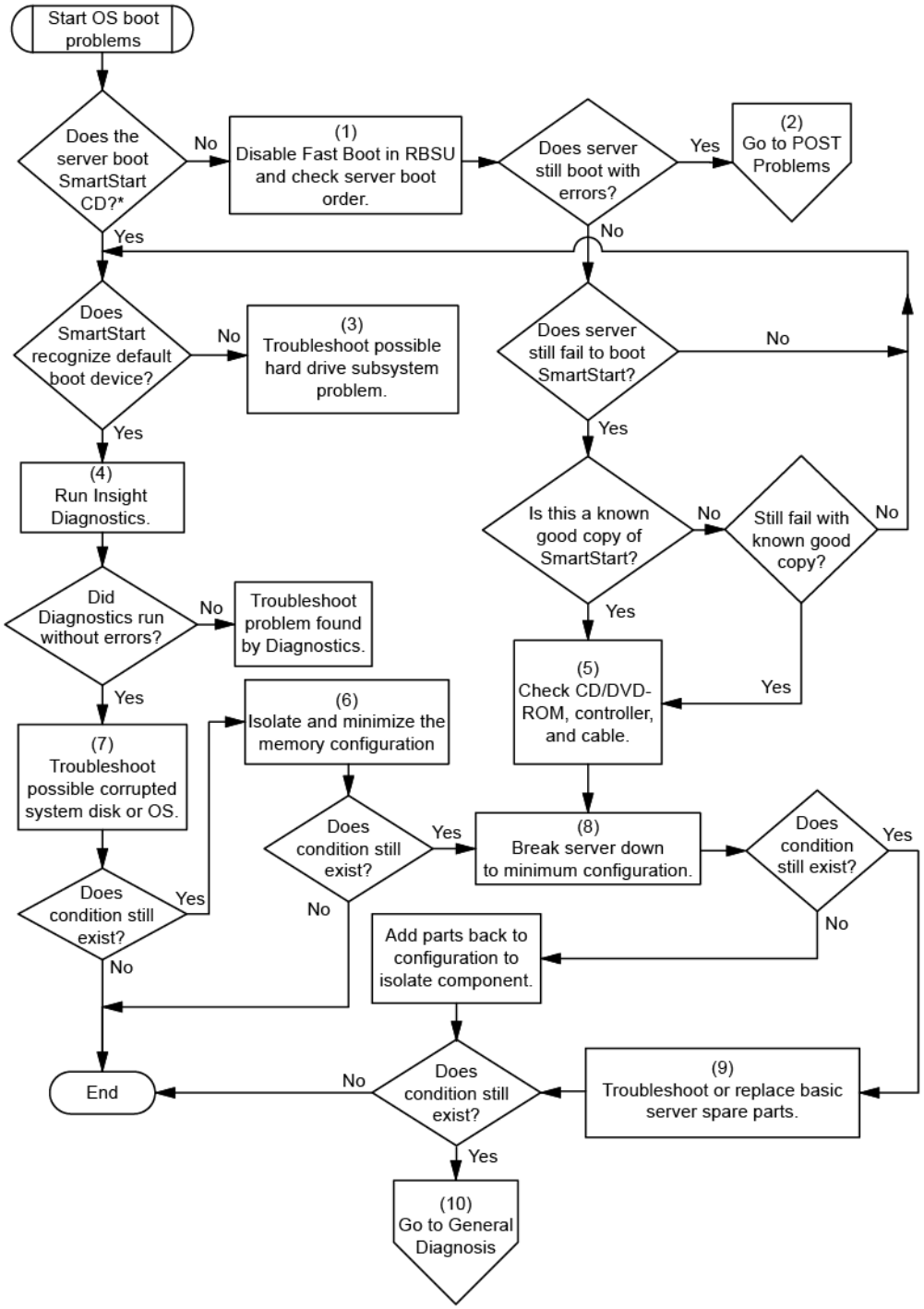
Symptoms:

- Server does not boot a previously installed OS
- Server does not boot SmartStart

Possible causes:

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

Item	See
1	*HP ROM-Based Setup Utility User Guide* (*http://www.hp.com/servers/smartstart*)
2	"POST problems flowchart (on page 102)"
3	• "Hard drive problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • Controller documentation
4	"HP Insight Diagnostics (on page 88)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
5	• "Loose connections (on page 96)" • "CD-ROM and DVD drive problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • Controller documentation
6	"General memory problems are occurring" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
7	• "Operating system problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • "HP contact information (on page 120)"
8	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • Maintenance and service guides for p-Class server blades, located on the Documentation CD or the HP website (http://www.hp.com/products/servers/proliant-bl/p-class/info) • Maintenance and service guides for c-Class server blades, located on the Documentation CD or the HP website (http://www.hp.com/go/bladesystem/documentation)
9	"General diagnosis flowchart (on page 98)"



* See the server blade OS boot problems flowchart (on page 104)

Server fault indications flowchart

Symptoms:

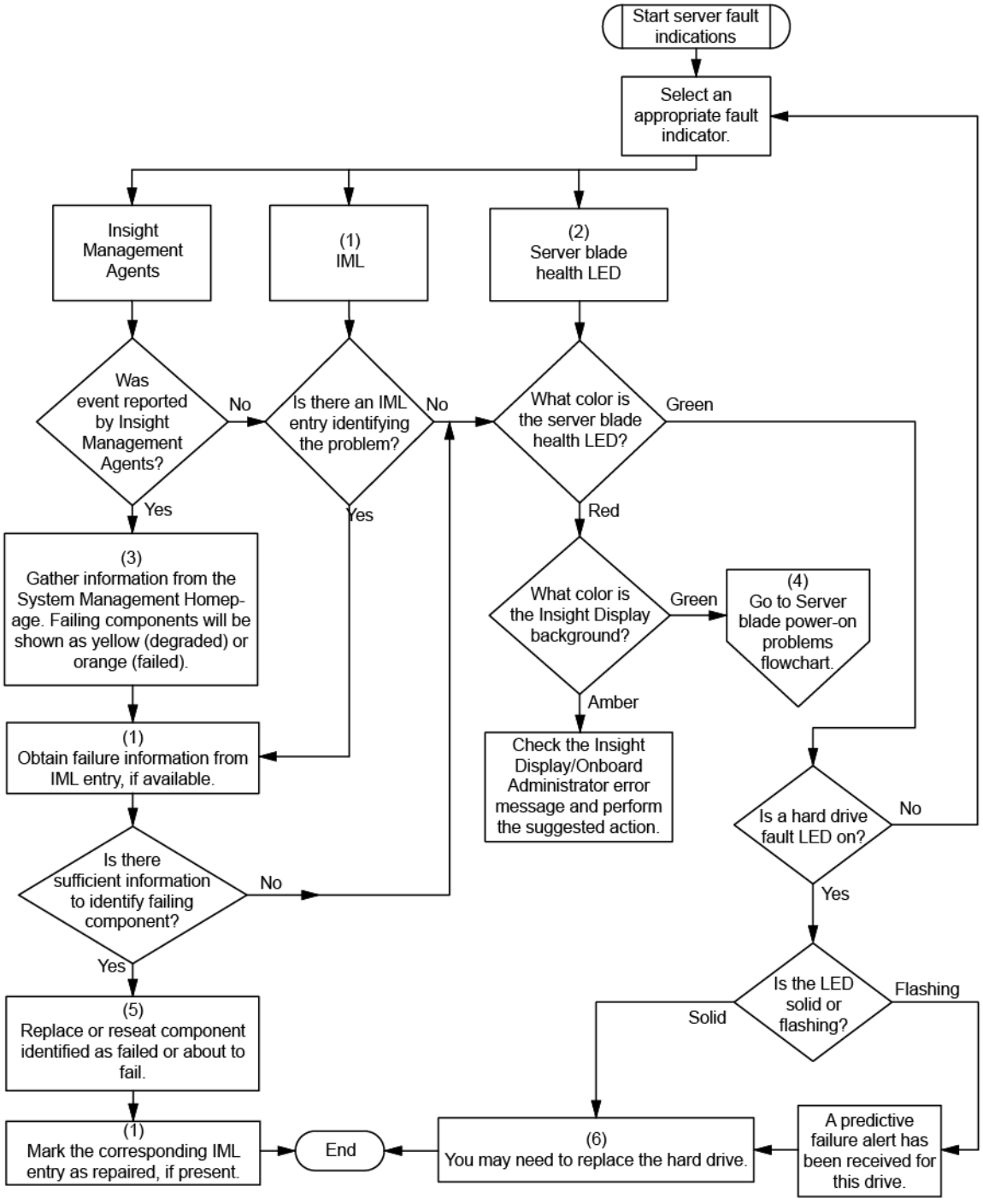
- Server boots, but a fault event is reported by Insight Management Agents
- Server boots, but the internal health LED, external health LED, or component health LED is red or amber

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	See
1	• "Integrated Management Log (on page 88)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • "Event list error messages" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)"
2	"Component identification (on page 7)"
3	System Management Homepage (https://localhost:2381)
4	"Power-on problems flowchart ("Server blade power-on problems flowchart" on page 100)"
5	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • Maintenance and service guides for c-Class server blades, located on the Documentation CD or the HP website (http://www.hp.com/go/bladesystem/documentation) • "HP contact information (on page 120)"
6	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 92)" • Maintenance and service guides for c-Class server blades, located on the Documentation CD or the HP website (http://www.hp.com/go/bladesystem/documentation)



POST error messages and beep codes

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.

System battery

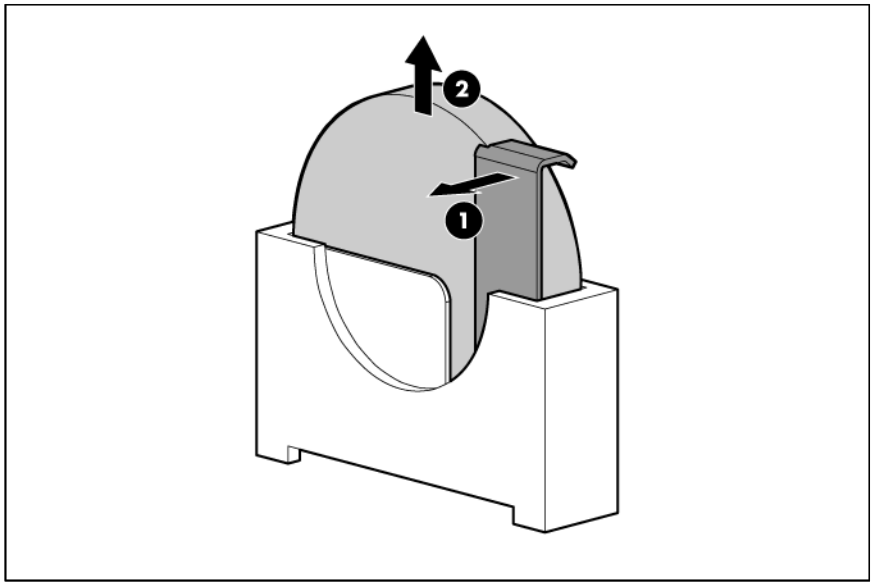
If the server blade no longer automatically displays the correct date and time, you may need to replace the battery that provides power to the real-time clock. Under normal use, battery life is 5 to 10 years.

WARNING: The computer contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. A risk of fire and burns exists if the battery pack is not properly handled. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose the battery to temperatures higher than 60°C (140°F).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace only with the spare designated for this product.

To remove the component:

1. Power down the server blade (on page 16).
2. Remove the server blade (on page 17).
3. Place the server blade on a flat, level surface with the A-side of the server blade facing up. To determine the A-side, see the label attached to the access panel.
4. Remove the access panel (A-side) (on page 18).
5. Identify the battery location ("System board components (A-side)" on page 9).
6. Remove the battery.



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

To replace the component, reverse the removal procedure.

Regulatory compliance notices

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.

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

Products bearing the CE marking comply with the following EU Directives:

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC
- Ecodesign Directive 2009/125/EC, where applicable

CE compliance of this product is valid if powered with the correct CE-marked AC adapter provided by HP.

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) that are listed in the EU Declaration of Conformity issued by HP for this product or product family and available (in English only) either within the product documentation or at the following HP website (http://www.hp.eu/certificates) (type the product number in the search field).

The compliance is indicated by one of the following conformity markings placed on the product:

For non-telecommunications products and for EU harmonized telecommunications products, such as Bluetooth® within power class below 10mW.



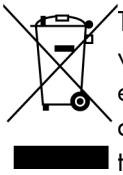
For EU non-harmonized telecommunications products (If applicable, a 4-digit notified body number is inserted between CE and !).



Please refer to the regulatory label provided on the product.

The point of contact for regulatory matters is Hewlett-Packard GmbH, Dept./MS: HQ-TRE, Herrenberger Strasse 140, 71034 Boeblingen, GERMANY.

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.

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、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-B

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、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は適切な対策を講ずるよう要求されることがあります。

VCCI-A

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 방송통신기기)	이 기기는 업무용(A급)으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외의 지역에서 사용하는 것을 목적으로 합니다.

Class B equipment

B급 기기 (가정용 방송통신기기)	이 기기는 가정용(B급)으로 전자파적합등록을 한 기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

Chinese notice

Class A equipment

声明
此为 A 级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取可行的措施。

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 June 24, 2007; and with IEC 60825-1:2007.

⚠ **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, 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.



Wireless devices

You can install one or more integrated wireless devices. In some environments, the use of wireless devices might be restricted. Such restrictions might apply on airplanes, in hospitals, near explosives, or in other hazardous locations. Before you turn on this product, be sure that you understand local policies and have proper authorization.

Do not co-locate or operate this device in conjunction with any other antenna or transmitter.

To avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antennae should be greater than 20 cm (8 in).

⚠ **WARNING: Exposure to Radio Frequency Radiation**—The radiated output power of this device is below the FCC radio frequency exposure limits. Nevertheless, human contact during normal operation should be minimized.

Brazilian notices

Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.

Canadian notices

Wireless operation is subject to two conditions. The first is that the wireless device may not cause interference. The second is that the wireless device must accept any interference, including interference that may cause undesired operation of the device.

Japanese notices

この機器の使用周波数帯では、電子レンジ等の産業・科学・医療用機器のほか工場の製造ライン等で使用されている移動体識別用の構内無線局（免許を要する無線局）及び特定小電力無線局（免許を要しない無線局）が運用されています。

1　この機器を使用する前に、近くで移動体識別用の構内無線局及び特定小電力無線局が運用されていないことを確認して下さい。

2　万一、この機器から移動体識別用の構内無線局に対して電波干渉の事例が発生した場合には、速やかに使用周波数を変更するか又は電波の発射を停止した上、下記連絡先にご連絡頂き、混信回避のための処置等（例えば、パーティションの設置など）についてご相談して下さい。

3　その他、この機器から移動体識別用の特定小電力無線局に対して電波干渉の事例が発生した場合など何かお困りのことが起きたときは、次の連絡先へお問い合わせ下さい。

連絡先：日本ヒューレット・パッカード株式会社　ＴＥＬ：０１２０－０１４１２１

Taiwan notices

低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信規定作業之無線電信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Electrostatic discharge

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.

Specifications

Environmental specifications

Specification	Value
Temperature range*	—
Operating	10°C to 35°C (50°F to 95°F)
Non-operating	-30°C to 60°C (-22°F to 140°F)
Relative humidity (noncondensing)**	—
Operating	10% to 90% @ 28°C (82.4°F)
Non-operating	5% to 95% @ 38.7°C (101.7°F)
Altitude†	—
Operating	3050 m (10,000 ft)
Non-operating	9144 m (30,000 ft)

* The following temperature conditions and limitations apply:
  - All temperature ratings shown are for sea level.
  - An altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft) up to 3048 m (10,000 ft) applies.
  - No direct sunlight is allowed.
  -The maximum permissible rate of change is 10°C/hr (18°F/hr).
  - The type and number of options installed may reduce the upper temperature and humidity limits.
  - Operating with a fan fault or above 30°C (86°F) may reduce system performance.

** Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F).

†Maximum storage altitude corresponds to a minimum pressure of 70 kPa (10.1 psia).

Server blade specifications

Specification	Value
Height	10.72 cm (4.22 in)
Depth	51.28 cm (20.09 in)
Width	36.73 cm (14.46 in)
Weight (maximum)	21.8 kg (47.9 lb)
Weight (minimum)	15.9 kg (35.1 lb)

Technical support

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
- Product identification 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:

- See the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/us/en/wwcontact.html).

For HP technical support:

- In the United States, for contact options see the Contact HP United States webpage (http://welcome.hp.com/country/us/en/contact_us.html). To contact HP by phone:
  - Call 1-800-HP-INVENT (1-800-474-6836). This service is available 24 hours a day, 7 days a week. For continuous quality improvement, calls may be recorded or monitored.
  - If you have purchased a Care Pack (service upgrade), call 1-800-633-3600. For more information about Care Packs, refer to the HP website (http://www.hp.com/hps).
- In other locations, see the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/us/en/wwcontact.html).

Customer Self Repair

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

- **Mandatory**—Parts for which customer self repair is mandatory. If you request HP to replace these parts, you will be charged for the travel and labor costs of this service.

- **Optional**—Parts for which customer self repair is optional. These parts are also designed for customer self repair. If, however, you require that HP replace them for you, there may or may not be additional charges, depending on the type of warranty service designated for your product.

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

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

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

Réparation par le client (CSR)

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

Obligatoire - Pièces pour lesquelles la réparation par le client est obligatoire. Si vous demandez à HP de remplacer ces pièces, les coûts de déplacement et main d'œuvre du service vous seront facturés.

Facultatif - Pièces pour lesquelles la réparation par le client est facultative. Ces pièces sont également conçues pour permettre au client d'effectuer lui-même la réparation. Toutefois, si vous demandez à HP de remplacer ces pièces, l'intervention peut ou non vous être facturée, selon le type de garantie applicable à votre produit.

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

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

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

Riparazione da parte del cliente

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

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

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

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

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

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

Customer Self Repair

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

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

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

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

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

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

Reparaciones del propio cliente

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

- **Obligatorio:** componentes para los que la reparación por parte del usuario es obligatoria. Si solicita a HP que realice la sustitución de estos componentes, tendrá que hacerse cargo de los gastos de desplazamiento y de mano de obra de dicho servicio.
- **Opcional:** componentes para los que la reparación por parte del usuario es opcional. Estos componentes también están diseñados para que puedan ser reparados por el usuario. Sin embargo, si precisa que HP realice su sustitución, puede o no conllevar costes adicionales, dependiendo del tipo de servicio de garantía correspondiente al producto.

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

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

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

Customer Self Repair

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

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

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

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

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

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

Reparo feito pelo cliente

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

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

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

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

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

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

顧客自己修理保証サービス

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

- 必須 - 顧客自己修理が必須の部品。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、その修理サービスに関する交通費および人件費がお客様に請求されます。
- 任意 - 顧客自己修理が任意である部品。この部品も顧客自己修理用です。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、お買い上げの製品に適用される保証サービス内容の範囲内においては、別途費用を負担していただくことなく保証サービスを受けることができます。

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

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

客户自行维修

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

- **强制性的** — 要求客户必须自行维修的部件。如果您请求 HP 更换这些部件，则必须为该服务支付差旅费和人工费用。
- **可选的** — 客户可以选择是否自行维修的部件。这些部件也是为客户自行维修设计的。不过，如果您要求 HP 为您更换这些部件，则根据为您的产品指定的保修服务类型，HP 可能收取或不再收取任何附加费用。

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

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

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

客戶自行維修

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

- **強制的** — 客戶自行維修所使用的零件是強制性的。如果您要求 HP 更換這些零件，HP 將會向您收取此服務所需的外出費用與勞動成本。
- **選購的** — 客戶自行維修所使用的零件是選購的。這些零件也設計用於客戶自行維修之用。不過，如果您要求 HP 為您更換，則可能需要也可能不需要負擔額外的費用，端視針對此產品指定的保固服務類型而定。

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

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

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

고객 셀프 수리

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

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

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

Acronyms and abbreviations

ACU

Array Configuration Utility

AES-NI

advanced encryption standard new instructions

AMP

Advanced Memory Protection

ASR

Automatic Server Recovery

BBWC

battery-backed write cache

BMC

baseboard management controller

CSR

Customer Self Repair

DDR3

double data rate-3

ESD

electrostatic discharge

FBWC

flash-backed write cache

IEC

International Electrotechnical Commission

iLO 3

Integrated Lights-Out 3

IML

Integrated Management Log

KVM

keyboard, video, and mouse

LV DIMM

Low voltage DIMM

NUMA

Non-Uniform Memory Architecture

ORCA

Option ROM Configuration for Arrays

POST

Power-On Self Test

PSP

ProLiant Support Pack

PXE

Preboot Execution Environment

QPI

QuickPath Interconnect

RBSU

ROM-Based Setup Utility

RDIMM

Registered Dual In-line Memory Module

RPM

Red Hat Package Manager

SAS

serial attached SCSI

SATA

serial ATA

SD

Secure Digital

SDDC

Single Device Data Correction

SDHC

Secure Digital High-Capacity

SIM

Systems Insight Manager

SMB

scalable memory buffer

SMI

scalable memory interconnect

SUV

serial, USB, video

TPM

trusted platform module

TXT

trusted execution technology

UID

unit identification

USB

universal serial bus

VCA

Version Control Agent

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