HP ProLiant BL490c 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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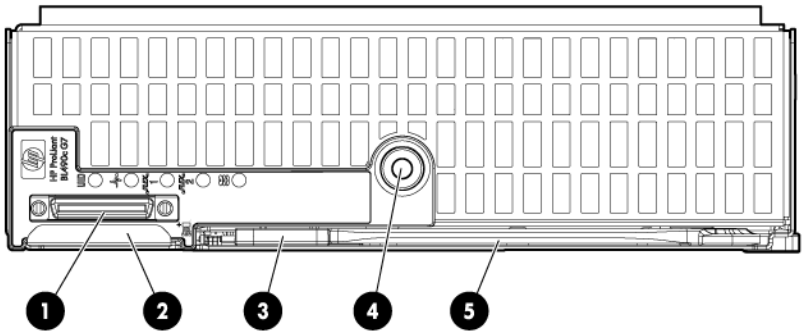
Contents

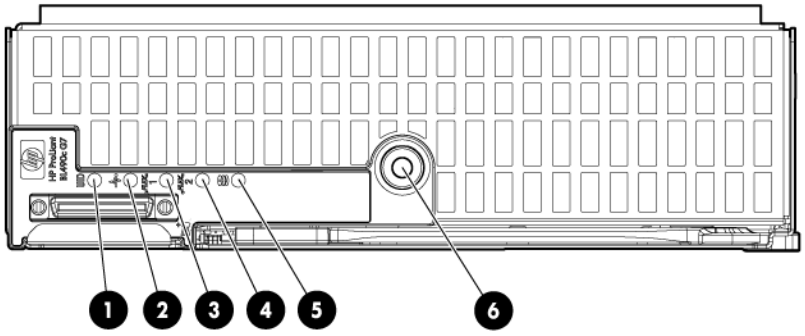
Component identification

Front panel components



Item	Description
1	HP c-Class Blade SUV Cable connector
2	Serial label pull tab
3	Release button
4	Power On/Standby button
5	Server blade release lever

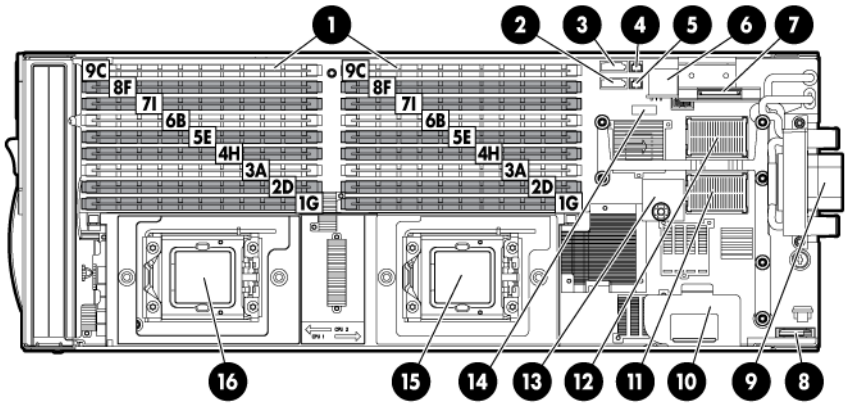
Front panel LEDs



Item	Description	Status
1	UID LED	Blue = Identified Blue flashing = Active remote management Off = No active remote management

Item	Description	Status
2	Internal health LED	Green = Normal Flashing = Booting Amber = Degraded condition Red = Critical condition
3	Flex 1 LED	Green = Network linked Green flashing = Network activity Off = No link or activity
4	Flex 2 LED	Green = Network linked Green flashing = Network activity Off = No link or activity
5	Hard drive activity LED	Green = Activity Off = No activity
6	System power LED	Green = On Amber = Standby (auxiliary power available) Off = Off

System board components



Item	Description
1	DIMM slots
2	SSD data connector 2
3	SSD data connector 1
4	SSD power connector 1
5	SSD power connector 2
6	Internal USB connector
7	SD card slot
8	System battery
9	Enclosure connector
10	Battery tray
11	Mezzanine connector 1 (Type I only)
12	Mezzanine connector 2 (Type I or Type II)

Item	Description
13	TPM connector
14	System maintenance switch
15	Processor socket 2
16	Processor socket 1

The symbols  correspond to the symbols located on the interconnect bays. For more information, see the *HP ProLiant BL490c G7 Server Blade Installation Instructions* that ship with the server blade.

Mezzanine connector definitions

Item	Connector	Card support
Mezzanine connector 1	PCIe x8	Type I mezzanine card only
Mezzanine connector 2	PCIe x8	Type I or II mezzanine card

System maintenance switch

Position	Function	Default
1*	iLO 3 security override	Off
2	Configuration lock	Off
3	Reserved	Off
4	Reserved	Off
5*	Password disabled	Off
6*	Reset configuration	Off
7	Reserved	Off
8	Reserved	Off

*To access redundant ROM, set S1, S5, and S6 to ON.

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 8).
- Access the redundant ROM ("Accessing the redundant ROM" on page 9).

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 49)." 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 11).
2. Remove the server blade (on page 12).
3. Remove the access panel (on page 13).
4. Change position 6 of the system maintenance switch to on.

5. Install the access panel (on page 13).
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

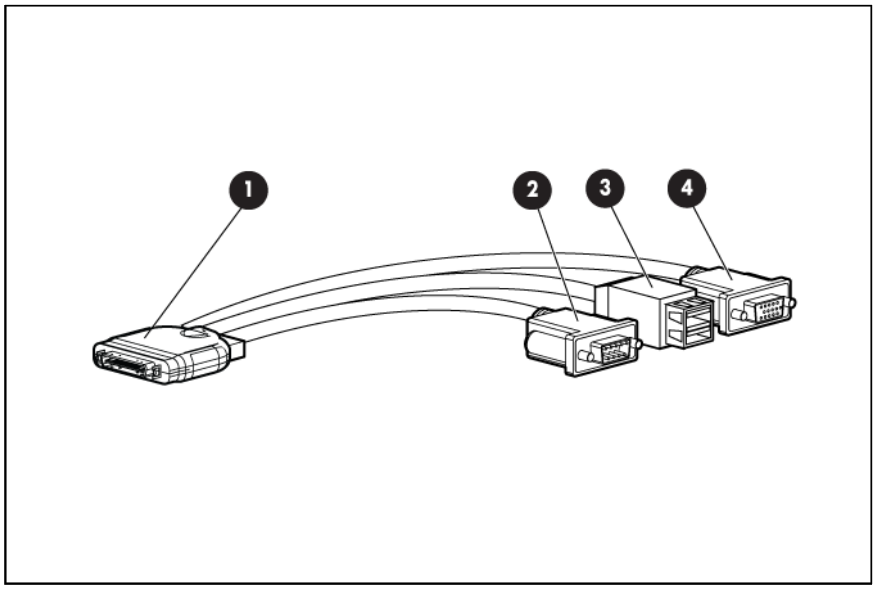
If the system ROM is corrupted, the system automatically switches to the redundant ROM in most cases. If the system does not automatically switch to the redundant ROM, perform the following steps:

1. Power down the server blade (on page 11).
2. Remove the server blade (on page 12).
3. Remove the access panel (on page 13).
4. Change positions 1, 5, and 6 of the system maintenance switch to on.
5. Install the access panel (on page 13).
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.

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 HP BladeSystem 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 HP BladeSystem 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 technology (on page 54)."

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 HP BladeSystem 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 HP BladeSystem 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 HP BladeSystem 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.

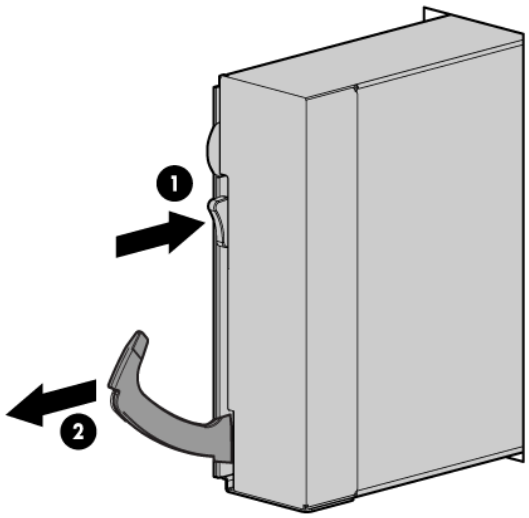
After initiating a virtual power down command, be sure that the server blade is in standby mode by observing that the system power LED is amber.

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.

To remove the component:

1. Identify the proper server blade.
2. Power down the server blade (on page 11).
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

To remove the component:

1. Power down the server blade (on page 11).
2. Remove the server blade (on page 12).
3. Press the access panel release button.
4. Slide the access panel towards the rear of the server blade, and then lift to remove the panel.

Install the access panel

1. Place the access panel on top of the server blade.
2. Slide the access panel forward until it clicks into place.

Setup

Overview

To install a server blade, complete 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)

Installing server blade options

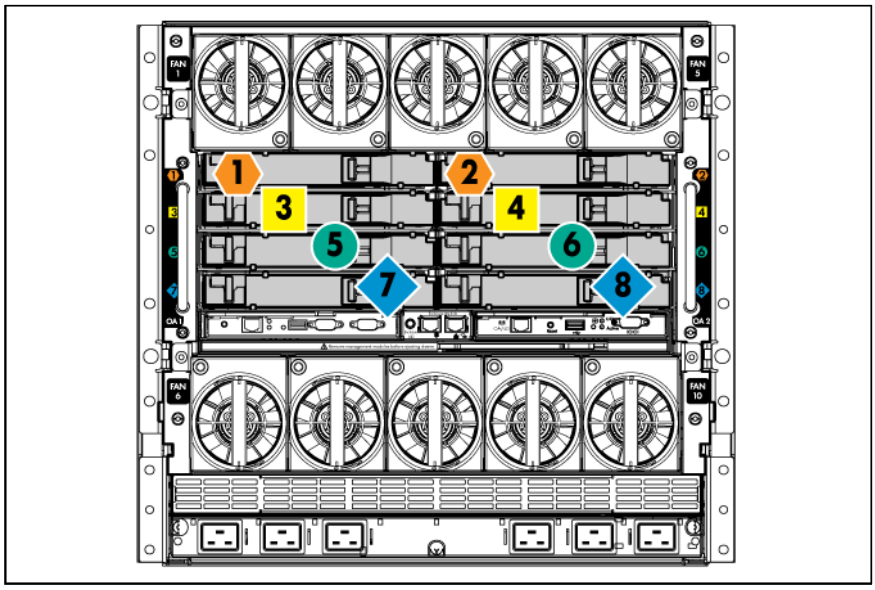
Before installing and initializing the server blade, install any server blade options, such as an additional processor, hard drive, or mezzanine card.

Installing 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

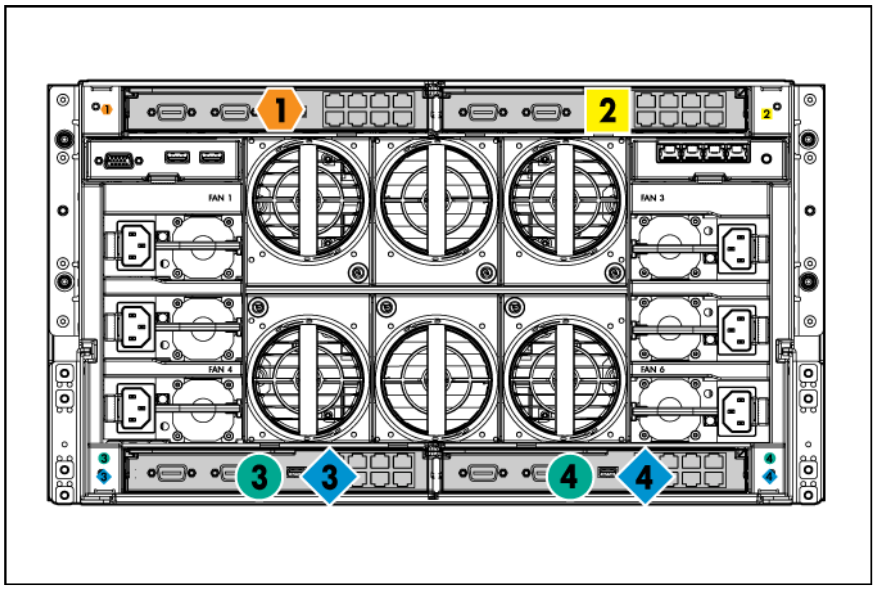


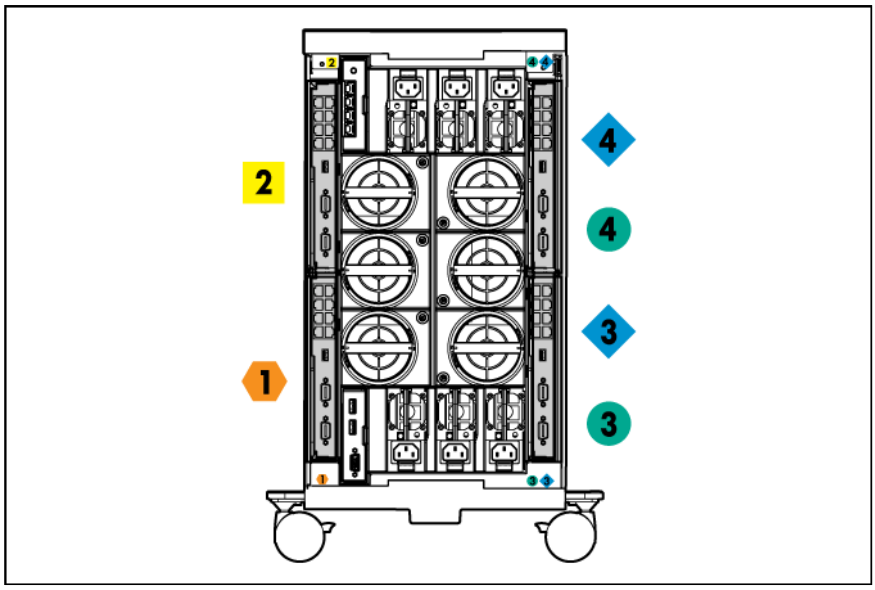
To support network connections for specific signals, install an interconnect module in the bay corresponding to the embedded NIC or mezzanine signals.

Server blade signal	Interconnect bay	Interconnect bay labels
Flex adapter 1 (embedded)	1	⬢
Flex adapter 2 (embedded)	2	⬢
Mezzanine 1	3 and 4	■
Mezzanine 2	5 and 6	●
	7 and 8	◆

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).

- HP BladeSystem c3000 Enclosure and Tower Enclosure





Server blade signal	Interconnect bay number	Interconnect bay label	Notes
Flex adapter 1, 2 (embedded)	1	⬢	—
Mezzanine 1	2	■	Four port cards connect to bay 2.
Mezzanine 2	3 and 4	● ◆	• Four port cards • Ports 1 and 3 connect to bay 3. • Ports 2 and 4 connect to bay 4.

Connecting to the network

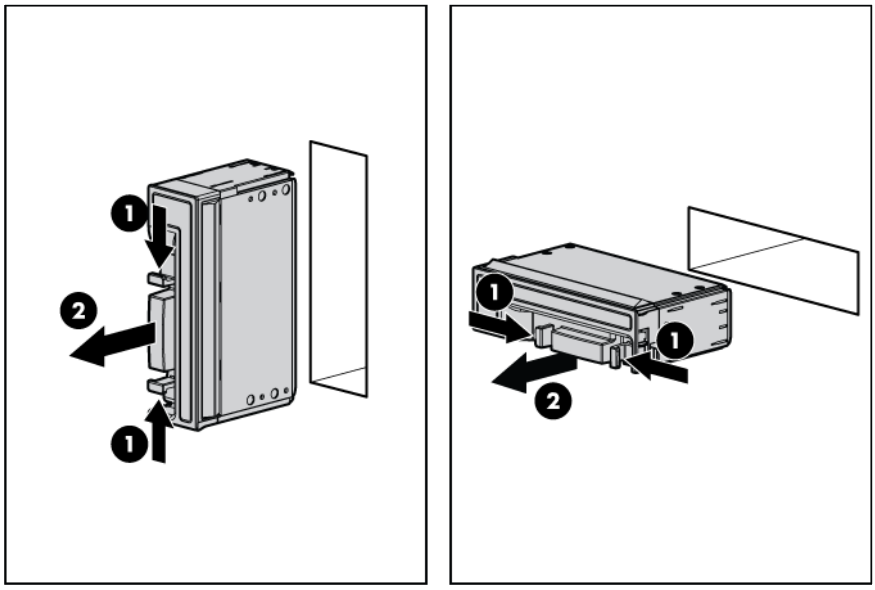
To connect the HP BladeSystem to a network, each enclosure must be configured with network interconnect devices to manage signals between the server blades and the external network.

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).

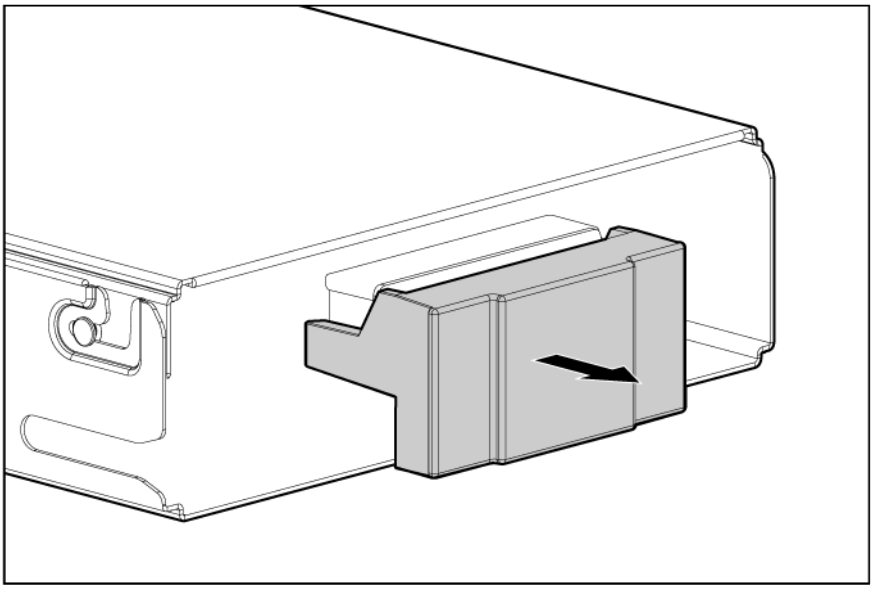
Installing a server blade

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

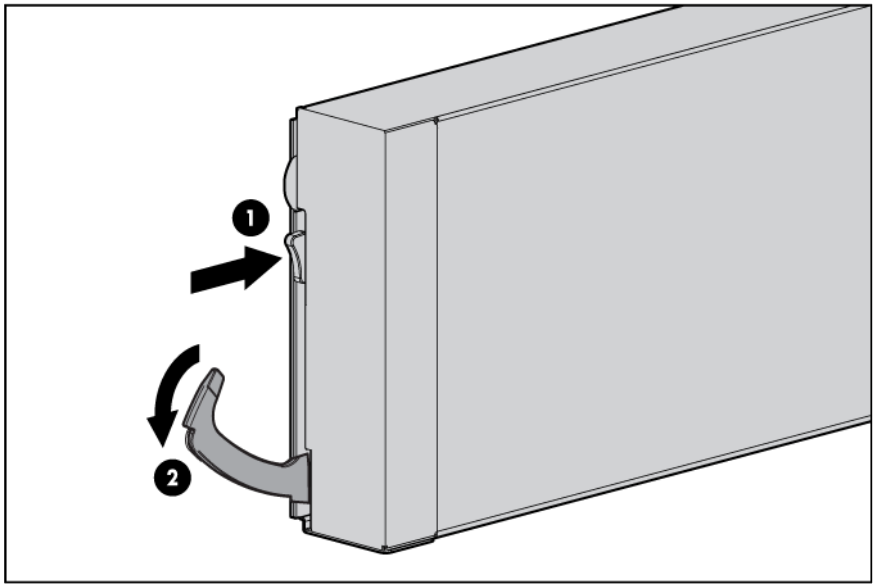
1. Remove the device bay blank.



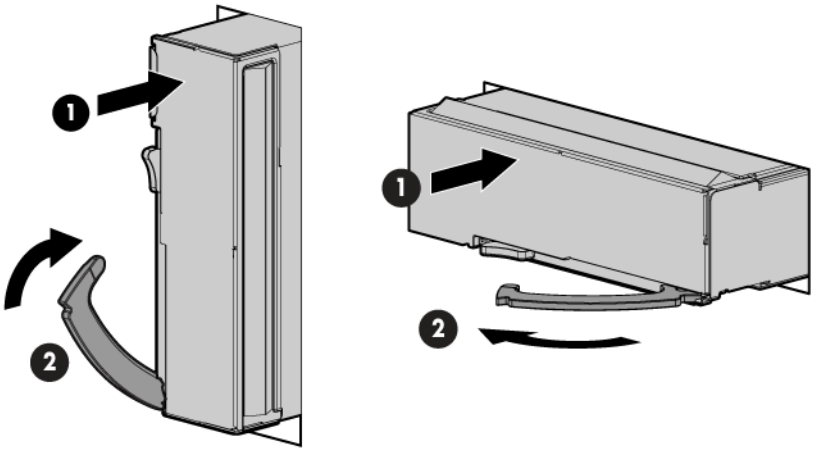
2. Remove the enclosure connector cover.



3. Prepare the server blade for installation.



4. 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.

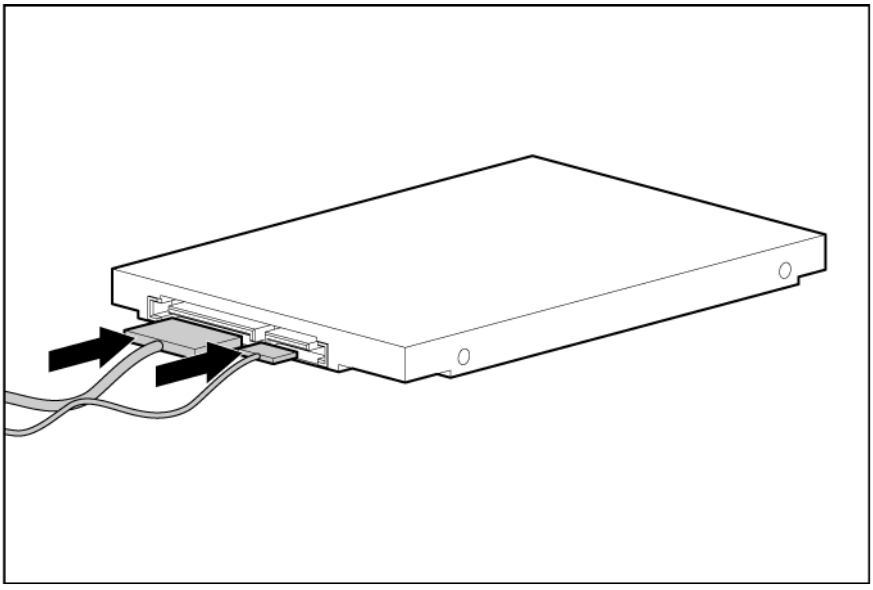
⚠ **CAUTION:** To prevent damage to electrical components, properly ground the server before beginning any installation procedure. Improper grounding can cause electrostatic discharge.

Hard drive option

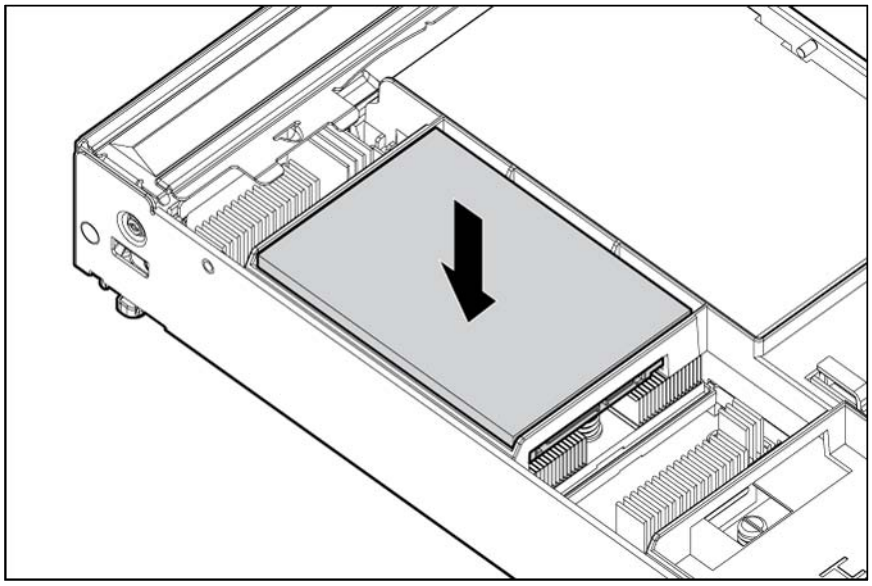
⚠ **WARNING:** To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

To install the component:

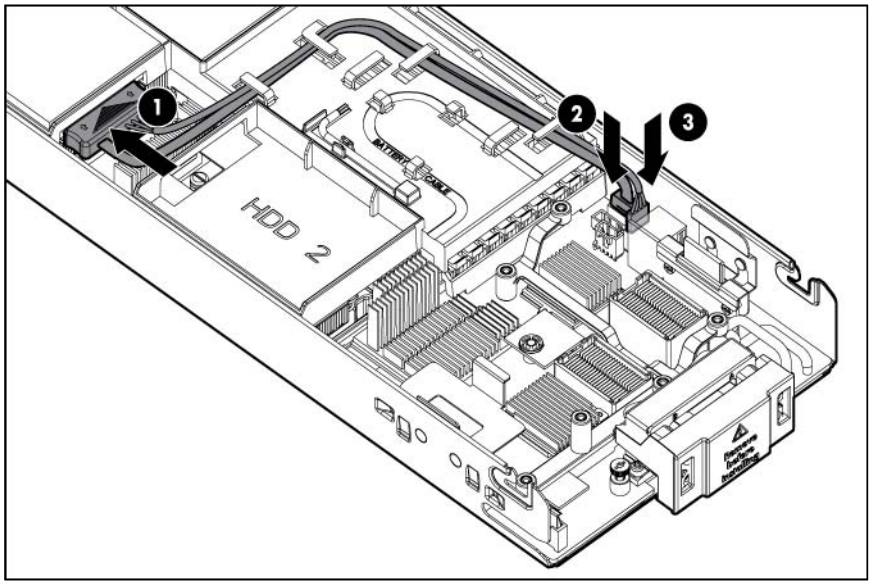
1. Power down the server blade (on page 11).
2. Remove the server blade (on page 12).
3. Remove the access panel (on page 13).
4. Connect the cables to the hard drive.



5. Install the hard drive.



6. Connect and route the cables.



7. Install the access panel (on page 13).
8. Install the server blade ("Installing a server blade" on page 17).

Memory options

IMPORTANT: This server blade does not support mixing RDIMMs and UDIMMs. Attempting to mix these two types causes the server to halt during BIOS initialization.

The memory subsystem in this server blade can support RDIMMs or UDIMMs. Both types are referred to as DIMMs when the information applies to both types. When specified as RDIMM or UDIMM, the information applies to that type only. All memory installed in the server blade must be the same type.

The server blade supports the following DIMM speeds:

- Single- and dual-rank PC3-10600 (DDR-1333) DIMMs operating at 1333 and 1066 MHz
- Quad-rank PC3-8500 (DDR-1067) DIMMs operating at 1066 MHz

Depending on the processor model, the number of DIMMs installed, and whether UDIMMs or RDIMMs are installed, the memory clock speed may be reduced to 1066 or 800 MHz. For more information on the effect of DIMM slot population, see "General DIMM slot population guidelines (on page 25)."

Memory subsystem architecture

The memory subsystem in this server blade is divided into channels. Each processor supports three channels, and each channel supports three DIMM slots, as shown in the following table.

Channel	Slot	Slot number
1	G D A	1 2 3
2	H E B	4 5 6
3	I F C	7 8 9

This multi-channel architecture provides enhanced performance in Advanced ECC mode. This architecture also enables the Mirrored Memory and Lockstep memory modes. This server blade supports both Registered PC3 DIMMs (RDIMMs) and Unbuffered DIMMs (UDIMMs).

DIMM slots in this server are identified by number and by letter. Letters identify the slots to populate for specific AMP modes. Slot numbers are reported by ROM messages during boot and for error reporting.

Single-, dual-, and quad-rank DIMMs

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

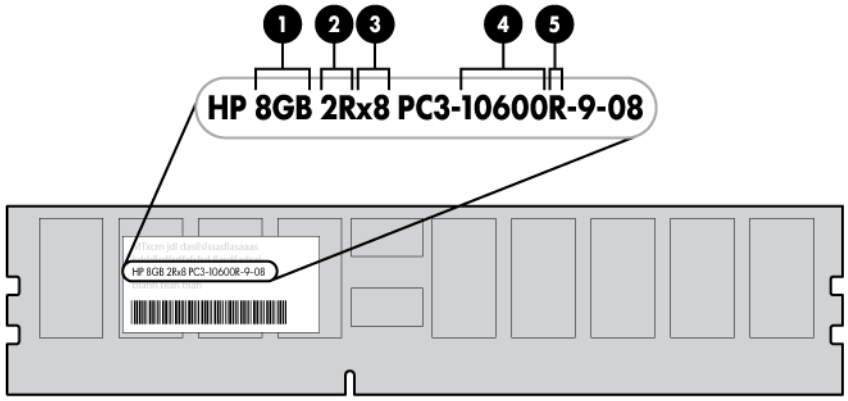
A single-rank DIMM has one set of memory chips that is accessed while writing to or reading from the memory. A dual-rank DIMM is similar to having two single-rank DIMMs on the same module, with only one rank accessible at a time. A quad-rank DIMM is, effectively, two dual-rank DIMMs on the same module. 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

IMPORTANT: This server blade does not support mixing RDIMMs and UDIMMs. Attempting to mix these two types causes the server to halt during BIOS initialization.

The memory subsystem may be populated with either RDIMMs or UDIMMs, but mixing the two types is not supported. 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	Memory speed	10600 = 1333-MHz 8500 = 1066-MHz
5	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).

Memory configurations

To optimize server blade availability, the server blade supports the following AMP modes:

- Advanced ECC—provides the greatest memory capacity for a given DIMM size, while providing up to 4-bit error correction. This mode is the default option for this server blade.
- Mirrored Memory—provides maximum protection against failed DIMMs. Uncorrectable errors in one channel are corrected by the mirror channel.
- Lockstep—provides enhanced protection while making all installed memory available to the operating system. The server blade can continue to function if a single- or multi-bit memory failure within a single DRAM device occurs.

Advanced Memory Protection options are configured in RBSU. If the requested AMP mode is not supported by the installed DIMM configuration, the server blade boots in Advanced ECC mode. For more information, see "HP ROM-Based Setup Utility (on page 49)."

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

RDIMM maximum memory configurations

The following table lists the maximum memory configuration possible with 8-GB RDIMMs.

Rank	Single-processor	Dual-processor
Single-rank	72 GB	144 GB
Dual-rank	72 GB	144 GB
Quad-rank	48 GB	96 GB

UDIMM maximum memory configurations

The server blade supports a maximum of 12 GB with one processor and 24 GB with two processors using 2-GB single- or dual-rank UDIMMs.

Advanced ECC memory configuration

Advanced ECC memory is the default memory protection mode for this server blade. Standard ECC can correct single-bit memory errors and detect multi-bit memory errors. When multi-bit errors are detected using Standard ECC, the error is signaled to the server blade and causes the server blade to halt.

Advanced ECC protects the server blade against some multi-bit memory errors. Advanced ECC can correct both single-bit memory errors and 4-bit memory errors if all failed bits are on the same DRAM device on the DIMM.

Advanced ECC provides additional protection over Standard ECC because it is possible to correct certain memory errors that would otherwise be uncorrected and result in a server blade failure. The server blade provides notification that correctable error events have exceeded a pre-defined threshold rate.

Mirrored memory configuration

Mirroring provides protection against uncorrected memory errors that would otherwise result in server blade downtime. Mirroring is performed at the channel level. Channels 1 and 2 are used; channel 3 is not populated.

Data is written to both memory channels. Data is read from one of the two memory channels. If an uncorrectable error is detected in the active memory channel, data is retrieved from the mirror channel. This channel becomes the new active channel, and the system disables the channel with the failed DIMM.

Lockstep memory configuration

Lockstep mode provides protection against multi-bit memory errors that occur on the same DRAM device. Lockstep mode can correct any single DRAM device failure on x4 and x8 DIMM types. The DIMMs in each channel must have identical HP part numbers.

Lockstep mode uses channel 1 and channel 2. Channel 3 is not populated. Because channel 3 cannot be populated when using Lockstep mode, the maximum memory capacity is lower than Advanced ECC mode. Memory performance with Advanced ECC is also slightly higher.

General DIMM slot population guidelines

Observe the following guidelines for all AMP modes:

- 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.
- Do not mix Unbuffered and Registered PC3 DIMMs.
- Each channel supports up to two Unbuffered DIMMs.
- If quad-rank DIMMs are installed for a processor, a maximum of two DIMMs can be installed on each channel for that processor.
- If a channel contains quad-rank DIMMs, the quad-rank DIMM must be installed first on that channel.

DIMM speeds are supported as indicated in the following table.

Populated slots (per channel)	**Rank**	**Speeds supported (MHz)**
1	Single- or dual-rank	1333, 1066
1	Quad-rank	1066
2	Single- or dual-rank	1066
3	Single- or dual-rank	800

Advanced ECC population guidelines

For Advanced ECC mode configurations, observe the following guidelines:

- Observe the general DIMM slot population guidelines (on page 25).
- DIMMs may be installed individually.

Single-processor Advanced ECC population order

For Advanced ECC mode configurations with a single processor, populate the DIMM slots in the following order:

- RDIMM: Sequentially in alphabetical order (A through I)
- UDIMM: A through F, sequentially in alphabetical order. Do not populate DIMM slots G through I.

Multi-processor Advanced ECC population order

For Advanced ECC mode configurations with multiple processors, populate the DIMM slots for each processor in the following order:

- RDIMM: Sequentially in alphabetical order (A through I)
- UDIMM: A through F, sequentially in alphabetical order. Do not populate DIMM slots G through I.

Mirrored Memory population guidelines

For Mirrored Memory mode configurations, observe the following guidelines:

- Observe the general DIMM slot population guidelines (on page 25).

- Always install DIMMs in channels 1 and 2 for each installed processor.
- Do not install DIMMs in channel 3 for any processor.
- DIMMs installed on channel 1 and channel 2 of an installed processor must be identical.
- In multi-processor configurations, each processor must have a valid Mirrored Memory configuration.
- In multi-processor configurations, each processor may have a different valid Mirrored Memory configuration.

Single-processor Mirrored Memory population order

For Mirrored Memory mode configurations with a single processor, populate the DIMM slots in the following order:

- RDIMM
  - First: A and B
  - Next: D and E
  - Last: G and H
  - Do not populate slots C, F, or I.
- UDIMM
  - First: A and B
  - Last: D and E
  - Do not populate slots C, F, G, H, or I.

After installing the DIMMs, use RBSU to configure the system for Mirrored Memory support ("Configuring mirrored memory" on page 51).

Multi-processor Mirrored Memory population order

For Mirrored Memory mode configurations with multiple processors, populate the DIMM slots for each processor in the following order:

- RDIMM
  - First: A and B
  - Next: D and E
  - Last: G and H
  - Do not populate slots C, F, or I.
- UDIMM
  - First: A and B
  - Last: D and E
  - Do not populate slots C, F, G, H, or I.

After installing the DIMMs, use RBSU to configure the system for mirrored memory support ("Configuring mirrored memory" on page 51).

Lockstep Memory population guidelines

For Lockstep memory mode configurations, observe the following guidelines:

- Observe the general DIMM slot population guidelines (on page 25).
- Always install DIMMs in channels 1 and 2 for each installed processor.
- Do not install DIMMs in channel 3 for any processor.
- DIMM configuration on channel 1 and channel 2 of a processor must be identical.
- In multi-processor configurations, each processor must have a valid Lockstep Memory configuration.
- In multi-processor configurations, each processor may have a different valid Lockstep Memory configuration.

Single-processor Lockstep population order

For Lockstep memory mode configurations with a single processor, populate the DIMM slots in the following order:

- RDIMM
  - First: A and B
  - Next: D and E
  - Last: G and H
  - Do not populate slots C, F, or I.
- UDIMM
  - First: A and B
  - Last: D and E
  - Do not populate slots C, F, G, H, or I.

After installing the DIMMs, use RBSU to configure the system for Lockstep memory support ("Configuring lockstep memory" on page 52).

Multi-processor Lockstep population order

For Lockstep memory mode configurations with multiple processors, populate the DIMM slots for each processor in the following order:

- RDIMM
  - First: A and B
  - Next: D and E
  - Last: G and H
  - Do not populate slots C, F, or I.
- UDIMM
  - First: A and B
  - Last: D and E
  - Do not populate slots C, F, G, H, or I.

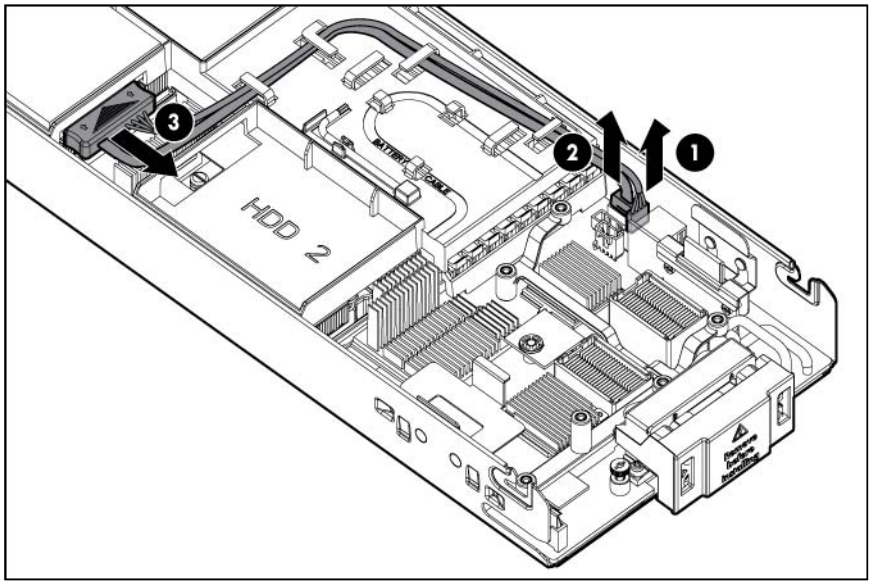
After installing the DIMMs, use RBSU to configure the system for Lockstep memory support ("Configuring lockstep memory" on page 52).

Installing DIMMs

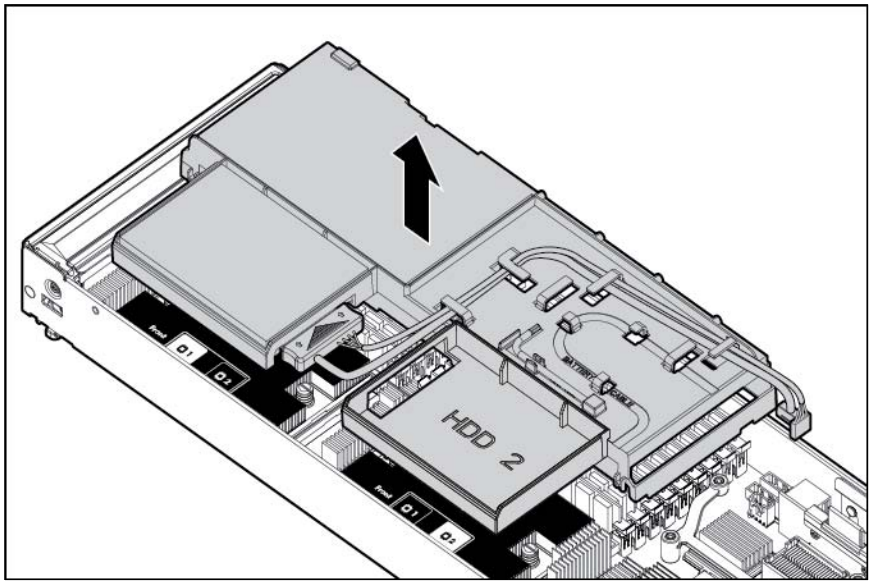
WARNING: To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

To install the component:

1. Power down the server blade (on page 11).
2. Remove the server blade (on page 12).
3. Remove the access panel (on page 13).
4. Disconnect the hard drive cables.

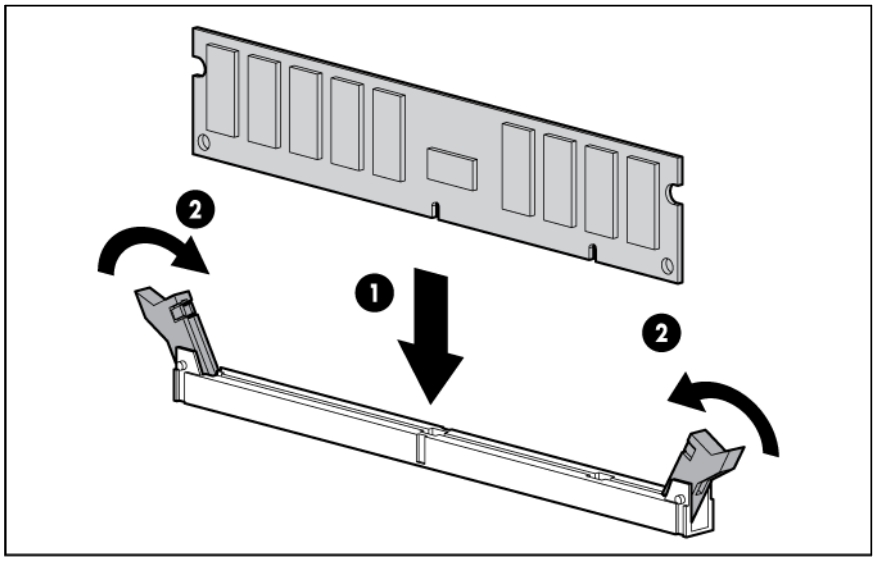


5. Remove the DIMM baffle with the hard drives and cables in place.



6. Open the DIMM slot latches.

7. Install the DIMM.



8. Install the DIMM baffle.
9. Connect the hard drive cables.
10. Install the access panel (on page 13).
11. Install the server blade ("Installing a server blade" on page 17).

Processor option

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: 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.

CAUTION: To prevent possible server blade overheating, always populate processor socket 2 with a processor and a heatsink or a processor socket cover and a heatsink blank.

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

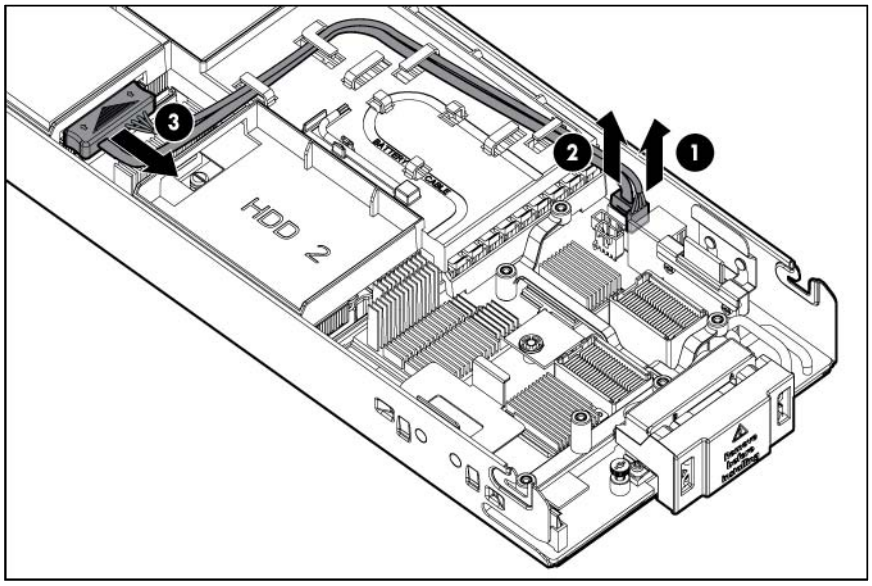
IMPORTANT: When installing the heatsink, align the guide pins on the processor retention bracket with the alignment holes in the heatsink.

To install the component:

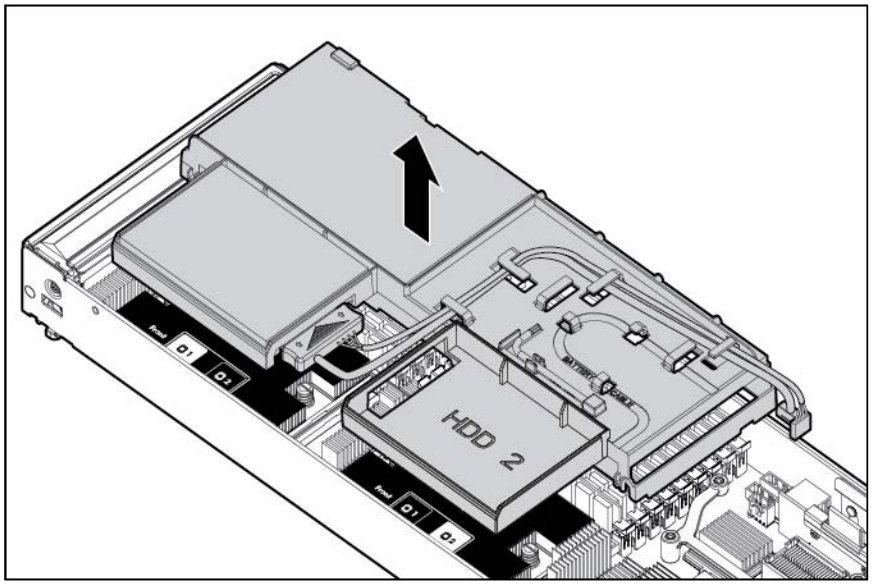
1. Update the system ROM.

   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 11).
3. Remove the server blade (on page 12).
4. Remove the access panel (on page 13).

5. Disconnect the hard drive cables from the system board.

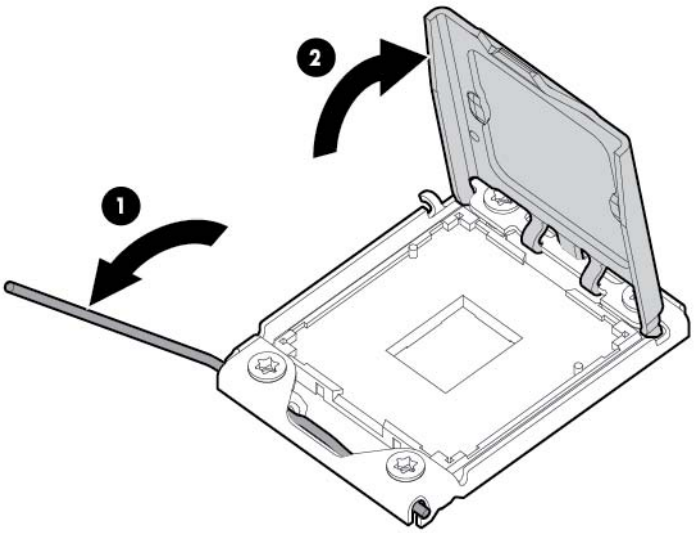


6. Remove the DIMM baffle with the hard drives and cables in place.



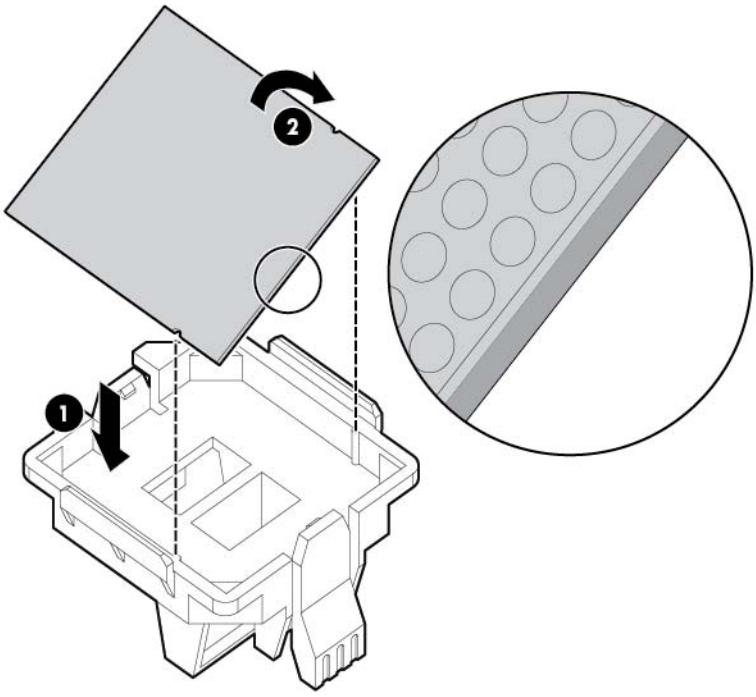
△ **CAUTION:** Failure to completely open the processor locking lever prevents the processor from seating during installation, leading to hardware damage.

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

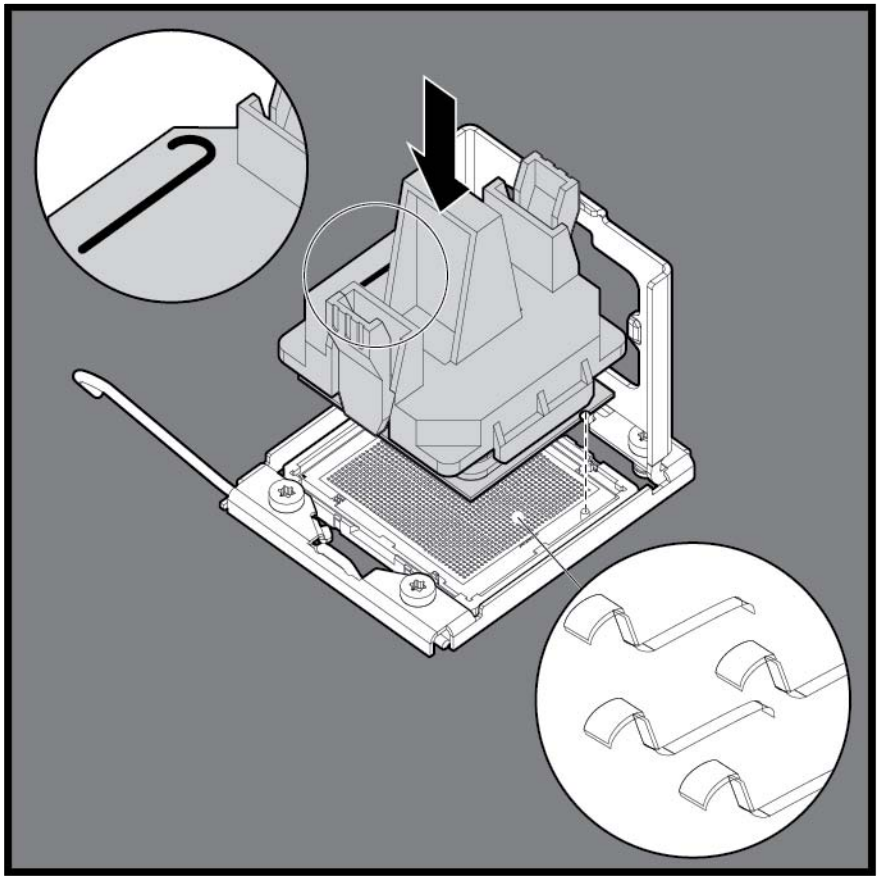


IMPORTANT: Be sure the processor remains inside the processor installation tool.

8. 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.



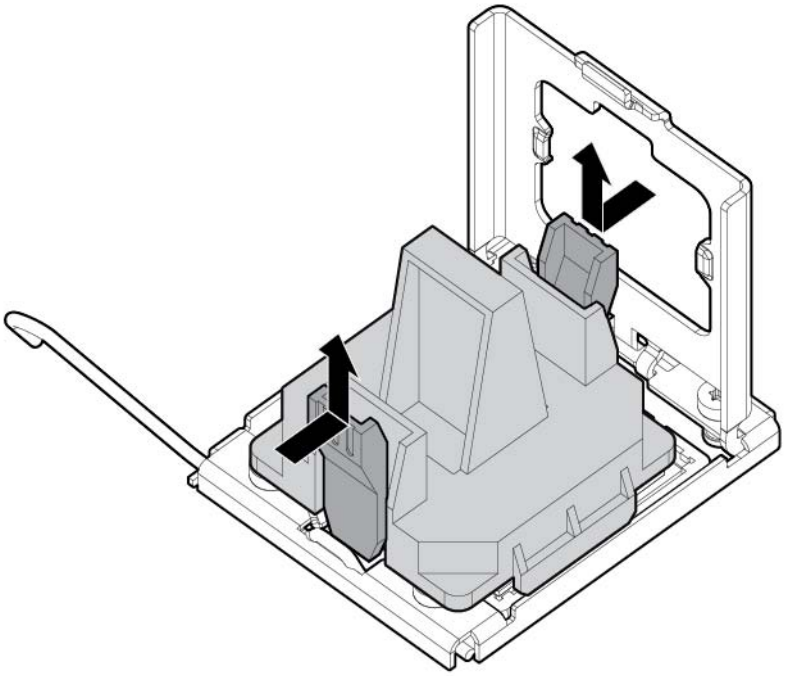
9. Align the processor installation tool with the socket, and then install the processor. **THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED**.



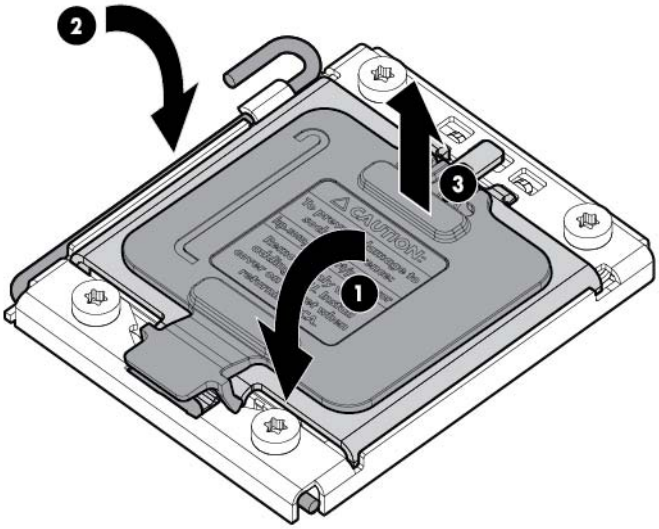
△ **CAUTION: THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED.** To avoid damage to the system board:

- 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.

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

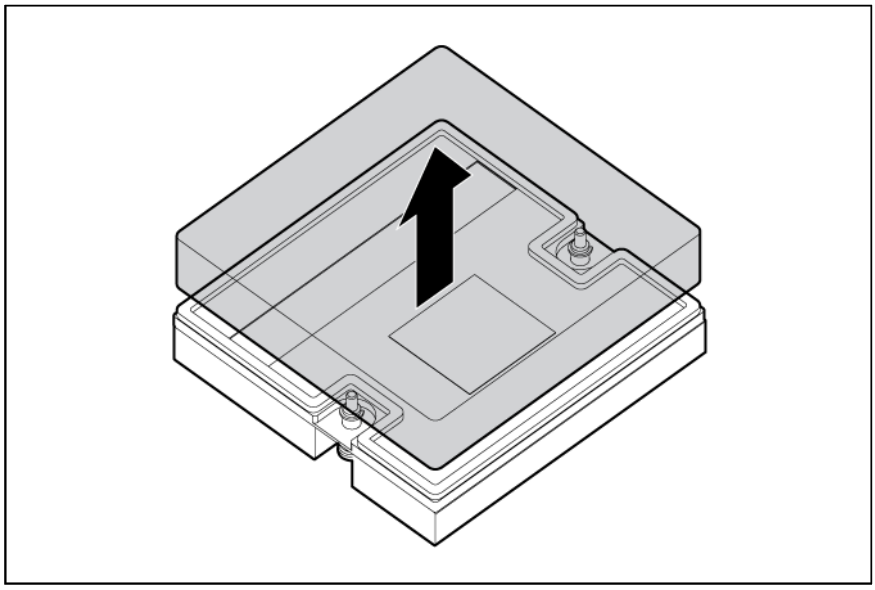


11. Close the processor socket retaining bracket and the processor locking lever. **The processor socket cover is automatically ejected**. Remove the cover.



△ **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.

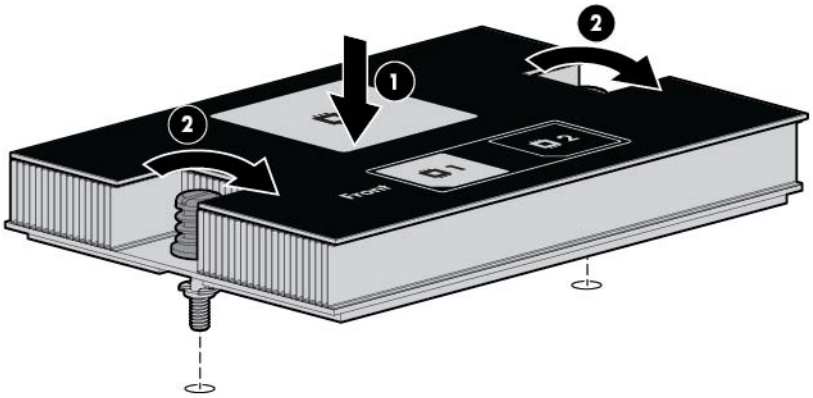
12. Remove the thermal interface media protective cover.



CAUTION: To avoid damage to the system board, processor socket, and screws, do not overtighten the heatsink screws. Use the wrench supplied with the system to reduce the possibility of overtightening the screws.

CAUTION: To avoid possible thermal damage, install replacement heatsinks as indicated on the heatsink labels. The heatsinks are not interchangeable between processor 1 and processor 2 within a server blade.

13. Install the heatsink. Insert both screws, and then alternate tightening until the heatsink is seated properly.



14. Install the DIMM baffle.
15. Connect the hard drive cables ("Hard drive cabling" on page 40).
16. Install the access panel (on page 13).
17. Install the server blade ("Installing a server blade" on page 17).

Mezzanine card option

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.

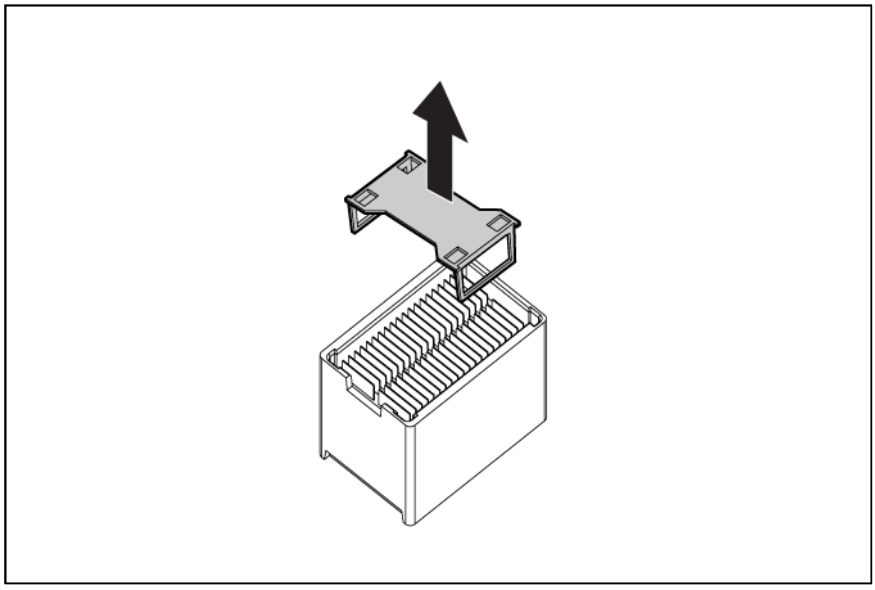
- Install Type I mezzanine cards on either mezzanine 1 connector or mezzanine 2 connector.
- Install Type II mezzanine cards only on mezzanine 2 connector.

Optional mezzanine cards enable network connectivity and provide Fibre Channel support. For mezzanine card locations, see the system board components (on page 7).

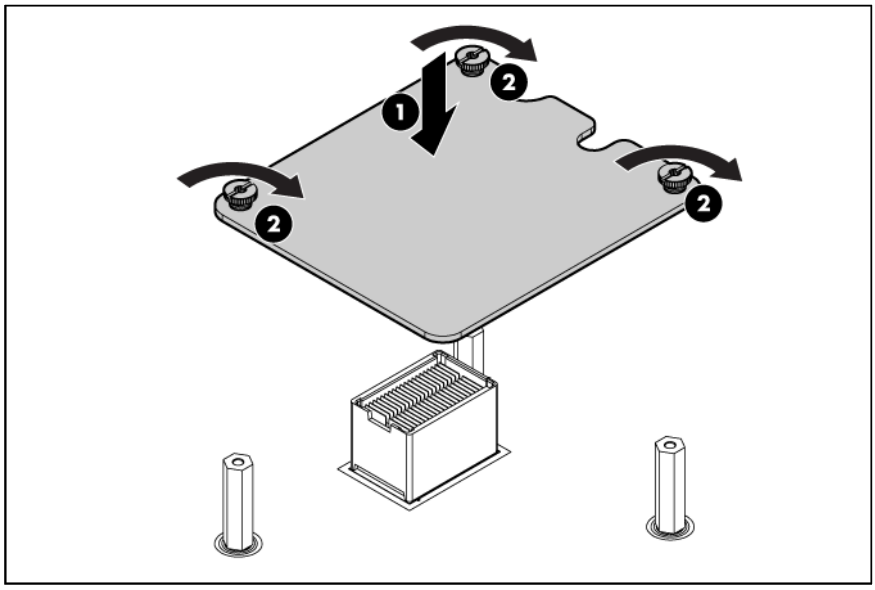
For mezzanine card signal mapping, see "Interconnect bay numbering and device mapping (on page 15)."

To install the component:

1. Power down the server blade (on page 11).
2. Remove the server blade (on page 12).
3. Remove the access panel (on page 13).
4. Remove the mezzanine connector cover.



5. Install the mezzanine card. Press down on the connector to seat the board.



6. Install the access panel (on page 13).
7. Install the server blade ("Installing a server blade" on page 17).

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 (on page 37).
2. Retaining the recovery key/password (on page 38).
3. Enabling the Trusted Platform Module (on page 38).

   Enabling the TPM requires accessing the ROM-Based Setup Utility (RBSU) ("HP ROM-Based Setup Utility" on page 49). 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.

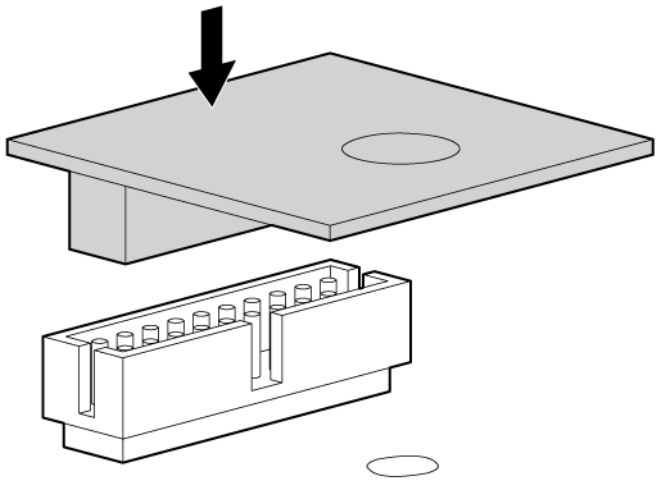
Installing the Trusted Platform Module board

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

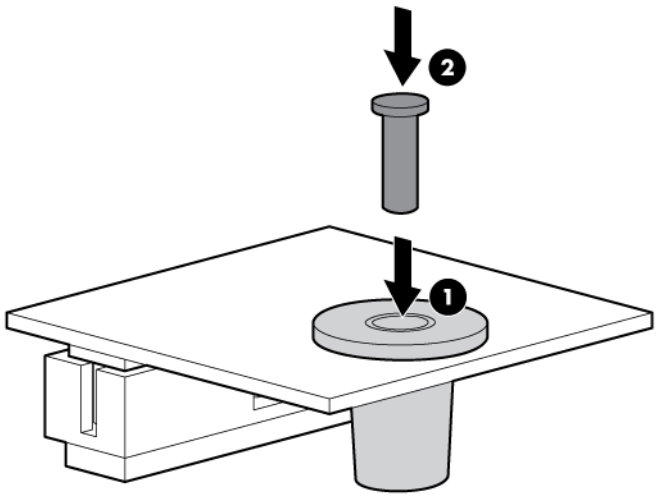
1. Power down the server blade (on page 11).
2. Remove the server blade (on page 12).
3. Place the server blade on a flat, level work surface.
4. Remove the access panel (on page 13).

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" on page 7).



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



7. Install the access panel (on page 13).
8. Install the server blade ("Installing a server blade" on page 17).
9. Power up the server blade (on page 11).

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.

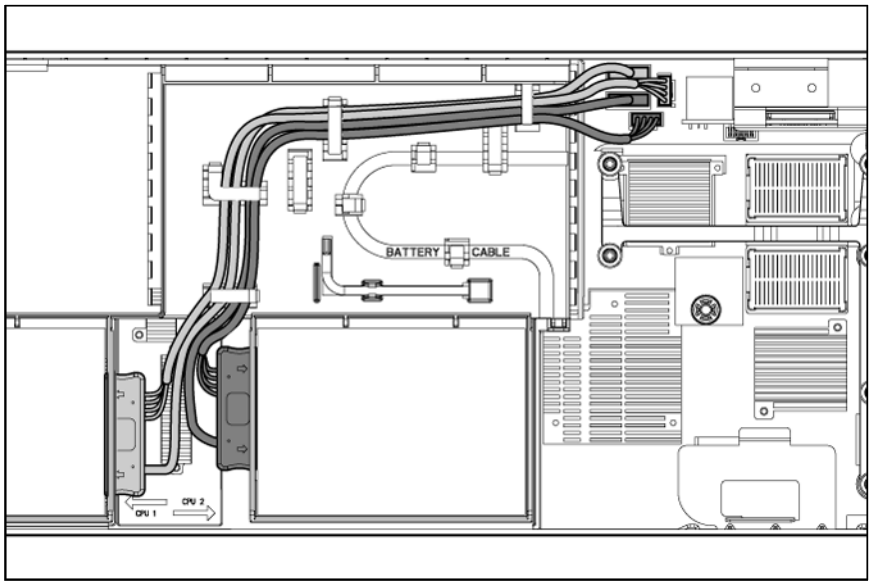
For more information on firmware updates and hardware procedures, see the *HP Trusted Platform Module Best Practices White Paper* on the HP website (http://www.hp.com/support).

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

Cabling

Hard drive cabling

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



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 10)."

Connecting locally to a server blade with video and USB devices

Use the SUV 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

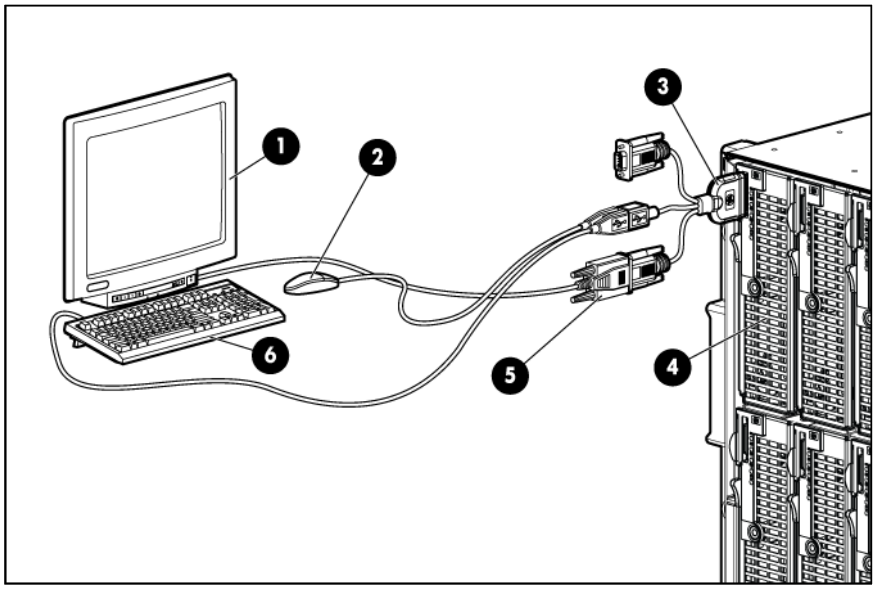
Numerous configurations are possible. This section offers two possible configurations. For more information, see "USB support and functionality (on page 55)."

Accessing a server blade with local KVM

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

> **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.

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	Server blade
5	Video connector
6	USB keyboard

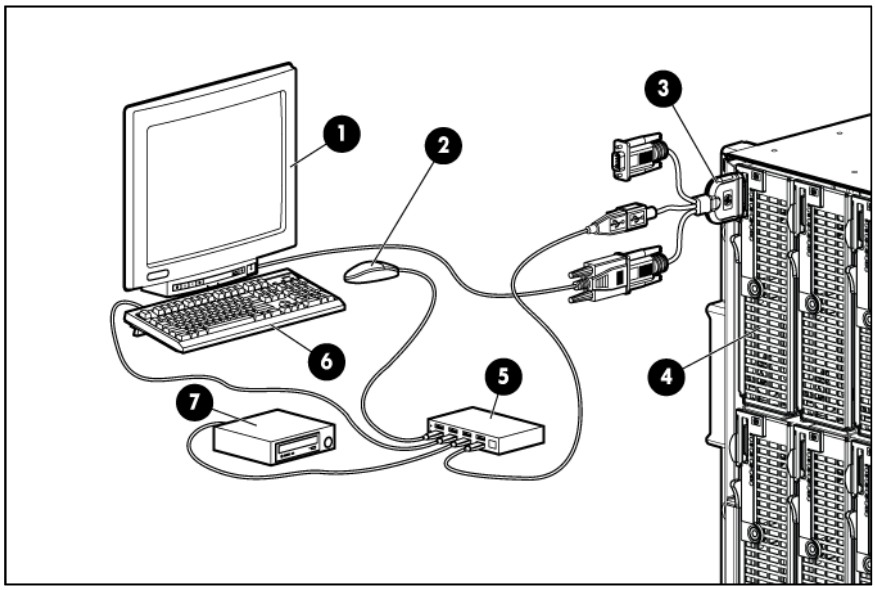
Accessing a server blade with local media devices

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.

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.

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



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. HP BladeSystem 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® 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 Java™ 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
- 1-Gb/s network adapter or greater

- PXE deployment server (storing boot images)
  - AMD Athlon™ XP processor (2.0 GHz or greater recommended), AMD Athlon™ 64 processor, or Intel® Pentium® III or higher processor (2.0 GHz or greater recommended)
  - 2 GB of RAM
  - 1-Gb/s network adapter
  - CD-ROM drive
- Windows® repository server (Windows® or Linux deployment)
  - 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 Java™ 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 46)
- CD-ROM deployment (on page 46)
- Diskette image deployment (on page 47)
- SAN configuration (on page 48)

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 43)."

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 47)

- USB CD-ROM (on page 47)

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 43)."
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 40)."
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.

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 44)."

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 48)
- PXE ("PXE deployment" on page 46)

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 43)."

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 43)."
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 56)
- 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 52) and Erase Utility (on page 54)

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 Advanced ECC memory

To configure Advanced ECC memory:

1. Install the required DIMMs ("Installing DIMMs" on page 27).
2. When the prompt appears, access RBSU by pressing the **F9** key during power-up.
3. Select **System Options**.
4. Select **Advanced Memory Protection**.
5. Select **Advanced ECC Memory**.
6. Press the **Enter** key.
7. Press the **Esc** key to exit the current menu or press the **F10** key to exit RBSU.

For more information on Advanced ECC, see the HP website (http://h18000.www1.hp.com/products/servers/technology/memoryprotection.html).

Configuring mirrored memory

To configure mirrored memory:

1. Install the required DIMMs ("Installing DIMMs" on page 27).
2. Access RBSU by pressing the **F9** key during power-up when the prompt is displayed.
3. Select **System Options**.
4. Select **Advanced Memory Protection**.
5. Select **Mirrored Memory with Advanced ECC Support**.
6. Press the **Enter** key.

7. Press the **Esc** key to exit the current menu or press the **F10** key to exit RBSU.

For more information on mirrored memory, see the white paper on the HP website (http://h18000.www1.hp.com/products/servers/technology/memoryprotection.html).

Configuring lockstep memory

To configure Lockstep memory:

1. Install the required DIMMs ("Installing DIMMs" on page 27).
2. Access RBSU by pressing the **F9** key during power-up when the prompt is displayed.
3. Select **System Options**.
4. Select **Advanced Memory Protection**.
5. Select **Lockstep with Advanced ECC Support**.
6. Press the **Enter** key.
7. Press the **Esc** key to exit the current menu, or press the **F10** key to exit RBSU.

For more information on Lockstep memory, see the white paper on the HP website (http://h18000.www1.hp.com/products/servers/technology/memoryprotection.html).

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 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 49).

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 40)."

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 56) 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 58).

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 56)

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 49) 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)

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 59). 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 60).
2. Gather symptom information (on page 62).
3. Prepare the server for diagnosis (on page 62).
4. Use the Start diagnosis flowchart (on page 65) 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.

6.44 kg
14.20 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 56) 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 11).
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 29) 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 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 63)." 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 65)," 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 66)." 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.

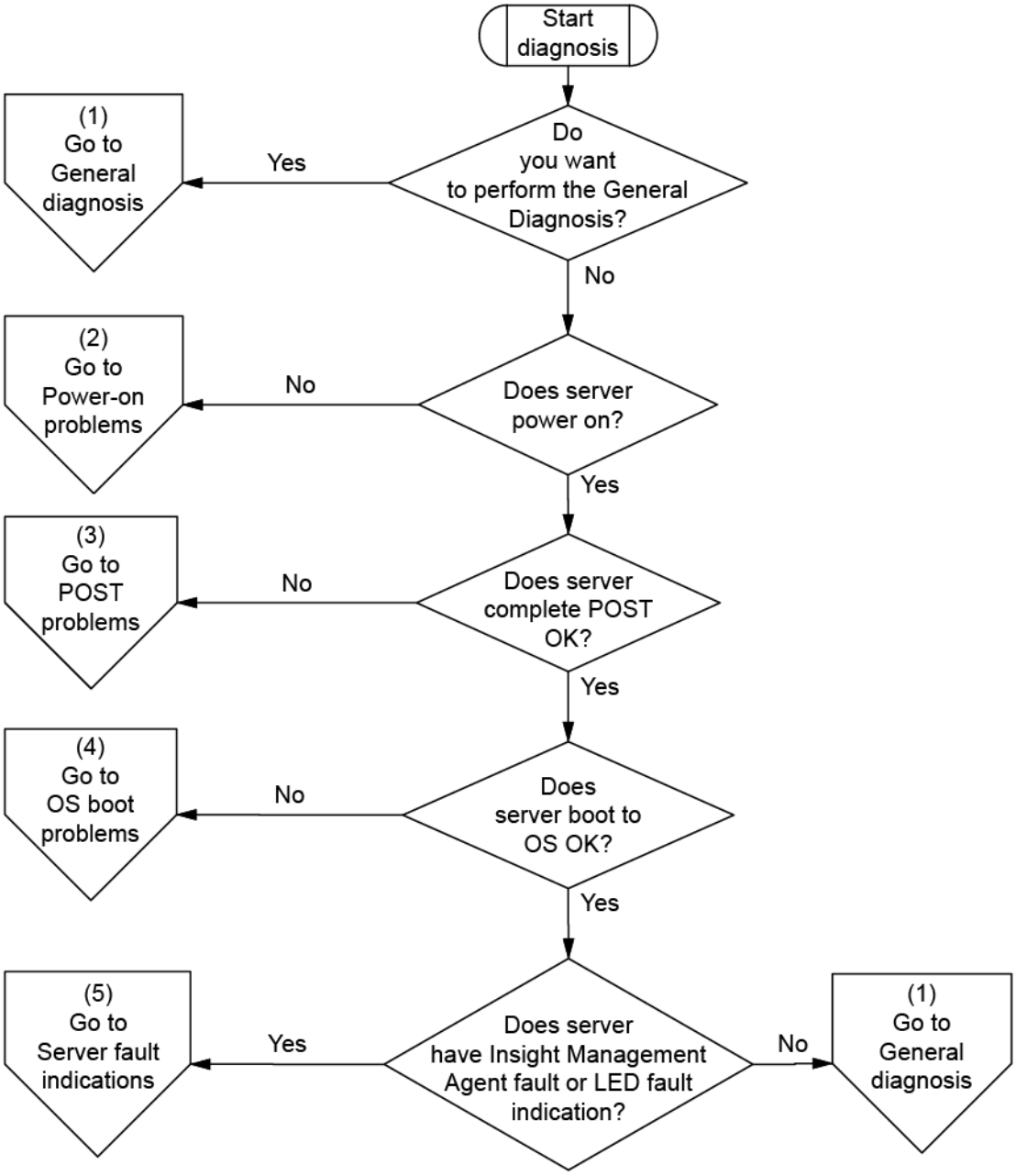
The available flowcharts include:

- Start diagnosis flowchart (on page 65)
- General diagnosis flowchart (on page 66)
- Server blade power-on problems flowchart (on page 68)
- POST problems flowchart (on page 70)
- OS boot problems flowchart (on page 72)
- Server fault indications flowchart (on page 74)

Start diagnosis flowchart

Use the following flowchart to start the diagnostic process.

Item	See
1	"General diagnosis flowchart (on page 66)"
2	"Power-on problems flowchart ("Server blade power-on problems flowchart" on page 68)"
3	"POST problems flowchart (on page 70)"
4	"OS boot problems flowchart (on page 72)"
5	"Server fault indications flowchart (on page 74)"

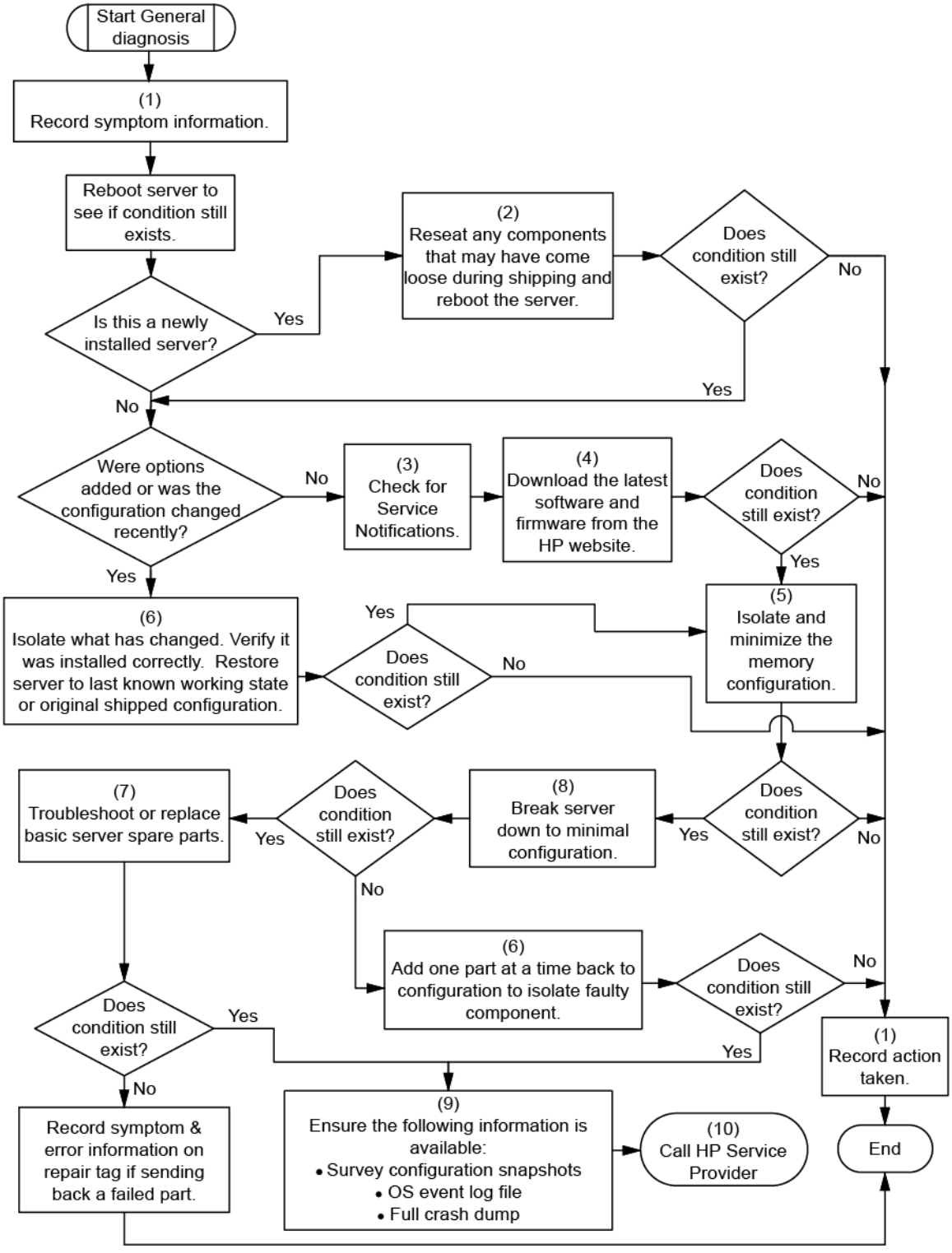


General diagnosis flowchart

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 62)"
2	"Loose connections (on page 64)"
3	"Service notifications (on page 64)"

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 60)"
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 60)"
8	"Breaking the server down to the minimum hardware configuration (on page 63)" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)"
9	• "Server information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • "Operating system information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)"
10	"HP contact information (on page 87)"



Server blade power-on problems flowchart

Symptoms:

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

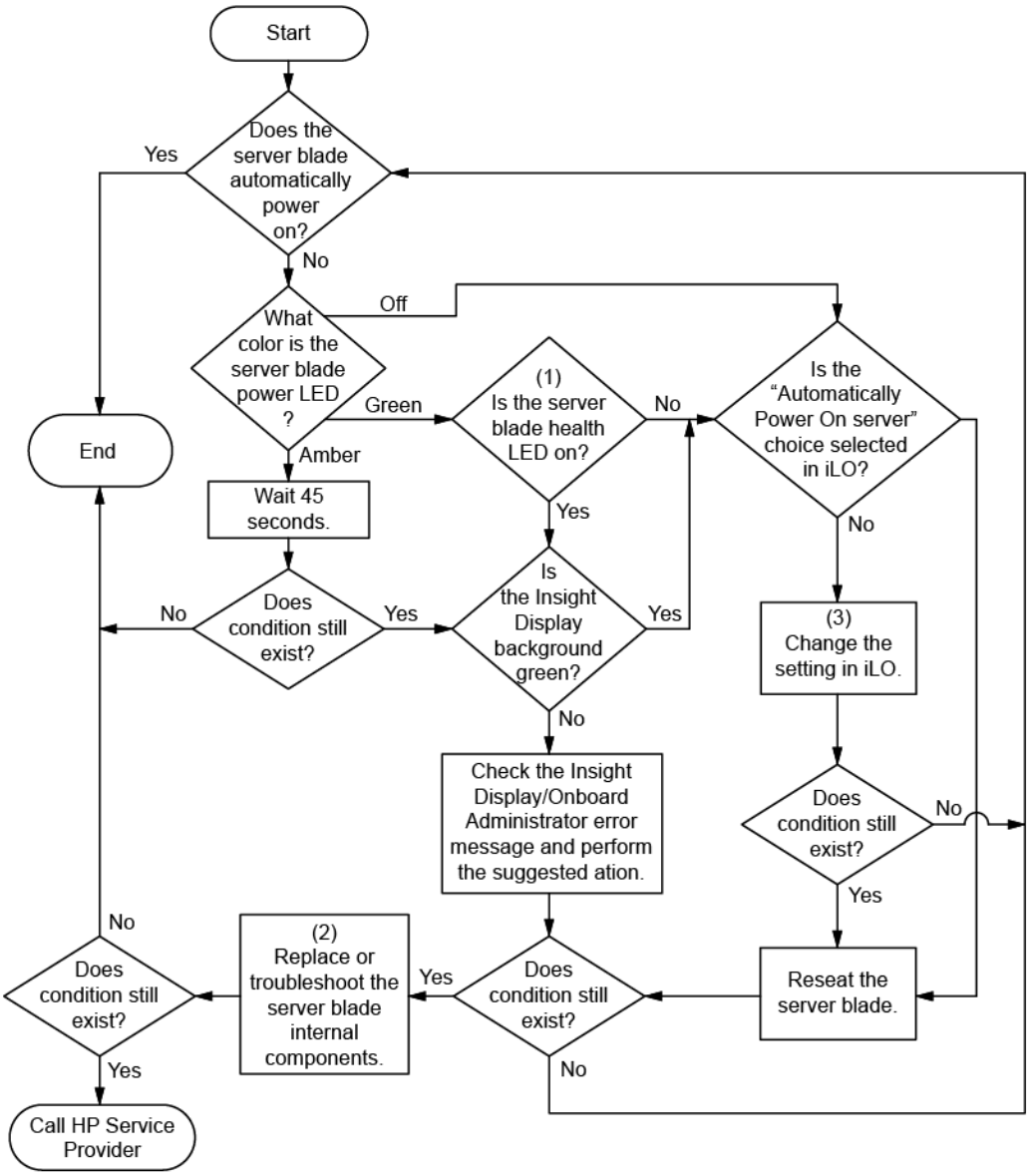
- The health LED is red or amber.

  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 6)"
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

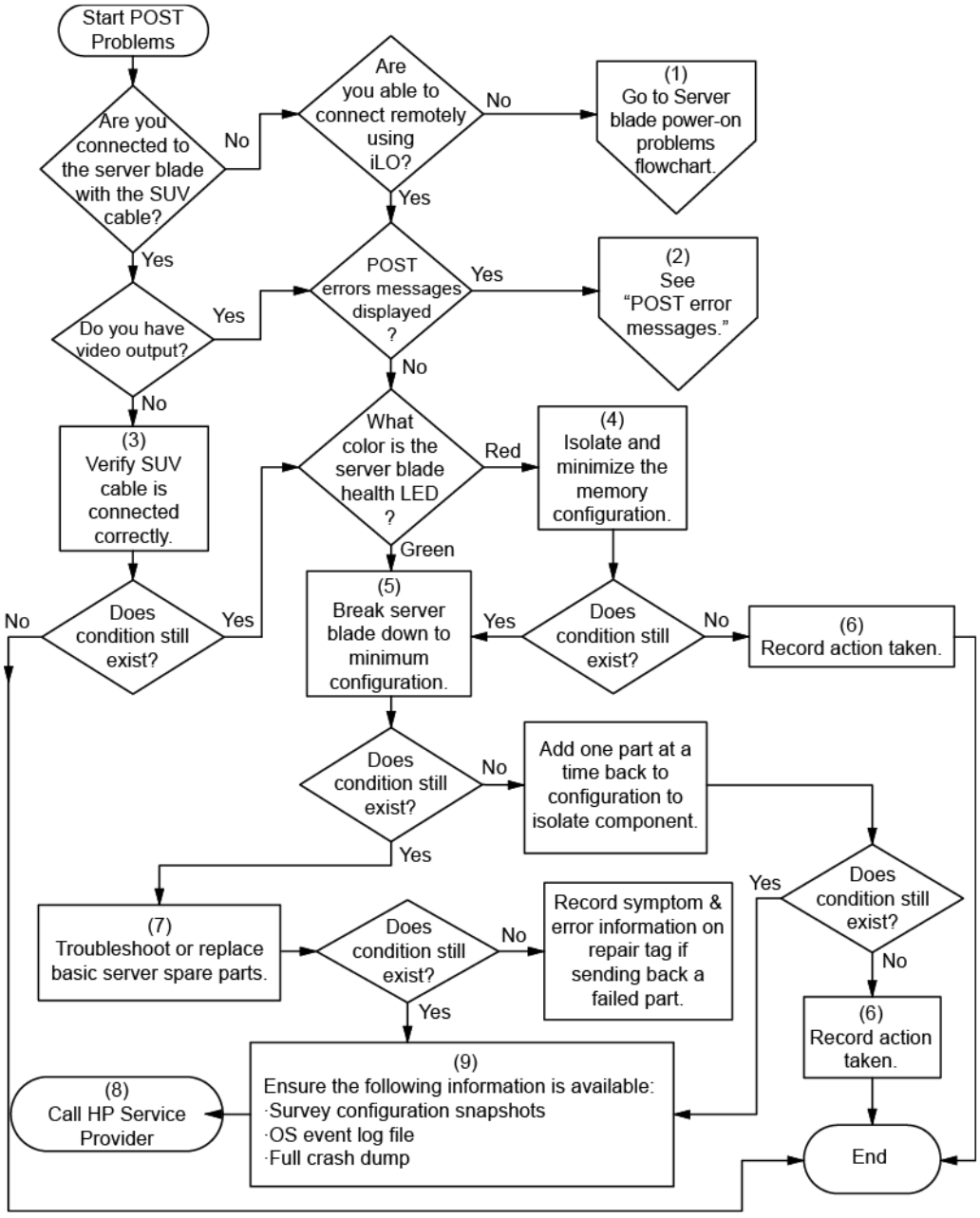
  NOTE: The server has completed POST when the system attempts to access the boot device.

- 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 68)
2	"POST error messages and beep codes (on page 76)"
3	"Video problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)"
4	"General memory problems are occurring" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)"
5	"Breaking the server down to the minimum hardware configuration (on page 63)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)"
6	"Symptom information (on page 62)"
7	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • 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 87)"
9	• "Server information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • "Operating system information you need" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)"



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.

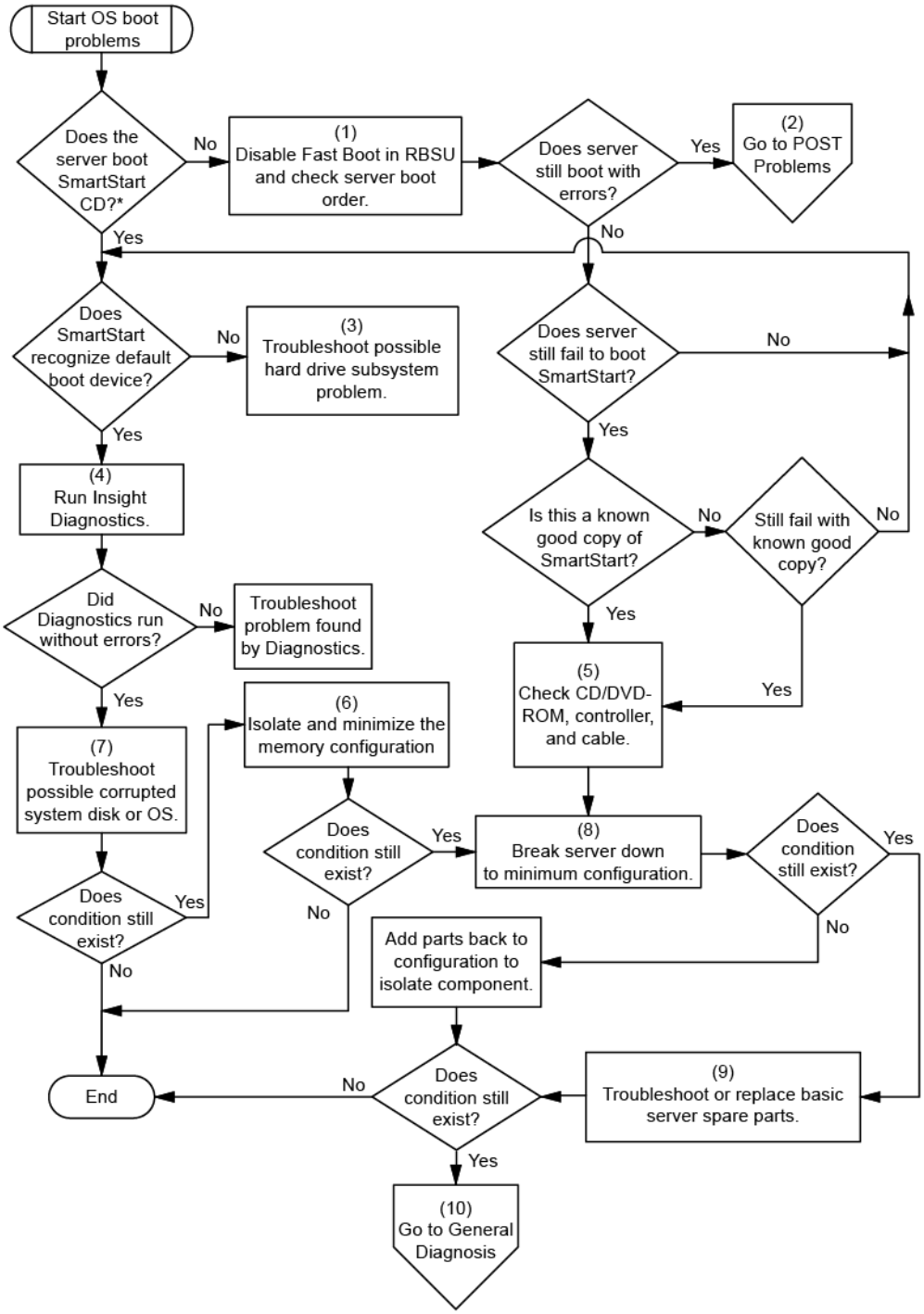
Symptoms:

- 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 70)"
3	• "Hard drive problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • Controller documentation
4	"HP Insight Diagnostics (on page 56)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)"
5	• "Loose connections (on page 64)" • "CD-ROM and DVD drive problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • 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 60)"
7	• "Operating system problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • "HP contact information (on page 87)"
8	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • 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 66)"



* See the server blade OS boot problems flowchart (on page 72)

Server fault indications flowchart

Symptoms:

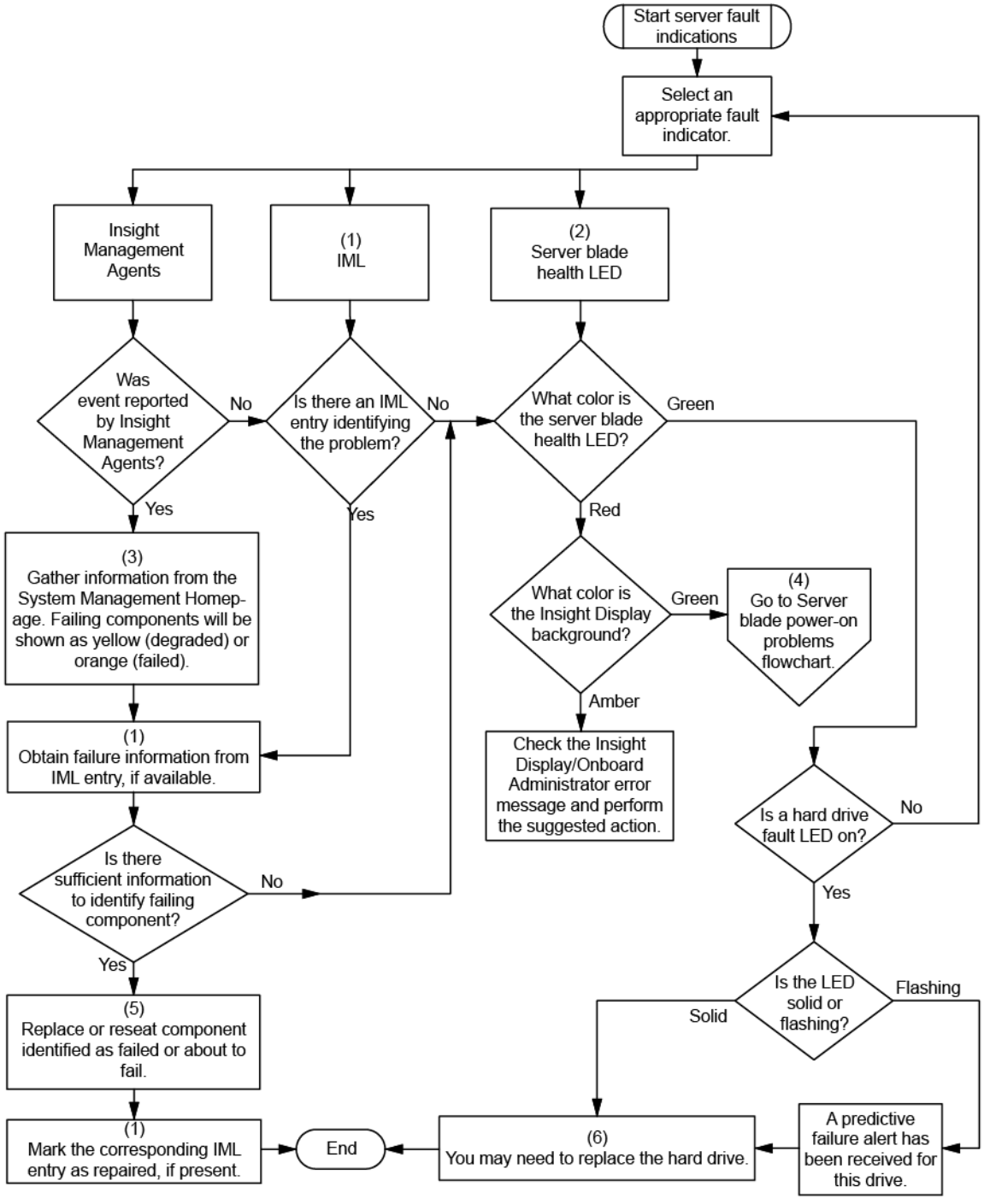
- Server boots, but a fault event is reported by Insight Management Agents
- Server boots, but the internal health LED, external health LED, or component health LED is red or amber

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 57)" or in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • "Event list error messages" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)"
2	"Component identification (on page 6)"
3	System Management Homepage (https://localhost:2381)
4	"Power-on problems flowchart ("Server blade power-on problems flowchart" on page 68)"
5	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • 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 87)"
6	• "Hardware problems" in the *HP ProLiant Servers Troubleshooting Guide* located on the Documentation CD or see "Troubleshooting resources (on page 60)" • 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.

Battery replacement

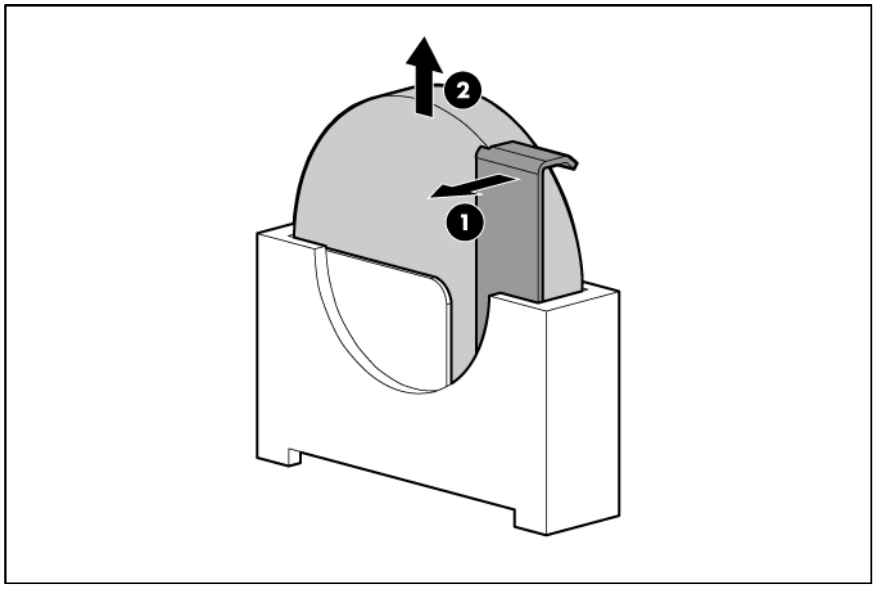
If the server blade no longer automatically displays the correct date and time, you may need to replace the battery that provides power to the real-time clock. Under normal use, battery life is 5 to 10 years.

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 11).
2. Remove the server blade (on page 12).
3. Remove the access panel (on page 13).
4. Identify the battery location ("System board components" on page 7).
5. Remove the battery.



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

To replace the component, reverse the removal procedure.

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

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:

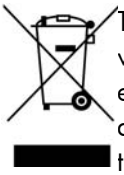
For non-telecommunications products and for EU harmonized telecommunications products, such as Bluetooth® within power class below 10mW.

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.

Acoustics statement for Germany (Geräuschemission)

Schalldruckpegel L_{pA} < 70 dB(A)

Zuschauerpositionen (bystander positions), Normaler Betrieb (normal operation)

Nach ISO 7779:1999 (Typprüfung)

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	18.16 cm (7.15 in)
Depth	50.95 cm (20.06 in)
Width	5.56 cm (2.19 in)
Weight (maximum)	6.44 kg (14.20 lb)
Weight (no drives installed)	4.87 kg (10.75 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

What is customer self repair?

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

A convenient, easy-to-use program:

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

Acronyms and abbreviations

ABEND

abnormal end

AMP

Advanced Memory Protection

ASR

Automatic Server Recovery

CSR

Customer Self Repair

DHCP

Dynamic Host Configuration Protocol

HP SIM

HP Systems Insight Manager

iLO 3

Integrated Lights-Out 3

IML

Integrated Management Log

ISEE

Instant Support Enterprise Edition

NBP

Network Bootstrap Program

ORCA

Option ROM Configuration for Arrays

POST

Power-On Self Test

PSP

ProLiant Support Pack

PXE

Preboot Execution Environment

RBSU

ROM-Based Setup Utility

SUV

serial, USB, video

TFTP

Trivial File Transfer Protocol

UID

unit identification

USB

universal serial bus

VCA

Version Control Agent

WfM

Wired for Management

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