HP ProLiant ML570 Generation 3 Server Maintenance and Service Guide

Audience assumptions

This guide is for an experienced service technician. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazards in products with hazardous energy levels and are familiar with weight and stability precautions for rack installations.

Contents

Specifications   99

Acronyms and abbreviations   107

Index   113

Illustrated parts catalog

In this section

Customer self repair

What is customer self repair?

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

A convenient, easy-to-use program:

- An HP support specialist will diagnose and assess whether a replacement part is required to address a system problem. The specialist will also determine whether you can replace the part.

- Replacement parts are express-shipped. Most in-stock parts are shipped the very same day you contact HP. You may be required to send the defective part back to HP, unless otherwise instructed.

- Available for most HP products currently under warranty or contract. For information on the warranty service, refer to the HP website (http://h18004.www1.hp.com/products/servers/platforms/warranty/index.html).

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

Customer replaceable parts are identified in the following tables.

Mechanical components
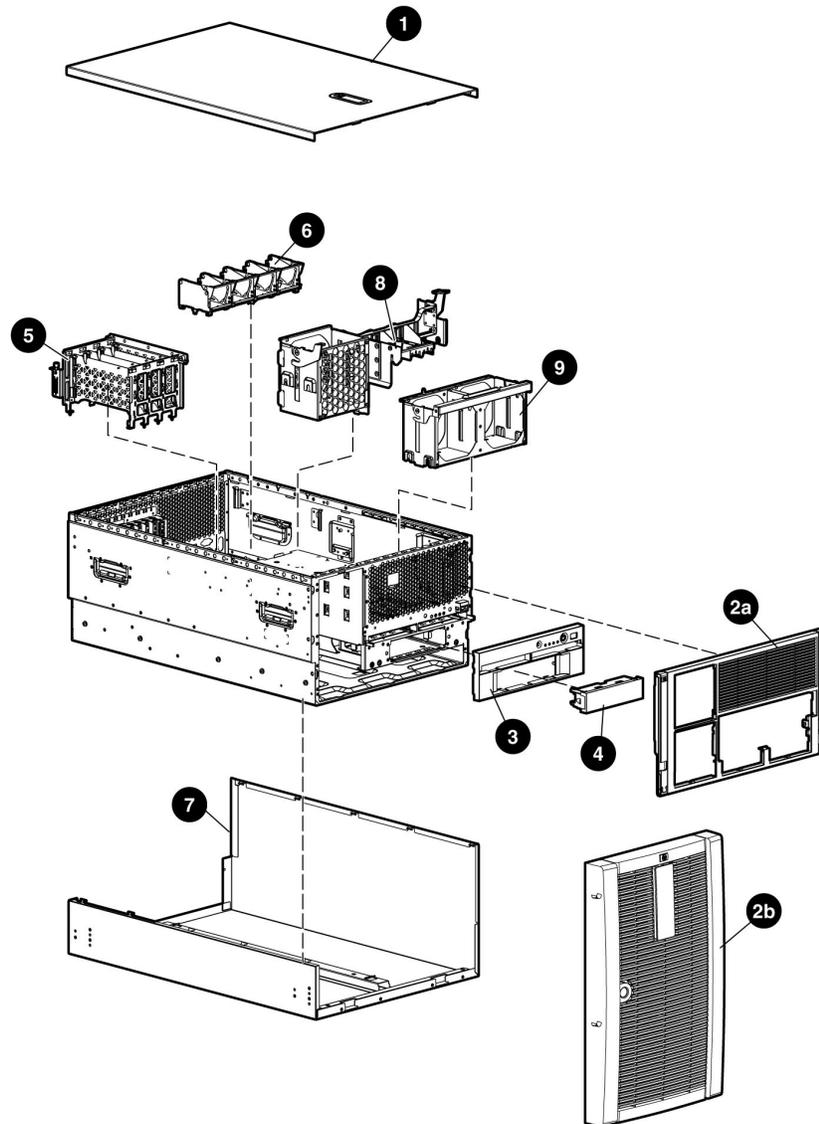
Item	Description	Assembly Number	Spare Part Number	Customer Self Repair
1	Access panel, ProLiant ML570 G3 Server	366264-002	374553-001	Yes
2a	Bezel, Rack, ProLiant ML570 G3 Server	373317-001	374557-001	Yes
2b	Bezel, Tower, ProLiant ML570 G3 Server	373316-001	374556-001	Yes
	Plastics Kit, ProLiant ML570 G3 Server		374550-001	Yes
*	• Hot-plug basket, PCI-X	372583-001	—	
*	• Baffle assembly	353829-001	—	
3	• Bezel assembly, media	373319-001	—	
*	• Retainer, tower bezel	158475-003	—	
*	• Latch, PCI, carbon	228194-001	—	
*	• Latch, PCI, blue	228194-002	—	
*	• Retainer, memory board	366262-001	—	
*	• Retainer, memory board	366263-001	—	
*	• Latch, center wall	366272-001	—	
*	• Latch, center wall	366273-001	—	
*	• Latch, center wall	366274-001	—	
*	• Retainer, PCI, carbon	379046-001	—	
*	• Retainer, PCI, blue	379046-002	—	
	Hardware Kit, Misc, ProLiant ML570 G3 Server		374551-001	Yes
4	Blank, tape drive	373318-001	—	
*	Blank, power supply	366450-001	—	
*	Blank, CD/DVD/diskette	377569-001	—	
5	Cage, memory modules			
6	Hold-down, processor power module			
8	Center wall			

Item	Description	Assembly Number	Spare Part Number	Customer Self Repair
7	Cover, tower, ProLiant ML570 G3 Server	374503-001	377839-001	Yes
9	Cage, fan			
*	Kit, rack mount	374503-001	377839-001	Yes
*	Blank, hard drive	302531-001	122759-001	Yes
*	Casters, tower	289720-003	296277-001	Yes
*	Return kit, tower, ProLiant ML570 G3 Server		374554-001	Yes
*	Return kit, rack, ProLiant ML570 G3 Server		374555-001	Yes
*	Screwdriver, Torx, T-15	107473-001	199630-001	Yes

*Not shown

System components
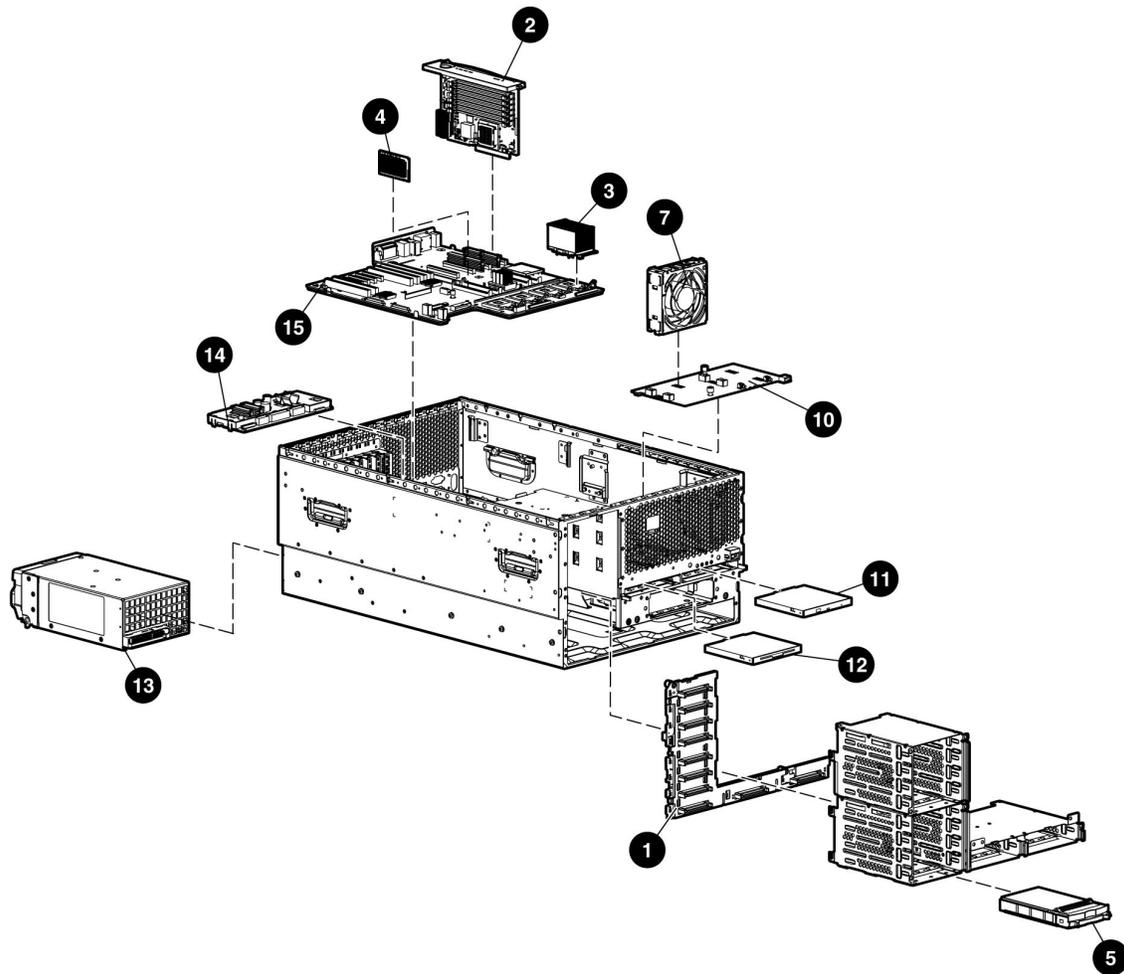
Item	Description	Assembly Number	Spare Part Number	Customer Self Repair
	System Components			
3	Processor, 3.66 GHz, 1 MB, with heatsink	376659-002	389027-001	Yes
*	Processor, 3.33 GHz, 8 MB, with heatsink	376660-001	379982-001	Yes
*	Processor, 3.00 GHz, 8 MB, with heatsink	376660-002	379981-001	Yes
*	Processor, 3.16 GHz, 1 MB, with heatsink	376659-001	377840-001	Yes
*	Processor, 2.83 GHz, 4 MB, with heatsink	376661-001	377840-001	Yes
13	Power Supply, 910/1300 Watt	337667-001	364360-001	Yes
	Boards			
1	Board, SCSI Backplane, ProLiant ML570 G3 Server	012076-001	368161-001	No
2	Board, Memory, ProLiant ML570 G3 Server	012073-001	368160-001	Yes
4	Board, Processor Power Module	367240-001	370718-001	Yes
10	Board, Fan/CD/Diskette	012085-001	374547-001	Yes
14	Board, Power Backplane, ProLiant ML570 G3 Server	012079-001	374546-001	No
15	Board, System, ProLiant ML570 G3 Server	012067-001	368159-001	No
*	Board, PCI Hot-Plug switch	011077-001	230981-001	Yes
	Memory			
	DIMM, PC3200, DDR2			
*	a) 512 MB	345112-051	359241-001	Yes
*	b) 1 GB	345113-051	359242-001	Yes
*	c) 2 GB, single rank	345114-061	359243-001	Yes

Item	Description	Assembly Number	Spare Part Number	Customer Self Repair
*	d) 2 GB, dual rank	345114-051	378021-001	Yes
	SCSI Ultra320 universal hot-plug hard drive			
5	a) 36.4 GB 15K rpm	271837-016	289241-001	Yes
*	b) 72.8 GB 10K rpm	271837-008	289042-001	Yes
*	c) 72.8 GB 15K rpm	271837-018	289243-001	Yes
*	d) 146.8 GB 10K rpm	271837-010	289044-001	Yes
*	e) 300 GB 10k rpm	271837-021	351126-001	Yes
	Removable Media Drives			
11	DVD drive, 8x	168003-935/9D1	268795-001	Yes
12	Diskette drive, 3.5 in	263394-001	267132-001	Yes
*	CD-RW drive	294766-9D1/935	337273-001	Yes
	Cables			
*	Cable kit, power		374549-001	Yes
*	• Cable, fan power	372618-001	—	
*	• Cable, power backplane, 12 pin	372619-001	—	
*	• Cable, power backplane, 14 pin	372620-001	—	
*	• Cable, power backplane, 22 pin	372621-001	—	
*	Cable kit, data		374548-001	Yes
*	• Cable, fan	372616-001	—	
*	• Cable, power backplane	372617-001	—	
*	• Cable, jacketed, blue	166298-041	—	
*	• Cable, jacketed, yellow	166298-042	—	
*	• Cable, PCI HP	224999-002	—	
	Miscellaneous			
*	AC power cord, 15 A, 125 V	178968-001	237457-001	Yes

Item	Description	Assembly Number	Spare Part Number	Customer Self Repair
*	AC power cord, C14-C19	287485-001	311582-001	Yes
*	Battery, 3 V, Lithium	166899-001	153099-001	Yes
7	Fan, 120 mm, Hot-plug	364517-001	374552-001	Yes
*	Keyboard, PS/2, US	352750-001	355630-001	Yes
*	Mouse, PS/2	103179-165	311060-001	Yes

*Not shown

Removal and replacement procedures

In this section

Required tools

You need the following items for some procedures:

- T-10 Torx screwdriver

- T-15 Torx screwdriver

- Diagnostics Utility

Safety considerations

Before performing service procedures, review all the safety information.

Preventing electrostatic discharge

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

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.

- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.

- Place parts on a grounded surface before removing them from their containers.

- Avoid touching pins, leads, or circuitry.

- Always be properly grounded when touching a static-sensitive component or assembly.

Server warnings and cautions

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

⚠️ **WARNING: To reduce the risk of electric shock or damage to the equipment:**

- **Do not disable the power cord grounding plug. The grounding plug is an important safety feature.**

- **Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.**

- **Unplug the power cord from the power supply to disconnect power to the equipment.**

- **Do not route the power cord where it can be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord extends from the server.**

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

△ **CAUTION:** Do not operate the server for long periods without the access panel. Operating the server without the access panel results in improper airflow and improper cooling that can lead to thermal damage.

Preparation procedures

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

- Extend the server from the rack ("Extending the server from the rack" on page 18).

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

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

- Power down the server ("Powering down the server" on page 20).

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

- Remove the server from the rack ("Removing the server from the rack" on page 21).

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

- Remove the access panel ("Access panel" on page 21).

  If you are servicing server internal components, remove the access panel.

- Remove the tower bezel ("Unlocking and removing the tower bezel" on page 23).

  If you are servicing front panel components or need to remove the access panel in a server configured as a tower, remove the tower bezel.

- Remove the rack bezel ("Removing the rack bezel" on page 24).

  If you are servicing the SCSI drive cage in a server configured for rack mounting, remove the rack bezel.

- Remove the processor air baffle ("Air baffle" on page 25).

  If you are servicing a processor, PPM, or need to remove the system board, remove the processor air baffle.

- Remove the center wall ("Center wall" on page 26).

  If you need to remove the system board, remove the center wall.

     NOTE: A T-15 Torx screwdriver is attached to the rear of the server.

Extending the server from the rack

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

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

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

2. Extend the server on the rack rails until the server rail-release latches engage.
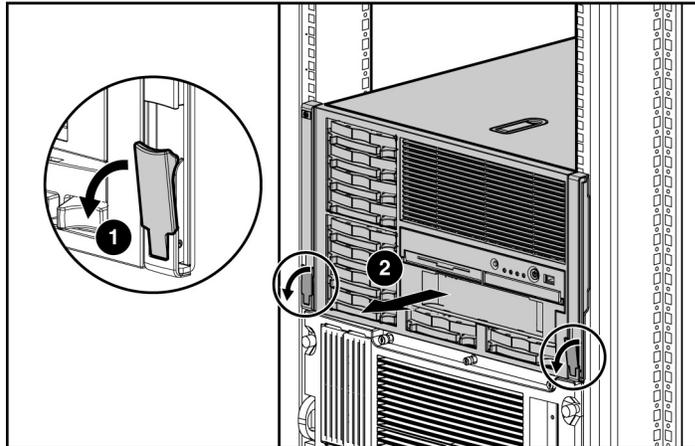
⚠ **WARNING: To reduce the risk of personal injury or equipment damage, be sure that the rack is adequately stabilized before extending a component from the rack.**

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

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

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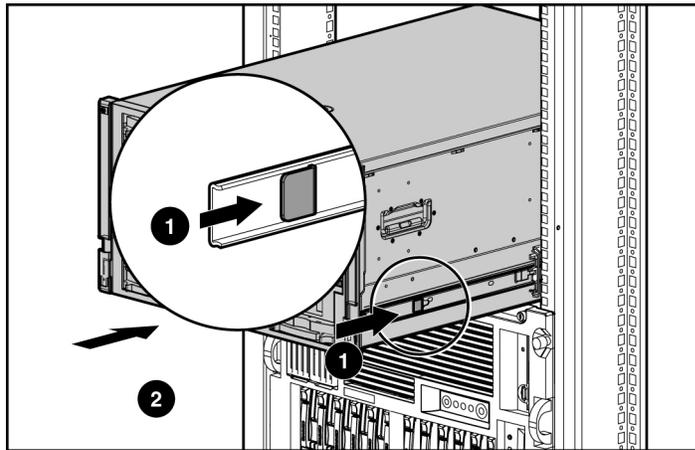
Powering down the server

⚠ **WARNING: To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to remove power from the server. The front panel Power On/Standby button does not completely shut off system power. Portions of the power supply and some internal circuitry remain active until AC power is removed.**

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

1. Shut down the OS as directed by the OS documentation.

2. Press the Power On/Standby button to place the server in standby mode. When the server enters standby power mode, the system power LED changes to amber.

3. Disconnect the power cords.

The system is now without power.

Access panel

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

⚠ **CAUTION:** Do not operate the server for long periods without the access panel. Operating the server without the access panel results in improper airflow and improper cooling that can lead to thermal damage.

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

2. Open the locking latch, slide the access panel to the rear of the chassis, and remove the access panel.

   NOTE: If the locking latch is locked, use a Torx T-15 screwdriver to unlock the latch.
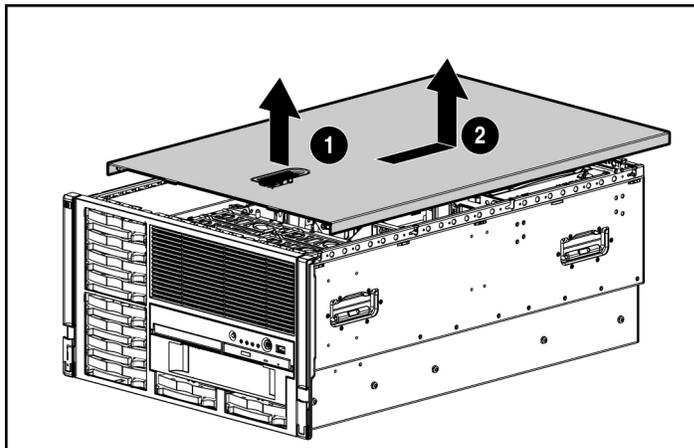
After installing hardware options, replace the access panel. Be sure that the panel is securely locked into place before powering up the server.

Removing the server from the rack

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

1. Power down the server ("Powering down the server" on page 20).

2. Extend the server from the rack ("Extending the server from the rack" on page 18).

3. Disconnect the cabling and remove the server from the rack. For more information, refer to the documentation that ships with the rack mounting option.

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

Unlocking and removing the tower bezel

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

To unlock the tower bezel, use the key provided with the server to unlock the bezel with a counterclockwise turn.
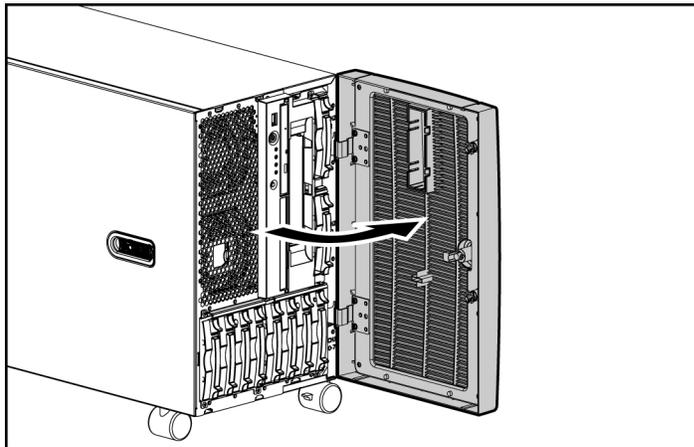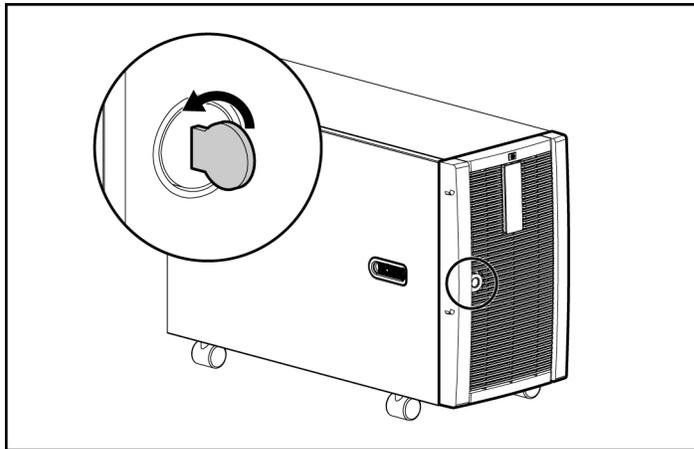
If necessary, remove the tower bezel.
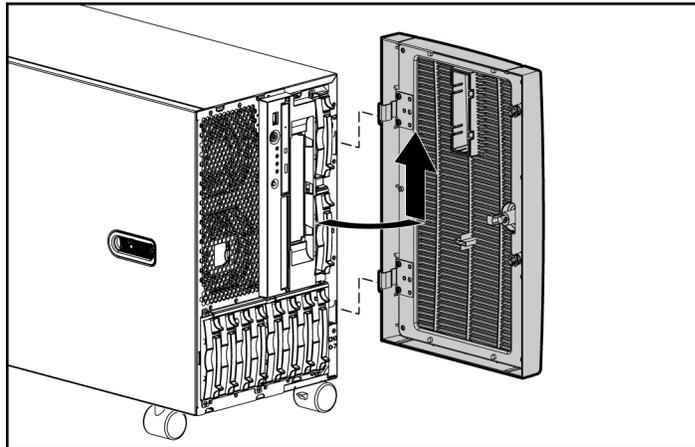
Removing the rack bezel

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

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

To remove the rack bezel:

1. Extend or remove the server from the rack ("Extending the server from the rack" on page <u>18</u>, "Removing the server from the rack" on page <u>21</u>).
2. Remove the tape drive blank or the tape drive.
3. Using the Torx T-15 screwdriver, unscrew the three screws on each side of the rack bezel.
4. Push down on the snap and pull the rack bezel away from the chassis.

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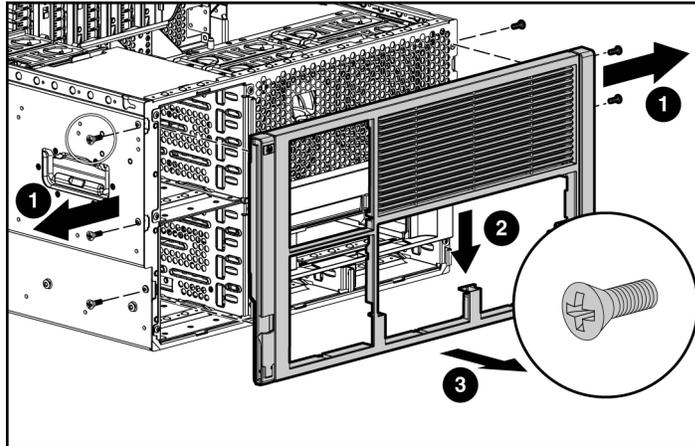
Air baffle

To remove the component:

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

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

3. Remove the access panel ("Access panel" on page).

4.   Remove the processor air baffle.
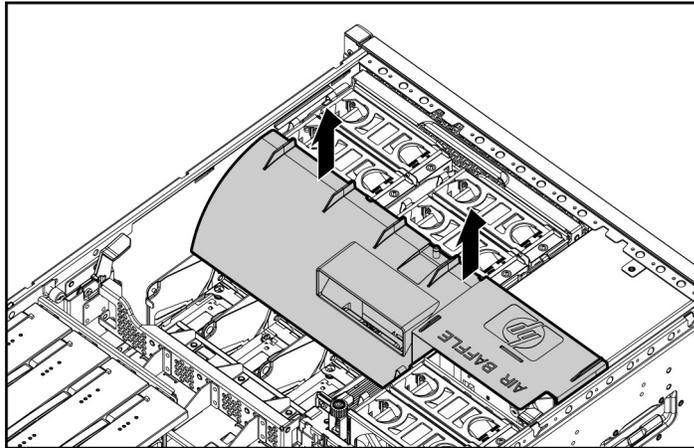
To replace the component, reverse the removal procedure.

Center wall

To remove the component:

1.   Power down the server ("Powering down the server" on page 20).

2.   Unlock and open the front bezel ("Unlocking and removing the tower bezel" on page 23) (tower servers only).

3.   Extend or remove the server from the rack ("Extending the server from the rack" on page 18, "Removing the server from the rack" on page 21).

4.   Remove the access panel ("Access panel" on page 21).

5.   Remove all expansion boards.

6.   Lift the three latches and loosen the thumbscrew that secures the center wall to the chassis.

7. Remove the center wall from the server.
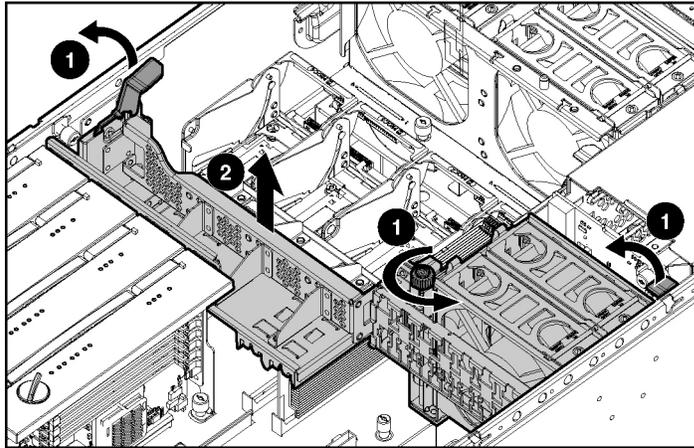
To replace the component, reverse the removal procedure.

Redundant hot-plug power supply

⚠ **WARNING: To reduce the risk of electric shock, do not disassemble the power supply or attempt to repair it. Replace it only with the specified spare part.**

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

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

To remove the component:

1. Disconnect the power cord from the power supply.

2. Remove the hot-plug power supply from the server.
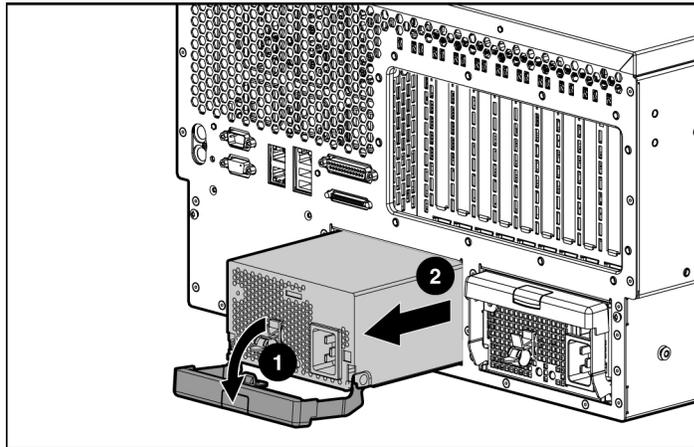
⚠ **CAUTION:** To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

To replace the component, reverse the removal procedure.

Hard drive blank

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

To remove the component:

1. Remove the hard drive blank.
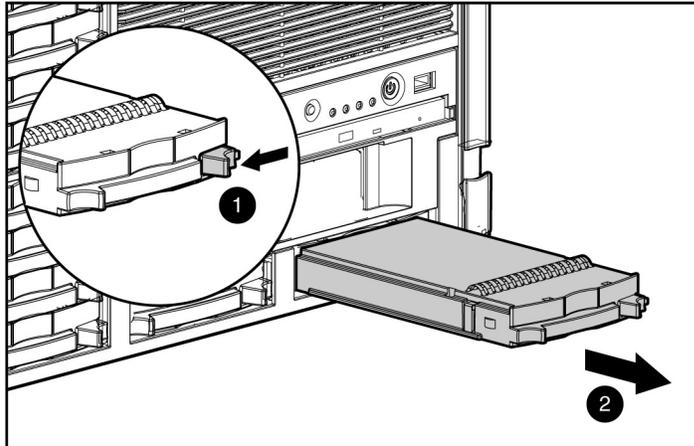
To replace the component, reverse the removal procedure.

Hot-plug hard drives

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

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

To remove the component:

1. Determine the status of the hard drive from the hot-plug hard drive LEDs ("Hot-plug SCSI hard drive LED combinations" on page 92, "Hot-plug SCSI hard drive LEDs" on page 91).

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

3.   Remove the hard drive.
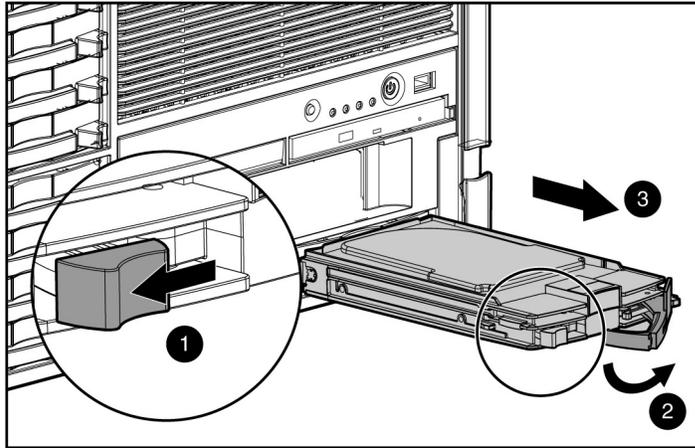
To replace the component, reverse the removal procedure.

Diskette drive blank

To remove the component:

1.   Power down the server ("Powering down the server" on page 20).

2.   Press the ejector button.

3. Remove the diskette drive blank.
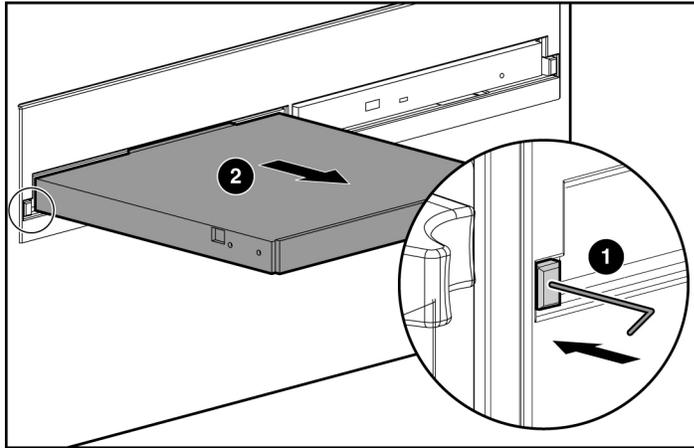
To replace the component, reverse the removal procedure.

Diskette drive

To remove the component:

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

2. Press the ejector button.

3.   Remove the diskette drive from the server.
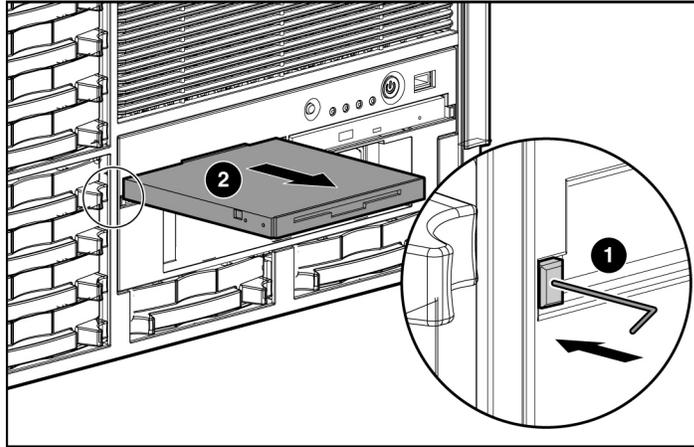
To replace the component, reverse the removal procedure.

Optical device

To remove the component:

1.   Power down the server ("Powering down the server" on page 20).

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

2.   Press the ejector button.

3.   Remove the optical device.
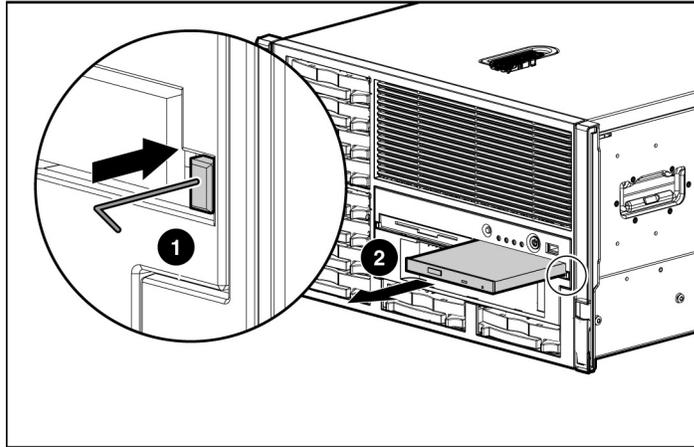
To replace the drive, slide the drive into the bay until it clicks.

Hot-plug fans

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

When all redundant fans are installed, individual fans can be hot-swapped at any time. To remove the component:

1.   Extend the server from the rack, if applicable ("Extending the server from the rack" on page 18).

2.   Remove the access panel ("Access panel" on page 21).

3. Remove the hot-plug fan.
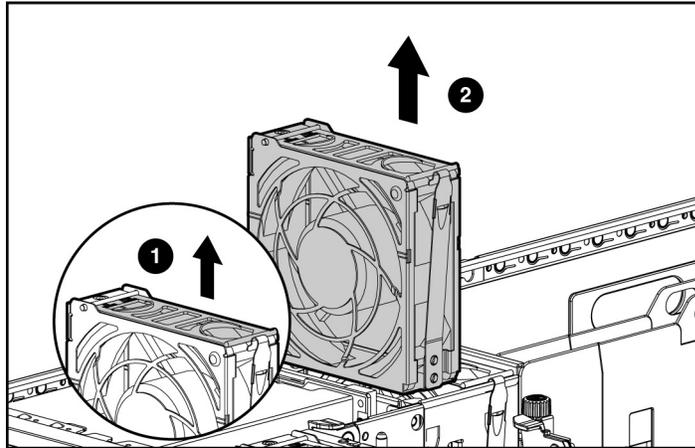
To replace the component, reverse the removal procedure.

Expansion boards

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

The server supports PCI-X, PCI Express, and hot-plug PCI-X expansion boards. For location, refer to Rear Panel Components (on page 79).

Slot	Expansion card type	Capable speed
1	PCI-X, non-hot-plug	100 MHz* (slots 1 and 2 share the same bus)
2	PCI-X, non-hot-plug	100 MHz* (slots 1 and 2 share the same bus)
3	PCI-X, non-hot-plug	100 MHz* (slots 3 and 4 share the same bus)
4	PCI-X, non-hot-plug	100 MHz* (slots 3 and 4 share the same bus)

Slot	Expansion card type	Capable speed
5	PCI Express	x4
6	PCI Express	x4
7	PCI Express	x4
8	PCI Express	x4
9	Hot-plug PCI-X	133 MHz
10	Hot-plug PCI-X	133 MHz

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

To remove the component:

1. Power down the server ("Powering down the server" on page 20).

2. Extend or remove the server from the rack ("Extending the server from the rack" on page 18, "Removing the server from the rack" on page 21).

3. Remove the access panel ("Access panel" on page 21).

4. Disconnect any required internal or external cables from the expansion board.

5.   Release the retaining clip.
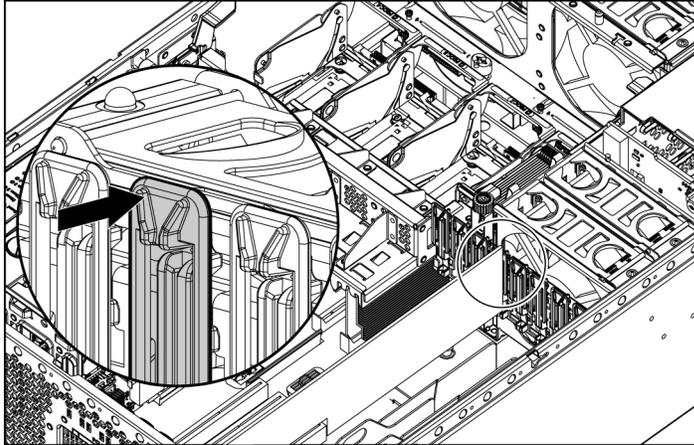
6.   Remove the expansion board.
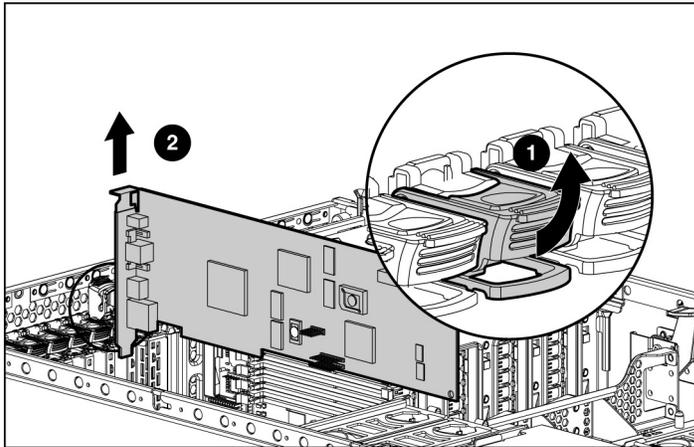
To replace the component, reverse the removal procedure.

Memory options

This server supports up to four memory boards. Each memory board contains six DIMM slots for a total of 24 DIMM slots in the server. Memory can be expanded by installing PC2-3200R Registered DDR2 DRAM DIMMs.

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

- Advanced ECC (hot-add enabled)

- Advanced ECC (hot-add disabled)

- Online Spare Memory (on page)

- Hot-Plug Mirrored Memory (dual- and quad-board) ("Hot-plug mirrored memory" on page)

- Hot-Plug RAID Memory (on page)

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

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

For an overview of single- and dual-rank DIMMs, refer to "Single- and Dual-Rank DIMMs."

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

General memory configuration requirements

The following configuration requirements apply regardless of the AMP mode.

- DIMMs must be installed in pairs.

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

- Always populate the memory boards in sequential order: Board 1, Board 2, Board 3, and Board 4. Any deviation from this requirement results in the server booting in Advanced ECC mode and Advanced ECC guidelines apply.

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

- Dual-rank DIMMs must be populated before single-rank DIMMs (see table).

- If dual-rank DIMMs are installed in Bank A and Bank B, no additional DIMMs may be installed in Bank C.

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

    NOTE: A bank contains 2 DIMMs.

Configuration	Bank A	Bank B	Bank C
1	Single		
2	Single	Single	
3	Single	Single	Single
4	Dual		
5	Dual	Single	
6	Dual	Single	Single
7	Dual	Dual	

- The system can be configured for any AMP mode in RBSU. RBSU displays a warning message if the selected AMP mode is not supported by the current configuration. However, if the DIMM configuration at POST does not meet the requirements for the AMP mode selected in RBSU, the server defaults to Advanced ECC. The system indicates this by displaying a message during POST and the status LED for the configured AMP mode flashes amber.

- Unpopulated memory boards (those without any installed DIMMs) can be installed in the server for storing extra memory boards.

- If the server contains more than 4 GB of memory, consult the OS documentation about accessing the full amount of installed memory.

Configuring the memory

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

To configure the memory:

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

2. Test the DIMMs for all AMP modes, except Advanced ECC, before configuring the AMP mode in RBSU. The two testing methods are:

    –   POST memory test

    –   ROM-Based Diagnostics test

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

3. Select the AMP mode.

Advanced ECC Memory

Advanced ECC Memory is the default memory protection mode for this server. In Advanced ECC, the server is protected against correctable memory errors. The server provides notification if the level of correctable errors exceeds a pre-defined threshold rate. The server does not fail because of correctable memory errors. Advanced ECC provides additional protection over Standard ECC in that it is possible to correct certain memory errors that would otherwise be uncorrectable and result in a server failure. Whereas Standard ECC can correct single-bit memory errors, Advanced ECC can correct single-bit memory errors and multi-bit memory errors if all failed bits are on the same DRAM device on the DIMM.

The following guidelines apply to Advanced ECC Memory:

*   All general memory requirements apply.

*   Advanced ECC mode is supported with 1, 2, 3, or 4 memory boards.

*   Hot-add is always enabled for Advanced ECC.

- Board insertions do not convert the AMP mode while the server is running. A server cannot be converted from Advanced ECC to Online Spare Memory, mirrored memory, or Hot-Plug RAID memory by inserting a board while the server is running. Board insertions in Advanced ECC are solely for making additional memory resources available to the OS.

- Advanced ECC is the only mode in which hot-add operations are supported. This is the only mode in which the amount of memory available to the OS can be increased without a reboot.

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

  - Boards must be inserted sequentially.

  - Multiple hot-add board insertions can be performed on the same server. For example, if a server has three empty memory board slots, three hot-add board insertions can be performed.

  - If multiple hot-add operations are performed, allow one board insertion operation to complete (as indicated by the memory board LEDs and OS logs) before inserting another memory board.

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

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

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

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

Online spare memory

Online Spare Memory provides a higher level of memory protection than Advanced ECC. With Online Spare Memory, the probability of a server failing because of uncorrectable memory errors is reduced.

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

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

The following guidelines apply to Online Spare Memory:

- All general memory requirements apply.

- Online Spare Memory is supported with 1, 2, 3, or 4 memory boards.

- Each board must have a valid Online Spare configuration. No dependencies exist for the configuration between different memory boards.

- Each memory board includes its own Online Spare Bank. All boards operate independently in Online Spare mode. Each board can failover to its Online Spare Bank independent of the other memory boards. Some boards can be in Online Spare degraded mode while others are still in operational Online Spare mode.

- The minimum valid Online Spare configuration for a memory board requires at least one bank of dual-rank DIMMs or two banks of single-rank DIMMs. If the server does not meet these requirements, an error message is displayed during POST and the server defaults to Advanced ECC and Advanced ECC guidelines apply.

- The server automatically configures the optimal Online Spare solution.

- Online Spare Memory does not support any hot-plug operations.

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

- If only single-rank DIMMs are used on a memory board, all DIMMs should be of the same size on that memory board.

- If only dual-rank DIMMs are used on a memory board, all DIMMs should be of the same size on that memory board.

- If a mixture of single- and dual-rank DIMMs are used on a memory board, the dual-rank DIMMs should be two times the size of any single-rank DIMM.

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

Hot-plug mirrored memory

Hot-Plug mirrored memory (mirrored memory) provides a higher level of memory protection than either Advanced ECC or Online Spare Memory. With mirrored memory, the server is protected against uncorrectable memory errors that would otherwise result in server failure. Mirrored memory allows the server to keep two copies of all memory data on separate memory boards.

If an uncorrectable error is encountered, the proper data is retrieved from the memory board that does not contain the error. In addition, mirrored memory allows failed or degraded DIMMs to be replaced while the server is running without requiring server downtime. The memory board with the failed DIMM(s) can be removed, failed DIMMs replaced, and the board re-inserted into the server without any interruption to the OS.

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

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

The following guidelines apply to mirrored memory:

- All general memory requirements apply.

- Mirrored memory is supported with two or four memory boards.

- Memory boards 1 and 2 are populated for dual-board mirrored memory. Boards 1, 2, 3, and 4 are populated for quad-board mirrored memory. Any deviation from these guidelines results in the server booting in Advanced ECC mode and Advanced ECC guidelines apply.

- Memory boards 1 and 2 form a mirrored pair for dual-board mirrored memory. For quad-board mirrored memory, memory boards 3 and 4 form an additional mirrored pair.

- Memory boards within a mirrored pair must have the same amount of total memory. However, each board of the mirrored pair may have different DIMM configurations as long as they have equal total size. For example, memory boards 1 and 2 could each contain 2 GB of physical memory per board with board 1 containing two 1-GB DIMMs and board 2 containing four 512-MB DIMMs.

- The amount of memory between mirrored pairs can be different in quad-board mirrored memory mode. For example, memory pair 1 (boards 1 and 2) can contain 2 GB each while memory pair 2 (boards 3 and 4) contain 4 GB each.

- In quad-board mirrored memory, the two pairs of memory boards operate independently. One of the pairs of memory boards can be degraded while the other pair of memory boards can still be fully mirrored.

- Hot-add operations are not permitted. Board removals and insertions in mirrored memory are solely for the purpose of hot-replace operations.

- For hot-replace to function properly, the memory board must be re-inserted into the location from which it was removed. If the board is placed into the incorrect slot (for example, if board 2 is removed in dual-board mirroring mode and re-inserted into memory slots 3 or 4), a configuration error occurs. Attempting to insert a board into the improper position results in audio alarms and visual alerts.

- Replace only one board at a time. That is, if memory boards 2 and 4 both contain memory errors, remove board 2, replace the failed DIMMs, and replace board 2 before proceeding to board 4.

- If a board is inserted into a valid memory slot but with an invalid DIMM configuration (including too much or too little memory), a DIMM configuration error occurs and a visual alert occurs. Refer to Memory Board LEDs ("Memory board LEDs and components" on page 93).

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

Hot-plug RAID memory

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

Although mirrored memory keeps two copies of all memory data, RAID memory keeps only one copy of all memory data and additional parity information. If an uncorrectable memory error is encountered, the server can create the proper data using the parity information and the information from the other memory boards that contain no failures.

As with mirrored memory, RAID memory allows failed or degraded DIMMs to be replaced while the server is running without requiring server downtime. The memory board with the failed DIMM(s) can be removed, failed DIMMs replaced, and the board re-inserted into the server without any interruption to the OS.

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

The following guidelines apply to Hot-Plug RAID memory:

- All general memory requirements apply.

- RAID memory is only supported with four memory boards.

- All four memory boards must have the same amount of total memory. However, each board may have different DIMM configurations as long as they have equal total size. Any deviation from this rule results in the server booting in Advanced ECC mode and Advanced ECC guidelines apply.

- No hot-add operations are supported in RAID memory, only hot-replace.

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

Memory boards and DIMMs

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

The following table illustrates AMP modes that support hot-plug features.

Advanced Memory Protection Mode	Hot-Replace Supported	Hot-Add Supported
Advanced ECC		X
Online Spare Memory		
Hot-Plug Mirrored Memory	X	
Hot-Plug RAID Memory	X	

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

1. Remove a memory board.

2. Replace failed or degraded DIMM(s).

3. Reinstall the memory board in the slot from which it was removed.

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

> **IMPORTANT:** Be sure to power down the server when performing board removal procedures in a server that is not configured for Mirrored or Hot-Plug RAID Memory.

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

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

⚠ **WARNING: To prevent personal injury from hazardous energy:**

- **Remove watches, rings, or other metal objects.**
- **Use tools with insulated handles.**
- **Do not place tools or metal parts on top of batteries.**

Removing a memory board (non-hot-plug)

1. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 18).

2. Remove the access panel ("Access panel" on page 21).

3. Determine which memory board is to be removed by locating the memory board that displays an amber Board Status LED. Take note of the failed DIMM, if applicable.

4. Power down the server ("Powering down the server" on page 20).

5. Unlock the memory board locking switch.

6. Unlock and open the memory board ejector lever.

7. Remove the memory board.
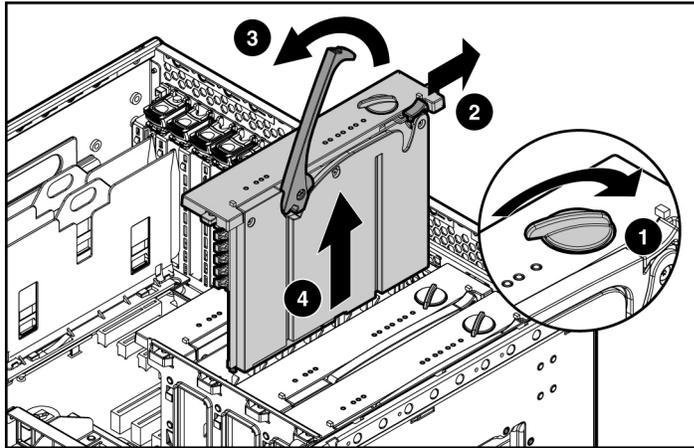
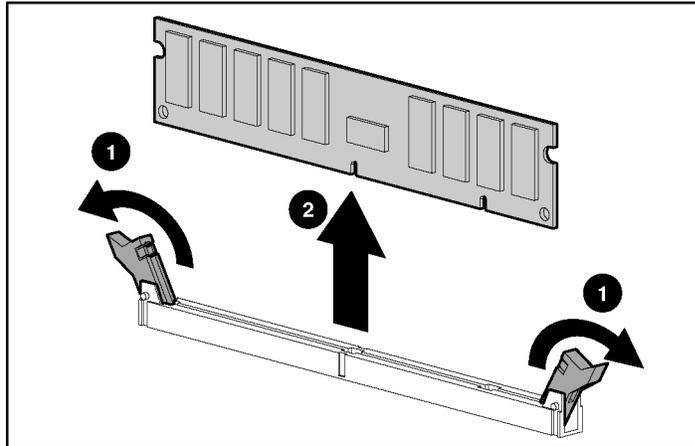

8. Replace the DIMM ("DIMMs" on page).

9. Install the memory board ("Installing a memory board" on page).

DIMMs

To remove the component:

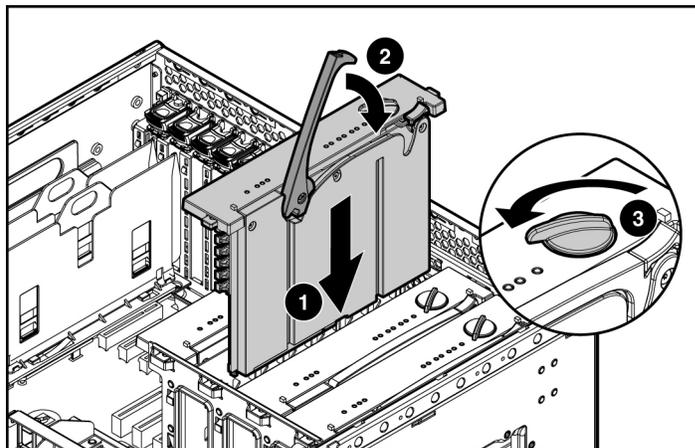1. Remove the memory board ("Removing a memory board (non-hot-plug)" on page).

2. Remove the DIMM.

To replace the component, reverse the removal procedure.

Installing a memory board

1. Align the memory board with the memory board guide clips.
2. Install the memory board into the server and close the ejector lever.
3. Move the locking switch to the locked position.

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

4.   If this is a non-hot-plug procedure, power up the server and configure the memory ("Configuring the memory" on page 39). If this is a hot-plug procedure, proceed to step 5.

5.   Observe the LEDs on the top of the memory board to be sure that the memory is functioning properly ("Memory board LEDs and components" on page 93). The LED states will be valid when the memory board has finished rebuilding for hot-plug operations and when the server has completed booting after a non-hot-plug operation.

6.   Reinstall the access panel ("Access panel" on page 21).

Processor

The server supports up to four processors. With two or more processors installed, the server supports boot functions through the processor installed in processor socket 1. However, if processor 1 fails, the system attempts to boot from processor 2 and provides a processor failure message.

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

> **CAUTION:** To prevent possible server malfunction and damage to the equipment, do not mix processors of different types.

> **IMPORTANT:** If upgrading processor speed, update the system ROM before installing the processor.
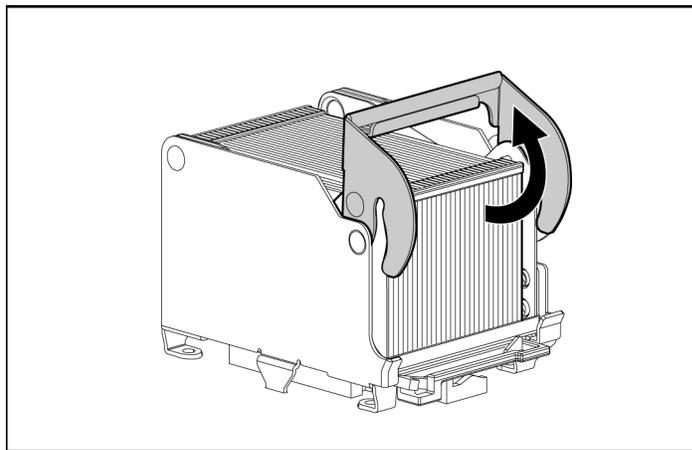
> **IMPORTANT:** Processor socket 1 and PPM slot 1 must be populated at all times or the server will not function properly.

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

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

To remove the component:

1. Power down the server ("Powering down the server" on page 20).

2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 18).

3. Remove the access panel ("Access panel" on page 21).

4. Remove the processor air baffle ("Air baffle" on page 25).

5. Open the processor retaining bracket.

6. Release the processor locking lever.

7. Remove the processor.

⚠ **CAUTION:** Failure to completely open the processor locking lever prevents the processor from seating during installation, leading to hardware damage.
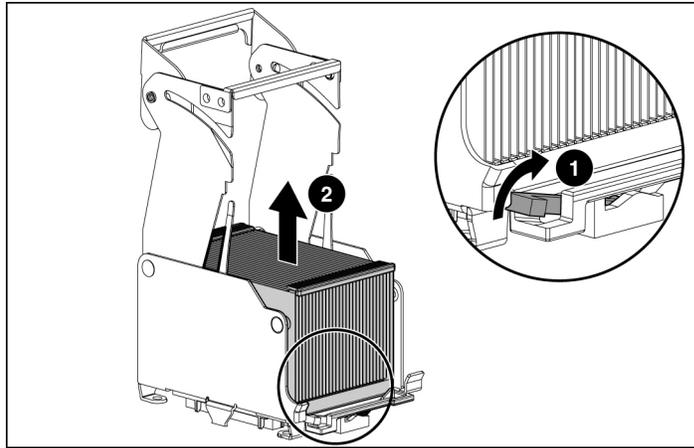
⚠ **CAUTION:** To prevent possible server malfunction or damage to the equipment, be sure to align the pins on the socket with the corresponding guide holes on the processor assembly.
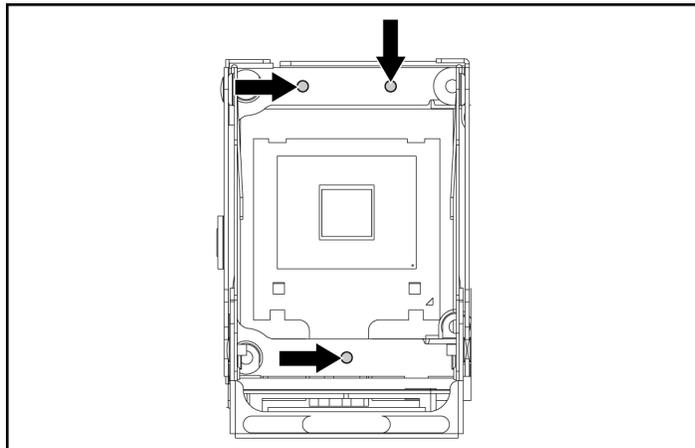
To replace the component, reverse the removal procedure.

PPM

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

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

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

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

To remove the component:

1. Power down the server ("Powering down the server" on page 20).

2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 18).

3. Remove the access panel ("Access panel" on page 21).

4. Remove the processor air baffle ("Air baffle" on page 25).

5. Open the latches on the PPM retaining bracket and remove the PPM retaining bracket.
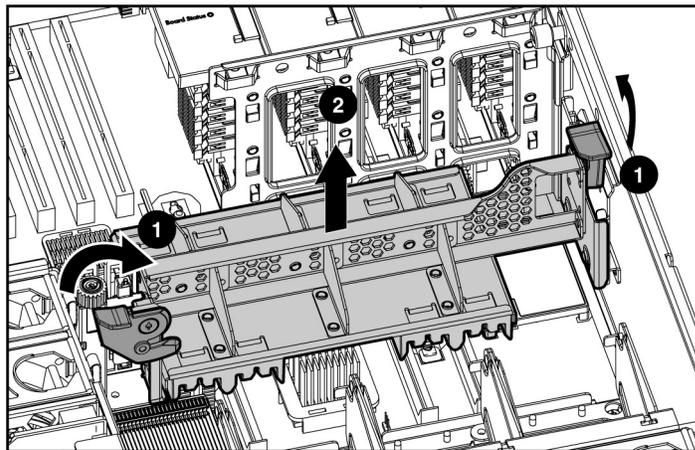
6. Remove the PPM.
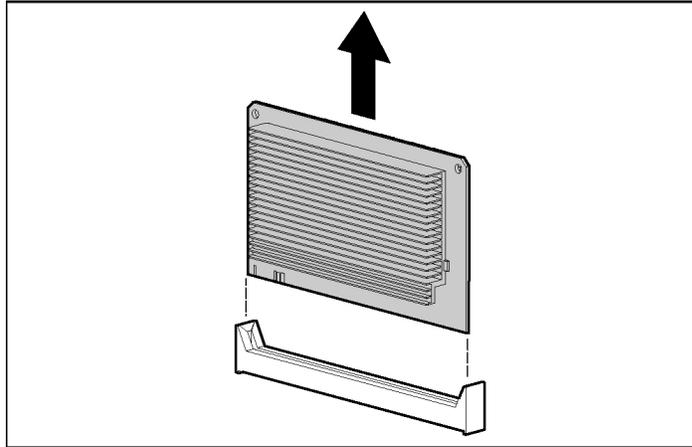
> **IMPORTANT:** Always install a PPM when you install a processor. The
> system fails to boot if the corresponding PPM is missing.

To replace the component, reverse the removal procedure.

SCSI backplane board

To remove the component:

1. Power down the server ("Powering down the server" on page 20).

2. Extend the server from the rack, if applicable ("Extending the server from the
    rack" on page 18).

3. Unlock and open the tower bezel ("Unlocking and removing the tower bezel"
    on page 23) (tower servers only).

4. Remove the access panel ("Access panel" on page 21).

5. Remove the processor air baffle ("Air baffle" on page 25).

6. Remove the center wall ("Center wall" on page 26).

7. If the server is rack mounted, remove the rack bezel ("Removing the rack
    bezel" on page 24).

8. Remove the media bezel.

9. Disconnect all cabling.
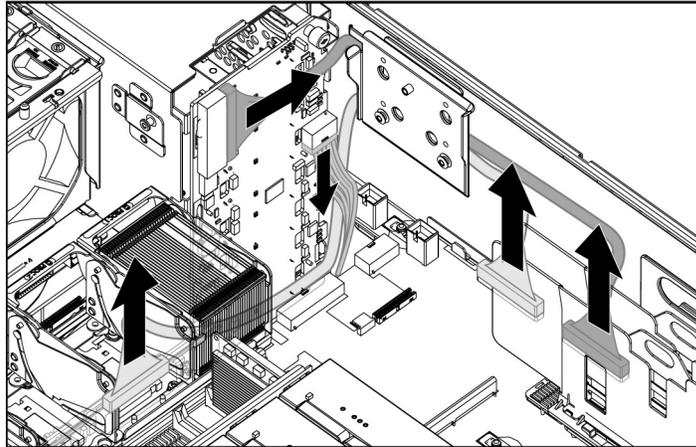
10. Remove the SCSI cage from the server chassis.

11. Remove the SCSI backplane board.
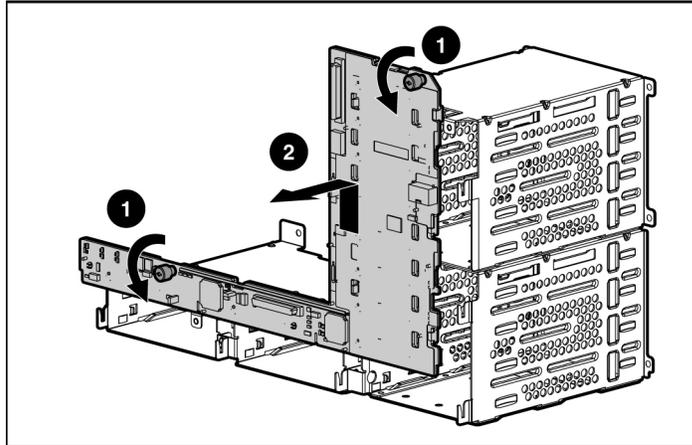
To replace the component, reverse the removal procedure.

> **NOTE:** In some configurations, it may be necessary to route the SCSI cables over the fan cage.
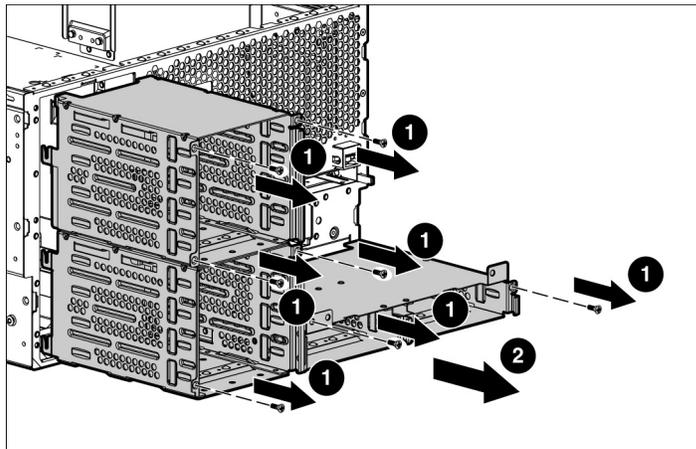
System board

To remove the component:

1. Power down the server ("Powering down the server" on page 20).

2. Extend the server from the rack, if applicable ("Extending the server from the rack" on page 18).

3. Unlock and open the tower bezel ("Unlocking and removing the tower bezel" on page 23) (tower servers only).

4. Place the chassis on its side with the access panel facing upwards.

5. Remove the access panel ("Access panel" on page 21).

6. Remove the processor air baffle ("Air baffle" on page 25).

7. Remove all expansion boards.

8. Remove all memory boards ("Removing a memory board (non-hot-plug)" on page 46).

9. Remove all processors ("Processor" on page 49).

10. Remove all PPMs ("PPM" on page 52).

11. Remove the center wall ("Center wall" on page 26).

12. Disconnect all power and data cables ("Cable connector identification" on page 64) from the system board.

13. Remove the memory board.
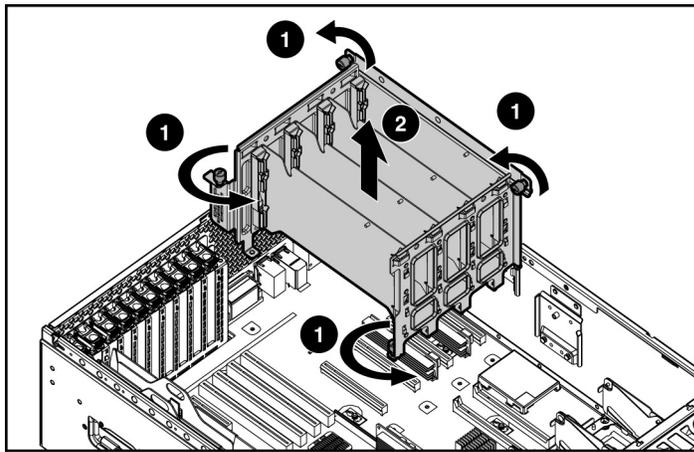
14. Remove the system board ("System board" on page 55).
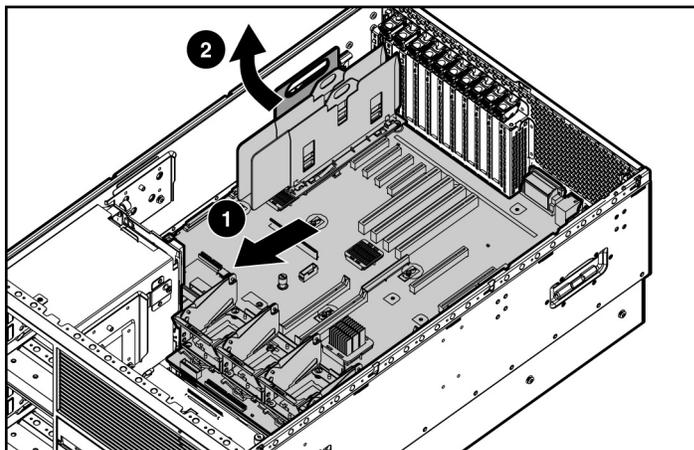
15. Remove the PCI-X Hot Plug basket from the system board.

To replace the component, reverse the removal procedure.

Power backplane

To remove the component:

1. Remove the system board ("System board" on page 55).

2. Remove the power backplane.
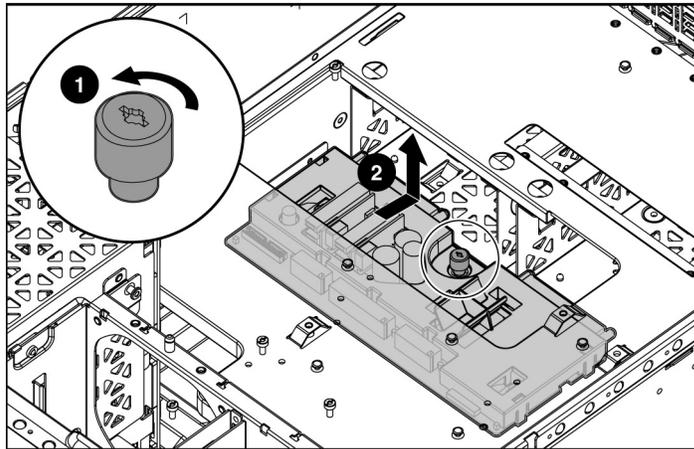
To replace the component, reverse the removal procedure.

Tape drive blank

To remove the component:

1. Unlock and open the tower bezel ("Unlocking and removing the tower bezel" on page 23) (tower servers only).

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

2. Pull the tape drive blank out of the chassis.
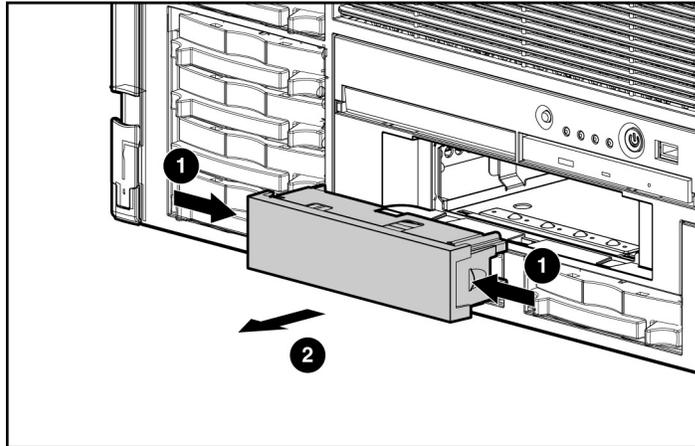
To replace the component, reverse the removal procedure.

Tape drive

To remove the component:

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

2. Slide the tape drive out of the server far enough to reach the cables.
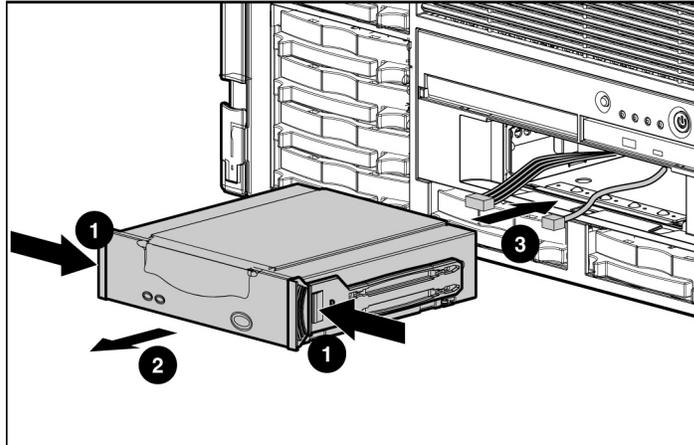
3. Disconnect the data and power cables from the tape drive.

4. Remove the plastic guides from the tape drive:

   a. Lift the plastic retainer from the slot closest to the front of the drive.

   b. Repeat for the opposite plastic clip.

To replace the component, reverse the removal procedure.

Battery

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

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

- **Do not attempt to recharge the battery.**

- **Do not expose the battery to temperatures higher than 60°C (140°F).**

- **Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.**

- **Replace only with the spare designated for this product.**

To locate the battery:
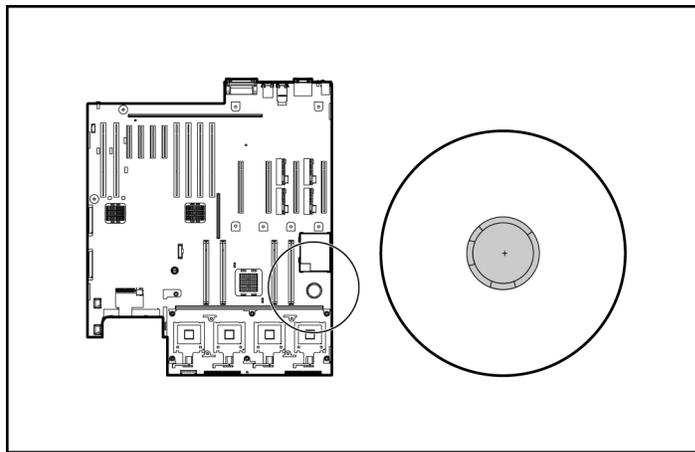
To remove the component:

1. Power down the server ("Powering down the server" on page <u>20</u>).

2. Extend or remove the server from the rack ("Extending the server from the rack" on page <u>18</u>, "Removing the server from the rack" on page <u>21</u>).

3. Remove the access panel ("Access panel" on page <u>21</u>).

4. Remove the PPM holddown ("PPM" on page <u>52</u>).

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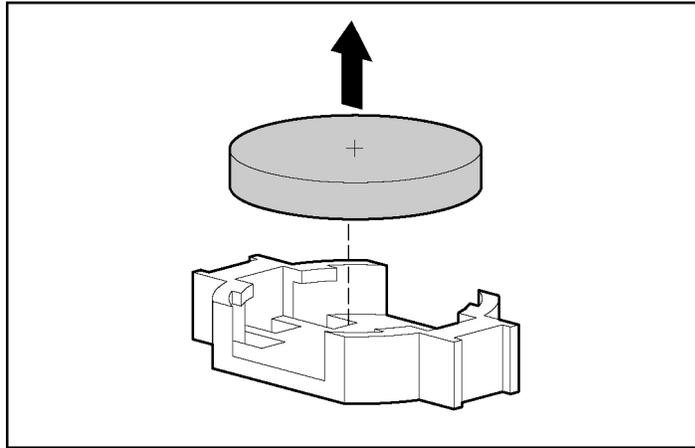
To replace the component, reverse the removal procedure.

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

Re-entering the server serial number and product ID

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

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

2. Select the **System Options** menu.

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

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

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

5. Enter the serial number and press the **Enter** key.

6. Select **Product ID**.

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

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

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

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

Server cabling

In this section

Storage device cabling guidelines

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

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

Cable connector identification
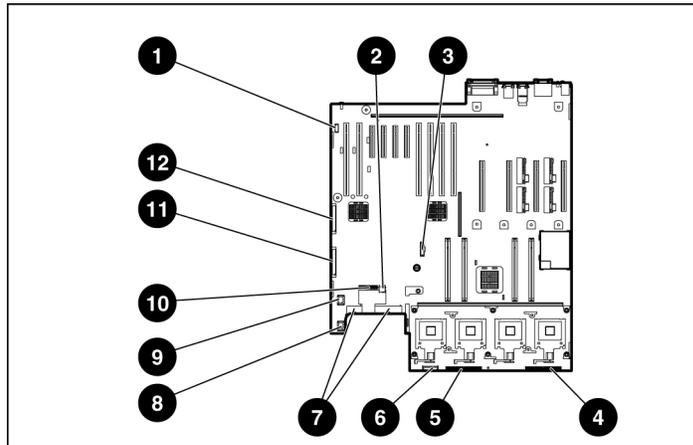
Item	Description
1	PCI Hot-Plug board
2	USB option
3	RILOE II
4	Fan board signal
5	Fan board signal
6	Fan board power
7	Power supply connectors
8	Fan connector
9	Fan connector
10	Power supply signal
11	SCSI 2
12	SCSI 1

SCSI cabling

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

- Standard SCSI cabling to the SCSI ports (on page)

- Standard SCSI cabling to an expansion board ("External SCSI cabling configuration" on page)

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

Standard SCSI cabling to the SCSI ports

    NOTE: In some configurations, it may be necessary to route the SCSI cables over the fan cage.
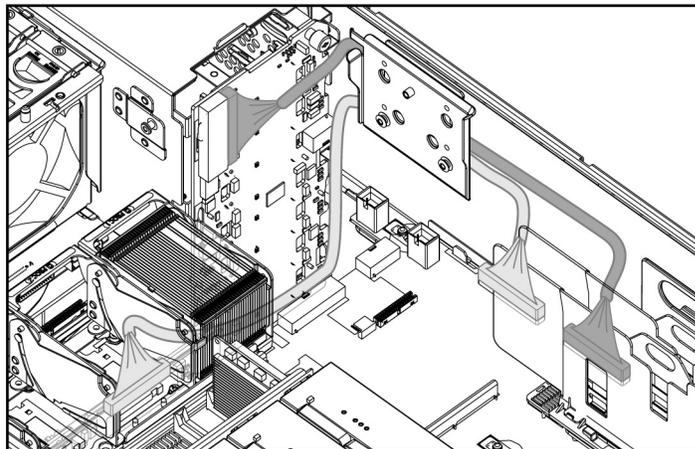
External SCSI cabling configuration

In order to connect an external device to the server:

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

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

NOTE: It may be necessary to run RBSU to assign boot order to SCSI Port 2.
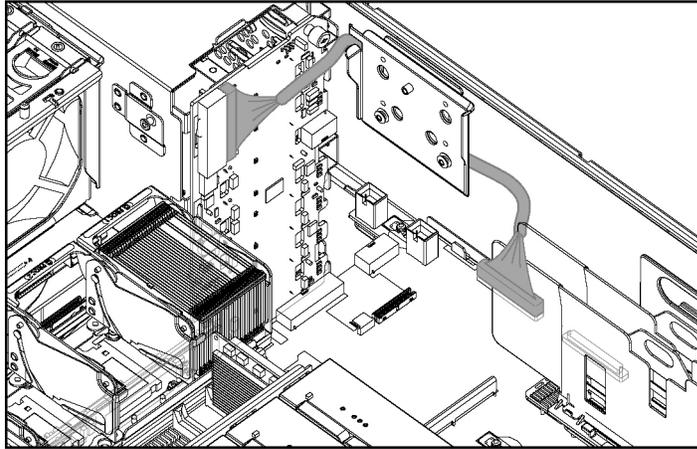
2.   Connect the external device.
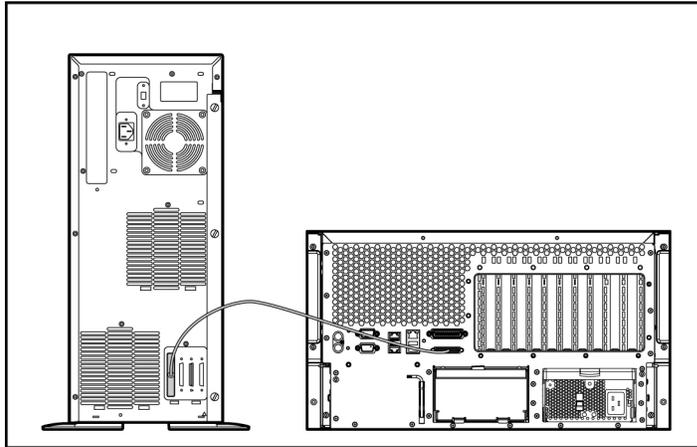
Tape drive cabling to the USB port

> **IMPORTANT:** Route the USB cable under the mid fan cage.
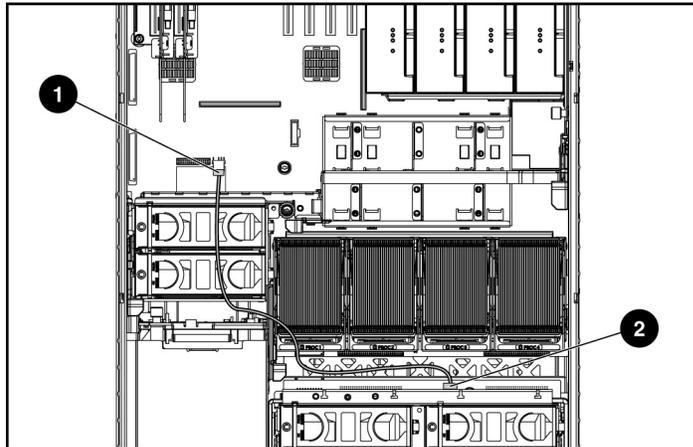
Item	Description
1	USB connector on the system board
2	USB connector on the media device

RILOE II cabling

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

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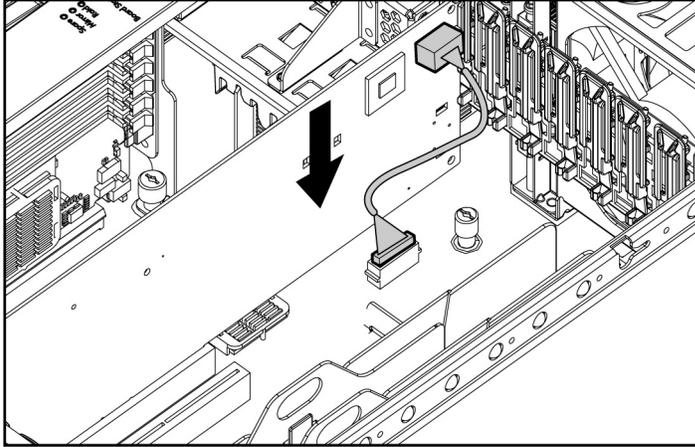
Diagnostic tools

In this section

SmartStart software

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

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

- Configuring hardware using embedded configuration utilities, such as RBSU and ORCA

- Preparing the system for installing "off-the-shelf" versions of leading operating system software

- Installing optimized server drivers, management agents, and utilities automatically with every assisted installation

- Testing server hardware using the Insight Diagnostics Utility ("HP Insight Diagnostics" on page 75)

- Installing software drivers directly from the CD. With systems that have internet connection, the SmartStart Autorun Menu provides access to a complete list of ProLiant system software.

- Enabling access to the Array Configuration Utility, Array Diagnostic Utility, and Erase Utility

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

SmartStart Scripting Toolkit

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

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

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

HP Instant Support Enterprise Edition

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

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

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

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

Option ROM Configuration for Arrays

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

The utility also provides support for the following functions:

- Reconfiguring one or more logical drives
- Viewing the current logical drive configuration
- Deleting a logical drive configuration

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

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

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

HP ROM-Based Setup Utility

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

- Configuring system devices and installed options

- Displaying system information

- Selecting the primary boot controller

- Configuring memory options

- Language selection

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

ROMPaq utility

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

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

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

System Online ROM flash component utility

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

- Works offline and online

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

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

- Integrates with other software maintenance, deployment, and operating system tools

- Automatically checks for hardware, firmware, and operating system dependencies, and installs only the correct ROM upgrades required by each target server

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

Integrated 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 HP Insight Diagnostics

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

Integrated Lights-Out technology

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

Using iLO, you can:

- Remotely power up, power down, or reboot the host server.

- Send alerts from iLO regardless of the state of the host server.

- Access advanced troubleshooting features through the iLO interface.

- Diagnose iLO using HP SIM through a web browser and SNMP alerting.

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

Automatic server recovery

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

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

HP Systems Insight Manager

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

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

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

HP Insight Diagnostics

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

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

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

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

USB support

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

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

- POST

- RBSU

- Diagnostics

- DOS

- Operating environments which do not provide native USB support

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

Internal USB functionality

An internal USB connector is available for use with USB backup tape drives. The internal connector is not shared with any of the external USB connectors. One internal USB device and up to three external devices can be supported at the same time.

Server component identification

In this section

Front panel components

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

Front panel LEDs and buttons
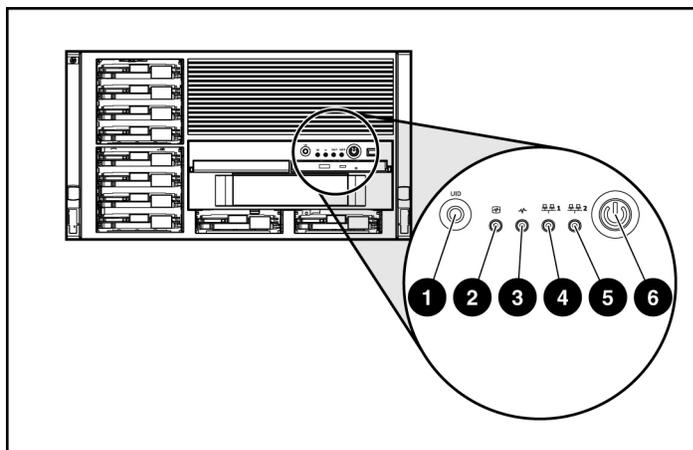
Item	Description	Status
1	UID switch and LED	Blue = Activated
		Flashing blue = System being managed remotely
		Off = Deactivated
2	Internal system health LED	Green = Normal (system on)
		Flashing Amber = System health is degraded
		Flashing Red = System health is critical

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

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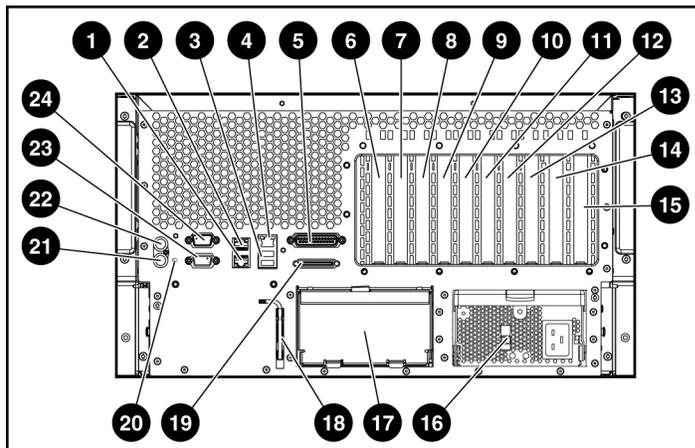
Item	Description
1	NIC 2
2	NIC 1
3	USB Ports
4	iLo
5	Parallel port
6	64-bit/100-MHz PCI-X slot 1
7	64-bit/100-MHz PCI-X slot 2
8	64-bit/100-MHz PCI-X slot 3
9	64-bit/100-MHz PCI-X slot 4
10	PCI Express x4 slot 5
11	PCI Express x4 slot 6
12	PCI Express x4 slot 7
13	PCI Express x4 slot 8
14	64-bit/133-MHz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

Rear panel LEDs and buttons
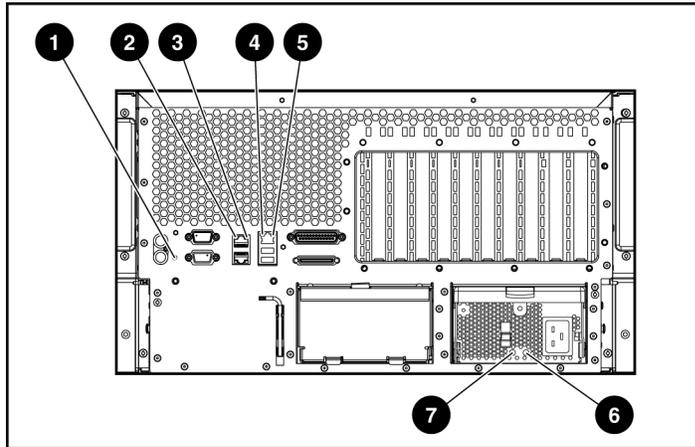
Item	Description	LED Color	Status
1	Unit ID LED	Blue	On = Activated
			Flashing = System remotely managed
			Off = Deactivated
2	NIC Activity LED (Integrated NC7782)	Green	On or flashing = Linked to network
			Off = Not linked to network
3	NIC Link LED (Integrated NC7782)	Green	On = Network activity
			Off = No network activity
4	iLO NIC Activity LED	Green	On or flashing = Network activity
			Off = No network activity
5	iLO NIC Link LED	Green	On = Linked to network
			Off = Not linked to network
6	Power supply LED (primary and redundant)	Green	Refer to Hot-plug Power Supply LEDs (on page 89)
7	Power supply LED (primary and redundant)	Amber	Refer to Hot-plug Power Supply LEDs (on page 89)

System board components
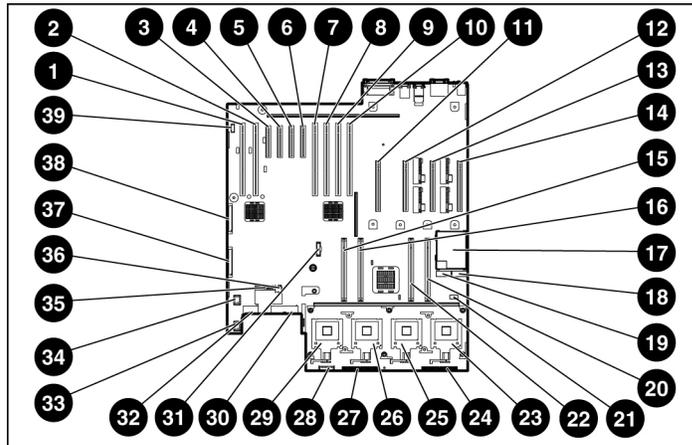
Item	Description
1	64-bit/133-MHz PCI-X Hot-Plug slot 10
2	64-bit/133-MHz PCI-X Hot-Plug slot 9
3	PCI Express x4 slot 8
4	PCI Express x4 slot 7
5	PCI Express x4 slot 6
6	PCI Express x4 slot 5
7	64-bit/100-MHz PCI-X slot 4
8	64-bit/100-MHz PCI-X slot 3
9	64-bit/100-MHz PCI-X slot 2
10	64-bit/100-MHz PCI-X slot 1
11	Memory board slot 1
12	Memory board slot 2
13	Memory board slot 3
14	Memory board slot 4
15	PPM slot 1

Item	Description
16	PPM slot 2
17	QuickFind diagnostic display
18	System maintenance switch (SW-2)
19	Miscellaneous switch (SW-1)
20	PPM slot 4
21	NMI jumper
22	PPM slot 3
23	Processor socket 4
24	Fan board signal connector
25	Processor socket 3
26	Processor socket 2
27	Fan board signal connector
28	Fan board power connector
29	Processor socket 1
30	Power connector
31	RILOE II connector
32	Power connector
33	Fan connector
34	Fan connector
35	Power supply signal connector
36	USB option connector
37	SCSI connector 2
38	SCSI connector 1
39	PCI hot-plug board connector

System maintenance switches

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

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

The system maintenance switch (SW2) is an eight-position switch that is used for system configuration. The default position for all eight positions is Off.

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

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

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

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

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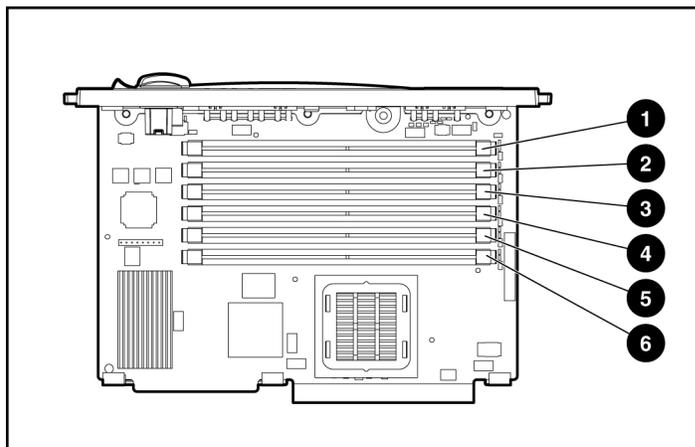
DIMM Slot	Description	Bank
1	PC2-3200R DIMM slot	Bank A
2	PC2-3200R DIMM slot	Bank A
3	PC2-3200R DIMM slot	Bank B
4	PC2-3200R DIMM slot	Bank B
5	PC2-3200R DIMM slot	Bank C
6	PC2-3200R DIMM slot	Bank C

Internal health LED combinations

When the internal health LED on the front panel illuminates either flashing amber or flashing red, the server is experiencing a health event. Combinations of illuminated system board LEDs (on page 87) and the internal health LED indicate system status.

System board LEDs

In normal operations, all the LEDs are off unless one of the components fails. When a component fails, the LED illuminates amber.
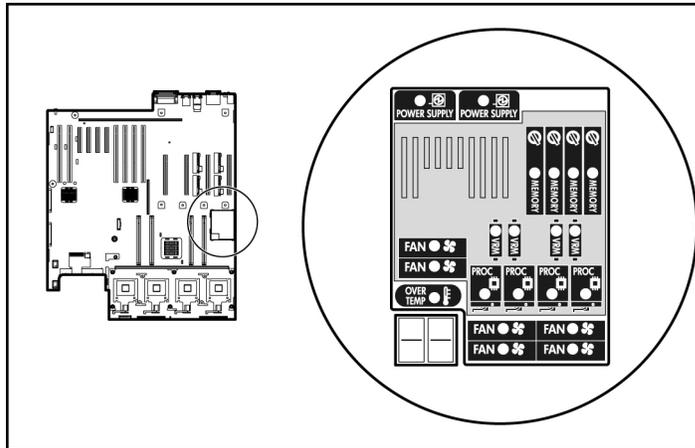
Code	Component	Explanation
01	Power supply cable(s)	System board to power supply cables: defective cables or cables not installed
04	Fan board cable(s)	Fan board power or signal cables are not installed.
05	Memory board	Base memory failure (memory board 1 is not installed or no valid memory configuration is present)
06	SCSI board power cable	SCSI board or cable is not present
07	PCI hot-plug switch board	PCI Hot Plug switch board or cable is not present.
08	System interlock	Main system interlock catch-all. Indicates an interlock problem not flagged by codes 01 to 07.
f1	Processor 1 unsupported	Processor 1 unsupported. Replace with a supported processor.
t2	Processor 2 unsupported	Processor 2 unsupported. Replace with a supported processor.

Code	Component	Explanation
t3	Processor 3 unsupported	Processor 3 unsupported. Replace with a supported processor.
t4	Processor 4 unsupported	Processor 4 unsupported. Replace with a supported processor.
P1	Processor 1 is missing	Processor 1 is missing, and is required to boot. Install Processor 1. If processor 4 is installed and the system is booting up, the P1 code and Port 84/85 will be displayed one second each to show the unit is booting.
U1	PPM1 is missing	Processor 1 is installed without PPM 1. Install PPM 1.
U2	PPM2 is missing	Processor 2 is installed without PPM 2. Install PPM 2.
U3	PPM3 is missing	Processor 3 is installed without PPM 3. Install PPM 3.
U4	PPM4 is missing	Processor 4 is installed without PPM 4. Install PPM 4.
A0	Pre POST code	Standby mode
P5	Power supply	No power from the power supply
_5	Power backplane	No 5-V power from the power supply backplane board
33	Power backplane	No 3.3-V power from the power supply backplane board
15	1.5V Regulator	No 1.5-V power from the voltage regulator on the system board
Ut	VTT Regulator	No power from the VTT voltage regulator on the system
5U	PPM Failure	No power from the PPM
nb	No boot	Indicates a no-boot situation

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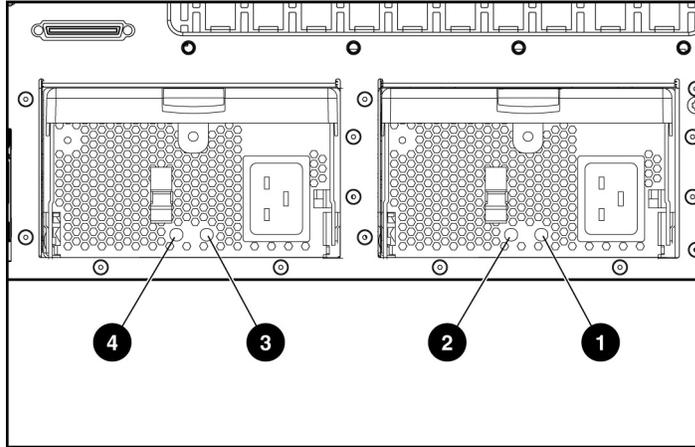
Item	Description
1	Primary power supply power LED (green)
2	Primary power supply fail LED (amber)
3	Redundant power supply power LED (green)
4	Redundant power supply fail LED (amber)

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

SCSI IDs

The server supports two simplex SCSI channels.

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

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

The SCSI IDs for both channel configurations are illustrated. HP recommends populating hard drive bays starting with the lowest SCSI ID.
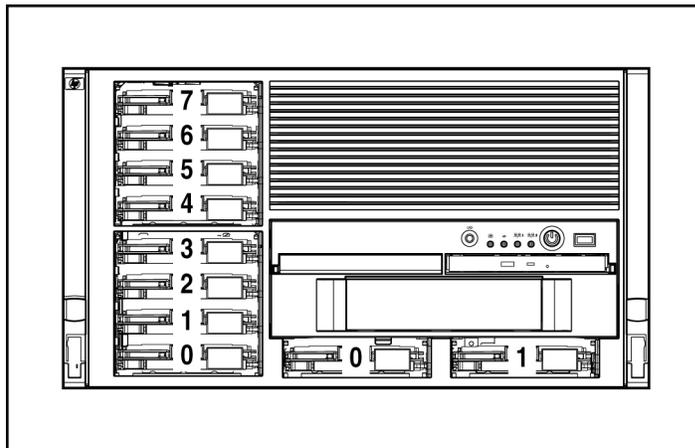
NOTE: These SCSI ID designations apply regardless of the controller or the configuration used.

NMI jumper

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

Systems running Microsoft® Windows® experience a blue-screen trap when the OS crashes. When this happens, Microsoft® recommends that system administrators perform an NMI event by temporarily shorting the NMI header with a jumper. The NMI event enables a hung system to become responsive again.

Hot-plug SCSI hard drive LEDs
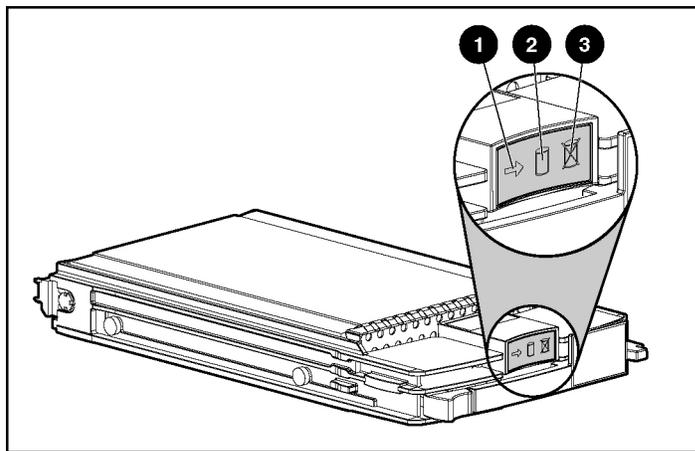
Item	LED Description	Status
1	Activity status	On = Drive activity
		Flashing = High activity on the drive or drive is being configured as part of an array.
		Off = No drive activity
2	Online status	On = Drive is part of an array and is currently working.
		Flashing = Drive is actively online.
		Off = Drive is offline.
3	Fault status	On = Drive failure
		Flashing = Fault-process activity
		Off = No fault-process activity

Hot-plug SCSI hard drive LED combinations

Activity LED (1)	Online LED (2)	Fault LED (3)	Interpretation
On, off, or flashing	On or off	Flashing	A predictive failure alert has been received for this drive. Replace the drive as soon as possible.
On, off, or flashing	On	Off	The drive is online and is configured as part of an array. If the array is configured for fault tolerance and all other drives in the array are online, and a predictive failure alert is received or a drive capacity upgrade is in progress, you may replace the drive online.
On or flashing	Flashing	Off	**Do not remove the drive. Removing a drive may terminate the current operation and cause data loss.** The drive is rebuilding or undergoing capacity expansion.
On	Off	Off	**Do not remove the drive.** The drive is being accessed, but (1) it is not configured as part of an array; (2) it is a replacement drive and rebuild has not yet started; or (3) it is spinning up during the POST sequence.
Flashing	Flashing	Flashing	**Do not remove the drive. Removing a drive may cause data loss in non-fault-tolerant configurations.** Either (1) the drive is part of an array being selected by an array configuration utility; (2) Drive Identification has been selected in HP SIM; or (3) drive firmware is being updated.
Off	Off	On	The drive has failed and has been placed offline. You may replace the drive.
Off	Off	Off	Either (1) the drive is not configured as part of an array; (2) the drive is configured as part of an array, but it is a replacement drive that is not being accessed or being rebuilt yet; or (3) the drive is configured as an online spare. If the drive is connected to an array controller, you may replace the drive online.

Memory board LEDs and components

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

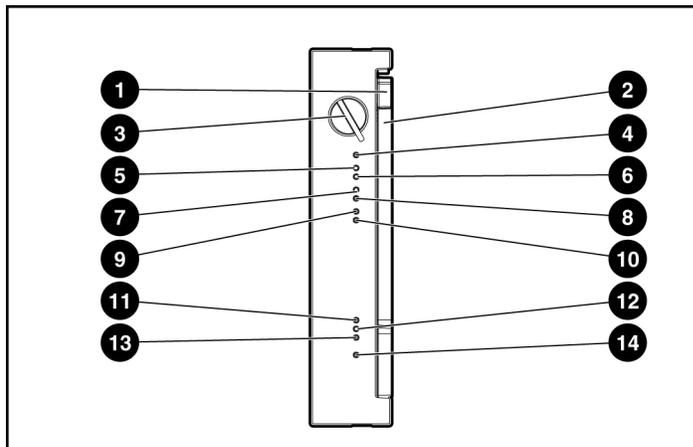Error indicators will only be cleared if:

- The locking switch is locked after the board is reinstalled

- The system has been rebooted

- The board is removed from the system

> ⚠ **CAUTION:** When the memory board locking switch is unlocked in a mode that does not support hot-add or hot-replace capabilities, audio alarms and visual alerts occur. Removing the memory board at this point causes server failure.
>
> To end the audio alarms and visual alerts, move the memory board locking switch back to the locked position. This action does not result in data corruption or server failure.
>
> If removal of a single memory board is required and it is the only memory board, power down the server and make the necessary memory changes.

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

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

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

–   If the mode selected is the desired mode, modify the DIMM/board configuration to support the desired mode. Refer to the memory overview section.

–   If the mode selected is not the desired mode, run RBSU and change the AMP mode. Refer to "HP ROM-Based Setup Utility ("HP ROM-Based Setup Utility" on page 72)" for more information.

    NOTE: If the Online Spare, Mirrored, and RAID LEDs are off, the server is in Advanced ECC mode. Refer to "HP ROM-Based Setup Utility (on page 72)" for more information.

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

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

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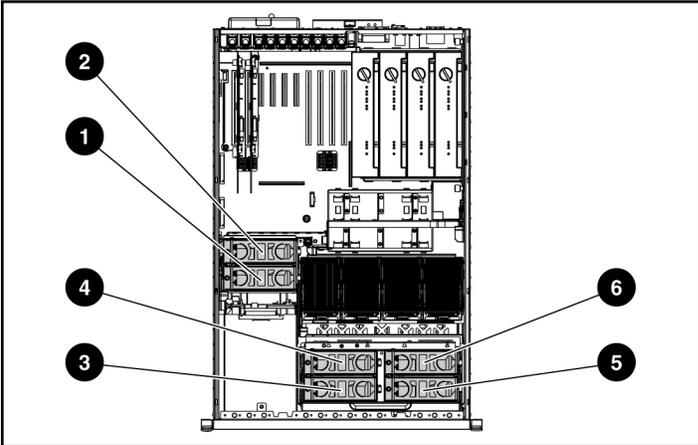
Item	Description	Configuration
1	Fan 1	Redundant
2	Fan 2	Primary
3	Fan 3	Redundant
4	Fan 4	Primary
5	Fan 5	Redundant
6	Fan 6	Primary

Specifications

In this section

Server specifications

The following information pertains to the rack configuration.

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

Power supply output	910 W (low line) 1300 W (high line)

Environmental specifications

Temperature range*	Specification
Operating	10°C to 35°C (50°F to 95°F)
Shipping	-40°C to 70°C (-40°F to 158°F)
Maximum wet bulb temperature	28°C (82.4°F)
Relative humidity (noncondensing)**	Specification
Operating	10% to 90%
Non-operating	5% to 95%

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

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

Hot-plug power supply calculations

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

DDR SDRAM DIMM specifications

NOTE: Use only 512-MB, 1-GB, 2-GB, or 4-GB; 72-bit wide; 2.5-V; PC2-3200 Registered ECC DDR2 SDRAM. Use HP DDR2 SDRAM only.

Item	Description
Size	512 MB, 1 GB, 2 GB, or 4 GB

Item	Description
Width	72 bits
Upgrade requirement	Any combination of like-paired DDR SDRAM DIMMs that provide a minimum of 1 GB

1.44-MB diskette drive specifications

Item	Description
Dimensions	
Height	12.7 mm (0.5 in)
Width	96 mm (3.8 in)
Depth	130 mm (5.1 in)
LEDs (front panel)	Green = On
Read/write capacity per diskette	
High density	1.44 MB
Low density	720 KB
Drives supported	1
Drive height	One-third height
Drive rotation	300 rpm
Transfer rate	
High	500 Kb/s
Low	250 Kb/s
Bytes/sector	512
Sectors per track (high/low)	18/9
Tracks per side (high/low)	80/80
Access times	
Track-to-track (high/low)	3 ms/6 ms
Average (high/low)	169 ms/94 ms

Item	Description
Setting time	15 ms
Latency average	100 ms
Cylinders (high/low)	80/80
Read/write heads	2

CD-ROM drive specifications

Item	Description
Applicable disk	CD-ROM (modes 1 and 2); mixed mode (audio and data combined); CD-DA; Photo CD (single/multiple-session), CD-XA ready; CDi ready
Capacity	550 MB (mode 1, 12 cm)
	640 MB (mode 2, 12 cm)
Block size	2368, 2352 bytes (mode 0)
	2352, 2340, 2336, 2048 bytes (mode 1)
	2352, 2340, 2336, 2048 bytes (mode 2)
Dimensions	
Height	12.7 mm (0.50 in)
Depth	132.08 mm (5.20 in)
Width	132.08 mm (5.20 in)
Weight	0.34 kg (0.75 lb)
Data transfer rate	
Sustained	150 KB/s (sustained 1X), 1500/3600 KB/s (10X to 24X)
Burst	16.6 MB/s
Access times (typical)	
Full stroke	300 ms
Random	140 ms
Diameter	12 cm, 8 cm (4.70 in, 3.15 in)
Thickness	1.2 mm (0.05 in)

Item	Description
Track pitch	1.6 µm (6.3×10^{-7} in)
Cache/buffer	128 KB
Startup time	< 10 s
Stop time	< 5 s (single); < 30 s (multisession)
Laser parameters	
Type	Semiconductor laser GaAs
Wave length	700 ± 25 nm
Divergence angle	53.5° ± 1.5°
Output power	0.14 mW
Operating conditions	
Temperature	5°C to 45°C (41°F to 118°F)
Humidity	5% to 90%

DVD-ROM drive specifications

Item	Description
Disk formats	DVD (single and double layer), DVD-5, DVD-9, DVD-10, DVD-R, CD-ROM Mode 1 & 2, CD-DA, CD-XA (Mode 2, Form 1 & 2), CD-I (Mode 2, Form 1 & 2), CD-I ready, CD-Bridge, CD-R, PhotoCD (single and multi-session)
Capacity	4.7 GB (DVD-5), 8.5 GB (DVD-9), 9.4 GB (DVD10), 550 Mb (Mode 1, 12 cm), 640 Mb (Mode 2, 12 cm), 180 Mb (8 cm)
Block size	2352 bytes (mode 0) 2352, 2340, 2336, 2048 bytes (mode 1) 2352, 2340, 2336, 2048 bytes (mode 2) 2048 bytes (DVD)
Dimensions	
Height	12.7 mm (0.50 in)
Depth	132.08 mm (5.20 in)
Width	132.08 mm (5.20 in)

Item	Description
Weight	0.34 kg (0.75 lb)
Data transfer rate	
Sustained	4463 - 10,800 KB/s (8X CAV DVD mode), 150 KB/s (sustained 1X CD-ROM), 1552 3600 KB/s (24X CAV CD-ROM)
Burst	16.6 MB/s with DMA support
Access times (typical)	
Full stroke	<200 ms CD <300 ms DVD
Random	<110 ms CD <180 ms DVD
Diameter	12 cm, 8 cm (4.70 in, 3.15 in)
Thickness	1.2 mm (0.05 in)
Track pitch	0.74 µm (3.15 $\times\ 10^{-7}$ in) DVD-ROM 1.6 µm (6.3 $\times 10^{-7}$ in) CD-ROM
Cache/buffer	
Startup time	< 10 s
Stop time	< 5 s (single); < 30 s (multisession)
Laser parameters	128 KB
Type	Semiconductor laser GaAs
Wave length	700 ± 25 nm
Divergence angle	53.5° ± 1.5°
Output power	0.14 mW
Operating conditions	
Temperature	5°C to 45°C (41°F to 118°F)
Humidity	5% to 90%

Ultra320 SCSI hard drive specifications

Item	36.4-GB	72.8-GB	72.8-GB	146.8-GB	300-GB
Capacity	36,419.6 MB	72,837.2 MB	72,837.2 MB	146,815.74 MB	300,000 MB
Height	1.0 in (One-third height)	1.0 in (One-third height)	1.0 in (One-third height)	1.0 in (One-third height)	1.0 in (One-third height)
Width	4.0 in	4.0 in	4.0 in	4.0 in	4.0 in
Interface	Ultra320 SCSI	Ultra320 SCSI	Ultra320 SCSI	Ultra320 SCSI	Ultra320SCSI
Transfer rate	320 MB/sec	320 MB/sec	320 Mb/sec	320 MB/sec	320 MB/sec
Rotational speed	15,000 rpm	10,000 rpm	15,000 rpm	15,000 rpm	10,000 rpm
Bytes per sector	512	512	512	512	512
Logical blocks	71,132,000	142,264,000	142,264,000	286,749,488	585,937,500
Operating temperature	10°C to 35°C (50°F to 95°F)	10°C to 35°C (50°F to 95°F)	10°C to 35°C (50°F to 95°F)	10°C to 35°C (50°F to 95°F)	10°C to 35°C (50°F to 95°F)

Acronyms and abbreviations

ABEND

abnormal end

ACU

Array Configuration Utility

AMP

Advanced Memory Protection

ASR

Automatic Server Recovery

BBWC

battery-backed write cache

DDR

double data rate

DU

driver update

EFS

Extended Feature Supplement

IEC

International Electrotechnical Commission

iLO

Integrated Lights-Out

IML

Integrated Management Log

IPL

initial program load

IRQ

interrupt request

MPS

multi-processor specification

NEMA

National Electrical Manufacturers Association

NFPA

National Fire Protection Association

NIC

network interface controller

NVRAM

non-volatile memory

ORCA

Option ROM Configuration for Arrays

PCI Express

peripheral component interconnect express

PCI-X

peripheral component interconnect extended

PDU

power distribution unit

POST

Power-On Self-Test

PPM

Processor Power Module

PSP

ProLiant Support Pack

PXE

preboot eXecution environment

RBSU

ROM-Based Setup Utility

RILOE II

Remote Insight Lights-Out Edition II

SATA

serial ATA

SCSI

small computer system interface

SDRAM

synchronous dynamic RAM

SIM

Systems Insight Manager

SIMM

single inline memory module

SPM

system power module

SSD

support software diskette

TMRA

recommended ambient operating temperature

UID

unit identification

USB

universal serial bus

VCA

version control agent

VHDCI

very high density cable interconnect

WOL

Wake-on LAN

Index