

HP BladeSystem p-Class Enclosure Installation Guide



March 2005 (Second Edition)
Part Number 354556-002

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Planning the installation

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Rack requirements

The HP BladeSystem p-Class Server Blade Enclosure is compatible with the following racks:

- 41U, 33U, and 25U HP Rack System/E
- 42U, 36U, and 22U Compaq branded 10000 and 9000 Series racks
 - NOTE:** The system is optimized for 10000 Series racks.
- Telco racks
- Third-party rack cabinets that meet the following requirements:
 - Width - 48.26 cm (19 in)
 - Depth - 73.66 cm (29 in) between front and rear RETMA rails
 - Clearance - 7.62 cm (3 in) minimum clearance between rear RETMA rails and rear rack door to accommodate system cabling
 - Open area - minimum of 65 percent open area to provide adequate airflow through any rack front or rear doors

Warnings, cautions, and important



WARNING: To reduce the risk of personal injury or damage to equipment, heed all warnings and cautions throughout the installation instructions.



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

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



WARNING: To reduce the risk of personal injury or equipment damage when unloading a rack:

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



WARNING: 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: The power enclosure and the server blade enclosure are very heavy. To reduce the risk of personal injury or damage to the equipment:

- Observe local occupational health and safety requirements and guidelines for manual material handling.
- Remove hot-plug power supplies and server blades from their enclosures before installing or removing the enclosures.
- Use caution and get help to lift and stabilize enclosures during installation or removal, especially when the enclosure is not fastened to the rack.



WARNING: To reduce the risk of personal injury or damage to the equipment, you must adequately support enclosures during installation and removal.



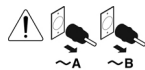
WARNING: Always use at least two people to lift an enclosure into the rack. If the enclosure is being loaded into the rack above chest level, a third person must assist with aligning the enclosure with the rails while the other two people support the weight of the enclosure.



WARNING: Before installing an enclosure in the rack, be sure that all hot-plug power supplies, server blades, and interconnects are removed from the enclosure. Blanks can be left in the enclosure.



WARNING: Be sure to install enclosures starting from the bottom of the rack and work your way up the rack.



These symbols, on power supplies or systems, indicate that the equipment is supplied by multiple sources of power.

WARNING: To reduce the risk of injury from electric shock, remove all power cords to completely disconnect power from the system.

- Each power enclosure has two or more power supply cords. A single rack or cabinet may contain more than one power enclosure. Power may be supplied in a redundant fashion. Removing any single source of power does not necessarily remove power from any portion of the system. When performing any service other than hot-plug module replacement, you must completely disconnect all power to that portion of the system.
- When performing service procedures on server blade enclosures, ensure that both A and B DC power feeds are disconnected from the enclosure before servicing.
- When performing service procedures on power enclosures, shut off the circuit breakers to both A and B AC power feeds and then disconnect both power cords from the wall outlet before servicing.



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



WARNING: To reduce the risk of electric shock or damage to the equipment, enter enclosures or perform service on system components only as instructed in the user documentation.



WARNING: A risk of electric shock from high leakage current exists. Before connecting the AC supply to the power enclosures, be sure that the electrical outlets are properly grounded (earthed).



CAUTION: Always be sure that equipment is properly grounded and that you follow proper grounding procedures before beginning any installation procedure. Improper grounding can result in ESD damage to electronic components. For more information, refer to, "Electrostatic Discharge (on page [93](#))."



CAUTION: When performing non-hot-plug operations, you must power down the server blade and/or the system. Use caution when performing other operations, such as hot-plug installations or troubleshooting.



CAUTION: Protect the equipment from AC power fluctuations and temporary interruptions with a regulating facility UPS device. This device protects the hardware from damage caused by power surges and voltage spikes and keeps the system in operation during a power failure.

IMPORTANT: Data on the dimensions and weights of HP BladeSystem p-Class components can be found in the *HP BladeSystem p-Class System Maintenance and Service Guide*. The same data can be determined by using the online HP BladeSystem p-Class Sizing Utility.

Space and airflow requirements

To enable servicing and ensure adequate airflow, observe the following spatial requirements when deciding where to install an HP branded, Compaq branded, telco, or third-party rack:

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

HP BladeSystem servers draw cool air in through the front and expel warm air through the rear of the enclosure. Therefore, the front of the rack enclosure must be adequately ventilated to enable ambient room air to enter the enclosure, and the rear of the enclosure must be adequately ventilated to enable the warm air to escape from the enclosure.

IMPORTANT: Do not block the ventilation openings.

If the front of the rack is not completely filled with components, the remaining gaps between the components can cause changes in the airflow, which can adversely affect cooling within the rack. Cover these gaps with blanking panels.



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

Compaq branded 9000 Series racks provide proper server cooling from flow-through perforations in the front and rear doors that provide 65 percent open area for ventilation.



CAUTION: Always use blanks to fill empty spaces in enclosures. This arrangement ensures proper airflow. Using an enclosure without the proper blanks results in improper cooling that can lead to thermal damage.

Temperature requirements

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

The operating temperature inside the rack is always higher than the room temperature and is dependent on the configuration of equipment in the rack. Check the TMRA for each piece of equipment before installation.



CAUTION: To reduce the risk of damage to the equipment when installing third-party options:

- Do not permit optional equipment to impede airflow around the equipment or to increase the internal rack temperature beyond the maximum allowable limits.
- Do not exceed the manufacturer's TMRA.

Power requirements



WARNING: A risk of fire or damage to the equipment exists.

Each AC power cord for the power enclosure has an electrical rating based on the model and power supply configuration. The rating is marked on the side of the enclosure.

It is important that the system be configured according to the guidelines in the *HP BladeSystem p-Class System Overview and Planning white paper*. Failure to follow these guidelines may result in an overload of the electrical circuits feeding the power enclosure.

When performing system upgrades, refer to the *HP BladeSystem p-Class System Overview and Planning white paper* to be sure that the new configuration does not overload the existing power enclosure scheme.

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



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



CAUTION: Protect the equipment from power fluctuations and temporary interruptions with a regulating UPS. This device protects the hardware from damage caused by power surges and voltage spikes and keeps the equipment in operation during a power failure.

Grounding requirements

This equipment must be grounded properly for proper operation and safety. In the United States, you must install the equipment in accordance with NFPA 70, 1999 Edition (National Electric Code), Article 250, as well as any local and regional building codes.

In Canada, you must install the equipment in accordance with Canadian Standards Association, CSA C22.1, Canadian Electrical Code.

In all other countries, you must install the equipment in accordance with any regional or national electrical wiring codes, such as the International Electrotechnical Commission (IEC) Code 364, parts 1 through 7. Furthermore, you must be sure that all power distribution devices used in the installation, such as branch wiring and receptacles, are listed or certified grounding-type devices.

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

Installing HP BladeSystem p-Class enclosures

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Installation overview

To install an enclosure into the rack:

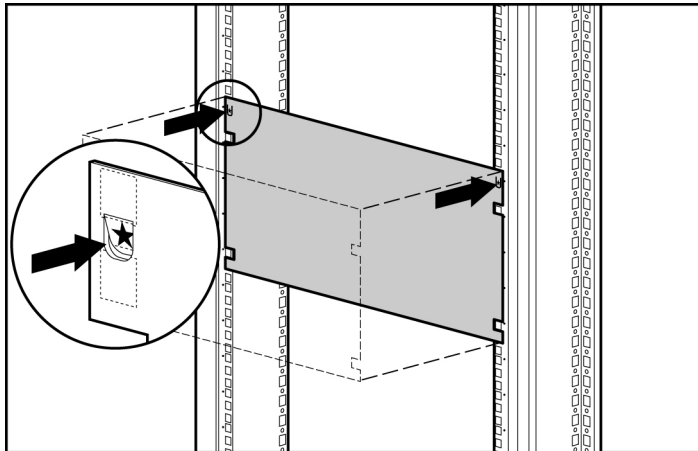
1. If you are installing the HP BladeSystem 3U power enclosure, use the rack template ("Measuring with the rack template" on page [16](#)) to mark the locations for power distribution devices.
2. Install the rack rails ("Installing the rack rails (3U power supply and server blade enclosures)" on page [17](#)) for each enclosure.
3. Install the cage nuts ("Installing the cage nuts" on page [20](#)), if necessary.
IMPORTANT: You must install cage nuts for each power distribution device (scalable bus bar or mini bus bar).
IMPORTANT: Be sure that the guiding fins on the enclosure seat properly in the guiding groove on the rack rail.
4. Position yourself at the front of the rack, and align the enclosure guiding fins with the guiding groove in the rack rails.
5. Slide the enclosure fully into the rack.
6. Tighten the thumbscrews to secure the enclosure in the rack.

Measuring with the rack template

NOTE: A rack template is not provided with the 1U power supply enclosure.

Rack templates ship with the bus bars and provide detailed instructions on where to position bus bar hinges and enclosure rack rails. Each power supply enclosure kit and server blade enclosure kit includes rack rails recommended for that enclosure. The rack rails that ship with the HP BladeSystem 3U Power Enclosure and HP BladeSystem p-Class Server Blade Enclosure are identical.

When installing multiple enclosures, install the rack rails for one enclosure, then install the enclosure. Repeat for each additional enclosure.



Installing the rack rails and cage nuts

You must install two rack rails to support each enclosure. Rack rails have the following features:

- Adjustable depth of 60.96 cm to 91.44 cm (24 in to 36 in)
 - IMPORTANT:** For proper bus bar installation and clearance, the rack rail depth must be set from 73.66 cm to 76.20 cm (29 in to 30 in).
- Depth indicator, visible in the middle of the rail

- "L" and "R" markings to identify left and right rack rails (from the front of the rack)



CAUTION: Always plan the rack installation so that the heaviest item is on the bottom of the rack. Install the heaviest item first, and continue to populate the rack from the bottom to the top.

Installing the HP BladeSystem p-Class 1U Power Enclosure rack rails

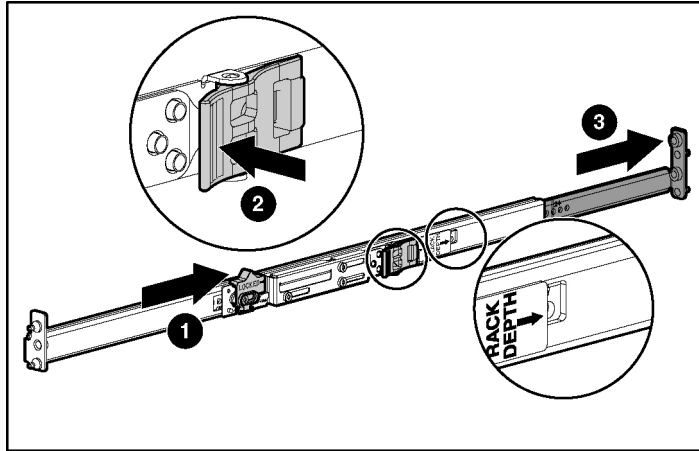
The HP BladeSystem p-Class 1U Power Enclosure uses HP 1U Adjustable Toolless Rails. Refer to the installation instructions that are included with the rail hardware kit for detailed installation instructions. Cage nuts are not used with the HP BladeSystem p-Class 1U Power Enclosure.

NOTE: Power distribution devices (scalable bus bar and mini bus bar) are not required when installing the HP BladeSystem 1U Power Enclosure. The power enclosure is designed to connect directly to one server blade enclosure.

Installing the rack rails (3U power supply and server blade enclosures)

1. Adjust the rack rails to fit the rack, using the numbers on the rack rail as a guide.

NOTE: The depth of an HP or a Compaq branded rack (29 in) is clearly indicated on the rack rails.

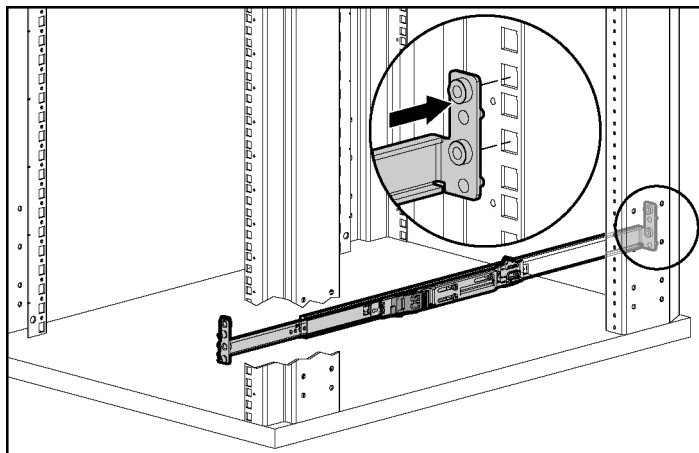


IMPORTANT: Numbers on the rack rail provide a gross adjustment of the depth of the rack rail. You may need to adjust the rack rail depth again to ensure a proper fit.

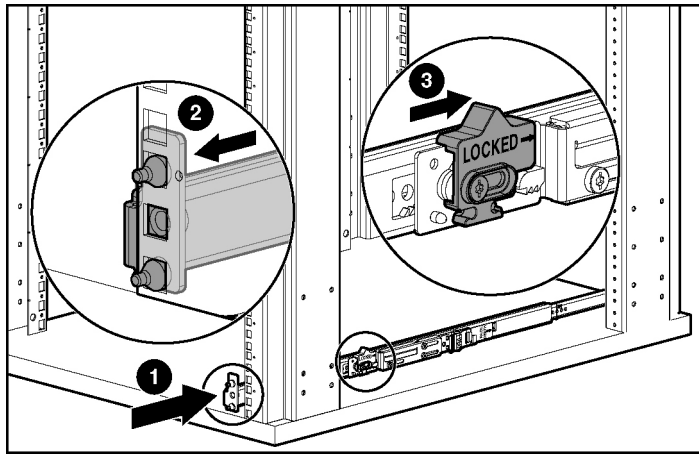
2. Install the right rack rail into the rack:

NOTE: Identify the left (L) and right (R) rack rails by markings stamped into the sheet metal.

- a. Insert the rear of the right rack rail into the rack at the marks you made when measuring with the template.



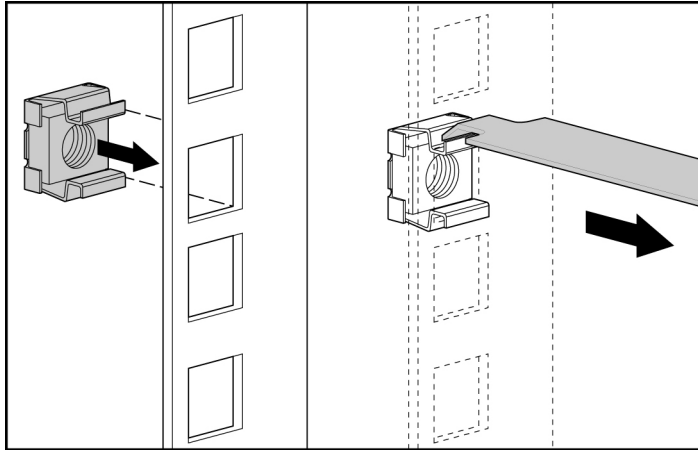
- b. Compress the spring-loaded rack rail toward the rear of the rack.
- c. Using the marks you made when measuring with the template, align the front of the right rail with the holes and release the rail, allowing it to lock into position.
- d. Engage the locking gear.



CAUTION: Rack rails must be installed as tightly as possible. Failure to obtain a proper fit may result in damage to equipment.

- 3. Repeat the preceding step for the left rack rail.
 - IMPORTANT:** To ease installation, install all cage nuts for enclosures, bus bar hinges, and cable brackets before installing the remaining infrastructure.
- 4. Using the marks you made when measuring with the template, install the cage nuts ("Installing the cage nuts" on page 20) for enclosures, bus bar hinges, and the cable bracket.
 - IMPORTANT:** In AC power configurations, the bottom hinges for each bus bar are installed on the ends of the power enclosure rack rails. The rails have extrusions to align the hinges and holes to accept the screws. In facility DC power configurations, you must install cage nuts to support the bottom hinges. Refer to the template for hinge locations.

Installing the cage nuts



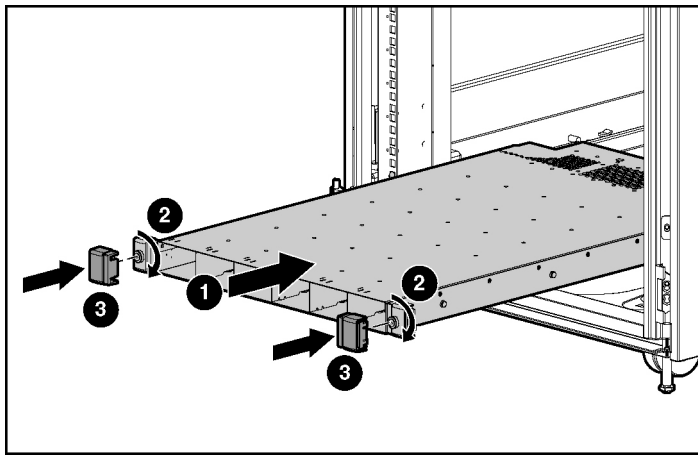
Installing HP BladeSystem p-Class enclosures into the rack

NOTE: Install all server blade enclosures before installing power distribution devices at the rear of the rack.

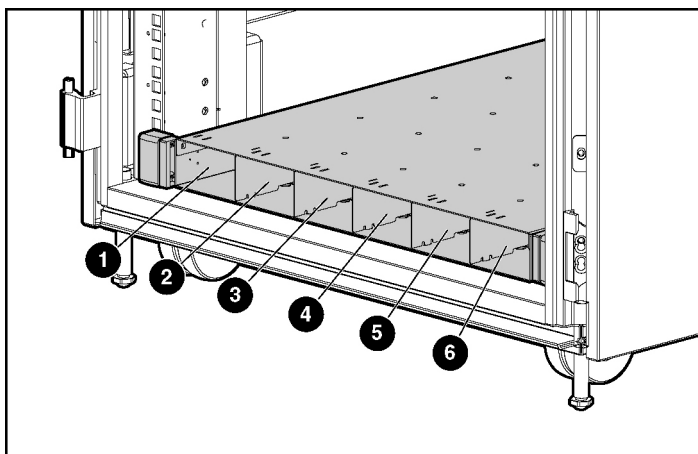
Installing HP BladeSystem p-Class 1U Power Enclosures



CAUTION: Always plan the rack installation so that the heaviest item is on the bottom of the rack. Install the heaviest item first, and continue to populate the rack from the bottom to the top.



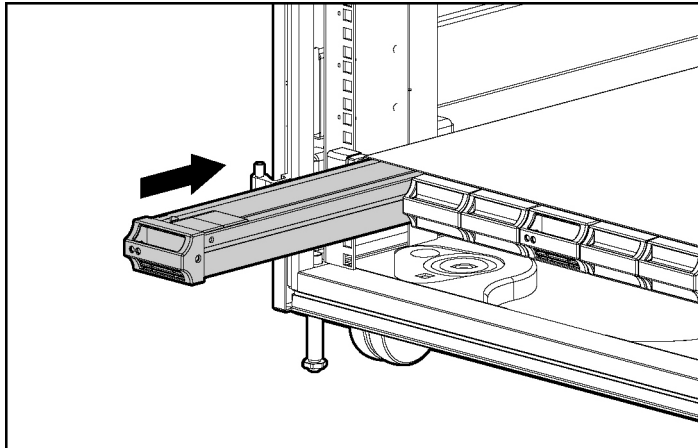
Identifying HP BladeSystem p-Class 1U Power Supply Enclosure bays



Item	Description	Configuration
1	Power supply bay 1	Bus A
2	Power supply bay 2	Bus A
3	Power supply bay 3	Bus A
4	Power supply bay 4	Bus B
5	Power supply bay 5	Bus B
6	Power supply bay 6	Bus B

Installing an HP BladeSystem 1U Power Supply

If necessary, remove the power supply blank.

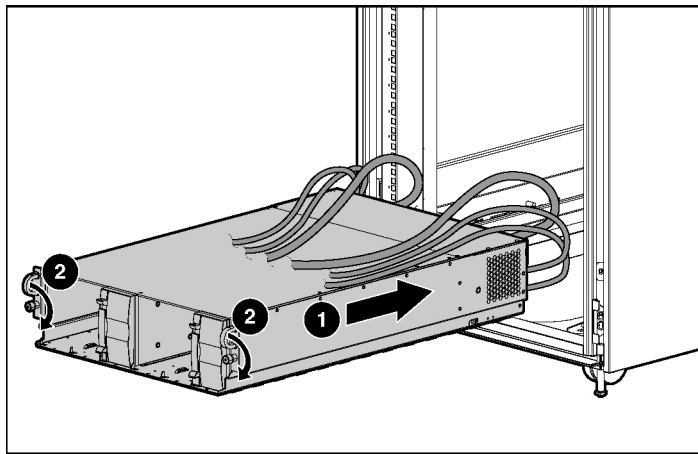


NOTE: Order the appropriate AC power cord if you are not using the PDU solution to provide power to the equipment.

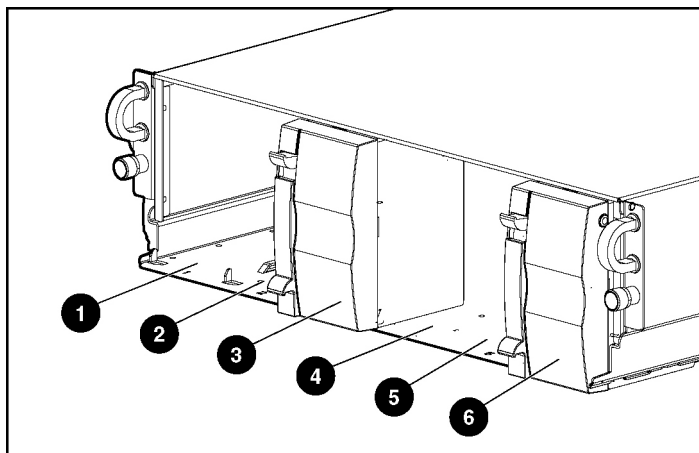
Installing HP BladeSystem p-Class 3U Power Enclosures



CAUTION: Always plan the rack installation so that the heaviest item is on the bottom of the rack. Install the heaviest item first, and continue to populate the rack from the bottom to the top.



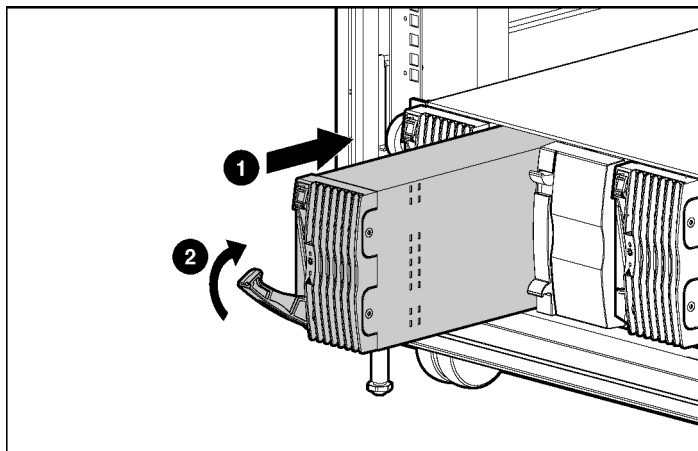
Identifying HP BladeSystem p-Class 3U Power Enclosure bays



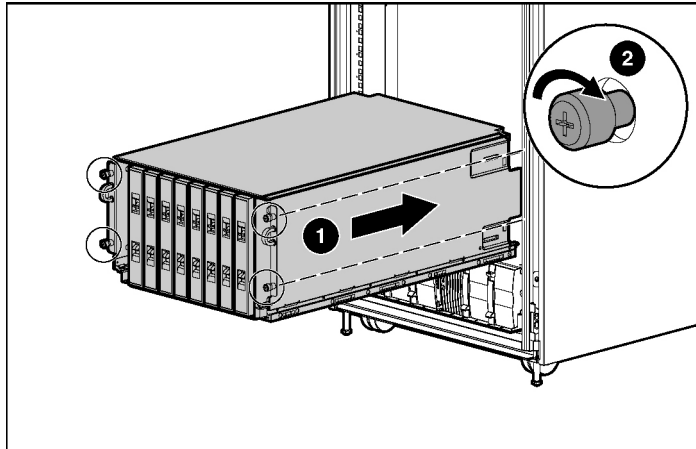
Item	Description	Configuration
1	Power supply bay 1	Bus A
2	Power supply bay 2	Bus A
3	Power supply bay 3	Bus A
4	Power supply bay 4	Bus B
5	Power supply bay 5	Bus B
6	Power supply bay 6	Bus B

Installing an HP BladeSystem 3U Power Supply

If necessary, remove the power supply blank.



Installing HP BladeSystem p-Class Server Blade Enclosures



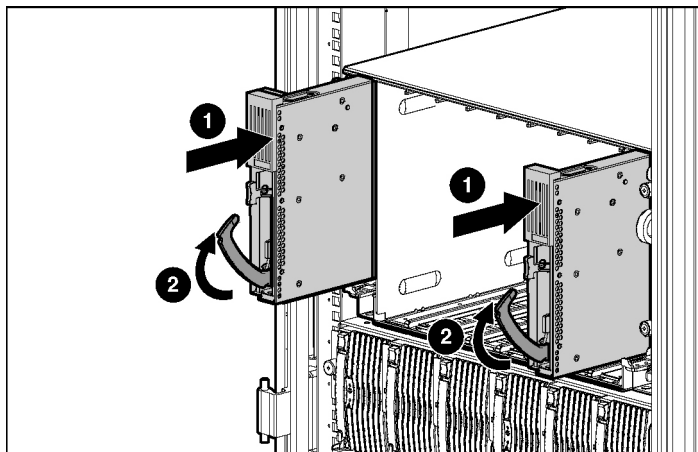
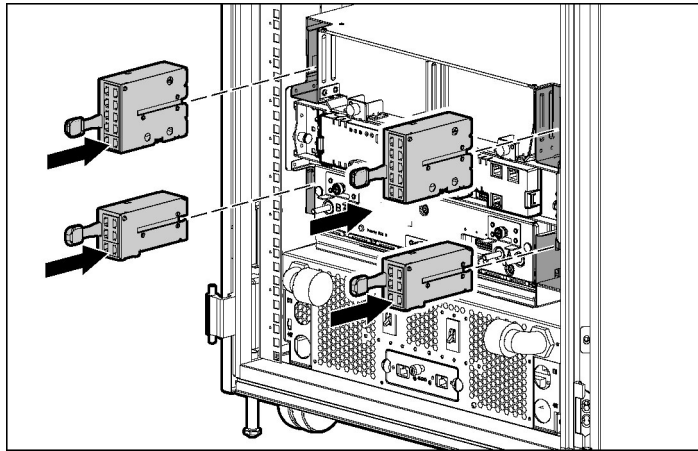
Installing interconnects

Each server blade enclosure requires a pair of interconnects and server blades to provide network access for data transfer. The leftmost and rightmost bays of each server blade enclosure are interconnect bays.

IMPORTANT: Interconnect options vary. A server blade enclosure requires a pair of interconnects of the same type. Do not mix two types of interconnects in the same enclosure. Refer to the documentation that ships with the interconnect option or server blade option you have selected. Additional information is available at the HP website (<http://www.hp.com/go/bizsupport>).

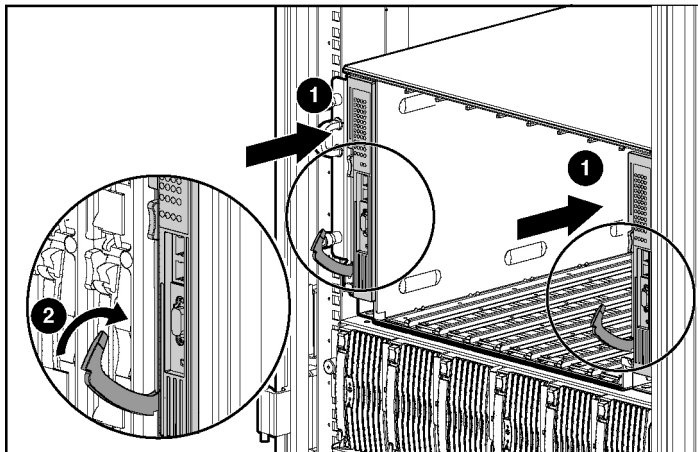
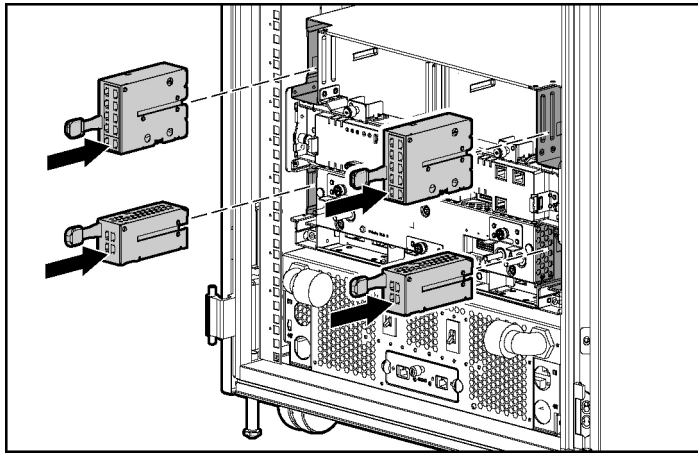
Installing HP BladeSystem interconnect modules and RJ-45 patch panels

NOTE: Always install the interconnect modules in the rear of the server blade enclosure before installing the switch or patch panel in the front of the server blade enclosure.



Installing HP BladeSystem interconnect modules and interconnect switches

NOTE: Always install the interconnect modules in the rear of the server blade enclosure before installing the switch or patch panel in the front of the server blade enclosure.



Cabling and powering up the system

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System cabling overview

After all system hardware is installed, cable the components. Refer to the *HP ProLiant BL System Best Practices Guide* on the Documentation CD or the HP website (<http://www.hp.com>) for HP recommendations on cable ordering.



WARNING: To reduce the risk of electric shock or injury due to high-current electrical energy, be sure that all power is completely disconnected at the source before beginning any power connections to the power bus bars or power bus box.

To cable the system:

1. Cable the management modules. Refer to "Cabling the management modules (on page [39](#))."

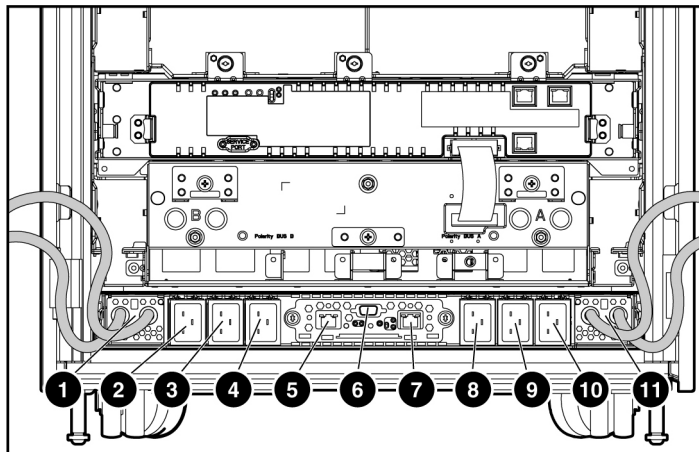
2. Connect the network cables to the interconnects. Refer to the documentation that came with the interconnects or to the *HP ProLiant BL System Best Practices Guide* on the Documentation CD or on the HP website (<http://www.hp.com/go/bizsupport>).



WARNING: Be sure that all circuit breakers are locked in the off position before connecting any power components.

3. If you are using a facility AC power source, complete the following steps:
 - a. If you are installing the HP BladeSystem p-Class 1U Power Enclosure, connect the power cables from the power enclosure to the server blade enclosure. Refer to "Connecting the HP BladeSystem p-Class 1U DC Power Cable to the server blade enclosure (on page [44](#))."
 - b. If you are installing the HP BladeSystem p-Class 3U Power Enclosure in a scalable bus bar configuration or Mini Bus Bar Dual Power Box configuration, connect the load-balancing signal cable between power enclosures. Refer to "Connecting the load-balancing signal cable (on page [50](#))."
 - c. Connect the bus bars or power bus boxes to the enclosures. Refer to "Installing power distribution devices (on page [33](#))" and "Installing the power couplers ("Installing the power connectors" on page [38](#))."
4. If you are using a facility DC power source:
 - a. Connect the grounding cable to the server blade enclosures. Refer to "Connecting facility DC power to the power distribution bus bars (on page [51](#))."
 - b. Install the facility DC cables. Refer to the documentation that ships with the Facility DC Cable Kit.
 - c. Connect the bus bars or power bus boxes to the enclosures. Refer to "Installing power distribution devices (on page [33](#))" and "Installing the power couplers ("Installing the power connectors" on page [38](#))."
 - d. Install the cable bracket. Refer to the documentation that ships with the brackets.
5. Connect to your facility AC or DC power source and power up the system. Refer to the "Powering up the system (on page [59](#))."

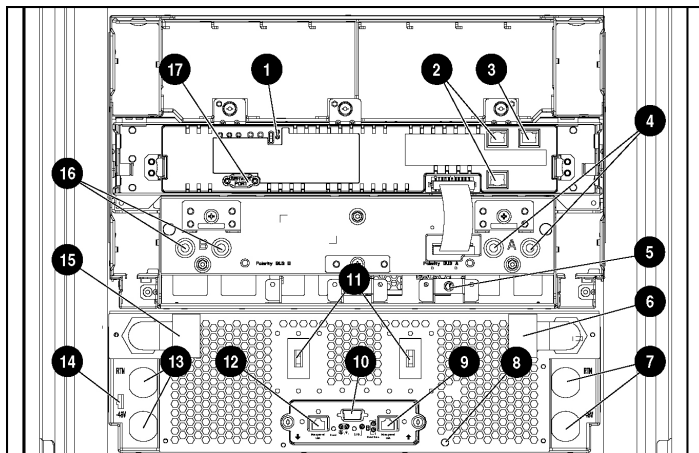
Identifying HP BladeSystem p-Class 1U Power Enclosure components



Item	Description	Cable type
1	DC output power connector for bus B	DC power cable
2	AC input power connector for bay 6	PDU power cord
3	AC input power connector for bay 5	PDU power cord
4	AC input power connector for bay 4	PDU power cord
5	Power enclosure management link connector (to enclosure below, if necessary)	RJ-45 management link cable
6	Power management module service port	—
7	Power enclosure management link connector (to server enclosure above)	RJ-45 management link cable
8	AC input power connector for bay 3	PDU power cord

Item	Description	Cable type
9	AC input power connector for bay 2	PDU power cord
10	AC input power connector for bay 1	PDU power cord
11	DC output power connector for bus A	DC power cable

Identifying HP BladeSystem p-Class 3U Power Enclosure and Server Blade Enclosure components



Item	Description	Cable type
1	Power zone configuration switch	—
2	Server blade management link connectors (top to enclosure above, bottom to enclosure below)	RJ-45 management link cable
3	iLO connector	RJ-45
4	DC power input connectors for bus A	DC power cable
5	Server blade enclosure grounding cable screw	—

Item	Description	Cable type
6	AC input power connector for bus A	AC power cord
7	DC output power connector for bus A	DC power cable
8	Power enclosure grounding cable screw	—
9	Power management link connectors to enclosure above	RJ-45 management link cable
10	Power management module service port	—
11	Power enclosure AC circuit breakers (to hot-plug power supplies) for bus B (left) and bus A (right)	—
12	Power management link connectors to enclosure below	RJ-45 management link cable
13	DC output power connector for bus B	DC power cable
14	Load balancing signal cable	—
15	AC input power connector for bus B	AC power cord
16	DC power input connectors for bus B	DC power cable
17	Server blade management module service port	—

Installing power distribution devices

NOTE: Power distribution devices (scalable bus bar and mini bus bar) are not required when installing the HP BladeSystem 1U Power Enclosure. The power enclosure is designed to connect directly to one server blade enclosure.

NOTE: Other power distribution options may exist for the server blade. Refer to the specific power distribution documentation for more information.

Solution	Power enclosures supported	Server blade enclosures supported	Maximum rack space occupied
Scalable bus bar	2	5	36U
Mini bus bar	1	3	21U
Mini bus bar*	2	3	24U
Power bus box	1	1	9U

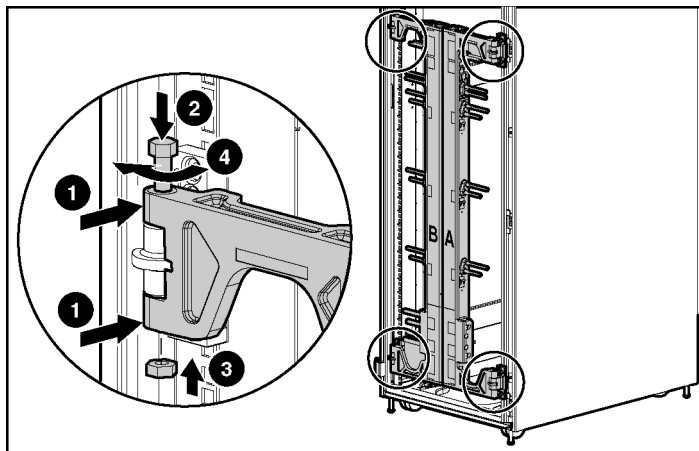
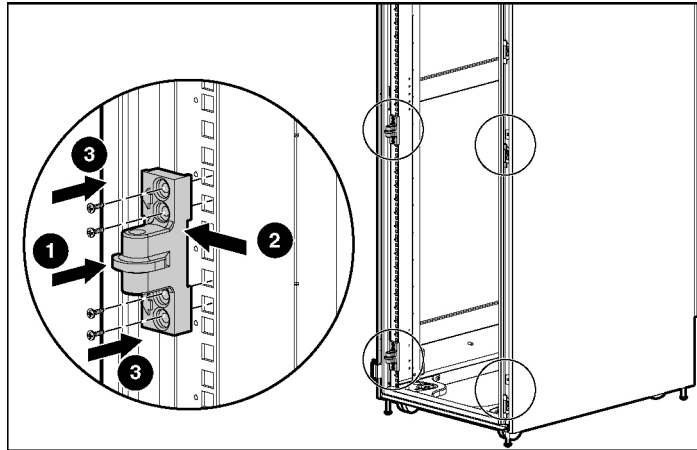
* A Mini Bus Bar Dual Power Box supports two power enclosures attached to the mini bus bar to enable a redundant AC power configuration.

Two mini bus bar configurations, each with one power enclosure and three server blade enclosures, can be installed one above the other to fully populate a 42U rack.

NOTE: Scalable and mini bus bars attach to the rack in the same manner.

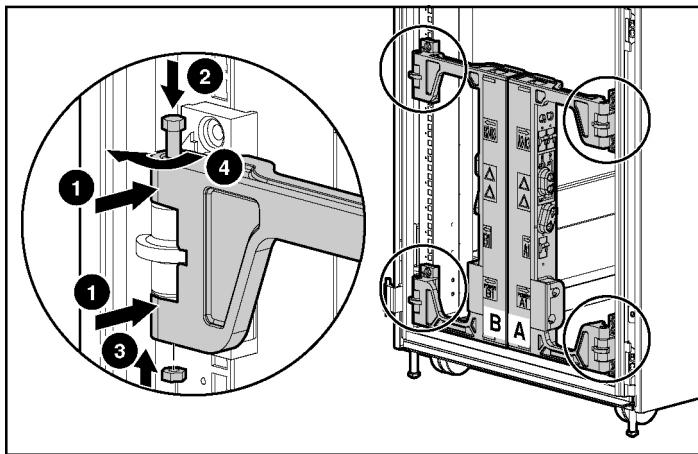
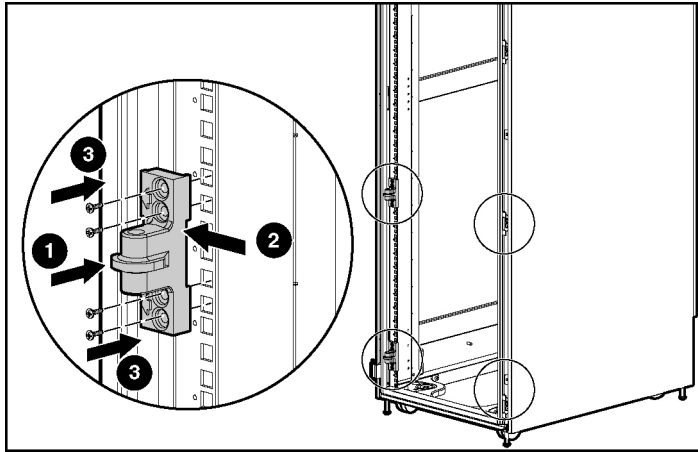
Installing a scalable bus bar kit

NOTE: Use the location marks made when you measured the rack with the rack template.



Installing a mini bus bar kit

NOTE: Use the location marks made when you measured the rack with the rack template.



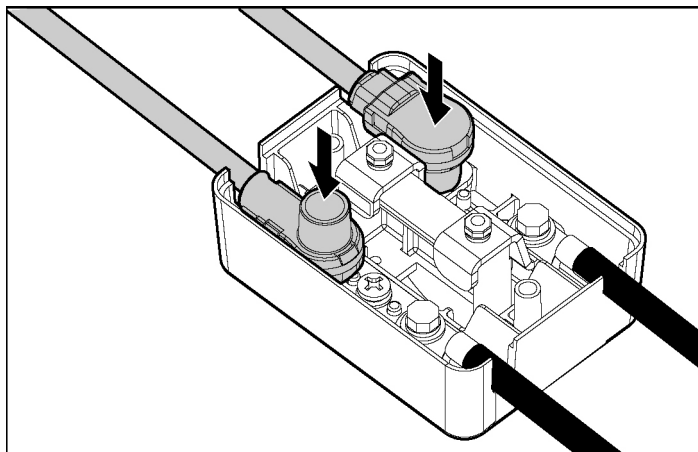
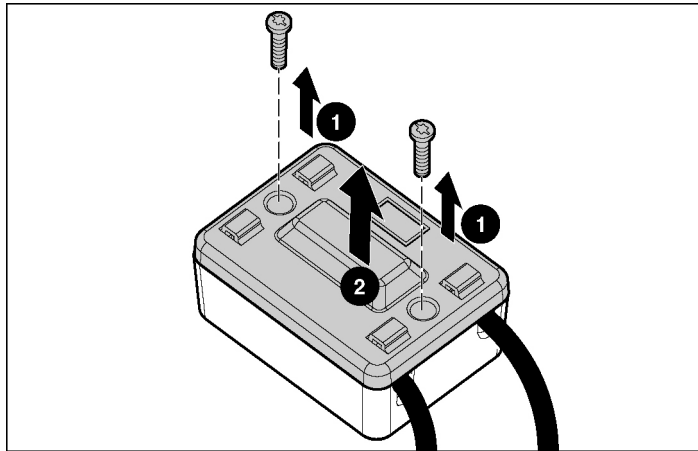
Installing a power bus box

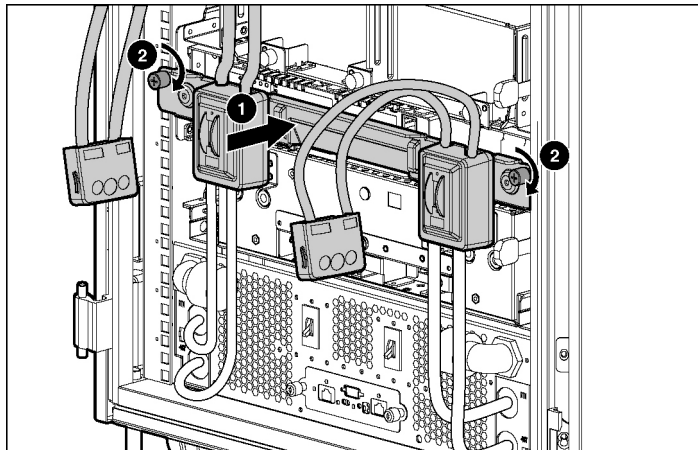
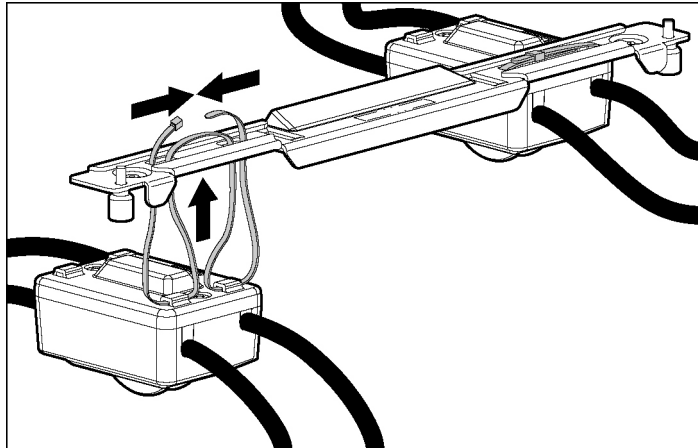


WARNING: If using facility DC power, cables must be connected by a licensed electrician or trained service personnel familiar with high-power circuitry.



WARNING: Be sure that all circuit breakers are locked in the off position before connecting any power components.





Installing the power connectors

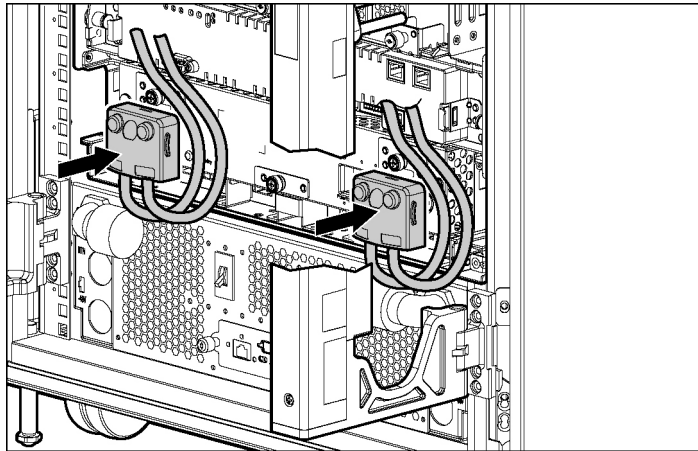
The power connectors are positioned to line up to adjacent server blade enclosures.



WARNING: If using facility DC power, cables must be connected by a licensed electrician or trained service personnel familiar with high-power circuitry.



WARNING: Be sure that all circuit breakers are locked in the off position before connecting any power components.



Cabling the management modules

The server blade management modules and power management modules are cabled together in daisy-chain fashion to provide the management link. Each management module has two management link connectors: one to connect to enclosures above and one to connect to enclosures below. Cabling the management modules enables the system to identify rack topology for power and data management.



CAUTION: Do not install NIC cabling or telephone cabling into the management link connectors; these devices are not supported.

When deploying the HP BladeSystem 1U Power Enclosure and attached server enclosure into an existing installation, it is necessary to upgrade all management module firmware on all enclosures to the latest version.

Management cabling guidelines

Observe the following guidelines for cabling the management modules.

On the server blade management module:

- The upper Management Link connects to the upper enclosure.
- The lower Management Link connects to the lower enclosure.
- The iLO port connects to the iLO network.

On the power management module:

- The right management link connector connects to enclosures above the module.
- The left management link connector connects to enclosures below the module.

Additional guidelines for a 42U solution

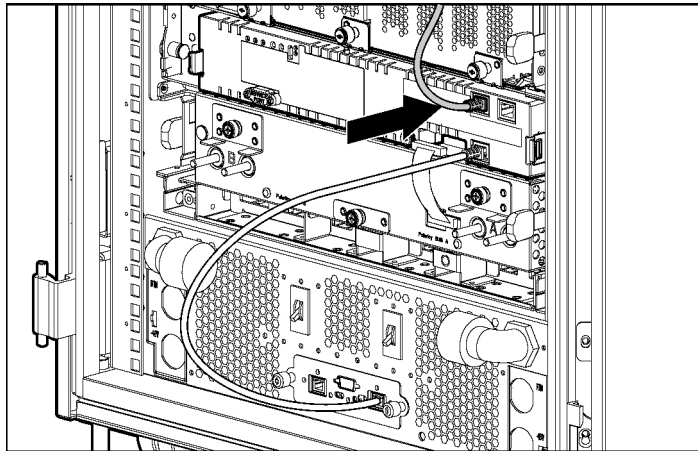
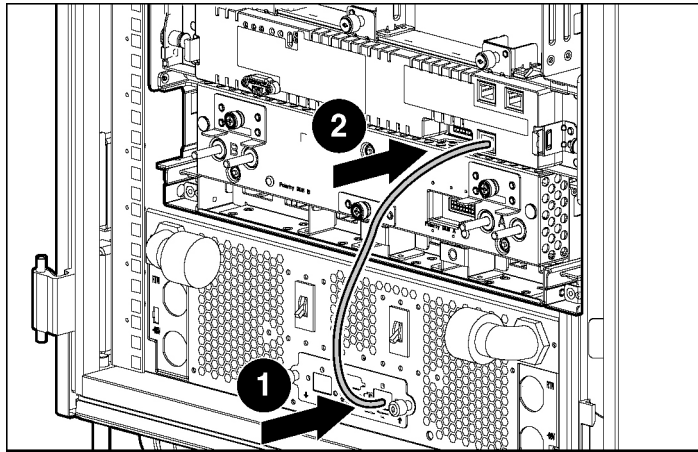
Observe the following additional guidelines for configuring a full-rack 42U solution with two pairs of mini bus bars:

- You must set the power configuration switches to establish the two power zones. Refer to [Power configuration switches](#) (on page [72](#)) in this guide.
- You must cable the power management module in zone 2 (upper pair of mini bus bars) to both adjacent server blade management modules, above and below. This connection enables system management to establish a full-rack topology.

Connecting the management module cables

NOTE: This section applies only to systems that are configured with an enhanced server blade enclosure.

NOTE: Management modules are used only for information management (asset tracking, for example). Disconnecting the management module cabling does not affect system operation.

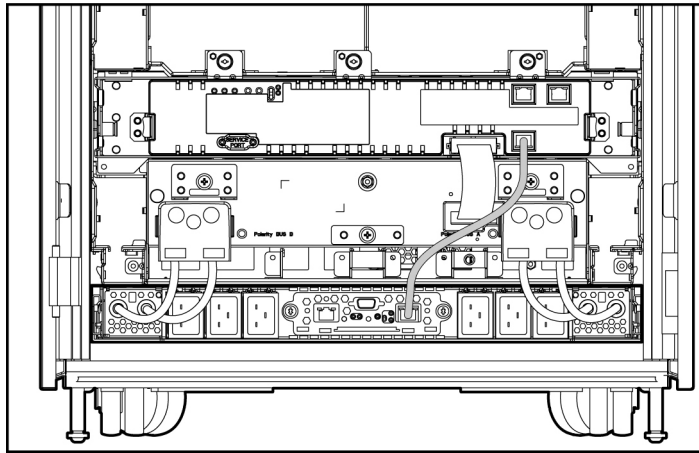


IMPORTANT: Improper cabling causes all the management link connector LEDs on the management modules to flash.

Be sure the power configuration switches are set properly if you have a full-rack solution with two pairs of mini bus bars. Refer to Power Configuration Switches (on page [72](#)) in this guide.

Connecting the HP BladeSystem p-Class 1U Management Link Cable

When deploying the HP BladeSystem 1U Power Enclosure and attached server enclosure into an existing installation, it is necessary to upgrade all management module firmware on all enclosures to the latest version.

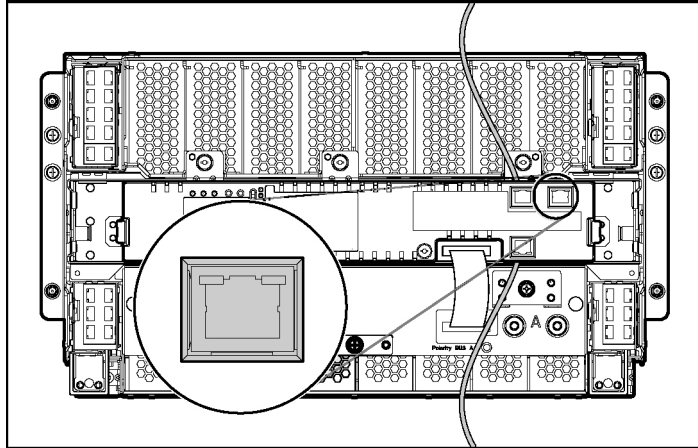


IMPORTANT: In installations configured with the HP BladeSystem 1U Power Enclosures and Power Supplies, the power zones are calculated dynamically using the topology information from all the connected enclosures. Disregard the power zone switch and LEDs on the HP BladeSystem 1U Power Enclosure.

If deploying the HP BladeSystem 1U Power Enclosure into a rack installation with other HP BladeSystem Enclosures, the enclosures can be connected to each other with management link cables to identify rack topology. Refer to the "Configuring the dynamic power saver (on page [57](#))" section in this document.

Connecting to iLO

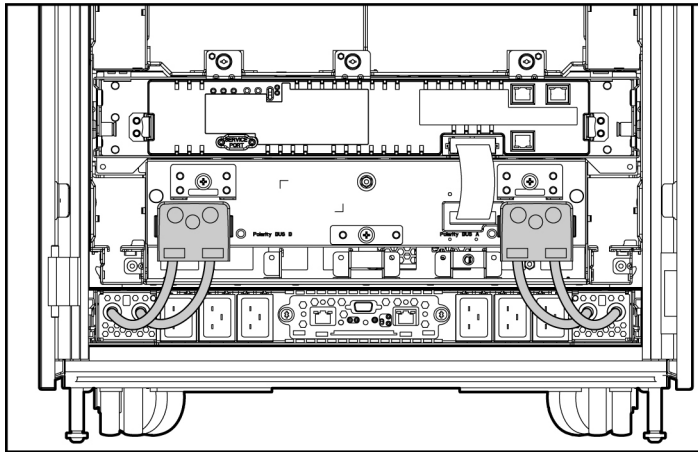
NOTE: This section applies only to systems that are configured with an enhanced server blade enclosure.



Cabling the network to the system

Cable the interconnects to the network. Refer to the supporting documentation for specific details on cabling the interconnects.

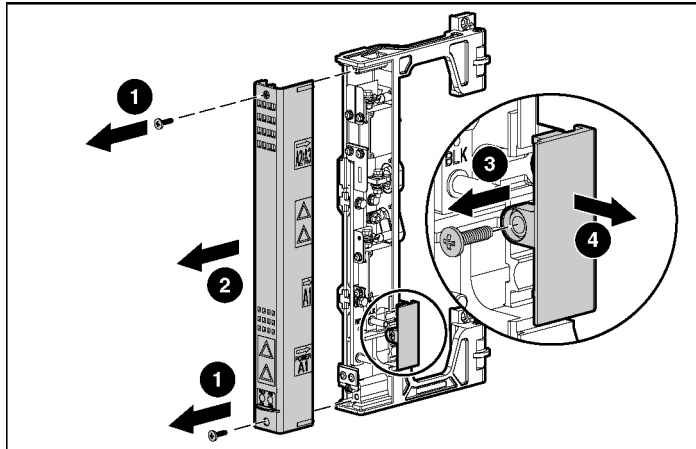
Connecting the HP BladeSystem p-Class 1U DC power cable to the server blade enclosure



Connecting power cables to a mini bus bar

Connect the power cables to the mini bus bar.

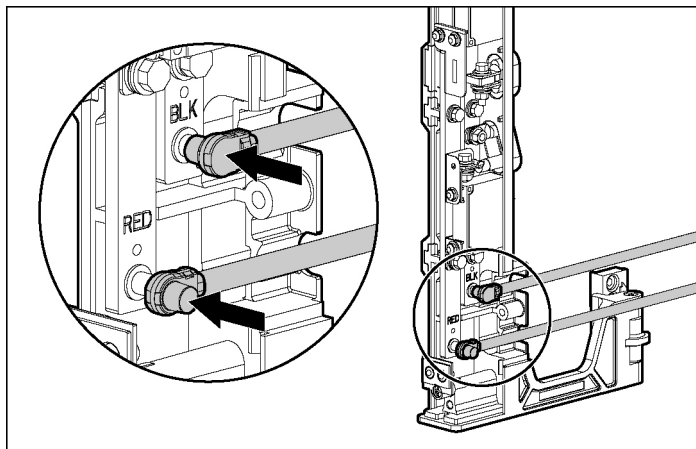
Removing the mini bus bar cover



Connecting power cables to the mini bus bar

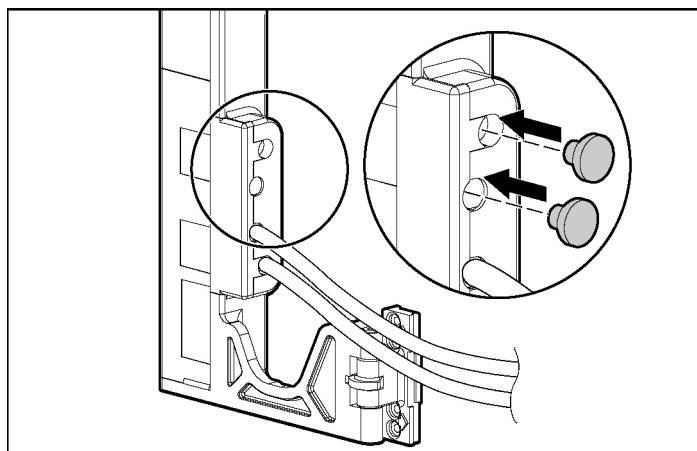
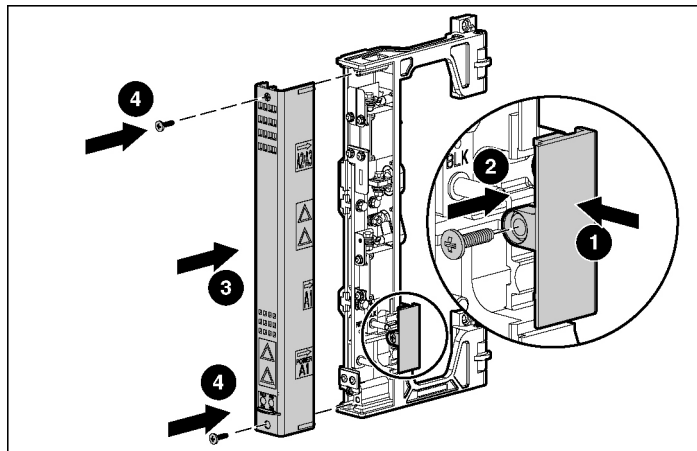


WARNING: If using facility DC power, cables must be connected by a licensed electrician or trained service personnel familiar with high-power circuitry.

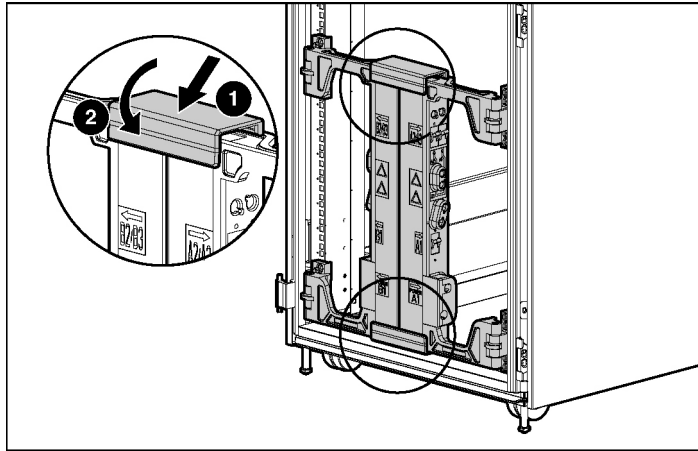


NOTE: If you are connecting two HP BladeSystem 3U Power enclosures to mini bus bars, refer to the *HP BladeSystem Mini Bus Bar Dual Power Kit Installation Instructions* or to the *HP BladeSystem p-Class Enclosure Installation Guide*.

Replacing the mini bus bar cover



Securing the mini bus bars



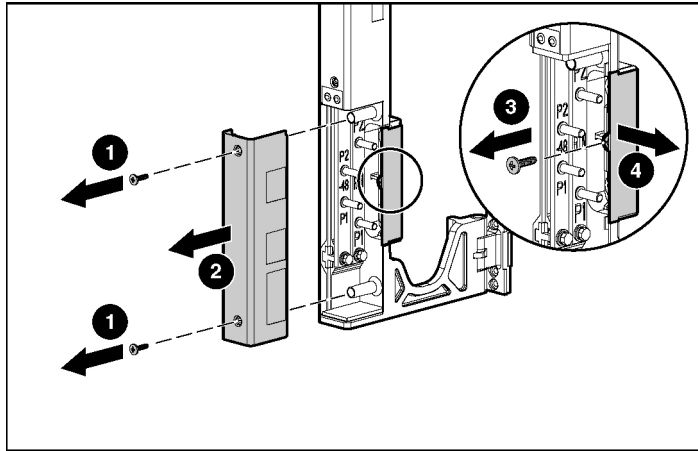
Connecting power cables to a scalable bus bar

Connect the DC power cables to the scalable bus bar.

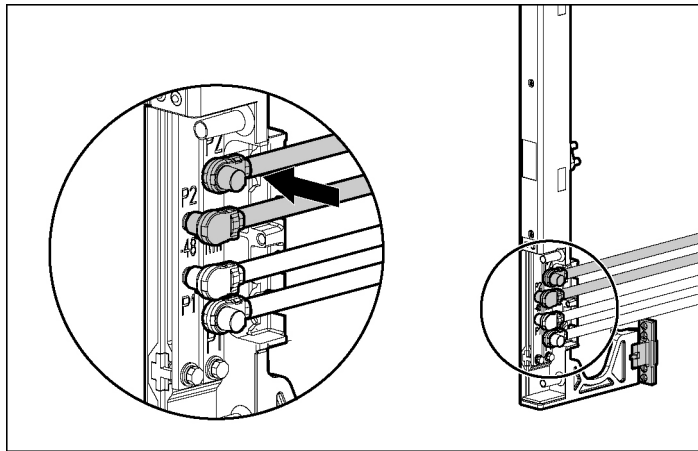
Removing the scalable bus bar covers



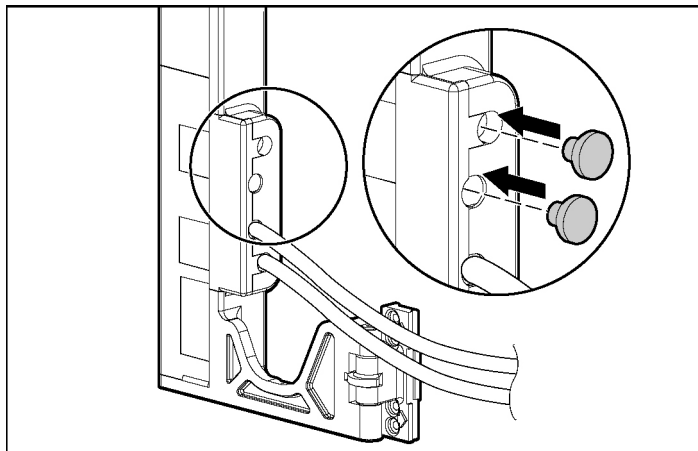
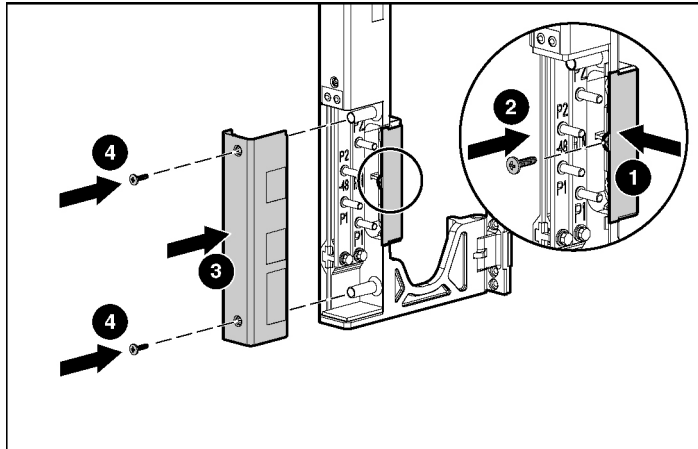
WARNING: If using facility DC power, cables must be connected by a licensed electrician or trained service personnel familiar with high-power circuitry.



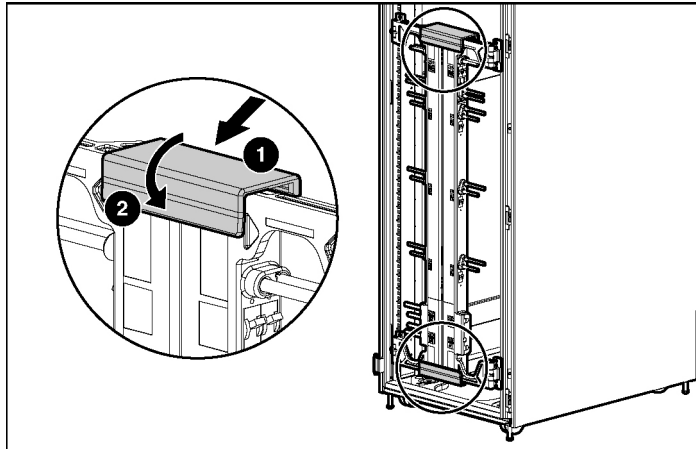
Connecting power cables to the scalable bus bar



Replacing the scalable bus bar cover



Securing the scalable bus bars

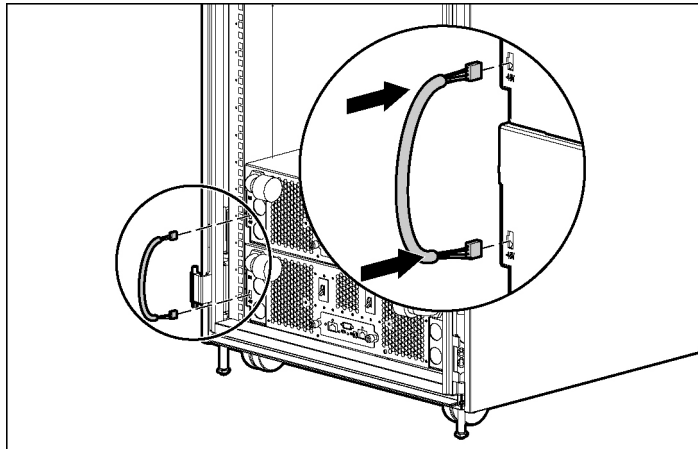


Connecting the load-balancing signal cable

When a power zone is configured with two HP BladeSystem 3U Power Enclosures, the load-balancing signal cable must be used to enable the power enclosures to balance their power output for the system power demand in that power zone.

IMPORTANT: If the load-balancing signal cable is not installed, the management software issues alerts.

IMPORTANT: If the configuration does not include HP BladeSystem p-Class 3U Power Enclosures, no load-balancing signal cables are necessary.



Connecting facility DC power to the power distribution bus bars

Install the facility DC cable option kit. Refer to the documentation that ships with that kit.

The grounding cable satisfies enclosure-to-enclosure grounding requirements in facility DC power environments. Each type of bus bar supports a different number of enclosures; therefore, each Facility DC Cable Option Kit contains a grounding cable to support the appropriate number of enclosures.



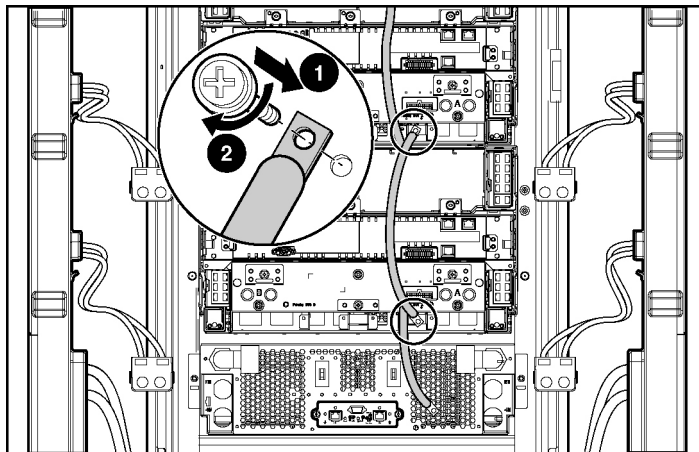
WARNING: The ground cable must be connected to each enclosure in the rack and to a suitable ground (earth) terminal located within the rack or cabinet. The terminal in the rack must be connected to a suitable building ground (earth) terminal in accordance with local, regional, or national electrical codes or regulations. Do not rely on the rack or cabinet chassis to provide adequate continuity of the rack ground connection.



WARNING: If using facility DC power, cables must be connected by a licensed electrician or trained service personnel familiar with high-power circuitry.

To connect the grounding cable:

1. Insert the mounting screw through the grounding cable lead and into the enclosure (1).
2. Tighten the mounting screw to secure the grounding cable to the enclosure (2).



3. Repeat steps 1 and 2 as needed for the configuration until all enclosures in the rack are connected by the grounding cable.
4. Connect the lower end of the grounding cable to the facility grounding connection.

Installing the cable bracket

Install the cable bracket (optional) provided with each power distribution kit.

Configuration examples

Refer to the following examples for typical HP BladeSystem configurations:

- Scalable bus bar configuration example (on page [53](#))
- Two mini bus bar configuration example (on page [54](#))
- Redundant mini bus bar configuration example (on page [55](#))
- Full rack 42U solution with two pairs of mini bus bars (on page [56](#))
- Configuring the Dynamic Power Saver (on page [57](#))

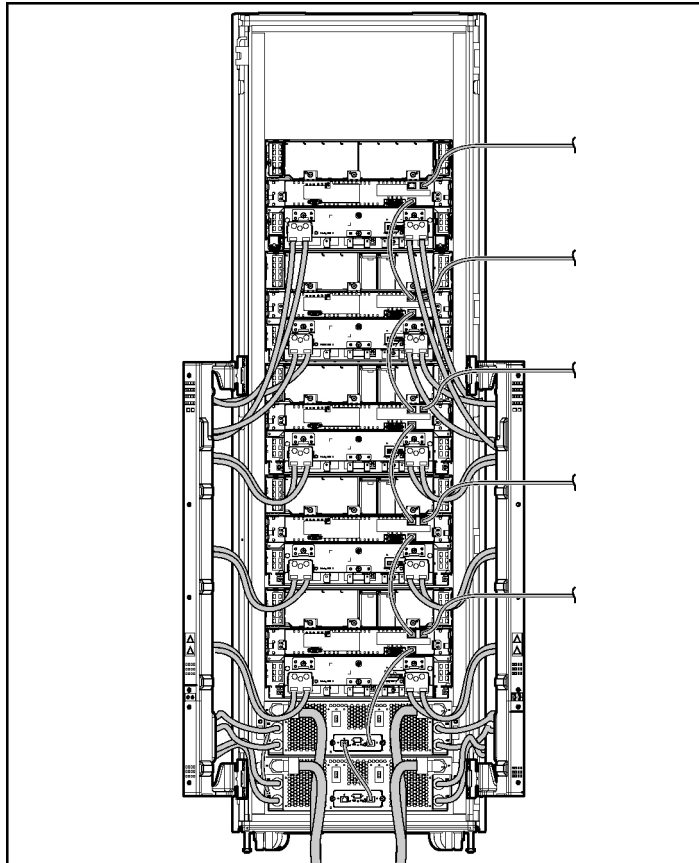
Scalable bus bar configuration example



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



CAUTION: Always use blanks to fill empty spaces in enclosures. This arrangement ensures proper airflow. Using an enclosure without the proper blanks results in improper cooling that can lead to thermal damage.



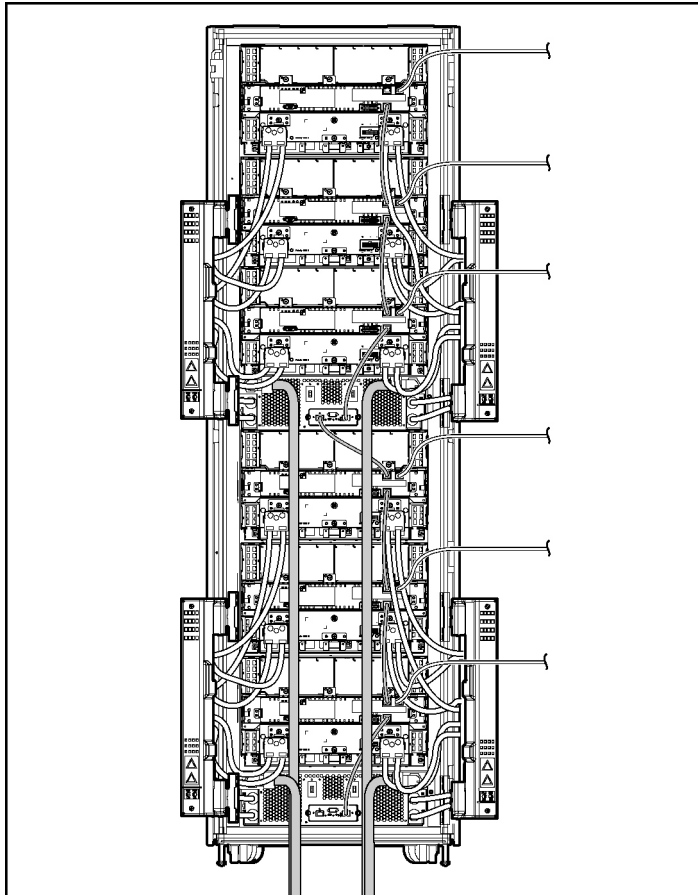
Two mini bus bar configuration example



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



CAUTION: Always use blanks to fill empty spaces in enclosures. This arrangement ensures proper airflow. Using an enclosure without the proper blanks results in improper cooling that can lead to thermal damage.



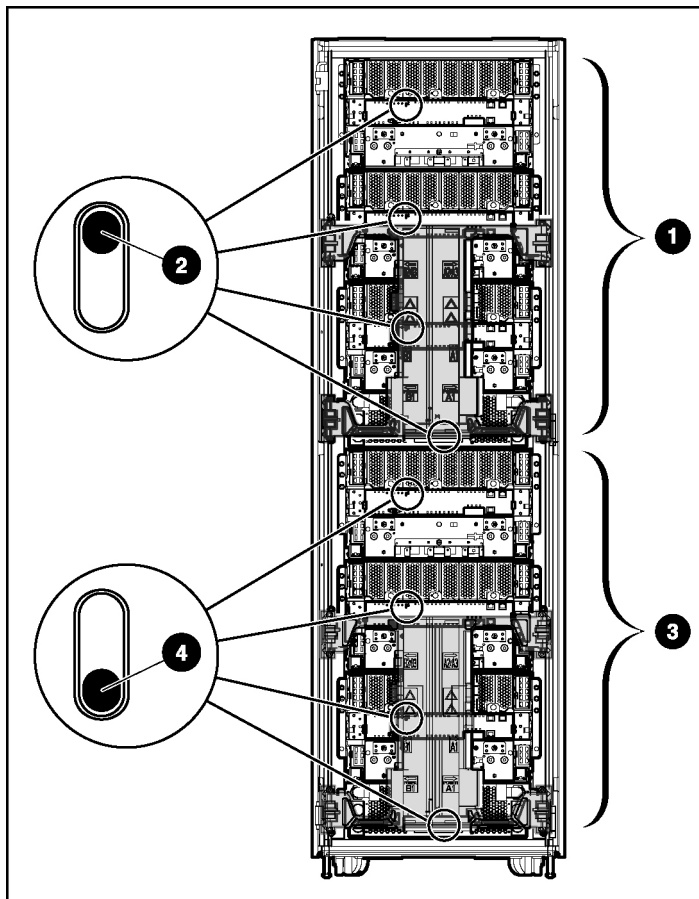
Redundant mini bus bar configuration example

The configurations illustrated in this document are non-redundant AC mini bus bar configurations. To obtain AC redundancy, you need the AC redundant mini bus bar box. Refer to the documentation supplied with the AC redundant mini bus bar box and to the *HP ProLiant BL System Best Practices Guide*.

Full rack 42U solution with two pairs of mini bus bars

Observe the following additional guidelines for configuring a full-rack 42U solution with two pairs of mini bus bars:

- Set the power configuration switches to establish the two power zones.
- Cable the power management module in zone 2 (upper pair of mini bus bars) to both adjacent server blade management modules, above and below. This connection enables system management to establish a full rack topology.



Item	Description
1	Power zone 2
2	Zone 2 switches in the up (secondary) position
3	Power zone 1
4	Zone 1 switches in the down (default) position

IMPORTANT: In installations configured with the HP BladeSystem 1U Power Enclosures and Power Supplies, the power zones are calculated dynamically using the topology information from all the connected enclosures. Disregard the power zone switch and LEDs on the HP BladeSystem 1U Power Enclosure.

For more information on configuring the power zones, refer to the *HP ProLiant BL System Best Practices Guide*.

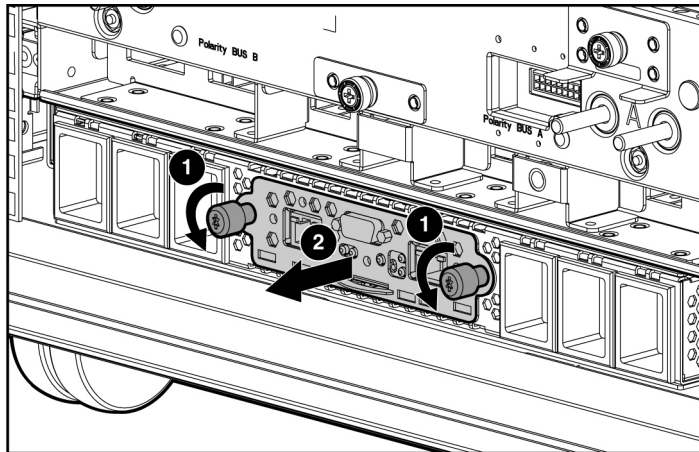
Configuring the Dynamic Power Saver

NOTE: The Dynamic Power Saver is a feature of the HP BladeSystem p-Class 1U Power Supply Enclosure.

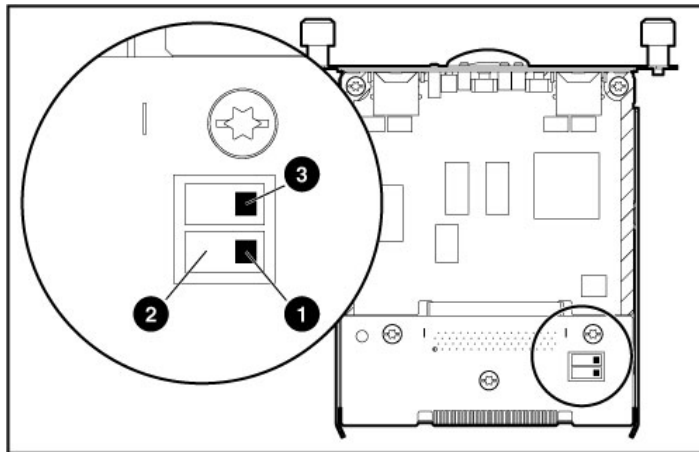
NOTE: The Dynamic Power Saver configures the available power supplies to operate at maximum efficiency.

When the Dynamic Power Saver feature is enabled, the total enclosure power consumption is monitored in real time. Power supplies are placed in a standby condition when the power demand from the server enclosure is low. When power demand increases, the standby power supplies instantaneously deliver the required power. This enables the enclosure to operate at optimum efficiency.

To configure the Dynamic Power Saver, remove the power enclosure management module.



Use the following figure and table to identify the Dynamic Power Saver switch location and function.



Position	Function
1	Dynamic Power Saver disabled (default)
2	Dynamic Power Saver enabled

Position	Function
3	Reserved (off=default)

Powering up the system



WARNING: Be sure that all circuit breakers are locked in the off position before connecting any power components.

Refer to the following procedures to power up your HP BladeSystem installation:

- Powering up the system (HP BladeSystem p-Class 1U Power Enclosure) (on page [59](#))
- Powering up the system (HP BladeSystem p-Class 3U Power Enclosure) (on page [60](#))
- Powering up the system (facility DC) (on page [61](#))

Powering up the system (HP BladeSystem p-Class 1U Power Enclosure)

NOTE: Order the appropriate AC power cord if you are not using the PDU solution to provide power to the equipment.

If you have installed the 1U power enclosure:

1. Be sure all power supplies are seated in the power enclosure.
2. Connect each PDU Power Cord to the power enclosure.
3. Connect each PDU Power Cord to the PDU.
4. Connect the PDU to the facility power connection.
5. Apply power to the facility power connection, if necessary.
6. Be sure that the hot-plug power supply LEDs and power enclosure DC power LEDs are illuminated green. Refer to "LEDs, buttons, and switches (on page [63](#))" or to the documentation included with the HP BladeSystem p-Class 1U Power Enclosure.

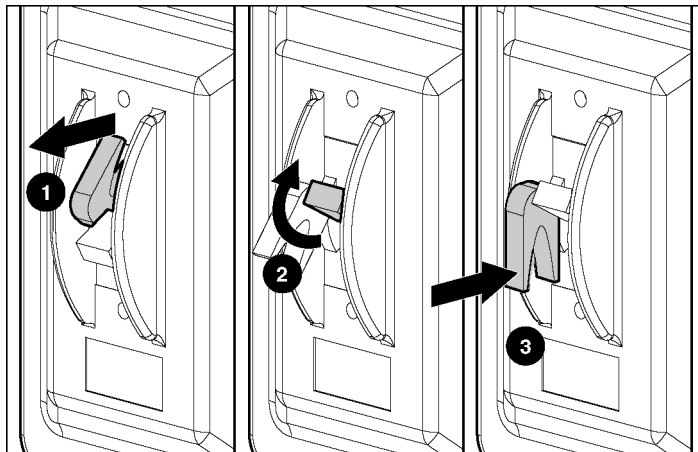
7. Be sure that the server blade enclosure DC power LEDs are illuminated green. Refer to "LEDs, buttons, and switches (on page 63)" or to the documentation included with the HP BladeSystem p-Class Server Blade Enclosure.

Power is now applied to all system hardware.

Powering up the system (HP BladeSystem p-Class 3U Power Enclosure)

If you have installed the HP BladeSystem p-Class 3U Power Enclosure:

1. Be sure all power supplies are seated in the power enclosure.
2. Connect the power cords to the AC power source.
3. Apply power to the facility power connection, if necessary.
4. Unlock the circuit breakers on the power enclosure.



5. Toggle the switches to the on position. This action applies AC power to the hot-plug power supplies.
6. Lock the switch in the on position.

7. Be sure that the hot-plug power supply LEDs, power enclosure DC power LEDs, and bus bar power LEDs are illuminated green. Refer to the "LEDs, buttons, and switches (on page 63)" or to the documentation included with the HP BladeSystem p-Class 3U Power Enclosure.
8. Unlock the circuit breaker switches on the bus bars or power bus boxes and toggle the switches to the on position. This action applies DC power to the server blade enclosures.

IMPORTANT: Only unlock circuit breakers for couplers that are attached to a server blade enclosure.

9. Be sure that the server blade enclosure DC power LEDs are illuminated green. Refer to "LEDs, buttons, and switches (on page 63)" or to the documentation included with the HP BladeSystem p-Class Server Blade Enclosure.

NOTE: Circuit breakers continue to function in the event of an overload condition even if they are locked.

IMPORTANT: Be sure to lock all the circuit breaker switches in the on position. This action prevents anyone from accidentally powering down the system.

Power is now applied to all system hardware.

Powering up the system (facility DC)

If you are using a facility DC power source:

1. Connect the power cables to the DC power source.
2. Apply power to the facility power connection, if necessary.
3. Unlock the circuit breaker switches on the bus bars or power bus boxes and toggle the switches to the on position. This action applies DC power to the server blade enclosures.

IMPORTANT: Be sure to lock all the circuit breaker switches in the on position. This action prevents anyone from accidentally powering down the system.

NOTE: Circuit breakers continue to function in the event of an overload condition even if they are locked.

4. Be sure that the server blade enclosure DC power LEDs are illuminated green. Refer to "LEDs, buttons, and switches (on page 63)" or to the documentation included with the HP BladeSystem p-Class Server Blade Enclosure.

Power is now applied to all system hardware.

Completing the installation

To complete the BladeSystem installation, perform the following tasks:

- Build the management environment.
- Name the server blade enclosures.
- Name the server blade components.
- Update the component firmware.
- Install operating systems on the server blades.
- Deploy application software onto the server blades.
- Establish the SAN environment (optional).

For more information, refer to the *HP Remote Insight Lights-Out Edition User Guide*, the *HP Remote Insight Lights-Out Edition II User Guide*, or the *HP Integrated Lights-Out User Guide* available at the Remote Management website (<http://www.hp.com/servers/lights-out>).

LEDs, buttons, and switches

In this section

LEDs.....	63
Buttons and switches	71

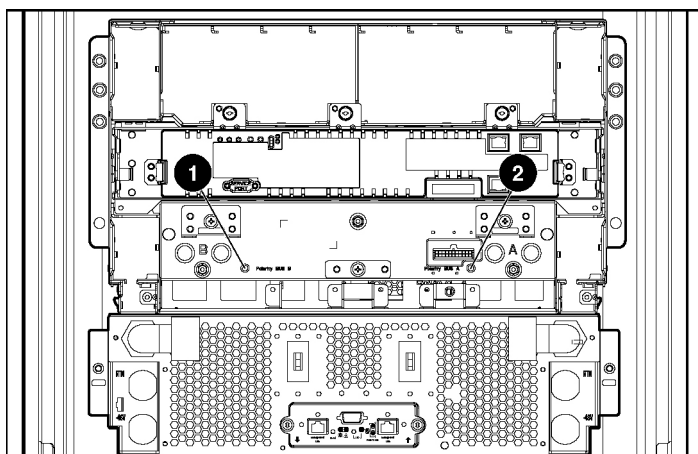
LEDs

The system contains several sets of LEDs that indicate the status and settings of hardware components. Use the following sections to determine the location and functions of LEDs on system components.

For information about LEDs on server blades, interconnect modules, hard drives, and other devices, refer to the documentation supplied with each device.

Server blade enclosure LEDs

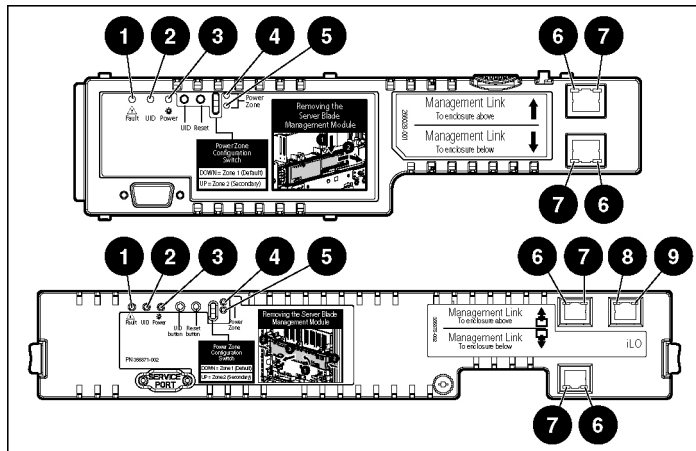
The server blade enclosure has two LEDs that provide the status of DC power input. Use the following figure and table to identify LED locations and functions.



Item	LED Description	Status
1	Bus B power	Off = No power available Green = Power available Red = Polarity reversed
2	Bus A power	Off = No power available Green = Power available Red = Polarity reversed

Server blade management module LEDs

The server blade management module has LEDs for identification, power status, and management activity. Use the following figure and table to identify LED locations and functions.



Item	LED Description	Status
1	Fault status LED	Red = Fault process activity Off = No fault process activity

Item	LED Description	Status
2	Unit identification	Blue = Identified Off = No active remote management
3	Power LED	Off = No power Green = Management module is powered up
4/5	Power configuration	Off/Green = Power zone 1 (default) Green/Green = Power zone 2 (secondary)
6	Management link activity LED	Amber = Activity* Off = No link or activity
7	Management link LED	Green = Network linked* Off = No link
8	iLO activity	Green = Activity Off = No activity
9	iLO Link	Green = Network linked Off = No link

* All management link connector LEDs flash on the server blade management modules and power management modules when management modules are cabled improperly.

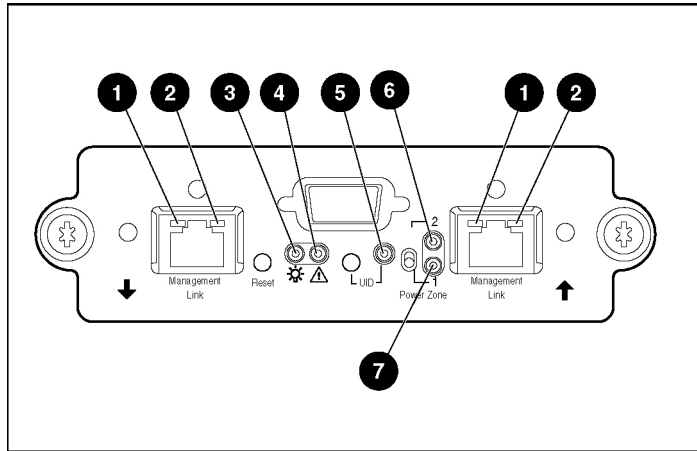
Power management module LEDs

The power management module has LEDs for identification, power status, and management activity.

IMPORTANT: If the power configuration switch is set improperly, all power management module management link connector LEDs flash.

IMPORTANT: If management modules are cabled improperly, all management link connector LEDs flash on all management modules.

Use the following figure and table to identify LED locations and functions.

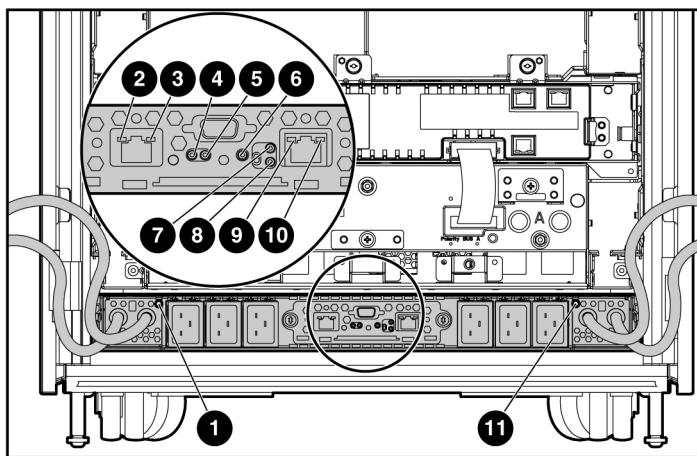


Item	LED Description	Status
1	Management link activity LED	Amber = Network activity* Off = No link or activity
2	Management link LED	Green = Network linked* Off = No link
3	Power	Off = No power Green = Management module is powered up
4	Fault status LED	Red = Fault process activity Off = No fault process activity
5	UID LED	Blue = Identified Off = Not identified
6/7	Power configuration	Off/Green = Power zone 1 (default) Green/Green = Power zone 2 (secondary)

* All management link connector LEDs flash on all management modules when management modules are cabled improperly. Management link connector LEDs flash on the power management module only when power configuration switches are set improperly.

HP BladeSystem p-Class 1U Power Enclosure LEDs

Use the following figure and table to identify LED locations and functions.



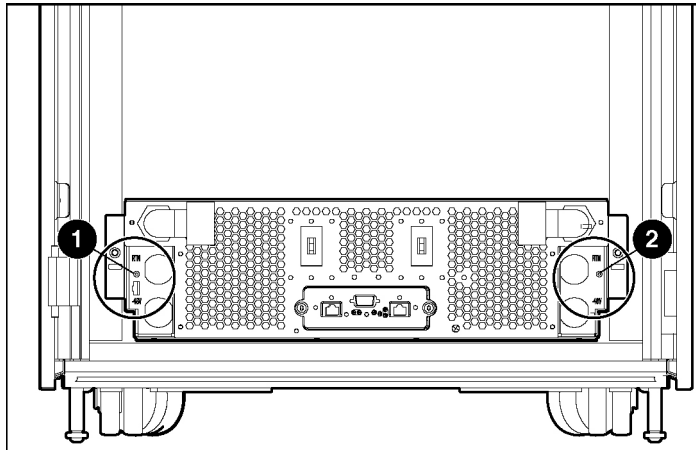
Item	LED Description	Status
1	Bus B DC power LED	Off = No DC power available Green = DC power available
2	Management link activity LED	Amber flashing = Network activity Off = No link or activity
3	Management link LED	Green = Network linked Off = No link
4	Power LED	Off = No power Green = Management module is powered up

Item	LED Description	Status
5	Fault status LED	Red flashing = Fault process activity Off = No fault process activity
6	UID LED	Blue = Identified Off = No active remote management
7, 8	Power zone LEDs	See note ¹
9	Management link activity LED	Amber flashing = Network activity Off = No link or activity
10	Management link LED	Green = Network linked Off = No link
11	Bus A DC power LED	Off = No DC power available Green = DC power available

¹ Power zones are automatically configured based on the location of the enclosures in the rack and the management link connections. Disregard the power zone switch and LEDs on the HP BladeSystem 1U Power Enclosure.

HP BladeSystem p-Class 3U Power Enclosure LEDs

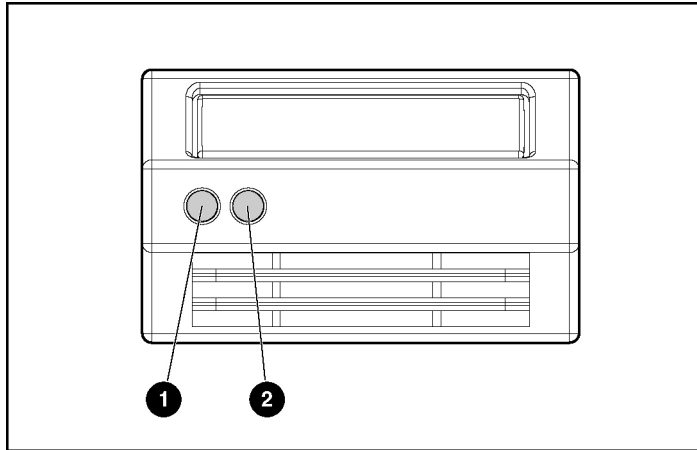
The power enclosure has two LEDs, one for each bus, to indicate DC power presence. Use the following figure and table to identify LED locations and functions.



Item	LED Description	Status
1	Bus B DC power	Off = No DC power available Green = DC power available
2	Bus A DC power	Off = No DC power available Green = DC power available

HP BladeSystem p-Class 1U Power Supply LEDs

The power supply has two LEDs to indicate the power supply status. Use the following figure and table to identify LED locations and functions.



NOTE: The Dynamic Power Saver configures the available power supplies to operate at maximum efficiency.

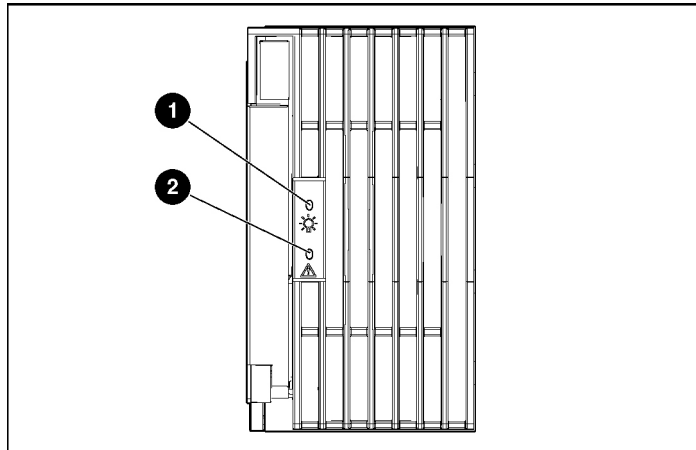
Condition	Power LED (1)	Fault LED (2)
No AC	Off	Off
AC available, power supply in standby mode ¹	Flashing (Green)	Off
Power supply on, delivering power	Green	Off
Power supply fault condition ²	Off	Amber

¹ This condition will occur when the Dynamic Power Saver is enabled.

² To reset the power supply overload warning, remove AC power or hot-unplug and hot-plug the power supply if more than one power supply in the enclosure is delivering power to the server enclosure.

HP BladeSystem p-Class 3U Power Supply LEDs

The power enclosure has two LEDs, one for each bus, to indicate DC power presence. Use the following figure and table to identify LED locations and functions.



Item	LED Description	Status
1	Bus B DC power	Off = No DC power available Green = DC power available
2	Bus A DC power	Off = No DC power available Green = DC power available

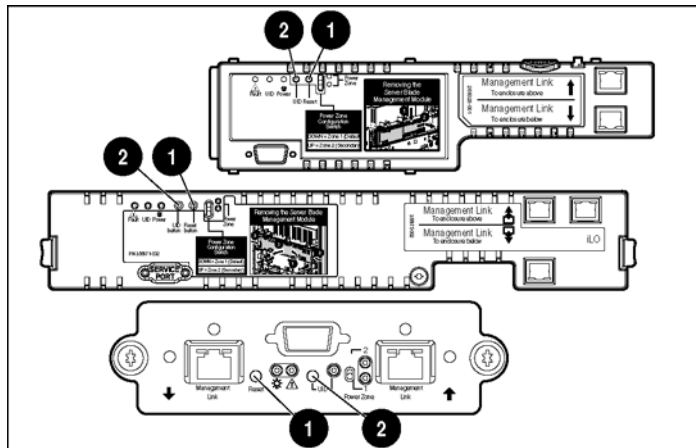
Buttons and switches

The system contains switches that reset the systems, identify components of the systems, and establish the power zone settings. Use the following sections to determine the location and functions of these switches on system components.

For information about switches on server blades, interconnect modules, hard drives, and other devices, refer to the documentation supplied with each device.

Reset and UID buttons

Each management module contains a reset button and UID button. Use the following figure and table to identify button locations and functions.



Item	Description	Function
1	Reset button	Reinitializes management functions
2	UID button	Toggles UID LED between on and off

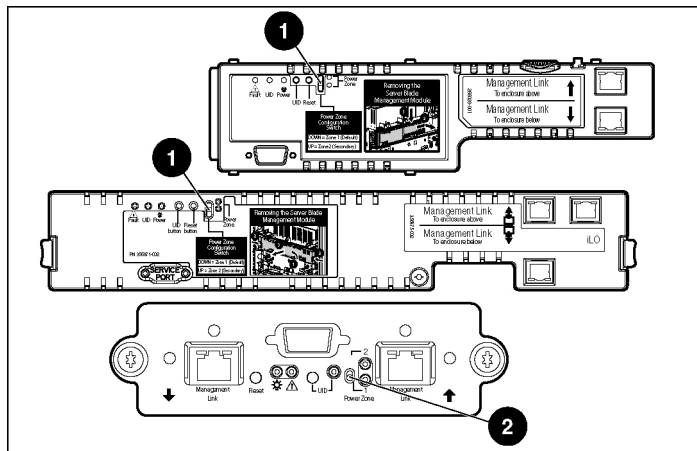
Power configuration switches

IMPORTANT: In installations configured with the HP BladeSystem 1U Power Enclosures and Power Supplies, the power zones are calculated dynamically using the topology information from all the connected enclosures. Disregard the power zone switch and LEDs on the HP BladeSystem 1U Power Enclosure.

The server blade management modules and power management modules have a two-position switch that identifies the use of single or multiple power zones in the rack environment. In installations configured with HP BladeSystem p-Class 3U Power Supply Enclosures, you must set these switches at the time of installation for the system to recognize multiple power zones and rack topology properly.

The zone 1 switch setting is the default position. It is used for scalable bus bar, single mini bus bar, and power bus box solutions. The zone 2 switch setting is only used for a secondary power zone when you configure a full-rack 42U solution with two pairs of mini bus bars.

Use the following figure and table to identify switch locations and functions.



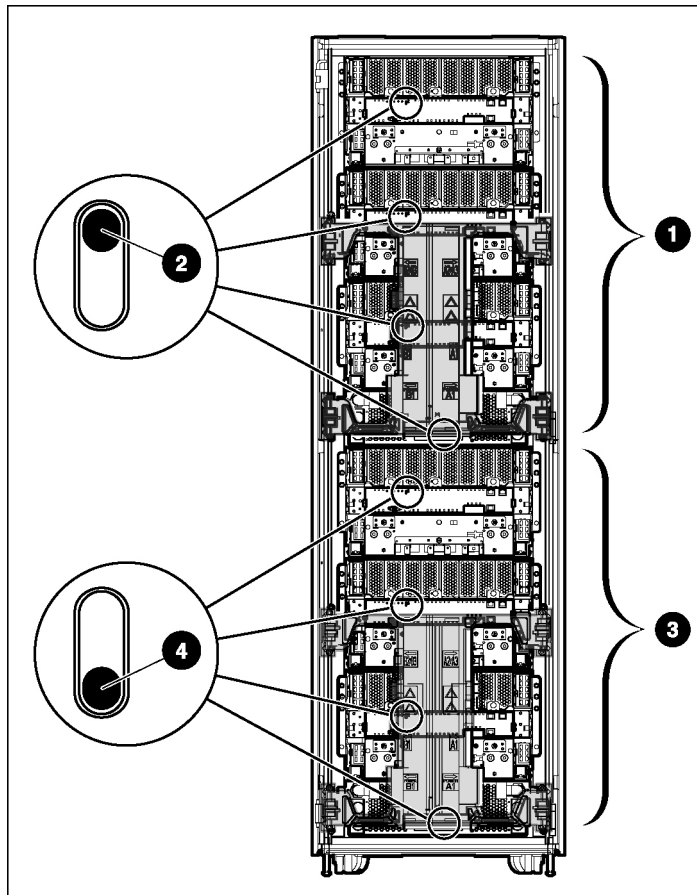
Item	Description	Function
1	Reset switch	Reinitializes management functions
2	UID switch	Toggles UID LED between on and off

After the initial power-up, use the LEDs to verify correct switch settings. Refer to the "Server blade management module LEDs (on page 64)" and "Power management module LEDs (on page 65)" sections in this guide.

IMPORTANT: All power configuration switches in the same zone must be set to the same position. The system issues alerts and the management link connector LEDs on the power management modules flash when these switches are set improperly.

To set the switches for multiple power zones, use the following example and figure.

Example: A full-rack 42U solution with two pairs of mini bus bars requires two power zones. To distinguish the two power zones, set all the power configuration switches on management modules in the upper zone (zone 2) to the up position; the power configuration switches on the management modules in the lower zone (zone 1) remain in the down (default) position.



Item	
1	Power zone 2
2	Zone 2 switches in the up (secondary) position
3	Power zone 1
4	Zone 1 switches in the down (default) position

Troubleshooting

In this section

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Troubleshooting resources

NOTE: For common troubleshooting procedures, the term "server" is used to mean servers and server blades.

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

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

- The server-specific Documentation CD
- The Business Support Center on the HP website (<http://www.hp.com/support>). You can find the guide by using the navigation features on the HP website.
- The Technical Documentation website (<http://www.docs.hp.com>). Select **Enterprise Servers, Workstations and Systems Hardware**, and then the appropriate server.

Important safety information

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



Important safety information

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

Symbols on equipment

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



This symbol indicates the presence of hazardous energy circuits or electric shock hazards. Refer all servicing to qualified personnel.

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



This symbol indicates the presence of electric shock hazards. The area contains no user or field serviceable parts. Do not open for any reason.

WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure.



This symbol on an RJ-45 receptacle indicates a network interface connection.

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



This symbol indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.



21.55 - 36.33 kg

47.5 - 80.1 lbs.

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

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



These symbols, on power supplies or systems, indicate that the equipment is supplied by multiple sources of power.

WARNING: To reduce the risk of injury from electric shock, remove all power cords to completely disconnect power from the system.

Warnings and cautions



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



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

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



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

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Unplug the power cord from the power supply to disconnect power to the equipment.
- Do not route the power cord where it can be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord extends from the server.



21.55 - 36.33 kg

47.5 - 80.1 lbs.

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

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



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



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

Regulatory compliance notices

In this section

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Regulatory compliance identification numbers

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

Federal Communications Commission notice

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

FCC rating label

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

Class A equipment

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

Class B equipment

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

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

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

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

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

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

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

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

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

Modifications

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

Cables

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

Canadian notice (Avis Canadien)

Class A equipment

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

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

Class B equipment

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

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

European Union regulatory notice

This product complies with the following EU Directives:

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

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

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



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



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

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

Japanese notice

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

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

VCCIマークが付いていない場合には、次の点にご注意下さい。

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

Power cord statement for Japan

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

BSMI notice

警告使用者:

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

Korean notice A&B

Class A equipment

A급 기기 (업무용 정보통신기기)

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

Class B equipment

B급 기기 (가정용 정보통신기기)

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

Laser compliance

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



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

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

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

Battery replacement notice



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

- **Do not attempt to recharge the battery.**
- **Do not expose the battery to temperatures higher than 60°C (140°F).**
- **Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.**



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

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

Taiwan battery recycling notice

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



Electrostatic discharge

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Preventing electrostatic discharge

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

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

Grounding methods to prevent electrostatic discharge

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

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

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

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

Technical support

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Before you contact HP

Be sure to have the following information available before you call HP:

- Technical support registration number (if applicable)
- Product serial number
- Product model name and number
- Applicable error messages
- Add-on boards or hardware
- Third-party hardware or software
- Operating system type and revision level

HP contact information

For the name of the nearest HP authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- In other locations, refer to the HP website (<http://www.hp.com>).

For HP technical support:

- In North America:

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

Acronyms and abbreviations

ACU

Array Configuration Utility

BBWC

battery-backed write cache

BIOS

Basic Input/Output System

BOOTP

Bootstrap Protocol

TCP/IP

Transmission Control Protocol/Internet Protocol

ConRep

Configuration Replication utility

CPU

central processing unit

DHCP

Dynamic Host Configuration Protocol

DIMM

dual inline memory module

DMA

direct memory access

ECC

error checking and correcting

EEPROM

electrical erasable programmable read only memory

ESD

electrostatic discharge

EULA

end user license agreement

FC

Fibre Channel

GBIC

Gigabit Interface Converter

HBA

host bus adapter

IEC

International Electrotechnical Commission

iLO

Integrated Lights-Out

ISEE

Instant Support Enterprise Edition

LAN

local-area network

LED

light-emitting diode

LUN

logical unit number

MTBF

mean time between failures

NEC

National Electrical Code

NEMA

National Electrical Manufacturers Association

NIC

network interface controller

NMI

non-maskable interrupt

NVRAM

non-volatile memory

OEM

original equipment manufacturer

ORCA

Option ROM Configuration for Arrays

PDU

power distribution unit

POST

Power-On Self Test

PXEBOOT

Preboot eXecution Environment Enable/Disable utility

RAID

redundant array of inexpensive (or independent) disks

RBSU

ROM-Based Setup Utility

RDP

Remote Desktop Protocol

RIB

Remote Insight Board

RILOE

Remote Insight Lights-Out Edition

RILOE II

Remote Insight Lights-Out Edition II

RMA

return material authorization

SAN

Storage Area Network

SCSI

small computer system interface

SDRAM

synchronous dynamic RAM

TCP/IP

Transmission Control Protocol/Internet Protocol

TMRA

recommended ambient operating temperature

UID

unit identification

UPS

uninterruptible power system

USB

universal serial bus

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