HP ProLiant BladeSystem p-Class System

Maintenance and Service Guide

Part number: 230856-008

Eighth edition: June 2006

Legal notices

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Table 1 Revisions

Date	Edition	Revision
June 2006	8	Updated Technical Support section with correct contact information Added ROHS-compliant part numbers Added CGESM switch information

About This Guide

This maintenance and service guide can be used for reference when servicing HP BladeSystem p-Class systems.

WARNING! To reduce the risk of personal injury from electric shock and hazardous energy levels, only authorized service technicians should attempt to repair this equipment. Improper repairs can create conditions that are hazardous.

Technician Notes

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 from electric shock and hazardous energy levels, do not exceed the level of repairs specified in these procedures. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create conditions that are hazardous.

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

- Disconnect power from the system by unplugging all power cords from the power supplies.
- 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.

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

NOTE: Any indications of component replacement or printed wiring board modifications may void any warranty.

Where to Go for Additional Help

In addition to this guide, the following information sources are available on the documentation CD or on the Web at http://www.hp.com.

- HP ProLiant BL System Best Practices Guide
- HP ProLiant BL System Common Procedures Guide
- HP ProLiant BL p-Class System Setup and Installation Guide
- HP HP BladeSystem p-Class System Hardware Installation and Configuration Poster
- HP ProLiant Servers Troubleshooting Guide
- Altiris eXpress Deployment Server for ProLiant Servers User Guide
- HP Integrated Lights-Out User Guide
- ROM-Based Setup Utility User Guide
- White paper: HP HP BladeSystem p-Class System Overview and Planning

- White paper: Configuring a Preboot eXecution Environment (PXE) using Red Hat Linux 7.2 on HP ProLiant Servers
- QuickSpecs
- Service Quick Reference Guide
- Service training guides
- HP service advisories and bulletins
- QuickFind information services
- HP Systems Insight Manager (HP SIM) software

For additional information or copies of these documents, visit the HP website (http://www.hp.com).

Integrated Management Log

The server includes an integrated, nonvolatile management log that contains fault and management information. The contents of the Integrated Management Log (IML) can be viewed with HP SIM.

Technical Support

For the name of the nearest HP authorized reseller:

- In the United States, see the HP US service locator webpage (http://www.hp.com/service_locator)
- In other locations, see the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/US/en/wwcontact.html)

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/).
  - In other locations, see the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/US/en/wwcontact.html)

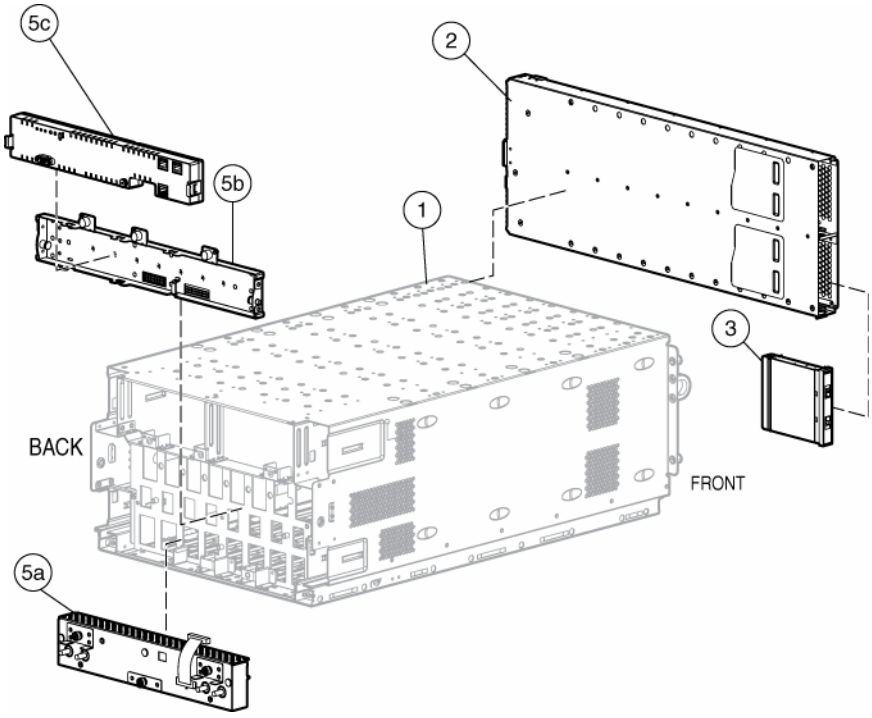
1 Illustrated Parts Catalog

This chapter provides illustrated parts and spare parts lists for the HP BladeSystem p-Class system components. Refer to Table 1-1 through Table 1-6 for the names of referenced spare parts.

HP BladeSystem p-Class Server Blade Enclosure Components

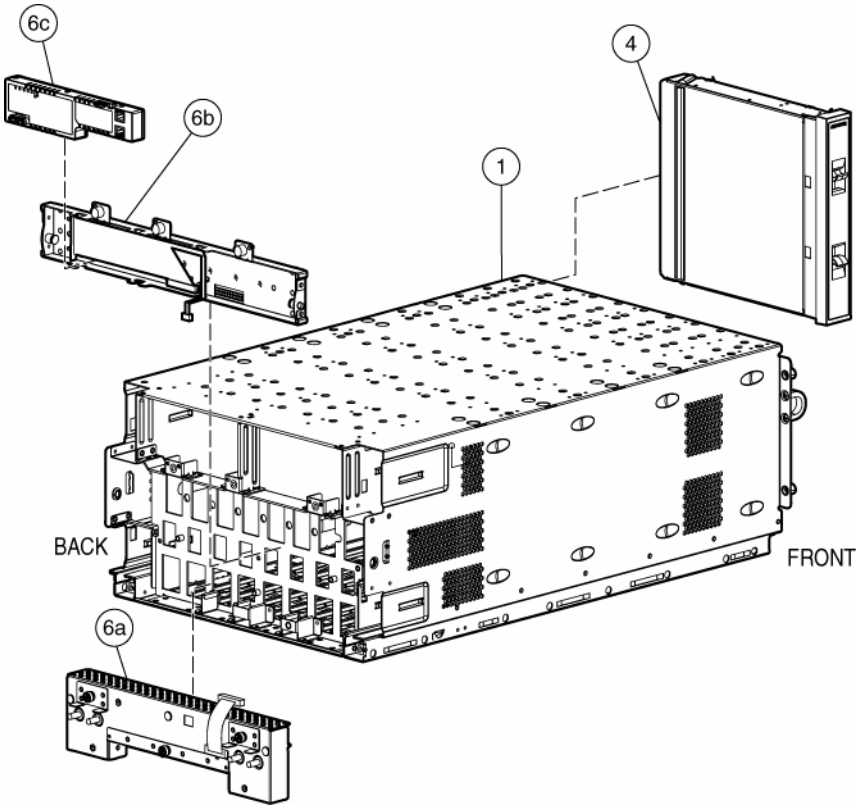
Server Blade Enclosure Components with Enhanced Backplane Components — Exploded View

Figure 1-1 Server blade enclosure components with enhanced backplane components – exploded view



Server Blade Enclosure Components — Exploded View

Figure 1-2 Server blade enclosure components – exploded view



Server Blade Enclosure Spare Parts List

Table 1-1 Server Blade Enclosure Spare Parts List

Item	Description	Original Spare Part Number	Modified Spare Part Number
	Mechanical Components		
1	Server blade enclosure	—	—
2	ProLiant BL30p blade sleeve 1	—	—
	Blade sleeve access panel *	361881-001	—
3	Server blade blank (half-height)	Part of kit 361750-001	—
4	Server blade blank (full-height)	270462-001	—
	Enhanced Backplane Components [1]		
5a	Power backplane assembly	357905-001‡ See requirement	416511-001
5b	Signal backplane	357906-001‡ See requirement	416512-001
5c	Server blade management module	357904-001‡ See requirement	416510-001
	Backplane Components [2]		
6a	Power backplane assembly	253234-001	—
6b	Signal backplane	253233-001	—
6c	Server blade management module	253237-001	—
	Miscellaneous		
7	Server blade management module cable *	Part of kit 270465-001	—
8	Diagnostic cable *	Part of kit 270465-001	—
9	Local I/O cable *	355935-001	—
10	Rack mounting hardware kit *	270463-001	—
11	Telco rack startup kit *	Part of kit 270464-001	—
12	Telco rack expansion kit *	Part of kit 270464-001	—
[1]Required for HP ProLiant BL30p series server blades			
[2]Not compatible with HP ProLiant BL30p series server blades			
*Not shown			

‡**REQUIREMENT:**

For Customers in the EU only.

The use of the Original Spare part is regulated by RoHS legislation§.

If your unit contains a part that is labelled with the Modified Spare number, the Modified Spare must be ordered as the replacement part in the EU.

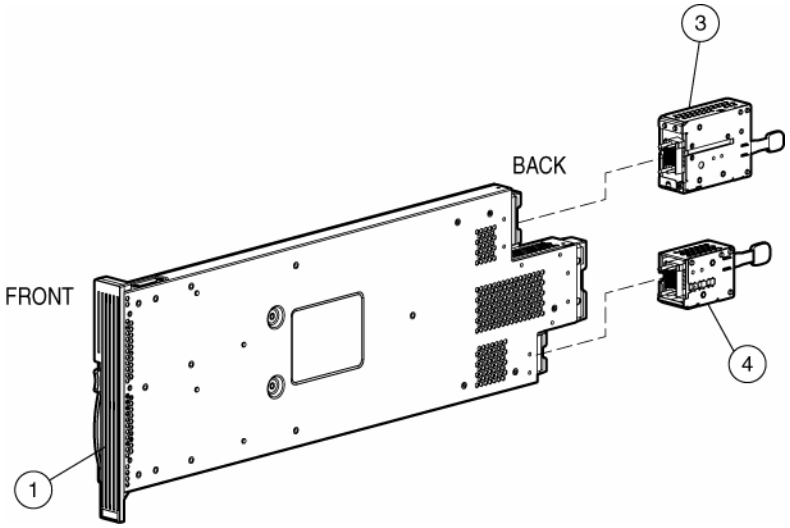
If your unit contains a part that is labelled with the Original Spare number, please order the Original Spare as the replacement part in the EU. In this case either the Original Spare or the Modified Spare may be shipped which will not affect performance or functionality of the unit.

§*Directive 2002/95/EC restricts the use of lead, mercury, cadmium, hexavalent chromium, PBBs and PBDEs in electronic products.*

HP BladeSystem p-Class Interconnect Components

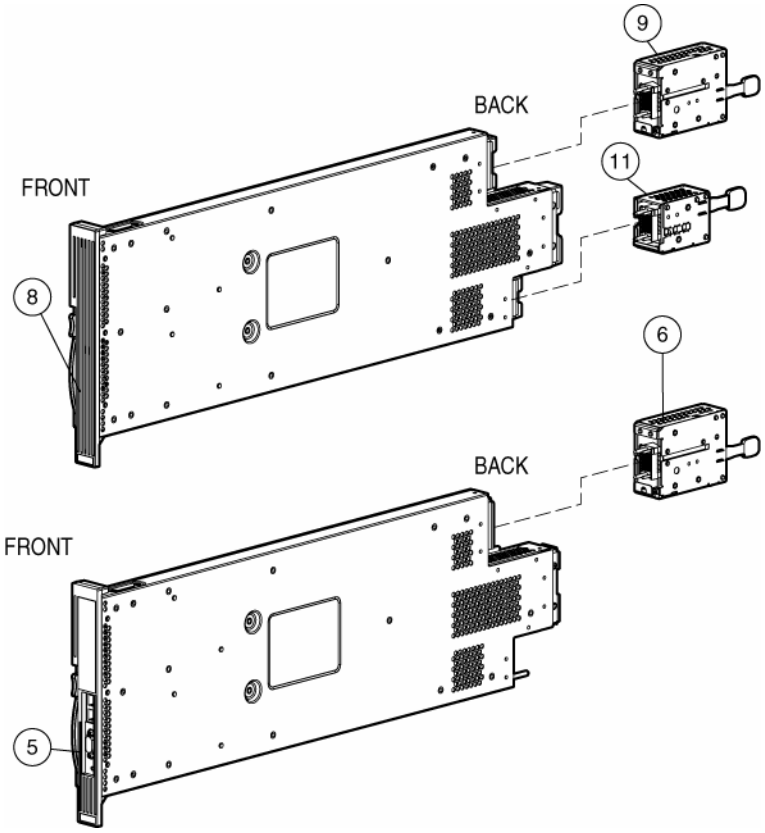
RJ-45 Patch Panel — Exploded View

Figure 1-3 RJ-45 patch panel — exploded view



GbE Interconnect Switch and GbE2 Interconnect Switch — Exploded View

Figure 1-4 GbE Interconnect Switch and GbE2 Interconnect Switch — exploded view



HP BladeSystem p-Class Interconnect Spare Parts List

Table 1-2 HP BladeSystem p-Class Interconnect Spare Parts List

Item	Description	Original Spare Part Number	Modified Spare Part Number
	ProLiant BL p-Class RJ-45 Patch Panels		
1	RJ-45 patch panel	253236-001	—
2	RJ-45 patch panel 2, with Fibre Channel Support *	322299-001	—
3	Patch panel RJ-45 module, 10-connector	253240-001	—
4	Patch panel RJ-45 module, 6-connector	253241-001	—
	ProLiant BL p-Class GbE Interconnect Switch		
5	GbE Interconnect Switch	261502-001	—
6	QuadT interconnect module, 4-connector	261501-001	—
7	DualTSX interconnect module, 4-connector *	282171-001	—
	ProLiant BL p-Class GbE2 Interconnect Switch		
8	GbE2 Interconnect Switch	321148-001‡ See requirement	405127-001
9	OctalFC interconnect module	321145-001	—
10	Fibre Channel signal-conditioning card, 4-connector (optional) *		—
11	QuadSX interconnect module, 4-connector (fiber-based networks)	321146-001‡ See requirement	405288-001
12	QuadT2 interconnect module, 4-connector (copper-based networks) *	321147-001‡ See requirement	4052889-001
	ProLiant BL p-Class CGESM Interconnect Switch		
13	Ethernet Interconnect Switch*	368285-001	—
14	SFP interconnect module (fiber-based networks)*	379064-001	—
15	SFP interconnect module (copper-based networks)*	379065-001	—
	Miscellaneous		
16	Plastics hardware kit (includes Fibre Channel cable removal tool) *	311767-001	—

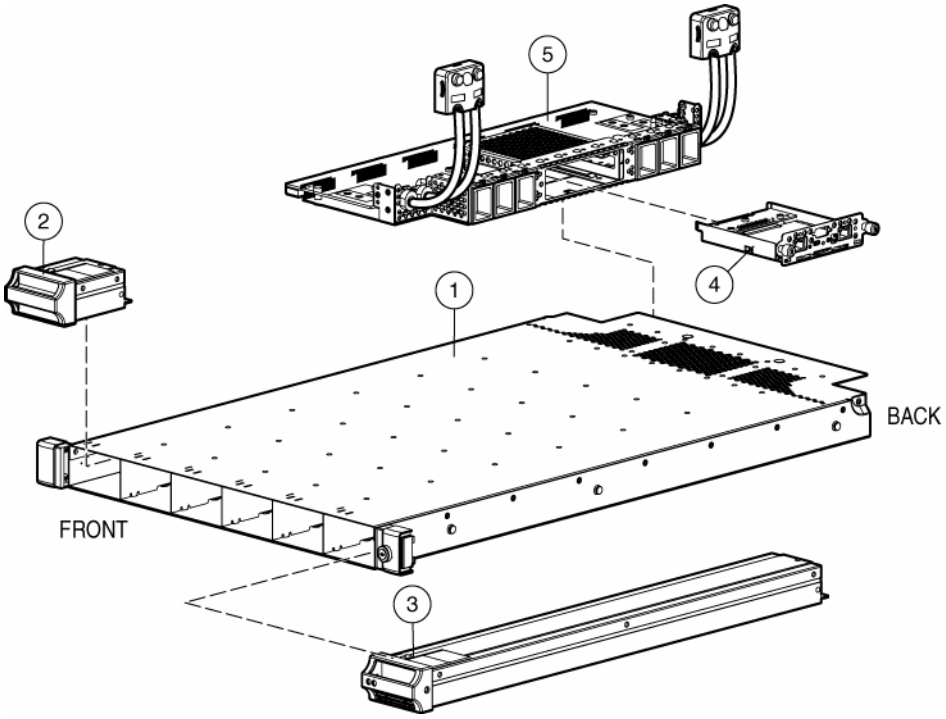
* Not shown

‡REQUIREMENT:
For Customers in the EU only.
The use of the Original Spare part is regulated by RoHS legislation§.
If your unit contains a part that is labelled with the Modified Spare number, the Modified Spare must be ordered as the replacement part in the EU.
If your unit contains a part that is labelled with the Original Spare number, please order the Original Spare as the replacement part in the EU. In this case either the Original Spare or the Modified Spare may be shipped which will not affect performance or functionality of the unit.
§Directive 2002/95/EC restricts the use of lead, mercury, cadmium, hexavalent chromium, PBBs and PBDEs in electronic products.

Power Enclosure Components

HP BladeSystem p-Class 1U Power Enclosure — Exploded View

Figure 1-5 HP BladeSystem p-Class 1U power enclosure — exploded view



HP BladeSystem p-Class 1U Power Enclosure Spare Parts List

Table 1-3 HP BladeSystem p-Class 1U Power Enclosure Spare Parts List

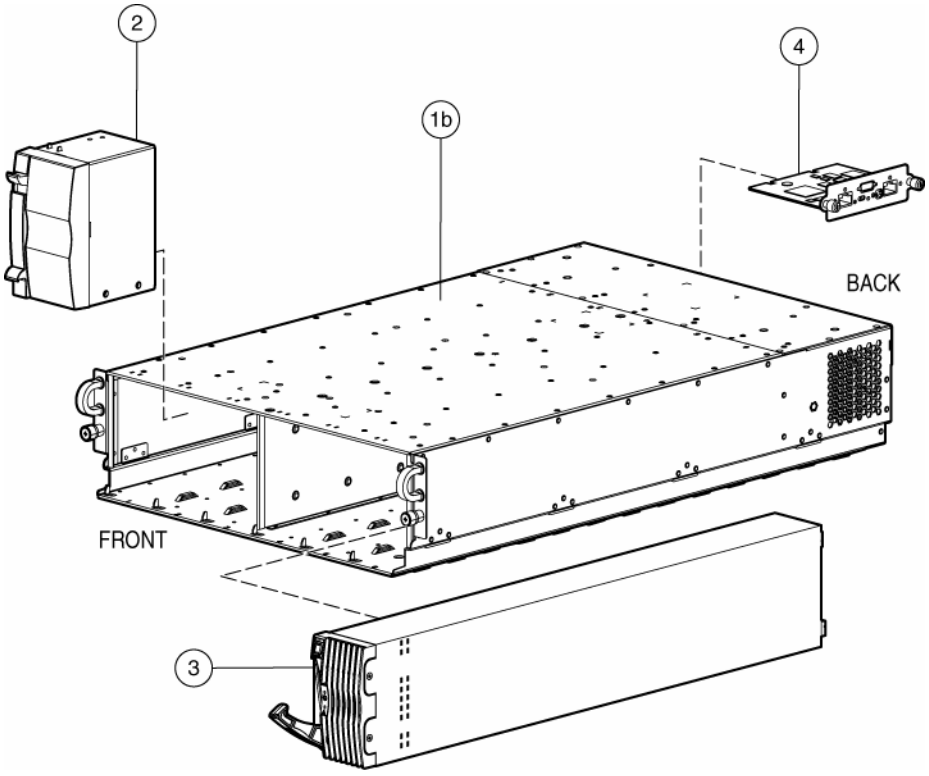
Item	Description	Original Spare Part Number	Modified Spare Part Number
1	Power enclosure chassis (shown for reference only)	—	—
2	Plastics kit, miscellaneous:* Blank, power supply Thumbscrew covers*	384782-001‡ See requirement	409741-001
3	Power supply, 2000W, 1U	384779-001	—
4	Module, power management	384781-001‡ See requirement	409744-001
5	Board, backplane, 1U power enclosure	384780-001	—
	Miscellaneous		
6	Rack mounting hardware kit *	360104-001	—
7	Management cable*	270465-001	—
8	PDU jumper cable*	393854-001‡ See requirement	409746-001

* Not shown

‡**REQUIREMENT:**
For Customers in the EU only.
The use of the Original Spare part is regulated by RoHS legislation§.
If your unit contains a part that is labelled with the Modified Spare number, the Modified Spare must be ordered as the replacement part in the EU.
If your unit contains a part that is labelled with the Original Spare number, please order the Original Spare as the replacement part in the EU. In this case either the Original Spare or the Modified Spare may be shipped which will not affect performance or functionality of the unit.
§*Directive 2002/95/EC restricts the use of lead, mercury, cadmium, hexavalent chromium, PBBs and PBDEs in electronic products.*

HP BladeSystem p-Class 3U Power Enclosure — Exploded View

Figure 1-6 HP BladeSystem p-Class 3U power enclosure — exploded view (cables removed for clarity)



HP BladeSystem p-Class 3U Power Enclosure Spare Parts List

Table 1-4 HP BladeSystem p-Class 3U Power Enclosure Spare Parts List

Item	Description	Original Spare Part Number	Modified Spare Part Number
1	Power enclosure, chassis with backplane and power cords	—	—
	a) North American/Japanese single-phase	274840-001	—
	b) North American/Japanese three-phase*	274841-001	—
	c) International single-phase *	274842-001	—
	d) International three-phase *	274843-001	—
2	Power supply blank	274844-001	—
3	Hot-plug power supply	253232-001	—
4	Power management module	253238-001	—
	Miscellaneous		
5	Cables *	Part of kit 270465-001	—
	a) Power management module cable	—	—
	b) Load-balancing signal cable, external	—	—
6	Rack mounting hardware kit *	270463-001	—
7	Telco rack startup kit *	Part of kit 270464-001	—
8	Telco rack expansion kit *	Part of kit 270464-001	—

* Not shown

Power Distribution Components

Power Bus Bar Components — Exploded View

Figure 1-7 Power bus bar components — exploded view (bus bar cables and couplers removed for clarity)

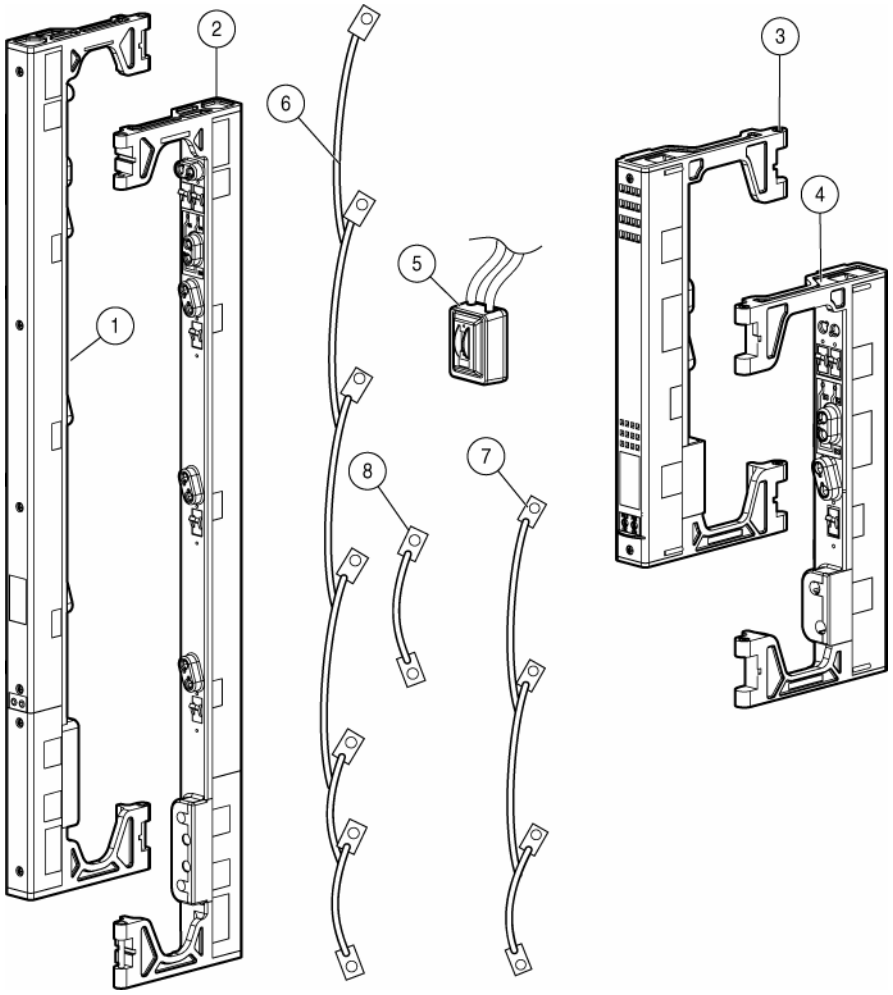
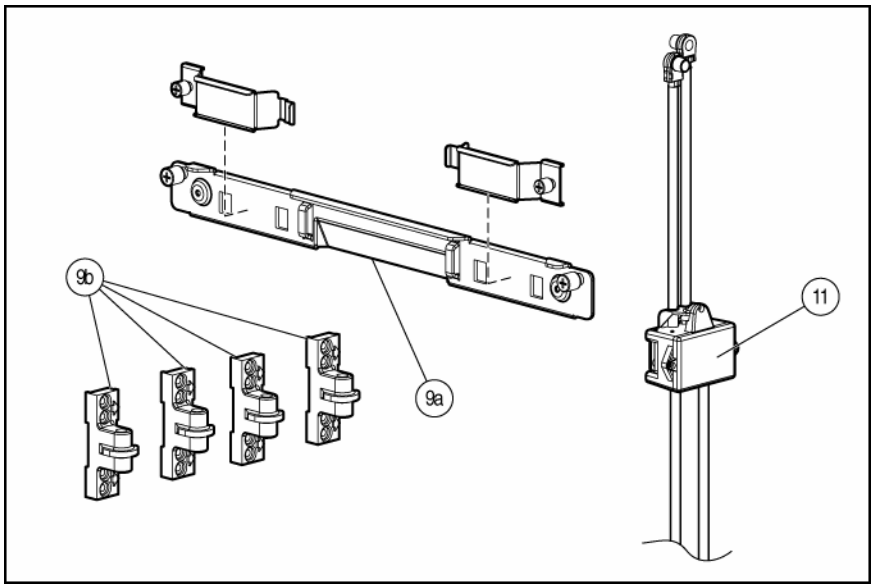


Figure 1-8 Power distribution components — exploded view



Power Distribution Components Spare Parts List

Table 1-5 Power Distribution Components Spare Parts List

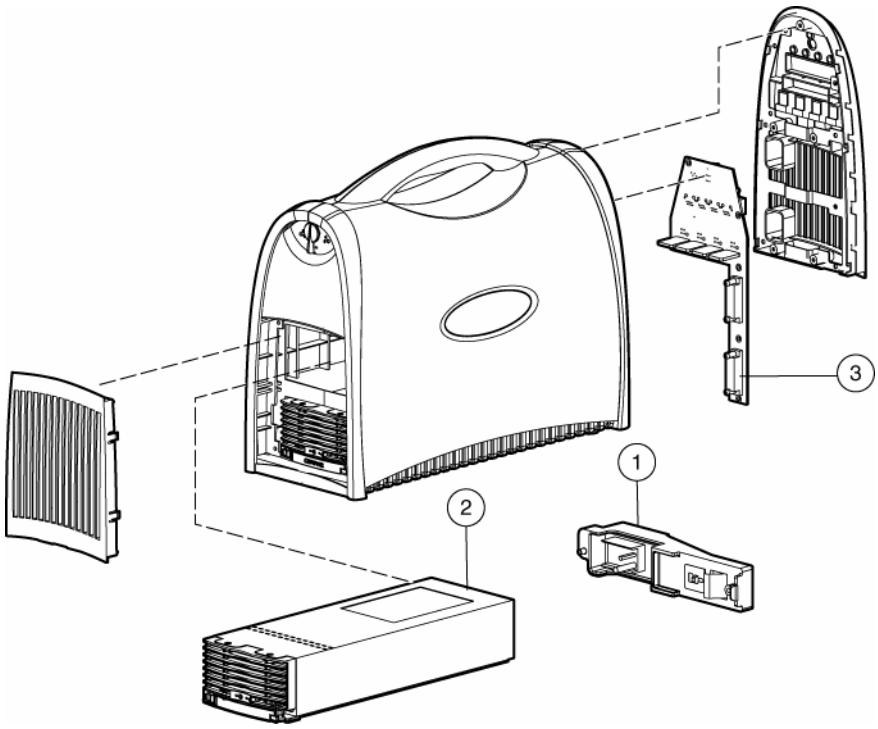
Item	Description	Original Spare Part Number	Modified Spare Part Number
	System Components		
1	Scalable bus bar A	270460-001	—
2	Scalable bus bar B	270459-001	—
3	Mini bus bar A	—	—
4	Mini bus bar B	270457-001	—
5	Power bus box (with A and B labels)	270461-001	—
	Facility DC Power		
6	Scalable bus bar grounding cable	Part of kit 270465-001	—
7	Mini bus bar grounding cable	Part of kit 270465-001	—
8	Power bus box grounding cable	Part of kit 270465-001	—
	Miscellaneous		
9	Miscellaneous hardware	287480-001	—
	a) Cable bracket	—	—
	b) Hinge	—	—
	c) Hinge bolt *	—	—
	d) Hinge nut *	—	—
	e) Cage nuts *	—	—
	f) Bus bar locking latches *	—	—
10	Null-modem cable *	Part of kit 270465-001	—
11	Mini Bus Bar Dual Power Box	Part of kit 366506-001	—
12	HP BladeSystem p-Class Power Extension Kit	392206-001	—
	Power cable, red*	—	—
	Power cable, black*	—	—
	Power junction box*	—	—
	Hardware kit*	—	—

* Not shown

Diagnostic Station Components

Diagnostic Station — Exploded View

Figure 1-9 Diagnostic station — exploded view



Diagnostic Station Spare Parts List

Table 1-6 Diagnostic Station Spare Parts List

Item	Description	Original Spare Part Number	Modified Spare Part Number
1	VHDM converter	257875-001	—
2	Power supply	164460-001	—
3	System board	257874-001	—
	Miscellaneous		
4	Cable kit *	257873-001	—
	AC power cord	—	—
	DC power cord for server blade	—	—
	DC power cord for interconnect switch	—	—
	Data transfer cable	—	—
	Network cable with RJ-45 connectors	—	—
	Diagnostic cable	—	—
5	Plastics kit *	257871-001	—
6	Return kit *	259492-001	—

* Not shown

2 Removal and Replacement Procedures

This chapter provides subassembly/module-level removal and replacement procedures for system components. After completing all necessary removal and replacement procedures, verify that all components operate properly by running the appropriate diagnostic software:

- For server blade components, run the Server Diagnostics utility, available from the HP website (http://www.hp.com).
- For server blade enclosure and power enclosure components, run the infrastructure diagnostics. Refer to Chapter 3, "Diagnostic Tools" for more information.

Safety Considerations

Electrostatic Discharge Information

- A discharge of static electricity can damage static-sensitive devices or microcircuitry. Proper packaging and grounding techniques are necessary precautions to prevent damage. To prevent electrostatic damage, observe the following precautions:
- Transport products in static-safe containers such as conductive tubes, bags, or boxes.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free stations.
- Cover workstations with approved static-dissipating material. Use a wrist strap connected to the work surface and properly grounded tools and equipment.
- Keep the work area free of nonconductive materials such as ordinary plastic assembly aids and foam packing.
- Always be properly grounded when touching a static-sensitive component or assembly.
- Use conductive field service tools.

Server Blade Warnings and Cautions

⚠ **WARNING!** To reduce the risk of shock or injury from high-current electrical energy, do not remove the server blade access panel while the server blade is installed in the server blade enclosure. Do not remove the server blade access panel and then install the server blade into the server blade enclosure.

⚠ **WARNING!** Setting the server blade Power On/Standby button to the standby position removes power from most areas of the server blade. This process may take 30 seconds, during which time some internal circuitry remains active. To remove power completely, remove the server blade from the server blade enclosure.

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

⚠ **CAUTION:** When performing non-hot-plug operations, you must power down the server blade and/or the system. However, it may be necessary to leave the server blade powered up when performing other operations, such as hot-plug installations or troubleshooting.

Rack Warnings and Cautions

⚠ **WARNING!** The power supply 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!** Always use at least two people to lift a power supply enclosure or server blade 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!** To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks of the rack are extended to the floor.
- The full weight of the rack rests on the leveling jacks.
- The stabilizers are attached to the rack if it is a single rack installation.
- The racks are coupled in multiple rack installations.

⚠ **WARNING!** When installing the server blade enclosure in a telco rack, be sure that the rack frame is adequately secured to the building structure.

⚠ **WARNING!** To reduce the risk of personal injury or damage to the equipment, at least two people are needed to safely unload the rack from the pallet. An empty 42U rack weighs 115 kg (253 lb), is over 2.1 m (7 ft) tall, and may become unstable when being moved on its casters. Do not only stand in front of the rack as it rolls down the ramp from the pallet, but also handle the rack from both sides.

⚠ **WARNING!** To reduce the risk of shock or injury from high-current electrical energy, do not reach into a server blade enclosure once it has been installed in a rack and connected to a working rack bus bar. Do not touch the power or data backplanes within the server blade enclosure once it has been installed.

⚠ **WARNING!** To reduce the risk of shock or injury from high-current electrical energy, do not reach into a power supply enclosure once it has been installed in a rack and connected to a power source. Do not touch the connectors within the power supply enclosure once it has been installed.

⚠ **WARNING!** To reduce the risk of shock or injury from high-current electrical energy, do not open any access covers on the rack bus bar after it has been connected to a power source.

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

⚠ **CAUTION:** Always ensure that equipment is properly grounded before beginning any installation procedure. Electrostatic discharge resulting from improper grounding can damage electronic components. For more information, refer to the setup and installation guide.

Power Components Warnings and Cautions

⚠ **WARNING!** A licensed electrician or trained service personnel familiar with high-power circuitry must install this equipment.

⚠ **WARNING!** Be sure power to all components is off. Be sure that the power enclosure and hot-plug power supply LEDs are not illuminated.

⚠ **WARNING!** Be sure that power is not applied to the Mini Bus Bar Dual Power Box power cables before connecting to or disconnecting from the power supply. Disconnect all AC power cords from the power source.

⚠ **WARNING!** Be sure that all power enclosure circuit breakers are locked in the off position before connecting or disconnecting any power components.

Symbols on Equipment

Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

25 kg
55 lb

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

Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component.

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

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

WARNING! Any surface or area of the equipment marked with these symbols indicates the presence of electric shock hazards. The enclosed area contains no operator serviceable parts.

Any RJ-45 receptacle marked with these symbols 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.

Server Blade Enclosure Components

Use the procedures in this section to service HP BladeSystem p-Class server blade enclosures.

Server Blade Enclosure Preparation

To service the server blade enclosure or any of its non-hot-plug components, you must power down the enclosure.

To verify server blade component failures, run the infrastructure diagnostics. Refer to Chapter 3, "Diagnostic Tools," for more information.

△ **CAUTION:** Electrostatic discharge can damage electronic components. Be sure you are properly grounded before beginning any installation procedure. For more information, refer to the "Electrostatic Discharge Information" section in this chapter.

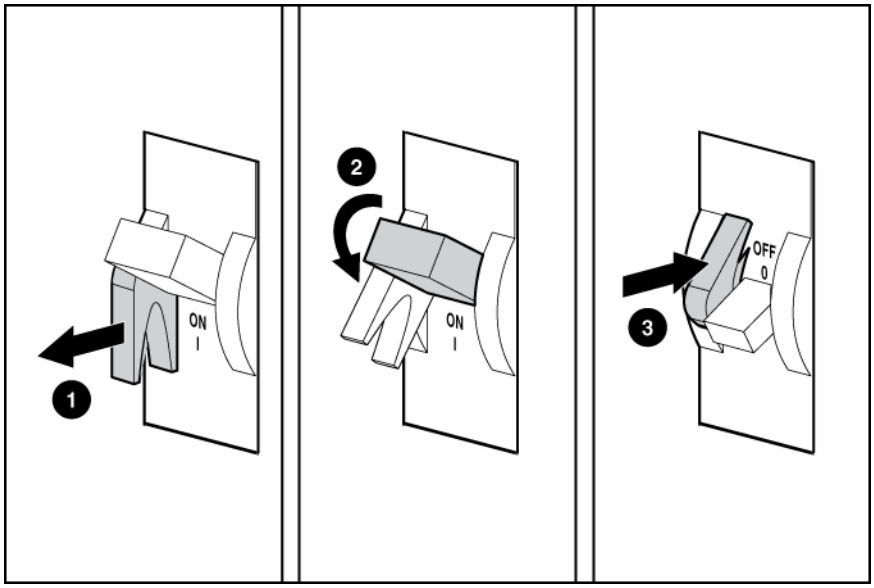
To power down the server blade enclosure:

1. Power down the server blades in the enclosure. Refer to the documentation shipped with the server blades.
2. Identify the proper server blade enclosure from the back of the rack.
3. If the server blade enclosure is powered from a 1U power enclosure, remove AC input power from the 1U power enclosure and disconnect it from the PDU:

a. Remove power from the facility power connection.
b. Disconnect the PDU jumper cords from the power enclosure.

4. If the server blade enclosure is powered from a 3U power enclosure, remove power from the bus bar or power bus box couplers (both A and B) connected to the server blade enclosure:
   a. Unlock the circuit breakers switches (1).
   b. Set the switches to the off position (2).
   c. Lock the switches in the off position (3).

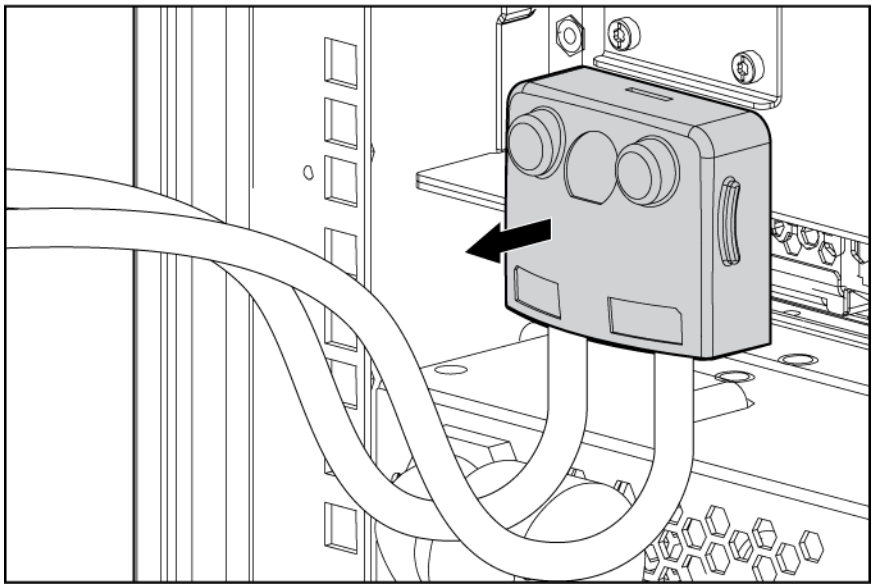
Figure 2-1 Setting the circuit breaker switch to the off position



⚠ **WARNING!** Always remove input power from the bus bars (both A and B) or the power bus boxes (both A and B) before disconnecting the couplers.

5. Disconnect both of the bus bar or the power bus box couplers (A and B) from the server blade enclosure rear panel.

Figure 2-2 Disconnecting a bus bar or power bus box coupler

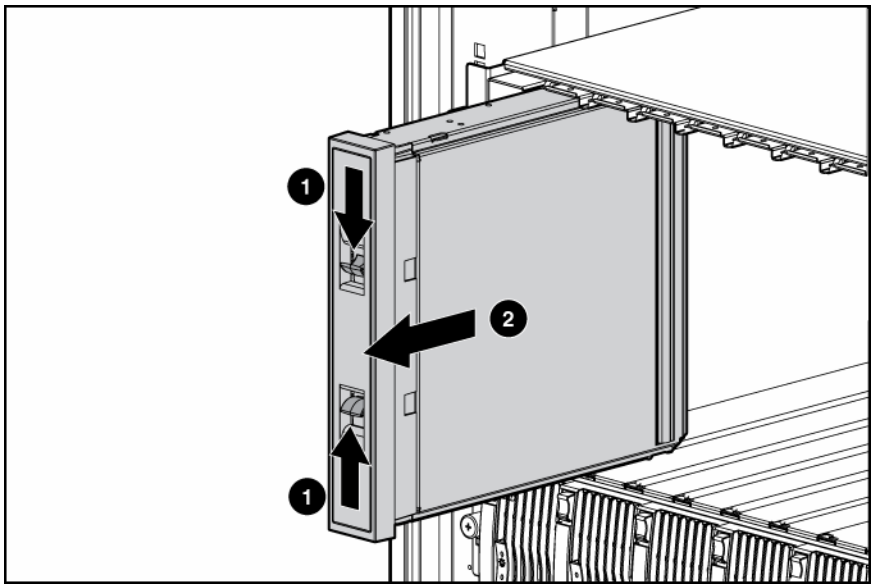


Server Blade Blanks

To remove a server blade blank:

1. Press the release buttons simultaneously (1).
2. Slide the server blade blank from the server blade enclosure (2).

Figure 2-3 Removing a server blade blank



CAUTION: Always populate server blade enclosure bays with either a server blade or server blade blank. Operating the enclosure without a server blade or server blade blank results in improper airflow and improper cooling that can lead to thermal damage.

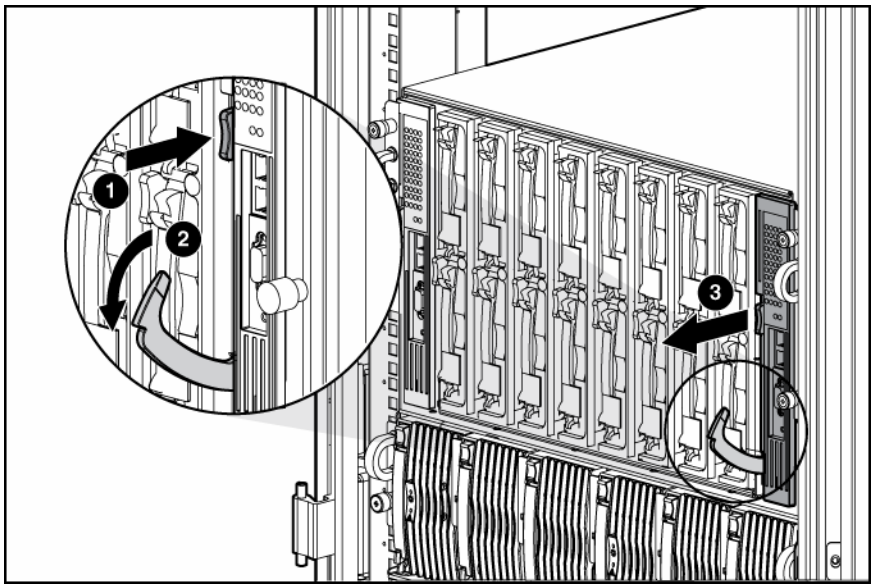
To replace a server blade blank, align the blank with the empty bay and slide it in until the blank is fully seated.

RJ-45 Patch Panels and Interconnect Switches

To remove an RJ-45 patch panel or interconnect switch:

1. Press the release button (1).
2. Open the ejector lever (2).
3. Slide the RJ-45 patch panel or interconnect switch out of the server blade enclosure (3). Place a hand under the device to support it as you remove it from the enclosure.

Figure 2-4 Removing an RJ-45 patch panel or interconnect switch



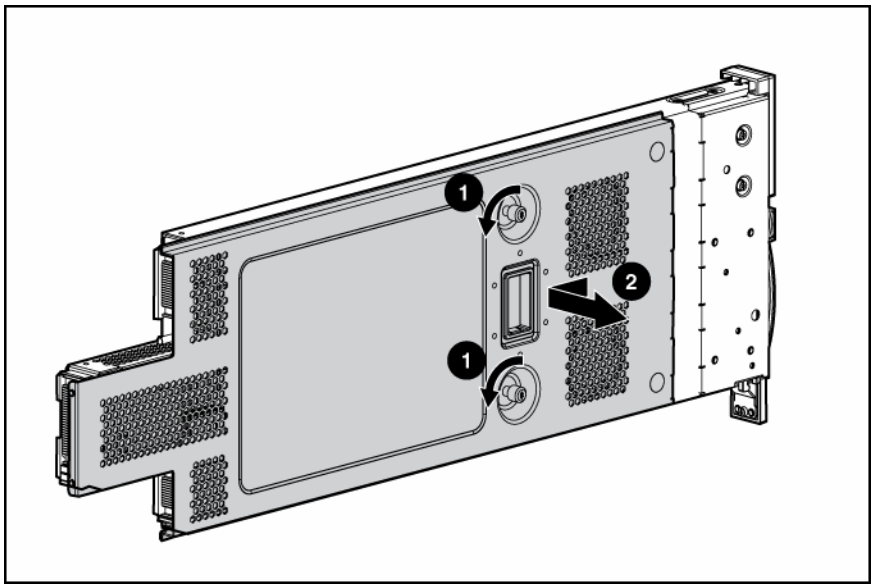
Reverse steps 1 through 3 to replace an RJ-45 patch panel or interconnect switch.

Fibre Channel Signal Conditioning Card

To remove the Fibre Channel Signal Conditioning card from the GbE2 Interconnect Switch:

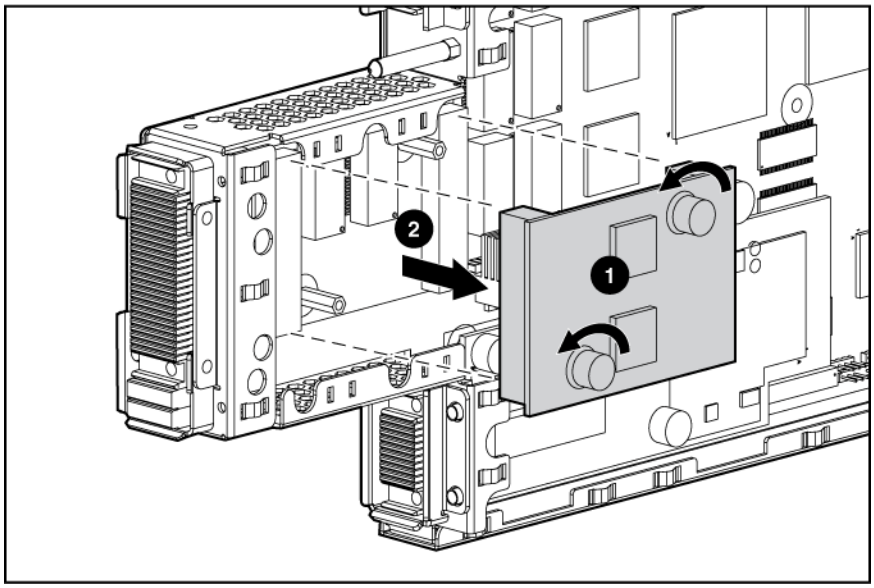
1. Remove the interconnect switch. Refer to the "RJ-45 Patch Panels and Interconnect Switches" section in this chapter.
2. Remove the GbE2 Interconnect Switch cover.

Figure 2-5 Removing the GbE2 Interconnect Switch cover



3. Remove the Fibre Channel signal-conditioning card.

Figure 2-6 Removing the Fibre Channel signal-conditioning card



Reverse steps 1 through 3 to replace the Fibre Channel signal-conditioning card.

Patch Panel RJ-45 and Interconnect Modules

Identify the proper number of modules for the interconnect solution:

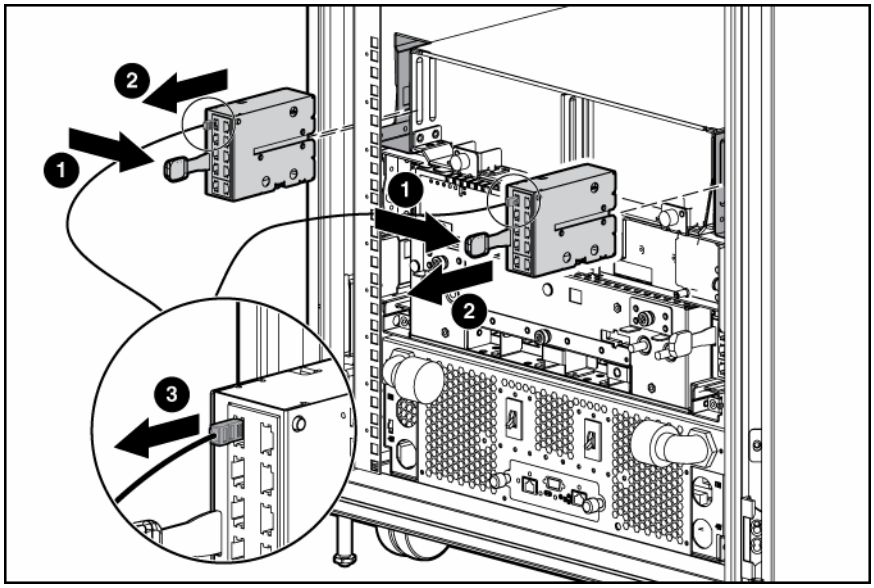
- Each RJ-45 patch panel has two patch panel RJ-45 modules:
  - A 10-connector module (near the top of the communication bay)
  - A six-connector module (near the bottom of the communication bay)
- Each GbE Interconnect Switch has one interconnect module with connectors (near the top of the communication bay).

Each GbE2 Interconnect Switch can have a maximum of two interconnect modules if using the optional OctalFC interconnect module. The connectors for the OctalFC interconnect module are near the top of the communication bay. The connectors for the Ethernet interconnect module (copper or fiber) are near the bottom of the communication bay.

To remove a patch panel RJ-45 module or interconnect module:

1. Press the module release lever (1).
2. Slide the patch panel RJ-45 module or interconnect module out of the RJ-45 patch panel or interconnect switch (2).
3. Disconnect the network cables (3).

Figure 2-7 Removing a patch panel RJ-45 module or interconnect module



Reverse steps 1 through 3 to replace a patch panel RJ-45 module or interconnect module.

Enhanced Server Blade Enclosure Backplane Components

Server Blade Management Module

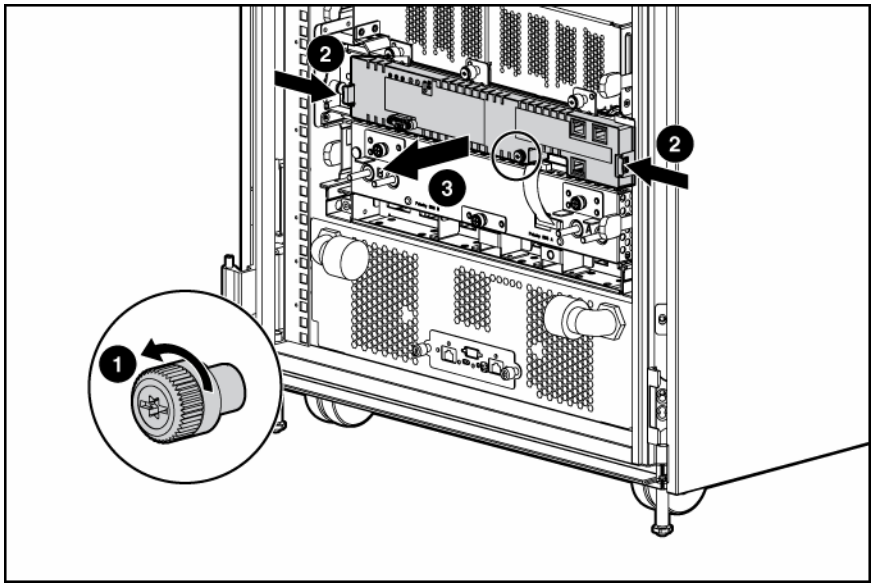
To remove the server blade management module:

1. Disconnect any management cables connected to the server blade management module.

NOTE: This component is hot-plug capable.

2. Loosen the thumbscrew securing the server blade management module (1).
3. Press the release tabs at either end of the module (2).
4. Pull the module away from the enclosure (3).

Figure 2-8 Removing a server blade management module



To replace the server blade management module:

1. Align the server management module with the metal guide tabs on the signal backplane.
2. Press the module into place.
3. Tighten the thumbscrew to fully seat the connectors.
4. Install the management module cabling. Refer to the HP ProLiant p-Class Server Blade Enclosure Installation Guide.

Signal Backplane

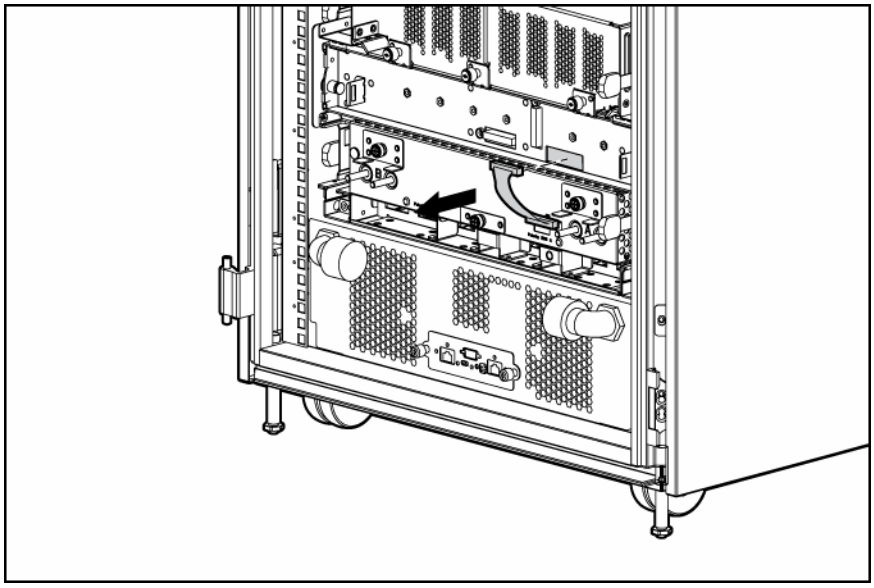
To remove the signal backplane:

1. Power down the server blade enclosure. Refer to the "Server Blade Enclosure Preparation" section in this chapter.
2. Decide whether to perform this service procedure in the rack:
   - If you can access the rear of the server blade enclosure without difficulty, proceed with step 3.
   - If you cannot access the rear of the server blade enclosure easily, remove the server blade enclosure from the rack. Refer to the "Server Blade Enclosure" section in this chapter; then, proceed to step 5.
3. Unseat the RJ-45 patch panels or interconnect switches from the signal backplane by sliding them approximately 2.54 cm (1 in) out of the server blade enclosure. Refer to the "RJ-45 Patch Panels and Interconnect Switches" section in this chapter.
4. Unseat the server blades from the signal backplane by sliding them approximately 2.54 cm (1 in) out of the server blade enclosure. Refer to the documentation shipped with the server blades.
5. Remove the server blade management module. Refer to the "Server Blade Management Module" section in this chapter.

IMPORTANT: For ease of removal, it may be necessary to disconnect the grounding cable (facility DC configuration only) from the server blade enclosure.

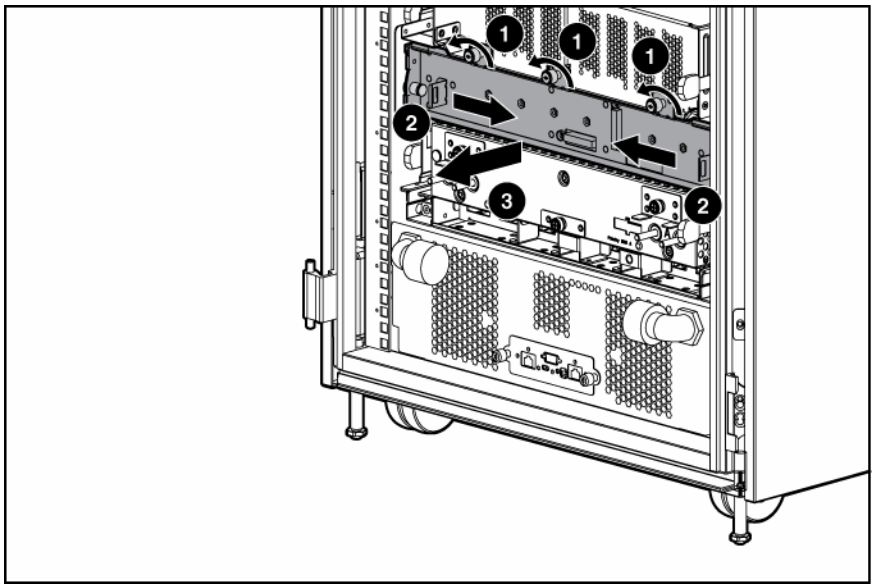
6. Disconnect the signal backplane power cable from the signal backplane.

Figure 2-9 Disconnecting the signal backplane power cable



7. Loosen the three thumbscrews (1).
8. Disengage the locking pins (2).
9. Pull the signal backplane away from the chassis (3).

Figure 2-10 Removing a signal backplane



IMPORTANT: The replacement part ships with a protective cover on the VHDM connectors. Remove this cover before installing the new part.

Reverse steps 1 through 9 to replace the signal backplane.

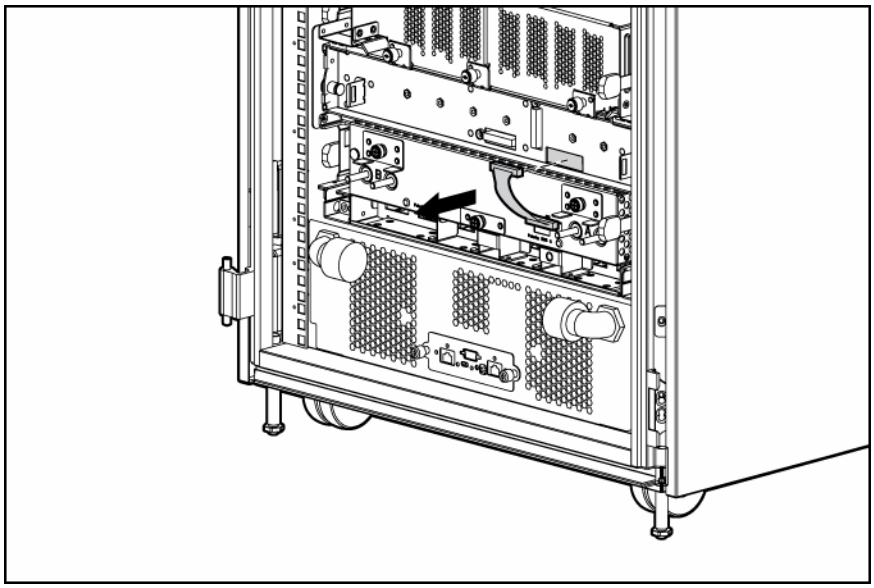
Power Backplane Assembly

WARNING! To reduce the risk of injury from hot surfaces, allow external components to cool before servicing them.

To remove the power backplane assembly:

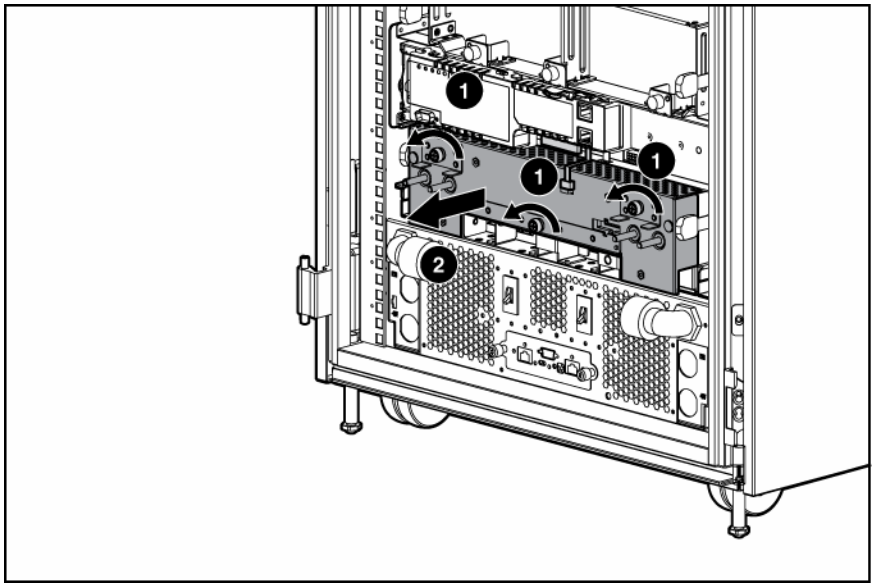
1. Power down the server blade enclosure. Refer to the "Server Blade Enclosure Preparation" section in this chapter.
2. Decide whether to perform this service procedure in the rack:
   - If you can access the rear of the server blade enclosure without difficulty, proceed with step 3.
   - If you cannot access the rear of the server blade enclosure easily, remove the server blade enclosure from the rack. Refer to the "Server Blade Enclosure" section in this chapter; then, proceed with step 5.
3. Unseat the server blades from the power backplane assembly by sliding them approximately 2.54 cm (1 in) out of the server blade enclosure. Refer to the documentation shipped with the server blades.
4. Remove the server blade management module from the signal backplane. Refer to the "Server Blade Management Module" instructions in the "Enhanced Server Blade Enclosure Backplane Components" section of this chapter.
5. Disconnect the signal backplane power cable from the signal backplane.

Figure 2-11 Disconnecting signal backplane power cable



6. Loosen the three thumbscrews (1).
7. Pull the power backplane assembly away from the chassis (2).

Figure 2-12 Removing a power backplane assembly



Reverse steps 1 through 7 to replace the power backplane assembly.

Standard Server Blade Enclosure Backplane Components

Server Blade Management Module

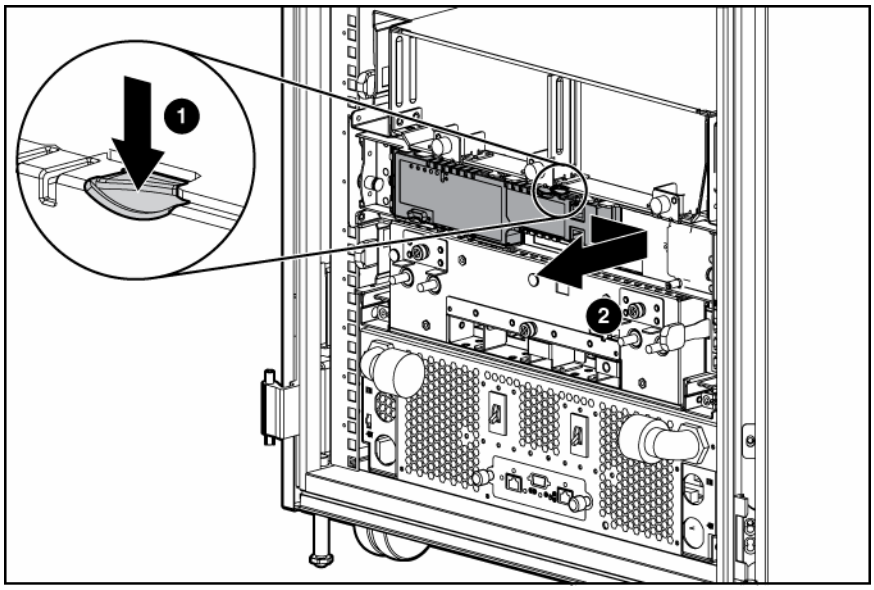
To remove the server blade management module:

1. Disconnect any management cables connected to the server blade management module.

NOTE: This component is hot-plug capable.

2. Press the release tab (1).
3. Slide the module to the right and pull it away from the enclosure (2).

Figure 2-13 Removing a server blade management module



To replace the server blade management module:

1. Align the module with its connector and the metal guiding tabs on the server blade enclosure.
2. Slide the module to the left to insert it into the connector until it is fully seated.
3. Install the management module cabling. Refer to the *HP BladeSystem p-Class System Setup and Installation Guide*.

Signal Backplane

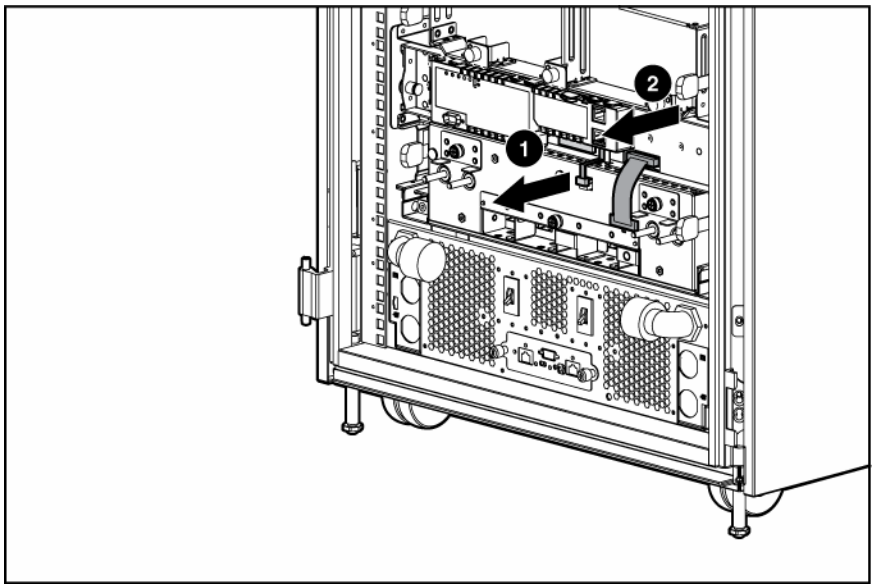
To remove the signal backplane:

1. Power down the server blade enclosure. Refer to the "Server Blade Enclosure Preparation" section in this chapter.
2. Decide whether to perform this service procedure in the rack:
   - If you can access the rear of the server blade enclosure without difficulty, proceed with step 3.
   - If you cannot access the rear of the server blade enclosure easily, remove the server blade enclosure from the rack. Refer to the "Server Blade Enclosure" section in this chapter; then, proceed with step 5.
3. Unseat the RJ-45 patch panels or interconnect switches from the signal backplane by sliding them approximately 2.54 cm (1 in) out of the server blade enclosure. Refer to the "RJ-45 Patch Panels and Interconnect Switches" section in this chapter.
4. Unseat the server blades from the signal backplane by sliding them approximately 2.54 cm (1 in) out of the server blade enclosure. Refer to the documentation shipped with the server blades.
5. Remove the server blade management module. Refer to the "Server Blade Management Module" instructions in the "Standard Server Blade Enclosure Backplane Components" section of this chapter.

IMPORTANT: For ease of removal, it may be necessary to disconnect the grounding cable (facility DC configuration only) from the server blade enclosure.

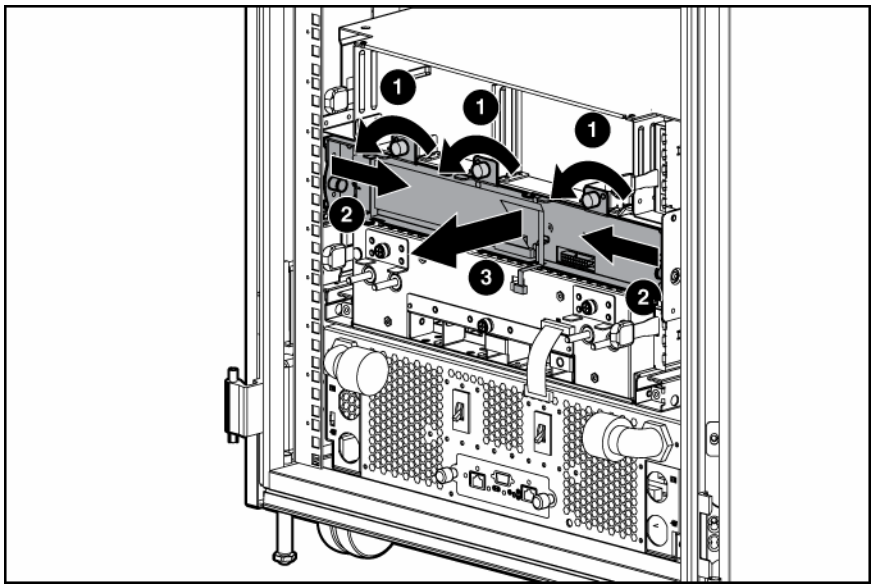
6. Disconnect the server blade management module signal cable from the power backplane assembly (1).
7. Disconnect the power backplane cable from the signal backplane (2).

Figure 2-14 Disconnecting signal and power backplane cables



8. Loosen the three thumbscrews (1).
9. Disengage the locking pins (2).
10. Pull the signal backplane away from the chassis (3).

Figure 2-15 Removing a signal backplane



IMPORTANT: The replacement part ships with a protective cover on the VHDM connectors. Remove this cover before installing the new part.

Reverse steps 1 through 10 to replace the signal backplane.

Power Backplane Assembly

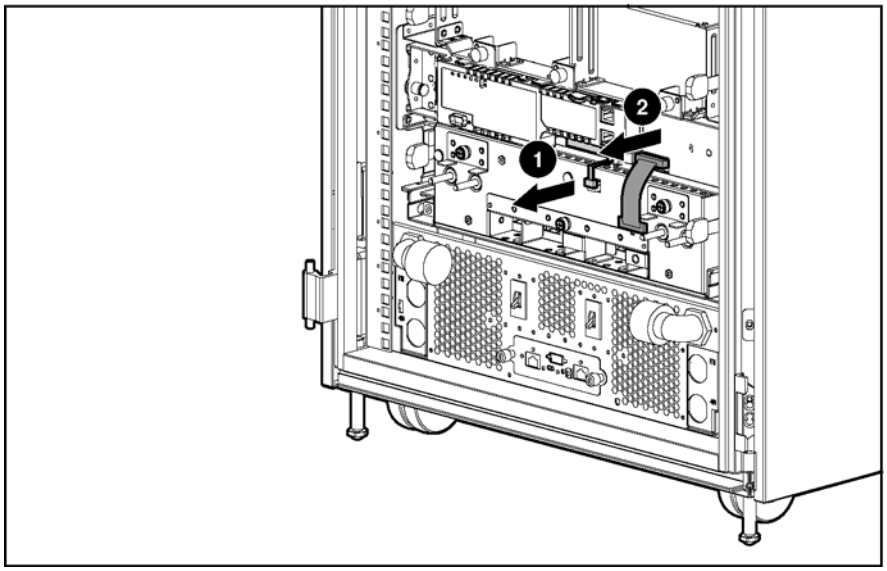
WARNING! To reduce the risk of injury from hot surfaces, allow external components to cool before servicing them.

To remove the power backplane assembly:

1. Decide whether to perform this service procedure in the rack:
   - If you can access the rear of the server blade enclosure without difficulty, proceed with step 3.
   - If you cannot access the rear of the server blade enclosure easily, remove the server blade enclosure from the rack. Refer to the "Server Blade Enclosure" section in this chapter; then, proceed with step 5.

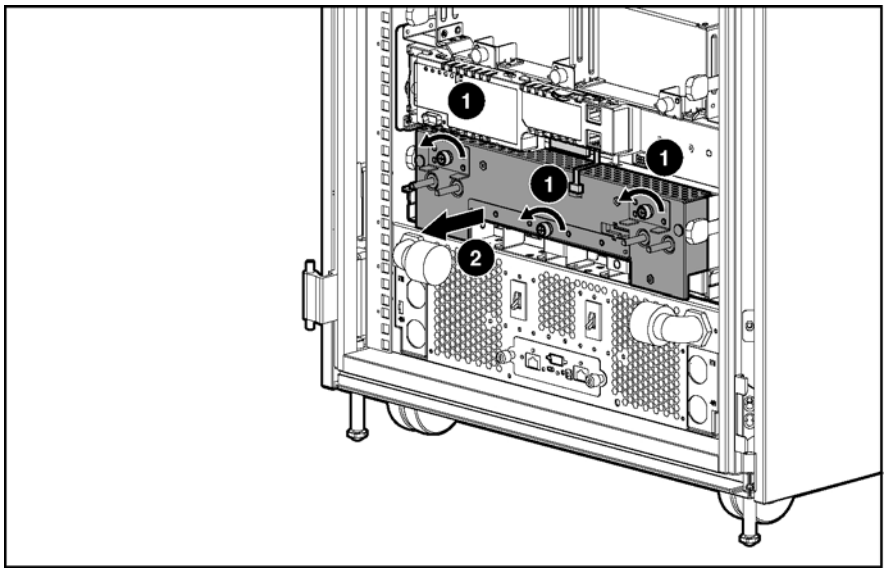
2. Unseat the server blades from the power backplane assembly by sliding them approximately 2.54 cm (1 in) out of the server blade enclosure. Refer to the documentation shipped with the server blades.
3. Disconnect the server blade management module signal cable from the power backplane assembly (1).
4. Disconnect the power backplane cable from the signal backplane (2).

Figure 2-16 Disconnecting signal and power backplane cables



5. Loosen the three thumbscrews (1).
6. Pull the power backplane assembly away from the chassis (2).

Figure 2-17 Removing a power backplane assembly



Reverse steps 1 through 6 to replace the power backplane assembly.

Server Blade Enclosure

△ **CAUTION:** Electrostatic discharge can damage electronic components. Be sure you are properly grounded before beginning any installation procedure. For more information, refer to the "Electrostatic Discharge Information" section in this chapter..

To remove the server blade enclosure:

1. Remove all server blades. Refer to the documentation shipped with the server blades.
2. Remove all server blade blanks, if you are replacing the server blade enclosure. Refer to the "Server Blade Blanks" section in this chapter.

3. Power down the server blade enclosure. Refer to the "Server Blade Enclosure Preparation" section in this chapter.

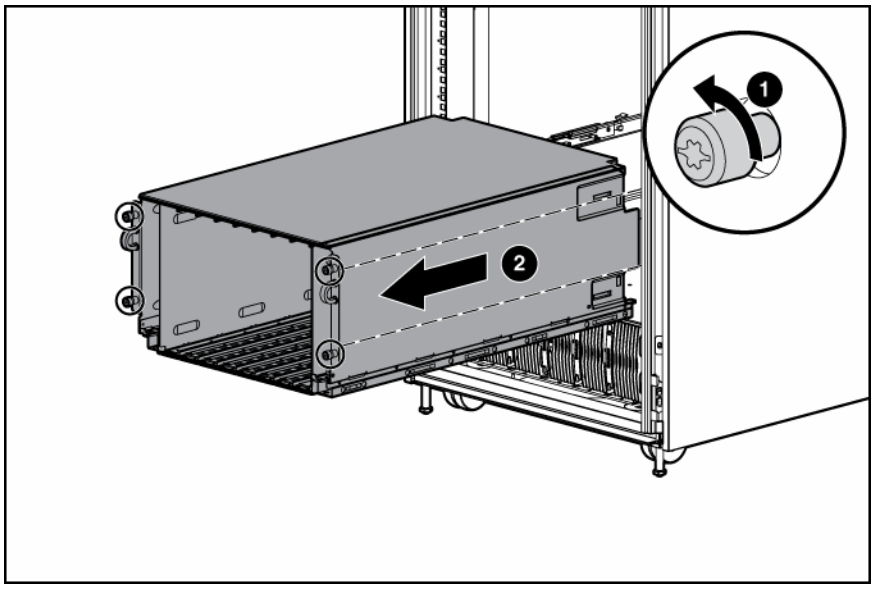
NOTE: If you are only removing the server blade enclosure to service its non-hot-plug components, server blade blanks can remain installed.

4. Remove both RJ-45 patch panels or interconnect switches. Refer to the "RJ-45 Patch Panels and Interconnect Switches" section in this chapter.
5. Remove all interconnect modules. Refer to the "Patch Panel RJ-45 and Interconnect Modules" section in this chapter.
6. Disconnect the grounding cable, if you have a facility DC environment.
7. Disconnect any management module cables from the server blade management module.

WARNING! At least two people must lift a server blade enclosure together when removing it from the rack.

8. Loosen the front panel thumbscrews (1).
9. Slide the enclosure out of the rack (2).

Figure 2-18 Removing a server blade enclosure



10. Place the enclosure on a sturdy, level surface.

Reverse steps 1 through 10 to replace a server blade enclosure.

WARNING! At least two people must lift a server blade enclosure into the rack together. If the enclosure is installed 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.

Power Enclosure Components

Use the procedures in this section to service HP BladeSystem p-Class power enclosures.

Power Components Preparation

To service the power enclosure, bus bars, or power bus boxes, you must isolate them from the input power source.

CAUTION: The following procedures remove all power from power distribution devices and the server blades connected to these devices. To prevent possible data loss, you may choose to power down the server blades and server blade enclosures before proceeding.

CAUTION: 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.

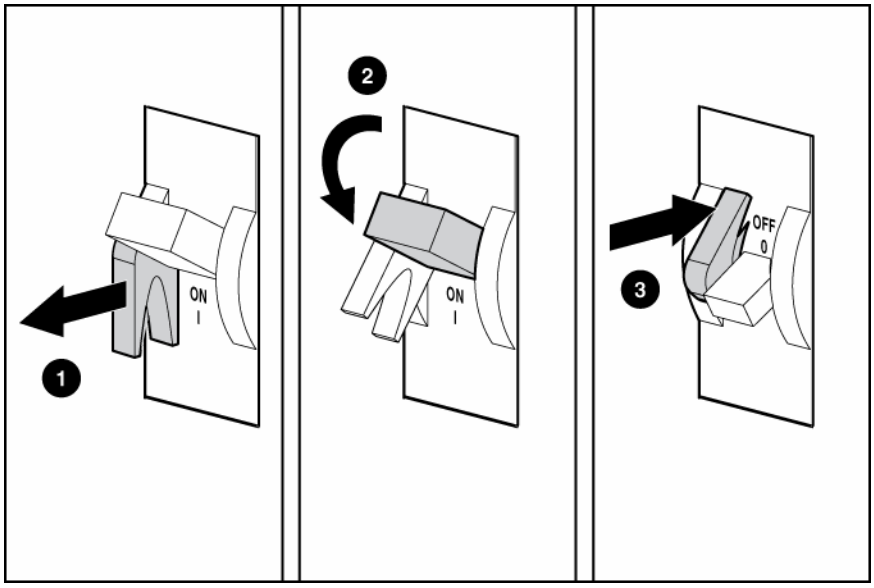
CAUTION: When performing service procedures on server blade enclosures, ensure that both A and B DC power feeds are disconnected from the enclosure before servicing.

CAUTION: 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.

To remove AC input power from the 1U power enclosure:

1. Remove power from the facility power connection.
2. To remove AC input power from the 3U power enclosures:
   a. Unlock the AC circuit breakers on the rear of the power enclosures (1).
   b. Set the AC circuit breakers (A and B) to the off position (2).
   c. Lock the AC circuit breakers (A and B) in the off position (3).

Figure 2-19 Setting AC circuit breaker switches to the off position



To remove facility DC input power from bus bars and power bus boxes:

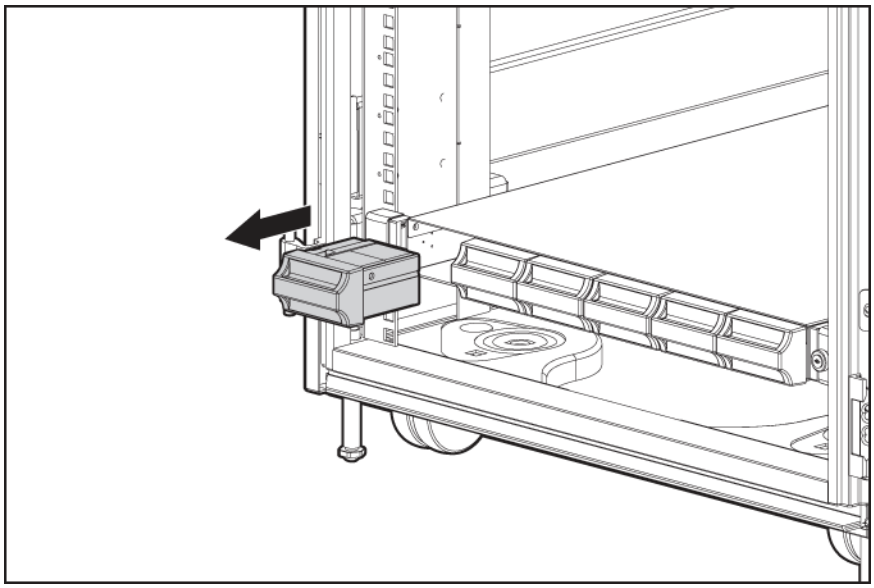
1. Shut off facility DC power to the facility DC power cables.
2. Disconnect the facility DC power cables from the facility connection.

HP BladeSystem p-Class 1U Power Supply Blank

To remove a power supply blank:

1. Press the release buttons simultaneously.
2. Pull the power supply blank out of the power enclosure.

Figure 2-20 Removing an HP BladeSystem p-Class 1U Power Supply Blank



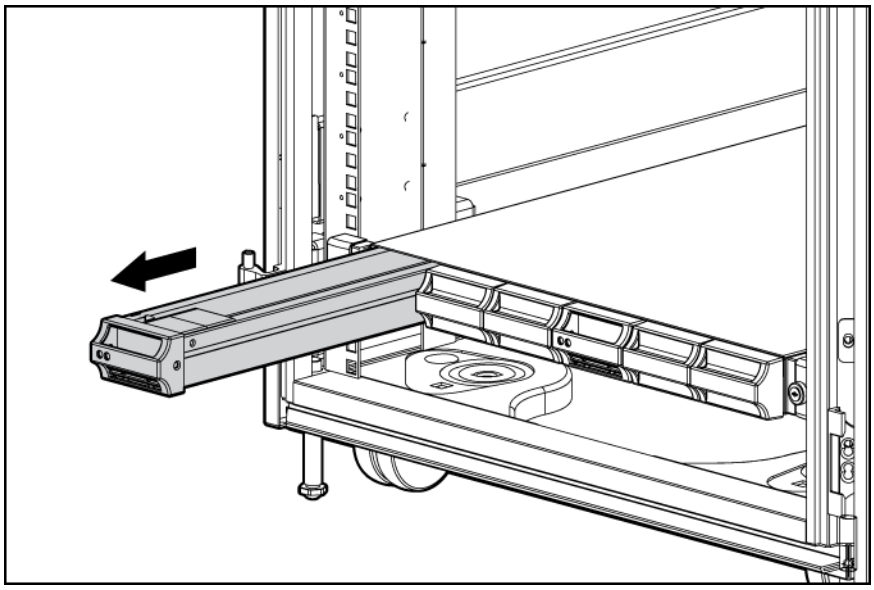
To replace a power supply blank, slide the power supply blank into the bay until it seats.

HP BladeSystem p-Class 1U Power Supply

To remove a power supply:

1. Press the release buttons simultaneously.
2. Pull the power supply out of the enclosure.

Figure 2-21 Removing a 1U Power Supply



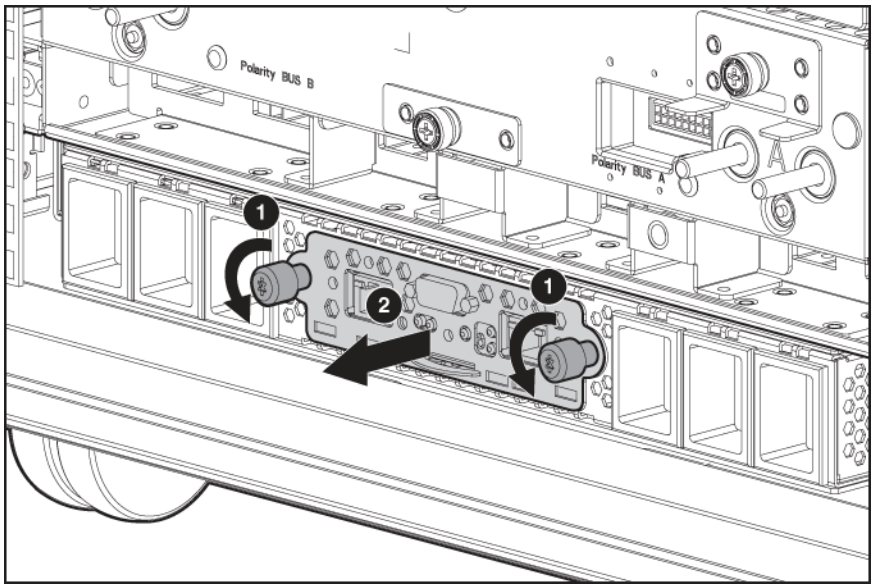
To replace a power supply, slide the power supply into the bay until it seats.

HP BladeSystem p-Class 1U Power Enclosure Power Management Module

To remove a management module:

1. Disconnect any management cables connected to the module.
2. Loosen the thumbscrews (1).
3. Slide the module out of the power enclosure (2).

Figure 2-22 Removing the 1U power management module



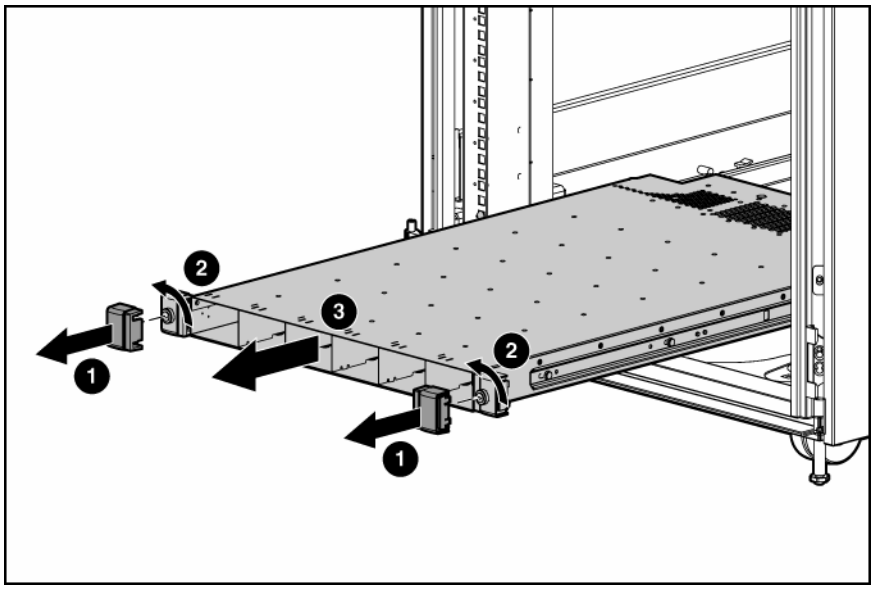
Reverse steps 1 through 3 to replace the power management module.

HP BladeSystem p-Class 1U Power Enclosure

To remove a power enclosure:

1. Remove power from the AC Power source. Refer to the "Power Components Preparation" section in this chapter.
2. Disconnect the PDU jumper cords from the power enclosure.
3. Disconnect the power enclosure DC output cables from the server blade enclosure.
4. Remove all hot-plug power supplies. Refer to the "HP BladeSystem p-Class 1U Power Supply" section in this chapter.
5. Remove the thumbscrew covers (1).
6. Loosen the front panel thumbscrews (2).
7. Slide the power enclosure out (3).

Figure 2-23 Removing a 1U power enclosure



8. Disengage the rack rails from the enclosure.
9. Remove the enclosure from the rack.

⚠ **WARNING!** At least two people must lift an enclosure together when removing it from the rack.

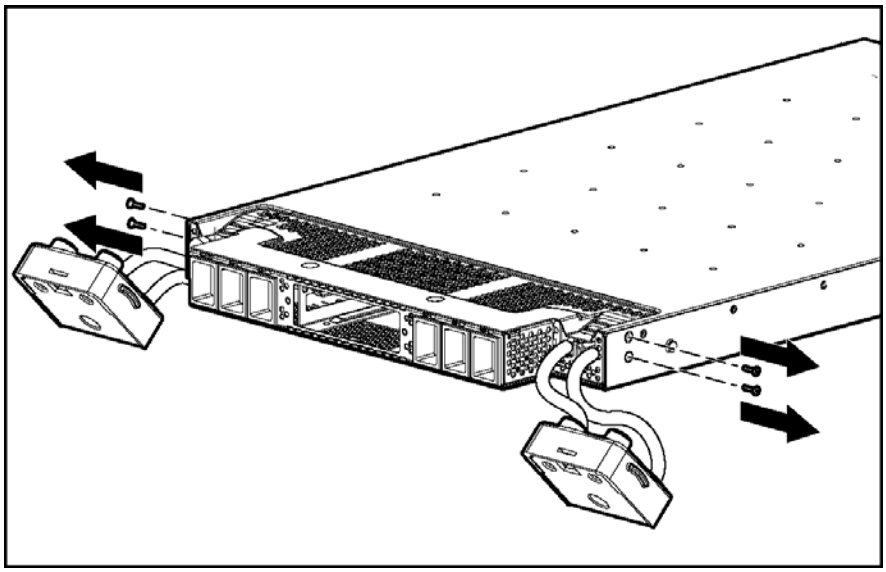
Reverse steps 1 through 9 to replace the power enclosure.

HP BladeSystem p-Class 1U Power Enclosure Backplane Board

To remove the power backplane assembly:

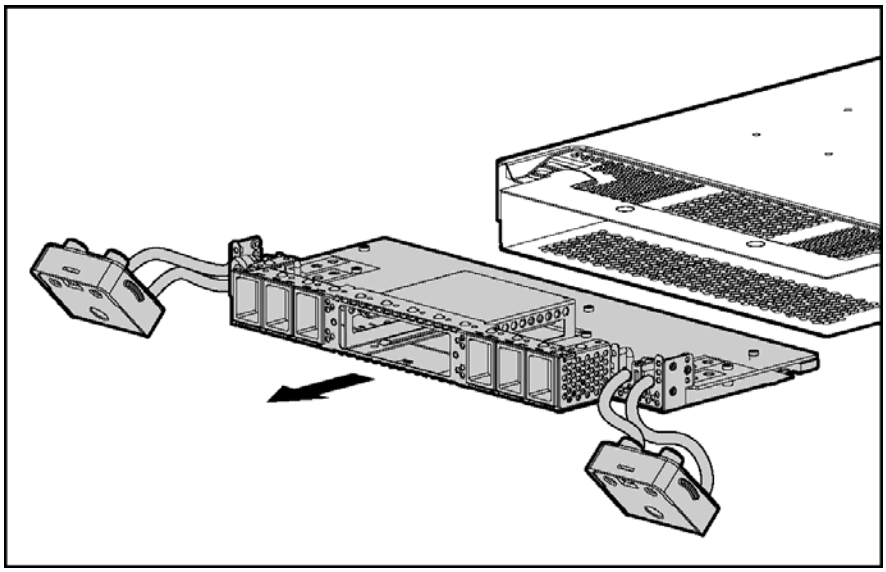
1. Power down the system. Refer to the “Power Components Preparation” section in this chapter.
2. Remove the power management module. Refer to the “HP BladeSystem p-Class 1U Power Enclosure Power Management Module” section in this chapter.
3. Remove the power enclosure from the rack. Refer to the “HP BladeSystem p-Class 1U Power Enclosure” section in this chapter.
4. Remove the four T-10 screws from the sides of the power enclosure.

Figure 2-24 Removing the screws from the power enclosure



5. Remove the backplane board from the enclosure

Figure 2-25 Removing the backplane board from the power enclosure



Reverse steps 1 through 5 to replace a backplane board.

NOTE: Use a text-based terminal program to connect to the diagnostic port on the management module to set the serial number to the chassis serial number.

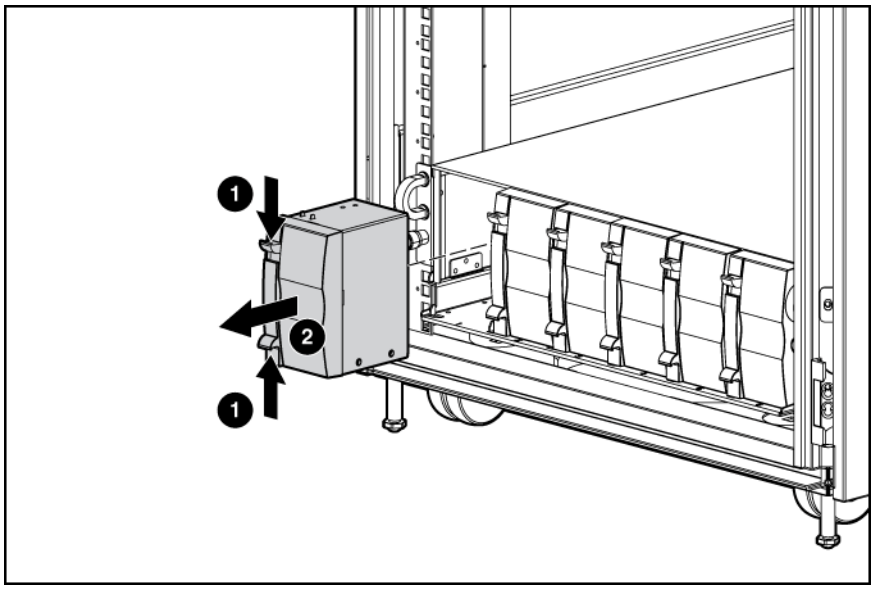
HP BladeSystem p-Class 3U Power Supply Blank

IMPORTANT: In single-phase power enclosures, bays 3 and 6 are not used and power supply blanks are secured with a screw. To remove the blanks in these bays, you must remove the screw.

To remove a power supply blank:

1. Press the release buttons simultaneously (1).
2. Pull the power supply blank out of the power enclosure (2).

Figure 2-26 Removing a 3U power supply blank



CAUTION: Always populate power supply bays with either a hot-plug power supply or power supply blank. Operating the enclosure without a hot-plug power supply or power supply blank results in improper airflow and improper cooling that can lead to thermal damage..

To replace a power supply blank, slide the power supply blank into the bay until it seats.

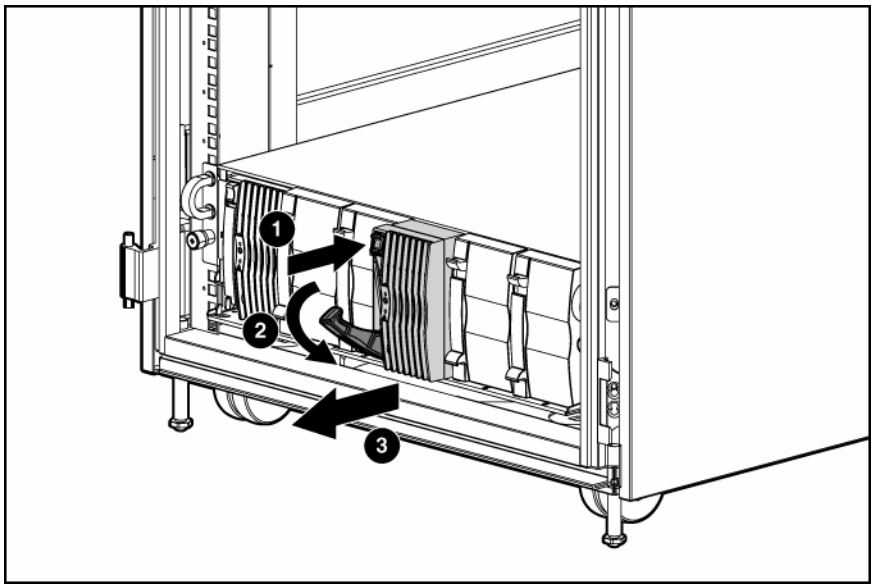
HP BladeSystem p-Class 3U Power Supply

CAUTION: To maintain a redundant power configuration, remove and replace one hot-plug power supply at a time. If the system is not configured for power redundancy, you may choose to install a redundant power supply to provide adequate system power during the service procedure. You can monitor system power with HP Systems Insight Manager (HP SIM).

To remove a hot-plug power supply:

1. Press the release button (1).
2. Open the ejector handle (2)
3. Slide the hot-plug power supply out of the power enclosure (3). Place a hand under the hot-plug power supply to support it as you remove it from the enclosure.

Figure 2-27 Removing a 3U hot-plug power supply



To replace a hot-plug power supply, slide the hot-plug power supply into the bay and close the lever.

HP BladeSystem p-Class 3U Power Enclosure Power Management Module

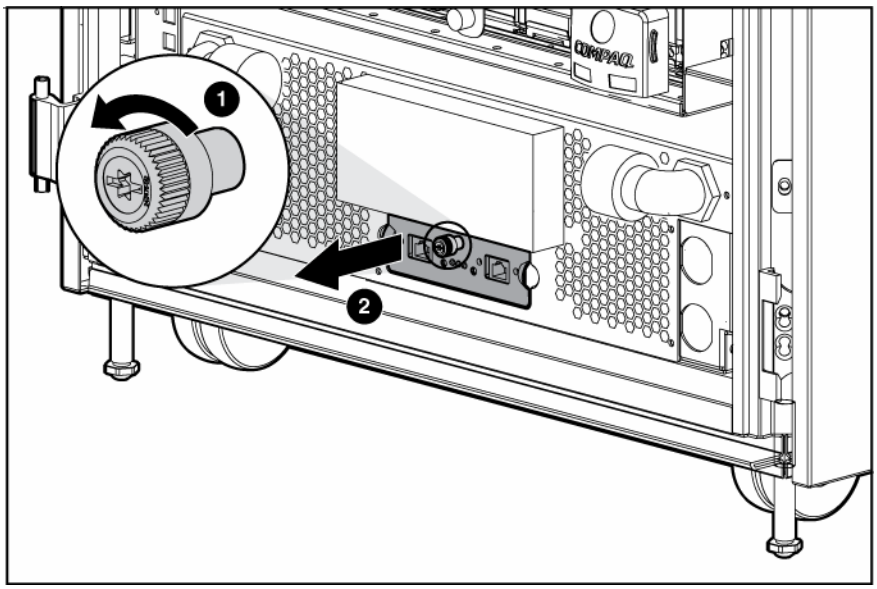
To remove the power management module:

1. Disconnect any management cables connected to the module.

NOTE: This component is hot-plug capable.

2. Loosen the thumbscrews (1).
3. Slide the module out of the power enclosure (2).

Figure 2-28 Removing the 3U power management module



Reverse steps 1 through 3 to replace the power management module.

HP BladeSystem p-Class 3U Power Enclosure

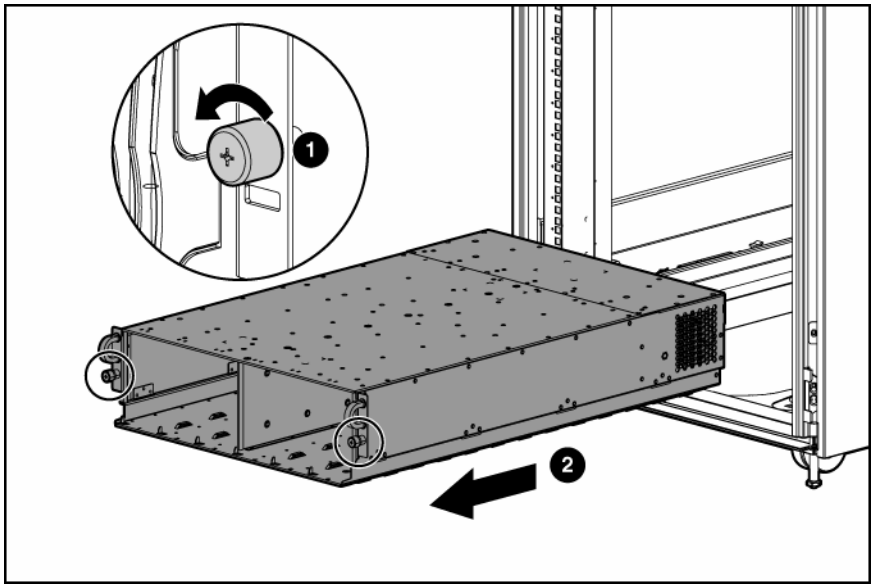
To remove a power enclosure:

1. Remove power from the power distribution components. Refer to the “Power Components Preparation” section in this chapter.
2. Disconnect the AC power cords from the AC source.

3. If you have bus bars, refer to steps 3 through 6 of the “Scalable or Mini Bus Bars” section in this chapter.
4. If you have power bus boxes, refer to steps 3 through 5 of the “Power Bus Box” section in this chapter.
5. Disconnect the load-balancing signal cable, if you have two power enclosures installed in a scalable bus bar configuration.
6. Remove the power management module. Refer to the “HP BladeSystem p-Class 3U Power Enclosure Power Management Module” section in this chapter.
7. Remove all power supply blanks. Refer to the “HP BladeSystem p-Class 3U Power Supply Blank” section in this chapter.
8. Loosen the front panel thumbscrews (1).
9. Slide the power enclosure out of the rack (2).

WARNING! At least two people must lift an enclosure together when removing it from the rack..

Figure 2-29 Removing a 3U power enclosure



Reverse steps 1 through 9 to replace the power enclosure.

Power Distribution Components

Use the procedures in this section to service HP BladeSystem p-Class power distribution components.

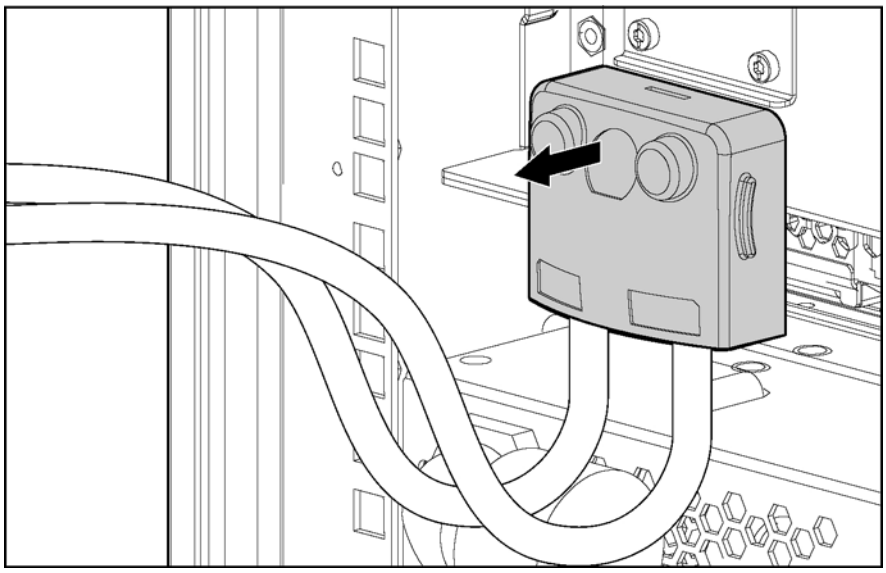
NOTE: Power distribution devices (scalable bus bar and mini bus bar) are not required when installing the HP BladeSystem p-Class 1U Power Enclosure. The power enclosure is designed to connect directly to one server blade enclosure.

Scalable or Mini Bus Bars

To remove the scalable or mini bus bars:

1. Remove power from the bus bars. Refer to the “Power Components Preparation” section in this chapter.
2. Disconnect all bus bar couplers (both A and B sides) from the server blade enclosures.

Figure 2-30 Disconnecting bus bar couplers from server blade enclosures



3. Remove the screws from the bus bar access cover (1).
4. Remove the access cover (2).

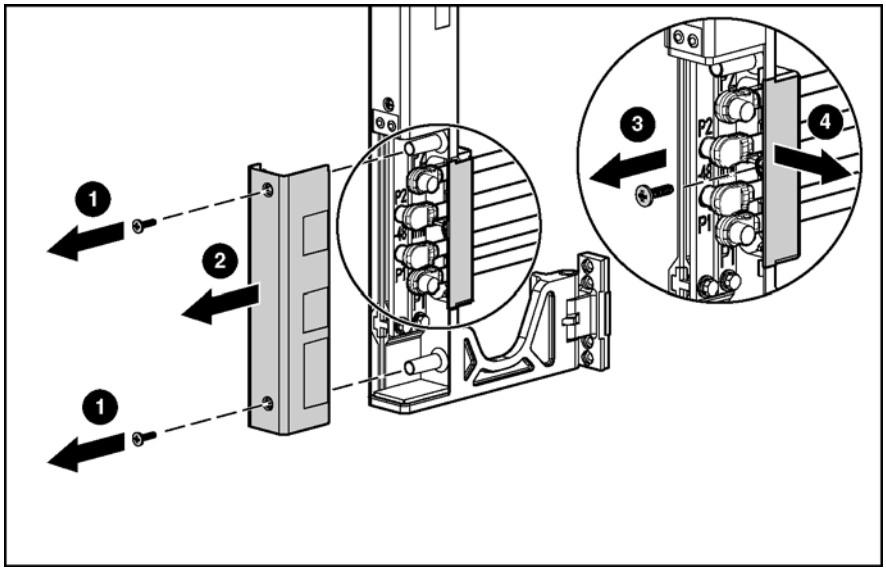
NOTE: The access covers for mini bus bars are different from scalable bus bars. For an illustration of the mini bus bar access cover, refer to the "Mini and Scalable Bus Bars" section in Chapter 4, "Connectors, LEDs, and Switches."

5. Remove the screw from the cable guide (3).

NOTE: You may need to use a magnetized screwdriver to reinstall this screw.

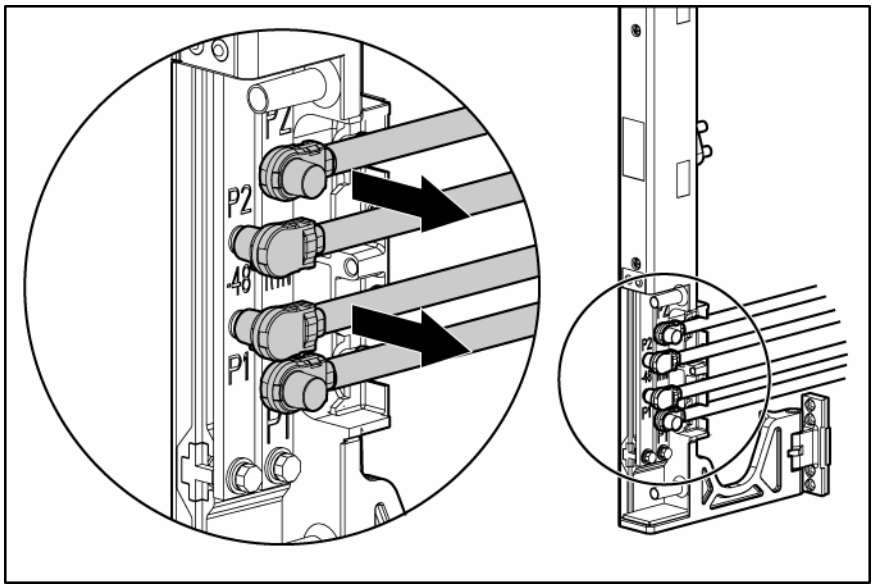
6. Remove the cable guide (4).

Figure 2-31 Accessing the power cables



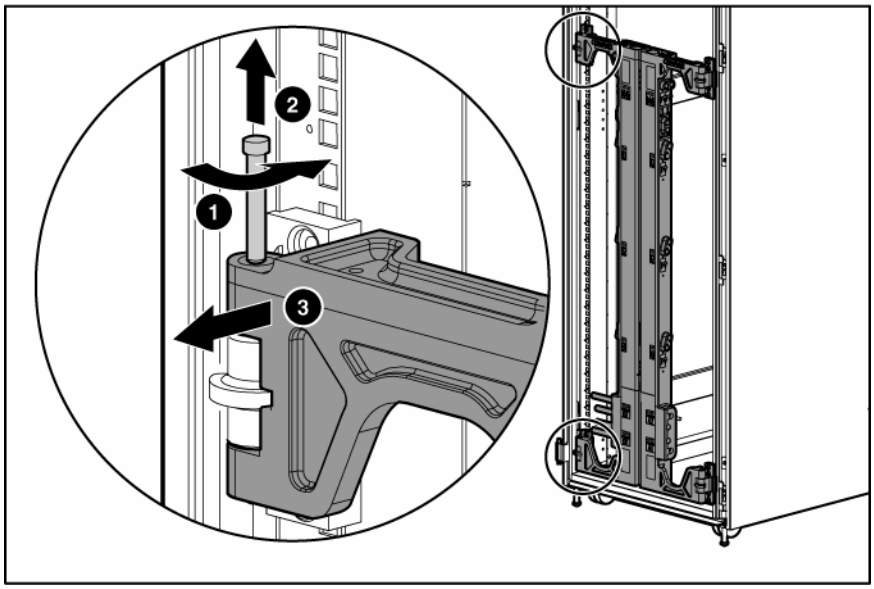
7. Disconnect the facility DC or power enclosure DC power cables from the bus bar DC input connectors.

Figure 2-32 Disconnecting power cables



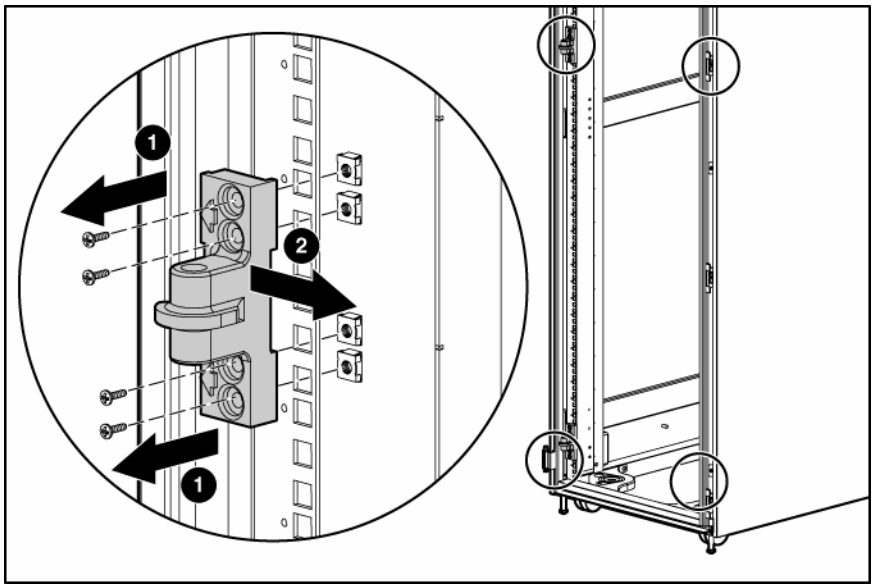
8. Use a 4 mm (5/32 in) hex wrench to loosen the hinge bolts securing the bus bar to the hinge (1).
9. Pull the hinge bolts out of the hinges (2).
10. Remove the bus bars from the hinges (3).

Figure 2-33 Removing the hinge bolts and bus bars



11. Repeat steps 8 through 10 for the second bus bar, if you are replacing both bus bars.
12. Remove the screws securing the hinge to the rack (1).
13. Remove the hinges from the rack (2).

Figure 2-34 Removing the hinges from the rack



Reverse steps 1 through 13 to replace the bus bars.

Mini Bus Bar Dual Power Box

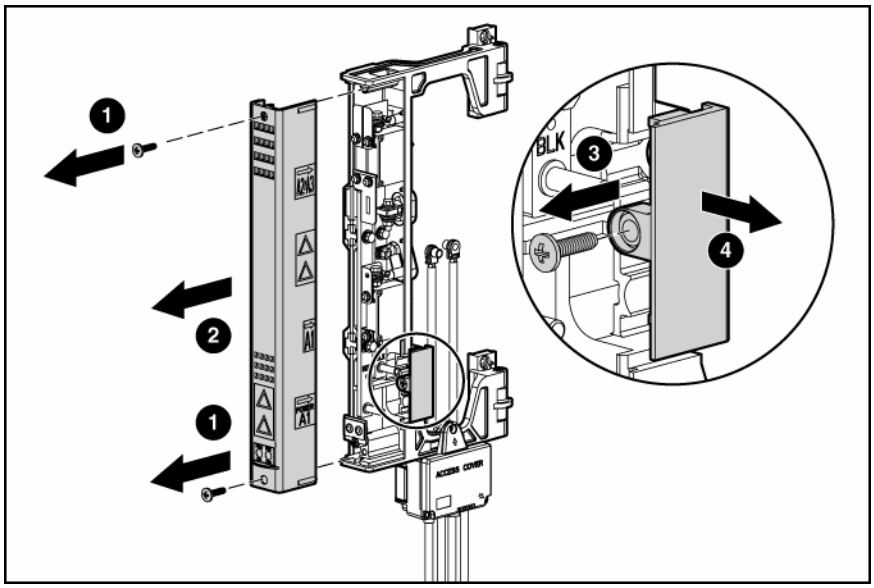
WARNING! Be sure that power is not applied to the Dual Power Box power cables before connecting to the power enclosure. Disconnect all AC power cords from the power source.

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

To remove the Mini Bus Bar Dual Power Box(es):

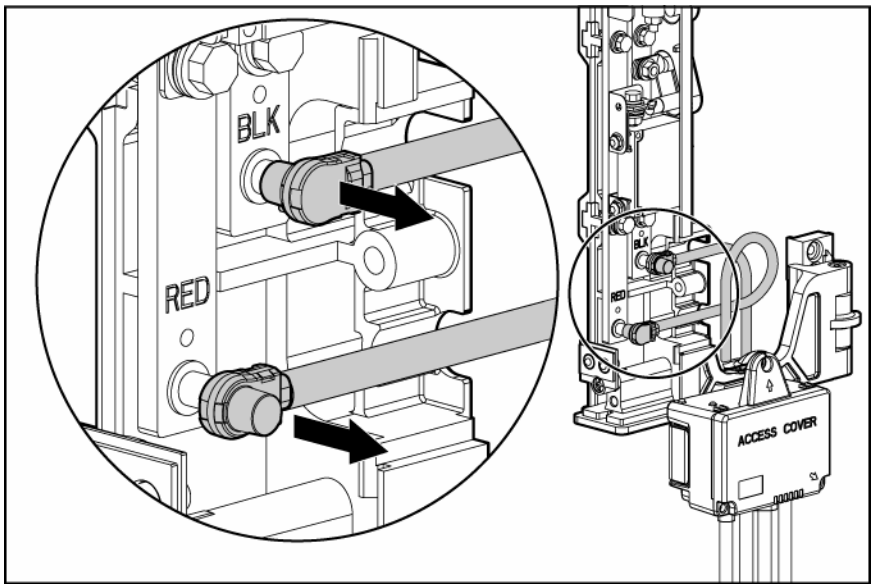
1. Remove the mini bus bar cover.

Figure 2-35 Removing mini bus bar cover



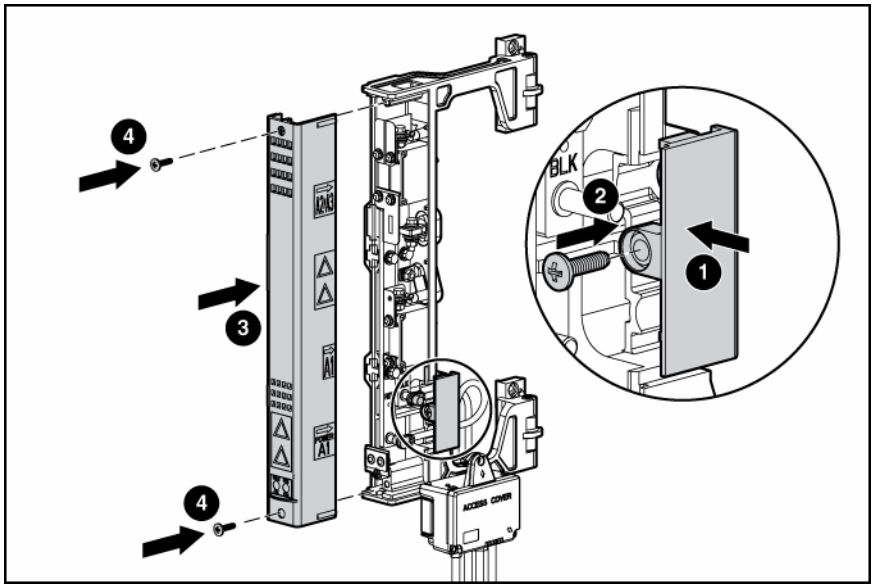
2. Remove the Dual Power Box cables from the mini bus bar.

Figure 2-36 Removing cables from mini bus bar



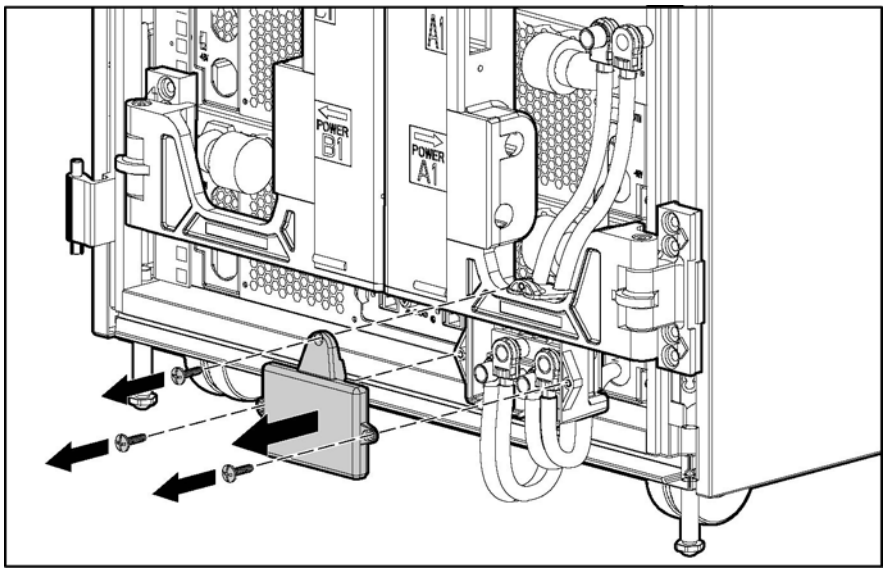
3. Replace the mini bus bar cover.

Figure 2-37 Replacing mini bus bar cover



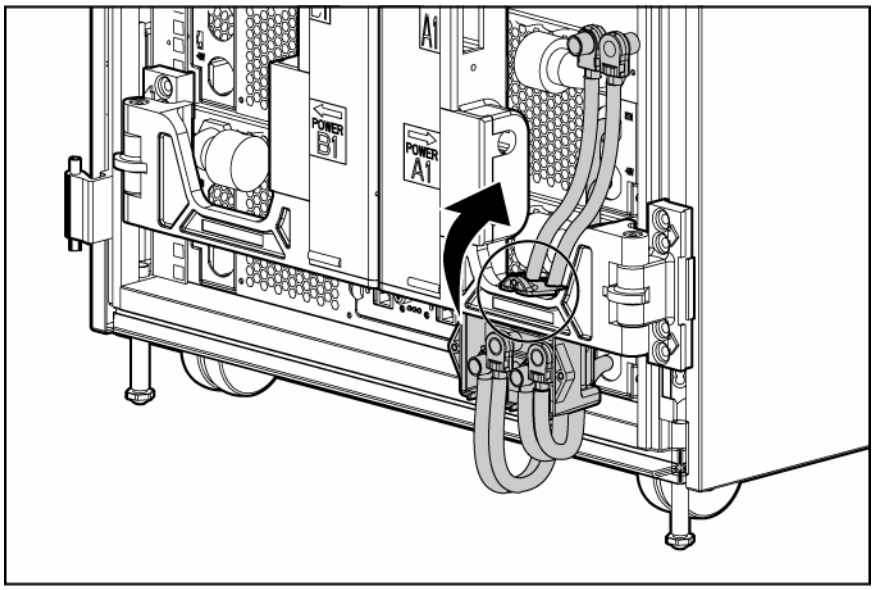
4. Remove the cover from the Dual Power Box using a T-25 Torx screwdriver.

Figure 2-38 Removing Dual Power Box cover



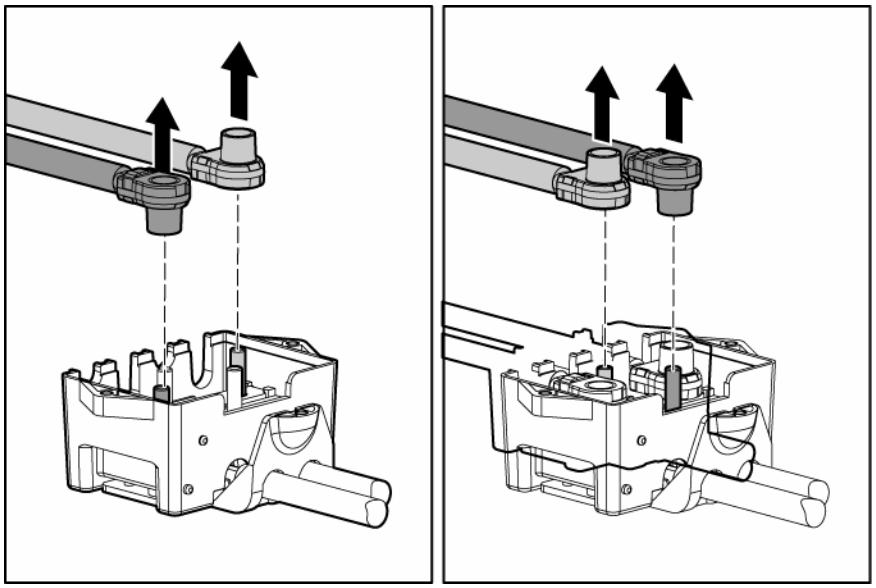
5. Detach the Dual Power Box from the mini bus bar.

Figure 2-39 Detach the Dual Power Box from mini bus bar



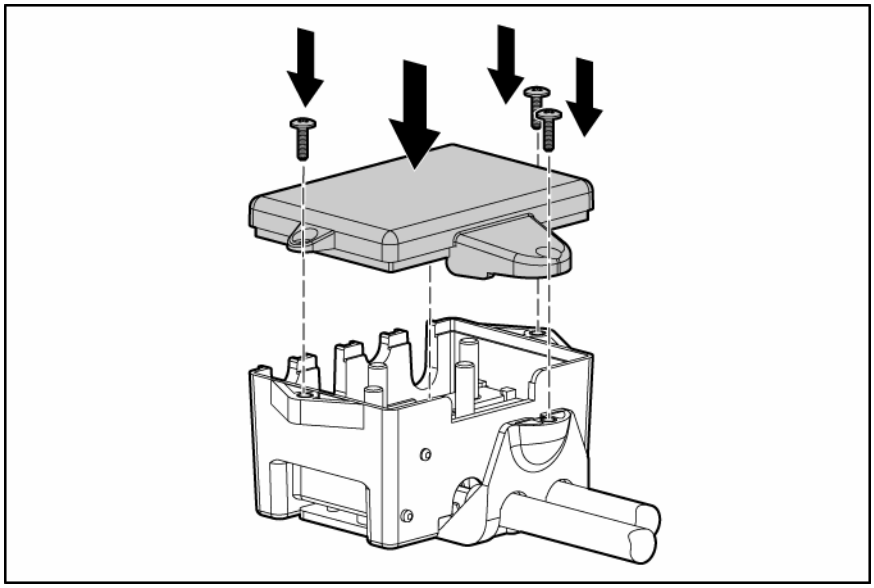
6. Remove the power cables.

Figure 2-40 Removing cables from the Dual Power Box



7. Replace the Dual Power Box cover using a T-25 Torx screwdriver.

Figure 2-41 Replacing the Dual Power Box cover



Repeat this procedure for the second mini bus bar.

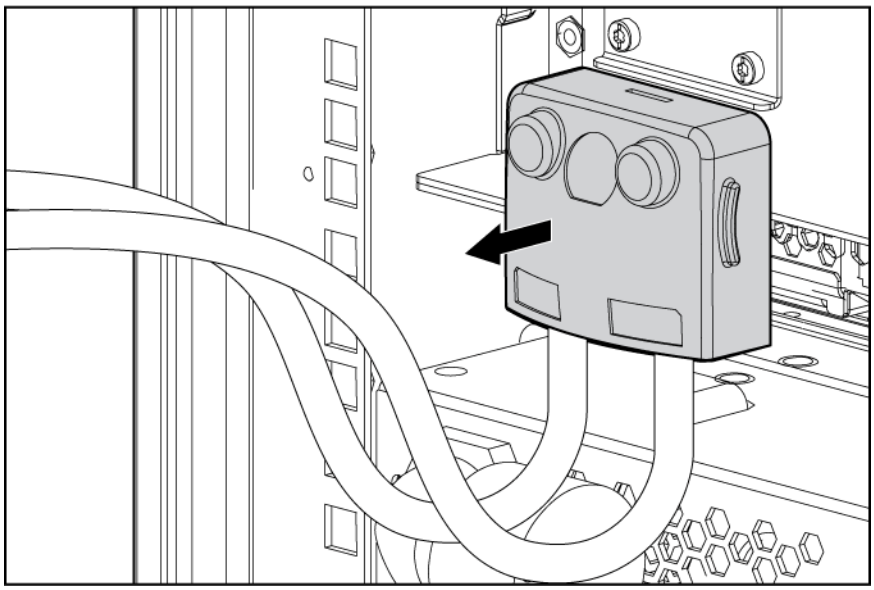
Reverse steps 1 through 7 to replace the mini bus bar dual power box.

Power Bus Box

To remove the power bus box:

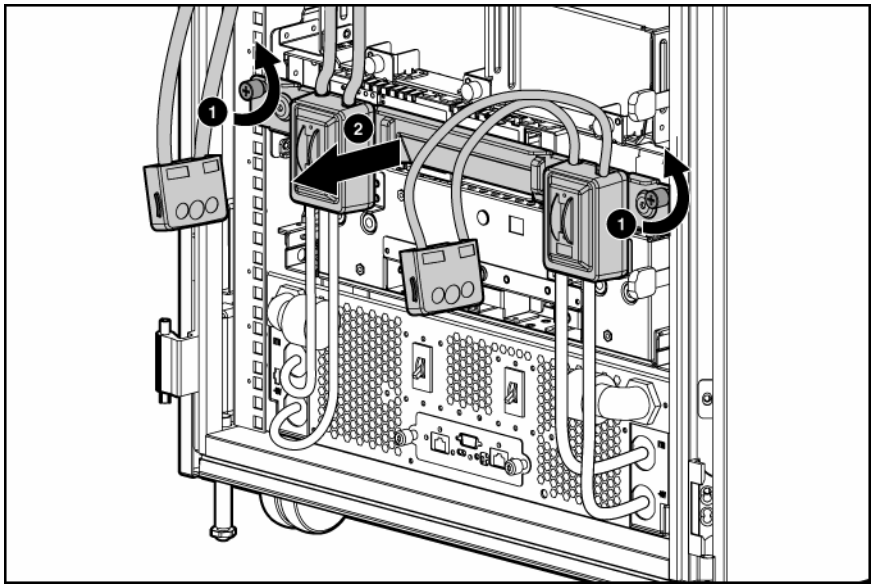
1. Remove power from the power bus box. Refer to the "Power Components Preparation" section in this chapter.
2. Disconnect the power bus box coupler from the server blade enclosure.

Figure 2-42 Disconnecting a power bus box coupler from a server blade enclosure



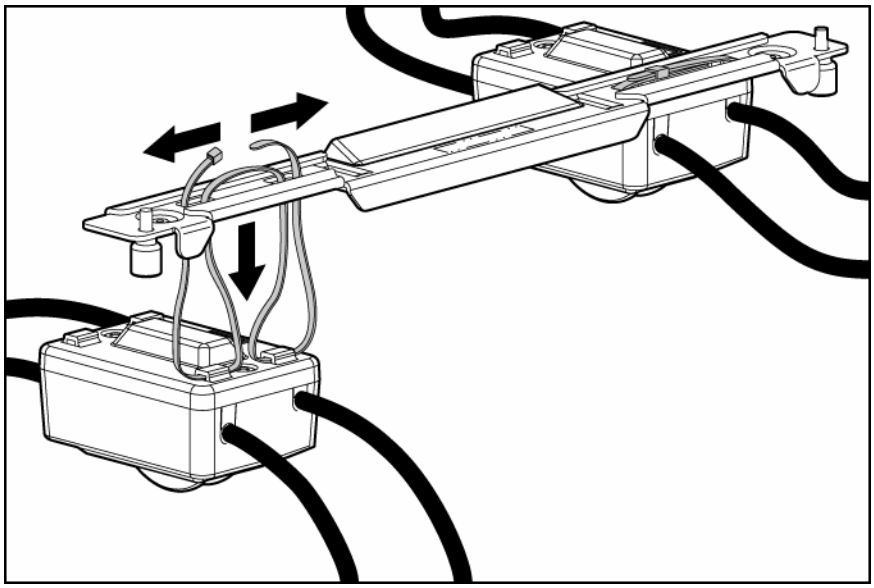
3. Remove the cable bracket from the rack:
   a. Loosen the thumbscrews (1).
   b. Pull the bracket away from the rack (2).

Figure 2-43 Removing the cable bracket from the rack



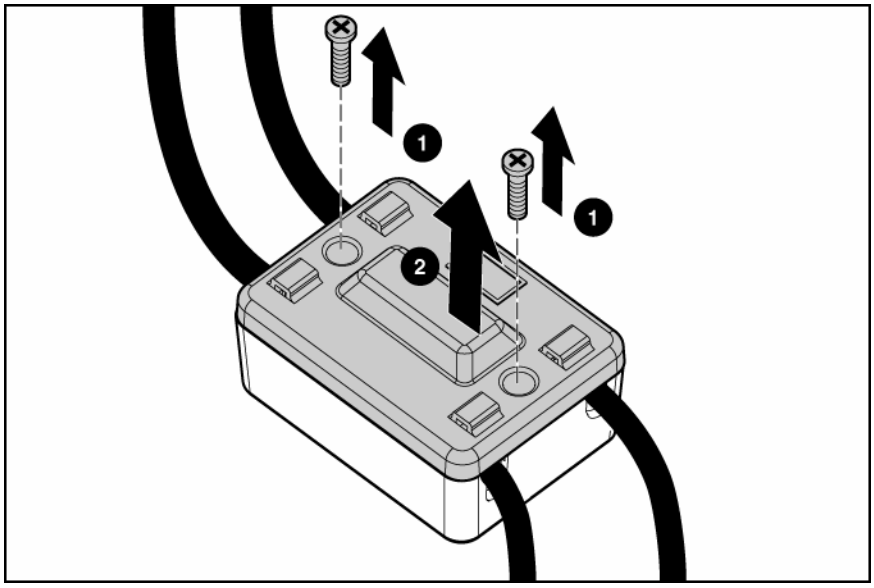
4. Remove the power bus box from the cable bracket.

Figure 2-44 Removing the power bus box from the cable bracket



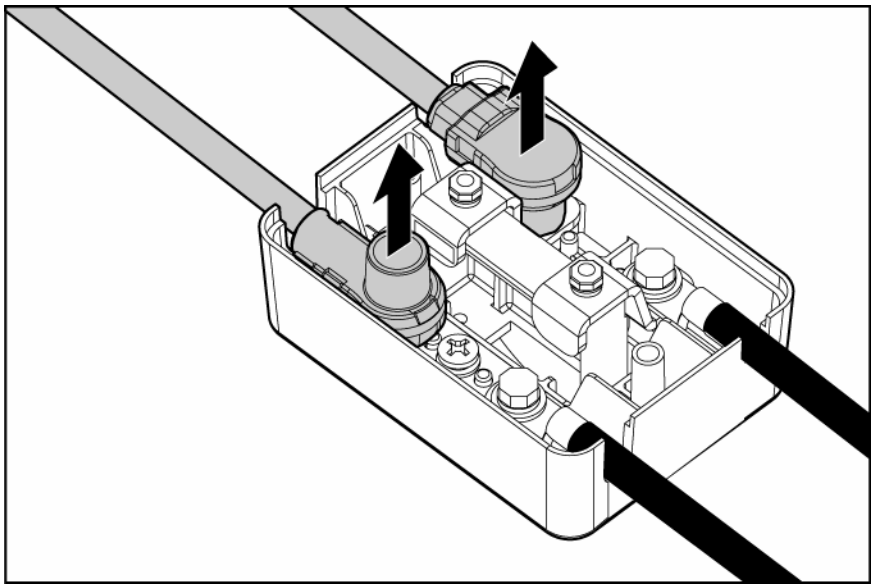
5. Remove the screws from the power bus box cover (1).
6. Remove the cover (2).

Figure 2-45 Removing the power bus box cover



7. Disconnect the facility DC input cables or power enclosure DC output power cables.

Figure 2-46 Disconnecting cables from the power bus box



Reverse steps 1 through 7 to replace the power bus box.

Facility DC Power Cables

To remove the facility DC power cables:

1. Remove power from the facility DC power cables. Refer to the "Power Components Preparation" section in this chapter. Be sure to disconnect the facility DC power cables from the facility connection.
2. Remove the access cover on the power component:
   - If the cables are connected to a bus bar, refer to steps 3 through 6 of the "Scalable or Mini Bus Bars" section in this chapter.
   - If the cables are connected to a power bus box, refer to steps 3 through 6 of the "Power Bus Box" section in this chapter.

Reverse steps 1 and 2 to replace the facility DC power cables. To install facility DC power cables, refer to the documentation that ships with the facility DC power cables.

Diagnostic Station Components

Use the procedures in this section to service HP BladeSystem p-Class diagnostic stations.

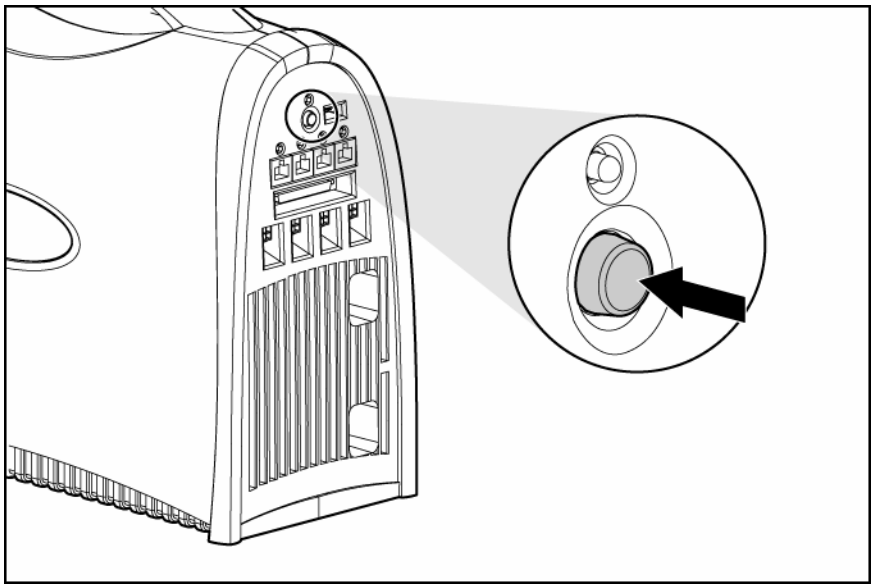
Diagnostic Station Preparation

To service the diagnostic station, you must disconnect the unit from all components and remove all power from the unit.

To prepare the diagnostic station:

1. Power down the external computer, if it is connected to the diagnostic station. Refer to the documentation for the external computer.
2. Power down the server blade, if it is connected to the diagnostic station. Refer to the "Server Blade Enclosure Preparation" section in this chapter.
3. Power down the diagnostic station by pressing the Power On/Off button.

Figure 2-47 Powering down the diagnostic station



4. Remove the diagnostic station AC power cord from the AC outlet.
5. Disconnect the DC power cord from the diagnostic station.
6. Disconnect all data cables from the diagnostic station.
7. Place the diagnostic station on a flat, level surface.

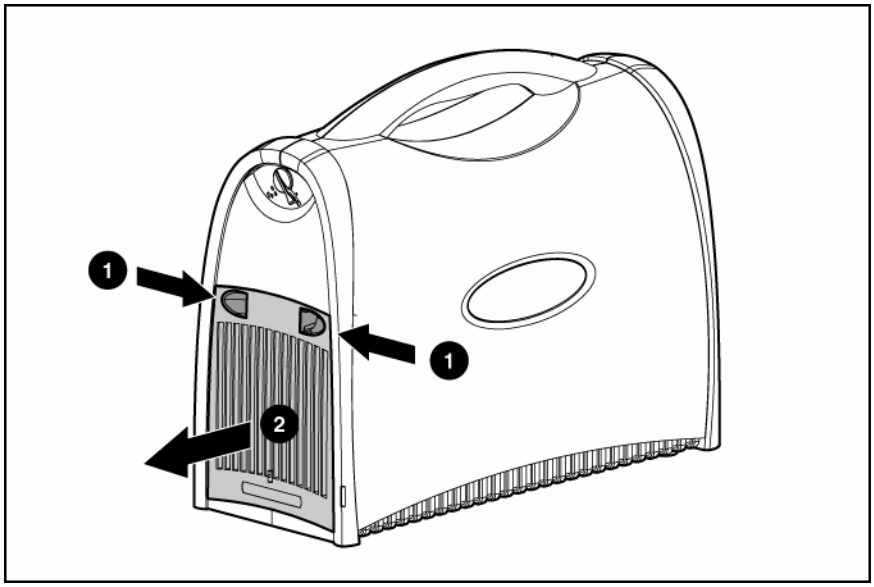
Reverse steps 1 through 7 to power up the diagnostic station. For full installation and cabling procedures, refer to the documentation that ships with the diagnostic station.

Diagnostic Station Power Supply

To remove a diagnostic station power supply:

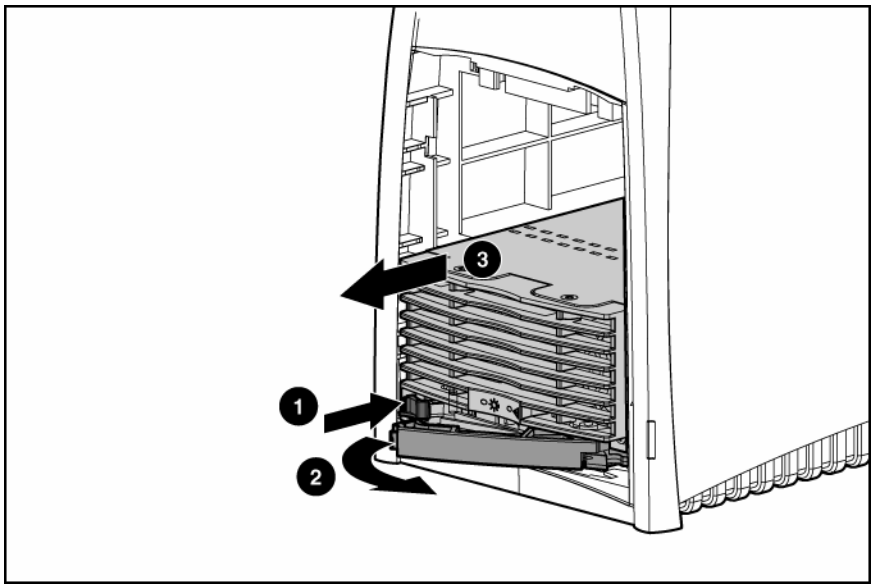
1. Power down the diagnostic station. Refer to the "Diagnostic Station Preparation" section in this chapter.
2. Remove the power supply access cover:
   a. Pinch the locking latch (1).
   b. Pull the access cover away from the chassis (2).

Figure 2-48 Removing the power supply access cover



3. Press the release button (1).
4. Open the ejector lever (2).
5. Pull the power supply out of the bay (3).

Figure 2-49 Removing the diagnostic station power supply



Reverse steps 1 through 5 to replace the diagnostic station power supply.

Diagnostic Station System Board

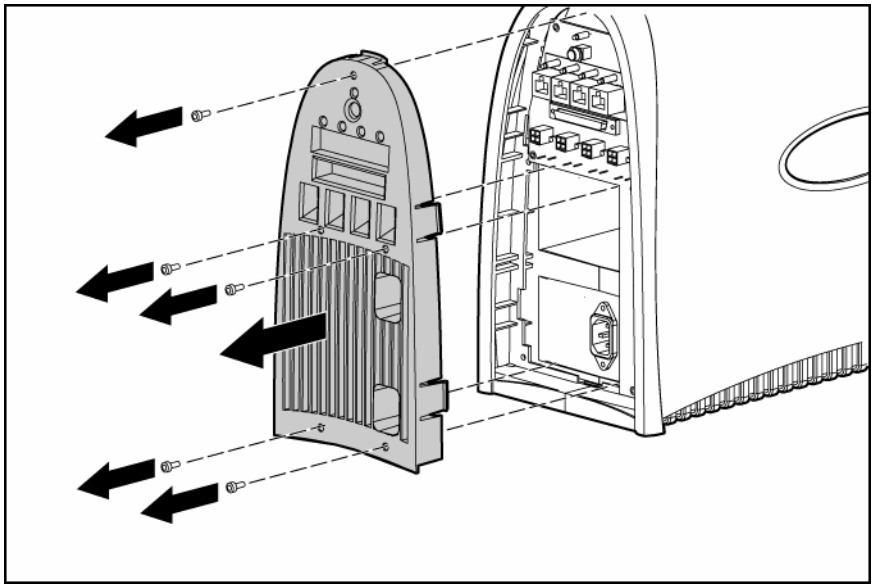
To remove a diagnostic station system board:

1. Power down the diagnostic station. Refer to the "Diagnostic Station Preparation" section in this chapter.

⚠ **WARNING!** To reduce the risk of shock or injury from high-current electrical energy, be sure to disconnect all AC power cords before performing service procedures.

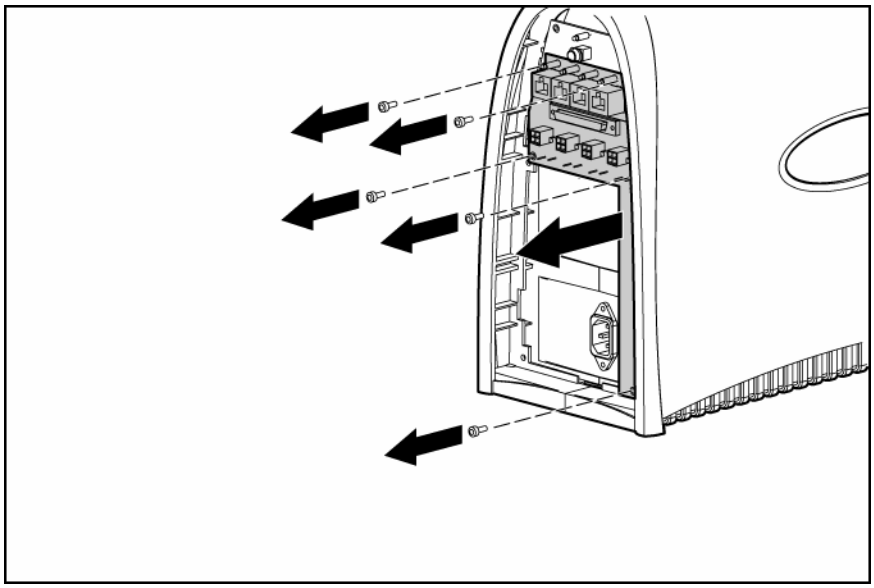
2. Use a T-15 Torx screwdriver to remove the five screws securing the front panel access cover and pull the front panel access cover away from the chassis.

Figure 2-50 Removing the front panel access cover



3. Remove the five screws securing the system board to the chassis and pull the system board away from the chassis.

Figure 2-51 Removing the diagnostic station system board



Reverse steps 1 through 3 to replace the diagnostic station system board.

3 Diagnostic Tools

This chapter is an overview of software and firmware diagnostic tools that are available for configuring, monitoring, and managing the system.

HP BladeSystem p-Class Diagnostic Tools

Use the following tools to diagnose problems, test hardware, and monitor and manage system operations.

Table 3-1 Diagnostic Tools

Tool	Description	How to run the tool
Array Diagnostics Utility (ADU)	ADU is designed to run on all HP systems that support HP array controllers. ADU collects information about the array controllers in the system and generates a list of detected problems.	For a list of HP systems that support ADU, visit the HP website: www.hp.com/support/files.html For a complete list of ADU error messages, refer to the *HP ProLiant Servers Troubleshooting Guide*.
Automatic Server Recovery-2 (ASR-2)	ASR-2 automatically restarts the server blade after a catastrophic operating system failure. Available Recovery provides software error recovery and environmental recovery. Unattended Recovery logs the error information to the IML, resets the server blade, and tries to restart the operating system.	Run RBSU and set ASR-2 to enable this tool.
	HP Diagnostics tests and verifies operation of HP hardware. If HP Diagnostics finds a hardware failure, it isolates the replaceable part, if possible.	Access HP Diagnostics when POST detects a system configuration error. For a complete list of POST error messages, refer to the *HP ProLiant Servers Troubleshooting Guide*. HP Diagnostics can be downloaded from the HP website: www.hp.com/support/files
HP Systems Insight Manager (HP SIM)	HP SIM is a client/server application used to remotely manage HP hardware in a network environment. HP SIM reports hardware fault conditions (both failure and pre-failure) and collects data for reporting and graphing.	For more information on viewing and printing the event list, refer to the *HP Systems Insight Manager User Guide* or the *HP HP BladeSystem p-Class System Setup and Installation Guide*.
ROMPaq Utility	The ROMPaq Utility checks the system and provides a choice of available ROM revisions and controller firmware.	You can download this utility from the HP website: www.hp.com
Survey Utility	The Survey Utility gathers critical hardware and software information on server blades. If a significant change occurs between data-gathering intervals, the Survey Utility marks the previous information and overwrites the survey text files to reflect the latest changes in the configuration.	The Survey Utility is available on the HP ProLiant Essential Rapid Deployment Pack CD or on the HP website: www.compaq.com/support/files/servers/us/index.html

Table 3-1 Diagnostic Tools

Tool	Description	How to run the tool
Integrated Lights-Out ROM-Based Setup Utility (iLO RBSU)	The iLO RBSU is the recommended method to configure and set up the iLO. The iLO RBSU is designed to assist you with setting up an iLO on a network; it is not intended for continued administration.	Run iLO RBSU by pressing the **F8** key during POST.
Integrated Management Log (IML)	The IML is a log of system events such as system failures or nonfatal error conditions. View events in the IML from within: • HP SIM • Survey Utility • Operating system-specific IML utilities	The IML requires HP operating system management drivers. Refer to the HP ProLiant Essentials Rapid Deployment Pack CD for instructions on installing the appropriate drivers.
Option ROM Configuration for Arrays (ORCA)	The ORCA utility is a menu-driven utility that does not require a CD and can be started when the server blade is booting. This utility enables users to perform the following functions: • Create, configure, and/or delete logical drives • Specify RAID levels • Assign online spares • Set interrupts and the boot controller order	Run ORCA by pressing the **F8** key during POST.
HP ProLiant Essentials Rapid Deployment Pack (RDP)	The optional HP ProLiant Essentials RDP is the preferred method for rapid, high-volume server blade deployments. The RDP includes Altiris eXpress Deployment Server and the SmartStart Scripting Toolkit.	Install the CD in the CD-ROM drive of the administrator workstation or client PC and refer to the documentation that ships with the software.
ROM-Based Setup Utility (RBSU)	RBSU configures the hardware installed in the server blade. This utility enables users to perform the following functions: • Store configuration information in nonvolatile memory • Manage memory installation, processor upgrades, network interface cards, and mass storage devices • Assist in installing an operating system • Configure ports and IRQs, if required	Run RBSU by pressing the **F9** key during POST.

Firmware Upgrades for Management Modules

For information about upgrading server blade management module or power management module firmware, refer to the HP website:

www.hp.com

Infrastructure Diagnostics

The server blade management modules and power management modules contain service ports that enable service personnel to perform the following functions:

- View the current vital statistics for the HP BladeSystem p-Class system infrastructure.

- Gather fault information.
- Re-populate chassis serial numbers following a backplane replacement.

Connecting to the Service Port

A connection to the service port requires a client PC with the minimum components:

- Serial connector
- Terminal software

Also, locate the null-modem cable that ships with the bus bars or power bus boxes.

To connect to the service port:

1. Connect the null-modem cable to the service port. Refer to Chapter 4, "Connectors, LEDs, and Switches," for service port locations.
2. Connect the other end of the null-modem cable to the client PC.
3. Power on the client PC.
4. Run the terminal software.

Configuring Terminal Settings

To complete the connection to the service, use terminal software, such as Microsoft® Windows® HyperTerminal or Minicom for Linux. Be sure to configure the following settings:

- 9600 bps
- No parity
- 8 data bits
- 1 stop bit
- Software flow control, may also be called XON/XOFF

IMPORTANT: The service port does not support hardware flow control settings.

- VT100 terminal emulation

Accessing the Diagnostics

To access the diagnostics:

1. Connect to the management module. Refer to the "Connecting to the Service Port" section in this chapter.
2. Configure the terminal settings. Refer to the "Configuring Terminal Settings" section in this chapter.
3. Observe the screen:
   a. If the management module and enclosure are already powered on, you may need to refresh the screen. To refresh the screen, press the **Enter** key or the space bar.

NOTE: When accessing the infrastructure diagnostics on a powered module, the screen may be blank or it may display information from the previous diagnostic cycle. Refresh the screen to see current data.

   b. If the management module and enclosure are not powered on, apply power to the enclosure. When the startup screen appears, listing the firmware version and a `Press Enter` prompt, press the **Enter** key.

Usage Guidelines

Observe the following guidelines for using diagnostics:

- Be sure the hardware connections and terminal configuration settings are complete before accessing the diagnostics.
- For screen captures, use terminal software that contains a file capture feature or for screen captures using Windows, press the **Shift** + **Print Scrn** keys and paste from the clipboard into a document.

Navigation Guidelines

- Use the hotkeys listed in the Command Legend at the bottom of the screen to navigate the diagnostics.
- Press the **M** key to return to the main screen from any other screen.
- Press the **H** key to view the help screen from any other screen.

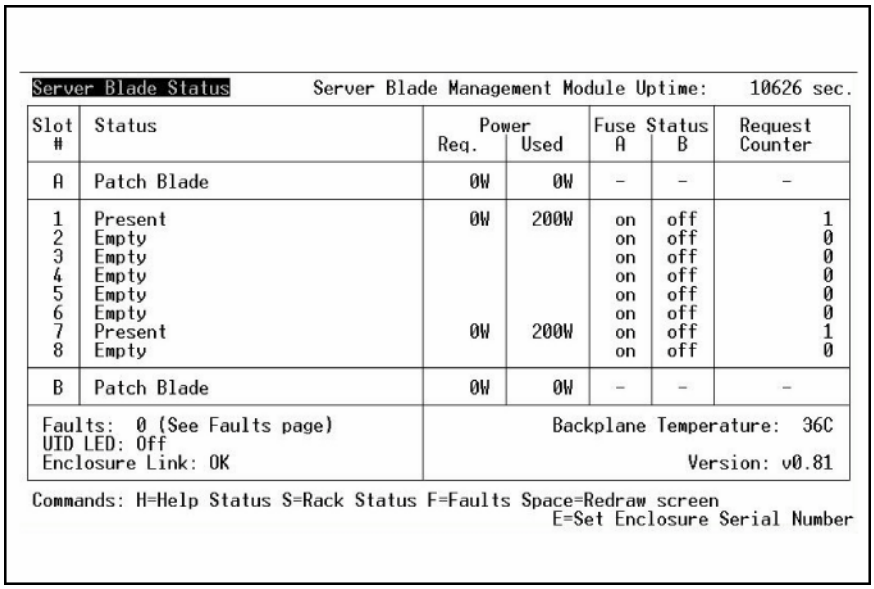
Server Blade Management Module

This section describes diagnostic screens for the server blade management module.

IMPORTANT: The screens in this section only provide information about the server blade enclosure to which you are connected. To run diagnostics and access information about different server blade enclosures, you must connect to the server blade management module on that enclosure.

NOTE: When accessing the infrastructure diagnostics on a powered module, the screen may be blank or it may display information from the previous diagnostic cycle. Refresh the screen to see current data.

Figure 3-1 Server Blade Status screen (server blade management module)



Server Blade Status Server Blade Management Module Uptime: 10626 sec.

Slot #	Status	Power Req.	Power Used	Fuse Status A	Fuse Status B	Request Counter
A	Patch Blade	0W	0W	-	-	-
1	Present	0W	200W	on	off	1
2	Empty			on	off	0
3	Empty			on	off	0
4	Empty			on	off	0
5	Empty			on	off	0
6	Empty			on	off	0
7	Present	0W	200W	on	off	1
8	Empty			on	off	0
B	Patch Blade	0W	0W	-	-	-

Faults: 0 (See Faults page)
UID LED: Off
Enclosure Link: OK
Backplane Temperature: 36C
Version: v0.81

Commands: H=Help Status S=Rack Status F=Faults Space=Redraw screen
E=Set Enclosure Serial Number

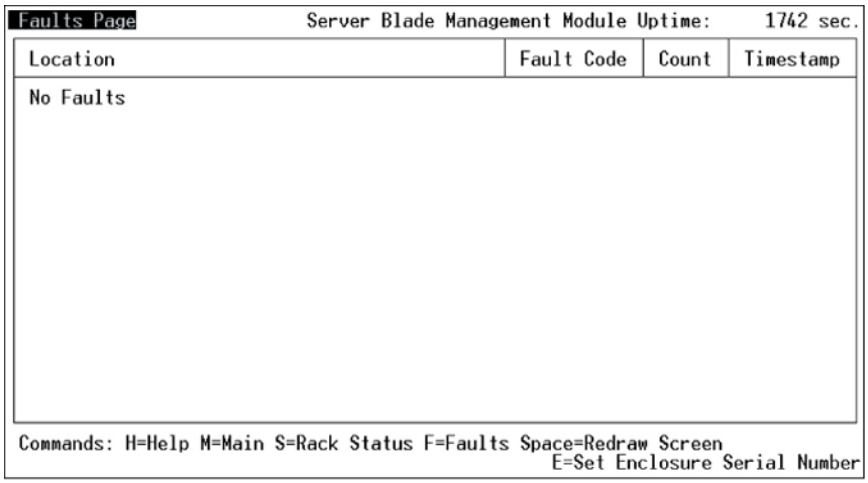
The Server Blade Status screen includes the following information:

- Uptime
- Blade location (slot #), status, power usage, fuse status, device ID, request counter
- Number of fault conditions
- Status of unit identification (UID) LED
- Status of enclosure link
- Enclosure backplane temperature
- Management module firmware version
- Command legend

Fault Screen

To view the Faults Page screen, press the **F** key.

Figure 3-2 Faults Page screen



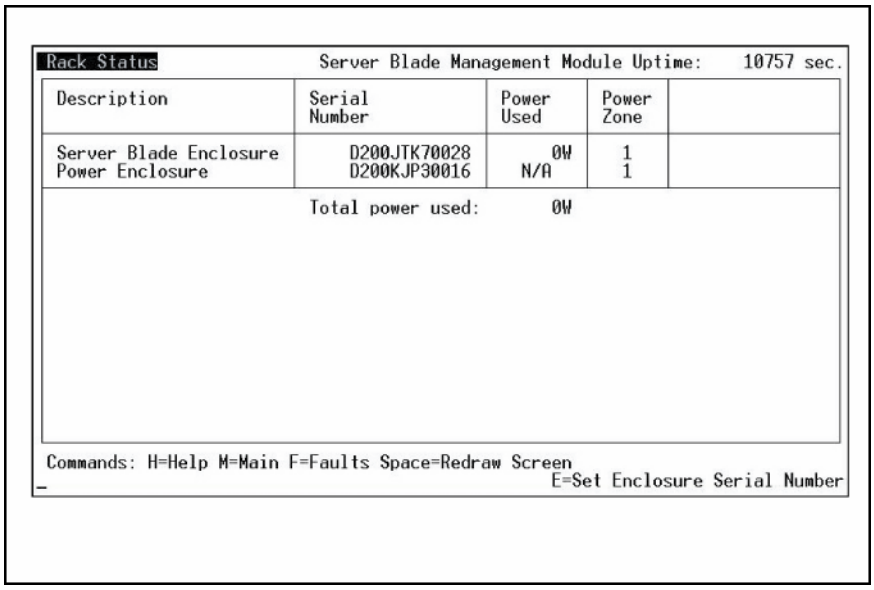
The Faults Page screen includes the following information:

- Uptime
- Location and description of fault codes
- Number of faults (count)
- Faults timestamp
- Command legend

Rack Status Screen

To view the Rack Status screen, press the **S** key.

Figure 3-3 Rack Status screen



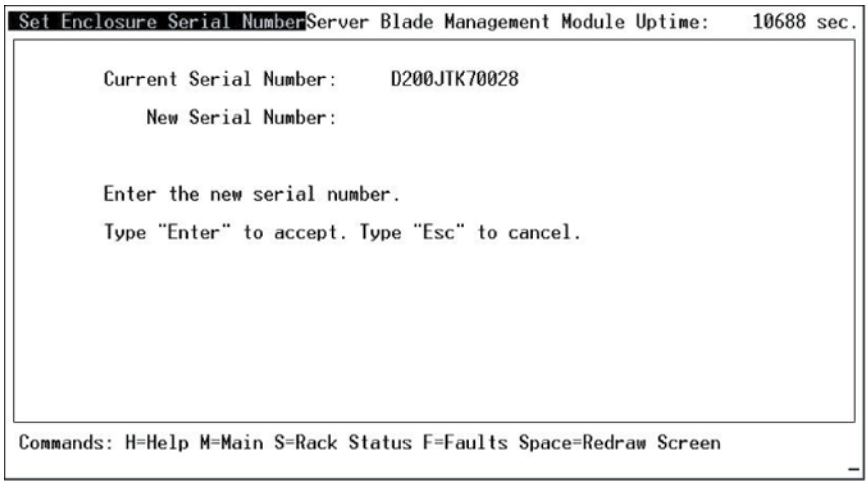
The Rack Status screen includes the following information about all enclosures in the rack:

- Uptime
- Enclsoure description
- Enclsoure serial number
- Enclosure power usage
- Enclosure power zone
- Command legend

Set Enclosure Serial Number Screen

To view the Set Enclosure Serial Number screen, press the **E** key.

Figure 3-4 Set Enclosure Serial Number screen



To set the enclosure serial number:

1. Type the new serial number.
2. Press the **Enter** key.
3. Type the new serial number again.
4. Reset all management modules in the rack for the changes to take effect.

Power Management Module

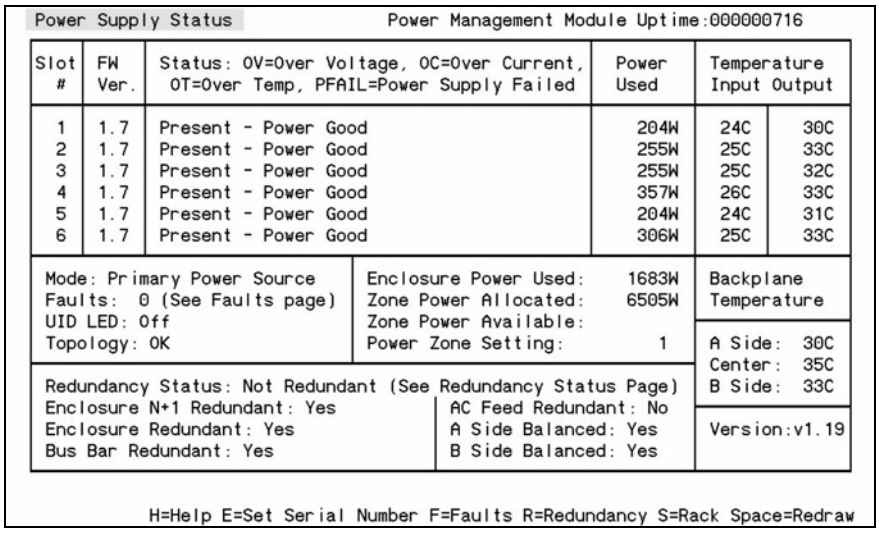
This section describes diagnostic screens for the power management module.

IMPORTANT: The screens in this section only provide information about the power enclosure to which you are connected. To run diagnostics and access information about different power enclosures, you must connect to the power management module on that enclosure.

NOTE: When accessing the infrastructure diagnostics on a powered module, the screen may be blank or it may display information from the previous diagnostic cycle. Refresh the screen to see current data.

Power Supply Status Screen

Figure 3-5 Power Supply Status screen (power management module)



The Power Supply Status screen includes the following information:

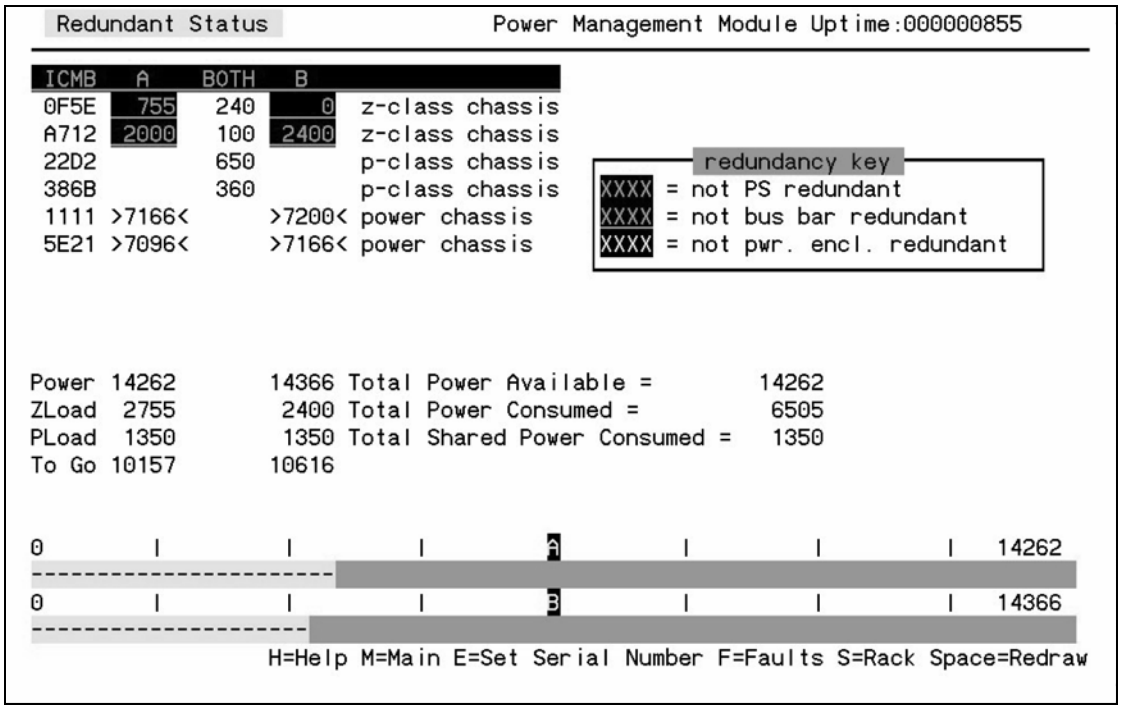
- Uptime
- Power supply location (slot #), status, power usage, input/output temperature
- Enclosure backplane temperature

- Number of fault conditions
- Status of unit identification (UID) LED
- Status of enclosure link
- Management module firmware version
- Redundancy status
- Command legend

Redundant Status Screen

To view the Redundant Status screen, press the **R** key.

Figure 3-6 Redundant Status screen



The Redundant Status screen includes the following information:

- Power supply redundancy (Enclosure N+1 redundancy)
- Power enclosure redundancy (3U power enclosures only)
- Bus bar redundancy (3U power enclosures only)
- AC feed redundancy
- A Side/B Side balancing
- Commands legend

4 Connectors, LEDs, and Switches

This chapter explains the location and function of system connectors, internal and external LEDs, and switches.

Connectors

Use the following sections to identify connectors on the following HP BladeSystem p-Class system components:

- Server blade enclosures and server blade management modules
- Power enclosures and power management modules
- RJ-45 Patch Panel and RJ-45 Patch Panel 2
- GbE and GbE2 Interconnect switches
- CGESM switch module
- Bus bars and power bus boxes
- Diagnostic cable, local I/O cable, and diagnostic station

Enclosures and Management Modules

Use Figure 4-1, Figure 4-2, and Table 4-1 to identify enclosure and management module components.

Figure 4-1 Rear view of server blade enclosure (with enhanced backplane components) and power enclosure

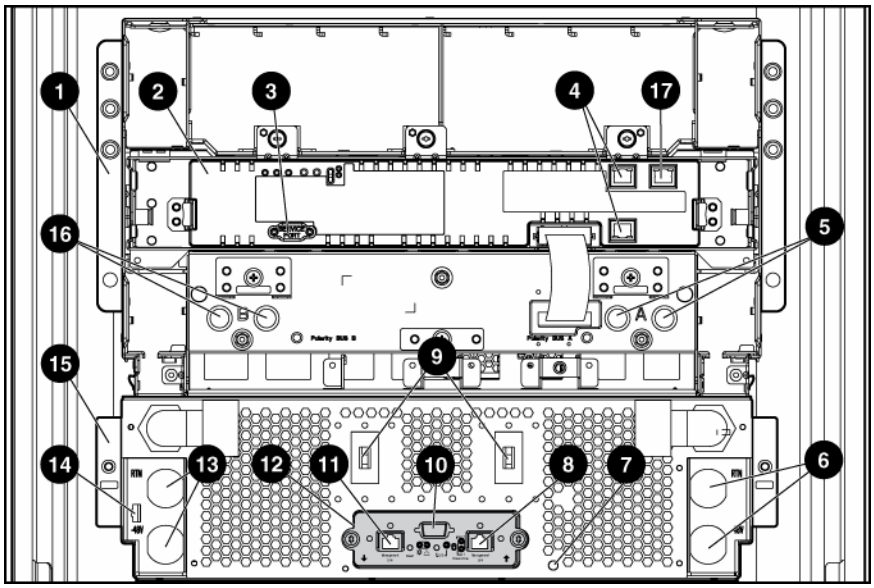


Figure 4-2 Rear view of server blade enclosure and power enclosure

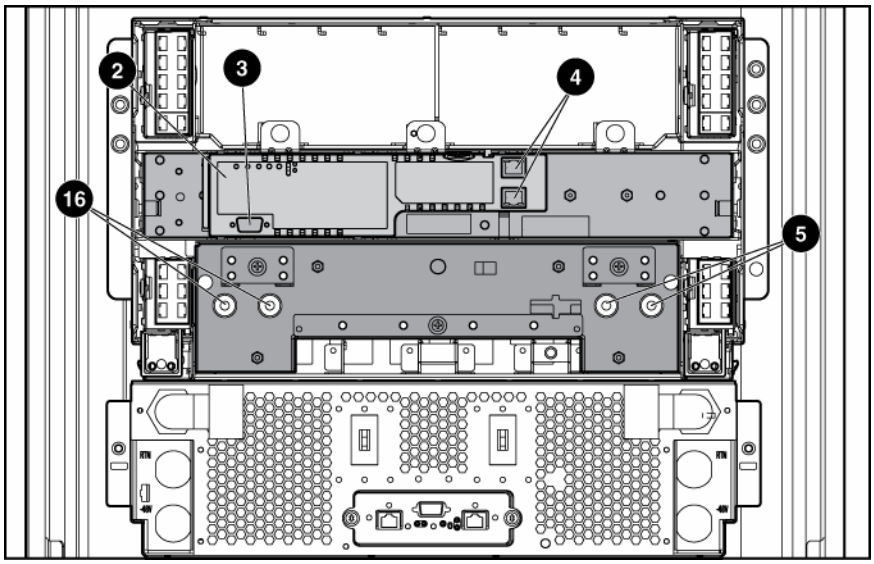


Table 4-1 Enclosure, Management Module, and Backplane Components

Item	Description
1	Server blade enclosure
2	Server blade management module
3	Server blade management module service port*
4	Server blade management link connectors (top to enclosure above, bottom to enclosure below)
5	DC power input connector for bus A
6	DC output power cable pairs (-48V and return) for bus A
7	Grounding cable screw
8	Power management link connector to enclosure above
9	Power enclosure AC circuit breakers (to hot-plug power supplies) for bus B (left) and bus A (right)
10	Power management module service port*
11	Power management link connector to enclosure below
12	Power management module
13	DC output power cable pairs (-48V and return) for bus B

Table 4-1 Enclosure, Management Module, and Backplane Components

Item	Description
14	Load-balancing signal cable connector
15	Power enclosure
16	DC power input connector for bus B
17	Server blade management module iLO port

* The service port enables qualified service personnel to run infrastructure diagnostics. Refer to Chapter 3, "Diagnostic Tools," for more information.

HP BladeSystem p—Class 1U Power Enclosures

Use Figure 4-3 and Table 4-2 to identify the HP BladeSystem p-Class 1U Power Enclosure components.

Figure 4-3 HP BladeSystem p-Class 1U Power Enclosure

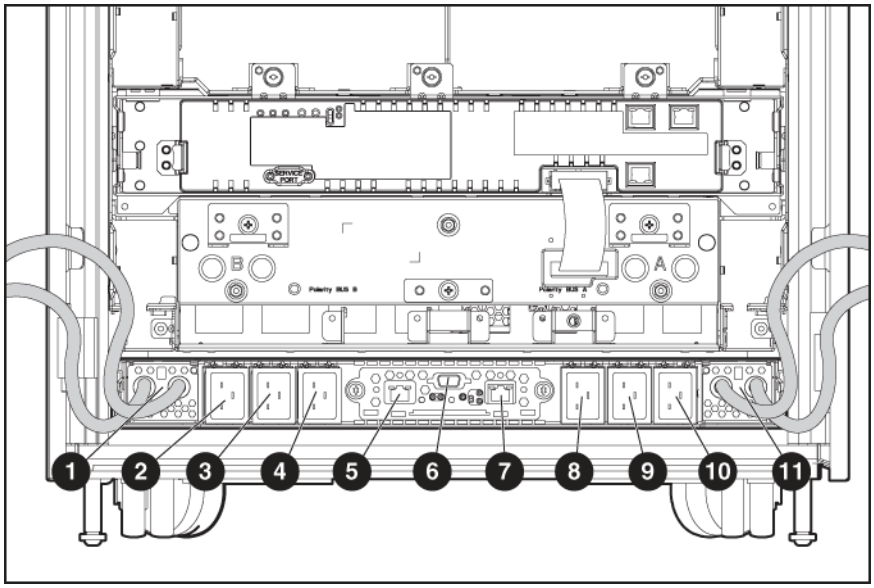


Table 4-2 Enclosure, Management Module, and Backplane Components

Item	Description
1	DC output power connector for bus B
2	AC input power connector for bay 6
3	AC input power connector for bay 5
4	AC input power connector for bay 4
5	Power enclosure management link connector (to enclosure below, if necessary)
6	Power management module service port
7	Power enclosure management link connector (to enclosure above)
8	AC input power connector for bay 3
9	AC input power connector for bay 2
10	AC input power connector for bay 1
11	DC output power connector for bus A

RJ-45 Patch Panel and RJ-45 Patch Panel 2

A pair of interconnects (either patch panels or interconnect switches) provide all network data connections for one server blade enclosure. Each RJ-45 Patch Panel and RJ-45 Patch Panel 2 has two RJ-45 interconnect modules: a 10-connector module and a 6-connector module.

Figure 4-4 and Table 4-3 identify the patch panel RJ-45 connectors corresponding to the BL20p G2 server blade network adapter Ethernet signals.

Figure 4-4 Patch panel RJ-45 connectors for the BL20p G2 server blade

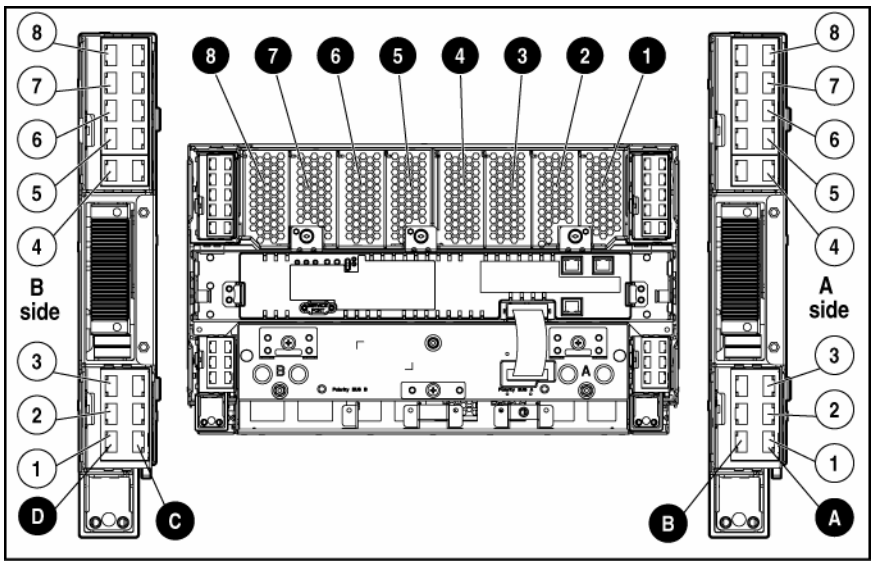


Table 4-3 Patch Panel RJ-45 Connectors for the BL20p G2 Server Blade

Item	Enclosure	Enclosure with Enhanced Backplanes
D1–D8	iLO 10/100T NIC	Not used [1]
C1–C8	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC
B1–B8	NC7781 10/100/1000T data NIC 2	NC7781 10/100/1000T data NIC [2]
A1–A8	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC

[1]ILO connections are made through the iLO port on the server blade management module.
[2]This is the default enabled PXE NIC. Using the ROM setup utility on the server, any other data NIC may be PXE enabled.

Figure 4-5 and Table 4-4 indicate the patch panel RJ-45 connectors corresponding to the BL30p server blade network adapter Ethernet signals.

IMPORTANT: BL30p server blades require the enhanced server blade enclosure.

Figure 4-5 Patch panel RJ-45 connectors for the BL30p server blades

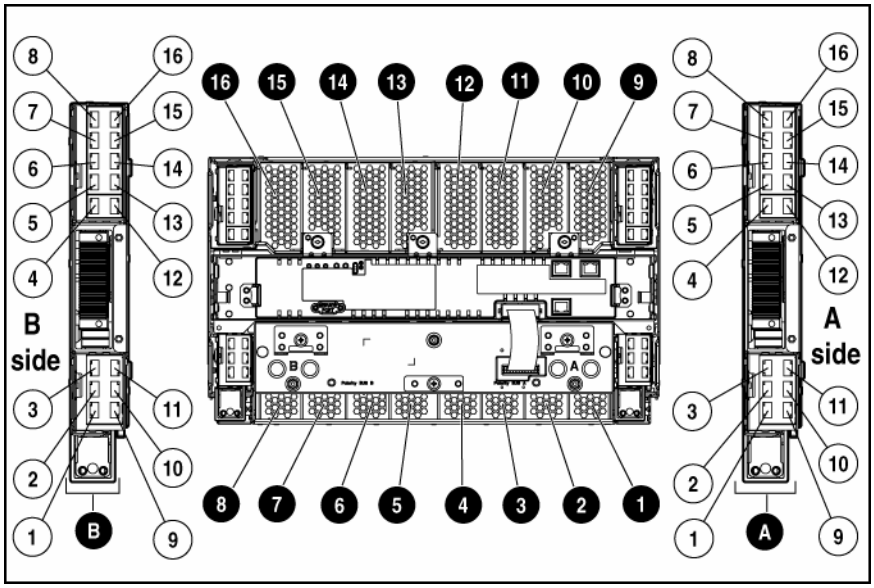


Table 4-4 Patch Panel RJ-45 Connectors for the BL30p Server Blade

Item	Enclosure	Enclosure with Enhanced Backplanes
B1–B16	N/A[1]	NC7781 10/100/1000T data NIC
A1–A16	N/A[1]	NC7781 10/100/1000T data NIC[2]

[1]BL30p series blades require server blade enclosures with enhanced backplane components. Refer to "Server Blade Enclosure Spare Parts List" in Chapter 1.
[2]This is the default enabled PXE NIC. Using the ROM setup utility on the server, any other data NIC may be PXE enabled.

Figure 4-6 and Table 4-5 indicate the patch panel RJ-45 connectors corresponding to the BL40p server blade network adapter Ethernet signals.

Figure 4-6 Patch panel RJ-45 connectors for the BL40p server blades

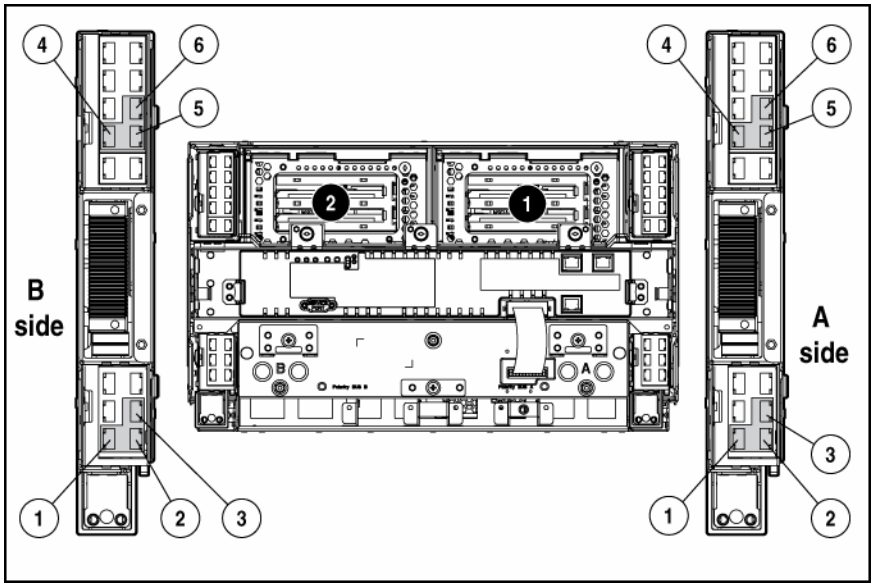


Table 4-5 Patch Panel RJ-45 Connectors for the BL40p Server Blades

Item	Enclosure	Enclosure with Enhanced Backplanes
Server Blade 1		
B1	iLO 10/100T NIC	Not used [1]
B2	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC
B3	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC
A1	NC7781 10/100/1000T data NIC [2]	NC7781 10/100/1000T data NIC [2]
A2	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC
A3	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC
Server Blade 2		
B4	iLO 10/100T NIC	Not used [1]
B5	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC
B6	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC

[1] ILO connections are made through the iLO port on the server blade management module.
[2] This is the default enabled PXE NIC. Using the ROM setup utility on the server, any other data NIC may be PXE enabled.

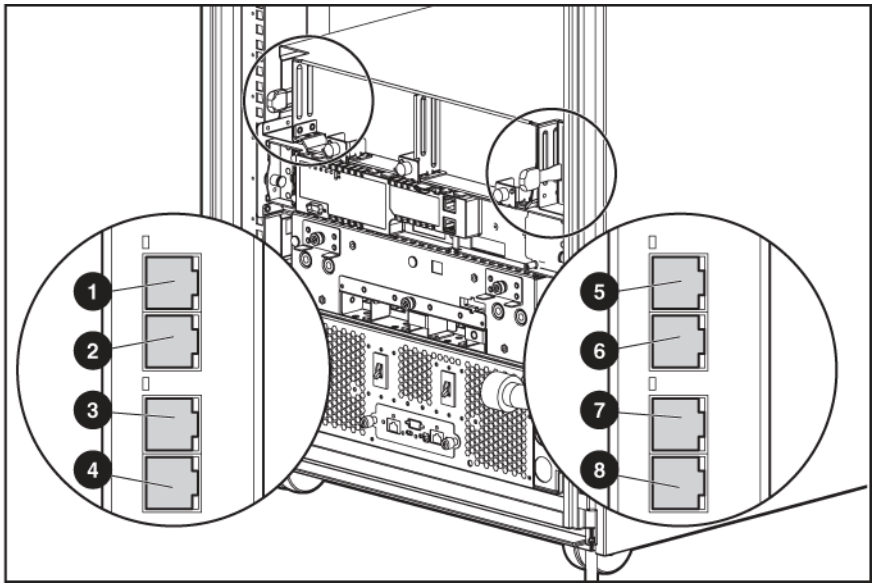
A4	NC7781 10/100/1000T data NIC [2]	NC7781 10/100/1000T data NIC [2]
A5	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC
A6	NC7781 10/100/1000T data NIC	NC7781 10/100/1000T data NIC

[2] This is the default enabled PXE NIC. Using the ROM setup utility on the server, any other data NIC may be PXE enabled

GbE and GbE2 Interconnect Switches (Rear Panel)

Each HP BladeSystem p-Class interconnect switch has an interconnect module with four Ethernet connectors for network cabling. Two additional Ethernet connectors and a serial DB-9 connector are located on the front of each interconnect switch (not shown).

Figure 4-7 QuadT interconnect module RJ-45 connectors

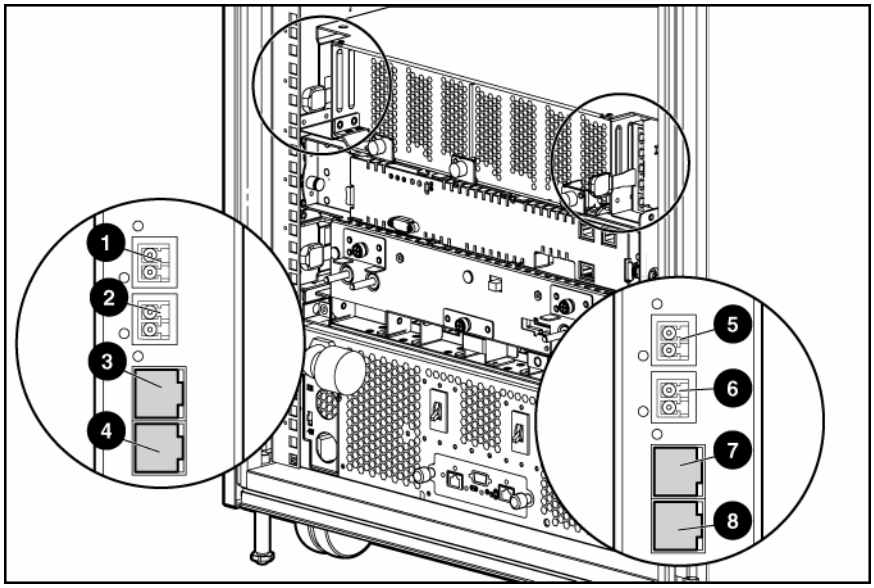


NOTE: The QuadT interconnect module ships with the HP BladeSystem p-Class C-GbE Interconnect Kit.

Table 4-6 QuadT Interconnect Module RJ-45 Connectors

Item	Description
1	Port 22 RJ-45 connector for 10/100/1000Base-T uplink on switch B
2	Port 21 RJ-45 connector for 10/100/1000Base-T uplink on switch B
3	Port 20 RJ-45 connector for 10/100Base-T uplink on switch B
4	Port 19 RJ-45 connector for 10/100Base-T uplink on switch B
5	Port 22 RJ-45 connector for 10/100/1000Base-T uplink on switch A
6	Port 21 RJ-45 connector for 10/100/1000Base-T uplink on switch A
7	Port 20 RJ-45 connector for 10/100Base-T uplink on switch A
8	Port 19 RJ-45 connector for 10/100Base-T uplink on switch A

Figure 4-8 DualTSX interconnect module connectors

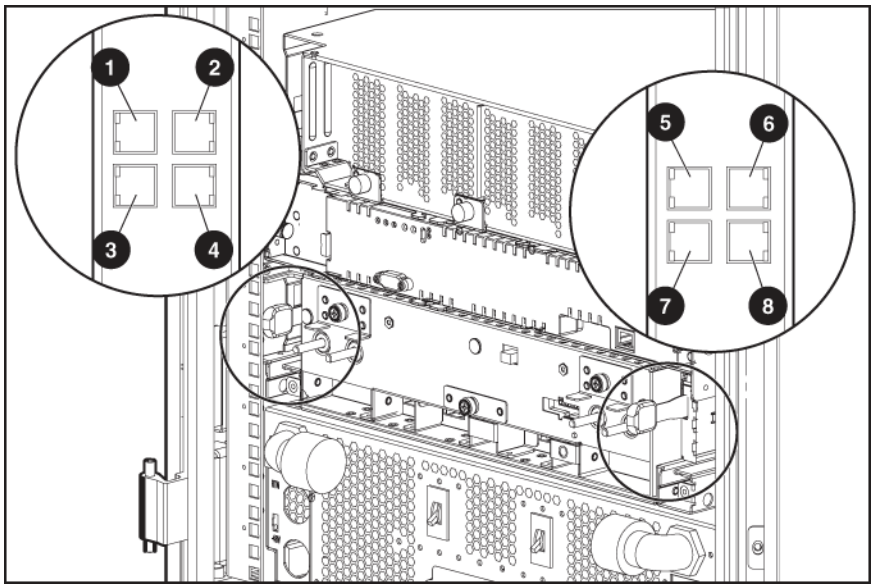


NOTE: The DualTSX interconnect module ships with the HP BladeSystem p-Class F-GbE Interconnect Kit.

Table 4-7 DualTSX Interconnect Module Connectors

Item	Description
1	Port 22 LC connector for 1000Base-SX uplink on switch B
2	Port 21 LC connector for 1000Base-SX uplink on switch B
3	Port 20 RJ-45 connector for 10/100Base-T uplink on switch B
4	Port 19 RJ-45 connector for 10/100Base-T uplink on switch B
5	Port 22 LC connector for 1000Base-SX uplink on switch A
6	Port 21 LC connector for 1000Base-SX uplink on switch A
7	Port 20 RJ-45 connector for 10/100Base-T uplink on switch A
8	Port 19 RJ-45 connector for 10/100Base-T uplink on switch A

Figure 4-9 QuadT2 interconnect module connectors

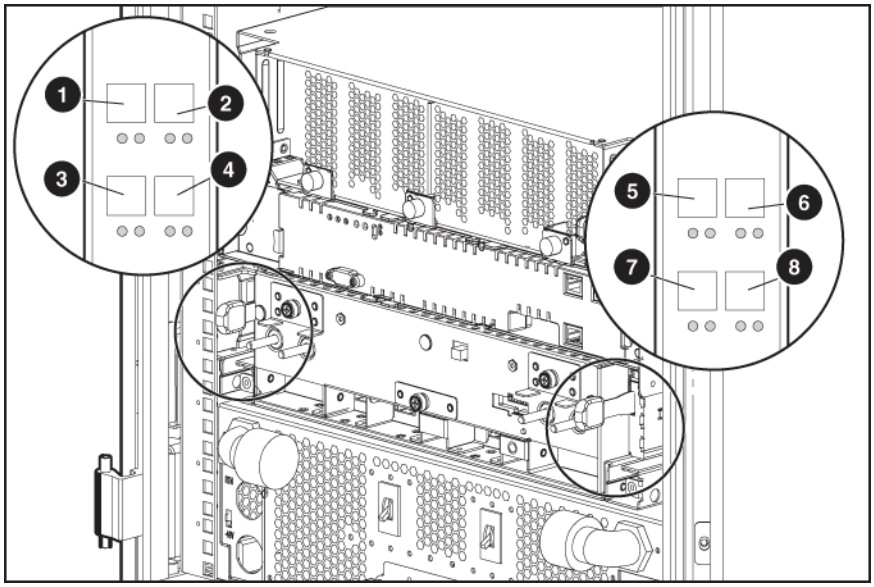


NOTE: The QuadT2 interconnect module ships with the HP BladeSystem p-Class C-GbE2 Interconnect Kit.

Table 4-8 QuadT2 Interconnect Module Connectors

Item	Description
1	Port 22 RJ-45 connector for 10/100/1000Base-T Mb uplink for switch B
2	Port 21 RJ-45 connector for 10/100/1000Base-T Mb uplink for switch B
3	Port 20 RJ-45 connector for 10/100/1000Base-T Mb uplink for switch B
4	Port 19 RJ-45 connector for 10/100/1000Base-T Mb uplink for switch B
5	Port 22 RJ-45 connector for 10/100/1000Base-T Mb uplink for switch A
6	Port 21 RJ-45 connector for 10/100/1000Base-T Mb uplink for switch A
7	Port 20 RJ-45 connector for 10/100/1000Base-T Mb uplink for switch A
8	Port 19 RJ-45 connector for 10/100/1000Base-T Mb uplink for switch A

Figure 4-10 QuadSX interconnect module connectors



NOTE: The QuadSX interconnect module ships with the HP BladeSystem p-Class C-GbE2 Interconnect Kit.

Table 4-9 QuadSX Interconnect Module Connectors

Item	Description
1	Port 22 LC fiber connector for 1000SX uplink on switch B
2	Port 21 LC fiber connector for 1000SX uplink on switch B
3	Port 20 LC fiber connector for 1000SX uplink on switch B
4	Port 19 LC fiber connector for 1000SX uplink on switch B
5	Port 22 LC fiber connector for 1000SX uplink on switch A
6	Port 21 LC fiber connector for 1000SX uplink on switch A
7	Port 20 LC fiber connector for 1000SX uplink on switch A
8	Port 19 LC fiber connector for 1000SX uplink on switch A

For pass-through of BL20p G2 series and BL30p series Fibre Channel (FC) signals, the GbE2 Storage Connectivity Kit is available for use with the C-GbE2 and F-GbE2 interconnect kits. The GbE2 Storage Connectivity Kit includes two OctalFC interconnect modules (one per GbE2 Interconnect Switch). Each OctalFC interconnect module includes eight small form factor pluggable (SFP) transceiver slots for insertion of the SFPs provided with the FC cards supported on the BL20p G2 and BL30p server blades.

NOTE: The FC LEDs (if so equipped) on the various interconnect options will not work when installed in an Enhanced Server Blade Enclosure.

Figure 4-11 OctalFC interconnect module ports

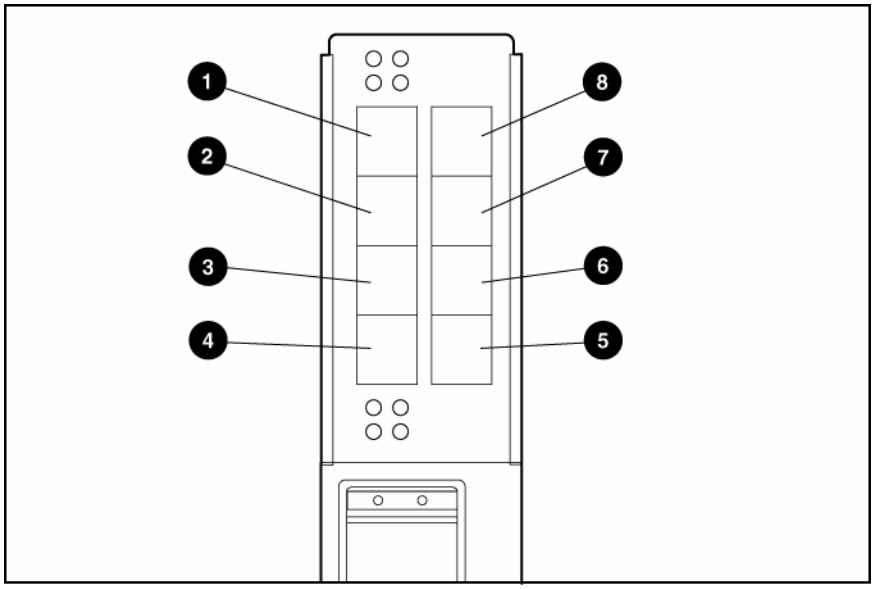


Table 4-10 OctalFC Interconnect Module Ports

Item	BL20p G2	BL30p*
1	FC port for server blade 1	FC port for server blade 1 and 9
2	FC port for server blade 2	FC port for server blade 2 and 10
3	FC port for server blade 3	FC port for server blade 3 and 11
4	FC port for server blade 4	FC port for server blade 4 and 12
5	FC port for server blade 5	FC port for server blade 5 and 13
6	FC port for server blade 6	FC port for server blade 6 and 14
7	FC port for server blade 7	FC port for server blade 7 and 15
8	FC port for server blade 8	FC port for server blade 8 and 16

*BL30p series blades require server blade enclosures with enhanced backplane components. Refer to "Server Blade Enclosure Spare Parts List" in Chapter 1.

CGESM Switch Modules

Front Panel

Use Figure 4-12 and Table 4-11 to identify connectors on the CGESM switch module front panel.

Figure 4-12 CGESM connectors

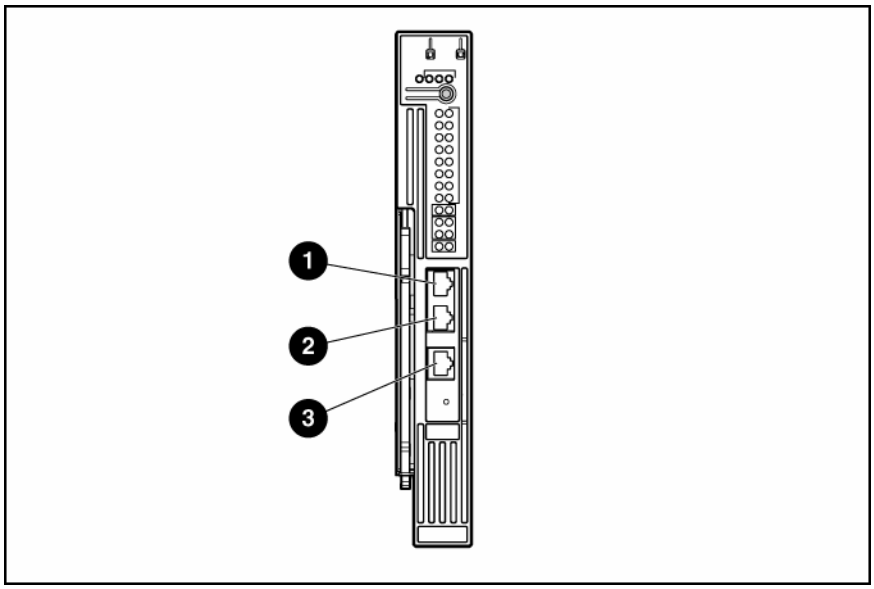


Table 4-11 CGESM Switch Module Connectors

Item	Description
1	Ethernet port 23
2	Ethernet port 24
3	Console port

Rear Panel

Use Figure 4-13 and Table 4-12 to identify the SFP ports for the 10/100/1000 Base-T copper or 1000 Base-SX fiber uplinks (ports 19-22)

Figure 4-13 Rear panel SFP port numbering

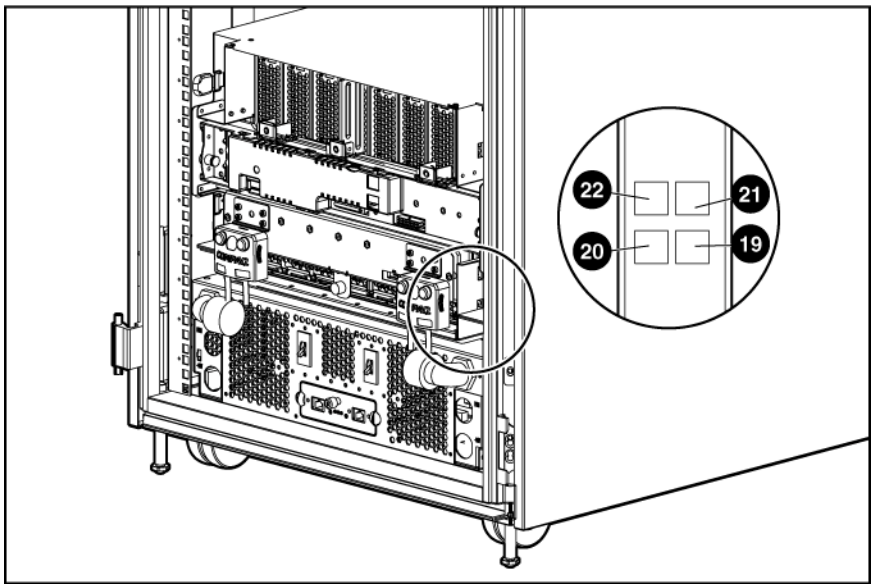


Table 4-12 SFP Module Ports

Port	Description
22	Port 22 SFP connector for 10/100/1000 Base-T copper or 1000 Base-SX fiber uplink
21	Port 21 SFP connector for 10/100/1000 Base-T copper or 1000 Base-SX fiber uplink
20	Port 20 SFP connector for 10/100/1000 Base-T copper or 1000 Base-SX fiber uplink
19	Port 19 SFP connector for 10/100/1000 Base-T copper or 1000 Base-SX fiber uplink

Mini and Scalable Bus Bars

Use Figure 4-14 and Table 4-13 to identify mini and scalable bus bar components.

Figure 4-14 Scalable (shown left) and mini (shown right) bus bar components

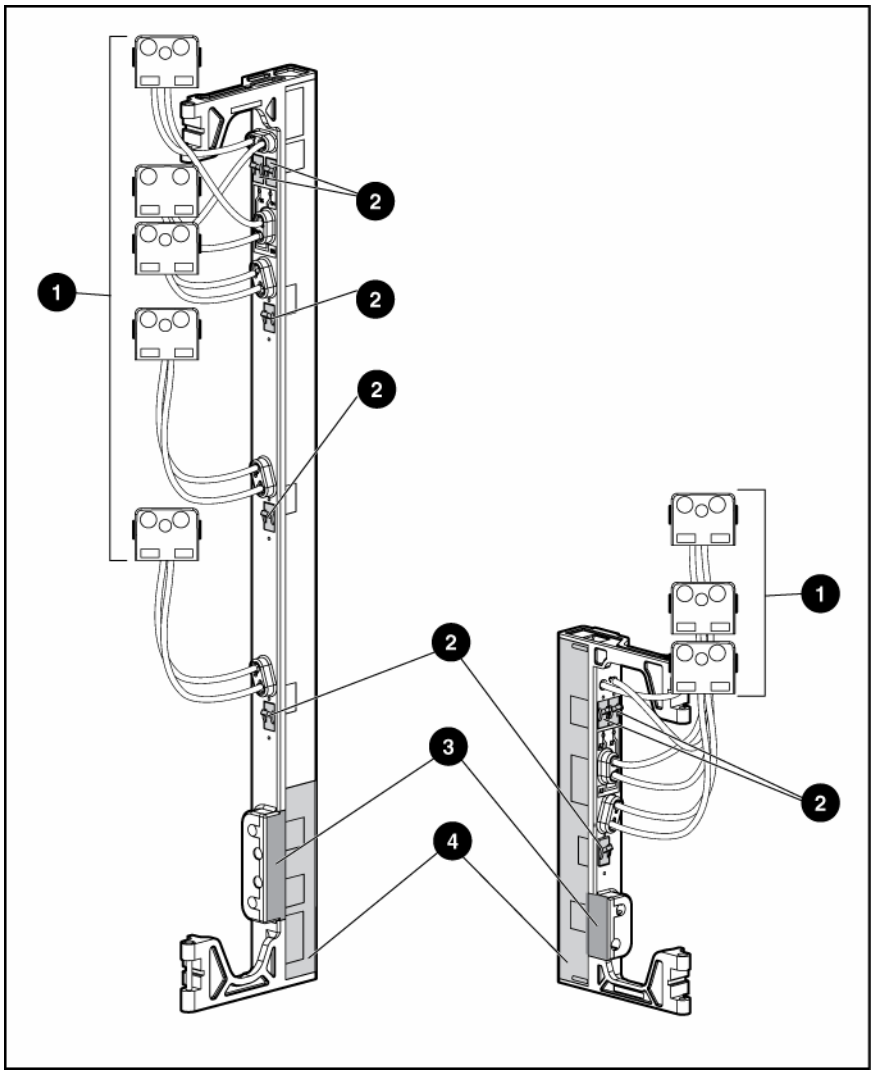


Table 4-13 Mini and Scalable Bus Bar Components

Item	Description
1	DC power output cables with couplers
2	DC circuit breakers
3	DC power input connector access
4	DC power input connector access cover
5	Mini Bus Bar Dual Power Box (not shown; for use with Mini Bus Bar only)*

* Included in the Mini Bus Bar Dual Power Kit, this option enables the Mini Bus Bar to support two power enclosures.

Power Bus Box

Use Figure 4-15 and Table 4-14 to identify power bus box components.

Figure 4-15 Power bus box components (some internal pieces removed for clarity)

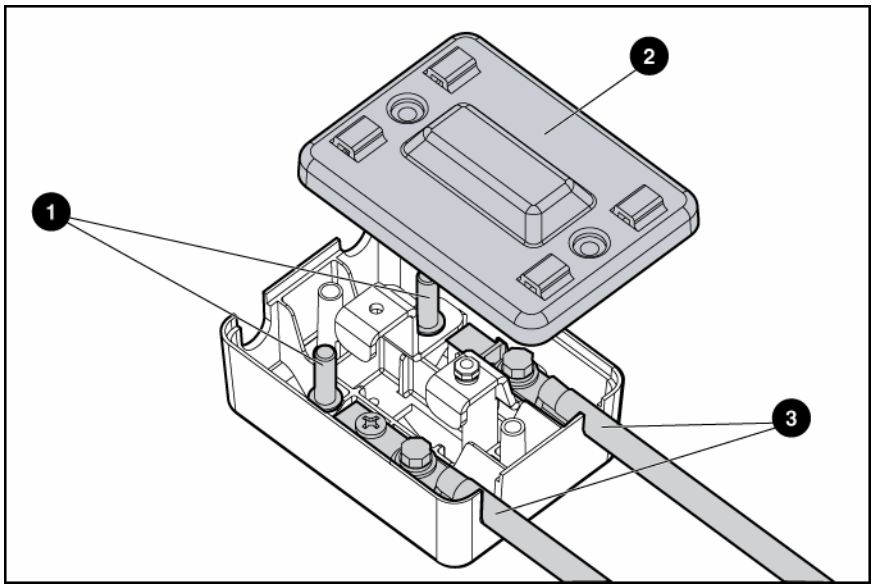


Table 4-14 Power Bus Box Components

Item	Description
1	DC power input connectors
2	Access cover
3	DC power output cables with coupler (installed)
	Circuit breaker (on opposite side)

Diagnostic and Local I/O Cables

CAUTION: Disconnect the diagnostic cable or the local I/O cable from the port when not in use. The port and connector do not provide permanent connections.

CAUTION: Rear iLO connector performance degrades when the local I/O cable or the diagnostic cable is in use, even when the iLO connector on the cable is not in use.

CAUTION: Always match the server blade connector on the local I/O cable to the I/O port that is located next to the I/O icon. Match the server blade connector on the diagnostic cable to the diagnostic port on the front of the server blade. Mismatched cables prevent proper connection.

Use either the diagnostic cable or the local I/O cable to perform some server blade configuration and diagnostic procedures. Depending on the model, the server blade will have either a diagnostic port or an I/O port. The I/O port only accepts the local I/O cable and the diagnostic port only accepts the diagnostic cable. If the server blade has an I/O icon next to the I/O port on the front of the server blade, use the local I/O cable. If the port has no icon, use the diagnostic cable.

Use Figure 4-16 to identify the I/O icon. Use Figure 4-17 and Table 4-15 to identify diagnostic cable connectors.

Figure 4-16 Local I/O cable and I/O icon

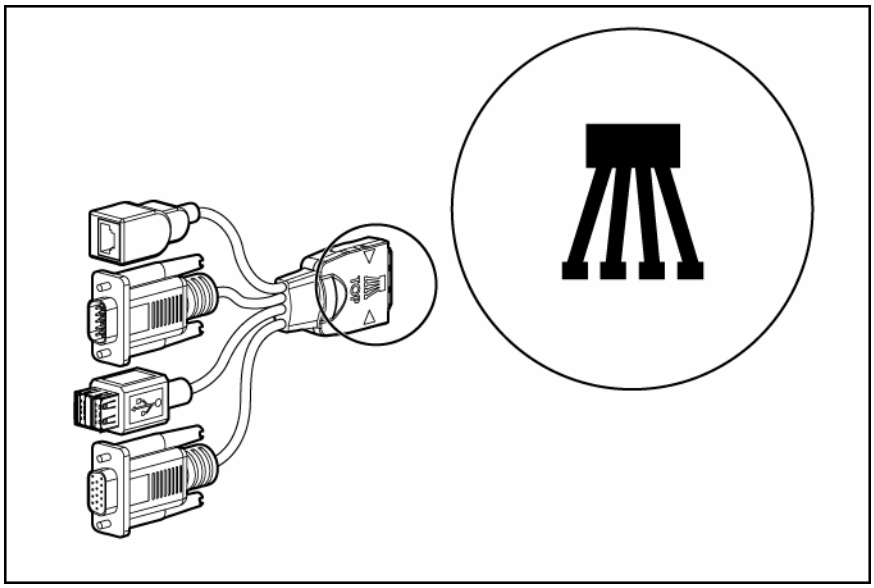


Figure 4-17 Diagnostic and local I/O cable connectors

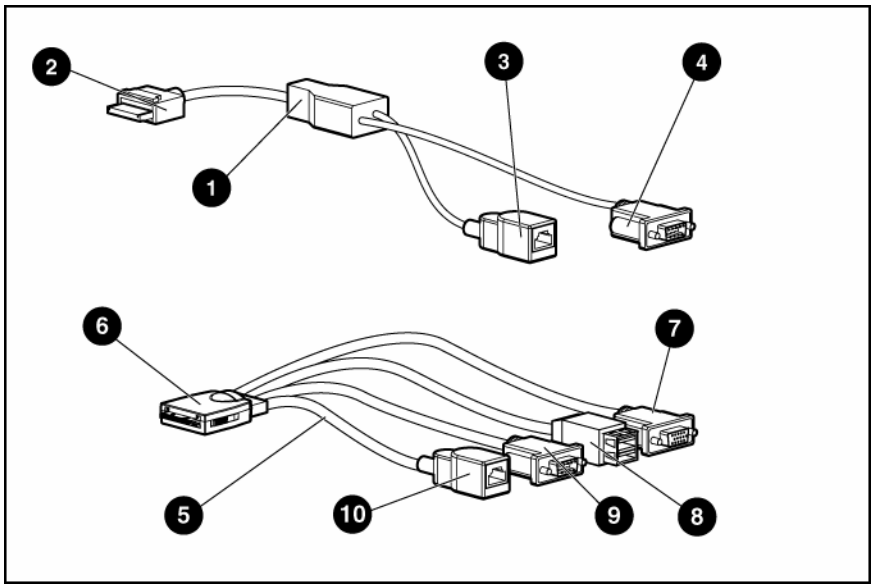


Table 4-15 Diagnostic and Local I/O Cable Connectors

Item	Description
1	Diagnostic cable
2	Server blade connector
3	iLO RJ-45 (10/100 Ethernet) connector
4	Kernel debug connector**
5	Local I/O cable*
6	Server blade connector
7	Video connector
8	USB connectors (2)
9	Kernel debug connector**
10	iLO RJ-45 (10/100 Ethernet) connector

* The local I/O cable is labeled with the I/O icon. The diagnostic cable has no label or icon.
** The kernel debug connector does not function as a serial port.

Diagnostic Station

Use Figure 4-18 and Table 4-16 to identify diagnostic station connectors.

Figure 4-18 Diagnostic station connectors

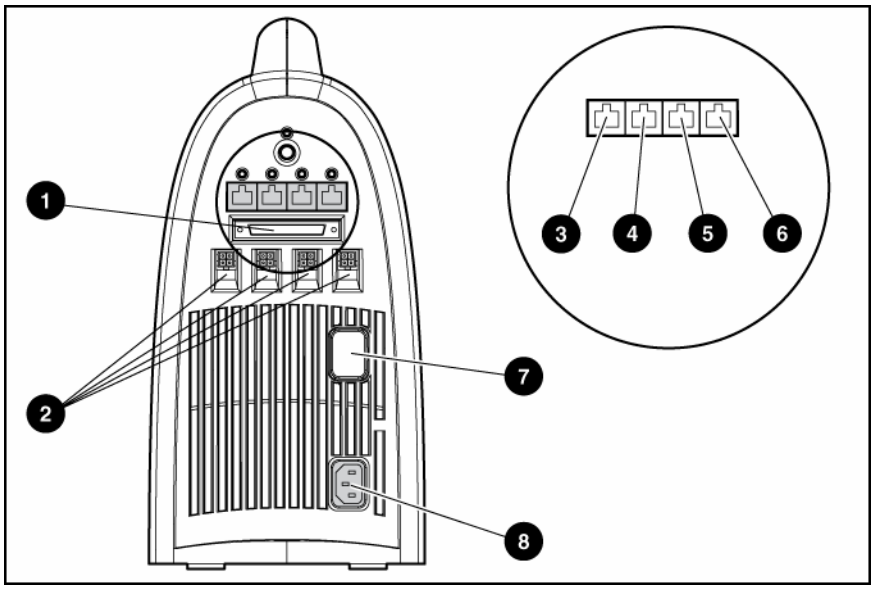


Table 4-16 Diagnostic Station Connectors

Item	Description
1	Data transfer port
2	DC power connectors
3	RJ-45 connector for NIC
4	RJ-45 connector for NIC
5	RJ-45 connector for NIC
6	RJ-45 connector for NIC
7	Reserved
8	AC power connector

LEDs

Use the following section to identify LEDs on the following HP BladeSystem p-Class system components:

- Hot-plug SCSI hard drives
- Server blade enclosure
- RJ-45 patch panels
- Interconnect switches
- Interconnect modules
- Server blade management module
- Power management module
- Power enclosure
- Hot-plug power supply
- Bus bars
- Diagnostic station

Hot-Plug SCSI Hard Drives

Each hot-plug SCSI hard drive has three LED indicators located on the front of the drive. The LEDs provide activity, online, and fault status for each corresponding drive when configured as a part of an array and attached to a powered-on Smart Array controller. Their behavior may vary depending on the status of other drives in the array. Use Figure 4-19 and Table 4-17 to identify LED locations and functions.

Figure 4-19 Hot-plug SCSI hard drive LEDs

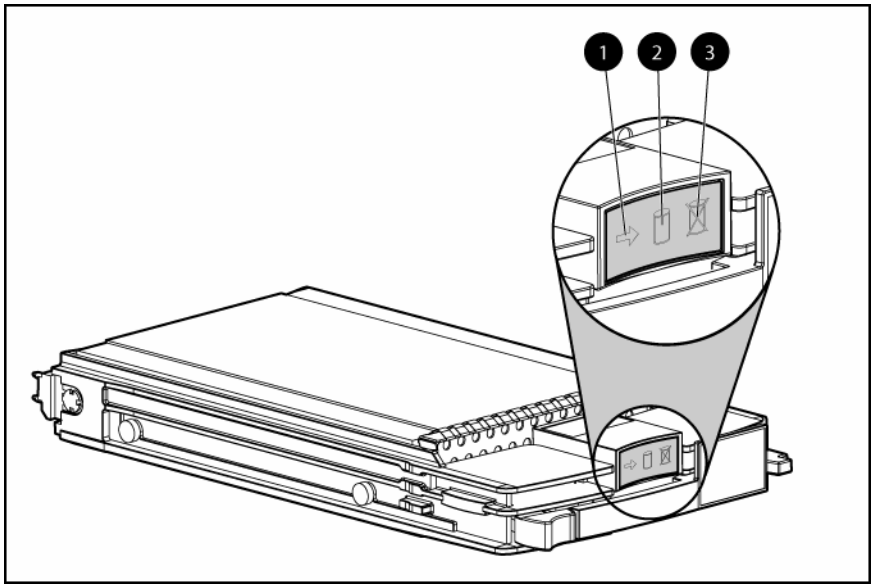


Table 4-17 Hot-Plug SCSI Hard Drive LEDs

1 Activity	2 Online	3 Fault	Means
On	Off	Off	**Do not remove the drive. Removing a drive during this process causes data loss.** The drive is being accessed and is not configured as part of an array.
On	Flashing	Off	**Do not remove the drive. Removing a drive during this process causes data loss.** The drive is rebuilding or undergoing capacity expansion.
Flashing	Flashing	Flashing	**Do not remove the drive. Removing a drive during this process causes data loss.** The drive is part of an array being selected by the Array Configuration Utility. -Or- The Options ROMPaq is upgrading the drive.
Off	Off	Off	OK to replace the drive online if a predictive failure alert is received and the drive is attached to an array controller. The drive is not configured as part of an array. -Or- If this drive is part of an array, then a powered-on controller is not accessing the drive. -Or- The drive is configured as an online spare.
Off	Off	On	OK to replace the drive online. The drive has failed and has been placed offline.
Off	On	Off	OK to replace the drive online if a predictive failure alert is received, provided that the array is configured for fault tolerance and all other drives in the array are online. The drive is online and configured as part of an array.
On or flashing	On	Off	OK to replace the drive online if a predictive failure alert is received, provided that the array is configured for fault tolerance and all other drives in the array are online. The drive is online and being accessed.

Server Blade Enclosure

The server blade enclosure has two LEDs that provide the status of DC power input. Use Figure 4-20 and Table 4-18 to identify LED locations and functions.

Figure 4-20 Server blade enclosure LEDs

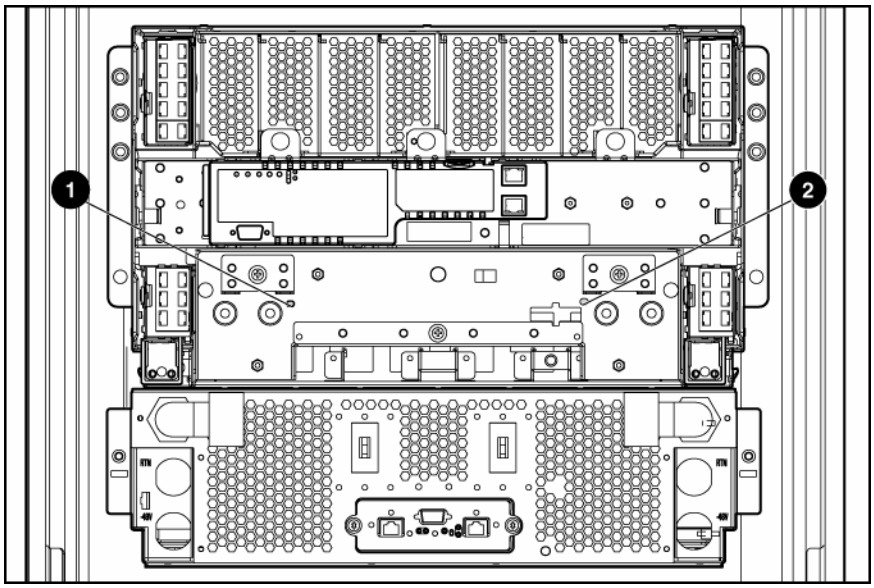


Table 4-18 Server Blade Enclosure LEDs

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

RJ-45 Patch Panel and RJ-45 Patch Panel 2

Each RJ-45 connector on the patch panel RJ-45 modules has two LEDs. Use Figure 4-21 and Table 4-19 to identify LED locations and functions for one connector.

Figure 4-21 RJ-45 patch panel LEDs

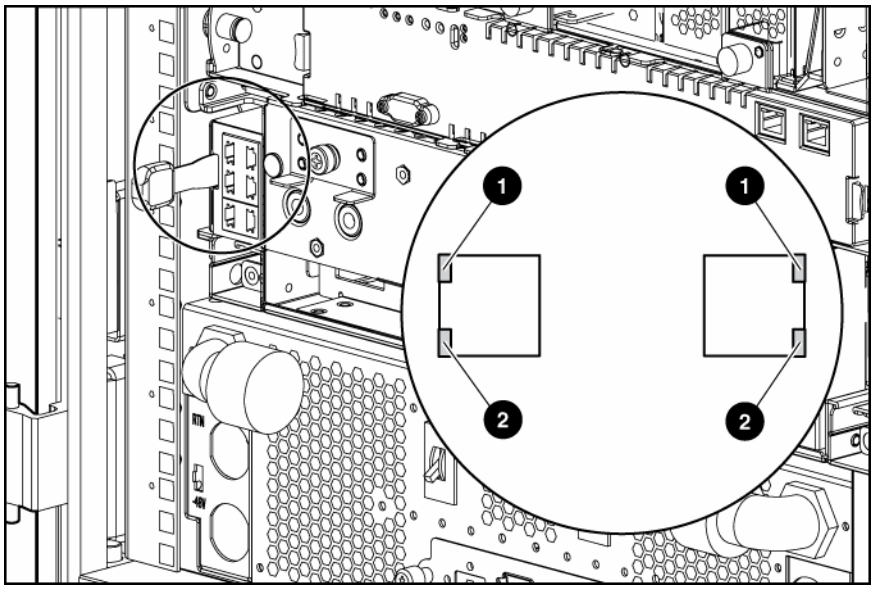


Table 4-19 RJ-45 Patch Panel LEDs

Item	LED Description	Status
1	Network link	Amber = Network link Off = No network link
2	Network activity/server blade presence	Green (with no cable) = Server blade present Green (with cable) = Server blade present and no activity Green flashing = Network activity Off = Server blade not present

GbE and GbE2 Interconnect Switches

Each interconnect switch has LEDs to indicate connectivity, speed, and management functions.

Front Panel LEDs

Use Figure 4-22 through Figure 4-27 and Table 4-20 through Table 4-25 to identify interconnect switch front panel LED locations, assignments, and functions.

Figure 4-22 GbE Interconnect Switch front panel LEDs

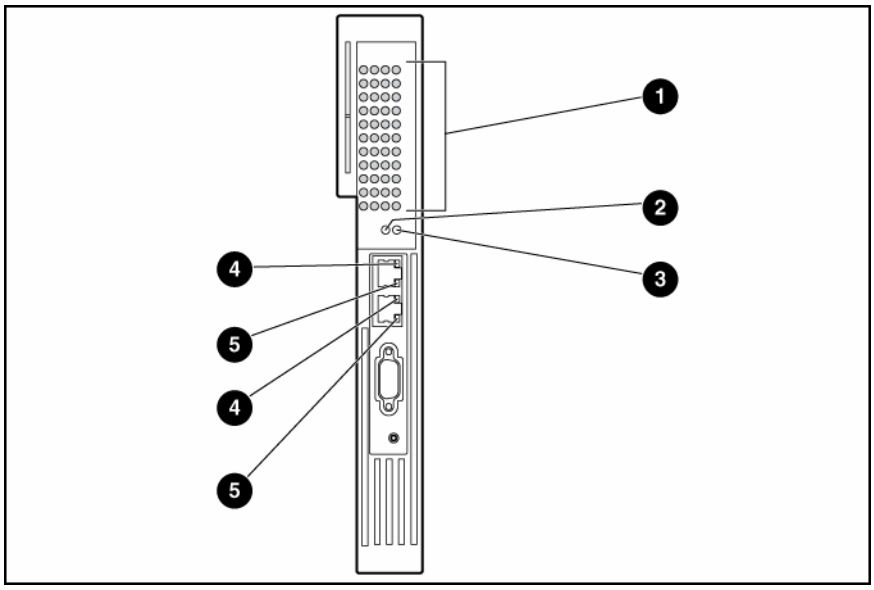


Table 4-20 GbE Interconnect Switch Front Panel LEDs

Item	LED Description	Status
1	NIC Link activity and speed LEDs	Refer to Figure 4-23, Figure 4-24, Table 4-21, and Table 4-22 for NIC LED assignments and functions.
2	Power status LED	Green = Power on Amber = Stand-by mode Off = Power off
3	Management status LED	Flashing = Management session active Off = No management session active
4	Front panel RJ-45 connector link speed LEDs	Amber = 1000 Mbps Green = 100 Mbps Off = No link

Table 4-20 GbE Interconnect Switch Front Panel LEDs

Item	LED Description	Status
5	Front panel RJ-45 connector link activity LEDs	Green = Link and no activity Green flashing = Link and activity Amber = Port disabled Off = No link

Figure 4-23 GbE Interconnect Switch front panel NIC LED assignments

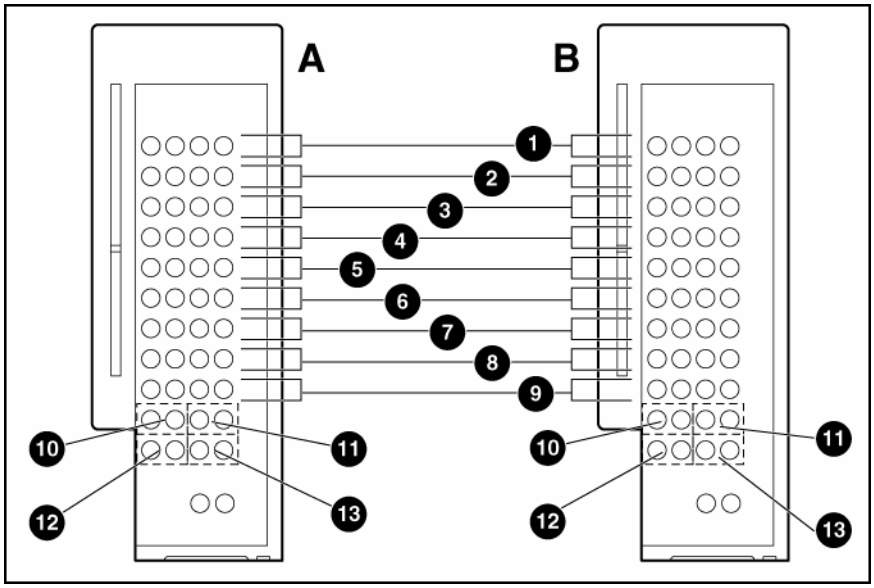


Table 4-21 GbE Interconnect Switch Front Panel NIC LED Assignments

Item	Description
1	Server blade bays 1 and 9* NICs
2	Server blade bays 2 and 10* NICs
3	Server blade bays 3 and 11* NICs
4	Server blade bays 4 and 12* NICs
5	Server blade bays 5 and 13* NICs
6	Server blade bays 6 and 14* NICs
7	Server blade bays 7 and 15* NICs
8	Server blade bays 8 and 16* NICs
9	Ports 17 and 18 inter-switch crosslinks
10	Port 19 RJ-45 connector for switch A rear panel uplink
11	Port 20 RJ-45 connector for switch A rear panel uplink
12	Port 21 RJ-45 connector for switch A rear panel uplink
13	Port 22 RJ-45 connector for switch A rear panel uplink

* Server bays 9 through 16 apply only when using BL30p series server blades.

Figure 4-24 GbE Interconnect Switch front panel NIC LED functions

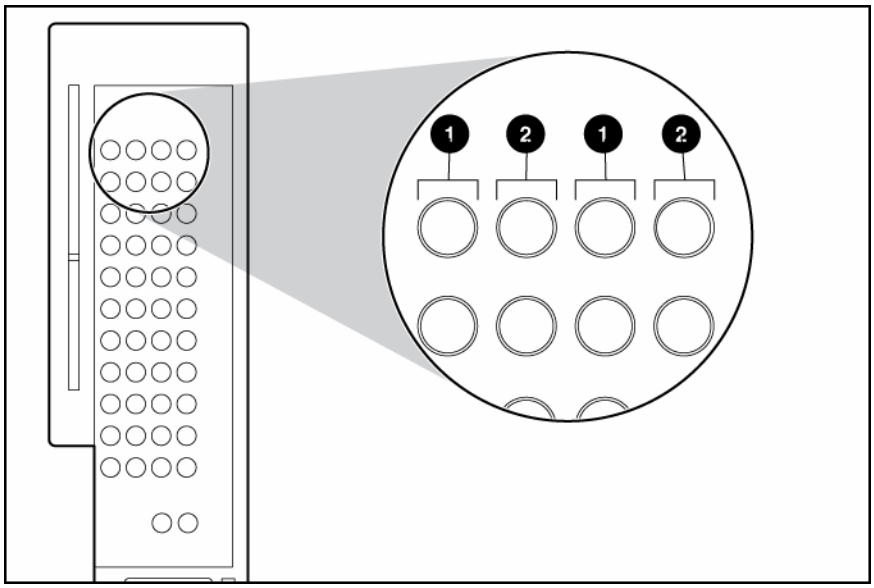


Table 4-22 GbE Interconnect Switch Front Panel NIC LED Functions

Item	LED Description	Status
1	Link speed	Amber = 1000 Mbps Green = 100 Mbps Off = 10 Mbps
2	Link activity	Green = Link and no activity Green flashing = Link and activity Amber = Port disabled Off = No link

Figure 4-25 GbE2 Interconnect switch front panel LEDs

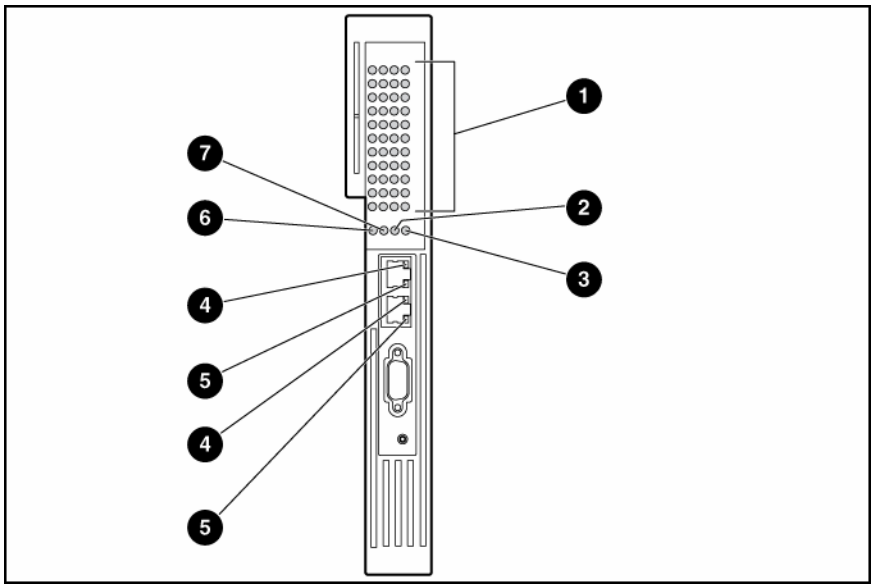


Table 4-23 GbE2 Interconnect Switch Front Panel LEDs

Item	LED Description	Status
1	NIC Link activity and speed LEDs	Refer to Figure 4-26, Figure 4-27, Table 4-24, and Table 4-25 for NIC LED assignments and functions.

Table 4-23 GbE2 Interconnect Switch Front Panel LEDs

Item	LED Description	Status
2	Power status LED	Green = Power on Amber = Stand-by mode Off = Power off
3	Management status LED	Flashing = Management session active Off = No management session active
4	Front panel RJ-45 connector link speed LEDs	Amber = 1000 Mbps Green = 100 Mbps Off = No link
5	Front panel RJ-45 connector link activity LEDs	Green = Link and no activity Green flashing = Link and activity Amber = Port disabled Off = No link
6	Front panel RJ-45 connector link activity LEDs	Green = Link and no activity Green flashing = Link and activity Amber = Port disabled Off = No link
7	10G LED	Reserved for future use

Figure 4-26 GbE2 Interconnect switch front panel NIC LED

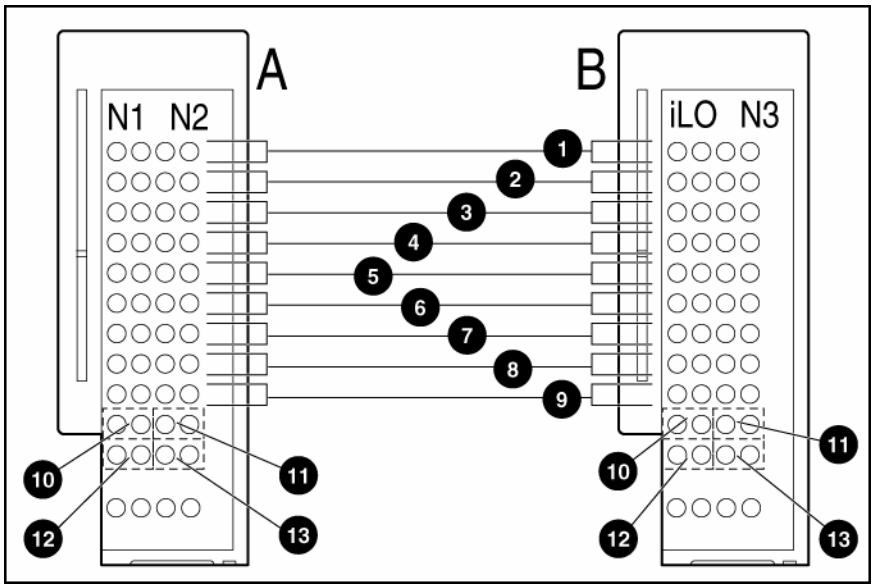


Table 4-24 GbE2 Interconnect Switch Front Panel NIC LED Assignments

Item	Description
1	Server blade bays 1 and 9* NICs
2	Server blade bays 2 and 10* NICs
3	Server blade bays 3 and 11* NICs
4	Server blade bays 4 and 12* NICs
5	Server blade bays 5 and 13* NICs
6	Server blade bays 6 and 14* NICs
7	Server blade bays 7 and 15* NICs
8	Server blade bays 8 and 16* NICs
9	Ports 17 and 18 inter-switch crosslinks
10	Port 19 RJ-45 connector for switch A rear panel uplink

Table 4-24 GbE2 Interconnect Switch Front Panel NIC LED Assignments

Item	Description
11	Port 20 RJ-45 connector for switch A rear panel uplink
12	Port 21 RJ-45 connector for switch A rear panel uplink
13	Port 22 RJ-45 connector for switch A rear panel uplink
* Server bays 9 through 16 apply only when using BL30p series server blades	

Figure 4-27 GbE2 Interconnect Switch front panel NIC LED functions

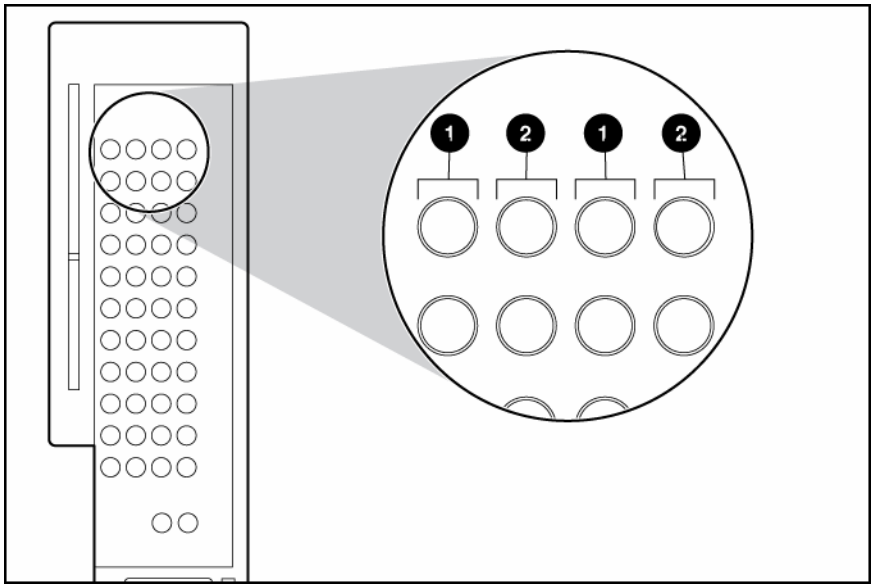


Table 4-25 GbE2 Interconnect Switch Front Panel NIC LED Functions

Item	LED Description	Status
1	Link speed	Amber = 1000 Mbps Green = 100 Mbps Off = 10 Mbps
2	Link activity	Green = Link and no activity Green flashing = Link and activity Amber = Port disabled Off = No link

Rear Panel LEDs

Use Figure 4-28 through Figure 4-32 and Table 4-26 through Table 4-30 to identify interconnect switch and interconnect module rear panel LEDs.

Figure 4-28 QuadT interconnect module LEDs

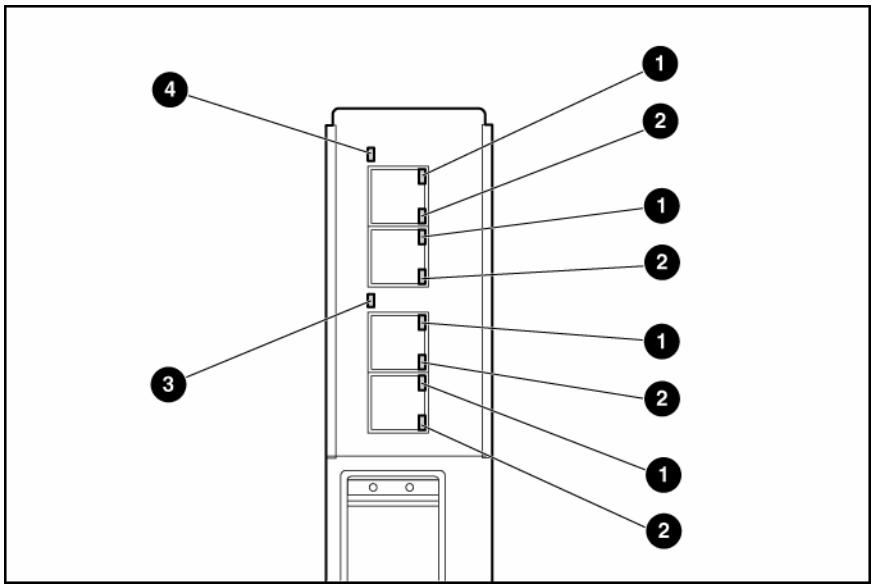


Table 4-26 QuadT Interconnect Module LEDs

Item	LED Description	Status
1	Link activity	Green = Link and no activity Green flashing = Link and activity Amber = Port disabled Off = No link
2	Link speed	Amber = 1000 Mbps Green = 100 Mbps Off = 10 Mbps
3	Reserved for future use	—
4	Reserved for future use	—

Figure 4-29 DualTSX interconnect module LEDs

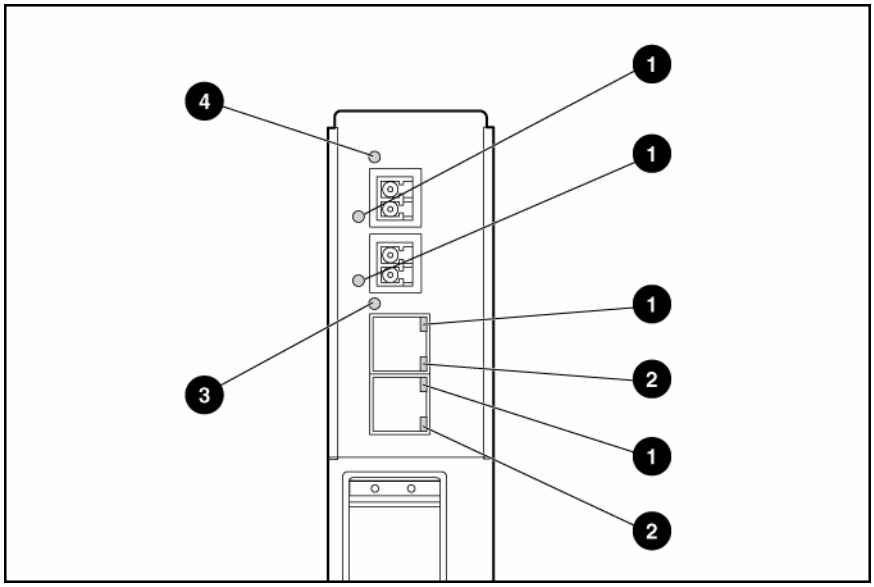


Table 4-27 DualTSX Interconnect Module LEDs

Item	LED Description	Status
1	Link activity	Green = Link and no activity Green flashing = Link and activity Amber = Port disabled Off = No link
2	Link speed	Green = 100 Mbps Off = 10 Mbps
3	Reserved for future use	—
4	Reserved for future use	—

Figure 4-30 QuadT2 interconnect module LEDs

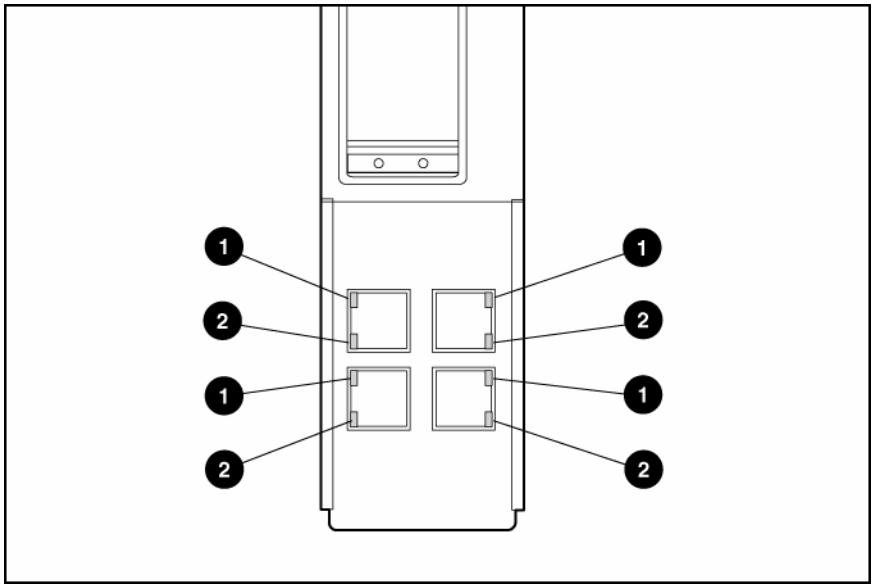


Table 4-28 QuadT2 Interconnect Module LEDs

Item	LED Description	Status
1	Link activity	Green = Link and no activity Green flashing = Link and activity Amber = Port disabled Off = No link
2	Link speed	Amber = 1000 Mbps Green = 100 Mbps Off = 10 Mbps

Figure 4-31 QuadSX interconnect module LEDs

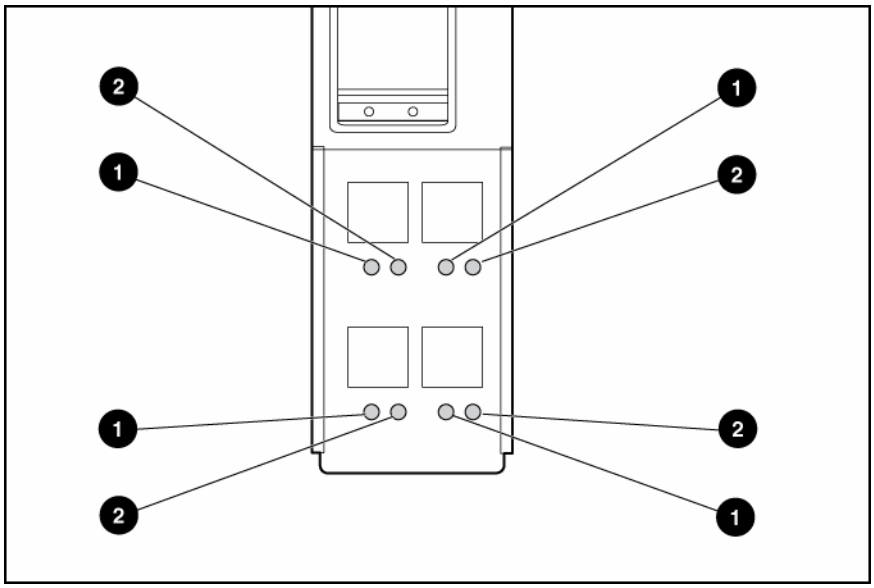


Table 4-29 QuadSX Interconnect Module LEDs

Item	LED Description	Status
1	Link speed	Amber = 1000 Mbps
2	Link activity	Green = Link and no activity Green flashing = Link and activity Amber = Port disabled Off = No link

Figure 4-32 OctalFC interconnect module LEDs

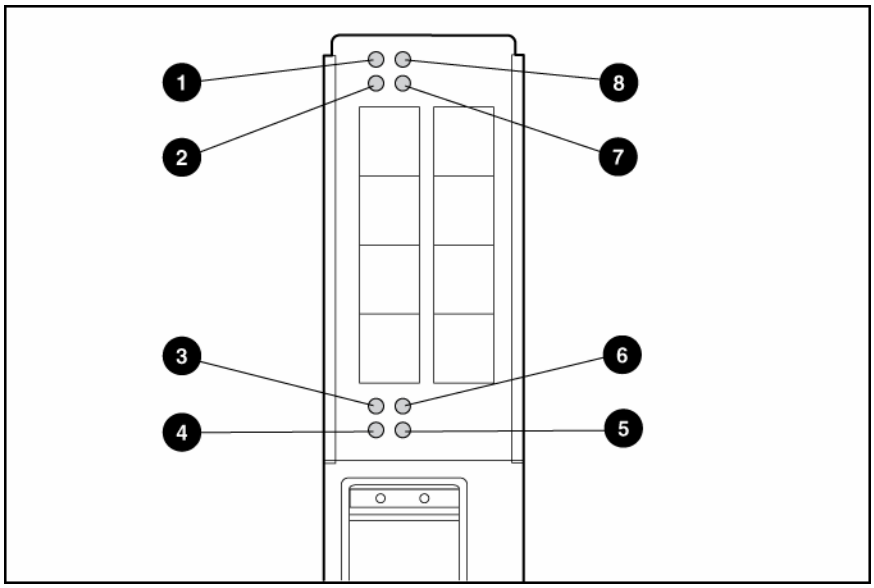


Table 4-30 OctalFC Interconnect Module LEDs

Item	LED Description	Status
1	Fibre Channel ports 1 and 9*	Green = Link Off = No link
2	Fibre Channel ports 2 and 10*	Green = Link Off = No link
3	Fibre Channel ports 3 and 11*	Green = Link Off = No link

Table 4-30 OctalFC Interconnect Module LEDs

Item	LED Description	Status
4	Fibre Channel ports 4 and 12*	Green = Link Off = No link
5	Fibre Channel ports 5 and 13*	Green = Link Off = No link
6	Fibre Channel ports 6 and 14*	Green = Link Off = No link
7	Fibre Channel ports 7 and 15*	Green = Link Off = No link
7	Fibre Channel ports 8 and 16*	Green = Link Off = No link

* Server bays 9 through 16 apply only when using BL30p series server blades.

CGESM Switch Modules

Use Figure 4-33 and Table 4-31 through Table 4-34 to identify LED locations and functions on the CGESM switch module:

Figure 4-33 CGESM switch module LEDs

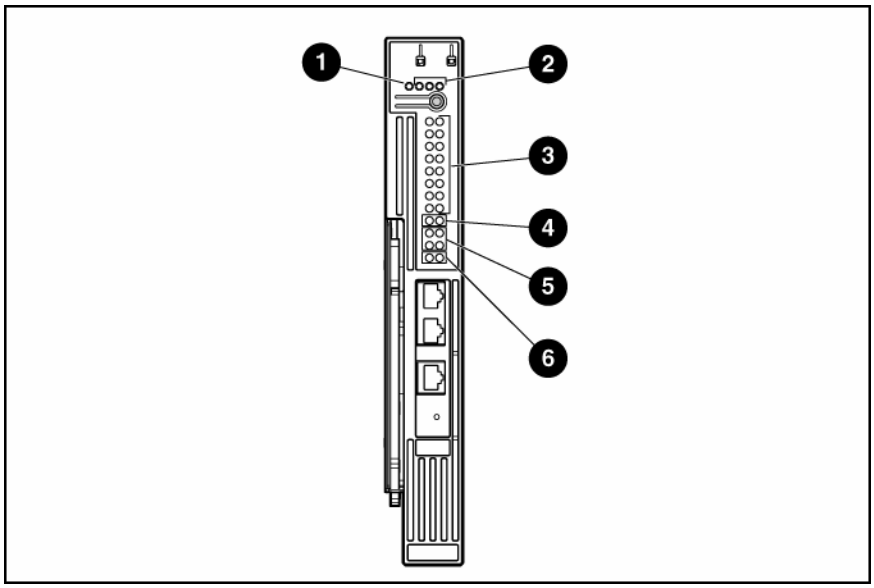


Table 4-31 CGESM switch module LEDs

Item	Description
1	System (Syst) LED
2	Mode LEDs
3	Downlink ports 1-16 LEDs
4	Cross-connect (XC) ports 17 and 18 LEDs
5	Uplink ports 19-22 LEDs
6	Front panel (FP) Ethernet ports 23 and 24 LEDs

System LED

The System (Sys) LED shows whether the system is receiving power and is functioning properly. Table 4-32 lists the LED colors and their meanings.

Table 4-32 CGESM Switch Module System (Syst) LED

Color	System Status
Off	System is not powered on
Green	System is operating normally
Amber	System is receiving power but is not functioning properly.

Port LEDs and Modes

Each RJ-45 port and SFP module slot has a port LED. These port LEDs, as a group or individually, display information about the switch and about the individual ports. The port modes determine the type of information displayed through the port LEDs. Table 4-33 lists the mode LEDs and their associated port mode and meaning.

To select or change a mode, press the mode button until the desired mode is highlighted. See the "Switches and Buttons" section in this chapter. When you change port modes, the meanings of the port LED colors also change. Table 4-34 explains how to interpret the port LED colors in different port modes.

Table 4-33 CGESM Switch Module Port LEDs and Modes

Mode LED	Port Mode	Description
STAT	Port status	The port status. This is the default mode.
DPLX	Port duplex mode	The port duplex mode: full duplex or half duplex.
SPD	Port speed	The port operating speed: 10, 100, or 1000 Mbps.

Table 4-34 CGESM Switch Module - Meaning of LED Colors in Different Modes on the Switch

Port Mode	LED Color	Meaning
STAT (port status)	Off	No link or port was administratively shut down.
	Green	Link present.
	Flashing green	Activity. Port is transmitting or receiving data.
	Alternating green-amber	Link fault. Error frames can affect connectivity, and errors such as excessive collisions, CRC errors, and alignment and jabber errors are monitored for link-fault indication.
	Amber	Port is blocked by Spanning Tree Protocol (STP) and is not forwarding data.
NOTE: After a port is reconfigured, the port LED can remain amber for up to 30 seconds as STP checks the switch for possible loops.		
DPLX (duplex)	Off	Port is operating in half duplex mode.
	Green	Port is operating in full duplex mode.
SPD	Off	Port is operating at 10 Mbps.
	Green	Port is operating at 1000 Mbps.
	Flashing green	Port is operating at 1000 Mbps.

Server Blade Management Modules

The server blade management module has LEDs for identification, power status, and management activity. Use Figure 4-34 and Table 4-35 to identify LED locations and functions.

Figure 4-34 Server blade management module LEDs

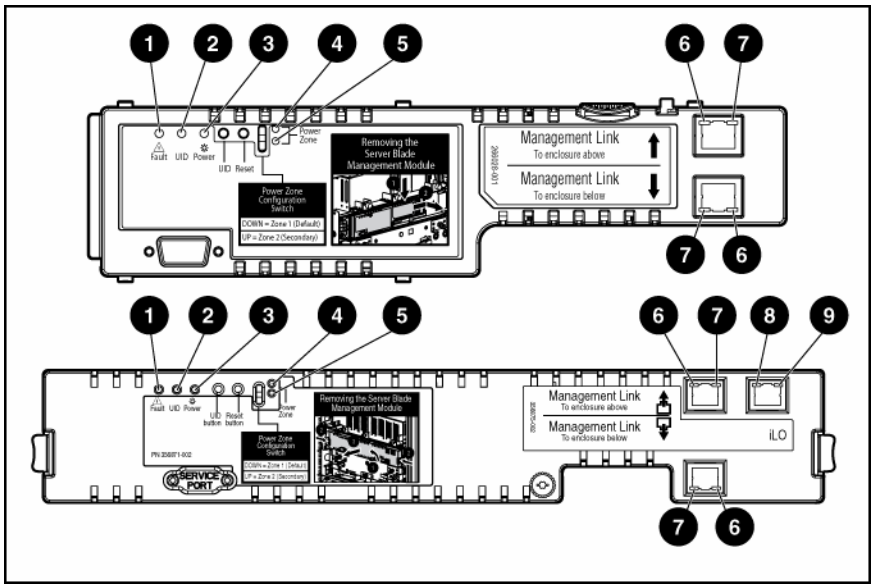


Table 4-35 Server Blade Management Module LEDs

Item	LED Description	Status
1	Fault	Red = Fault condition Off = No fault condition
2	Unit identification	Blue = Unit identified Off = Unit not identified
3	Power	Green = Power available Off = No power available
4	Power configuration	Off/Green = Power zone 1 (default) Green/Green = Power zone 2 (secondary)
5	Management bus activity	Amber = Activity * Off = No activity
6	Management link	Green = Link * Off = No link
7	iLO Activity	Green = Activity Off = No Activity
8	iLO Link	Green = Network Link Off = No Network Link
9	iLO Link	Green = Network Link Off = No Network 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

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

IMPORTANT: All power management module management link connector LEDs flash when the power configuration switch is set improperly

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

NOTE: The location of the power management module switches, connectors, and LEDs on 1U and 3U enclosures is the same.

Use Figure 4-35 and Table 4-36 to identify LED locations and functions.

Figure 4-35 Power management module LEDs

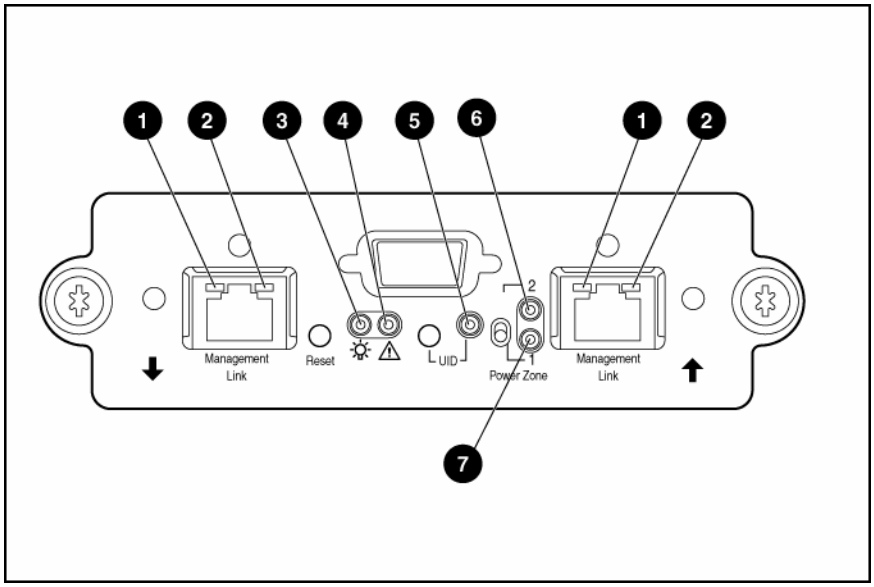


Table 4-36 Power Management Module LEDs

Item	LED Description	Status
1	Management bus activity	Amber = Activity * Off = No activity
2	Management link	Green = Link * Off = No link
3	Power	Green = Power available Off = No power available
4	Fault	Red = Fault condition Off = No fault condition
5	Unit identification	Blue = Unit identified Off = Unit 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

Use Figure 4-36 and Table 4-37 to identify LED locations and functions.

Figure 4-36 Power enclosure LEDs

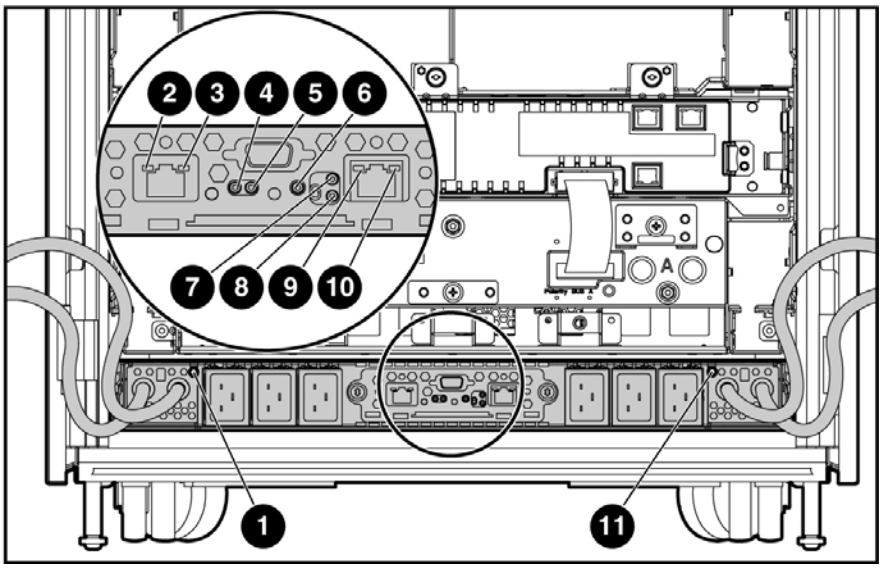


Table 4-37 HP BladeSystem p-Class 1U Power Enclosure LEDs

Item	LED Description	Status
1	Bus B DC power LED	Green = DC power available Off = No 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	Green = Management module is powered up Off = No power
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	Green = DC power available Off = No 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

The power enclosure has two LEDs, one for each bus, to indicate DC power presence. Use Figure 4-37 and Table 4-38 to identify LED locations and functions.

Figure 4-37 Power enclosure LEDs

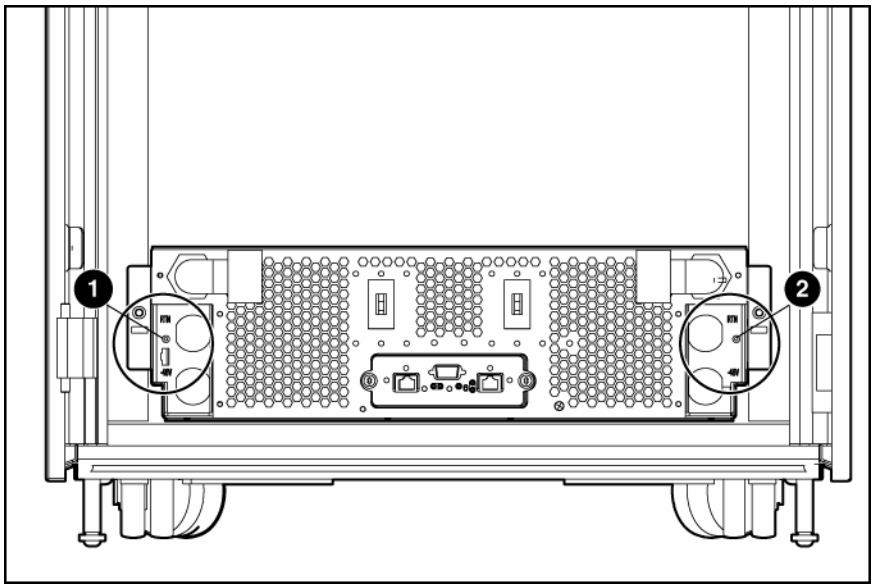


Table 4-38 Power Enclosure LEDs

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

HP BladeSystem p-Class 1U Power Supply LEDs

The power supply has two LEDs to indicate the power supply status. Use Figure 4-38 and Table 4-39 to identify LED locations and functions.

Figure 4-38 HP BladeSystem p-Class 1U Power Supply LEDs

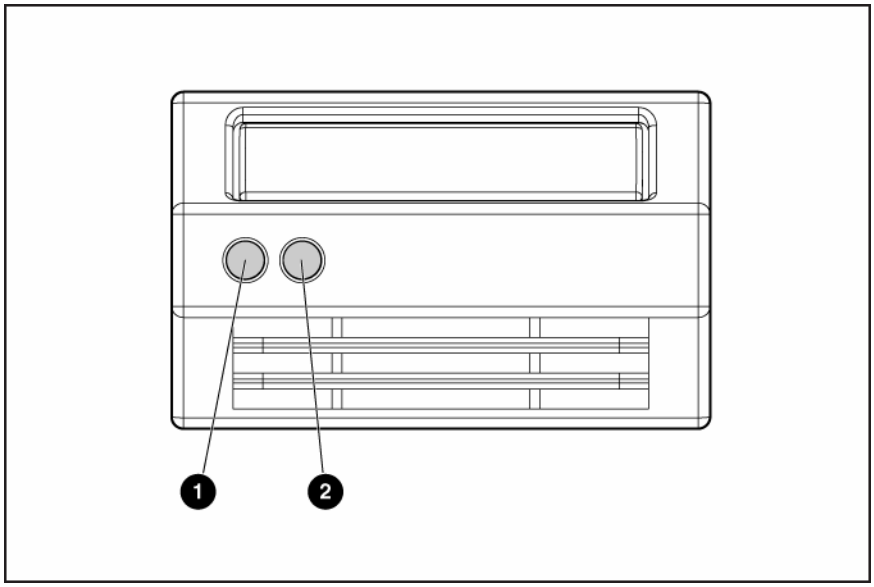


Table 4-39 HP BladeSystem 1U Power Supply LEDs

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

Table 4-39 HP BladeSystem 1U Power Supply LEDs

Condition	Power LED (1)	Fault LED (2)
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 fault condition warning, perform one of the following actions:

- Remove and reconnect AC power from the power enclosure.
- Remove and replace the power supply as a hot-plug procedure if more than one power supply is delivering power to the server enclosure.

HP BladeSystem p-Class 3U Power Supply LEDs

The hot-plug power supply has LEDs to indicate fault and power status. Use Figure 4-39 and Table 4-40 to identify LED locations and functions.

Figure 4-39 Hot-plug power supply LEDs

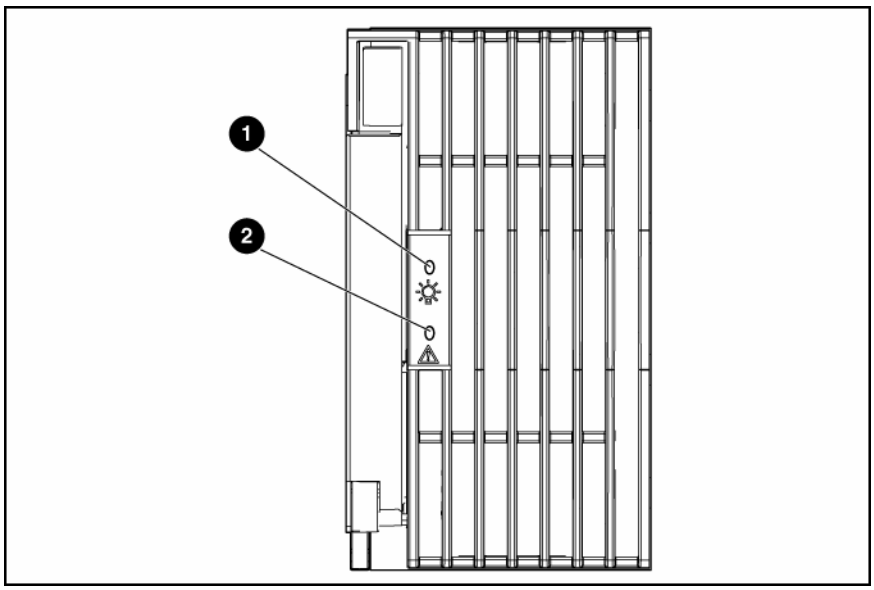


Table 4-40 Hot-Plug Power Supply LEDs

Item	LED Description	Status
1	Power	Green = Power is available. Green flashing = Hot-plug power supply is in standby. Off = No power is available, and/or hot-plug power supply has failed.
2	Fault	Amber = Hot-plug power supply has failed. Amber flashing = Current limit has been exceeded, and/or system has too few hot-plug power supplies. Off = Normal

Bus Bars

The bus bar has two LEDs to indicate DC power presence and polarity. Use Figure 4-40 and Table 4-41 to identify LED locations and functions.

Figure 4-40 Bus Bar LEDs (cables removed for clarity)

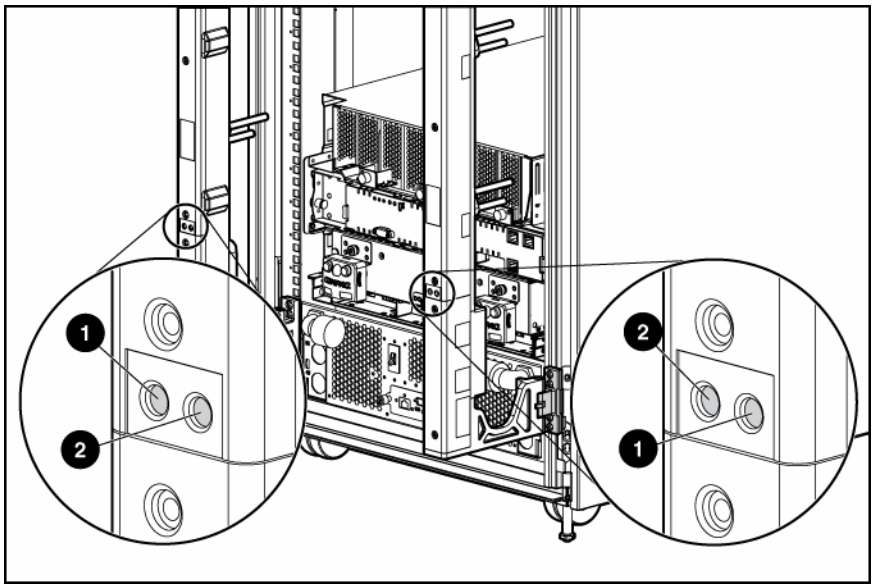


Table 4-41 Bus Bar LEDs

Item	LED Description	Status
1	DC Power	Off = No DC power available Green = DC Power available
2	Polarity	Off = Polarity correct Red = Polarity reversed

Diagnostic Station

The diagnostic station has multiple LEDs to indicate power and network functions. Use Figure 4-41 and Table 4-42 to identify LED locations and functions.

Figure 4-41 Diagnostic station LEDs

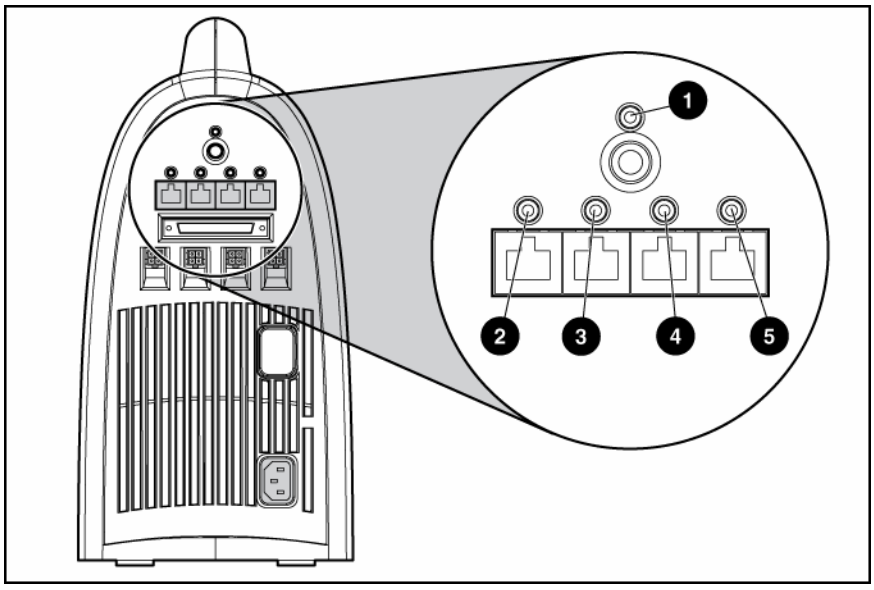


Table 4-42 Diagnostic Station LEDs

Item	LED Description	Status
1	Power and health	Green = Power on Red = Power supply failure
2	NIC link/activity	Green = Linked to network

Table 4-42 Diagnostic Station LEDs

Item	LED Description	Status
3	NIC link/activity	Flashing green = Network activity Off = No activity
4	NIC link/activity	
5	NIC link/activity	

Switches and Buttons

Use the following sections to identify the locations and functions of push-button and system switches.

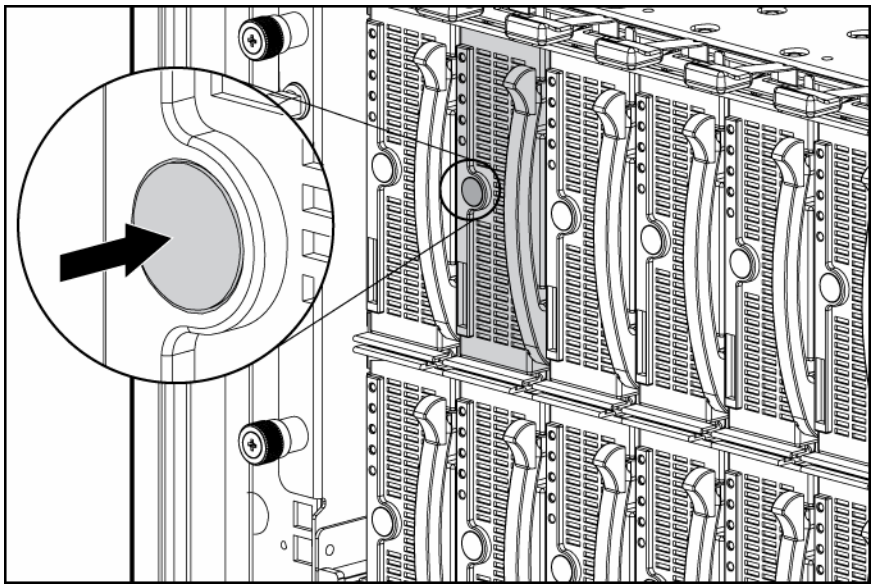
- Power On/Standby Button
- Reset and Unit Identification Buttons
- Dynamic Power Saver
- Power Configuration Switches
- CGESM Switch Modules

Power On/Standby Button

Setting the server blade Power On/Standby button to the standby position removes power from most areas of the server blade. This process may take 30 seconds, during which time some internal circuitry remains active.

Use Figure 4-42 to identify the button location. Note that this is only one example. The Power On/Standby button for other server blade models may look different.

Figure 4-42 Power On/Standby button (BL30p server blades shown)



Reset and Unit Identification Buttons

Each management module contains a reset button and unit identification (UID) button. Use Figure 4-43 and Table 4-43 to identify the button locations and functions.

Figure 4-43 Server blade management modules (top and middle) and power management module (bottom)

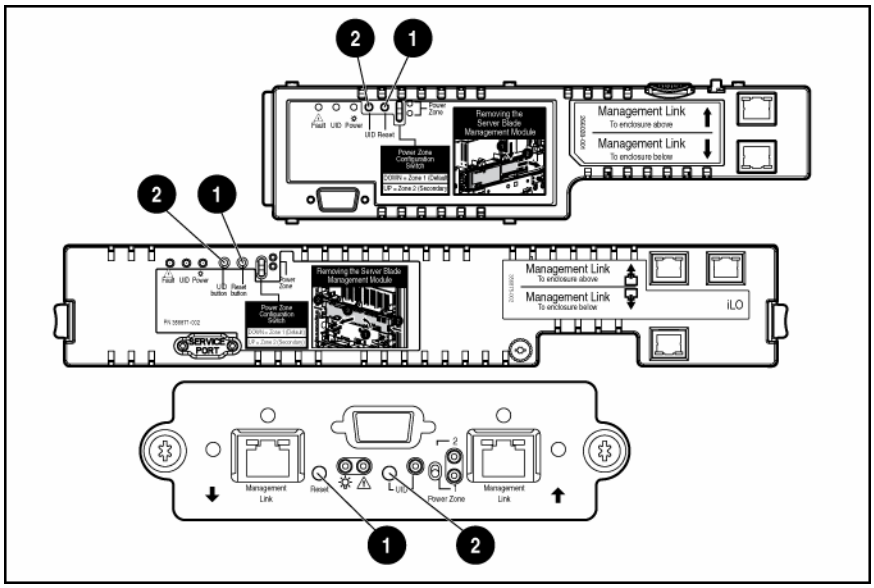


Table 4-43 Reset and Unit Identification Buttons

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

Dynamic Power Saver

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.

NOTE: Dynamic Power Saver is a feature of the HP BladeSystem 1U Power Enclosure.

Use Figure 4-44, Figure 4-45, and Table 4-44 to identify the Dynamic Power Saver switch location and function.

Figure 4-44 Removing the management module

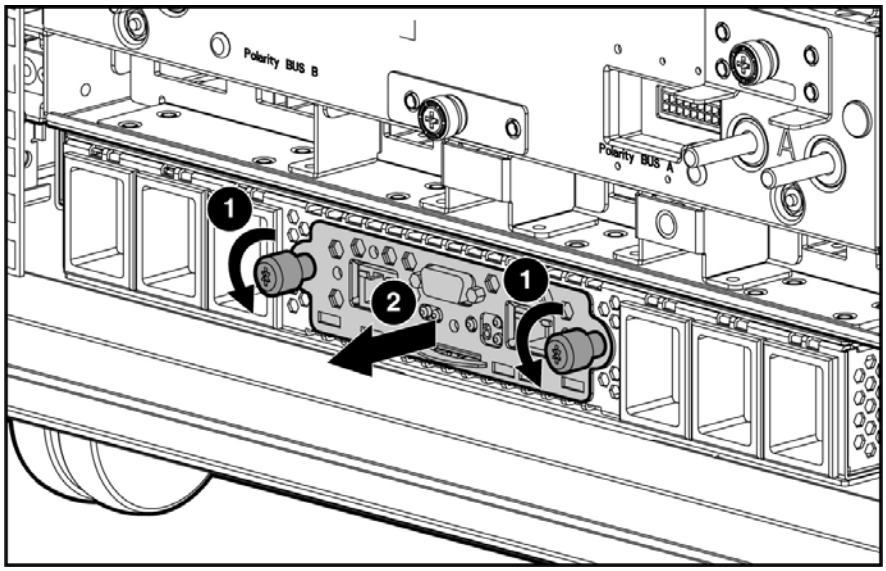


Figure 4-45 Setting Dynamic Power Saver switches

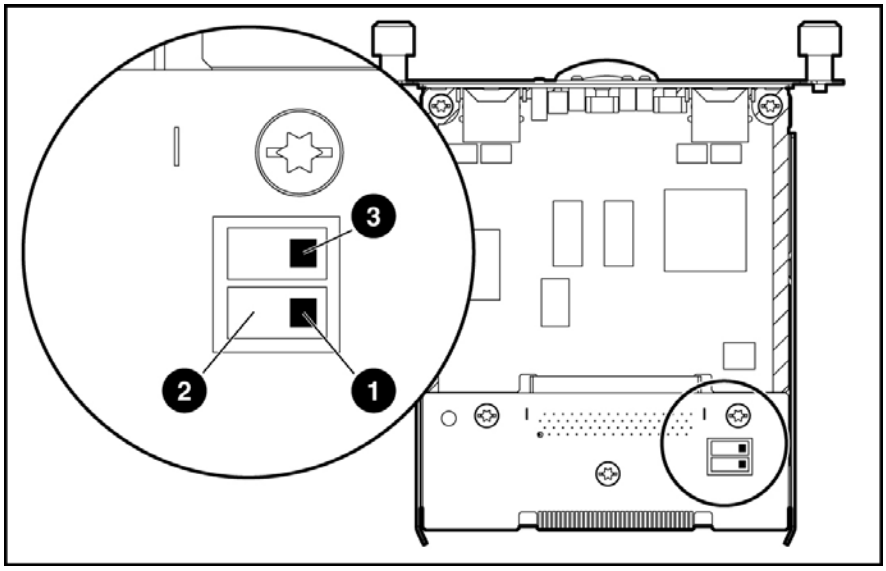


Table 4-44 Dynamic Power Saver Configuration Switches

Position	Function
1	Dynamic Power Saver disabled (default)
2	Dynamic Power Saver enabled
3	Reserved (Off=default)

Power Configuration Switches

The server blade management modules and HP BladeSystem p-Class power enclosure power management modules have a two-position switch that identifies the use of single or multiple power zones in the rack environment.

The zone 1 switch setting is the default position; it is used for scalable bus bar, one set of mini bus bars, 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.

IMPORTANT: In installations configured with the HP BladeSystem p-Class 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 p-Class 1U Power Enclosure.

For the system to recognize multiple power zones and rack topology properly, you must set these switches at the time of installation. Use Figure 4-46 and Table 4-45 to identify switch locations and settings.

Figure 4-46 Power configuration switches

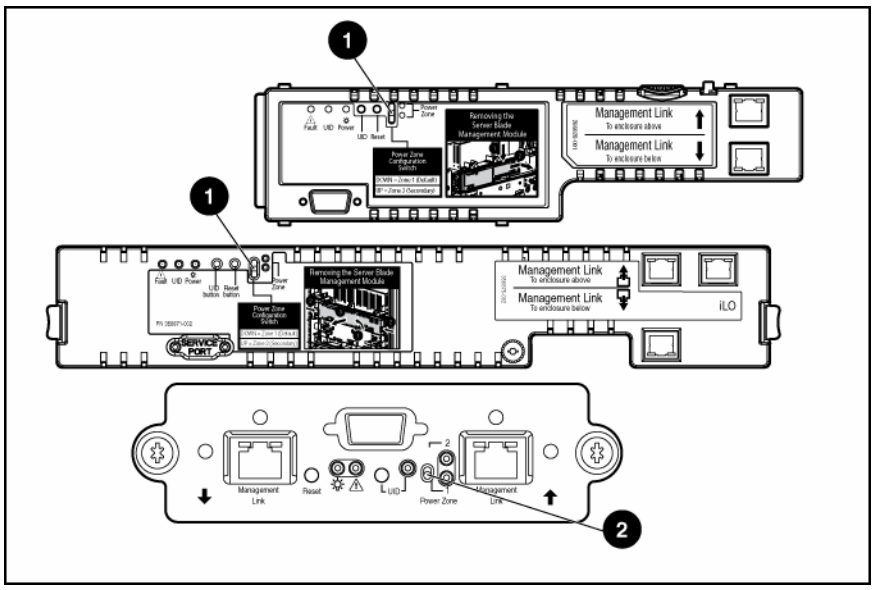


Table 4-45 Power Configuration Switches

Item	Description	Positions
1	Server blade management module power configuration switch	Up = Zone 2 (secondary) Down = Zone 1 (default)
2	Power management module power configuration switch	

After the initial power-up, use the LEDs to verify correct switch settings. Refer to the "Server Blade Management Modules" and "Power Management Module" sections in this chapter.

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 Example 1, Figure 4-47, and Table 4-46:

Example1: 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.

Figure 4-47 Power zones in a full-rack 42U solution

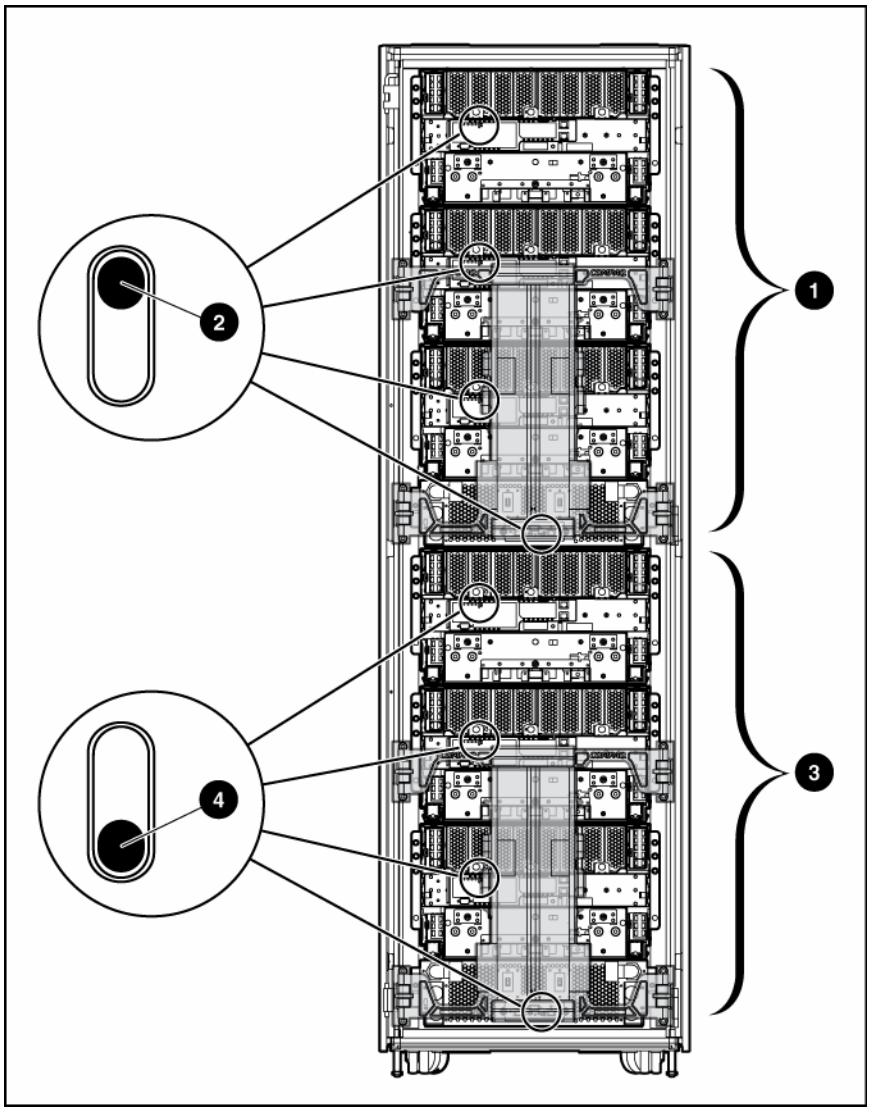


Table 4-46 Power Zones in a Full-Rack 42U Solution

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

CGESM Switch Modules

Use Figure 4-48 and Table 4-47 to identify buttons on the CGESM switch modules.

Figure 4-48 CGESM switch module buttons

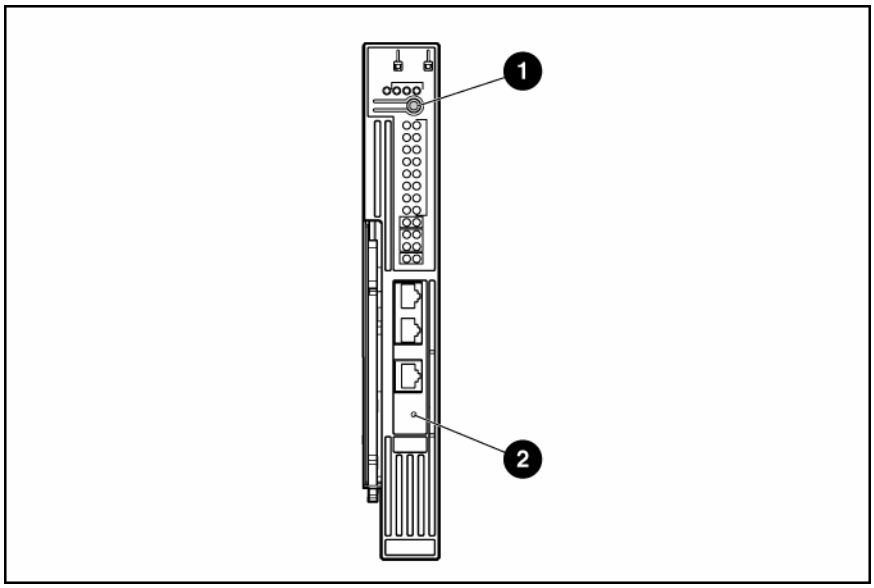


Table 4-47 CGESM Switch Module Buttons

Item	Description
1	Mode button
2	Power/Reset button

5 Specifications

This chapter provides operating and performance specifications for the following HP BladeSystem p-Class system components:

- Server blade enclosure
- RJ-45 patch panel
- HP BladeSystem p-Class GbE and GbE2 Interconnect Switch
- HP BladeSystem p-Class CGESM Switch Module
- Power enclosures
  - HP BladeSystem p-Class 1U Power Supply Enclosures
  - HP BladeSystem p-Class 3U North America/Japan models
  - HP BladeSystem p-Class 3U International models
- Hot-plug power supply
- Power distribution devices
  - Scalable bus bars
  - Mini bus bar
  - Power bus boxes
  - HP BladeSystem p-Class Power Extension Kit
- Facility DC

Server Blade Enclosure

Table 5-1 Operating and Performance Specifications for a Server Blade Enclosure

Specification	Value	
Dimensions		
Height	26.67 cm (10.5 in)	
Depth	73.30 cm (28.86 in)	
Width	44.70 cm (17.60 in)	
Weight with RJ-45 patch panels		
No HP BladeSystem 20p blades	36.33 kg (80.10 lb)	
8 HP BladeSystem 20p blades	99.84 kg (220.10 lb)	
Input requirements		
Rated input voltage	-43 VDC to -53 VDC	Nominal -48 VDC
Rated input current	62.5 A at -48 VDC	
Rated input power	3,000 W	
Individual server blade bay ratings		
Rated input voltage	-43 VDC to -53 VDC	Nominal -48 VDC
Rated input current	6.25 A at -48 VDC	
Rated input power	300 W	
Temperature range [1]		
Operating	10° to 35°C (50° to 95°F)	
Non-operating	-30° to 60°C (-22° to 140°F)	
Relative humidity, noncondensing [2]		
Operating	20% to 80%	
Non-operating	5% to 95%	
Wet bulb temperature		

Table 5-1 Operating and Performance Specifications for a Server Blade Enclosure

Specification	Value
Operating	28°C (82.4°F)
Non-operating	38.7°C (101.7°F)

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa.

Table 5-2 Operating and Performance Specifications for an Enhanced Server Blade Enclosure

Specification	Value	
Dimensions		
Height	26.67 cm (10.5 in)	
Depth	73.30 cm (28.86 in)	
Width	44.70 cm (17.60 in)	
Weight with RJ-45 patch panels		
No HP BladeSystem 20p blades	36.33 kg (80.10 lb)	
8 HP BladeSystem 20p blades	99.84 kg (220.10 lb)	
Input requirements		
Rated input voltage	-43 VDC to -53 VDC	Nominal -48 VDC
Rated input current (per side)	64.1 A at -48 VDC	
Rated input power (total)	6000 W	
Individual server blade bay ratings		
Rated input voltage	-43 VDC to -53 VDC	Nominal -48 VDC
Rated input current	14.6 A at -48 VDC	
Rated input power	700 W	
Temperature range [1]		
Operating	10° to 35°C (50° to 95°F)	
Non-operating	-30° to 60°C (-22° to 140°F)	
Relative humidity, noncondensing [2]		
Operating	20% to 80%	
Non-operating	5% to 95%	
Wet bulb temperature		
Operating	28°C (82.4°F)	
Non-operating	38.7°C (101.7°F)	

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa.

RJ-45 Patch Panel

Table 5-3 Operating and Performance Specifications for an RJ-45 Patch Panel

Specification	Value
Dimensions	
Height	26.43 cm (10.41 in)
Depth	70.35 cm (27.70 in)
Width	3.899 cm (1.54 in)
Capability	IEEE 802.2, 802.3, 802.3u
Network transfer rate	
10 Base-T (half-duplex)	10 Mbps
10 Base-T (full-duplex)	20 Mbps
100 Base-TX (half-duplex)	100 Mbps
100 Base-TX (full-duplex)	200 Mbps
1000 Base-TX (full-duplex)	1000 Mbps
Connector	RJ-45
Cable support	
10 Base-TX	Categories 3, 4, or 5 UTP (2 or 4 pair); up to 100 m (328 ft)
100 Base-TX	Category 5 UTP (2 pair); up to 100 m (328 ft)
1000 Base-TX	Category 5E (4 pair); up to 100 m (328 ft)
Power requirements	200 mA at +5 V DC
Temperature range [1]	
Operating	10° to 35°C (50° to 95°F)
Non-operating	-30° to 60°C (-22° to 140°F)
Relative humidity, noncondensing [2]	
Operating	20% to 80%
Non-operating	5% to 95%
Wet bulb temperature	
Operating	28°C (82.4°F)
Non-operating	38.7°C (101.7°F)

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa.

HP BladeSystem p-Class GbE Interconnect Switch

Table 5-4 Operating and Performance Specifications for an HP BladeSystem p-Class GbE Interconnect Switch

Specifications	Value
Dimensions	
Height	26.43 cm (10.41 in)
Depth	70.35 cm (27.70 in)
Width	3.899 cm (1.54 in)

Table 5-4 Operating and Performance Specifications for an HP BladeSystem p-Class GbE Interconnect Switch

Specifications	Value
Capability	IEEE 802.1D, 802.1p, 802.1Q, 802.2, 802.3, 802.3u, 802.3ab, 802.3ac, 802.3x, 802.3z
Network transfer rate	
10Base-T (half-duplex)	10 Mbps
10Base-T (full-duplex)	20 Mbps
100Base-TX (half-duplex)	100 Mbps
100Base-TX (full-duplex)	200 Mbps
1000Base-T (full-duplex)	2000 Mbps
Connectors	
Interconnect switch	2 RJ-45, 1 DB-9
QuadT interconnect module	4 RJ-45
DualTSX interconnect module	2 RJ-45, 2 LC fiber
Cable support	
10Base-T	Categories 3, 4, or 5 UTP (2 or 4 pair); up to 100 m (328 ft)
100Base-TX	Category 5 UTP (2 pair); up to 100 m (328 ft)
1000Base-T	Category 5 UTP (4 pair); up to 100 m (328 ft)
1000Base-SX	50/125 um Multimode Fiber with 400 MHz/Km rating has a maximum distance of 500 m (1640 ft) 50/125 um Multimode Fiber with 500 MHz/Km rating has a maximum distance of 550 m (1804 ft) 62.5/125 um Multimode Fiber with 160 MHz/Km rating has a maximum distance of 220 m (721.8 ft) 62.5/125 um Multimode Fiber with 200 MHz/Km rating has a maximum distance of 275 m (902.2 ft)
Power requirements	1050 mA maximum at -48 VDC, 50 W per GbE Interconnect Switch
Temperature range [1]	
Operating	10° to 35°C (50° to 95°F)
Non-operating	-30° to 60°C (-22° to 140°F)
Relative humidity, noncondensing [2, 3]	
Operating	20% to 80%
Non-operating	5% to 95%
Wet bulb temperature	
Operating	28°C (82.4°F)
Non-operating	38.7°C (101.7°F)

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.

[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa.

[3]Refer to the *HP BladeSystem p-Class GbE Interconnect Switch User Guide* for detailed information.

HP BladeSystem p-Class GbE2 Interconnect Switch

Table 5-5 Operating and Performance Specifications for a HP BladeSystem p-Class GbE2 Interconnect Switch

Specification	Value
Dimensions	
Height	26.43 cm (10.41 in)
Depth	70.35 cm (27.70 in)
Width	3.90 cm (1.54 in)
Capability	IEEE 802.1D, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3ac, 802.3ad, 802.3x, 802.3z
Network transfer rate	
10Base-T (half-duplex)	10 Mbps
10Base-T (full-duplex)	20 Mbps
100Base-TX (half-duplex)	100 Mbps
100Base-TX (full-duplex)	200 Mbps
1000Base-TX (half duplex)	1000 Mbps
1000Base-TX (full-duplex)	2000 Mbps
1000Base-SX (full-duplex)	2000 Mbps
Connectors	
GbE2 Interconnect Switch	2 RJ-45, 1 DB-9
QuadT2 interconnect module	4 RJ-45
QuadSX interconnect module	4 SFP fiber transceivers with LC connectors
Cable support	
10Base-T	Categories 3, 4, or 5 UTP (2 pair); up to 100 m (328 ft) EIA/TIA-568 100-ohm STP; 100 m (328 ft)
100Base-T	Category 5 UTP (2 pair or 4 pair); up to 100 m (328 ft) EIA/TIA-568 100-ohm STP; 100 m (328 ft)
1000Base-T	Category 5e UTP (4 pair); up to 100 m (328 ft) EIA/TIA-568 100-ohm STP; 100 m (328 ft)
1000Base-SX	50/125 um Multimode Fiber with 400 MHz/Km rating has a maximum distance of 500 m (1640 ft) 50/125 um Multimode Fiber with 500 MHz/Km rating has a maximum distance of 550 m (1804 ft) 62.5/125 um Multimode Fiber with 160 MHz/Km rating has a maximum distance of 220 m (721.8 ft) 62.5/125 um Multimode Fiber with 200 MHz/Km rating has a maximum distance of 275 m (902.2 ft)
Power requirements	2040 mA maximum at -48 VDC, 98 W per interconnect switch without GbE2 Storage Connectivity kit 2355 mA maximum at -48 VDC, 113 W per interconnect switch with GbE2 Storage Connectivity kit
Temperature range [1]	
Operating	10° to 35°C (50° to 95°F)
Non-operating	-30° to 60°C (-22° to 140°F)
Relative humidity, noncondensing [2, 3]	
Operating	20% to 80%
Non-operating	5% to 95%
Wet bulb temperature	

Table 5-5 Operating and Performance Specifications for a HP BladeSystem p-Class GbE2 Interconnect Switch

Specification	Value
Operating	28°C (82.4°F)
Non-operating	38.7°C (101.7°F)

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa.
[3]Refer to the *HP BladeSystem p-Class GbE2 Interconnect Switch User Guide* for detailed information.

HP BladeSystem p-Class CGESM Switch Module

Table 5-6 Operating and Performance Specifications for a HP BladeSystem p-Class CGESM Switch Module

Specification	Value
Physical Dimensions	
Weight	5.22 kg (11.6 lb)
Dimensions (H x D x W)	4.06 x 71.12 x 26.42 cm. (1.6 x 28.4 x 10.4 in)
Power Requirements	
DC input voltage	-48 VDC, 2.6 A
Power consumption	125 W
Environmental Ranges	
Operating temperature[1]	10 to 35°C (50 to 95°F)
Storage temperature[1]	-30 to 60°C (-22 to 140°F)
Relative humidity[2,3]	20 to 85% (noncondensing)
Operating altitude	Up to 3049 m (10,000 ft)
Storage altitude	Up to 4573 m (15,000 ft)

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa.
[3]Refer to the *HP BladeSystem p-Class CGESM Switch Module User Guide* for detailed information.

Power Enclosures

North America/Japan

Table 5-7 Operating and Performance Specifications for HP BladeSystem p-Class 1U Power Enclosures

Specification	Value
Dimensions	
Height	4.47 cm (1.75 in)
Depth	68.96 cm (27.15 in)
Width	44.7 cm (17.60 in)
Weights	
No hot-plug power supplies	10 kg (22 lb)
All hot-plug power supplies	2.4 kg (5.3 lb)
Input requirements	

Table 5-7 Operating and Performance Specifications for HP BladeSystem p-Class 1U Power Enclosures

Specification	Value
Rated input voltage	200 VAC to 240 VAC
Rated input frequency	50 Hz to 60 Hz
Rated input current per side	3 x 13 A
Rated input power per side	3 x 2310 W
Power connector	IEC-320 C20
Output voltage specifications	
Rated output voltage	-48.8 VDC to -54 VDC
Rated output current	117 A
Rated output power	6,000 W
Nominal power	6,000 W at 208 VAC
Ambient temperature range [1]	
Operating	10° to 35°C (50° to 95°F)
Shipping	-30° to 60°C (-22° to 140°F)
Relative humidity, noncondensing [2]	
Operating	20% to 80%
Non-operating	5% to 95%
Wet bulb temperature	
Operating	28°C (82.4°F)
Non-operating	38.7°C (101.7°F)

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa

Table 5-8 Operating and Performance Specifications for HP BladeSystem p-Class 3U Power Enclosures (North America/Japan)

Specification	Value for Single-Phase Model	Value for Three Phase Model
Dimensions		
Height	13.34 cm (5.25 in)	13.34 cm (5.25 in)
Depth	68.96 cm (27.15 in)	68.96 cm (27.15 in)
Width	44.7 cm (17.60 in)	44.7 cm (17.60 in)
Weights		
No hot-plug power supplies	21.55 kg (47.5 lb)	21.55 kg (47.5 lb)
All hot-plug power supplies	45.13 kg (99.5 lb)	56.93 kg (125.5 lb)
Input Requirements		
Rated input voltage	200 VAC to 240 VAC	200 VAC to 240 VAC line to line, three-phase (3W+G)
Rated input frequency	50 Hz to 60 Hz	50 Hz to 60 Hz
Rated input current per side	24 A	24 A per phase
Rated input power per side	5,760 W	9,976 W
Power plug	1 NEMA L6-30P per side	1 NEMA L15-30 per side
Output voltage specifications		

Table 5-8 Operating and Performance Specifications for HP BladeSystem p-Class 3U Power Enclosures (North America/Japan)

Specification	Value for Single-Phase Model	Value for Three Phase Model
Rated output voltage	-48.8 VDC to -54 VDC	-48.8 VDC to -54 VDC
Rated output current	99 A	170 A
Rated output power	4,298 W	8,310 W
Nominal power	4,158 W at 208 VAC	7,202 W at 208 VAC
Ambient temperature range [1]		
Operating	10° to 35°C (50° to 95°F)	10° to 35°C (50° to 95°F)
Shipping	-30° to 60°C (-22° to 140°F)	-30° to 60°C (-22° to 140°F)
Relative humidity, noncondensing [2]		
Operating	20% to 80%	20% to 80%
Non-operating	5% to 95%	5% to 95%
Wet bulb temperature		
Operating	28°C (82.4°F)	28°C (82.4°F)
Non-operating	38.7°C (101.7°F)	38.7°C (101.7°F)

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa

International

Table 5-9 Operating and Performance Specifications for HP BladeSystem p-Class 3U Power Enclosures (International)

Specification	Value for Single-Phase Model	Value for Three-Phase Model
Dimensions		
Height	13.34 cm (5.25 in)	13.34 cm (5.25 in)
Depth	68.96 cm (27.15 in)	68.96 cm (27.15 in)
Width	44.7 cm (17.60 in)	44.7 cm (17.60 in)
Weights		
No hot-plug power supplies	21.55 kg (47.5 lb)	21.55 kg (47.5 lb)
All hot-plug power supplies	45.13 kg (99.5 lb)	56.93 kg (125.5 lb)
Input requirements		
Rated input voltage	200 VAC to 240 VAC	346 VAC to 415 VAC, three-phase Y(3W+N+G) 200 VAC to 240 VAC, line to neutral
Rated input frequency	50 Hz to 60 Hz	50 Hz to 60 Hz
Rated input current per side	24 A	20 A per phase
Rated input power per side	5,760 W	10,552 W
Power plug	1 IEC 309 3-pin, 32A per side	1 IEC 309 5-pin, 32A per side
Output voltage specifications		
Rated output voltage	-48.8 VDC to -54 VDC	-48.8 VDC to -54 VDC
Rated output current	99 A	180 A

Table 5-9 Operating and Performance Specifications for HP BladeSystem p-Class 3U Power Enclosures (International)

Specification	Value for Single-Phase Model	Value for Three-Phase Model
Rated output power	4,798 W	8,790 W
Nominal power	4,598 W at 230 VAC	8,790 W at 230 VAC L-N
Ambient temperature range [1]		
Operating	10° to 35°C (50° to 95°F)	10° to 35°C (50° to 95°F)
Shipping	-30° to 60°C (-22° to 140°F)	-30° to 60°C (-22° to 140°F)
Relative humidity, noncondensing [2]		
Operating	20% to 80%	20% to 80%
Non-operating	5% to 95%	5% to 95%
Wet bulb temperature		
Operating	28°C (82.4°F)	28°C (82.4°F)
Non-operating	38.7°C (101.7°F)	38.7°C (101.7°F)

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa.

Hot-Plug Power Supply

Table 5-10 Operating and Performance Specifications for an HP BladeSystem p-Class 1U Power Supply

Specification	Value
Dimensions	
Height	40 mm (1.6 in)
Depth	531.4 mm (20.9 in)
Width	68.5 mm (2.7 in)
Weight	2.7 kg (6 lb)
Input voltage specifications	
Rated input voltage	200 VAC to 240 VAC
Frequency range	50 Hz to 60 Hz
Rated input power	2310 W
Rated input current	13 A
Output voltage specifications	
Rated output voltage	-48.8 VDC to -54 VDC +4.75 VDC to +5.25 VDC
Rated output power	2,000 W
Rated output current	38.9 A (on -48 VDC output) 5 A (on +5 Vaux output)
Ambient temperature range [1]	
Operating	5°C to 35°C (41°F to 95°F)
Non-operating	-40°C to 70°C (-40°F to 158°F)
Relative humidity, noncondensing [2]	
Operating	5% to 95%
Non-operating	5% to 95%

Table 5-10 Operating and Performance Specifications for an HP BladeSystem p-Class 1U Power Supply

Specification	Value
Dielectric voltage withstand	
Input to output/ground	2,150 VDC

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa.

Table 5-11 Operating and Performance Specifications for an HP BladeSystem p-Class 3U Power Supply

Specification	Value
Dimensions	
Height	123.5 mm (4.86 in)
Depth	559 mm (22 in)
Width	69.5 mm (2.73 in)
Weight	6.35 kg (14 lb)
Input voltage specifications	
Rated input voltage	200 VAC to 240 VAC
Frequency range	50 Hz to 60 Hz
Rated input power	3,476 W
Rated input current	18 A
Output voltage specifications	
Rated output voltage	-48.8 VDC to -53 VDC +4.75 VDC to +5.25 VDC
Rated output power	2,955 W
Rated output current	57 A (on -48 VDC output) 5 A (on +5 Vaux output)
Ambient temperature range [1]	
Operating	5°C to 35°C (41°F to 95°F)
Non-operating	-40°C to 70°C (-40°F to 158°F)
Relative humidity, noncondensing [2]	
Operating	5% to 95%
Non-operating	5% to 95%
Dielectric voltage withstand	
Input to output/ground	2,150 VDC

[1]Operating temperature has an altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft). No direct sunlight. Upper operating limit is 3,048 m (10,000 ft) or 70 Kpa/10.1 psia. Upper non-operating limit is 9,144 m (30,000 ft) or 30.3 KPa/4.4 psia.
[2]Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage is 70 KPa.

Power Distribution Devices

Table 5-12 Operating and Performance Specifications for Power Distribution Devices

Specification	Power Extension Kit	Dual Power Input Box	Power Bus Box	Mini Bus Bar	Scalable Bus Bar
Power enclosures or facility DC feeds supported (3U each)	2	2	1	1	2
Server blade enclosures supported (6U each)	—	—	1	3	5
Total rack height of supported enclosures	—	—	9U	21U	36U
Dimensions	—				
Height	—	9.53 cm (3.75 in)	12.95 cm (5.1 in)	49.40 cm (19.45 in)	123.37 cm (48.57 in)
Depth	—	6.22 cm (2.45 in)	8.26 cm (3.25 in)	5.59 cm (2.2 in)	5.59 cm (2.2 in)
Width	—	10.16 cm (4 in)	9.14 cm (3.6 in) each	50.14 cm (19.74 in)	50.14 cm (19.74 in)
Weight	—	1.45 kg (3.2 lb)	1.64 kg (3.62 lb)	5.99 kg (13.2 lb)	11.79 kg (26 lb)
Rated operating voltage	-43.2 VDC to -54 VDC	-43.2 VDC to -54 VDC	-43.2 VDC to -54 VDC	-43.2 VDC to -54 VDC	-43.2 VDC to -54 VDC
Max total power supported	—	—	3,000 W	9,000 W	15,000 W
Total max input current at min voltage	70 A	70 A	69.44 A at -43.2 VDC	208.32 A at -43.2 VDC	347.2 A at -43.2 VDC (equivalent of 175 A per feed) *
Total max input current at nominal voltage	—	—	62.5 A at -48 VDC	187.5 A at -48 VDC	312.5 A at -48 VDC (equivalent of 156.25 A per feed) *
Max current per power feed *	70 A	70 A	70 A	210 A	210 A
Max local ambient temperature	65°C (149°F)	65°C (149°F)	65°C (149°F)	65°C (149°F)	65°C (149°F)

*All systems support redundant power configurations by using separate power inputs for each bus. Scalable bus bars provide dual power inputs (P1 and P2) for each bus.

Facility DC

Table 5-13 Operating and Performance Specifications for Facility DC

Specifications	Value
Voltage	
Nominal input voltage	-48 VDC
Operating voltage range	-48 VDC ±10% or -43.2 VDC to -52.8 VDC
Max Input voltage slew rate	0.5 V/uS

Table 5-13 Operating and Performance Specifications for Facility DC

Specifications	Value
Redundant feed voltages *	Bus A and bus B voltages must differ by no more than 5 VDC during steady-state operation.
Ripple/Noise	480 mV PARD **
Overshoot	Must remain within regulation limits on all feeds during startup or shutdown
Voltage transients	Must not exceed -60 VDC
Current	
Max steady state input current	62.5 A per server blade enclosure installed at -48 VDC
Max steady state current per feed/total	
Power bus boxes	70 A/70 A
Mini bus bars	210 A/210 A
Scalable bus bars	210 A/350 A or equivalent of 175 A per feed *
In-rush current	Must support up to 2X the maximum operating current per server blade enclosure (125 A) for up to 1.0 mS
Input over-current	Customer must provide fusing for facility DC feeds that protect the system from catastrophic over-current within 20 uS. Fuse should sustain all in-rush and operating currents.
Max input current slew rate	1A/uS
Max rated power	3,000 W per server blade enclosure
Connections and cables	HP provided cable option kit: The facility DC connection kit supports the connection of up to four -48 VDC, RETURN pairs and ground. The power cable assemblies consist of 1/0 AWG, color-coded, flexible cable rated at 105°C (221°F), terminated with bus mating connectors at one end and not terminated at the other end. The cable length provided enables the customer to route to a fuse panel within or adjacent to the rack.

*All systems support redundant power configurations by using separate power inputs for each bus. Scalable bus bars provide dual power inputs (P1 and P2) for each bus.

**Periodic and random noise (PARD). Maximum allowable peak-to-peak ripple and noise (as measured at the load on any output channel). The ripple and noise is measured over a 20-Hz to 100-MHz frequency band. A resistive load (non-electronic) is used for this measurement. Each output is by-passed to return by a 10-uF tantalum capacitor with an ESR less than 100 milli-Ohms in parallel with a 0.47-uF ceramic capacitor, at the point of load. The load cable is 12 feet of twisted wire capable of carrying the current. The printed wiring board assembly is installed in its enclosure for this measurement, or the measurement leads are properly shielded with Earth grounds applied to the insert.

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