Site Preparation Guide

HP Integrity rx7640 and HP 9000 rp7440 Servers

Third Edition

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About this Document

This document covers the HP Integrity rx7640 and HP 9000 rp7440 Servers.

This document does not describe system software or partition configuration in any detail. For detailed information concerning those topics, refer to the HP System Partitions Guide: Administration for nPartitions.

Book Layout

This document contains the following chapters and appendices:

- Chapter 1 - Overview
- Chapter 2 - Site Preparation
- Appendix A - Templates
- Index

Intended Audience

This document is intended to be used by customer engineers assigned to support the HP Integrity rx7640 and HP 9000 rp7440 Servers.

Publishing History

The Printing History below identifies the edition dates of this document. Updates are made to this publication on an unscheduled, *as needed*, basis. The updates will consist of a complete replacement document and pertinent on-line or CD-ROM documentation.

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Second Edition	. . . . .	September 2006
Third Edition	Minor edits throughout. Added information about the rp7440 Server.	January 2007

Related Information

You can access other information on HP server hardware management, Microsoft® Windows® administratuon, and diagnostic support tools at the following Web sites:

http://docs.hp.com

The main Web site for HP technical documentation is `http://docs.hp.com`.

Server Hardware Information: http://docs.hp.com/hpux/hw/

The `http://docs.hp.com/hpux/hw/` Web site is the systems hardware portion of docs.hp.com. It provides HP nPartition server hardware management information, including site preparation, installation, and more.

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- `http://docs.hp.com/windows_nt/`
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HP books are available worldwide through bookstores, online booksellers, and office and computer stores.

Typographic Conventions

The following notational conventions are used in this publication.

WARNING A warning lists requirements that you must meet to avoid personal injury.

CAUTION A caution provides information required to avoid losing data or avoid losing system functionality.

NOTE A note highlights useful information such as restrictions, recommendations, or important details about HP product features.

- `Commands and options` are represented using `this font`.
- **`Text that you type exactly as shown`** is represented using **`this font`**.
- *`Text to be replaced with text that you supply`* is represented using *`this font`*.

  Example:
  "Enter the `ls -l` *`filename`* command" means you must replace *`filename`* with your own text.
- **Keyboard keys and graphical interface items (such as buttons, tabs, and menu items)** are represented using **this font**.

  Examples:
  The **Control** key, the **OK** button, the **General** tab, the **Options** menu.
- **Menu —> Submenu** represents a menu selection you can perform.

  Example:
  "Select the **Partition —> Create Partition** action" means you must select the **Create Partition** menu item from the **Partition** menu.
- `Example screen output` is represented using `this font`.

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1 HP Integrity rx7640 Server and HP 9000 rp7440 Server Overview

The HP Integrity rx7640 and HP 9000 rp7440 servers are members of HP's business-critical computing platform family in the mid-range product line.

The information in this guide applies to the HP Integrity rx7640 and HP 9000 rp7440 servers, except for a few items specifically denoted as applying only to the HP Integrity rx7640 Server.

The server is a 10U[1] high, 8-socket symmetric multiprocessor (SMP) rack-mount or standalone server. Features of the server include:

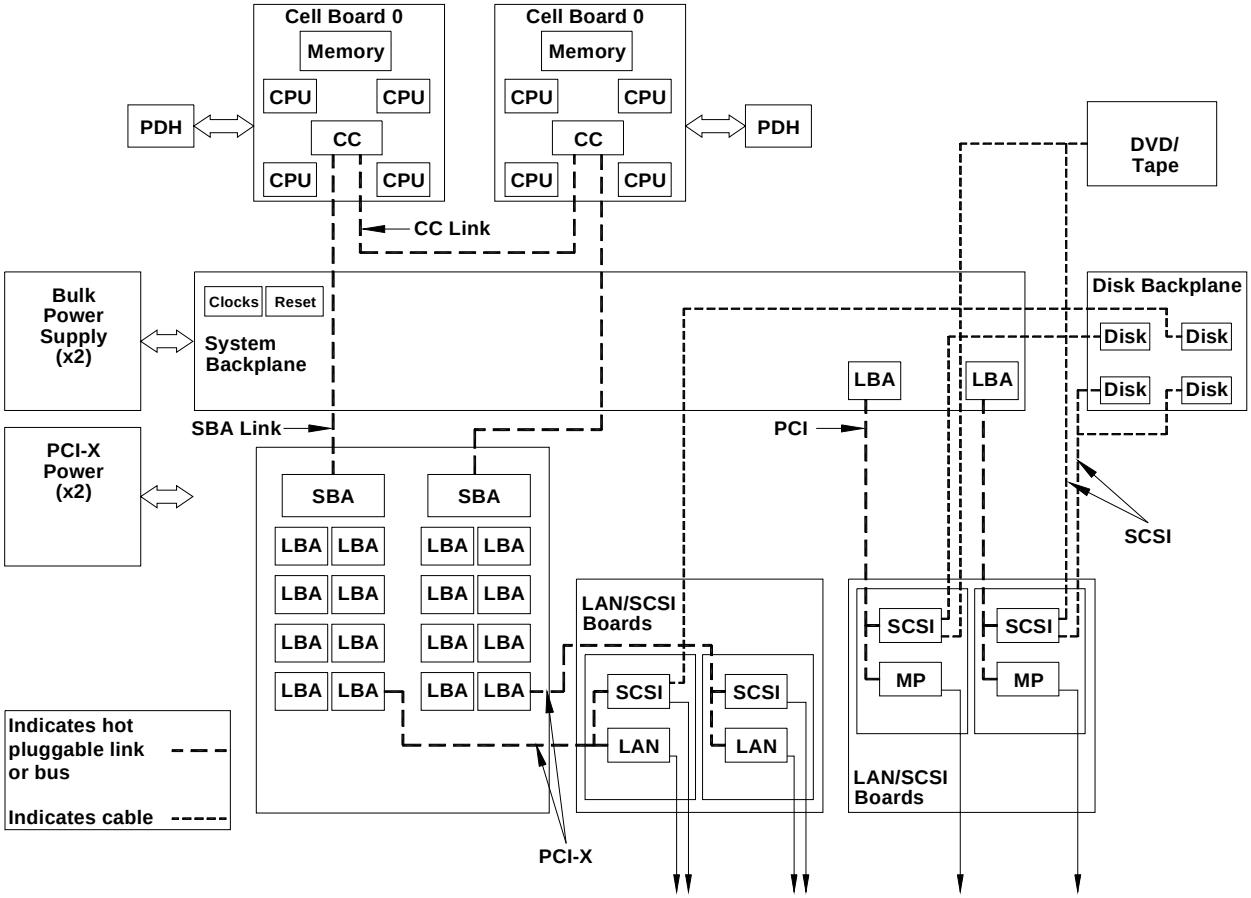
- Up to 256 GB of physical memory provided by dual inline memory modules (DIMMs).
- Dual-core processors.
- Up to 16 processors with a maximum of 4 processor modules per cell board and a maximum of 2 cell boards.
- One cell controller (CC) per cell board.
- Turbo fans to cool CPUs and CCs on the cell boards.
- Up to four embedded hard disk drives.
- One half-height DVD drive, two slimline DVDs or one DAT drive.
- Two front chassis mounted N+1 fans.
- Two rear chassis mounted N+1 fans.
- Six N+1 PCI-X card cage fans.
- Two N+1 bulk power supplies.
- N+1 hot-swappable system oscillators.
- Sixteen PCI-X slots divided into two partitions. Each partition can accommodate up to eight PCI/PCI-X/PCI-X 2.0 cards.
- Up to two core I/O card sets.
- One manageability processor per core I/O card with failover capability when two or more core I/O cards are installed and properly configured.
- Four 220 V AC power plugs. Two are required and the other two provide power source redundancy.

1. The U is a unit of measurement specifying product height. One U is equal to 1.75 inches.

Detailed Server Description

The following section provides detailed information about the server components.

Figure 1-1 8-Socket Server Block Diagram



Dimensions and Components

The following section describes server dimensions and components.

Figure 1-2 Server (Front View With Bezel)

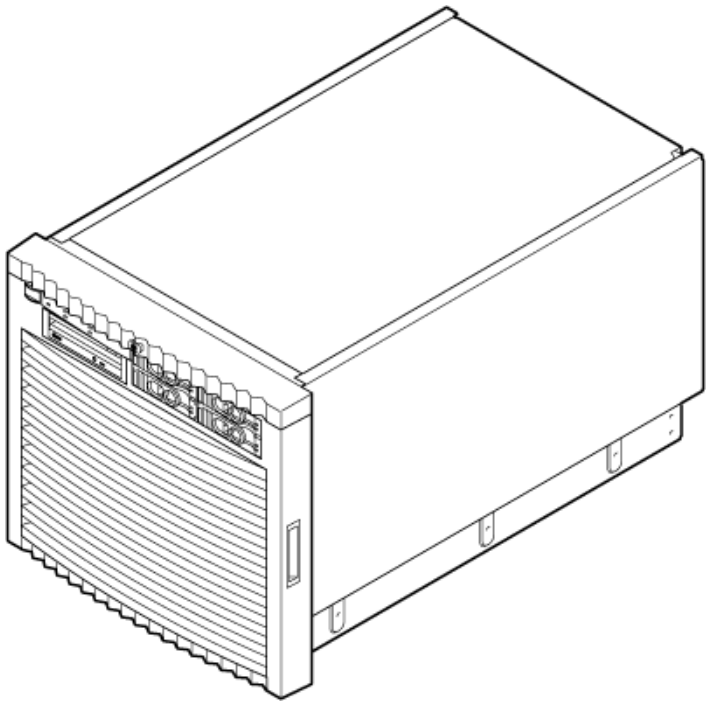
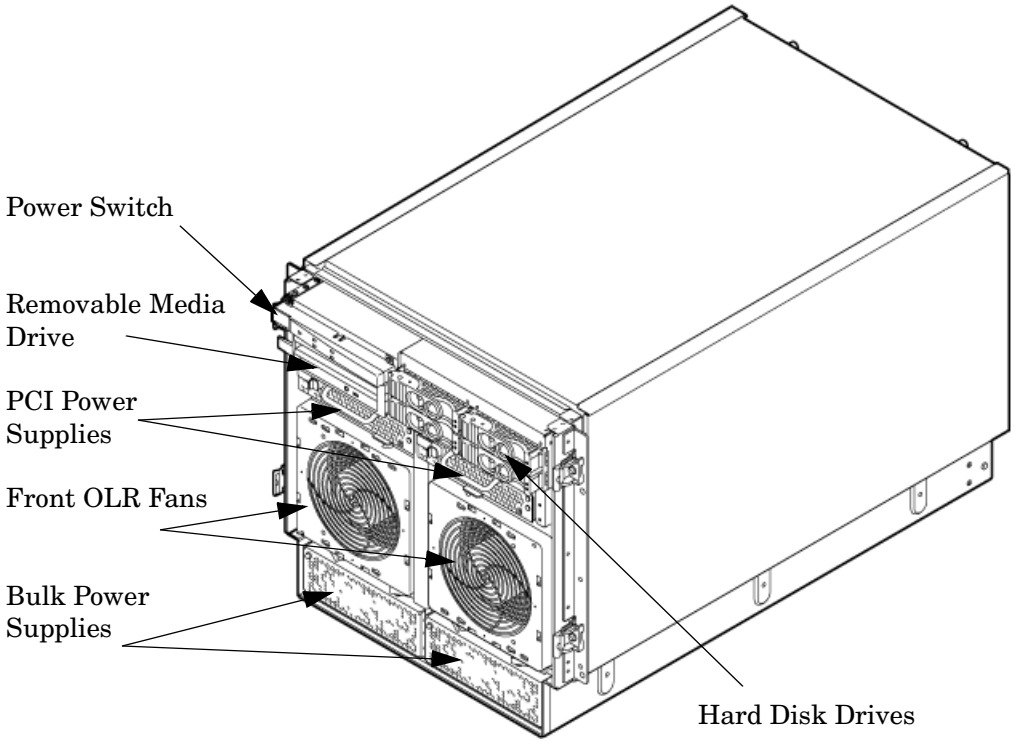


Figure 1-3 Server (Front View Without Bezel)



The server has the following dimensions:

- Depth: Defined by cable management constraints to fit into standard 36-inch deep rack:

  25.5 inches from front rack column to PCI connector surface

  26.7 inches from front rack column to MP Core I/O connector surface

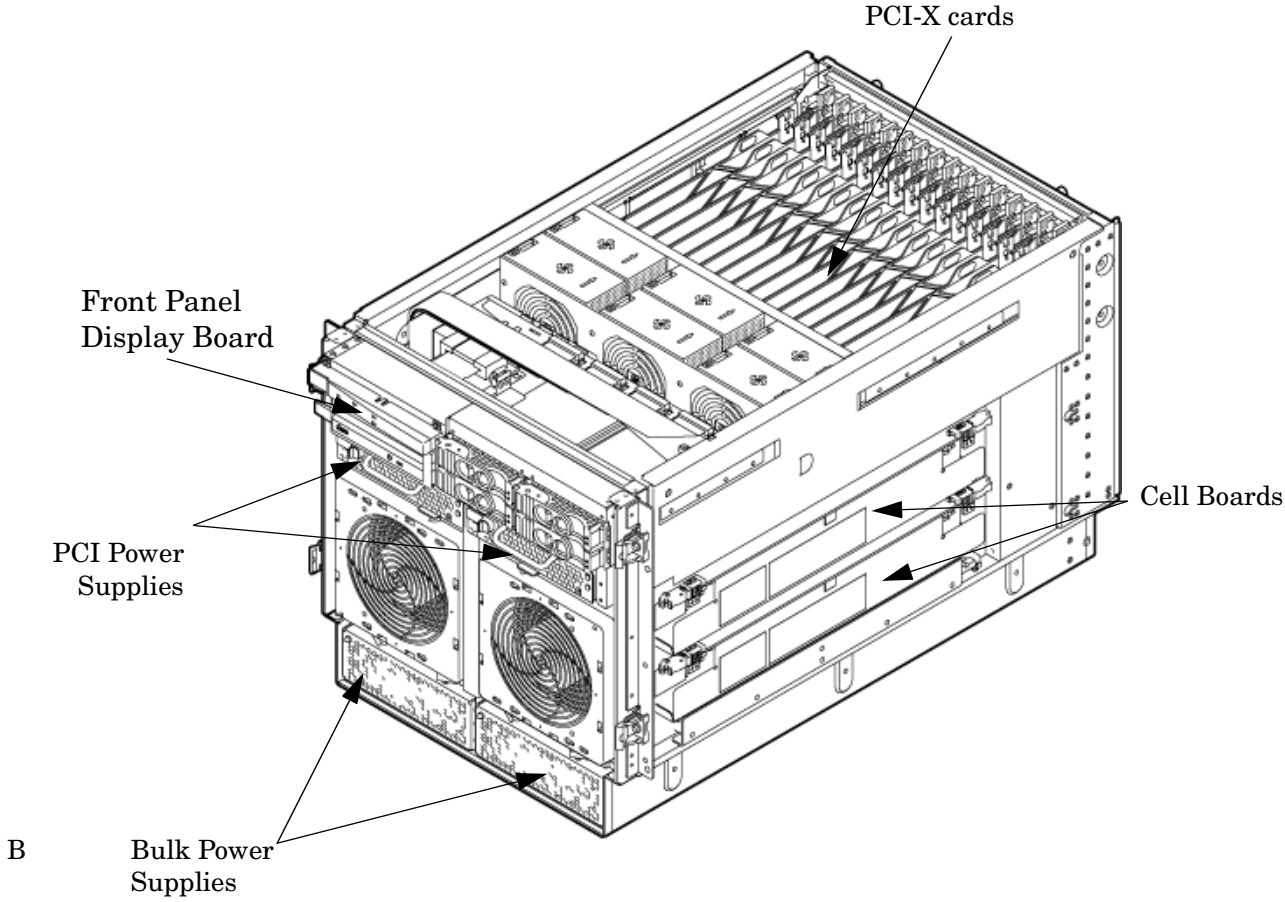
  30 inches overall package dimension, including 2.7 inches protruding in front of the front rack columns.
- Width: 44.45 cm (17.5 inches), constrained by EIA standard 19 inch racks.
- Height: 10U – 0.54 cm = 43.91 cm (17.287 inches). This is the appropriate height for a product that consumes 10U of rack height while allowing adequate clearance between products directly above and below this product. Fitting four server units per 2 m rack and upgrade of current 10U height products in the future are the main height constraints.

The mass storage section located in the front enables access to the 3.5-inch hard drives without removal of the bezel. This is especially helpful when the system is mounted in the lowest position in a rack. The mass storage bay also accommodates one 5.25-inch removable media device. The front panel display board, containing LEDs and the system power switch, is located directly above the 5.25-inch removable media bay.

Below the mass storage section and behind the removable front bezel are two, N+1 PCI-X power supplies.

The bulk power supply section is partitioned by a sealed metallic enclosure located in the bottom of the package. This enclosure houses the N+1 fully redundant BPSs. Install these power supplies from the front of the server after removing the front bezel.

Figure 1-4 Right-Front View



Access the PCI-X card section, located toward the rear, by removing the top cover.

The PCI card bulkhead connectors are located at the rear top.

The PCI OLR fan modules are located in front of the PCI-X cards. These six 9.2-cm fans are housed in plastic carriers. They are configured in two rows of three fans.

Four OLR system fan modules, externally attached to the chassis, are 15-cm (6.5-inch) fans. Two fans are mounted on the front surface of the chassis and two are mounted on the rear surface.

The cell boards are accessed from the right side of the chassis behind a removable side cover.

The two MP/SCSI boards are positioned vertically at the rear of the chassis.

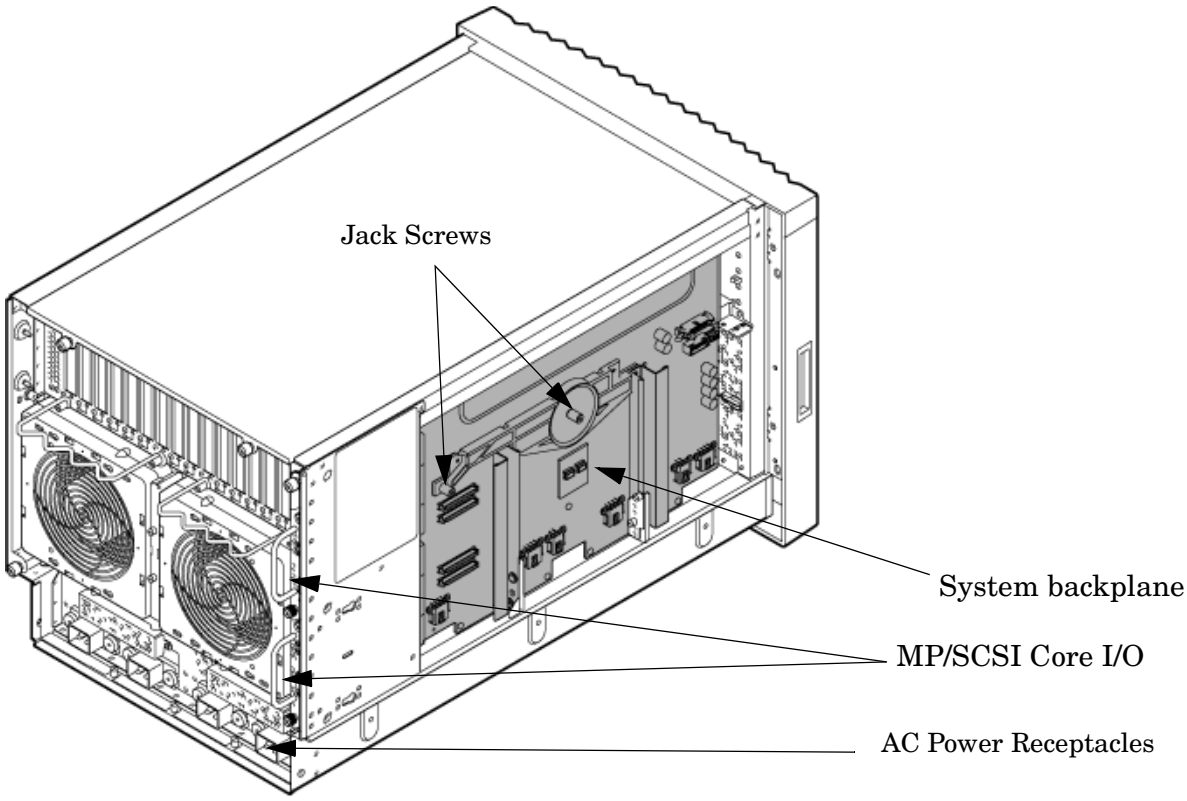
The two hot-pluggable N+1 redundant bulk power supplies provide a wide input voltage range. They are installed in the front of the chassis, directly under the front fans.

A cable harness that connects from the rear of the BPSs to the system backplane provides DC power distribution.

Access the system backplane by removing the left side cover. The system backplane hinges from the lower edge and is anchored at the top with two jack screws.

The SCSI ribbon-cable assembly routes from the mass storage area to the backside of the system backplane for connection to the MP/SCSI card, and to the AB290A LAN/SCSI PCI-X cards.

Figure 1-5 Left-Rear View



Front Panel

Front Panel Indicators and Controls

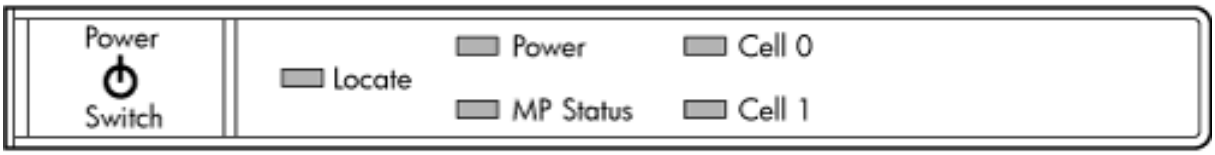
The front panel, located on the front of the server, includes the power switch. Refer to Figure 1-6.

Enclosure Status LEDs

The following status LEDs are on the front panel:

- Locate LED (blue)
- Power LED (tri-color)
- Management processor (MP) status LED (tri-color)
- Cell 0, 1 status (tri-color) LEDs

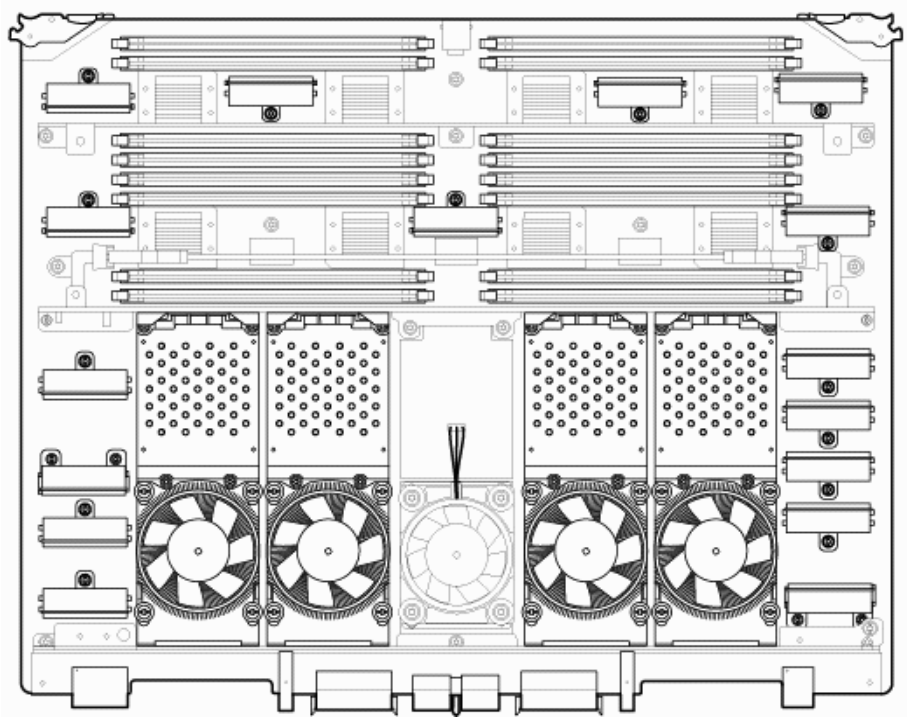
Figure 1-6 Front Panel LEDs and Power Switch



Cell Board

The cell board, illustrated in Figure 1-7, contains the processors, main memory, and the CC application specific integrated circuit (ASIC) which interfaces the processors and memory with the I/O, and to the other cell board in the server. The CC is the heart of the cell board, enabling communication with the other cell board in the system. It connects to the processor dependent hardware (PDH) and micro controller hardware. Each cell board holds up to two processor modules and 16 memory DIMMs. One or two cell boards can be installed in the server. A cell board can be selectively powered off for adding processors, memory, or for maintenance of the cell board, without affecting the other cell board in a configured partition.

Figure 1-7 Cell Board



The server has a 48 V distributed power system and receives the 48 V power from the system backplane board. The cell board contains DC-to-DC converters to generate the required voltage rails. The DC-to-DC converters on the cell board do not provide N+1 redundancy.

The cell board contains the following major buses:

- Two front side buses (FSB), each with up to two processors
- Four memory buses (one going to each memory quad)
- Incoming and outgoing I/O bus that goes off board to an SBA chip
- Incoming and outgoing crossbar bus that goes off board to the other cell board
- PDH bus that goes to the PDH and microcontroller circuitry

All of these buses come together at the CC chip.

Because of space limitations on the cell board, the PDH and microcontroller circuitry resides on a riser board that plugs into the cell board at a right angle. The cell board also includes clock circuits, test circuits, and de-coupling capacitors.

PDH Riser Board

The PDH riser board is a small card that plugs into the cell board at a right angle. The PDH riser interface contains the following components:

- Microprocessor memory interface microcircuit
- Hardware including the processor dependant code (PDH) flash memory
- Manageability microcontroller with associated circuitry

The PDH obtains cell board configuration information from cell board signals and from the cell board local power module (LPM).

Central Processor Units

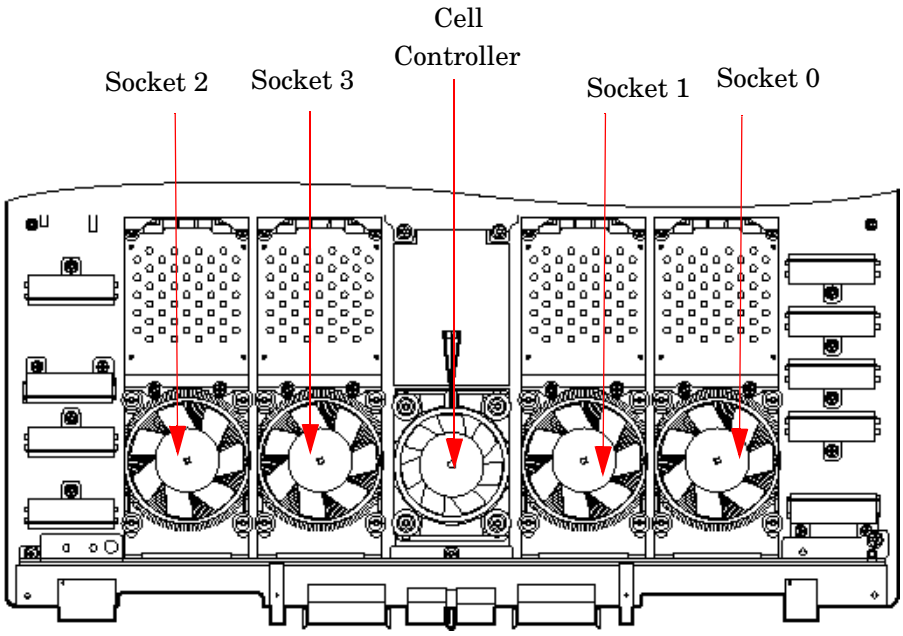
The cell board can hold up to four CPU modules. Each CPU module can contain up to two CPU cores on a single socket. Modules are populated in increments of one. On a cell board, the processor modules must be the same family, type, and clock frequencies. Mixing of different processors on a cell board or partition is not supported. Refer to Table 1-1 for the load order that must be maintained when adding processor modules to the cell board. Refer to Figure 1-8 for the locations on the cell board for installing processor modules.

NOTE Unlike previous HP cell based systems, the HP Integrity rx7640 server cell board does not require that a termination module be installed at the end of an unused FSB. System firmware is allowed to disable an unused FSB in the CC. This enables both sockets of the unused bus to remain unpopulated.

Table 1-1 Cell Board CPU Module Load Order

Number of CPU Modules Installed	Socket 2	Socket 3	Socket 1	Socket 0
1	Empty slot	Empty slot	Empty slot	CPU installed
2	CPU installed	Empty slot	Empty slot	CPU installed
3	CPU installed	Empty slot	CPU installed	CPU installed
4	CPU installed	CPU installed	CPU installed	CPU installed

Figure 1-8 CPU Locations on Cell Board

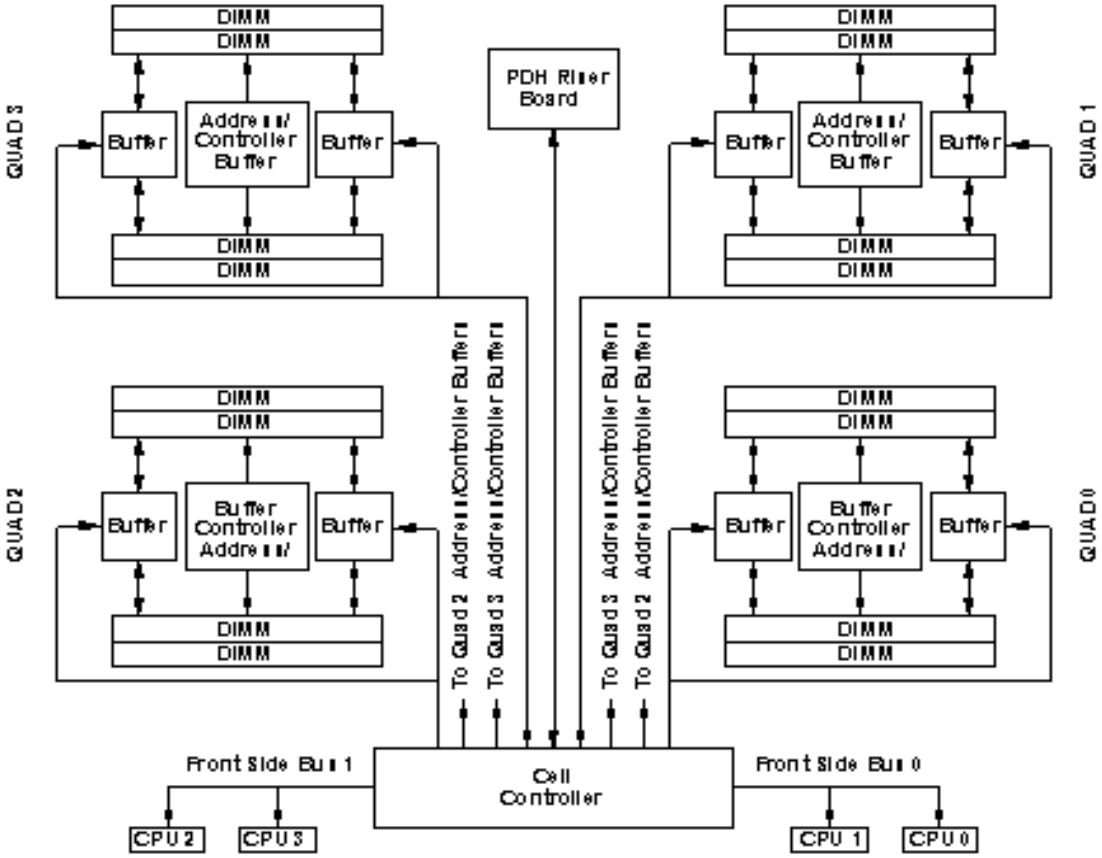


Memory Subsystem

Figure 1-9 shows a simplified view of the memory subsystem. It consists of two independent access paths, each path having its own address bus, control bus, data bus, and DIMMs. Address and control signals are fanned out through register ports to the synchronous dynamic random access memory (SDRAM) on the DIMMs.

The memory subsystem comprises four independent quadrants. Each quadrant has its own memory data bus connected from the cell controller to the two buffers for the memory quadrant. Each quadrant also has two memory control buses; one for each buffer.

Figure 1-9 Memory Subsystem



DIMMs

The memory DIMMs used by the server are custom designed by HP. Each DIMM contains DDR-II SDRAM memory that operates at 533 MT/s. Industry standard DIMM modules do not support the high availability and shared memory features of the server. Therefore, industry standard DIMM modules are not supported.

The server supports DIMMs with densities of 1, 2, and 4 Gb. Table 1-2 on page 33 lists each supported DIMM size, the resulting total system capacity, and the memory component density. Each DIMM is connected to two buffer chips on the cell board.

Table 1-2 Server DIMMs

DIMM Size	Total Capacity	Memory Component Density
1 Gb	32 Gb	128 Mb
2 Gb	64 Gb	256 Mb
4 Gb	128 Gb	512 Mb

Cells and nPartitions

An nPartition comprises one or more cells working as a single system. Any I/O chassis that is attached to a cell belonging to an nPartition is also assigned to the nPartition. Each I/O chassis has PCI card slots, I/O cards, attached devices, and a core I/O card assigned to the I/O chassis.

On the server, each nPartition has its own dedicated portion of the server hardware which can run a single instance of the operating system. Each nPartition can boot, reboot, and operate independently of any other nPartitions and hardware within the same server complex.

The server complex includes all hardware within an nPartition server: all cabinets, cells, I/O chassis, I/O devices and racks, management and interconnecting hardware, power supplies, and fans.

A server complex can contain one or two nPartitions, enabling the hardware to function as a single system or as multiple systems.

NOTE Partition configuration information is available on the Web at:

http://docs.hp.com

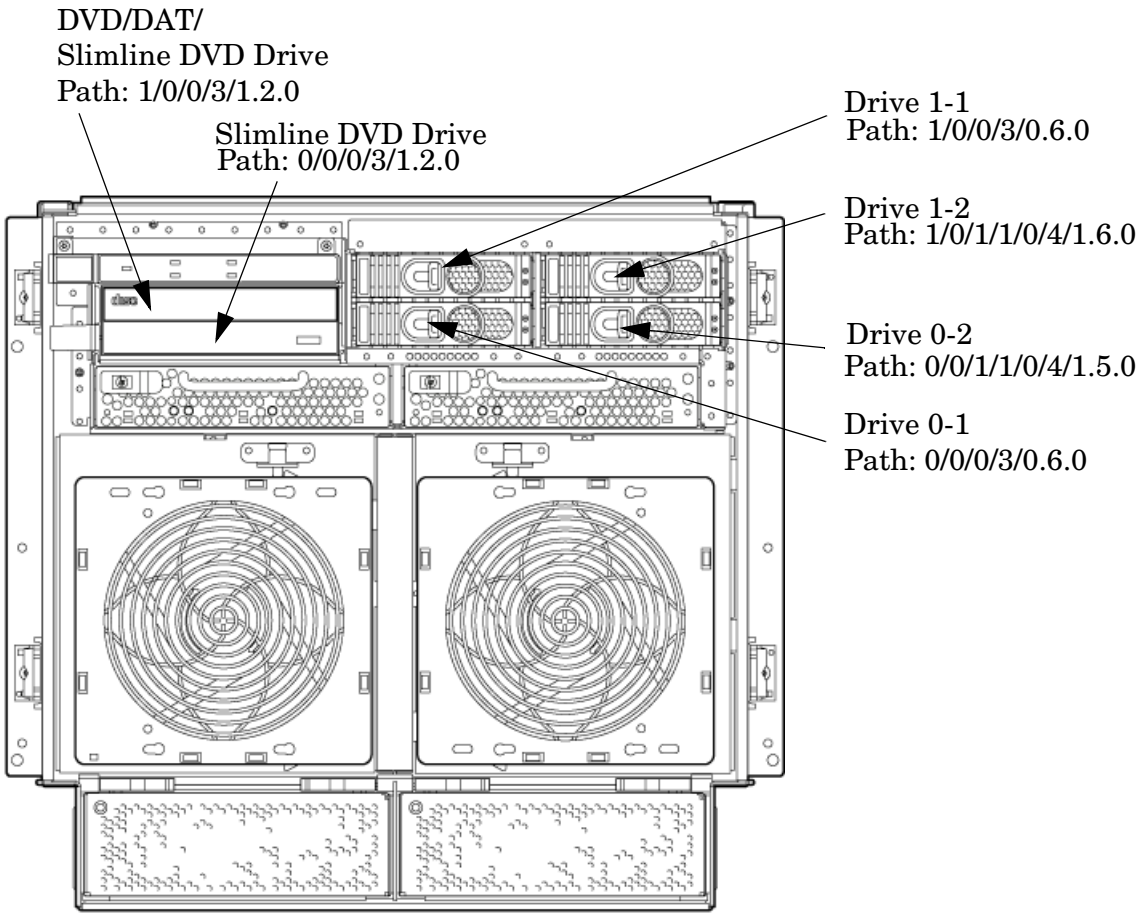
Refer to *HP System Partitions Guide: Administration for nPartitions* for details.

Internal Disk Devices for the Server

As Figure 1-10 shows, in a server cabinet, the top internal disk drives connect to cell 1 through the core I/O for cell 1. Both of the bottom disk drives connect to cell 0 through the core I/O for cell 0.

The DVD/DAT drive connects to cell 1 through the core I/O card for cell 1.

Figure 1-10 Disk Drive and DVD Drive Location



System Backplane

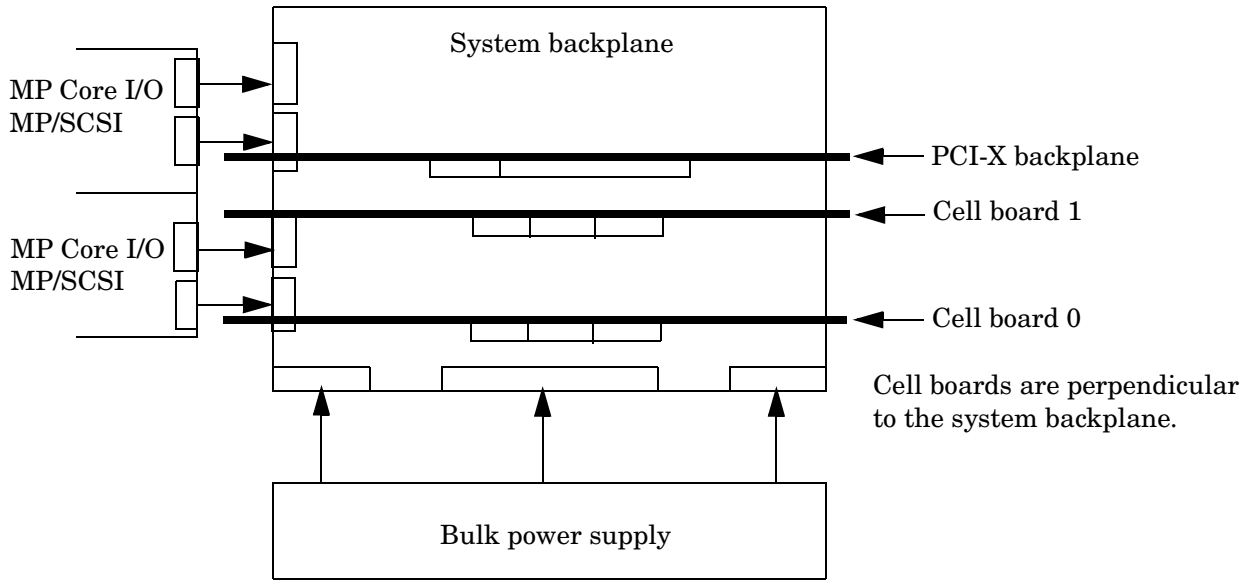
The system backplane contains the following components:

- The system clock generation logic
- The system reset generation logic
- DC-to-DC converters
- Power monitor logic
- Two local bus adapter (LBA) chips that create internal PCI buses for communicating with the core I/O card

The backplane also contains connectors for attaching the cell boards, the PCI-X backplane, the core I/O board set, SCSI cables, bulk power, chassis fans, the front panel display, intrusion switches, and the system scan card. Unlike Superdome or the HP Integrity rx8640, there are no Crossbar Chips (XBC) on the system backplane. The “crossbar-less” back-to-back CC connection increases performance.

Only half of the core I/O board set connects to the system backplane. The MP/SCSI boards plug into the backplane, while the LAN/SCSI boards plug into the PCI-X backplane.

Figure 1-11 System Backplane Block Diagram



System Bacplane to PCI-X Backplane Connectivity

The PCI-X backplane uses two connectors for the SBA link bus and two connectors for the high speed data signals and the manageability signals.

SBA link bus signals are routed through the system backplane to the cell controller on each corresponding cell board.

The high speed data signals are routed from the SBA chips on the PCI-X backplane to the two LBA PCI bus controllers on the system backplane.

Clocks and Reset

The system backplane contains reset and clock circuitry that propagates through the whole system. The system backplane central clocks drive all major chip set clocks. The system central clock circuitry features redundant, hot-swappable oscillators.

I/O Subsystem

The cell board to the PCI-X board path runs from the CC to the SBA, from the SBA to the ropes, from the ropes to the LBA, and from the LBA to the PCI slots seen in Figure 1-12. The CC on cell board 0 and cell board 1 communicates through an SBA over the SBA link. The SBA link consists of both an inbound and an outbound link with an effective bandwidth of approximately 11.5 GB/sec. The SBA converts the SBA link protocol into “ropes.” A rope is defined as a high-speed, point-to-point data bus. The SBA can support up to 16 of these high-speed bi-directional rope links for a total aggregate bandwidth of approximately 11.5 GB/sec.

Each LBA acts as a bus bridge, supporting either one or two ropes and capable of driving 33 MHz or 66 MHz for PCI cards. The LBAs can also drive at 66 MHz or 133 MHz for PCI-X cards, and at 266 MHz for PCI-X mode 2 cards installed in mode 2 capable slots.

Figure 1-12 PCI-X Board to Cell Board Block Diagram

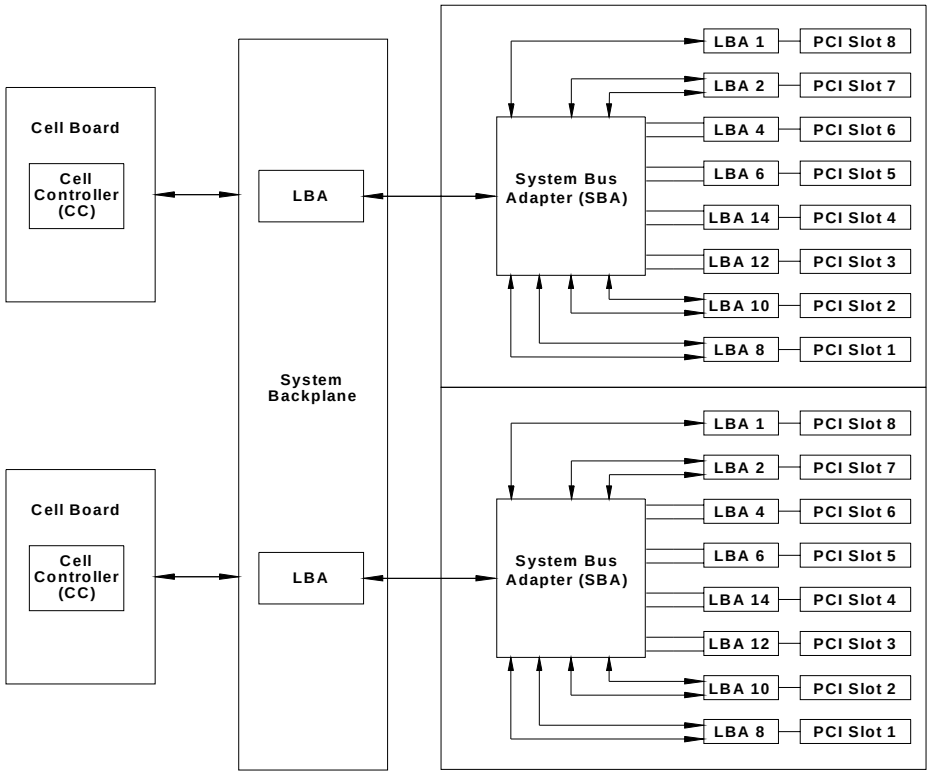


Table 1-3 and Table 1-4 list the mapping of PCI-X slots to boot paths. The cell column refers to the cell board installed in the server in cell slot 0 and in cell slot 1.

Table 1-3 PCI-X paths for Cell 0

Cell	PCI-X Slot	IO Chassis	Path
0	1	0	0/0/8/1
0	2	0	0/0/10/1
0	3	0	0/0/12/1
0	4	0	0/0/14/1
0	5	0	0/0/6/1
0	6	0	0/0/4/1
0	7	0	0/0/2/1
0	8	0	0/0/1/1

Table 1-4 PCI-X Paths Cell 1

Cell	PCI-X Slot	I/O Chassis	Path
1	1	1	1/0/8/1
1	2	1	1/0/10/1
1	3	1	1/0/12/1
1	4	1	1/0/14/1
1	5	1	1/0/6/1
1	6	1	1/0/4/1
1	7	1	1/0/2/1
1	8	1	1/0/1/1

The server supports two internal SBAs. Each SBA provides the control and interfaces for eight PCI-X slots. The interface is through the rope bus (16 ropes per SBA). For each SBA, the ropes are divided in the following manner:

- A single rope is routed to support the core I/O boards through LBAs located on the system backplane.
- A single rope is routed to an LBA on the PCI backplane to support a slot for PCI and PCI-X cards (slot 8).
- Six ropes are bundled into double ropes to three LBAs. They support slots 1, 2, and 7 for PCI and PCI-X mode 1 cards.
- Eight fat ropes are bundled into quad ropes to four LBAs. They support slots 3, 4, 5, and 6 for PCI and PCI-X mode 2 cards.

NOTE PCI-X slots 1-7 are dual rope slots while slot 8 is a single rope slot. A rope is defined as a high speed point to point data bus.

The PCI-X backplane is the primary I/O interface for the server. It provides 16, 64-bit, hot-plug PCI/PCI-X slots. Fourteen of the slots have dual ropes connected to the LBA chips. The remaining two slots have a single rope connected to each LBA chip. Each of the sixteen slots are capable of 66 MHz/33 MHz PCI or 133 MHz/66 MHz PCI-X. Four slots in PCI-X support 266 MHz. All sixteen PCI slots are keyed for 3.3 volt connectors (accepting both Universal and 3.3 V cards). See Table 1-5 for more details.

The PCI-X backplane is physically one board, but it behaves like two independent partitions. SBA 0, its associated LBAs, and eight PCI-X slots form one I/O partition. SBA 1, its associated LBAs, and eight PCI-X slots form the other I/O partition. One I/O partition can be reset separately from the other I/O partition, but cannot be powered down independently.

IMPORTANT Always refer to the PCI card's manufacturer for the specific PCI card performance specifications. PCI, PCI-X mode 1, and PCI-X mode 2 cards are supported at different clock speeds. Select the appropriate PCI-X I/O slot for best performance.

Table 1-5 lists the PCI-X slot types supported on the server.

Table 1-5 PCI-X Slot Types

I/O Partition	Slot[a]	Maximum MHz	Maximum Peak Bandwidth	Ropes	Supported Cards	PCI Mode Supported
0	8	133	533 MB/s	001	3.3 V	PCI or PCI-X Mode 1
	7	133	1.06 GB/s	002/003	3.3 V	PCI or PCI-X Mode 1
	6	266	2.13 GB/s	004/005	3.3 V or 1.5 V	PCI-X Mode 2
	5	266	2.13 GB/s	006/007	3.3 V or 1.5 V	PCI-X Mode 2
	4	266	2.13 GB/s	014/015	3.3 V or 1.5 V	PCI-X Mode 2
	3	266	2.13 GB/s	012/013	3.3 V or 1.5 V	PCI-X Mode 2
	2	133	1.06 GB/s	010/011	3.3 V	PCI or PCI-X Mode 1
	1	133	1.06 GB/s	008/009	3.3 V	PCI or PCI-X Mode 1
1	8	133	533 MB/s	001	3.3 V	PCI or PCI-X Mode 1
	7	133	1.06 GB/s	002/003	3.3 V	PCI or PCI-X Mode 1
	6	266	2.13 GB/s	004/005	3.3 V or 1.5 V	PCI-X Mode 2
	5	266	2.13 GB/s	006/007	3.3 V or 1.5 V	PCI-X Mode 2
	4	266	2.13 GB/s	014/015	3.3 V or 1.5 V	PCI-X Mode 2
	3	266	2.13 GB/s	012/015	3.3 V or 1.5 V	PCI-X Mode 2
	2	133	1.06 GB/s	010/011	3.3 V	PCI or PCI-X Mode 1
	1	133	1.06 GB/s	008/009	3.3 V	PCI or PCI-X Mode 1

a. Each slot will auto select the proper speed for the card installed up to the maximum speed for the slot. Placing high speed cards into slow speed slots will cause the card to be driven at the slow speed.

MP/SCSI Board

Up to two MP/SCSI cards can be plugged into the server. At least one MP/SCSI board is required (independent of partitions). An additional MP/SCSI board is required in a dual partition system. Both MP/SCSI boards are oriented vertically and plug into the system backplane. The MP/SCSI board incorporates a dual channel Ultra320 SCSI controller and is hot-pluggable.

LAN/SCSI Board

At least one LAN/SCSI board is required for the minimum system configuration. Two are required in a dual partition system. The LAN/SCSI board is a standard PCI form factor card with PCI card edge connectors. The PCI-X backplane has one slot location reserved for the required board and another that can accommodate either a second LAN/SCSI board or any other supported add-in PCI-X card. The LAN/SCSI board is hot-pluggable.

Mass Storage (Disk) Backplane

Internal mass storage connections to disks are routed on the mass storage backplane, which has connectors and termination logic. All hard disks are hot-plug, but removable media disks are not. The servers accommodate one internal, half-height, removable media device, or two internal, slim line DVD+RW removable media devices.. The mass storage backplane incorporates a circuit that enables power to the internal removable media device to be programmatically cycled.

2 Server Site Preparation

This chapter describes the basic server configuration and its physical specifications and requirements.

Dimensions and Weights

This section provides dimensions and weights of the system components. Table 2-1 gives the dimensions and weights for a fully configured server.

Table 2-1 Server Dimensions and Weights

	Standalone	Packaged
Height- Inches (centimeters)	17.3 (43.9)	35.75 (90.8)
Width- Inches (centimeters)	17.5 (44.4)	28.0 (71.1)
Depth- Inches (centimeters)	30.0 (76.2)	28.38 (72.0)
Weight - Pounds (kilograms)	220.0[a] (100.0)	665.0[b] (302.0)

a. This weight represents a fully configured server before it is installed in a rack.
b. The packaged weight represents a server installed in a 2-m rack. The packaged weight includes a fully configured server in a 2-m rack with a rear door, rail slide kit, line cord anchor kit, interlock assembly, cable management arm, 120-lb ballast kit, and a 60-A PDU. The shipping box, pallet, and container, not included in the packaged weight in Table 2-1, adds approximately 150.0-lb to the total system weight when shipped. The size and number of miscellaneous pallets will be determined by the equipment ordered by the customer.

Table 2-2 provides component weights for calculating the weight of a server not fully configured. Table 2-3 provides an example of how to calculate the weight. Table 2-4 is a blank worksheet for calculating the weight of the server. To determine the overall weight, follow the example in Table 2-3, and complete the worksheet in Table 2-4 for your system.

Table 2-2 Server Component Weights

Quantity	Description	Weight lb (kg)
1	Chassis	90.0 (41.0)
1 - 2	Cell board	27.80 (12.61) each
1	System backplane	12 (5.44) (estimate)
1	PCI-X card cage assemply	20.4 (9.25)
2	Bulk power supply	18.0 (8.2) each
1	Mass storage backplane	1.0 (0.45)
2	PCI-X power supplies	5.0 (2.27) each
1 - 4	Hard disk drive	1.60 (0.73) each
1	Removable media disk drive	2.20 (1.00) each

Table 2-3 Example Weight Summary

Component	Quantity	Multiply	Weight (kg)
Cell board	2	27.8 (12.16)	107.20 (48.64)
PCI card (varies - used sample value)	4	0.34 (0.153)	1.36 (0.61)
Power supply (BPS)	2	18 (8.2)	36.0 (16.4)
DVD drive	1	2.2 (1.0)	4.4 (2.0)
Hard disk drive	4	1.6 (0.73)	6.40 (2.90)
Chassis with skins and front bezel cover	1	90.0(41.0)	131.0 (59.42)
		Total weight	286.36 (129.89)

Table 2-4 Weight Summary

Component	Quantity	Multiply By	Weight (kg)
Cell Board		27.8 (12.16)	
PCI Card		0.34 (0.153)	
Power Supply (BPS)		18 (8.2)	
DVD Drive		2.2 (1.0)	
Hard Disk Drive		1.6 (0.73)	
Chassis with skins and front bezel cover		90.0 (41.0)	
		Total weight	

Electrical Specifications

This section provides electrical specifications for the server.

Grounding

The site building shall provide a safety ground and protective earth for each AC service entrance to all cabinets.

Install a protective earthing (PE) conductor that is identical in size, insulation material, and thickness to the branch-circuit supply conductors. The PE conductor must be green with yellow stripes. The earthing conductor must be connected from the unit to the building installation earth or if supplied by a separately derived system, at the supply transformer or motor-generator set grounding point.

Circuit Breaker

The Marked Electrical for the server is 15 amps per line cord. The recommended circuit breaker size is 20 amps for North America. For countries outside North America, consult your local electrical authority having jurisdiction for the recommended circuit breaker size.

The server contains four C20 power receptacles located at the bottom rear bulkhead. A minimum of two power cords must be used to maintain normal operation of the server. A second set of two cords can be added to improve system availability by protecting, for example, against power source failures or accidentally tripped circuit breakers. The server can receive AC input from two different AC power sources.

System AC Power Specifications

Power Cords

Table 2-5 lists the various power cables available for use with the server. Each power cord is 15 feet (4.5 meters) in length with a IEC 60320-1 C19 female connector attached to one end.

Table 2-5 Power Cords

Part Number	Description	Where Used
8120-6895	Stripped end, 240 volt	International - Other
8120-6897	Male IEC309, 240 volt	International - Europe
8121-0070	Male GB-1002, 240 volts	China
8120-6903	Male NEMA L6-20, 240 volt	North America/Japan

System Power Specifications

Table 2-6 lists the AC power requirements for the HP Integrity rx7640 and HP 9000 rp7440 servers. Table 2-7 lists the system power requirements for the HP Integrity rx7640 Server. Table 2-8 provides the system power requirements for the HP 9000 rp7440 Server. These tables provide information to help determine the amount of AC power needed for your computer room.

Table 2-6 AC Power Requirements

Requirements	Value	Comments
Nominal input voltage	200/208/220/230/240 (VAC rms)	
Frequency range (minimum - maximum)	50 - 60 (Hz)	
Number of phases	1	
Maximum input current	12 amps	Per line cord
Maximum inrush current	30 A peak for 15 ms	Per line cord
Power factor correction	>0.98 >0.95	At all loads of 50% - 100% of supply rating At all loads 0f 25% - 50% of supply rating
Ground leakage current (mA)	<3.0 (ma)	Per line cord

Table 2-7 System Power Requirements for the HP Integrity rx7640 Server

Power Required (50–60 Hz)	Watts	VA	Comments
Maximum Theoretical Power	3166	3231	See Note 1
Marked Electrical Power	– – –	2640	12A @ 220 VAC, See Note 2
User-Expected Maximum Power	2128	2171	See Note 3

Table 2-8 System Power Requirements for the HP 9000 rp7440

Power Required(50-60 Hz)	Watts	VA	Comments
Maximum Theoretical Power	3092	3130	See # 1
Marked Electrical Power		2640	12A@ 220 VAC, see # 2
User-Expected Maximum Power	2078	2120	see # 3

Note 1: Maximum Theoretical Power: or “Maximum Configuration” (Input power at the ac input expressed in Watts and Volt-Amps to take into account Power factor correction.)

The calculated sum of the maximum worst case power consumption for every subsystem in the server. This number will never be exceeded by a functioning server for any combination of hardware and software under any conditions.

Note 2: Marked Electrical Power: (Input power at the ac input expressed in Volt-Amps.)

The Marked Electrical Power is the rating given on the chassis label and represents the input power required for facility ac power planning and wiring requirements. This number represents the expected maximum power consumption for the server based on the power rating of the bulk power supplies. This number can safely be used to size ac circuits and breakers for the system under all conditions.

Note 3: User-Expected Maximum Power: or User Expected Maximum Power, (Input power at the ac input expressed in Watts and Volt-Amps.)

The measured maximum worst case power consumption. This number represents the larges power consumption that HP engineers were able to produce for the server with any combination of hardware under laboratory conditions using aggressive software applications designed specifically to work the system at maximum load. This number can safely be used to compute thermal loads and power consumption for the system under all conditions.

Environmental Specifications

This section provides the environmental, power dissipation, noise emission, and airflow specifications for the server.

Temperature and Humidity

The cabinet is actively cooled using forced convection in a Class C1-modified environment. The recommended humidity level for Class C1 is 40 to 55% relative humidity (RH).

Operating Environment

The system is designed to run continuously and meet reliability goals in an ambient temperature of 5° to 35° C at sea level. The maximum allowable temperature is derated 1° C per 1,000 feet of elevation above 3,000 feet above sea level up to 25° C at 10,000 feet. For optimum reliability and performance, the recommended operating range is 20° to 25° C. This meets or exceeds the requirements for Class 2 in the corporate and ASHRAE standard. See Table 2-9 on page 48 for an example of the ASHRAE thermal report.

Table 2-9 Example ASHRAE Thermal Report

	Condition						
	Voltage 208 Volts						
	Typical Heat Release	Airflow, nominal	Airflow, maximum at 35° C	Weight		Over System Dimensions (W x D x H)	
Description	Watts	cfm	(m^3/hr)	lb	kg	Inches	mm
Minimum configuration	670	960	1631	192.2	87.4	h=17.29 w=17.50 d=30.00	439.17 444.50 762.00
Full configuration	2128	960	1631	220	100	h=17.29 w=17.50 d=30.00	439.17 444.50 762.00
Typical configuration	1090	960	1637	N/A	N/A	h=17.29 w=17.50 d=30.00	439.17 444.50 762.00
ASHRAE class			Minimum configuration	1 cell board, 2 CPUs, 2 GB, 1 core I/O card			
			Full configuration	2 cell boards, 8 CPUs, 64 GB, 2 core I/O cards			
			Typical configuration	1 cell board, 4 CPUs, 32 GB, 1 core I/O card, 8 I/O cards, 2 hard drives			

Environmental Temperature Sensor

To ensure that the system is operating within the published limits, the ambient operating temperature is measured using a sensor placed near the chassis inlet, between the cell boards. Data from the sensor is used to control the fan speed and to initiate system overtemp shutdown.

Non-Operating Environment

The system is designed to withstand ambient temperatures between -40° to 70° C under non-operating conditions.

Cooling

Internal Chassis Cooling

The cabinet incorporates front-to-back airflow across the cell boards and system backplane. Two 150 mm fans, mounted externally on the front chassis wall behind the cosmetic front bezel, push air into the cell section. Two 150 mm fans housed in cosmetic plastic fan carriers, mounted externally to the rear chassis wall, pull air through the cell section.

Each fan is controlled by a smart fan control board, embedded in the fan module plastic housing. The smart fan control board receives fan control input from the system fan controller on the system backplane and returns fan status information to the system fan controller. The smart fan control board also controls the power and the pulse width modulated control signal to the fan and monitors the speed indicator back from the fan. The fan status LED is driven by the smart fan control board.

Bulk Power Supply Cooling

Cooling for the bulk power supplies (BPS) is provided by two 60 mm fans contained within each BPS. Air flows into the front of the BPS and is exhausted out of the top of the power supply through upward facing vents near the rear of the supply. The air is then ducted out of the rear of the chassis with minimal leakage into the cell airflow plenum.

PCI/Mass Storage Section Cooling

Six 92 mm fans located between the mass storage devices and the PCI card cage provide airflow through these devices. The PCI fans are powered with housekeeping power and run at full speed at all times. The air is pulled through the mass storage devices and pushed through the PCI Card Cage. Perforation is provided between the PCI bulkheads to allow adequate exhaust ventilation.

Standby Cooling

Several components within the chassis consume significant amounts of power while the system is in standby mode. The system fans run at a portion of full speed during standby to remove the resulting heat from the cabinet. The fans within the power supply will operate at full speed during standby.

Typical Power Dissipation and Cooling

Table 2-10 provides calculations for configurations for the HP Integrity rx7640 Server. For calculations for the HP 9000 rp7440 Server, see Table 2-11.

Table 2-10 Typical Server Configurations for the HP Integrity rx7640 Server

Cell Boards	Memory Per Cell Board	PCI Cards (assumes 10 watts each)	DVDs	Hard Disk Drives	Core I/O	Bulk Power Supplies	Typical Power	Typical Cooling
Qty	GBytes	Qty	Qty	Qty	Qty	Qty	Watts	BTU/hr
2	32	16	2	4	2	2	2128	7265
2	16	8	0	2	2	2	1958	6685
2	8	8	0	2	2	2	1921	6558
1	8	8	0	1	1	2	1262	4308

Table 2-11 Typical Server Configurations for the HP 9000 rp7440 Server

Cell Boards	Memory Per Cell Board	PCI Cards (assumes 10 watts each)	DVDs	Hard Disk Drives	Core I/O	Bulk Power Supplies	Typical Power	Typical Cooling
Qty	GBytes	Qty	Qty	Qty	Qty	Qty	Watts	BTU/hr
2	32	16	3	2	2	2	2078	7096
2	16	8	2	2	2	2	1908	6515
2	8	8	2	2	2	2	1871	6389
1	8	8	1	1	1	2	1237	4224

The air conditioning data is derived using the following equations.

- Watts x (0.860) = kcal/hour
- Watts x (3.414) = Btu/hour
- Btu/hour divided by 12,000 = tons of refrigeration required

NOTE When determining power requirements you must consider any peripheral equipment that will be installed during initial installation or as a later update. Refer to the applicable documentation for such devices to determine the power and air-conditioning that is required to support these devices.

Acoustic Noise Specification

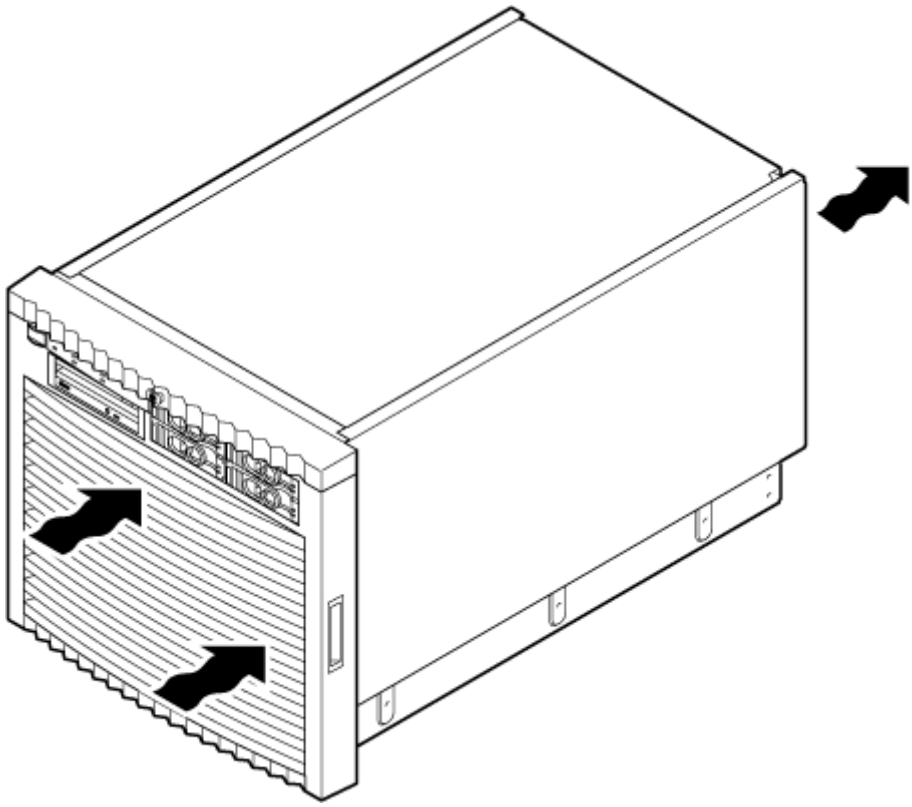
The acoustic noise specification for the server is 57.3 db (sound pressure level at bystander position) It is appropriate for dedicated computer room environments but not office environments. The LwA is 7.5 Bels. Care should be taken to understand the acoustic noise specifications relative to operator positions within the computer room or when adding servers to computer rooms with existing noise sources.

Airflow

The recommended server cabinet air intake temperature is between 20° and 25° C (68° and 77° F) at 960 CFM.

Figure 2-1 illustrates the location of the inlet and outlet airducts on a single cabinet. Air is drawn into the front of the server and forced out the rear.

Figure 2-1 Airflow Diagram



System Requirements Summary

This section summarizes the requirements that must be considered in preparing the site for the server.

Power Consumption and Air Conditioning

To determine the power consumed and the air conditioning required, follow the guidelines in Table 2-10.

NOTE When determining power requirements, consider any peripheral equipment that will be installed during initial installation or as a later update. Refer to the applicable documentation for such devices to determine the power and airconditioning that is required to support these devices.

Maximum power is the sum of the worst case power consumption of every subsystem in the box and should be used to size worst case power consumption. Typical power consumption numbers are what HP engineers have measured when running power-intensive applications. These are generally lower than maximum power numbers because all of the subsystems in the box to simultaneously drawing maximum power for long durations is uncommon.

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