Site Preparation Guide, HP Integrity rx8640, HP 9000 rp8440 Servers

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About This Document

This document covers the HP Integrity rx8640 and the HP 9000 rp8440 server systems.

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 - Server Overview
- Chapter 2 - System Specifications
- Appendix A- Templates
- Index

Intended Audience

This document is intended to be used by customer engineers assigned to support the HP Integrity rx8640 and HP 9000 rp8440 servers.

Publishing History

The following publishing history identifies the editions and release dates of this document. Updates are made to this document on an unscheduled, *as needed*, basis. The updates will consist of a new release of this document and pertinent online or CD-ROM documentation.

First Edition	March 2006
Second Edition	September 2006
Third Edition	January 2007
Fourth Edition	September 2007

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  You will be asked to provide the product number & serial number and may be required to provide dated proof of purchase.

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Server Support Information

For online access to technical support information, self-solve tools, online assistance, community forums of IT experts, broad multi-vendor knowledge base, monitoring and diagnostic tools, refer to the following web site:

http://www.hp.com/support

To subscribe to HP's driver and support alerts/notifications program, refer to the following web site:

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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.

Windows Operating System Information You can find information about administration of the Microsoft® Windows® operating system at the following Web sites, among others:

- `http://docs.hp.com/windows_nt/`
- `http://www.microsoft.com/technet/`

Diagnostics and Event Monitoring: Hardware Support Tools Complete information about HP hardware support tools, including online and offline diagnostics and event monitoring tools, is at the `http://docs.hp.com/hpux/diag/` Web site. This site has manuals, tutorials, FAQs, and other reference material.

Web Site for HP Technical Support: http://us-support2.external.hp.com HP IT resource center Web site at `http://us-support2.external.hp.com/` provides comprehensive support information for IT professionals on a wide variety of topics, including software, hardware, and networking.

Books about HP-UX Published by Prentice Hall The `http://www.hp.com/hpbooks/` Web site lists the HP books that Prentice Hall currently publishes, such as HP-UX books including:

- *HP-UX 11i System Administration Handbook* and Toolkit
  `http://www.hp.com/hpbooks/prentice/ptr_0130600814.html`
- *HP-UX Virtual Partitions*
  `http://www.hp.com/hpbooks/prentice/ptr_0130352128.html`

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 rx8640 and HP 9000 rp8440 Server Overview

The HP Integrity rx8640 server and the HP 9000 rp8440 server are members of the HP business-critical computing platform family of mid-range, mid-volume servers, positioned between the HP Integrity rx7640, HP 9000 rp7440 and HP Integrity Superdome servers.

IMPORTANT: The differences between the HP Integrity rx8640 and the HP 9000 rp8440 servers are identified in Chapter 1 and Chapter 2. See Chapter 2 (page 33). Otherwise, these two sx2000–based systems share common hardware and technology throughout.

The server is a 17U[1] high, 16-socket symmetric multiprocessor (SMP) rack-mount or standalone server. Features of the server include:

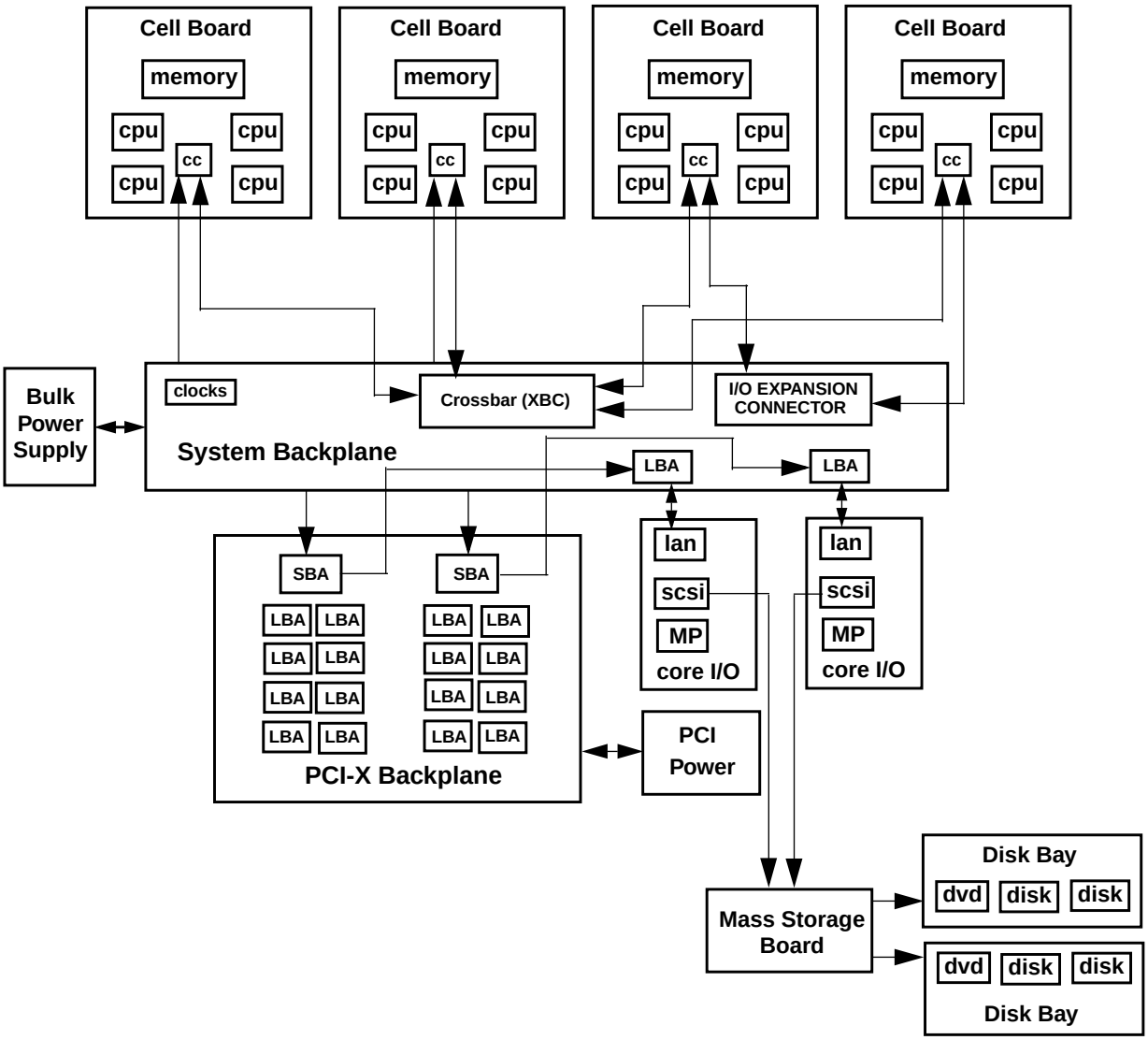
- Up to 512 GB of physical memory provided by dual inline memory modules (DIMMs).
- Up to 32 processors with a maximum of 4 processor modules per cell board and a maximum of 4 cell boards. Supports dual-core processors.
- One cell controller (CC) per cell board.
- Turbo fans to cool CPUs and CCs on the cell boards.
- Up to four embedded hard disk drives.
- Up to two internal DVD drives or one DVD drive and one DDS-4 DAT drive.
- Nine front chassis mounted N+1 fans.
- Twelve rear chassis mounted N+1 fans.
- Six N+1 PCI-X card cage fans.
- Up to six N+1 bulk power supplies.
- Two N+1 PCI-X power supplies.
- N+1 hot-swappable system clock oscillators.
- Sixteen PCI-X slots are divided into two I/O chassis. Each I/O chassis can accommodate up to eight PCI/PCI-X/PCIe/PCI-X 2.0 cards.
- Up to two core I/O cards.
- One failover service processor per core I/O card.
- Four 220 V AC power plugs. Two are required and the other two provide power source redundancy.

Detailed Server Description

The following section provides detailed intormation about the server components.

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

Figure 1-1 16-Socket Server Block Diagram



Dimensions and Components

The following section describes server dimensions and components.

Figure 1-2 Server (Front View With Bezel)

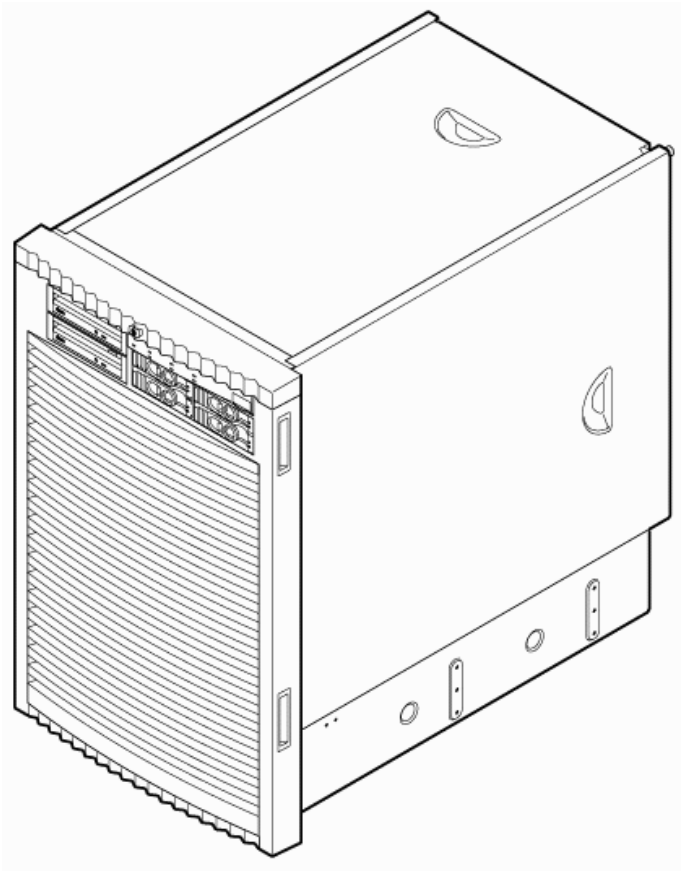
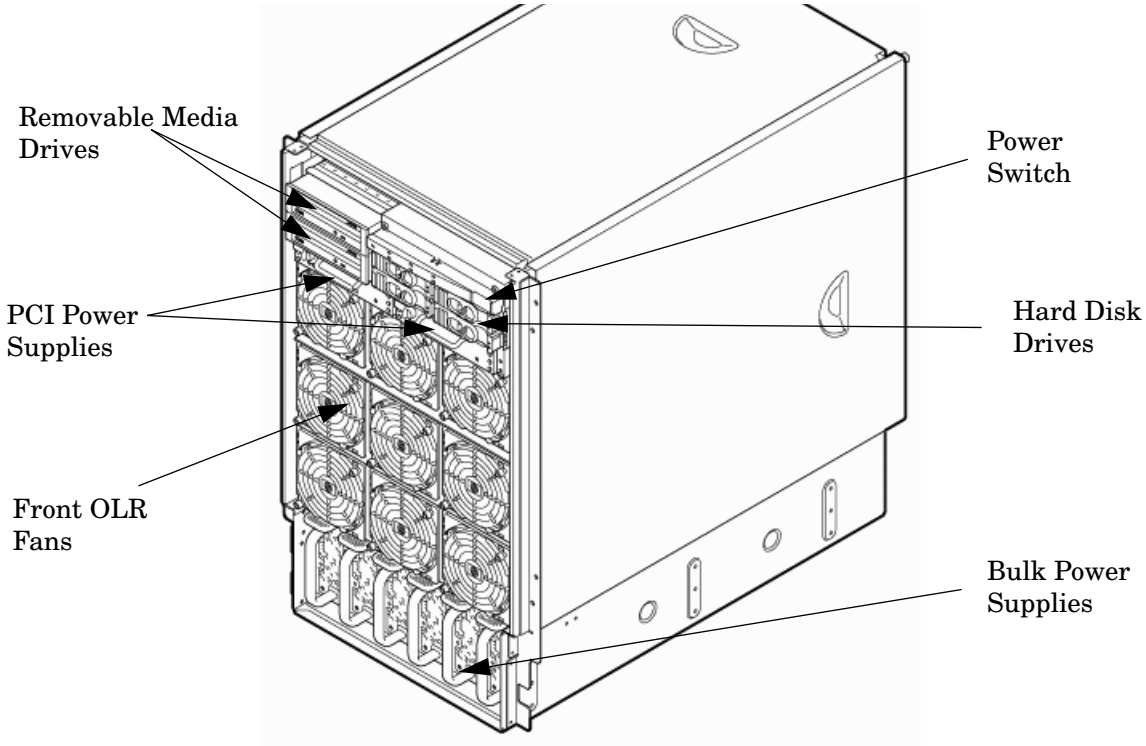


Figure 1-3 Server (Front View Without Bezel)



The server has the following dimensions:

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

  25.5 inches from front rack column to PCI connector surface

  26.7 inches from front rack column to core I/O card connector surface

  30 inches overall package dimension, including 2.7 inches protruding in front of the front rack columns
- Width: 17.5 inches, constrained by EIA standard 19-inch racks
- Height: 17 U (29.55 inches), constrained by package density

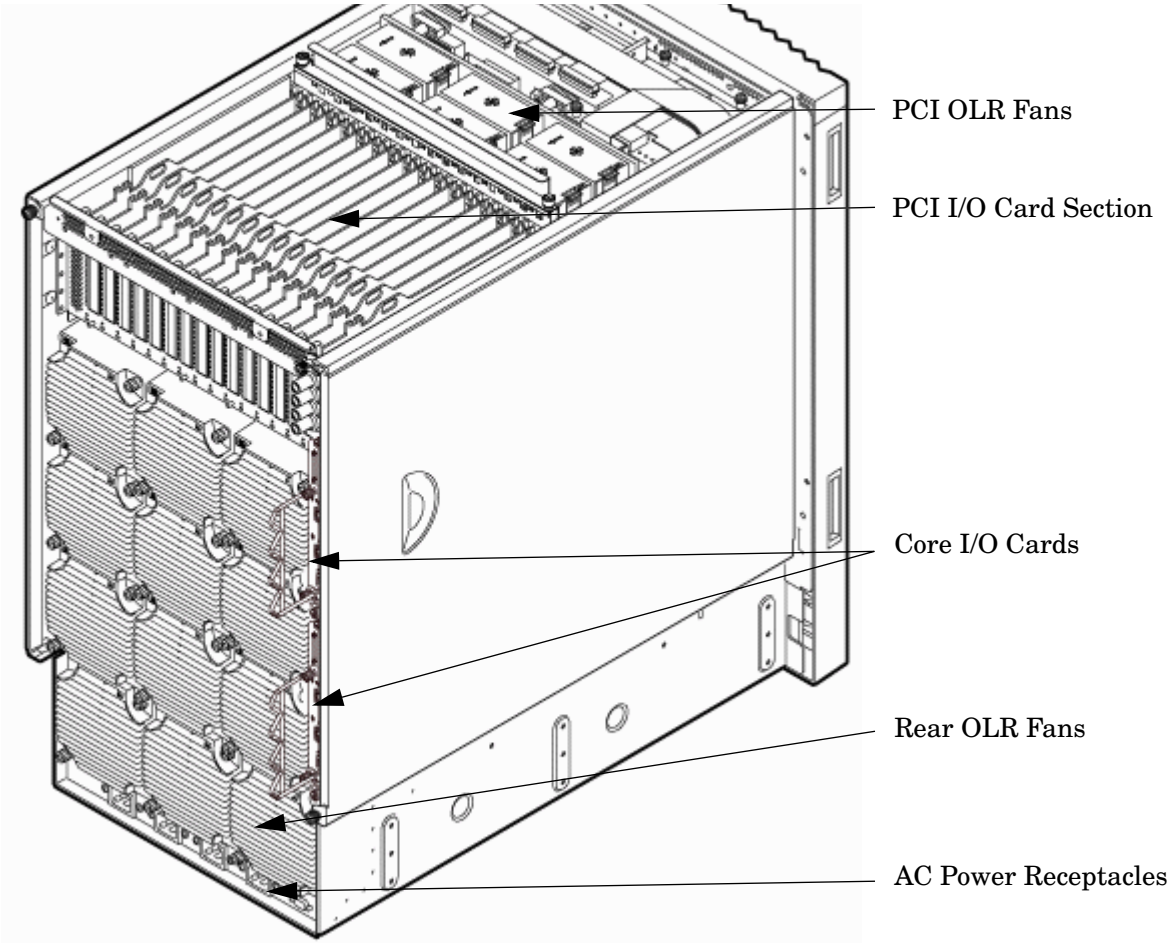
The mass storage section located in the front enables access to removable media drives without removal of the bezel. The mass storage bay accommodates two 5.25-inch removable media drives and up to four 3.5-inch hard disk drives. The front panel display, containing LEDs and the system power switch, is located directly above the hard drive media bays.

Below the mass storage section and behind a removable bezel are two PCI-X power supplies. Each PCI-X power supply powers both I/O partitions. Two PCI-X power supplies offer a N+1 configuration.

Enclosed with protective finger guards are nine front online replace (OLR) fan modules.

The bulk power supply is partitioned by a sealed metallic enclosure located in the bottom of the server. This enclosure houses the N+1 fully redundant bulk power supplies. Install these power supplies from the front of the server after removing the front bezel. The power supply is 2.45 X 5.625 X 20.0 inches.

Figure 1-4 Server (Rear View)



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

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

The PCI X OLR fan modules are located in front of the PCI cards. They are housed in plastic carriers.

The 12 rear OLR fans attached outside the chassis house 120-mm exhaust fans.

The cell boards are located on the right side of the server behind a removable side cover. For rack mounted servers on slides, the rack front door requires removal *if* it is hinged on the right side of the rack. Removal will allow unrestricted access to server sides after sliding server out for service..

The two redundant core I/O cards are positioned vertically end-to-end at the rear of the chassis.

Redundant line cords attach to the AC power receptacles at the bottom rear. Two 20-amp cords are required to power the server. Two additional line cords provide redundancy.

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 a single large jack screw assembly.

The SCSI ribbon cable assembly also routes across and fastens to the backside of the system backplane near the connectors that attach the core I/O boards.

The blue deployment handles hinge outward for manual lift. When server is slide mounted, they retract against chassis to enable slide action without obstruction.

Front Panel

Front Panel Indicators and Controls

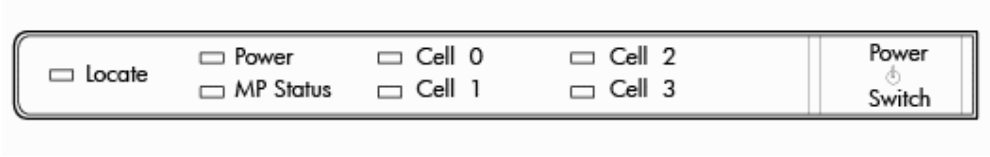
The front panel, located on the front of the server, includes the power switch. Refer to Figure 1-5.

Enclosure Status LEDs

The following status LEDs are on the front panel:

- Locate LED (blue)
- Power LED (tricolor)
- Management processor (MP) status LED (tricolor)
- Cell 0, 1, 2, 3 status (tricolor) LEDs

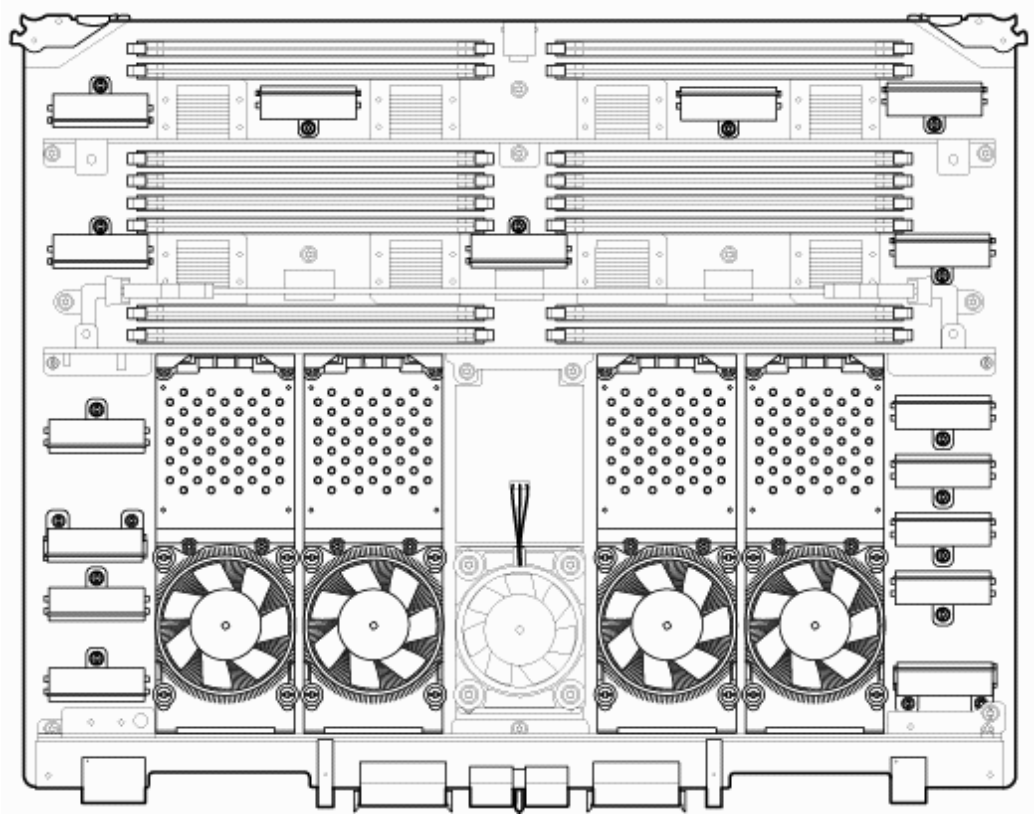
Figure 1-5 Front Panel LEDs and Power Switch



Cell Board

The cell board, illustrated in Figure 1-6, contains the processors, main memory, and the CC application specific integrated circuit (ASIC) which interfaces the processors and memory with the I/O. The CC is the heart of the cell board, providing a crossbar connection that enables communication with other cell boards in the system. It connects to the processor dependent hardware (PDH) and microcontroller hardware. Each cell board holds up to four processor modules and 16 memory DIMMs. One to four cell boards can be installed in the server. A cell board can be selectively powered off for adding processors, memory or maintenance of the cell board, without affecting cells in other configured partitions.

Figure 1-6 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:

- Front side buses (FSB) for each of the four 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 busses that communicate to the crossbar chips on the system backplane
- 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 reside on a riser board that plugs at a right angle into the cell board. The cell board also includes clock circuits, test circuits, and decoupling capacitors.

PDH Riser Board

The server 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

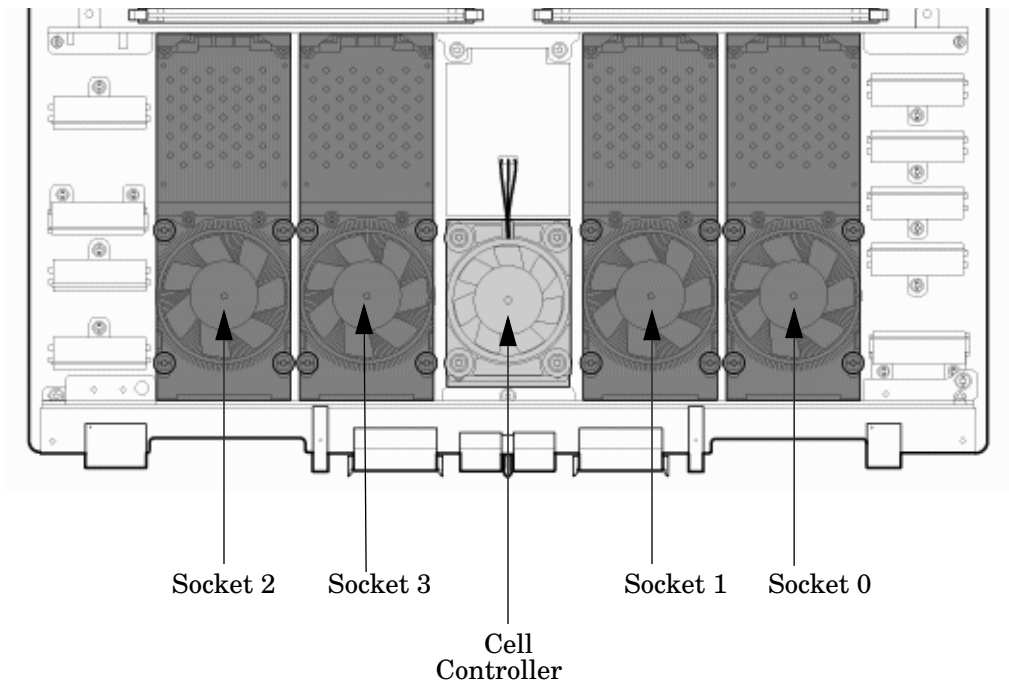
The cell board can hold up to four CPU modules. Each CPU module can contain up to two CPU cores on a single die. Modules are populated in increments of one. On a cell board, the processor modules must be the same family, type, and clock frequencies. Mixing of different processors on a cell or a partition is not supported. See Table 1-1 for the load order that must be maintained when adding processor modules to the cell board. See Figure 1-7 for the locations on the cell board for installing processor modules.

NOTE: Unlike previous HP cell based systems, the 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 1-7 Socket Locations on Cell Board

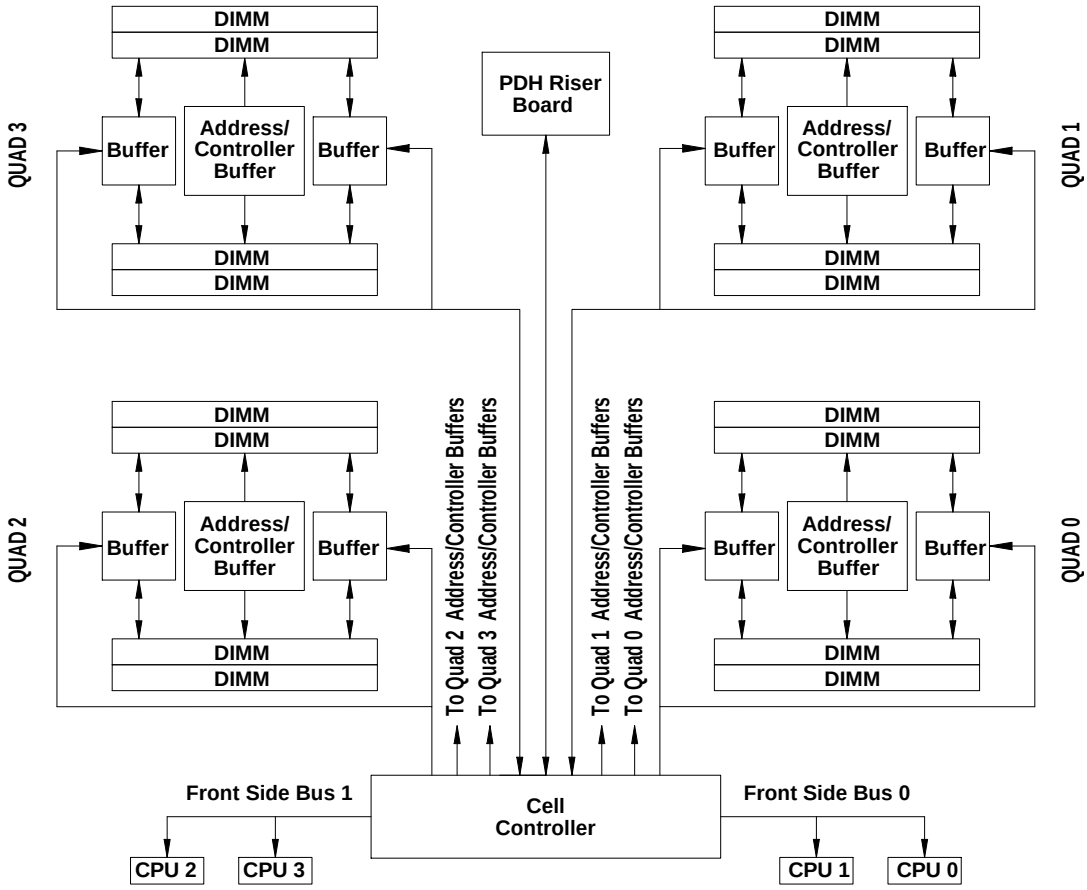


Memory Subsystem

Figure 1-8 shows a simplified view of the memory subsystem. It consists of four 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 1-8 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 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, 4, and 8 GB. Table 1-2 lists each supported DIMM size, the resulting total server capacity, and the memory component density. Each DIMM is connected to two buffer chips on the cell board.

Table 1-2 DIMM Sizes Supported

DIMM Size	Total Capacity	Memory Component Density
1 GB	64 GB	256 Mb
2 GB	128 GB	512 Mb
4 GB	256 GB	1024 Mb
8 GB	512 GB	2048 Mb

Valid Memory Configurations

The first cell must have one DIMM pair loaded in slots 0A/0B. The server can support as little as 2 GB of main memory using two 1 GB DIMMs installed on one of the cell boards and as much as 512 GB by filling all 16 DIMM slots on all four cell boards with 8 GB DIMMs.

The following rules explain the memory configuration:

1. DIMMs must be loaded in pairs (same size within a pair).
2. DIMM pairs must be loaded in slot order (0A/0B, 1A/1B, 2A/2B, ...)
3. Largest DIMMs must be loaded first followed by progressively smaller DIMM module sizes.

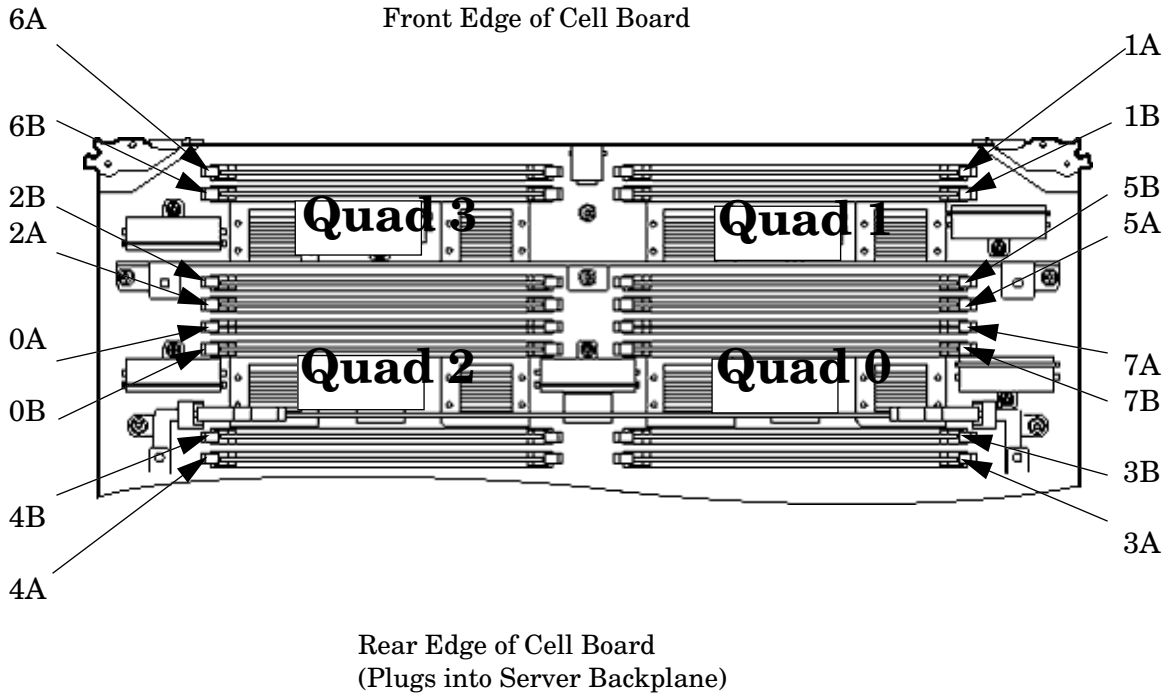
A paired set of DIMMs is called a rank. DIMMs in a rank must be of the same capacity. See Table 1-3 and Figure 1-9for DIMM load order and layout on the cell board.

A quad is a grouping of four DIMMs (Figure 1-9). Configurations with 8 or 16 DIMM slots loaded are recommended. Adding a rank enables a dedicated DDR-II bus on a cell to increase the amount of usable memory bandwidth available. Available memory is proportional to the amount of memory installed.

Table 1-3 DIMM Load Order

Number of DIMMs Installed	Action Taken	DIMM Location on Cell Board	Quad Location
2 DIMMs = 1 rank	Install first	0A and 0B	Quad 2
4 DIMMs = 2 rank	Add second	1A and 1B	Quad 1
6 DIMMs = 3 rank	Add third	2A and 2B	Quad 3
8 DIMMs = 4 rank	Add fourth	3A and 3B	Quad 0
10 DIMMs = 5 rank	Add fifth	4A and 4B	Quad 2
12 DIMMs = 6 rank	Add sixth	5A and 5B	Quad 1
14 DIMMs = 7 rank	Add seventh	6A and 6B	Quad 3
16 DIMMs = 8 rank	Add last	7A and 7B	Quad 0

Figure 1-9 DIMM Slot Layout



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 more 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

Figure 1-10 (page 22) shows the top internal disk drives connect to cell 0 through the core I/O for cell 0, in a server cabinet. The bottom internal disk drives connect to cell 1 through the core I/O for cell 1.

The upper removable media drive connects to cell 0 through the core I/O card for cell 0 and the lower removable media drive connects to cell 1 through the core I/O card for cell 1.

Figure 1-10 Internal Disks Locations

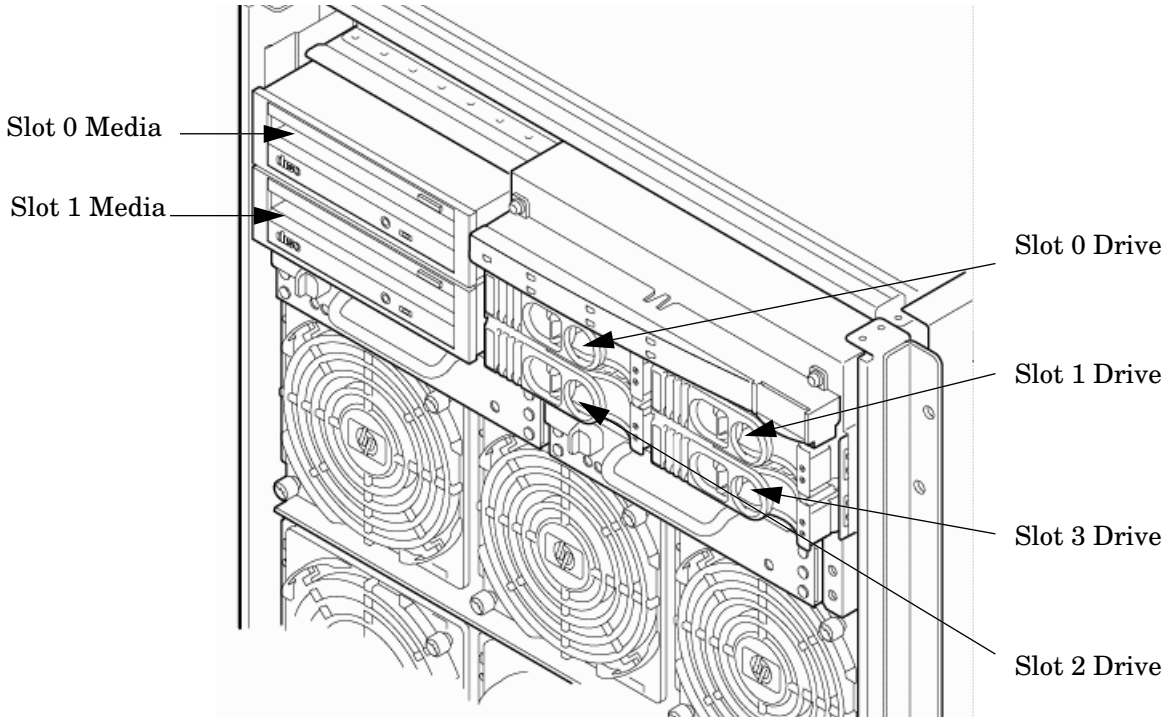


Table 1-4 Removable Media Drive Path

Removable Media	Path
Slot 0 media	0/0/0/2/1.x[1].0
Slot 1 media	1/0/0/2/1.x[1].0

1 X equals 2 for a DVD drive while X equals 3 for a DDS-4 DAT drive.

Table 1-5 Hard Disk Drive Path

Hard Drive	Path
Slot 0 drive	0/0/0/2/0.6.0
Slot 1 drive	0/0/0/3/0.6.0
Slot 2 drive	1/0/0/2/0.6.0
Slot 3 drive	1/0/0/3/0.6.0

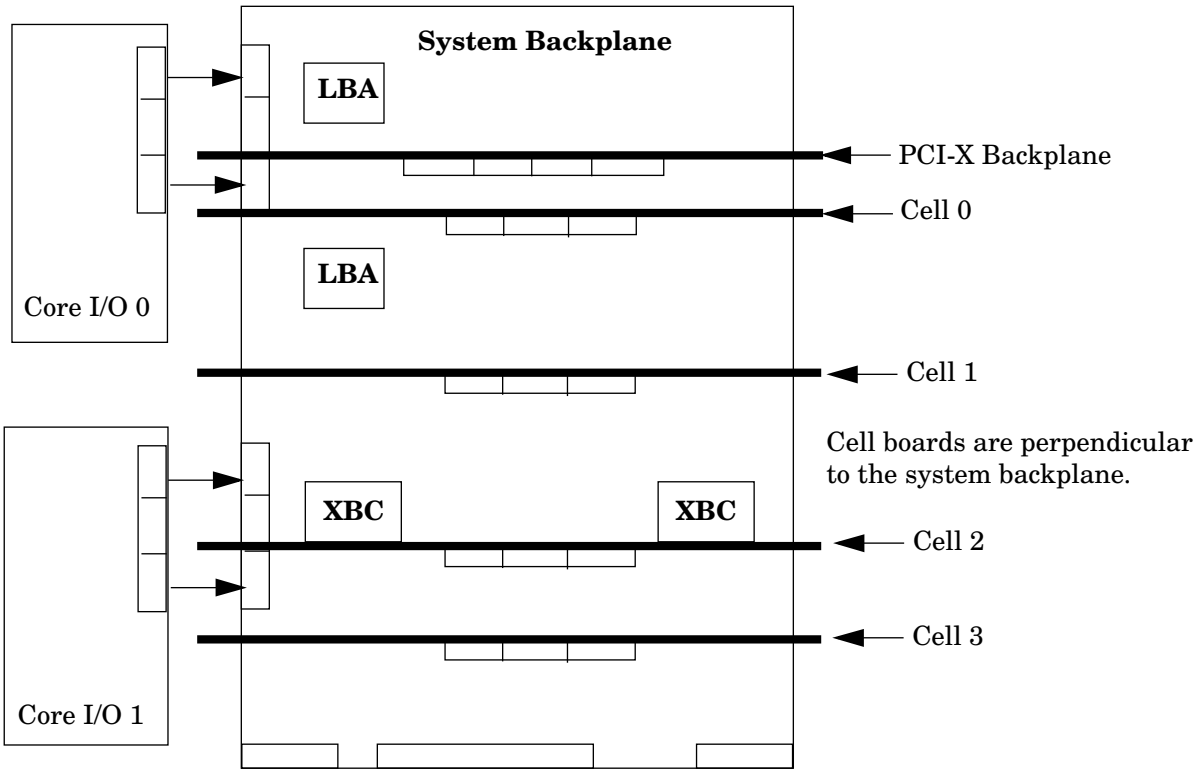
System Backplane

The system backplane board contains the following components:

- Two crossbar chips (XBC)
- Clock generation logic
- Preset generation logic
- Power regulators
- 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, PCI-X backplane, MP core I/O cards SCSI cables, bulk power, chassis fans, front panel display, intrusion switches, and external system bus adapters (SBA) link connectors.

Figure 1-11 System Backplane Block Diagram



The two LBA PCI bus controllers on the system backplane create the PCI bus for the core I/O cards. You must shut down the partition for the core I/O card before removing the card.

Having the SCSI connectors on the system backplane allows replacement of the core I/O card without having to remove cables in the process.

System Backplane to Cell Board Connectivity

The system backplane provides four sets of connectors, one set for each cell board.

The system backplane routes the signals from the cell boards to the communication crossbars. Cell boards 0 and 1 are directly connected to the I/O backplane found in the server. Cell boards 2 and 3 can be connected to a separate I/O expansion chassis connected to the system backplane.

System Backplane to Core I/O Card Connectivity

The core I/O cards connect at the rear of the system backplane through two connectors. SCSI and LAN on a core I/O are accessed via a PCI-X 66 MHz bus. Two LBA bus controllers located on the system backplane allow communication to the I/O devices. The LBAs are connected to the SBA on the PCI-X backplane by single ropes.

The system backplane routes the signals to the various components in the system. The core I/O signals include the SCSI bus for the system hard drives and the bus for the removable media devices. Each core I/O card provides SCSI buses for the mass storage devices.

The management processor for the chassis resides on the core I/O card, so the system backplane also provides interfaces required for management of the system. These interfaces and the manageability circuitry run on standby power.

You can remove the core I/O cards from the system as long as you shut down the partition for the core I/O card before removing the card. The hot-plug circuitry that enables this feature is located on the system backplane near the core I/O sockets.

System Backplane 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.

PCI/PCI-X 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 as shown 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 a peak bandwidth of approximately 11.5 GB/s at 3.2 GT/s. 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 bidirectional rope links for a total aggregate bandwidth of approximately 11.5 GB/s.

There are LBA chips on the PCI-X backplane that act as a bus bridge, supporting either one or two ropes for PCI-X 133 MHz slots and the equivalent bandwidth of four ropes for PCI-X 266 slots. Each LBA acts as a bus bridge, supporting 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 mode 1 cards,

and at 266 MT/s for PCI-X mode 2 cards installed in mode 2 capable slots. When cell board 2 and cell board 3 are present, the cell boards attach to their own associated SBA and LBA chips on the PCI-X board in the Server Expansion Unit.

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

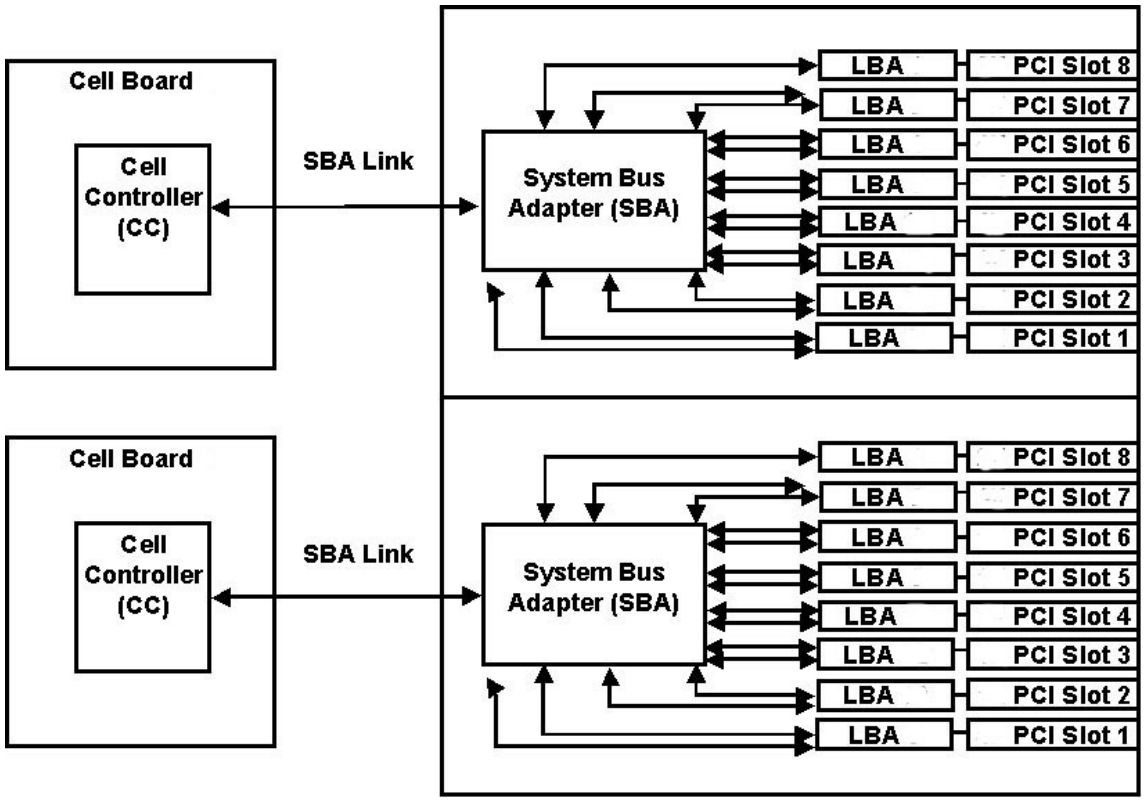


Table 1-6 and Table 1-7 list the mapping of PCI-X slots to boot paths. The cell column refers to the cell boards installed in the server.

Table 1-6 PCI-X Slot Boot Paths Cell 0

Cell	PCI Slot	Ropes	Path
0	1	8/9	0/0/8/1/0
0	2	10/11	0/0/10/1/0
0	3	12/13	0/0/12/1/0
0	4	14/15	0/0/14/1/0
0	5	6/7	0/0/6/1/0
0	6	4/5	0/0/4/1/0
0	7	2/3	0/0/2/1/0
0	8	1	0/0/1/1/0

Table 1-7 PCI-X Slot Boot Paths Cell 1

Cell	PCI Slot	Ropes	Path
1	1	8/9	1/0/8/1/0
1	2	10/11	1/0/10/1/0
1	3	12/13	1/0/12/1/0

Table 1-7 PCI-X Slot Boot Paths Cell 1 *(continued)*

Cell	PCI Slot	Ropes	Path
1	4	14/15	1/0/14/1/0
1	5	6/7	1/0/6/1/0
1	6	4/5	1/0/4/1/0
1	7	2/3	1/0/2/1/0
1	8	1	1/0/1/1/0

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 (3) 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 (4) 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.

Each of the 16 slots is capable of 33 MHz/66 MHz PCI or 66 MHz/133 MHz PCI-X. Four slots in PCI-X support 266 MHz. All 16 PCI slots are keyed for 3.3 V connectors (accepting both Universal and 3.3 V cards). The PCI-X backplane does not provide any 5 V slots for the I/O cards. Table 1-8 summarizes the PCI-X slot types.

The PCI-X backplane is physically one board, yet it behaves like two independent partitions. SBA 0 and its associated LBAs and eight PCI-X slots form one I/O partition. SBA 1 and 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 1-8 PCI-X Slot Types

I/O Partition	Slot[1]	Maximum MHz	Maximum Peak Bandwidth	Ropes	Supported Cards	PCI Mode Supported
0	8[2]	66	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[2]	66	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 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.

2 Slot is driven by a single rope and has a maximum speed of 66 MHz.

PCIe Backplane

The 16–slot (8 PCI and PCI-X; 8 PCI-Express) mixed PCI-X/PCI-Express (“PCIe”) I/O backplane was introduced for the Dual-Core Intel® Itanium® processor 9100 Series release and is heavily leveraged from the PCI-X backplane design. Only the differences will be descibed here. See “PCI/PCI-X I/O Subsystem” (page 24) for common content between the two boards..

The PCI-Express I/O backplane comprises two logically independent I/O circuits (partitions) on one physical board.

- The I/O chip in cell location zero (0) and its associated four PCI-X ASICs, four PCIe ASICs, and their respective PCI/PCI-X/PCIe slots form PCI-Express I/O partition 0 plus core I/O.
- The I/O chip in cell location one (1) and its associated four PCI-X ASICs, four PCIe ASICs, and their respective PCI/PCI-X/PCIe slots form PCI-Express I/O partition 1 plus core I/O.

Each PCI/PCI-X slot has a host-to-PCI bridge associated with it, and each PCIe slot has a host-to-PCIe bridge associated with it. A dual slot hot swap controller chip and related logic is also associated with each pair of PCI or PCIe slots. The I/O chip on either cell location 0 or 1 is a primary I/O system interface. Upstream, the I/O chips communicate directly with the cell controller ASIC on the host cell board via a high bandwidth logical connection known as the HSS link.When installed in the SEU chassis within a fully configured system, the ASIC on cell location 0 connects to the cell controller chip on cell board 2, and the ASIC on cell location 1 connects to the cell controller chip on cell board 3 through external link cables.

Downstream, the ASIC spawns 16 logical 'ropes' that communicate with the core I/O bridge on the system backplane, PCI interface chips, and PCIe interface chips. Each PCI chip produces a single 64–bit PCI-X bus supporting a single PCI or PCI-X add-in card. Each PCIe chip produces a single x8 PCI-Express bus supporting a single PCIe add-in card.

The ropes in each I/O partition are distributed as follows:

- One PCI-X ASIC is connected to each I/O chip with a single rope capable of peak data rates of 533Mb/s (PCIX-66).
- Three PCI-X ASICs are connected to each I/O chip with dual ropes capable of peak data rates of 1.06Gb/s (PCIX-133).
- Four PCIe ASICs are connected to each I/O chip with dual fat ropes capable of peak data rates of 2.12Gb/s (PCIe x8).

In addition, each I/O chip provides an external single rope connection for the core I/O.

Each PCI-Express slot on the PCIe I/O board is controlled by its own ASIC and is also independently supported by its own half of the dual hot swap controller. All PCIe slots are designed to be compliant with PCIe Rev.1.0. The PCI-Express I/O backplane will provide slot support for VAUX3.3, SMB*, and JTAG.

PCIe Slot Boot Paths

PCIe slot boot paths are directly leveraged from the PCI-X backplane. See Table 1-6 (page 25) and Table 1-7 (page 25) for more details.

NOTE: The differences between the PCI X backplane and the PCIe backplane are as follows:

- Twelve ropes are bundled in two rope pairs to 6 LBAs to support 6 slots for PCI and PCI-X cards instead of 14. These ropes are capable of 133MHz.
- Sixteen ropes are bundled into dual fat ropes to 8 LBAs to support 8 additional slots for PCIe cards. These ropes are capable of 266MHz.

Table 1-9 PCIe Slot Types

I/O Partition	Slot[1]	Maximum MHz	Maximum Peak Bandwidth	Ropes	Supported Cards	PCI Mode Supported
0	8[2]	66	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	PCIe
	5	266	2.13 GB/s	006/007	3.3 V	PCIe
	4	266	2.13 GB/s	014/015	3.3 V	PCIe
	3	266	2.13 GB/s	012/013	3.3 V	PCIe
	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[2]	66	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	PCIe
	5	266	2.13 GB/s	006/007	3.3 V	PCIe
	4	266	2.13 GB/s	014/015	3.3 V	PCIe
	3	266	2.13 GB/s	012/013	3.3 V	PCIe
	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 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.

2 Slot is driven by a single rope and has a maximum speed of 66 MHz.

Core I/O Card

Up to two core I/O cards can be plugged into the server. Two core I/O cards enable two I/O partitions to exist in the server. The server can have up to two partitions. When a Server Expansion Unit with two core I/O cards is attached to the server, two additional partitions can be configured.

A core I/O card can be replaced with standby power applied. The system power to the core I/O is handled in the hardware the same way a hot-plug PCI/PCI-X card is handled. Standby power to core I/O is handled by power manager devices to limit inrush current during insertion.

Core I/O Boot Paths

The servers internal I/O devices are located on the core I/O. The following table outlines the paths assigned to the hard disk and removable media disk bays located on the front of the server chassis. Core I/O card 0 refers to the core I/O located in the upper slot at the rear of the system. Core I/O card 1 refers to the core I/O located in the lower slot at the rear of the system. Core I/O cards 2 and 3 are located in the SEU (if available).

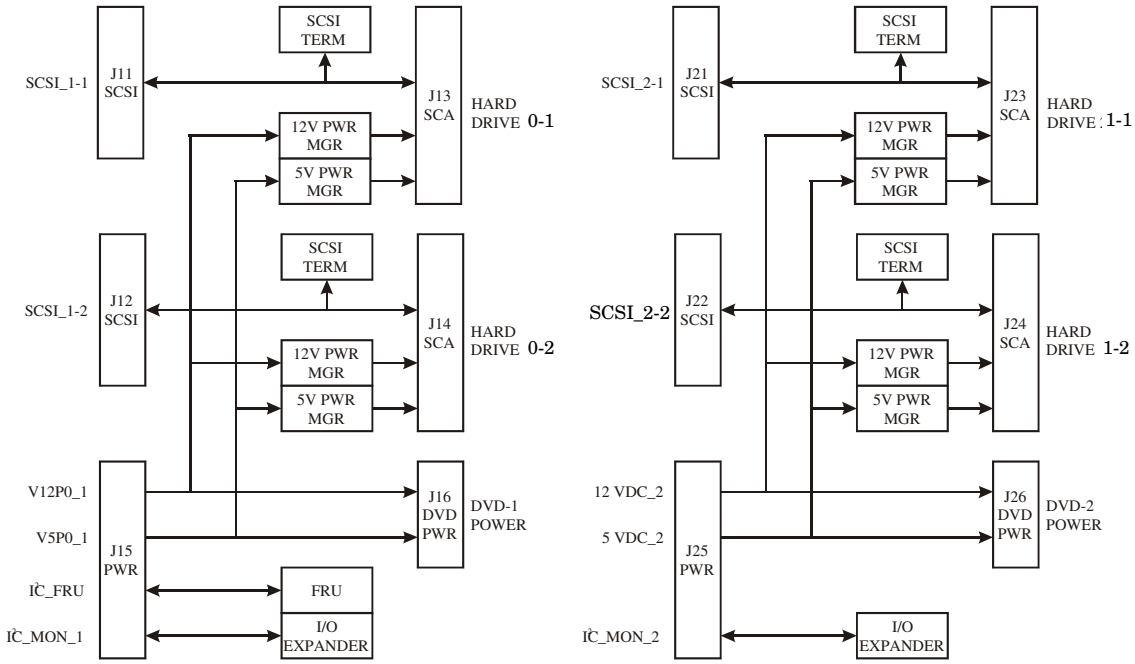
Table 1-10 Core I/O Boot Paths

Core I/O Card	Device	Path	Description
0	1Gb LAN	0/0/0/1/0	Core I/O 0 SYS LAN connector.
0	SCSI Drive	0/0/0/2/0.6.0	Hard drive located in upper left disk bay.
0	SCSI Drive	0/0/0/2/1.X.0	Removable media DVD (X=2) or DDS-4 (X=3) tape drive located in the upper disk bay.
0	SCSI Drive	0/0/0/3/0.6.0	Hard drive located in the upper right disk bay.
0	SCSI Drive	0/0/0/3/1	SCSI drive connected to the external SCSI Ultra3 connector on the core I/O card.
1	1Gb LAN	1/0/0/1/0	Core I/O 1 SYS LAN connector.
1	SCSI Drive	1/0/0/2/0.6.0	Hard drive located in the lower left disk bay.
1	SCSI Drive	1/0/0/2/1.X.0	Removable media DVD (X=2) or DDS-4 (X=3) tape drive located in the lower disk bay.
1	SCSI Drive	1/0/0/3/0.6.0	Hard drive located in the lower right disk bay.
1	SCSI Drive	1/0/0/3/1	SCSI drive connected to the external SCSI Ultra3 connector on the core I/O card.

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 hot-plug. The server accommodates two internal, removable media devices. Power connectors for removable media devices are on the mass storage backplane. For more information, refer to Figure 1-13.

Figure 1-13 Mass Storage Block Diagram



2 System Specifications

This chapter describes the basic system configuration, physical specifications and requirements for the server.

Dimensions and Weights

This section provides dimensions and weights of the server and server 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)	29.55 (75.00)	86.50 (219.70)
Width - Inches (centimeters)	17.50 (44.50)	40.00 (101.60)
Depth - Inches (centimeters)	30.00 (76.20)	48.00 (122.00)
Weight - Pounds (kilograms)	368.00[1] (166.92)	813.00[2] (368.77)

1 This weight represents a fully configured server before it is installed in a rack.

2 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	131.00 (59.42)
1	System backplane	20.0 (9.07)
1	PCI-X I/O backplane assembly	20.40 (9.25)
2	PCI-X power supply	5.00 (2.27) each
6	Bulk power supply	12.00 (5.44) each
1	Mass storage backplane	1.00 (0.45)
1 - 4	Cell board	27.80 (12.61) each
1 - 4	Hard disk drive	1.60 (0.73) each
1 - 2	Removable media disk drive	2.20 (1.00) each

Table 2-3 Example Weight Summary

Component	Quantity	Multiply	Weight (kg)
Cell board	4	27.8 lb 12.16 kg	107.20 lb 48.64 kg
PCI card (varies - used sample value)	4	0.34 lb 0.153 kg	1.36 lb 0.61 kg

Table 2-3 Example Weight Summary *(continued)*

Component	Quantity	Multiply	Weight (kg)
Power supply (BPS)	6	12 lb 5.44 kg	72 lb 32.66 kg
DVD drive	2	2.2 lb 1.0 kg	4.4 lb 2.0 kg
Hard disk drive	4	1.6 lb 0.73 kg	6.40 lb 2.90 kg
Chassis with skins and front bezel cover	1	131 lb 59.42 kg	131 lb 59.42 kg
		Total weight	322.36 lb 146.22 kg

Table 2-4 Weight Summary

Component	Quantity	Multiply By	Weight (kg)
Cell Board		27.8 lb 12.16 kg	lb kg
PCI Card		varies lb varies kg	lb kg
Power Supply (BPS)		12 lb 5.44 kg	lb kg
DVD Drive		2.2 lb 1.0 kg	lb kg
Hard Disk Drive		1.6 lb 0.73 kg	lb kg
Chassis with skins and front bezel cover		131 lb 59.42 kg	lb kg
		Total weight	lb kg

Electrical Specifications

This section provides electrical specifications for the HP Integrity rx8640 and the HP 9000 rp8440 servers. These servers share common specifications. The exceptions are separate system power as well as power dissipation and cooling requirements. The associated data can be found in (xrefs here).

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 described is to 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 (A0–A1) must be used to maintain normal operation of the server. A second set of two cords (B0–B1) 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-m) 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
8121-0070	Male GB-1002, 240 volt	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 servers. This table provides information to help determine the amount of AC power needed for your computer room.

Table 2-6 HP Integrity rx8640 and HP 9000 rp8440 AC Power Requirements

Requirements	Value	Comments
Nominal input voltage	200–240 VAC	
Minimum operating voltage	180 VAC	
Maximum operating voltage	269 VAC	
Frequency range (minimum - maximum)	50/60 Hz	
Number of phases	1	
Rated line current	15 A	Per line cord
Maximum inrush current	54 A peak for 20 ms	Per line cord
Dropout carry-through time at minimum line voltage	20 ms	
Circuit breaker rating	20A	Per line cord

Table 2-6 HP Integrity rx8640 and HP 9000 rp8440 AC Power Requirements *(continued)*

Requirements	Value	Comments
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 HP Integrity rx8640 System Power Requirements

Power Required (50–60 Hz)	Watts	VA	Comments
Maximum Theoretical Power	5862	5982	See Note 1
Marked Electrical Power	– – –	5400	30A @ 180 VAC, See Note 2
User Expected Maximum Power	3883	3962	See Note 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: Typical 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.

Table 2-8 HP 9000 rp8440 System Power Requirements

Power Required (50–60 Hz)	Watts	VA	Comments
Maximum Theoretical Power	5720	5837	See Note 1
Marked Electrical Power	– – –	5400	30A @ 180 VAC, See Note 2
User Expected Maximum Power	3789	3866	See Note 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: (Input power at the ac input expressed in Watts and Volt-Amps.)

The measured maximum worst case power consumption. This number represents the largest 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 air flow 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° C–32° 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° C to 25° C. This meets or exceeds the requirements for Class 2 in the corporate and ASHRAE standard. See Table 2-9 (page 37) 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 32° C	Weight		Over System Dimensions (W x D x H)	
Description	Watts	cfm	(m3/hr)	lb	kg	Inches	mm
Minimum configuration	971	960	1631	178	81	h=29.55 w=17.50 d=30.00	750.57 444.50 762.00
Full configuration	3883	960	1631	370	168	h=29.55 w=17.50 d=30.00	750.57 444.50 762.00
Typical configuration	2380	960	1631	286	130	h=29.55 w=17.50 d=30.00	750.57 444.50 762.00

Table 2-9 Example ASHRAE Thermal Report *(continued)*

	Condition		
ASHRAE class		Minimum configuration	1 cell board, 2 CPUs, 2 GB, 1 core I/O card
		Full configuration	4 cell boards, 16 CPUs, 128 GB, 2 core I/O cards, 16 I/O cards, 4 hard disks
		Typical configuration	2 cell boards, 8 CPUs, 64 GB, 1 core I/O card, 8 I/O cards, 2 hard disks

Environmental Temperature Sensor

To ensure that the system is operating within the published limits, the ambient operating temperature is measured using a sensor placed on the server backplane. 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° C to 70° C under non-operating conditions.

Cooling

Internal Chassis Cooling

The cabinet incorporates front-to-back airflow across the system backplane. Nine 120-mm fans mounted externally on the front chassis wall behind the cosmetic front bezel push air into the unit. Twelve 120-mm fans housed in cosmetic plastic fan carriers and mounted externally to the rear chassis wall pull air through the unit.

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 though upward facing vents near the rear of the supply. The air is then ducted out of the rear of the chassis.

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 off of 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. Separation is provided between the PCI bulkheads to allow adequate exhaust ventilation and to help reduce the localized airflow dead spots that typically occur at the faceplate tail of each PCI card.

Standby Cooling

Several components within the chassis consume significant amounts of power while the system is in standby mode. The system fans will 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 HP Integrity rx8640 Server Power Dissipation and Cooling

Table 2-10 provides calculations for the rx8640 configurations as described in the table.

Table 2-10 Typical HP Integrity rx8640 Server Configurations

Cell Board	Memory per Cell Board	PCI Cards (assumes 10W 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
4	32	16	2	4	2	6	3883	13257
4	16	16	2	4	2	6	3627	12383
4	8	8	0	2	2	6	3419	11672
2	32	16	2	4	2	4	2749	9385
2	16	8	0	2	2	4	2461	8402
2	8	8	0	2	2	4	2397	8183
1	8	8	0	1	1	3	1893	6463

The air-conditioning data in Table 2-10 are 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.

Typical HP 9000 rp8440 Server Power Dissipation and Cooling

Table 2-11 provides calculations for the rp8440 configurations as described in the table.

Table 2-11 Typical HP 9000 rp8440 Server Configurations

Cell Board	Memory per Cell Board	PCI Cards (assumes 10W 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
4	32	16	2	4	2	6	3789	12936
4	16	16	2	4	2	6	3533	12062
4	8	8	0	2	2	6	3325	11352
2	32	16	2	4	2	4	2702	9225
2	16	8	0	2	2	4	2414	8241
2	8	8	0	2	2	4	2350	8023
1	8	8	0	1	1	3	1893	6463

The air-conditioning data in Table 2-11 are 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

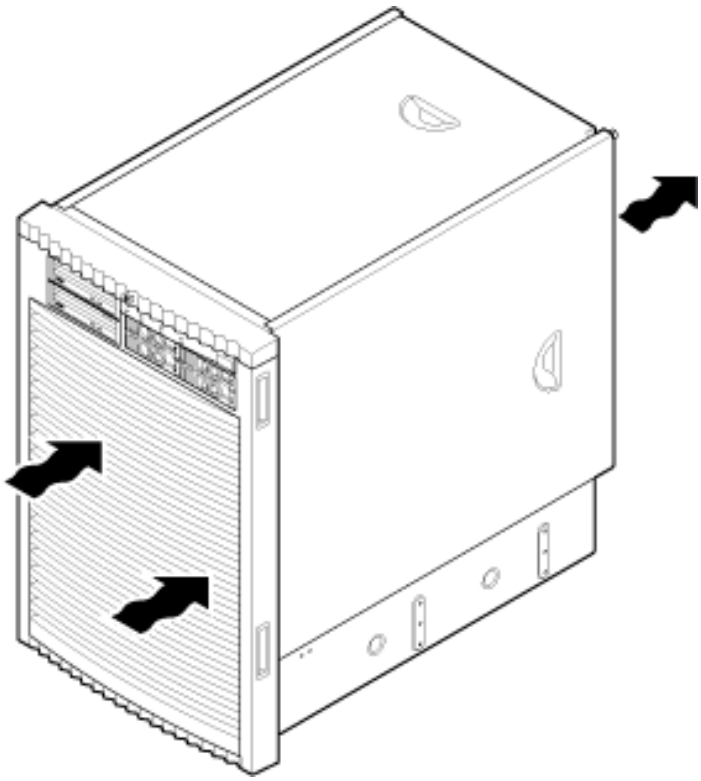
The acoustic noise specification for the servers is 55.6 db (sound pressure level at bystander position). It is appropriate for dedicated computer room environments, not office environments. The LwA is 7.4 Bels. Care should be taken to understand the acoustic noise specifications relative to operator positions within the computer room or when adding servers to computer rooms with existing noise sources.

Air Flow

The recommended server cabinet air intake temperature is between 20° C and 25° C (68° F 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

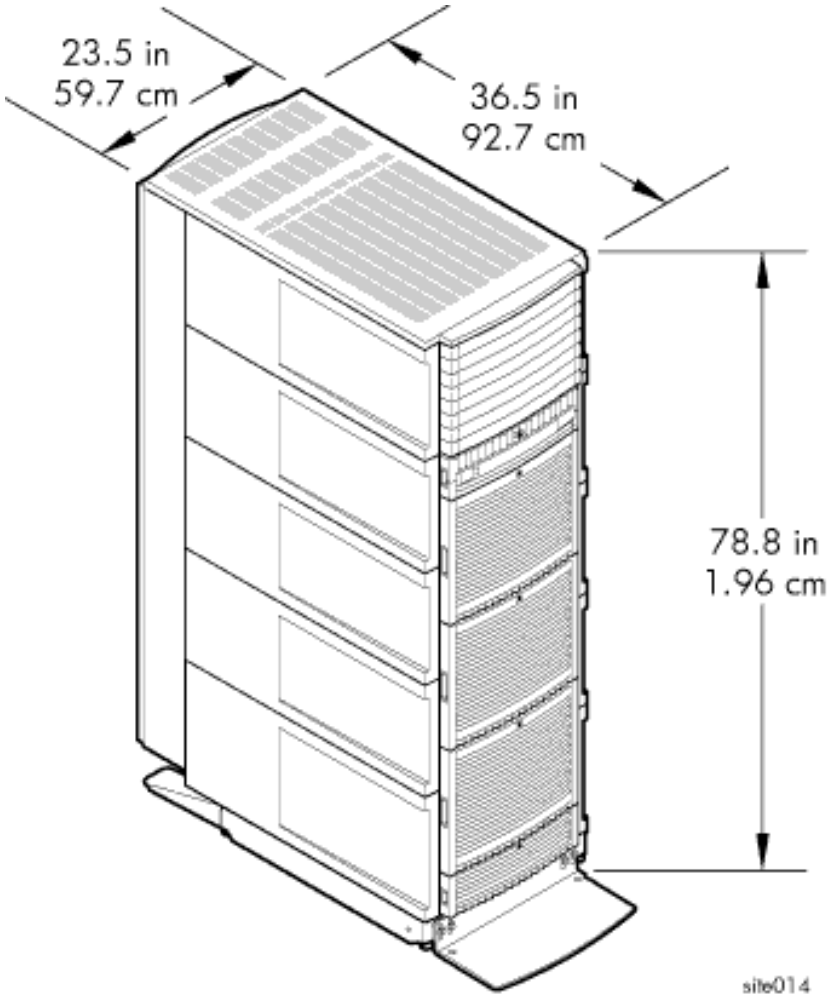


A Templates

This appendix contains blank floor plan grids and equipment templates. Combine the necessary number of floor plan grid sheets to create a scaled version of the computer room floor plan.

Figure A-1 illustrates the overall dimensions required for the servers.

Figure A-1 Server Space Requirements



Equipment Footprint Templates

Equipment footprint templates are drawn to the same scale as the floor plan grid (1/4 inch = 1 foot). These templates show basic equipment dimensions and space requirements for servicing. Refer to Figure A-2 (page 42).

The service areas shown on the template drawings are lightly shaded.

Use the equipment templates with the floor plan grid to define the location of the equipment that will be installed in your computer room.

NOTE: Photocopying typically changes the scale of drawings copied. If you copy any templates, then you must also copy all templates and floor plan grids.

Computer Room Layout Plan

Use the following procedure to create a computer room layout plan:

1. Remove several copies of the floor plan grid (Figure A-3).

2. Cut and join them together (as necessary) to create a scale model floor plan of your computer room.
3. Remove a copy of each applicable equipment footprint template (Figure A-2).
4. Cut out each template selected in step 3; then place it on the floor plan grid created in step 2.
5. Position pieces until you obtain the desired layout, then fasten the pieces to the grid. Mark locations of computer room doors, air-conditioning floor vents, utility outlets, and so on.

NOTE: Attach a reduced copy of the completed floor plan to the site survey. HP installation specialists use this floor plan during equipment installation.

Figure A-2 Server Cabinet Template

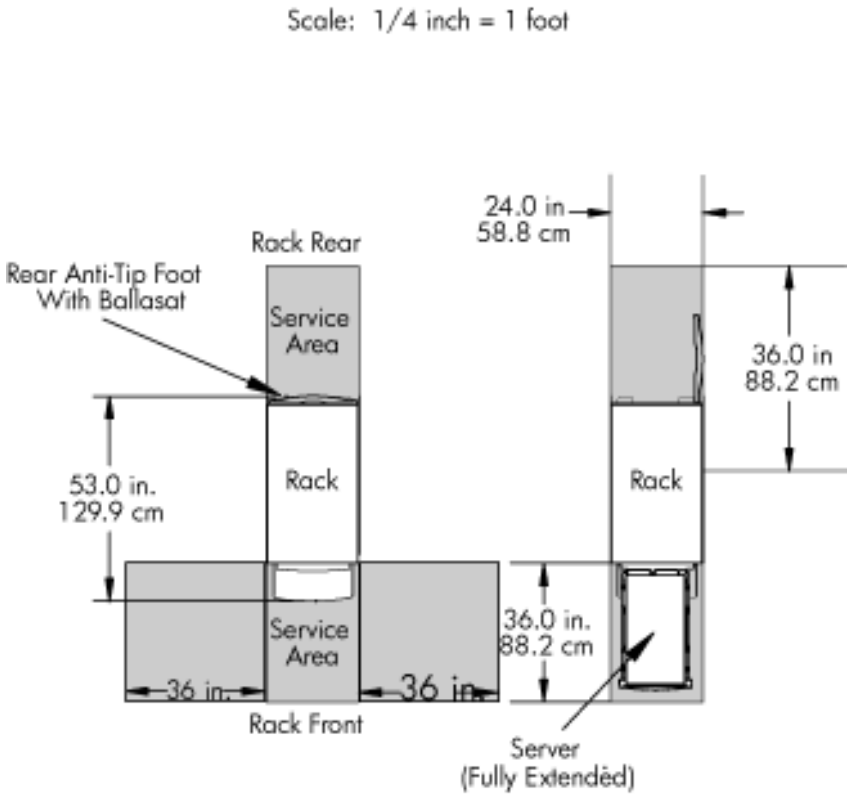


Figure A-3 Planning Grid

Scale: 1/4 inch = 1 foot

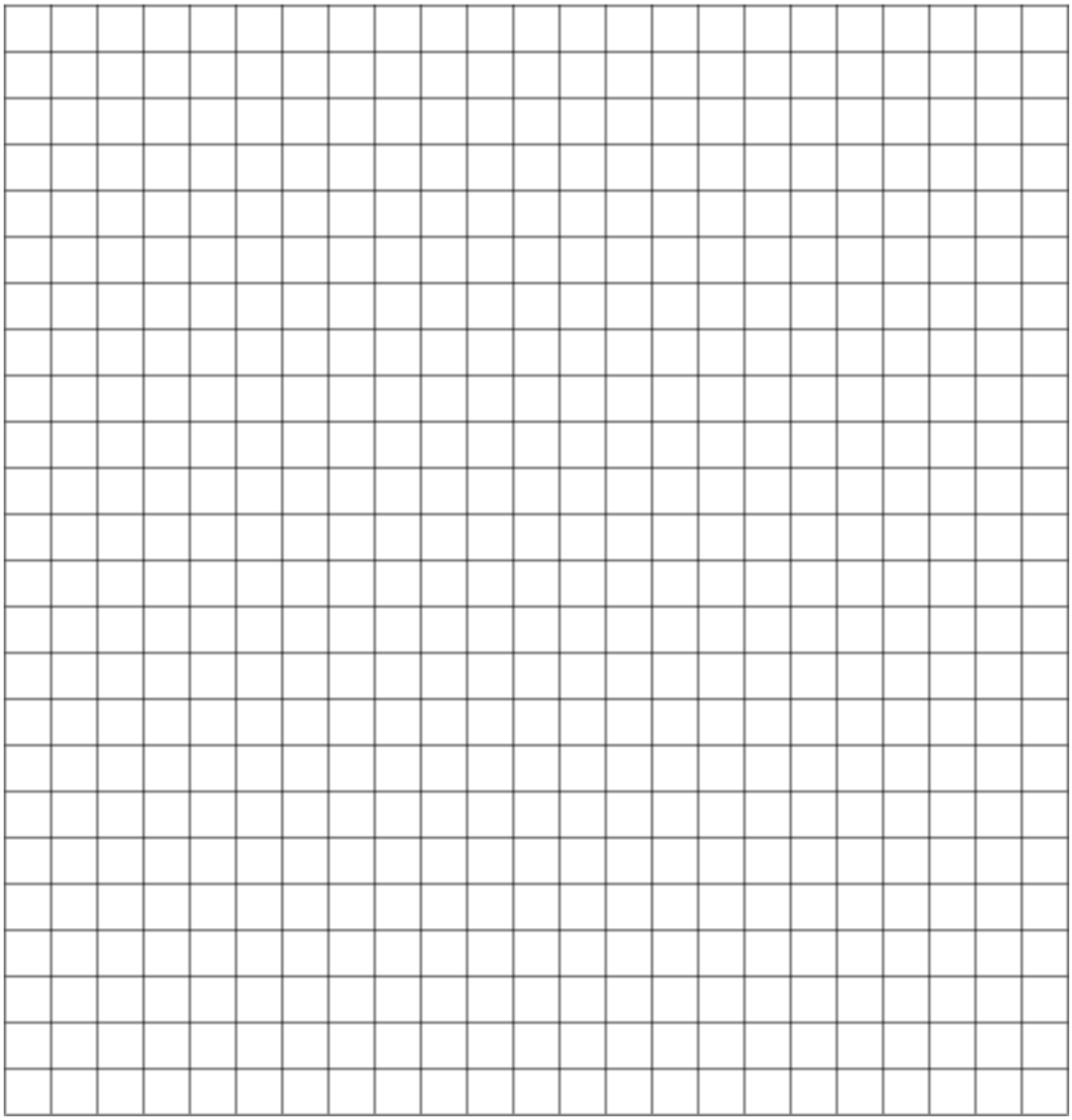
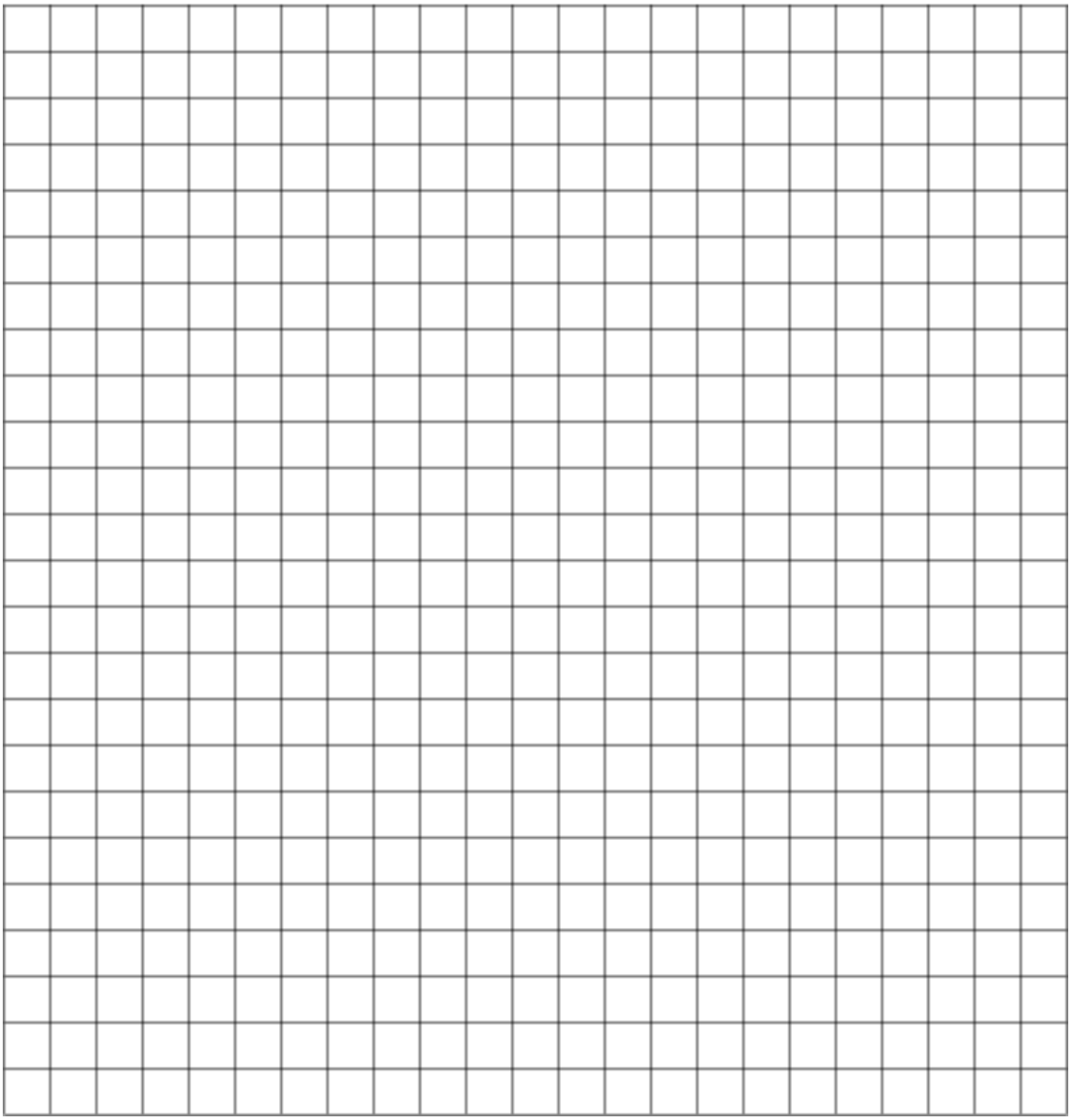


Figure A-4 Planning Grid

Scale: 1/4 inch = 1 foot



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