HP Integrity rx6600 HP Service Guide

HP Service Guide

HP Part Number: AB464-9002B
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About This Document

This document describes how to troubleshoot and diagnose server problems, and remove and replace server components for the HP Integrity rx6600, Regulatory Model Number: RSVLA-0405.

The document printing date and part number indicate the document's current edition. The printing date will change when a new edition is printed. Minor changes may be made at reprint without changing the printing date. The document part number will change when extensive changes are made.

Document updates may be issued between editions to correct errors or document product changes. To ensure that you receive the updated or new editions, you should subscribe to the appropriate product support service. See your HP sales representative for details.

The latest version of this document can be found online at:

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Intended Audience

This document is intended to provide technical product and support information for authorized service providers, customer system administrators, and HP support personnel.

New and Changed Information in This Edition

This document has been updated to include information on the PCI/PCI-X/PCI-E I/O Backplane and PCI-E core I/O cards.

Publishing History

Table 1 lists the publishing history details for this document.

Table 1 Publishing History Details

Document Manufacturing Part Number	Publication Date
AB464-9002A	September 2006
AB464–9022B	February 2007

Document Organization

The *HP Integrity rx6600 HP Service Guide* is divided into several chapters; each chapter contains information about servicing the HP Integrity rx6600. The appendixes contain supplemental information.

Chapter 1 (page 23)	Use this chapter to develop a high-level understanding of the major server subsystems. The server dimensions and weight are also included.
Chapter 2 (page 35)	Use this chapter to locate and learn about the server controls, ports, and LEDs.
Chapter 3 (page 47)	Use this chapter to learn how to power off and power on the server.
Chapter 4 (page 51)	Use this chapter to learn how to remove and replace server components.
Chapter 5 (page 131)	Use this chapter to help troubleshoot and diagnose server problems.
Appendix A (page 173)	This appendix lists the field replaceable units (FRU).
Appendix B (page 177)	This appendix provides information on how to boot and shut down the operating systems supported on the server.
Appendix C (page 193)	Use this chapter to learn about MCA analysis.

Typographic Conventions

This document uses the following conventions:

audit(5)	An HP-UX manpage. In this example, *audit* is the name and *5* is the section in the *HP-UX Reference*. On the Web and on the Instant Information CD, it may be a hot link to the manpage itself. From the HP-UX command line, you can enter "`man audit`" or "`man 5 audit`" to view the manpage. See *man*(1).
Book Title	The title of a book. On the Web and on the Instant Information CD, it may be a hot link to the book itself.
KeyCap	The name of a keyboard key. Note that **Return** and **Enter** both refer to the same key.
Emphasis	Text that is emphasized.
Bold	Text that is strongly emphasized.
Term	The defined use of an important word or phrase.
`ComputerOut`	Text displayed by the computer.
`UserInput`	Commands and other text that you type.
`Command`	A command name or qualified command phrase.
`Variable`	The name of a variable that you can replace in a command or function or information in a display that represents several possible values.
[ ]	The contents are optional in formats and command descriptions. If the contents are a list separated by a pipe (|), you must choose one of the items.
{ }	The contents are required in formats and command descriptions. If the contents are a list separated by a pipe (|), you must choose one of the items.
...	The preceding element can be repeated an arbitrary number of times.
|	Separates items in a list of choices.

Related Documents

The *HP Server Documentation CD* has been provided with the server. It contains a complete documentation set for the server, including localized versions of key documents.

Other documents in this collection include:

HP Integrity rx6600 Installation Guide

HP Integrity rx6600 Site Preparation Guide

HP Integrity rx6600 Safety and Regulatory Information

HP Integrity rx3600 and rx6600 Console Quick Start

HP Integrity iLO 2 MP Operations Guide

HP Integrity rx3600 & rx6600 Upgrade Guide

The latest versions of these documents, and any updates to these documents are posted under the *Enterprise Servers, Workstations and Systems Hardware* collection under *HP Integrity rx6600* at:

`http://www.docs.hp.com`.

HP Encourages Your Comments

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Include document title, manufacturing part number, and any comments, errors found, or suggestions for improvement you have concerning this document. Also, please include what we did right so we can incorporate it into other documents.

1 Introduction

The HP Integrity rx6600 server is a 7U, rack- or pedestal-installed server. The server's internal peripherals include serial-attached SCSI (SAS) disks and a DVD or DVD+RW drive. Its high availability features include N+1 hot-swappable fans, 1+1 hot-swappable power supplies, and hot-pluggable PCI-X cards and SAS disks. This server can contain one, two, three, or four dual-core Itanium® processors and up to 192 GB of memory.

This chapter addresses the following topics:

I/O

The rx6600 server may contain either a 10 slot PCI/PCI-X IOBP or a 10 slot PCI/PCI-X/PCI-E IOBP. The primary purpose of the CIOBP board is to extend I/O from the PB board's Core Electronics Complex through HP-proprietary high-speed ropes links. Local I/O bridges receive these Ropes in 18-line signal-bundles, known as rope-bundles, as upstream input and provide PCI/PCI-X/PCI-E interface buses as output to downstream I/O card adapters. The PCI/PCI-X/PCI-E interfaces are classified under two major categories: Public and Private.

Public interfaces are those which connect to PCI slot connector(s) that are left available to the customer to elect-based on their application needs-the I/O-card adapters which they wish to install, granted the Public slot populated supports said adapter. Private interfaces are "predestined," or predefined, to live-out a life in the service of Core-IO. Core-IO is comprised of two species, Fast-core and Slow-core, also known as the UCIO (Unified Core-I/O). All Public slots support HP-server traditional OL* "hot-plug" operations. The Private slots and UCIO are not "hot-pluggable." PDHP slots rely on the facilities of DHPC (Dual Hot-plug Controller) FPGAs to enable OL* hot-plug functionality. See Table 1-1 (page 26) and Table 1-2 (page 26) for details.

On the 10 slot PCI/PCI-X IOBP there are a total 8 Public slots (PCI-X mode1/2), 2 Private Fast-core slots (PCI-X mode1), and 1 Private Slow-core UCIO slot (PCI 32-bit/33MHz). The eight Public slots are further subdivided into three speed/bandwidth configurations:

- Four PDHP (Public Dual Hot-plug), which operate at 64-bit/66MHz PCI-X
- Two PSHP-SDR (Public Single Hot-plug - Single Data Rate), operating at 64-bit/133MHz PCI-X
- Two PSHP-DDR (Public Single Hot-plug - Double Data Rate), at 64-bit/266MHz (133MHz double clocked) PCI-X mode2

Four 66 MHz PCI/PCI-X slots are shared in groups of two. Shared slots have many speed and mode change restrictions during hot-plug add or remove operations. For more information on PCI/PCI-X card configuration and restrictions, see "PCI/PCI-X Configurations" on page 68.

Four of the server PCI/PCI-X slots are not shared. Two of the nonshared slots are 133 MHz PCI/PCI-X, and two of the slots are 266 MHz PCI/PCI-X.

On the 10 slot PCI/PCI-X/PCI-E IOBP there are a total of eight Public slots (four PCI-X mode 1 and four PCI-E), two Private Fast-core slots (PCI/PCI-X mode 1 64-bit/66MHz), and one Private Slow-core UCIO slot (PCI 32-bit/33 MHz). The eight Public slots are further divided into three speed/bandwidth configurations:

- Two PDHP, which operate at 64-bit/66MHz PCI-X
- Two PSHP, operating at 64-bit/133MHz PCI-X
- Two PCI-E 8-lane (x8) SDR 2.5 Gbps
- Two PCI-E 8-lane (x8) DDR 2.5 Gbps

The two 66 MHz PCI/PCI-X slots are shared, and the two PCI-E DDR slots are shared. Shared slots have many speed and mode change restrictions during hot-plug add or remove operations. For more information on PCI/PCI-X card configuration and restrictions, see “PCI/PCI-X Configurations” on page 68. The two 133 MHz PCI-X slots and two PCI-E DDR are not shared.

In addition, the CIOBP serves as home to several independent subsystems, namely PDH (SB), Manageability/UCIO (iLO 2 MP, BMC), PRS (Power-on Reset Sequencer), and FSC (Fan Speed Control). Beyond these subsystems, the CIOBP hosts sundry other circuits; among these are: PCI interface to Core-LAN & Core-SCSI Fast-core cards, PCI hotplug circuitry, PDH-monitor interface entry-point, Scan Utility interface entry-point, Common Doorbell Board (CDB) interface entry-point, bus-switches and DHPCs for PDHP-slot hot-plug functionality, TPM interface entry-point, I/O Voltage Regulator Module (I/O VRM) interface entry-point, and several non-isolated POLs for 12-volt power conversion to local rail voltages.

Figure 1-1 (page 24) is a block diagram of the I/O subsystem.

Figure 1-1 I/O Subsystem Block Diagram

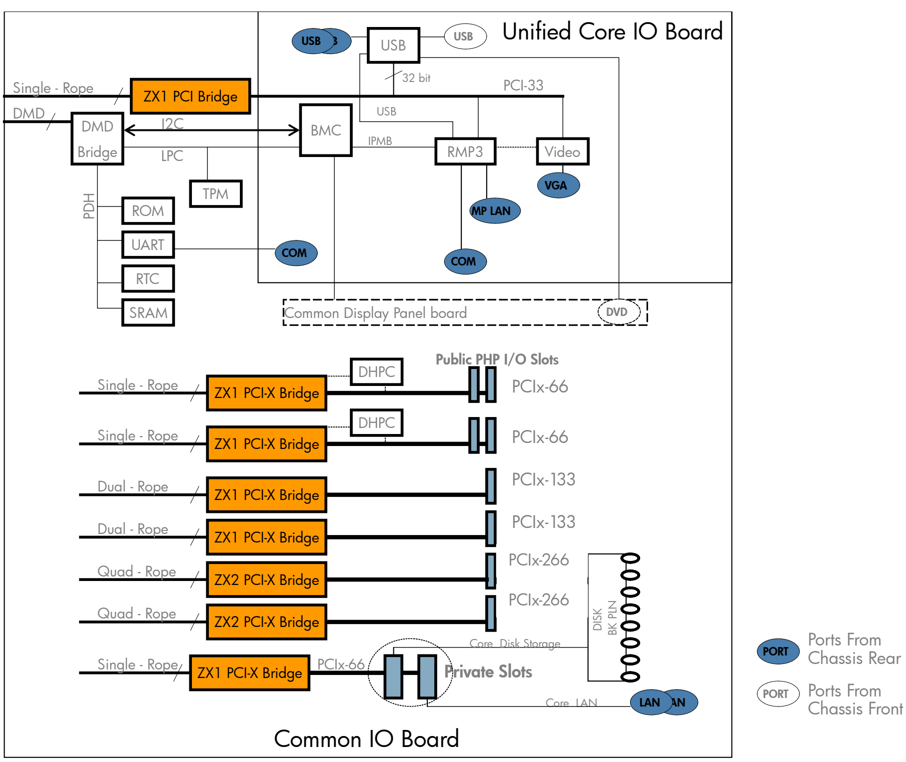
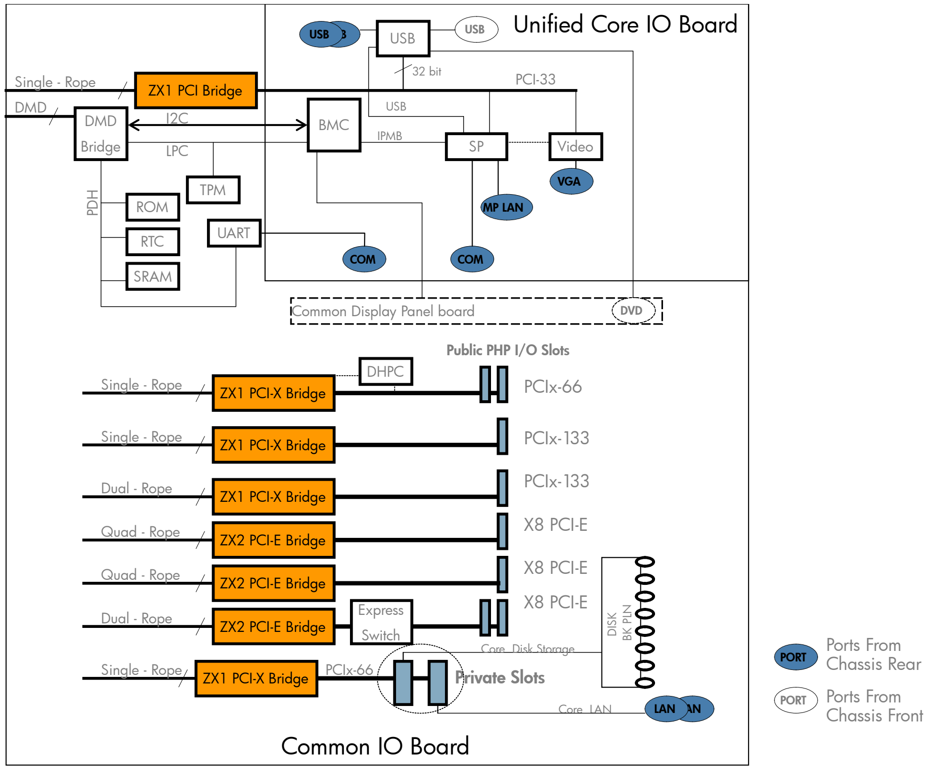


Figure 1-2 (page 25) is a block diagram of the PCI/PCI-X/PCI-E I/O subsystem.

Figure 1-2 PCI/PCI-X/PCI-E I/O Subsystem Block Diagram



The I/O board assembly is serviced from the rear of the chassis and connects through the midplane board to the processor board. It is mounted on a removable carrier tray that contains six full-length and two short-length PCI/PCI-X or PCI-E hot-pluggable public slots and two standard PCI/PCI-X private slots. The private slots are used for the LAN core I/O and SAS core I/O cards. The I/O board assembly also contains the processor-dependent hardware (PDH) functionality.

The server supports PCI/PCI-X/PCI-E hot-pluggable operations in all the public I/O slots. PCI/PCI-X/PCI-E hot-pluggable operations enable you to add or remove a PCI/PCI-X/PCI-E card while the server is powered on. Each slot is physically separated with a divider that contains a card extraction mechanism and a mechanical retention latch (MRL).

Attention LEDs, doorbell buttons, and power LEDs for each hot-pluggable PCI/PCI-X/PCI-E slot are located on the PCI bulkhead at the rear of the server chassis.

Wake on LAN, a hardware feature that enables the remote power on of computers through special network packets, is enabled in core PCI/PCI-X slots one and two.

The core I/O board contains the server VGA (optional) and USB ports, and most of the manageability functions, such as the baseboard management controller (BMC), and the Integrated Lights-Out 2 Management Processor (iLO 2 MP). The core I/O board connects through an internal cable to the display panel board. The display panel board includes the front panel LEDs, diagnostic LED panel, DVD, and front panel USB port.

Ropes is an HP-proprietary, custom bus interface. It clocks data packets across long-length nets using source synchronous clocking schemes. There are eighteen signals bundled per Ropes group, of which there are a total of 16 in the rx6600. Four of these groups only include 14 signals: groups 6, 7, 14, and 15. The reason for this has to do with the way ZX2 cords together groups to make the Quad-Rope bundle. Ropes bundles connect ZX2 to the HBAs. Ropes links operate at 266MHz with HSTL 1.5V level signaling. Each group is capable of 0.5GB/s peak bandwidth. Table 1-1 (page 26) and Table 1-2 (page 26) display the association of the Ropes group(s) to the PCI slot / HBA to which they connect.

Table 1-1 PCI/PCI-X I/O Rope Groups

Ropes	PCI Bus	Slot #	Speed	Bits	Number of Slots	Hot Swap / OLR	Function
0	0	-	33	32	1	N	UCIO
8	1	1, 2	66	64	2	N	Core I/O (Private Fast-core Slots
1	7	9, 10	66	64	2	Y	General PCI-X (PDHP slots)
9	6	7, 8	66	64	2	Y	General PCI-X (PDHP slots)
2, 3	5	6	133	64	1	Y	High-Speed PCI-X (PDHP-SDR slots)
10, 11	4	5	133	64	1	Y	High-Speed PCI-X (PDHP-SDR slots)
4, 5, 6, 7	3	4	266	64	1	Y	PCI-X 2.0, DDR (PSHP-DDR slots)
12, 13, 14, 15	2	3	266	64	1	Y	PCI-X 2.0, DDR (PSHP-DDR slots)

Table 1-2 PCI/PCI-X/PCI-E I/O Rope Groups

Ropes	Slot #	Speed	Bits	Number of Slots	Hot Swap/OLR	Function
0	-	33	32	1	N	UCIO
8	1, 2	66	64	2	N	Core I/O (Private Fast-core Slots)
1	9, 10	66	64	2	Y	General PCI-X (PDHP slots)
9	8	133	64	1	Y	High-Speed PCI-X (PDHP slots)
2, 3	7	133	64	1	Y	High-Speed PCI-X (PDHP-SDR slots)
10, 11	3, 4	2.5 Gbps	x8	2	YN	PCI-E x8 (SDR slots)
4, 5, 6, 7	6	2.5 Gbps	x8	2	Y	PCI-E x8 (DDR slots)
12, 13, 14, 15	5	2.5 Gbps	x8	2	Y	PCI-E x8 (DDR slots)

Processor

The server processor subsystem accommodates one, two, three, or four dual-core Itanium processor modules. The processor subsystem consists of the following elements:

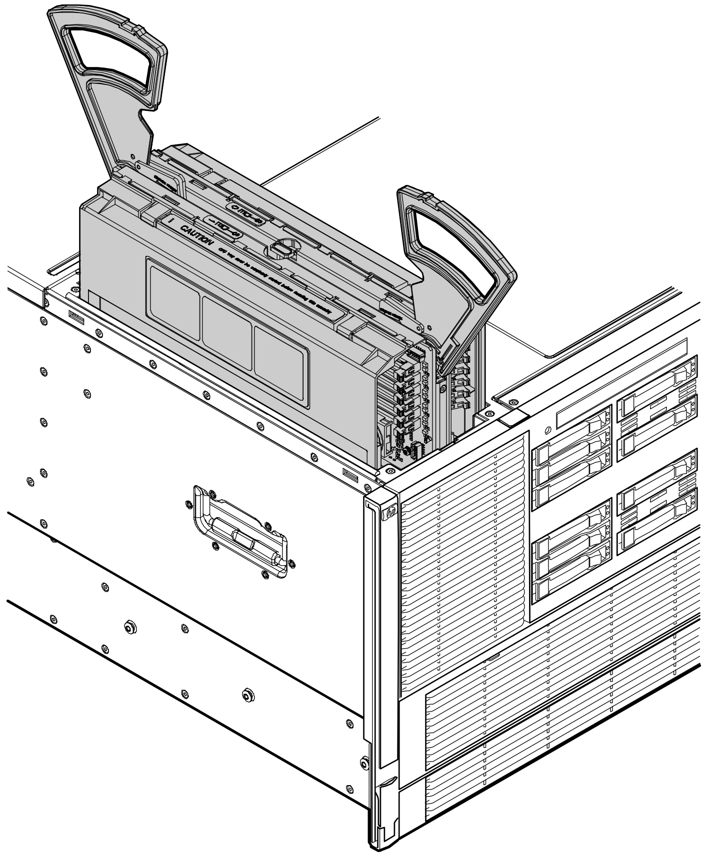
- zx2 CEC front side bus, memory, and I/O controller
- System clock generation and distribution
- Circuitry for manageability and fault detection

The zx2 CEC and the processor modules are located on the processor board assembly. Each processor connects to the processor board through a zero insertion force (ZIF) socket. The processor board is mounted on a removable carrier tray that is attached to the processor board access door. Access this assembly through the front of the server after the memory carrier is removed.

Memory

The server DIMMS are seated on memory boards that are enclosed in an extractable memory carrier assembly.

Figure 1-3 Memory Carrier Assembly



The memory boards plug directly into sockets on the processor board when the memory carrier assembly is fully seated.

The server supports the following DIMM sizes:

- 512 MB
- 1 GB
- 2 GB
- 4 GB

Table 1-3 lists the memory carrier configurations and the maximum memory for each configuration.

Table 1-3 Memory Carrier Configurations

Memory Carrier	Memory Boards	Maximum Configuration
24-DIMM	One 24-DIMM memory multiplexer (mux)-based board	96 GB (24 X 4 GB DIMMs)
48-DIMM	Two 24-DIMM memory multiplexer (mux)-based boards	192 GB (48 X 4 GB DIMMs)

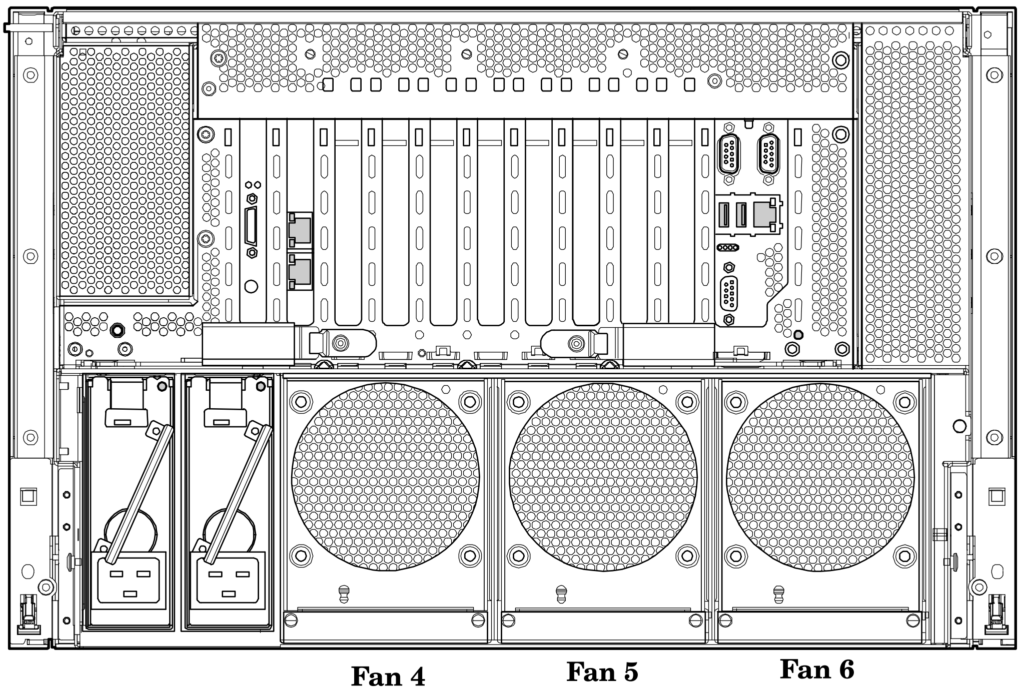
Cooling

There are six system fans assemblies that cool the server. The fans are redundant, hot-swappable, and interchangeable. You service the fans through the top and rear of the chassis. The fans are N+1, meaning that the server has six fans, but can operate for a very limited time with five fans running. If the time threshold is reached, the server automatically shuts down to prevent an overtemperature condition.

General AirflowAirflow enters through the front and exhausts out the rear. Airflow baffles may be required to optimize air circulation within the enclosure. Fans are monitored by the system to indicate performance.

The rx6600 airflow strategy contains two thermal zones with three Fan Units in the bottom zone, and three fan units in the upper zone along with two power supplies that provide their own individual cooling. Depending on the customer's configurations, certain component locations will need filler panels. These installed airflow filler panels and blockers will guarantee airflow and EMI integrity. Internally, the system may require a CPU airflow baffle and a Memory airflow baffle. Rear I/O bulkhead covers required in unoccupied slots. Each fan unit consists of two rotors. The fan units are hot-swappable components.

Figure 1-4 Fan Units



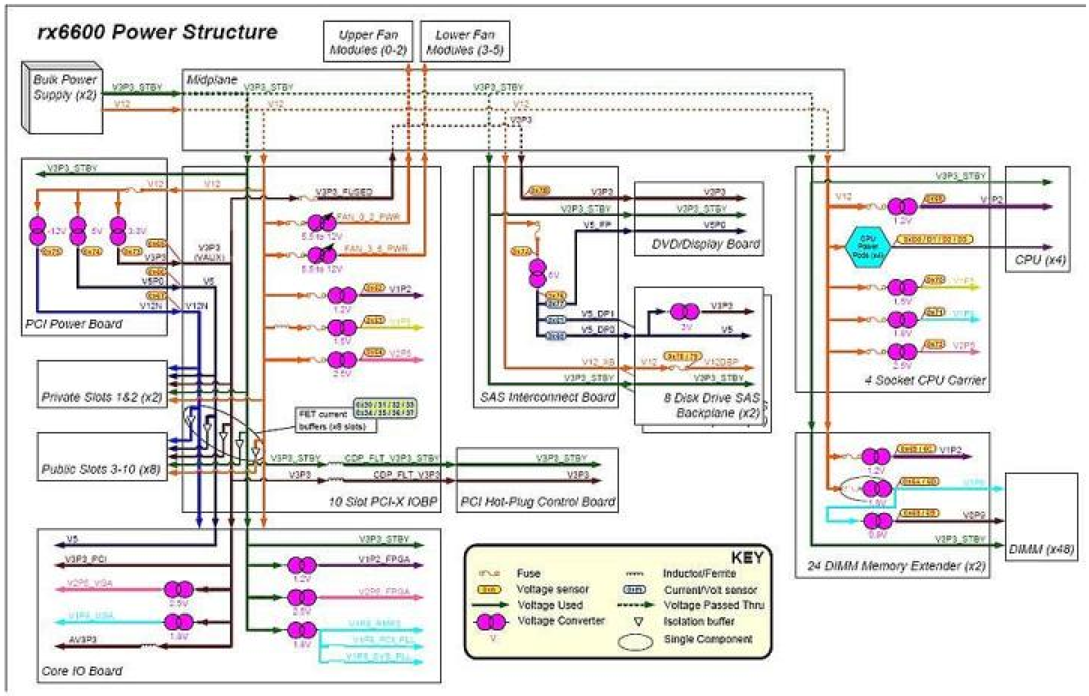
The rx6600 has the following cooling features:

- Thermal sensor in the front panel [0xd8]. The thermal sensor measures inlet ambient air temperature.
- Up to 4 dual processors. Each processor has its own thermal register [0xd9, 0xda, and each thermal register measures internal die temperature.
- Intrusion sensor, located on the common display pca, and held in contact mode by the top cover.
- Power supplies, each power supply has its own pair of fans running at full speed. Each of the power supplies has its own (virtual) health sensor [0x40, 0x41].
- Fan units 1 through 6. Each fan unit consists of 2 individual fans rotors [0xe0 to 0xe9].

Power

The server power subsystem is designed to provide high availability with 1+1 power supply redundancy. Figure 1-5 (page 29) is a block diagram of the power subsystem, including voltage labels for each main server subsystem that requires power.

Figure 1-5 Power Subsystem Block Diagram



Two hot-swappable ac/dc power supplies generate main system power and a standby power voltage. One active power supply is sufficient to operate the system at maximum load. Each power supply receives ac power through the integrated ac inlet. The system can operate at 180-264 VAC and achieve 1+1 redundancy. The power supplies are power factor corrected and the maximum dc power output of the power system is 1600 watts. Service the hot-swappable power supplies by sliding them out the rear of the chassis.

Power Button

The power button on the rx6600 is a momentary contact push button. The BMC polls the front panel power button at a rate of at least 2 Hz. The power button is an input to the System Power State Management. If the system is off, a single button press will turn on the system. If the system has booted to an O/S, and a short button press is detected, a graceful-shutdown request will be sent to the system by pulsing ACPI_PWR_BTN_L; when the ACPI bits are set to note the O/S has shut down, the BMC will perform a hard power down. If the system has not booted to an O/S, or if a long (5 second) button press is detected, the system will do an immediate hard power off.System Power State ManagementThe system power may be controlled from the power button, an IPMI Chassis command, Wake-On-LAN, loss or gain of ac.

Applying System Power in normal customer usage, the rx6600 runs on 180 to 264V. Standby power will be supplied on either; hence the BMC will power up when the power supplies are plugged in. The BPS0_AC_OK and BPS1_AC_OK signals indicate whether the ac voltage to the power supplies is within the required range. If neither BPS0_AC_OK nor BPS1_AC_OK is asserted, then the BMC should log an event and prevent the system from turning on.

Power On Sequence

1. Update the cache of DIMM SPD information.

2. Ensure that the memory board is detected and that the cpu board has a processor in socket 0. If these FRUs are not detected the BMC logs an event against the Missing Device sensor (sensor 0x15).

3. Check for a BPS0_AC_OK or a BPS1_AC_OK signal. If neither is asserted, then the ac supply has a problem.

4. If any FRUs are missing or both ac supplies are not valid, then return to power off state.

5. Initialize I/O Expander settings prior to turning on power.

6. Set Power Sequencer Order. Set system frequency in Power Sequencer.

7. Pulse BMC_PWR_CMD to tell the Power Sequencer to enable the voltages in the system.

8. Wait for SEQ_MPON to know the power sequencer has finished and check if SEQ_STATUS=0 for a fault condition. If a fault has occurred, scan sensors for the cause and generate events.

9. Perform any pre-Reset Hardware Setup needed while power is on.

10. Release Reset by setting MPON=1.

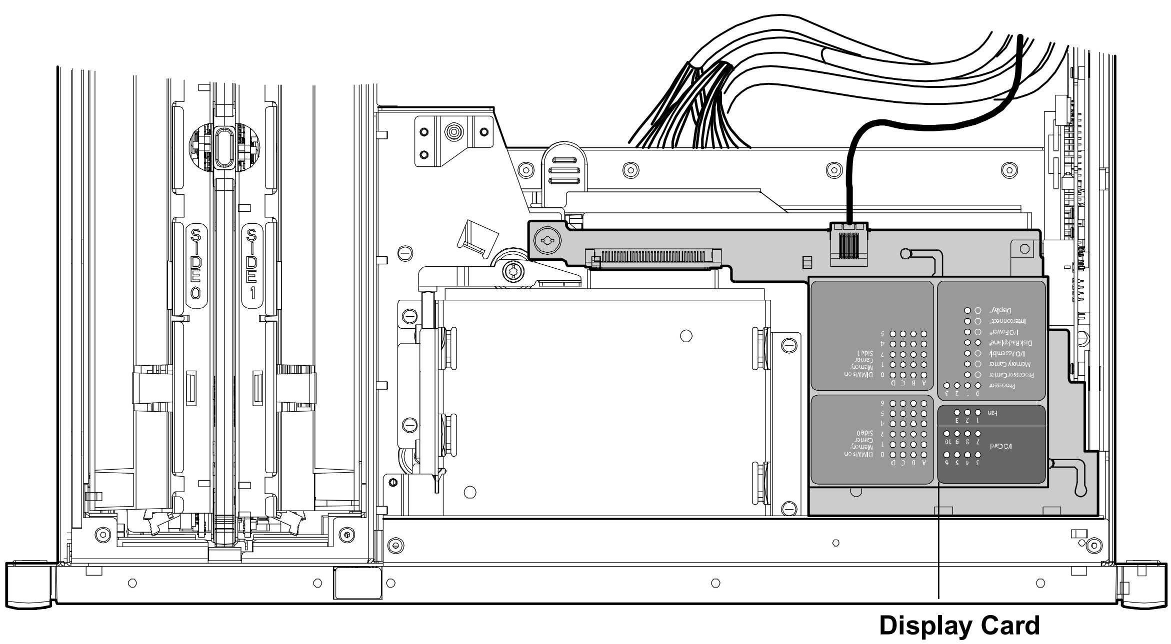
Front Display Panel, DVD, and Diagnostic Panel

The front display panel, DVD, and diagnostic panel are supported on a single board, called the display board, located in the front of the chassis. Service the display board from the top of the chassis. The front display panel consists of the system status LEDs and a power switch. Use the front display panel to determine the power status of the server and monitor the server as it progresses through the boot cycle. Use the various LED states to assist with troubleshooting system problems.

A slimline DVD drive, or optional DVD+RW drive, is located above the hard disk drives in the horizontal orientation of the front panel. There is a USB 2.0 port positioned between the DVD drive and the front display panel.

Each customer replaceable unit (CRU), with the exception of the power supplies, has a unique set of status indicators located on a diagnostic panel that you view through the top cover. CRUs include components such as individual memory DIMMs, processors, and fans. LEDs that correspond to each CRU illuminate when there is a problem.

Figure 1-6 Front Panel Display Card Location



Mass Storage

The server mass storage subsystem (SAS) contains the following elements:

- SAS disk drives
- SAS cables

- SAS backplane board
- SAS core I/O card

The server can contain up to 16 SAS disk drives. The drives have LEDs that indicate activity and device status, and an LED used to locate each drive. Additionally, there is a set of slot availability LEDs positioned in the middle of the disk drive bays on the front of the chassis. The LEDs indicate which slots are available for use.

The disk drives plug directly into the SAS backplane board. The server ships standard with two SAS backplane boards and one SAS core I/O card. Two cables connect from the SAS backplane board to the SAS core I/O card located in PCI/PCI-X slot 1. An optional second SAS core I/O card is available. Service the SAS backplane board and SAS core I/O card from the top of the chassis.

IMPORTANT: The number of SAS core I/O cards determines the SAS configuration. The SAS configuration affects the location of the LAN core I/O card. In a single SAS core I/O card configuration, the secondary set of SAS cables connect to the secondary SAS backplane, but are routed and lay loose in the server I/O backplane area.

Table 1-4 lists the available SAS configurations.

Table 1-4 SAS Configurations

SAS Core I/O Cards	SAS Core I/O Card Location	LAN Core I/O Card Location
1	Slot 1	Slot 2
2	Slots 1 and 2	Slot 10
2	Slots 1 and 3	Slot 2
1	Slot 3	Slot 2
2	Slots 3 and 4	Slot 2

Firmware

Firmware consists of many individually linked binary images that are bound together by a single framework at run time. Internally, the firmware employs a software database called a device tree to represent the structure of the hardware platform and to provide a means of associating software elements with hardware functionality.

The firmware incorporates the following main interfaces:

Processor Abstraction Layer (PAL)
: PAL provides a seamless firmware abstraction between the processor and system software and platform firmware.

System Abstraction Layer (SAL)
: SAL provides a uniform firmware interface, and initializes and configures the platform.

Extensible Firmware Interface (EFI)
: EFI provides an interface between the operating system and the platform firmware. EFI uses data tables that contain platform-related information, and boot and run-time service calls that are available to the operating system and its loader to provide a standard environment for booting.

Advanced Configuration and Power Interface (ACPI)
: ACPI provides a standard environment for configuring and managing server systems. ACPI moves system power configuration and management from the system firmware to the operating system, and abstracts the interface between the platform hardware and the operating system software. This enables each to evolve independently of the other.

The firmware supports HP-UX 11i version 2, June 2006 release, Linux®, Windows®, and OpenVMS 8.3 operating systems through the Itanium processor family standards and extensions, and has no operating system-specific functionality included. All operating systems are presented with the same interface to system firmware, and all features are available to the operating system.

User Interface

The Itanium processor family firmware employs a user interface defined by an HP standard called Pre-OS System Startup Environment (POSSE). The POSSE shell is based on the EFI standard shell. Several commands were added to the standard EFI Shell to support HP value-added functionality.

Event IDs for Errors and Events

The system firmware generates event IDs for errors, events, and forward progress to the iLO 2 MP through common shared memory. The iLO 2 MP interprets and stores event IDs. Reviewing these events helps you diagnose and troubleshoot problems with the server. For more information, see Appendix D (page 221).

Dimensions and Weight

Table 1-5 lists the dimensions and weight of the HP Integrity rx6600 for a rack- or pedestal-installed configuration .

Table 1-5 Rack- or Pedestal-Installed Server Dimensions and Values

Dimension	Value
Server weight (loaded product weight range estimate)	120-150 lbs.
Rack	
Rack dimensions (depth x width x height)	69.6 cm (27.4 in) x 44 cm (17.32 in) x 30.58 cm (12.04 in)
Rack weight	Max: 68.04 kg (150 lbs)
Rack unit	Server takes up 7U in the rack
Pedestal	
Pedestal dimensions (depth x width x height)	69.3 cm (27.3 in) x 48.9 cm (19.3 in) x 42.2 cm (16.7 in)
Pedestal weight	Max: 15.5 kg. (34 lbs.)
Minimum standalone configuration	69.9 kg. (154 lbs.)
Maximum standalone configuration	83.5 kg. (184 lbs.)

Server Specifications

Table 1-6 lists the server specifications for the HP Integrity rx6600.

Table 1-6 Server Specifications

Component	Specification	
	rx6600 with PCI/PCI-X IOBP	**rx6600 with PCI/PCI-X/PCI-E IOBP**
Processors	One, two, three, or four Itanium dual-core processors: • 1.4 GHz/12 MB cache • 1.6 GHz/18 MB cache • 1.6 GHz/24 MB cache	
Memory	24-DIMM memory carrier or 48-DIMM memory carrier Supported DDR2 DIMM sizes: 512 MB, 1 GB, and 2 GB	
Disk drives	One to 16 hot-pluggable SAS hard drives	

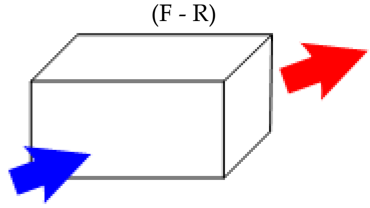
Table 1-6 Server Specifications *(continued)*

Component	Specification: rx6600 with PCI/PCI-X IOBP	Specification: rx6600 with PCI/PCI-X/PCI-E IOBP
PCI slots	Two private PCI-X 66 MHz slots	
	Eight public PCI-X slots: • Four PCI-X slots, 66 MHz • Two PCI-X slots, 133 MHz • Two PCI-X2 slots, 266 MHz	Eight Public slots: • Two PCI-X slots, 66 MHz • Two PCI-X slots 133 MHz • Four PCI-E, x8
SAS core I/O	Eight port SAS core I/O card (PCI-X), or eight port SAS core I/O card with RAID (PCI-X)	Eight port SAS core I/O card (PCI-X), or eight port SAS core I/O card with RAID (PCI-X or PCI-E), or eight port SAS core I/O card with RAID able to connect to external storage (PCI-E)
LAN core I/O	Two GigE LAN ports	
Management core I/O	Two serial ports, two USB 2.0 ports, one 10 Base-T/100 Base-T LAN port, and one optional VGA port	
Optical device	One DVD or DVD+RW drive	
Power supply	One 1600 watt power supply, 1+1 redundancy with second power supply	

Table 1-7 Physical and Environmental Specifications

	Condition: Typical Heat Release, Voltage 200-240 Vac	Condition: Airflow, Nominal		Condition: Airflow, Maximun at 35°C[1]		Weight: Server	Weight: Rack	Weight: Pedestal	Overall System Dimensions (W X D X H: Rack	Overall System Dimensions (W X D X H: Pedestal
Description	Watts	CFM	m^3/hr[2]	CFM	m^3/hr[2]	120-150 lbs.	150 lbs (68.04 kg) max	Max: 15.5 kg. (34 lbs.)	69.6 cm (27.4 in) x 44 cm (17.32 in) x 30.58 cm (12.04 in)	69.3 cm (27.3 in) x 48.9 cm (19.3 in) x 42.2 cm (16.7 in)
Minimum Configuration	433 W	346	588	441	750			154 lbs. (6909 kg.)		
Maximum Configuration	1633 W	346	588	441	750			184 lbs. (83.5 kg.)		
Typical Configuration	998 W	346	588	441	750					

Table 1-7 Physical and Environmental Specifications *(continued)*

	Condition			Weight			Overall System Dimensions (W X D X H	
	Typical Heat Release	Airflow, Nominal	Airflow, Maximun at 35°C[1]					
	Voltage 200-240 Vac			Server	Rack	Pedestal	Rack	Pedestal
ASHRAE Class 1	Air Flow Diagram Cooling Scheme (F - R)  Front to Rear (F-R)		Minimum Configuration	(1x) Itanium 1.4G/12M or 1.6G/18M or 1.6G/24M CPUs, (4x) 4GB DDRII DIMM memory, (0x) SAS Hard Drives, (0x) PCI/PCI-X/PCI-E added to public I/O cards.				
			Maximum Configuration	(4x) 1.6G/24M CPUs, (48x) 4GB DDRII DIMM memory, (16x) SAS Hard Drives, (8x) PCI/PCI-X/PCI-E added to public I/O cards.				
			Typical Configuration	Half-loaded configuration: (2x) Itanium 1.4G/12M or 1.6G/18M or 1.6G/24M CPUs, (24x) 4GB DDRII DIMM memory, (8x) SAS Hard Drives, (4x) PCI/PCI-X/PCI-E added to public I/O cards.				

1 Derate maximum dry bulb temperature 1oC/300 m above 900 m.

2 m^3/hr=1.7 x CFM

2 Controls, Ports, and LEDs

This chapter provides a basic description of the controls, ports, and LEDs found on the front panel and rear panel of the HP Integrity rx6600. For more information on LED functions and descriptions, see Chapter 5: "Troubleshooting" (page 131).

This chapter addresses the following topics:

Front Panel

The front panel of the server includes the controls, ports, and LEDs commonly used when the server is operational.

Figure 2-1 shows the control, port, and LED locations on the server front panel.

Figure 2-1 Front Panel Control, Port, and LED Locations

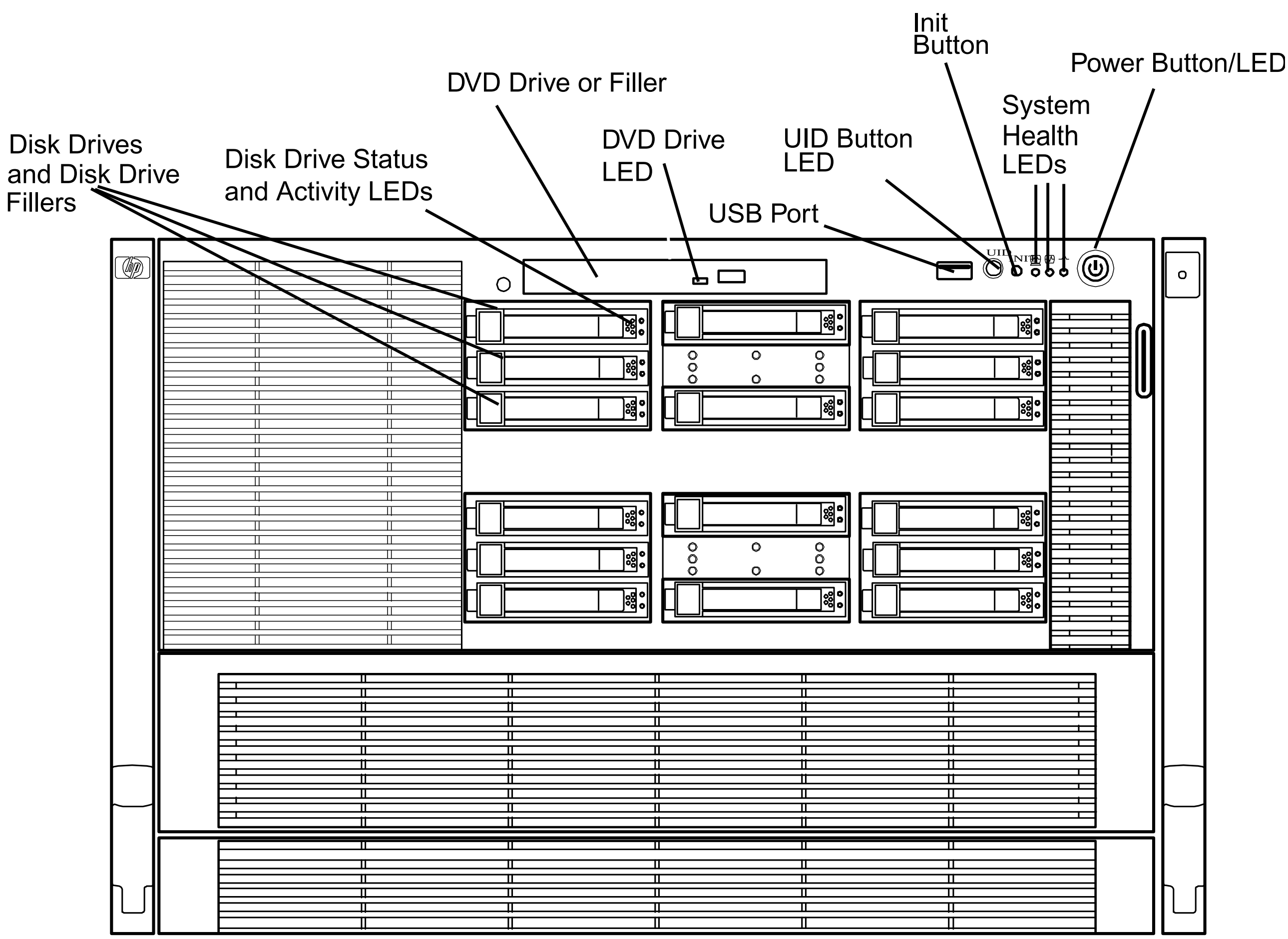


Table 2-1 lists the front panel controls.

Table 2-1 Front Panel Controls

Name	Function
Power Button	Manually powers the server on and off.
UID Button	Helps locate a particular server within a rack of servers. You can remotely activate this button using various system utilities.
Init Button	Resets the system; irrecoverably halts all system processing and I/O activity and restarts the server.

Figure 2-2 shows the front control panel LEDs.

Figure 2-2 Front Control Panel LEDs

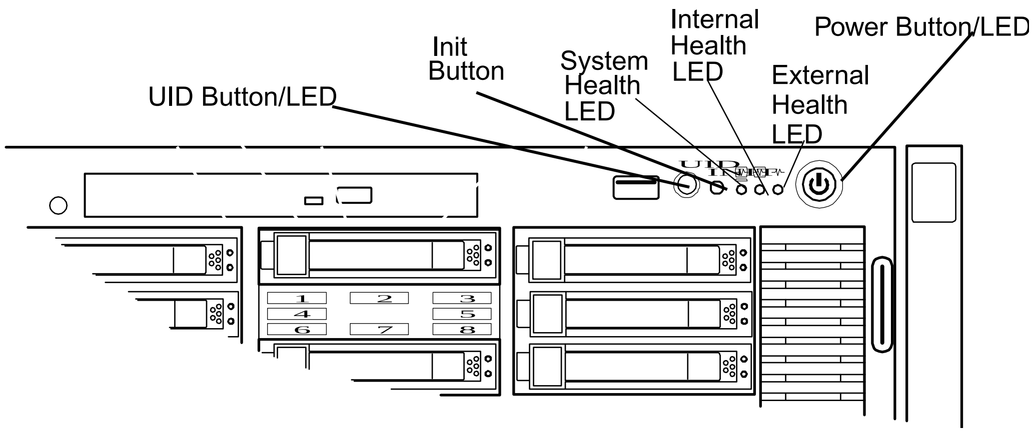


Table 2-2 lists the front control panel LEDs and describes the meaning of the LED states.

Table 2-2 Front Control Panel LEDs

Name	States
Power LED	• Off: No ac power • Green: Full power is on • Yellow: Standby power is on
UID LED	• Off: UID button is not activated • Blue: UID button is activated There is an additional UID LED and button located on the rear panel of the server. Both UID LEDs illuminate when you activate either the front or rear UID buttons.
System Health LED	Provides information about the system status. The following are LED states: • Off: System is off • Green: Normal operation • Flashing amber: Warning • Flashing red: System fault

Table 2-2 Front Control Panel LEDs *(continued)*

Name	States
Internal Health LED	Indicates the status of internal serviceable components. This LED maintains its state when the system is in standby mode (system power turned off but ac power still applied to the system). When the internal health LED is lit, the corresponding failed component LED illuminates on the diagnostic panel. See Chapter 5, "Troubleshooting," for more details on the internal health LEDs. The following are LED states: • Off: System is off • Green: System health is good • Flashing amber: System health is degraded • Flashing red: System health is critical
External Health LED	Indicates the status of external serviceable components. When the external health LED is lit, the corresponding failed component LED illuminates. The following are LED states: • Off: System is off • Green: System health is good • Flashing amber: System health is degraded • Flashing red: System health is critical

Storage and Media Devices

The server can contain up to 16 hot-pluggable SAS disk drives and one DVD or DVD-RW drive. Storage and media devices have LEDs that indicate activity and device status. Hot-pluggable SAS disk drives also have an LED used to locate a particular drive. SAS disk drive slots map to LEDs that indicate whether a slot is available for use.

Hot-Pluggable Disk Drive LEDs

The hot-pluggable disk drives have two LEDs per drive (Figure 2-3), as follows:

- Drive Status LED: The drive status LED is bicolor and can display amber or blue. Amber indicates a warning, or failure condition. Blue identifies a particular disk drive. The Drive Status LED is blue when you use various software utilities, such as online diagnostics and SAS drive configuration tools.
- Drive Activity LED: The drive activity LED is solid green during normal operation and flickers when a drive is accessed.

Figure 2-3 shows the hot-pluggable disk drive LEDs.

Figure 2-3 Hot-Pluggable Disk Drive LEDs

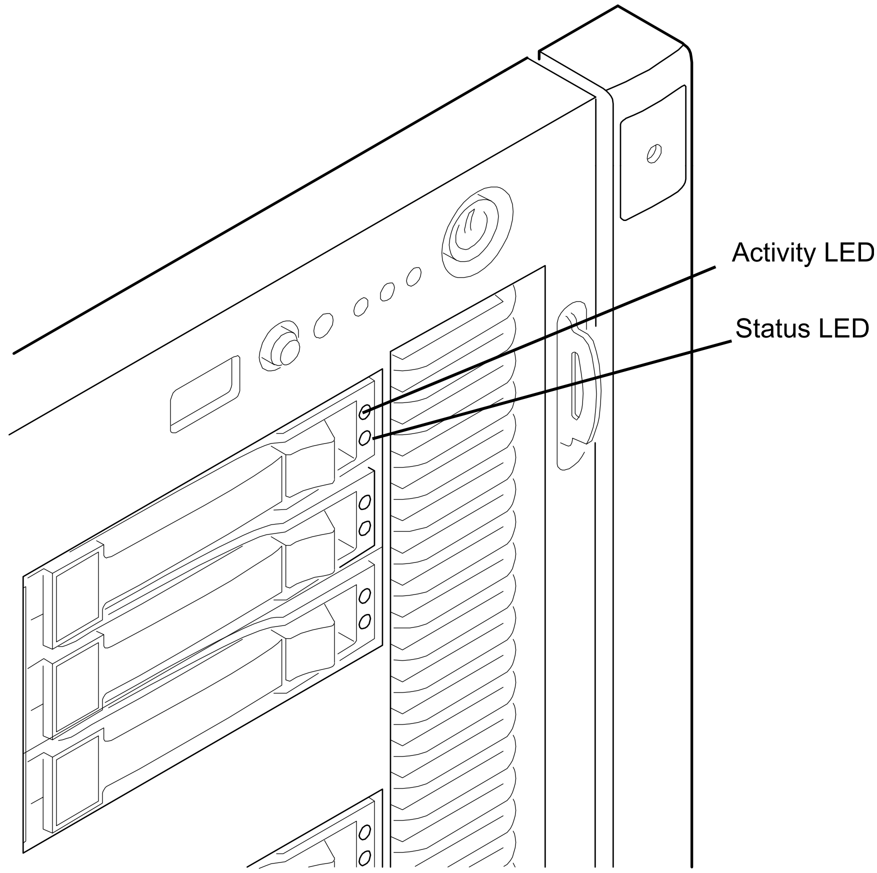


Table 2-3 lists the hot-pluggable disk drive LEDs and states.

Table 2-3 Hot-Pluggable Disk Drive LEDs

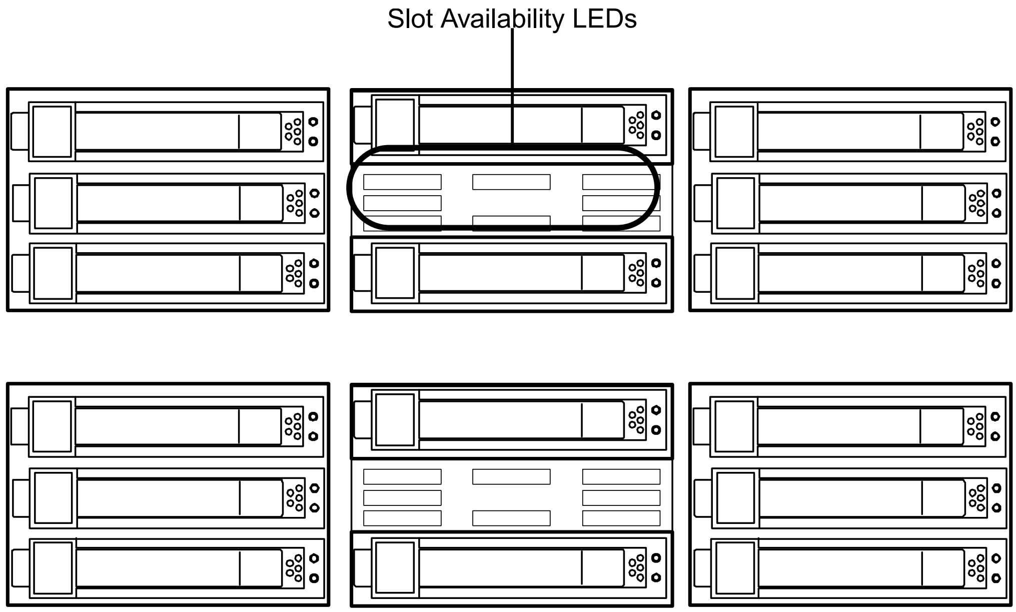
Activity LED	Status LED	Disk Drive State
Off	Off	Offline or not configured
Solid green	Off	Normal operation; no activity
Flickering green	Off	Normal operation; disk read or write activity
Off	Flashing amber at constant 1 Hz	Offline, no activity; predictive failure
Solid green	Flashing amber at constant 1 Hz	Online, no activity; predictive failure
Flickering green	Flashing amber at constant 1 Hz	Disk activity; predictive failure
Off	Solid amber	Offline; no activity; critical fault
Off	Solid blue	Offline; drive selected by locator function
Flashing green at constant 1 Hz	Off	Drive rebuilding

Hot-Pluggable Disk Drive Slot Availability LEDs

The hot-pluggable disk drive slot availability LEDs are located on the front bezel in the center of the two groups of eight SAS disk drive slots (Figure 2-4). If a disk drive slot is available for use, the numbered LED for the disk drive slot illuminates. Disk drive slot numbers do not illuminate if they are not available. For example, if there are 16 disk drive slots, and slots one through eight are available, the number LEDs for 1, 2, 3, 4, 5, 6, 7, and 8 illuminate; numbers 9, 10, 11, 12, 13, 14, 15, and 16 do not illuminate.

Figure 2-4 shows the hot-pluggable disk drive slot availability LEDs for one group of eight disk drives.

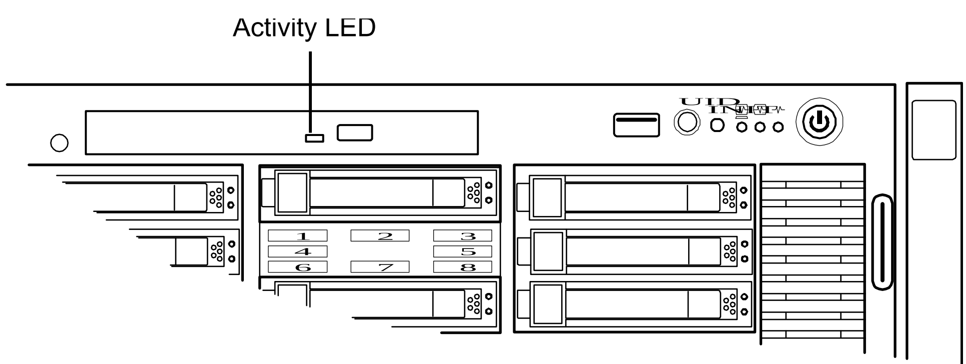
Figure 2-4 Hot-Pluggable Disk Drive Slot Availability LEDs



DVD Drive

The server has one DVD drive or one DVD-RW drive. This device has one activity LED.

Figure 2-5 DVD Drive

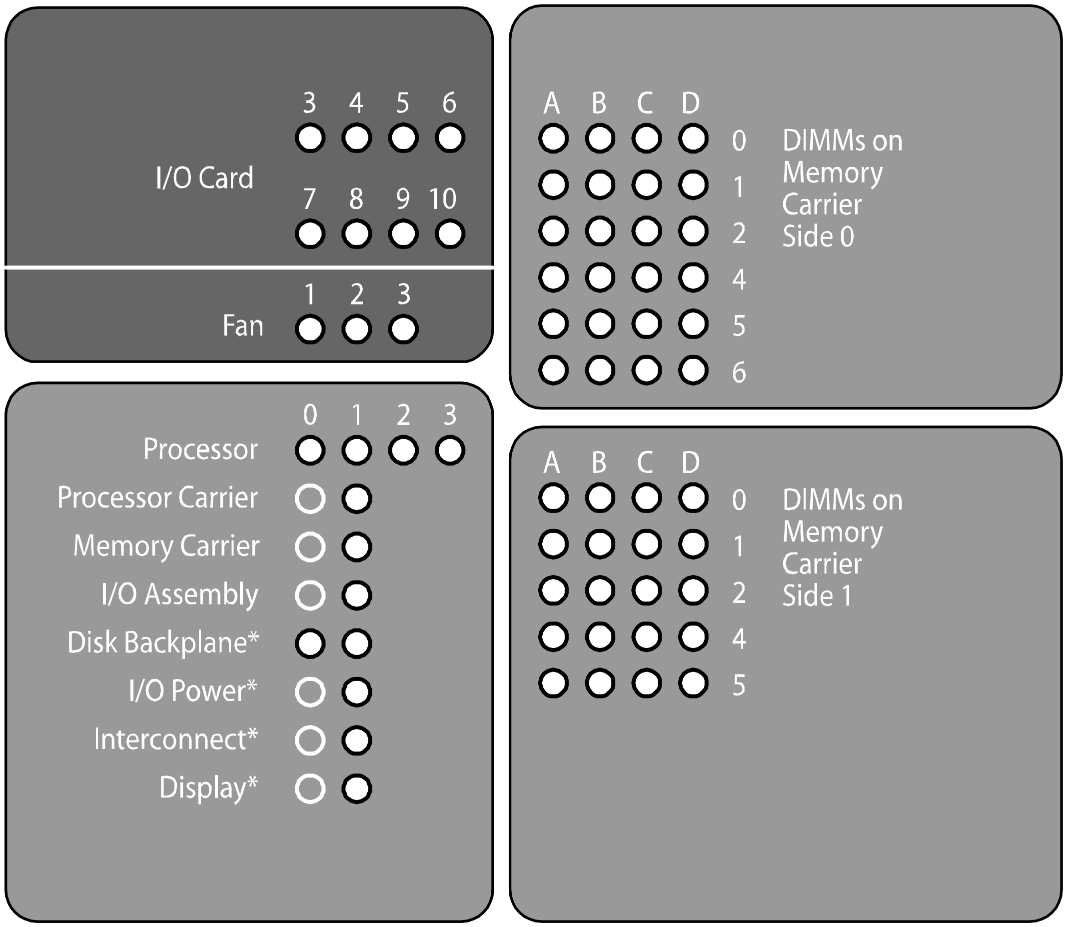


Diagnostic Panel

The diagnostics panel provides a single location to view the LEDs that provide location information for internal system components that have a detectable failure. The LEDs illuminate solid amber only when a failure occurs and otherwise do not illuminate. The LEDs are visible through the diagnostic panel on the outside of the top cover. The diagnostics panel is oriented similar to the layout of the components in the system. Diagnostic LEDs are provided for each internal serviceable component in the system, including all DIMMs.

Figure 2-6 shows the diagnostic panel label and LEDs.

Figure 2-6 Diagnostic Panel Label and LEDs



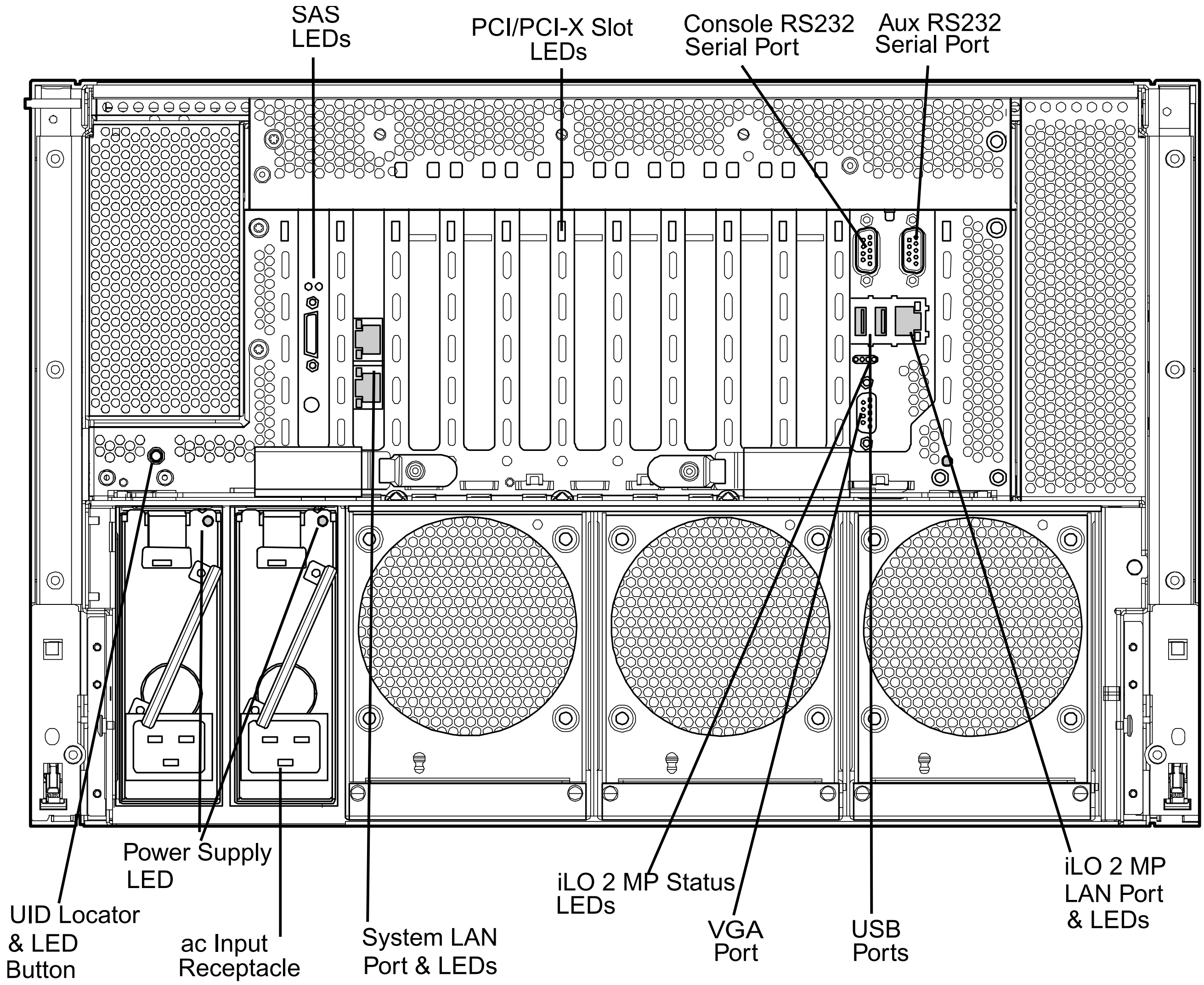
Rear Panel

The server rear panel includes communication ports, I/O ports, ac power connectors, and the locator LED/button. LEDs located on the rear panel of the server signal the operational status of the following components:

- iLO 2 MP
- System LAN
- Power supply
- PCI/PCI-X/PCI-E slots

Figure 2-7 shows the rear panel control, port, and LED locations.

Figure 2-7 Rear Panel Control, Port, and LED Locations

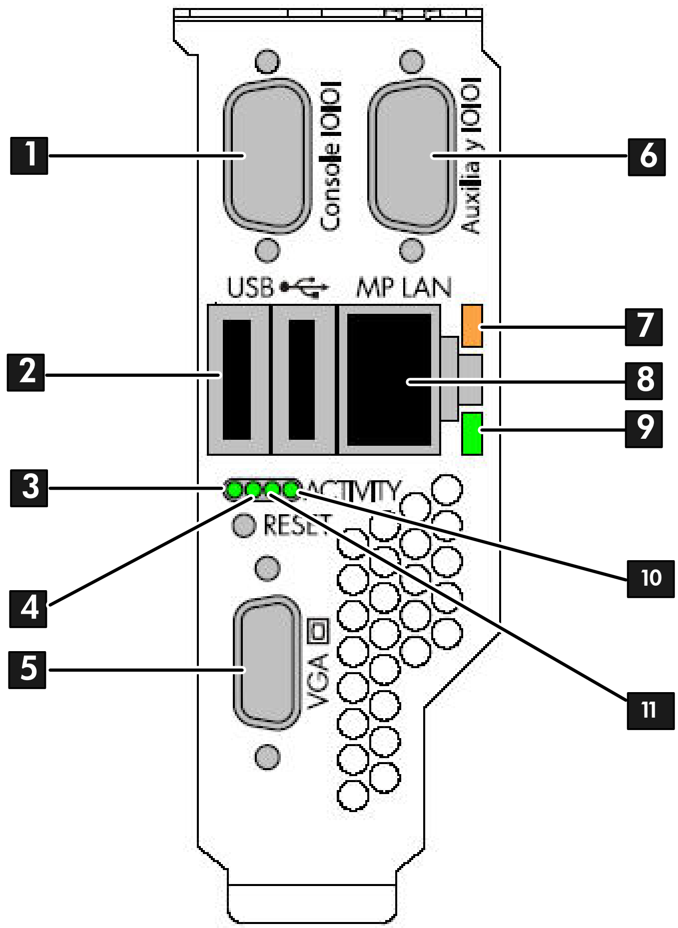


iLO 2 MP

The server contains an iLO 2 MP on the core I/O board that enables local and remote management of the server. The iLO 2 MP can function using standby power and is active when ac power is present and the front panel power switch is off. The iLO 2 MP is also active when ac power is present and the front power switch is on.

Figure 2-8 shows the controls, ports, and LEDs on the core I/O board. The figure is oriented vertically to match the orientation of the core I/O board.

Figure 2-8 Core I/O Board Controls, Ports, and LEDs



1	iLO 2 MP RS-232 Serial Port (DB-9F to DB-9F cable) Connected to emulation terminal device (PC, laptop, or ASCII terminal)	5	VGA Port (No iLO 2 MP access; EFI only)	9	Link and Activity LED
2	USB 2.0 Ports (any USB device)	6	General Use Serial Port (Printers, etc.)	10	Standby Power
3	BMC Heartbeat	7	10 Base-T/100 Base-T Mode LED	11	MP Self Test
4	MP Heartbeat	8	iLO 2 MP LAN Port (10/100 LAN)		

iLO 2 MP Reset Button

The iLO 2 MP reset button enables you to reset the iLO 2 MP, and optionally reset the user-specific values to factory default values. To soft reset the iLO 2 MP, press the button momentarily, then release it. To soft reset the iLO 2 MP and return user-specific values to factory default values, press the button for more than four seconds, then release it. The following values are reset to factory default values:

- Serial terminal baud rate settings
- User names and passwords

Core I/O Board Ports

Table 2-4 lists a description of the core I/O board ports.

Table 2-4 Core I/O Board Ports

Port	Description
10 Base-T/100 Base-T LAN	LAN port dedicated for remote access to the iLO 2 MP
Auxiliary Serial	Local serial port.
Console Serial (iLO 2 MP)	Local serial port that provides a console connection to the server
USB	Two public USB 2.0 ports used primarily to connect to a keyboard and mouse for console input functions (Windows and Linux operating systems only)
VGA (optional)	VGA port used primarily to connect to a monitor that displays console output (Windows and Linux operating systems only)

iLO 2 MP Status LEDs

Table 2-5 and Figure 2-8 show the state of the iLO 2 MP status LEDs during normal operation.

Table 2-5 iLO 2 MP Status LEDs

iLO 2 MP Status LED	LED State
Standby power	Solid green
iLO 2 MP Self test	Off The LED is solid amber when ac power is first applied. It remains solid amber for a few seconds until the iLO 2 MP completes its self test; the LED then turns off.
iLO 2 MP Heartbeat	Flashing green
BMC Heartbeat	Flashing green

iLO 2 MP LAN LEDs

Table 2-6 and Figure 2-8 show the iLO 2 MP LAN link status LEDs and states.

Table 2-6 iLO 2 MP LAN Link Status LEDs

Link Status	LED State
Activity	Blinking green
Link with no activity	Solid green
No link	Off

Table 2-7 and Figure 2-8 show the iLO 2 MP LAN link speed LEDs and states.

Table 2-7 iLO 2 MP LAN Link Speed LEDs

Link Speed	LED State
100 Mb	Solid amber
10 Mb	Off

System LAN

The system LAN functionality is provided by the LAN core I/O card. The ports on the LAN core I/O card are two RJ-45 style 10 Base-T/100 Base-T/1000 Base-T system LAN ports.

Table 2-8 and Figure 2-9 show the system LAN link status LEDs and states.

Table 2-8 System LAN Link Status LEDs

Link Status	LED State
Activity	Blinking green
Link with no activity	Solid green
No link	Off

Figure 2-9 LAN Link and Status LEDs

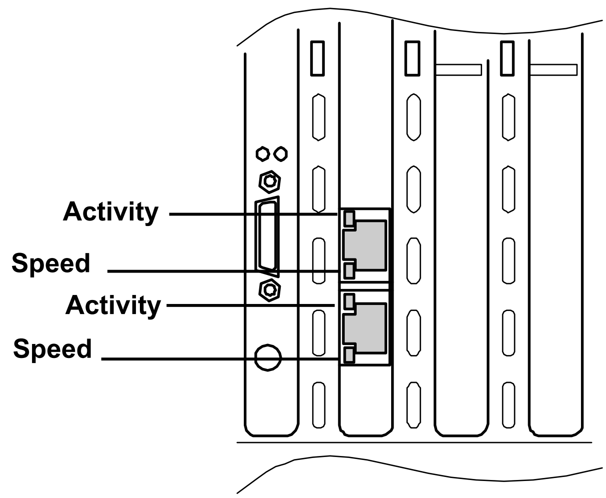


Table 2-9 lists the system LAN link speed LEDs and states.

Table 2-9 System LAN Link Speed LEDs

Link Status	LED State
1000 Mb	Solid orange
100 Mb	Solid green
10 Mb	Off

Power Supply

The server can have one or two power supplies, labeled PS0 and PS1. Each power supply has an ac input receptacle and an LED that shows the power state of the server (Figure 2-7).

The server has three power states: standby power, full power, and off. Plug the power cord into the appropriate receptacle on the rear of the chassis to achieve the standby power state. To bring the server to full power plug the power cord into the appropriate receptacle, and either activate the power using the iLO 2 MP `PC` command, or push the power button. To bring the server to the off state, unplug the power cords.

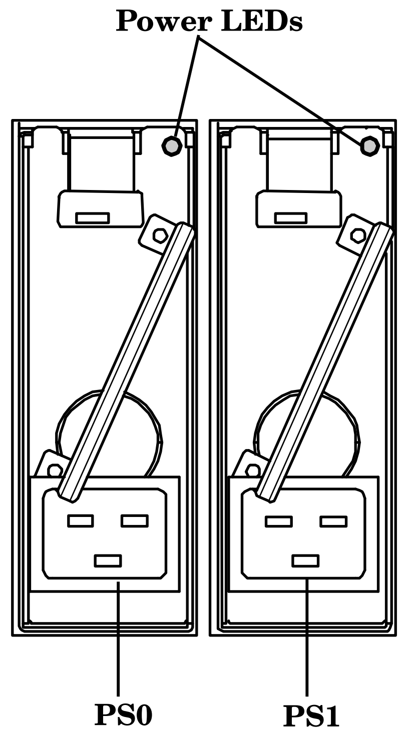
Table 2-10 lists the power supply LED states.

Table 2-10 Power Supply LED

Power Supply Condition	Power Supply LED
No ac power	Off
ac power; standby power on	Blinking green
Full power on; normal operation	Solid green
Power supply failure	Blinking amber

Figure 2-10 shows the power LEDs.

Figure 2-10 Power LEDs



Rear Panel UID LED and Button

The UID button is used to help locate a particular server within a rack of servers (Figure 2-7). You can remotely activate this function using various system utilities.

Table 2-11 lists the rear panel UID LED states.

Table 2-11 Rear Panel UID LED

Name	States
UID LED	• Off: UID button is not activated • Blue: UID button is activated There is an additional UID LED and button located on the front control panel of the server. Both UID LEDs illuminate when you activate either of the front or rear UID buttons

PCI/PCI-X/PCI-E Card Slot

The server has eight public, hot-pluggable PCI/PCI-X/PCI-E slots and two private core I/O slots. Each slot has an attention LED that serves two purposes (Figure 2-7). It indicates a potential problem with the slot that requires immediate attention. Additionally, the LED can function as a locator used to identify a particular PCI/PCI-X/PCI-E slot. You can activate the locator functionality using various software utilities.

CAUTION: Private core I/O slots one and two are not hot-pluggable. Do not remove the cards in these slots without first powering off the server and unplugging the power cords.

3 Powering Off and Powering On the Server

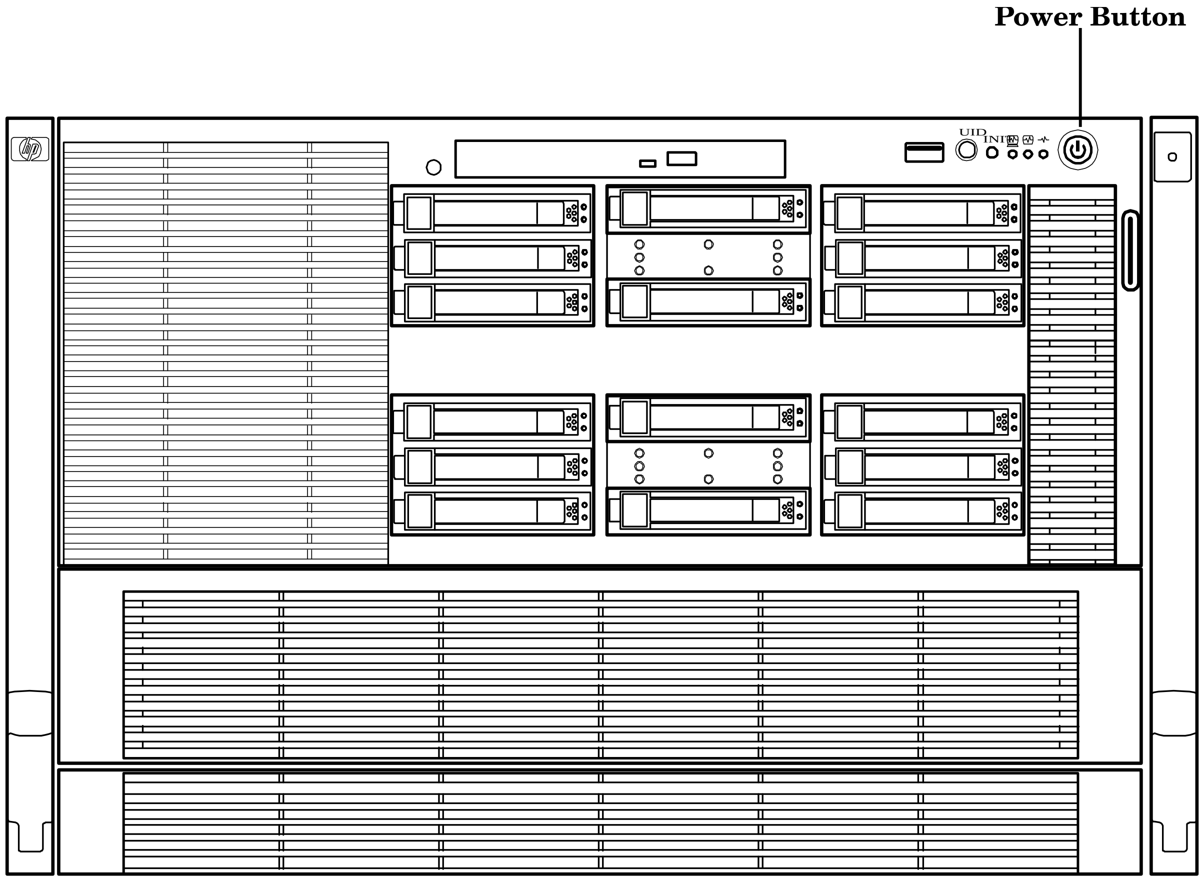
This chapter provides information and procedures for powering off and powering on the server. For more information, see “Booting and Shutting Down the Operating System” (page 177), or the operating system documentation.

This chapter addresses the following topics:

Server Power Button

Figure 3-1 shows the server power button.

Figure 3-1 rx6600 Server



Power States

The server has three power states:

Standby power	Plug the power cord into the appropriate receptacle on the rear of the chassis; the front panel power button is not turned on.
Full power	Full power occurs when you plug the power cord into the appropriate receptacle, and either activate the power using the iLO 2 MP `PC` command, or press the power button.
Off	Unplug the power cords.

Table 3-1 lists the server power states.

Table 3-1 Power States

Power States	Power Cable Plugged into Receptacle	Powered On with the iLO 2 MP `PC` Command, or Front Panel Power Button Pressed	AC Voltage Applied	DC Voltage Applied
Standby power	Yes	No	Yes	No
Full power	Yes	Yes	Yes	Yes
Off	No	No	No	No

NOTE: If the power restore feature is set to **Always On** through the iLO 2 MP `PR` command, the server can automatically power on to the full power state.

Powering Off the Server

Power off the server using the following methods:

- iLO 2 MP `PC` command
- Power button

Powering Off the Server Using the iLO 2 MP

To power off the server using the iLO 2 MP, follow these steps:

1. Gracefully shut down the operating system.
2. Initiate a console session and access the **MP Main Menu**.
3. Enter **`CM`** to enable command mode.
4. Enter **`PC`** to use the remote power control command.
5. Enter **`OFF`** to power off the server, and enter **`YES`** when prompted to confirm the action.

IMPORTANT: The main dc voltage is now removed from the system; however, ac voltage for standby power is still present in the server.

6. Unplug all power cables from the receptacles on the rear panel of the server.

Powering Off the Server Manually

To manually power off the server, follow these steps:

1. Gracefully shut down the operating system.
2. Press the power button to power off the server.

IMPORTANT: The main dc voltage is now removed from the system; however, ac voltage for standby power is still present in the server.

3. Unplug all power cables from the receptacles on the rear panel of the server.

Powering On the Server

Power on the server to full power using the following methods if the server is in the standby power state:

- iLO 2 MP `PC` command
- Power button

Powering On the Server Using the iLO 2 MP

NOTE: If the power restore feature is set to **Always On** through the iLO 2 MP `PR` command, the server can automatically power on to the full power state.

To power on the server using the iLO 2 MP, follow these steps:

1. Plug all power cables into the receptacles on the rear panel of the server.
2. Initiate a console session and access the **MP Main Menu**.
3. Enter **`CM`**to enable command mode.
4. Enter **`PC`** to use the remote power control command.
5. Enter **`ON`** to power on the server, and enter **`YES`** when prompted to confirm the action.
6. Start the operating system.

Powering On the Server Manually

NOTE: If the power restore feature is set to **Always On** through the iLO 2 MP `PR` command, the server can automatically power on to the full power state.

To manually power on the server, follow these steps:

1. Plug all power cables into the receptacles on the rear panel of the server.
2. Press the power button to start the server.
3. Start the operating system.)

4 Removal and Replacement

This chapter describes safety information, required service tools, accessing the server, and the removal and replacement of hardware components for the HP Integrity rx6600 server.

This chapter addresses the following topics:

Required Service Tools

Service of this server requires one or more of the following tools:

- Electrically Conductive Field Service Grounding Kit (P/N 9300-1155)
- Processor install tool (attached to the processor board assembly)
- 1/4 inch flat blade screwdriver
- ACX-15 Torx screwdriver
- ACX-10 Torx screwdriver

Safety Information

Use care to prevent injury and equipment damage when removing and replacing server components. Voltages can be present within the server. Many assemblies are sensitive to damage by electrostatic discharge (ESD).

Follow the safety conventions listed below to ensure safe handling of components, to prevent injury, and to prevent damage to the server:

- When removing or installing any server component, follow the instructions provided in this guide.
- If installing a hot-swappable or hot-pluggable component when power is applied (fans are running), reinstall the server cover immediately to prevent overheating.
- If installing a hot-pluggable component, complete the required software intervention prior to removing the component.
- If installing an assembly that is neither hot-swappable nor hot-pluggable, disconnect the power cable from the external server power receptacle.

WARNING! Ensure that the system is powered off and all power sources are disconnected from the server prior to removing or installing server hardware (unless you are removing or installing a hot-swappable or hot-pluggable component).

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is turned off.

Failure to observe this warning can result in personal injury or damage to equipment.

- Do not wear loose clothing that can snag or catch on the server or on other items.
- Do not wear clothing subject to static charge buildup, such as wool or synthetic materials.
- If installing an internal assembly, wear an antistatic wrist strap and use a grounding mat, such as those included in the Electrically Conductive Field Service Grounding Kit (HP 9300-1155).
- Handle accessory boards and components by the edges only. Do not touch any metal-edge connectors or any electrical components on accessory boards.

HP Integrity rx6600 Component Classification

The server components are classified into three major categories:

- Hot-swappable
- Hot-pluggable
- Cold-swappable

A brief explanation of each category and the classifications for the server components follow.

Hot-Swappable Components

A component is defined as hot-swappable if you can remove it from the chassis while the server remains operational. Hot-swappable components require no software intervention prior to removing the component.

NOTE: Hot-swappable components are marked with red touch points.

The following are hot-swappable components:

- Fan units
- Power supplies
- Disk drive fillers

Hot-Pluggable Components

A component is defined as hot-pluggable if you can remove it from the chassis while the server remains operational. Software intervention is required prior to removing a hot-pluggable component.

NOTE: Hot-pluggable components are marked with red touch points.

The following are hot-pluggable components:

- Disk drives
- PCI/PCI-X/PCI-E cards

Cold-Swappable Components

To remove and replace cold-swappable components, or components that are neither hot-swappable nor hot-pluggable, shut down the operating system, power off the server, and disconnect the ac power cable. For complete instructions on shutting down the operating system and powering off the server, see Appendix B (page 177).

NOTE: Cold-swappable components are marked with blue touch points.

The following are cold-swappable components:

- Front bezel
- DVD drive
- Memory carrier assembly
- Memory DIMMs
- Processor board assembly
- Dual-core processors
- I/O board assembly
- System battery
- I/O voltage regulator module
- Trusted Platform Module
- PCI/PCI-X card divider
- Core I/O board
- Core I/O board battery
- SAS core I/O card
- LAN core I/O card
- Doorbell board
- Display board
- SAS backplane board
- Interconnect board
- Midplane board

Accessing a Rack-Installed Server

The following procedure explains how to gain access to the HP Integrity rx6600 that is installed in an approved rack. For rack installation instructions, review the document titled *Installation Guide, Mid-Weight Slide Kit, 5065-7291*. You can access this document at:

http://h18004.www1.hp.com/products/servers/proliantstorage/bcs-rackandpower/information_library.html

WARNING! Ensure that all antitip features are employed (front and rear antitip feet installed; adequate ballast properly placed, and so on) are employed prior to extending the server from the rack.

Extending the Server from the Rack

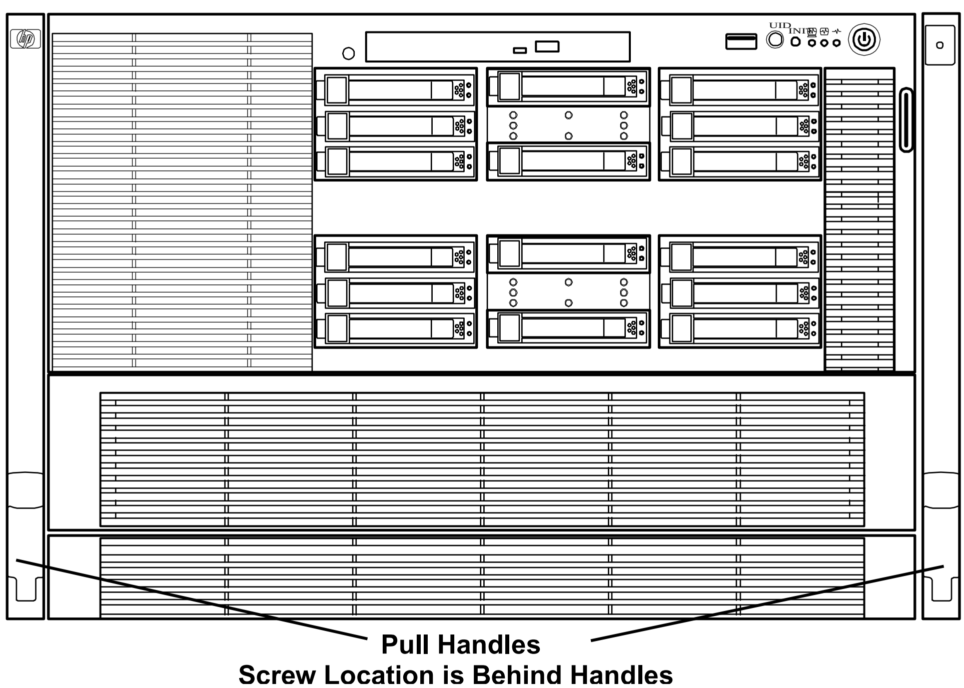
NOTE: Ensure that there is enough area (approximately 1.5 meters [4.5 ft.]) to fully extend the server from the front of the rack.

To extend the server from the rack, follow these steps:

1. Remove the T25 screws with the orange tags that fasten the front of the server to the rack (Figure 4-1).
2. Remove the orange screws from the rear of the rack located on the left and right slide rails.
3. Flip out the two pull handles located on both ends of the front bezel (Figure 4-1).
4. Slowly pull the server forward by the handles until it is fully extended.

NOTE: The server is fully extended when the rail clips are locked in place and the top cover is completely accessible.

Figure 4-1 Rack Screw Location



Inserting the Server into the Rack

To insert the server into the rack, follow these steps:

1. Press the rail clips on both sides of the server inward.
2. Push the server into the rack until it stops.

Accessing a Pedestal-Installed Server

Follow these steps to access the internal components in a pedestal mounted server.

1. Loosen the two thumb screws in the server rear upper right and left corners which hold the top in place.
2. Slide the top back by pulling on the indented finger grips on the top.
3. Once the top has moved about 1/4 inch it can be lifted off.

Figure 4-2 Server in Pedestal Kit

1 Finger Grips
2 Thumb Screws

Removing and Replacing the Top Cover

Use the following procedures to remove and replace the top cover.

NOTE: When the top cover is open or removed, the chassis fan units increase to high speed to assist cooling. When the top cover is replaced at the end of the operation, the chassis fan units return to normal speed.

Removing the Top Cover

To remove the top cover, follow these steps:

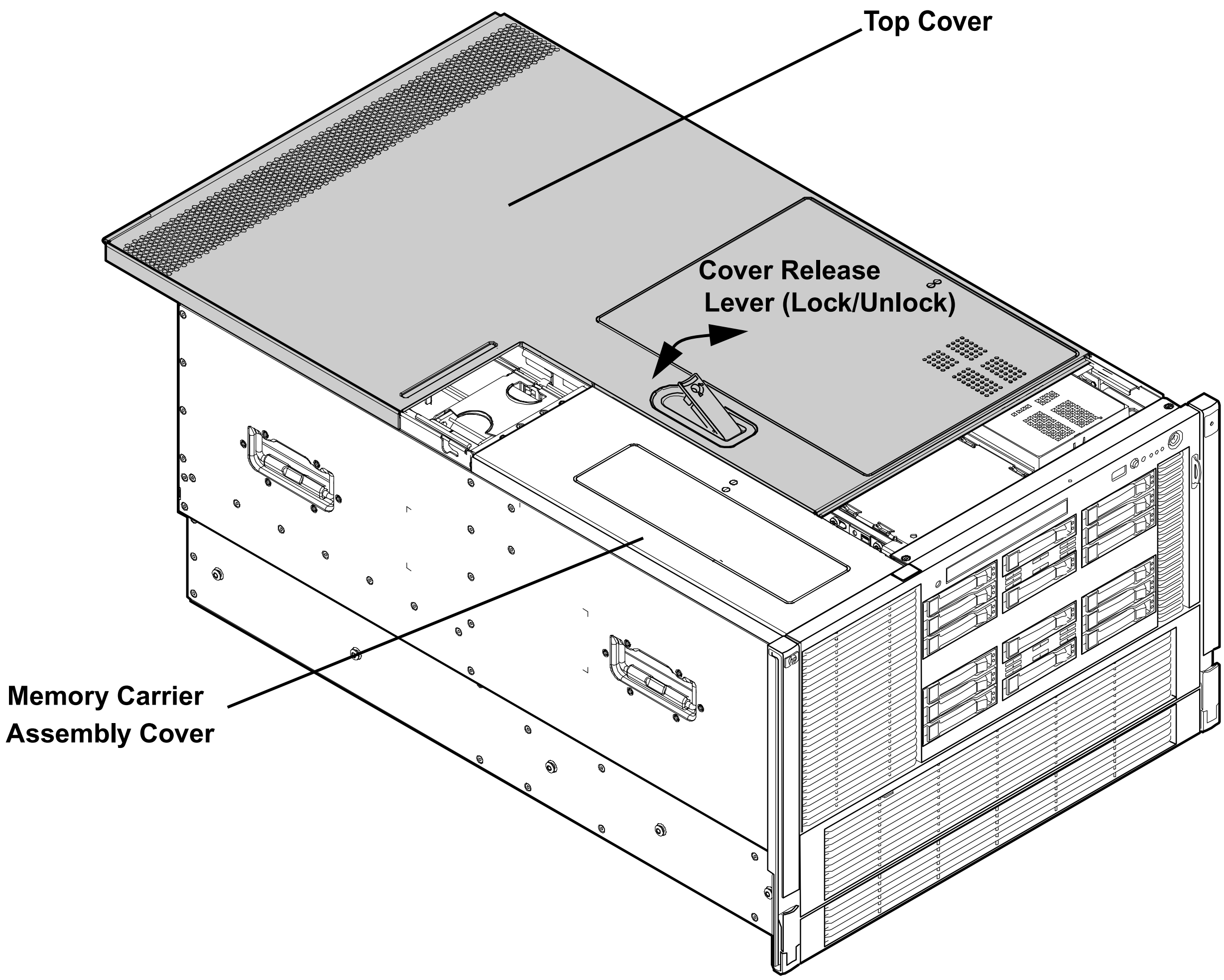
1. If rack installed, fully extend the server out from the rack. See "Extending the Server from the Rack" (page 54).
2. Unlock the cover release lever by turning the cam approximately 90 degrees counterclockwise.
3. Pull up on the cover release lever to disengage the top cover from the chassis (Figure 4-3).

NOTE: The cover release lever also disengages the memory carrier assembly cover for removal.

You can leave the memory carrier assembly cover in place while servicing any components except for the memory carrier assembly and the processor board assembly.

4. Slide the cover toward the rear of the server until the tabs release from the slots in the chassis.
5. Lift the cover off the chassis.

Figure 4-3 Removing and Replacing the Top Cover



Replacing the Top Cover

NOTE: Replace the memory carrier assembly cover before replacing the top cover.

To replace the top cover, follow these steps:

1. Ensure the cover release lever is in the open position (Figure 4-3).
2. Align the tabs of the top cover with the corresponding slots in the chassis and insert the tabs into the slots.
3. Slide the cover forward until it is flush with the front of the chassis.
4. Push the cover release lever down into the latched position (Figure 4-3).
5. Lock the cover release lever by turning the cam approximately 90 degrees clockwise.

Removing and Replacing the Memory Carrier Assembly Cover

Use the following procedures to remove and replace the memory carrier assembly cover.

NOTE: When the memory carrier assembly cover is open or removed, the chassis fan units increase to high speed to assist cooling. When the top cover is replaced at the end of the operation, the chassis fan units return to normal speed.

Removing the Memory Carrier Assembly Cover

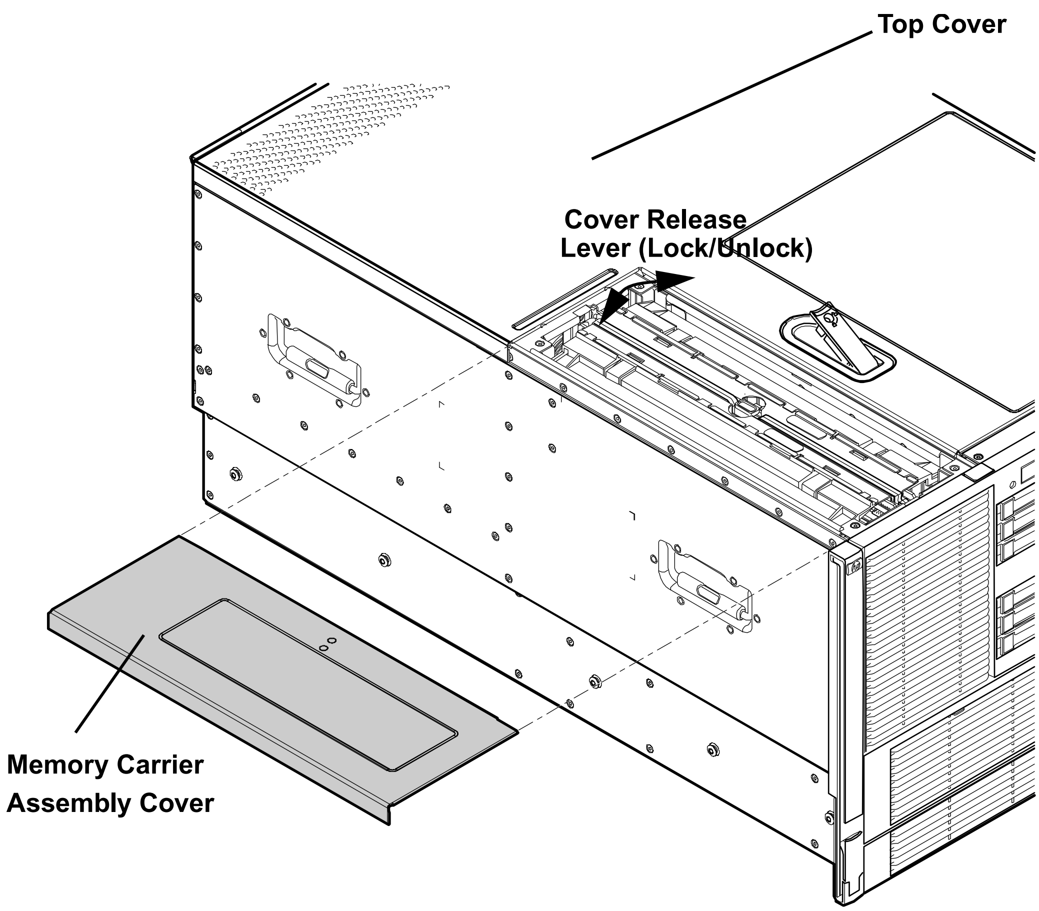
To remove the memory carrier assembly cover, follow these steps:

1. If rack installed, slide the server out from the rack until it stops. See "Extending the Server from the Rack" (page 54).

   NOTE: You do not need to extend the server completely out of the rack to remove the memory carrier assembly cover.

2. Unlock the cover release lever by turning the cam approximately 90 degrees counterclockwise.
3. Pull up on the cover release lever to disengage the top cover and memory carrier assembly cover from the chassis (Figure 4-3).
4. Slide the memory carrier assembly cover toward the left side of the server to free it from the center of the chassis, and lift the cover off of the chassis (Figure 4-4).

Figure 4-4 Removing and Replacing the Memory Carrier Assembly Cover



Replacing the Memory Carrier Assembly Cover

To replace the memory carrier assembly cover, follow these steps:

1. Position the cover onto the opening above the memory carrier assembly.
2. Slide the cover toward the right side of the server until it is flush with the center chassis wall, push firmly.
3. Slide the top cover forward until it is flush with the front of the chassis.
4. Push the cover release lever down into the latched position (Figure 4-3).
5. Lock the cover release lever by turning the cam approximately 90 degrees clockwise.

Removing and Replacing a Hot-Swappable Chassis Fan Unit

There are three interchangeable, hot-swappable chassis fan units in the server. Fan unit 1 is located behind the memory carrier assembly. Fan units 2 and 3 are located in the center of the chassis between the disk drives and the I/O board assembly. There are also three external hot-swappable fans located at the rear of the chassis. You can replace the hot-swappable fans using the procedures in this section when system power is on or off.

CAUTION: Observe all ESD safety precautions before removing or replacing a fan unit. Failure to follow ESD safety precautions can result in damage to the server.

NOTE: A hot-swappable device does not require interaction with the operating system before the device is removed from or installed into the server.

The dc power to the server does not have to be off to remove or replace a hot-swappable chassis fan unit.

Removing an Internal Hot-Swappable Chassis Fan Unit

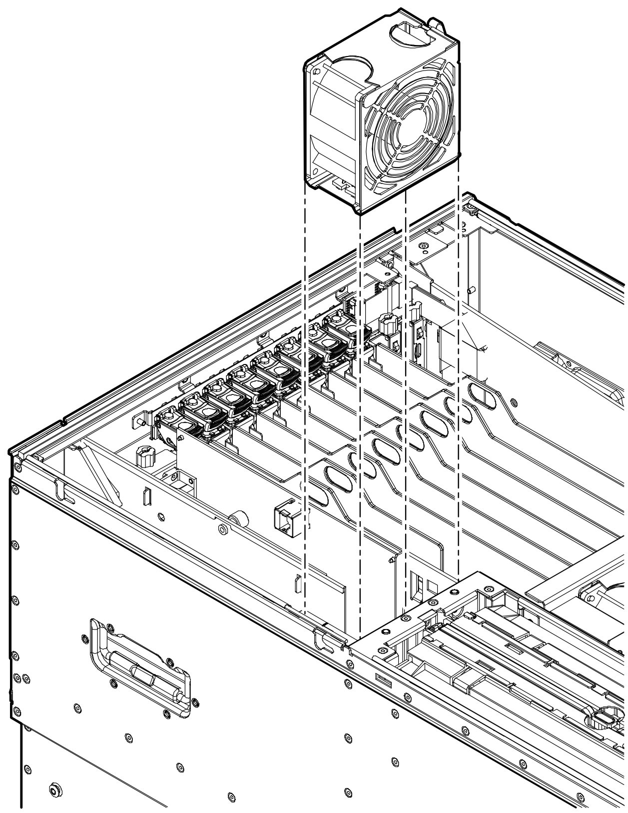
To remove an internal hot-swappable chassis fan unit, follow these steps:

1. If rack installed, slide the server completely out from the rack. See “Extending the Server from the Rack” (page 54).
2. Remove the top cover. See “Removing the Top Cover” (page 55).

3. Insert thumb and forefinger into the openings on the top of the fan and squeeze until the fan releases from the socket.
4. Pull the fan straight up and out of the chassis.

CAUTION: To prevent server components from overheating, replace the fan within 20 seconds. Failure to observe this caution results in the server automatically shutting down to prevent an overtemperature condition.

Figure 4-5 Removing and Replacing Hot-Swap Chassis Fan Units (Internal)



Replacing an Internal Hot-Swappable Chassis Fan Unit

Use the following procedures to remove and replace an internal hot-swappable chassis fan unit.

CAUTION: To prevent server components from overheating, replace the fan within 20 seconds. Failure to observe this caution results in the server automatically shutting down to prevent an overtemperature condition.

NOTE: The fan unit is keyed to fit into the fan housing in the correct orientation only.

To replace an internal hot-swappable chassis fan unit, follow these steps:

1. Push the fan unit firmly into the fan housing until it is flush with the top of the chassis.

   NOTE: It can take up to ten seconds after installation for the new fan LED to turn off.

2. Check the diagnostic LED that corresponds to the replaced fan unit.
   - When the fan is functioning normally, the LED is off.
   - If the fan fails, the LED is lit.
3. Replace the server top cover. See “Replacing the Top Cover” (page 56).

Removing a Rear External Hot-Swappable Chassis Fan Unit

To remove a rear external hot-swappable chassis fan unit, follow these steps:

1. Press down on the fan release button and pull the fan housing unit straight out from the rear of the chassis until it stops (Figure 4-6).
2. Insert thumb and forefinger into the openings on the top of the fan and squeeze until the fan releases from the socket (Figure 4-7).
3. Pull the fan straight up and out of the chassis.

CAUTION: To prevent server components from overheating, replace the fan within 20 seconds. Failure to observe this caution results in the server automatically shutting down to prevent an overtemperature condition.

Figure 4-6 shows the external fan unit release button.

Figure 4-6 Fan Unit Release Button (External)

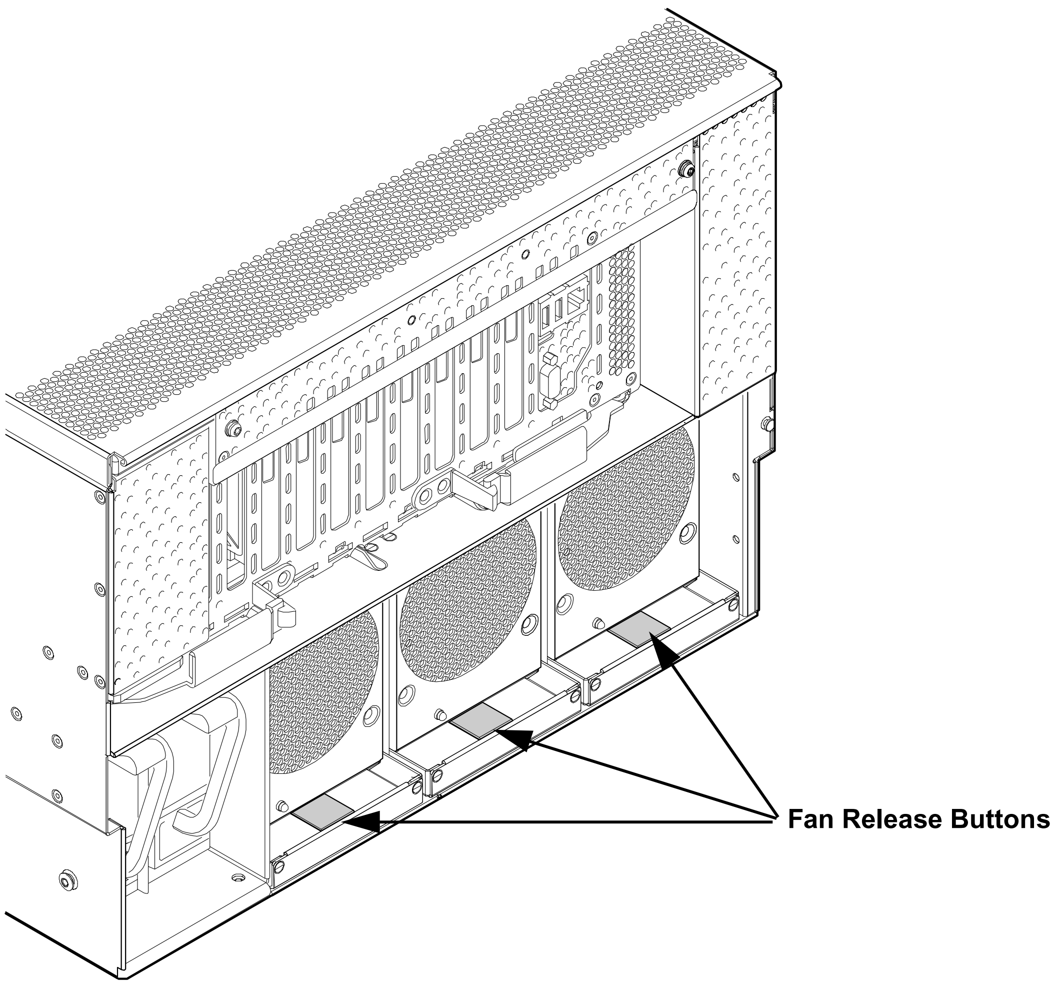
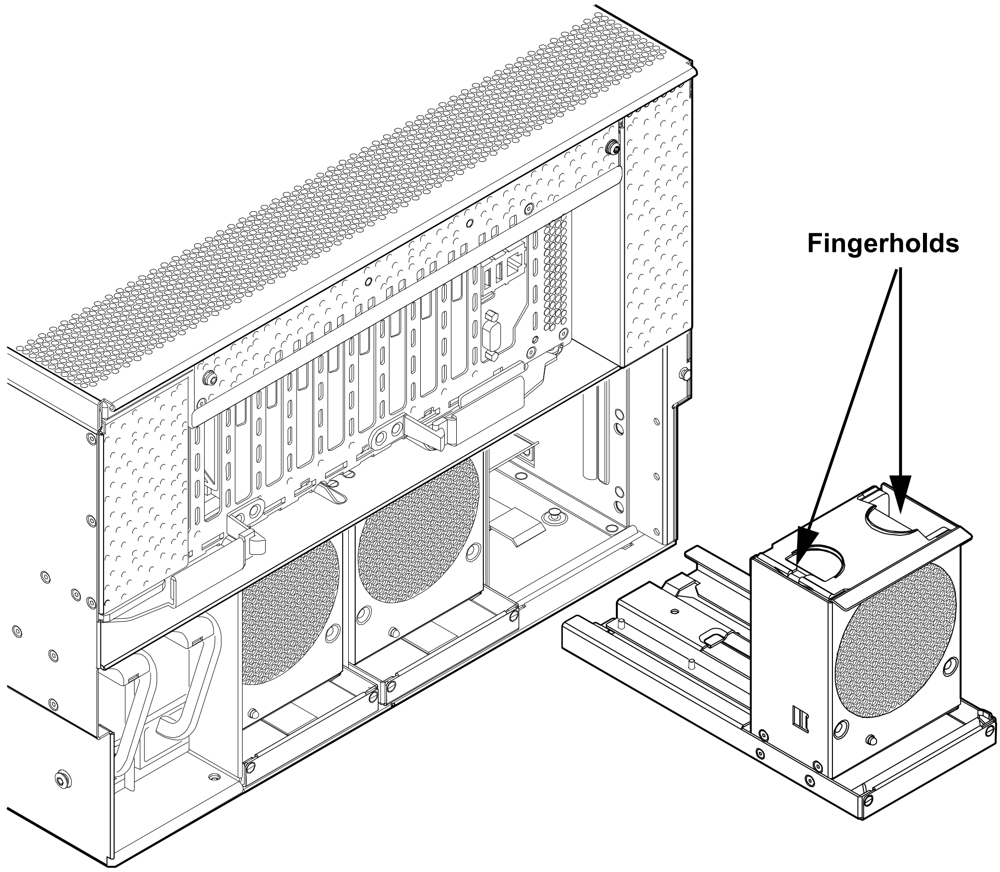


Figure 4-7 shows the fan and fan housing after the housing is pulled out of the chassis.

Figure 4-7 Removing and Replacing a Rear External Fan Unit



Replacing a Rear External Hot-Swappable Chassis Fan Unit

To replace a rear external hot-swappable chassis fan unit, follow these steps:

NOTE: The fan unit is keyed to fit into the fan housing in one orientation only.

1. Push the fan unit firmly into the fan housing until it is flush with the top of the fan housing.

   NOTE: It can take up to ten seconds after installation for the new fan LED to turn off.

2. Push the fan housing unit toward the front of the chassis until it clicks into place.
3. Check the diagnostic LED that corresponds to the replaced fan unit.
   - When the fan is functioning normally, the LED is off
   - When the fan fails, the LED is lit

Removing and Replacing a Hot-Swappable Power Supply

The server can have one or two hot-swappable power supplies. These power supplies are located at the rear of the server. The supported configuration of the server requires a minimum of one power supply. You can install or replace a hot-swappable power supply using the procedures in this section when system power is on or off.

CAUTION: Observe all ESD safety precautions before removing or replacing a power supply. Failure to follow ESD safety precautions can result in damage to the server.

NOTE: A hot-swappable device does not require interaction with the operating system before the device is removed from or installed into the server.

The dc power to the server does not have to be off to install or replace a hot-swappable power supply.

Power Supply Loading Guidelines

The supported configuration of the server requires a minimum of one power supply installed in slot P0 or slot P1. You can install a second, optional hot-swappable power supply to provide 1+1 capability. The left side (viewed from the rear of the chassis) hot-swappable power supply is identified as P0, and the second hot-swappable power supply is identified as P1 (Figure 4-8).

CAUTION: When a second power supply is not used, the empty power supply slot must remain covered with the supplied metal filler panel. Failure to observe this caution can result in damage due to overheating if the server top cover does not remain in place

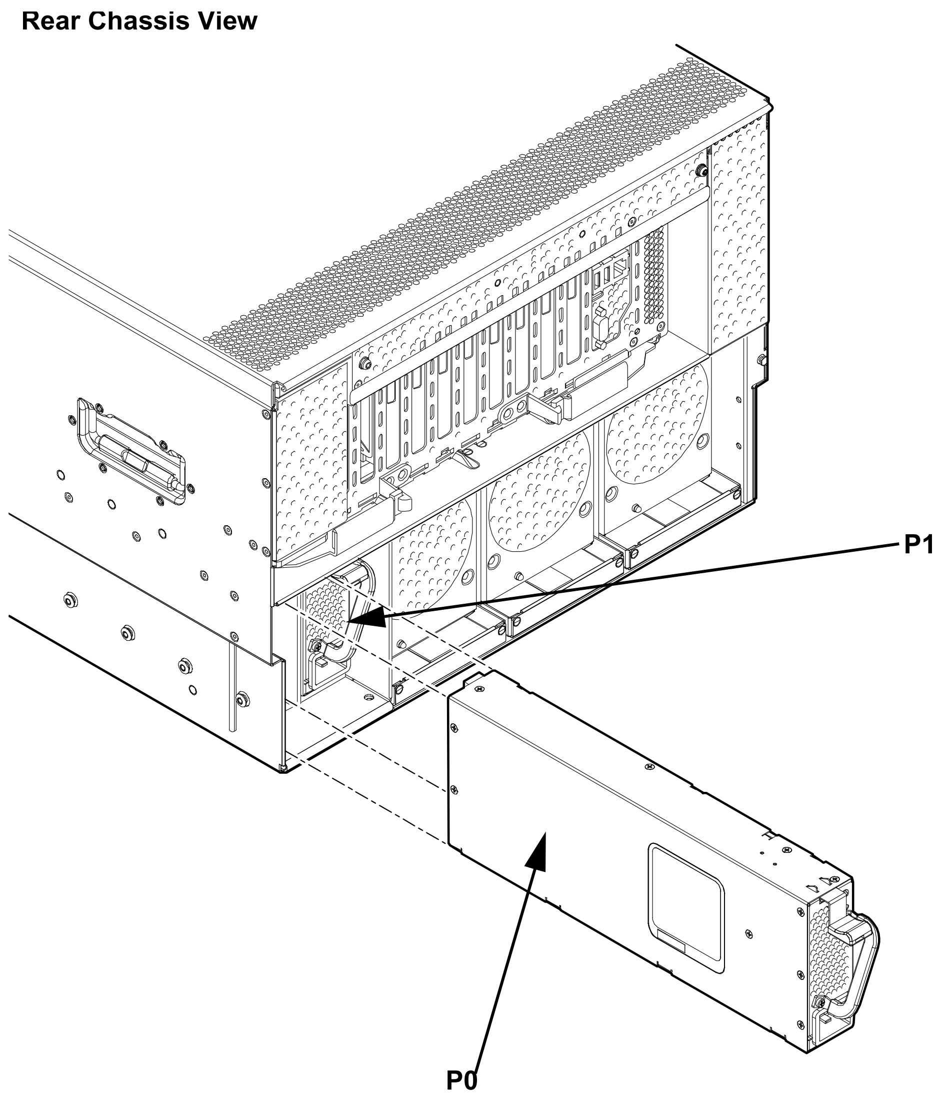
CAUTION: Install the hot-swappable power supply into the server before attaching the new power cord. Failure to observe this caution can result in damage to the server

Removing a Hot-Swappable Power Supply

To remove a hot-swappable power supply, follow these steps:

1. Move the cable management arm from the rack slide nearest the power supplies just enough to allow access to the power supplies.
2. Remove the power cord plug from the power supply receptacle.
3. Grasp the handle and push the locking tab down with your thumb to release the power supply from the socket on the midplane board.
4. Support the power supply with both hands, and pull the power supply out of the server (Figure 4-8).

Figure 4-8 Removing and Replacing a Hot-Swappable Power Supply



Replacing a Hot-Swappable Power Supply

To replace a hot-swappable power supply, follow these steps:

1. Remove the metal filler panel if required.
2. Support the new power supply with both hands, and slide it into the empty slot until it clicks into place (Figure 4-8).

IMPORTANT: Ensure the power supply is flush with the adjacent power supply or metal filler panel.

3. Plug the power cord into the power supply receptacle.

NOTE: The LED immediately turns on when power is applied.

4. Replace the cable management arm.

Removing and Replacing a Hot-Swappable Disk Drive Filler

Disk drive fillers are installed for all slots that do not contain a disk drive.

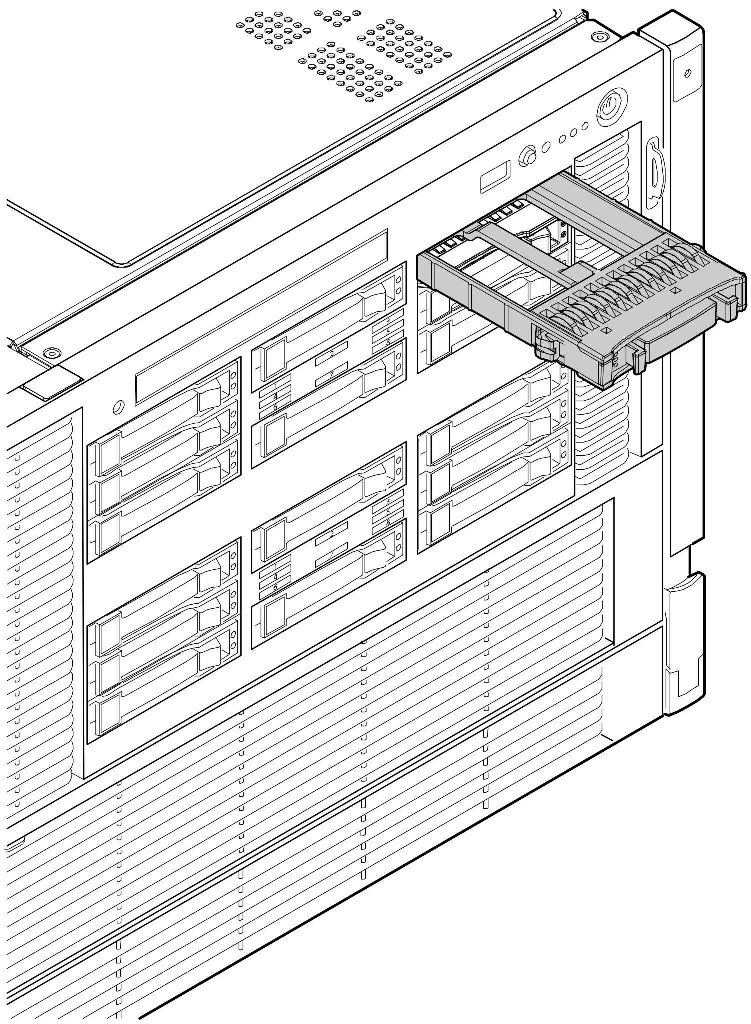
IMPORTANT: For cooling purposes, always leave disk drive fillers in slots that do not contain a disk drive.

Removing a Hot-Swappable Disk Drive Filler

To remove a hot-swappable disk drive filler, follow these steps:

1. Squeeze the tabs on the front of the filler to release it from the slot in the drive bay.
2. Pull gently until the filler slides out of the chassis.

Figure 4-9 Removing and Replacing a Hot-Swappable Disk Drive Filler



Front Chassis View

Replacing a Hot-Swappable Disk Drive Filler

To replace a hot-swappable disk drive filler, follow these steps:

1. Orient the disk drive filler so that the release tab is on the left side of the filler, and the airflow holes are on the right side of the filler.
2. Insert the filler into the slot guides, and slide the filler into the slot until it clicks into place and is fully seated.

Removing and Replacing a Hot-Pluggable Disk Drive

There are 16 hot-pluggable disk drives located in the front of the server. You can replace the hot-pluggable disk drives using the procedures in this section when server power is on or off.

CAUTION: A hot-pluggable device may require interaction with the operating system before you can safely remove it from or install it into the server. Verify that the operating system supports removing and replacing disk drives while the operating system is running. If the operating system does not support this feature, shut down the operating system before removing or installing a hot-swappable disk drive. Failure to observe this caution can result in system failure.

NOTE: The replacement disk drive must have the same product number as the disk drive that you replace.

Removing a Hot-Pluggable Disk Drive

To remove a hot-pluggable disk drive, follow these steps:

1. Push the release tab away from the drive extraction handle and pull the extraction handle outward.
2. Pull gently until the hot-pluggable disk drive slides out of the chassis.

NOTE: For cooling purposes, always leave disk drive fillers in slots that do not contain a disk drive.

Figure 4-10 Removing and Replacing a Hot-Pluggable Disk Drive

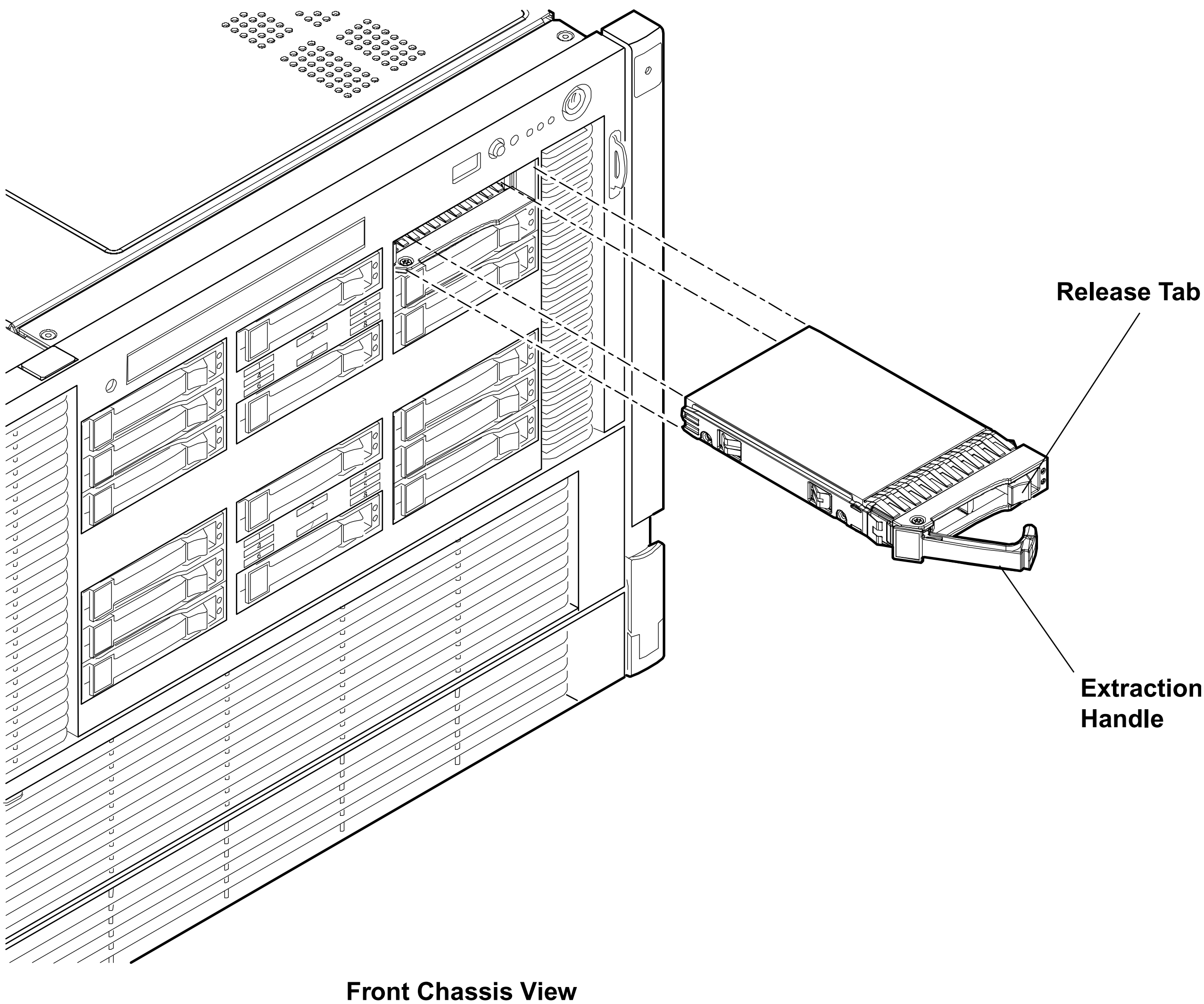
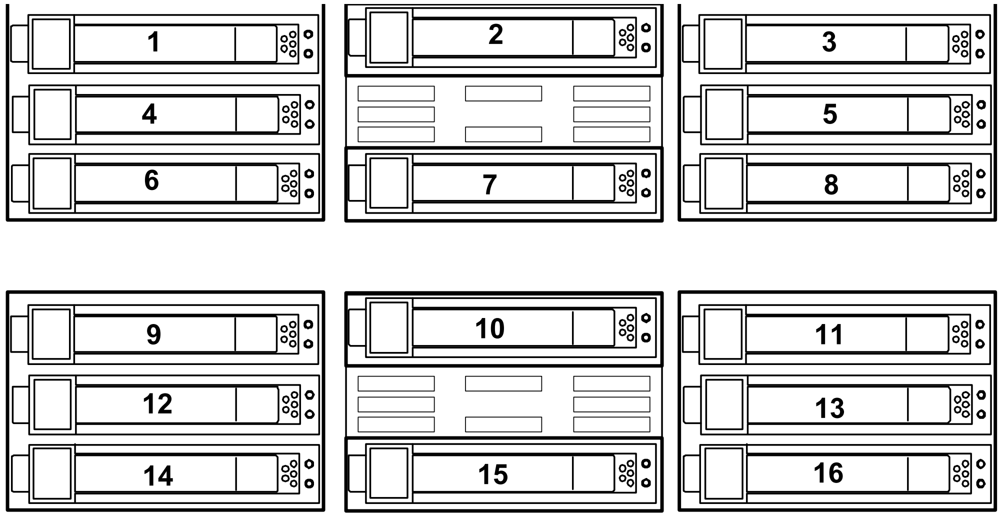


Figure 4-11 Disk Drive Slot IDs



Disk Drive Load Order

Disk drives are loaded in the following order:

1st drive load in Bay 8

2nd drive load in Bay 7

3rd drive load in bay 6

4th drive load in bay 5

5th drive load in Bay 4

6th drive load in Bay 3

7th drive load in bay 2

8th drive load in bay 1

9th drive load in Bay 16

10th drive load in Bay 15

11th drive load in bay 14

12th drive load in bay 13

13th drive load in Bay 12

14th drive load in Bay 11

15th drive load in bay 10

16th drive load in bay 9

Replacing a Hot-Pluggable Disk Drive

To install a hot-pluggable disk drive, follow these steps:

1. Use Figure 4-11 to determine the next available disk drive installation slot.

NOTE: Drives are loaded in order, starting with number 1, working from left to right and top to bottom.

2. Remove the disk drive filler if required. See "Removing and Replacing a Hot-Swappable Disk Drive Filler" (page 63).

NOTE: Save the disk drive filler for future use. For cooling purposes, always place disk drive fillers in slots that do not contain a disk drive.

3. Insert the hot-pluggable disk drive into the slot guides, and slide the drive into the slot until it seats into the socket on the disk backplane.
4. Close the extraction handle by pushing it inward until it clicks into place.
5. Observe the following disk drive LEDs to ensure the drive is functional. For more information, see "Hot-Pluggable Disk Drive LEDs" (page 37).
   - Drive status LED
   - Drive activity LED

Removing and Replacing a Hot-Pluggable PCI/PCI-X/PCI-E Card

PCI/PCI-X/PCI-E cards are located on the I/O board assembly. Two of these cards are dedicated to core I/O functions and require that the server be powered off for card replacement. Core I/O cards have designated slots on the I/O board assembly. The remaining eight PCI/PCI-X/PCI-E cards are hot-pluggable. Software intervention is required prior to removing a PCI/PCI-X/PCI-E card. This section describes the following hot-plug operations and PCI/PCI-X/PCI-E card replacement procedures:

- "PCI/PCI-X/PCI-E Configurations"

  Describes PCI/PCI-X/PCI-E capabilities and relates card functions and capabilities to specific slots.

- "Online Addition (OLA)"

  Describes the installation of new PCI/PCI-X/PCI-E expansion cards in previously empty slots without powering down the server.

- "Online Replacement (OLR)"

  Describes the replacement of a PCI/PCI-X/PCI-E card without powering down the server. This action requires suspending the associated driver. The existing driver for the old card must be compatible with the new card.

CAUTION: If you are performing OLR on HP-UX 11i version 1 (and later), the card you install must be exactly the same as the card you replace. This is also known as like-for-like replacement.

- "Removing a PCI/PCI-X/PCI-E Card Offline"

  Describes the removal of a PCI/PCI-X/PCI-E card after powering down the server.

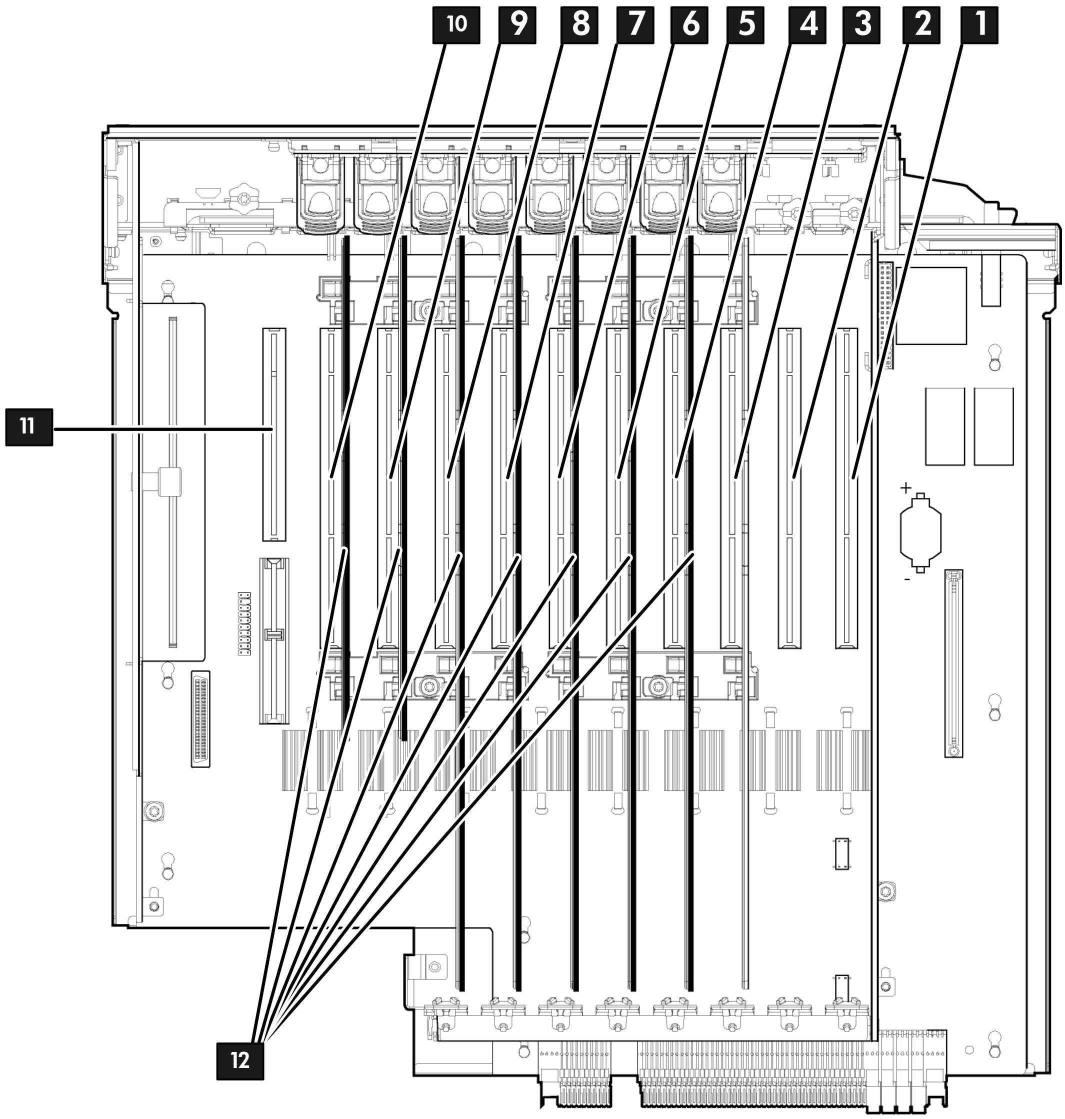
- "Installing a PCI/PCI-X/PCI-E Card Offline"

  Describes the installation of a PCI/PCI-X/PCI-E card after powering down the server.

Figure 4-12 shows the PCI/PCI-X/PCI-E slot identification and card divider locations.

NOTE: Slots one through eight are full-length; slots nine and ten are short-length.

Figure 4-12 PCI/PCI-X/PCI-E Slot Identification and Card Divider Locations



1	Slot 1	5	Slot 5	9	Slot 9
2	Slot 2	6	Slot 6	10	Slot 10
3	Slot 3	7	Slot 7	11	Core I/O Board Slot
4	Slot 4	8	Slot 8	12	PCI/PCI-X/PCI-E Card Dividers

PCI/PCI-X/PCI-E Configurations

PCI/PCI-X/PCI-E slots are numbered from one through ten in the server (Figure 4-12).

The following describes configuration requirements for slots 1 through 10 on the PCI/PCI-X/ I/O backplane:

- PCI-X slots 1 and 2 are reserved for use by the core I/O cards SAS core I/O cards and the Gigabit Ethernet LAN core I/O card. Slots 1 and 2 are not hot-pluggable. Install only supported PCI-X SAS and LAN core I/O cards in slots 1 and 2. PCI-E SAS core I/O is installed in slots 3 and 4 on the PCI/PCI-X/PCI-E IOBP. Depending upon the number and type of SAS core I/O cards installed on the system, the Gigabit Ethernet LAN core I/O card may be installed in slot 10.

- Slots 3 and 4 are nonshared slots. The maximum speed for cards in slots 3 and 4 is PCI-X 266 MHz.
- Slots 5 and 6 are nonshared slots. The maximum speed for cards in slots 5 and 6 is PCI-X 133 MHz.
- Slots 7, 8, 9, and 10 are shared slots. These four slots are limited by bus-mode or frequency-related incompatibilities. If you use different modes, such as PCI instead of PCI-X, or different card speeds in a shared bus environment, the slot automatically downgrades to the lesser mode or speed. The maximum capability of each slot is PCI-X 66 MHz.

NOTE: Shared slots have card compatibility restrictions. If one of the shared slots is occupied, the card added to the second slot is limited by the configuration of the occupied slot. If the new card has a slower capability than the current bus configuration, it fails. If the new card has a faster capability than the current bus configuration, it only runs at the slower bus mode and frequency of the current bus configuration.

The following are common configuration scenarios for cards that use shared slots. These examples also apply to slots nine and ten because they are shared (both use a common bus).

1. If there is a PCI-X 66 MHz card in slot 7, and you hot-plug a PCI 33 MHz card into slot 8, the operation fails. The new PCI 33 MHz card does not initialize and the slot powers down because you cannot change bus speed during hot-plug operations. The new card has a slower bus speed than the current card.

   NOTE: If the server is rebooted in this configuration, both cards initialize to run at PCI 33 MHz. The system firmware can only change the bus capability down to the lowest common value.

2. If there is a PCI 33 MHz card in slot 7, and you hot-plug insert a PCI-X 66 MHz card into slot 8, the new card works but it runs at PCI 33 MHz.
3. If the server is powered off, and you insert a PCI 33 MHz card into slot 7 (that shares a common bus with a PCI-X 66 MHz card in slot 8), then both cards run at PCI 33 MHz when the server powers up.

The following describes configuration requirements for slots one through ten on the PCI/PCI-X/PCI-E I/O backplane:

- PCI-X slots 1 and 2 are reserved for use by the core I/O cards PCI-X SAS core I/O cards and the Gigabit Ethernet LAN core I/O card. Slots 1 and 2 are not hot-pluggable. Install only supported PCI-X SAS and LAN core I/O cards in slots 1 and 2. PCI-E slots 3 and 4 are used for the PCI-E SAS Core I/O cards, but are public slots. If the PCI-E core I/O is not installed, these slots are available for other PCI-E I/O cards.
- Slots 3 and 4 are swtiched PCI-E x8
- Slots 5 and 6 are nonswitched PCI-E x8.
- Slots 7 and 8 are nonshared slots. The maximum speed for cards in slots 7 and 8 is PCI-X 133 MHz.
- Slots 9 and 10 are shared slots. These two slots are limited by bus mode or frequency-related incompatibilities.

IMPORTANT: Slots 9 and 10 on the PCI/PCI-X/PCI-E I/O backplane have the same configuration limitations as slots 9 and 10 on the PCI/PCI-X I/O backplane.

Table 4-1 lists the PCI/PCI-X card slot frequency and bus mode compatibility for shared slots.

Table 4-1 PCI/PCI-X Card Slot Frequency/Bus Mode Compatibility for Shared Slots[1]

Current PCI Bus Mode and Frequency for the Current Card in a Shared Slot	Cards to be installed				
	PCI 33	**PCI 66**	**PCI-X 66**	**PCI-X 133**	**PCI-X 266**
PCI 33 MHz	Compatible[2]	Compatible[2]New card running at PCI 33 MHz	Compatible[2]New card running at PCI 33 MHz	Compatible[2]New card running at PCI 33 MHz	Compatible[2]New card running at PCI 33 MHz
PCI 66 MHz	Incompatible-frequency[3]	Compatible[2]New card running at PCI 66 MHz	Compatible[2]New card running at PCI 66 MHz	Compatible[2]New card running at PCI 66 MHz	Compatible[2]New card running at PCI 66 MHz
PCI-X 66 MHz	Incompatible-frequency[3]	Incompatible-bus[4]	Compatible[2]New card running at PCI-X 66 MHz	Compatible[2]New card running at PCI-X 66 MHz	Compatible[2]New card running at PCI-X 66 MHz

1 The conditions described in this table apply only to shared slots (slots 7, 8, 9, and 10). Slots 1, 2, 3, 4, 5, and 6 are not shared slots.
2 Card is accepted and runs at frequency shown.
3 The new card does not initialize and powers down due to frequency mismatch.
4 The new card does not initialize and powers down due to bus mode mismatch.

PCI/PCI-X/PCI-E Card Path Logging

Some PCI/PCI-X/PCI-E failures result in I/O path logging. These paths help to indicate the source of the error and can be included in the error message or logged into console or event logs.

Table 4-2 describes the PCI/PCI-X I/O paths for the server. Table 4-3 (page 72) describes the PCI/PCI-X/PCI-E I/O paths for the server.

Table 4-2 PCI/PCI-X I/O Paths

Slot	Function with Path	Location (as viewed from rear of chassis)	HP-UX Device Path	EFI Device Path
Slot 1	SAS core I/O card	Left-most slot (private; nearest to power supply)	0/4/1/*	Acpi(HWP0002,400)/Pci(1◎*)
Slot 2	Dual port Gigabit LAN (Core I/O LAN)	2nd from left (private)	0/4/2/*	Acpi(HWP0002,400)/Pci(2◎*)
Slot 3	I/O with 266 MHz/ 64 bit PCI-X card	3rd from left (public)	0/7/1/*	Acpi(HWP0002,700)/Pci(1◎*)
Slot 4	I/O with 266 MHz/ 64 bit PCI-X card	4th from left (public)	0/3/1/*	Acpi(HWP0002,300)/Pci(1◎*)
Slot 5	I/O with 133 MHz/ 64 bit PCI-X card	5th from left (public)	0/6/1/*	Acpi(HWP0002,600)/Pci(1◎*)
Slot 6	I/O with 133 MHz/ 64 bit PCI-X card	6th from left (public)	0/2/1/*	Acpi(HWP0002,200)/Pci(1◎*)
Slot 7	I/O with 66 MHz/ 64 bit PCI-X card (shared with slot 8)	7th from left (public)	0/5/1/*	Acpi(HWP0002,500)/Pci(1◎*)
Slot 8	I/O with 66 MHz/ 64 bit PCI-X card (shared with slot 7)	8th from left (public)	0/5/2/*	Acpi(HWP0002,500)/Pci(2◎*)

Table 4-2 PCI/PCI-X I/O Paths *(continued)*

Slot	Function with Path	Location (as viewed from rear of chassis)	HP-UX Device Path	EFI Device Path
Slot 9	I/O with 66 MHz/ 64 bit PCI-X card (shared with slot 10)	9th from left (public)	0/1/1/*	Acpi(HWP0002,100)/Pci(1◎*)
Slot 10	I/O with 66 MHz/ 64 bit PCI-X card (shared with slot 9)	10th from left (public; nearest to core I/O board)	0/1/2/*	Acpi(HWP0002,100)/Pci(2◎*)
Core I/O board	Core I/O iLO 2 MP	Right-most special slot (private)	0/0/1/*	Acpi(HWP0002,0)/Pci(1◎*)
	Core I/O USB	Right-most special slot (private)	0/0/2/*	Acpi(HWP0002,0)/Pci(2◎*)
	Core I/O VGA (optional)	Right-most special slot (private)	0/0/4/*	Acpi(HWP0002,0)/Pci(4◎*)

Table 4-3 PCI/PCI-X/PCI-E I/O Paths

<table>
<tr><th>Slot</th><th>Function Associated with Path</th><th>Location as viewed from rear of chassis</th><th>HP-UX Device Path</th><th>EFI Device Path</th></tr>
<tr><td>Slot 1</td><td>SAS core I/O card</td><td>Left-most slot (nearest to power supply)</td><td>0/4/1/*</td><td>Acpi(HWP0002,PNP0A03,400)/Pci(1|*)</td></tr>
<tr><td>Slot 2</td><td>Dual port Gigabit LAN (Core I/O LAN)</td><td>2nd from left</td><td>0/4/2/*</td><td>Acpi(HWP0002,PNP0A03,400)/Pci(2|*)</td></tr>
<tr><td>Slot 3</td><td>I/O PCI-E x8 (switched with slot 4)
Optional SAS core I/O card</td><td>3rd from left</td><td>0/6/0/0/0/0/1/0/0/*</td><td>Acpi(HPQ0002,PNP0A08,600)/Pci(0|0)/Pci(0|0)/Pci(1|0)/Pci(0|*)</td></tr>
<tr><td>Slot 4</td><td>I/O PCI-E x8 (switched with slot 3)
Optional SAS core I/O card</td><td>4th from left</td><td>0/6/0/0/0/0/0/0/0/*</td><td>Acpi(HPQ0002,PNP0A08,600)/Pci(0|0)/Pci(0|0)/Pci(0|0)/Pci(0|*)</td></tr>
<tr><td>Slot 5</td><td>I/O PCI-E x8</td><td>5th from left</td><td>0/7/0/0/0/*</td><td>Acpi(HPQ0002,PNP0A08,700)/Pci(0|0)/Pci(0|*)</td></tr>
<tr><td>Slot 6</td><td>I/O PCI-E x8</td><td>6th from left</td><td>0/3/0/0/0/*</td><td>Acpi(HPQ0002,PNP0A08,300)/Pci(0|0)/Pci(0|*)</td></tr>
<tr><td>Slot 7</td><td>I/O 133 MHz 64-bit PCI-X card</td><td>7th from left</td><td>0/2/1/*</td><td>Acpi(HWP0002,PNP0A03,200)/Pci(1|*)</td></tr>
<tr><td>Slot 8</td><td>I/O 133 MHz 64-bit PCI-X card</td><td>8th from left</td><td>0/5/1/*</td><td>Acpi(HWP0002,PNP0A03,500)/Pci(1|*)</td></tr>
<tr><td>Slot 9</td><td>I/O with 66 MHz 64-bit PCI-X card (shared with slot 10)</td><td>9th from left</td><td>0/1/1/*</td><td>Acpi(HWP0002,PNP0A03,100)/Pci(1|*)</td></tr>
<tr><td>Slot 10</td><td>I/O with 66 MHz 64-bit PCI-X card (shared with slot 9)</td><td>10th from left (nearest to core I/O board)</td><td>0/1/2/*</td><td>Acpi(HWP0002,PNP0A03,100)/Pci(2|*)</td></tr>
</table>

Table 4-3 PCI/PCI-X/PCI-E I/O Paths *(continued)*

Slot	Function Associated with Path	Location as viewed from rear of chassis	HP-UX Device Path	EFI Device Path
Core I/O board	Core I/O iLO 2 MP	Right most special slot	0/0/1/*	Acpi(HWP0002,PNP0A03,0)/Pci(1|*)
Core I/O board	Core I/O USB	Right most special slot	0/0/2/*	Acpi(HWP0002,PNP0A03,0)/Pci(2|*)
Core I/O board	Core I/O VGA (optional)	Right most special slot	0/0/4/*	Acpi(HWP0002,PNP0A03,0)/Pci(4|*)

Online Addition (OLA)

IMPORTANT: Before installing a PCI/PCI-X/PCI-E card, ensure you install the proper drivers.

To add a PCI/PCI-X/PCI-E card into an empty slot, follow these steps:

1. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
2. Remove the top cover from the chassis. See "Removing the Top Cover" (page 55).
3. Select an empty slot that is appropriate for the card you are installing. See "PCI/PCI-X/PCI-E Configurations" (page 69) for more information.

CAUTION: Do not accidentally push the manual retention latch (MRL) of a powered-on, occupied slot; this automatically cuts off the power for that slot.

4. Open the MRL.
   a. Press the indentation on the MRL to release it from the chassis wall.
   b. Lift the edge of the MRL, and rotate it upward 90 degrees until it rests against the chassis wall and the PCI/PCI-X card bulkhead filler is fully exposed.
5. Remove the PCI/PCI-X/PCI-E bulkhead filler.

CAUTION: When inserting the PCI/PCI-X/PCI-E card, be careful that you do not accidentally touch an attention button on the other PCI/PCI-X/PCI-E MRLs; this shuts down another PCI/PCI-X/PCI-E card/slot. If you do this, push the attention button again within five seconds to cancel the shutdown.

Also, ensure that you fully seat the card into the slot or the card can fail after power is reapplied to the slot.

6. Insert the PCI/PCI-X/PCI-E card into the empty slot, and use firm, even pressure to seat the card in the slot.
7. Connect all internal and external cables to the PCI/PCI-X/PCI-E card.
8. Close the MRL.
   a. Rotate the MRL downward 90 degrees.
   b. Push the edge of the MRL down until it clicks into place on the PCI/PCI-X/PCI-E card bulkhead.
9. Close the gate latch to secure the end of the card if it is full-length.

10. Activate the PCI/PCI-X/PCI-E card and slot.
    a. Press the red attention button located on the MRL of the appropriate slot. The power LED starts to blink.
    b. Wait until the power LED goes from blinking to steady on.

NOTE: After pushing the attention button, you have five seconds to cancel the operation by pushing the attention button again. After five seconds, pressing the attention button initiates slot powerdown.

11. Replace the top cover. See “Replacing the Top Cover” (page 56).

Online Replacement (OLR)

CAUTION: For HP-UX 11i version 1 (and later), you can only replace an existing card with a like card.

To remove and replace a PCI/PCI-X/PCI-E card into a populated slot, follow these steps:

1. If rack installed, slide the server completely out from the rack. See “Extending the Server from the Rack” (page 54).
2. Remove the top cover from the chassis. See “Removing the Top Cover” (page 55).
3. Deactivate the PCI/PCI-X/PCI-E card and slot.
    a. Press the red attention button located on the MRL of the appropriate slot, and the power LED starts to blink.
    b. Wait until the power LED goes from blinking to steady off.

NOTE: After pushing the attention button, you have five seconds to cancel the operation by pushing the attention button again.

4. Pull the gate latch toward the front of the chassis to completely unlock the PCI/PCI-X/PCI-E card.
5. Open the MRL.
    a. Press the indentation on the MRL to release it from the chassis wall.
    b. Lift the edge of the MRL, and rotate it upward 90 degrees until it rests against the chassis wall and the PCI/PCI-X/PCI-E card bulkhead is fully exposed.
6. Disconnect all external and internal cables attached to the PCI/PCI-X/PCI-E card.
7. Grasp the PCI/PCI-X/PCI-E card divider by the handle, and pull upward to eject the PCI/PCI-X/PCI-E card from the slot.
8. Grasp the PCI/PCI-X/PCI-E card by the edges and lift it out of the chassis.

CAUTION: When inserting the PCI/PCI-X/PCI-E card, be careful that you do not accidentally touch an attention button on the other MRLs; this shuts down that PCI/PCI-X/PCI-E card slot. If you do this, push the attention button again within five seconds to cancel the shutdown.

Also, ensure that you fully seat the card into the slot or the card can fail after power is reapplied to the slot.

9. Insert the PCI/PCI-X/PCI-E card into the empty slot, and use firm, even pressure to seat the card in the slot.
10. Reconnect all internal and external cables to the PCI/PCI-X/PCI-E card.

11. Close the MRL.
    a. Rotate the MRL downward 90 degrees.
    b. Push the edge of the MRL down until it clicks into place on the PCI/PCI-X/PCI-E card bulkhead.
12. Close the gate latch to secure the end of the card if it is full-length.
13. Activate the PCI/PCI-X/PCI-E card and slot.
    a. Press the red attention button located on the MRL of the appropriate slot, and the power LED starts to blink.
    b. Wait until the power LED goes from blinking to steady on.

NOTE: After pushing the attention button, you have five seconds to cancel the operation by pushing the attention button again. After five seconds, pressing the attention button initiates slot powerdown for online replacement (OLR) of the card.

14. Replace the top cover. See "Replacing the Top Cover" (page 56).

Removing a PCI/PCI-X/PCI-E Card Offline

Observe the following warning and cautions before performing an offline removal of a PCI/PCI-X/PCI-E card.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before removing a PCI/PCI-X/PCI-E card offline. Failure to follow ESD safety precautions can result in damage to the server.

CAUTION: Record the slot location of all PCI cards as they are removed. Depending on the operating system, replacing the PCI cards in a different location may require system reconfiguration and may cause boot failure.

To remove a PCI card from the server with the power off, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
3. Remove the top cover from the chassis. See "Removing the Top Cover" (page 55).
4. Pull the gate latch toward the front of the chassis to completely unlock the PCI/PCI-X/PCI-E card if it is full-length.
5. Open the MRL.
    a. Press the indentation on the MRL to release it from the chassis wall.
    b. Lift the edge of the MRL, and rotate it upward 90 degrees until it rests against the chassis wall and the PCI/PCI-X/PCI-E card bulkhead is fully exposed.
6. Disconnect all external and internal cables attached to the PCI/PCI-X/PCI-E card.
7. Grasp the PCI/PCI-X/PCI-E card divider by the handle, and pull upward to eject the PCI/PCI-X/PCI-E card from the slot.
8. Grasp the PCI/PCI-X/PCI-E card by the edges and lift it out of the chassis.

Installing a PCI/PCI-X/PCI-E Card Offline

NOTE: Before installing a PCI/PCI-X/PCI-E card, ensure that you install the proper drivers for the PCI/PCI-X/PCI-E card.

To install a PCI/PCI-X/PCI-E card with the server power off, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
3. Remove the top cover from the chassis. See "Removing the Top Cover" (page 55).
4. Select an empty slot that is appropriate for the card you are installing. For more information see "PCI/PCI-X/PCI-E Configurations" (page 69) and Figure 4-12.
5. Open the MRL.
   a. Press the indentation on the MRL to release it from the chassis wall.
   b. Lift the edge of the MRL, and rotate it upward 90 degrees until it rests against the chassis wall and the PCI/PCI-X/PCI-E card bulkhead filler is fully exposed.
6. Remove the PCI/PCI-X/PCI-E bulkhead filler.
7. Insert the PCI/PCI-X/PCI-E card into the empty slot, and use firm, even pressure to seat the card in the slot.

   CAUTION: Ensure that you fully seat the card into the slot, or the card can fail after power is reapplied to the slot.

8. Connect all internal and external cables to the PCI/PCI-X/PCI-E card.
9. Close the MRL.
   a. Rotate the MRL downward 90 degrees.
   b. Push the edge of the MRL down until it clicks into place on the PCI/PCI-X/PCI-E card bulkhead.
10. Close the gate latch to secure the end of the card if it is full-length.
11. Replace the top cover. See "Replacing the Top Cover" (page 56).
12. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
13. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

Removing and Replacing the DVD Drive

The DVD drive is located in the front of the server above the hard disk drives.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

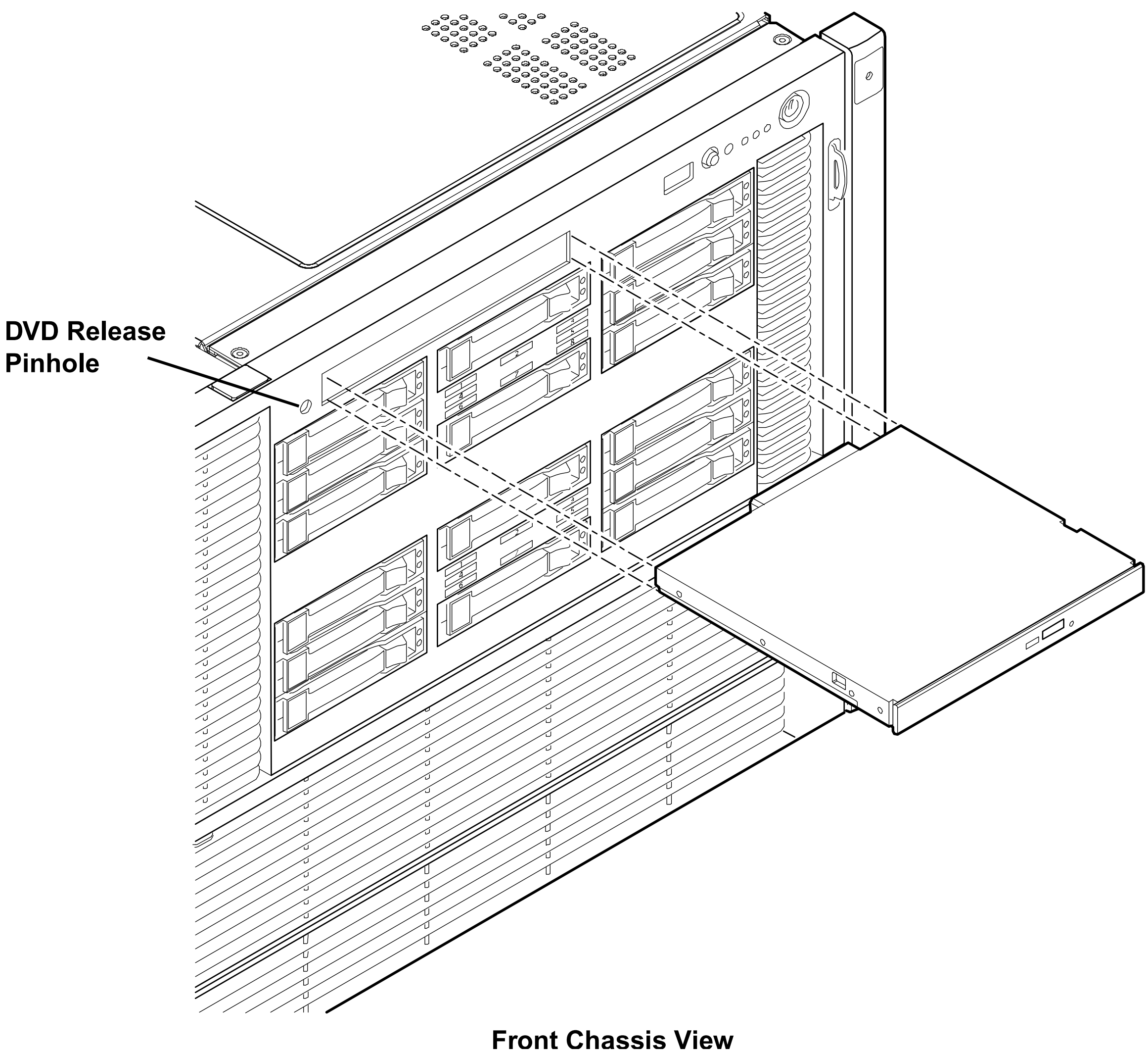
CAUTION: Observe all ESD safety precautions before removing or replacing hard disk drives. Failure to follow ESD safety precautions can result in damage to the server.

Removing the DVD Drive

To remove the DVD drive, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. Insert a tool that fits into the hole to the left of the DVD drive, and push firmly to eject the drive out of the bay (Figure 4-13).
3. Pull the DVD drive straight out to remove it from the chassis (Figure 4-13).

Figure 4-13 DVD Drive Removal and Replacement



Replacing the DVD Drive

To replace a DVD drive, follow these steps:

1. Insert the DVD drive, and push it straight into the drive bay until it clicks into place (Figure 4-13).
2. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

Removing and Replacing the Front Bezel

The front bezel provides server control and port access, and LED interfaces. You must power off the server to remove the front bezel.

> **NOTE:** The procedures in this section refer to the upper portion of the front bezel; the lower portion of the front bezel is the processor access door.

Removing the Front Bezel

To remove the front bezel, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server out from the rack until it stops. See "Extending the Server from the Rack" (page 54).
3. Remove the memory carrier assembly cover. See "Removing the Memory Carrier Assembly Cover" (page 57).

   > **NOTE:** You do not need to fully remove the top cover to service this component; however, the top cover release lever must be open.
   >
   > You must remove the memory carrier assembly because it attaches directly to the processor board.

4. Remove the memory carrier assembly. See "Removing the Memory Carrier Assembly" (page 79).
5. Press the button located on top of the bezel and directly in front of the memory carrier assembly to release the processor board access door (Figure 4-19).

   > **CAUTION:** The processor board access door opens to approximately a 30 degree angle. Do not force the door to open to a greater angle. Failure to observe this caution results in damage to server components.

6. Use the processor board assembly access door as a handle and gently slide the assembly out of the chassis approximately six inches.
7. Remove the eight screws that attach the bezel to the chassis.
8. Tilt the bezel away from the chassis.
9. Flip out the two pull handles located on both ends of the front bezel.
10. Remove the plastic server label located to the right of the front panel LEDs.
    a. Grasp the label, and pull it out until it stops.
    b. Lift up on the notched retaining tab at the rear of the label until it clears the slot.
    c. Pull the label completely out of the chassis.

    > **IMPORTANT:** You must reinstall the plastic server label into the replacement bezel.

11. Slide the bezel to the right to release it from the chassis, and lift it off the chassis.

Replacing the Front Bezel

To replace the front bezel, follow these steps:

1. Align the bezel slots with the tabs on the chassis.
2. Slide the bezel from right to left to lock it into place.
3. Tilt the bezel toward the chassis until it is flush with the chassis.
4. Flip in the two pull handles located on both ends of the front bezel.
5. Replace the four screws that attach the bezel to the right side of the chassis.
6. Replace the four screws that attach the bezel to the left side of the chassis.
7. Reinsert the plastic label with the notched end on the bottom, and push it into the slot in the bezel.
8. Slide the processor board assembly into the chassis until it begins to seat into the socket located on the midplane board.
9. Push the processor board access door upward until it locks into position.
10. Replace the memory carrier assembly. See "Replacing the Memory Carrier Assembly" (page 81).
11. Replace the memory carrier assembly cover. See "Replacing the Memory Carrier Assembly Cover" (page 57).
12. Close the top cover release lever.
13. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
14. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

Removing and Replacing the Memory Carrier Assembly

The memory carrier assembly encloses the system DIMMs. There is one memory carrier assembly that is available for this server:

- 48-DIMM memory carrier assembly

The memory carrier assembly has two sides, 0 and 1, each of which contain a 24-DIMM memory board. System DIMMs seat onto the memory boards.

Table 4-4 lists the supported memory carrier assembly configurations.

Table 4-4 Supported Memory Carrier Assembly Configurations

Memory Carrier Configuration	Memory Boards Installed
24DIMM memory carrier assembly (configuration 1)	1 X 24-DIMM memory board
48-DIMM memory carrier assembly (configuration 2)	2 X 24-DIMM memory boards

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the Memory Carrier Assembly

To remove the memory carrier assembly, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server out from the rack until it stops. See "Extending the Server from the Rack" (page 54).
3. Unlatch the cover release lever on the top cover and remove the memory carrier assembly cover. See "Removing the Memory Carrier Assembly Cover" (page 57).

NOTE: You do not need to fully remove the top cover to service this component; however, the top cover release lever must be open.

4. Press the button located in the center of the memory carrier assembly to release the extraction handles (Figure 4-14).

CAUTION: Manipulate the extraction handles with care; failure to observe this caution can result in damage to the extraction handles.

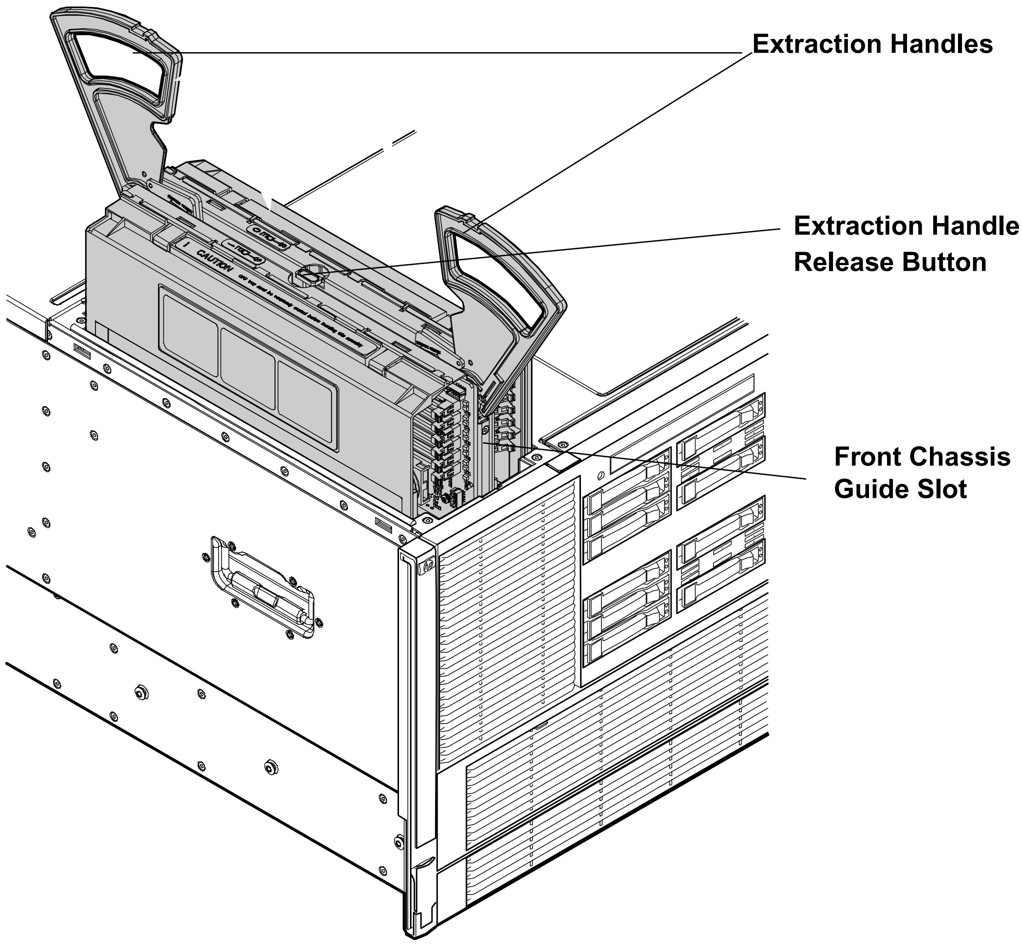
5. Pull up on the extraction handles, and rotate them outward approximately 90 degrees (Figure 4-14).

NOTE: The extraction handles latch into the open position with an audible click.

6. Pull the extraction handles to lift the memory carrier assembly out of the chassis (Figure 4-14).

NOTE: To avoid damage to the extraction handles, HP recommends rotating the handles inward and snapping them into the locked position when servicing the system DIMMs or any time the carrier is out of the chassis. Before replacing the memory carrier assembly, press the button to release the extraction handles. Use the handles to replace the memory carrier into the chassis.

Figure 4-14 Removing and Replacing the Memory Carrier Assembly



Replacing the Memory Carrier Assembly

CAUTION: Ensure the processor board assembly is fully seated before you replace the memory carrier assembly. The processor board assembly access door must be flush with the front bezel.

To replace the memory carrier assembly, follow these steps:

1. Ensure that the extraction handles are positioned in the outward, unlocked position.
2. Align the memory carrier assembly with the front and rear chassis guide slots.

NOTE: Assembly side 0 is on the left, and assembly side 1 is on the right as viewed from the front of the chassis.

3. Slide the memory carrier assembly into the chassis until it begins to seat into the socket located on the processor board.

CAUTION: Do not apply excessive force when closing the extraction handles and seating the memory carrier assembly into the socket on the processor board. Manipulate the extraction handles with care; failure to observe these cautions can result in damage to the extraction handles and other server components.

4. Rotate the extraction handles inward and press the handles straight down until they snap into the locked position.
5. Replace the memory carrier assembly cover and latch the top cover release lever closed. See "Replacing the Memory Carrier Assembly Cover" (page 57).
6. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
7. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

Removing and Replacing System Memory

System memory, or DIMMs, are located on a pair of memory boards inside the memory carrier assembly.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing System Memory

To remove system memory, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server out from the rack until it stops. See "Extending the Server from the Rack" (page 54).
3. Unlatch the cover release lever on the top cover and remove the memory carrier assembly cover. See "Removing the Memory Carrier Assembly Cover" (page 57).

NOTE: You do not need to fully remove the top cover to service this component; however, the top cover release lever must be open. You must remove the memory carrier because it attaches directly to the processor board.

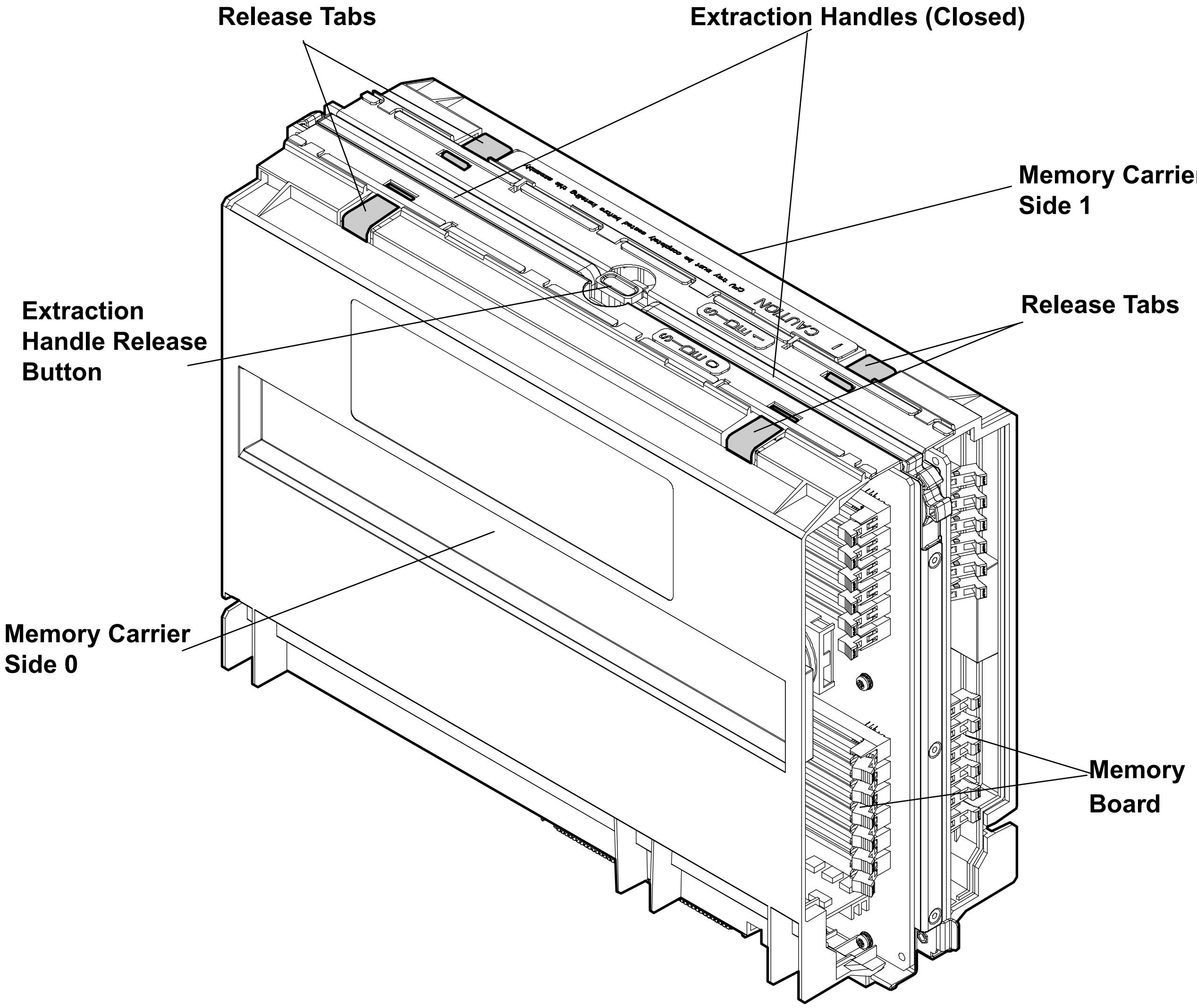
4. Remove the memory carrier assembly. See "Removing the Memory Carrier Assembly" (page 79).

NOTE: To avoid damage to the extraction handles, HP recommends rotating the handles inward and snapping them into the locked position when servicing the system DIMMs or any time the carrier is out of the chassis. Before replacing the memory carrier assembly, press the button to release the extraction handles. Use the handles to replace the memory carrier into the chassis.

5. Locate the DIMM you need to remove. Use Figure 4-17: “48-DIMM Memory Carrier Board Slot IDs”,.
6. Lay the memory carrier assembly on side 0 or side 1 so that the memory board containing the DIMMs that require servicing faces upward (Figure 4-15).
7. Remove the memory carrier assembly side cover.
   a. Press the release tabs (Figure 4-15) on both sides of the extraction handle release button until the side cover releases from the top center of the assembly.
   b. Rotate the side cover slightly to free the tabs from the retaining slots at the base of the assembly (Figure 4-16).
   c. Lift the side cover off the assembly.
8. Release the DIMM from the slot.
   a. Identify the DIMM you want to remove on the memory board.
   b. Push the appropriate extraction levers found on either side of the DIMM slot outward to the open position (Figure 4-18).
9. Remove the DIMM from the slot.

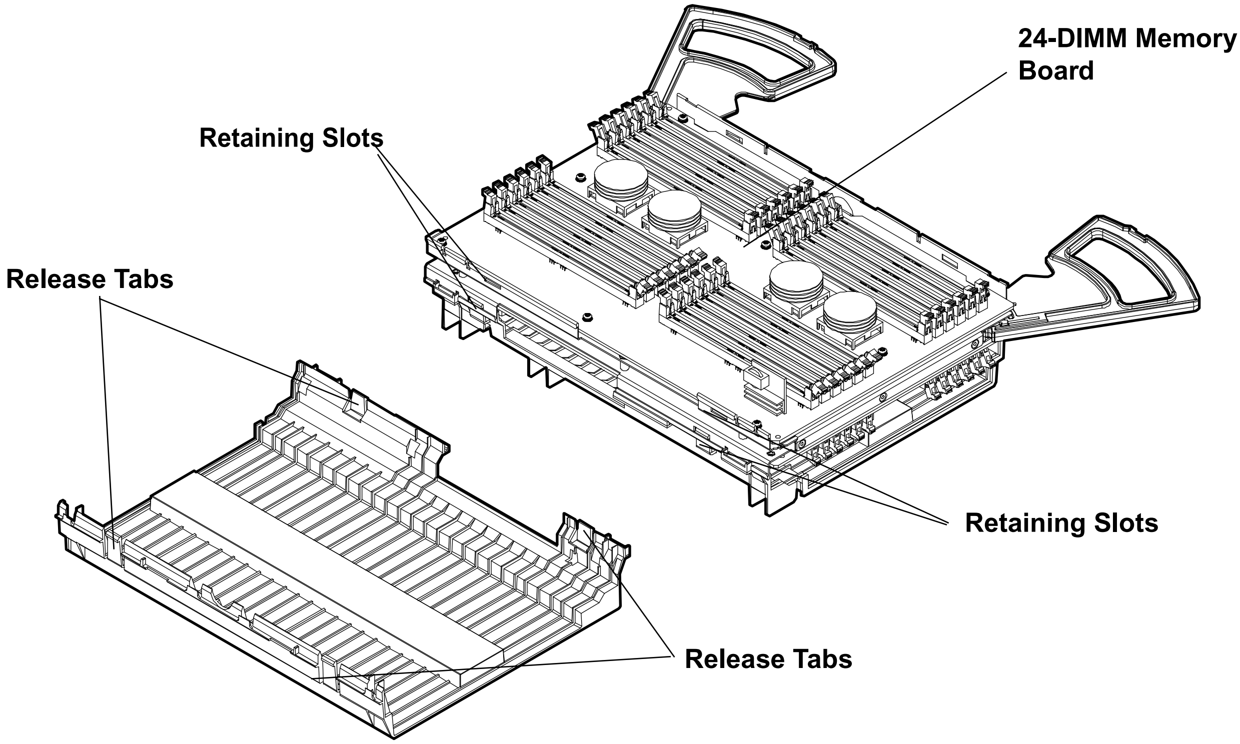
Figure 4-15 shows the memory carrier assembly removed from the chassis.

Figure 4-15 Memory Carrier Assembly



The following figure shows the memory carrier assembly with the side cover open.

Figure 4-16 Memory Carrier Assembly with Side Cover Open



Memory Installation Conventions

Before installing memory, read and understand the following memory installation conventions:

- Supported DIMM sizes and memory configurations
- DIMM load order
- DIMM slot IDs

Supported DIMM Sizes and Memory Configurations

The standard server configuration includes a 48-DIMM memory carrier which contains one or two 24-DIMM memory boards.

System DIMMs seat onto the memory boards. The minimum server configuration requires at least one memory quad, or group of four DIMMs.

The following are the supported DIMM sizes for the server:

- 512 MB
- 1 GB
- 2 GB
- 4 GB

Table 4-5 lists the supported memory configurations for the server.

Table 4-5 Memory Configuration Requirements

Memory Carrier Type	Memory Boards Installed	Minimum Memory Configuration	Maximum Memory Configuration
24-DIMM memory carrier (configuration 1)	1 X 24-DIMM memory board	2 GB (one quad: four 512 MB DIMMs)	96 GB (six quads: 24 X 4 GB DIMMs)
48-DIMM memory carrier (configuration 2)	2 X 24-DIMM memory boards	2 GB (one quad: four 512 MB DIMMs)	192 GB (12 quads: 48 X 4 GB DIMMs)

Memory Load Order

When installing memory, use a minimum of one quad of like-sized DIMMs. Insert additional DIMMs into the 48-DIMM memory carrier in the next available quad, in order of capacity from largest to smallest.

Install DIMMs into the appropriate slots on the 48-DIMM memory carrier boards; each slot has a unique ID. Use Figure 4-17 to determine where to install DIMMs on the memory board.

CAUTION: Failure to observe the following cautions results in system degradation or failure:

- Do not mix DIMM sizes or types within a quad.
- Load DIMM quads in order of size from largest to smallest. For example, if you have a quad of 2 GB DIMMs and a quad of 1 GB DIMMs, install the quad of 2 GB DIMMs first.

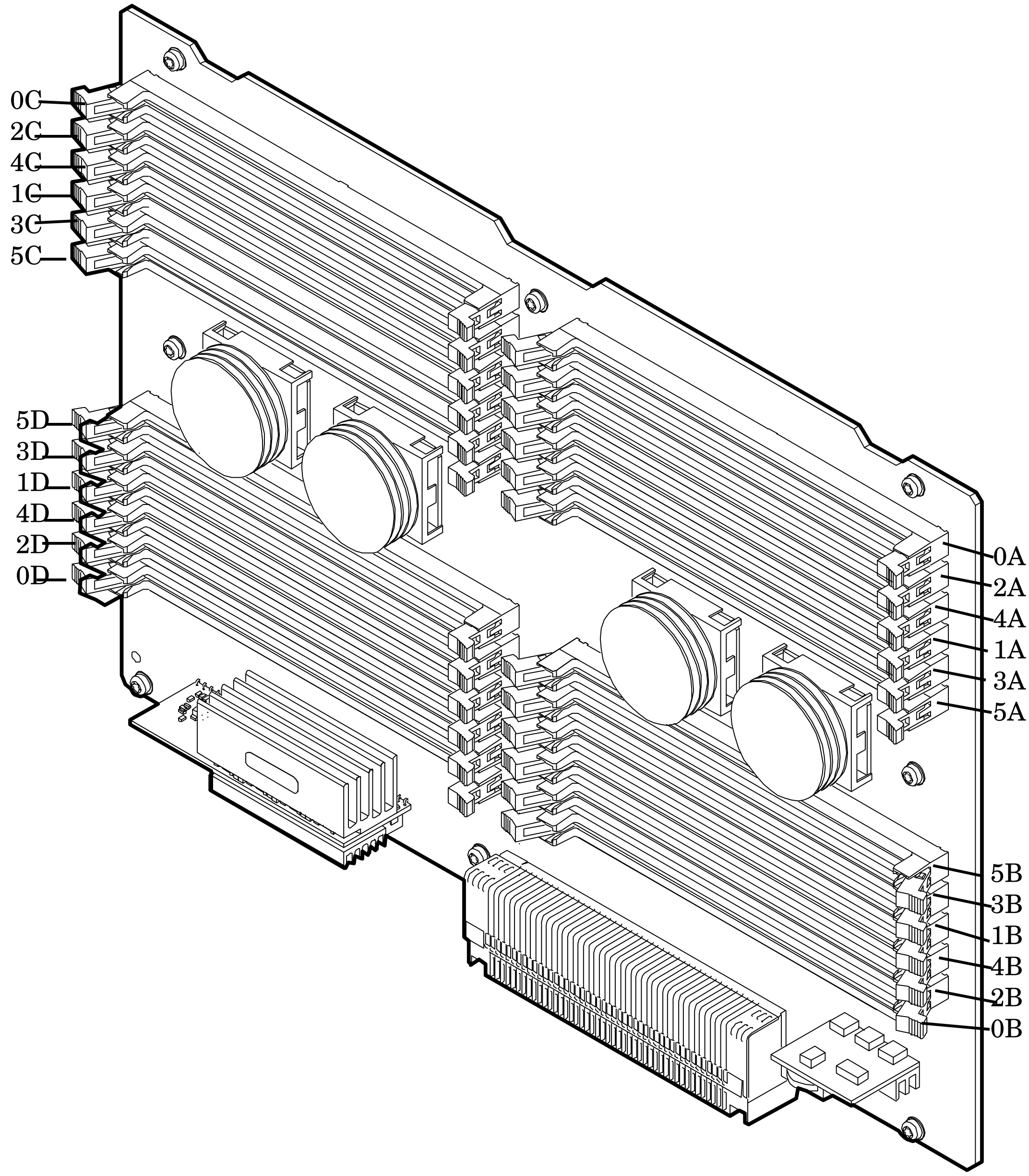
24-DIMM Memory Carrier Load Order For a single 24-DIMM memory board configuration, load DIMMs in order from quad 0 to quad 5.

48-DIMM Memory Carrier Load Order The 48-DIMM memory carrier has two sides, labeled side 0 and side 1, each of which can contain a memory carrier board. The 48-DIMM memory carrier can contain up to 12 quads of memory. DIMM quads are loaded in order of capacity from largest to smallest.

The DIMM slot IDs are the same for both 24-DIMM memory carrier boards. Unique slots are identified within the carrier by the side in which they reside. For example, slot 0A is identified as slot 0A, side 0; or slot 0A, side 1.

Figure 4-17 shows the DIMM slot IDs for the 48-DIMM memory carrier board.

Figure 4-17 48-DIMM Memory Carrier Board Slot IDs



Memory Loading Rules and Guidelines

Use the following rules and guidelines when installing memory:

- Install DIMMs in quads.
- Ensure all DIMMs within a quad are identical.
- Install quads in order of capacity from largest to smallest. For example, install all 2 GB quads before 1 GB or smaller quads, and install all 1 GB quads before 512 MB quads.
- Side 0 must have equal or greater memory capacity than side 1.
- Install DIMM quads based on the following rules:
  1. Load quads into either side of the memory carrier in order, starting with quad 0 and ending with quad 5.
  2. Install the first quad in side 0, quad 0.
  3. Install the second quad in side 1, quad 0.
  4. For the remaining quads:

a. If both sides of the memory carrier contain the same capacity of memory, install the next quad in side 0.
b. If side 0 contains more memory capacity than side 1, install the next quad in side 1.
c. If side 1 is full, install the remaining quads in side 0.

Table 4-6 shows several examples of proper memory carrier loading order.

IMPORTANT: The number in parenthesis indicates the order in which the quads are loaded.

Table 4-6 48-DIMM Memory Carrier Loading Examples

	Quad Number	Quad Slot IDs	Memory Carrier Side 0	Memory Carrier Side 1
Example 1				
	0	0A, 0B, 0C, 0D	2 GB DIMMs (1)	2 GB DIMMs (2)
	1	1A, 1B, 1C, 1D	2 GB DIMMs (3)	2 GB DIMMs (4)
	2	2A, 2B, 2C, 2D	1 GB DIMMs (5)	1 GB DIMMs (6)
	3	3A, 3B, 3C, 3D	1 GB DIMMs (7)	1 GB DIMMs (8)
	4	4A, 4B, 4C, 4D	512 MB (9)	512 MB (10)
	5	5A, 5B, 5C, 5D	512 MB (11)	512 MB (12)
Example 2				
	0	0A, 0B, 0C, 0D	2 GB DIMMs (1)	1 GB DIMMs (2)
	1	1A, 1B, 1C, 1D	1 GB DIMMs (4)	1 GB DIMMs (3)
	2	2A, 2B, 2C, 2D	512 MB (7)	512 MB (5)
	3	3A, 3B, 3C, 3D	512 MB (9)	512 MB (6)
	4	4A, 4B, 4C, 4D		512 MB (8)
	5	5A, 5B, 5C, 5D		512 MB (10)
Example 3				
	0	0A, 0B, 0C, 0D	2 GB DIMMs (1)	512 MB (2)
	1	1A, 1B, 1C, 1D	512 MB (6)	512 MB (3)
	2	2A, 2B, 2C, 2D	512 MB (8)	512 MB (4)
	3	3A, 3B, 3C, 3D		512 MB (5)
	4	4A, 4B, 4C, 4D		512 MB (7)
	5	5A, 5B, 5C, 5D		512 MB (9)

Installing Memory

IMPORTANT: You must pull the ac power plugs on the server every time you modify the DIMMs. If you do not pull the ac power plugs, the system does not display the correct DIMM information.

To install memory, follow these steps:

1. Power off the server and disconnect the power cables. See “Powering Off the Server” (page 48).
2. If rack installed, slide the server out from the rack until it stops. See “Extending the Server from the Rack” (page 54).
3. Unlatch the cover release lever on the top cover and remove the memory carrier assembly cover. See “Removing the Memory Carrier Assembly Cover” (page 57).

NOTE: You do not need to fully remove the top cover to service this component; however, the top cover release lever must be open.

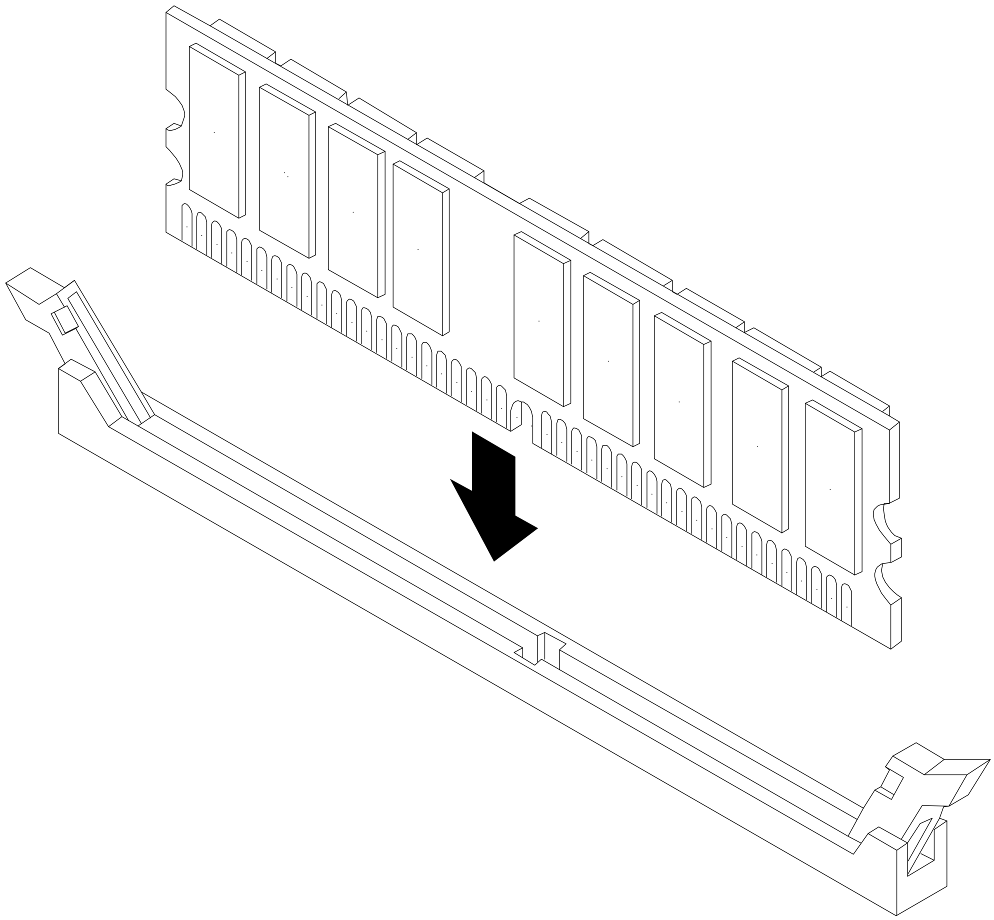
4. Remove the memory carrier assembly. See “Removing the Memory Carrier Assembly” (page 79).

NOTE: To avoid damage to the extraction handles, HP recommends rotating the handles inward and snapping them the locked position when servicing the system DIMMs or any time the carrier is out of the chassis. Before replacing the memory carrier, press the button to release the extraction handles. Use the handles to replace the memory carrier into the chassis.

5. Complete the following memory installation prerequisite tasks before installing the memory:
   a. Determine the DIMM load order for the 48-DIMM memory carrier. For more information, see “Memory Load Order” (page 86).
   b. Determine the DIMM slots to populate. Use Figure 4-17: “48-DIMM Memory Carrier Board Slot IDs”.
   c. Read, understand, and follow the general guidelines to install memory in the server. See “Memory Loading Rules and Guidelines” (page 87).
6. Lay the memory carrier assembly on side 0 or side 1 so that the memory carrier side that contains the DIMM slots that require servicing faces upward (Figure 4-15).
7. Remove the memory carrier assembly side cover.
   a. Press the release tabs (Figure 4-15) on both sides of the extraction handle release button until the side cover releases from the top center of the assembly.
   b. Rotate the side cover slightly to free the tabs from the retaining slots at the base of the assembly (Figure 4-16).
   c. Lift the side cover off the assembly.

8. Install the DIMM (Figure 4-18).
   a. Align the DIMM with the correct slot on the memory board, and align the key in the connector with the notch in the DIMM.
   b. Firmly and evenly push on each end of the DIMM until it seats into the slot.
   c. Ensure the extraction levers are in the locked position.

Figure 4-18 Inserting DIMM into Memory Board Connector



9. Replace the memory carrier assembly side cover.
   a. Insert the side cover tabs into the retaining slots at the base of the assembly (Figure 4-16).
   b. Insert the tabs (Figure 4-15) into the slots on both sides of the extraction handle release button until the side cover snaps into place.

NOTE: To install DIMMs into slots on the other side of the memory carrier, turn the carrier over to the opposite side (side 0 or side 1) and repeat the installation procedure.

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10. Replace the memory carrier assembly and latch the top cover release lever closed. See "Replacing the Memory Carrier Assembly" (page 81).
11. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
12. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

Removing and Replacing the Processor Board Assembly

The processor board assembly holds one, two, three, or four dual-core Itanium processors. It is located beneath the disk drives and memory carrier assembly in the bottom service bay. The processor board is mounted onto a removable carrier tray that is retained in the service bay by a hinged access door.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the Processor Board Assembly

To remove the processor board assembly, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server out from the rack until it stops. See "Extending the Server from the Rack" (page 54).
3. Unlatch the cover release lever on the top cover and remove the memory carrier assembly cover. See "Removing the Memory Carrier Assembly Cover" (page 57).

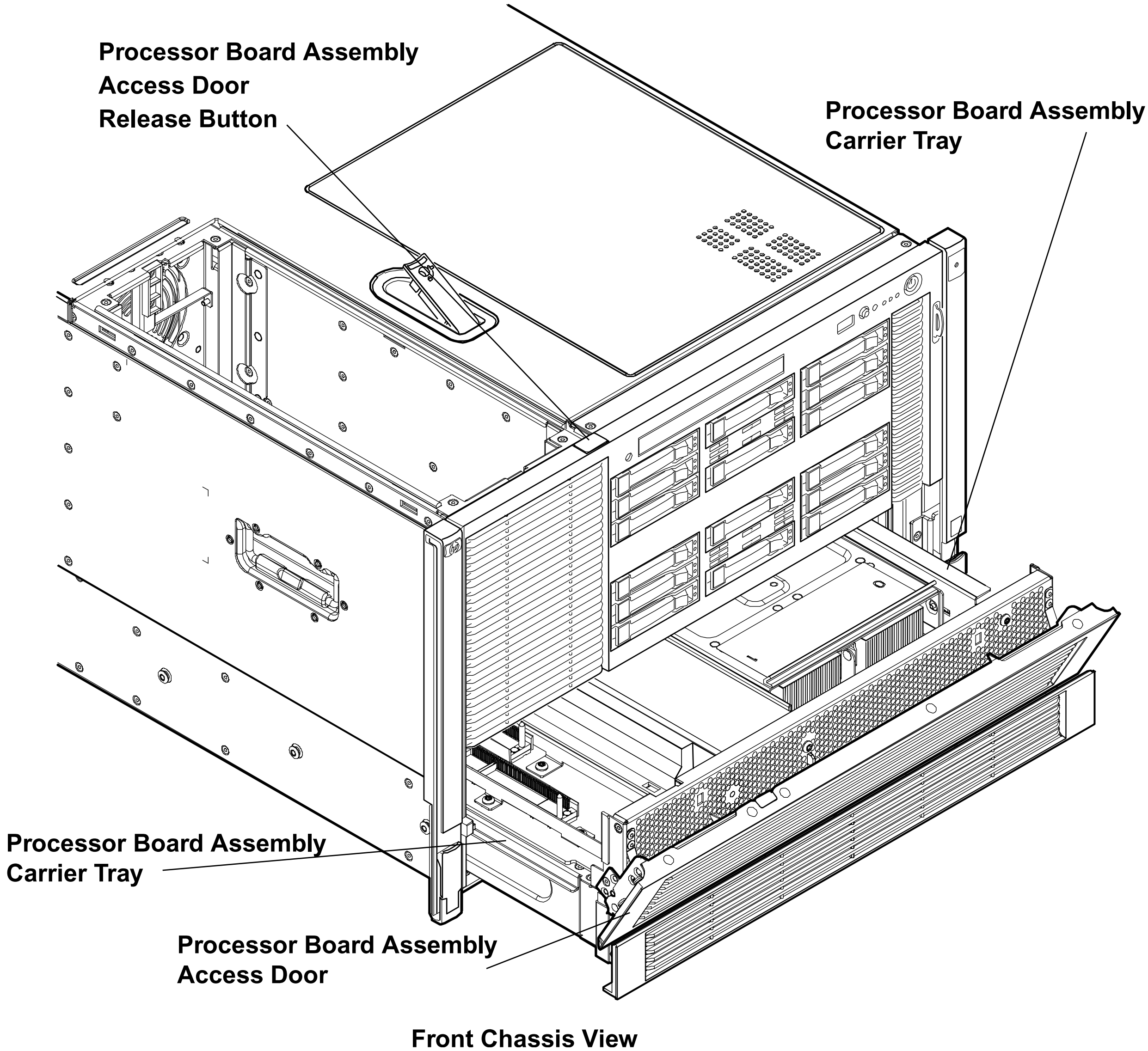
NOTE: You do not need to fully remove the top cover to service this component; however, the top cover release lever must be open. You must remove the memory carrier because it attaches directly to the processor board.

4. Remove the memory carrier assembly. See "Removing the Memory Carrier Assembly" (page 79).
5. Press the button located on top of the bezel and directly in front of the memory carrier assembly to release the processor board access door (Figure 4-19).

CAUTION: The processor board access door opens to approximately a 30 degree angle. Do not force the door to open to a greater angle. Failure to observe this warning results in damage to server components.

6. Use the processor board assembly access door as a handle and gently slide the assembly out of the chassis approximately six inches.
7. Grasp the handholds on the assembly carrier tray with both hands and carefully slide the assembly out of the chassis (Figure 4-19).

Figure 4-19 Removing the Processor Board Assembly



Replacing the Processor Board Assembly

To replace the processor board assembly, follow these steps:

1. Align the edges of the processor board assembly with the assembly guides in the chassis.
2. Slide the processor board assembly into the chassis until it begins to seat into the socket located on the midplane board.
3. Push the processor board access door upward until it locks into position.
4. Replace the memory carrier assembly. See "Replacing the Memory Carrier Assembly" (page 81).
5. Replace the memory carrier assembly cover and latch the top cover release lever closed. See "Replacing the Memory Carrier Assembly Cover" (page 57).
6. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
7. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

Removing and Replacing a Dual-Core Processor

The HP Integrity rx6600 uses dual-core processors. That is, each processor contains two cores that function as separate processors. Dual-core processors double the processing power of the server while maintaining the physical dimensions of a single processor.

The server can contain one, two, three, or four dual-core processors that provide the following configuration options:

- 1P/2C (One processor/two cores)
- 2P/4C (Two processors/four cores)
- 3P/6C (Three processors/six cores)
- 4P/8C (Four processors/eight cores)

If the server has fewer than the maximum number of dual-core processors installed, install the additional processors in the appropriate slot.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Ensure that processor speed and cache size are identical for all processors. Failure to observe this caution results in performance degradation or system failure.

The easiest way to ensure compatibility is to use dual-core processors with identical part numbers.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Processor Load Order

You can install up to four dual-core processors on the processor board. If fewer than the maximum number of dual-core processors are installed (one, two, or three in the HP Integrity rx6600 server), install them in the designated locations on the processor board.

The slots on the processor board are labeled Module 0, Module 1, Module 2, and Module 3. The Module 0 and Module 1 slots are located on the top of the processor board assembly, and the Module 2 and Module 3 slots are located on the underside of the processor board assembly.

IMPORTANT: Use the supplied handholds to turn the processor board assembly over if you are servicing the Module 2 or Module 3 slots.

Install the first processor in the Module 0 slot. Install the second dual-core processor in the Module 1 socket, and so on. The load sequence is described in Table 4-7.

Table 4-7 HP Integrity rx6600 Processor Load Order

Dual-Core Processor	Slot
1	Module 0
2	Module 1
3	Module 2
4	Module 3

Required Tools

To install and remove processors, use the processor install tool fastened to the processor board.

Removing a Dual-Core Processor

To remove a dual-core processor, follow these steps:

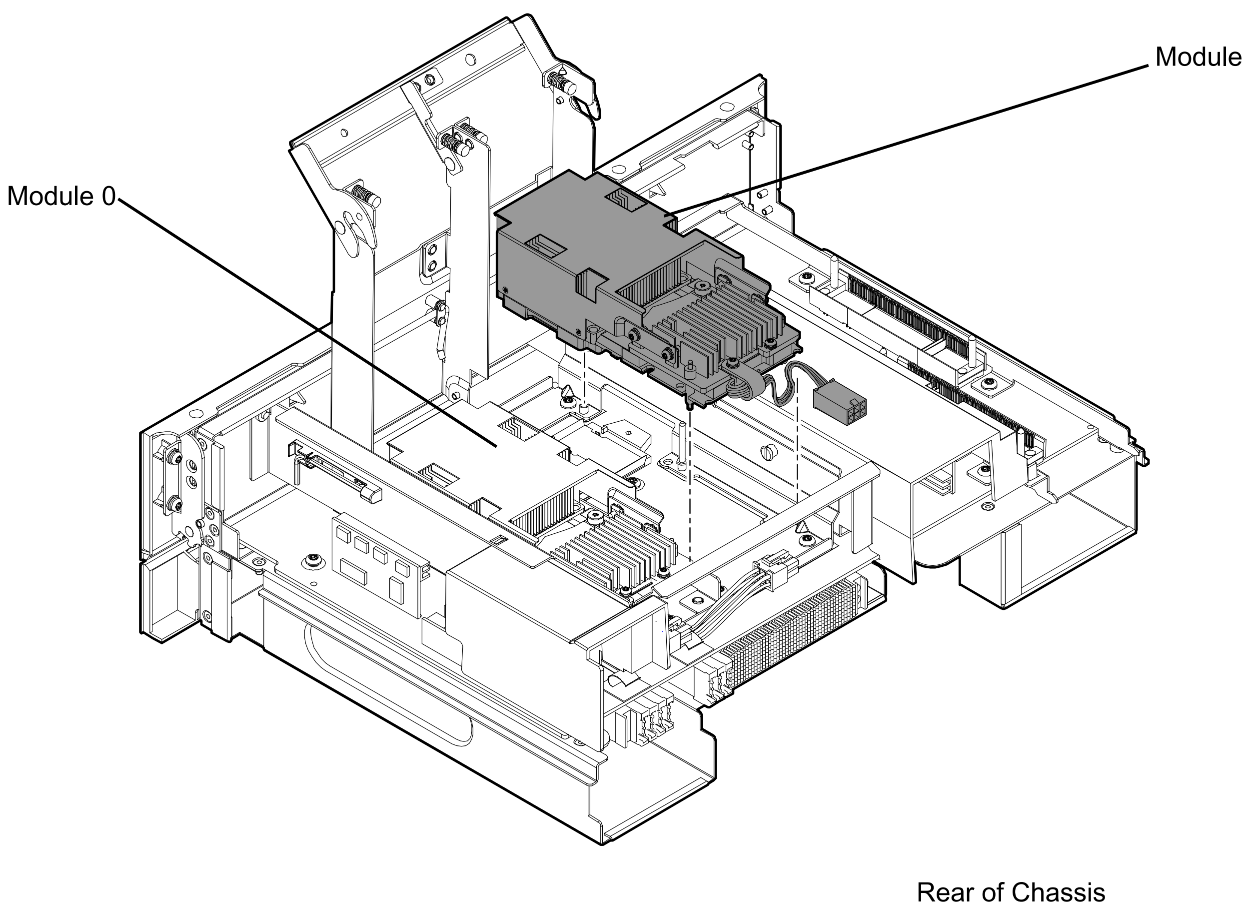
1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server out from the rack until it stops. See "Extending the Server from the Rack" (page 54).
3. Remove the memory carrier assembly cover. See "Removing the Memory Carrier Assembly Cover" (page 57).

NOTE: You do not need to fully remove the top cover to service this component; however, the top cover release lever must be open. You must remove the memory carrier because it attaches directly to the processor board.

---

4. Remove the memory carrier assembly. See "Removing the Memory Carrier Assembly" (page 79).
5. Remove the processor board assembly. See "Removing the Processor Board Assembly" (page 91).

Figure 4-20 Processor Board Assembly



6. Open the processor cage (Figure 4-20).
   a. Grasp the processor cage handle, and apply adequate force to rotate the handle upward.
   b. Use the handle to rotate the cage closure approximately 90 degrees toward the front of the assembly until it stops.

IMPORTANT: Ensure the processors are entirely exposed and can clear the cage closure for removal.

7. Disconnect the processor power cable from the connector cable that attaches directly to the processor board (Figure 4-21).
8. Unlock the processor from the socket on the processor board (Figure 4-23).
   a. Unfasten the processor install tool (2.5 mm screwdriver) from the tool holder on the processor board.
   b. Insert the processor tool into the hole that runs down the side of the heatsink.
   c. Rotate the processor tool counterclockwise 180 degrees.

   CAUTION: The zero insertion force (ZIF) socket for the processor is locked and unlocked by half of a full turn of the processor install tool. The counterclockwise 180 degree rotation (half turn) unlocks the socket. A clockwise 180 degree rotation locks the socket. Attempting to turn the locking mechanism more than 180 degrees can severely damage the socket.

   d. Refasten the processor install tool to the tool holder on the processor board.
9. Remove the dual-core processor from the processor slot.
   a. Carefully grasp the sheet metal that encases the processor.
   b. Pull the processor straight up and out of the chassis.
10. Protect the processor from damage.
    a. Install the protective pin cover on the processor connectors to shield the connector pins.
    b. Place the dual-core processor in an antistatic container.

Figure 4-21 shows the power connector and cable for the processor.

Figure 4-21 Processor Power Cable

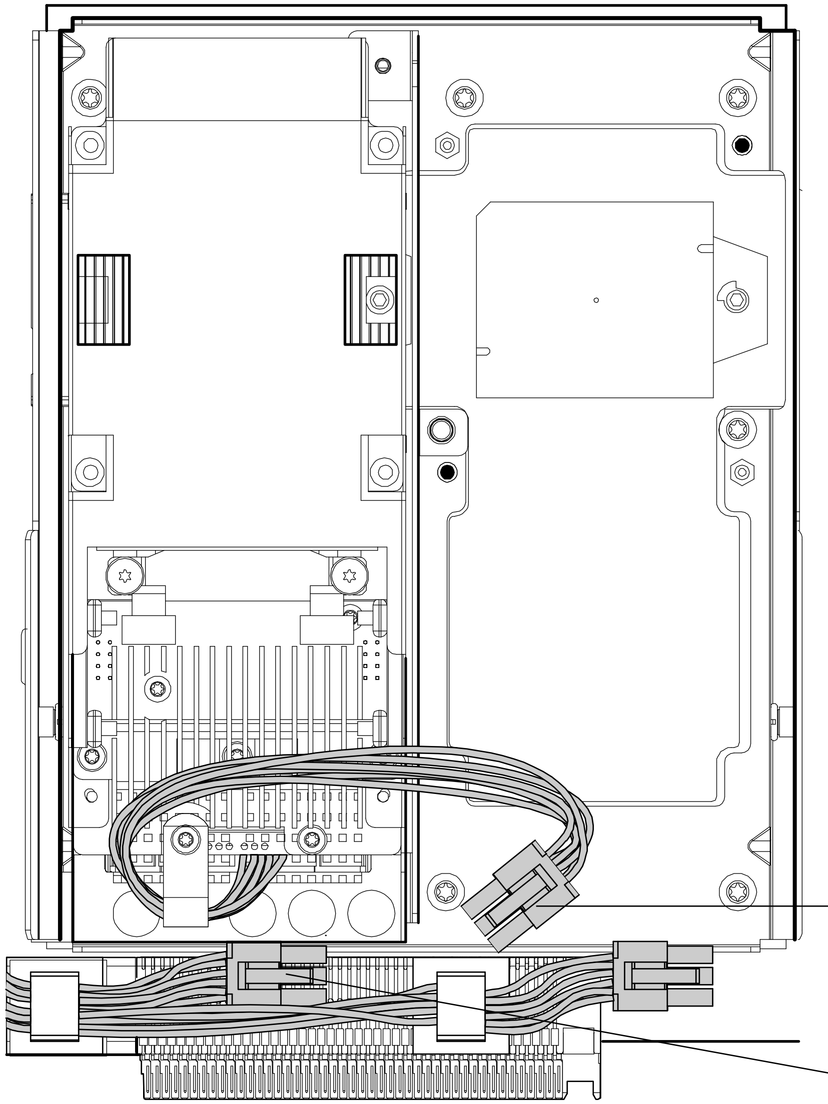


Figure 4-22 shows the processor socket lock and unlock mechanism and alignment post locations:

Figure 4-22 Processor Alignment Posts and Lock/Unlock Mechanism

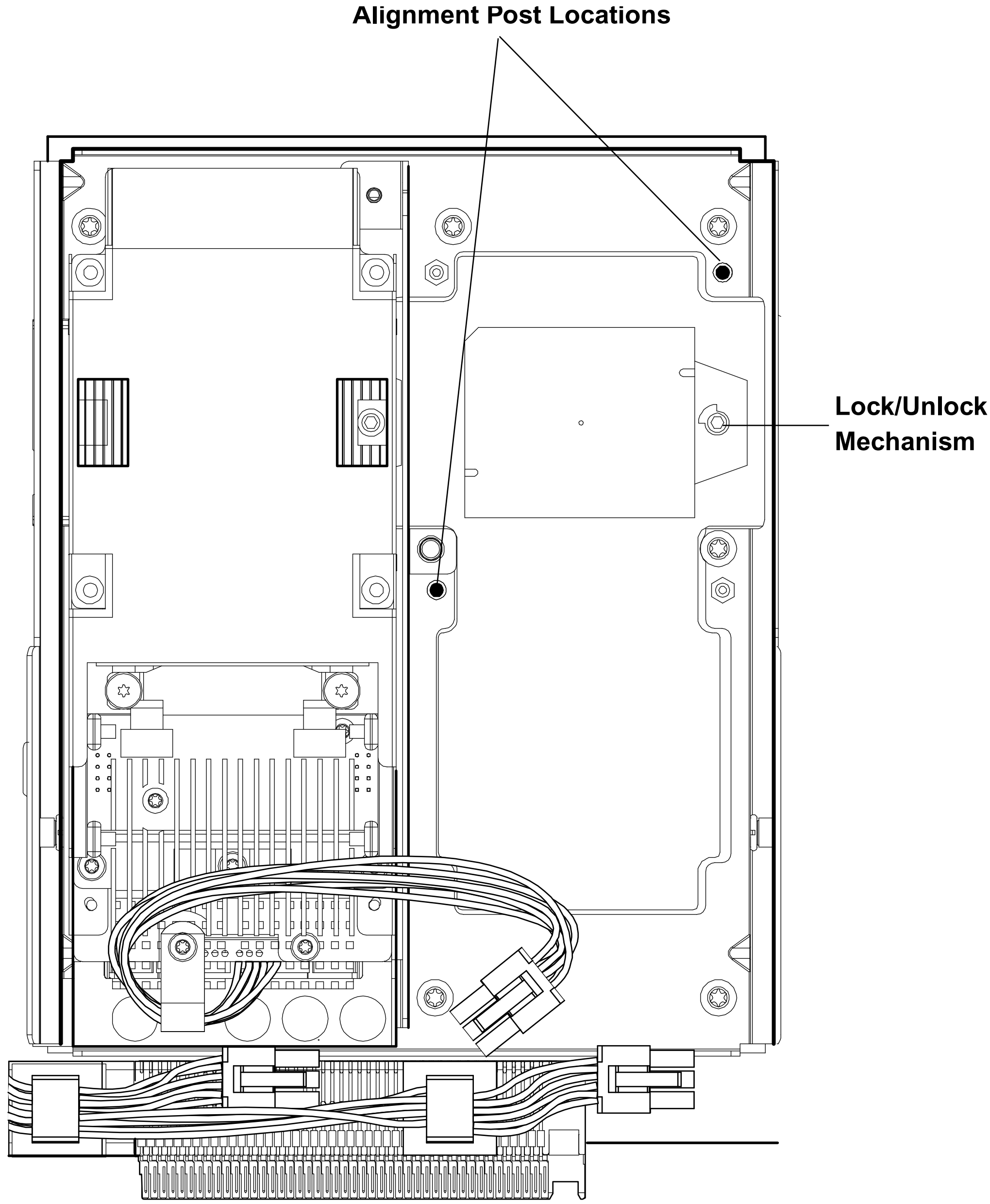
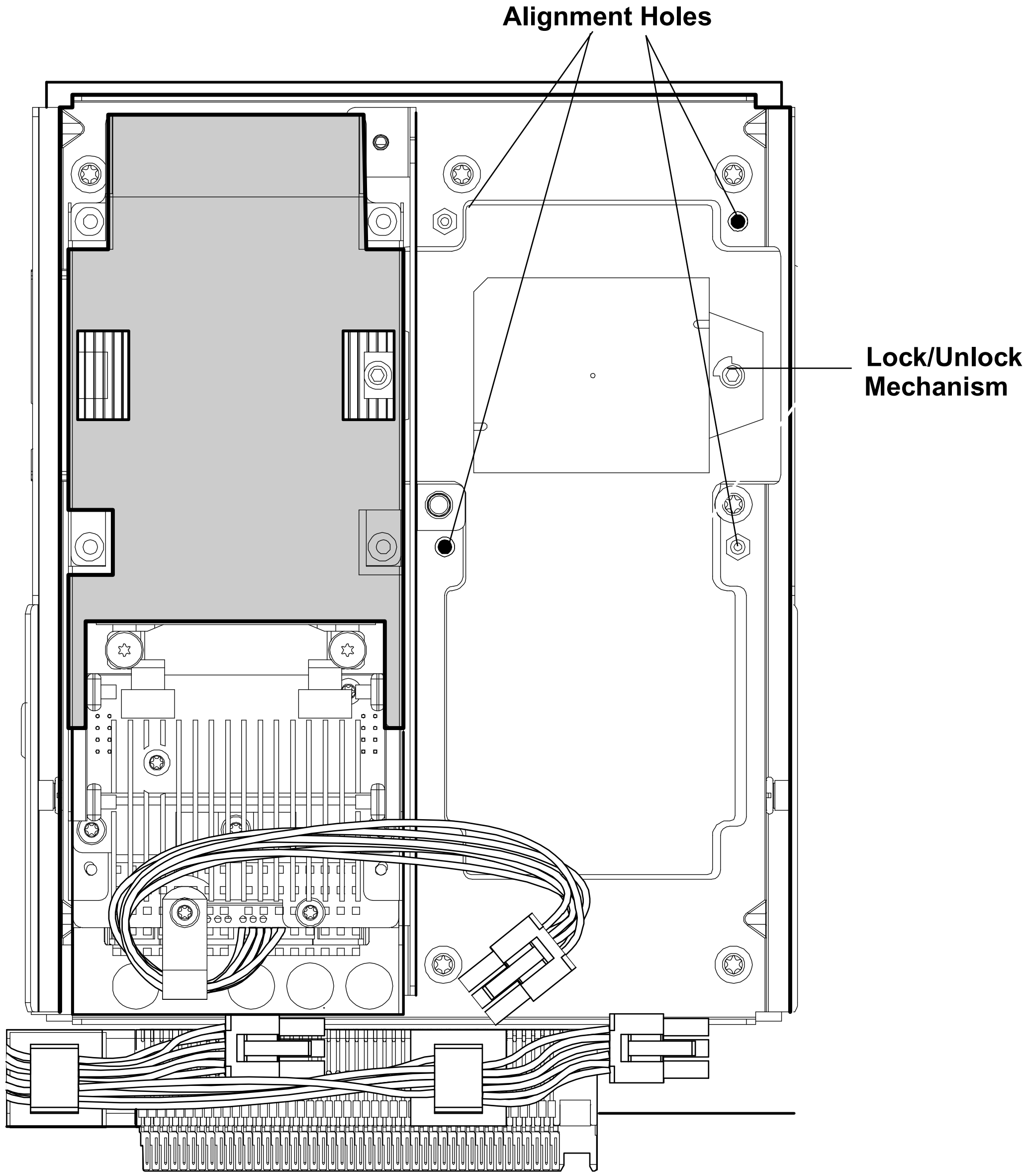


Figure 4-23 shows the processor lock and unlock mechanism location and the alignment holes with the processor installed:

Figure 4-23 Processor Alignment Holes and Lock/Unlock Mechanism



Installing a Dual-Core Processor

To install a dual-core processor, follow these steps:

NOTE: Prior to installing a dual-core processor into the server, read the following instructions carefully and see the figures in this chapter for a complete understanding of this process.

---

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server out from the rack until it stops. See "Extending the Server from the Rack" (page 54).
3. Remove the memory carrier assembly cover. See "Removing the Memory Carrier Assembly Cover" (page 57).

NOTE: You do not need to fully remove the top cover to service this component; however, the top cover release lever must be open. You must remove the memory carrier because it attaches directly to the processor board.

4. Remove the memory carrier assembly. See "Removing the Memory Carrier Assembly" (page 79).
5. Remove the processor board assembly. See "Removing the Processor Board Assembly" (page 91).
6. Open the processor cage (Figure 4-20).
   a. Grasp the processor cage handle, and apply adequate force to rotate the handle upward.
   b. Use the handle to rotate the cage closure approximately 90 degrees toward the front of the assembly until it stops.

IMPORTANT: Ensure that the processor slot is entirely exposed. The processor must clear the cage closure for proper installation.

7. Locate the appropriate processor slot (Module 0 or Module 1) for the processor installation (Figure 4-20).
8. Remove the plastic airflow blocker covering the processor slot, if required.
9. Remove the protective dust cover from the processor socket, if required.
10. Ensure the cam on the processor socket lock is in the unlocked, position (Figure 4-22).

CAUTION: The zero insertion force (ZIF) socket for the processor is locked and unlocked by half of a full turn of the processor install tool. The counterclockwise 180 degree rotation (half turn) unlocks the socket. A clockwise 180 degree rotation locks the socket. Attempting to turn the locking mechanism more than 180 degrees can severely damage the socket.

11. Remove any protective packaging from the new processor.

NOTE: Protective covers are installed to protect connector pins. Save these covers for future use.

12. Inspect the processor pins and verify that the pins are not bent.
13. Align the alignment holes on the processor with the alignment posts on the processor cage, and carefully lower the processor onto the processor socket (Figure 4-22 and Figure 4-23).

CAUTION: Do not press the processor into the socket. When properly aligned, the processor pins seat into the socket. No additional pressure is required. Damage to the pins can occur if too much pressure is applied.

14. Lock the processor into the socket on the processor board (Figure 4-23).
   a. Unfasten the processor install tool (2.5 mm driver) from the tool holder on the processor board.
   b. Insert the processor tool into the hole that runs down the side of the heatsink.
   c. Rotate the processor tool clockwise 180 degrees.
   d. Refasten the processor install tool to the tool holder on the processor board.
15. Reconnect the processor power cable to the connector cable that attaches directly to the processor board (Figure 4-21).
16. Close the processor cage (Figure 4-20).
   a. Grasp the processor cage handle and rotate the cage closure inward toward the rear of the assembly until it is completely closed.
   b. Apply adequate force to push the handle down until it is flush with the cage.

17. Replace the processor board assembly. See "Replacing the Processor Board Assembly" (page 92).
18. Replace the memory carrier assembly. See "Replacing the Memory Carrier Assembly" (page 81).
19. Replace the memory carrier assembly cover and latch the top cover release lever closed. See "Replacing the Memory Carrier Assembly Cover" (page 57).
20. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
21. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).
22. Verify processor replacement and operation by using either the iLO 2 MP commands or the EFI commands.

Removing and Replacing the I/O Board Assembly

The I/O board assembly contains the following server components:

- System battery
- I/O voltage regulator module
- Core I/O board
- LAN core I/O card
- SAS core I/O card
- PCI/PCI-X cards
- Trusted Platform Module (TPM)

IMPORTANT: System information is stored on the I/O board assembly. You must write the serial number and model string information to the new I/O board after installation.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the I/O Board Assembly

To remove the I/O board assembly, follow these steps:

1. Record the boot configuration settings. To find the settings, use the INFO ALL EFI Shell command.
2. Use Figure 4-27: "TPM Location on I/O Board", to determine if there is a TPM on the I/O board assembly. If so, record the TPM settings to transfer to the replacement I/O board assembly. See the HP-UX operating system documentation for instructions.

3. Power off the server and disconnect the power cables. See “Powering Off the Server” (page 48).

CAUTION: The removal and replacement of the I/O board assembly occurs through the rear of the rack for rack-installed servers. Carefully follow the board removal and replacement procedures. You must first perform several tasks with the server extended out from the front of the rack.

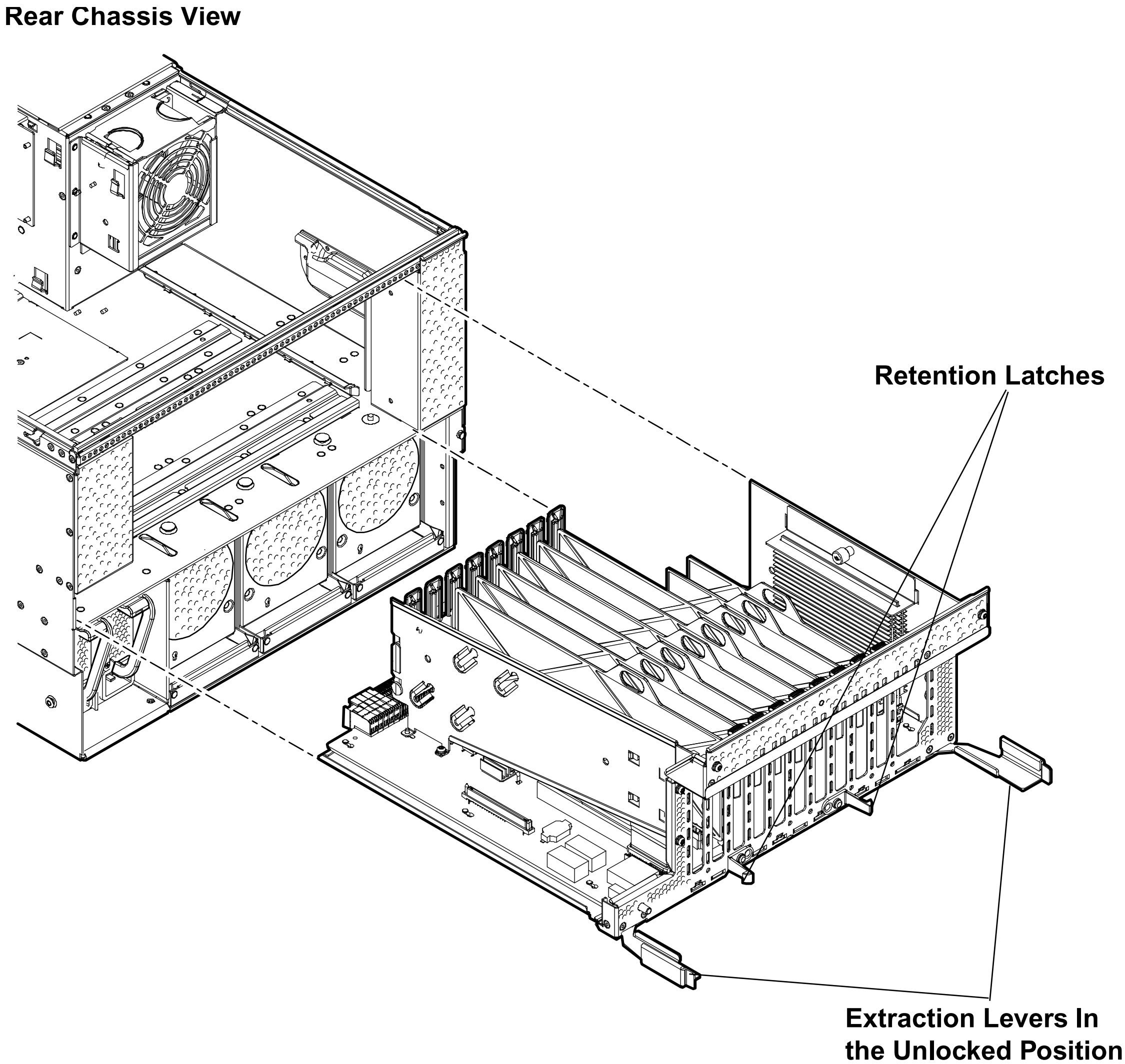
4. If rack installed, slide the server completely out from the rack. See “Extending the Server from the Rack” (page 54).
5. Remove the top cover. See “Removing the Top Cover” (page 55).
6. Disconnect the internal USB cable from the connector on the core I/O board.
7. Disconnect the SAS cables attached to the SAS core I/O card in PCI slot 1.

CAUTION: When disconnecting the SAS cables, note the labeling on the cables. Both cables and sockets are clearly marked with the correct channel. When reconnecting these cables, match each cable with the appropriate socket on the SAS core I/O card. If the cables are mismatched, the server will not reboot.

8. Slide the server completely back into the rack.
9. Open the cable management arm wide enough to slide the I/O board out the rear of the rack.
10. Disconnect all external cabling attached to ports at the rear of the chassis.
11. Press in on the retention levers to unlock the I/O board assembly extraction handles (Figure 4-24).
12. Pull the I/O board assembly extraction handles outward to unplug the I/O board assembly from the socket on the midplane board.
13. Slide the I/O board assembly all the way out the rear of the chassis (Figure 4-24).

NOTE: The I/O board assembly is large. Use care when lifting it out of the server chassis.

Figure 4-24 I/O Board Assembly Removal and Replacement



Replacing the I/O Board Assembly

IMPORTANT: Ensure that the I/O board extraction handles are in the outward, unlocked position to engage the assembly correctly with the midplane board socket.

NOTE: The I/O board assembly is large. Use care when sliding it into the server chassis.

To replace the I/O board assembly, follow these steps:

1. Transfer the following components from the removed I/O board assembly to the replacement I/O board assembly in the following order:
   a. SAS core I/O card. See "Removing and Replacing the SAS Core I/O Card" (page 115).
   b. LAN core I/O card. See "Removing and Replacing the LAN Core I/O Card" (page 116).
   c. Trusted Platform Module (TPM). Use Figure 4-27: "TPM Location on I/O Board", to determine if there is a TPM on the removed I/O board assembly. If so, transfer the TPM

from the removed I/O board assembly to the replacement I/O board assembly. See "Removing and Replacing the Trusted Platform Module" (page 107).

   d. Core I/O board. See "Removing and Replacing the Core I/O Board" (page 111).

2. Align the I/O board assembly rails with the chassis slots, and slide the assembly into the chassis until it stops against the midplane board socket (Figure 4-24).

> **IMPORTANT:** Do not pinch the cable of the fan located behind the memory carrier assembly between the fan housing unit and the I/O board when sliding the board into the chassis

3. Ensure that the I/O board assembly is flush against the midplane board socket, and firmly push the extraction handles inward until the assembly plugs completely into the midplane board socket.
4. Press in on the retention levers to lock the I/O board assembly extraction handles into place.
5. Reconnect all external cabling into the ports at the rear of the chassis.
6. Close and secure the cable management arm.
7. Slide the server completely out from the front of the rack.
8. Reconnect the internal SAS cables to the connectors on the SAS core I/O card in PCI slot 1.

> **CAUTION:** When reconnecting the SAS cables, note the labeling on the channel cables. Both cables and sockets are clearly marked with the correct channel. Match each cable with the appropriate socket on the SAS core I/O card. If the cables are mismatched, the server will not boot correctly.

9. Reconnect the USB cable to the connector on the core I/O board.
10. Replace the top cover. See "Replacing the Top Cover" (page 56).
11. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

> **IMPORTANT:** Serial number and model string data information is stored on both the interconnect board and the I/O board. When installing a new I/O board, copy this information from the interconnect board to the new I/O board.

12. Respond **`YES`** to prompts regarding copying information onto the new board.
13. Verify the serial number and model string data information copied onto the new I/O board.
    a. Boot to EFI.
    b. Enter **service** mode:

```
Shell> sysmode service
Current System Mode: ADMIN
You are now in SERVICE mode.
```

    c. Use the `sysset` command to verify that all values are set:

```
Shell> sysset

System Information:
Manufacturer: hp
Product Name: server rx6600
Product Number: AB464A
Secondary Product Number is Identical
Serial number: SGH43442VB
Secondary Serial Number is Identical
UUID: 3C33C58E-2E5A-11D8-A33B-4188C0AEFAE2 (Valid)
Secondary UUID is Identical
Product ID: 0x301
```

14. Enable the TPM. See "Removing and Replacing the Trusted Platform Module" (page 107).
15. Restore the TPM settings. See the HP-UX operating system documentation for instructions.
16. Verify the system board replacement and operation using either the iLO 2 MP commands or the EFI commands.

Removing and Replacing the System Battery

The system battery is located on the I/O board assembly. Replace the battery with an identical or equivalent battery only. Dispose of used batteries according to the manufacturer's instructions.

WARNING! Lithium batteries can explode if mistreated. Do not recharge, disassemble, or dispose of batteries in a fire. Failure to observe this warning can result in personal injury or damage to equipment.

Removing the System Battery

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

IMPORTANT: Before removing the system battery, record all boot and LAN configuration settings. (Find the settings using the INFO ALL EFI command.) You must reset these values after replacing the battery.

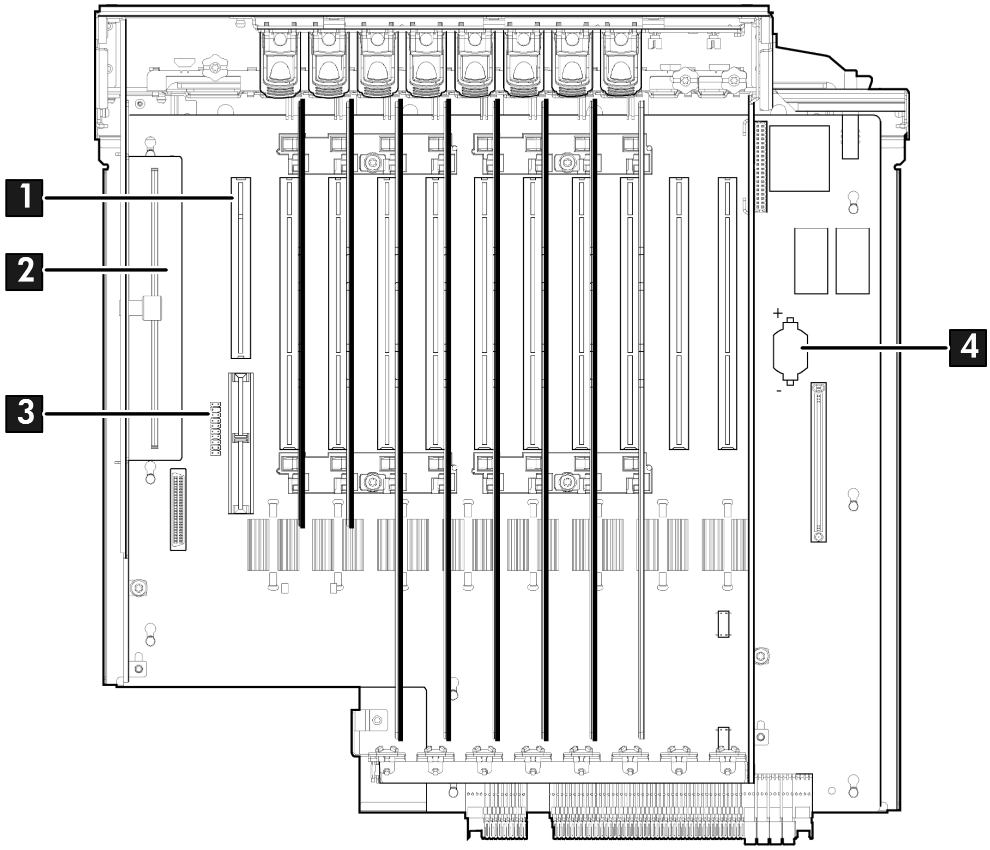
To remove and replace the system battery, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).

   CAUTION: You must remove the I/O board assembly to service the system battery. The removal and replacement of the I/O board assembly occurs through the rear of the rack for rack-installed servers. Carefully follow the removal and replacement procedures; you must first perform several tasks with the server extended out from the front of the rack. See "Removing and Replacing the I/O Board Assembly" (page 100) for complete instructions.

2. Remove the I/O board assembly. See "Removing the I/O Board Assembly" (page 100).
3. Locate the system battery on the I/O board assembly (Figure 4-25).
4. Insert a flat tool under the battery and carefully lift upward to pry the battery from the socket.

Figure 4-25 Battery Location on I/O Board



1 Core I/O Board Slot	3 TPM	4 System Battery
2 I/O VRM		

Replacing the System Battery

CAUTION: You must remove the I/O board assembly to service the system battery. The removal and replacement of the I/O board assembly occurs through the rear of the rack for rack-installed servers. Carefully follow the removal and replacement procedures; you must perform several tasks with the server extended out the front of the rack. See "Removing and Replacing the I/O Board Assembly" (page 100) for complete instructions.

1. Insert the replacement battery into the socket on the I/O board assembly.

   NOTE: The positive terminal of the battery is designated by the **+** sign. Install the battery with the **+** sign facing up.

2. Replace the I/O board assembly. See "Replacing the I/O Board Assembly" (page 102).
3. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).
4. Reset the server date and time using the EFI `date` and `time` commands.

Removing and Replacing the I/O Voltage Regulator Module

The I/O voltage regulator module (VRM) is a stand alone component located on the I/O board assembly that regulates voltage for all I/O operations.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

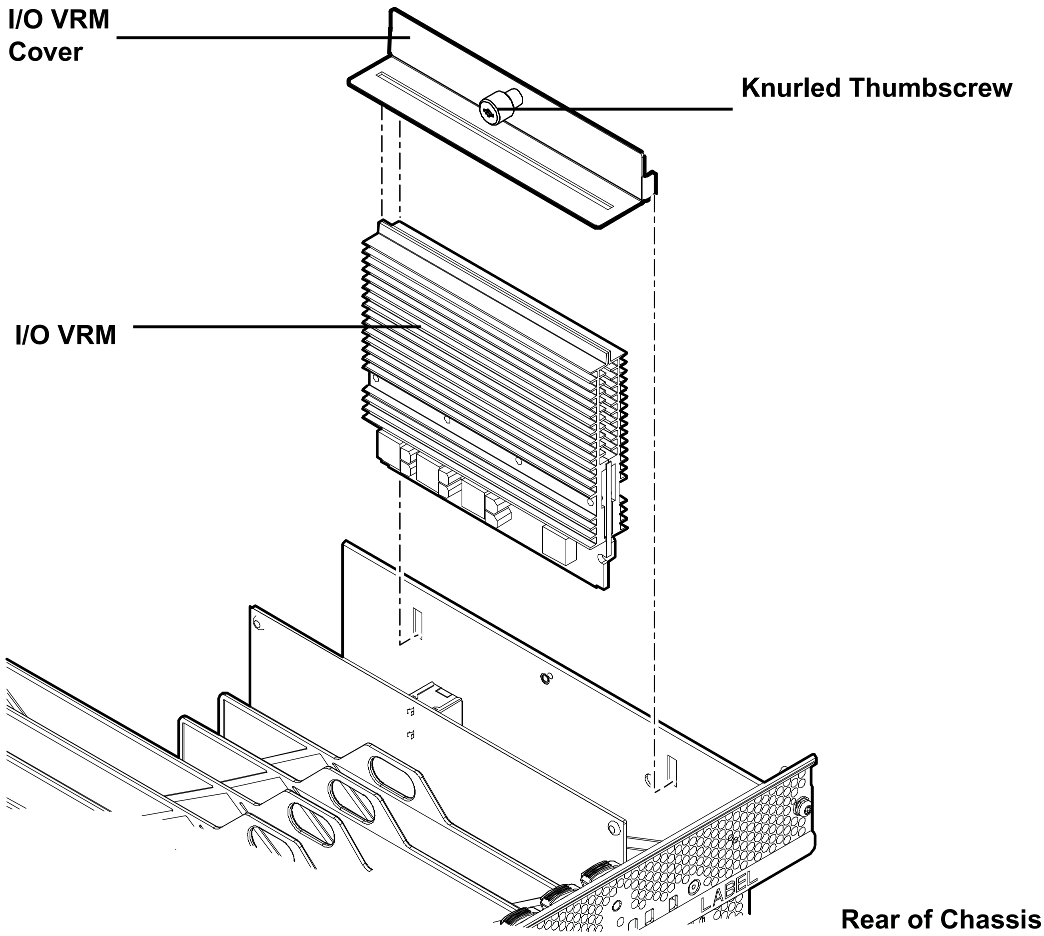
CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the I/O VRM

To remove the I/O VRM, follow these steps:

1. Power off the server and disconnect the power cables. See “Powering Off the Server” (page 48).
2. If rack installed, slide the server completely out from the rack. See “Extending the Server from the Rack” (page 54).
3. Remove the top cover. See “Removing the Top Cover” (page 55).
4. Remove the I/O VRM cover (Figure 4-26).
   a. Locate the knurled thumbscrew on top of the I/O VRM cover and turn it counterclockwise until the cover disengages from the chassis wall.
   b. Lift the cover off the I/O VRM.
5. Push the extraction levers found on either side of the I/O VRM slot outward to the open position to release the I/O VRM from the socket.
6. Grasp the I/O VRM by the edges and lift it out of the chassis (Figure 4-26).

Figure 4-26 Removing and Replacing the I/O VRM



Replacing the I/O VRM

To replace the I/O VRM, follow these steps:

1. Insert the I/O VRM into the socket on the I/O board.

NOTE: The I/O VRM is keyed to fit into the socket in only one direction.

   a. Firmly and evenly push on each end of the I/O VRM until it seats into the slot.
   b. Ensure that the extraction levers are in the closed position.

NOTE: You may need to manually close the extraction levers.

2. Place the I/O VRM cover on top of the I/O VRM and turn the knurled thumbscrew clockwise until the cover tightens into place on the chassis wall (Figure 4-26).
3. Replace the top cover. See “Replacing the Top Cover” (page 56).
4. If rack installed, slide the server completely into the rack. See “Inserting the Server into the Rack” (page 54).
5. Reconnect the power cables and power on the server. See “Powering On the Server” (page 48).

Removing and Replacing the Trusted Platform Module

The Trusted Platform Module (TPM) is an optional security component which enhances security capabilities for the server if it is running the HP-UX operating system. The TPM is a security chip that is unique to the server. It performs key security processes independent of other hardware components. The TPM creates and stores additional encryption keys from the root key of the system. The encryption keys created by the TPM encapsulate system application encryption keys to provide an additional layer of security for sensitive system data.

The fundamental capabilities of the TPM include:

- Platform authentication
- Sensitive information protection
- Data integrity
- System privacy

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

IMPORTANT: You must run the supported version of the HP-UX operating system to utilize the TPM security component.

Removing the TPM

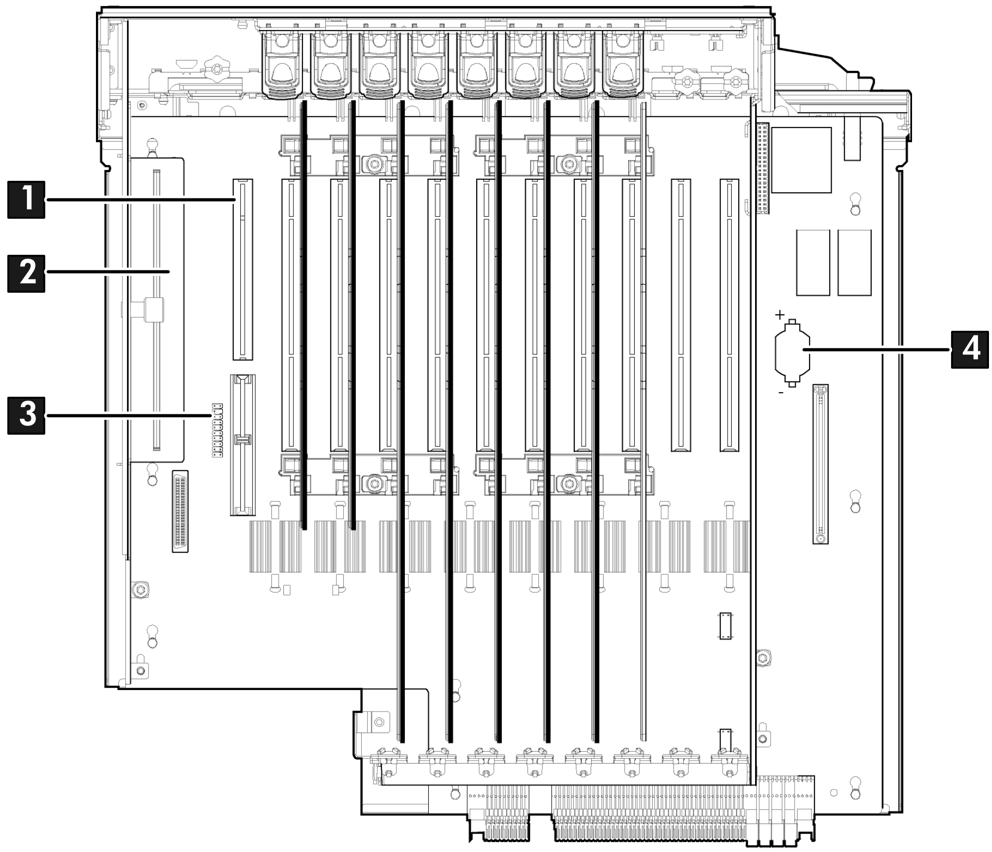
To remove the TPM, follow these steps:

1. Back up the current TPM settings. See the HP-UX operating system documentation for more information.
2. Power off the server and disconnect the power cables. See “Powering Off the Server” (page 48).
3. If rack installed, slide the server completely out from the rack. See “Extending the Server from the Rack” (page 54).
4. Remove the top cover. See “Removing the Top Cover” (page 55).

5. Remove the core I/O board. See “Removing the Core I/O Board” (page 112).
6. Grasp the TPM by the edges and lift it out of the socket on the I/O board (Figure 4-27).

CAUTION: Destroy the TPM after removing it from the server. Follow local regulations to securely destroy the TPM. Do not attempt to use the TPM in another server.

Figure 4-27 TPM Location on I/O Board



1 Core I/O Board Slot	3 TPM	4 System Battery
2 I/O VRM		

Replacing the TPM

To replace the TPM, follow these steps:

1. Insert the TPM.
   a. Align the TPM connector pinouts with the pins on the I/O board socket.

   NOTE: The female connector on the TPM has one pinout plugged, which aligns with a missing pin on the male connector on the I/O board assembly.

   b. Push the TPM straight down into the socket until it is fully seated (Figure 4-27).
2. Replace the core I/O board. See “Replacing the Core I/O Board” (page 112).
3. Replace the top cover. See “Replacing the Top Cover” (page 56).
4. If rack installed, slide the server completely into the rack. See “Inserting the Server into the Rack” (page 54).
5. Reconnect the power cables and power on the server. See “Powering On the Server” (page 48).
6. Set the TPM to the prior state, if available, or to a customer preference. Example 4-1 is an example of using the `secconfig` command to enable the TPM.

Example 4-1 Enabling the TPM

1. Access the EFI Shell.
2. Enter `info sec` to display the server security settings on the screen. The TPM is disabled by default.
3. Enter `secconfig` to display a list of configurable security settings.
4. Enter `secconfig tpm on` to enable the TPM.

7. Reset the server.
8. Boot the operating system. See "Booting and Shutting Down HP-UX" (page 178).
9. Restore the former TPM settings to the new TPM. See the HP-UX operating system documentation for more information.
10. Back up the TPM security information. See the HP-UX operating system documentation for more information.

Removing and Replacing PCI/PCI-X/PCI-E Card Dividers

PCI/PCI-X/PCI-E card dividers are located on the I/O board assembly, between the PCI/PCI-X/PCI-E cards. Eight dividers provide short circuit protection to the hot-pluggable PCI/PCI-X/PCI-E cards by preventing inadvertent contact between cards during the replacement, addition, or removal of a card.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing a PCI/PCI-X/PCI-E Card Divider

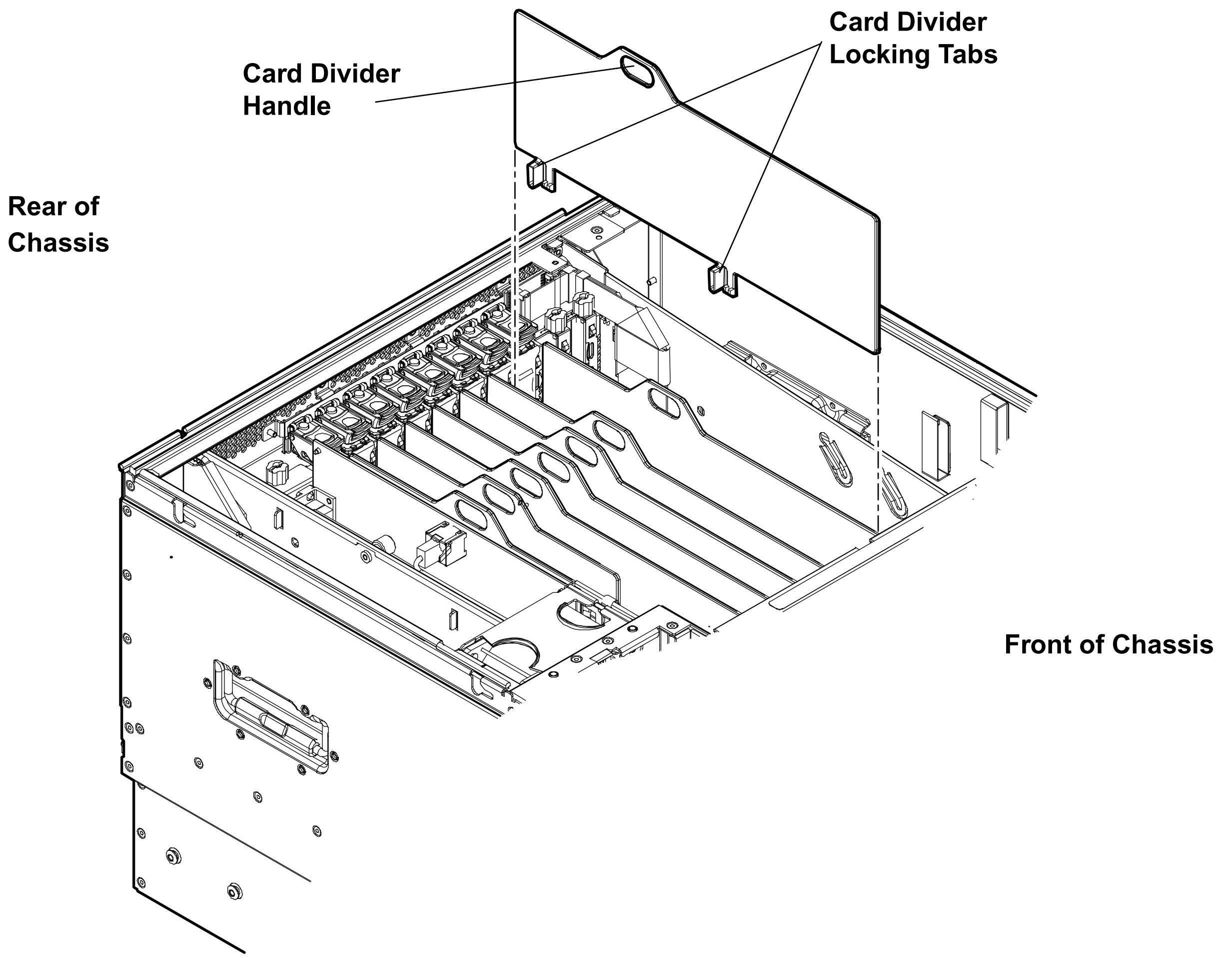
To remove a PCI/PCI-X/PCI-E card divider, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
3. Remove the top cover. See "Removing the Top Cover" (page 55).

CAUTION: When extracting the card divider, ensure you release the locking tabs completely or you can damage them. If you damage the tabs, the divider does not seat properly when you reinsert it.

4. Use a tool to carefully push the two tabs that attach the card divider to the I/O board assembly.
5. Pull the card divider up sharply by the handle to disengage it from the I/O board assembly (Figure 4-28).

Figure 4-28 PCI/PCI-X/PCI-E Card Divider



Replacing a PCI/PCI-X/PCI-E Card Divider

To replace a PCI/PCI-X/PCI-E card divider, follow these steps:

1. Insert the PCI/PCI-X/PCI-E card divider locking tabs into the slots on the I/O board assembly.
2. Push down firmly to seat the card divider into the slots on the I/O board assembly.
3. Replace the top cover. See “Replacing the Top Cover” (page 56).
4. If rack installed, slide the server completely into the rack. See “Inserting the Server into the Rack” (page 54).
5. Reconnect the power cables and power on the server. See “Powering On the Server” (page 48).

Removing and Replacing the Core I/O Board

The core I/O board provides local and remote manageability access, and manages many critical server functions and components such as:

- Power supplies
- Fans
- Main memory
- Front panel
- Processors
- Remote interfaces
- USB

- VGA (optional)
- Server boards

The core I/O board has a unique, dedicated slot located to the left of the public PCI/PCI-X card slots (as viewed from the front of the chassis) on the I/O board assembly. The core I/O board includes VGA (optional), iLO 2 MP LAN, iLO 2 MP USB, and iLO 2 MP serial ports, and locator and iLO 2 MP status LEDs. For more detail on the port locations and LEDs, see Chapter 5: "Troubleshooting" (page 131).

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: The dedicated core I/O board slot is not hot-pluggable.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the Core I/O Board

IMPORTANT: The replacement core I/O board may not be the same as the current core I/O board. If the server is running an operating system other than Windows or Linux, the current core I/O board may not have a VGA connector. The replacement core I/O board always ships with a VGA connector. The VGA connector may not be functional depending on the server operating system. However, when you run system discovery utilities, such as MAPPER, the output includes VGA.

To remove the core I/O board, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. Disconnect all external cables attached to the board.
3. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
4. Remove the top cover. See "Removing the Top Cover" (page 55).
5. Disconnect the internal USB cable attached to the core I/O board.
6. Remove the slotted T15 screw that attaches the card bulkhead to the chassis; use a T15 screwdriver to turn the screw counterclockwise until it is free from the chassis.

   CAUTION: Do not rock the board side to side during removal, or you can damage the slot pins. Pull the board straight up and out of the chassis.

7. Grasp both edges of the board and apply even force to lift the board straight up and out of the chassis.

Replacing the Core I/O Board

To replace the core I/O board, follow these steps:

1. Insert the replacement card into the dedicated core I/O board slot.

CAUTION: Do not rock the board side to side during installation, or you can damage the slot pins. Push the board straight down into the slot for installation.

   a. Insert the tab at the base of the card bulkhead into the slot in the chassis.
   b. Align the card connectors with the slots on the I/O board.
   c. Apply firm, even pressure to both sides of the card until it fully seats into the slot.
2. Replace the slotted T15 screw that attaches the card bulkhead to the chassis; use a T15 screwdriver to turn the screw clockwise until it tightens to the chassis.
3. Reconnect the USB cable to the card.
4. Replace the top cover. See "Replacing the Top Cover" (page 56).
5. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
6. Reconnect all external cables to the card.
7. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

Removing and Replacing the Core I/O Board Battery

Replace the battery with an identical or equivalent battery only. Dispose of used batteries according to the manufacturer's instructions.

WARNING! Lithium batteries can explode if mistreated. Do not recharge, disassemble, or dispose of batteries in a fire. Failure to observe this warning can result in personal injury or damage to equipment.

Removing the Core I/O Board Battery

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

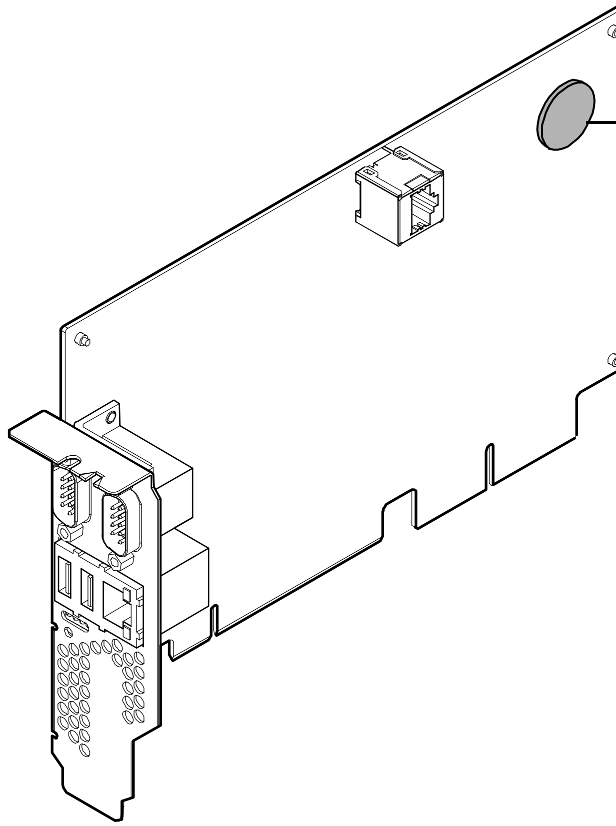
IMPORTANT: Before removing the system battery, record all boot and LAN configuration settings. (Find the settings using the INFO ALL EFI command.) You must reset these values after replacing the battery.

To remove the core I/O board battery, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
3. Remove the top cover from the chassis. See "Removing the Top Cover" (page 55).
4. Remove the core I/O board. See "Removing the Core I/O Board" (page 112).

5. Locate the battery on the core I/O board (Figure 4-25).
6. Insert a flat tool under the battery and carefully lift upward to pry the battery from the socket.

Figure 4-29 Battery Location on UCIO Card



Replacing the Core I/O Board Battery

To replace the core I/O board battery, follow these steps:

1. Insert the replacement battery into the socket.

> **NOTE:** The positive terminal of the battery is designated by a **+** sign. Install the battery with the **+** sign facing up.

2. Replace the core I/O board. See “Replacing the Core I/O Board” (page 112).
3. Replace the top cover. See “Replacing the Top Cover” (page 56).
4. If rack installed, slide the server completely into the rack. See “Inserting the Server into the Rack” (page 54).
5. Reconnect the power cables and power on the server. See “Powering On the Server” (page 48).
6. Restore the iLO 2 MP configuration settings using the server console. For additional information about using the iLO 2 MP, see the *HP Integrity iLO 2 MP Operations Guide*.

Removing and Replacing the SAS Core I/O Card

The SAS core I/O card connects to the SAS disk backplane and controls internal data storage operations for the server. There are four types of SAS core I/O cards supported on the server:

- A half length generic SAS card (PCI-X)
- A full length SAS card with RAID capability (PCI-X or PCI-E)
- Full length SAS card with RAID capability able to connect to external storage (PCI-E)

The server ships standard with two SAS backplane boards. Slots 1 and 2 are dedicated for the PCI-X core I/O cards. The LAN core I/O card is installed either in slot 2 or slot 10 depending on the configuration. PCI-E SAS core I/O cards are installed in slots 3 or 4 on the PCI-E I/O backplane.

CAUTION: PCI/PCI-X slots 1 and 2 are dedicated for use by core I/O cards. Do not place any other PCI/PCI-X expansion cards in slots 1 and 2. Slots 1 and 2 are not hot-plug capable.

IMPORTANT: The number of SAS core I/O cards determines the SAS configuration. The SAS configuration affects the location of the LAN core I/O card. In a single SAS core I/O card configuration, the secondary set of SAS cables connect to the secondary SAS backplane, but are routed and lay loose in the server I/O backplane area.

Table 4-8 lists the SAS core I/O card locations and SAS configurations.

Table 4-8 SAS Core I/O Card Locations and SAS Configurations

SAS Core I/O Cards	SAS Core I/O Card Location	LAN Core I/O Card Location
1	Slot 1	Slot 2
2	Slot 2	Slot 10
2	Slots 1 and 3	Slot 2
1	Slot 3	Slot 2
2	Slots 3 and 4	Slot 2

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the SAS Core I/O Card

NOTE: You may need to remove the LAN core I/O card to access the SAS core I/O card.

To remove the SAS core I/O card, follow these steps:

1. Power off the server and disconnect the power cables. See “Powering Off the Server” (page 48).
2. If rack installed, slide the server completely out from the rack. See “Extending the Server from the Rack” (page 54).

3. Remove the top cover. See "Removing the Top Cover" (page 55).

> **CAUTION:** When disconnecting the SAS cables, note the labeling on the cables. Both cables and sockets are clearly marked with the correct channel. When reconnecting these cables, match each cable with the appropriate socket on the SAS core I/O card. If the cables are mismatched, the server will not reboot.

4. Disconnect the internal SAS cables attached to the card.
5. Remove the slotted T15 screw that attaches the card bulkhead to the chassis; use a T15 screwdriver to turn the screw counterclockwise until it is free from the chassis.
6. SAS RAID card only. Pull the gate latch toward the front of the chassis to unlock the SAS core I/O card.
7. Grasp the card by the edges and lift it out of the chassis.

Replacing the SAS Core I/O Card

To replace the SAS core I/O card, follow these steps:

1. Insert the replacement card into the dedicated SAS core I/O card slot.
   a. Insert the tab at the base of the card bulkhead into the slot in the chassis.
   b. Align the card connectors with the slots on the I/O board.
   c. Apply firm, even pressure to both sides of the card until it fully seats into the slot.
2. SAS RAID card only. Close the gate latch to secure the end of the card.
3. Replace the slotted T15 screw that attaches the card bulkhead to the chassis; use a T15 screwdriver to turn the screw clockwise until it tightens to the chassis.

> **CAUTION:** When reconnecting the SAS cables, note the labeling on the channel cables. Both cables and sockets are clearly marked with the correct channel. Match each cable with the appropriate socket on the SAS core I/O card. If the cables are mismatched, the server will not reboot.

4. Reconnect the internal SAS cables to the card.
5. Replace the top cover. See "Replacing the Top Cover" (page 56).
6. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
7. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

Removing and Replacing the LAN Core I/O Card

The LAN core I/O card enables network connectivity for the server. The dedicated slot for the LAN core I/O card is slot 2 unless there are two PCI-X SAS core I/O cards installed. In this case, the dedicated slot for the LAN core I/O card is slot 10.

IMPORTANT: The number of SAS core I/O cards determines the SAS configuration. The SAS configuration affects the location of the LAN core I/O card.

Table 4-8 (page 115) lists the LAN core I/O card location based on the number of installed SAS core I/O cards.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: PCI/PCI-X slots 1 and 2 are dedicated for use by core I/O cards. Do not place any other PCI/PCI-X expansion cards in slots 1 and 2. Slots 1 and 2 are not hot-plug capable.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the LAN Core I/O Card

To remove the LAN core I/O card, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. Disconnect all external cables attached to the card.
3. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
4. Remove the top cover. See "Removing the Top Cover" (page 55).
5. Remove the slotted T15 screw that attaches the card bulkhead to the chassis; use a T15 screwdriver to turn the screw counterclockwise until it is free from the chassis.
6. Grasp the card by the edges and lift it out of the chassis.

Replacing the LAN Core I/O Card

To replace the LAN core I/O card, follow these steps:

1. Insert the replacement card into the dedicated LAN core I/O slot.
    a. Insert the tab at the base of the card bulkhead into the slot in the chassis.
    b. Align the card connectors with the slots on the I/O board.
    c. Apply firm, even pressure to both sides of the card until it fully seats into the slot.
2. Replace the slotted T15 screw that attaches the card bulkhead to the chassis; use a T15 screwdriver to turn the screw clockwise until it tightens to the chassis.
3. Replace the top cover. See "Replacing the Top Cover" (page 56).
4. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
5. Reconnect all external cables to the card.
6. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).

Removing and Replacing the Display Board

The display board is a combination board that supports the following server components:

- Power switch and status LEDs
- DVD drive
- Front panel USB port
- Diagnostic panel

The display board attaches to an interconnect board that functions as a link between the midplane board and the display board.

The display board contains the power switch and the following status LEDs:

- Power LED
- System health LED
- Internal health LED
- External health LED
- Locator LED

For more detailed information about front panel LED behavior, see Chapter 5: “Troubleshooting” (page 131).

The display board includes a USB connector that supports USB 2.0 (480 Mbps).

The diagnostic panel provides failure identification for each component that has a detectable error associated with it. For more information on the diagnostic panel LEDs, see Chapter 5: “Troubleshooting” (page 131).

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the Display Board

To remove the display board, follow these steps:

1. Power off the server and disconnect the power cables. See “Powering Off the Server” (page 48).
2. If rack installed, slide the server completely out from the rack. See “Extending the Server from the Rack” (page 54).
3. Remove the top cover. See “Removing the Top Cover” (page 55).
4. Remove the air baffle.
5. Disconnect the USB cable from the connector on the display board.

NOTE: The USB cable connector is an RJ45 connector; it is not a typical USB connector.

6. Remove the DVD drive. See “Removing the DVD Drive” (page 77).
7. Locate the knurled thumbscrew behind the DVD drive that holds the display board in place.
8. Turn the thumbscrew counterclockwise until the board releases from the chassis.

9. Remove the top two screws from the right side of the bezel. Pull the bezel out from the chassis approximately one half inch so that the display board can clear the locator and power buttons.

CAUTION: Do not pull the bezel out from the chassis more than one half inch. Do not use the USB connector as a handle to remove the display board. Failure to observe these cautions can result in damage to server components.

10. Hold the bezel out from the chassis, and use the diagnostic panel light guide as a handle to simultaneously push the board to the left to unplug it from the socket on the interconnect board.
11. Slide the board toward the rear of the chassis until it stops against the guide pins.

NOTE: Use the guide pins on the chassis and the L-shaped keyways on the display board to help you with the display board removal procedure.

12. Tilt the board toward the front of the chassis, and lift it out at an angle.
13. Remove the diagnostic panel light guide by squeezing the plastic tabs until they disengage from the slots on the board.

IMPORTANT: Do not discard the diagnostic panel light guide. You must install it onto the replacement display board.

Figure 4-30 Display Board Location

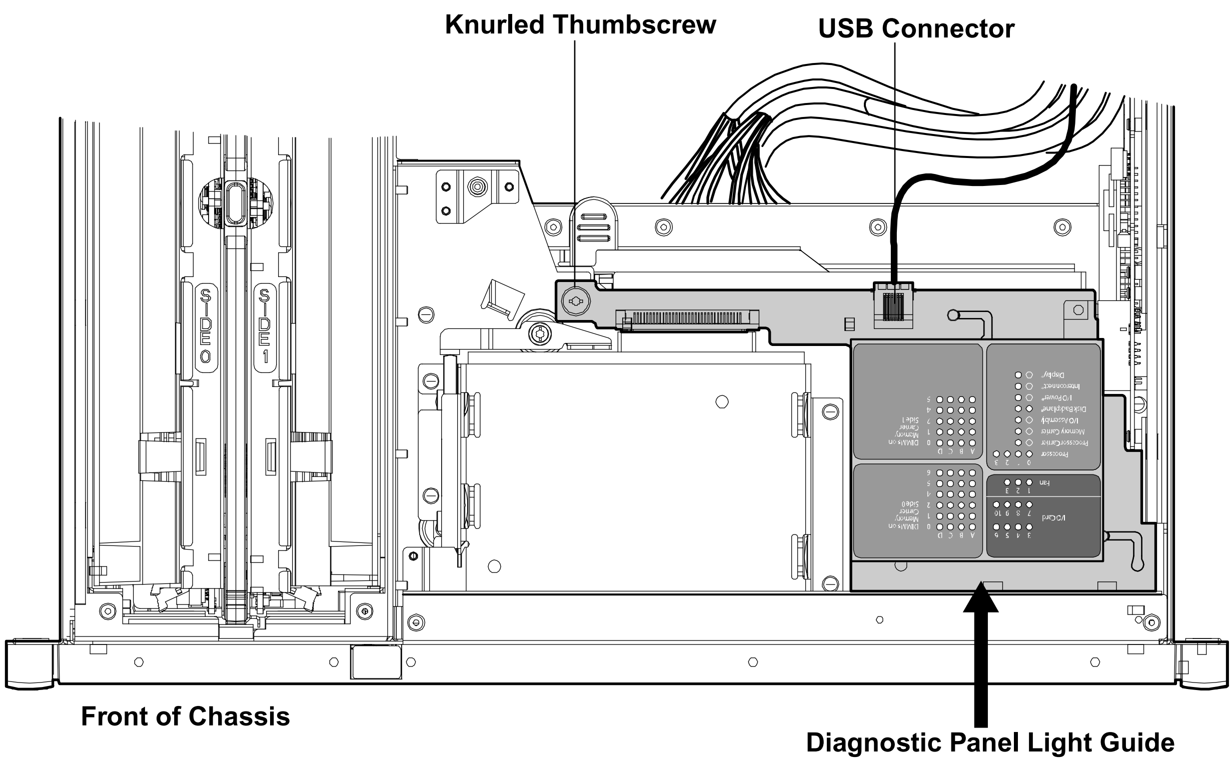
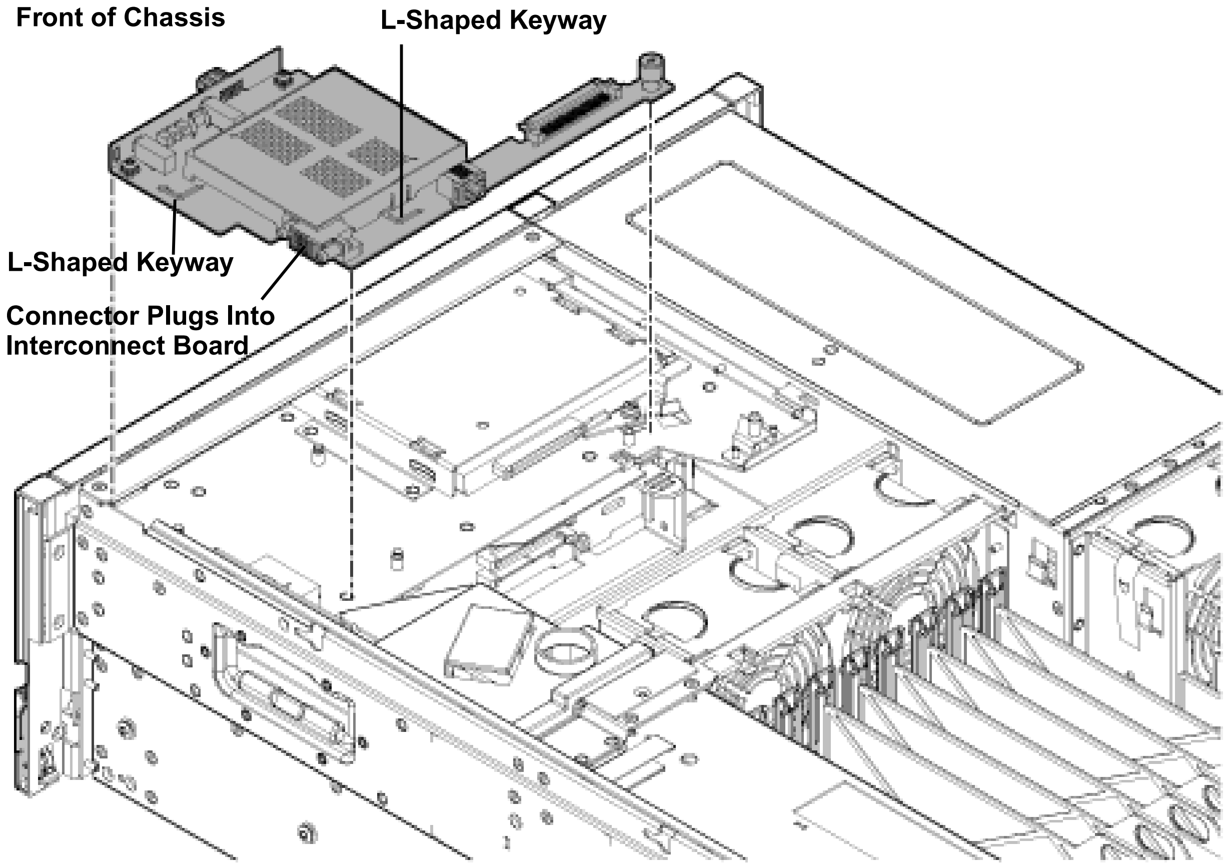


Figure 4-31 Display Board Removal and Replacement



Replacing the Display Board

To replace the display board, follow these steps:

NOTE: Use the guide pins on the chassis and the L-shaped keyways on the display board to help you with the display board replacement procedures.

1. Remove the diagnostic panel light guide protective cover from the replacement display board.

CAUTION: Do not use the USB connector as a handle to replace the display board. Failure to observe this warning can result in damage to server components.

2. Place the display board onto the guide pins.
3. Use the diagnostic panel light guide as a handle to push the board toward the front of the chassis until it fully seats against the front of the chassis.
4. Remove the top two screws from the right side of the bezel. Pull the bezel out from the chassis approximately one half inch so that the display board can clear the locator and power buttons.

CAUTION: Do not pull the bezel out from the chassis more than one half inch. Failure to observe this warning can result in damage to server components.

5. Hold the bezel out from the chassis, and simultaneously push the board to the right to plug it into the socket on the interconnect board.
6. Locate the knurled thumbscrew behind the DVD drive that holds the display board in place. Turn the screw clockwise until the board is secured into place.

7. Install the diagnostic panel light guide.
   a. Align the diagnostic panel light guide tabs with the slots on the display board.
   b. Push down firmly on the light guide until it seats onto the board.
8. Replace the top two right-side bezel screws.
9. Replace the DVD drive. See “Replacing the DVD Drive” (page 78).
10. Reconnect the USB cable into the connector on the display board.
11. Replace the air baffle.
12. Replace the top cover. See “Replacing the Top Cover” (page 56).
13. If rack installed, slide the server completely into the rack. See “Inserting the Server into the Rack” (page 54).
14. Reconnect the power cables and power on the server. See “Powering On the Server” (page 48).

Removing and Replacing the SAS Backplane Board

Serial-attached SCSI (SAS) is a new, faster version of the industry standard SCSI technology. Although SCSI is a proven technology, its parallel data communication model restricts it from providing the speed and scalability required for modern data transfer and storage. In a parallel data communication environment, multiple devices share one bus; all data travels over the same cable and through the same port.

SAS provides serial, or point-to-point, data transfer. A point-to-point architecture means that each device has its own private bus, cable, and port. This architecture improves the reliability and availability of data, and greatly enhances data transfer rates. Current data transfer rates are 3 Gb/s. Additional features of the SAS technology include:

- Full-duplex capability (all data reads and writes occur simultaneously)
- Automatic device discovery and configuration (each device is assigned a unique SAS address)
- Thin cables and small connectors (assists with cooling and ease cable management issues)
- Increased scalability (expanders enable support for thousands of SAS devices)

The server ships standard with two SAS backplane boards. The primary SAS backplane board connects to the primary SAS core I/O card in slot 1. If there are two SAS core I/O cards, the secondary SAS backplane board connects to the secondary SAS core I/O card.

IMPORTANT: The number of SAS core I/O cards determines the SAS configuration. In a single SAS core I/O card configuration, the secondary set of SAS cables connect to the secondary SAS backplane, but are routed and lay loose in the server I/O backplane area.

Table 4-9 lists the SAS configurations.

Table 4-9 SAS Configurations

SAS Core I/O Cards	SAS Core I/O Card Location	SAS Backplane Boards	SAS Cables Shipped	SAS Cables Connected
1	Slot 1	2	4	2
2	Slot 2	2	4	4

The SAS backplane boards attach to an interconnect board that functions as a link between the midplane board and the SAS backplane boards.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the SAS Backplane Board

To remove the SAS backplane board, follow these steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
3. Remove the top cover. See "Removing the Top Cover" (page 55).
4. Remove the air baffle.
5. Slide the SAS drives and fillers approximately two inches out of the drive bays. See "Removing a Hot-Pluggable Disk Drive" (page 65).
6. Disconnect the SAS cables from the connectors on the SAS backplane board.

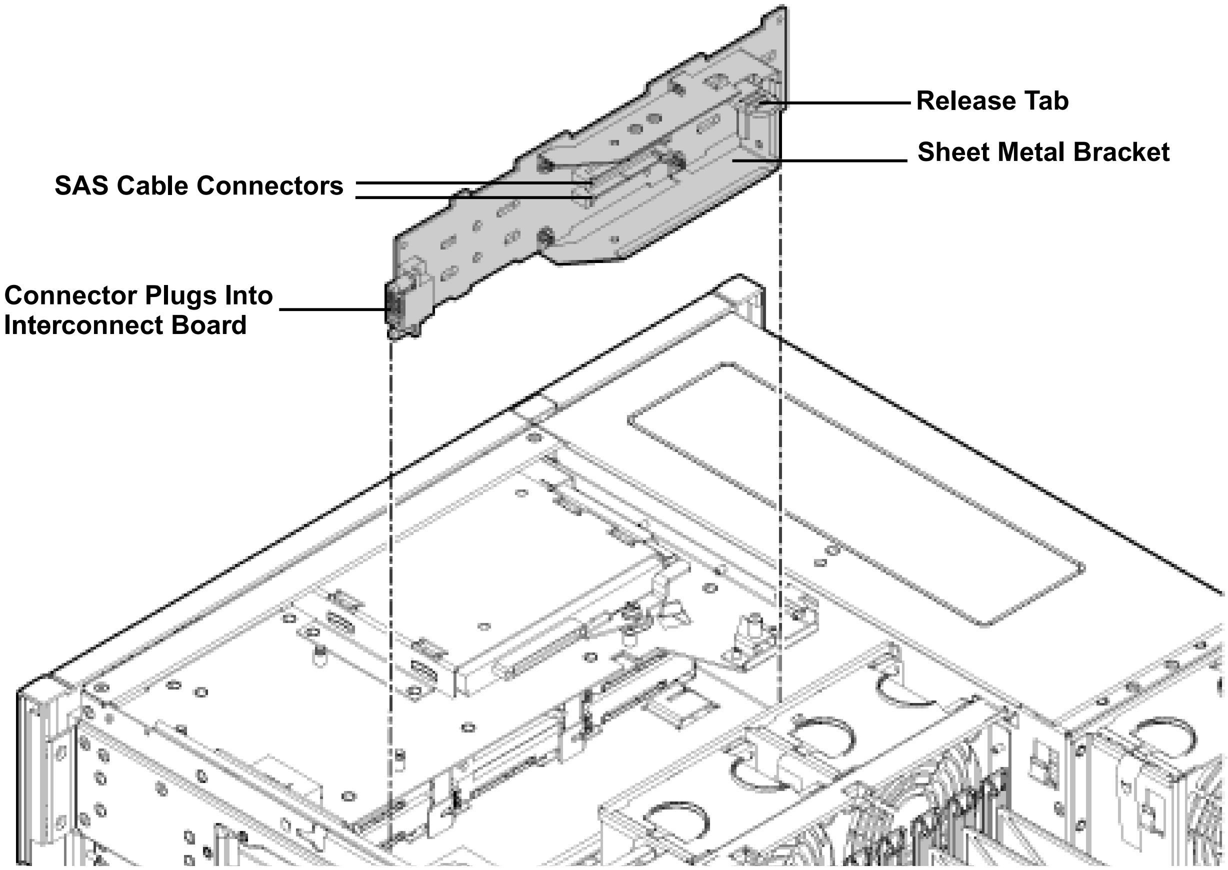
   CAUTION: When disconnecting the SAS cables, note the labeling on the cables. Both cables and sockets are clearly marked with the correct channel. When reconnecting these cables, match each cable with the appropriate socket on the SAS backplane board. If the cables are mismatched, the server will not function correctly.

7. Remove the interconnect board air baffle. See "Removing the Interconnect Board" (page 124).
8. Push down on the release lever to disengage the SAS backplane board from the chassis.

   CAUTION: Do not use the release lever as a handle to remove the SAS backplane board. Failure to observe this caution can result in damage to the release lever and the SAS backplane board.

9. Use the sheet metal bracket that surrounds the SAS backplane board as a handle and slide the board to the left to unplug it from the socket on the interconnect board.
10. Pull the board straight back toward the rear of the chassis, and lift the board out of the chassis.

Figure 4-32 SAS Backplane Board Removal and Replacement



Replacing the SAS Backplane Board

To replace the SAS backplane board, follow these steps:

1. Hold the SAS backplane board by the sheet metal bracket and guide it toward the front of the chassis until the four keyway slots on the board seat onto the locking studs.
2. Push the board to the right to plug it into the socket on the interconnect board. The release lever locks into place when the board is fully seated.
3. Replace the interconnect board air baffle. See “Replacing the Interconnect Board” (page 125).
4. Reconnect the SAS cables into the connectors on the SAS backplane board.

CAUTION: When reconnecting the SAS cables, note the labeling on the channel cables. Both cables and sockets are clearly marked with the correct channel. Match each cable with the appropriate socket on the SAS backplane board. If the cables are mismatched the server will not function correctly.

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5. Replace the SAS disk drives. See “Replacing a Hot-Pluggable Disk Drive” (page 67).
6. Replace the air baffle.
7. Replace the top cover. See “Replacing the Top Cover” (page 56).
8. If rack installed, slide the server completely into the rack. See “Inserting the Server into the Rack” (page 54).
9. Reconnect the power cables and power on the server. See “Powering On the Server” (page 48).

Removing and Replacing the Interconnect Board

The interconnect board attaches the midplane board to the display board and the SAS backplane board.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

IMPORTANT: System information is stored on the interconnect board. You must write serial number and model string information to the new interconnect board after installation.

Removing the Interconnect Board

To remove the interconnect board, follow these steps:

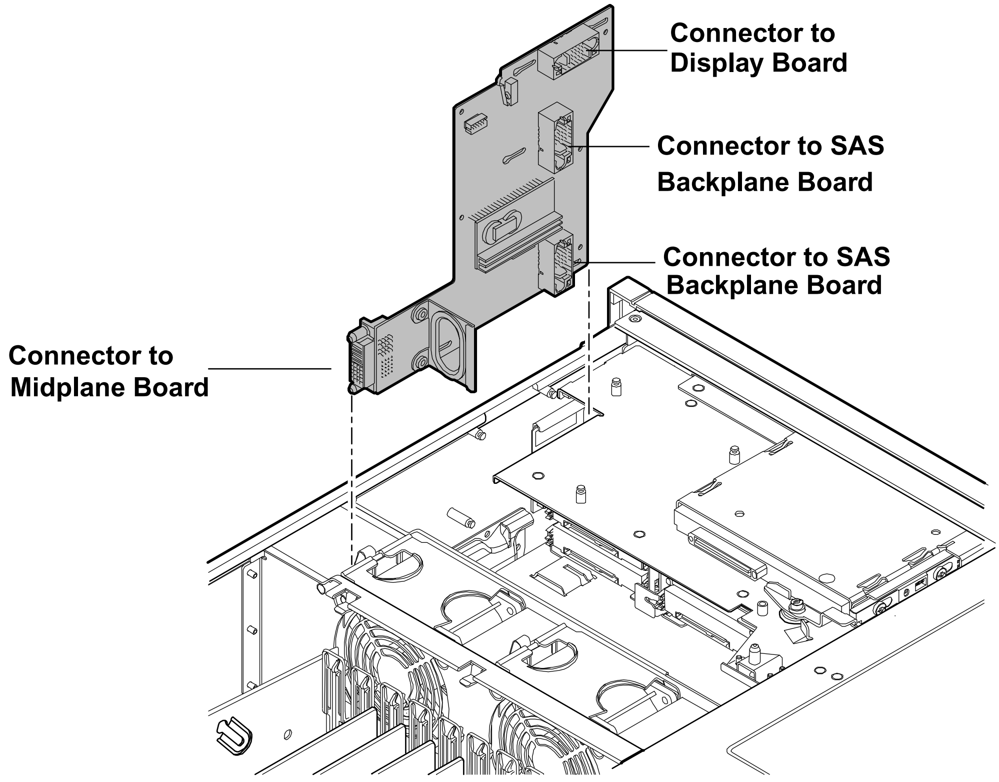
NOTE: Use the guide posts located on the chassis and the keyways located on the interconnect board to help you with the interconnect board removal and replacement procedures.

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
3. Remove the top cover. See "Removing the Top Cover" (page 55).
4. Remove the air baffle.
5. Disconnect the USB cable from the connector on the display board.
6. Remove the DVD drive. See "Removing the DVD Drive" (page 77).
7. Remove the display board. See "Removing the Display Board" (page 118).
8. Slide the SAS drives and fillers approximately two inches out of the drive bays. See "Removing a Hot-Pluggable Disk Drive" (page 65).

   CAUTION: When disconnecting the SAS cables, note the labeling on the cables. Both cables and sockets are clearly marked with the correct channel. When reconnecting these cables, you must match each cable with the appropriate socket on the SAS core I/O card. If the cables are mismatched, the server will not reboot.

9. Disconnect the SAS data and power cables from the connectors on the SAS backplanes.
10. Remove the interconnect board air baffle.
    a. Insert your finger into the opening on the interconnect board air baffle and pull upward to release the air baffle from the chassis.
    b. Lift the air baffle out of the chassis at an angle.
11. Remove the lower SAS backplane. See "Removing the SAS Backplane Board" (page 122).
12. Remove the upper SAS backplane. See "Removing the SAS Backplane Board" (page 122).
13. Insert your fingers into the handle on the interconnect board and push the board toward the front of the chassis to unplug it from the socket on the midplane board.
14. Lift the interconnect board out of the chassis.

Figure 4-33 Interconnect Board Removal and Replacement



Replacing the Interconnect Board

To replace the interconnect board, follow these steps:

CAUTION: Handle the interconnect board carefully, or you can damage the plastic insulator material on the back of the board.

NOTE: Use the guide posts located on the chassis and keyways located on the interconnect board to help you with the interconnect board removal and replacement procedures.

---

1. Place the interconnect board onto the guide posts.
2. Insert your fingers into the board handle and push the board toward the rear of the chassis until it plugs into the socket on the midplane board.
3. Replace the lower SAS backplane. See "Replacing the SAS Backplane Board" (page 123).
4. Replace the upper SAS backplane. See "Replacing the SAS Backplane Board" (page 123).
5. Guide the interconnect board air baffle into the chassis and snap it into place.

CAUTION: When reconnecting the SAS cables, note the labeling on the channel cables. Both cables and sockets are clearly marked with the correct channel. Match each cable with the appropriate socket on the SAS core I/O card. If the cables are mismatched, the server will not reboot.

---

6. Reconnect the SAS data and power cables into the connectors on the SAS backplanes.
7. Replace the display board. See "Replacing the Display Board" (page 120).
8. Replace the SAS disk drives. See "Replacing a Hot-Pluggable Disk Drive" (page 67).
9. Replace the DVD drive. See "Replacing the DVD Drive" (page 78).
10. Reconnect the USB cable into the connector on the display board.
11. Replace the air baffle.

12. Replace the top cover. See "Replacing the Top Cover" (page 56).
13. If rack installed, slide the server completely into the rack. See "Inserting the Server into the Rack" (page 54).
14. Reconnect the power cables and power on the server. See "Powering On the Server" (page 48).
15. Respond **`YES`** to prompts regarding copying information onto the new board.

IMPORTANT: Serial number and model string data information is stored on both the interconnect board and the I/O board. When you install a new interconnect board, you must copy this information from the I/O board to the new interconnect board.

---

16. Verify the serial number and model string data information copied onto the new interconnect board.
    a. Boot to EFI.
    b. Enter **service** mode:

    ```
    Shell> sysmode service
    Current System Mode: ADMIN
    You are now in SERVICE mode.
    ```

    c. Use the `sysset` command to verify that all values are set:

    ```
    Shell> sysset

    System Information:
    Manufacturer: hp
    Product Name: server rx6600
    Product Number: AB464A
    Secondary Product Number is Identical
    Serial number: SGH43442VB
    Secondary Serial Number is Identical
    UUID: 3C33C58E-2E5A-11D8-A33B-4188C0AEFAE2 (Valid)
    Secondary UUID is Identical
    Product ID: 0x301
    ```

Removing and Replacing the Midplane Board

The midplane board is attached to the main bulkhead in the center of the chassis. It provides a connection between the power supplies, the I/O board assembly, and the processor board assembly.

WARNING! Ensure that the system is powered off and all power sources have been disconnected from the server prior to performing this procedure.

Voltages are present at various locations within the server whenever an ac power source is connected. This voltage is present even when the main power switch is in the off position.

Failure to observe this warning can result in personal injury or damage to equipment.

CAUTION: Observe all ESD safety precautions before attempting this procedure. Failure to follow ESD safety precautions can result in damage to the server.

Removing the Midplane Board

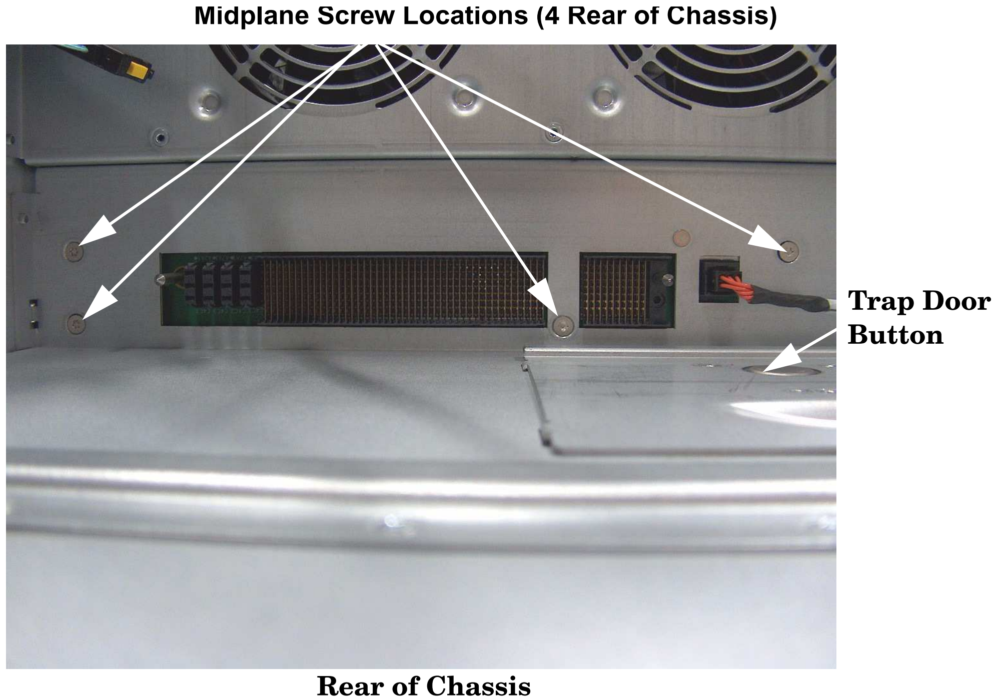
To remove the midplane board, perform the following steps:

1. Power off the server and disconnect the power cables. See "Powering Off the Server" (page 48).
2. If rack installed, slide the server completely out from the rack. See "Extending the Server from the Rack" (page 54).
3. Remove the top cover. See "Removing and Replacing the Top Cover" (page 55).
4. Remove the memory carrier assembly cover. See "Removing the Memory Carrier Assembly Cover" (page 57).
5. Remove the memory carrier assembly. See "Removing the Memory Carrier Assembly" (page 79).
6. Remove the processor board assembly. See "Removing the Processor Board Assembly" (page 91).
7. Unplug the USB cable from the connector on the display board.
8. Remove the DVD drive. See "Removing the DVD Drive" (page 77).
9. Remove the display board. See "Removing the Display Board" (page 118).
10. Slide the SAS drives and fillers approximately two inches out of the drive bays. See "Removing a Hot-Pluggable Disk Drive" (page 65).

CAUTION: When disconnecting the SAS cables, note the labeling on the cables. Both cables and sockets are clearly marked with the correct channel. When reconnecting these cables, match each cable with the appropriate socket on the SAS core I/O card. If the cables are mismatched, your server will not boot the OS.

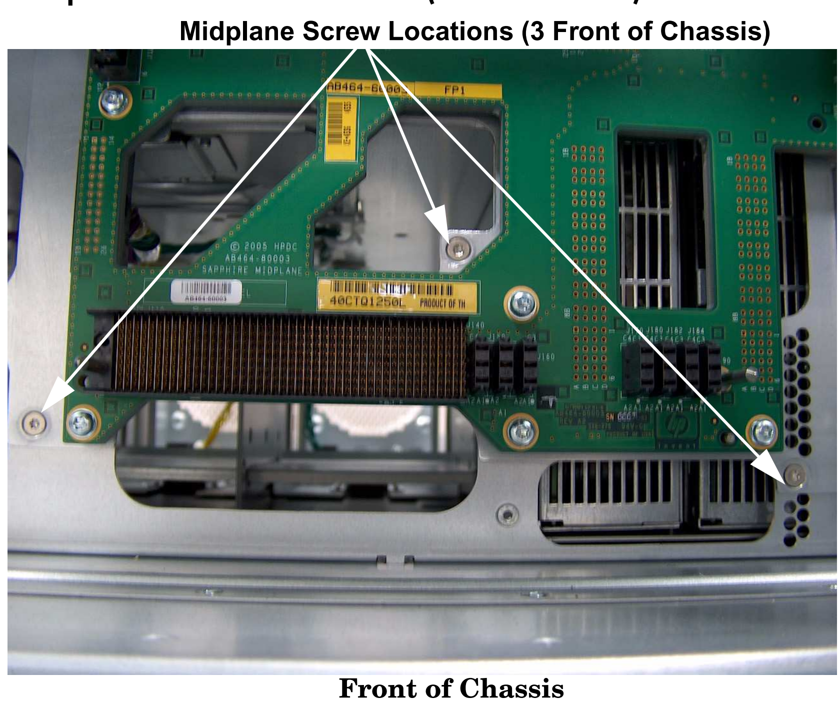
11. Unplug the SAS data and power cables from the connectors on the SAS backplane boards.
12. Remove the upper SAS backplane board. See "Removing the SAS Backplane Board" (page 122).
13. Remove the lower SAS backplane board. See "Removing the SAS Backplane Board" (page 122).
14. Remove the interconnect board. See "Removing the Interconnect Board" (page 124).
15. Remove the I/O board assembly. See "Removing the I/O Board Assembly" (page 100).
16. Remove the power supplies. See "Removing a Hot-Swappable Power Supply" (page 62).
17. Disconnect the fan cables from the fan 1 and fan 2/3 housing units.
    a. Disconnect fan 1 cable connector.
    b. Disconnect the fan 2/fan 3 cable connector.
18. Open the trap door by pressing down on the button and sliding trap door toward the rear of the server. (Figure 4-35).
19. Disconnect external fan cables.
20. Swing the hinged CPU panel up to expose the midplane screws.
21. Use a Torx 10 screwdriver to remove the three Torx screws attaching the midplane board to the sheet metal bracket through the front of the chassis (Figure 4-34).

Figure 4-34 Midplane Board Screw Location (Rear of Chassis)



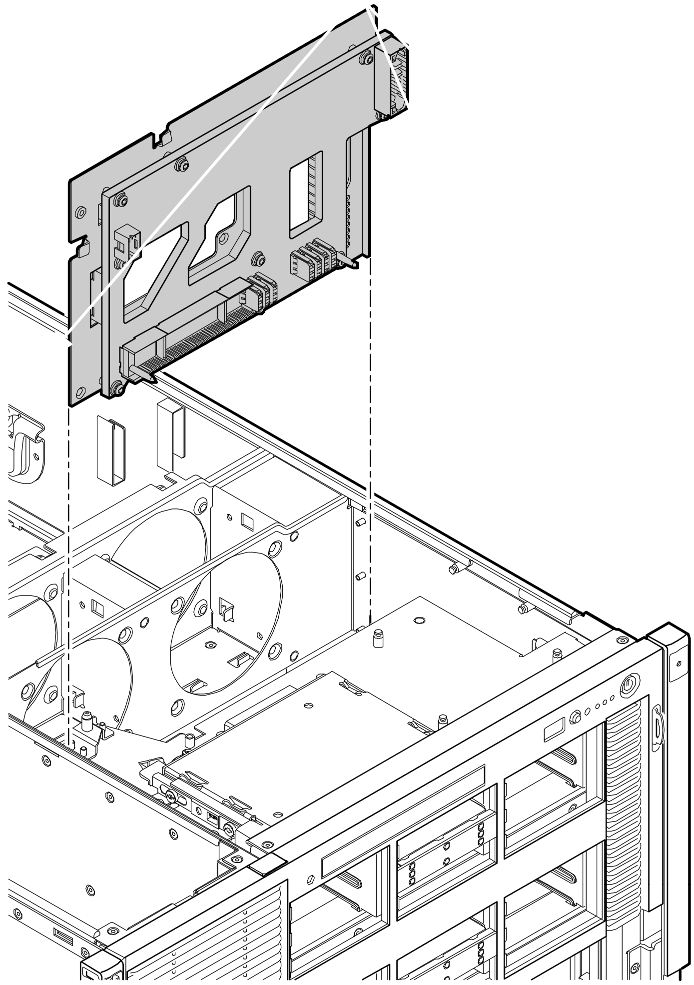
22. Use a Torx 10 screwdriver to remove the four Torx screws attaching the midplane board to the sheet metal bracket through the rear of the chassis (Figure 4-35).

Figure 4-35 Midplane Board Screw Location (Front of Chassis)



23. Grasp the top edge of the midplane board and lift straight up to release it from the guide pins on the chassis; and pull straight out and up to remove the midplane board from the chassis.

Figure 4-36 Midplane Board



Replacing the Midplane Board

To replace the midplane board, perform these steps:

1. Place the midplane board onto the guide pins on the chassis wall. Push straight down until it seats onto the locking studs.
2. Use a Torx 10 screwdriver to replace and tighten the four Torx screws attaching the midplane board to the sheet metal bracket through the rear of the chassis (Figure 4-34).
3. Swing the hinged CPU panel up to expose the midplane screw holes. Use a Torx 10 screwdriver to replace and tighten the three Torx screws attaching the midplane board to the sheet metal bracket through the front of the chassis (Figure 4-35).
4. Reconnect the fan cables into the fan 1 and fan 2 housing units.
   a. Guide the cable connector up through the opening in the fan housing.
   b. Push the cable connector toward the front of the chassis until the connector tabs seat into place.
5. Replace the trap door and slide it toward the front of the server.
6. Replace the power supplies. See “Replacing a Hot-Swappable Power Supply” (page 63).
7. Replace the I/O board assembly. See “Replacing the I/O Board Assembly” (page 102).
8. Replace the interconnect board. See “Replacing the Interconnect Board” (page 125).
9. Replace the lower SAS backplane board. See “Replacing the SAS Backplane Board” (page 123).

10. Replace the upper SAS backplane board. See “Replacing the SAS Backplane Board” (page 123).

CAUTION: When reconnecting the SAS cables, note the labeling on the channel cables. Both cables and sockets are clearly marked with the correct channel. Match each cable with the appropriate socket on the SAS core I/O card. If the cables are mismatched your server will not boot the OS.

11. Plug the SAS data and power cables into the connectors on the SAS backplane boards.
12. Replace the SAS disk drives. See “Replacing a Hot-Pluggable Disk Drive” (page 67).
13. Replace the display board. See “Replacing the Display Board” (page 120).
14. Replace the DVD drive. See “Replacing the DVD Drive” (page 78).
15. Plug the USB cable into the connector on the display board.
16. Replace the processor board assembly. See “Replacing the Processor Board Assembly” (page 92).
17. Replace the memory carrier assembly. See “Replacing the Memory Carrier Assembly” (page 81).
18. Replace the memory carrier assembly cover. See “Replacing the Memory Carrier Assembly Cover” (page 57).
19. Replace the top cover. See “Replacing the Top Cover” (page 56).
20. If rack installed, slide the server completely into the rack. See “Inserting the Server into the Rack” (page 54).
21. Reconnect the power cables and power on the server. See “Powering On the Server” (page 48).

5 Troubleshooting

This chapter provides strategies, procedures, and tools for troubleshooting server error and fault conditions.

This chapter addresses the following topics:

Methodology

General Troubleshooting Methodology

There are multiple entry points to the troubleshooting process, dependent upon your level of troubleshooting expertise, the tools/processes/procedures which you have at your disposal, and the nature of the system fault or failure.

Typically, you select from a set of symptoms, ranging from very simple (System LED is blinking) to the most difficult (Machine Check Abort, for example, MCA, has occurred). The following is a list of symptom examples:

- Front Panel LED blinking
- System Alert present on console
- System won't power-up
- System won't boot
- Error/Event Message received
- Machine Check Abort (MCA) occurred

Next, you narrow down the observed problem to the specific troubleshooting procedure required. Here, you isolate the failure to a specific part of the server, so that you can perform more detailed troubleshooting. For example:

- Problem- Front Panel LED blinking

NOTE: The Front Panel Health LEDs will be flashing amber with a warning indication, or flashing red with a fault indication.

— System Alert on console?
— Analyze the alert by using the system event log (SEL), to identify the last error logged by the server. Use the iLO 2 MP commands to view the SEL, using either the iLO 2 MP's serial text interface, or telnet, SSH, or Web GUI on the iLO 2 MP LAN.

At this point, you will have a good idea about which area of the system requires further analysis. For example, if the symptom was "system won't power-up", the initial troubleshooting procedure may have indicated a problem with the dc power rail not coming up after the power switch was turned on.

You have now reached the point where the failed Field Replaceable Unit (FRU or FRUs) has been identified and needs to be replaced. You must now perform the specific removal and replacement procedure, and verification steps. See Chapter 4: "Removal and Replacement" (page 51) for information.

NOTE: If multiple FRUs are identified as part of the solution, a fix cannot be guaranteed unless all identified failed FRUs are replaced.

There may be specific recovery procedures you need to perform to finish the repair. For example, if the core I/O board FRU is replaced, you will need to restore customer specific information.

Should a failure occur, the front panel LEDs, the diagnostic panel LEDs, and the system event log (SEL) will help you identify the problem or FRU:

- LEDs. The front panel LEDs and LAN LEDs of the server change color and blink to help identify specific problems.
- The System Event Log (SEL) provides detailed information about the errors identified by the LEDs.

For system alerts of levels 3-5, the attention condition on the system LED can be cleared by accessing the logs using the `sl`command, available in the MP Main Menu. To access the iLO 2 MP from the console serial port, enter**CTRL-B** or **ESC-(** .

If the LEDs and SEL do not give you enough information for you to identify the problem you are experiencing, HP also provides diagnostic tools with each operating system. See "Troubleshooting Tools" (page 139) for information.

NOTE: Always check the iLO 2 MP system event logs (SEL) in the case of a blinking yellow or red front panel LED, before replacing any hardware.

Recommended Troubleshooting Methodology

The recommended methodology for troubleshooting a server error or fault is as follows:

1. Consult the system console for any messages or emails pertaining to a server error or fault.
2. View the front panel LEDs (Power, External Health, Internal Health, and System Health), either locally, or remotely using the iLO 2 MP `vfp` command.
3. Compare the state of the server's LEDs (for example, Off; Flashing or Steady; Red, Green, or Amber) with the LED states listed in Table 5-2.
4. Go to the step number of Table 5-3, as specified in the rightmost column of Table 5-2, located in the row which corresponds to your front panel LED display state.
5. Read the symptom/condition information in the leftmost column of the Table 5-3.

6. Perform the action(s) specified in the **Action** column.
7. If more information is required, see the appropriate subsection of this chapter, where this information is provided in the **Action** column. The **Action** you are directed to perform may be to access and read one or more error logs, such the event log or forward progress log.

While we do suggest that you follow the recommended troubleshooting methodology, and use the troubleshooting information in this guide, you may elect to go directly to the information which corresponds to your own entry point of choice.

Table 5-1 provides the corresponding subsection or location title for these different entry points. For example, if you prefer to start by examining the logs, you can go directly to "Errors and Reading Error Logs" (page 146).

Table 5-1 Troubleshooting Entry Points

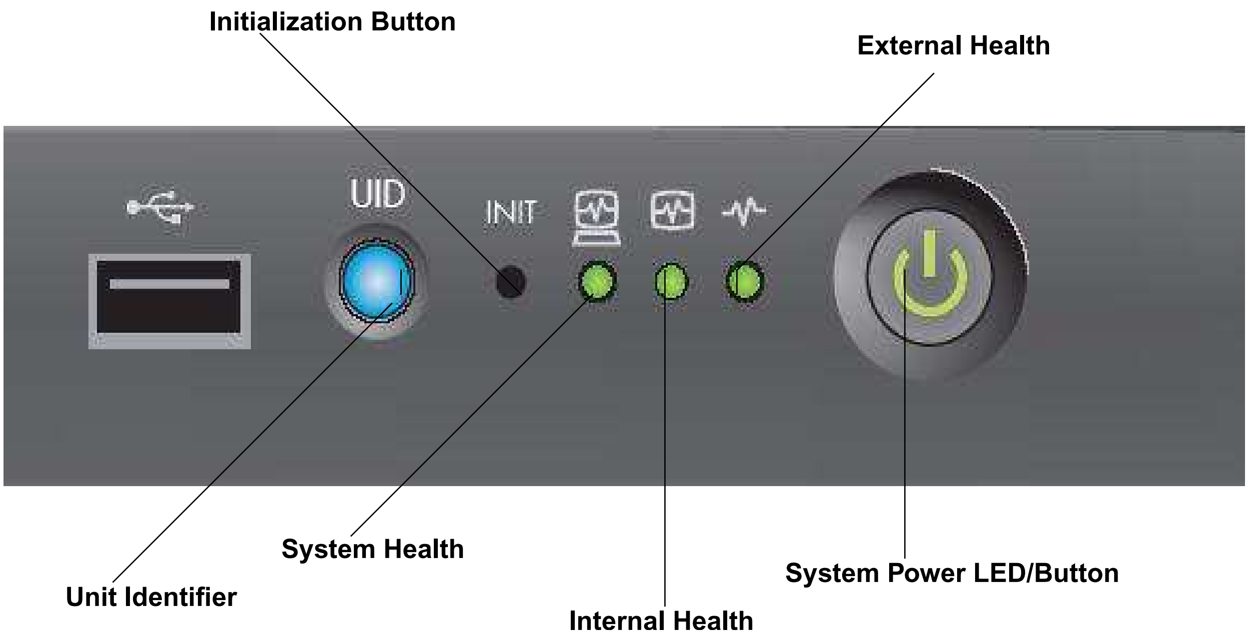
Entry Point	Subsection or Location
Front panel/Diagnostic panel LEDs	"Basic and Advanced Troubleshooting Tables" (page 133) and "Troubleshooting Tools" (page 139)
System Event Log and Forward Progress Logs	"Errors and Reading Error Logs" (page 146)
Offline and Online Diagnostics/INIT button	"Troubleshooting Tools" (page 139)
MCA Analysis	Appendix C (page 193)
System Event Analyzer (SEA)	"Troubleshooting Tools" (page 139) (see also `http://h18023.ww1.hp.com/support/svctools/webes` for more information about this tool)

Basic and Advanced Troubleshooting Tables

The following troubleshooting tables are designed for use by both trained and untrained support personnel. They should be the first tool used to determine the symptom(s) or condition of a suspect server. Be aware that the state of the front panel LEDs can be viewed locally, or remotely (using the `vfp` command from the iLO 2 MP).

The tables are designed to cover troubleshooting symptoms from ac power-on up to booting the operating system (OS), specifically in Steps 1-5. In most cases, Table 5-2: "Front Panel LED States" (page 134) identifies the step number where troubleshooting should begin in the Table 5-3: "Basic Entry Class Troubleshooting" (page 135). Alternatively, you can skip the Table 5-2, and start with Step 1 in Table 5-3, sequencing through the table steps to locate the symptom/condition most descriptive of your current server status; this will become the first step in your troubleshooting procedure. Where appropriate, an action or actions prescribed in the **Action** column of Table 5-3 is followed by a reference to the corresponding subsection of this chapter for further information.

Figure 5-1 Front Panel LEDs



NOTE: In Table 5-2, the Unit Identifier (UID)/Locator LED has not been included, because it is not used directly for troubleshooting rx6600 servers. However, indirectly, it can provide useful system information; for example, when it is blue, this is an indication that the BMC is working.

Similarly, the INIT Button, which is a momentary switch with pinhole access, that is used to cause a system INIT or Transfer of Control (TOC), is not discussed in the following tables either. It basically is like a system reset, preserving the entire memory image, so that you can obtain a crash dump and receive OS error information. This button can be used to recover a hung system, and to obtain information useful for debugging -- it is less harsh than a power reset.

NOTE: In Table 5-2, LED states indicating error conditions are provided in bold, italic, uppercase (for example, **FLASHING AMBER**).

Table 5-2 displays the front panel LED states.

Table 5-2 Front Panel LED States

System Health	Internal Health	External Health	System Power	Basic Entry Class Troubleshooting Table Step Number
Off	Off	Off	Off	1 in Table 5-3
Off	Off	Off	**STEADY AMBER**	2a in Table 5-3
FLASHING AMBER OR RED	Off or Steady Green	***FLASHING AMBER***	Steady Green	2b/2c in Table 5-3
Off	**FLASHING AMBER**	Steady Green	Steady Green	8b in Table 5-4
FLASHING AMBER OR RED	**FLASHING AMBER**	Steady Green	Steady Green	3a/3b in Table 5-3
Off	Steady Green	Steady Green	Steady Green	4a, 4b, 4c, and 4d in Table 5-3
Steady Green/Off	Steady Green	Steady Green	Steady Green	8a in Table 5-4
Steady Green	Steady Green	Steady Green	Steady Green	5, 6, and 7 in Table 5-3 and Table 5-4

Table 5-3 lists basic entry class troubleshooting conditions and actions.

Table 5-3 Basic Entry Class Troubleshooting

<table>
<tr><th>Step</th><th>Condition</th><th>Action</th></tr>
<tr><td>1</td><td>Chassis appears “dead” -- no front panel LEDs are on, and no fans are running.</td><td>Nothing is logged for this condition.
1. For new server installations, review the install procedures.
2. Verify that the power cords are connected to both the power supplies and to the ac receptacles.
3. Verify that ac power, at the proper ac voltage levels, is available to the receptacles.
4. Check the front panel connector and the cable to the rest of the system.
5. If power button’s integrated LED on front panel remains off, reseat the power supplies, replace the power cords, and replace the bulk power supplies, in that order (see “Power Subsystem Behavior” (page 159) for details.)
The preceding problem is fixed when the front panel LED states are as follows: System Health is Off; Internal Health is Off; External Health is Off; and Power is Steady Amber.</td></tr>
<tr><td>2a</td><td>Server does not power on after front panel power button is momentarily depressed; for example, is depressed for less than four seconds.

NOTE: This step assumes BMC is running.</td><td>A fatal fault has been detected and logged, attempting to power on the server (System Health is Off, Internal Health is Off, External Health is Off, and Power is Steady Amber).
1. Examine each power supply’s LEDs -- if not Steady Green, replace power supply (see “Power Subsystem Behavior” (page 159) for details).
2. Examine the iLO 2 MP logs for events related to bulk power supplies (see “Power Subsystem Behavior” (page 159) for details).
Preceding problem is fixed when BMC’s heartbeat LED is Flashing Green, and the front panel LEDs are as follows: System Health is Off, Internal Health is Off, External Health is Off, and Power is Steady Green.</td></tr>
<tr><td>2b</td><td>Both front panel System Health and External Health LEDs are Flashing Amber.</td><td>A warning or critical failure has been detected and logged after server powers on (System Health is Flashing Amber, Internal Health is Off /Steady Green, External Health is Flashing Amber, and Power is Steady Green)
1. Examine each power supply’s LEDs. If not Steady Green, replace power supply (see “Power Subsystem Behavior” (page 159) for information).
2. Examine each external fan’s LED (rx6600 only). If not Steady Green, replace fan(s) (see “Cooling Subsystem” (page 161) for information).
Preceding problem is fixed when iLO 2 MP logs are read, and the front panel LED states are as follows: System Health is Off, Internal Health is Off/ Steady Green, External Health is Steady Green, and Power is Steady Green.</td></tr>
<tr><td>2c</td><td>Front panel System Health LED is Flashing Red and External Health LED is Flashing Amber.</td><td>A fatal fault has been detected and logged after server powers on (System Health is Flashing Red, Internal Health is Off/Steady Green, External Health is Flashing Amber, and Power is Steady Green).
1. Examine each power supply’s LEDs. If not Steady Green, replace power supply (see “Power Subsystem Behavior” (page 159) for information
2. Examine each external fan’s LED (rx6600 only). If not Steady Green, replace fan(s) (see “Cooling Subsystem” (page 161) for details).
Preceding problem is fixed when iLO 2 MP logs are read, and the front panel LED states are as follows: System Health is Off, Internal Health is Off/Steady Green, External Health is Steady Green, Power is Steady Green.</td></tr>
<tr><td>3a</td><td>Both front panel System Health LED and Internal Health LED are Flashing Amber.</td><td>A warning or critical failure has been detected and logged, while booting or running system firmware (System Health is Flashing Amber, Internal Health is Flashing Amber, External Health is Steady Green, and Power is Steady Green).
1. Check Diagnostic LED panel to identify failed or faulty internal FRU (see “Troubleshooting Tools” (page 139) for details).
Preceding problem is fixed when a redundant, internal FRU is replaced, iLO 2 MP logs are read, and the front panel LED states are as follows: System Health is Off, Internal Health is Steady Green, External Health is Steady Green, and Power is Steady Green.</td></tr>
</table>

Table 5-3 Basic Entry Class Troubleshooting *(continued)*

Step	Condition	Action
3b	Front panel System Health LED is Flashing Red and Internal Health LED is Flashing Amber.	A fatal fault has been detected and logged, while booting or running system firmware (System Health is Flashing Red, Internal Health is Flashing Amber, External Health is Steady Green, and Power is Steady Green). **1.** Check Diagnostic LED panel to identify failed or faulty internal FRU (see "Troubleshooting Tools" (page 139) for details). Preceding problem is fixed when a redundant, internal FRU is replaced, iLO 2 MP logs are read, and the front panel LED states are as follows: System Health is Off, Internal Health is Steady Green, External Health is Steady Green, and Power is Steady Green.[LINEBREAK]
4a	Cannot see iLO 2 MP prompt on system console -- server power is off/on.	Front panel LEDs indicate that the server is either booting or running system firmware, or is booting or running the OS (for example, System Health is Off/Steady Green, Internal Health is Steady Green, External Health is Steady Green, and Power is Steady Green). Nothing may be logged for this condition. **1.** The most common reasons for this are console cabling issues, console configuration issues, etc. Check these issues first. **2.** Examine MPs Heartbeat LED. **3.** If off, iLO 2 MP is not operational; if Flashing Amber, ROM error exists. **4.** Reset iLO 2 MP, by using the pinhole reset button on the core I/O card. **5.** If no change, replace the core I/O FRU board (see "Management Subsystem (iLO 2 MP/BMC)" (page 165) for details). Preceding problem is fixed when iLO 2 MP's Heartbeat LED and the System Health LED are Steady Green.
	Still no iLO 2 MP prompt on system console...	Nothing may be logged for this condition. **NOTE:** If the iLO 2 MP is off, the System Health will be off as well. Front panel LEDs indicate that the server is either booting or running the OS. **1.** Verify that the proper terminal type is set: Supported settings are hpterm, VT100+ (default), and VTUTF8. **2.** Verify that the RS232C configuration matches between the server and the local console or modem (see "Supported Configurations" (page 149) for information). **3.** Look for loose, damaged, or disconnected power and signal cables on the I/O backplane FRU. Preceding problem is fixed when iLO 2 MP menu appears on the system console, and the System Health is Steady Green.
4b	Cannot see EFI prompt on system console.	Nothing may be logged for this condition (System Health is Off, Internal Health is Steady Green, External Health is Steady Green, and Power is Steady Green). Front panel LEDs indicate that the server is either booting or running the OS. **1.** Examine the state (for example, flashing or solid on) of the three LEDs, located in the back left corner of the chassis, visible through the perforations in the chassis. Server (logic and system firmware) stages are tracked by the PDH FPGA, using these three LEDs (see "Troubleshooting Tools" (page 139) for details). **2.** Examine the iLO 2 MP logs for entries related to processors, processor power modules (PPMs), shared memory, and core I/O devices (see "Errors and Reading Error Logs" (page 146) for details). Preceding problem is fixed when EFI menu appears on the system console, and system firmware booting completes.

Table 5-3 Basic Entry Class Troubleshooting *(continued)*

Step	Condition	Action
4c	Cannot find a boot disk or removable media drive.	Nothing may be logged for this condition (System Health is Off, Internal Health is Steady Green, External Health is Steady Green, and Power is Steady Green). **1.** Examine the boot device, to determine if it is plugged into its drive bay properly. **2.** Examine the drive's cabling for any problems. **3.** Examine the boot path settings. **4.** Examine the iLO 2 MP logs for entries related to processors, processor power modules (PPMs), shared memory, and core I/O devices. Preceding problem is fixed, when all boot devices are found.
4d	There are RAID channel redundancy failures.	Nothing is logged for this condition (System Health is Off, Internal Health is Steady Green, External Health is Steady Green, and Power is Steady Green) **1.** Examine the LED next to each RAID connector, and replace the RAID HBA (if this LED is either Steady Amber or Steady Red, it indicates RAID drives are degraded or corrupted, respectively). Preceding problem is fixed when all of these LEDs remain Off, after next power on.
5	Cannot see OS prompt on system console.	Front panel LEDs indicate that the server's power is turned on, and that the server is either booting or running the OS. Nothing may be logged for this condition (System Health is Steady Green, Internal Health is Steady Green, External Health is Steady Green, Power is Steady Green). **1.** Examine the iLO 2 MP logs for entries related to processors, processor power modules (PPMs), shared memory, and core I/O devices (see "Errors and Reading Error Logs" (page 146) for details). **NOTE:** Be sure to check the console settings from the Boot Manager for your OS. Preceding problem is fixed when OS prompt appears on the system console.

Table 5-4 lists the advanced entry class troubleshooting conditions and actions.

Table 5-4 Advanced Entry Class Troubleshooting

Step	Symptom/Condition	Action
6	Cannot read System Event Log from the system console.	System event logging has stopped and a BMC malfunction is assumed (System Health is Steady Green, Internal Health is Steady Green, External Health is Steady Green, and Power is Steady Green). **1.** Examine console messages for any EFI errors or warnings about BMC operation or communications. **2.** Examine the BMC's Heartbeat LED; if it is not Flashing Green, replace the core I/O board FRU (see "Management Subsystem (iLO 2 MP/BMC)" (page 165) for details). **3.** Test the operation of the BMC by toggling the UID locator switch LED on the front panel -- the Blue LED is turned On/Off by the BMC, when this switch is toggled . Preceding problem is fixed when BMC's Heartbeat LED is Flashing Green, and the System Event Log resumes logging
7	OS is non-responsive (hung).	Front panel LEDs indicate that the server's power is turned on, and it is either booting or running the OS (for example, System Health is Steady Green, Internal Health is Steady Green, External Health is Steady Green, and Power is Steady Green). Nothing may be logged for this condition. **1.** Use a paper clip, pencil, or pen to depress the INIT button on the front panel to start a system initialization. **2.** Reboot the OS and escalate. **3.** Obtain the system hardware status dump for root cause analysis. **4.** Examine the iLO 2 MP logs for entries related to processors, processor power modules (PPMs), shared memory, and core I/O devices (see "Errors and Reading Error Logs" (page 146) for details). Preceding problem is fixed when root cause has been determined.
8a	MCA occurs during server operation; the server reboots the OS. **NOTE:** Server reboots OS, if enabled.	Front panel LEDs indicate the server detected a fatal error that it cannot recover from using OS recovery routines (for example, System Health is Flashing Red, Internal Health is Steady Green, External Health is Steady Green, and Power is Steady Green). **1.** Capture the MCA dump with the EFI command,`errdumpmca` . If the system can boot the OS, you can capture binary MCA dump files online. **2.** Examine the iLO 2 MP logs for entries related to processors, processor power modules (PPMs), shared memory, and core I/O devices (see "Errors and Reading Error Logs" (page 146) for details). **3.** See "Troubleshooting Tools" (page 139) for instructions on running the MCA Analysis Tool to determine the most likely faulty or failed FRU. **4.** See "MCA Analysis" (page 193) for manual MCA analysis procedures, if the automated MCA Analysis Tool, used in step 3, does not provide a fix. Preceding problem is fixed when the MCA does not repeat, or the source of the MCA has been determined and dealt with.
8b	MCA occurs during server operation; server reboot of OS is prevented. **NOTE:** The troubleshooting actions for this step are identical to those in Step 8a, except that the server in this step must be hard reset to begin the booting process) **NOTE:** You must hard reset the server to clear the fatal condition and boot the OS.)	Front panel LEDs indicate that the server detected a fatal, front side bus error, caused by MBEs reading cache or DIMM; or by any parity in the I/O path between SBA, LBA, or HBA (for example, System Health is Off, Internal Health is Flashing Amber, External Health is Steady Green, Power is Steady Green). System firmware is running to gather and log all error data for this MCA event. **1.** Examine the iLO 2 MP logs for entries related to processors, processor power modules (PPMs), shared memory, and core I/O devices (see "Errors and Reading Error Logs" (page 146) for details). **2.** See "Troubleshooting Tools" (page 139) for instructions on running the MCA Analysis Tool to determine the most likely faulty or failed FRU. **3.** See "MCA Analysis" (page 193) for manual MCA analysis procedures, if the automated MCA Analysis Tool, used in step 2, does not provide a fix. Preceding problem is fixed when the MCA does not repeat.

Troubleshooting Tools

LEDs

Front Panel

The front panel of the system contains the Power Button/System Power LED, Internal and External Health LEDs, System Health LED, Locator Switch/LED, and an INIT button. rx6600 servers use flashing states (for example, flashing amber or red) on these LEDs to indicate a warning or an error.

There are a total of three buttons, arranged horizontally, with the UID button and the power button each having an integrated LED. In addition to the two integrated button/LEDs, there are three health LEDs and an INIT button.

The health LEDs are arranged sequentially in line with the Power button/LED, and as the system starts up, there will be more "green" the further the system proceeds in the startup process.

1. The power LED will turn green soon as the system starts to power up.
2. The external health indicator will turn green as soon as the BMC can light it.
3. The internal health indicator will turn green as soon as the `BOOT_START` event is received from system firmware (`BOOT_START` can be determined by LED states on the I/O backplane board).
4. The system health indicator will turn green when firmware leaves "exit boot services" and we begin to boot an OS.

The health LEDs are driven by the BMC; the Power LED is driven solely by hardware. BMC code determines the state of the Internal and External Health LEDs, while the iLO 2 MP code, examining incoming events using its event dictionary, determines the state of the System Health LED.

External Health LED (EHLED)

The front panel Externally Serviceable Server Health LED, called the External Health LED, indicates the status of the components that are externally serviceable. In most systems, this LED is only used to monitor the power supply status and external fans (rx6600 only). Whenever the external health LED is lit, the corresponding FRU should be lit for the failed component.

Failures that cause the External Health LED to light will not cause the Internal Health LED to light. These two LEDs cover failures of different components.

Table 5-5 displays information about the External Health LED states.

Table 5-5 External Health LED States

Definition	Flash Rate	LED Color
Health good on all external FRUs and system power is off.	LED Off	Off
System power is on; externally serviceable components (usually accessible from front or back, such as fans and power supplies) are okay.	Steady	Green
An externally accessible FRU failed (system is on or in standby mode). Usually, this is a power supply or fan failure. Check front/back LEDs for failed component.	Flash 1 Hz	Amber

Amber supersedes green. This LED is cleared when all failed externally accessible entities are repaired and report that they are good, or on any ac/standby power cycle.

Table 5-6 describes the VFP External Health LEDs.

Table 5-6 VFP External Health Description

Off	<none>
On Green	External parts, including fans and power supplies, okay
Flashing Amber	A redundant, externally accessible FRU failed (check front/back LEDs)

Internal Health LED (IHLED)

The required front panel Internally Serviceable Server Health LED, called Internal Health LED, indicates the status of the components internal to the system chassis. These components require the user to open the system in order to be serviced. This LED will maintain its state when the system is in standby mode (system power turned off but ac power still applied to the system).

On larger Integrity servers that have a Diagnostic LED board, this LED tells the service person that she/he should view that board for more information about the server failure. If the Internal Health LED is green, there is no fault information displayed on the Diagnostic LED board, and no fault information displayed on LEDs that are inside the server.

The amber indicators on this LED must correspond to internal health conditions that will light other LEDs in the box, indicating which component must be serviced to correct the fault. For example, the Diagnostic LED board will have a fault indicator lit when this LED is in the Amber condition. Failures that cause the Internal Health LED to light will not cause the External Health LED to light.

Table 5-7 displays information about the Internal Health LED states.

Table 5-7 Internal Health LED States

Definition	Flash Rate	LED Color
Health good on all internal FRUs and system off.	LED Off	
Health good on all internal FRUs, and system firmware has passed “BOOT_START”.	Steady	Green
An internally accessible FRU failed (system is on or in standby mode). Check the Diagnostic Panel or internal system LEDs.	Flash 1 Hz	Amber

The internal health LED will clear once all of the LEDs on the Diagnostic LED panel have been cleared. For details on how each LED in the Diagnostic panel is cleared, see “Diagnostics Panel LEDs” (page 141); also see the respective system specification for the server in question. Events that cause each internal FRU (or Diagnostic Panel) LED to light are listed in the FRU section.

Amber supersedes Green. This LED is cleared when all failed internally accessible entities are repaired and report that they are good, or on any ac/standby power cycle.

Table 5-8 describes the VFP Internal Health LEDs.

Table 5-8 VFP Internal Health Description

Off	<none>
On Green	Internal parts, including CPUs and memory, okay
Flashing Amber	An internally accessible FRU failed: check diagnostic panel

System Health LED (SHLED)

This LED is used:

- To carry forward the ATTENTION functionality of legacy Integrity and HP 9000 front panel designs
- To give an indication of whether the system is up or down. External and internal health LEDs do not indicate if the system is booted.
- To cover the wide range of faults for which software/firmware is not completely sure that a FRU must be reseated or replaced. External and internal health LEDs do not light unless software or firmware makes a solid determination that a FRU must be reseated or replaced.

This LED indicates the overall health state of the system, including the state of system firmware and the OS. If the LED is Amber or Red, the system needs attention, and the event logs should be examined for details of the problem.

Table 5-9 describes the System Health LED states.

Table 5-9 System Health LED States

Definition	Flash Rate	LED Color
System is off, or system is booting firmware with no failures, since SEL logs last examined.	LED Off	
System has left the firmware boot, and an OS is booting or running with no failures, since SEL logs last examined.	Steady	Green
A warning or critical failure has been detected and logged.	Flash 1 Hz	Amber
A fatal fault has been detected and logged.	Flash 2 Hz	Red

Table 5-10 displays the following strings in its virtual front panel for the four states of this LED

Table 5-10 VFP System Health Description

Off	<none>
On Green	OS booting or running
Flashing Amber	Warning or critical fault: check logs for details
Flashing Red	Fatal fault -- system crashed or cannot boot: check logs for details

Locator Switch/LED (Unit Identifier or UID)

The Locator Switch/LED allows a specific system to be identified in a rack or data center environment. One Locator Switch/LED is located in the front panel, and a second is located in the rear of the chassis. LEDs are incorporated inside the pushbutton to minimize space. Both switches are toggle switches, meaning you push it once to turn on the LED, and you push it again to turn off the LED. Pressing the front panel Switch/LED, or entering the iLO 2 MP and LOC commands, lights the rear panel LED, and vice versa.

- Off = Off
- Blue (Not flashing) = Identification

Diagnostics Panel LEDs

The Diagnostics Panel improves serviceability by allowing you to look in a single location for the LEDs that provide failing FRU locating/mapping information. These amber LEDs are only lit when a failure occurs; otherwise, they are off. A label on the panel is oriented in a fashion analogous to the orientation of the components within the server: a diagnostic LED exists for each FRU in the system, including all DIMMs.

LED locations are presented in Figure 5-2.

Figure 5-2 rx6600 Diagnostic Panel LEDs

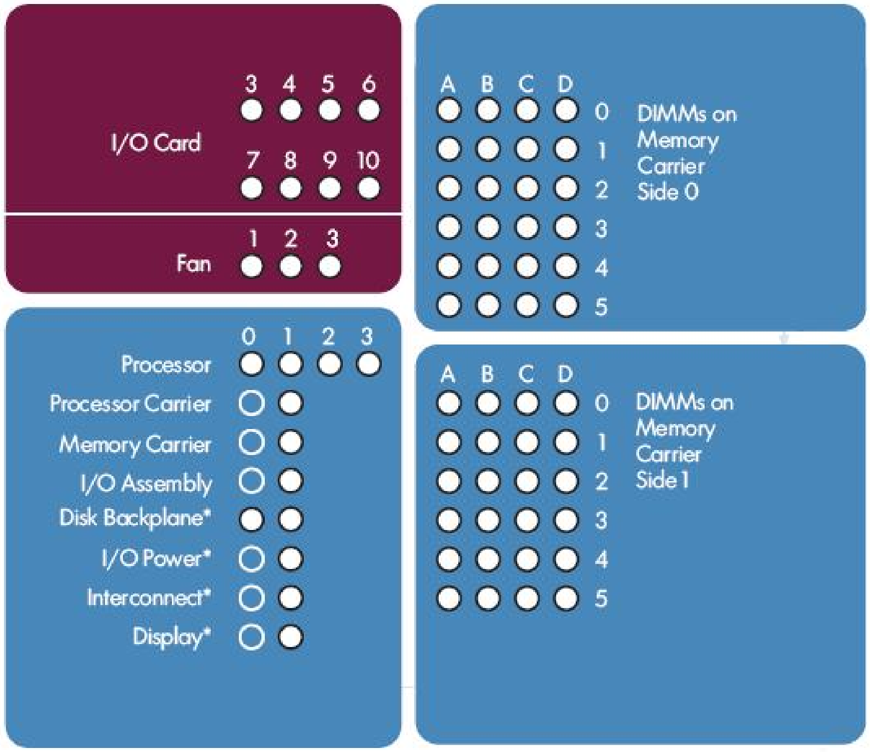


Table 5-11 lists the diagnostic panel LED states.

Table 5-11 Diagnostics Panel LED States

Definition	Flash Rate	LED Color
FRU health is assumed good.	LED Off	Off
FRU health last known to be bad.	Steady	Amber

Field Replaceable Unit Health LEDs

In addition to the front panel diagnostic LEDs, field replaceable units (FRUs) provide additional diagnostic capability with LEDs, whose order or layout is product dependent.

NOTE: If multiple error conditions occur, all applicable FRU lights are activated. In such a case, the most critical error will determine the front panel color.

Diagnostics

A suite of offline and online support tools are available to enable manufacturing, field support personnel, and the customer to troubleshoot system problems. In general, if the operating system (OS) is already running, it is not desirable to shut it down, and the online support tools should be used.

If the OS cannot be booted, you must use the offline support tools resolve the problem. The offline support tools are available either from the EFI partition, or from the IPF Offline Diagnostics and Utilities CD (IPF systems only). Once the problem preventing booting has been resolved, the OS should be booted, and the online support tools should be used for any further testing.

If it is not possible to reach EFI from either the main disk or from a CD, you must troubleshoot, using the visual fault indicators, console messages, and system error logs that are available.

Online Diagnostics/Exercisers

Online support tools are available which permit centralized error archiving, and which provide hardware inventory tools, as long as the agents/providers that support them are installed on the managed server.

On HP-UX systems, the legacy tools within OnlineDiag will continue to be supported. The online support tools, on the HP-UX 11.23 and greater operating systems, include the Support Tool Manager (STM) tools, and the additional Web-Based Enterprise Management (WBEM) features added by SysFaultMgmt.

The STM suite of tools includes verifiers, diagnostics, exercisers, information modules, and expert tools.

Verifiers quickly determine whether or not a specific device is operational by performing tasks similar in nature to the way applications use the device. No license is required to run the verifiers.

Diagnostics are tools designed to identify faulty or failed FRUs.

Exercisers stress devices in order to facilitate the reproduction of intermittent problems.

Information modules create a log of information specific to one device, including:

- The product identifier
- A description of the device
- The hardware path to the device
- The vendor
- Onboard log information (if applicable)
- Miscellaneous information associated with the device
- The firmware revision code, if firmware is present in the device, is also displayed

Expert tools are device-specific troubleshooting utilities for use by sophisticated users. Their functionality varies from tool to tool, but they are intended to be interactive, and rely on users to provide information necessary to perform a particular task. These tools require users to have the appropriate license, if they wish to run them.

Online Support Tool Availability

Online diagnostics are included in the HP-UX OE media, and are installed by default.

Online Support Tools List

The following online support tools are available on HP-UX 11.23 hosted systems. In some cases, a tool, such as a disk exerciser, is generic to many types of hardware; in other cases, a tool, such as a tape diagnostic. is specific to a particular technology or type of tape drive.

Table 5-12 lists the online support tools.

Table 5-12 Online Support Tools List

Functional Area	Information	Verify	Exercise	Diagnose	Expert
System	Yes	No	No	No	No
CPU/FPU	No	No	Yes	No	Yes
Memory	Yes	No	Yes	No	No
Graphics	Yes	Yes	Yes	No	No
Core I/O LAN	Yes	Yes	Yes	Yes	No
Disk/Arrays	Yes	Yes	Yes	No	No
Tape	Yes	Yes	Yes	Yes	Yes
M/O	Yes	No	No	No	Yes

Table 5-12 Online Support Tools List *(continued)*

Functional Area	Information	Verify	Exercise	Diagnose	Expert
Add-On Network I/O Cards	Yes	Yes	Yes	No	Yes
Add-On Mass Storage I/O Cards	Yes	No	No	No	No

Linux Online Support Tools

Online support tools are provided through Insight Manager (IM7) on Linux hosted systems. The exact coverage of these tools is the same as for the current IA-32 implementation. The IPF version of Insight Manager (IM7) has been re-architected to take advantage of current standards; such as, WBEM, WMI, CDM, CIM, XML.

IPF (IA-64) Offline Diagnostics

RAGE is an offline support tools platform that is run from EFI. The RAGE environment supports tools written by HP. ODE is the offline diagnostics suite, along with RAGE exercisers for CPU, Memory, and Disk I/O. The RAGE exercisers boot from EFI, run in the RAGE environment.

Offline Support Tool Availability

Limited RAGE exercisers are available from the EFI or HP Service (HPSP) partition on the main system disk. Updates to the EFI (HPSP) partition are available through the CD Installer option on the IPF Offline Diagnostics and Utilities CD. At a minimum, an ISO image of the IPF Offline Diagnostics and Utilities CD will be available from the HP Web.

Offline Support Tools List

Table 5-13 lists the offline support tools.

Table 5-13 Offline Support Tools List

Offline Tool	Functional Area
CPUDIAG	Processor Diagnostic
MEMDIAG	Memory Diagnostic
MAPPER	System Mapping Utility
TITANDIAG	SBA/LBA Chipset
PERFVER	Peripheral Verifier
DFDUTIL	SAS/SCSI Disk Firmware Update Utility
DISKUTIL	Disk Test Utility (Non-Destructive)
COPYUTIL	Data Copy Utility
DISKEXPT	Disk Expert Utility
IODIAG	I/O Diagnostics Launch Facility (Executes third party diagnostics and runs BIST, if available)
CIODIAG2	Core I/O Diagnostic
Specific Card I/O Diagnostics	Card-Specific I/O Diagnostics/BIST
CPU	RAGE Exercisers
MEM	RAGE Exercisers
Disk I/O	RAGE Exercisers

General Diagnostic Tools

The following tools are currently available for support on other Integrity server platforms. The distribution method is through the Web.

Table 5-14 lists the general diagnostic tools.

Table 5-14 General Diagnostic Tools List

Diagnostic Tool	Description
IPMI Event Decoder	Provides detailed information about the IPMI event (Problem description, cause, action)
System Event Analyzer (SEA)	Program which automatically analyzes system error logs and IPMI SEL events. Produces callout reports and FRU information (see `http://h18023.www1.hp.com/support/svctools/webes` for more information about this tool).
MCA Analyzer	Program that assists in the evaluation of an MCA. Available as both a standalone, PC-based program, and as a monitor (see Appendix C (page 193) for information about this tool).

Fault Management Overview

The goal of fault management and monitoring is to increase system availability, by moving from a reactive fault detection, diagnosis, and repair strategy to a proactive fault detection, diagnosis, and repair strategy. The objectives are:

- To detect problems automatically, as nearly as possible to when they actually occur.
- To diagnose problems automatically, at the time of detection.
- To automatically report in understandable text a description of the problem, the likely cause(s) of the problem, the recommended action(s) to resolve the problem, and detailed information about the problem.
- To ensure that tools are available to repair or recover from the fault.

HP-UX Fault Management

Proactive fault prediction and notification is provided on HP-UX by SysFaultMgmt WBEM indication providers, as well as by the Event Management System (EMS). The Event Management Service and WBEM provide frameworks for monitoring and reporting events.

SysFaultMgmt WBEM indication providers and the EMS Hardware Monitors allow users to monitor the operation of a wide variety of hardware products, and alert them immediately if any failure or other unusual event occurs. By using hardware event monitoring, users can virtually eliminate undetected hardware failures that could interrupt system operation or cause data loss.

Complete information on installing and using EMS hardware event monitors, as well as a list of supported hardware, can be found in the *EMS Hardware Monitors Users Guide*. An electronic copy of this book is provided on the Web site http://docs.hp.com/hpux/diag.

WBEM indication providers and EMS Hardware Monitors

Hardware monitors are available to monitor the following components (These monitors are distributed free on the OE media.):

- Chassis/Fans/Environment
- CPU monitor
- UPS monitor*
- FC Hub monitor*
- FC Switch monitor*
- Memory monitor
- Core Electronics Components
- Disk drives
- Ha_disk_array

NOTE: No SysFaultMgmt WBEM indication provider is currently available for components followed by an asterisk.

EMS HA Monitors High Availability monitors are also available through EMS to monitor disk, cluster, network, and system resources. These tools are available from HP at an additional cost.

Errors and Reading Error Logs

Event Log Definitions

Often the underlying root cause of an MCA event is captured by system or BMC firmware in both the System Event and Forward Progress Event Logs (SEL and FP, respectively). These errors are easily matched with MCA events by their timestamps. For example, the loss of a CPU's VRM might cause a CPU fault. Decoding the MCA error logs would only identify the failed CPU as the most likely faulty FRU. Following are some important points to remember about events and event logs:

- Event logs are the equivalent of the old chassis logs for status or error information output.
- Symbolic names are used in the source code; for example, `MC_CACHE_CHECK`.
- The hex code for each event log is 128 bits long with an architected format:
  - Some enumerated fields can be mapped to defined text strings.
  - All can be displayed in hex, keyword, or text mode.
- Events are created by firmware or OS code, and are sent over the PDH bus to the BMC for storage in either or both of the SEL and FP logs (HP-UX shows an I/O path for the BMC).
- The iLO 2 MP can display event logs: SEL events are sent over the IPMB, between the BMC and the iLO 2 MP.
- Event logs can also be read back over the PDH bus by software (IPMI driver or agent) for storage on disk.

Using Event Logs

To consult the event logs:

1. Connect to the system console.
2. Use **Control-B** to access the iLO 2 MP menu.
3. Use the sl command to view event logs: System Event (E) and Forward Progress (F) logs are very useful in determining the context of an error (See the following figure for an example):

NOTE: Remember that:

- `E` shows only event logs for Warning, Critical, or Fatal faults by default; `F` shows all event log outputs.
- System Event Logs (SELs) are never overwritten, unless they are first manually cleared: since they employ ring buffering, oldest logs get overwritten first. Forward Progress Logs (FPLs) are circular and contain additional, non-critical information.
- The alert threshold can be changed.

iLO 2 MP Event Logs

The iLO 2 MP provides diagnostic and configuration capabilities. See the *HP Integrity iLO 2 MP Operations Guide* for details on the iLO 2 MP commands. To access the iLO 2 MP, follow these steps:

NOTE: The iLO 2 MP must be accessed from a terminal console which has access to the iLO 2 MP.

1. Login with proper username and password.

   NOTE: Default operator login and password: login = **`oper`**, password = **`oper`**.

2. Press `cl` to display the console history log. This log displays console history from oldest to newest.
3. Press `sl` to display the status logs. The status logs consist of:
   - System Event
   - Forward Progress
   - Current Boot
   - Previous Boot
   - Live Events
   - Clear SEL/FPL Logs

System Event Log (SEL) Review

1. Access the main menu under the iLO 2 MP's command prompt (typing `cm`brings you to the command menu).
2. Run the `sl` command. The **Event Log Viewer** menu displays:

```
SL

Event Log Viewer:

Log Name             Entries    % Full         Latest Entry
-------------------------------------------------------------------
E - System Event           9         1 %      29 Oct 2002 19:15:05
F - Forward Progress     129         3 %
B - Current Boot          82
P - Previous Boot          0
C - Clear All Logs
L - Live Events
Enter your choice or {Q] to Quite:
```

3. Select **e** to review the system events. The **Event Log Navigation** menu displays:

```
Enter menu item or [Ctrl-B] to Quit: e

       Log Name            Entries    % Full      Latest Timestamped Entry
```

```
--------------------------------------------------------------------------

   E - System Event          12         1 %      31 Oct 2003 23:37:45

Event Log Navigation Help:

   +       View next block     (forward in time,  e.g. from 3 to 4)
   -       View previous block (backward in time, e.g. from 3 to 2)
   <CR>    Continue to the next or previous block
   D       Dump the entire log
   F       First entry
   L       Last entry
   J       Jump to entry number
   H       View mode configuration - Hex
   K       View mode configuration - Keyword
   T       View mode configuration - Text
   A       Alert Level Filter options
   U       Alert Level Unfiltered
   ?       Display this Help menu
   Q       Quit and return to the Event Log Viewer Menu
   Ctrl-B  Exit command, and return to the MP Main Menu


MP:SL (+,-,<CR>,D, F, L, J, H, K, T, A, U, ? for Help, Q or Ctrl-B to Quit)
 >a

Alert Level Threshold Filter:
   1  : Major Forward Progress
   2  : Informational
   3  : Warning
   5  : Critical
   7  : Fatal

Enter alert level threshold or [Q] to quit filter setup: 3

   -> Alert threshold level 3 filter will be applied.


Set up alert filter options on this buffer? (Y/[N])

       Log Name            Entries    % Full         Latest Entry
-------------------------------------------------------------------
E - System Event          410        47 %      18 Feb 2003 09:38:10

Event Log Navigation Help:

   +       View next block     (forward in time,  e.g. from 3 to 4)
   -       View previous block (backward in time, e.g. from 3 to 2)
   <CR>    Continue to the next or previous block
   D       Dump the entire log for capture and analysis
   F       First entry
   L       Last entry
   J       Jump to entry number
   V       View mode configuration (text, keyword, hex)
   ?       Display this Help menu
   Ctrl-B  Quit and return to the Main Menu
```

4. Select **a**, and select a threshold filter number to filter events to desired level.

```
MP:SL (+,-,<CR>,D, F, L, J, H, K, T, A, U, ? for Help, Q or Ctrl-B to Quit)
 >a

Alert Level Threshold Filter:
   1  : Major Forward Progress
   2  : Informational
```

```
   3  : Warning
   5  : Critical
   7  : Fatal

Enter alert level threshold or [Q] to quit filter setup: 3

   -> Alert threshold level 3 filter will be applied.
```

5. Select **v**, and select **t** to change the display to text mode:

```
Display Mode Configuration:
              H - Hex mode
   Current -> K - Keyword mode
              T - Text mode
Enter new value, or [Q] to Quit:
```

6. To decode the blinking state of system LED, review the entire SEL and look at events with alert level 3 and above.

   For example:

```
Log Entry 24: 14 Feb 2003 15:27:02
Alert Level 3: Warning
Keyword: Type-02 1b0800 1771520
Hot Swap Cage: SCSI cable removed
Logged by: BMC;  Sensor: Cable / Interconnect - SCSI ChExt Cable
Data1: Device Removed/Device Absent
0x203E4D0AC6020220 FFFF0008F61B0300

Log Entry 73: 00:00:12
Alert Level 3: Warning
Keyword: Type-02 050301 328449
The server's built-in sensors have detected an open chassis door.
Logged by: BMC;  Sensor: Physical Security - Chassis Open
Data1: State Asserted
0x200000000C020570 FFFF010302050300
```

Supported Configurations

This subsection provides a system build-up procedure. For examples of how to use the iLO 2 MP to acquire configuration information for troubleshooting purposes, see Appendix D (page 221).

System Block Diagram

The following is a system block diagram, showing the major rx6600 server functional components and their interconnections:

Figure 5-3 rx6600 Server System with PCI/PCI-X I/O Backplane Block Diagram

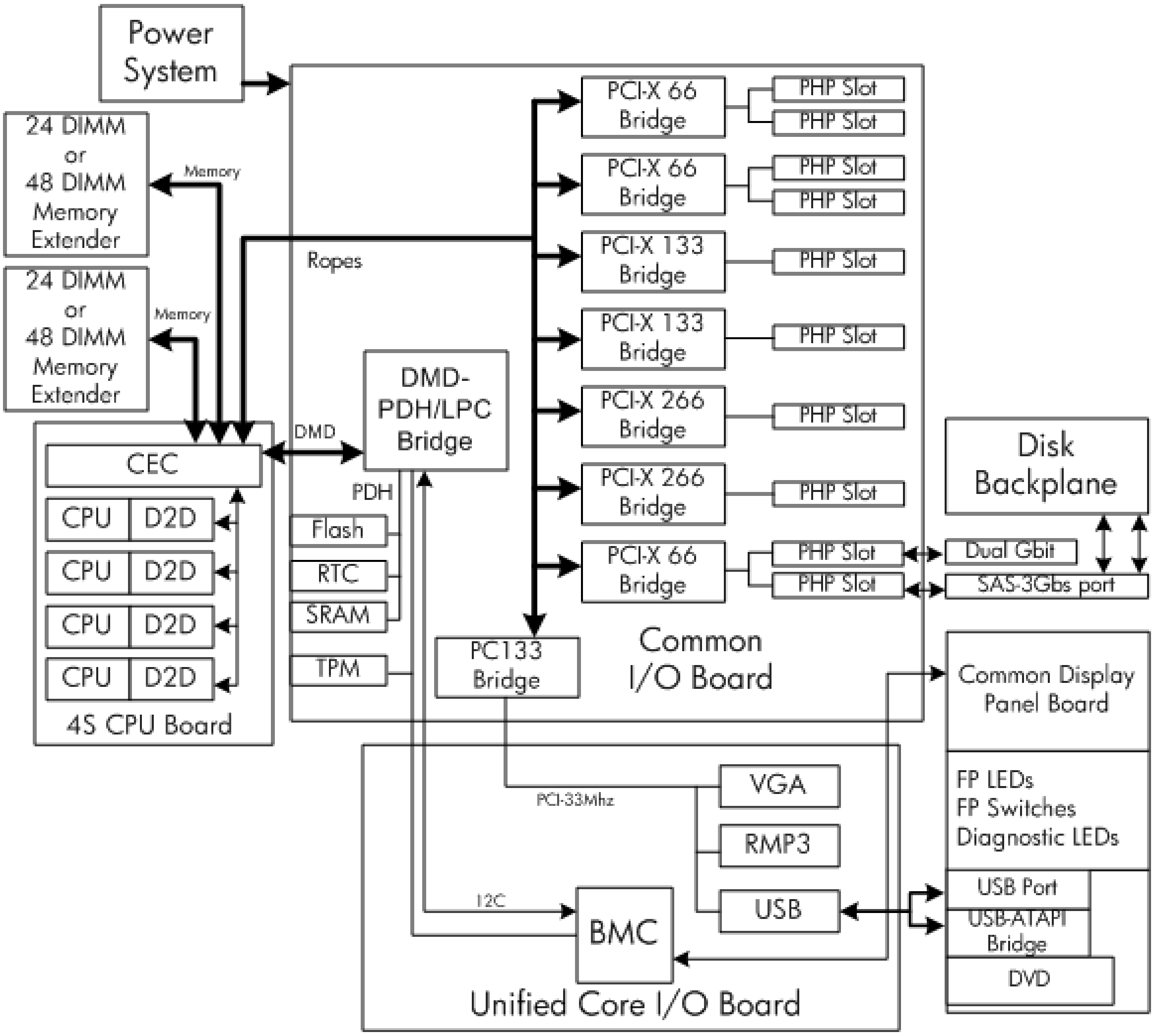
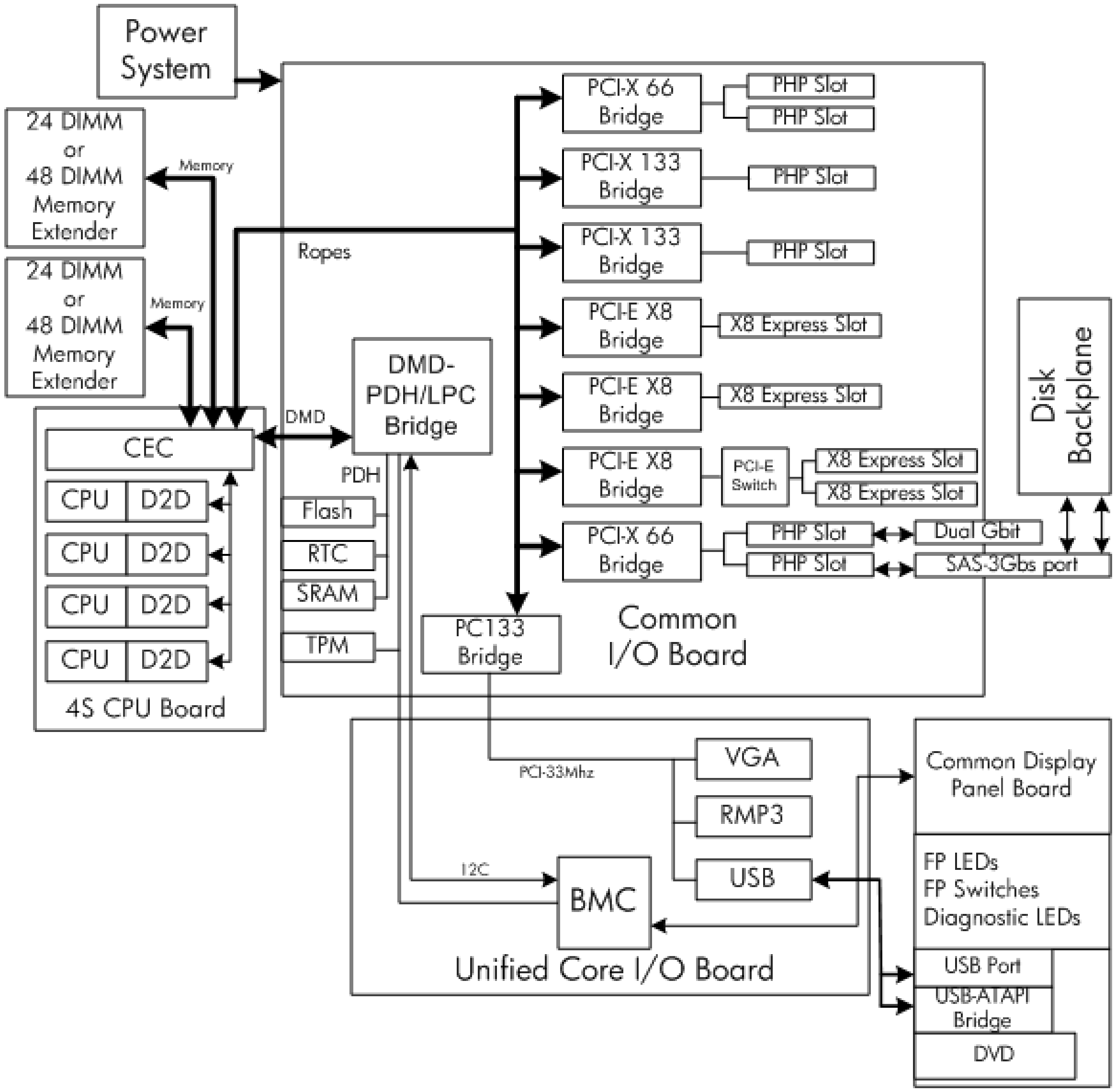


Figure 5-4 rx6600 Server System with PCI/PCI-X/PCI-E I/O Backplane Block Diagram



There are two types of FRUs in the rx6600 server:

- Externally accessible FRUs (eFRUs)
- Internally accessible FRUs (iFRUs)

In the following two lists, asterisks identify those FRUs identifiable by Diagnostic Panel LEDs when they are faulty or have failed.

The following is a list of all external FRUs (eFRUs) in the rx6600 server:

- *Bulk power supply (1 and 2)
- Console device
- Power cords
- Modems/UPS
- *DVD and 2.5 HDDs (SAS or SATA)
- Cooling fans (4-6) (rx6600 only)

The following is a list of all the internal FRUs (iFRUs) in the rx6600 server:

- I/O board assembly
- *Core I/O board
- Core LAN HBA

- SAS Disk HBA
- *CPU board and CPUs
- Disk BP board (1 and 2)
- *Memory extender and DIMMs
- FP and Diagnostic LED board
- HBAs (optional)
- I/O VRM
- *Cooling Fans (1-3)
- Midplane board
- Interconnect board

NOTE: Items preceded by an asterisk in the lists above have associated diagnostic LEDs, which indicate device fault or failure.

System Build-Up Troubleshooting Procedure

Use this procedure only when the system powers on and remains powered on but does not enter into or pass POST or does not boot to EFI menu.

1. Remove the ac power cord from each bulk power supply and extend the server chassis, if racked.
2. Remove all of the HDDs from the front of the chassis, then the memory extender and CPU board FRUs.
3. Remove the top cover to gain access to, and remove, everything but the I/O backplane board and core I/O board FRUs.
4. Plug in the ac power cord(s) and the iLO 2 MP and system console should come alive and you should have the following FRU IDs listed after executing the `CM>DF` command:

```
FRU IDs:
--------

02-Power Converter 03-Power Supply 0 04-Power Supply1

05-Diagnostic Panel 06-Front Panel 00-Motherboard


Log Entry 4: Dec 2005 00:00:09

Alert Level 5: Critical

Keyword: Type-02 257100 2453760

Missing FRU device - Mem Extender

Logged by: Baseboard Management Controller,

Sensor: Entity Presence

0x2000000009020050 FF01807115250300
```

If you do not see all of the above FRU IDs, concentrate on the missing FRU ID(S). You should eventually end up with the following Alert (IPMI) event for this action as read from the SEL:

If you do not get the above Alert Level 5 (IPMI) event, but get another sort of high level alert, try replacing the I/O backplane board. Examine the pins on the midplane board, and if necessary, replace the midplane board.

5. The next step would be to add the memory extender (with at least one rank of DIMMs). Remember to remove the ac power cord(s) before making this configuration change.

   Here is the output of the iLO 2 MP> `DF` command you should expect at this point (this example has two ranks of DIMMs installed).

   ```
   FRU IDs:
   --------
   0152-DIMM0D 0001-Mem Extender 0002-Power Converter

   0003-Power Supply 0 0004-Power Supply 1 0005-Diagnostic Panel

   0006-Front Panel 0128-DIMM0A 0136-DIMM0B

   0144-DIMM0C 0160-DIMM1A 0168-DIMM1

   0176-DIMM1C 0184-DIMM1D 0000-Motherboard
   ```

   If you do not see all of the above FRU IDs, concentrate on the missing FRU ID(S). You should eventually end up with the following Alert (IPMI) event for this action as read from the SEL:

   If you do show the Alert level 5 “Missing FRU device - CPU 0 PIROM”, continue to the next step.

   ```
   Log Entry 3: Dec 2005 21:50:43

   Alert Level 5: Critical

   Keyword: Type-02 257100 2453760

   Missing FRU device - CPU 0 PIROM

   Logged by: Baseboard Management Controller,

   Sensor: Entity Presence

   0x2041CB3DB3020040 FF20807115250300
   ```

6. Insert the CPU board FRU with at least module 0 processor installed. When you add the CPU board FRU and turn on system power, the cooling fans should turn on and stay on and the DF command output should look something like the following:

   ```
   FRU IDs
   -------
   0001-Mem Extender 0002-Power Converter 0003-Power Supply 0

   0004-Power Supply 1 0005-Diagnostic Panel 0006 Front Panel

   0007-Disk Management 0008-Disk backplane 0010-Processor Board

   0012-Power Pod 0 0013-Power Pod 1 0032-CPU 0 PIROM

   0033-CPU 1 PIROM 0036-Processor 0 RAM 0037-Processor 1 RAM

   0128-DIMM0A 0136-DIMM0B 0144-DIMM0C

   0152-DIMM0D 0160-DIMM1A 0168-DIMM1B

   0176-DIMM1C 0184-DIMM1D 0000-Motherboard
   ```

   At this point, if the installed FRUs are all functional, the system should initiate POST on all processors. It is recommended to observe the system console output using “Live Logs” to ensure that POST is initiated and completes without error.

If POST does not start after a few seconds, suspect some sort of CPU board or processor problem. Typical problems will show up in the SEL or FWP. If the IMPI event logs do not point to a root cause, escalate to bring in expert assistance.

CPU/Memory/SBA

All of the CPU, Memory controller, and System Bus Adapter (SBA or I/O rope controller) functions reside on the Processor card FRU; memory DIMMs reside on memory extender FRUs; and the Local Bus Adapter (LBAs or PCI-X bus controller chips) reside on the common I/O Backplane FRU along with core and customer Host Bus Adapter (HBA device controller) I/O cards. This section discusses the roles of logical CPUs, physical memory ranks, and the rope interfaces in the SBA logic of the Zx2 chip.

Troubleshooting the CPU

Each rx6600 server supports from one to four IPF processor modules. Each processor module contains two individual CPU cores. This results in up to eight physical CPUs installed in rx6600 servers.

Furthermore, unlike previous IPF processor modules, each physical CPU core contains logic to support two physical threads. This results in up to eight physical threads, or the equivalent of 16 logical CPUs in rx6600 servers when four processor modules are installed and enabled.

NOTE: The operating system kernel attaches one or more software processes to each available thread. In multiple processor servers, having more threads means all software processes are launched and executed faster.

IPF Processor Load Order

For a minimally loaded server, one IPF processor module must be installed in CPU socket 0 on the Processor board FRU, and its threads must be enabled by user actions. Additional processor modules of the same revision are installed in CPU sockets 1-3 in rx6600 servers.

Processor Module Behaviors

All enabled CPUs and their threads almost immediately become functional after system power is applied. Each thread is in a race to fetch their instructions from their CPU's instruction and data caches to complete early self test and rendezvous.

Early code fetches come from PDH, until memory is configured. Normal execution is fetched from main memory.

Local machine check abort (MCA) events cause the physical CPU core and one or both of its logical CPUs within that IPF processor module to fail while all other physical and their logical CPUs continue operating. Double-bit data cache errors in any physical CPU core will cause a Global MCA event that causes all logical and physical CPUs in the server to fail and reboot the operating system.

Customer Messaging Policy

- A diagnostic LED only lights for physical CPU core errors, when isolation is to a specific IPF processor module. If there is any uncertainty about a specific CPU, the customer is pointed to the SEL for any action, and the suspect IPF processor module's FRU LED on the diagnostic panel is not lighted.
- For configuration style errors, for example, when there is no IPF processor module installed in CPU socket 0, all of the FRU LEDs on the diagnostic LED panel are lighted for all of the IPF processor modules that are missing.
- No diagnostic messages are reported for single-bit errors that are corrected in both instruction and data caches, during corrected machine check (CMC) events to any physical CPU core.

Diagnostic messages are reported for CMC events when thresholds are exceeded for single-bit errors; fatal processor errors cause global / local MCA events.

Table 5-15 lists the processor events that light the diagnostic panel LEDs.

Table 5-15 Processor Events That Light Diagnostic Panel LEDs

Diagnostic LEDs	Sample IPMI Events	Cause	Source	Notes
Processors	Type E0h, 39d:04d BOOT_DECONFIG_CPU	Processor failed and deconfigured	SFW	This event will likely follow other failed processor(s)
Processors	Type E0h, 5823d:26d PFM_CACHE_ERR_PROC	Too many cache errors detected by processor	WIN Agent	Threshold exceeded for cache parity errors on processor
Processors	Type E0h, 5824d:26d PFM_CORR_ERROR_MEM	Too many corrected errors detected by platform	WIN Agent	Threshold exceeded for cache errors from processor corrected by Zx2
Processors	Type 02h, 02h:07h:03h VOLTAGE_DEGRADES_TO_NON_RECOVERABLE	Voltage on FRU is inadequate	BMC	Power Pod voltage is out of range (likely too low)
Processor Carrier	Type 02h, 02h:07h:03h VOLTAGE_DEGRADES_TO_NON_RECOVERABLE	Voltage on FRU is inadequate	BMC	A voltage on the processor carrier is out of range (likely too low)

Table 5-16 lists the processor events that may light the diagnostic panel LEDs.

Table 5-16 Processor Events That May Light Diagnostic Panel LEDs

Diagnostic LED(s)	Sample IPMI Events	Cause	Source	Notes
Processors	Type E0h, 734d:26d BOOT_CPU_LOADING_ERROR	Installed processors are not compatible	SFW	
Processors	Type E0h, 2953d:26d BOOT_CPU_LOADING_ERROR	Processors and/or termination out of order	SFW	
Processors	Type E0h, 36d:26d BOOT_CPU_LATE_TEST_FAIL	A logical CPU (thread) failed late self test	SFW	
Processors	Type E0h, 677d:26d MC_RENDEZVOUS_SLAVES_FAIL	A logical CPU (thread) slave failed to rendezvous	SFW	
Processors	Type E0h, 30d:26d BOOT_CPU_CONFIG_FAIL	A CPU core failed the configuration process	SFW	

Table 5-16 Processor Events That May Light Diagnostic Panel LEDs *(continued)*

Diagnostic LED(s)	Sample IPMI Events	Cause	Source	Notes
Processors	Type E0h, 790d:26d BOOT_CPU_BAD_CORE_FIXED_RATIO	A processor's fixed core frequency ratio is incompatible with bus frequency	SFW	
Processors	Type E0h, 745d:26d BOOT_FINAL_RENDEZ_WATCHDOG_FAIL	A watchdog timer expired and determined that a monarch processor is not responding.	SFW	
Processors	Type E0h, 83d:26d BOOT_RENDEZ_FAILURE	A logical CPU (thread) rendezvous failure	SFW	Bad or slow processor
Processors	Type E0h, 67d:26d BOOT_MONARCH_TIMEOUT	The logical monarch CPU (thread) has timed out	SFW	
Processors	Type E0h, 57d:26d BOOT_INCOMPATIBLE_SLAVE	A logical slave CPU (thread) is incompatible with logical monarch CPU	SFW	
Processors	Type E0h, 56d:26d BOOT_INCOMPATIBLE_ PAL	CPU PAL incompatible with processor	SFW	
Processors	Type E0h, 34d:26d BOOT_CPU_FAILED	A processor failed	SFW	
Processors	Type E0h, 33d:26d BOOT_CPU_EARLY_TEST_FAIL	A logical CPU (thread) failed early self test	SFW	
Processors	Type 02h, 25h:71h:80h MISSING_FRU_DEVICE	No physical CPU cores present	BMC	Possible seating or failed processor

Troubleshooting Memory

The memory controller logic in the Zx2 chip supports three versions of memory expanders: a 48 slot version that provides six physical ranks that hold 4/8/12/16/20/24 memory DIMMs in both memory cells 0 and 1.

All three versions of memory expanders must have their memory DIMMs installed in groups of four, known as a quad. DIMM quads of different sizes can be installed in any physical rank on all versions of memory expanders, but they must be grouped by their size.

Both the 24 and 48 slot memory expanders support physical memory ranks with four DIMMs while the common 8 slot memory expander's memory cells 0 and 1 each support physical ranks with two DIMMs. In the 8 slot memory expander, however, the logical quad of four DIMMs includes ranks from both sides 0 and 1 running in lock step with each other.

Memory DIMM Load Order

For a minimally loaded server, four equal-size memory DIMMs must be installed in slots 0A, 0B, 0C, and 0D on the same side of the 24/48 slot memory expander; and in the 0A and 0B slots on both 0 and 1 sides of the 8 slot memory expander.

The first quad of DIMMs are always loaded into rank 0's slots for side 0 then in the rank 0's slots for side 1. The next quad of DIMMs are loaded into rank 1's slots for side 0, then for side 1, and so on, until all ranks slots for both sides are full.

Best memory subsystem performance result when both memory sides 0 and 1 have the same number of DIMM quads in them.

Memory Subsystem Behaviors

The Zx2 chip in the rx6600 server provides increased reliability of memory DIMMs and memory expanders. For example, previous entry class servers with Zx1 chips provided error detection and correction of all memory DIMM single-bit errors and error detection of most multi-bit errors within a memory DIMM quad, or 4 bits per rank (this feature is called chip sparing).

The Zx2 chip doubles memory rank error correction from 4 bytes to 8 bytes of a 128 byte cache line, during cache line misses initiated by processor cache controllers and by Direct Memory Access (DMA) operations initiated by I/O devices. This feature is called double DRAM sparing, as 2 of 72 DRAMs in any DIMM quad can fail without any loss of server performance.

Corrective action, DIMM/memory expander replacement, is required when a threshold is reached for multiple double-byte errors from one or more memory DIMMs in the same rank. And when any uncorrectable memory error (more than 2 bytes) or when no quad of like memory DIMMs is loaded in rank 0 of side 0. All other causes of memory DIMM errors are corrected by Zx2 and reported to the Page Deallocation Table (PDT) / diagnostic LED panel.

Customer Messaging Policy

- Only light a diagnostic LED for memory DIMM errors when isolation is to a specific memory DIMM. If any uncertainty about a specific DIMM, point customer to the SEL for any action and do not light the suspect DIMM's FRU LED on the diagnostic panel.
- For configuration style errors, for example, no memory DIMMs installed in rank 0 of side 0, follow the HP policy of lighting all of the FRU LEDs on the diagnostic LED panel for all of the DIMMs that are missing.
- No diagnostic messages are reported for single-byte errors that are corrected in both Zx2 caches and memory DIMMs during corrected platform error (CPE) events. Diagnostic messages are reported for CPE events when thresholds are exceeded for both single-byte and double byte errors; all fatal memory subsystem errors cause global MCA events.
- PDT logs for all double byte errors will be permanent; single byte errors will initially be logged as transient errors. If the server logs 2 single byte errors within 24 hours, upgrade them to permanent in the PDT.

Table 5-17 lists the memory subsystem evens that light the diagnostic panel LEDs.

Table 5-17 Memory Subsystem Events That Light Diagnostic Panel LEDs

Diagnostic LEDs	Sample IPMI Events	Cause	Source	Notes
Memory Carriers	Type 02h, 02h:07h:03h VOLTAGE_DEGRADES_TO_NON_RECOVERABLE	Voltage on memory expander is inadequate	BMC	A voltage on the memory expander is out of range (likely too low)
DIMMs	Type E0h, 208d:04d MEM_NO_DIMMS_INSTALLED	No memory DIMMs installed (in rank 0 of cell 0)	SFW	Light all DIMM LEDs in rank 0 of cell 0
DIMMs	Type E0h, 172d:04d MEM_DIMM_SPD_CHECKSUM	A DIMM has a serial presence detect (SPD) EEPROM with a bad checksum	SFW	Either EEPROM is misprogrammed or this DIMM is incompatible
DIMMs	Type E0h, 4652d:26d WIN_AGT_PREDICT_MEM_FAIL	This memory rank is correcting too many single-bit errors	WIN Agent	Memory rank is about to fail or environmental conditions are causing more errors than usual

Table 5-18 lists the memory subsystem evens that may light the diagnostic panel LEDs.

Table 5-18 Memory Subsystem Events That May Light Diagnostic Panel LEDs

Diagnostic LEDs	Sample IPMI Events	Cause	Source	Notes
Processor Carrier	Type E0h, 189d:26d MEM_ERR_LOG_FAILED_TO_CLEAR	Unable to clear the platform error logs in CEC	SFW	
Processor Carrier	Type E0h, 181d:26d MEM_ECC_MBE_SIGNAL_TST_FAILED	Self-test of CEC multi-bit error signaling has failed	SFW	
Processor Carrier	Type E0h, 160d:26d MEM_BIB_REG_FAILURE	The CEC failed the register test	SFW	
Processor Carrier	Type E0h, 187d:26d MEM_ECC_MBE_SIGNAL_TST_FAILED	System firmware (SFW) was unable to clear the platform error logs on the CEC	SFW	
Processor Carrier	Type E0h, 190d:26d MEM_ERR_REG_CLEAR_FAILURE	The error registers in the CEC failed to clear	SFW	
Processor Carrier	Type E0h, 208d:26d MEM_MC_REG_FAILURE	The CEC's memory controller failed the register test	SFW	
Memory Carriers	Type 02h, 02h:07h:06h VOLTAGE_NON_RECOVERABLE	Expander voltage error	BMC	Voltage wholly contained on memory expander shows failure
DIMMs	Type E0h, 4000d:26d MEM_CHIPSPARE_DEALLOC_RANK	Detected that an SDRAM is failing on the DIMM	SFW	The failing DIMM's rank will be deallocated

Table 5-18 Memory Subsystem Events That May Light Diagnostic Panel LEDs *(continued)*

Diagnostic LEDs	Sample IPMI Events	Cause	Source	Notes
DIMMs	Type E0h, 174d:26d MEM_DIMM_TYPE_INCOMPATIBLE	DIMM type is not compatible with current DIMMs for this platform	SFW	
DIMMs	Type E0h, 173d:26d MEM_DIMM_SPD_FATAL	Detected a fatal error in DIMM's serial presence detect (SPD)	SFW	
DIMMs	Type E0h, 795d:26d MEM_DIMM_QUAD_MISMATCH	DIMM mismatch found within rank of four	SFW	24 / 48 slot version of memory carrier
DIMMs	Type E0h, 779d:26d MEM_DIMM_PAIR_MISMATCH	DIMM mismatch found within rank of two	SFW	8 slot version of memory carrier

Troubleshooting SBA

The server shares a common I/O backplane that supports a total of 10 PCI slots: slots 1-2 on rx6600 systems with only one core I/O SAS card, and slots 1, 2, and 10 for systems with two core I/O SAS cards, are for customer use. Slots 2-10 are used for core I/O functions on systems with only 1 SAS core I/O card; slots 2-9 are used on systems with 2 SAS core I/O cards. The System Bus Adapter (SBA) logic within the Zx2 chip of a server uses 16 rope interfaces to support up to eight Lower Bus Adapter (LBA) chips. Each LBA chip interfaces with the SBA in the Zx2 chip through one or multiple rope interfaces, as follows:

- One LBA chip uses a single rope interface (used by core I/O) to support a single 32-bit PCI slot running @ 33 MHz;
- Three LBA chips use a single-rope interface (one used by core I/O and two are for customer use) to support dual 64-bit PCI-X slots running @ 66 MHz;
- Two LBA chips use dual-rope (4 ropes total) interfaces (both are for customer use) to support two single 64-bit PCI-X slots running @ 133 MHz;
- Two LBA chips use two quad-rope (8 ropes total) interfaces (both are for customer use) to support two single 64-bit PCI-X slots running @ 266 MHz.

Power Subsystem (BPS and I/O VRM)

The two bulk power supply FRUs shared by both the chassis provides N+1 redundancy for their chassis. Each power supply FRU is identified by the chassis as 0 and 1 for logging purposes only as there are no LEDs on the diagnostic LED panel for these external FRUs.

Power supply FRU failures are identified visually by a single green LED that is turned off when one or both of the power supplies fail; logged as an IPMI event by voltage sensor logic; and identified as a power supply FRU failure by the BMC turning on the appropriate LEDs on the front LED panel.

The I/O VRM FRU, located beside the core I/O board FRU, provides all I/O subsystem dc power.

Power Subsystem Behavior

Each bulk power supply FRU provides 1600 Watts of dc power from a nominal 240 VAC 50-60 Hz. The baseboard management controller (BMC) chip located on the Unified Core I/O board FRU controls the flow of +12 VDC power to the server's FRUs. (Note that you can both control and display power supply status remotely with the iLO 2 MP `pc` and `ps` commands, respectively.)

Typical power up sequence of the server is as follows:

- Power LED on front panel glows steady Amber when one or two bulk power supplies are plugged into nominal ac voltage and the +3.3 VDC housekeeping voltage comes on and stays on whenever ac power is present.
- The BMC, iLO 2 MP, Flash memory, and chassis intrusion circuits are reset after the +3.3 VDC housekeeping voltage stabilizes.
- The BMC monitors the power button on the front panel.
- When the power button is pressed or when a Wake-on-LAN (WOL) signal is asserted, the BMC signals the bulk power supplies to fully power up.
- +12 VDC comes up and all of the cooling fans and the various VRMs come up sequentially.
- The BMC signals when the server is ready to come out of reset (clocks are programmed and stable, etc.).
- The server is brought out of reset.
- The Zx2 chip resets all components connected and the server begins the boot process.

Power LED/Switch

The front panel system power LED indicates the status of system power. It is incorporated inside the power button itself.

The power button has a momentary switch (as opposed to a latching switch) that is recessed or covered to prevent accidental activation/de-activation.

If the OS is up, pressing the power button for less than 4 seconds results in a graceful shutdown of the operating system and a subsequent removal of system power. Pressing the power button for greater than 4 seconds results in a hard shutdown (system power removed). While the server is booting (before the system has passed `EFI_EXIT_BOOT_SERVICES`), the BMC will power the server off immediately on a button press, since there is no concept of soft shutdown in this state.

In the event that the OS is absent or hung, or that the manageability subsystem (specifically the BMC) in the server is not responding, a greater than 4 second press of the power button is required to power down the system (a less than 4 second press on the power button will have no effect).

To ensure that the system powers up in a deterministic fashion, the power button must be masked for 4 seconds after a power-down.

Table 5-19 lists the power LED states.

Table 5-19 Power LED States

Definition	Flash Rate	LED Color
No ac power to the system	LED Off	
System power is turned on	Steady	Green
System is shut down, but ac and housekeeping (standby) power are active.	Steady	Amber

For HA and safety reasons, this LED is run directly off the power rails, rather than run under firmware control.

Power Supply Power LED

There is a 1 Hz Flashing Green POWER LED (PWR), located on each power supply, which indicates that ac is applied to the PSU, and that housekeeping voltages are available. This same LED becomes Steady Green when all power outputs are available. If this LED enters a 1 Hz Flashing Amber state, it indicates that the power supply has failed, and a replacement unit is necessary.

Table 5-20 lists the power supply conditions mapped to POWER LED states.

Table 5-20 Power Supply Conditions Mapped to Power LED States

Power Supply Condition	Power Supply Power LED
No ac power applied to any PSUs	Off
No ac power applied to this PSU only	Off
ac present; housekeeping on	Flashing Green (Slow ~ 1 Hz)
Power supply dc outputs On and OK	Steady Green
Power supply failure (includes overvoltage, overcurrent, overtemperature, and fan failure)	Flashing Amber (Slow ~ 1 Hz)

The Power Supply Power LED is visible on the power supply's exterior face.

I/O VRM

Table 5-21 lists the I/O power events that light the diagnostic panel LEDs.

Table 5-21 I/O Power Events That Light Diagnostic Panel LEDs

Diagnostic LEDs	Sample IPMI Events	Cause	Source	Notes
I/O Power	Type 02h, 02h:07h:03h VOLTAGE_DEGRADES_TO_NON_RECOVERABLE	Voltage on FRU is inadequate	BMC	A voltage on the I/O power assembly is out of range (likely too low)

Cooling Subsystem

The three fan cooling zones located within the chassis provide N+1 redundancy for the chassis using three identical dual fan assembly FRUs. In turn, each dual fan assembly FRU provides additional N+1 redundancy for the fan cooling zone it controls. Each dual fan assembly FRU is identified by the chassis as fans 1, 2, and 3 both for logging purposes and for fault identification on the diagnostic LED panel.

There are six fan cooling zones within the rx6600 chassis that provide N+1 redundancy for the chassis using six identical dual fan assembly FRUs. In turn, each dual fan assembly FRU provides additional N+1 redundancy for the fan cooling zone it controls. Each dual fan assembly FRU is identified by the chassis as fan 1-6 both for logging purposes and for fault identification. Note, however, that three of the six total dual fan assemblies are considered as internal FRUs and are identified by the chassis as fans1, 2, and 3 on the diagnostic LED panel while the other three dual fan are considered as external FRUs identified as fans 4, 5, and6 and do not have LEDs on the diagnostic LED panel.

External cooling fan FRU failures are identified visually by a single green LED on the dual fan assembly FRU that is turned on when one or both of the fans fail; logged as an IPMI event by fan sensor logic; and identified as a fan assembly FRU failure by the BMC turning on the appropriate LEDs on the front and diagnostic LED panels.

Cooling Subsystem Behavior

The baseboard Management Controller (BMC) chip located on the Unified Core I/O board FRU controls fan speed on ambient air temperatures, chip temperatures, server configuration, and fan operation or failure. Air is drawn through the front of the chassis and pushed out the rear by the cooling fans. (Note that you can display fan status remotely with the iLO 2 MP `ps` command.)

Within the HP integrity rx6600 server, temperature sensors report chassis temperatures to the BMC, which controls fan speed based on this information.

Table 5-22 lists the cooling subsystem events that light the diagnostic panel LEDs.

Table 5-22 Cooling Subsystem Events That Light Diagnostic Panel LEDs

Diagnostic LEDs	Sample IPMI Events	Cause	Source	Notes
Fans (1-3)	Type 02h, 0Ah:07h:01h COOLING_UNIT_WARNING	Fan has either previously failed or is degrading	BMC	Cleared when fan is replaced
Fans (1-3)	Type 02h, 0Ah:07h:02h COOLING_UNIT_FAILURE	Fan has failed and no longer meets minimum requirements	BMC	Cleared when fan is replaced

Common I/O Backplane (LBAs/Ropes/PDH/PCI-X Slots)

This subsection provides information on troubleshooting issues with the 8 public and 2 private PCI-X slots.

I/O Subsystem Behaviors

The main role of the I/O subsystem is to transfer blocks of data and instruction words between physical shared memory and virtual memory (system disks / disk array). The system boot is the first time blocks of data and instructions words are transferred into physical shared memory from a local disk / DVD or from a remote disk on another server through multiple LAN transfers. This process is referred to as Direct Memory Access (DMA) and is initiated by I/O devices located in core I/O or on Host Bus Adapter (HBA) I/O cards and does not involve any logical CPUs.

A secondary role of the I/O subsystem is to transfer data between the internal registers within each CPU core and the internal control/store registers within the Zx2 / PDH / Local Bus Adapters (LBA) and HBA chips. This process is referred to as programmed I/O and is initiated by logical CPUs executing external LOAD / STORE instructions. (Note that both system firmware and OS kernel both use this method to initiate DMA transfers.)

Customer Messaging Policy

- Always point customer to the SEL for any action from low level I/O subsystem faults as there may not be any lighted LEDs on the diagnostic panel. (Note that IPMI events in SEL / FPL provide the logical Acpi path of suspect I/O subsystem FRU. Use Table 5-25: “PCI/PCI-X Slot-Rope-ACPI Paths” (page 164) to determine the physical PCI slot #.)
- For configuration style errors, for example, no iLO 2 MP / core I/O HBAs installed or working, see the Supported Configurations subsection for actions.
- Some diagnostic messages are reported for high level I/O subsystem errors; all fatal I/O subsystem errors cause global MCAs. (Note that HP-UX provides its own path with the physical Rope # of the suspect I/O subsystem FRU. Use Table 5-25: “PCI/PCI-X Slot-Rope-ACPI Paths” (page 164), to determine the physical PCI slot number.)

Table 5-23 lists the I/O subsystem events that light the diagnostic panel LEDs.

Table 5-23 I/O Subsystem Events That Light Diagnostic Panel LEDs

Diagnostic LEDs	Sample IPMI Events	Cause	Source	Notes
I/O Card	Type 02h, 03h:05h:01h CURRENT_LIMIT_EXCEEDED	Over-current on PCI slot	BMC	Likely a short on I/O card or I/O slot.
I/O Backplane	Type 02h, 02h:07h:03h VOLTAGE_DEGRADES_TO_NON_RECOVERABLE	Voltage on FRU is inadequate	BMC	A voltage on the I/O backplane is out of range (likely too low)
Disk Backplane	Type 02h, 02h:07h:03h VOLTAGE_DEGRADES_TO_NON_RECOVERABLE	Voltage on FRU is inadequate	BMC	A voltage on the I/O backplane is out of range (likely too low)

Table 5-24 lists the I/O card events that may light the diagnostic panel LEDs.

Table 5-24 I/O Card Events That May Light Diagnostic Panel LEDs

Diagnostic LEDs	Sample IPMI Events	Cause	Source	Notes
I/O Card	Type E0h, 4658d:26d IO_PCI_POWER_OVERLOAD_ERR	A non hot plug I/O slot's power consumption increases the total I/O power consumption beyond the supported limit	SFW	Disallow O/S boot and display the following EFI error message, "I/O configuration exceed
I/O Card	Type E0h, 137d:26d IO_NOT_ENOUGH_POWER_ERROR	Insufficient power to power on a hot-plug PCI-X slot	SFW	Display EFI warning message "Failed I/O slot(s) deconfigured"
I/O Card	Type E0h, 147d:26d IO_SLOT_STANDBY_POWER_ERROR	PCI slot's standby power failed	SFW	Either a card / slot problem. Reseat card first.
I/O Card	Type E0h, 131d:26d IO_HOT_PLUG_CTRL_FAILED	PCI-X hot-plug controller failed	SFW	Either a card / slot problem. Reseat card first
I/O Card	Type E0h, 139d:26d IO_PCI_MAPPING_TOO_BIG	PCI bus walk (I/O discovery) resources exceeded	SFW	Remove any unsupported I/O cards. Move I/O card to an unused PCI slot
I/O Card	Type E0h, 148d:26d IO_UNKNOWN_PCIXCAP_VAL	Found invalid PCIXCAP value	SFW	
I/O Card	Type E0h, 141d:26d IO_PCIXCAP_SAMPLE_ERROR	PCIXCAP sampling error	SFW	
I/O Card	Type E0h, 123d:26d IO_CHECK_LBA_MISSING_ERR	Expected I/O host bridge (Lower Bus Adapter) is missing	SFW	
I/O Card	Type E0h, 619d:26d IO_CHECK_LBA_DECONFIG_ERR	Expected I/O host bridge (Lower Bus Adapter) is deconfigured	SFW	
I/O Card	Type E0h, 133d:26d IO_LBA_CLEAR_ERR_FAILED	I/O LBA clear error failed	SFW	
I/O Card	Type E0h, 144d:26d IO_SBA_CLEAR_ERR_FAILED	I/O SBA clear error failed	SFW	
I/O Card	Type E0h, 146d:26d IO_SLOT_POWER_ON_ERROR	PCI-X slot power on error	SFW	
I/O Card	Type E0h, 145d:26d IO_SLOT_POWER_DEFAULT_ERROR	PCI-X slot has incorrect default power state	SFW	

Table 5-24 I/O Card Events That May Light Diagnostic Panel LEDs *(continued)*

Diagnostic LEDs	Sample IPMI Events	Cause	Source	Notes
I/O Card	Type E0h, 136d:26d IO_LBA_RESET_ERROR	I/O host bridge (Lower Bus Adapter) is inaccessible because rope reset failed to complete	SFW	
I/O Card	Type E0h, 130d:26d IO_DLL_ERROR	PCI clock DLL error	SFW	
I/O Card	Type E0h, 143d:26d IO_ROPE_RESET_ERROR	I/O rope reset failed to complete	SFW	

Table 5-25 lists the PCI slot-rope-acpi paths.

Table 5-25 PCI/PCI-X Slot-Rope-ACPI Paths

<table>
<tr><th>OLARD</th><th>Physical Slot #</th><th>Physical Rope #</th><th>Logical ACPI Path</th></tr>
<tr><td>No</td><td>XX
Slow core iLO 2 MP at 33MHz.</td><td>0</td><td>Acpi(HWP0002,PNP0A03,0)/Pci(1 |0)
Acpi(HWP0002,PNP0A03,0)/Pci(1 | 1)
Acpi(HWP0002,PNP0A03,0)/Pci(1 | 2)
Acpi(HWP0002,PNP0A03,0)/Pci(2 | 0)
Acpi(HWP0002,PNP0A03,0)/Pci(2 | 1)
Acpi(HWP0002,PNP0A03,0)/Pci(2 | 2)</td></tr>
<tr><td>No</td><td>1
Fast core storage at 66 MHz.</td><td>8</td><td>Acpi(HWP0002,PNP0A03,400)/Pci(1 | 0)</td></tr>
<tr><td>No</td><td>2
Fast core LAN at 66 MHz.</td><td>8</td><td>Acpi(HWP0002,PNP0A03,400)/Pci(2 | 0)
Acpi(HWP0002,PNP0A03,400)/Pci(2 | 1)</td></tr>
<tr><td>Yes</td><td>3
Public, single at 266 MHz.</td><td>12, 13, 14 & 15</td><td>Acpi(HWP0002,PNP0A03,700)/Pci(1 | 0)</td></tr>
<tr><td>Yes</td><td>4
Public, single at 266 MHz.</td><td>4, 5, 6 & 7</td><td>Acpi(HWP0002,PNP0A03,300)/Pci(1 | 0)</td></tr>
<tr><td>Yes</td><td>5
Public, single at 133 MHz.</td><td>10 & 11</td><td>Acpi(HWP0002,PNP0A03,600)/Pci(1 | 0)</td></tr>
<tr><td>Yes</td><td>6
Public, single at 133 MHz.</td><td>2 & 3</td><td>Acpi(HWP0002,PNP0A03,200)/Pci(1 | 0)</td></tr>
<tr><td>Yes</td><td>7
Public, shared at 66 MHz.</td><td>9</td><td>Acpi(HWP0002,PNP0A03,500)/Pci(1 | 0)</td></tr>
<tr><td>Yes</td><td>8
Public, shared at 66 MHz.</td><td>9</td><td>Acpi(HWP0002,PNP0A03,500)/Pci(2 | 0)</td></tr>
<tr><td>Yes</td><td>9
Public, shared at 66 MHz.</td><td>1</td><td>Acpi(HWP0002,PNP0A03,100)/Pci(1 | 0)</td></tr>
<tr><td>Yes</td><td>10
Public, shared at 66 MHz.</td><td>1</td><td>Acpi(HWP0002,PNP0A03,100)/Pci(2 | 0)</td></tr>
</table>

Table 5-26 PCI/PCI-X/PCI-E Slot-Rope-ACPI Paths

OLARD	Physical Slot #	Physical Rope #	Logical ACPI Path
No	XX Slow core iLO 2 MP at 33MHz.	0	Acpi(HWP0002,PNP0A03,0)/Pci(1|*)
No	XX Core I/O USB	0	Acpi(HWP0002,PNP0A03,0)/Pci(2|*)
No	XX Core I/O VGA (optional)	0	Acpi(HWP0002,PNP0A03,0)/Pci(4|*)
No	1 Fast core storage at 66 MHz.	8	Acpi(HWP0002,PNP0A03,400)/Pci(1|*)
No	2 Fast core LAN at 66 MHz.	8	Acpi(HWP0002,PNP0A03,400)/Pci(2|*)
Yes	3 Public, switched daul x8	10 & 11	Acpi(HPQ0002,PNP0A08,600)/Pci(0|0)/Pci(0|0)/Pci(1|0)/Pci(0|*)
Yes	4 Public, switched dual x8	10 & 11	Acpi(HPQ0002,PNP0A08,600)/Pci(0|0)/Pci(0|0)/Pci(0|0)/Pci(0|*)
Yes	5 Public, single at x8	12, 13, 14 & 15	Acpi(HPQ0002,PNP0A08,700)/Pci(0|0)/Pci(0|*)
Yes	6 Public, single at x8	4, 5, 6 & 7	Acpi(HPQ0002,PNP0A08,300)/Pci(0|0)/Pci(0|*)
Yes	7 Public, single at 133 MHz	2 & 3	Acpi(HWP0002,PNP0A03,200)/Pci(1|*)
Yes	8 Public, single at 133 MHz	9	Acpi(HWP0002,PNP0A03,500)/Pci(1|*)
Yes	9 Public, shared at 66 MHz.	1	Acpi(HWP0002,PNP0A03,100)/Pci(1|*)
Yes	10 Publice, shared at 66 MHz	1	Acpi(HWP0002,PNP0A03,100)/Pci(2|*)

Management Subsystem (iLO 2 MP/BMC)

Manageability LAN LED on the Core I/O board FRU's bulkhead

The manageability LAN uses two LEDs, viewable from the rear of the server. The manageability LAN LED indicates link and activity status.

Only 10 Mb and 100 Mb speeds are currently supported on the manageability LAN.

Table 5-27

Table 5-27 Manageability LAN LED States and Speeds

Link	LED State
Status	
Activity	Blinking green
Link with no activity	Solid green
No link	Off
Speed	

Table 5-27 Manageability LAN LED States and Speeds *(continued)*

Link	LED State
100 MB	Solid amber
10 MB	Off

lists the manageability LAN LED statuses with their corresponding LED states.

NOTE: For information on the Core LAN LED, see "I/O Subsystem (SAS/SATA/SCSI/DVD/HDD/Core I/O)" (page 166).

Manageability Reset Button on Core I/O Board FRU's Bulkhead

The manageability reset button, with pinhole access from the rear of the server, allows you to reset the iLO 2 MP; it optionally also resets user-specified values to factory default values. A momentary press causes a soft reset of the iLO 2 MP, when the button is released; a greater than four-second press effects the same end upon release, and also returns user-specified values to factory default values (hard reset).

The crucial values to be reset are:

- Serial terminal baud settings
- User names and passwords

Manageability Status LED

The manageability status LED indicates the state and health of the iLO 2 MP. It is visible from the rear of the server.

Table 5-28 lists the manageability status LED states.

Table 5-28 Manageability Status LED

LED State	Definition
Off	iLO 2 MP is not responding
Steady Amber	Self Test
0.5 Hz Flashing Green	Heartbeat
1 Hz Flashing Amber	ROM Error

I/O Subsystem (SAS/SATA/SCSI/DVD/HDD/Core I/O)

Verifying Hard Disk Drive Operation

Each hard disk drive has an activity LED indicator on the front of the drive.

NOTE: Only the Activity LED is used. The Status LED is not monitored by the OS.

Lightpipes on the disk drive transmit light to these apertures from LEDs on the inside rear of the hot-swap mass storage cage. Verify that the LED shows the correct activity indication for all disk drives that you installed:

1. Turn on power to the server and display monitor.
2. During the boot sequence, watch the Activity LED on each hard disk drive: **Activity LED**: The LED quickly cycles from amber to green. The LED stays steady green until the drive spins up.
3. If the activity LED stays illuminated steady green on any disk drives (after the drive spins up), the drive cage may not be correctly installed. Check installation as follows:

a. Turn off the HP server power switch and unplug the ac power cords and any cables.
b. Verify that the SAS interface is correctly installed.
c. Reconnect the ac power cords and any cables. Restart the HP server to determine whether the LEDs now become illuminated during the boot. If not, contact your reseller.

4. If the LED indicator on a single disk drive is not illuminated during boot, the disk drive may be installed incorrectly, or its lightpipes may be damaged.

   Check the lightpipe on the disk drive as follows:

   a. Remove the disk drive.
   b. Inspect the lightpipes for damage. If a lightpipe is damaged, contact your reseller.

   CAUTION: The lightpipes are fragile. Be careful not to damage them when you inspect them or when you reinsert the disk drive.

   c. Reinstall the disk drive.
   d. Restart the HP server to determine whether the LED now becomes illuminated during the boot. If not, contact your reseller.

5. To check the SCSI drives, use the EFI Shell `info io` command.

LAN LEDs

There are LAN LEDs on the rear bulkhead of LAN HBA in PCI-X slot 2 with 1 core I/O SAS card installed.

HBA Bulkhead LAN LEDs

There are two 1 Gb LAN ports on the LAN HBA's bulkhead. They are LAN A and LAN B.

LAN A Connector LEDs

The 1 Gb LAN A interface provides two LEDs on the LAN bulkhead.

Table 5-29 lists the Gb LAN A connector LEDs.

Table 5-29 Gb LAN A Connector LEDs

LAN LED	Location	Color	State
Not used	Top	None	None
1000mb	2nd from top	Amber	Blinking amber – the 1000 Mbps with ethernet protocol and twisted-pair wiring is enabled. Off – no link.
100mb	2nd from bottom	Green	Blinking green – the 100 Mbps with ethernet protocol and twisted-pair wiring is enabled. Off – no link.
Activity	Bottom	Green	Blinking green – The Activity LED lights, and all other LEDs are off for a 10 Mbps connection. Off – no activity

LAN B Connector LEDs

The 1 Gb LAN B interface provides two LEDs on the LAN bulkhead.

Table 5-30 lists the Gb LAN B connector LEDs.

Table 5-30 Gb LAN B Connector LEDs

LED	Description
Speed (upper left)	Yellow—the 1000 MHz with ethernet protocol and twisted-pair wiring is enabled, off—no link
Speed (upper left)	Green—the 100 MHz with ethernet protocol and twisted-pair wiring is enabled, off—no link
Link (upper right)	Green—link
Link (upper right)	Off—No link

Booting

Table 5-31 shows the normal boot process, as reflected in changes to front panel LED states:

Table 5-31 Normal Boot Process LED States

Step	System Health	Internal Health	External Health	Power	Diagnostic Panel	Normal Power-Up Through OS Boot
1	Off	Off	Off	Off	Off	No ac power to the system.
2	Off	Off	Off	Steady Amber	Off	System is shut down, but ac power and standby power is active.
3	Off	Off	Off	Steady Green	Off	System power rails are on when Power switch is toggled.
4	Off	Off	Steady Green	Steady Green	Off	System power rails are on; BMC drives External Health LED.
5	Off	Steady Green	Steady Green	Steady Green	Off	System is booting firmware (has passed `BOOT_START` in firmware).
6	Steady Green	Steady Green	Steady Green	Steady Green	Off	System has finished booting firmware and an OS is either booting or running.

NOTE: In the normal boot process, shown in Table 5-31, even though the BMC is running while the system is shut down (for example, Power LED is steady amber), it doesn't drive the External Health LED to Steady Green until +12VDC power from the Bulk Power Supplies is applied.

The following list itemizes the steps that characterize basic platform boot flow. Step numbers provided correspond to the steps in Table 5-31:

3) System power switch turns on bulk power supplies and fans, and releases RESET on all CPUs simultaneously, when toggled on.

5) Initial CPU firmware code fetch is PAL code from EEPROM in PDH, retrieved four bytes at a time by DMDC in ZX2 (no shared memory or I/O devices are available at this time; for example, they are not initially configured).

5) Firmware code stack is initially in BBRAM in PDH, retrieved 4 byes at a time, through PDH and DMD buses.

5) PAL code configures all CPUs.

5) SAL code configures all platform CEC chips, including shared memory and all responding I/O devices.

5) Firmware code and stack are relocated to shared memory, after all x4DIMM ranks in shared memory are configured and tested.

5) EFI Shell is launched from shared memory, and cache lines are retrieved 128 bytes at a time by MEMC in Zx2.

6) OS loader is launched using the EFI device driver.

6) OS boots and starts its own device drivers.

6) OS may use runtime PAL and SAL calls, and APCI features (these abstraction layers allow platform independence).

Firmware

The system has three sets of firmware installed:

- System firmware
- BMC firmware
- iLO 2 MP firmware

All firmware (SFW, BMC, iLO 2 MP, and so on.) must be from the same release. Independent updates are not supported. Details about a specific release are available in the associated Release Notes.

Firmware updates are available at:

`http://www.hp.com` under "Support and Drivers".

Identifying and Troubleshooting Firmware Problems

Erratic system operation, or the fact that the server may not boot successfully to the EFI Boot Manager or to the EFI Shell, are symptoms of possible firmware problems.

It should be noted that problems due to firmware are relatively rare, and you should look for other problem causes first.

If you are dealing with a firmware problem, the probable failure areas are:

- Unsupported firmware installation
- Corrupt firmware installation

To troubleshoot firmware problems:

1. Verify that all system and BMC firmware components are from the same release (use the iLO 2 MP`sr` command).
2. Reinstall all firmware.

Updates

Your system has an EFI utility for updating your system, BMC, and iLO 2 MP firmware. This utility's name is `fwupdate.efi`

To update your firmware, follow these steps:

1. Start up the system and get to the EFI command prompt.
2. Execute the following EFI command at the EFI Shell prompt, to determine the current firmware version: `Shell>` **`info fw`**
3. Look for the latest firmware updates at http://www.hp.com. If a new version of the firmware is available, download it and save it to CD, or copy it over the network to the system you are going to update
4. On the system you are updating, execute the `fwupdate.efi` command from the EFI command prompt, in the following manner: **`fweupdate -f <xxx>.bin`**

   where **`<xxx>`** is the firmware version number for the firmware you need to install

The iLO 2 MP firmware can be updated in three ways:

1. Using the same utilities that are used by system firmware and the BMC.
2. Initiating a firmware upgrade from the iLO 2 MP user interface; the iLO 2 MP pulls its image from the FTP server that you specify.
3. Initiating a firmware upgrade from the HP System Insight Manager (SIM) as a "Group Action".

Server Interface (System Console)

All system console connections (VGA, USB, local RS-232 and iLO 2 MP LAN) are located on the bulkhead of the core I/O board FRU at the rear of the chassis.

HP-UX uses the RS-232 serial text connection to a (dumb) terminal or terminal emulator software running on a PC to control server operations locally.

HP-UX alternatively uses the iLO 2 MP LAN connection over a private network to control server operations locally using telnet or SSH, and remotely over a public network through the Web GUI.

Both the Windows and LINUX operating systems use the VGA (monitor) and USB (keyboard and mouse) connections to control server operations locally.

Troubleshooting Tips

RS-232 connection: If a dumb terminal / PC running terminal emulation software is attached to the iLO 2 MP "local" port and does not respond to a Control-B CR key sequence (and the terminal is running 9600 baud, 8 data bits, is ONLINE, and so on), it is possible that the iLO 2 MP is not operational / functional. See "Management Subsystem (iLO 2 MP/BMC)" (page 165) for the following LED locations:

- The iLO 2 MP's Heartbeat LED
- The BMC's Heartbeat LED

Replace core I/O board FRU if both Heartbeat LEDs are not flashing green; suspect bulk power supplies, or midplane board FRU, or I/O backplane board FRU if both Heartbeat LEDs are off.

LAN connections: See "I/O Subsystem (SAS/SATA/SCSI/DVD/HDD/Core I/O)" (page 166) for iLO 2 MP LAN LED states.

Environment

Ambient intake air temperature is often different from ambient room temperature; you should measure the operating temperature and humidity directly in front of the cabinet cooling air intakes, rather than measure only ambient room conditions.

Within the server, temperature sensors report chassis temperature to the BMC. The BMC controls fan speed, based on this information.

Temperature sensors are found on the display panel, where a thermal sensor detects the ambient room temperature. This sensor's reading is the main parameter used to regulate fan speed, under normal conditions

Table 5-32 provides environmental specifications for the server:

Table 5-32 Environmental Specifications

Parameter	Operating Range	Recommended Operating Range	Maximum Rate of Change	Non-Operating Range
Temperature	5-35 degrees C (up to 5000 feet)	20-25 degrees C (up to 5000 feet)	10 degrees C/hr. with tape; 20 degrees C/hr. without tape	-40 degrees to +70 degrees C
Relative Humidity	15-80% at 35 degrees C noncondensing	40-60% at 35 degrees C noncondensing	30% per hour noncondensing	

Reporting Your Problems to HP

HP customer care will help you solve server problems and, if necessary, initiate appropriate serviceprocedures.

Support is available on the Web and by phone.

For information on contacting the HP IT Resource Center (ITRC) near you, go to:

http://www.itrc.hp.com`http://www.itrc.hp.com`

Online Support

To contact HP Customer Support online, see Worldwide Limited Warranty and Technical Support Guide or visit us at:

`http://www.hp.com/go/bizsupporthttp://www.hp.com/go/bizsupport`

On our Web page, enter the server model number (rx6600) and search the field.

The following information is available on this Web site:

- Software and firmware updates
- The latest drivers and utilities
- Additional documentation

Phone Support

To contact HP customer support by phone, go to the HP IT Resource Center (ITRC) near you, at: `http://www.itrc.hp.com`.

Local phone numbers are listed in your native language for help.

Information to Collect Before you Contact Support

NOTE: It is highly recommended that you keep detailed records of any changes to your system, and of how system behavior has changed over time, or as a result of changes made to your system.

Before you contact HP support, you should:

1. Check the previous sections of this chapter and attempt to solve the problem.
   - Note failure symptoms and error indications (LEDs and messages).
   - Capture and permanently log the current SEL and FPL contents.
   - Try to determine precisely what did or did not happen.
2. Collect the following information:
   - The model number of your server (for example, rx6600).
   - The product number of your server. This can be found on the identification label, which is found at the front of the unit.
   - The serial number of your server. This can be found on the identification label.
3. Be familiar with your system configuration.
   - Are you using the LAN, RS232, or Web interface to monitor the server?
   - How many processors, DIMMs, and PCI cards have been installed?
   - What versions of processor, memory, and PCI cards are used and where are they installed?
   - What accessories are installed?
4. Determine the following
   - Which firmware versions are in use?
   - When did the problem start?

- Have recent changes been made to the system?
- Which OS and version is in use?

A Field Replaceable Units Information

This appendix provides the following information for each field replaceable unit (FRU):

- Manufacturing part number
- Description
- Replacement part number
- Exchange part number

This appendix addresses the following topics:

- “Parts Only Warranty Service” (page 173)
- “Customer Self Repair” (page 173)
- “FRU List” (page 174)

Parts Only Warranty Service

Your HP Limited Warranty may include a parts only warranty service. Under the terms of parts only warranty service, HP will provide replacement parts free of charge. For parts only warranty service, CSR part replacement is mandatory. If you request HP to replace these parts, you will be charged for the travel and labor costs of this service.

Customer Self Repair

HP products are designed with many Customer Self Repair (CSR) parts to minimize repair time and allow for greater flexibility in performing defective parts replacement. If during the diagnosis period HP (or HP service providers or service partners) identifies that the repair can be accomplished by the use of a CSR part, HP will ship that part directly to you for replacement. There are three categories of CSR parts:

- Yes: Parts for which customer self repair is mandatory. If you request HP to replace these parts, you will be charged for the travel and labor costs of this service.
- Optional: Parts for which customer self repair is optional. These parts are also designed for customer self repair. If, however, you require that HP replace them for you, there may or may not be additional charges, depending on the type of warranty service designated for your product.
- No: Some HP parts are not designed for customer self repair. To satisfy the customer warranty, HP requires that an authorized service provider replace the part.

Based on availability and where geography permits, CSR parts are shipped for next business day delivery. Same-day or four-hour delivery may be offered at an additional charge where geography permits. If assistance is required, you can call the HP Technical Support Center and a technician will help you over the telephone.

HP specifies in the materials shipped with a replacement CSR part whether a defective part must be returned to HP. In cases where it is required to return the defective part to HP, you must ship the defective part back to HP within a defined period of time, normally five (5) business days. The defective part must be returned with the associated documentation in the provided shipping material. Failure to return the defective part may result in HP billing you for the replacement. With a CSR, HP pays for all the shipping and part return costs and determines the courier to be used.

For more information about HP's Customer Self Repair program, contact your local service provider. For the North American program, refer to the HP Web site at:

`http://www.hp.com/go/selfrepair`

Table A-1 provides CSR information.

Table A-1 Customer Self Repair Information

Code	Level	Description	Comments
AY	Yes	Level A with instructions available in the service guide	Requires you to replace these parts under warranty. No technical skills required.
BY	Optional	Level B with instructions available in the service guide	Low to moderate technical skills required.
CY	Optional	Level C with instructions available in the service guide	High technical skills required.
N	No	Not a customer replaceable part.	Some HP parts are not designed for customer self repair. In order to satisfy the customer warranty, HP requires that an authorized service provider replace the part.

FRU List

Table A-2 lists the field replaceable units of the HP Integrity rx6600 server.

NOTE: Use the part nomenclature from this list to choose the correct part from the HP Partsurfer.

Table A-2 FRU List

Manufacturing Part Number	Description	Replacement Part Number	Exchange Part Number	Customer Self Repair
Processors				
AB576-2100A/AB576AX	CPU module, 1.4 GHZ/12 MB Cache	AB576-67017	AB576-69017	BY
AB577-2100A/AB577AX	CPU module, 1.6 GHZ/18 MB Cache	AB577-67018	AB577-69018	BY
AB578-2100A/AB578AX	CPU module, 1.6 GHZ/24 MB Cache	AB578-67019	AB578-69019	BY
Memory (DIMMs)				
AB563AX	512 MB DIMM	AD326A	AB563-69001	BY
AB564AX	1 GB DIMM	AD327A	AB564-69001	BY
AB565AX	2 GB DIMM	AD328A	AB565-69001	BY
AB566AX	4 GB DIMM	AD329A	AB566-69001	BY
PCI-X and Core I/O Cards				
AB352-60003	PCI-X 2-Port GbE core card	AB352-67003	n/a	BY
435234-001	PCI-X serial attach SCSI adapter	435709-001	n/a	BY
336685-001	PCI-X SAS RAID controller (P600)	370855-001	n/a	BY
309522-001N	SAS controller, cache (P600)	309522-001	n/a	BY
307132-001	SAS controller, battery (P600)	307132-001	n/a	BY
012760-002	PCI-E SAS RAID controller (P400)	405832-001	n/a	BY
012764-004	256 Cache module (P400)	405836-001	n/a	BY
408658-001	Battery cable assembly, 11.5"	409124-001	n/a	BY
381573-001	Battery, BBWC, NiMH, 3.6-V (P400 & P800)	398648-001	n/a	BY

Table A-2 FRU List *(continued)*

Manufacturing Part Number	Description	Replacement Part Number	Exchange Part Number	Customer Self Repair
381572-001	PCI-E SAS RAID controller able to connect to external storage (P800)	398657-001	n/a	BY
405965-001	Battery retainer (P800)		n/a	BY
	PCA Boards			
AB463-60003	Core I/O board with VGA	AB463-67003	AB463-69003	AY
AB463-60004	Core I/O board without VGA	AB463-67003	AB463-69003 (same as with VGA)	AY
AB463-60006	SAS disk backplane board	AB463-67006	n/a	BY
AB464-60003	Midplane board	AB464-67003	n/a	NO
AB463-60020	Display board	AB463-67020	n/a	BY
AB464-60006	Interconnect board	AB464-67006	n/a	CY
AB464-60102	4-socket processor board	AB464-60102	AB464-69102	BY
	Internal Disks/Removable Media			
375863-001	36 GB SAS HDD	376596-001	n/a	AY
375863-002	72 GB SAS HDD	376597-001	n/a	AY
168003-9D5	DVD drive, 8X slim, IS, S5, CBT, TE	397928-001	n/a	AY
AD143-2100A	DVD+RW drive, 8X, S5, CBT, TE	AD143-2100A	n/a	AY
	Server Subassemblies			
AB463-2134B	I/O backplane assembly	AB463-67034	AB463-69034	BY
AD126-2100C	24-DIMM memory carrier assembly	AD126-67001	AD126-69001	AY
AD127-2100C	48-DIMM memory carrier assembly	AD127-67001	AD127-69001	AY
	Fan Assemblies			
AB463-2158A	Fan	AB463-2158A	n/a	AY
	Otherb			
314581-003	Trusted Platform Module	406059-001	n/a	CY
0950-4677	I/O VRM	0950-4617	n/a	BY
0957-2198	Power supply	0957-2198	AD052-69001	AY
1420-0356	System battery	1420-0356	n/a	BY
AB464-3401F	rx6600 memory carrier plastic cover (24/48 DIMM)	AB464-3401F	n/a	BY
8710-2446	2.5mm Hex	8710-2446	n/a	BY
376383-002	HDD filler panel	376383-002	n/a	AY
AB464-2132A	rx6600 bezel rack mount (includes nameplate)	AB464-2132A	n/a	BY

Table A-2 FRU List *(continued)*

Manufacturing Part Number	Description	Replacement Part Number	Exchange Part Number	Customer Self Repair
AB463-3421B	rx6600 air baffle		n/a	AY
		Cablesb		
AB463-2003A	Display board USB signal cable (connects to UCIO board)	AB463-2003A	n/a	AY
AB463-2005A	Power cable: internal memory fan	AB463-2005A	n/a	BY
AB463-2006A	Power cable: internal CPU fan	AB463-2006A	n/a	CY
AB463-2011A	Doorbell board cable	AB463-2011A	n/a	AY
AB463-2012C	CPU power pod cable	AB463-2012C	n/a	AY
AB463-2017A	SAS data A cable	AB463-2017A	n/a	AY
AB463-2017A	SAS data B cable		n/a	AY
AB464-2002C	Power, fan, assembly	AB464-2002C	n/a	CY
5184-1894	Serial console cable	5184-1894	n/a	AY
		Power Cords		
8120-6903	Power Cord - U.S	8120-6903	n/a	AY
8121-0871	Power Cord - Australia	8121-0871	n/a	AY
8121-0070	Power Cord	8121-0070	n/a	AY
8120-6898	Power Cord - UK & HK & Singapore	8120-6898	n/a	AY
8121-0161	Power Cord	8121-0161	n/a	AY
8120-6895	Power Cord	8120-6895	n/a	AY
8121-0675	Power Cord	8121-0675	n/a	AY
8120-6897	Power Cord - Sweden & Denmark	8120-6897	n/a	AY
8120-6899	Power Cord - Europe	8120-6899	n/a	AY
8121-0802	Power Cord	8121-0802	n/a	AY
8121-0974	Power Cord	8121-0974	n/a	AY

B Booting and Shutting Down the Operating System

This chapter covers procedures for booting and shutting down operating systems on entry class HP Integrity servers. HP supports the following operating systems:

- HP-UX 11i Version 2 (B.11.23)
- HP Open VMS I64
- Microsoft Windows Server 2003
- Red Hat Enterprise Linux 4
- SuSE Linux Enterprise Server 9

This chapter addresses the following topics:

- "Configuring System Boot Options" (page 177)
- "Booting and Shutting Down HP-UX" (page 178)
- "Booting and Shutting Down HP OpenVMS" (page 183)
- "Booting and Shutting Down Microsoft Windows" (page 186)
- "Booting and Shutting Down Linux" (page 189)

Configuring System Boot Options

This section discusses the system boot options you can configure on entry class HP servers, including the boot options list and the autoboot setting for the server.

NOTE: To better follow the instructions in this chapter, you should be familiar with the boot paths. See "PCI/PCI-X/PCI-E Card Path Logging" (page 71).

Boot Options List

This section discusses the system boot options you can configure on entry class HP Integrity servers, including the boot options list and the autoboot setting for the server.

The boot options list is a list of loadable items available for you to select from the **EFI Boot Manager** menu. The boot options list includes the EFI Shell and one or more operating system loaders.

NOTE: In some versions of EFI, the **Boot Configuration** menu is listed as the **Boot Option Maintenance Menu**.

The following example includes boot options for HP OpenVMS, Microsoft Windows, HP-UX, and the EFI Shell. The final item in the **EFI Boot Manager** menu, the **Boot Configuration menu**, is not a boot option. The **Boot Configuration** menu enables system configuration through a maintenance menu.

```
EFI Boot Manager ver 1.10 [14.61]  Please select a boot option

    HP OpenVMS 8.2-1
    EFI Shell [Built-in]
    Windows Server 2003, Enterprise
    HP-UX Primary Boot: 4/0/1/1/0.2.0
    Boot Option Maintenance Menu


    Use ^ and v to change option(s). Use Enter to select an option
```

- To set HP-UX boot options see "Adding HP-UX to the Boot Options List" (page 178)
- To set OpenVMS boot options see "Adding HP OpenVMS to the Boot Options List" (page 183)
- To set Windows boot options see "Adding Microsoft Windows to the Boot Options List" (page 186)
- To set Linux boot options see "Adding Linux to the Boot Options List" (page 189)

To manage the boot options list for each system, use the EFI Shell, the EFI **Boot Configuration** menu, or operating system utilities.

At the EFI Shell, the `bcfg` command supports listing and managing the boot options list for all operating systems, except Microsoft Windows. On HP Integrity systems with Windows installed, the `\MSUtil\nvrboot.efi` utility is provided for managing Windows boot options from the EFI Shell. For HP Integrity systems with OpenVMS installed, the `\efi\vms\vms_bcfg.efi` and `\efi\vms\vms_show` utilities are provided for managing OpenVMS boot options.

Operating system utilities for managing the boot options list include the HP-UX `setboot` command and the HP OpenVMS `@SYS$MANAGER:BOOT_OPTIONS.COM` command.

The EFI **Boot Configuration** menu provides the **Add a Boot Option**, **Delete Boot Option(s)**, and **Change Boot Order** menu items (use this method if you must add an EFI Shell entry to the boot options list).

Autoboot Setting

The `autoboot` setting determines, at startup, whether a system automatically loads the first item in the boot options list, or remains at the **EFI Boot Manager** menu. When autoboot is enabled, EFI loads the first item in the boot options list after a designated timeout period.

Configure the autoboot setting for an HP Integrity system using either the `autoboot` EFI Shell command, or the **Set Auto Boot TimeOut** menu item from the EFI **Boot Configuration** menu.

To disable autoboot from the EFI Shell, issue the **`autoboot off`** command.

To enable autoboot with the default timeout value issue the **`autoboot on`** command.

To enable autoboot with a timeout of 60 seconds issue the **`autoboot time 60`** command.

To set autoboot from HP-UX issue the `setboot` command.

To issue autoboot from HP-UX issue the **`setboot -b on`** command.

To disable autoboot issue the **`setboot -b off`** command.

Booting and Shutting Down HP-UX

This section covers booting and shutting down HP-UX on entry class HP Integrity servers.

- To add an HP-UX entry to the boot options list, see "Adding HP-UX to the Boot Options List" (page 178).
- To boot HP-UX, use the following procedures:
  - "Booting HP-UX From the EFI Boot Manager" (page 179) describes the standard ways to boot HP-UX. Typically this results in booting HP-UX in multi-user mode.
  - "Booting HP-UX in Single-User Mode" (page 181) describes how to boot HP-UX in single-user mode.
  - "Booting HP-UX in LVM-Maintenance Mode" (page 182) describes how to boot HP-UX in LVM-maintenance mode
- To shut down the HP-UX operating system, see "Shutting Down HP-UX" (page 182).

Adding HP-UX to the Boot Options List

This section describes how to add an HP-UX entry to the system boot options list.

You can add the `\EFI\HPUX\HPUX.EFI` loader to the boot options list from the EFI Shell or EFI Boot Configuration menu (or in some versions of EFI, the Boot Option Maintenance Menu).

NOTE: The operating system installer automatically adds an entry to the boot options list.

To add an HP-UX boot option when logged in to HP-UX, use the `setboot` command. For more information see the *setboot*(1M) manpage.

To add an HP-UX item to the boot options list from the EFI Shell, follow these steps:

1. Access the EFI Shell environment.

   a. Log in to the iLO 2 MP and enter the `CO` command to access the system console.

b. Confirm that you are at the **EFI Boot Manager** menu (the main EFI menu). If you are at another EFI menu, select **Exit** option from the submenus until you return to the screen labeled `EFI Boot Manager`.

c. From the **EFI Boot Manager** menu, select the **EFI Shell** to access the EFI Shell environment.

2. Access the EFI System Partition (`fsX:` where *X* is the file system number) for the device from which you want to boot HP-UX.

   For example, enter `fs2:` to access the EFI System Partition for the bootable file system number `2`. The EFI Shell prompt changes to reflect the file system currently accessed.

   The full path for the HP-UX loader is `\EFI\HPUX\HPUX.EFI` on the device you are accessing.

3. At the EFI Shell environment, use the `bcfg` command to manage the boot options list.

   The `bcfg` command includes the following options for managing the boot options list:

bcfg boot dump	Displays all items in the boot options list for the system.
bcfg boot rm #	Removes the item number specified by # from the boot options list
bcfg boot mv #a #b	Move the item number specified by #a to the position specified by #b in the boot list.
bcfg boot add # file.efi "Description"	Add a new boot option to the position in the boot options list specified by #. The new boot option references file.efi and is listed with the title specified by Description.

   For example, bcfg boot add1 \EFI\HPUX\HPUX.EFI “HP-UXi” adds an HP-UX 11i item as the first entry in the boot options list.

   See the `help bcfg` command for details.

4. Exit the console and iLO 2 MP interfaces if you are finished using them.

   a. Press **Control-B** to exit the system console and return to the **MP Main Menu**.

   b. To exit the iLO 2 MP, enter `X` at the **MP Main Menu**.

Booting HP-UX in Standard Mode

Use either of the following procedures to boot HP-UX:

- “Booting HP-UX From the EFI Boot Manager” (page 179)
- “Booting HP-UX From the EFI Shell” (page 180)

Booting HP-UX From the EFI Boot Manager

From the **EFI Boot Manager** menu, select an item from the boot options list to boot HP-UX.

1. Access the **EFI Boot Manager** menu for the system on which you want to boot HP-UX.

   a. Log in to the iLO 2 MP and enter `CO` to select the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu. If you are at another EFI menu, select **Exit** from the submenus until you return to the screen labeled `EFI Boot Manager`.

2. At the **EFI Boot Manager** menu, select an item from the boot options list.

   Each item in the boot options list references a specific boot device and provides a specific set of boot options or arguments you use when booting the device.

3. Press **Enter** to initiate booting using the selected boot option.
4. Exit the console and iLO 2 MP interfaces when finished using them.

   a. Press **Control-B** to exit the system console and return to the **MP Main Menu**.

   b. To exit the iLO 2 MP, type `X` at the **MP Main Menu**.

Booting HP-UX From the EFI Shell

From the EFI Shell environment, to boot HP-UX on a device, follow these steps:

1. Access the EFI Shell environment for the system on which you want to boot HP-UX.

   a. Log in to the iLO 2 MP and enter `CO` to select the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu. If you are at another EFI menu, select **Exit** from the submenus until you return to the screen labeled `EFI Boot Manager`.

   c. From the **EFI Boot Manager** menu, select the **EFI Shell** menu option to access the EFI Shell environment.

2. At the EFI Shell environment, issue the **`map`** command to list all currently mapped bootable devices.

   The bootable file systems you need are listed as `fs0:`, `fs1:`, and so on.

3. Access the EFI System Partition (`fs`*`X`*`:` where *X* is the file system number) for the device from which you want to boot HP-UX.

   For example, enter `fs2:` to access the EFI System Partition for the bootable file system number `2`. The EFI Shell prompt changes to reflect the file system currently accessed.

   The file system number can change each time it is mapped, for example, when the system boots or when the `map -r` command is issued.

4. When accessing the EFI System Partition for the desired boot device, issue the **`HPUX`** command to initiate the `HPUX.EFI` loader on the device you are accessing.

   The full path for the loader is `\EFI\HPUX\HPUX.EFI`. When initiated, the loader references the `\EFI\HPUX\AUTO` file and proceeds to boot HP-UX using the default boot behavior specified in the `AUTO` file.

   You have 10 seconds to interrupt the automatic booting of the default boot behavior. Press any key during this 10-second period to stop the HP-UX boot process and enables you to interact with the `HPUX.EFI` loader.

   a. To exit the loader (the `HPUX>` prompt) enter `exit` to return to the EFI Shell.

   b. To boot the HP-UX operating system, do not type anything during the 10-second period given for stopping at the `HPUX.EFI` loader. For example:

```
Shell> map
Device mapping table
  fs0  : Acpi(000222F0,269)/Pci(0 0)/Scsi(Pun8,Lun0)/HD(Part1,Sig72550000)

   blk0 : Acpi(000222F0,269)/Pci(0 0)/Scsi(Pun8,Lun0)
  blk1 : Acpi(000222F0,269)/Pci(0 0)/Scsi(Pun8,Lun0)/HD(Part1,Sig72550000)

  blk2 : Acpi(000222F0,269)/Pci(0 0)/Scsi(Pun8,Lun0)/HD(Part2,Sig72550000)

   blk3 : Acpi(000222F0,2A8)/Pci(0 0)/Scsi(Pun8,Lun0)
   blk4 : Acpi(000222F0,2A8)/Pci(0 1)/Scsi(Pun2,Lun0)

Shell> fs0:

fs0:\> hpux

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HP-UX Boot Loader for IA64  Revision 1.723

Press Any Key to interrupt Autoboot
```

```
\efi\hpux\AUTO ==> boot vmunix
Seconds left till autoboot -   9
```

5. Exit the console and iLO 2 MP interfaces when finished using them.

   Press **Control-B** to exit the system console and return to the **MP Main Menu**. To exit the iLO 2 MP, enter `X` at the Main Menu.

Booting HP-UX in Single-User Mode

To boot HP-UX in single-user mode, follow these steps:

1. Access the EFI Shell environment for the system on which you want to boot HP-UX in single-user mode.

   a. Log in to the iLO 2 MP and enter `CO` to select the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu. If you are at another EFI menu, select **Exit** from the submenus until you return to the screen with the `EFI Boot Manager` heading.

   c. From the **EFI Boot Manager** menu, select the **EFI Shell** to access the EFI Shell environment.
2. Access the EFI System Partition (`fs`*X*`:` where *X* is the file system number) for the device from which you want to boot HP-UX.
3. Issue the **`HPUX`** command to initiate the `\EFI\HPUX\HPUX.EFI` loader on the device you are accessing.
4. Boot to the HP-UX Boot Loader prompt (`HPUX>`) by pressing any key within the 10 seconds given for interrupting the HP-UX boot process.

   After you press a key, the `HPUX.EFI` interface (the HP-UX Boot Loader prompt, `HPUX>`) launches. For help using the `HPUX.EFI` loader, enter the `help` command. To return to the EFI Shell, enter `exit`.

   ```
   fs0:\> hpux

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   All rights reserved

   HP-UX Boot Loader for IA64  Revision 1.723

   Press Any Key to interrupt Autoboot
    efi hpux AUTO ==> boot vmunix
   Seconds left till autoboot -   9
   ```

   [User types a key to stop the HP-UX boot process and access the HPUX.EFI loader.]

   ```
      Type 'help' for help

   HPUX>
   ```

5. At the `HPUX.EFI` (`HPUX>`) enter the `boot -is vmunix` command to boot HP-UX in single-user mode.

   ```
   HPUX> boot -is vmunix
   > System Memory = 4063 MB
   loading section 0
   .............................................. (complete)
   loading section 1
   ........ (complete)
   loading symbol table
   loading System Directory(boot.sys) to MFS
   ....
   loading MFSFILES Directory(bootfs) to MFS
   ......
   Launching /stand/vmunix
   SIZE: Text:25953K + Data:3715K + BSS:3637K = Total:33306K
   ```

```
Console is on a Serial Device
Booting kernel...
```

6. Exit the console and iLO 2 MP interfaces when finished using them.

   a. Press **Control-B** to exit the system console and return to the **MP Main Menu**.

   b. To exit the iLO 2 MP, type `X` at the **MP Main Menu**.

Booting HP-UX in LVM-Maintenance Mode

To boot HP-UX in LVM-maintenance mode, follow these steps:

1. Access the EFI Shell environment for the system on which you want to boot HP-UX in LVM-maintenance mode.

   a. Log in to the iLO 2 MP and enter `CO` to select the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu. If you are at another EFI menu, select **Exit** from the submenus until you return to the screen with the `EFI Boot Manager` heading.

   c. From the **EFI Boot Manager** menu, select the **EFI Shell** to access the EFI Shell environment.
2. Access the EFI System Partition (`fs`*X*`:` where *X* is the file system number) for the device from which you want to boot HP-UX.
3. Issue the **`HPUX`** command to initiate the `\EFI\HPUX\HPUX.EFI` loader on the device you are accessing.
4. Type any key within the 10 seconds given for interrupting the HP-UX boot process. This stops the boot process at the `HPUX.EFI` interface (the HP-UX Boot Loader prompt, `HPUX>`).
5. At the HPUX prompt, enter the **`boot -lm vmunix`** command to boot HP-UX in LVM-maintenance mode.
6. Exit the console and iLO 2 MP interfaces when finished using them.

   Press **Control-B** to exit the system console and return to the **MP Main Menu**. To exit the iLO 2 MP, type `X` at the **MP Main Menu**.

Shutting Down HP-UX

Use the `shutdown` command to shut down HP-UX running on a system, .

For more information see the *shutdown*(1M) manpage and the following procedure:

To shut down the HP-UX operating system, follow these steps:

1. Log in to HP-UX running on the system that you want to shut down.

   Log in to the iLO 2 MP for the server and use the Console menu to access the system console. Accessing the console through the iLO 2 MP enables you to maintain console access to the system after HP-UX has shut down.
2. Issue the **`shutdown`** command with the appropriate command-line options.

   The command-line options you specify dictate the way in which HP-UX shuts down, and whether the system is rebooted.

   - To shut down HP-UX and halt (power off) the system, issue the **`shutdown -h`** command.

     To reboot a halted system power on the system using the `PC` command at the iLO 2 MP Command menu.
   - To shut down HP-UX and reboot the system, issue the **`shutdown -r`** command.

Booting and Shutting Down HP OpenVMS

This section describes the procedures for booting and shutting down HP OpenVMS on entry class HP Integrity servers, and procedures for adding HP OpenVMS to the boot options list.

- To add an HP OpenVMS entry to the boot options list, see "Adding HP OpenVMS to the Boot Options List" (page 183).
- To boot HP OpenVMS on an entry class HP Integrity server, see "Booting HP OpenVMS from the EFI Boot Manager" (page 184).
- To shut down HP OpenVMS, see "Shutting Down HP OpenVMS" (page 185).

Adding HP OpenVMS to the Boot Options List

On HP Integrity servers, you can use the following procedures to manage boot options list entries for HP OpenVMS.

You can add the `\efi\vms\vms_loader.efi` loader to the boot options list from the EFI Shell or the EFI Boot Configuration menu (or in some versions of EFI, the Boot Option Maintenance Menu).

NOTE: The operating system installer automatically adds an entry to the boot options list.

To add an HP OpenVMS item to the boot options list from the EFI Shell, follow these steps:

1. Access the EFI Shell environment.

   a. Log in to the iLO 2 MP and enter `CO` to access the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu (the main EFI menu). If you are at another EFI menu, select the **Exit** from the submenus until you return to the screen with the `EFI Boot Manager` heading.

   c. From the **EFI Boot Manager** menu, select **EFI Shell** to access the EFI Shell environment.

2. Access the EFI System Partition (`fs`*X*`:` where *X* is the file system number) for the device from which you want to boot HP OpenVMS.

   For example, enter `fs2:` to access the EFI System Partition for the bootable file system number `2`. The EFI Shell prompt changes to reflect the file system currently accessed.

   The full path for the HP OpenVMS loader is `\efi\vms\vms_loader.efi`. It is on the device you are accessing.

3. At the EFI Shell environment, use the `bcfg` command to manage the boot options list.

   The `bcfg` command includes the following options for managing the boot options list:

bcfg boot dump	Displays all items in the boot options list for the system.
bcfg boot rm #	Removes the item number specified by # from the boot options list
bcfg boot mv #a #b	Move the item number specified by #a to the position specified by #b in the boot list.
bcfg boot add # file.efi "Description"	Add a new boot option to the position in the boot options list specified by #. The new boot option references file.efi and is listed with the title specified by Description.

   For example, `bcfg boot add 1 \efi\vms\vms_loader.efi "HP OpenVMS"`adds an HP OpenVMS item as the first entry in the boot options list.

   See the `help bcfg` command for details.

NOTE: You can also accomplish this step by using the `\efi\vms\vms_bcfg.efi` and `\efi\vms\vms_show.efi` utilities, which are available on the EFI System Partition for HP OpenVMS. Both `vms_bcfg` and `vms_show` are unique utilities for OpenVMS I64. The `vms_bcfg` utility differs from the `bcfg` EFI command in that `vms_bcfg` enables you to specify boot devices using VMS-style device names.

4. Exit the console and iLO 2 MP interfaces if you are finished using them.

   Press **Control-B** to exit the system console and return to the **MP Main Menu**. To exit the iLO 2 MP, enter `X` at the **MP Main Menu**.

Booting HP Open VMS

To boot HP OpenVMS on an entry class HP Integrity server, use one of the following procedures:

- "Booting HP OpenVMS from the EFI Boot Manager" (page 184)
- "Booting HP OpenVMS from the EFI Shell" (page 184)

Booting HP OpenVMS from the EFI Boot Manager

From the **EFI Boot Manager**, follow these steps:

1. Access the **EFI Boot Manager** menu for the system on which you want to boot HP OpenVMS.

   a. Log in to the iLO 2 MP and enter `CO` to select the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu. If you are at another EFI menu, select **Exit** from the submenus until you return to the screen labeled `EFI Boot Manager`.

2. At the **EFI Boot Manager** menu, select an item from the boot options list.

   Each item in the boot options list references a specific boot device and provides a specific set of boot options or arguments to use when booting the device.

3. Press **Enter** to initiate booting using the selected boot option.
4. Exit the console and iLO 2 MP interfaces when finished using them.

   Press **Control-B** to exit the system console and return to the **MP Main Menu**. To exit the iLO 2 MP, type `X` at the **MP Main Menu**.

Booting HP OpenVMS from the EFI Shell

To boot HP OpenVMS from the EFI Shell environment, follow these steps:

1. Access the EFI Shell environment for the system on which you want to boot HP OpenVMS.

   a. Log in to the iLO 2 MP and enter `CO` to select the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu (the main EFI menu). If you are at another EFI menu, select **Exit** from the submenus until you return to the screen labeled `EFI Boot Manager`.

   c. From the **EFI Boot Manager** menu, select **EFI Shell** menu to access the EFI Shell environment.

2. Issue the **`map`** command to list all currently mapped bootable devices.

   The bootable file systems are typically listed as `fs0:`, `fs1:`, and so on.

3. Access the EFI System Partition (`fs`*X*`:` where *X* is the file system number) for the device from which you want to boot HP OpenVMS.

   For example, enter `fs2:` to access the EFI System Partition for the bootable file system number `2`. The EFI Shell prompt changes to reflect the file system currently accessed.

   Also, the file system number can change each time it is mapped; for example, when the system boots, or when the `map -r` command is issued.

4. When accessing the EFI System Partition for the desired boot device, issue the **`efi vms vms_loader`** command to initiate the `vms_loader.efi` loader on the device you are accessing.

```
fs5:> \efi\vms\vms_loader.efi


   HP OpenVMS Industry Standard 64 Operating System, Version XAV1-D2Y
     Copyright 1976-2005 Hewlett-Packard Development Company, L.P.


%PKA0, Copyright (c) 1998 LSI Logic PKW V3.2.20 ROM 4.19
%PKA0, SCSI Chip is SYM53C1010/66, Operating mode is LVD Ultra3 SCSI
%SMP-I-CPUTRN, CPU #01 has joined the active set.
%SMP-I-CPUTRN, CPU #02 has joined the active set.
%STDRV-I-STARTUP, OpenVMS startup begun at 13-JUL-2005 14:54:36.25
%EWA0, Auto-negotiation mode set by console

...
```

5. Exit the console and iLO 2 MP interfaces when finished using them.

   Press **Control-B** to exit the system console and return to the **MP Main Menu**. To exit the iLO 2 MP, enter `X` at the **MP Main Menu**.

Shutting Down HP OpenVMS

To shut down the HP OpenVMS operating system, follow these steps:

1. Log in to HP OpenVMS running on the system that you want to shut down.
2. Log in to the iLO 2 MP for the server and use the Console menu to access the system console. Accessing the console through the iLO 2 MP enables you to maintain console access to the system after HP OpenVMS has shut down.
3. At the OpenVMS DCL command element prompt issue the **`@SYS$SYSTEM:SHUTDOWN`** command and specify the shutdown options in response to the prompts. For example:

```
>@SYS$SYSTEM:SHUTDOWN


        SHUTDOWN -- Perform an Orderly System Shutdown
                    on node RSNVMS

How many minutes until final shutdown [0]:
Reason for shutdown [Standalone]:
Do you want to spin down the disk volumes [NO]?
Do you want to invoke the site-specific shutdown procedure [YES]?
Should an automatic system reboot be performed [NO]? yes
When will the system be rebooted [shortly via automatic reboot]:
Shutdown options (enter as a comma-separated list):
 REBOOT_CHECK        Check existence of basic system files
 SAVE_FEEDBACK       Save AUTOGEN feedback information from this boot
 DISABLE_AUTOSTART   Disable autostart queues
 POWER_OFF           Request console to power-off the system

Shutdown options [NONE]:

%SHUTDOWN-I-OPERATOR, this terminal is now an operator’s console
%%%%%%%%%%%  OPCOM  12-JUL-2005 18:47:51.01  %%%%%%%%%%%
Operator status for operator _RSNVMS$OPA0:
CENTRAL, PRINTER, TAPES, DISKS, DEVICES, CARDS, NETWORK, CLUSTER, SECURITY,
...
```

NOTE: HP OpenVMS I64 does not support the `POWER_OFF` shutdown option.

Booting and Shutting Down Microsoft Windows

This section describes how to boot and shut down Microsoft Windows on entry class HP Integrity servers and how to add Windows entries to the system boot options list.

- "Adding Microsoft Windows to the Boot Options List" (page 186)
- "Booting the Microsoft Windows Operating System" (page 187)
- "Shutting Down Microsoft Windows" (page 188)

Adding Microsoft Windows to the Boot Options List

NOTE: The operating system installer automatically adds an entry to the boot options list.

To add a Microsoft Windows entry to the system boot options list, follow these steps:

1. Access the EFI Shell environment.

   a. Log in to the iLO 2 MP and enter `CO` to access the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu. If you are at another EFI menu, select **Exit** from the submenus until you return to the screen labeled `EFI Boot Manager`.

   c. From the **EFI Boot Manager** menu, select **EFI Shell** to access the EFI Shell environment.

2. Access the EFI System Partition (`fsX:` where *X* is the file system number) for the device from which you want to boot Microsoft Windows.

   For example, enter `fs2:` to access the EFI System Partition for the bootable file system number `2`. The EFI Shell prompt changes to reflect the file system currently accessed.

   The full path for the Microsoft Windows loader is `\efi\microsoft\winnt50\ia64ldr.efi` and it is on the device you are accessing.

NOTE: You must only initiate this loader from the EFI Boot Menu, not from the EFI Shell.

3. List the contents of the `\EFI\Microsoft\WINNT50` directory to identify the name of the Windows boot option file (`Boot00nn`) that you want to import into the system boot options list.

```
fs0:\> ls EFI\Microsoft\WINNT50
Directory of: fs0:\EFI\Microsoft\WINNT50

  09/18/03  11:58a <DIR>          1,024  .
  09/18/03  11:58a <DIR>          1,024  ..
  12/18/03  08:16a                  354  Boot0001
          1 File(s)         354 bytes
          2 Dir(s)


fs0:\>
```

4. Issue the **`\MSUtil\nvrboot.efi`** command to launch the Microsoft Windows boot options utility. For example:

```
fs0:\> msutil\nvrboot

NVRBOOT: OS Boot Options Maintenance Tool [Version 5.2.3683]

   1. SUSE SLES 9
   2. HP-UX Primary Boot: 0/0/1/0/0.2.0
 * 3. Windows Server 2003, Datacenter
   4. EFI Shell [Built-in]
```

```
  * = Windows OS boot option

  (D)isplay (M)odify (C)opy E(x)port (I)mport (E)rase (P)ush (H)elp (Q)uit

Select>
```

5. Use the **`Import`** command to import the Window boot option file. For example:

```
Select> i
Enter IMPORT file path: \EFI\Microsoft\WINNT50\Boot0001
Imported Boot Options from file: \EFI\Microsoft\WINNT50\Boot0001

Press enter to continue
```

6. Type **Q** to quit the NVRBOOT utility.
7. Exit the console and iLO 2 MP interfaces if you are finished using them.

   Press **Control-B** to exit the system console and return to the **MP Main Menu**. To exit the iLO 2 MP, type `X` at the **MP Main Menu**.

Booting the Microsoft Windows Operating System

To boot the Windows Server 2003 operating system on an HP Integrity server, follow these steps:

1. Access the **EFI Boot Manager** menu for the system on which you want to boot Windows.

   a. Log in to the iLO 2 MP and enter the `CO` command to select the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu. If you are at another EFI menu, select **Exit** from the submenus until you return to the screen labeled `EFI Boot Manager`.
2. Select an item from the boot options list.

   Each item in the boot options list references a specific boot device and provides a specific set of boot options or arguments to be used when booting the device.
3. Press **Enter** to initiate booting using the selected boot option.
4. Once Windows begins loading, wait for the Special Administration Console (SAC) to become available.

   The SAC interface provides a text-based administration tool that is available from the system console. For example.

```
Loading.: Windows Server 2003, Datacenter
Starting: Windows Server 2003, Datacenter



                             Starting Windows...
*************************************************************************

Computer is booting, SAC started and initialized.

Use the "ch -?" command for information about using channels.
Use the "?" command for general help.

SAC>
```

   For details see the SAC online help (type ? at the SAC> prompt)
5. Exit the console and iLO 2 MP interfaces when finished using them.

   Press **Control-B** to exit the console and return to the **MP Main menu**. To exit the iLO 2 MP, type `X` at the **MP Main menu**.

Shutting Down Microsoft Windows

CAUTION: Do not shut down Windows Server 2003 SAC `restart` or `shutdown` commands under normal circumstances. Issuing `restart` or `shutdown` at the `SAC>` prompt causes the system to restart or shut down immediately and can result in the loss of data.

Use the Windows **Start** menu or the `shutdown` command to shut down gracefully.

To shut down Windows Server 2003 use one of the following methods.

- "Shutting Down Windows from the Start Menu" (page 188)
- "Shutting Down Windows from the Command Line" (page 188)

Shutting Down Windows from the **Start** Menu

Select **Shut Down** from the **Start** menu and select either **Restart** or **Shut down** from the pull-down menu.

The **Restart** menu item shuts down and restarts the system. The **Shut down** menu item shuts down the system.

You can use this method when using a graphical interface to the system.

Shutting Down Windows from the Command Line

You can issue the **`shutdown`** command from a command prompt through the Special Administration Console (SAC) or from any other command line.

The Windows `shutdown` command includes the following options:

`/s`	Shuts down and powers off the system. This is the equivalent of **Start—>Shut Down, Shut down**. To power on the system, use the iLO 2 MP `PC` command.
`/r`	Shuts down and restarts the system. This is the equivalent of **Start—>Shut Down, Restart**.
`/a`	Aborts a system shutdown.
`/t` *xxx*	Sets the timeout period before shutdown to *xxx* seconds. The timeout period ranges from 0–600, with a default of 30.

See the `help shutdown` Windows command for details.

To shutdown Windows from the command line, follow these steps:

1. Log in to Windows running on the system that you want to shut down.

   For example, access the system console and use the SAC interface to start a command prompt, from which you can issue Windows commands to shut down the system.

2. Check to see whether any users are logged in. Use the `query user` or `query session` command.
3. Issue the **`shutdown`** command and the appropriate options to shut down the Windows Server 2003 on the system.

   Use one of the following options when shutting down Windows:

   - To shut down Windows and reboot, issue the following command:

     `shutdown /r`

   - To shut down Windows and power off server hardware, issue the following command:

     `shutdown /s`

   NOTE: To reboot a powered off system you must power on the system using the `PC` command at the iLO 2 MP Command menu

   - To abort a shutdown, issue the following command:

     `shutdown /a`

   For example:

```
shutdown /r /t 60 /c "Shut down in one minute."
```

This command initiates a Windows system shutdown and reboot after a timeout period of 60 seconds. The `/c` option specifies a message that is broadcast to any other users of the system.

Booting and Shutting Down Linux

This section covers booting and shutting down Linux on entry class HP servers. Procedures for Red Hat Enterprise Linux and SuSE Linux Enterprise Server are included in this section.

- To add a Linux entry to the boot options list, see "Adding Linux to the Boot Options List" (page 189).
- To boot Linux on entry class HP Integrity servers, use the following procedures.
  - See "Booting the Red Hat Enterprise Linux Operating System" (page 190).
  - See "Booting the SuSE Linux Enterprise Server Operating System" (page 191).
- To shut down either Red Hat Enterprise Linux or SuSE Linux Enterprise Server, see "Shutting Down Linux" (page 191).

Adding Linux to the Boot Options List

This section describes how to add a Linux entry to the system boot options list. The processes for adding both Red Hat Enterprise Linux and SuSE Linux Enterprise Servers are included.

NOTE: On HP Integrity servers, the operating system installer automatically adds an entry to the boot options list.

To add a Linux item to the boot options list, follow these steps:

1. Access the EFI Shell.

   a. Log in to the iLO 2 MP and enter the `CO` command to access the system console.

   b. Confirm that you are at the **EFI Boot Manager** menu (the main EFI menu). If you are at another EFI menu, select **Exit** from the submenus until you return to the screen with the `EFI Boot Manager`.

   c. Select the **EFI Shell** to access the EFI Shell environment.

2. Access the EFI System Partition (`fs`*X*`:` where *X* is the file system number) for the device from which you want to boot Linux.

   For example, enter `fs2:` to access the EFI System Partition for the bootable file system number `2`. The EFI Shell prompt changes to reflect the file system currently accessed.

   The full path for the Red Hat Enterprise Linux loader is `\EFI\redhat\elilo.efi` and it is on the device you are accessing.

   The full path for the SuSE Linux Enterprise Server loader is `\efi\SuSE\elilo.efi`, and it is on the device you are accessing.

3. Use the `bcfg` command to manage the boot options list.

   The `bcfg` command includes the following options for managing the boot options list:

`bcfg boot dump`	Displays all items in the boot options list for the system.
`bcfg boot rm #`	Removes the item number specified by # from the boot options list.
`bcfg boot mv` *#a #b*	Moves the item number specified by *#a* to the position specified by *#b* in the boot options list.
`bcfg boot add #` *file.efi* `"`*Description*`"`	Adds a new boot option to the position in the boot options list specified by `#`. The new boot option

references *file.efi* and is listed with the title specified by *Description*.

For example, `bcfg boot add 1 \EFI\redhat\elilo.efi "Red Hat Enterprise Linux"`adds a Red Hat Enterprise Linux item as the first entry in the boot options list.

Likewise, `bcfg boot add 1 \efi\SuSE\elilo.efi "SLES 9"`adds a SuSE Linux item as the first entry in the boot options list.

See the `help bcfg` command for details.

4. Exit the console and iLO 2 MP interfaces if you are finished using them.

   Press **Control-B** to exit the system console and return to the **MP Main Menu**. To exit the iLO 2 MP, enter `X` at the **MP Main Menu**.

Booting the Red Hat Enterprise Linux Operating System

You can boot the Red Hat Enterprise Linux operating system on HP Integrity servers using either of these methods:

- "Booting Red Hat Enterprise Linux from the EFI Boot Manager Menu" (page 190)
- "Booting Red Hat Enterprise Linux from the EFI Shell" (page 190)

Booting Red Hat Enterprise Linux from the EFI Boot Manager Menu

NOTE: If Red Hat is booted from the iLO 2 MP, set console=ttyS0 at the `elilo` prompt to redirect console output to the iLO 2 MP.

1. Select a Red Hat Enterprise Linux entry from the **EFI Boot Manager** menu.
2. To load the Red Hat Enterprise Linux operating system at the **EFI Boot Manager** menu, select its entry from the list of boot options.
3. Selecting a Linux entry from the boot options list boots the operating system using `ELILO.EFI` loader and the `elilo.conf` file.

Booting Red Hat Enterprise Linux from the EFI Shell

1. Access the EFI Shell.

   From the system console, select **EFI Shell** from the **EFI Boot Manager** menu to access the shell.

2. Access the EFI System Partition for the Red Hat Enterprise Linux boot device.

   Use the `map` EFI Shell command to list the file systems (`fs0`, `fs1`, and so on) that are known and mapped.

   To select a file system to use, enter its mapped name followed by a colon (`:`). For example, to operate with the boot device that is mapped as `fs3`, enter **`fs3:`** at the EFI Shell prompt.

3. Enter **`ELILO`** at the EFI Shell command prompt to launch the `ELILO.EFI` loader.

   If needed, you can specify the loader's full path by entering **`\EFI\redhat\elilo`** at the EFI Shell command prompt.

4. Allow the `ELILO.EFI` loader to proceed with booting the Red Hat Enterprise Linux kernel.

   By default, the `ELILO.EFI` loader boots the kernel image and options specified by the default item in the `elilo.conf` file.

   To interact with the `ELILO.EFI` loader, interrupt the boot process, for example, type a space at the `ELILO boot`

   prompt.To exit the loader, use the `exit` command.

Booting the SuSE Linux Enterprise Server Operating System

You can boot the SuSE Linux Enterprise Server 9 operating system on HP Integrity servers using either of these methods:

- "Selecting a SuSE Linux Enterprise Server entry from the EFI Boot Manager menu" (page 191)
- "Booting SuSE Linux Enterprise Server from the EFI Shell" (page 191).

Selecting a SuSE Linux Enterprise Server entry from the EFI Boot Manager menu

1. Access the **EFI Boot Manager** menu.
2. Select its entry from the list of boot options.
3. Choose a Linux entry from the boot options list to boot the operating system using `ELILO.EFI` loader and the `elilo.conf` file.

Booting SuSE Linux Enterprise Server from the EFI Shell

1. From the system console, select **EFI Shell** from the **EFI Boot Manager** menu to access the EFI Shell.
2. Access the EFI System Partition for the SuSE Linux Enterprise Server boot device.

   Use the `map` EFI Shell command to list the file systems (`fs0`, `fs1`, and so on) that are known and mapped.

   To select a file system to use, enter its mapped name followed by a colon (`:`). For example, to operate with the boot device that is mapped as `fs3`, enter **`fs3:`** at the EFI Shell prompt.
3. Enter **`ELILO`** at the EFI Shell command prompt to launch the `ELILO.EFI` loader.

   If needed, you can specify the loader's full path by entering **`\efi\SuSE\elilo`** at the EFI Shell command prompt.
4. Allow the `ELILO.EFI` loader to proceed with booting the SuSE Linux kernel.

   By default, the `ELILO.EFI` loader boots the kernel image and options specified by the default item in the `elilo.conf` file.

   To interact with the `ELILO.EFI` loader, interrupt the boot process, for example, type a space at the `ELILO boot` prompt. To exit the loader, use the `exit` command.

Shutting Down Linux

Use the `shutdown` command to shut down Red Hat Enterprise Linux or SuSE Linux Enterprise Server.

The Red Hat Enterprise Linux and SuSE Linux Enterprise Server `shutdown` command has the following options:

`-h` Powers off the server after shutdown.

Use the `PC` command at the iLO 2 MP command menu to manually power on or power off server hardware, as needed.

`-r` Reboots after shutdown.

`-c` Cancels a shutdown in progress.

time Determines when to shut down. (Required.) You can specify *time* in any of the following ways:

- Absolute time in the format *hh*:*mm*, in which *hh* is the hour (one or two digits) and *mm* is the minute (two digits).
- Number of minutes to wait in the format +*m*, in which *m* is the number of minutes.
- `now` to immediately shut down; this is equivalent to using `+0` to wait zero minutes.

For details see the *shutdown*(8) Linux manpage. Also see the Linux manpage for the `poweroff` command.

To shutdown Linux, follow these steps:

1. Log in to Linux running on the system you want to shut down.
2. Issue the **`shutdown`** command with the desired command-line options, and include the required *time* argument to specify when the operating system shutdown is to occur.

   For example, `shutdown -r +20` shuts down and reboots the system in twenty minutes.

C MCA Analysis

This appendix details the ways to solve machine check abort (MCA) errors that occur on your BL860c server blade.

NOTE: This appendix is for HP personnel only, and should not be shared with customers.

The following sections are included in this appendix:

- "Introduction"
- "Installation"
- "Gathering MCA Logs"
- "Running the Machine Check Analyzer"
- "MCA Analysis"

Introduction

Use this appendix to troubleshoot your BL860c server blade that has experienced a fatal error due to hardware or other problems. Solve the problem by analyzing the error logs with the machine check analyzer (mca), as described in this appendix.

The errors discussed here are called Machine Check Aborts (MCAs).

NOTE: Throughout this appendix, MCA and mca mean two different things:

- MCA = Machine Check Abort (fatal server blade error)
- mca = machine check analyzer (tool used to diagnose MCAs)

Audience

An in-depth knowledge of computer architecture is not required to run the mca. The procedures are suitable for Customer Engineers (CEs). For a more in-depth discussion of how to use the mca, see the MCA Analyzer web site at `http://mca-analyzer.rose.hp.com`

Supported Systems

The mca also analyzes MCAs for several other systems. To see the list of systems supported on your version of mca, run the program and note the lists of computer models in the tabbed dialog boxes in the right of the mca window.

Supported systems include:

- Integrity SuperDome
- HP 9000 SuperDome
- rp8400/rp7410
- rx7620
- rx8620
- rp7420
- rp8420
- rx5670
- rx4640
- rp3440
- rp4440
- rx2600/zx6000
- rc2600
- zx2000
- rx1600
- c8000

- rx3600/rx6600
- BL860c

Requirements

The requirements to install mca have been kept simple -- just copy the MCA.EXE file to an x86 computer running Windows. Running the mca program requires:

- Operating system - Microsoft Windows 98 or later (for example, Windows 98 SE, Windows NT4, Windows 2000, and Windows XP)
- Disk space - ~3 MB for the program, variable disk space for log files

The program does NOT require:

- Connection to the Internet or the Web.
- Password protection or hardware key protection.
- Registry dependencies.
- Special DLL files on the host Windows system (that is, all libraries are statically linked).

Concepts

MCAs are fatal problems that cannot be corrected by the computer and require containment. Examples:

- Double-bit memory error
- System hardware fault (DC-DC converter, multiple fan failure, multiple power supply failure, etc.)
- Operating system failure.
- Boot disk failure

Other types of errors can be corrected by the computer.

For example:

- Single-bit memory errors
- Single-bit cache errors
- Single fan failures

Even though correctable errors may leave error logs, the mca does not analyze them and they are not covered in this document. In the architecture, correctable errors are known as Corrected Platform Errors (CPEs), Corrected Machine Checks (CMCs), and Low Priority Machine Checks (LPMCs).

The machine check analyzer (mca) decodes and analyzes MCA error logs, attempts to identify the root cause of the failure, and provides a list of Field Replaceable Units (FRUs) that could have caused the failure.

Using the mca is straightforward. Install the mca on a Windows-based computer, then gather error logs from the computer that suffered the machine check. If necessary, convert the error logs into the file format required by the mca. Finally, transfer the resulting file(s) to the Windows computer and run mca.

The entire process, from error to fix, goes like this:

1. When a fatal or uncorrectable error occurs, the computer executes a firmware routine to handle MCAs.
2. During this routine, the computer writes the contents of internal registers and other troubleshooting data to Non-Volatile Memory (NVM). This data is referred to as a tombstone.
3. The computer shuts down. Depending on the problem, the computer may or may not be able to reboot to the operating system (OS). If the computer is able to boot the OS, the OS stores MCA error data in one or more files.
4. Obtain the MCA logs (tombstones) for analysis. The specific method for obtaining the error logs depends on the computer model and whether the computer is offline (running EFI) or online (running an operating system). For computers with multiple processors, a single event may cause multiple error logs, with each CPU producing a separate error log. Such

an event is called a global MCA. In contrast, a local MCA only involves one processor. For a global MCA, the mca program expects all the error logs for the event to be concatenated into one file. For the server blade systems, the mca expects either ASCII files (errdump) or binary format for online error logs.

5. Transfer the combined log file (either text or binary depending on system type) to a Windows-based computer and execute the mca.
6. The mca is an expert system that employs logical rules to analyze the data in the tombstone. The output is a message with possible causes of the problem and suggested fixes. A typical fix is to change a Field Replaceable Unit (FRU).

   The difficulty comes with those problems that are complex or ambiguous. Such cases require a hardware specialist with a deep knowledge of the computer architecture. For these specialists, the mca provides data in the "Analyzer Trace" window.

Utilities

The different utilities used to analyze MCAs include:

- `mca`is a utility running under Windows for analyzing MCAs
- `errdump`is an EFI utility which displays system error logs in ASCII format
- `getMCA`is a Windows program for gathering tombstones -- converting files from Windows Event (`.evt`) format to the binary format required by mca

Installation

Install the mca by copying the file `MCA.EXE` onto a Windows-based computer.

Gathering MCA Logs

Getting the MCA error log files for the mca is the most complex part of the whole process. Use a different method for getting the files, depending on the architecture of the computer (Integrity or PA-RISC) and the operating system or firmware environment the computer is running (EFI, BCH, HP-UX, or Windows).

No matter what the specific method, the underlying process is the same:

1. If the system is offline, get error log data from Non-Volatile Memory (NVM) and store it in a tombstone file. If the system is online, a tombstone file has already been generated.
2. Convert the tombstone file to the form needed by mca. For most systems, the tombstone file must be in ASCII (text) format. If there are several tombstone files generated for the same machine check, they should be concatenated into a single file.
3. Transfer the tombstone file to the Windows machine running `mca`.

The following table shows the different processes for the different architectures and computer models:

Table C-1 Architecture/Model/Process Matrix

Architecture	CEC (platform)	Models	Offline logs	Online logs	mca expects	Process
Integrity (IPF)	Zx1 ("Pluto")	rx5670, rx4640, rx2620, rx2600, rx1620, rx1600, cx2620, cx2600, zx6000, zx2000, BL60p	single file (text)	separate files (binary)	text	Offline log file: transfer as-is. OR Online log files: concatenate if necessary.
Integrity (IPF)	Zx2	rx2660, rx3600, rx6600, BL860c	single file (text)	separate files (binary)	text	Offline log file: transfer as-is. OR Online log files: concatenate if necessary.

The specific methods for gathering error log files are described in the following sections.

Gathering MCA Error Logs

For all systems except Integrity Superdome, the MCA log files must be in either ASCII text or binary format.

The mca program allows some flexibility in the input format, but any significant corruption may prevent mca from recognizing the register data correctly.

Gather the MCA error logs from the computer which had the error. There are several different methods:

- Integrity machines offline
- Integrity machines running HP-UX
- Integrity machines running Windows

Procedure C-2 Integrity Machines Offline

1. Enter the command `errdump mca` at the EFI prompt.
2. Log the data to disk (with *Reflections*, use **File | Logging | Logging On | Disk**; after the data has been displayed, turn off logging).

Procedure C-3 Integrity Machines Running HP-UX

Process the tombstones at `/var/tombstones/mcaYYYYMMDDHHMMSS.C` (where `YYYYMMDDHHMMSS` is a timestamp, and`C` is an increasing positive number starting with 000).

- If there are several files for the same MCA event (if they have the same timestamp), concatenate them. For example, `hp-ux> cat mca20030206173412.*.txt > mca20030206173412.all`

NOTE: Make sure the wildcard character matches only the files you want to concatenate.

Procedure C-4 Integrity Machines Running Windows

1. Obtain tombstones by converting Windows Event (`.evt`) files to the required binary format with the `getMCA` program.
2. Use files as-is; do NOT convert them to ASCII.
3. If there are several files for the same MCA event (if they have the same timestamp), concatenate them. For example, `COPY /B FILENAME.??? FILENAME.all`

NOTE: Make sure the wildcard character matches only the files you want to concatenate.

Naming Conventions for Integrity Error Logs

Error log files in Integrity architecture have the following naming convention. The OS follows the same convention for tombstones, without the global CPU number. Instead, it uses the local CPU number for the particular partition:

```
mcaYYYYMMDDHHMMSS.CCC

YYYY              = year (for example,   03 for 2003)
MM                = month (for example,   07 for July)
DD                = day of month
HH                = hours in 24-hour format (for example,  01 is 1 AM;   13 is 1 PM)
MM                = minutes
SS                = seconds
CCC               = Increasing positive number starting from 000.
           Will reset to 000 when new timestamp is gathered.
```

Example:

```
mca20030116142947.000  =

mca                    The Machine Check Abort (mca) that occurred at
```

```
2003                 2003
01                   January
16                   16
1429                 14:29:47    (2:29:47 PM)
000                  log number
```

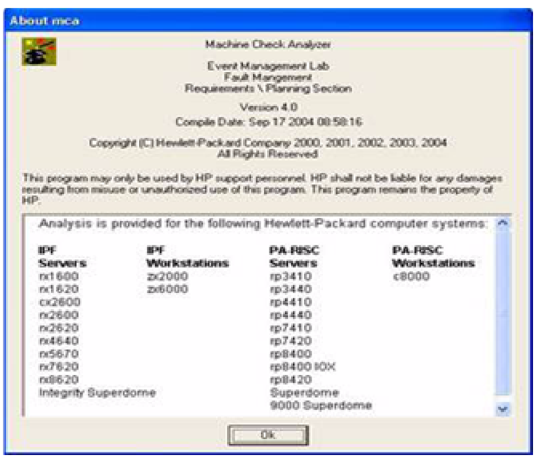
Running the Machine Check Analyzer

Running the mca program is the easy part of the process. The mca is intuitive, with onscreen instructions and a status line that prompts you for input.

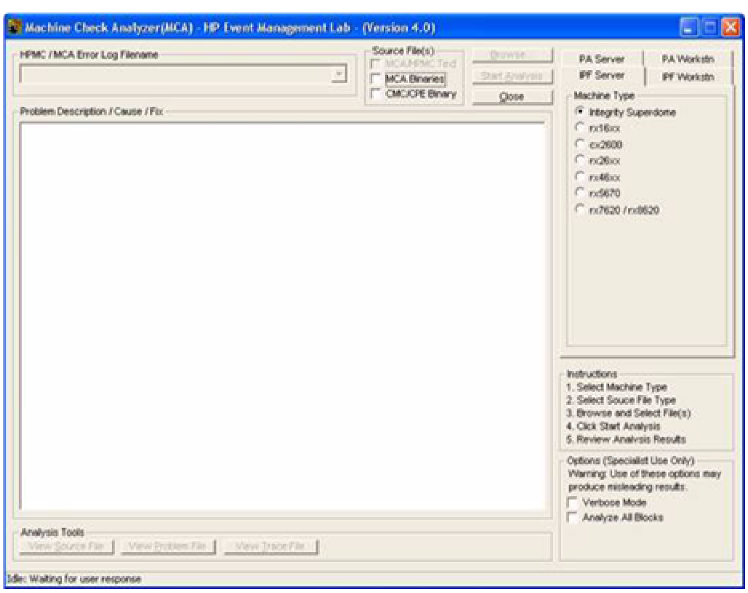
After you call up the program, select the error log file, and the model of the machine that experienced the MCA. The results display online and are saved in a file.

To run the machine check analyzer (mca):

1. Start the machine check analyzer:
   - **a.** Use the Windows Explorer to locate the machine check analyzer program, `mca.exe`
   - **b.** Double click on `mca.exe` to start the application.
2. When the “About MCA” screen appears, click the **OK** button to proceed.



3. When the main user interface window appears, first select the machine type for the system whose logs are to be analyzed:



   a. Click on the machine tab (upper right quadrant of the screen) to select a machine class:
      - IPF Server
      - IPF Workstation
      - PA-RISC Server
      - PA-RISC Workstation
   b. Click on the radio button under “Machine Type”, which corresponds to the system you wish to analyze.
4. Select the source file or files to analyze.
   a. Click the checkbox for the appropriate file type in the “Source File(s)” list:
      - MCA/HPMC Text
      - MCA Binaries
      - CMC/CPE Binary
   b. Click on the Browse button to open a file dialog window.
   c. Click on the file or files to be analyzed.
   d. Click the Open button.
   e. Select any Specialist Options (lower right quadrant of the screen):
      - Click the checkbox for any option you wish to include:
        — Verbose Mode
        — Analyze All Blocks
5. Start the analysis. Click the Start Analysis button (upper right quadrant of the screen).
6. Once the analysis is complete, review the results:.
   a. Review the contents of the Problem Description/Cause/Fix window.
   b. Use the Analysis Tools to review the output files:
      - View Source File
        — Text File -- opens source file
        — Binary File(s) -- opens the binary to text decode file
      - View Problem File
        — Opens the problem files. This is the same information presented in the Problem Description/Cause/Fix window.
      - View Trace File
        — Opens the trace file. This file provides a trace of the analysis operation.
7. Exit the mca:
   - Click on the Close button.

MCA Analysis

All BL860c server blades are designed to allow untrained customers to replace all FRUs designated as customer replaceable units (CRUs). In many servers, this means all of the FRUs. Troubleshooting (T/S) procedures, therefore, must be written for these untrained personnel.

There are some T/S tasks that require knowledge of HP diagnostics, utilities, and other aids in order to use them correctly. So these same T/S documents must include procedures, etc. for HP’s field support and mfg. personnel. The following defines those levels of expertise, called layers:

- **Layer 1** (untrained customer): Checking configuration rules, externally visible LEDs, simple log entries, cable connections, console messages, F/W versions/updates; remove and replace of solid CRU faults.
- **Layer 2** (trained customer/Self Support/CE/RCE): All of layer 1 plus checking internally visible LEDs, electrical measurements, MCA analyzers, complex log entries, run diagnostics, and utilities; remove and replace of solid/intermittent FRU faults.

- **Layer 3** (Field Support): All of layers 1 and 2 plus using SCAN tools, PDH monitors, logic analyzers, and more complex diagnostics and utilities (for example; OS*, STING) to determine if class problem/software/firmware.
- **Layer 4** (Manufacturing): All of layers 1and 2 plus using 3070 testing, x-ray, CARL and GSO lab tools to determine root cause of solid faults.

MCA Manual Analysis

The purpose of this section is to:

- Assist minimally trained HP support personnel (layer 2) perform both automated and manual analysis of MCA events on low-end HP Integrity and BL860c server blades
- Provide more in-depth information on manual analysis of fatal events on low-end HP Integrity and BL860c server blades for layers 3 and 4 support personnel

This section is broken into the following subsections:

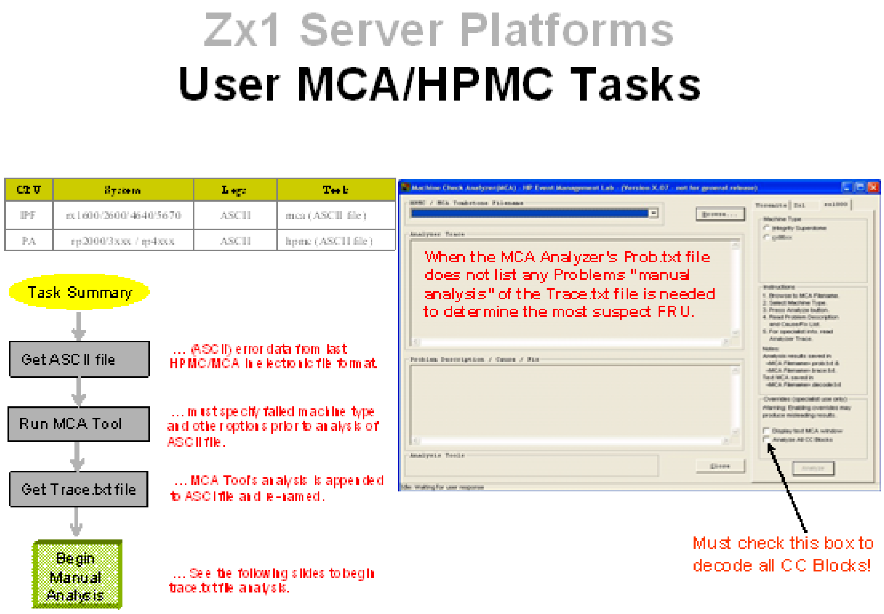
- "Using the Automated MCA Analyzer Tool (layers 2 through 4)" (page 199)
- "Using the Manual Troubleshooting Aids (layers 2 through 4)" (page 201)
- "Introduction to External CPU Operations (layers 3 and 4)" (page 205)
- "MCA Event Analysis (layers 3 and 4)" (page 210)

The first two subsections of this section contain procedures necessary for layers 2 through 4 personnel to accomplish manual MCA analysis, but it is NOT intended to bypass running the automated MCA analyzer tool. The manual aid's intent is to provide a snap analysis of the most suspect FRUs, when the automated MCA analyzer tool either finds multiple problems or simply cannot find any problem. The last two subsections of this section, for layers 3 and 4 personnel, address a need for a more general understanding of Integrity and BL860c server blade hardware operations that enhances fault analysis after most MCAs. New block level descriptions of the three most common external CPU operations add visibility to these failed operations. The material provided herein aids understanding the behaviors of MCAs towards identifying the server's hardware logic functions involved and the important error logging CSRs to examine.

Using the Automated MCA Analyzer Tool (layers 2 through 4)

The MCA Analyzer Tool is provided by HP to automatically analyze MCA error logs. To use the tool you must retrieve the MCA error file from the server and input it to the analyzer. See Figure C-1.

Figure C-1 User Tasks to Automatically Analyze MCAs



Event Log Definitions

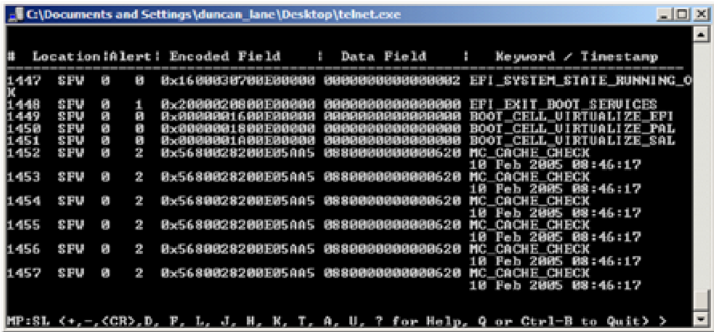
Often the underlying root cause of an MCA event is captured by System or BMC firmware in both the System Event and Forward Progress event logs. These errors are easily matched with MCA events by their timestamps. Some examples might be the loss of a CPU's VRM, for example, that causes a CPU fault. Decoding the MCA error logs would identify the failed CPU as the most likely FRU.

- Event logs are the equivalent of the old chassis logs for output of status or error information
- Symbolic names used in source code, for example, `MC_CACHE_CHECK`
- The hex code for each event log is 128 bits long with an architected format:
  - Some enumerated fields can be mapped to defined text strings
  - Can be displayed in hex or keyword or text mode
- Events are created by firmware or OS code and sent over the PDH bus to the BMC for storage into either or both the SEL and FP logs (HP-UX shows an I/O path for the BMC)
- Event logs are displayed by the MP. SEL events are sent over the IPMB between the BMC and the MP
- Event logs are read back over the PDH bus by software (IPMI driver or agent) for storage on disk

Event Logs

- Connect to system console. Use **Ctrl-B** to access the **MP Main Menu**; use the `sl` command to view event logs: `E` (System Event) or `F` (Forward Progress) logs are very useful for context around an error (see Figure C-2)
- `E:` shows event logs with alert level 2 or higher. The SEL defaults to alert level 2 on the server blade because there are some level 2 events related to rack infrastructure changes. The alert threshold can be changed. The SEL is never overwritten unless first manually cleared. It can get full.
- `F:` shows all event log outputs
- Event logs are never overwritten unless manually cleared; ring buffer so the oldest logs get overwritten
- Alert level threshold can be changed

Figure C-2 Forward Progress Log Entries Displayed in Keyboard Mode



Manual MCA Analysis Tasks

If the MCA Analyzer Tool is not able to provide a fix, a manual analysis of the error file is required. The following steps assist in manually analyzing an MCA event.

Procedure C-6 User Tasks to Manually Analyze MCAs

1. Run the source file through the MCA Analyzer Tool using the Analyze All CC Blocks option of the Analyzer Tool when nothing is listed in the prob.txt file or to check the accuracy of the reported problem.
2. The analyzer creates a trace.txt file. In the trace.txt file locate the “Loading error logs” heading (usually at the beginning of the trace.txt file).
3. Follow the verbal procedures for the 3-step flowchart to select the most appropriate external operation from the important error logging CSRs logged in the trace.txt file.
4. Follow the numbers to examine the important error logging CSRs associated with the most appropriate and ignore all other error logging CSRs.
5. Identify the most suspect FRU by matching either the error bit or hex code value contained in the important error logging CSRs to those identified in the trace.txt file.

Using the Manual Troubleshooting Aids (layers 2 through 4)

This section contains a flowchart for manual analysis of an MCA error log. Each flowchart path examines the important error logging CSRs and ignores all collateral errors logged by other CSRs. Always examine the SEL of a suspect server for any DC-2-DC failures to a CPU, as this can be a root cause of an MCA event that is not logged by the error logging CSRs examined with this flowchart. See Figure C-3.

The determination of important CSRs is based on the following assumptions explained in the next two sections:

- All failed CPU cache fetch and flush operations (Cache Line) are logged by CPU(s) or HP’s processor chipset Zx1. Under certain circumstances, the processor logs a cache error and signals either a BINIT or BERR, and theZx1 logs the BINIT or BERR as being signaled in the bus by either of the processors
- Most, but not all failed PIO Read CSR operations (PIO CSR) return H/F phase to the initiating CPU
- All failed PIO write CSR operations (PIO CSR) and most, but not all failed DMA I/O operations (DMA I/O) are discovered by failed PIO read CSR operations that may return H/F phase to the initiating CPU
- The logic function that detects an error is always considered “valid” as this helps to determine both the direction of the data flow and the most suspect FRU

Figure C-3 Three Step Error Logging CSR to External Operations Flowchart

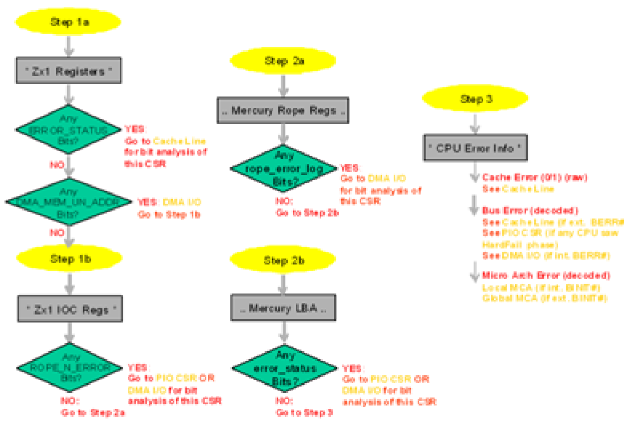


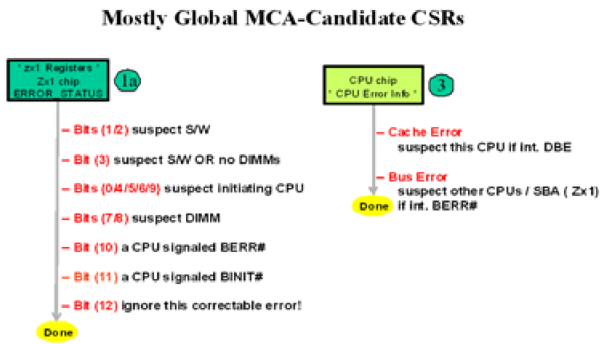
Table C-2 Verbal Narration of Flowchart Steps

Column Head	
Step 1a	Examine the Zx1 (Pluto) Registers section of the error file • If (any bit set in ERROR_STATUS CSR) then Go to Cache Line for further analysis • Else if (any bit set in the DMA I/O_MEM_UN_ADDR CSR) then Go to DMA I/O for further analysis
Step 1b	Examine the Zx1 IOC Registers section of the error file • If (any bit set in ROPE_N_ERROR CSR) then Go to PIO CSR (If no help there go to DMA I/O) • Else Go to Step 2a
Step 2a	Examine the Mercury Rope Registers • If (any bit set in rope_error_log) then Go to DMA I/O for further analysis • Else Go to Step 2b
Step 2b	Examine the Mercury LBA Registers • If (any bit set in error_status CSR) then Go to PIO CSR (If no help there go to DMA I/O) • Else Go to Step 3
Step 3	Examine the CPU error info • If (Cache Error 0/1 is not decoded by tool) then See Cache Line for CPU's role • If (Bus Error is decoded by tool) then — If (external BERR#) then See Cache Line for CPU's role — If (any CPU saw a HardFail phase) then See PIO CSR for CPU's role — If (internal BERR#) then See DMA I/O for CPU's role • If (Micro Arch Error is decoded by tool) then — If (external BINIT# or BERR#) then MCA is Global... • Else — If (internal BINIT#) then MCA is Local...

Manual Analysis of Cache Line Faults

Figure C-4 shows error logging CSR bit decodes for cache line faults

Figure C-4 Error Logging CSR Bit Decodes for Cache Line Faults



NOTE: Bit 3 is also caused by problems on any of the I/O controllers (Zx1 SBA); either a rope is hung, or a DMA error occurred.

Bits 5 and 6 are also caused by system board faults (Zx1 BIB block).

Example C-1 Manual Analysis of Cache Line Faults

```
**** Zx1 Registers ****ERROR_LOG_EN 0x9500 0x0000000000001dff
ERROR_SIG_EN 0x9508 0x0000000000000117
ERROR_STATUS 0x9510 0x0000000000000808
```

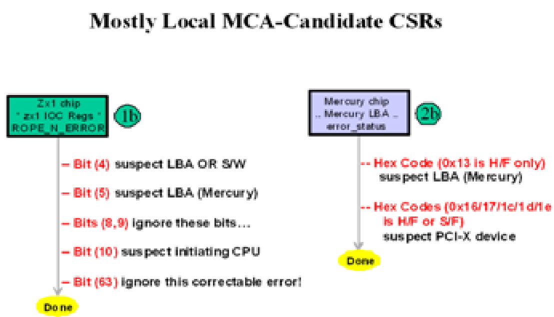
(bits 3 and 11 are set. The error comes from a CPU and it is most likely a software problem.)

```
ERROR_OVFL 0x9518 0x0000000000000000
ERROR_FIRST 0x9588 0x0000000000000000
    .
     .
DMA I/O_MEM_ERR_LOG_EN 0x0430 0x000000000000c000
DMA I/O_MEM_ERR_STATUS 0x0438 0x0000000000000000
DMA I/O_MEM_ERR_OVFL 0x0440 0x0000000000000000
DMA I/O_MEM_COR_ADDR 0x0448 0x0000000000000000
DMA I/O_MEM_COR_SYND1 0x0450 0x0000000000000000
DMA I/O_MEM_COR_SYND2 0x0458 0x0000000000000000
DMA I/O_MEM_COR_DATA 0x0460 0x0000000000000000
DMA I/O_MEM_UN_ADDR 0x0468 0x0000000000000000
DMA I/O_MEM_UN_SYND1 0x0470 0x0000000000000000
DMA I/O_MEM_UN_SYND2 0x0478 0x0000000000000000
DMA I/O_MEM_UN_DATA )0x0480 0x0000000000000000
```

Manual Analysis of PIO CSR Faults

Figure C-5 shows the error logging decodes for PIO CSR faults.

Figure C-5 Error Logging CSR Bit Decodes for PIO CSR Faults



Example C-2 Manual Analysis of PIO CSR Faults

```
.... Mercury LBA ....
]error_status 0x688 0x000000010000021c
```

(0x1c code, the PCI-X device is most likely cause. Replace the PCI HBA. (See ropes to PCI-X slot tables.))

```
master_id_log 0x0690 0x0000000000000000
inbound_err_add 0x0290 0x0000000000000000
inbound_err_attrib 0x0298 0x0000000000000000
completion_msg_log 0x02A0 0x0000000000000000
outbound_err_address 0x0070 0x00000000efffff00
error_config 0x0680 0x0000000000001d50
status_info_cntrl 0x0108 0x0000000000000040
function_id 0x0000 0x22b00146122e103c
```

NOTE: `error_status` is invalid if there is a slot power under-voltage failure (check the following bits on the `LBA_OLR_CONTROL`). This is true for single-slot ropes.

```
Av=set
Pwgd_inv=set
Olr_dual=not set
Pwgd_int_L=not set
```

`error_status` is invalid if there is a slot power leak (check the following bits on the `LBA_OLR_CONTROL`). This is true for single-slot ropes.

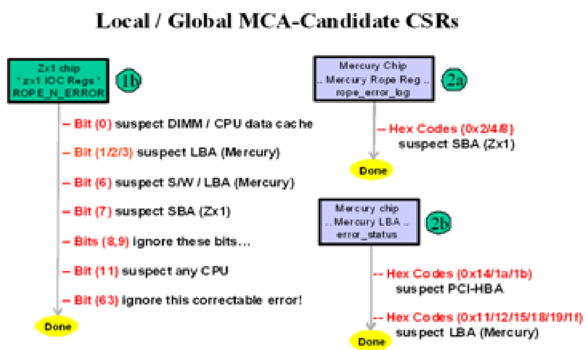
```
Av=set
Por=set
Olr_dual=not set
Pwgd=not set
```

Function ID bit 63: PCI-X device parity error not signaled in `error_status`register. Check the PCI-X device.

Manual Analysis of DMA I/O Faults

Figure C-6 shows the error decodes for DMA I/O Faults.

Figure C-6 Error logging CSR Bit Decodes for DMA I/O Faults



Example C-3 Manual Analysis of DMA I/O Faults

```
.... Mercury LBA ....
error_status 0x688 0x0000000100000211
```

(0x11 code, This Mercury LBA is most likely bad, replace (system board or PCI backplane) with this component on it. (See ropes to PCI-X slot tables.))

```
master_id_log 0x0690 0x0000000000000000
inbound_err_add 0x0290 0x0000000000000000
inbound_err_attrib 0x0298 0x0000000000000000
completion_msg_log 0x02A0 0x0000000000000000
outbound_err_address 0x0070 0x00000000efffff00
error_config 0x0680 0x0000000000001d50
status_info_cntrl 0x0108 0x0000000000000040
```

NOTE: `error_status` is invalid if there is a slot power under-voltage failure (check the following bits on the `LBA_OLR_CONTROL`). This is true for single-slot ropes.

```
Av=set
Pwgd_inv=set
Olr_dual=not set
Pwgd_int_L=not set
```

`error_status` is invalid if there is a slot power leak (check the following bits on the `LBA_OLR_CONTROL`). This is true for single-slot ropes.

```
Av=set
Por=set
Olr_dual=not set
Pwgd=not set
```

Function ID bit 63: PCI-X device parity error not signaled in `error_status`register. Check the PCI-X device.

Introduction to External CPU Operations (layers 3 and 4)

In order for a CPU to do useful work it must be able to fetch instructions or data from memory, perform operations on the data, and write the updated data back to memory. The following discussion will cover three of the most common CPU operation types used to accomplish these tasks:

1. Cache line operations between the CPU cache and shared memory
2. PIO CSR operations between CPU internal registers and external CSRs in the platform CEC
3. DMA I/O operations between the IOC cache (inZx1) and shared memory.

FAQs

- **What are the components that comprise a Zx2 memory subsystem?**

  Components consist of MEMC logic (in Zx2) that controls two each memory cells (0 and 1) and the DIMMs that make up a server's shared memory

- **What is the purpose of memory ranks?**

  Each memory rank must contain 4 each memory DIMMs (or quad) of the same size and type. The BL860c server blade contains one rank (four DIMM slots).

- **Explain the role of a memory DIMM?**

  Each DIMM contains the individual SDRAM chips that make up the server's shared memory, accessed by CPU cache and IOC cache in 128 byte chunks, called cache lines

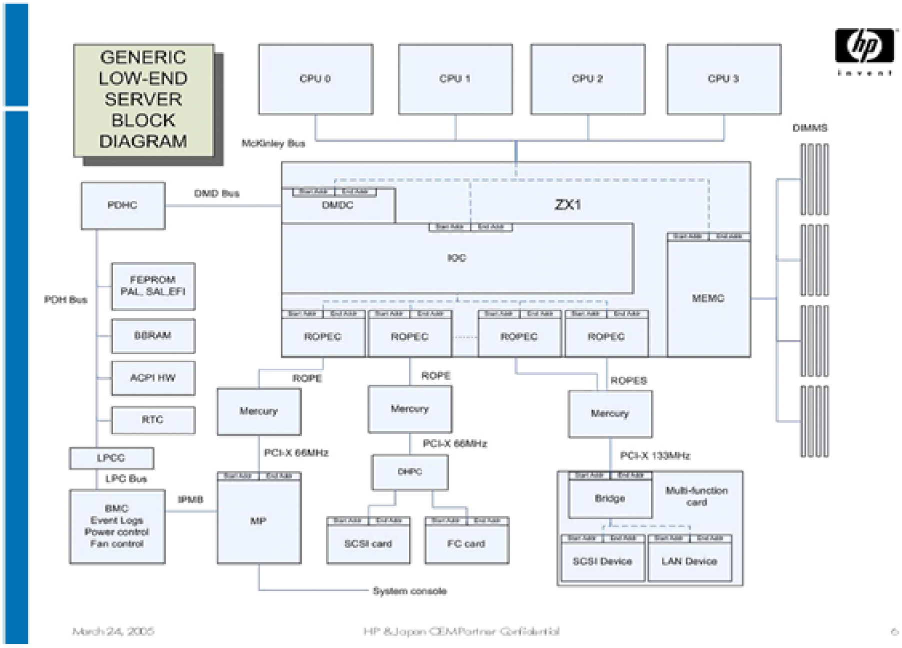
- **What is the makeup of a memory cache line?**

  Cache lines consist of 128 bytes of shared memory that are equally divided across four DIMMs in the same rank where the cache line is store or to be written; each DIMM in a quad contains 32 bytes of the cache line's 128 bytes

Basic Platform Boot Flow

- BMC turns on power supplies, fans and releases RESET on all CPUs at once with the system power switch.
- Initial CPU firmware code fetch is PAL code from FEPROM in PDH and retrieved 4 bytes at a time by DMDC (in Zx1)
- No shared memory or I/O devices available (initially un-configured)
- Firmware code stack is initially in BBRAM in PDH and are retrieved 4 bytes at a time via PDH and DMD Buses
- PAL code configures all CPUs
- SAL code configures all platform CEC chips including shared memory and all responding I/O devices
- Firmware code and stack are relocated to shared memory (after all DIMM ranks in shared memory are configured and tested)
- EFI shell is launched from shared memory and are retrieved128 byte cache lines at a time by MEMC (in Zx1)
- OS loader is launched using EFI device driver; OS boots and starts its own device drivers
- OS may use runtime PAL and SAL calls and ACPI features (these abstraction layers allow platform independence)
- Figure C-7 shows a generic illustration of low end server components. However, we will be using much simpler representations of these components throughout this document that accurately reflects this one. Note that only one of two memory cells is shown.

Figure C-7 Generic Block Diagram of Entry Class Server



McKinley Bus Transaction Routing

Each CEC chip and I/O device has address range register(s)

- Shown in figure 7's block diagram as a single pair of "start/end" registers within the logic blocks of Zx1, MP, core I/O, and PCI HBAs but are often several pairs to support several address ranges
- Some address ranges are fixed but most are programmed by system firmware or the OS or both during boot
- These logic blocks claim and respond to transactions that fall within their address range(s)

Address ranges should not overlap

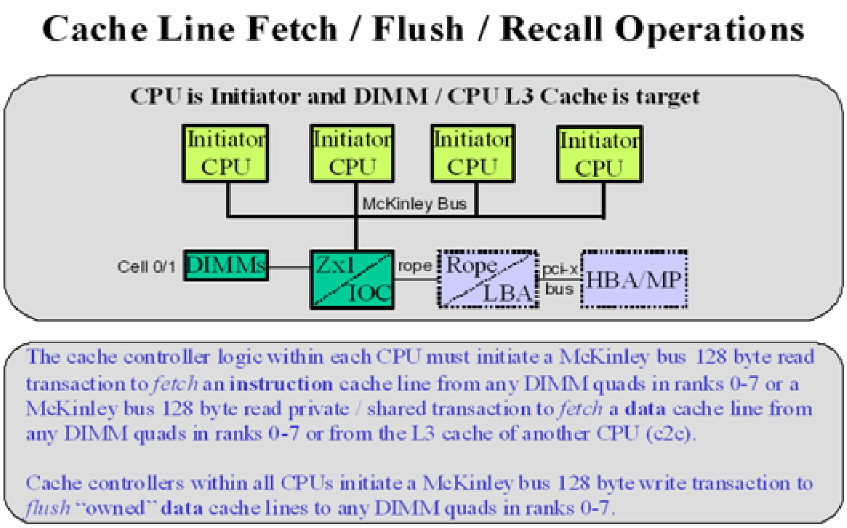
Any McKinley Bus transaction that misses the assigned address ranges causes a Machine Check Abort event, unless temporarily masked

External Cache Line Operations

Cache Lines are the mechanism by which external instructions and data words are transferred between CPUs and physical shared memory. Each cache line contains 128 bytes of instruction words or data words but not both. Since individual instruction and data words are 64-bits or 8 bytes in length there are 16 of them in every 128 byte cache line.

NOTE: Each CPU begins fetching instruction cache lines from the FEPROM in PDH immediately after the RESET signal is released by the BMC. See Figure C-8.

Figure C-8 Block Diagram of External Cache Operations on Zx1 Based Server



FAQs

- **Tell me more about cache lines**

  IPF's architecture must receive their instruction streams bundled (by compilers) with embedded information to maximize instruction parallelism through their sixteen execution units.

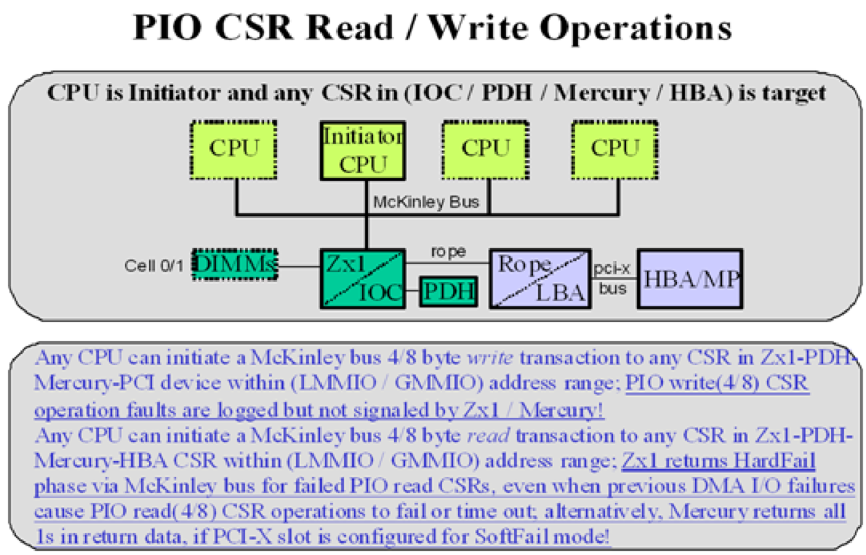
- **Tell me about TLBs**

  CPUs use their internal translation lookaside buffers (TLBs) to translate each cache line's 64-bit virtual address into a 44-bit physical address to locate the location where the cache line is stored in shared memory.

External Physical I/O CSR Operations

Programmed (memory-mapped) I/O means that the CPU routinely executes Load / Store instructions to either modify / retrieve the contents of an external CSR in Zx1 / PDH / Mercury / PCI-X device. Each CSR's content (or 8-byte data word) is accessed through its unique 44-bit physical address mapped to every CSR in the server, including those in core I/O and PCI-X card devices. Each CPU may have up to four external PIO CSR operations outstanding at a time. See Figure C-9.

Figure C-9 Block Diagram of External PIO CSR Operations on Zx1 Based Server



FAQs

- **Tell me about CSRs**

  Some Control Status Registers (CSRs) are used to record error information from the various components of the server. All CSRs in a Zx1 based server are 64-bits in size and number from right to left (or little endian).

- **Tell me about PDH**

  Processor–dependant hardware (PDH) contains both read-only and temporary memory storage and control buffers that are accessed by CPUs using Load / Store instructions to retrieve / store their contents 4/8 bytes at a time to/from internal CPU registers. CPUs cannot use LOAD/STORE instructions to access/store 4/8 bytes from/to physical shared memory (DIMM quads in ranks 0-7).

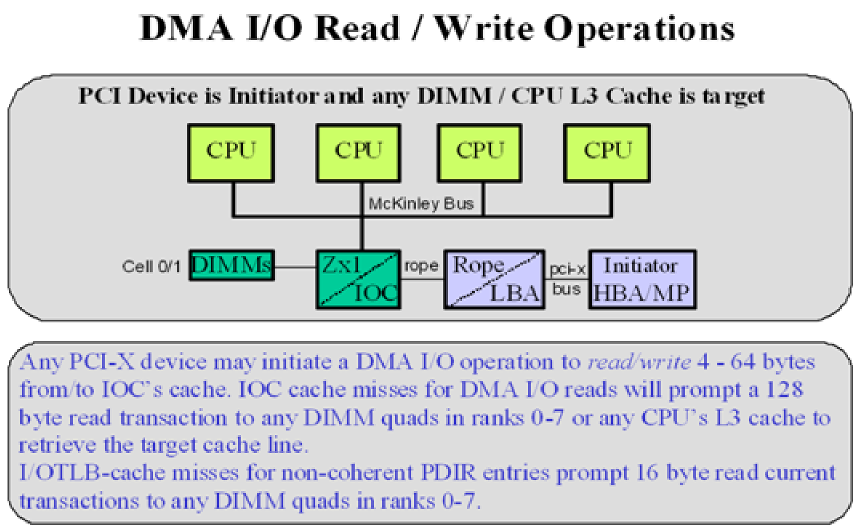
- **Tell me about HardFail vs. SoftFail**

  SoftFail faults are not detected by the hardware and are not logged by error logging CSRs as their counterpart HardFail faults. Instead, SoftFail faults return all 1's in the data word of a PIO CSR read operation (Load instruction to an external CSR in one of the PCI-X card devices). This allows the server to continue operating whenever a faulty PCI-X card's device fails during normal operation instead of forcing an MCA event. The SoftFail feature is supported by HP-UX 11i version 2 or higher. LBA chips within the I/O subsystem may be configured for SoftFail operation if the I/O driver that claims their PCI-X bus supports this feature.

External Direct Memory Access I/O Operations

Direct Memory Access I/O are I/O drivers within system F/W. The OS kernel issues many PIO operations to external CSRs or RAM in core I/O or PCI-X card devices to facilitate DMA I/O operations which manage the movement of blocks of data between virtual memory devices (lans / disks / tapes / DVDs / CDs) and physical shared memory. see Figure C-10.

Figure C-10 Block Diagram of External DMA I/O Operations on Zx1 Based Server



FAQs

- **Tell me about I/O-TLBs**

  External DMA I/O operations use the I/O-TLB (or PDIR) within the IOC function to map all 32-bit physical addresses used by some legacy PCI card devices to access / store their data into 44-bit physical addresses prior to storing their data into shared memory (DIMM quads in ranks 0-7) or retrieving blocks of data from shared memory (as individual cache lines).

- **Why do some LBAs have one rope and some have two ropes?**

  The second rope allows for a doubling of the throughput between the SBA and the LBA. This extra bandwidth supports faster PCI-X bus frequencies. Note that slower HBAs will not run faster in a faster PCI-X slot but fast HBAs will run slower in a PCI-X slot with a slower PCI-X bus frequency.

MCA Event Analysis (layers 3 and 4)

A fatal hardware error detected during an external operation causes a Machine Check Abort (MCA) event to be recorded by error logging CSRs. MCA events result in unexpected reboots of the server. A message on the system console and a flashing Attention LED indicate an unread error message in the system event log (SEL).

- Second highest interruption (RESET is higher)
- Error detected by CPU or CEC chipset
- Maskable but almost always enabled
- Some typical causes that require error containment:
  - Whenever BERR# or BINIT# McKinley Bus signal is asserted
  - An MBE while reading a cache line from shared memory or during some McKinley Bus transactions
  - A HardFail response returned on the McKinley Bus from a failed PIO read CSR operation
  - Any McKinley Bus transaction timeout
  - An MBE while reading a cache line from any CPU's cache; a parity error reading Zx1's I/O cache/TLB
  - CPU(s) vector to fixed address 0xFFFFF90 (machine check handler in FEPROM in PDH)

  A Machine Check Abort (MCA) is the event recorded on HP Integrity (Intel® Itanium® based) servers: rx1600, rx2000, rx2600, rx4640, rx5670, and BL860c server blades.

MCA Logic Flow Overview

HW logging -> pal_check() -> sal_check() -> OS_MCA()

- pal_check is part of the PAL firmware from Intel
  - Logs CPU state information and clears CPU errors
- sal_check is part of SAL firmware written by HP
  - Saves CPU and chipset data to battery backed RAM
  - Clears chipset errors
- OS_MCA is the handler provided by the OS
  - Uses FW calls to retrieve data saved by PAL and SAL
  - Creates crashdump log files; sends console message
  - Reboots the OS

Examining Server Logs

The most common action is to retrieve and view the MCA error log from the suspect server.

Several key files provide much of the information required to fully troubleshoot a failed server. The following three error logs are accessed from the iLO MP / EFI menu:

- System Event Log (SEL) to see all alert level 2 or higher events
- Forward Progress Log (FPL) to see all alert level events
- Live events

To invoke any of the above logs, enter `sl` from the **MP Main Menu**.

Use the following iLO MP outputs to determine the vital status of the server:

- `sysrev` (system revision)
- `ps` (power status)

Error Logging and Signaling in Platform Hardware

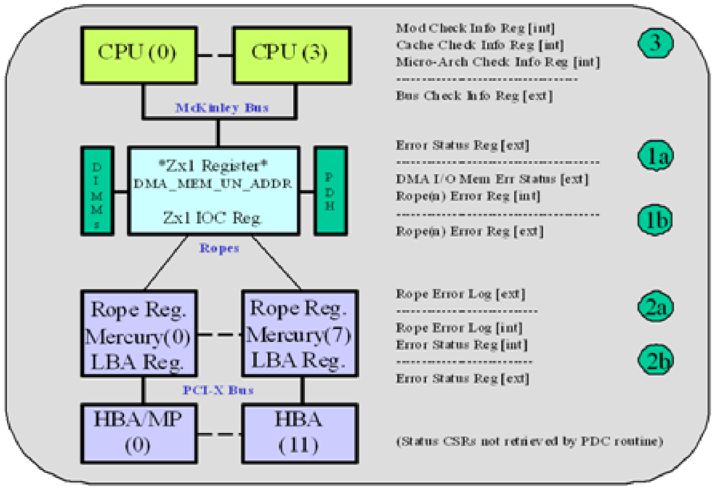
- CPUs and chipsets contain error logging CSRs
- Hardware stores data into the error logging CSRs that, in turn, provide a snapshot of the system's state when an error occurs
- CPU register state preserved by pal_check() during MC handling
- Errors detected by the chipset are signaled in the response phase of McKinley Bus transactions
- Posted writes cannot return an error after being claimed by the I/O controller in Zx1 because they do not require an acknowledgement back to the initiating CPU

Examining Error Logging CSRs

Careful examination of the different error bits / hex codes logged by certain error logging CSRs provide basic information about the fault and the external CPU operation that failed, including: the severity of the error, arrows are used to show the direction of the data flow, and whether the fault was detected internal / external to the detecting logic function.

Figure 11 provides a simple block diagram of a Zx1 server's major logic chips on the left side and each chip's the most important CSR to examine on the right side. On the far right side are the sequence numbers that defines the order in which to examine error logging CSRs. See Figure C-11.

Figure C-11 Block View of Important MCA Error Logging CSRs



FAQs

- **How are specific failed external operations determined from the MCA error data in error logging CSRs?**

  Many logged errors within error logging CSRs are associated with DMA I/O operations / PIO CSR operations / cache line operations. A flowchart is provided to make this association for you from the important logged CSR error data of all participating CPUs, Zx1, and Mercury chips after an MCA event.

- **How is the most suspect FRU determined?**

  Each of the three external CPU operations is broken down to the appropriate logged CSR error data bits / hex codes from each chip's logic function as a further aid to identifying the most suspect FRU.

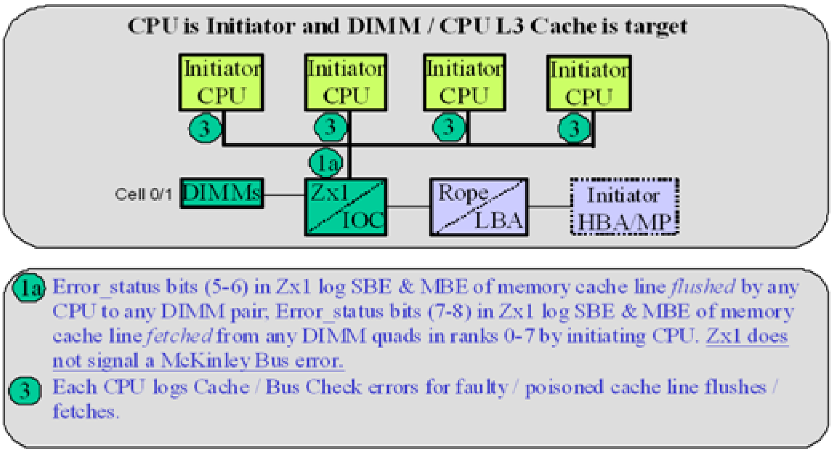
- **What is the role of BERR# / BINIT# / HardFail phase?**

  All are McKinley bus mechanisms used to stop one or all CPUs and some Zx1 logic functions prior to an MCA event.

Failed Cache Fetch/Flush Operation

Figure C-12 shows only the CPU (3), Zx1 (1a), and DIMM pairs involved and the data paths between them; flow is from any CPU's Level 3 cache to Zx1 to DIMM pairs and back to CPU.

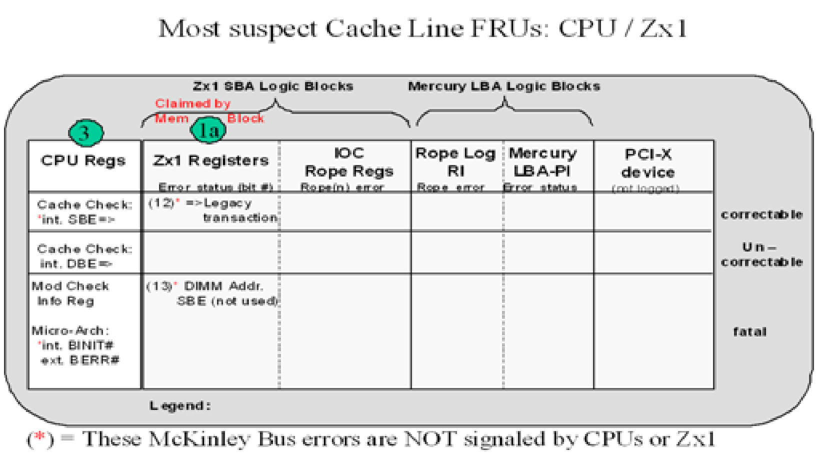
Figure C-12 Catch Line Fetch/Flush Data Paths



Failed Cache LineError Table

The following figure (13) shows only those faults logged for failed cache line operations that are internal to the CPU (3) or Zx1 (1a) logic function that detected them. Therefore, these faults directly identify a CPU or Zx1 as the most suspect FRU. See Figure C-13.

Figure C-13 Internal Cache Line Errors



NOTE: The arrows indicate the direction of the data flow logged by each error bit. The dark vertical lines indicate the boundary between CPUs and Zx1, Zx1 and Mercury, and Mercury and PCI FRUs. The dashed vertical lines indicate the boundaries between logic blocks within Zx1 and Mercury FRUs.

Hardware Platform Error Severities

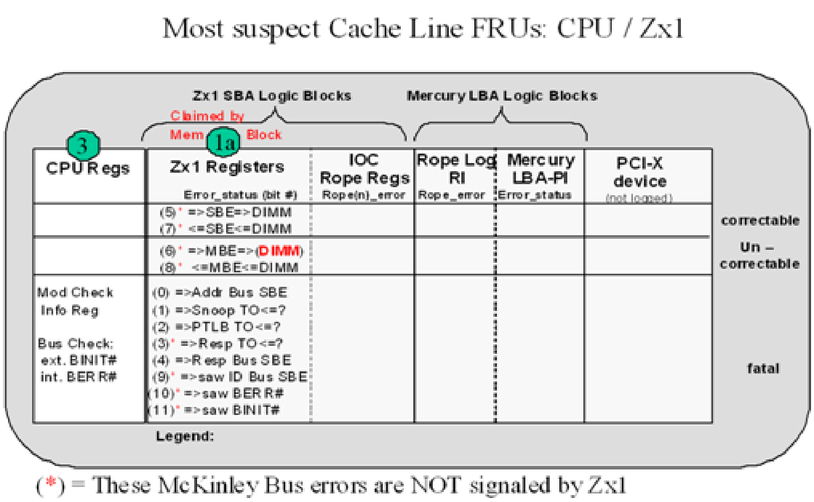
Correctable (by hardware) faults are logged by error logging CSRs in Zx1 and Mercury chips, when enabled, are a major cause for corrected platform error (CPE) events. These events are not signaled but they are logged by PAL / SAL / BMC / processor-dependent firmware and periodically examined by STM software / BMC firmware.

Uncorrectable faults are logged by error logging CSRs in Zx1 the chip, when enabled, are a very minor cause for machine check abort (MCA) events. These rare events are logged by processor-dependent firmware, generate a ts99 file, and cause a running OS to reboot.

Fatal faults are logged by error logging CSRs, in Zx1 and Mercury chips when enabled, are the major cause for MCA events. These events are logged by processor-dependent firmware, generate a ts99 file, and cause a running HP-UX OS to reboot.

Figure C-14 shows only those faults logged for failed Level 3 cache line operations that are external to the CPU (3) or Zx1 (1a) logic function that detected them. Note that it is those uncorrectable faults detected by Zx1 that identify the most suspect FRU as either the Zx1 chip or a DIMM pair; whereas, all fatal faults detected by Zx1 identify a CPU as the most suspect FRU.

Figure C-14 External Cache Line Errors



NOTE: The arrows indicate the direction of the data flow logged by each error bit. The dark vertical lines indicate the boundary between CPUs and Zx1, Zx1 and Mercury, and Mercury and PCI FRUs. The dashed vertical lines indicate the boundaries between logic blocks within Zx1 and Mercury FRUs.

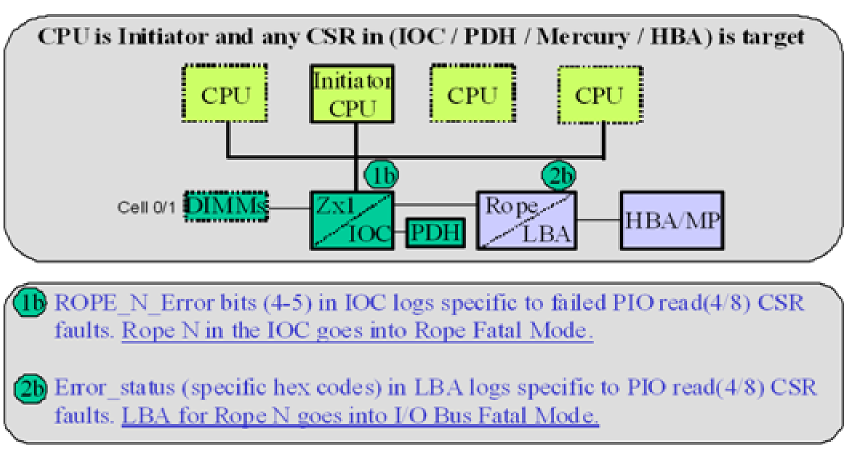
Example C-4 MCA due to a Response Timeout

- CPU issues a transaction on the McKinley bus to an invalid physical address (44-bit address does not fall within any assigned address range for either shared memory or a CSR)
- None of the CEC chips issue a response to the transaction
- Zx1 chip times out the response phase and pulls BERR# to signal a global MCA
- All CPUs take the MCA vector and all execute `pal_check()` in parallel
- All CPUs enter `sal_check()`
- In `sal_check()` one CPU is selected to log and clear chipset errors; other CPUs wait in idle loops
- All CPUs hand off to the OS_MCA handler
- In OS_MCA handler: One CPU is selected to retrieve the error log information using calls to SAL_GET_STATE_INFO; writes crashdump files to disk; other CPUs just wait in idle loops
- Server reboots the OS

Failed PIO CSR Operation

Figure C-15 shows only the Zx1 (1b) and Mercury (2b) modules as involved and the data paths between them: Flow is from initiating CPU to any external CSR within Zx1 / PDH / Mercury / PCI-X device and back to same CPU.

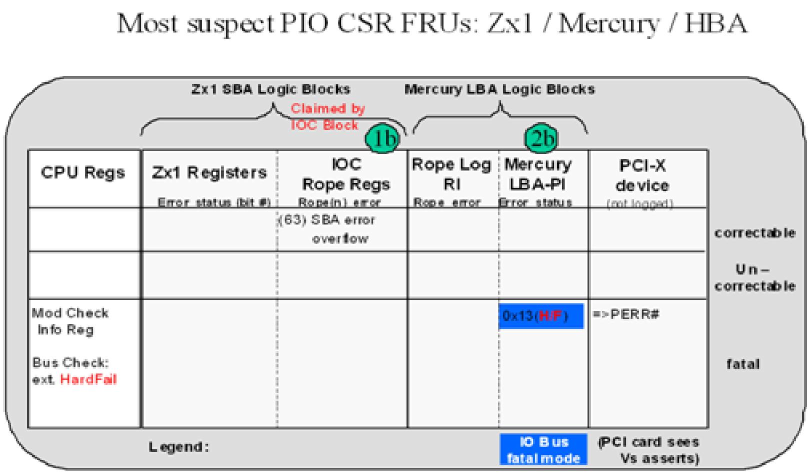
Figure C-15 PIO CSR Read/Write Data Paths



Failed PIO CSR Error Table

Figure C-16 shows only those faults logged for failed PIO CSR operations that are internal to the Zx1 (1b) or Mercury (2b) logic function that detected them. Therefore, these faults directly identify the Zx1 or Mercury as the most suspect FRU.

Figure C-16 Internal PIO CSR Errors



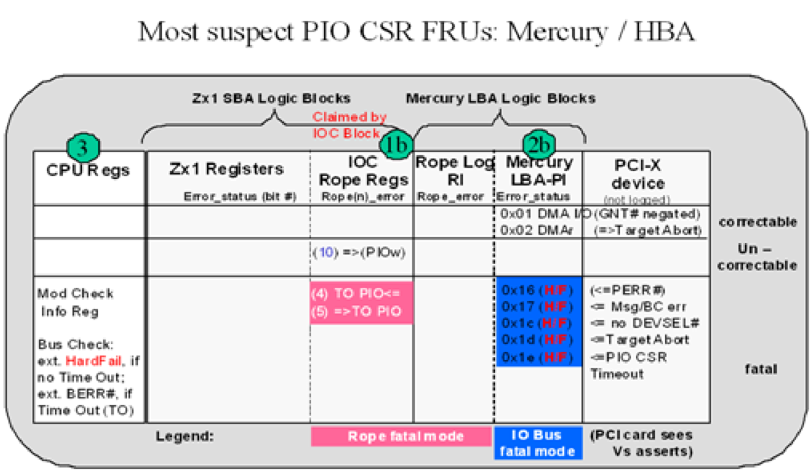
The arrows indicate the direction of the data flow logged by each error bit. The dark vertical lines indicate the boundary between CPUs and Zx1, Zx1 and Mercury, and Mercury and PCI FRUs. The dashed vertical lines indicate the boundaries between logic blocks within Zx1 and Mercury FRUs.

Example C-5 MCA due to a Fatal Error on a Read CSR

- CPU issues a read to a CSR of a PCI device
- Parity error occurs on PCI-X bus
- Mercury (LBA) detects the error, logs it (0x13) and goes into IO Bus Fatal Mode:
  - — All future CSR writes are discarded
  - — All future CSR reads get a HardFail response
  - — HardFail response returned for the current read CSR that failed
- CPU that issued the read CSR gets the HF response and takes a Local MCA – no other CPUs are affected
  - — CPU enters pal_check() and the rest of the MCA path
  - — When OS_MCA handler completes then the server will reboot the OS
- One CPU will log information on the MCA

Figure C-17 shows only those faults logged for failed PIO CSR operations that are external to the CPU (3) or Zx1 (1c) or Mercury (2b) logic function that detected them. Note that it is those fatal faults detected by Zx1 or Mercury that identify either the Zx1 chip or the Mercury chip or the PCI-X HBA as the most suspect FRU.

Figure C-17 External PIO CSR Errors



NOTE: The arrows indicate the direction of the data flow logged by each error bit. The dark vertical lines indicate the boundary between CPUs and Zx1, Zx1 and Mercury, and Mercury and PCI FRUs. The dashed vertical lines indicate the boundaries between logic blocks within Zx1 and Mercury FRUs.

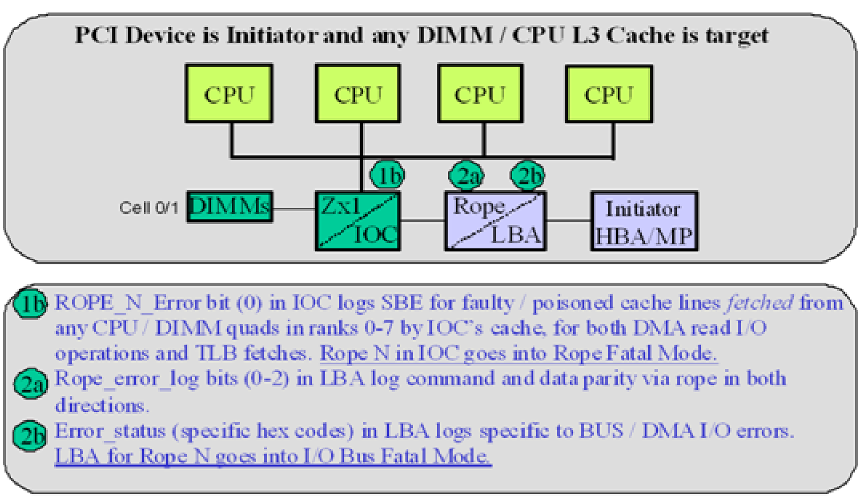
Example C-6 MCA due to a Fatal Error on a Write CSR

- Driver running on CPU0 writes to a non-existent CSR of PCI device; PCI device does not respond with DEVSEL#
- Mercury (LBA) detects the error, logs (0x1c) and goes into IO Bus fatal mode; CSR Write did not require a response so no way to return an error on this transaction; CPU0 that issued the write CSR is unaware of the failure; all future CSR writes to this LBA are discarded; all future CSR reads get a HardFail response
- CPU1 issues a read CSR to a valid device on the same PCI bus as the original failure and gets an HF response because Mercury is in IO Bus Fatal Mode; CPU1 takes a local MCA - other CPUs are unaffected; CPU1 enters pal_check() and follows the MCA path
- When OS_MCA handler completes then the server reboots the OS
- CPU1 will have created an errdump log for the MCA; (CPU1 received a HardFail response to a failed read CSR); Mercury logged an error on a write CSR, shows the address but not which bus agent initiated the write CSR; no way to trace back to which CPU issued the bad write CSR; not even sure it is a bad write CSR
- Clearing Mercury's IO Bus fatal mode requires reset of the PCI bus which clears all the range registers on PCI devices (do not know from the log if the CSR's address was valid); could have been a write CSR to a valid address and a PCI device simply failed to claim it

Failed DMA I/O Operation

Figure C-18 shows only the Zx1 (1b) and Mercury (2a and 2b) modules as involved and the data paths between them: Flow is from PCI-X device to Mercury to Zx1 (IOC cache) and back to PCI-X device.

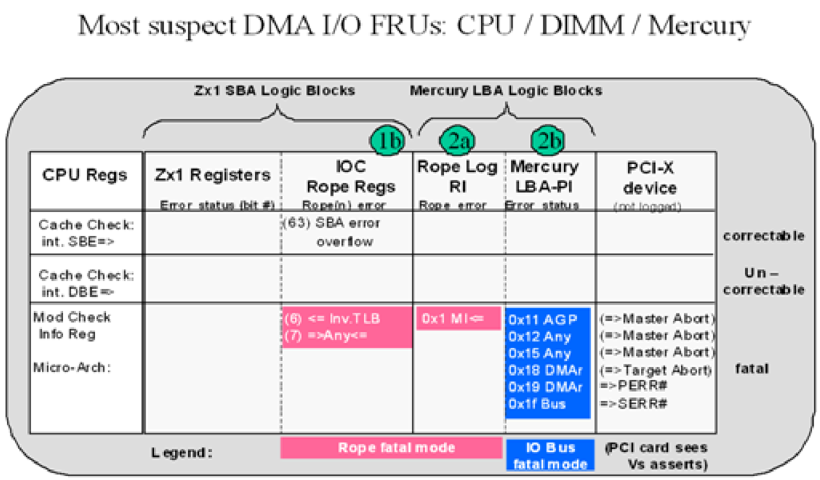
Figure C-18 DMA I/O Read/Write Data Paths



Failed DMA I/O Error Table

Figure C-19 shows only those faults logged for failed DMA I/O operations that are internal to the Zx1 (1b) or Mercury (2a and 2b) logic function that detected them. Therefore, these faults directly identify a CPU or Zx1 or Mercury as the most suspect FRU.

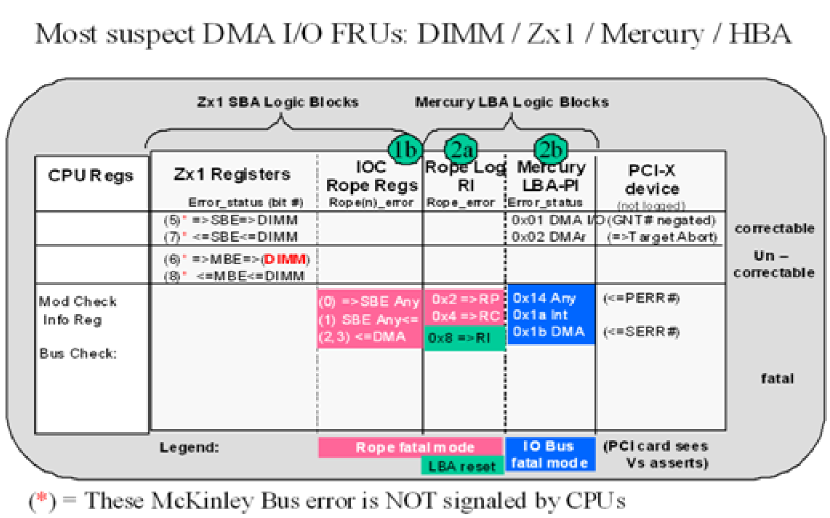
Figure C-19 Internal DMA I/O Errors



> **NOTE:** The arrows indicate the direction of the data flow logged by each error bit. The dark vertical lines indicate the boundary between CPUs and Zx1, Zx1 and Mercury, and Mercury and PCI FRUs. The dashed vertical lines indicate the boundaries between logic blocks within Zx1 and Mercury FRUs.

Figure C-20 shows only those faults logged for failed DMA I/O operations that are external to the Zx1 (1b) or Mercury (2a and 2b) logic function that detected them. Note that it is those uncorrectable faults detected by Zx1 that identify a DIMM quad as the most suspect FRU; whereas, all fatal faults detected by Zx1 or Mercury identify either the Zx1 or Mercury or PCI-X HBA as the most suspect FRU.

Figure C-20 External DMA I/O Errors



NOTE: The arrows indicate the direction of the data flow logged by each error bit. The dark vertical lines indicate the boundary between CPUs and Zx1, Zx1 and Mercury, and Mercury and PCI FRUs. The dashed vertical lines indicate the boundaries between logic blocks within Zx1 and Mercury FRUs.

D iLO 2 MP Configuration Troubleshooting Examples

This appendix provides iLO 2 MP configuration troubleshooting examples.

Troubleshooting Examples

The following examples demonstrate how to use the iLO 2 MP to acquire configuration information about rx6600 servers for troubleshooting purposes:

```
 *************************************************************************
  This is a private system.
  Do not attempt to login unless you are an authorized user.
  Any authorized or unauthorized access or use may be monitored and can
  result in criminal or civil prosecution under applicable law.
 *************************************************************************

 *************************************************************************
  Only default users are configured.
  Use one of the following user/password pairs to login:

  Admin/Admin
  Oper/Oper
 *************************************************************************

MP login: Admin
MP password: *****


       Hewlett-Packard Integrated Lights-Out HP Integrity

    (c) Copyright Hewlett-Packard Company 1999-2005.  All Rights Reserved.

                           MP Host Name: mp0014c29c053d

                              Revision F.01.11


 *************************************************************************
                        MP ACCESS IS NOT SECURE
  Default MP users are currently configured and remote access is enabled.
  Modify default users passwords or delete default users (see UC command)
                                   OR
            Disable all types of remote access (see SA command)
 *************************************************************************


   MP MAIN MENU:

         CO: Console
        VFP: Virtual Front Panel
         CM: Command Menu
         CL: Console Log
         SL: Show Event Logs
         HE: Main Help Menu
          X: Exit Connection

[mp0014c29c053d] MP> vfp
                        .
        Welcome to the Virtual Front Panel (VFP).
        Use Ctrl-B to exit.

LEDs      LOCATOR       SYSTEM        INT. HEALTH   EXT. HEALTH   POWER
-----------------------------------------------------------------------------
```

```
          OFF           OFF           ON GREEN      ON GREEN      ON GREEN

-----------------------------------------------------------------------------
Status    POW:System Power on
          INT:Internal parts, including CPUs and Memory, okay
          EXT:Externally accessible fans and power supplies okay
-----------------------------------------------------------------------------
LEDs      LOCATOR       SYSTEM        INT. HEALTH   EXT. HEALTH   POWER
-----------------------------------------------------------------------------

          OFF           OFF           ON GREEN      ON GREEN      ON GREEN

-----------------------------------------------------------------------------
Status    POW:System Power on
          INT:Internal parts, including CPUs and Memory, okay
          EXT:Externally accessible fans and power supplies okay
-----------------------------------------------------------------------------



   MP MAIN MENU:

         CO: Console
        VFP: Virtual Front Panel
         CM: Command Menu
         CL: Console Log
         SL: Show Event Logs
         HE: Main Help Menu
          X: Exit Connection

[mp0014c29c053d] MP> cm

        (Use Ctrl-B to return to MP main menu.)

[mp0014c29c053d] MP:CM> df


DF

To dump all available FRU information without any paging, use
the command line interface: DF -ALL -NC


Display FRU Information Menu:
     S - Specific FRU
     A - All available FRUs
     V - Display Mode: Text

Enter menu item or [Q] to Quit: a
a

FRU Entry #   0 :
FRU NAME: Processor 0 ID:20

PROCESSOR DATA
 S-spec/QDF:  QGGW
 Sample/Prod: 00

CORE DATA
 Arch Revision                :  00
 Core Family                  :  20
 Core Model                   :  00
 Core Stepping                :  02
 Max Core Freqency            : 1400 MHZ
```

```
 Max SysBus Freqency           :  200 MHZ
 Core Voltage                  : 1100 mV
 Core Voltage Tolerance,High   :   32 mV
 Core Voltage Tolerance,Low    :   96 mV

CACHE DATA
 Cache Size                    : 6000 KB

PACKAGE DATA
 Package Revision              : NE Substrate Revision: 01

PROC PART NUMBER DATA
 Part Number                   : 80549KC
 Electronic Signature          : 0003C9C6E904531D

THERMAL REF DATA
 Upper Temp Ref                :  90 C
 Calibr Offset                 :   0 C

FEATURES DATA
 IA-32 Proc Core Feature Flags:  FFFB8743
 IA-64 Proc Core Feature Flags:  1B81806300000000
 Package Feature Flags         :  03000000
 Devices on TAP Chain          :  2

Type <CR> for next entry, or Q to quit:


FRU Entry #   1 :
FRU NAME: Processor 0 RAM ID:24
Invalid Checksum

Type <CR> for next entry, or Q to quit:

FRU Entry #   2 :
FRU NAME: Mem Extender 0 ID:01

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time       : 5054102
 Manufacturer        : CELESTICA
 Product Name        : 24 DIMM Memory Extender
 S/N                 : 40CTPR3503
 Part Number         : AB464-60001
 Fru File ID         : 10
 Custom Info         : XG
 Custom Info         : 4526
 Custom Info         : A1
 Custom Info         : 0

PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:      ICT     Functional  LCD     CTO     Audit   Field Repair
-------------      ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision    0000    0000        0000    0000    0000    0000
  Test Pass Date   000000  000000      000000  000000  000000  000000
  Test Location    00      00          00      00      00      00
Test Count
  # Tests          00      00          00      00      00      00
  # Failures       00      00          00      00      00      00
  # NTF            00      00          00      00      00      00
```

```
Type <CR> for next entry, or Q to quit:


FRU Entry #   3 :
FRU NAME: Mem Extender 1 ID:02

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time      : 5053823
 Manufacturer       : CELESTICA
 Product Name       : 24 DIMM Memory Extender
 S/N                : 40CTPR350R
 Part Number        : AB464-60001
 Fru File ID        : 10
 Custom Info        : XG
 Custom Info        : 4526
 Custom Info        : A1
 Custom Info        : 0

PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:     ICT     Functional  LCD     CTO     Audit   Field Repair
-------------     ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision   0000    0000        0000    0000    0000    0000
  Test Pass Date  000000  000000      000000  000000  000000  000000
  Test Location   00      00          00      00      00      00
Test Count
  # Tests         00      00          00      00      00      00
  # Failures      00      00          00      00      00      00
  # NTF           00      00          00      00      00      00

Type <CR> for next entry, or Q to quit:

FRU Entry #   4 :
FRU NAME: Power Supply 0 ID:03

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time      : 4944297
 Manufacturer       : C&D
 Product Name       : BULK POWER SUPPLY
 S/N                : SR5160299
 Part Number        : 0957-2140
 Fru File ID        : 10
 Custom Info        : p4
 Custom Info        : ????
 Custom Info        : A1
 Custom Info        : 0

PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:     ICT     Functional  LCD     CTO     Audit   Field Repair
-------------     ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision   0000    0000        0000    0000    0000    0000
  Test Pass Date  000000  000000      000000  000000  000000  000000
  Test Location   00      00          00      00      00      00
```

```
Test Count
  # Tests         00      00           00      00      00      00
  # Failures      00      00           00      00      00      00
  # NTF           00      00           00      00      00      00

Type <CR> for next entry, or Q to quit:


FRU Entry #   5 :
FRU NAME: I/O Assembly ID:05

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time      : 5020717
 Manufacturer       : CELESTICA
 Product Name       : 10 Slot PCI-X IOBP
 S/N                : 40CTPR301G
 Part Number        : AB463-60001
 Fru File ID        : 10
 Custom Info        : XM
 Custom Info        : 4526
 Custom Info        : A3
 Custom Info        : 0

PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:     ICT     Functional  LCD     CTO     Audit   Field Repair
-------------     ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision   0101    0000        0000    0000    0000    0000
  Test Pass Date  2d9c4c  000000      000000  000000  000000  000000
  Test Location   00      00          00      00      00      00
Test Count
  # Tests         00      00          00      00      00      00
  # Failures      00      00          00      00      00      00
  # NTF           00      00          00      00      00      00

Type <CR> for next entry, or Q to quit:
Type <CR> for next entry, or Q to quit:


FRU Entry #   6 :
FRU NAME: Display Board ID:06

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time      : 5032800
 Manufacturer       : CELESTICA
 Product Name       : DVD/Display Board
 S/N                : 40CTPS1001
 Part Number        : AB463-60020
 Fru File ID        : 10
 Custom Info        : XK
 Custom Info        : 4526
 Custom Info        : A2
 Custom Info        : 0

PRODUCT INFO:

MFG and TEST HISTORY:
```

```
Process Step:      ICT     Functional  LCD     CTO     Audit   Field Repair
-------------      ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision    0000    0000        0000    0000    0000    0000
  Test Pass Date   000000  000000      000000  000000  000000  000000
  Test Location    00      00          00      00      00      00
Test Count
  # Tests          00      00          00      00      00      00
  # Failures       00      00          00      00      00      00
  # NTF            00      00          00      00      00      00

Type <CR> for next entry, or Q to quit:


FRU Entry #   7 :
FRU NAME: Disk Backplane 0 ID:07

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time        : 5025600
 Manufacturer         : CELESTICA
 Product Name         : 8 Disk Drive SAS Backplane
 S/N                  : 40CTPSV51A
 Part Number          : AB463-60006
 Fru File ID          : 10
 Custom Info          : XF
 Custom Info          : 4526
 Custom Info          : A3
 Custom Info          : 0

PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:      ICT     Functional  LCD     CTO     Audit   Field Repair
-------------      ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision    0000    0000        0000    0000    0000    0000
  Test Pass Date   000000  000000      000000  000000  000000  000000
  Test Location    00      00          00      00      00      00
Test Count
  # Tests          00      00          00      00      00      00
  # Failures       00      00          00      00      00      00
  # NTF            00      00          00      00      00      00

Type <CR> for next entry, or Q to quit:


FRU Entry #   8 :
FRU NAME: Disk Backplane 1 ID:08

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time        : 5025600
 Manufacturer         : CELESTICA
 Product Name         : 8 Disk Drive SAS Backplane
 S/N                  : 40CTPSV52N
 Part Number          : AB463-60006
 Fru File ID          : 10
 Custom Info          : XF
 Custom Info          : 4526
 Custom Info          : A3
 Custom Info          : 0
```

```
PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:     ICT     Functional  LCD     CTO     Audit   Field Repair
-------------     ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision   0000    0000        0000    0000    0000    0000
  Test Pass Date  000000  000000      000000  000000  000000  000000
  Test Location   00      00          00      00      00      00
Test Count
  # Tests         00      00          00      00      00      00
  # Failures      00      00          00      00      00      00
  # NTF           00      00          00      00      00      00

Type <CR> for next entry, or Q to quit:


FRU Entry #   9 :
FRU NAME: Interconnect Bd ID:09

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time       : 5047200
 Manufacturer        : CELESTICA
 Product Name        : SAS Interconnect Board
 S/N                 : 40CTPU4004
 Part Number         : AB464-60006
 Fru File ID         : 10
 Custom Info         : XE
 Custom Info         : 4528
 Custom Info         : A1
 Custom Info         : 0

PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:     ICT     Functional  LCD     CTO     Audit   Field Repair
-------------     ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision   0000    0000        0000    0000    0000    0000
  Test Pass Date  000000  000000      000000  000000  000000  000000
  Test Location   00      00          00      00      00      00
Test Count
  # Tests         00      00          00      00      00      00
  # Failures      00      00          00      00      00      00
  # NTF           00      00          00      00      00      00

Type <CR> for next entry, or Q to quit:


FRU Entry #  10 :
FRU NAME: ProcessorCarrier ID:0A

CHASSIS INFO:
 Type:Rack Mount Chassis
 Part Number         :
 Serial Number       :

BOARD INFO:
 Mfg Date/Time       : 5001120
 Manufacturer        : HP-PRMO
```

```
 Product Name       : 4 Socket CPU Carrier
 S/N                : PR20525000
 Part Number        : AB464-60102
 Fru File ID        : 10
 Custom Info        : X6
 Custom Info        : 4528
 Custom Info        : A2
 Custom Info        : 0

PRODUCT INFO:
 Manufacturer       : hp
 Product Name       : server rx6600
 Part/Model         :
 Version            :
 S/N                :
 Asset Tag          :
 FRU File ID        : 11
 Custom Info        : 402

MFG and TEST HISTORY:

Process Step:      ICT     Functional  LCD     CTO     Audit   Field Repair
-------------      ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision    0000    0000        0000    0000    0000    0000
  Test Pass Date   000000  000000      000000  000000  000000  000000
  Test Location    00      00          00      00      00      00
Test Count
  # Tests          00      00          00      00      00      00
  # Failures       00      00          00      00      00      00
  # NTF            00      00          00      00      00      00

Type <CR> for next entry, or Q to quit:


FRU Entry #  11 :
FRU NAME: Hot-Plug Board ID:0B

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time      : 5040000
 Manufacturer       : CELESTICA
 Product Name       : PCI Hot Plug Control Board
 S/N                : 40CTPS153E
 Part Number        : AB463-60002
 Fru File ID        : 10
 Custom Info        : XD
 Custom Info        : 4527
 Custom Info        : A2
 Custom Info        : 0

PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:      ICT     Functional  LCD     CTO     Audit   Field Repair
-------------      ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision    0000    0000        0000    0000    0000    0000
  Test Pass Date   000000  000000      000000  000000  000000  000000
  Test Location    00      00          00      00      00      00
Test Count
  # Tests          00      00          00      00      00      00
  # Failures       00      00          00      00      00      00
```

```
  # NTF           00      00           00      00      00      00

Type <CR> for next entry, or Q to quit:


FRU Entry #  12 :
FRU NAME: I/O Power Module ID:0F

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time       : 2105376
 Manufacturer        : C&D
 Product Name        : PCI POWER BOARD
 S/N                 : 9080605200B3
 Part Number         : AB463-60016
 Fru File ID         : 10
 Custom Info         : X1
 Custom Info         : 0520
 Custom Info         : A1
 Custom Info         : 0

PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:     ICT     Functional  LCD     CTO     Audit   Field Repair
-------------     ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision   0000    0000        0000    0000    0000    0000
  Test Pass Date  000000  000000      000000  000000  000000  000000
  Test Location   00      00          00      00      00      00
Test Count
  # Tests         00      00          00      00      00      00
  # Failures      00      00          00      00      00      00
  # NTF           00      00          00      00      00      00

Type <CR> for next entry, or Q to quit:


FRU Entry #  13 :
FRU NAME                 : MemExt0 DIMM0A
FRU ID                   : 0x80
JEDEC SPD Rev            : 0x11
JEDEC Mfg ID             : 0xC100000000000000
JEDEC Mfg Location       : 0x45
JEDEC Mfg Part #         : 72T64001HR3.7A
JEDEC Mfg Revision Code  : 0x1508
JEDEC Mfg Year           : 0x05
JEDEC Mfg Week           : 0x19
JEDEC Mfg Serial #       : 0x04083912
Mfg Unique Serial #      : 0x00C145051904083912

Type <CR> for next entry, or Q to quit:


FRU Entry #  14 :
FRU NAME                 : MemExt0 DIMM0B
FRU ID                   : 0x88
JEDEC SPD Rev            : 0x11
JEDEC Mfg ID             : 0xC100000000000000
JEDEC Mfg Location       : 0x45
JEDEC Mfg Part #         : 72T64001HR3.7A
JEDEC Mfg Revision Code  : 0x1508
JEDEC Mfg Year           : 0x05
```

```
JEDEC Mfg Week          : 0x19
JEDEC Mfg Serial #      : 0x04083815
Mfg Unique Serial #     : 0x00C145051904083815

Type <CR> for next entry, or Q to quit:

FRU Entry #  15 :
FRU NAME                : MemExt0 DIMM0C
FRU ID                  : 0x90
JEDEC SPD Rev           : 0x11
JEDEC Mfg ID            : 0xC100000000000000
JEDEC Mfg Location      : 0x45
JEDEC Mfg Part #        : 72T64001HR3.7A
JEDEC Mfg Revision Code : 0x1508
JEDEC Mfg Year          : 0x05
JEDEC Mfg Week          : 0x19
JEDEC Mfg Serial #      : 0x04086720
Mfg Unique Serial #     : 0x00C145051904086720

Type <CR> for next entry, or Q to quit:

FRU Entry #  16 :
FRU NAME                : MemExt0 DIMM0D
FRU ID                  : 0x98
JEDEC SPD Rev           : 0x11
JEDEC Mfg ID            : 0xC100000000000000
JEDEC Mfg Location      : 0x45
JEDEC Mfg Part #        : 72T64001HR3.7A
JEDEC Mfg Revision Code : 0x1508
JEDEC Mfg Year          : 0x05
JEDEC Mfg Week          : 0x19
JEDEC Mfg Serial #      : 0x04086421
Mfg Unique Serial #     : 0x00C145051904086421

Type <CR> for next entry, or Q to quit:

FRU Entry #  17 :
FRU NAME: Motherboard ID:00

CHASSIS INFO:

BOARD INFO:
 Mfg Date/Time      : 5024160
 Manufacturer       : CELESTICA
 Product Name       : Core IO Board without VGA
 S/N                : 40CTPSY50R
 Part Number        : AB463-60004
 Fru File ID        : 10
 Custom Info        : XM
 Custom Info        : 4526
 Custom Info        : A4
 Custom Info        : 0

PRODUCT INFO:

MFG and TEST HISTORY:

Process Step:     ICT     Functional  LCD     CTO     Audit   Field Repair
-------------     ---     ----------  ---     ---     -----   ------------
Test Info
  Test Revision   0000    0000        0000    0000    0000    0000
  Test Pass Date  000000  000000      000000  000000  000000  000000
  Test Location   00      00          00      00      00      00
Test Count
  # Tests         00      00          00      00      00      00
```

```
  # Failures      00      00          00      00      00      00
  # NTF           00      00          00      00      00      00

   -> This is the last entry in the selected list.

[mp0014c29c053d] MP:CM>

[mp0014c29c053d] MP:CM> ps

PS
System Power state: On
Temperature       : Normal

Overtemperature protection: Enabled

Power supplies                 State
-----------------------------------------------------------
Power Supply 0                Normal
Power Supply 1                Not Installed


Fans                           State
-----------------------------------------------------------
System Fan 1                  Normal
System Fan 2                  Normal
System Fan 3                  Normal
System Fan 4                  Normal
System Fan 5                  Normal
System Fan 6                  Normal

[mp0014c29c053d] MP:CM> ss

SS

System Processor Status:

   Monarch Processor: 0

   Processor Module 0: Installed and Configured

[mp0014c29c053d] MP:CM> ma

   MP MAIN MENU:

         CO: Console
        VFP: Virtual Front Panel
         CM: Command Menu
         CL: Console Log
         SL: Show Event Logs
         HE: Main Help Menu
          X: Exit Connection

[mp0014c29c053d] MP> co

        (Use Ctrl-B to return to MP main menu.)

- - - - - - - - - - Prior Console Output - - - - - - - - - -
  blk0 : Acpi(HWP0002,PNP0A03,0)/Pci(2 1)/Usb(0, 0)
  blk1 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk2 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk3 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk4 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk5 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk6 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk7 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
```

```
  blk8 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
Shell>
- - - - - - - - - - - - Live Console - - - - - - - - - - - -

Shell> info all

SYSTEM INFORMATION

Date/Time:  Sep  9, 2005  15:01:45  (20:05:09:09:15:01:45)
Manufacturer:  hp
Product Name:  server rx6600
Product Number:
Serial Number:
UUID:  FFFFFFFF-FFFF-FFFF-FFFF-FFFFFFFFFFFF
System Bus Frequency:  200 MHz

PROCESSOR MODULE INFORMATION

           # of              L3      L4      Family/
   CPU     Logical           Cache   Cache   Model          Processor
   Module  CPUs     Speed    Size    Size    (hex.)    Rev  State
   ------  -------  -------- ------  ------  -------   ---  ------------
     0        2      1.4 GHz   12 MB   None    20/00     A2        Active

CPU threads are turned off.

MEMORY INFORMATION

Extender 0:
     ---- DIMM A -----  ---- DIMM B -----  ---- DIMM C -----  ---- DIMM D -----

      DIMM   Current      DIMM   Current      DIMM   Current      DIMM   Current

---  ------ ----------  ------ ----------  ------ ----------  ------ ----------

 0    512MB     Active   512MB     Active   512MB     Active   512MB     Active

 1    ----               ----               ----               ----

 2    ----               ----               ----               ----

 3    ----               ----               ----               ----

 4    ----               ----               ----               ----

 5    ----               ----               ----               ----


Extender 1:
     ---- DIMM A -----  ---- DIMM B -----  ---- DIMM C -----  ---- DIMM D -----

      DIMM   Current      DIMM   Current      DIMM   Current      DIMM   Current

---  ------ ----------  ------ ----------  ------ ----------  ------ ----------

 0    ----               ----               ----               ----

 1    ----               ----               ----               ----

 2    ----               ----               ----               ----

 3    ----               ----               ----               ----

 4    ----               ----               ----               ----
```

```
 5   ----               ----               ----               ----


   Active Memory    : 2048 MB
   Installed Memory : 2048 MB

I/O INFORMATION

BOOTABLE DEVICES

   Order  Media Type  Path
   -----  ----------  ---------------------------------------




   Seg  Bus  Dev  Fnc  Vendor  Device Slot
    #    #    #    #     ID      ID     #   Path
   ---  ---  ---  ---  ------  ------  ---  -----------
    00   00   01   00  0x103C  0x1303   XX  Acpi(HWP0002,PNP0A03,0)/Pci(1 0)
    00   00   01   01  0x103C  0x1302   XX  Acpi(HWP0002,PNP0A03,0)/Pci(1 1)
    00   00   01   02  0x103C  0x1048   XX  Acpi(HWP0002,PNP0A03,0)/Pci(1 2)
    00   00   02   00  0x1033  0x0035   XX  Acpi(HWP0002,PNP0A03,0)/Pci(2 0)
    00   00   02   01  0x1033  0x0035   XX  Acpi(HWP0002,PNP0A03,0)/Pci(2 1)
    00   00   02   02  0x1033  0x00E0   XX  Acpi(HWP0002,PNP0A03,0)/Pci(2 2)
    00   20   02   00  0x8086  0x1079   10  Acpi(HWP0002,PNP0A03,100)/Pci(2 0)

    00   20   02   01  0x8086  0x1079   10  Acpi(HWP0002,PNP0A03,100)/Pci(2 1)

    00   80   01   00  0x1000  0x0054   01  Acpi(HWP0002,PNP0A03,400)/Pci(1 0)

    00   80   02   00  0x1000  0x0054   02  Acpi(HWP0002,PNP0A03,400)/Pci(2 0)


   Fast initialization: Enabled
   System Wake-On-LAN:  Enabled

BOOT INFORMATION

   Monarch CPU:

   Current  Preferred
   Monarch   Monarch
     CPU       CPU
   Module/   Module/
   Logical   Logical   Warnings
   -------  ---------  --------
     0/0       0/0

   AutoBoot: ON - Timeout is : 7 sec

   Boottest:

   BOOTTEST Settings Default Variable

   OS is not speedy boot aware.

   Selftest     Setting
   ---------    --------------
   early_cpu    Run this test
   late_cpu     Run this test
   platform     Run this test
   chipset      Run this test
   io_hw        Run this test
   mem_init     Run this test
```

```
   mem_test     Run this test

   LAN Address Information:

   LAN Address        Path
   -----------------  ----------------------------------------
  *Mac(00306E5D96EE)  Acpi(HWP0002,PNP0A03,100)/Pci(2 0)/Mac(00306E5D96EE))

   Mac(00306E5D96EF)  Acpi(HWP0002,PNP0A03,100)/Pci(2 1)/Mac(00306E5D96EF))


FIRMWARE INFORMATION

  *System Firmware A Revision: 62.03 [4530]
      PAL_A: 7.31/3.04
      PAL_B: 3.04
      EFI Spec: 1.10
      EFI Intel Drop: 14.62
      EFI Build: 5.10
      SAL Spec: 3.01
      SAL_A: 2.00
      SAL_B: 62.03
      POSSE: 0.20
      ACPI: 7.00
      SMBIOS: 2.3.2a
   System Firmware B Revision: 60.23 [4516]
   BMC Revision: 70.25
      IPMI: 1.00
   Management Processor Revision: F.01.11
   Updatable EFI Drivers:
      Floating-Point Software Assistance Handler:  00000118
      Broadcom Gigabit Ethernet Driver:            0007000A
      SCSI Bus Driver:                             00000012
      SCSI Tape Driver:                            00000011
      Usb Ohci Driver:                             00000030
      USB Bus Driver:                              00000013
      USB Bot Mass Storage Driver:                 00000013
      Generic USB Mass Storage Driver:             00000013

   * Indicates active system firmware image

WARNING AND STOP BOOT INFORMATION

  Warning[55]: Invalid or inaccessible system ID(s)

CHIP REVISION INFORMATION

   Chip                  Logical     Device      Chip
   Type                    ID          ID       Revision
   -------------------   -------     ------     --------
   Memory Controller        0        4032         0020
   Root Bridge              0        4030         0020
     Host Bridge          0000       122e         0032
     Host Bridge          0001       122e         0032
      HotPlug Controller    0           0         0123
     Host Bridge          0002       122e         0032
     Host Bridge          0003       12ee         0011
     Host Bridge          0004       122e         0032
     Host Bridge          0005       122e         0032
      HotPlug Controller    0           0         0123
     Host Bridge          0006       122e         0032
     Host Bridge          0007       12ee         0011
     Other Bridge           0           0         0030
       Other Bridge         0           0         000c
         Baseboard MC       0           0         7025
```

```
Shell> help
List of classes of commands:

boot          -- Booting options and disk-related commands
configuration -- Changing and retrieving system information
device        -- Getting device, driver and handle information
memory        -- Memory related commands
shell         -- Basic shell navigation and customization
scripts       -- EFI shell-script commands

Use 'help <class>' for a list of commands in that class
Use 'help <command>' for full documentation of a command
Use 'help -a' to display list of all commands

Shell> boot
'boot' not found
Exit status code: Invalid Parameter

Shell> he boot
'he' not found
Exit status code: Invalid Parameter

Shell> help boot
Boot and disk commands:

autoboot    -- View or set autoboot timeout variable
bcfg        -- Displays/modifies the driver/boot configuration
boottest    -- Set/View BootTest bits
clearlogs   -- (null)
dblk        -- Displays the contents of blocks from a block device
lanboot     -- Performs boot over LAN from EFI Shell
mount       -- Mounts a file system on a block device
reset       -- Resets the system
tftp        -- Tftp to a bootp/dhcp enabled unix boot server
vol         -- Displays volume information of the file system

Use 'help <command>' for full documentation of a command
Use 'help -a' to display list of all commands

Shell> help configuration
Configuration commands:

cpuconfig   -- Deconfigure or reconfigure cpus
date        -- Displays the current date or sets the date in the system
err         -- Displays or changes the error level
esiproc     -- Make an ESI call
errdump     -- View/Clear logs
info        -- Display hardware information
monarch     -- View or set the monarch processor
palproc     -- Make a PAL call
salproc     -- Make a SAL call
time        -- Displays the current time or sets the time of the system
ver         -- Displays the version information

Use 'help <command>' for full documentation of a command
Use 'help -a' to display list of all commands

Shell> help memory
Memory commands:

default     -- Sets, Resets, or Clears default NVM values
dmpstore    -- Displays all NVRAM variables
dmem        -- Displays the contents of memory
memmap      -- Displays the memory map
```

```
mm          -- Displays or modifies MEM/IO/PCI
pdt         -- View or set page deallocation table

Use 'help <command>' for full documentation of a command
Use 'help -a' to display list of all commands

Shell> ehlp
'ehlp' not found
Exit status code: Invalid Parameter

Shell> help shell
Shell navigation and other commands:

alias       -- Displays, creates, or deletes aliases in the EFI shell
attrib      -- Displays or changes the attributes of files or directories
cd          -- Displays or changes the current directory
cls         -- Clears the standard output with an optional background color
comp        -- Compares the contents of two files
cp          -- Copies one or more files/directories to another location
edit        -- Edits an ASCII or UNICODE file in full screen
eficompress -- Compress a file
efidecompress -- Compress a file
exit        -- Exits the EFI Shell
help       -- Displays help menus, command list, or verbose help of a command
hexedit     -- Edits with hex mode in full screen
ls          -- Displays a list of files and subdirectories in a directory
mkdir       -- Creates one or more directories
mode        -- Displays or changes the mode of the console output device
mv          -- Moves one or more files/directories to destination
rm          -- Deletes one or more files or directories
set        -- Displays, creates, changes or deletes EFI environment variables
setsize     -- Sets the size of the file
touch       -- Updates time with current time
type        -- Displays the contents of a file
xchar       -- Turn on/off extended character features

Use 'help <command>' for full documentation of a command
Use 'help -a' to display list of all commands

Shell> help script
Invalid command. Type 'help' for a list of commands

Shell> help
List of classes of commands:

boot          -- Booting options and disk-related commands
configuration -- Changing and retrieving system information
device        -- Getting device, driver and handle information
memory        -- Memory related commands
shell         -- Basic shell navigation and customization
scripts       -- EFI shell-script commands

Use 'help <class>' for a list of commands in that class
Use 'help <command>' for full documentation of a command
Use 'help -a' to display list of all commands

Shell> help scripts
Shell script commands/programming constructs:

echo        -- Displays messages or turns command echoing on or off
for/endfor  -- Executes commands for each item in a set of items
goto        -- Makes batch file execution jump to another location
if/endif    -- Executes commands in specified conditions
pause       -- Prints a message and suspends for keyboard input
stall       -- Stalls the processor for some microseconds
```

```
Use 'help <command>' for full documentation of a command
Use 'help -a' to display list of all commands

Shell>

   MP MAIN MENU:

         CO: Console
        VFP: Virtual Front Panel
         CM: Command Menu
         CL: Console Log
         SL: Show Event Logs
         HE: Main Help Menu
          X: Exit Connection

[mp0014c29c053d] MP> vfp
                        .
        Welcome to the Virtual Front Panel (VFP).
        Use Ctrl-B to exit.

LEDs      LOCATOR       SYSTEM        INT. HEALTH   EXT. HEALTH   POWER
-----------------------------------------------------------------------------

          OFF           OFF           ON GREEN      ON GREEN      ON GREEN

-----------------------------------------------------------------------------
Status    POW:System Power on
          INT:Internal parts, including CPUs and Memory, okay
          EXT:Externally accessible fans and power supplies okay
-----------------------------------------------------------------------------
LEDs      LOCATOR       SYSTEM        INT. HEALTH   EXT. HEALTH   POWER
-----------------------------------------------------------------------------

          OFF           OFF           ON GREEN      ON GREEN      ON GREEN

-----------------------------------------------------------------------------
Status    POW:System Power on
          INT:Internal parts, including CPUs and Memory, okay
          EXT:Externally accessible fans and power supplies okay
-----------------------------------------------------------------------------


   MP MAIN MENU:

         CO: Console
        VFP: Virtual Front Panel
         CM: Command Menu
         CL: Console Log
         SL: Show Event Logs
         HE: Main Help Menu
          X: Exit Connection

[mp0014c29c053d] MP> co

        (Use Ctrl-B to return to MP main menu.)
- - - - - - - - - - - Prior Console Output - - - - - - - - - -
for/endfor  -- Executes commands for each item in a set of items
goto        -- Makes batch file execution jump to another location
if/endif    -- Executes commands in specified conditions
pause       -- Prints a message and suspends for keyboard input
stall       -- Stalls the processor for some microseconds

Use 'help <command>' for full documentation of a command
Use 'help -a' to display list of all commands
```

```
Shell>
- - - - - - - - - - - - Live Console - - - - - - - - - - - -

Shell> exit

Use ^ and v to change option(s). Use Enter to select an option

Loading.: EFI Shell [Built-in]
EFI Shell version 1.10 [14.62]
Device mapping table
  blk0 : Acpi(HWP0002,PNP0A03,0)/Pci(2 1)/Usb(0, 0)
  blk1 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk2 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk3 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk4 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk5 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk6 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk7 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
  blk8 : Acpi(HWP0002,PNP0A03,400)/Pci(1 0)/Sas(Addr5000C500)
```

E Core I/O Card Utilities

This appendix provides information on core I/O cards that need additional configuration.

This appendix addresses the following topics:

Integrated RAID

Use Integrated RAID (IR) where either storage capacity, redundancy, or both of a RAID configuration are required. Two components of IR are:

- Integrated Mirror (IM)
- Global Hot Spare

Integrated Mirror

The advantage of an IM is there is always a mirrored copy of the data. An IM provides data protection for the system boot volume to safeguard critical information such as the operating system on servers and high performance workstations. An IM supports two simultaneous mirrored volumes, making an array, providing fault-tolerant protection for critical data. Typically, one of these volumes is the boot volume. If a disk in an IM fails, the hot swap capability enables the volume to be easily restored by replacing the failed disk. The firmware then automatically re-mirrors to the replaced disk.

Global Hot Spare

Each SAS controller can have one global hot spare disk available to automatically replace a failed disk in the one or two IM volumes configured on the controller. The hot spare makes the IM array more fault tolerant. Up to two IM volumes are supported per SAS controller plus the hot spare.

HP 8 Internal Port SAS HBA (SAS Controller)

The following information is provided to assist you in configuring the 8 Internal Port SAS HBA controller during installation.. For additional information refer to the *HP 8 Internal Port SAS Host Bus Adapter (SAS Controller) Users Guide* in the *I/O Cards and Networking Software* collection under *SAS Host Bus Adapters* at http://www.docs.hp.com.

MPTUTIL Utility

The `mptutil` utility enables you to update the adapter flash memory with the EFI driver and HBA firmware. New versions of these images are released periodically.

IMPORTANT: Do not store the files in this package on a SAS device. If you store these files on a SAS device and the update fails, these files will not be accessible.

To update firmware, follow these steps:

1. Insert the *HP IPF Offline Diagnostics and Utilities CD* in the drive and boot to the EFI Shell.

NOTE: You can also download the firmware image file and update utility from the HP Web site at: http://www.hp.com in the **Driver Downloads** section.

IMPORTANT: When you boot the EFI enabled systems, the CD containing the utility must be in the drive to allow device mapping. The EFI utility and firmware image files are located in the root directory or in a subdirectory on the CD.

2. The CD drive displays in the list of mapped devices as **fs0**. To change to this device, enter **fs0:**

```
shell> fs0:
fs0:\>
```

3. To determine the current version of the firmware, follow these steps.
   a. At the EFI Shell, enter **mptutil** from the directory that contains `mptutil.efi`. The following example indicates that the EFI Serial Attached SCSI card utility version is 1.01.12.00:

```
fs0:\EFI\HP\TOOLS\NETWORK> mptutil
MPTUTIL-1.01.12.00
         Vendor  Device Choice
    ID      ID    Bus Device
 ------  ------  ------  --- ------
    0     1000h   0054h  14h  01h  LSI Logic SAS1068 Host Adapter
    1  -  Refresh
```

   b. Press **Enter**.
4. To update the firmware, use the `mptutil` command.
5. Reset the controller.

```
fs0:\> reset
```

The `mptutil` commands and functions are listed in Table E-1 and described in the following sections.

Table E-1 mptutil Commands and Functions

Command	Function
mptutil -f <firmware_file>	Updating HBA RISC firmware on the controller
mptutil -o -g <x86_file> <fcode_file>	Updating EFI driver on first controller
mptutil -o -vpd -c 0	Viewing VPD information
Parameters in < > are optional. A space is required between command line options and their parameters.	

The following sections describe the `mptutil` commands and functions.

Flashing Firmware on First Controller

To update the HBA RISC firmware on the first controller, follow these steps:

1. At the `fs0:\>` prompt, enter **mptutil -f <firmware_file> -c 0**.
2. At the `fs0:\>` prompt, enter **reset**.

The filename is optional and you are prompted for a filename if omitted.

Another way for the firmware to be flashed is done without your knowledge. When `mptutil` is executed, and a SAS HBA is in any state other than ready or operational, `mptutil` immediately performs a firmware download boot. The firmware provided by you to do the firmware download boot is immediately flashed after the firmware download boot has completed. `mptutil` does this because the firmware only moves to the operational state if it is running from flash and not memory. Operational state is needed to do everything else provided in the utility.

Flashing BIOS and EFI Driver on the First Controller

To update the EFI driver on the first controller, follow these steps:

1. At the fs0:\> prompt, enter **mptutil -o -g <Bios_File> <EFI_driver_file> -c 0**.
2. At the fs0:\> prompt, enter **reset**.

The filename is optional and you are prompted for a filename if omitted.

Common Questions About Flashing Firmware

Question — After I update firmware on my SAS HBA, why doesn't the version string change in the menu?

Answer — The firmware you just flashed on the HBA does not run until a diagnostic reset occurs. If you exit the utility and reenter it, the version string is updated.

Question — This image does not contain a valid nvdata when I try to flash the firmware, why?

Answer — You are expected to concatenate a proper nvdata image on to the firmware. mptutil keeps you from flashing an image without one. To concatenate nvdata and firmware you need to run the mptutil -o -d 64it__l.fw,sas106x.dat,output.fw command. .

- 64it__l.fw is the firmware image without a nvdata image
- sas106x.dat is the nvdata image. This file depends on the type/rev of HBA on which the firmware is used
- output.fw is the name of the file created with the firmware and nvdata concatenated. This concatenated image can be used for all boards of this type or revision.

Question — How do I program multiple cards in a system from the command line?

Answer — mptutil (EFI) does not support this.

Question — Can I program a new flash and option ROM in the same command line argument?

Answer — Yes. Run the mptutil -f <firmware_name> -b <option_rom_name> command.

Viewing the VPD Information for EFI Driver and RISC Firmware

To view the VPD information for the EFI driver and RISC firmware, follow these steps:

- At the fs0:\> prompt, enter **mptutil -o -vpd -c 0**.

EFI Commands

To configure an Integrated Mirror (IM) Array on the SAS Controller, use one of the following EFI commands:

- DRVCFG (GUI interface)
- CFGGEN (command line interface)

NOTE: If you are not using the IM functionality, do not follow these procedures.

DRVCFG Utility

To configure an IM on the SAS controller, follow these steps:

Starting the DRVCFG Utility

To start thedrvcfg configuration utility, follow these steps:

1. Select the EFI Shell from the console menu.
2. Type **drvcfg -s** and press **Enter**.

Using the DRVCFG Utility

The configuration utility uses several input keys (**F1**, **F2**, **HOME**, **END**, and so on) that may not be supported by all terminal emulation programs. Each of these keys has an alternate key that performs the same function. Review the terminal emulation program documentation to verify which input keys are supported. If problems occur using any of the function keys or **HOME**/**END**/**PGUP**/**PGDN**, it is recommended that the alternate keys be used.

There are general key inputs throughout the configuration utility that apply on all screens:

F1 Help	Context sensitive help for the cursor-resident field.
Arrow Keys	Select Item - Up, down, left, right movement to position the cursor.
Home/End	Select Item - Up, down, left, right movement to position the cursor.
+/-	Change Item - Items with values in [ ] brackets are modifiable. Numeric keypad + and numeric keypad - (minus) update a modifiable field to its next relative value.
Esc	Abort/Exit - Escape aborts the current context operation and/or exits the current screen. User confirmation is solicited as required if changes have been made by user. If you are using a serial console, pressing **Esc** causes a delay of several seconds before it takes effect. This is normal system behavior and is not an error.
Enter	Execute <item> - Executable items are indicated by highlighted text and a different background color. Press **Enter** to execute the field's associated function.

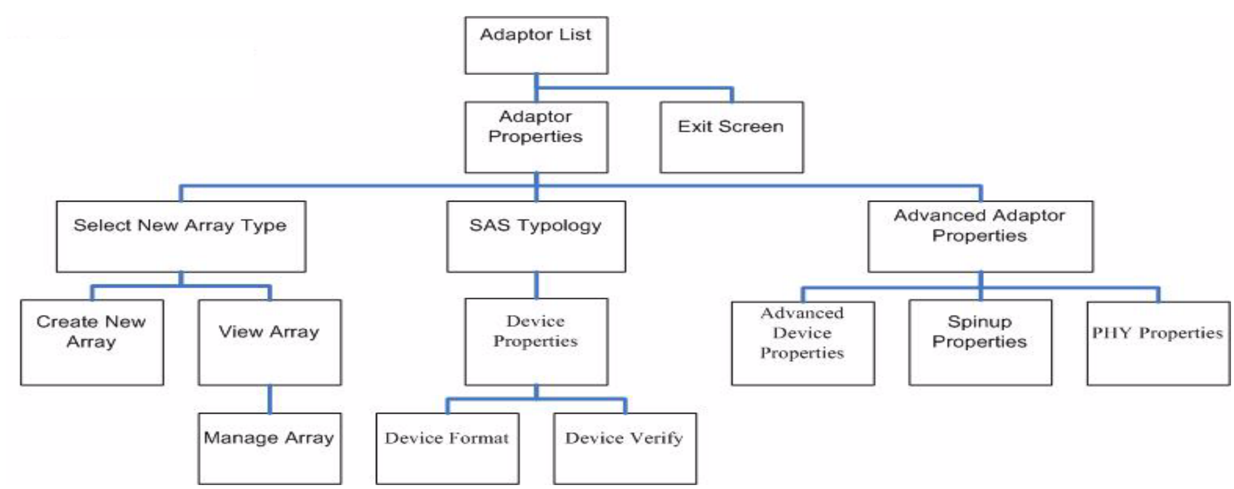
Configuration Utility Screens

All SAS BIOS configuration utility screens contain the following areas, starting at the top of the screen:

Header area	Identifies the utility and version number.
Menu area	Gives the title of the current screen, and on screens other than the **Adapter List** screen also identifies the adapter.
Main area	The main area for presenting data. This area has a cursor for item selection, and horizontal and vertical scroll bars if necessary.
Footer area	Provides general help information text.

Figure E-1 provides a map of how screens are accessed in the `DRVCFG` utility.

Figure E-1 Accessed Screens in the DRVCFG Utility



DRVCFG Screens

Adapter List Screen

The **Adapter List** screen displays when the configuration utility is first started. This screen displays a scrolling list of up to 256 SAS controllers in the system, and information about each of them. Use the arrow keys to select a SAS controller, and press **Enter** to view and modify the selected SAS controller's properties.

You can view and modify the SAS controller whether it is enabled or disabled. You can use the **Boot Support** setting in the **Adapter Properties** menu to change the status of this setting. You must reconnect the EFI Driver in order for a new **Boot Support** setting to take effect.

The following are the descriptions for the **Adapter List** screen.

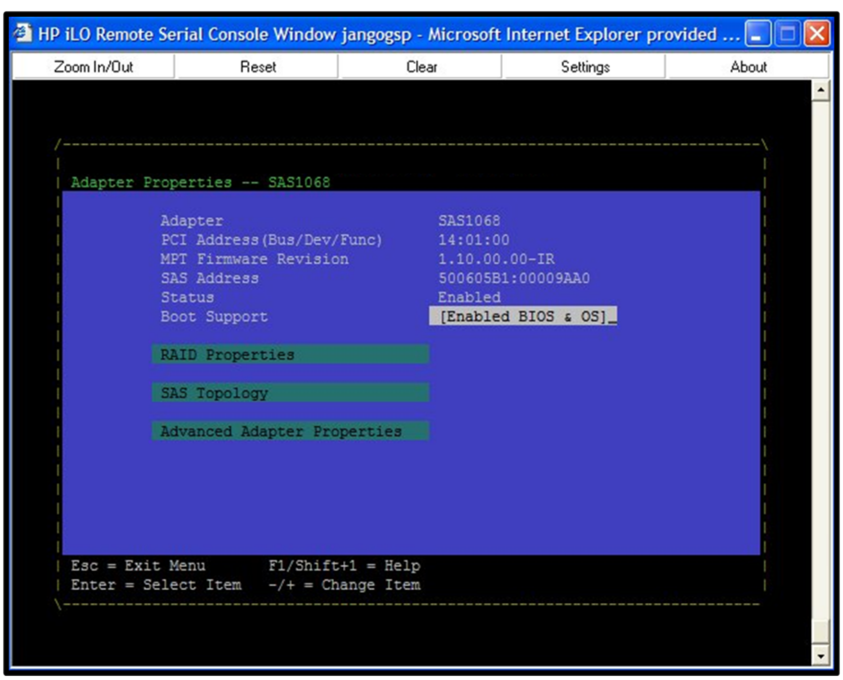
Adapter	Indicates the specific SAS Controller type.
PCI Bus	Indicates the PCI Bus number assigned by the system BIOS to an adapter (0x00 - 0xFF, 0 - 255 decimal)
PCI Dev	Indicates the PCI Device assigned by the system BIOS to an adapter (range 0x00 - 0x1F, 0 - 31 decimal)
PCI Fnc	Indicates the PCI Function assigned by the system BIOS to an adapter (range 0x00 - 0x7, 0 - 7 decimal)
FW Revision	Displays the Fusion MPT firmware version and type (IR or IT)
Status	Indicates whether the adapter is or is not eligible for software control (enabled, disabled or error)

Enabled	Indicates the EFI Driver is either currently controlling the adapter, or will attempt to control the adapter upon reload.
Disabled	Indicates the EFI Driver is either not controlling the adapter, or will discontinue control of the adapter upon reload.
Error	Indicates that the EFI Driver encountered a problem with the adapter. Viewing and modifying settings for the adapter is allowed but the information and functionality available may be limited.

Adapter Properties Screen

The **Adapter Properties** screen enables you to view and modify adapter settings. To scan the SAS controller's devices, select a SAS controller and press **Enter**. The **Adapter Properties** screen displays.

Figure E-2 Adapter Properties Screen



Use the arrow keys to select **RAID Properties**, and press **Enter** to view the **Select New Array Type** screen.

To access the following screens, use the arrow keys to select the screen, and press **Enter** on the appropriate field:

- RAID Properties
- SAS Topology
- Advanced Adapter Properties

The following are the descriptions for the **Adapter Properties** screen.

Adapter — Indicates the specific SAS Controller type.

PCI Address — Displays the PCI Address assigned by the system BIOS to the adapter.

- Bus value range 0x00 - 0xFF, 0 - 255 decimal
- Device value range 0x00 - 0x1F, 0 - 31 decimal
- Function range 0x00 - 0x7, 0 - 7 decimal

FW Revision — Displays the MPT firmware version and type in the format (x.xx.xx.xx- yy), where **x.xx.xx.xx** refers to the FW version and **yy** refers to the type. The currently supported type is IR.l).

SAS Address — Displays the SAS Address assigned to this adapter.

FW Revision — Displays the Fusion MPT firmware version and type (IR or IT)

Status — Indicates whether an adapter is eligible for configuration utility software control or is reserved for control by other software (Enabled, Disabled or Error).

- Enabled — Indicates the EFI Driver is either currently controlling the adapter, or will attempt to control the adapter upon reload.
- Disabled — Indicates the EFI Driver is either not controlling the adapter, or will discontinue control of the adapter upon reload.
- Error — Indicates that the EFI Driver encountered a problem with the adapter. Viewing and modifying settings for the adapter is allowed but the information and functionality available may be limited.

Boot Support — Specifies whether an adapter is eligible for configuration utility software control or is reserved for control by other software (Enabled BIOS & OS, Enabled BIOS Only, Enabled OS Only or Disabled).

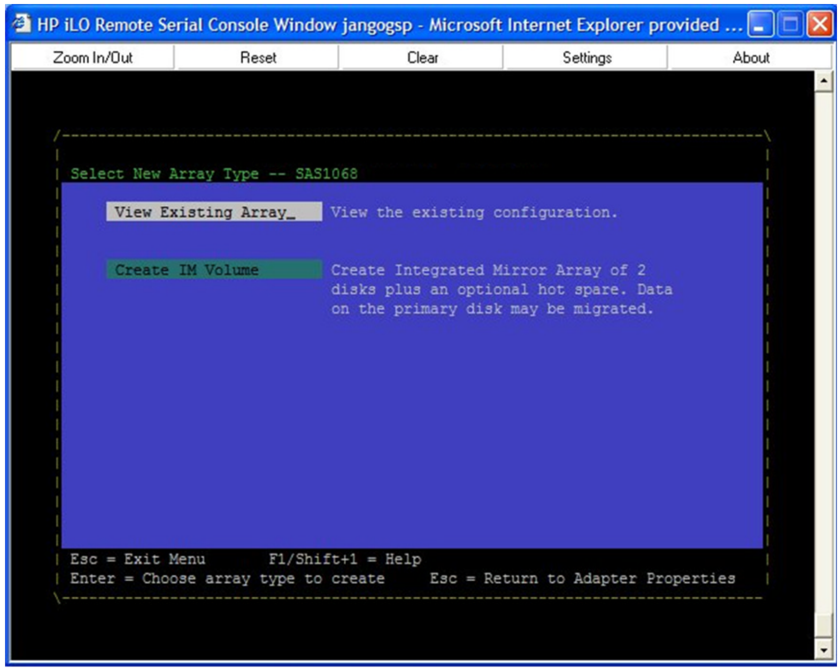
- Enabled BIOS & OS - SAS controller is controlled by both the BIOS and OS driver.
- Enabled BIOS Only - SAS controller is controlled only by the BIOS. This setting may not be supported by all OS drivers. For example, it is not possible to disable an adapter in a Windows driver.
- Enabled OS Only - SAS controller is controlled only by the OS driver.
- Disabled - SAS controller is not controlled by the BIOS when the SAS controller is loaded. However, the adapter is still visible through the configuration protocol.

Changes to the **Boot Support** setting are reflected in the **Status** field of the **Adapter List** menu. The new setting will do not take effect until the BIOS is reloaded (system reboot).

RAID Properties Screens

There are four screens within RAID properties. To access the screens, select RAID Properties from the **Adapter Properties** screen. The **Select New Array Type** screen displays.

Figure E-3 Select New Array Type Screen



Select New Array Type Screen

The **Select New Array Type** screen enables you to view an existing array or create an Integrated Mirror array of two disks, plus an optional hot spare.

- To go to the **Create New Array** screen, select Create IM Volume.
- To go to the **View Array** screen, select View an Existing Array.

Create New Array Screen

The **Create New Array** screen enables you to create a new array. To access the **Create New Array** screen, press **Enter** on the **Create IM Volume** field from the **Select New Array Type** screen.

To create a new array, follow these steps:

1. Select one of the following options:
   - To migrate to an IM array, press`M`. This keeps the existing data, and the disk is synchronized.
   - To delete all data on all the disks in the array, press`D`. This overwrites existing data when creating a new IM array, and the disk is not synchronized
2. To create the array after the volume is configured, press`C`. The system prompts you to save changes, which creates the array. During the creation process, the utility pauses. You are then taken back to the **Adapter Properties** screen.

The following are the descriptions for the **Create New Array** screen.

Array Type	Indicates the type of array being created.
Array Size	Indicates the size of the array in MegaBytes.
Bay	Displays the bay in which devices are located.
Device Identifier	Displays the device identifier.
RAID Disk	Specifies the devices (disks) that make up an IM array. If RAID Disk is **Yes**, the device is part of an IM array; if **No**, the device is not part of an IM array. This field is grayed out under the following conditions: • The device does not meet the minimum requirements for use in an IM array. • The device is not large enough to mirror existing data on the primary drive. • This disk has been selected as the hot spare for the IM array.

Hot Spr	Specifies whether a device is the hot spare for an IM array. If hot spare is Yes the device is used as a hot spare for the IM array; if No, the device is not used as a hot spare for the IM array. Only one hot spare per IM array is permitted. A hot spare is not required in an IM. You can specify a hot spare at array creation, or any time after creation, provided the array is made up of five disks or fewer. This field is grayed out under the following conditions: • The device does not meet the minimum requirements for use in an IM array. • The array already has a hot spare. • The array is made up of the maximum number of devices (six). • The device isn't large enough to mirror existing data on the primary. The hot spare drive must be greater than or equal to the size of any drive in any IM volume.
Drive Status	xxxx

OK	Disk is online and fully functional.
Missing	Disk is not responding.
Failed	Disk has failed.
Initalizing	Disk is initializing.
CfgOffln	Disk is offline at host's request.
User Fail	Disk is marked failed at host's request.
Offline	Disk is offline for some other reason.
Inactive	Disk has been set inactive.
Not Syncd	Data on disk is not synchronized with the rest of the array.
Primary	Disk is the primary disk for a 2 disk mirror and is OK.
Secondary	Disk is the secondary disk for a 2 disk mirror and is OK.
Wrg Type	Device is not compatible for use as part of an IM array.
Too Small	Disk is too small to mirror existing data.
Max Dsks	Maximum # of disks allowed for this type of Array reached and/or Maximum # of total IM disks on a controller reached.
No SMART	Disk doesn't support SMART, cannot be used in an RAID array.
Wrg Intfc	Device interface (SAS) differs from existing IM disks.

Pred Fail	Indicates whether device SMART is predicting device failure (Yes, No).
Size (MB)	Indicates the size of the device in megabytes (megabyte = 1024 x 1024 = 1,048,576). If the device is part of a two-disk array, this field reflects the size of the array, not the size of the individual disk. If the device is part of a three or more disk array, this field is the size that the disk makes up within the array. When creating a striped array, the usable size of the array is determined by the number of drives times the size of the smallest drive in the array. In arrays consisting of different sized drives, excess space on larger drives are unusable.

View Array Screen

The **View Array** screen enables you to view the current array configuration. To access the **View Array** screen, press **Enter** on the **View Existing Array** field from the **Select New Array Type** screen.

You can perform the following actions on the **View Array** screen:

- To view the next array, press **N**.
- To create a new array, press **C**.

Array	Displays the number of this array.
Identifier	Displays the identifier of this array.
Type	Displays the RAID type.
Scan Order	Displays the scan order of the array.
Size (MB)	Displays the size of the array.
Status	Displays the status of the array.
Bay	Displays the bay in which devices are located.
Device Identifier	Displays the device identifier.
RAID Disk	Specifies the devices (disks) that make up an IM array. If RAID Disk is **Yes**, the device is part of an IM array, if **No**, the device is not part of an IM array. This field is grayed out under the following conditions: • The device does not meet the minimum requirements for use in an IM array. • The device is not large enough to mirror existing data on the primary drive. • This disk has been selected as the hot spare for the IM array.
Hot Spr	Specifies whether a device is the hot spare for an IM array. If hot spare is Yes, the device is used as a hot spare for the IM array, if No, the device is not used as a hot spare for the IM array. Only one hot spare per IM array is permitted. A hot spare is not required in an IM. A hot spare can be specified at array creation, or any time after creation, provided the array is made up of 5 disks or fewer. This field is grayed out under the following conditions: • The device does not meet the minimum requirements for use in an IM array. • The array already has a hot spare. • The array is made up of the maximum number of devices (6). • The device isn't large enough to mirror existing data on the primary. The hot spare drive must be greater than or equal to the size of any drive in any IM volume.
Drive Status	xxxx

OK	Disk is online and fully functional.
Missing	Disk is not responding.
Failed	Disk has failed.
Initalizing	Disk is initializing.
CfgOffln	Disk is offline at host's request.
User Fail	Disk is marked failed at host's request.
Offline	Disk is offline for some other reason.
Inactive	Disk has been set inactive.
Not Syncd	Data on disk is not synchronized with the rest of the array.
Primary	Disk is the primary disk for a 2 disk mirror and is OK.
Secondary	Disk is the secondary disk for a 2 disk mirror and is OK.
Wrg Type	Device is not compatible for use as part of an IM array.
Too Small	Disk is too small to mirror existing data.

	Max Dsks	Maximum # of disks allowed for this type of Array reached and/or Maximum # of total IM disks on a controller reached.
	No SMART	Disk doesn't support SMART, cannot be used in an RAID array.
	Wrg Intfc	Device interface (SAS) differs from existing IM disks.
Pred Fail	Indicates whether device SMART is predicting device failure (Yes, No).	
Size (MB)	Indicates the size of the device in megabytes (megabyte = 1024 x 1024 = 1,048,576). If the device is part of a two-disk array, this field reflects the size of the array, not the size of the individual disk. If the device is part of a three or more disk array, this field is the size that the disk makes up within the array. When creating a striped array, the usable size of the array is determined by the number of drives times the size of the smallest drive in the array. In arrays consisting of different sized drives, excess space on larger drives are unusable.	

Manage Array Screen

The **Manage Array** screen enables you to manage the current array. To access the **Manage Array** screen, select the appropriate field and press **Enter** on the **Manage Array** field from the **View Array** screen.

The **Manage Array** screen enables you to perform the following actions:

Manage Hot Spare

To display a **Hot Spare Management** screen that has the same layout as the **Create New Array** screen, press **Enter** on Manage Hot Spare. This field is grayed out under the following conditions:

- The array is inactive.
- The array is at its maximum number of devices.
- Non-IR firmware is used.
- IR is disabled. The array is inactive.

Synchronize Array

To perform a synchronization of the IM array, press **Enter** on Synchronize Array. The screen prompts you to ask if you want to perform this action. Press **Y** for yes or **N** for no. This field is grayed out under the following conditions:

- The array is inactive.
- The array does not need to be resynchronized.
- The adapter's MPT firmware does not support the feature
- Non-IR firmware is used.
- IR is disabled. The array is inactive.

Activate Array

To perform an activation of an IM array, press **Enter** on Activate Array. The screen prompts you to ask if you want to perform this action. Press **Y** for yes or **N** for no.

Delete Array

To perform the deletion of the currently displayed IM array, press **Enter** on Delete Array. The screen prompts you to ask if you want to perform this action. Press **Y** for yes and **N** for no.

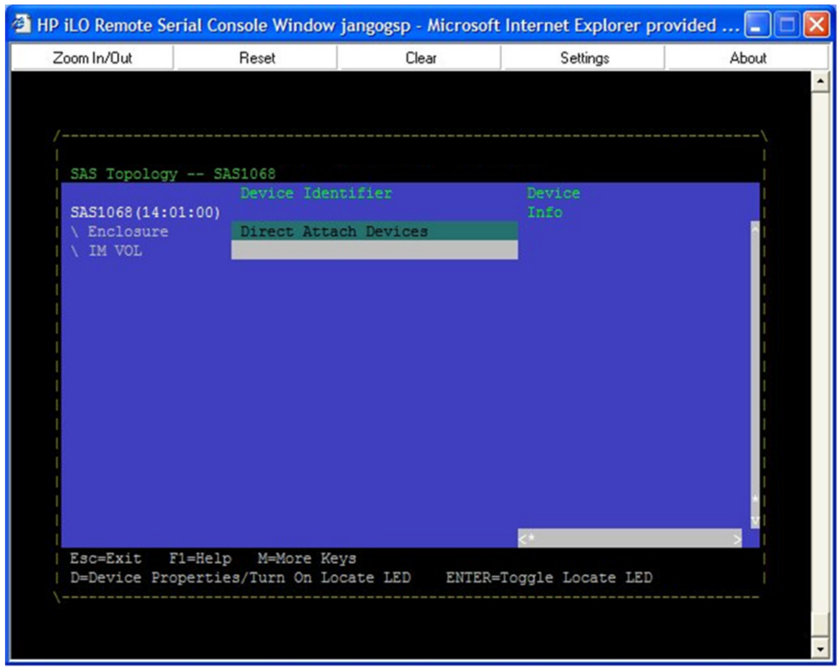
Identifier	Displays the identifier of this array.
Type	Displays the RAID type.
Scan Order	Displays the scan order of the array.
Size (MB)	Displays the size of this array.

Status Displays the status of this array.

SAS Topology Screen

The **SAS Topology** screen presents a view of the adapter's SAS hierarchy, and provides other user functionality. To access SAS Topology, press **Enter** on SAS Topology from the **Adaptor Properties** screen.

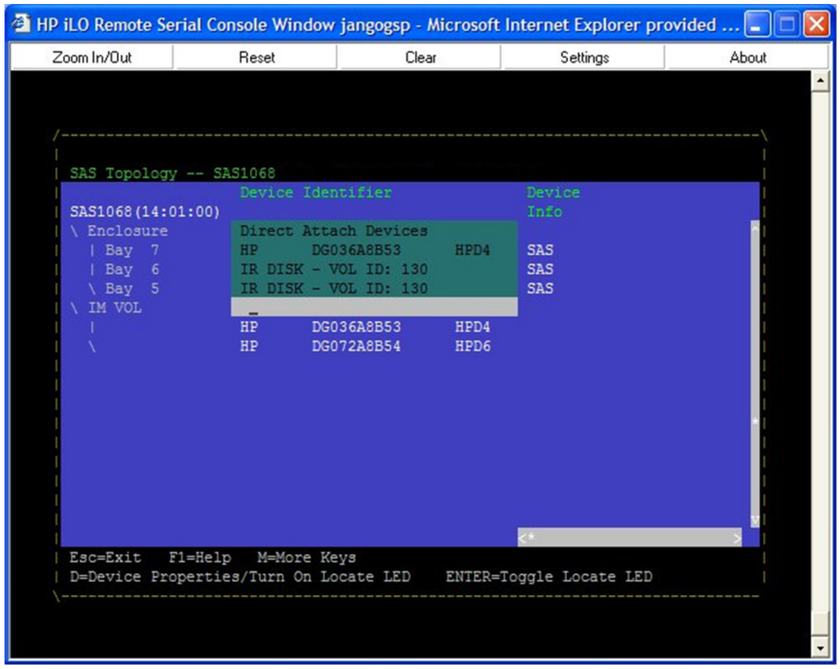
Figure E-4 SAS Topology Screen - Expander Closed



The following objects along with their significant properties are shown:

- Adapter
- PHYs
- Expanders/Enclosures
- Attached Devices

Figure E-5 SAS Topology Screen - Expander Open



You can access the **Device Properties** screen from SAS Topology:

- To access the **Device Properties** screen for the specific device and turn on the locate LED, press **D** from an expanded enclosure.

You can perform the following actions from SAS Topology:

- To expand the SAS Topology for display, select an expander/enclosure and press **Enter**. This displays all Phys/Devices/Bays. Press **Enter** again to collapse the expander/enclosure.
- To activate the locate LED, press **Enter** while on a device.
- To clear device mapping for non-present devices, press **C**.

Device Identifier	Indicates the ASCII device identifier string extracted from the device's Inquiry Data.
Device Info	Indicates if a device is SAS, SATA, Expander, or Enclosure.
Neg. Link Speed	Indicates the negotiated link speed for this Phy or whether it has been disabled.
Phy. Link Speed	Indicates the maximum hardware link rate possible for this Phy.

Device Properties Screen

The **Device Properties** screen displays information about a specific device. To access the **Device Properties** screen, press **D** from the **SAS Topology** screen when the cursor is on an expanded enclosure of the **Device Identifier** field of a device.

To access the following screens from Device Properties, select the appropriate field and press **Enter**:

- Device Format
- Device Verify

You can perform the following actions from Device Properties:

- To cycle to the next device, press **N**.
- To cycle to the previous device, press **P**.

Device Identifier	Indicates the ASCII device identifier string extracted from the device's Inquiry Data.
SAS Address	Indicates the SAS Address of this device.
Serial Number	Indicates the serial number for this device.

Elapsed Time	Displays the total time elapsed since Format or Verify Operation started.
Percent Complete	Graphical status bar display that indicates the current relative percentage complete of the operation.

Device Format and Device Verify Screens

The **Format** and **Verify** screens have a similar layout. To access the screens, press **Enter** on the appropriate field from the **Device Properties** screen. These screens include an elapsed time and status bar that begin incrementing once the operation is started, enabling you to determine progress of the operation.

Device Identifier	Indicates the ASCII device identifier string extracted from the device's Inquiry Data.
SAS Address	Indicates the SAS Address of this device.
Serial Number	Indicates the serial number for this device.
Elapsed Time	Displays the total time elapsed since Format or Verify Operation started.
Percent Complete	Graphical status bar display that indicates the current relative percentage complete of the operation.

Formatting

If enabled, a low-level formatting on a disk drive is allowed on the Device Format screen. Low-level formatting completely and irreversibly erases all data on the drive. To begin the format, press **F**.

IMPORTANT: Formatting defaults the drive to a 512-byte sector size even if the drive had previously been formatted to another sector size.

CAUTION: Once format has begun, you cannot stop or cancel the action.

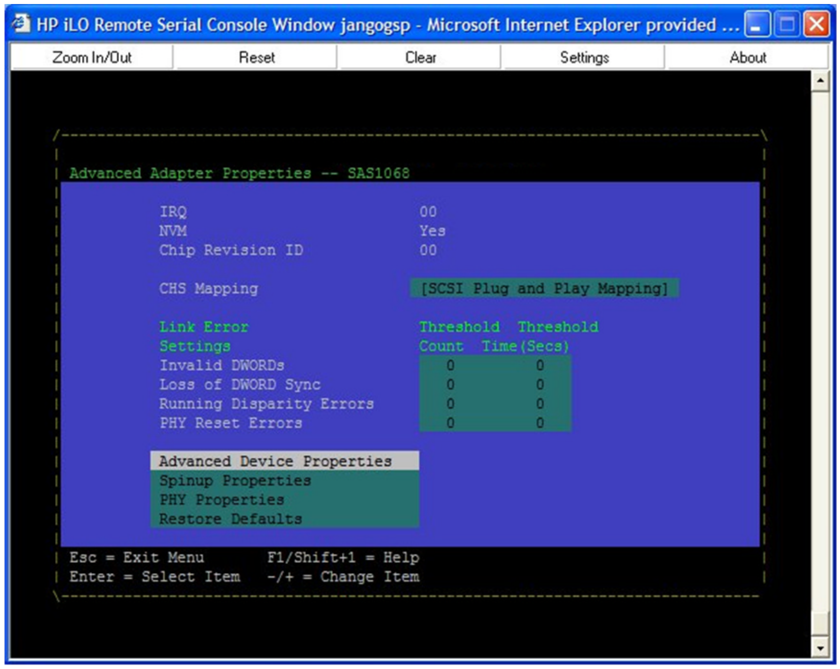
Verifying

The **Verify** screen enables you to verify all of the sectors on the device. If needed, you can reassign defective Logical Block Addresses (LBAs). To start the verification, press **Enter**.

Advanced Device Properties Screen

The Advanced Device Properties screen enables you to view and modify infrequently accessed device settings. To access Advanced Device Properties, press **Enter** on the Advance Device Properties field from the **Advanced Adaptor Properties** screen.

Figure E-6 Advanced Adaptor Properties Screen



You can perform the following actions from Advanced Device Properties:

- To set default values for all items on this screen, press **Enter** on Restore Defaults.
- To toggle between LUN 0 and All in any LUN field, press + or -. LUN 0 scans only LUN 0, All scans all LUNs.

Max Devices
: Specifies the maximum number of devices attached to the adapter for which to install a pre-OS IO interface.

Max Spin-ups
: Specifies the maximum number of targets that can be simultaneously spinning up. The IOC must delay by the time indicated in spin-up delay field before starting spin-up of the next set of targets. A value of zero in the **Maximum Target Spinups** field is treated the same as a value of one.

IO Timeouts
: Specifies the time which the host uses to timeout I/Os for the following devices with Non-Removable Media:
  - SCSI Device Type 00h - Direct Access
  - SCSI Device Type 04h - Write Once
  - SCSI Device Type 07h - Optical
  - SCSI Device Type 0Eh - Simplified Direct Access

IO Timeouts (Removable)
: Specifies the time which the host uses to timeout I/Os for the following devices with Removable Media:
  - SCSI Device Type 00h - Direct Access
  - SCSI Device Type 04h - Write Once
  - SCSI Device Type 05h - CD-ROM
  - SCSI Device Type 07h - Optical
  - SCSI Device Type 0Eh - Simplified Direct Access

IO Timeouts for Sequential Devices	Specifies the time (Time in seconds (0-999, 0 means no-timeout)) which the host uses to timeout I/Os for the following devices: • SCSI Device Type 01h - Sequential Access
IO Timeouts for Other Devices	Specifies the time (Time in seconds (0-999, 0 means no-timeout)) which the host uses to timeout I/Os for devices other than: • SCSI Device Type 00h - Direct Access • SCSI Device Type 01h - Sequential Access • SCSI Device Type 04h - Write Once • SCSI Device Type 05h - CD-ROM • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access
LUNs to Scan for Block Devices	Controls LUN scans for the following devices with Non-Removable Media: • SCSI Device Type 00h - Direct Access • SCSI Device Type 04h - Write Once • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access
LUNs to Scan for Block Devices (Removable)	Controls LUN scans for the following devices with Removable Media: • SCSI Device Type 00h - Direct Access • SCSI Device Type 04h - Write Once • SCSI Device Type 05h - CD-ROM • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access
LUNs to Scan for Sequential Devices	Controls LUN scans for the following devices: • SCSI Device Type 01h - Sequential Access
LUNs to Scan for Other Devices	Controls LUN scans for all devices other than the following: • SCSI Device Type 00h - Direct Access • SCSI Device Type 01h - Sequential Access • SCSI Device Type 04h - Write Once • SCSI Device Type 05h - CD-ROM • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access

Spinup Properties Screen

To access Spinup Properties, press **Enter** on the **Spinup Properties** field from the **Advanced Adaptor Properties** screen. This screen enables you to view and modify spin up specific settings.

Spin up refers to the disk drives getting up to rotation speed during system boot. To reduce the power requirement stress on the backplane a delay is introduced between drive spin ups.

Direct Attached Spinup Delay	Time, in seconds, between each disk drive spin up (default 3 seconds).
Direct Attached Max Targets	Number of disk drives that spin up at the same time (default 1 drive).
Expander Spinup Delay	Expanders are not supported.
Expander Max Target Devices	Expanders are not supported.

PHY Properties Screen

The PHY Properties screen enables you to view and modify PHY specific settings. To access PHY Properties, press **Enter** on the **PHY Properties** field from the **Advanced Adaptor Properties** screen.

You can perform the following actions from PHY Properties:.

- To display the next PHY, press **N**.
- To display the previous PHY, press **P**.
- To reset the Link Error Counts for this PHY or all PHYs, press **Enter** on Reset Link Error Counts. Resetting Link Error Counts issues a PHY Link Error Reset. The following prompt displays when you press **Enter**:

```
Are you sure you want to reset Phy error counts?
Reset error counts for this Phy only
Reset error counts for all Phys
Cancel
```

NOTE: The Link Error Settings values on this screen display the current values for this PHY only, and are not modifiable. To modify the Threshold values, you must return to **Advanced Adapter Properties** screen.

PHY	Displays the PHY number current information.
SAS Port	Indicates the associated SAS Port (0 to N) as configured on this adapter.
Link Status	Indicates the PHY link status. Possible values are: • Enabled, Unknown Link Rate • PHY Disabled • Enabled, negotiation failed • Enabled, SATA OOB Complete • Enabled, 1.5 Gbs • Enabled, 3.0 Gbs
Discovery Status	32 bit hexidecimal value indicating the discovery status for the PHY or Expander. Currently defined values are: • Discovery completed successfully - 0x00000000 • Loop Detected - 0x00000001 • Unaddressable device exists - 0x00000002 • Multiple Ports - 0x00000004 • Expander Error - 0x00000008 • SMP Timeout - 0x00000010 • Out of route entries - 0x00000020 • SMP Response Index Does Not Exist - 0x00000040 • SMP Response Function Failed - 0x00000080 • SMP CRC error - 0x00000100
Device Identifier	Indicates the ASCII device identifier string extracted from the device's Inquiry Data.
Scan Order	Indicates the scan order for this device (equivalent of a SCSI ID for parallel SCSI).
Device Information	Indicates if a device is SAS.
SAS Address	Indicates the SAS Address of this device.

Link Error Setting	• Invalid DWORDs - Number of invalid dwords that have been received outside of PHY reset sequences, since the last PHY Link Error Reset. [a] • Loss of DWORD Sync - Number of times, since the last PHY Link Error Reset, that dword synchronization was lost and the link reset sequence occurred.[a] • Running Disparity Errors - Number of dwords with running disparity errors that have been received outside of PHY reset sequences, since the last PHY Link Error Reset.[a] • PHY Reset Errors - Number of times the PHY reset sequence has failed, since the last PHY Link Error Reset.[a]
Link Error Count	Actual link error count values since the last PHY Link Error Reset.[a]
Threshold Count	Link error count threshold values.[b]
Threshold Time	Time, in seconds, over which to apply Threshold Count.[b]

[a]. The count stops when it reaches the maximum value.

[b]. When a Link Error Count exceeds a Threshold Count within the Threshold Time the link rate may be reduced by the MPT firmware.

Exit the SAS Configuration Utility Screen

As some changes only take effect when you exit the utility, it is important to always exit the utility properly. To exit the utility, follow these steps:

1. To return to the Adapter List from Adapter Properties, press **ESC**.
2. To exit the utility from the Adapter List, press **ESC**.

NOTE: A similar exit screen is used when exiting most other screens, and can be used to save settings.

The exit screen shows some options that are grey, indicating that they are not available. You can only select the available options. The exit choices are as follows:

- `Are you sure you want to exit?`
- `Cancel Exit`
- `Save changes and reboot`
- `Discard changes and reboot`
- `Exit the Configuration Utility and Reboot`

CFGGEN Utility

The `cfggen` utility is a command line utility that runs in the Linux, EFI, and Windows Pre-Installation (WinPE) environments. It is a minimally interactive program that you execute from a command line prompt, or a shell script. The results from invoking this utility are communicated through the program status value that is returned when the program exits. Use the `cfggen` utility to create IM storage configurations on SAS controllers. Some `cfggen` commands work only with SAS adaptors in the EFI environment.

Starting CFGGEN

The`cfggen`utility is located on the *HP IPF Offline Diagnostic and Utilities CD*. To use `cfggen`, follow these steps:

1. Insert the CD into the drive.
2. Boot the system to the EFI Shell prompt.

3. From the EFI Shell prompt, change to the CD drive.

```
shell> fs0: Enter
fs0:\>
```

4. Change to the directory that contains cfggen.efi.

```
fs0:\> cd EFI\HP\TOOLS\NETWORK Enter
fs0: EFI\HP\TOOLS\NETWORK>
```

   From this directory use cfggen.

CFGGEN Operation

cfggenis not case sensitive. You can enter cfggencommands and parameters in uppercase, lowercase, or a mixture of the two. Use the following conventions in the command descriptions:

- Text in italics must be entered exactly as shown on the command line
- Text surrounded by <> must be replaced with a required parameter
- Text surrounded by [ ] may be replaced by an optional parameter
- Parameters surrounded by {} must be entered one or more times, as appropriate for the executed command
- Do not enter the command line definition characters (<>, [ ], and {}) on the command line.

The cfggen utility uses a command line interface.

Syntax: cfggen <controller #> <command> <parameters>

NOTE: The program name, controller number, command, and parameters fields must be separated by the ASCII space character. The format of the parameters is command specific.

The program return value is returned to the user when the program exits. A value of0is returned if the command is successful. Otherwise, a value of1is returned.

Rules for creating IM volumes and hot spare disks

The following rules apply when creating IM volumes and hot spare disks:

- All disks that are part of an IM volume or a hot spare for an IM volume must be on the same SAS controller.
- IM volumes are supported.
- Only two IM volumes (plus a global hot spare) per controller can be created.
- An IM array must have exactly two disks.
- A hot spare disk cannot be created without at least one IM volume already created.
- The utility does not allow adding a hot spare disk of type different from disk types in any of the volume.
- With the AUTO command all drives used are the same type as the first available disk found, and the size is limited to the size of the smallest disk.

CFGGEN Commands

Using the CREATE Command

The CREATE command creates IM volumes on the SAS controller. Firmware and hardware limitations for this family of cards limit the number of configurations that are possible.

Syntax

```
cfggen <controller #> create <volume type> <size> [qsync] [noprompt]
```

Parameters

<volume type> Volume type for the volume to be created. Valid value is IM.

<size>	Size of the IM volume in Mbytes or “MAX” for the maximum size available.
[*qsync*]	Quick synchronization of the volume created.
[*noprompt*]	Eliminates warnings and prompts.

Operation

Once a disk has been added to an IM volume, all of its storage capacity may or may not be used depending on drive capacity and volume capacity. For example, if you add a 36 GB disk drive to a volume that only uses 9 GB of capacity on each disk drive, the remaining 27 GB of capacity on the disk drive is unusable.

The disk identified by the first SCSI ID on the command line is assigned as the primary disk drive when creating an IM volume. If the SAS controller is allowed to resync the disk drives, the data on the primary disk drive is available by accessing the newly created volume.

Using the AUTO Command

The `AUTO` command automatically creates an IM volume on the SAS controllers. The volume is created with the maximum number of disks available for use in the specified volume type. The main difference from the `CREATE` command is that with `AUTO` command user does not specify SCSI ID values for disks to use in the volume. The `cfggen` utility automatically uses the first disks it finds that are usable in the IM volume. Firmware and hardware limitations for the family of controllers limit the number of configurations that are possible.

Syntax

```
cfggen <controller #> auto <volume type> <size> [qsync] [noprompt]
```

Parameters

<volume type>	Volume type for the volume to be created. Valid value is IM.
<size>	Size of the RAID volume in Mbytes or “MAX” for the maximum size available.
[qsync]	Quick synchronization of the volume created.
[noprompt]	Eliminates warnings and prompts.

Operation

When `AUTO` creates an IM volume, the first disk found is assigned as the primary disk drive. If the controller is allowed to resync the disk drives, the data on the primary disk drive is available by accessing the newly created volume. Reply**`Yes`**if you want to complete the creation.

HOTSPARE

The `HOTSPARE` command creates a hot spare disk drive. The hot spare drive is added to hot spare pool 0.

Syntax

```
cfggen <controller #> HOTSPARE [DELETE] <Encl:Bay>
```

Parameters

<controller #>	A SAS controller number between 0 and 255.
[DELETE]	Specifies that the hot-spare is to be deleted (Omit the DELETE keyword to specify hot-spare creation).
<Encl>:<Bay>	Enclosure number and Bay number that identifying the disk drive that will become the hot spare.

Operation

The number of disk drives in an IM array plus the hot spare disk cannot exceed three. You can create only one hot spare disk. You must make sure the capacity of the hot spare disk is greater than or equal to the capacity of the smallest disk in the logical drive. An easy way to verify this is to use the DISPLAY command.

CAUTION: See rules for creating IM volumes and hot spare disks.

DELETE

The DELETE command sets the controller configuration to factory defaults. This command also deletes any existing IR volumes.

Syntax

```
cfggen <controller #> delete [noprompt]
```

Parameters

<controller #>	A SAS controller number between 0 and 255.
[noprompt]	Eliminates warnings and prompts.

Operation

After entering the DELETE command, the system prompts you and asks if you want to proceed with the command. Enter **Yes** if you want to proceed.

DISPLAY

This DISPLAY command displays information about controller configurations: controller type, firmware version, BIOS version, volume information, and physical drive information.

Syntax

```
cfggen <controller #> display [filename]
```

Parameters

<controller #>	A SAS controller number between 0 and 255.
[filename]	Valid filename to store output of command to a file.

Sample Output

```
Read configuration has been initiated for controller 0
------------------------------------------------------------------------
Controller information
------------------------------------------------------------------------
  Controller type                         : SAS1068
  EFI BSD version                         : 2.00.09.00
  Firmware version                        : 1.10.01.00
  Channel description                     : 1 Serial Attached SCSI
  Initiator ID                            : 63
  Maximum physical devices                : 62
  Concurrent commands supported           : 511
------------------------------------------------------------------------
IR Volume information
------------------------------------------------------------------------
IR volume 1
  Volume ID                               : 2
  Status of volume                        : Okay (OKY)
  RAID level                              : 1
  Size (in MB)                            : 34304
  Physical hard disks (Target ID)         : 9 1
------------------------------------------------------------------------
Physical device information
------------------------------------------------------------------------
Initiator at ID #63
Target on ID #1
  Device is a Hard disk
```

```
    Enclosure #                               : 1
    Slot #                                    : 8
    Target ID                                 : 1
    State                                     : Online (ONL)
    Size (in MB)/(in sectors)                 : 34732/71132960
    Manufacturer                              : HP
    Model Number                              : DG036A8B53
    Firmware Revision                         : HPD6
    Serial No                                 : 3LC04757000085425VFK
    Drive Type                                : SAS
  Target on ID #4
    Device is a Hard disk
    Enclosure #                               : 1
    Slot #                                    : 5
    Target ID                                 : 4
    State                                     : Ready (RDY)
    Size (in MB)/(in sectors)                 : 70007/143374738
    Manufacturer                              : HP
    Model Number                              : DG072A8B54
    Firmware Revision                         : HPD6
    Serial No                                 : 3LB02CXH00008523E83Z
    Drive Type                                : SAS
  Target on ID #5
    Device is a Hard disk
    Enclosure #                               : 1
    Slot #                                    : 4
    Target ID                                 : 5
    State                                     : Ready (RDY)
    Size (in MB)/(in sectors)                 : 70007/143374738
    Manufacturer                              : HP
    Model Number                              : DG072A8B5C
    Firmware Revision                         : HPD4
    Serial No                                 : B062P5B011M00547
    Drive Type                                : SAS
  Target on ID #6
    Device is a Hard disk
    Enclosure #                               : 1
    Slot #                                    : 3
    Target ID                                 : 6
    State                                     : Ready (RDY)
    Size (in MB)/(in sectors)                 : 70007/143374738
    Manufacturer                              : HP
    Model Number                              : DG072A8B5C
    Firmware Revision                         : HPD4
    Serial No                                 : B062P5B011RK0548
    Drive Type                                : SAS
  Target on ID #7
    Device is a Hard disk
    Enclosure #                               : 1
    Slot #                                    : 2
    Target ID                                 : 7
    State                                     : Ready (RDY)
    Size (in MB)/(in sectors)                 : 70007/143374738
    Manufacturer                              : HP
    Model Number                              : DG072A8B5C
    Firmware Revision                         : HPD4
    Serial No                                 : B062P5B011NB0548
    Drive Type                                : SAS
  Target on ID #9
    Device is a Hard disk
    Enclosure #                               : 1
    Slot #                                    : 7
    Target ID                                 : 9
    State                                     : Online (ONL)
    Size (in MB)/(in sectors)                 : 70007/143374738
```

```
  Manufacturer                                : HP
  Model Number                                : DG072A8B5C
  Firmware Revision                           : HPD4
  Serial No                                   : B062P5B010R10547
  Drive Type                                  : SAS
------------------------------------------------------------------------
Enclosure information
------------------------------------------------------------------------
Enclosure#                                    : 1
Logical ID                                    : 500605B0:0001A950
Numslots                                      : 8
StartSlot                                     : 1
Start TargetID                                : 0
Start Bus                                     : 0
```

Logical drive status values:

Okay (OKY)	Volume is Active and drives are functioning properly and user data is protected if the current RAID level provides data protection.
Degraded (DGD)	Volume is Active and the user's data is not fully protected due to a configuration change or drive failure; a data resync or rebuild may be in progress.
Inactive (OKY)	Volume is inactive and drives are functioning properly and user data is protected if the current RAID level provides data protection.
Inactive (DGD)	Volume is inactive and the user's data is not fully protected due to a configuration change or drive failure; a data resync or rebuild may be in progress.

Physical device status values are as follows:

Online (ONL)	The drive is operational and is part of a logical drive.
Hot Spare (HSP)	The drive is a hot spare that is available for replacing a failed drive in an array.
Ready (RDY)	The drive is ready for use as a normal disk drive or it can be, but has not been, assigned to a disk array or hot spare pool.
Available (AVL)	The hard disk drive may or may not be ready, and it is not suitable for inclusion in an array or hot spare pool (for example, it is not spun up, its block size is incorrect, or its media is removable).
Failed (FLD)	Drive was part of a logical drive or was a hot spare drive, and it failed. It has been taken offline.
Standby (SBY)	This status is used to tag all non-hard disk devices.

FORMAT

The `FORMAT` command performs a low-level format of a disk drive. This operation can only be performed on a hard disk drive. The drive cannot be an IR volume or a hot spare drive.

Syntax

```
cfggen <controller #> format <Encl:Bay> [noprompt]
```

Parameters

<controller #>	A SAS controller number between 0 and 255.
<Encl:Bay>	Enclosure number and Bay number that identifying the disk drive that will be formatted.
[noprompt]	Eliminates warnings and prompts.

> **CAUTION:** Performing a low-level format on a hard disk drive results in the destruction of all data stored on that disk drive. The operation cannot and should not be interrupted; doing so may result in irreparable damage to the hard disk drive.

Operation

Unless you include <no prompt> on the command line, warning messages display. You are required to properly answer a series of prompts or the command aborts. The answers are case sensitive and must be entered in upper case.

This command will not complete and return to a shell prompt until the format operation is complete. Depending on the capacity and model of disk drive, this can take a considerable amount of time.

STATUS

The `STATUS` command displays the status of any volume synchronization operation that is currently in progress on the controller.

Syntax

```
cfggen <controller #> status
```

Parameters

<controller #>	A SAS controller number between 0 and 255.

Operation

If no volume synchronization is in progress, `CFGIR` prints a message so indicating before exiting. The `STATUS` command adds the **Inactive** flag to the **Volume State** field, if the volume is marked as inactive by the controller firmware.

Sample Output

The following is an example of the status information returned when a volume resynchronization is in progress.

```
Background command progress status for controller 0...
IR Volume 1
  Current operation                          : None
  Volume ID                                  : 2
  Volume status                              : Enabled
  Volume state                               : Optimal
  Physical disk I/Os                         : Not quiesced
```

The status fields in the data displayed can take on the following values:

Current operation	Synchronize or None
Volume status	Enabled or Disabled
Volume state	Inactive] Optimal, Degraded or Failed
Physical disk I/Os	Quiesced or Not quiesced

ENABLEIR

The `ENABLEIR` command turns on IR functionality on a SAS controller. To accomplish the enabling, clear the `MPI_IOUNITPAGE1_DISABLE_IR` bit in the **IO Unit 1 MPT Configuration** page.

Syntax

```
cfggen <controller #> enableir
```

Parameters

<controller #> A SAS controller number between 0 and 255.

Operation

If there are any existing IR volumes when this command is run you are notified with an output message, no action is taken and `cfggen` returns SUCCESS. If IR is currently enabled when this command is run, `cfggen` returns SUCCESS.

Faulty controller or peripheral hardware (such as., cables, disk drives, and so on.) will not cause this utility to hang. It exits with the appropriate return value. If an operation fails, a reasonable attempt is made to recover the operation. This may include clearing the fault condition by whatever means necessary and retrying the operation.

DISABLEIR

The `DISABLEIR` command turns off IR functionality on a SAS controller. To accomplish the disabling, set the MPI_IOUNITPAGE1_DISABLE_IR bit in the **IO Unit 1 MPT Configuration** page.

Syntax

```
cfggen <controller #> disableir
```

Parameters

This command does not require <controller #>.

Sample Output

```
 Vendor  Device
Index  ID  ID  Bus Device
-----  ------  ------  ---------
0  1000h  0054h  14h 08h LSI 1068 SAS Host Adapter
```

LOCATE

The `LOCATE` command turns locate LED's on and off.

Syntax

```
cfggen <controller #> locate
```

Parameters

<controller #> A SAS controller number between 0 and 255.

Smart Array P400, P600 and P800 Controllers

The following information is provided to assist you in configuring the Smart Array P400, P600 and P800 controllers during installation. For additional information refer to the following documents:

- *HP Smart Array P400 Controller Support Guide*
- *HP Smart Array P600 Controller for Integrity Servers User Guide*
- *HP Smart Array P800 Controller for Integrity Servers User Guide*

Quick Installation Procedure

To install the controller, follow these steps:

1. Power off the server.
2. Install additional physical drives if necessary (see “Connecting External Storage” (page 263)). The number of drives in the server determines the RAID level that is auto configured when the server is powered on.
3. Power on the server.

4. Update the controller firmware (see "SAUPDATE Utility" (page 264)). When the firmware update process is complete, the server reboots and runs through a POST procedure. This POST procedure halts briefly during controller initialization and prompts you to open `ORCA` (Option ROM Configuration for Arrays).
5. Open `ORCA`. See "Configuring the Array" (page 269).
   - If using a headless console, press **Esc+8**.
   - Otherwise, press **F8**.
6. Configure the logical boot drive, and exit from `ORCA`.

Depending on the OS, additional device drivers and management agents must be installed. See the User Guide for the specific HP Smart Array Controller at:

`http://h20000.www2.hp.com/bizsupport/TechSupport/Home.jsp`under the specific HP Smart Array Controller product for installation procedures.

The latest firmware, drivers, utilities, software, and documentation for HP Integrity servers are available on the support page of the HP Web site at:

`http://www.hp.com/support/itaniumservers`

Connecting External Storage

IMPORTANT: Not all OSs, or Smart Array cards support external drives.

To connect external storage, follow these steps:

1. Power off the server.
2. Connect an external SAS cable to the external port of the controller.

   NOTE: You do not have to disconnect any internal drives on shared internal port 1I because the controller preferentially discovers devices attached to port 1E. However, drives on the shared internal port are unavailable until you disconnect the external storage device.

3. Tighten the lock screws on the cable connector.
4. Attach the other end of the cable to the SAS input connector of the external storage enclosure.

   IMPORTANT: Drives that are to be used in the same array must be of the same type, either all SAS or all SATA. (Parallel SCSI drives cannot be used with this controller.)

5. Tighten the lock screws on the cable connector.
6. Power on the enclosure.
7. Power on the server.

SAS Cable Part Numbers

If you require additional cables, order them by the option kit number listed in Table E-2.

Table E-2 SAS Cable Part Numbers

Cable Length	Option Kit Number	Cable Assembly Number
1.0 m (3.3 ft.)	389664-B21	361317-001
2.0 m (6.6 ft.)	389668-B21	361317-002
4.0 m (13 ft.)	389671-B21	361317-004
6.0 m (20 ft.)	389674-B21	361317-006

SAUPDATE Utility

Use `saupdate` from the EFI Shell to update the firmware image on the HP Smart Array P600. Command line options are described below. Follow one of these two procedures to run saupdate:.

- If you are using `saupdate` from the Offline Diagnostic CD:

1. Download the firmware and copy it to the EFI partition.
2. The CD containing `saupdate.efi` must be in the drive before booting the system to allow device mapping.
3. Boot the system to the EFI Shell prompt. The CD drive should appear in the list of mapped devices as **fs0**.
4. Change to this device by typing fs0: under EFI Shell prompt.
5. If the EFI utility and firmware image files are not located in the root directory, move to the directory in which these files are located, for example:

   ```
   fs0:\>cd \EFI\HP\TOOLS\IO_CARDS\SmartArray
   ```

IMPORTANT: Both `saupdate.efi` and the firmware image file must be located in the same directory. If they are not, copy them both to the EFI partition. Run the `saupdate.efi` using the `fs0:\> saupdate` command.

- If you are not using the Offline Diagnostic CD:

1. Download the SA EFI update utility `saupdate.efi` and copy it to the EFI partition.
2. Download the firmware and copy it to the EFI partition.
3. Boot the system to the EFI Shell and change directories to the EFI partition.
4. Run the `saupdate.efi` using the using the `fs0:\> saupdate.efi` command. The following screen displays. The version of the utility displays on the second line:

```
*************************************************************
Smart Array Offline Firmware Update Utility
Version: 1.04.12.00
(C) Copyright 2004 Hewlett Packard Development Company L.P.
*************************************************************
```

Syntax

saupdate <operation> <parameters>

Commands

You can use the following operations with saupdate:

- `LIST`
- `UPDATE`
- `UPDATE all`
- `HELP or?`

List

Use `LIST` to display all detected Smart Array controllers along with the active firmware versions.

```
fs0:\> saupdate LIST
*************************************************************
Smart Array Offline Firmware Update Utility
Version: 1.04.12.00
(C) Copyright 2004 Hewlett Packard Development Company L.P.
*************************************************************

Seg  Bus  Dev  Func       Description          Version
1    51    4    0       HP Smart Array 6400      1.92
1    20    1    0       HP Smart Array 5300      3.54
```

The identification information from this list is used to designate which controller is to be updated.

UPDATE

NOTE: The saupdate utility program file (`saupdate.efi`) must be located in the same file system as the firmware files.

```
saupdate UPDATE [ <seg:bus:dev:func>] [smartarray_firmware_file]
```

For example, to update the controller at segment 1, bus 51, device 4, function 0 from the example output above, enter a command at the EFI Shell prompt as in this following example:

```
fs0:\> saupdate UPDATE 1:51:4:0 CYBORG234.BIN
```

Replace `CYBORG234.BIN` with the name of your firmware file.

The following screen displays:

```
*************************************************************
Smart Array Offline Firmware Update Utility
Version: 1.04.12.00
(C) Copyright 2004 Hewlett Packard Development Company L.P.
*************************************************************

Updating controller in Seg: 1, Bus: 51, Dev: 4, Func: 0
Current firmware version 1.92Percentage completed: 100%

Activating firmware now, this may take several minutes.
Resetting and reinitializing controller.
Retrieving firmware version, this may take several minutes.
Current controller firmware version is 2.34.
```

NOTE: The UPDATE command will not prevent downgrade to a lower firmware version.

After updating the firmware, cycle the power on the system and on any external JBODS connected to the Smart Array HBAs.

Exit status codes`0: Success`

UPDATE all

When “all” is specified, the utility downloads the firmware image to all the controllers to which the firmware image applies and updates the remaining controllers. If an update operation fails for a controller, the utility still updates the remaining controllers.

The example below shows the command to update all controllers for which the firmware image file applies. The controllers for which the firmware image is not applicable are skipped. In this example, the Smart Array 6400 controller is updated, and the Smart Array 5300 is skipped:

```
fs0:\> saupdate UPDATE all CYBORG234.BIN
```

Replace `CYBORG234.BIN` with the name of your firmware file.

The following screen displays, showing the controllers that are updated and skipped:

```
*************************************************************
Smart Array Offline Firmware Update Utility
Version: 1.04.12.00
(C) Copyright 2004 Hewlett Packard Development Company L.P.
*************************************************************

Updating controller in Seg: 1, Bus: 51, Dev: 4, Func: 0
Current firmware version 1.92

Percentage completed: 100%
Activating firmware now, this may take several minutes.
Resetting and reinitializing controller.
Retrieving firmware version, this may take several minutes.
```

```
Current controller firmware version is 2.34.

************************************************************
Smart Array Offline Firmware Update Utility
Version: 1.04.12.00
(C) Copyright 2004 Hewlett Packard Development Company L.P.
*************************************************************

Firmware Image is not suitable for HP Smart Array
5300 Controller at Seg: 1, Bus 20, Dev: 1, Func:0
```

After updating the firmware, cycle the power on the system and on any external JBODS connected to the Smart Array HBAs.

HELP or ?

Use HELP or ? to display usage text, program version number, and build date:

Enter: `saupdate HELP`

or

`saupdate ?`

Error Messages

The following is a list of error messages under various situations:

- When keyword LIST or `UPDATE` is misspelled or extra parameters are specified:

  Error: Syntax Error

  Usage: `saupdate LIST` or `saupdate UPDATE [   all ]`
- When the controller ID in the `saupdate UPDATE` command is not correct:

  No matching controller found
- When a firmware file does not exist in the `saupdate UPDATE` command, the example shows: CYBORG101.BIN does not exist.

  `File CYBORG101.BIN: Not Found`
- When an invalid firmware or corrupted file is specified in the `saupdate UPDATE` command, the example shows: CYBORG101.BIN does not exist.

  `File CYBORG101.BIN: invalid or corrupted`

EBSU Utility

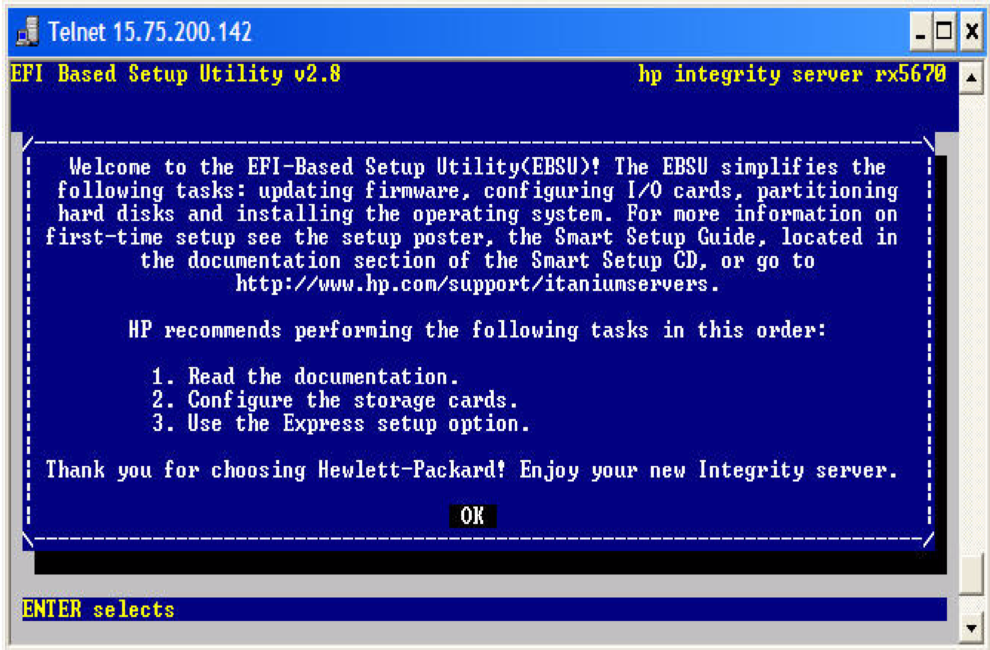
The EFI-based Setup Utility (EBSU) provides an easy-to-use interface for flashing firmware, partitioning the hard disk, installing diagnostic tools, configuring storage controllers, and running other EFI utilities.

NOTE: You can use EBSU to update firmware for many different devices in the system. Smart Array P600 is shown as an example.

To update the Smart Array firmware:

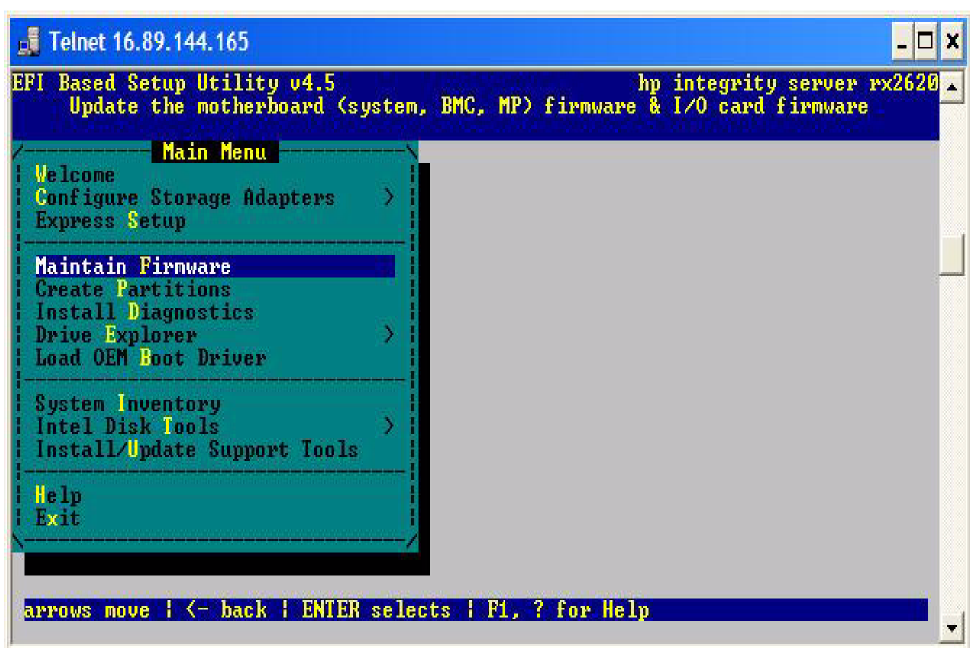
1. Power on the server. The server boots to EFI. The EFI Boot Manager may be used from the enhanced interface (grey background) or the legacy interface (black background).
2. Load the HP Smart Setup media into the server DVD drive.
3. From the EFI Boot Menu, select **Internal Bootable DVD** and press **Enter**. EBSU starts and displays the **Welcome** screen.

Figure E-7 EBSU Welcome Screen



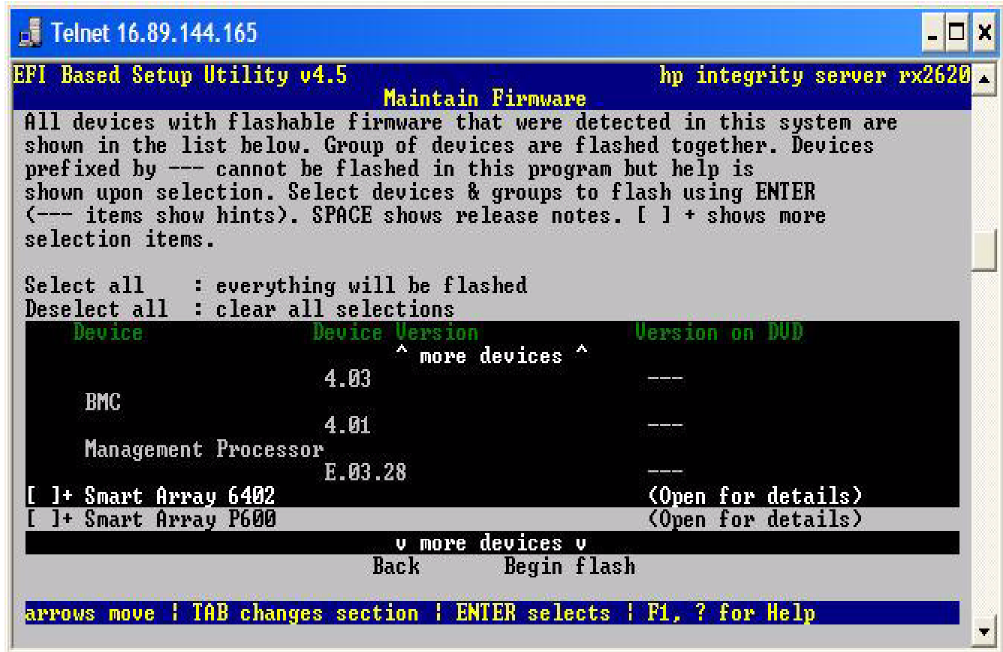
4. Select **OK** and press **Enter** to continue.
5. From the main menu, select **Maintain Firmware** and press **Enter**.

Figure E-8 EBSU Main Menu



6. In the **Maintain Firmware** screen, use the tab key to scroll down to the **Device** section.
7. Use the down arrow key to scroll down to the **Smart Array P600** item in the list.
8. Press **Enter** to display detailed information about the device.

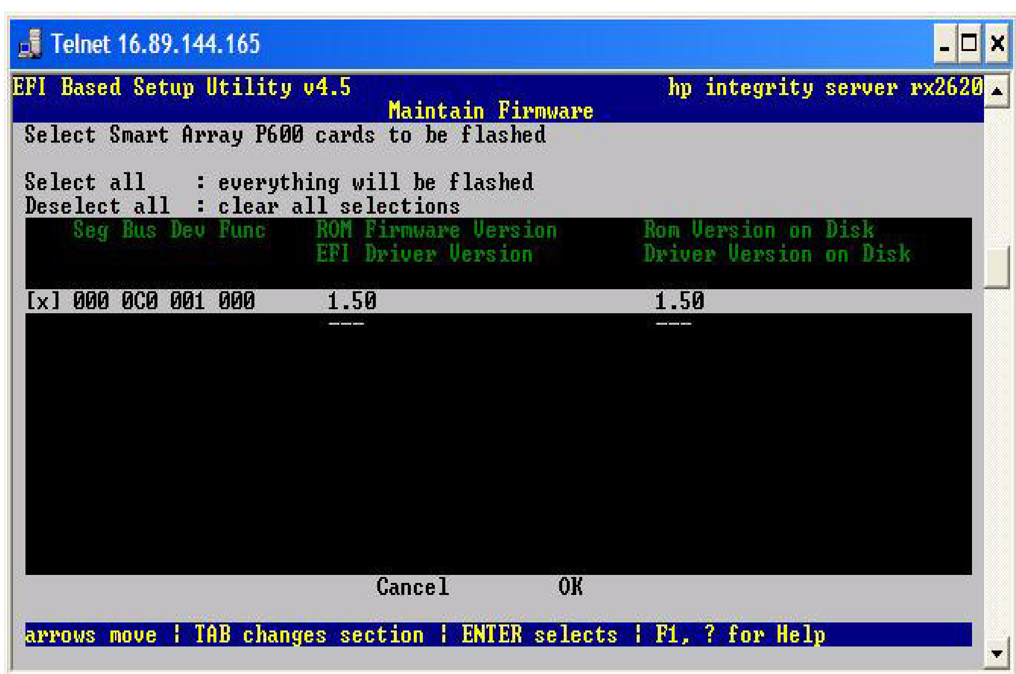
Figure E-9 EBSU Maintain Firmware Screen



EBSU displays the firmware update screen for the selected device.

- The version number in the first column (ROM Firmware Version) is the one currently installed on your system.
- The version number in the second column (ROM Version on Disk) is the one available on your Smart Setup media.

Figure E-10 EBSU Maintain Firmware Update Screen



9. Compare the two version numbers and perform one of the following options:
   - If the number in the first column is the same or higher than the number in the second column, your installed firmware is current. You do not need to update the firmware for this device! You can exit EBSU and quit this procedure.
   - If the number in the first column is less than the number in the second column, your installed firmware is older than the version on your Smart Setup media. You must update the firmware for this device! Proceed to Step 9 and continue from there.

NOTE: The utility does not allow you to flash the firmware if the installed version is the same or higher than the version on the Smart Setup media.

10. Use the tab key to scroll down into the **Device** section and highlight the device name.
11. Press **Enter** to select the device (this puts an "X" inside the box on the left side of the device name).
12. Use the tab key to move to the **OK** selection and press **Enter**.

    The firmware update begins and proceeds automatically to completion.

Configuring the Array

provides two utilities for manually configuring an array on a Smart Array controller:

- `ORCA`, a simple ROM-based configuration utility.
- Array Configuration Utility (`ACU`), a versatile, browser-based utility that provides maximum control over configuration parameters

NOTE: To copy a particular array configuration to several other servers on the same network, use the Array Configuration Replicator (ACR) or the scripting capability of `ACU`. ACR is provided in the SmartStart Scripting Toolkit, available on the HP Web site at: **http://www.hp.com/servers/sstoolkit**.

Whichever utility you use, the following limitations apply:

- For the most efficient use of drive space, do not mix drives of different capacities within the same array. The configuration utility treats all physical drives in an array as if they have the same capacity as the smallest drive in the array. The excess capacity of any larger drives is wasted because it is unavailable for data storage.
- The probability that an array will experience a drive failure increases with the number of physical drives in the array. If you configure a logical drive with RAID 5, keep the probability of failure low by using no more than 14 physical drives in the array.

For conceptual information about arrays, logical drives, and fault-tolerance methods, and for information about default array configuration settings, see the *HP Array Configuration Utility User Guide* at I/O Cards and Networking Software at:

http://docs.hp.com/en/netcom.html

Comparing the Utilities

Table E-3 lists the supported features and procedures for the `ACU` and `ORCA` utilities.

Table E-3 ACU and ORCA Supported Features and Procedures

	ACU	ORCA
Supported Features		
Uses a graphical interface	Yes	No
Available in languages other than English	Yes	No
Available on CE	Yes	No
Uses a wizard to suggest the optimum configuration for an unconfigured controller	Yes	No

Table E-3 ACU and ORCA Supported Features and Procedures *(continued)*

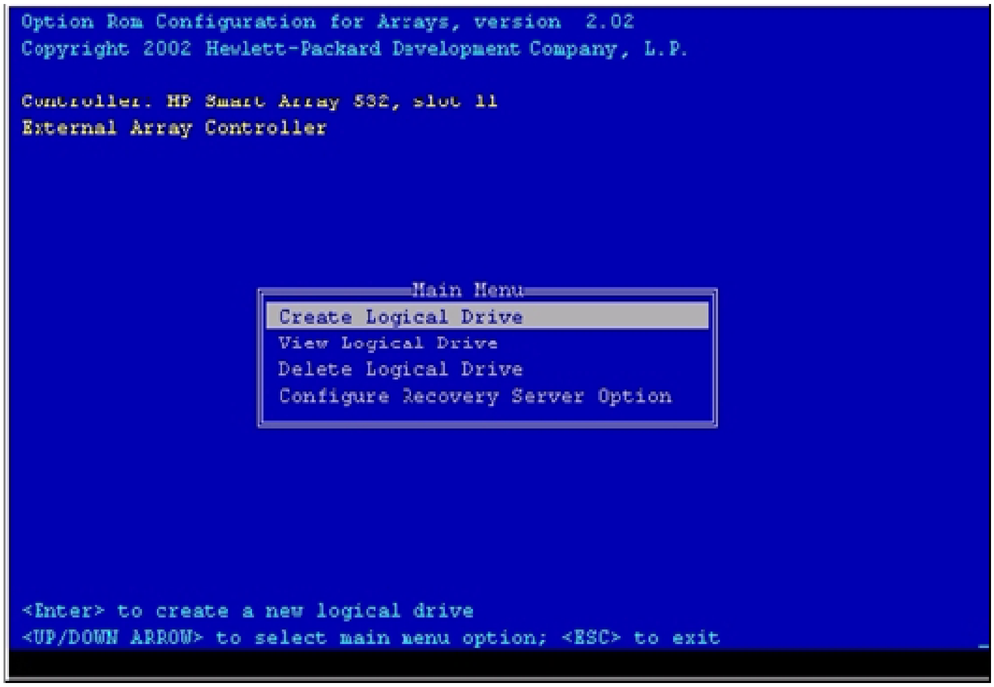
	ACU	ORCA
Describes configuration errors	Yes	No
Suitable for configuration while online	Yes	No
Suitable for configuration while offline	No	Yes
Supported Procedures		
Creation and deletion of arrays and logical drives	Yes	Yes
Assignment of RAID level	Yes	Yes
Sharing of spare drives among several arrays	Yes	No
Assignment of multiple spare drives per array	Yes	No
Setting of stripe size	Yes	No
Migration of RAID level or stripe size	Yes	No
Configuration of controller settings	Yes	No
Expansion of an array	Yes	No
Creation of multiple logical drives per array	Yes	No

ORCA Utility

To use `ORCA`, follow these steps:

1. Power on the server. POST runs, and any array controllers that are in the server are initialized one at a time. During each controller initialization process, POST halts for several seconds while an `ORCA` prompt message displays.
2. At the `ORCA` prompt:
   - If you are connected using a headless console, press the **Esc+8** combination.
   - Otherwise, press **F8**. The **ORCA Main Menu** displays, enabling you to create, view, or delete a logical drive.

Figure E-11 ORCA Main Menu



Creating a Logical Drive Using ORCA

To create a logical drive using `ORCA`, follow these steps:

1. Select **Create Logical Drive**. The screen displays a list of all available (unconfigured) physical drives and the valid RAID options for the system.
2. Use the **Arrow** keys, **Spacebar**, and **Tab** to navigate around the screen and set up the logical drive, including an online spare drive if one is required.

> **NOTE:** You cannot use `ORCA` to configure one spare drive to be shared among several arrays. Only `ACU` enables you to configure shared spare drives.

3. Press **Enter** to accept the settings.
4. Press **F8** to confirm the settings and save the new configuration. After several seconds, the **Configuration Saved** screen displays.
5. Press **Enter** to continue. You can now create another logical drive by repeating the previous steps.

> **NOTE:** Newly created logical drives are invisible to the operating system. To make the new logical drives available for data storage, format them using the instructions given in the operating system documentation.

ACU Utility

For detailed information about using `ACU`, see the *HP Array Configuration Utility User Guide* at I/O Cards and Networking Software at:

http://docs.hp.com/en/netcom.html

F Utilities

This appendix describes the utilities that are part of the server. These include the EFI Boot Manager, and EFI-POSSE.

This appendix addresses the following topics:

- "Extensible Firmware Interface Boot Manager" (page 273)
- "EFI/POSSE Commands" (page 276)
- "Specifying SCSI Parameters" (page 293)
- "Using the Boot Option Maintenance Menu" (page 298)
- "iLO 2 MP" (page 304)

Extensible Firmware Interface Boot Manager

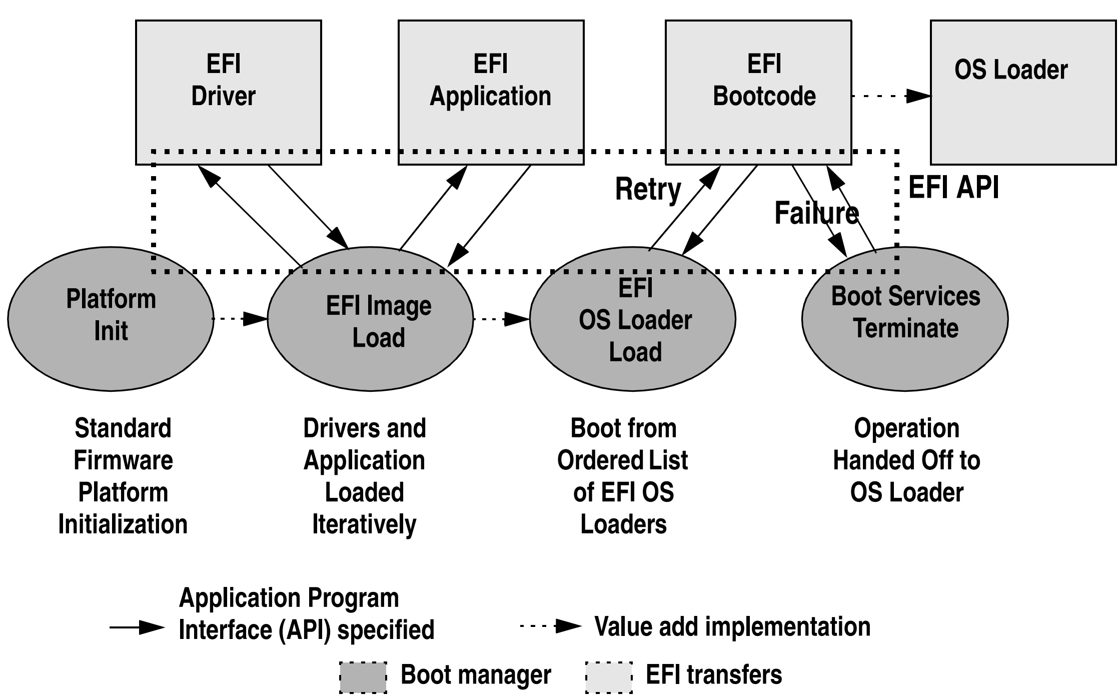
The Extensible Firmware Interface (EFI) is an OS and platform-independent boot and preboot interface. EFI resides between the OS and platform firmware, enabling the OS to boot without details about the underlying hardware and firmware. EFI supports boot devices, uses a flat memory model, and hides platform and firmware details from the OS.

NOTE: EFI and Pre-OS System Environment (POSSE) are similar. EFI is an Intel specification, whereas POSSE is the HP implementation that aids HP support.

EFI consolidates boot utilities similar to those found in PA-RISC systems, such as the Boot Console Handler (BCH), and platform firmware into a single platform firmware. EFI enables the selection of any EFI OS loader from any boot medium that is supported by EFI boot services. An EFI OS loader supports multiple options on the user interface.

EFI supports booting from media that contain an EFI OS loader or an EFI-defined system partition. An EFI-defined system partition is required by EFI to boot from a block device.

Figure F-1 EFI Boot Sequence



The EFI Boot Manager loads EFI applications (including the OS first stage loader) and EFI drivers from an EFI-defined file system or image loading service. Non-volatile RAM (NVRAM) variables point to the file to be loaded. These variables contain application-specific data that is passed directly to the EFI application. EFI variables provides system firmware with a boot menu that points to all the operating systems, even multiple versions of the same operating system.

The EFI Boot Manager enables you to control the server boot environment. Depending on boot option configuration after the server is powered up, the Boot Manager presents you with different ways to bring up the system. For example, you can boot to the EFI Shell, to an operating system located on the network or residing on media in the server, or to the **EFI Boot Maintenance** menu.

The following options are available in the **EFI Boot Manager** menu:

- Boot from a File—Automatically adds EFI applications as boot options or enables you to boot from a specific file. When you select this option, the system searches for an EFI directory. If the EFI directory is found, then it looks in each of the subdirectories below EFI. In each of those subdirectories, it looks for the first file that is an executable EFI application. Each of the EFI applications that meet this criterion can be automatically added as a boot option. In addition, legacy boot options for A: and C: are also added if those devices are present.

  You can also launch a specific application without adding it as a boot option. In this case, the EFI Boot Manager searches the root directories and the `\EFI\TOOLS` directories of all of the EFI system partitions present in the system for the specified EFI application.
- Add a Boot Option—Adds a boot option to the EFI Boot Manager. Specify the boot option by providing the name of the EFI application. Along with the name, you can also provide either ASCII or UNICODE arguments the file uses. Given the EFI application name and any options, the EFI Boot Manager searches for the executable file in the same directories as described in the Boot from a File option. When the file is found, it is executed.
- Delete Boot Options—Deletes a specific boot option or all boot options.
- Change Boot Order—Controls the relative order in which the EFI Boot Manager attempts to execute boot options. For help on the control key sequences you need for this option, see the help menu.
- Manage BootNext Setting—Selects a boot option to use only once (the next boot operation).
- Set Automatic Boot Timeout—Defines the value in seconds before the system automatically boots without user intervention. Set this value to zero to disable the timeout feature.
- Exit—Returns control to the **EFI Boot Manager** menu. This displays the active boot devices, including a possible integrated shell (if the implementation is so constructed).

For more information, see “Using the Boot Option Maintenance Menu” (page 298).

EFI Commands

Table F-1 lists EFI commands for the server.

Table F-1 EFI Commands

EFI Shell Command	BCH Command Equivalent (PA-RISC)	BCH Command Parameters (PA-RISC)	Definition
These commands are found in all other menus			
info boot	Boot	[PRI | HAA | ALT | <path>]	Boot from specified path
help <command>	HElp	[<menu> | <command>]	Display help for specified command or menu
reset	RESET		Reset the server (to allow reconfiguration of complex
exit (at EFI Shell)	MAin		Return to the main menu
MAin			
EFI Boot Manager “change boot order”	PAth	[PRI | HAA | ALT | CON | KEY | <path>]	Display or modify a path

Table F-1 EFI Commands *(continued)*

EFI Shell Command	BCH Command Equivalent (PA-RISC)	BCH Command Parameters (PA-RISC)	Definition
bcfg	SEArch	[ALL]	Search for boot devices
bcfg	SEArch	[DIsplay|IPL] [<path>]	Search for boot devices
many commands offer a [-b] parameter to cause 25 line breaks	ScRoll	[ON | OFF]	Display or change scrolling capability
COnfiguration			
autoboot	AUto	[BOot | SEarch | STart] [ON | OFF]	Display or set the auto start flag
info boot	BootID	[<processor #>[<bootid #>]]	Display or set processor boot identifier
EFI Boot Manager	Boot info		Display boot-related information
autoboot	BootTimer	[0-200]	Seconds allowed for boot attempt
cpuconfig	CPUCONFIG	[<cpu>][ON | OFF]]	Configure or deconfigure processor
conconfig	CONCONFIG	[<cpu>] [index] [ON | OFF | primary]	Configure primary console
ioconfig	IOCONFIG	IOCONFIG [fast_init | wol [on | off]]	Deconfigure or reconfigure I/O components or settings
boottest	FastBoot	[ON | OFF] or [test] [RUN | SKIP]	Display or set boot tests execution
date	Time	[cn:yr:mo:dy:hr:mn[:ss]]	Read or set the date
time	Time	[cn:yr:mo:dy:hr:mn[:ss]]	Read or set the real time clock
INformation			
info all	ALL		Display all server information
info boot	BootINfo		Display boot-releated information
info cpu	CAche		Display cache information
info chiprev	ChipRevisions		Display revision number of major VLSI
MP command <df>	FRU		Display FRU information
info fw	FwrVersion		Display firmware version for PDC, ICM, and complex
info io	IO		Display firmware version for PDC, ICM, and complex
lanaddress	LanAddress		Display core LAN station address
info mem	Memory		Display memory information
info cpu	PRocessor		Display processor information
SERvice			
errdump clear	CLEARPIM		Clear (zero) the contents of PIM

Table F-1 EFI Commands *(continued)*

EFI Shell Command	BCH Command Equivalent (PA-RISC)	BCH Command Parameters (PA-RISC)	Definition
mm	MemRead	<addr> [<len>] [<type>]	Read memory locations scope of page deallocation
pdt	page deallocation table (pdt)		Display or clear the page deallocation table
errdump mca errdump cmc errdump init	processor internal memory (PIM)	[<proc>] [HPMC|LPMC|TOC|ASIC]]	Display PIM information

EFI/POSSE Commands

This section describes the EFI/POSSE commands developed for the server.

NOTE: EFI and Pre-OS System Environment (POSSE) are similar. EFI is an Intel specification. POSSE is an HP implementation of EFI that aids HP support.

help

Provides information on the EFI Shell commands. The help command also aids administrators familiar with the BCH menus to adjust to their equivalent functions in EFI.

Syntax

```
help [-b] <category>
help [-b] <cmd>
help [-b] bch <bchmenu> <bchcmd>
```

Parameters

```
-b              Enable page breaking
category        Category of commands to view help on commands
cmd             Shell command name on which to provide verbose information
bch             Display the list of BCH commands and their corresponding EFI
bchmenu         BCH menu name taken from the top level of the BCH menu
bchcmd          BCH command on which to display information
```

Operation

If you issue the `help` command with no parameters, a list of shell command categories displays. To list all of the commands within a category, enter **`help <category>`**. If help is issued with the **`-b`** option, any output longer than one page pauses after each page displays. If a shell command name is used as a parameter, verbose help displays for that command.

If you issue the `help` command with the **`bch`** option, it displays a list of BCH commands and their corresponding EFI/POSSE commands. It instructs you to repeat the command line followed by a menu name for more information on that menu. If you issue `help` within the **`bch`** option and a menu name, it displays a list of commands that appear under that BCH menu. You can then issue `help` followed by **`bch`**, the menu name, and a BCH command name to display information about that command. This points you to the EFI command that has taken the place of that BCH functionality, or will inform the user that the functionality no longer exists. Alternately, enter `help` followed by `bch` and a BCH command name to go straight to that command.

Example F-1 `help` Command

```
Shell> help
List of classes of commands:

boot          -- Booting options and disk-related commands
configuration -- Changing and retrieving system information
devices       -- Getting device, driver and handle information
memory        -- Memory related commands
shell         -- Basic shell navigation and customization
scripts       -- EFI shell-script commands Type "help" followed by a class name for a list of commands in that class
Type "help" followed by command name for full documentation
```

Example F-2 help bch Command

```
    COnfiguration          help bch co
    INformation            help bch in
    PAth                   help bch pa
    ScRool                 help bch sr
    SEArch                 help bch sea
    SERvice                help bch ser
    BOot                   help bch bo
    HElp                   help bch he
    RESET                  help bch reset
    MAin                   help bch ma

    For more help on one of the commands above, at the prompt type:
        help bch COMMAND
```

Example F-3 `help configuration` Command

```
Shell> help configuration
Configuration commands:

cpuconfig  -- Deconfigure or reconfigure cpus
date       -- Display or set date
err        -- Display or set error level
esiproc    -- Make an ESI call
errdump    -- View/Clear logs
info       -- Display hardware information
monarch    -- View or set the monarch processor
palproc    -- Make a PAL call
salproc    -- Make a SAL call
time       -- Display or set time
ver        -- Displays version info

Type "help" followed by command name for full documentation on that command.
Type "help -a" to display a list of all commands.
```

Example F-4 `help cpuconfig` **Command**

```
Shell> help cpuconfig

CPUCONFIG [cpu] [on | off]

   cpu    Specifies which cpu to configure
   on | off Specifies to configure or deconfigure a cpu

   Notes:
        1. Cpu status will not change until next boot

   Examples:
       * To deconfigure CPU 0
       fs0:\> cpuconfig 0 off
       CPU will be deconfigured on the next boot

       * To display configuration status of cpus
       fs0:\> cpuconfig
       <CPU configuration data displayed>
```

Example F-5 `help ioconfig`**Command**

```
Shell> help ioconfig
Deconfigure or reconfigure IO components or settings

IOCONFIG [fast_init | wol [on | off]]

fast_init  Specifies device connection policy setting
wol        Specifies System Wake-On-LAN setting
on | off     Specifies to configure or deconfigure a feature or component

Note:
   1. If fast_init is enabled, firmware will connect only the minimum set of
      devices during boot.  This feature might cause boot failure; disable
this
      feature if failure occurs.

   2. Any pending Wake-On-LAN request will not be cleared until reboot if
      the setting is changed to disabled.

      System will clear pending Wake-On-LAN requests each time the system
      reboots if the setting is disabled.

Examples:
  * To display the current settings
    fs0:\> ioconfig
    Fast initialization: Enabled
    System Wake-On-LAN: Disabled

  * To display the current device connection policy setting
    fs0:\> ioconfig fast_init
    Fast initialization: Enabled

  * To disable fast initialization
    fs0:\> ioconfig fast_init off
    Fast initialization: Disabled

  * To enable the System Wake-On-LAN setting
    fs0:\> ioconfig wol on
    System Wake-On-LAN: Enabled
```

baud

Sets the baud rate and communication settings for a universal asynchronous receiver-transmitter (UART).

Syntax

```
baud <index> <baudrate>
```

Parameters

```
<index> 0 through the total number of UARTS minus one
<baudrate>      baud rate.
```

Operation

Use this command to change the speed for a UART in the system. This command works for all UARTs visible to EFI/POSSE. If the UART is part of processor dependent hardware (PDH) space and is initialized by the core firmware, this command communicates the settings to core firmware so the UART can be initialized with the new settings on the next boot.

System default is 9600 baud.

Other communication parameters are listed in Table F-2.

Table F-2 Communications Parameters

Parameter	Value
RECEIVE_FIFO_DEPTH	1
TIMEOUT	1000000
PARITY	No parity
DATA_BITS	8
STOP_BITS	1
CONTROL_MASK	0

boottest

Interacts with the speedy boot variable enabling it to be set appropriately.

Syntax

```
boottest                        Displays status of all speedy boot bits
boottest on                     Run all tests (for a normal boot time)
boottest off                    Skip all tests (for a faster boot time)
boottest [test]                 Displays status of specific Speedy Boot bit
boottest [test] [on off]        Sets or clears a specific Speedy Boot bit
```

Parameters

```
[test]  Each test can be set or cleared:
        booting_valid   Enable/disable system firmware response to BOOTING
                        bit. If OS Speedy Boot aware set to on.
        early_cpu       Enable/disable early CPU selftests.
        late_cpu        Enable/disable late CPU selftests.
        platform        Enable/disable system board hardware tests.
        chipset         Enable/disable CEC tests.
        io_hw           Enable/disable EFI driver Core I/O tests.
        mem_init        Enable/disable memory initialization.
        mem_test        Enable/disable full destructive memory tests.
```

Example F-6 `boottest` **Command**

```
Shell> boottest
   BOOTTEST Settings Default Variable
   Selftest         Setting
   -------------    ------------------------
   booting_valid    On (OS speedy boot aware)
   early_cpu        Run this test
   late_cpu         Run this test
   platform         Run this test
   chipset          Run this test
   io_hw            Run this test
   mem_init         Run this test
   mem_test         Run this test
```

Example F-7 `boottest early_cpu off` **Command**

```
Shell> boottest early_cpu off
   BOOTTEST Settings Default Variable
   Selftest         Setting
   -------------    ------------------------
   booting_valid    On (OS speedy boot aware)
   early_cpu        Skip this test
   late_cpu         Run this test
   platform         Run this test
   chipset          Run this test
   io_hw            Run this test
   mem_init         Run this test
   mem_test         Run this test
```

cpuconfig

Use this command to display the configured or deconfigured state of processors in the system and enables the user to configure or reconfigure processors.

Syntax

```
cpuconfig <cpu> <on | off>
```

Parameters

```
<cpu>           specify a processor
<on | off>        state to set the processor to
```

Operation

Issue `cpuconfig` with no parameters to display the configured or deconfigured status of all processors. To reconfigure CPUs, specify a CPU number and a state `on` or `off`. If you enter a valid state that is different from the current state of a CPU, its status changes on the next boot.

NOTE: The last remaining configured CPU in a system cannot be deconfigured.

Example F-8 `cpuconfig` **Command**

```
Shell>  cpuconfig
PROCESSOR INFORMATION
       # of                  L3     L4     Family/
CPU    Logical               Cache  Cache    Model           Processor
Slot   CPUs        Speed     Size   Size    (hex.)     Rev     State
---   -------    ---------  ----   -----   ------   ----    ----------
 0         1      1 GHz     1.5 MB   None   1F/01     B1          Active
 1         1      1 GHz     1.5 MB   None   1F/01     B1          Active
```

Example F-9 `cpuconfig 2` **Command**

```
Shell> cpuconfig 2 off
CPU will be deconfigured on next boot.

Shell> cpuconfig
PROCESSOR INFORMATION
       # of                  L3     L4       Family/
CPU     Logical              Cache  Cache    Model           Processor
Slot    CPUs        Speed    Size   Size    (hex.)    Rev     State
---   -------    ---------  ----   -----   ------   ----    ----------
 0       1          1 GHz    3 MB   None    1F/00    B2          Active
 1       1          1 GHz    3 MB   None    1F/00    B2    Sched Deconf
```

conconfig

Use this command to configure the primary console and turn on other consoles for mirroring from the firmware.

Syntax

```
conconfig [index][on | off | primary]
```

Parameters

```
Index        Specifies index of console to set as primary
on           Enables the specified console as a secondary console
off          Puts console into "Not Configured" (NC) state
primary      Sets the specified console as primary
```

Notes

- Primary console setting will take effect after reboot
- P in the status column indicates that the console is the primary.
- S in the status column indicates that the console is the secondary.
- NC in the status column indicates that the console is not configured.
- If a disabled console is set to primary, it will be enabled.

Example F-10 `conconfig` **Command**

To display current primary operating system console

```
Shell> conconfig
CONSOLE CONFIGURATION
Index Status Type     Device Path
----- ------ ----     -----------
1      NC   Serial    Acpi(PNP0501,0)
```

```
 2      S    Serial    Acpi(HWP0002,0)/Pci(1 1)
 3       P    VGA      Acpi(HWP0002,0)/Pci(4 0)
```

Example F-11 `conconfig 2 primary`**Command**

To change primary operating system console

```
Shell> conconfig 2 primary
CONSOLE CONFIGURATION
 Index Status Type     Device Path
 ----- ------ ----     -----------
 1       NC  Serial    Acpi(PNP0501,0)
 2       P   Serial    Acpi(HWP0002,0)/Pci(1 1)
 3       S    VGA        Acpi(HWP0002,0)/Pci(4 0)
```

Example F-12 `conconfig 3 off`**Command**

To disable a console

```
Shell> conconfig 3 off
CONSOLE CONFIGURATION
Index Status Type     Device Path
 ----- ------ ----      -----------
 1      NC    Serial   Acpi(PNP0501,0)
 2      P     Serial   Acpi(HWP0002,0)/Pci(1 1
 3      NC    VGA      Acpi(HWP0002,0)/Pci(4 0)
```

Example F-13 `conconfig 3 on`**Command**

To enable a console

```
Shell> conconfig 3 on
CONSOLE CONFIGURATION
Index Status Type     Device Path
 ----- ------ ----      -----------
 1      NC    Serial   Acpi(PNP0501,0)
 2      P     Serial   Acpi(HWP0002,0)/Pci(1 1)
 3      S     VGA      Acpi(HWP0002,0)/Pci(4 0)
```

ioconfig

Use this command to deconfigure or reconfigure I/O components or settings.

Syntax

```
ioconfig <fast_init | wol> <on | off>
```

Parameters

```
<fast_init>    specify device connection policy setting
<wol>          specify system wake-on-lan setting
<on | off>       specify to configure or deconfigure a feature or component
```

Operation

The `ioconfig` file is used to retain information on system's I/O configuration across reboots. The `ioconfig` file is created by `insf` at install time; and is modified by `insf`, `rmsf`, and `ioscan` when devices are added or removed. The only purpose of the `ioconfig` file to maintain configuration information when the system is not running.

Example F-14 `ioconfig`Command

```
Shell> ioconfig
Deconfigure or reconfigure IO components or settings

IOCONFIG [fast_init | wol [on | off]]

fast_init  Specifies device connection policy setting
wol        Specifies System Wake-On-LAN setting
on | off     Specifies to configure or deconfigure a feature or component

Note:
   1. If fast_init is enabled, firmware will connect only the minimum set of
      devices during boot.  This feature might cause boot failure; disable
this
      feature if failure occurs.

   2. Any pending Wake-On-LAN request will not be cleared until reboot if
      the setting is changed to disabled.

      System will clear pending Wake-On-LAN requests each time the system
      reboots if the setting is disabled.

Examples:
  * To display the current settings
    fs0:\> ioconfig
    Fast initialization: Enabled
    System Wake-On-LAN: Disabled

  * To display the current device connection policy setting
    fs0:\> ioconfig fast_init
    Fast initialization: Enabled

  * To disable fast initialization
    fs0:\> ioconfig fast_init off
    Fast initialization: Disabled

  * To enable the System Wake-On-LAN setting
    fs0:\> ioconfig wol on
    System Wake-On-LAN: Enabled
```

default

Enables you to restore non-volatile memory (NVM) to default values and clear NVM storage values.

Syntax

```
default     [efi | sal]
default     clear [bmc | efi | sal]
```

Parameters

```
clear      clears NVM storage values
```

Operation

Sets NVM and stable store values to predefined default values. Normally only a subset of values are available for default. To reset the system, execute the `default clear` command.

errdump

Displays the contents of processor internal memory logged on the first machine check abort (MCA) for all processors present in the system.

Syntax

```
errdump [mca | cpe | cmc | init | la | clear]
```

Parameters

```
mca                  dumps the Machine Check Abort error log
cpe                  dumps the Corrected Platform Error log
cmc                  dumps the Corrected Machine Check log
init                 dumps the Initialization log
la                   dumps the Logic Analyzer log
clear                erases all of the logs (mca, cpe, cmc, init, la)
```

Operation

Enter `errdump` with no parameters to display usage. Otherwise, the specified error log displays. Add `-n` to the clear parameter to disable the confirmation prompt. Access the `errdump`command from the **System Configuration** menu.

info

Displays most system information.

Syntax

```
info [ -b] [target]
```

Parameters

```
target:         valid targets are:
        all        display everything
        cpu        display information on cpus
        cache      display information on cache
        mem        display information on memory
        io         display information on io
        boot       display boot-related information
        chiprev      display information on chip revisions
        fw         display firmware version information
        sys        display system information
        warning    display warning and stop boot information
```

Example F-15 `info all` **Command**

```
Shell> info all

SYSTEM INFORMATION

Date/Time:  Oct 31, 2003  22:03:39  (20:03:10:31:22:03:39)

Manufacturer:  hp

Product Name:  server bl60p

Product Number:  A9901A

Serial Number:  MYJ3350026

UUID:  48B4F371-E34C-11D6-A8D6-07A8C14CB68B

System Bus Frequency:  200 MHz

PROCESSOR MODULE INFORMATION

         # of               L3      L4      Family/

   CPU   Logical            Cache   Cache   Model         Processor

   Slot  CPUs     Speed     Size    Size    (hex.)   Rev  State

   ----  -------  --------  ------  ------  -------  ---  ------------

     0      1        1 GHz  1.5 MB    None   1F/01    B1        Active

     1      1        1 GHz  1.5 MB    None   1F/01    B1        Active

MEMORY INFORMATION

     ---- DIMM A -----  ---- DIMM B -----

      DIMM   Current     DIMM   Current

---  ------ ----------  ------ ----------

 0   1024MB     Active  1024MB     Active

 1    ----               ----

 2    ----               ----

 3    ----               ----

   Active Memory    : 2048 MB

   Installed Memory : 2048 MB

I/O INFORMATION

BOOTABLE DEVICES

   Order  Media Type  Path

   -----  ----------  ---------------------------------------

   Seg  Bus  Dev  Fnc  Vendor  Device Slot

    #    #    #    #     ID      ID     #    Path
```

```
--- --- --- --- ------ ------ --- -----------
 00  00  01  00 0x1033 0x0035  XX Acpi(HWP0002,0)/Pci(1|0)
 00  00  01  01 0x1033 0x0035  XX Acpi(HWP0002,0)/Pci(1|1)
 00  00  01  02 0x1033 0x00E0  XX Acpi(HWP0002,0)/Pci(1|2)
 00  00  02  00 0x1095 0x0649  XX Acpi(HWP0002,0)/Pci(2|0)
 00  00  03  00 0x8086 0x1229  XX Acpi(HWP0002,0)/Pci(3|0)
 00  20  01  00 0x1000 0x0030  XX Acpi(HWP0002,100)/Pci(1|0)
 00  20  01  01 0x1000 0x0030  XX Acpi(HWP0002,100)/Pci(1|1)
 00  20  02  00 0x14E4 0x1645  XX Acpi(HWP0002,100)/Pci(2|0)
BOOT INFORMATION
   Monarch CPU:
   Current  Preferred
   Monarch   Monarch   Possible Warnings
   -------  ---------  -----------------
         0          0
   AutoBoot: OFF - Timeout is disabled
   Boottest:
   BOOTTEST Settings Default Variable
   OS is not speedy boot aware.
   Selftest     Setting
   ---------    --------------
   early_cpu    Run this test
   late_cpu     Run this test
   platform     Run this test
   chipset      Run this test
   io_hw        Run this test
   mem_init     Run this test
   mem_test     Run this test
   LAN Address Information:
   LAN Address        Path
   -----------------  ----------------------------------------
   Mac(00306E4C4F1A)  Acpi(HWP0002,0)/Pci(3|0)/Mac(00306E4C4F1A))
```

```
  *Mac(00306E4C0FF2)  Acpi(HWP0002,100)/Pci(2|0)/Mac(00306E4C0FF2))

FIRMWARE INFORMATION

   Firmware Revision: 1.10 [4341]

   PAL_A Revision: 7.31/5.37

   PAL_B Revision: 5.37

   SAL Spec Revision: 3.01

   SAL_A Revision: 2.00

   SAL_B Revision: 1.10

   EFI Spec Revision: 1.10

   EFI Intel Drop Revision: 14.61

   EFI Build Revision: 1.10

   POSSE Revision: 0.10

   ACPI Revision: 7.00

   BMC Revision: 2.24

   IPMI Revision: 1.00

   SMBIOS Revision: 2.3.2a

   Management Processor Revision: E.02.25

WARNING AND STOP BOOT INFORMATION

CHIP REVISION INFORMATION

   Chip                  Logical     Device      Chip

   Type                     ID          ID       Revision

   -------------------   -------     ------     --------

   Memory Controller         0       122b         0023

   Root Bridge               0       1229         0023

     Host Bridge          0000       122e         0032

     Host Bridge          0001       122e         0032

     Host Bridge          0002       122e         0032

     Host Bridge          0004       122e         0032

     Other Bridge            0          0         0002

     Other Bridge            0          0         0007

      Baseboard MC            0           0         0224
```

Example F-16 `info cpu` **Command**

```
Shell> info cpu

PROCESSOR MODULE INFORMATION

         # of                L3      L4      Family/

   CPU   Logical             Cache   Cache   Model          Processor

   Slot  CPUs     Speed      Size    Size    (hex.)   Rev   State

   ----  -------  --------   ------  ------  -------  ---   ------------

     0      1         1 GHz  1.5 MB    None   1F/01    B1         Active

     1      1         1 GHz  1.5 MB    None   1F/01    B1         Active
```

Example F-17 `info mem` **Command**

```
Shell> info mem

MEMORY INFORMATION

     ---- DIMM A -----  ---- DIMM B -----

      DIMM   Current      DIMM   Current

---  ------ ----------  ------ ----------

 0   1024MB     Active  1024MB     Active

 1    ----               ----

 2    ----               ----

 3    ----               ----

   Active Memory    : 2048 MB

   Installed Memory : 2048 MB
```

Example F-18 `info io` Command

```
Shell> info io

I/O INFORMATION

BOOTABLE DEVICES


   Order  Media Type  Path

   -----  ----------  ---------------------------------------

    1    CDROM      Acpi(HWP0002,0)/Pci(2|0)/Ata(Primary,Master)/CDROM(Entry0)


   Seg  Bus  Dev  Fnc  Vendor  Device Slot
    #    #    #    #     ID      ID     #    Path

   ---  ---  ---  ---  ------  ------  ---  -----------

    00   00   01   00  0x1033  0x0035   XX  Acpi(HWP0002,0)/Pci(1|0)

    00   00   01   01  0x1033  0x0035   XX  Acpi(HWP0002,0)/Pci(1|1)

    00   00   01   02  0x1033  0x00E0   XX  Acpi(HWP0002,0)/Pci(1|2)

    00   00   02   00  0x1095  0x0649   XX  Acpi(HWP0002,0)/Pci(2|0)

    00   00   03   00  0x8086  0x1229   XX  Acpi(HWP0002,0)/Pci(3|0)

    00   20   01   00  0x1000  0x0030   XX  Acpi(HWP0002,100)/Pci(1|0)

    00   20   01   01  0x1000  0x0030   XX  Acpi(HWP0002,100)/Pci(1|1)

    00   20   02   00  0x14E4  0x1645   XX  Acpi(HWP0002,100)/Pci(2|0)

    00   40   01   00  0x1000  0x0021   02  Acpi(HWP0002,200)/Pci(1|0)

    00   40   01   01  0x1000  0x0021   02  Acpi(HWP0002,200)/Pci(1|1)

    00   80   01   00  0x14E4  0x1645   01  Acpi(HWP0002,400)/Pci(1|0)

    00   E0   01   00  0x103C  0x1290   XX  Acpi(HWP0002,700)/Pci(1|0)

    00   E0   01   01  0x103C  0x1048   XX  Acpi(HWP0002,700)/Pci(1|1)

    00   E0   02   00  0x1002  0x5159   XX  Acpi(HWP0002,700)/Pci(2|0)
```

Example F-19 `info boot` **Command**

```
Shell> info boot
BOOT INFORMATION
   Monarch CPU:
     Current  Preferred
     Monarch   Monarch    Possible Warnings
    --------  ---------   ------------------
           0           0
   AutoBoot: on - Timeout is : 7 SEC
   Boottest:
   boottest  Settings Default Variable
   OS is not speedy boot aware.

    Selftest        Setting
   ----------       --------------
    early_cpu       Skip this test
    late_cpu        Run this test
    platform        Run this test
    chipset         Run this test
    io_hw           Run this test
    mem_init        Run this test
    mem_test        Run this test
```

lanaddress

Displays the core I/O MAC address.

Syntax:

`lanaddress`

Parameters

none

Example F-20 `lanaddress` **Command**

```
Shell> lanaddress

LAN Address Information:

   LAN Address        Path

   -----------------  ----------------------------------------

   Mac(00306E4C4F1A)  Acpi(HWP0002,0)/Pci(3|0)/Mac(00306E4C4F1A))

  *Mac(00306E4C0FF2)  Acpi(HWP0002,100)/Pci(2|0)/Mac(00306E4C0FF2))
```

monarch

Displays or modifies the ID of the bootstrap processor. The preferred monarch number is stored in NVM.

Syntax

`monarch <cpu>`

Parameters

`<cpu>`   specifies a cpu

Operation

If specified with no parameters, `monarch` displays the Monarch processor for the system. Specifying a processor number alters the preferred Monarch processor. None of these changes takes affect until after a reboot.

Example F-21 `monarch` **Command**

```
Shell> monarch
 Current   Preferred
 Monarch    Monarch     Possible Warnings
 -------   ---------    -----------------
       0          0
       0          0

To view monarch: fs0 :  monarch

                 | Processor
-----------------+-----------
current status   |    0
next boot status |    0

To set the monarch processor to 1: fs0 :\ monarch 1

                 | Processor
-----------------+-----------
current status   |    0
next boot status |    1
```

pdt

Displays or clears the contents of the Page Deallocation Table (PDT).

Syntax

```
pdt (clear)
```

Parameters

```
<clear>      clears the pdt
```

Operation

With no options specified, `pdt` displays the PDT information for the system. You must clear the PDT and reboot the system for memory reallocation and safe booting.

Example F-22 `pdt` Command

```
Shell> pdt
PDT Information
                Last Clear time: PDT has not been cleared
       Number of total entries in PDT:                 50
        Number of used entries in PDT:                  0
        Number of free entries in PDT:                 50
  Number of single-bit entries in PDT:                  0
   Number of multi-bit entries in PDT:                  0
     Address of first multi-bit error:  x0000000000000000
```

Example F-23 `pdt clear` Command

```
Shell> pdt clear
Are you sure you want to clear the PDT? [y/N] y
Shell>

Shell> pdt
PDT Information

                Last Clear time: 10/21/01  5:00p
       Number of total entries in PDT:                 50
        Number of used entries in PDT:                  0
        Number of free entries in PDT:                 50
  Number of single-bit entries in PDT:                  0
   Number of multi-bit entries in PDT:                  0
     Address of first multi-bit error: 0x0000000000000000
```

sysmode

Displays or modifies the system mode.

Syntax

```
sysmode <normal | admin | service>
```

Parameters

```
<normal>     sets system mode to normal

<admin>      sets system mode to admin

<service>     sets system mode to service
```

Operation

If specified alone, `sysmode` displays the system mode. If a mode is specified as a parameter, the system mode changes immediately. The system mode is retained on successive boots.

Example F-24 `sysmode` **Command**

```
Shell> sysmode
System Mode: NORMAL

Shell> sysmode admin
You are now in admin mode.

Shell> sysmode service
You are now in service mode.

Shell> sysmode normal
You are now in normal mode
```

Specifying SCSI Parameters

The following SCSI parameters can be configured for the SCSI board:

- SCSI ID (SCSI initiator ID)
- Maximum data transfer rate (SCSI rate)
- Bus width
- Whether the HBA is bootable (driver support)
- Avoid bus resets (secondary cluster server)

Using the SCSI Setup Utility

To use the SCSI Setup Utility to specify SCSI parameters, follow these steps:

1. At the EFI Shell prompt, type the following command to map the parameters for all PCI cards installed in the system:

   `shell> info io`

   A list of all the devices that are installed in the server and managed by EFI drivers displays. For example:

```
    Seg  Bus  Dev  Fnc  Vendor  Device Slot
     #    #    #    #     ID      ID     #   Path

    ---  ---  ---  ---  ------  ------  ---  -----------

     00   00   01   00  0x1033  0x0035   XX  Acpi(HWP0002,0)/Pci(1|0)

     00   00   01   01  0x1033  0x0035   XX  Acpi(HWP0002,0)/Pci(1|1)

     00   00   01   02  0x1033  0x00E0   XX  Acpi(HWP0002,0)/Pci(1|2)

     00   00   02   00  0x1095  0x0649   XX  Acpi(HWP0002,0)/Pci(2|0)

     00   00   03   00  0x8086  0x1229   XX  Acpi(HWP0002,0)/Pci(3|0)

     00   20   01   00  0x1000  0x0030   XX  Acpi(HWP0002,100)/Pci(1|0)

     00   20   01   01  0x1000  0x0030   XX  Acpi(HWP0002,100)/Pci(1|1)

     00   20   02   00  0x14E4  0x1645   XX  Acpi(HWP0002,100)/Pci(2|0)

     00   40   01   00  0x1000  0x0021   02  Acpi(HWP0002,200)/Pci(1|0)

     00   40   01   01  0x1000  0x0021   02  Acpi(HWP0002,200)/Pci(1|1)

     00   80   01   00  0x14E4  0x1645   01  Acpi(HWP0002,400)/Pci(1|0)

     00   E0   01   00  0x103C  0x1290   XX  Acpi(HWP0002,700)/Pci(1|0)

     00   E0   01   01  0x103C  0x1048   XX  Acpi(HWP0002,700)/Pci(1|1)
```

```
00   E0   02   00  0x1002  0x5159   XX  Acpi(HWP0002,700)/Pci(2|0)
```

In this example, a single SCSI interface is listed.

For each channel of the SCSI board, note certain information. For example, look at the information for the SCSI interface. For each channel of *this* SCSI interface, note the following information:

- `Bus #`: Identifies the bus the device is on. This is the same for both channels. In this example, the bus number is `20`.
- `Dev #`: The ID the device is assigned on the bus. This is the same for both channels. In this example, the SCSI interface is device `01`.
- `Fnc #`: Identifies the channel of the device (`00` for channel A, `01` for channel B, and so on). In this example, because the SCSI interface has two channels, one channel is `00` and the other is `01`.
- `Vendor ID`: Shows the device vendor ID. This is the same for both channels. For all SCSI interfaces, the ID is `0x1000`.
- `Device ID`: Shows the device ID. This is the same for both channels. In this example, the SCSI interface the ID is `0x0030`.
- `Slot #`: Identifies the physical card slot in the system where the SCSI interface is installed. This is the same for both channels. In this example, the SCSI interface is on the system board, therefore the slot number is `xx`.
- `Path`: Identifies the device path. In this example, the SCSI interface path is `Acpi(HWP0002,200)/Pci(1|0)` for channel A and `Acpi(HWP0002,200)/Pci(1|1)` for channel B.

Using the SCSI interface information from this example, the combined information that tells you this is a SCSI interface are the following (shown in **bold**, for highlighting purposes):

```
00   20   01   00  0x1000  0x0030   xx  Acpi(HWP0002,200)/Pci(1|0)
00   20   01   01  0x1000  0x0030   xx  Acpi(HWP0002,200)/Pci(1|1)
```

The vendor (**0x1000**) and device (**0x0030**) are the IDs for a SCSI interface. Of the devices with those IDs, this device has two channels (Fnc # of **00** followed by Fnc # of **01**). Also, this SCSI interface has a non-numeric (XX) slot # indicating that it is on the system board.

2. From the EFI Shell prompt, enter the following command to obtain the controller's handle for the SCSI interface:

   `Shell> devtree`

   A tree of all EFI-capable devices installed in the system displays. For example:

```
Shell> devtree

Device Tree

Ctrl[04]

Ctrl[0A] Acpi(HWP0002,0)

Ctrl[12] Usb Open Host Controller

Ctrl[13] Usb Open Host Controller

Ctrl[14] Acpi(HWP0002,0)/Pci(1 2)

Ctrl[15] PCI IDE/ATAPI Controller

Ctrl[48] DW-28E

Ctrl[83] FAT File System [FAT32] 118 MB
```

```
Ctrl[16] Acpi(HWP0002,0)/Pci(3|0)

Ctrl[49] Acpi(HWP0002,0)/Pci(3|0)/Mac(00306E4C4F1A)

Ctrl[0B] Acpi(HWP0002,100)

Ctrl[17] LSI Logic Ultra320 SCSI Controller

Ctrl[18] LSI Logic Ultra320 SCSI Controller

Ctrl[19] Acpi(HWP0002,100)/Pci(2|0)

Ctrl[4B] Broadcom NetXtreme Gigabit Ethernet (BCM5701)

Ctrl[0C] Acpi(HWP0002,200)

Ctrl[0D] Acpi(HWP0002,400)

Ctrl[0E] Acpi(HWP0002,700)

Ctrl[1A] Acpi(HWP0002,700)/Pci(1|0)

Ctrl[1B] Acpi(HWP0002,700)/Pci(1|1)

Ctrl[36] 16550 Serial UART Driver

Ctrl[37] VT-100+ Serial Console

Ctrl[31] Primary Console Input Device

Ctrl[32] Primary Console Output Device

Ctrl[30] Primary Standard Error Device

Ctrl[1C] Acpi(HWP0002,700)/Pci(2|0)

Ctrl[32] Primary Console Output Device

Ctrl[30] Primary Standard Error Device

Ctrl[33] Acpi(PNP0501,0)

Ctrl[34] 16550 Serial UART Driver

Ctrl[35] VT-100+ Serial Console

Ctrl[31] Primary Console Input Device

Ctrl[32] Primary Console Output Device

Ctrl[30] Primary Standard Error Device

Ctrl[44] VenHw(904EFCF0-F0A8-11D4-B4CA-303031303833)

Ctrl[46] VenHw(D65A6B8C-71E5-4DF0-A909-F0D2992B5AA9)
```

This information describes the SCSI interface because the path on the first line, `Acpi(HWP0002,100)`, is the path from the information displayed by the `info io` command. The next two lines describe the SCSI interface two channels, one line for each channel. The lines contain the SCSI interface description [`LSI Logic Ultra160 SCSI Controller`]. The value shown for `Ctrl`—`17` and `18` at the beginning of each line is the controller's handle for each channel. You need this value for the next step.

NOTE: The controller's handle values changes on every boot.

3. From the EFI Shell prompt, enter the following command to obtain the EFI driver's handle for the SCSI interface:

   `Shell> drvcfg`

   A list of all EFI-capable configurable components in the system is displayed. For example:

   ```
   Shell> drvcfg

   Configurable Components

   Drv[3D] Ctrl[15] Lang[eng]

   Drv[3F] Ctrl[19] Lang[eng]

   Drv[45] Ctrl[17] Lang[eng]

   Drv[45] Ctrl[18] Lang[eng]
   ```

   This listing shows which driver controls which device (controller). This information describes a SCSI interface because the values shown for `Ctrl—17` and `18` are the controller's handles for the SCSI interface two channels (from the information displayed by the `devtree` command).

NOTE: The EFI driver's handle values change on every boot.

TIP: From this command (`drvcfg`), record these two pieces of information for each channel of each SCSI interface for parameters to be changed:

- `Drv`(the EFI driver's handle)
- `Ctrl`(the controller's handle)

4. Using the driver's handle [`Drv`] and the controller's handle [`Ctrl`] from the `drvcfg`command, start the EFI SCSI Setup Utility for one channel of this SCSI interface.

   At the EFI Shell prompt, enter:

   `Shell> drvcfg -s` ***`drvr_handle cntrl_handle`***

   where:

   - *`drvr_handle`*: The handle of the driver that controls the channel with the SCSI ID you want to display or change.
   - *`cntrl_handle`*: The handle of the controller for the channel with the SCSI ID you want to display or change.

   For channel A of this SCSI interface, enter:

   `Shell> drvcfg -s 45 18`

5. The EFI SCSI Setup Utility starts and its main menu displays, showing a list of all the EFI capable SCSI interfaces in the system.

   Move the cursor to highlight the channel of the SCSI interface. Press **Enter** to determine which channel of the interface to highlight, match the `PCI Bus`, `PCI Dev`, and `PCI Func` values on this screen to the `Bus #`, `Dev #`, and `Fnc #` values from the `info io` command.

CAUTION: Do **not** select the `<Global Properties>` option on the main menu.

TIP: To move the cursor in the EFI SCSI Setup Utility, use the following keys:

- Arrow keys: ↑ ↓ ← →
- Alternate keys:

  H = left

  J = down

  K = up

  L = right

  I = home

  O = end

6. The **Adapter Properties** screen for this channel of the SCSI interface displays. Be sure the utility is running for the channel of the SCSI interface by comparing the values shown for `PCI Bus`, `PCI Device`, and `PCI Function` to the `Bus #`, `Dev #`, and `Fnc #` values from the `info io` command.

CAUTION: Do **not** change the value for any of the following fields on the **Adapter Properties** screen:

- `Auto Termination`
- `SCSI Parity`
- `SCSI Bus Scan Order`
- `Spinup Delay (Secs)`

Changing any of these fields can cause unpredictable results.

CAUTION: Do **not** change the value for any of the following fields on the **Device Properties** screen:

- `Scan Id`
- `Scan LUNs > 0`
- `Disconnect`
- `SCSI Timeout`
- `Queue Tags`
- `Format`
- `Verify`

Changing any of these fields can cause unpredictable results.

7. Display the SCSI parameters listed below for the channel of the SCSI interface and change the parameters if necessary, or restore its SCSI parameters to their default values.
   - SCSI ID
   - Maximum data transfer rate
   - Bus width
   - Whether the SCSI interface is bootable (driver support)
   - Avoid bus resets (secondary cluster server)
   - Restore Defaults
8. Use the arrow keys to navigate to the appropriate SCSI parameter.

9. Use the plus (**+**) and minus (**-**) keys to scroll through the values until the value you want displays.
10. Press **Esc** to exit the **Adapter Properties** screen.
11. Move the cursor to the action (`cancel`, `save`, or `discard`) you want to take, and press **Enter**.Select one of the following options:
    - Cancel the exit to stay on the **Adapter Properties** screen for the channel of the SCSI interface.
    - Save the changes you made, then exit the screen.
    - Discard the changes you made, then exit the screen.

    If you select `cancel`, you remain in the **Adapter Properties** screen for the channel of the SCSI interface. You can still change the channel's parameters.

    If you select `save` or `discard`, you go to the EFI SCSI Setup Utility main menu.

CAUTION: Do not select the `<Global Properties>` option on the main menu.

12. Press **Esc** to exit the main menu and the EFI SCSI Setup Utility.
13. Select the option for exiting the utility.
14. When prompted, press **Enter** to stop the SCSI interface; you are at the EFI Shell prompt.
15. At the EFI Shell prompt, enter the following command:

    ```
    Shell> reset
    ```

    The system starts to reboot. This is required to enable the new SCSI setting.

Using the Boot Option Maintenance Menu

This menu enables you to select console output and input devices as well as various boot options. It contains the following options:

- "Boot From a File" (page 299)
- "Add a Boot Option" (page 299)
- "Delete Boot Option(s)" (page 300)
- "Change Boot Order" (page 300)
- "Manage BootNext Setting" (page 301)
- "Set Auto Boot TimeOut" (page 301)
- "Select Active Console Output Devices" (page 302)
- "Select Active Console Input Devices" (page 303)
- "Select Active Standard Error Devices" (page 304)
- "Security/Password Menu" (page 304)
- "Resetting Passwords" (page 304)

These options are described in the following sections.

The following selections are available on all menus:

- **Help**: Displays the help available for the command.
- **Exit**: Returns to the main Boot Options Maintenance menu.
- **Enter**: Selects an item after using the arrow keys to highlight the item.
- **Save Settings to NVRAM**: Saves your changes.

NOTE: The options shown here are examples. Your system may have different options available based on the system configuration and installed hardware components.

Paths

All devices in the server are represented by paths in the EFI Shell. To identify the correct socket or disk drive, use the following tables.

Table F-3 Server Sockets

Socket	Path
1 PCI	Acpi(HWP0002,400)/pci(0|0)
2 PCI	Acpi(HWP0003,400)/pci(0|0)

Table F-4 Server Drives

Drive	Path
SCSI Disk	Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun0,Lun0)
SCSI Disk	Acpi(HWP0002,100)/Pci(1|1)/Scsi(Pun0,Lun1)
Removable Media Boot	Acpi(HWP0002,0)/Pci(2|0)/ATA(Primary,Master)

Boot From a File

Use this option to manually run a specific application or driver.

NOTE: This option boots the selected application or driver one time only. When you exit the application, you return to this menu.

This option displays the file systems on your server or workstation and enables you to browse these file systems for applications or drivers that are executable. Executable files end with the `.efi` extension. You can also select remote boot (LAN) options that have been configured on the network.

For example:

```
Boot From a File. Select a Volume

    NO VOLUME LABEL [Acpi(HWP0002,0)/Pci(2|0)/Ata(Primary,Master)/CDROM

    CD_FORMAT [Acpi(HWP0002,0)/Pci(2|0)/Ata(Secondary,Master)/CDROM

    Removable Media Boot [Acpi(HWP0002,500)/Pci(2|0)/Ata(Secondary,Master)

    Load File [EFI Shell [Built-in]]

    Load File [Acpi(HWP0002,0)/Pci(3|0)/Mac(00306E4C4F1A)]

    Exit
```

Where:

- `NO VOLUME LABEL`: A hard drive. When you format a hard drive, the EFI tools provide an option to LABEL the disk. In this example, the volume is not labelled.
- `CD_FORMAT`: The label created for the disk currently inside the DVD drive.
- `Removable Media Boot`: Allows you to boot from a removable media drive (CD/DVD drive). This option does not support booting from a specific file on a specific CD.
- `Load Files`: The EFI Shell and the LAN.

Add a Boot Option

Use this option to add items to the EFI boot menu.

This option displays the file systems that are on your system and lets you browse these file systems for applications or drivers that are executable. Executable files end with the `.efi`extension. You can also select remote boot (LAN) options that have been configured on the network. The option you select is added to the EFI boot menu.

If you add a new drive to your system, you must manually add its boot options list to make it a bootable device.

When adding a boot option that already exists in the Boot Manager list of boot options, you can choose whether to create a new option or modify the existing one.

- To modify an existing option, change the boot option name or add boot option arguments to the existing option.

NOTE: If you create a new boot option for an already existing option, multiple instances of the same boot option exist.

For example:

```
Add a Boot Option. Select a Volume

NO VOLUME LABEL [Acpi(HWP0002,0)/Pci(2|0)/Ata(Primary,Master)/CDROM

    Removable Media Boot [Acpi(HWP0002,0)/Pci(2|0)/Ata(Secondary,Master)

    Load File [EFI Shell [Built-in]]

    Load File [Acpi(HWP0002,0)/Pci(3|0)/Mac(00306E4C4F1A)]

    Exit
```

Where:

- NO VOLUME LABEL: A hard drive. You can search through the disk for bootable applications to add to the Boot Manager list of Boot options.
- `Removable Media Boot`: Treats the removable media as a bootable device.
- `Load File EFI Shell`: Adds a new instance to the EFI Shell. Load File with the MAC address adds a network boot option.
- `Load File with the MAC address`: Adds a network boot option.

Delete Boot Option(s)

Use this option to remove boot options from the EFI boot menu.

NOTE: This does not delete any files, applications, or drivers from your system.

This option displays a list of boot options that are configured on the system. The names match the options on the main Boot Manager menu.

If you remove a drive from the system, you must manually delete it from the boot options list.

- To delete an item from the list, use the arrow keys to highlight the item and press **Enter**.
- To remove all of the entries from the EFI Boot menu, select **Delete All Boot Options**. This setting can be used as a security device on systems that are accessed remotely.

Change Boot Order

Use this option to change the order of boot options. The order in which options are listed in the EFI boot menu also reflects the order in which the system attempts to boot. If the first boot option fails, the system tries to boot the second option, then the third, and so forth, until a boot option succeeds or until all options have failed.

For example, if you normally boot using a configuration on your LAN but want to boot from a local hard drive if the LAN is unavailable, move the LAN boot option to the top of the list, followed by the hard drive boot option.

The menu lists boot options that currently exist in the main Boot Manager menu. To change the priority of the items, select an option and move it up or down in the list.

- Press **U** to move an option up.
- Press **D** to move an option down.

- Select **Save Settings to NVRAM** to modify the order in the Boot Manager menu, which modifies the order that the Boot Manager attempts to boot the options.
- The items at the bottom of the screen are descriptions of the selected option.

For example:

```
Change boot order. Select an Operation

    EFI Shell [Built-in]

    Current OS

    Save Settings to NVRAM

    Help

    Exit



    VenHw(D65A6B8C-71E5-4DF0-A909-F0D2992B5AA9)

    Boot0000
```

Manage BootNext Setting

Use this option to run the selected boot option immediately upon entering the main Boot Manager menu. Select this option to boot an option that only needs to be booted once, without changing any other setting in the main Boot Manager menu. This is a one-time operation and does not change the permanent system boot settings.

This option displays the file systems that are on your system and lets you browse these file systems for applications or drivers that are executable. Executable files end with the `.efi`extension. You can also select remote boot (LAN) options that have been configured on the network.

To restore the default **BootNext** setting, select **Reset BootNext Setting**.

For example:

```
Manage BootNext setting. Select an Operation

    EFI Shell [Built-in]

    Current OS

    Reset BootNext Setting

    Save Settings to NVRAM

    Help

    Exit


    VenHw(D65A6B8C-71E5-4DF0-A909-F0D2992B5AA9)

    Boot0000
```

Set Auto Boot TimeOut

Use this option to set the amount of time the system pauses before attempting to launch the first item in the Boot Options list.

For example:

```
Set Auto Boot Timeout. Select an Option

    Set Timeout Value

    Delete/Disable Timeout

    Help

    Exit
```

Interrupting the timeout during the countdown stops the Boot Manager from loading any boot options automatically. If there is no countdown set, you must select boot options manually.

- To set the auto boot timeout value, in seconds, select **Set Timeout Value** and enter the desired value.
- To disable the timeout function, select **Delete/Disable Timeout**.

NOTE: When this option is selected, the server does not automatically boot. The server stops at the EFI boot menu and waits for user input.

Select Active Console Output Devices

Use this option to define the devices that display output from the system console. This list includes the VGA monitor and a serial port for directing output to a terminal emulation package.

NOTE: Multiple consoles are not supported for HP-UX or Windows. Use the Smart Setup CD to switch between COM A and the iLO 2 MP on Windows systems.

For example:

```
Select the Console Output Device(s)

      Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(PcAnsi)

Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(Vt100)

* Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(Vt100+)

Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(VtUtf8)

Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(PcAnsi)

Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(Vt100)

* Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(Vt100+)

Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(VtUtf8)

* Acpi(HWP0002,700)/Pci(2|0)
```

* indicates a currently selected device.

This menu is identical to the **Console Error Devices** menu. The server does not support different configurations for Output and Error console. When you make changes to either Output or Error console menus, you must make the identical change in the other menu. When you change serial devices, you must make changes to Output, Input, and Error menus for proper operation

Table F-5 Console Output Devices

Device	Select
Serial A/Serial 1	Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(Vt100+)
iLO 2 MP Serial Console	Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(Vt100+)
iLO 2 MP VGA Port	Acpi(HWP0002,700)/Pci(2|0)

- Each option is identified with an EFI device path. Not all options are available, depending on the configuration of the system and the options available. Device paths can differ slightly on different product models.
- On both serial device examples, UART 9600 indicates the current baud rate of the serial device which can be changed with the EFI Shell `baud` command, VenMsg Vt100+ is the current emulation type. Several different terminal emulation protocols are supported, as described in the previous example.
- Only one terminal emulation type (PcAnsi, Vt100, and so on) can be selected for each serial console, but multiple serial consoles can be selected at once.

Select Active Console Input Devices

Use this option to define the devices that are used to provide input to the system console.

This option displays the console devices on the system. This can include a standard keyboard and mouse, and a serial port for receiving output from a terminal emulation package on a laptop. Several different terminal emulation protocols are supported. When you change serial devices, you must make changes to Output, Input, and Error menus for proper operation.

NOTE: Some operating systems support multiple input devices, such as a simultaneous serial and keyboard input. See your OS documentation to determine how many consoles are supported with your system.

For example:

```
Select the Console Input Device(s)
  Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(PcAnsi)
  Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(Vt100)
* Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(Vt100+)
  Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(VtUtf8)
  Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(PcAnsi)
  Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(Vt100)
* Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(Vt100+)
  Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(VtUtf8)
```

* Indicates a currently selected device.

- Each option is identified with an EFI Device path. Not all options will be available, depending on the configuration of the system and the options available. Device paths can differ slightly on different product models.
- On both serial device examples, `UART 9600` indicates the current baud rate of the serial device, `VenMsg Vt100+` is the current emulation type. Several different terminal emulation protocols are supported.
- Only one terminal emulation type (PcAnsi, Vt100, and so on) can be selected for each serial console, but multiple serial consoles can be selected at once.

Table F-6 Console Input Devices

Device	Select
Serial A/Serial 1	Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(Vt100+)
iLO 2 MP Serial Console	Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(Vt100+)

Select Active Standard Error Devices

Use this option to define the devices that display error messages from the system console.

This menu is identical to the Console Output Devices menu. The server does not support different configurations for Output and Error console. When you make changes to either Output or Error console menus, you must make the identical change in the other menu. When you change serial devices, you must make changes to Output, Input, and Error menus for proper operation

Using the System Configuration Menu

The System Configuration Menu on systems with EFI firmware version 2.0 or higher includes the following options:

- Security/Password Menu: Enables you to change the administrator and user passwords.
- Advanced System Information Menu: Displays information about system and component configuration.
- Set System Date: Enables you to modify the system date.
- Set System Time: Enables you to modify the system time.
- Reset Configuration to Default: Enables you restore system settings to their original configuration.
- Help: Displays additional information about the available options.
- Exit: Returns to the EFI startup menu.

Security/Password Menu

You can set administrator and user passwords to provide different levels of access to the system firmware.

Resetting Passwords

If you forget your passwords, reset them by running using the iLO 2 MP <Ctrl+N>rscommand. This commando resets the iLO 2 MP and resets the password.

NOTE: You can only run this command when directly connected to the server.

iLO 2 MP

The **Integrated Lights-Out** management processor (iLO MP) for entry class Integrity servers is an autonomous management subsystem embedded directly on the server. It is the foundation of the server's High Availability (HA), embedded server, and fault management. It also provides system administrators secure remote management capabilities regardless of server status or location. The iLO MP is available whenever the system is connected to a power source, even if the server main power switch is in the off position.

HP has used several different names over the years to describe the management functionality embedded in their servers, including "the management processor." In addition, HP uses the term "management processor" to refer to any embedded microprocessor that manages a system. Management processor is a descriptive term (such as "server"), and iLO, is a brand name, or label (such as "Integrity").

Remote access is the key to maximizing efficiency of administration and troubleshooting for enterprise servers. Integrity servers have been designed so all administrative functions that can be performed locally on the machine, can also be performed remotely. iLO enables remote access to the operating system console, control over the server's power and hardware reset functionality, and works with the server to enable remote network booting through a variety of methods.

iLO 2 refers to an Integrated Lights Out 2 management processor (iLO 2 MP) with the latest advanced digital video redirection technology. This new feature gives you a higher performance graphics console redirection experience than with the previous iLO.

See the *HP Integrity iLO 2 MP Operations Guide* for complete information on the iLO 2 MP.

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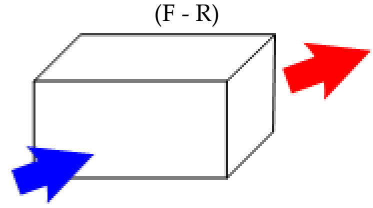
G Physical and Environmental Specifications

Table G-1 Physical and Environmental Specifications

<table>
<tr><th rowspan="3"></th><th colspan="5">Condition</th><th colspan="3" rowspan="2">Weight</th><th colspan="2" rowspan="2">Overall System Dimensions (W X D X H</th></tr>
<tr><th>Typical Heat Release</th><th colspan="2" rowspan="2">Airflow, Nominal</th><th colspan="2" rowspan="2">Airflow, Maximun at 35°C[1]</th></tr>
<tr><th>Voltage 200-240 Vac</th><th>Server</th><th>Rack</th><th>Pedestal</th><th>Rack</th><th>Pedestal</th></tr>
<tr><td>Description</td><td>Watts</td><td>CFM</td><td>m³/hr[2]</td><td>CFM</td><td>m³/hr[2]</td><td rowspan="4">120-150 lbs.</td><td rowspan="4">150 lbs (68.04 kg) max</td><td>Max: 15.5 kg. (34 lbs.)</td><td rowspan="4">69.6 cm (27.4 in) x 44 cm (17.32 in) x 30.58 cm (12.04 in)</td><td rowspan="4">69.3 cm (27.3 in) x 48.9 cm (19.3 in) x 42.2 cm (16.7 in)</td></tr>
<tr><td>Minimum Configuration</td><td>433 W</td><td>346</td><td>588</td><td>441</td><td>750</td><td>154 lbs. (6909 kg.)</td></tr>
<tr><td>Maximum Configuration</td><td>1633 W</td><td>346</td><td>588</td><td>441</td><td>750</td><td>184 lbs. (83.5 kg.)</td></tr>
<tr><td>Typical Configuration</td><td>998 W</td><td>346</td><td>588</td><td>441</td><td>750</td><td></td></tr>
<tr><td colspan="11"></td></tr>
<tr><td rowspan="3">ASHRAE Class 1</td><td colspan="4" rowspan="3">Air Flow Diagram Cooling Scheme (F - R)

Front to Rear (F-R)</td><td>Minimum Configuration</td><td colspan="5">(1x) Itanium 1.4G/12M or 1.6G/18M or 1.6G/24M CPUs, (4x) 4GB DDRII DIMM memory, (0x) SAS Hard Drives, (0x) PCI/PCI-X/PCI-E added to public I/O cards.</td></tr>
<tr><td>Maximum Configuration</td><td colspan="5">(4x) 1.6G/24M CPUs, (48x) 4GB DDRII DIMM memory, (16x) SAS Hard Drives, (8x) PCI/PCI-X/PCI-E added to public I/O cards.</td></tr>
<tr><td>Typical Configuration</td><td colspan="5">Half-loaded configuration: (2x) Itanium 1.4G/12M or 1.6G/18M or 1.6G/24M CPUs, (24x) 4GB DDRII DIMM memory, (8x) SAS Hard Drives, (4x) PCI/PCI-X/PCI-E added to public I/O cards.</td></tr>
</table>

1 Derate maximum dry bulb temperature 1oC/300 m above 900 m.

2 m^3/hr=1.7 x CFM