Intel® SR870BN4 Server System Product Guide

Order Number: A67043-004 Revision 01

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

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Part I: User's Guide

1 System Description

2 Board Set Description

3 Configuration Software and Utilities

4 Hot-swapping System Components

This manual consists of two parts:

- User's Guide, beginning on page 13—describes procedures that DO NOT REQUIRE internal server access. The user does not need to be a qualified service technician to perform procedures listed in the User's Guide.
- Service Technician's Guide, beginning on page 175—describes procedures that REQUIRE internal server access. The user must be a qualified service configuration technician to perform procedures listed in the Service Technician's Guide.

⚠ WARNING

Only a QUALIFIED SERVICE TECHNICIAN is authorized to remove the server's covers and to access any of the components inside the server, except as noted herein. Before removing top covers or modules, see "Figure 58. Locating System Modules" on page 181 and "Warnings and Cautions" on page 179.

⚠ WARNING

Anchor the equipment rack: The equipment rack must be anchored to an unmovable support to prevent it from falling over when one or more servers are extended in front of the rack on slides. The anchors must be able to withstand a force of up to 113 kg (250 lbs.). The user must also consider the weight of any other device installed in the rack. A crush hazard exists should the rack tilt forward which could cause serious injury.

Main AC power disconnects: The user is responsible for installing an AC power disconnect for the entire rack unit. This main disconnect must be readily accessible, and it must be labeled as controlling power to the entire unit, not just to the server(s).

Grounding the rack installation: To avoid the potential for an electrical shock hazard, the user must include a third wire safety-grounding conductor with the rack installation. If the server power cord is plugged into an AC outlet that is part of the rack, then the user must provide proper grounding for the rack itself. If the server power cord is plugged into a wall AC outlet, the safety-grounding conductor in the power cord provides proper grounding only for the server. The user must provide additional, proper grounding for the rack and other devices installed in it.

Overcurrent protection: The server is designed for an AC line voltage source with up to 20 amperes of overcurrent protection. If the power system for the equipment rack is installed on a branch circuit with more than 20 amperes of protection, the user must provide supplemental protection for the server.

⚠ WARNING – POWER CORD RATING

Do not attempt to modify or use an AC power cord that is not the exact type required. The user must use a power cord that meets the following criteria:

- Rating: For U.S./Canada cords must be UL Listed/CSA Certified, 16/3, 75C type, VW-1, SJT/SVT, with NEMA 5-15P or NEMA 6-15P attachment plug and IEC 320 C13 input power connector rated 15 amps. For outside U.S./Canada cords must be flexible harmonized (<HAR>) rated 250 V, 1.0 mm minimum conductor size with IEC 320 C13 input power connector and rated for no less than 10 amps.
- AC Attachment Connector, wall outlet end for outside U.S./Canada: The AC wall attachment plug should be a three conductor grounding type, rated at 125 V, 15 amps and must be for the configuration of the specific region or country. The AC wall attachment plug must bear at least an accepted safety agency certification mark for the specific region or country.
- Input Power Connector, server end: The connectors that plug into the AC receptacles on the server must be an IEC 320, sheet C13, type female connector and are rated for 125 V/250 V, 15 A.
- Cord length and flexibility: Cords must be less than 4.5 meters (14.76 feet) long.

⚠ CAUTION

Temperature: The range of temperatures in which the server operates when installed in an equipment rack, must not go below 10 °C (50 °F) or rise above 35 °C (95 °F). Extreme fluctuations in temperature can cause a variety of problems in your server.

Ventilation: The equipment rack must provide sufficient airflow to the front of the server to maintain proper cooling. The rack must also include ventilation sufficient to exhaust a maximum of 1500 W (5,100 BTU/hr) for the server. The rack selected and the ventilation provided must be suitable to the environment in which the server will be used.

Regulatory Specifications and Disclaimers

Declaration of the Manufacturer or Importer

We hereby certify that this product is in compliance with European Union EMC Directive 89/336/EEC, using standards EN55022 (Class A) and EN55024 and Low Voltage Directive 73/23/EEC, Standard EN60950.

Safety Compliance

USA:	UL 1950 – 3rd Edition/CSA 22.2. No. 950-M93
Canada:	UL Certified – 3rd Edition/CSA 22.2. No. 950-M93 for Canada (product bears the single UL mark for U.S. and Canada)
Europe:	Low Voltage Directive, 73/23/EECTUV/GS to EN60950 2nd Edition with Amendments, A1 = A2 + A3 + A4
International:	TUV/CB to IEC 60950 3rd Edition, EN60 950 2nd Edition + Amd 1-4, EMKO-TSE (74-SEC) 207/94 plus international deviations
Australian / New Zealand:	CB Report to IEC 60950, 3rd Edition plus Australian deviations

Electromagnetic Compatibility (EMC)

USA:	FCC CFR 47 Part 2 and 15, Verified Class A Limit
Canada:	IC ICES-003 Class A Limit
Europe:	EMC Directive, 89/336/EEC: EN55022, Class A Limit, Radiated & Conducted Emissions EN55024, ITE Specific Immunity Standard EN61000-4-2, ESD Immunity (Level 2 Contact Discharge, Level 3 Air Discharge) EN61000-4-3, Radiated Immunity (Level 2) EN61000-4-4, Electrical Fast Transient (Level 2) EN61000-4-5, AC Surge EN61000-4-6, Conducted RF EN61000-4-8, Power Frequency Magnetic Fields EN61000-4-11, Voltage Dips and Interrupts EN61000-3-2, Limit for Harmonic Current Emissions EN61000-3-3, Voltage Flicker
Japan:	VCCI Class A ITE (CISPR 22, Class A Limit) IEC 1000-3-2 Limit for Harmonic Current Emissions
Australia/New Zealand:	AS/NZS 3548, Class A
Taiwan:	BSMI Approval, Class A
Korea:	RRL Approval, Class A
Russia:	GOST Approved
International:	CISPR 22, Class A Limit

FCC Electromagnetic Compatibility Notice (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operating in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In this case, the user is required to correct the interference at the users own expense. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on; the user is encouraged to try to correct the interference by one or more of the following measures:

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

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment. The customer is responsible for ensuring compliance of the modified product.

FCC Declaration of Conformity

Product Type: SR870BN4

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

For questions related to the EMC performance of this product, contact:

Intel Corporation
2800 Center Drive
Dupont, WA 98327 USA

Laser Compliance Notice

Intel products that use laser technology comply with Class 1 laser requirements.

Class 1 Laser Product
Luokan 1 Laserlaite
Klasse 1 Laser Apparat
Laser Klasse 1

Electromagnetic Compatibility Notices (International)

Europe (CE Declaration of Conformity)

This product has been tested in accordance too, and complies with the Low Voltage Directive (73/23/EEC) and EMC Directive (89/336/EEC). The product has been marked with the CE Mark to illustrate its compliance.

Japan EMC Compatibility

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

English translation of the notice above:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

ICES-003 (Canada)

Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: “Appareils Numériques”, NMB-003 édictée par le Ministre Canadian des Communications.

English translation of the notice above:

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled “Digital Apparatus,” ICES-003 of the Canadian Department of Communications.

BSMI (Taiwan)

The BSMI Certification number and the following warning is located on the product safety label which is located visibly on the external chassis.

警告使用者:

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

1 System Description

Introduction

The Intel® SR870BN4 as shown in Figure 1 is a compact, high-density rack-mount server system with support for one to four Intel® Itanium® 2 processors and 32-GB DDR SDRAM memory. The system is based on the Intel S870BN4 board set and the Intel® E8870 chipset. The system supports hot-plug PCI and PCI-X add-in cards; hot-swap, redundant power supply modules; hot-swap, redundant cooling fans; and hot-swap hard disk drives. The system also provides interlock status LEDs for critical system interconnects. The system supports Symmetric Multiprocessing (SMP) and a variety of operating systems. Table 1 presents an overview of the server system's physical characteristics.

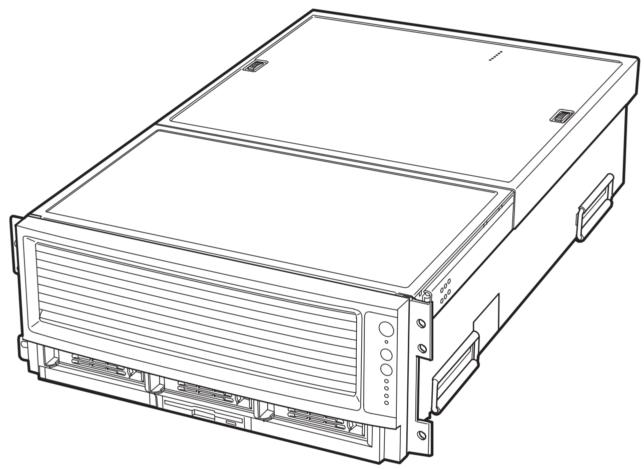


Figure 1. SR870BN4 Front View

Table 1 Server Physical Specifications

Characteristic	Specification
Height	178 mm (6.9 inches, 4U)
Width	445 mm (17.5 inches)
Depth	711 mm (28.0 inches)
Weight (max.)	48 kg (106 lbs)[1]
Required front clearance	76 mm cm (3 inches)
Required rear clearance	152 mm (6 inches)
Required side clearance	25 mm (1 inch)
Heat Dissipation	1500 W (5,100 BTU/hr)

1. The system weight listed above is an estimate for a fully configured system and will vary depending on the number of peripheral devices and add-in cards as well as the number of processors and DIMMs installed in the system.

Chassis Description

The chassis provides a modularized processor/memory subsystem, I/O subsystem, and peripheral bay. Other features are outlined in Table 2.

Table 2. Chassis Feature Summary

Feature	Comment
Server Configuration	Stand-alone system including external I/O PCI slots and disk expansion as needs grow Supports Intel Itanium 2 processors 32-GB Double Data Rate (DDR) Synchronous Dynamic Random Access Memory (SDRAM) memory support with 2-GB DIMMs
Expansion and Servicing	Front access to hot-swap hard disk drives Three hot-swap 1-inch Ultra320 SCSI hard disk drives Rear access to hot-swap power supplies Two hot-swap 1200-W power supplies in a redundant (1+1, 220 V) configuration with redundant power cords (one per power supply) Four top access hot-swap system fans in a redundant (3+1) configuration Dockable processor/memory subsystem, I/O subsystem and peripheral bay Dockable slim-line LS-240 and DVD/CD-ROM drives Interlock status indicator LEDs for major modulesEight 64-bit hot-plug PCI-X slots
Management	Remote management through LAN or modem Emergency Management Port Intelligent Platform Management Interface (IPMI) 1.5 compliant Wired for Management (WfM) 2.0 compliant Remote diagnostics support through LAN or modem
Upgrades	Field upgradeable to the next generation Itanium processor family Multi-generational chassis
System-level scalability	Up to 64GB DDR SDRAM (with -5XX revision and higher memory boards. 32 GB supported on -4XX revision memory boards) One to four Intel Itanium 2 processors External I/O (8 PCI slots) and disk expansion External SCSI connector

External Chassis Features

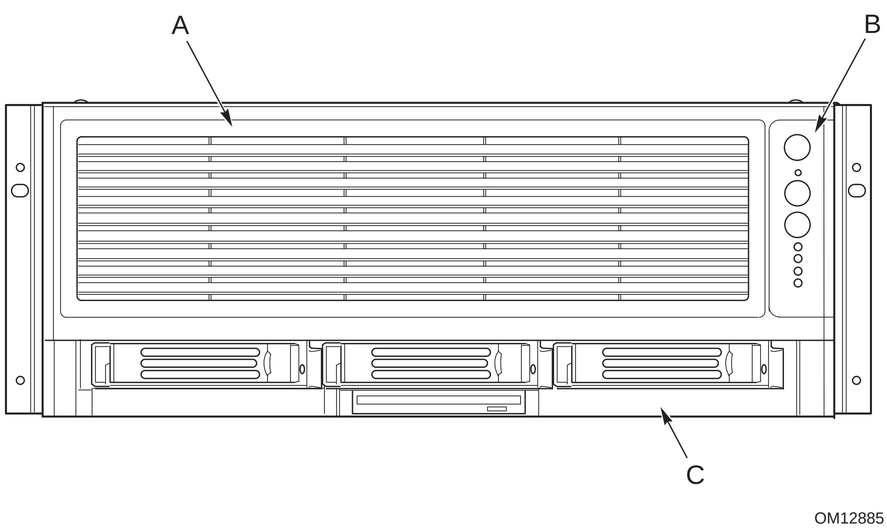
System controls and indicators are located in several places on the chassis as follows:

- Chassis front:
  Front panel: Front panel switches and LEDs
  Peripheral bay: Hard disk drive LEDs
  Processor/memory module: Subsystem serviceability LEDs
- Chassis back:
  Power supply modules (See Power Subsystem on page 31 for details)
  Hot-plug Indicator Board (HPIB)
- Chassis top:
  I/O subsystem
  Fan bay (See Cooling Subsystem on page 32 for details)

Each of these areas is discussed in this section.

Chassis Front

Figure 2 shows the front view of the chassis with the snap-on bezel in place. The bezel provides access to the front panel board and the peripheral bay.



A Bezel
B Front Panel
C Peripheral Bay

Figure 2. Chassis Front View

Front Panel

The front panel is located to the right of the processor/memory subsystem and provides user interface for system management via switches and status indicator LEDs. The front panel also contains the speaker. Figure 3 shows the control buttons and status indicators on the front panel. Table 3 describes their features.

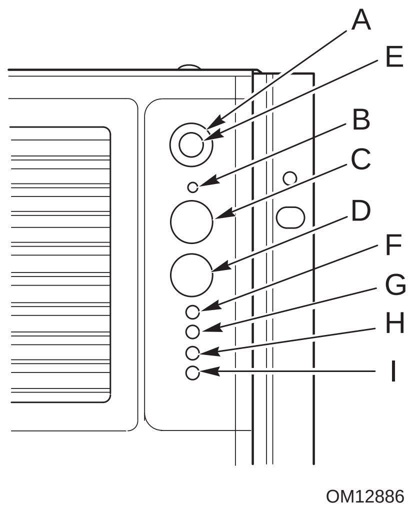


Figure 3. Front Panel Controls and Indicators

Table 3. Front Panel Control and Indicator Description

Item	Feature	Description
Switches		
A	System ID Switch	Toggle switch for blue System ID LEDs (the front panel system ID LED is located inside the system ID switch). See E below for description of LED operation.
B	Assert SDINT (System Diagnostic Interrupt) Switch	Asserts SDINT. This switch is accessible through a small opening and requires a narrow tool to activate.
C	Reset switch	Resets the system.
D	Power switch	Toggles system power. A delay of ~5 seconds is required between pressing the power switch to power down and then power up the system.

continued

Table 3. Front Panel Control and Indicator Description (continued)

Item	Feature	Description
LED Indicators		
E	System ID (Blinking or Solid Blue). The system ID LEDs are located inside the system ID switch on the front panel and on the back panel	Identifies the system. The system ID is activated either by the system ID switch or through server management software. Pressing the system ID switch once turns on the LEDs solid blue. Press the system ID switch again, the solid blue LEDs turn off. Remove activation - LEDs turn on blinking for 4 minutes (max). The system ID LEDs cannot be turned off by pressing the switch.
F	Main Power (Solid or Blinking Green)	A continuously lit LED indicates the presence of DC power in the system. The LED goes out when the power is turned off or the power source is disrupted. Blinking Green indicates the system is in sleep mode.
G	Power Fault (Solid Amber)	Indicates any system power faults. Off indicates power is OK.
H	Cooling Fault (Solid Amber)	Indicates any system cooling faults. Off indicates system cooling is OK.
I	General Fault (Solid amber)	Indicates a system failure. Off indicates system is OK.

Peripheral Bay

⚠ CAUTION

Removal of the LS240 and the DVD/CD drives requires removal of the peripheral bay from the chassis. Therefore, the LS240 and the DVD/CD drives cannot be hot-swapped. Power must be removed from the system when installing or removing these drives to avoid component damage.

The peripheral bay consists of two sections:

- The hot-swap hard drive bay (upper section) supporting three 1-inch hot-swap Ultra320 SCSI hard disk drives (A in Figure 4).
- The removable media drive bay (lower section) supporting:
  - One ½-inch IDE DVD/CD-ROM (B in Figure 4)
  - One ½-inch IDE LS-240 drive (C in Figure 4) or removable EMI Filler Panel (D in Figure 4).

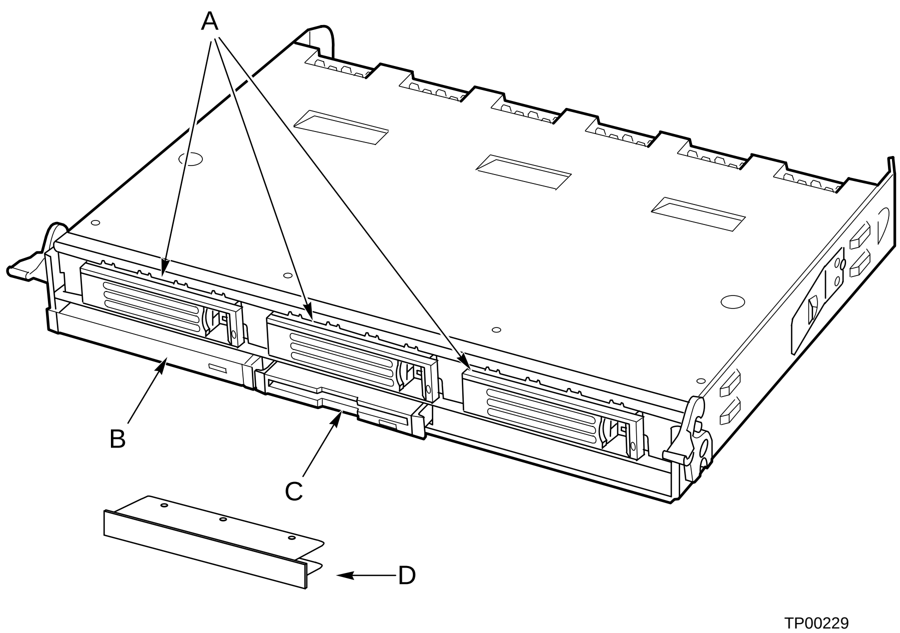
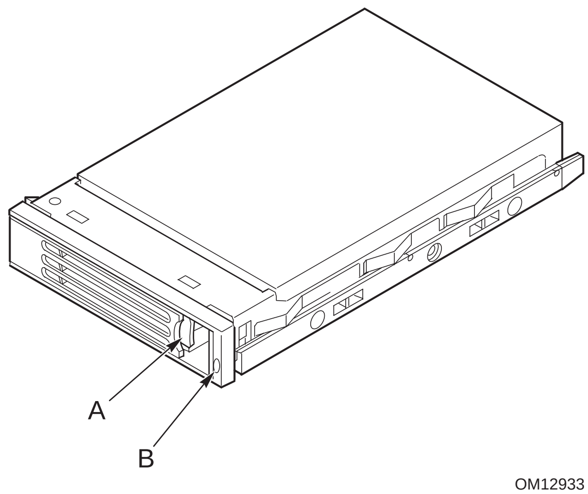


Figure 4. Peripheral Bay

Hot-swap Hard Disk Drive Bay

The hot-swap hard disk drive carrier (see Figure 5) is designed to accept 15,000-RPM (and slower) Ultra320 SCSI technology SCA-type hard disk drives.

The peripheral bay is designed to support Low Voltage Differential (LVD) SCSI disk drives only. Single-Ended (SE) SCSI devices are not supported in the peripheral bay. SE drives are only supported on the external SCSI connector.



A Carrier latch

B Status indicator

Figure 5. Hard Disk Drive Carrier

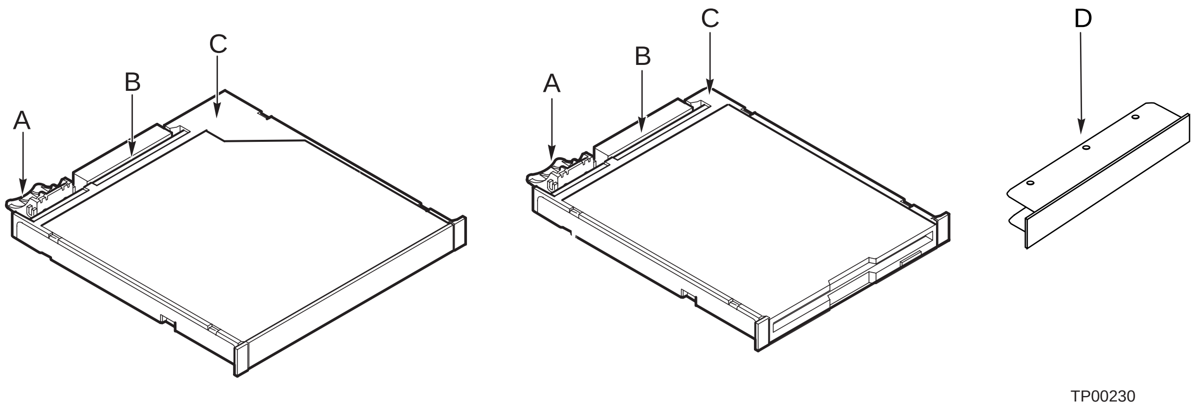
The carriers contain light-pipes that allow dual color LED indicators to show through the bezel to display hard disk drive status as described in Table 4.

Table 4. SCSI Hard Drive LED Details

Feature	Description
Green, flashing	Indicates the hard drive is active
Yellow/Green flashing	Indicates a hard drive fault and hard drive is powered
Yellow/Blank flashing	Indicates a hard drive fault and hard drive is not powered
Not illuminated	Indicates no hard drive is installed in the bay

Removable Media Drive Bays

The slim-line LS-240 and DVD/CD-ROM drives and their adapter boards are installed in plastic carriers (see Figure 6) and are inserted from the front of the removable media drive bay. The user must switch off system power and remove the peripheral bay to remove or install these drives. If the LS-240 is not included with the server, then a filler panel must be used (see D in Figure 6).



DVD/CD-ROM		**LS-240 Floppy Disk Drive**	
A	Latch	A	Latch
B	Adapter board with locking connector	B	Adapter board with locking connector
C	Plastic Carrier	C	Plastic Carrier

Figure 6. DVD/CD-ROM and LS-240 Drive Carriers

SCSI Backplane Board

The SCSI backplane board mates with the midplane board connector. It contains three 80-pin Single Connector Attachment (SCA)-2 connectors for hot-swap hard disk drives. The SCSI backplane board performs the tasks associated with hot-swapping the hard disk drives and enclosure monitoring and management. The features supported by the SCSI backplane board include the following:

- Monitoring the SCSI bus for enclosure services messages, and acting on them appropriately. Examples of such messages include: activate a drive fault indicator; power down a drive that has failed; and report SCSI backplane temperature.
- SAF-TE intelligent agent, which acts as proxy for “dumb” I2C devices (that have no bus mastering capability) during intrachassis communications.

NOTE

Because all hard disk drives have different cooling, power and vibration characteristics, Intel validates specific hard disk drive types in the SR870BN4 system. Refer to the SR870BN4 Server System Validation Summary on the Intel Business Link for a list of these drives available.

Processor/Memory Subsystem Serviceability Status Indicators

The serviceability status indicators contained in the processor/memory subsystem are shown in Figure 7 and described in Table 5. To view these indicators, remove the front bezel.

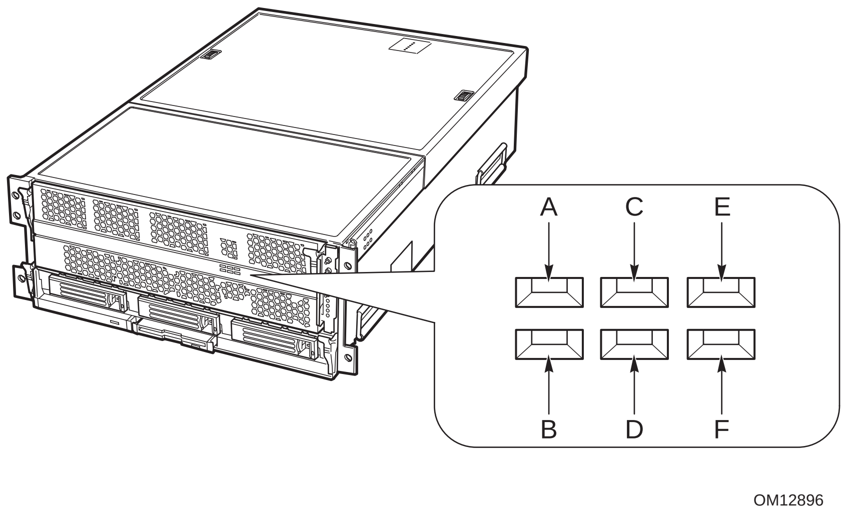


Figure 7. Location of Processor/Memory Subsystem Serviceability Indicators

Table 5. Processor/Memory Subsystem Serviceability Indicator Details

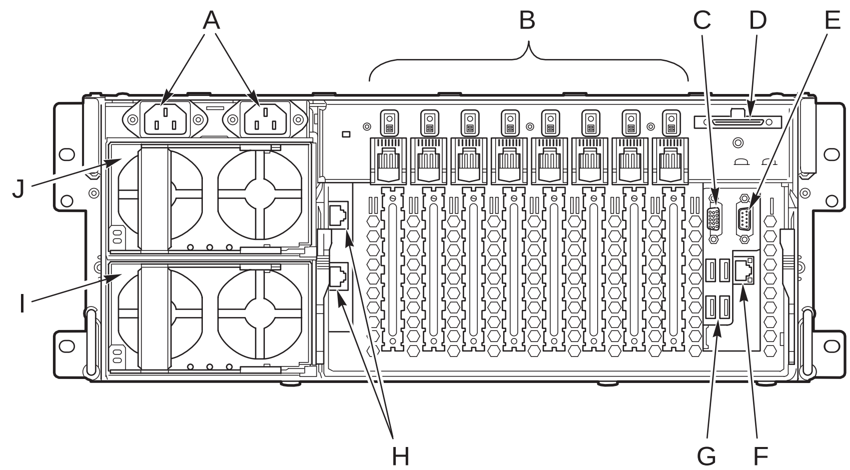
Item	Feature	Description
A	Processor 1 Present (green)	On – Processor 1 is present and installed properly Off – Processor 1 not detected
B	Processor 2 Present (green)	On – Processor 2 is present and installed properly Off – Processor 2 not detected
C	Processor 3 Present (green)	On – Processor 3 is present and installed properly Off – Processor 3 not detected
D	Processor 4 Present (green)	On – Processor 4 is present and installed properly Off – Processor 4 not detected
E	Memory Board 1 Interlock to Processor Board (green)	On – Memory board 1 is inserted properly into the processor board Off – Memory board 1 to processor board interlock not detected
F	Memory Board 2 Interlock to Processor Board (green)	On – Memory board 2 is inserted properly into the processor board Off – Memory board 2 to processor board interlock not detected

NOTE

Two additional LEDs (Green and Amber) and a switch appear on the left side of the processor board. These components are not implemented in the SR870BN4 system and are not visible or accessible through the front bezel.

Chassis Back

Figure 8 shows the features found on the chassis back panel including the I/O bay, the power supply modules, and user-accessible connectors.



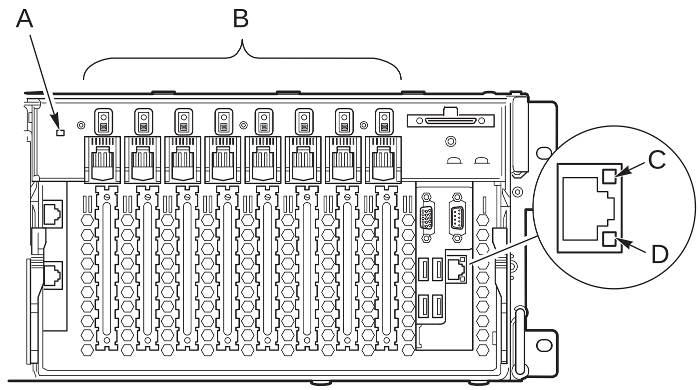
A	AC input power connectors	
B	PCI Slots (All slots support hot-plug PCI add-in cards)[1]	
	Slots 1 through 4	100-MHz, 64-bit PCI-X slot, half length
	Slot 5	100-MHz, 64-bit PCI-X slot, full length
	Slots 6 through 8	133-MHz, 64-bit PCI-X slot, full length
C	Video port, standard VGA compatible, 15-pin connector	
D	External SCSI connector (optional)[2]	
E	Serial port, 9-pin RS-232 connector[3]	
F	Ethernet port, RJ45 connector	
G	Four USB ports, 4-pin connectors	
H	ICMB connectors in/out (optional) ICMB port 1, SEMCONN 6-pin connector ICMB port 2, SEMCONN 6-pin connector	
I	Power supply 2	
J	Power supply 1	

Notes:
1. PCI slots support 3.3 V signal adapter cards only.
2. External SCSI bus supports both LVDS and SE signals via the external SCSI connector.
3. Emergency Management Port (EMP) access is provided via shared serial port.

Figure 8. Chassis Back Features

Back Panel

Figure 9 shows the location of the indicators and controls found on the back panel.

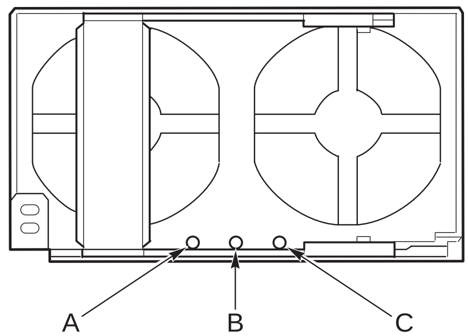


System ID Indicator LED		
A	System ID LED (blue)	Identifies the system. The system ID LED is activated either by the System ID switch on the front panel or through server management.
Hot-plug PCI Add-in Card Switches and LEDs		
B	Attention Switch	Notifies PCI hot-plug system software (ACPI PHP ASL) that a PCI hot-plug operation is about to take place. WARNING: Verify in BIOS release notes that this feature is supported before using the Attention button.
	MRL (Manually-operated Retention Latch) Switch	Disables power to the PCI slot if a PCI add-in card is present.
	Green LED	On – PCI slot is powered. Off – PCI slot is powered down.
	Amber LED	On – PCI slot or card fault condition.
Ethernet Interface Status LED Indicators		
C	Network Interface Status LED (green)	Shows activity and status.
D	Network Interface Status LED (yellow)	Shows activity and status.

Figure 9. Back Panel View Showing Indicator and Switch Locations

Power Supply LED Indicators

Each power supply module has three status LEDs the location and operating conditions for which are shown in Figure 10.



A	Power LED (green)	On - indicates the presence of DC power in the system Blinking - indicates the system is in ACPI sleep mode Off - indicates the power is turned off or the power source is disrupted
B	Failure LED (amber)	Indicates a power supply failure
C	Predictive Failure LED (amber)	Indicates a power supply failure is imminent

Figure 10. Power Supply Indicators

Table 6. Power Supply LED Status Indicators

	A (PWR) Power Supply (Green LED)	**B (FAIL) Power Supply Fail (Amber LED)**	**C (PFAIL) Predictive Failure (Amber LED)**
No AC power to all PSU	OFF	OFF	OFF
No AC power to this PSU only or PS failure	OFF	OFF	ON
AC present / Standby Output On	Blinking	OFF	OFF
Power supply DC outputs ON and OK	ON	OFF	OFF
Current limit	ON	OFF	Blinking
Predictive failure	ON	Blinking/Latched	OFF

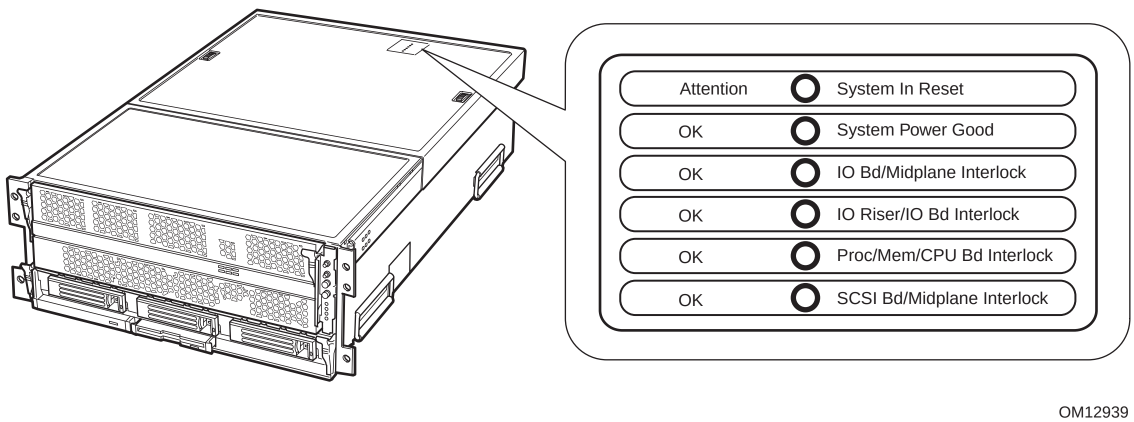
NOTE

Proper system cooling requires that the power supply bay be filled either by two power supply modules, or a power supply module and a filler panel.

Chassis Top

I/O Subsystem Serviceability Indicators

Figure 11 shows the I/O subsystem serviceability indicators. The indicators are located on the I/O board and are visible through the system top cover via light pipes. The I/O serviceability indicators provide system power, system reset, and interlock status for various subsystem and module connectors. These LEDs are powered by standby voltage to provide status as long as AC power is supplied to the system.



System In Reset (amber)	On – system reset asserted Off – system reset not asserted
System Power Good (green)	On – system power within normal operational range Off – system power failure
I/O Board to Midplane Board Interlock (green)	On – I/O subsystem inserted properly into midplane board Off – I/O subsystem to midplane board interlock not detected
I/O Riser to I/O Board Interlock (green)	On – I/O riser inserted properly into I/O board Off – I/O riser to I/O board interlock not detected
Processor/Memory/CPU Board Interlock (green)	On – processor/memory subsystem inserted properly into midplane board Off – processor/memory subsystem to midplane board interlock not detected
SCSI Board to Midplane Board Interlock (green)	On – SCSI backplane board inserted properly into midplane board Off – SCSI backplane board to midplane board interlock not detected

Figure 11. I/O Subsystem Serviceability Indicators

Internal Chassis Features

Power Subsystem

⚠ **WARNING**

Only qualified technical personnel should access the processor, memory, and non-hot-plug I/O subsystem areas while the system is energized as some exposed circuits exceed 240 VA and may cause burn injury if accidentally contacted.

The power subsystem can be configured as following:

- Two power supply modules installed, (1+1) redundancy at 220 VAC
- One power supply module installed, non-redundant at 220 VAC only
- Two power supply modules installed, non-redundant for 120 VAC

The power subsystem consists of the following:

- Power supply modules
- Plug-in DC-to-DC converters
- Power pods (located adjacent to the processors on processor board)
- The power distribution board

Power Supply Modules

The power supply modules are Server System Infrastructure (SSI) compliant, universal AC input with Power Factor Correction (PFC) Distributed Power Supplies (DPS). The power supply modules are rated at 1200 W over an input range of 180-264 VAC, and at 700 W over an input range of 90-132 VAC.

One power supply module connected to 220 VAC is capable of handling the worst-case power requirements for a fully configured system: four processors, 32 GB of memory, eight PCI add-in cards, three hard disk drives, a DVD or CD drive, and an LS-240 drive.

The power supply has two DC outputs: 48 V (main) and 12 V (standby). The 48 V main power is distributed throughout the server and is converted locally at point-of-load using either embedded or plug-in DC-to-DC converters.

In an N+1 configuration the 48 VDC outputs have active (forced) current sharing and 12 VDCSB outputs have passive current sharing.

The two externally enabled outputs have the following ratings:

- +48 VDC at: 24.0 A @HI line /13.5 A @LO line
- +12 VDCSB at: 4 A @any line

Redundant AC Power Source Operation

Each power supply module requires one power cord to supply AC power to the system. When two power supply modules and two power cords are installed, the system supports (1+1) power cord redundancy at 220 VAC. This feature allows the system to be powered by two separate AC sources. In this configuration, the system continues to operate without interruption if one of the AC sources fails.

Plug-in DC-to-DC Converters

Two types of plug-in DC-to-DC converters are used in the system:

- 5 V output
- Voltage ID (VID) (2.5 or 3.3 V output)

A control bit set by the board determines output voltage on the VID DC-to-DC converters. The T-DC-to-DC converters contain an LED for failure indication.

The processor board supports three VID T-DC-to-DC converters (one 3.3 V and two 2.5 V).

The I/O board supports two 5 V and two VID (3.3 V) T-DC-to-DC converters. Each T-DC-to-DC converter powers a separate plane on the board; therefore all DC-to-DC converter slots must be populated.

Processor Power Pods

Dedicated power pods supply power to each processor. The input connector of the power pod is connected to the 48 V power on the processor board via a short cable. The output connector of the power pod mates directly with the processor package.

The Power Distribution Board

The power distribution board supplies 48 V main and 12 V standby power to all server system components.

Cooling Subsystem

⚠ **CAUTION**

The chassis top cover must be installed and closed for proper system cooling. Additionally, cooling components must be hot-swapped within a limited time period. This time period applies only to the time that the cooling component is physically removed, not from the time of failure.

The cooling subsystem consists of a hot-swap, redundant (3+1) system fan array installed in the fan bay, and the fans in the power supply modules. In the event of a cooling component failure, system cooling is maintained and the system continues to operate while the component is being hot-swapped. All system fans have tachometer output and internal speed control.

✏ **NOTE**

The server supports only a fully populated system fan configuration. All configurations are redundant except those with only one power supply installed.

A series pair of 120x38 mm system fans cools the processors and part of the I/O subsystem. The rest of the processor/memory and I/O subsystem components, hard drives and power supplies are cooled by a series pair of 120x25 mm system fans along with the power supply fans. Hot-swap system fans drop into the fan bay and interface with connectors on the I/O board.

The fan bay also contains the individual fan status indicators that can be seen when the back top chassis cover is open. A system fan failure is indicated by two LEDs, the LED on the corresponding fan (A in Figure 12), and the Cooling Fault LED on the front panel (B in Figure 12).

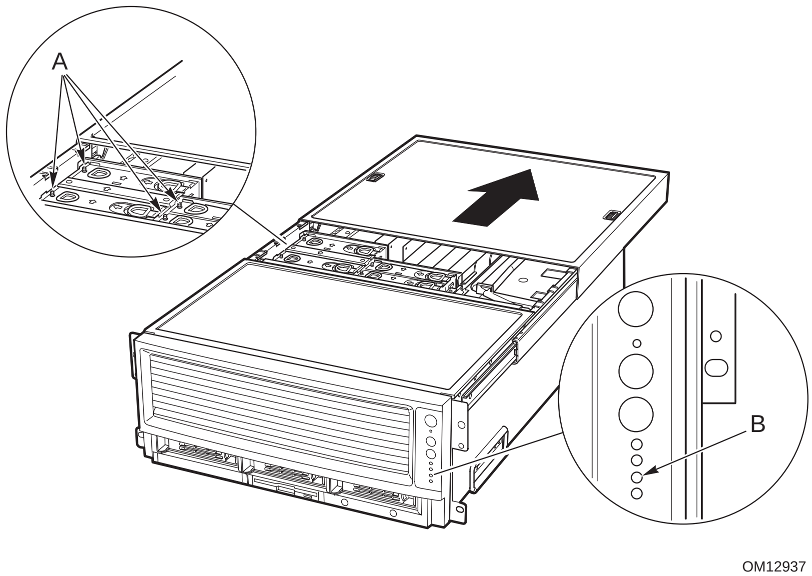


Figure 12. Fan Status Indicators

2 Board Set Description

Figure 13 displays a block diagram of the system and the board set within the system.

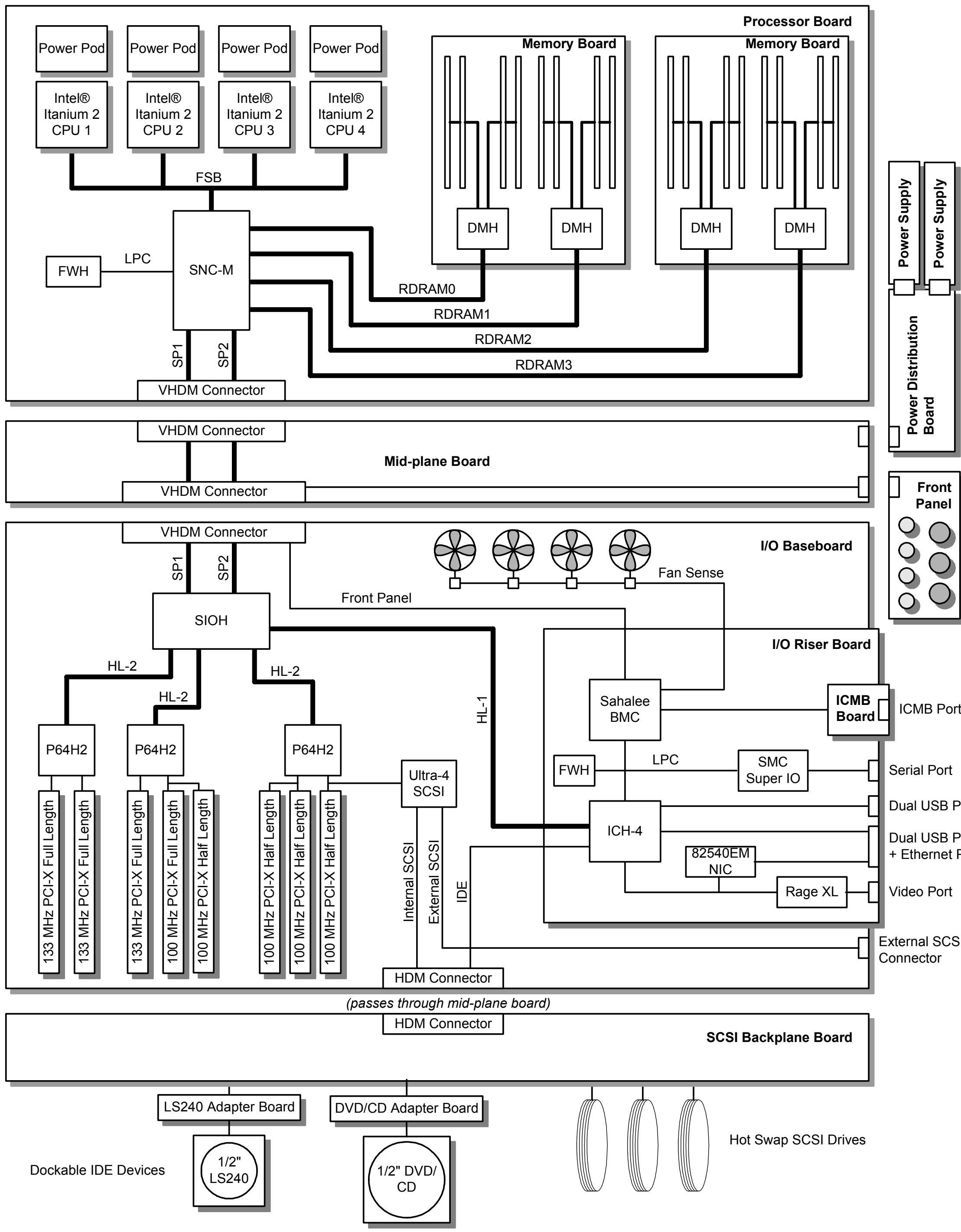


Figure 13. Server System Block Diagram

System Board Set

This section highlights the main features of the board set. The board set contains the following:

- Processor board
- Two memory boards
- I/O board
- I/O riser card
- Midplane board

In addition, the server contains the following system boards:

- Front panel board
- SCSI backplane board
- Power distribution board
- PCI HPIB
- Peripheral adapter boards
- ICMB Board (optional)

Major components of the board set include:

- Intel Itanium 2 processors
- Intel E8870 chip set
- High-capacity DDR SDRAM memory
- High-bandwidth I/O subsystem supporting PCI and PCI-X

Processor Board

The processor board contains sockets for installing up to four Intel Itanium 2 processors and supports up to four power pods. It also accepts the memory boards.

The processor board and memory boards are installed horizontally in the processor/memory module. The processor/memory module docks into the front of the chassis and mates with the midplane board mounted vertically in the middle of the chassis.

The processor board supports the following:

- Sockets for up to four Intel Itanium 2 processors. Two of the processor sockets are mounted on the secondary side of the processor board.
- Provision for up to four 48 V DC-to-DC converter power pods, one for each Intel Itanium 2 processor.
- DC-to-DC voltage converters:

  Two 48 V to 2.5 V plug-in DC-to-DC converters for DDR memory support

  One 48 V to 3.3 V plug-in DC-to-DC converter
- Embedded regulators:

  3.3 V to 1.2 V

  3.3 V to 1.5 V

  3.3 V to 1.8 V

  1.8 V to 1.3 V linear regulator
- One SNC-M component of the Intel®E8870 chip set.
- Three Firmware Hubs (FWH) for BIOS and system configuration utility (SCU) software.
- Two memory board connectors that support two Rambus channels each. One memory connector is mounted on the secondary side of the processor board.
- One VHDM 360-pin connector for I/O connections.
- One debug port for use with an In-Target Probe (ITP) (debug only).
- Two I2C system management buses (SMBus).
- Serviceability LEDs.

NOTE

The processor board also contains a switch and two LEDs on the front left corner of the primary side of the board that are not used in the SR870BN4 server system.

Processor Overview

Each Intel Itanium 2 processor plugs into a 700-pin Zero Insertion Force (ZIF) socket. Each processor is powered by a 48 V power pod located adjacent to the processor on the processor board. Attached to the top of each processor is a heat sink that dissipates thermal energy.

⚠ **CAUTION**

When shipping, unpacking, or handling Intel Itanium 2 processors, be sure to follow the guidelines described in "Handling the Intel Itanium 2 Processors" on page 211.

Memory Boards

The processor board is designed to support two memory boards (both of which must be installed for the system to operate). The memory boards are installed on the primary and secondary side of the processor board assembly as shown in Figure 84 on page 206.

The main components of the memory boards are shown in Figure 98 on page 222 and described as follows:

- Eight 184-pin, DDR-SDRAM DIMM sockets support up to 16 GB of memory using eight 2 GB DIMMs per memory board for a total of 32 GB per system using -4XX revision memory boards, or up to 32 GB of memory using eight 4 GB DIMMs per memory board for a total of 64 GB per system using -5XX revision memory boards.
- Two DMH (DDR Memory Hub) components of the E8870 chip set. This allows two Rambus channels from the E8870-memory controller (SNC-M) to be extended to four DDR channels on the memory boards. The Rambus channel supports 400 MHz operation and the DDR channels support 100 MHz operation.
- An integrated 2.5 V to 1.25 V DC-to-DC converter provides voltage for DDR signal termination.
- I2C logic.
- Field Replaceable Unit (FRU) device ID accessed through a private I2C bus.
- Voltage/temperature sensors.

DIMMs must be installed on a memory board in groups of four (a group of four constitutes a row) as shown in Installing DIMMs on page 223.

⚠ **CAUTION**

DIMMs should only be installed, removed, or replaced by a technically qualified person.

⚠ **CAUTION**

The system does not support mixed-sized DIMMs or DIMMs from different vendors within the same row.

✎ **NOTE**

The BIOS automatically detects, sizes, and initializes the memory array, depending on the type, size, and speed of the installed DIMMs. The BIOS reports memory size and allocation to the system through configuration registers.

I/O Board

The I/O board is installed horizontally in the I/O bay. The I/O riser card plugs into a connector on the I/O board. The I/O provides the following features:

- Intel E8870 chip set with Scalability Port system interface
- Six functionally independent Peripheral Component Interconnect (PCI) bus segments
- Three hot-plug 133-MHz, 64-bit PCI-X slots
- Five hot-plug 100-MHz, 64-bit PCI-X slots
- Integrated dual channel LSI 53C1030 Ultra320 Low Voltage Differential SCSI (LVDS) controller
- I/O riser support connector for I/O interface
- On-board power conversion from 48 V bulk power
- System reset and clock generation circuits
- I2C server management interface
- Redundant hot-plug system fan interface

I/O Riser

To conserve space on the I/O board, most system I/O and server management functions have been placed on the I/O riser card that plugs into the I/O board. The I/O connectors include video, serial, Local Area Network (LAN), and Universal Serial Bus (USB). The I/O riser:

- Contains an IDE bus controller and connector. The IDE bus is routed to the I/O board where it is further routed to the midplane board's disk bay connector.
- Converts 12 V STDBY (standby) to +5 V STDBY and +3.3 V STDBY and supplies them to the I/O board.
- Mates directly onto the I/O board and together they contain all of the I/O interfaces for the board set.

The I/O riser provides the following features:

- One I/O Control Hub 4 (ICH4) component
  Four Universal Serial Bus (USB) ports
  One IDE interface routed through the I/O board connector
- Network Interface Card (NIC) Intel® 82540EM 10/100/1000 Ethernet controller
  Ethernet port with I^2C support
- Low Pin Count (LPC) Super I/O
  One serial port
- 3 MB of flash memory
- Server management controller
- Integrated Intelligent Chassis Management Bus (ICMB)
- Integrated Rage† XL video controller and memory
  Video port
  Power control - Advanced Configuration and Power Interface (ACPI)
- Speaker control
- Integrated standby voltage DC-to-DC converters generating 3.3 V standby and 5 V standby

Midplane Board

The passive midplane board contains the following features:

- VHDM connectors for the processor/memory subsystem and the I/O subsystem
- An HDM connector that routes the SCSI bus, two IDE busses, and miscellaneous signals between the I/O board and the SCSI backplane
- Routing of four scalability ports
- 48 V power distribution
- 12 V standby distribution
- 3.3 V standby distribution
- 12 V distribution from the SCSI backplane board to the I/O board and power distribution board
- Blind-mate power distribution board connector
- Blind-mate front panel connector

Front Panel Board

The front panel board contains switches, LEDs, and the speaker for system interface.

SCSI Backplane Board

The SCSI backplane board supports three LVDS hard drives. Its features include:

- Three SCA connectors for hot-swap 1-inch SCSI hard drives
- One blind-mate connector for dockable slim-line IDE LS240 device
- One blind-mate connector for dockable slim-line IDE DVD or CD device
- SCSI accessed fault-tolerant enclosures (SAF-TE) logic
- 48 V to 12 V integrated DC-to-DC converter
- 12 V to 5 V integrated DC-to-DC converter
- 5 V to 2.5 V linear regulator

Peripherals

The server connects to supported peripheral devices through interfaces located on the I/O Board. The Super I/O on this board provides four USB ports, an Ethernet port, a serial port, an external SCSI connector (optional), a VGA video output port, and in and out ICMB connectors (optional). For a detailed view of the I/O Board connections, see Figure 8 on page 27.

External SCSI Connector (Optional)

An external SCSI connector is available as an option. A cable runs from the I/O board to the external SCSI connector installed on the back panel.

The I/O board contains two Ultra320 compliant SCSI channels. One channel is used internally while the other is for external system use. While the internal channel supports only Low Voltage Differential (LVD) signaling, the external channel supports both LVD and SE (single-ended) signaling. With LVD signaling, the channels can each support a maximum data rate of 320 MB/sec.

NOTE

The internal SCSI signal is routed to the midplane board's disk bay connector to interface with internal SCSI devices. There is an optional connector on that bus that allows an external SCSI controller to drive the internal bus.

Add-In Board Slots

The I/O board has three 64-bit/133 MHz hot-plug PCI-X and five 64-bit/100 MHz PCI-X expansion slots contained in the following three PCI segments:

- P64H2,0 provides for PCI-X slots 1 through 3 (all 100 MHz) and the dual channel LVDS controller
- P64H2,1 provides for PCI-X slots 4 through 6 (two 100 MHz and one 133 MHz)
- P64H2,2 provides for PCI-X slots 7 and 8 (both 133 MHz)

Video

The onboard, integrated ATI RAGE XL 64-bit SVGA chip contains an SVGA controller that is fully compatible with industry video standards. The system comes with 8 MB of 10-nanosecond onboard video memory.

The video controller supports pixel resolutions of up to 1600 x 1200 and up to 16.7 million colors. The controller also provides hardware accelerated bit block transfers of data.

The SVGA controller supports analog VGA monitors (single and multiple frequency, interlaced and noninterlaced) with a maximum vertical retrace noninterlaced frequency of 100 Hz.

The video connector is located on the I/O riser. See Figure 8 on page 27 for the location of this connector.

SCSI Controller

A LSI 53C1030 Ultra3 SCSI chip is a highly integrated bus master, dual-channel SCSI I/O processor for SCSI initiator and target applications. The chip supports dual channel, Ultra3 (Fast-80) SCSI functionality. This device interfaces the PCI bus to two Ultra3 SCSI buses. The 53C1030 is a fully autonomous device, capable of managing multiple I/O operations and associated data transfers from start to finish without host intervention. The 53C1030 provides power management feature support in accordance with the *PCI Bus Power Management Interface Specification*.

ICH4 IDE Controller

The ICH4 IDE controller is a multifunction device on the I/O Board that acts as a PCI-based Fast IDE controller. The device controls the following:

- PIO and IDE DMA/bus master operations
- Mode 4 timing
- Transfer rates up to 22 MB/sec (33 MB/sec using ultra DMA transfers)
- Buffering for PCI/IDE burst transfers
- Master/slave IDE mode

Server Management

The server management features are implemented using two micro controllers: the Baseboard Management Controller (BMC) on the I/O board and the QLogic† GEM359 SCSI hot-swap controller on the SCSI backplane board. The ICMB controller is integrated in the BMC and provides an interface to the external ICMB via the ICMB board.

The firmware for the BMC of each micro controller is field-upgradeable using the Firmware Update utility. For information on the Firmware Update Utility, refer to "Running the Firmware Update Utility" on page 67. The GEM359 firmware can be updated using a separate utility.

Baseboard Management Controller (BMC)

The Intel Baseboard Management Controller (BMC) and its associated circuitry reside on the I/O riser card. The BMC autonomously monitors system platform management events and logs their occurrences in the non-volatile System Event Log (SEL). This includes events such as over-temperature and over-voltage conditions, and fan failures. The BMC can also provide the interface to the monitored information so system management software can pole and retrieve the present status of the platform.

The BMC also provides the interface to the non-volatile 'Sensor Data Record (SDR) Repository'. Sensor Data Records provide a set of information that system management software can use to automatically configure itself for the number and type of IPMI sensors (such as temperature and voltage sensors) in the system.

The following is a list of the major functions of the BMC:

- System power control
- Platform Event Paging (PEP) / Platform Event Filtering (PEF)
- Power distribution board monitoring
- Temperature and voltage monitoring
- Fan failure monitoring
- Processor presence monitoring (no processors installed)
- Interlock monitoring
- Speaker 'Beep' capability on standby and when system is powered up
- Intel Itanium 2 processor SEEPROM interface (for processor information ROM [PIROM] and scratch EEPROM access)
- Processor temperature monitoring
- Hot-plug PCI slot status reporting
- Processor core ratio speed setting
- Chassis general fault light control
- Chassis cooling failure light control
- Chassis power fault light control
- Chassis power light control
- Chassis ID LEDs control
- System Event Log (SEL) interface
- Sensor Data Record (SDR) repository interface
- SDR/SEL timestamp clock
- Board set FRU information interface

- Fault resilient booting
- System management watchdog timer
- Front panel system diagnostic-interrupt handling
- Platform Management Interruption (PMI) / System Diagnostic Interrupt (SDI) status monitor
- Event receiver
- System interface to the IPMB (via system interface ports)
- IPMI Management Controller Initialization Agent (MCIA)
- Emergency Management Port (EMP) interface
- Serial/modem and LAN alerting

In this platform, the BMC also plays the role of the chassis bridge controller, thus providing integrated ICMB support. ICMB transports server management information between various chassis in a cluster configuration that can contain multiple servers and peripherals.

QLogic GEM359 SCSI Hot-swap Controller

The QLogic GEM359 Hot-swap Controller resides on the SCSI backplane board. The primary functions of the GEM359 are as follows:

- Implements the SAF-TE command set
- Controls the SCSI Hard Drive fault LEDs
- Provides a path for management information via the SCSI
- Retrieves hard disk drive fault status, SCSI backplane temperature, and fan failure information via IPMB
- Queries the status of the power distribution board by retrieving information from the BMC via IPMB
- Controls hard disk drive power-on and power-down, facilitating hot-swapping

3 Configuration Software and Utilities

Power-on Sequence and Power-on Self-Test (POST)

Turning on the system causes POST to run and control to pass to the Boot Manager. From the Boot Manager, the user can choose to invoke the Extensible Firmware Interface (EFI) Shell or the user can choose to go to the Boot Maintenance Menu. For information on the EFI Shell, refer to “The Extensible Firmware Interface (EFI) Shell” on page 48.

Follow these steps to power up the SR870BN4 server:

1. Press the power button on the front control panel. Pressing this button causes the server fans to start up and POST to begin running. The user can monitor boot progress on the video display on a monitor attached to the system.
2. POST, which is stored in flash memory, begins running. POST checks the drive carriers, processors, memory, keyboard, and most installed peripheral devices. During the memory test, POST displays the amount of memory it is able to access and test. The length of time needed to test memory depends on the amount of memory installed.
3. Video appears on the monitor attached to the system and begins to display boot progress. The AMI BIOS banner displays the loaded versions of the BIOS, PAL, SAL, and EFI.
4. POST concludes and passes control to the boot manager.
5. From the boot manager, the arrow keys can be used to highlight the option that invokes the EFI shell operating system (if installed), or the user can highlight and select the boot maintenance menu. Selecting the boot maintenance menu lets the user configure boot options and other boot environment variables. Booting to the EFI shell causes the following prompt to appear:

   ```
   Shell>
   ```
6. When the user sees this prompt, the user can load and start an operating system.

The Extensible Firmware Interface (EFI) Boot Manager

The EFI boot manager allows the user to control the server’s booting environment. Depending on how the user has configured the boot options, after the server is powered up the boot manager presents the user with different ways to bring up the system. For example, the user can boot to the EFI Shell, to an operating system located on the network or residing on media in the server, or to the Boot Maintenance Menu.

- EFI Shell: A simple, interactive environment that allows EFI device drivers to be loaded, EFI applications to be launched, and operating systems to be booted. The EFI shell also provides a set of basic commands used to manage files and the system environment variables. For more information on the EFI Shell, refer to “The Extensible Firmware Interface (EFI) Shell” on page 48.

- Boot Options: Files that the user includes as boot options. The user adds and deletes boot options by using the Boot Maintenance Menu. Each boot option specifies an EFI executable with possible options. For information on the Boot Maintenance Menu options, refer to Table 7.
- Boot Maintenance Menu: A menu of items allowing the user to configure boot options and other boot environment variables. Table 7 describes each menu item in the Boot Maintenance Menu.

Table 7. Boot Maintenance Menu Options

Option	Description
Boot from a File	Automatically adds EFI applications as boot options or allows the user to boot from a specific file. When the user chooses this option, the system searches for an EFI directory in all EFI System Partitions in the system. For each EFI directory the system finds, it searches through that directory's subdirectories. Within each subdirectory, the system looks for the first file that is an executable EFI Application. Each file that meets 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. Using this option, the user can also launch a specific application without adding it as a boot option. In this case the EFI Boot Manager searches the root directories of all of the EFI System Partitions present in the system for the specified EFI Application. To boot from a file: At the menu, select Boot from a File Option with the arrow key. Hit the <Enter> key to select. Select the EFI file to boot from with the arrow key. Hit <Enter> to select.
Add a Boot Option	Adds a boot option to the EFI Boot Manager. The user specifies the option by providing the name of the EFI application. Along with the name the user can also provide either ASCII or UNICODE arguments the file might use. Given the EFI application name and any options, the EFI Boot Manager searches for the executable file in the same partitions and directories as described in "Boot from a File" option. When the file is found, it is executed. To add a boot option: At the menu, select Add Boot Option with the arrow key. Hit the <Enter> key to select. Type in the name of the EFI application to add and hit <Enter>. Select Save to NVRAM. Select Exit to return to the Boot Manager.

continued

Table 7. Boot Maintenance Menu Options (continued)

Option	Description
Delete Boot Options	This feature allows the user to delete a specific boot option or all boot options. To delete boot options: At the menu, select Delete Boot Option with the arrow key. Hit the <Enter> key to select. Select the boot option to delete with the arrow key. Hit <Enter> to select. Enter <Y> to confirm. Select Save to NVRAM. Select Exit to return to the Boot Manager.
Change Boot Order	This feature allows the user to control the relative order in which the EFI Boot Manager attempts boot options. For help on the control key sequences the user needs for this option, refer to the help menu. To change the boot order: At the menu, select Change Boot Order with the arrow key. Select the Option to move with the arrow key. Hit <u> to move up in the boot order. Hit <d> to move down in the boot order. Select Save to NVRAM. Select Exit to return to the Boot Manager.
Manage BootNext Setting	This feature allows the user to select a boot option to use one time (the next boot operation). To manage boot next setting: At the menu, select Manage Boot Next Setting with the arrow key. Select the Option to boot next with the arrow key. Hit <b> to make this option the next boot option. Hit <r> to reset. Select Save to NVRAM. Select Exit to return to the Boot Manager.
Set Auto Boot Timeout	This feature allows the user to define the value in seconds that pass before the system automatically boots without user intervention. Setting this value to zero disables the timeout feature. To set auto boot timeout: At the menu, select Set Auto Boot Timeout with the arrow key. Three options are available. Select the Choose Value option with the arrow key and enter a value of “0” to disable auto boot. Select the Delete option with the arrow key and select the Delete setting with the arrow key and hit <Enter>. Choose a time out value of 65535 (0xFFFF) to allow the user to press any key while booting to EFI to disable timeout.

continued

Table 7. Boot Maintenance Menu Options (continued)

Option	Description
Select Console Output Device	This feature allows the user to select the device that the console output is sent to. To select the console output device: At the menu, select Manage Boot Next Setting with the arrow key. Select the Option to boot next with the arrow keyHit <b> to make this option the next boot option. Hit <r> to reset. Select Save to NVRAM. Select Exit to return to the Boot Manager.
Select Console Input Device	This feature allows the user to select the device that the console receives input from. To select the console input device: At the menu, select Manage Boot Next Setting with the arrow key. Select the Option to boot next with the arrow key. Hit <b> to make this option the next boot option. Hit <r> to reset. Select Save to NVRAM. Select Exit to return to the Boot Manager.
Select Standard Error Device	This feature allows the user to select the standard error device. To select the standard error device: At the menu, select Manage Boot Next Setting with the arrow key. Select the Option to boot next with the arrow key. Hit <b> to make this option the next boot option. Hit <r> to reset. Select Save to NVRAM. Select Exit to return to the Boot Manager.
Cold Reset	Performs a platform-specific cold reset of the system. A cold reset means a full platform reset. To perform a cold reset: At the menu, select Set Auto Boot Timeout with the arrow key. Hit <Enter>. The system resets.
Exit	Returns control to the EFI Boot Manager main menu. Selecting this option displays the active boot devices, including a possible integrated shell.

The Extensible Firmware Interface (EFI) Shell

The EFI Shell is an EFI application that allows other EFI applications to be launched, EFI device drivers to be loaded, and operating systems to be booted. The combination of the EFI firmware and the EFI Shell provides an environment that can be modified to easily adapt to many different hardware configurations.

The EFI shell also provides a set of basic commands used to manage files and EFI NVRAM shell and boot variables. A list of these basic commands is shown in Table 8. A more detailed description of the commands is available on the EFI website. To obtain the document, navigate to the *http://developer.intel.com/technology/efi* URL and click on the Tools hyperlink. Next, click on "EFI Sample Implementation", and follow the appropriate links to download the sample implementation. After downloading the sample, locate the "EFI1.1ShellCommands" document. Descriptions of the EFI shell commands are also available when operating in the EFI Shell by typing "help" and hitting the <Enter> key.

In addition to the standard shell commands available in the EFI Shell, the EFI environment allows the user to create your own shell commands and EFI applications. For detailed information about the EFI Shell, its commands, and the ability to develop within the environment, refer to the *EFI Developer's Guide*. To obtain the document, navigate to the *http://developer.intel.com/technology/efi* URL and click on the Tools hyperlink. Next, click on "EFI Application Toolkit", and follow the appropriate links to download the toolkit. After downloading the toolkit, locate the document named "Efi_dg".

Table 8. EFI Shell Commands

Command	Description
<drive_name>:	Changes drives. For example, entering fs0: and pressing the <Enter> key changes the drive to the LS-240 drive
alias [-bdv] [*sname*] [*value*]	Sets or gets alias settings
attrib [-b] [+/- rhs] [*file*]	Views or sets file attributes
bcfg -?	Configures boot driver and load options in EFI NVRAM
botmaint	Launches Boot Maintenance Manager
break	Executes a breakpoint
cd [*path*]	Changes the current directory
cls [*background color*]	Clears the screen
comp *file1 file2*	Compares two files
connect [-r] [-c] Handle# ½DeviceHandle# DriverHandle#	Binds the EFI driver to a device and starts the driver
cp [-r] *file* [*file*] ... [*dest*]	Copies files and directories, [-r] = recursive
date [*mm*/*dd*/*yyyy*]	Gets or sets the date
dblk device [Lba] [Blocks]	Performs a hex dump of BlkIo Devices
devices [-b] [-1XXX]	Displays devices
devtree [-b] [-d]	Displays device tree
dh [-b] [-p *prot_id*] | [*handle*]	Dumps handle information
disconnect DeviceHandle# [DriverHandle# [ChildHandle#]	Disconnects device from driver
dmem {address] [size] [;MMIO]	Displays the contents of memory
dmpstore	Dumps the variable store
drivers [-b] [-lXXX]	Displays drivers
drvcfg [-c] [-lXXX] [-f] [-v] [-s]	Invokes the driver configuration protocol
drvdiag [-c] [-lXXX] [-s] [-e] [-m]	Invokes the driver diagnostics protocol
echo [[-on | -off] | [text]	Echoes text to the standard output device or toggles script echo
edit [*filename*]	Opens the text editor allowing the user to create or edit a file
eficompress infile outfile	Compresses an EFI file
Efidecompress infile outfile	Decompresses an EFI file
endfor	Provides a delimiter for loop constructs (scripts only)
endif	Provides a delimiter for IF THEN constructs (scripts only)
for var in <set>	
goto label	Makes batch file execution jump to another label
guid [-b] [*sname*]	Dumps known guid ids
help [-b] [*internal_command*]	Displays help information
hexedit [[-f]FileName|[-d DiskName Offset Size]|[-m Offset Size]]	Edits in HEX mode
if [not] condition then	Provides conditional constructs (scripts only)

continued

Table 8. EFI Shell Commands (continued)

Command	**Description**
load *driver_name*	Loads a driver
loadbmp [-c] [-t] [-i[UGA Instance]] file	Displays a bitmap file on the screen
loadpcirom romfile	Loads a PCI option ROM
ls [-b] [*dir*] [*dir*] ...	Obtains directory listings
map [-bdvr] [*sname*[:]] [*handle*]	Maps *sname* to device path
mem [*address*] [*size*] [;MMIO]	Dumps Memory or Memory Mapped IO
memmap [-b]	Dumps memory map
mkdir *dir* [*dir*]	Creates a new directory
mm *address* [Width] [;Type] [n]	Memory Modify: type = Mem, MMIO, IO, PCI, [n] for non interactive mode when inside a .nsh file
mode [*col row*]	Sets or gets the current graphics mode
mount *BlkDevice* [*sname*[:]]	Mounts a file system on a block device
mv [src…] [dst]	Move one or more files/directories to destination
pause	Prompts to quit or continue (scripts only)
pci [*bus_dev*] [*func*]	Displays PCI device information
rconnect DeviceHandle# [DriverHandle# [ChildHandle#]] | [-r]	Reconnects one or more drivers from a device
reset [*reset_string*]	Performs a cold reset
rm *file*/*dir* [*file*/*dir*]	Removes files or directories
setsize file	Sets size of a new file
stall microseconds	Delays for the specified number of microseconds
time [*hh*:*mm*:*ss*]	Gets or sets the time
type [-a] [-u] [-b] *file*	Displays the contents of a file
ver	Displays version information
vol fs [*volume_label*]	Sets or displays a volume label

Using BIOS Setup

This section describes the BIOS Setup Utility. Use this utility to change the server configuration defaults. The user can run the utility with or without an operating system present on the server. Setup stores most of the configuration values in battery-backed CMOS. The rest of the values are stored in flash memory. The values take effect when the user boots the server. POST uses these values to configure the hardware. If the values and the hardware do not agree, POST generates an error message and the user must then run Setup to specify the correct configuration.

Run Setup to view or modify such server board features as:

- Serial port configuration
- Time/date (to be stored in RTC)
- IDE settings (LS-240, DVD/CD-ROM, etc.)
- SCSI BIOS
- Default CMOS settings and fail safe settings
- Password security
- Advanced chip set settings for boot up
- Information on system configuration, version, peripheral population, RAM size, and cache size

Starting Setup

To start Setup during the power-on sequence, follow these steps:

1. Press the power button on the front control panel of the server. For the location of the power button, see Figure 3 on page 21
2. When POST shows the message “Hit <F2> if the user wants to run SETUP,” press <F2>. If the server has an administrator password configured, the system prompts the user to enter the password. If the server does not have a password configured, the main screen of the BIOS Setup Utility appears. For information on the setup screens, refer to “Primary Screens” on page 52.

Record Your Setup Settings

Before the user alters any settings the user should be sure that the current values are recorded. If the default values ever need to be restored (after a CMOS clear, for example), the user must run Setup again. Referring to recorded original settings could make your task easier.

Navigating Setup Utility Screens

The BIOS setup utility consists of five primary menus. Each menu occupies a single screen and presents a list of menu items. Some menu items are sub-menus, while others are settings that the user can change from the screen. Table 9 describes how to navigate the utility screens and menus.

Table 9. Using Setup Screens

Press	To
←	Scroll left through the main menu screens
→	Scroll right through the main menu screens
ENTER	Select a sub-menu item or accept a drop-down choice
TAB	Select a field within a value (for example, date field)
F9	Select the default value
F10	Save your changes and exit Setup
ESC	Go back to a previous screen
↑	Scroll up through menu items or value lists
↓	Scroll down through menu items or value lists

Primary Screens

The BIOS Setup Utility uses these five primary screens:

Main Displays the BIOS version and details on processor type, and lets the user configure the system time, date, and language. For details on this screen, see "Main" on page 53.

Advanced Lets the user configure Option ROMs, configure peripheral devices, clear the event log, and disable POST error pauses. For details on this screen, see "Advanced" on page 55

Security Lets the user set a password. For details on this screen, see "Security" on page 56.

System Management Lets the user configure Console Redirection, Quite Boot, Serial Over LAN, and Service Partition options. Also displays BMC and HSC firmware revisions. For details on this screen, see "System Management" on page 57.

Exit Exits the utility with or without saving utilities and allows management of custom settings. For details on this screen, see "Exit" on page 59.

Main

Table 10 describes the menu items available on the **Main** screen. Default values appear in brackets.

Table 10. BIOS Setup Main Screen Menu Items

Menu Item	Default Value	Description
Language	[English (US)] Spanish Italian French German	Selects which language BIOS displays.
System Time	HH:MM:SS	Set the System Time in *hour:minute:second* format.
System Date	MM/DD/YYYY	Set the System Date in *month/day/year* format.
Processor Settings	Press <Enter> to present selection *submenu*	Selects the Sub-menu.
BIOS Version	[*bios_version_number*]	The currently loaded version of BIOS. The user cannot change this value. It appears for informational purposes only.
PAL Version	[PAL_*version_number*]	The currently loaded version of PAL. The user cannot change this value. It appears for informational purposes only.
SAL Version	[SAL_*version_number*]	The currently loaded version of SAL. The user cannot change this value. It appears for informational purposes only.
FPSWA Version	[FPSWA_*version_num*]	The currently loaded version of FPSWA. The user cannot change this value. It appears for informational purposes only.

Table 11. Processor Settings Submenu Items

Menu Item	Default Value	Description
Processor Retest	[Disabled] Enabled	If yes, BIOS clears historical processor status and retests all processors on the next boot
Processor 1 CPUID	N/A	Reports CPUID for Processor 1
Processor 1 L1 Cache Size	N/A	Reports L1 Cache Size for Processor 1
Processor 1 L2 Cache Size	N/A	Reports L2 Cache Size for Processor 1
Processor 1 L3 Cache Size	N/A	Reports L3 Cache Size for Processor 1
Processor 2 CPUID	N/A	Reports CPUID of the Processor 2
Processor 2 L1 Cache Size	N/A	Reports L1 Cache Size for Processor 2
Processor 2 L2 Cache Size	N/A	Reports L2 Cache Size for Processor 2
Processor 2 L3 Cache Size	N/A	Reports L3 Cache Size for Processor 2
Processor 3 CPUID	N/A	Reports CPUID of the Processor 3
Processor 3 L1 Cache Size	N/A	Reports L1 Cache Size for Processor 3
Processor 3 L2 Cache Size	N/A	Reports L2 Cache Size for Processor 3
Processor 3 L3 Cache Size	N/A	Reports L3 Cache Size for Processor 3
Processor 4 CPUID	N/A	Reports CPUID for Processor 4
Processor 4 L1 Cache Size	N/A	Reports L1 Cache Size for Processor 4
Processor 4 L2 Cache Size	N/A	Reports L2 Cache Size for Processor 4
Processor 4 L3 Cache Size	N/A	Reports L3 Cache Size for Processor 4

Advanced

Table 12 describes the menu items available on the **Advanced** screen. Five menu items exist on this screen. Each of these items contains sub-menus that in turn can also lead to subsequent sub-menus. Default values appear in brackets.

Table 12. BIOS Setup Advanced Screen Menu Items

Primary Menu Item	Sub Menu Items	Value	Description
Peripheral Configuration	Serial Port B	[Auto] Enabled Disabled	Configures Serial Port B at boot time. Auto Causes the server to determine the Base I/O address and interrupt to use for the port. Enabled Requires the user to supply the Base I/O address and the interrupt value. Disabled Causes the server to disable the port.
	Base I/O Address	3F8 [2F8] 3E8 2E8	Determines the Base I/O Address for the port.
	Interrupt	IRQ3 [IRQ4]	Determines the Interrupt for the port.
Option ROM Configuration	PCI SLOT 1 ROM	[Enabled] Disabled	Enables Slot 1 Option ROM.
	PCI SLOT 2 ROM	[Enabled] Disabled	Enables Slot 2 Option ROM.
	PCI SLOT 3 ROM	[Enabled] Disabled	Enables Slot 3 Option ROM.
	PCI SLOT 4 ROM	[Enabled] Disabled	Enables Slot 4 Option ROM.
	PCI SLOT 5 ROM	[Enabled] Disabled	Enables Slot 5 Option ROM.
	PCI SLOT 6 ROM	[Enabled] Disabled	Enables Slot 6 Option ROM.
	PCI SLOT 7 ROM	[Enabled] Disabled	Enables Slot 7 Option ROM.
	PCI SLOT 8 ROM	[Enabled] Disabled	Enables Slot 8 Option ROM.

continued

Table 12. BIOS Setup Advanced Screen Menu Items (continued)

Primary Menu Item	Sub Menu Items	Value	Description
Event Log Configuration	Event Logging	[Enabled] Disabled	Select Enabled to allow logging to System Event Log.
	Clear All Logs	[No] Yes	Setting to Yes will clear the System Event Log..
POST Error Pause		[Enabled] Disabled	Select “Disabled” if the user wants the system to boot with no user intervention on critical POST errors.

Security

Table 13 describes the menu items available on the **Security** screen.

NOTE

With the removal of legacy keyboard and mouse support, the legacy security core has been removed. Therefore, the security menu is briefer than on other server products. Also, the two-level password has been replaced with a single-level password.

Table 13. BIOS Setup Security Screen Menu Items

Menu Item	Default Value	Description
Administrator Password Is	[Not Installed] Installed	Status only, the user cannot modify. Once set, can be disabled by setting to a null string, or clear password jumper on board.
Set Password	Press <Enter>	When the <Enter> key is pressed, the user is prompted for a password, press ESC key to abort. Once set, can be disabled by setting to a null string, or clear password jumper on board. Note that only alpha-numeric characters are supported for the password. Other key entries are ignored Also the password is not case-sensitive.

System Management

Table 14 describes the menu items available on the **System Management** screen. Default values appear in brackets.

Table 14. BIOS Setup System Management Screen Menu Items

Menu Item	Default Value	Description
Quiet Boot	[Enabled] Disabled	Selecting this option enables the BIOS to display the OEM logo during POST. If disabled, the BIOS displays the normal POST messages. This option is hidden if the BIOS does not detect a valid logo in the flash area reserved for this purpose. Enabling this option disables serial redirection.
Service Boot	[Disabled] Enabled	Enabling this item allows the user to boot into Service Partition Boot mode. The item automatically resets to "Disabled" on the next system boot.
>Console Redirection	Press <Enter> to present selection *submenu*	Selecting this option allows the user to configure for console redirection.
OS Boot Timeout	[Enabled] Disabled 5 minutes 10 minutes 15 minutes 20 minutes	Sets the time allowed for booting an OS, from media or PXE.
BMC Revision	*[BMC_Rev]*	The currently loaded version of Baseboard Management Controller firmware. The user cannot change this value. It appears for informational purposes only.
HSC Revision	*[HSC_Rev]*	Information field only, hidden if not detected. Displays the Hot Swap Controller revision.

Table 15. Setup Console Redirection Sub Menu Items

Sub Menu Item	Default Value	Description
Serial Console Redirection	Enabled/Disabled	When enabled, Console Redirection uses only COM2. Choosing "Disabled" completely disables Console Redirection.
Baud Rate	9600 [19.2K] 38.4K 57.6K 115.2K	When Console Redirection is enabled, use the baud rate specified. When EMP is sharing the COM port as console redirection, the baud rate must be set to 19.2K to match EMP baud rate.
Flow Control	No Flow Control [CTS/RTS] CTS/RTS + CD XON/XOFF	No flow control. CTS/RTS = Hardware based flow control. CTS/RTS +CD = Hardware based + Carrier Detect flow control. When EMP is sharing the COM port as console redirection, the flow control must be set to CTS/RTS or CTS/RTS+CD depending on whether a modem is used.

Sub Menu Item	Default Value	Description
		Xon/Xoff = Software based flow control
Terminal Type	PC-ANSI VT100+ VT-UTF8	Select terminal type. Vt100+ only available when English selected as the language. VT-UTF8 uses UNICODE. PC-ANSI is the standard PC-type terminal.
Serial Port	COM2 2F8 IRQ3	Hardcoded – no selection available. Note that if Console Redirection is enabled, then the Base I/O address and IRQ selection of Serial Port B (under Menu Advanced, sub-menu Peripheral Configuration) should match this Serial Port setting under the Console Redirection submenu.
Remote Console Reset	Enabled/Disabled	Enables remote reset via escape key sequence; ESC R ESC r ESC R
ACPI OS Headless Operation	Disabled Same as BIOS Serial Port	Used to pass information about serial redirection to ACPI OS.
ACPI OS Baud Rate	9600 19.2k 38.4K 57.6k 115.2k	Only available when ACPI OS Headless Operation is Same as BIOS or Serial Port.
ACPI OS Flow Control	No Flow Control CTS/RTS XON / XOFF CTS/RTS + CD	Only available when ACPI OS Headless Operation is Same as BIOS or Serial Port . Same options as above; these are passed to the OS.
ACPI OS Terminal Type	PC-ANSI VT100+ VT-UTF8	Only available when ACPI OS Headless Operation is Same as BIOS or Serial Port . Same options as above; these are passed to the OS.

Exit

Table 16 describes the menu items available on the **Exit** screen. Default values appear in brackets.

Table 16. BIOS Setup Exit Screen Menu Items

Menu Item	Description
Exit Saving Changes	Lets the user exit Setup with or without saving your changes in CMOS. Clicking on the menu item causes the system to prompt the user for a Yes or No response. Yes Saves your changes and exits the utility. No Discards your changes and exits the utility.
Exit Discarding Changes	Lets the user exit Setup with or without discarding your changes. Clicking on the menu item causes the system to prompt the user for a Yes or No response. Yes Discards your changes and exits the utility. No Saves your changes and exits the utility.
Load Setup Defaults	Lets the user load Setup with factory defaults. Clicking on the menu item causes the system to prompt the user for a Yes or No response. Yes Loads the system setup defaults. No Aborts the action.
Save Custom Defaults (This menu will not be available until post platform release)	Lets the user load Setup with custom defaults. Clicking on the menu item causes the system to prompt the user for a Yes or No response. Yes Loads setup values from a file previously saved through the Save Custom Defaults menu item. the user must specify the file name. No Aborts the action.
Discard Changes	Lets the user discard the changed values the user has accumulated during this setup session. Clicking on the menu item causes the system to prompt the user for a Yes or No response. Yes Discards the setup values for the current setup utility session. No Aborts the action.

LSI SCSI Utility

The LSI SCSI utility allows the user to configure the SCSI capabilities of the server. This configuration utility can be accessed using an EFI-based utility provided by Intel. This utility is available on the Resource CD or from Intel® Business Link (IBL). Please contact your Intel representative for more information on obtaining this utility.

The EFI utility can be evoked from the EFI shell prompt with the command EFICnfg.efi. From here the SCSI drives can be configured. The utility contains help information at the bottom of each screen. More information on this utility will be documented in a future revision of this document.

NOTE

This utility is still being defined and changes may occur in the menus shown below. Entrance into this utility may be updated in a future revision of this document.

To run the LSI SCSI utility:

1. From the EFI Shell, run EFICnfg.efi to enter the LSI Logic SCSI Utility. The following information is displayed on your monitor:

```
Intel's EFI Configuration program ver 0.6 Serial # Controller description
1.  OnBoard Function0 Usb Universal Host Controller
2.  OnBoard Function1 Usb Universal Host Controller
3.  OnBoard Function0 LSI Logic Ultra320 SCSI Controller
4.  OnBoard Function1 LSI Logic Ultra320 SCSI Controller
Please enter a serial number (Enter 0 to Exit):
```

2. Select the Function0 LSI Logic Ultra320 SCSI Controller's serial number (in this case, 3) and press <Enter>.

The Main Menu appears as shown in Figure 14. LSI SCSI Utility Main Menu.

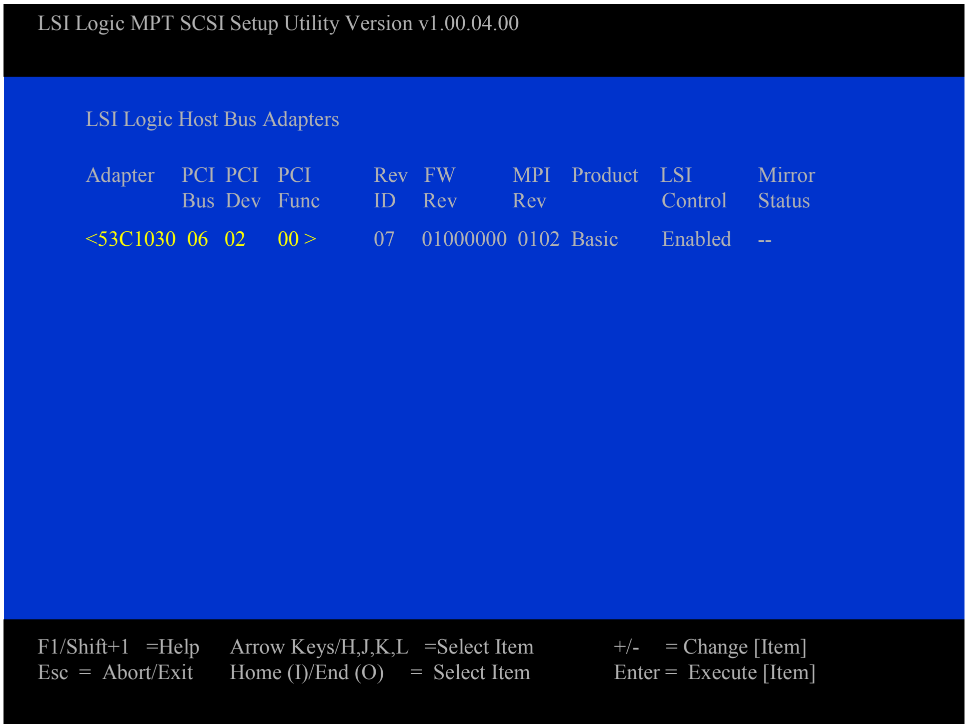


Figure 14. LSI SCSI Utility Main Menu

To select the adapter the user wishes to configure, use the arrow keys to highlight the adapter then press <Enter>. The screen clears and a message reading “Scanning for devices…” appears.

Figure 15 shows the adapter properties and its different configuration settings.

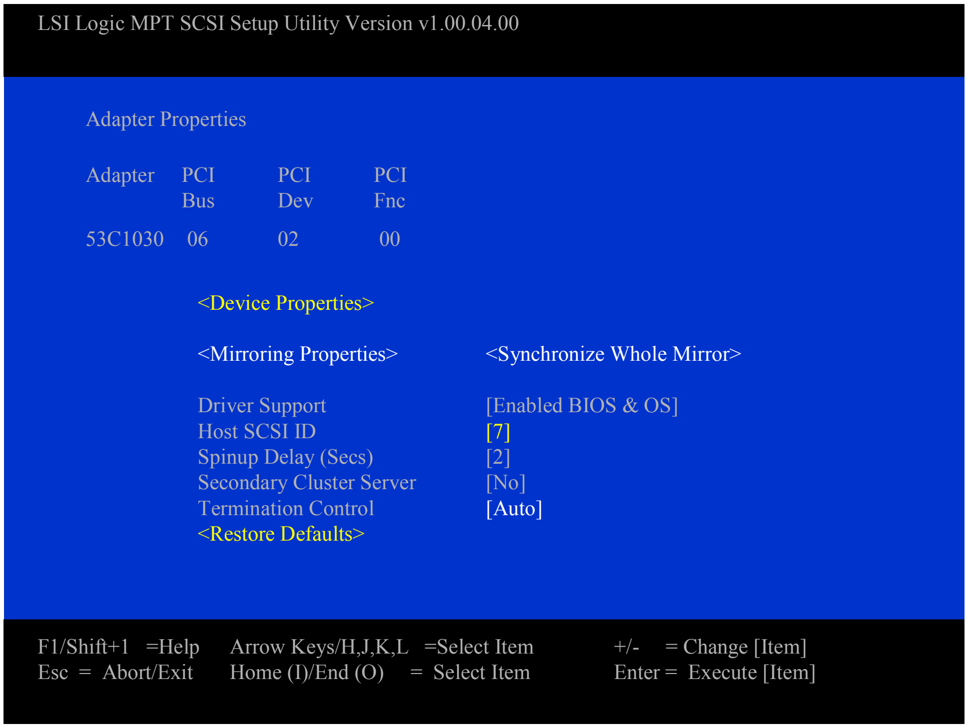


Figure 15. Adapter Properties

The following list shows the available options for each setting category.

Driver Support	Enabled BIOS & OS or Enabled OS Only or Enabled BIOS only or Disabled
Host SCSI ID	0 to 15
SCSI Bus Scan Order	Low to High (0..Max) or High to Low (Max..0)
Spin up delay (seconds)	1 to 15
Secondary Cluster Server	No or Yes
Termination	Auto

The <Restore Defaults> option allows the user to restore the default configuration of the SCSI adapter.

The <Device Properties> option takes the user to the Device Properties menu shown in Figure 16.

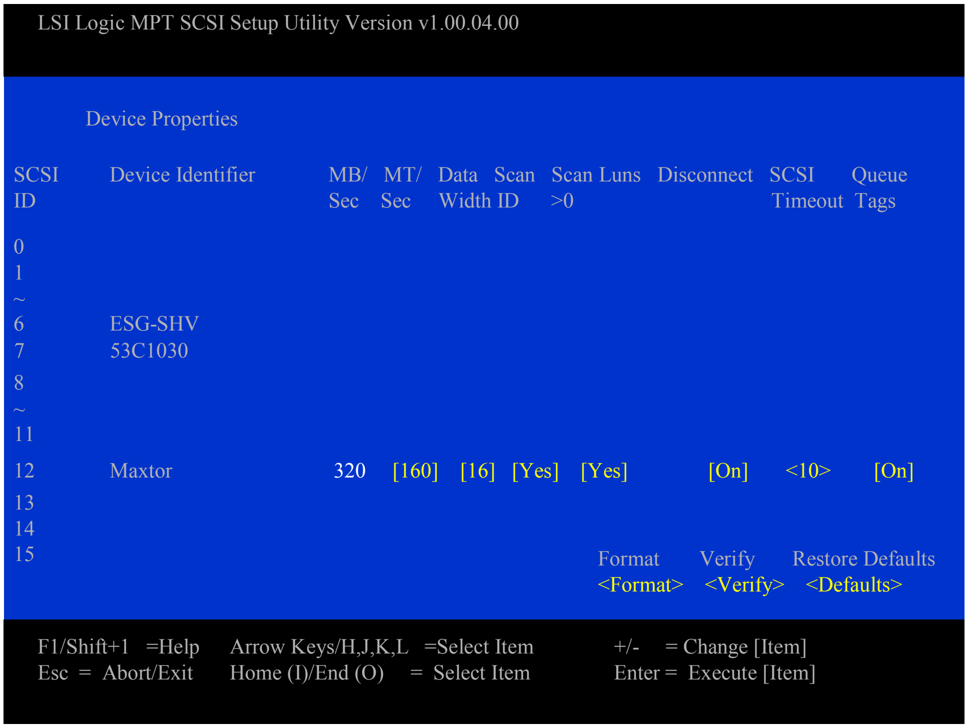


Figure 16. Device Properties

The Device Properties Menu shows options of devices attached to the adapter. It is a large menu and requires the use of the arrow keys to move fully to the left and fully down to see all configuration options. There are "slide bars" (not shown above) to the right and on the bottom to help define your location in the menu. The following list shows the available options for each setting category:

MB/Sec	320
MT/Sec	0 or 5, 10, 20, 40, 80, 160
Data Width	16 or 8
Scan ID	Yes or No
Scan Luns >0	Yes or No
Disconnect	On or Off
SCSI Timeout	<10>
Queue Tags	On or Off

Format, Verify, and Restore Defaults are all functions. They are located on the far left of the menu, but are shown below the other configuration options in the figure above. Format and Verify takes the user to another menu, see Figure 17 and Figure 18 below. These menus give appropriate warnings and allows the user the option of continuing with the function or canceling. Restore Defaults function do not take the user to another menu and does not give the user the option to cancel. If the user makes changes and then accidentally select the Restore Defaults function, all changes will be discarded.

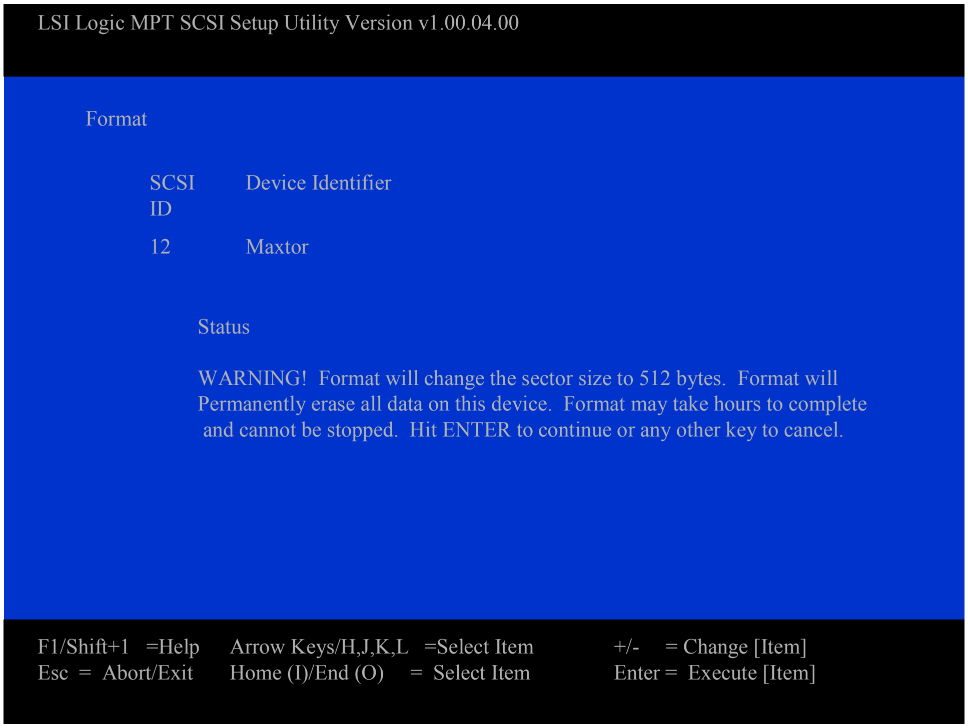


Figure 17. Device Properties Format Option

Figure 18. Device Properties Verify Option

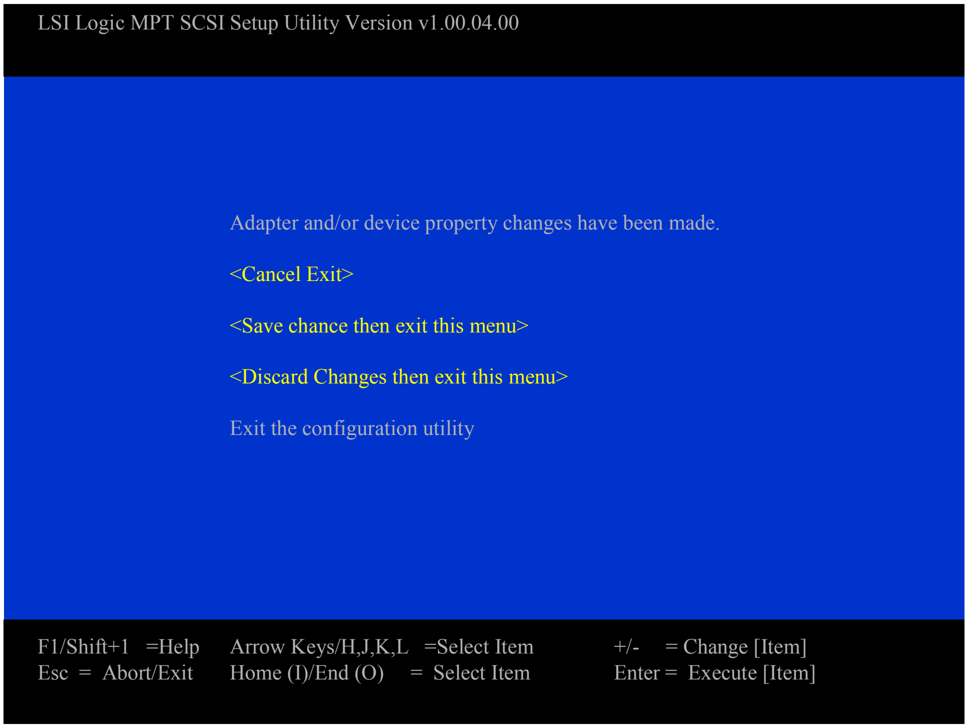


Figure 19. Adapter and/or Device Properties Exit Menu

When exiting the Adapter Properties Menu, if any changes have been made, the Exit Menu appears giving the following three options. Cancel Exit, Save Changes then exit, or Discard changes and exit.

Figure 20. SCSI Utility Exit Menu

When exiting the LSI Logic MPT SCSI Setup Utility, if any changes have been made, the Exit Menu appears giving the user these options. Cancel Exit, Save Changes then exit, or Discard changes and exit. The above menu shows the exit menu that appears if no changes have been made to the Setup Utility.

After exiting, the user is returned to the EFI Shell prompt.

The SR870BN4 Resource CD

The SR870BN4 Resource CD has the following contents:

- Utilities:
  System Maintenance Utility (SMU)
  Save and Restore System Configuration Utility
  One-Boot Flash Update (OFU) Utility
  EFI Platform Diagnostics
  EFI Configuration Tool
  Ramdriver
- The Product Guide
- Adobe† Acrobat† Reader

The Resource CD comes with a menu driven program that can be used for the following:

- Create removable media device containing utilities, service partition and diagnostics.
- Install EFI Service Partition. The EFI service partition provides the ability to remotely access SR870BN4 via modem or LAN for the purpose of executing configuration/setup utilities and diagnostics.
- Run SR870BN4 EFI based utilities.

Running Software Utilities Directly from the Resource CD

The following procedure allows the user to run the software utilities directly from the SR870BN4 Resource CD.

1. Insert the System Resource CD into the server's CD-ROM drive before booting to EFI Shell.
2. Boot the system into EFI Shell, the EFI CD Menu program launches automatically. If the EFI CD Menu program does not launch in the EFI Shell, mount and map to the CD drive and type 'startup' and press <Enter> to launch the EFI CD Menu.
3. Move the curser over to the Utilities and select the utility the user wants to run.

Upgrading the Firmware

Use the Firmware Update Utility to upgrade the firmware. This utility is an EFI application program that updates the following server management controllers:

- Baseboard Management Controller (BMC)
- Hot-swap Controller (HSC)

You can run the utility interactively by providing commands through the EFI shell, or the user can run it in non-interactive mode by supplying the command with any options. For information on the command-line options, see Table 17 on page 69.

Running the Firmware Update Utility

The following procedure shows how to use the interactive method to upgrade the firmware with the Firmware Update Utility.

1. Boot to the EFI Shell. For information on how to boot the server, refer to "The Extensible Firmware Interface (EFI) Boot Manager" on page 44.

2. Copy the following files to a removable media device. The current release of these files is available through IBL. Download the following files from IBL. (If the user does not have access to IBL, contact your Intel Sales Representative.)

   FWUpdate.efi

   IPMI.efi

   <*name*>.hex

   IPMIdriver.txt

   Firmwareupdate.txt

   <*name*>.txt

Where <name> represents the hex image for the controller being updated. For example, the files lnbmc11.hex and lnbmc11.txt represent the firmware and release note files, respectively for BMC release 11. Make a note of the name of the HEX file as you will need it later.

3. You can update the firmware either by the 'FWUpdate' utility's command line interface or through the GUI interface.
4. To run the Firmware Update Utility through the Command line Interface:
   a. Invoke the utility by entering the following command:
      ```
      fwupdate [HEX File Name] [Options]
      ```
   b. To view the command-line help, type:
      ```
      fwupdate /h
      or
      fwupdate /?
      ```
   c. To update boot block as well as operational block of the firmware from the command line interface:
      ```
      fwupdate [HEX File Name] /upload /bootena
      ```
      Note: An external jumper may be required in order to enable the boot block to be uploaded.
   d. To update the operational block only from the command line interface:
      ```
      fwupdate [HEX File Name] /upload
      ```
      Note: Check the FW release notes for the FW release that the user is trying to update. It may require updating both boot code and operational code.
   e. Go to step 8 and continue.
5. To run the Firmware Update Utility through the GUI interface:
   a. Invoke the utility by entering the following command:
      ```
      fwupdate <name>.hex
      ```
   b. In the command, <name>.hex is the file the user copied earlier in Step 2.
   c. Wait for the HEX file to load and the utility to display its menu items.
   d. Use the arrow keys to select the Update Flash menu item.
   e. Press the <Enter> key.
   f. The utility asks the user to update the boot code and/or the operational code. Check the firmware release notes for the release that the user is trying to update for information on what the user needs to update. The update might require the user to update both boot code and operational code or it might require the user to just update the operational code.

g. After the update completes successfully, the utility verifies the update by reading back the programmed code and comparing it to the HEX file.
h. Select the File menu tab and choose Exit to exit the utility.

6. If the user needs to update the firmware for additional controllers, repeat the above steps for each controller.
7. Power down the system by pressing and holding the power button on the front control panel.
8. Disconnect the AC power cords from the system and wait 60 seconds.
9. Connect the AC power cords and power up the system by pressing the power button.

Firmware Update Utility Command-line Options

Table 17 describes the command-line options for the Firmware Update Utility.

Table 17. Firmware Update Utility Command-line Options and Parameters

Option or Parameter	Description
FWUpdate	The name of the utility.
[Hex_File_Name]	The name of the input hex file used for the update/verification. The file path can be specified with the file name. There is no default filename or extension.
/h Or /?	Display command line help.
/upload	Upload the FW flash with the operational code contained in the hex file. The Platform Information Area (PIA) will also be uploaded, if it is present in the hex file. Upon completion, the firmware is verified against the hex file to ensure the upload was successful.
/norestore	When used in conjunction with /upload, the utility does not restore the user configuration settings after performing the update. Without this switch, the utility saves the user configurations prior to updating the FW, and then restores the saved user configuration settings after updating the FW.
/noverify	When used in conjunction with /upload, the utility does not compare the flash against the hex file after performing the update, as is usually done to verify a successful update. When not used in conjunction with /upload, this switch has no effect.
/ignorerevs	When used in conjunction with /upload, the firmware version in the hex file is not checked. Without this switch, the utility only allows uploading a version of the firmware that is greater than or equal to the version being replaced. When not used in conjunction with /upload, this switch has no effect.
/nopc	When used in conjunction with /upload, the platform check is disabled. Without this switch, the utility only allows uploading firmware that is intended for the target platform. The target platform is determined by reading the BIOS ID of the system and compares it against the Platform Name field in the boot code info block of the hex file. In the case of the PIA, the target platform is determined from the Platform Group and Platform ID fields of the PIA info block. When not used in conjunction with /upload, this switch has no effect.
/bootena	When used in conjunction with /upload, the boot-block of the device is uploaded in addition to the operational code and PIA if present in the hex file. NOTE: An external jumper may be required in order to enable the boot block to be uploaded (a jumper is not required for SR460AC4 platforms). On systems requiring the jumper, the boot block upload fails if the jumper is not set, and an error is generated indicating that the boot block could not be uploaded. However, the utility still attempts to upload the operation code and PIA, if present in the hex file. This switch may only be used in conjunction with /upload.

/verify	Verify the firmware. The utility compares the flash contents of boot code, operation code, and PIA (if applicable), with that contained in the hex file.
/fwversion	Display firmware version, for all supported devices in the system.
/infoblock	Display device info block of input hex file.
/nopause	Suppresses keyboard wait at end of transfer or on an error. This switch allows updates to be performed in a batch style environment without requiring user interaction.

Upgrading the BIOS by Using IFlash64

The BIOS is implemented as firmware that resides in the processor board and I/O riser flash ROMs. Use the EFI (Extensible Firmware Interface) based utility IFlash64.EFI to upgrade the BIOS.

NOTES

Refer to information at the Intel Business Link (IBL) for the latest information on upgrading the BIOS. If the user does not have access to the IBL, contact your Intel Sales Representative.

After the user completes the Iflash64 BIOS update, the user must clear CMOS. For information on how to clear CMOS, refer to "Clearing CMOS" on page 72.

BIOS Upgrade Procedure

A BIOS upgrade procedure can be done using the latest available System Update Package (SUP) for the SR870BN4 system. This package is available on IBL and is a script file that automatically runs IFlash64 and other firmware update utilities as required. However, the user can also use the IFlash64 utility to upgrade the BIOS following these steps:

1. Boot to the EFI Shell. For information on how to boot the server, refer to "The Extensible Firmware Interface (EFI) Shell" on page 48.
2. Copy the utility `IFlash64.EFI` and the binary input file to a removable media device. The binary file contains the new BIOS. All firmware, BIOS, and utility updates are posted to the Field Division Business Link (FDBL), which is maintained and accessible by Intel Customer Support. When the user needs updates, your designated Field Engineer authorizes the user to download files from the Intel Business Link (IBL). Refer to the update instructions provided with each BIOS release for the most current instructions.

3. Running the IFlash64 utility through the Command line Interface:
   a. Invoke the utility by entering the following command:
      `IFlash64 [File Name] [Options]`
   b. To view the command-line help, type:
      `IFlash64 /h`
      or
      `IFlash64 /?`
   c. NOTE: For information on IFlash64 command-line options and parameters, refer to Table 18.
   d. To update System BIOS from the command line interface, type:
      `IFlash64 [File Name] /update`
   e. To verify System BIOS from the command line interface, type:
      `IFlash64 [File Name] /verify`
   f. Go to Step 4
4. Running the IFlash64 Utility through the GUI Interface:
   a. Invoke the utility by entering the following command:
      `IFlash64`
      or
      `IFlash64 [File Name]`
   b. Use the arrow keys to browse through the menu and press the <Enter> key to select. A brief description of the selected menu item is displayed in the Tip-View window, which is displayed at the bottom of the screen.
   c. To update System BIOS from the GUI interface, select "Update System BIOS".
   d. To verify System BIOS from the GUI interface, select "Verify System BIOS".
5. Turn off the computer and follow the procedure to clear CMOS as described on "Clearing CMOS" on page 72.

IFlash64 Utility Command-line Options

Table 18 lists the command-line options for the IFlash64 Utility.

Table 18. IFlash64 Utility Command-line Options and Parameters

Parameter	Description
Iflash64	The name of the utility.
[Volume_File_Name]	Name of the BIOS binary volume file used for the update. The file path can be specified with the file name. There is no default file name.
/d	Display header and FLASH areas information of volume file.
/f	Load default values from CMOS on next boot.
/quiet	Quiet or non-interactive mode. It displays only error messages and disables prompting the user for input.
/reboot	Reboot system after update.
/update	Update system BIOS in non-interactive mode. Note that it only updates flash areas that are different than the ones found in the input binary file. Use "/o" to override this default operation.
/verify	Verify current Flash with contents of input binary file in non-interactive mode.
/h Or /?	Displays command line help.

Clearing CMOS

WARNING

Make sure that the rack is anchored securely so it will not tilt forward when the server chassis is extended. A crush hazard exists should the rack tilt forward which could cause serious injury.

The user must clear CMOS after the user completes the IFlash64 BIOS update. Clearing CMOS involves changing a jumper setting on the I/O riser card, restarting the server with the new jumper setting, restoring the jumper setting to its original position, and restarting the server a final time.

To clear CMOS follow these steps:

(Clearing CMOS by DIP switch)

1. Power down the server by pressing and holding the power button on the front control panel. The user might have to hold the power button down for several seconds.
2. Remove standby power from the server by unplugging both power cords from the system and removing them from the server.
3. Remove the screw that secures the non-hot-plug I/O cover over the I/O riser card and slide the cover off.
4. Remove the I/O riser card by following the procedure described in “Removing the I/O Riser Card” on page 187.
5. Position switch #3 on the five-position DIP switch at location S8A1 to the ON position as shown in Figure 137 on page 265.
6. Replace the I/O riser card by following the procedure described in “Replacing the I/O Riser Card” on page 187.s
7. Reinstall the server’s power cords and plug them into the power source.
8. Power on the server by pressing the power button on the front control panel.
9. Wait for the message 'NVRAM cleared by jumper' to appear. When the options 'Hit <F1> to load defaults or <F2> to run SETUP or <ESC> to continue, hit <F1> to load the defaults.

After the user clears CMOS, the switch setting must be restored to it’s “OFF” position and the server restarted. Follow these steps to return the switch to the default position and reboot the system.

1. Power down the system by pressing and holding the power button on the front control panel. The user might have to hold down the power button for several seconds.
2. Remove standby power from the server by unplugging both the power cords from the power source and removing them from the server.
3. Remove the I/O riser card by following the procedure described in “Removing the I/O Riser Card on page 187.
4. Reposition jumper switch #3 on the 5-position switch at location S8A1 so that it is in the “OFF” position. See Figure 137 on page 265 for the default position.
5. Replace the I/O riser card by following the procedure described in “Installing the I/O Riser Card” on page 189.
6. Close and secure the rear part of the top cover.
7. Reinstall the power cords and plug them into the power source.
8. If the chassis is rack mounted, push the system back into the cabinet rack.
9. Power on the server by pressing and holding the power button on the front control panel.

BIOS Recovery Mode

The BIOS Recovery Mode permits re-flashing the BIOS when the flash ROM has been corrupted. The usual sequence of events for automatic recovery is:

1. Request recovery media by repeating a low-tone beep with POST code.
2. Insert recovery media and reset the system.
3. One beep indicates recovery media valid, and flash update started.
4. Approximately two minutes later, two beeps indicate flash update complete.
5. System automatically resets and starts the new BIOS.

The BIOS Recovery Mode, when using an LS240, is initiated using the following procedure:

1. Prior to attempting recovery for the first time, either use a previously formatted unused or a blank LS-240 diskette.
2. Unzip the recovery image and copy the S870BN4A.REC file (S870BN4B.REC for Madison) onto the LS-240 diskette. The file S870BN4A.rec should be the only file on the disk.
3. With the system switched off and AC power disconnected:
   a. Place I/O riser toggle switch #1 to the ON position (S8A1) for forced BIOS recovery. For toggle switch location, refer to "I/O Riser Card Settings" the on page 265.
   b. Insert diskette in LS-240 drive.
   c. Reconnect the AC power and switch server power on.
   d. LS-240 diskette activity started.
   e. One full beep (start load S870BN4A.REC from disk to memory).
   f. Wait two minutes. No indication of LS-240 activity will be seen until two beeps are heard that indicate the BIOS recovery has completed successfully.
   g. Remove the LS-240 recovery diskette, switch system power off, and disconnect AC power.
   h. Replace the I/O toggle switch #1 to the OFF position, reconnect AC power and switch the system on per updated BIOS release notes (i.e. clear CMOS first time booting).

The BIOS Recovery Mode, when using a CD, is initiated using the following procedure:

1. Unzip the recovery image and burn the included .iso file to a blank CD. The file S870BN4A.rec should be the only file on the disk.
2. With the system switched off and AC power disconnected:
   a. Place I/O riser toggle switch #1 to the ON position (S8A1) for forced BIOS recovery. For toggle switch location, refer to "I/O Riser Card Settings" on page 265.
   b. Reconnect the AC power and switch server power on.
   c. Quickly insert CD into DVD drive
   d. LS-240 diskette activity should start.
   e. There should be one full beep (start load SR870BN4A.REC from disk to memory).
   f. Wait two minutes. No indication of LS-240 activity will be seen until two beeps are heard that indicate the BIOS recovery has completed successfully.
   g. Remove the LS-240 recovery diskette, switch system power off, and disconnect AC power.

Replace the I/O toggle switch #1 to the OFF position, reconnect AC power and switch the system on per updated BIOS release notes (i.e., clear CMOS first-time booting).

➡ **NOTE**

The system supports BIOS recovery using CD-ROM or DVD. The recovery image should be copied to the CD in El Torito format.

Using the FRUSDR Load Utility

The Field Replacement Unit (FRU) and Sensor Data Record (SDR) Load Utility (FRUSDR.EFI) is an Extensible Firmware Interface (EFI) program that updates or modifies the server management subsystem's product level FRU and SDR repository.

The user should run the FRUSDR Load Utility each time the user upgrades or replaces the hardware in your server; excluding add-in boards, hard drives, and RAM. The utility programs the sensors the server uses to monitor server management.

Using the FRUSDR Load Utility, the user can do the following:

- Discover the product configuration based on instructions in a master configuration file.
- Display the FRU information.
- Update the non-volatile storage device associated with the baseboard management controller (BMC) that holds the SDR and FRU information.
- Generically handle FRU devices that might not be associated with the BMC.
- Supply command lines and interactive input through the standard input device.
- View and direct results to the standard output device.

Running the FRUSDR Load Utility

Follow these steps to run the FRUSDR Load Utility:

1. Boot to the EFI Shell. For information on how to boot the server, refer to "Booting the Server from the Service Partition" on page 142
2. Copy the FRUSDR package to a removable media device or to the hard drive. The user can find the FRUSDR package on the CDROM included in the Country Kit that shipped with the server.
3. Load the Intelligent Platform Manager Interface (IPMI) driver by typing the following command:

```
load ipmi.efi
```

➡ **NOTE**

The IPMI driver file name might change independently of the FRUSDR Load Utility.

4. Run the utility by entering a frusdr command based on the following syntax:

```
frusdr [option] [/p]
```

The frusdr command accepts single options only. The user can accompany any option with the `/p` switch to cause the output to pause between blocks of displayed output. For descriptions of the FRUSDR Load Utility command-line options, see "FRUSDR Load Utility Command-line Options," below.

NOTE

The user can run the utility directly from the configuration software CD-ROM or from diskettes the user creates from the CD-ROM included in the Country Kit shipped with the system. If the user chooses to run the FRUSDR Load Utility from a diskette, the user must copy the utility from the CD-ROM and follow the instructions in the included README.TXT file.

5. Use the FRUSDR Load Utility to manage the server management subsystem's product level FRU and SDR repository.
6. Reboot the system by powering off and powering on the server. The reboot operation is necessary because the firmware must reload to properly initialize the sensors after programming and thus effect the changes the user has made to the FRU and SDR repository.

FRUSDR Load Utility Command-line Options

The basic command line format is:

```
frusdr [/?] [/h] [/p] [/d { fru, sdr}] [/Cfg filename.cfg]
```

Where:

/? or /H	Displays usage information
/D SDR	Displays the sensor data records
/D FRU (Address)	Displays the FRU located at a given address
/CFG (filename.cfg)	Uses the specified custom configuration file
/P	Pause the display between blocks of data to prevent the displayed data from scrolling off the screen

The /D FRU option displays FRU information from a device at the specified address allowing any FRU to be displayed. The parameters following the /D FRU are the same values as the FRU file header addresses, namely: NVS_TYPE, DEVICE_ID, DEV_CNTR (aka Device Controller), NVS_LUN, DEV_BUS and DEV_ADDRESS.

There are two addressing modes for FRU devices: Indirect and Direct.

Indirect: FRUSDR /D FRU [NVS_TYPE | DEV_CNTR | NVS_LUN | DEVICE_ID]
Direct: FRUSDR /D FRU [NVS_TYPE | DEV_CNTR | NVS_LUN | DEV_BUS | DEV_ADDR]

NVS_TYPE	The type of EEPROM; Either AT24C02, DS1624S, or IMBDEVICE. If not specified, IMBDEVICE is assumed.
DEV_CNTR	The controller’s IPMB device address; defaults to ‘C20’. Must be prefixed by ‘C’ and must be 3 characters in length, including the ‘C’.
NVS_LUN	The Logical Unit Number. Must be prefixed by ‘L’ and defaults to ‘L0’. LUN value may be any number between 0 – 3, though any value except the default is uncommon.
DEVICE_ID	The Device ID; defaults to 00. Used only if NVS_TYPE is IMBDEVICE, (i.e. Indirect Addressing).
DEV_BUS	The device’s bus number; it has no default. Required if NVS_TYPE is not IMBDEVICE (i.e. Direct Addressing). It has no default value.
DEV_ADDR	The device’s address; it has no default. Required if NVS_TYPE is not IMBDEVICE (i.e. Direct Addressing). It has no default value.

All numbers entered for DEV_CNTR, DEV_ID, DEV_BUS, and DEV_ADDR are interpreted as hexadecimal values, and must be in the range 0 – FF; the NVS_LUN must be 0, 1, 2 or 3. The command line arguments may be specified in any order and if one of the arguments is not specified, then its default value is used, if it has one. If DEV_BUS and DEV_ADDR are specified, i.e. Direct Addressing is used, then DEV_BUS is assumed to precede DEV_ADDR. If no arguments are specified for [Address] then the BMC FRU is displayed.

Example using Indirect addressing:

FRUSDR /D FRU IMBDEVICE CC0 L0 0

The utility interprets this as DEV_CNTR = 0xC0, NVS_LUN = 0, DEV_ID = 0;

Because many of these values are the default values, the same result could be accomplished with the following:

FRUSDR /D FRU CC0 0

Example using Direct addressing:

FRUSDR /D FRU AT24C02 C20 L0 9 AA

The utility interprets this as DEV_CNTR = 0x20, NVS_LUN = 0, DEV_BUS = 0x09, DEV_ADDR = 0xAA.

Because many of the values are the default values, the same result could be accomplished with the following:

FRUSDR /D FRU AT24C02 9 AA

Whenever more than one number is listed on the command line, the utility assumes the numbers are DEV_BUS and DEV_ADDR in that order. So the following command line:

FRUSDR /D FRU CC0 L0 5 AT24C02 A9

Would be interpreted as DEV_CNTR = 0xC0, NVS_LUN = 0, DEV_BUS 0x05, DEV_ADDR = 0xA9. And since NVS_TYPE is not IMBDEVICE, Direct addressing would be used.

The /CFG command line options uses the specified Configuration file. The configuration file may be used to load multiple FRU and SDR files. In the configuration file, each FRU and SDR file name must be called out. Additionally, each FRU area and field to be programmed must also be specified. The configuration file may be used to prompt or request information from the user, and to inquire from the user which FRU areas to program. For more information on the configuration file see page 82.

The /P command may be used with all other commands. It causes the data being displayed on the screen to pause after a pre-determined amount is written, so that the displayed data does not scroll off the screen. In some cases, if there is not enough data being displayed to warrant a pause, then the pause command is ignored.

Command Line Precedence

Command line precedence simply means, the first command found is operated on, followed by the next command, and so on. Commands can be broken up into two categories: Flag commands and action commands. The only flag command is the Pause (/P) flag command. This flag is then used by the action commands. The action commands are: /?, /D FRU, /D SDR, and /CFG.

The pause command only affects the execution of certain action commands. For example, the Pause flag command only provides additional information when used with the help and display FRU and SDR action commands.

If an action command does not use the Pause Flag, no error is displayed. It was felt that this is a minor error and should not prevent the utility from functioning. If more than one action command is listed on the command line, then an error is displayed and the utility exits. The error that is displayed depends on what the command was.

Displays Usage Information

When the utility is invoked with the /? or /H command line arguments, the following message is displayed on your screen:

```
FRUSDR Load Utility, Version 2.0
Copyright (c) 2002 Intel Corporation, All Rights Reserved
_______________________________________________________________________
Usage:  FRUSDR
           /? or /H           Displays detailed usage information.
           /D SDR             Displays Sensor Data Records.
           /D FRU [Address]   Displays the FRU located at a given Address.
           /CFG [CFG File]    Uses the specified custom Configuration file.
           /P                 Pauses the display between blocks of data.
```

This utility is used to program, compare, or display FRU and/or SDR information. It must be run on an Intel Itanium 2 system executing NSHELL under the EFI environment. Upon completing the programming of the FRU and/or SDR areas, the server should be rebooted.

Display the FRU located at a given Address

Usage: FRUSDR /D FRU [Address]

The Addressing mode may be 'Indirect' or 'Direct'

Indirect: FRUSDR /D FRU [NVS_TYPE | DEV_CNTR | NVS_LUN | DEV_ID]

Direct: FRUSDR /D FRU [NVS_TYPE | DEV_CNTR | NVS_LUN | DEV_BUS | DEV_ADDR]

NVS_TYPE - The type of EEPROM, { AT24C02, DS1624S, or IMBDEVICE (default) }

DEV_CNTR - Controller's Address; defaults to 'C20'. Must be prefixed by 'C'

NVS_LUN - The LUN; defaults to 'L00'. Must be prefixed by 'L'

DEV_ID - The Device ID; defaults to 00. Used only if NVS_TYPE is IMBDEVICE

DEV_BUS - The Device's bus; has no default value

DEV_ADDR - The Device's address; has no default value

The DEV_BUS and DEV_ADDR are required only if NVS_TYPE is not IMBDEVICE

If DEV_CNTR is specified, it must be 3 characters in length, including the 'C'

All numbers entered for DEV_CNTR, DEV_ID, DEV_BUS, and DEV_ADDR are interpreted as hexadecimal values, in the range 0 - FF; LUN must be 0, 1, 2 or 3.

The command line arguments may be specified in any order, and if one of the arguments is not specified then its default value is used; if it has one. If no arguments are specified for [Address] then the BMC FRU is displayed.

Use a specified custom configuration file.

Usage: FRUSDR /CFG [Configuration file name].

If not specified, the name of the CFG file defaults to 'MASTER.CFG'. The configuration file may be used to load multiple FRU and SDR files. In the configuration file, each FRU and SDR file name must be called out.

Additionally, each FRU area and field to be programmed must also be specified. The configuration file may be used to prompt or request information from the user, and to inquire from the user which FRU areas to program.

Displays Given Area

When the utility is invoked with the **/d FRU** or **/d SDR** command line argument, the indicated area is displayed. If the given display function fails because of an inability to parse the data present or hardware failure the utility displays an error message.

Displaying FRU Area

The FRU area is displayed in ASCII format when the field is ASCII or as a number when the field is a number. The FRU field strings are specified in the *IPMI Platform Management FRU Information Storage Definition*. Each FRU area displayed is headed with the FRU area designated name. Each FRU field has a field name header, followed by the field in ASCII or as a number. The Internal Use area is displayed in hex format, 16 bytes per line. The Board, Chassis and Product FRU areas are ended with an END OF FIELDS CODE, which indicate there is no more data in this area.

Example:

```
FRU IMBDEVICE on Controller 20h, LUN 00h, Device ID 00h
Display Header Area
Common Header Area (Version 1, Length 8)
 Internal Area Offset   = 01h
 Chassis Area Offset  = 0Ah
```

```
 Board Area Offset= 0Eh
 Product Area Offset  = 16h
 Multi-Record Offset  = 00h
 Pad                     = 00h
 Checksum             = D0h
```

```
Displaying Internal Use Area
Internal Information Area (Version 0, Length 72)

 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 00 00 00 00 00 00 01 00
Displaying Chassis Area
Chassis Information Area (Version 1, Length 32)
 Chassis Type           = 11h
 Part Number       (ASCII) = SBALMADSTD02PP
 Serial Number     (ASCII) = A05884265
END OF FIELDS CODE
Displaying Board Area
Board Information Area (Version 1, Length 64)
 Unicode Country Base    = 00h
 Manufacturing Time (mins) = 733803
 Manufacturer Name (ASCII) = Intel
 Product Name      (ASCII) = B440FX DP
 Serial Number     (ASCII) = N03121530
 Part Number       (ASCII) = 664653-001
 Mftr FRU File ID (ASCII) = 0123
```

END OF FIELDS CODE

```
Displaying Product Area
Product Information Area (Version 1, Length 80)
 Unicode Country Base      = 00h
 Manufacturer Name (ASCII) = Intel
 Product Name      (ASCII) = B440FX DPServer
 Part Number       (ASCII) = SBALMADSTD02PP
 Product Version   (ASCII) =
 Serial Number     (ASCII) = A05884265
 Asset Tag         (ASCII) =
 Mftr FRU File ID (ASCII) = 0123
```

END OF FIELDS CODE

Displaying SDR Area

The SDR non-volatile storage area is displayed in the following hex format. A Sensor Record Number X header separates the data, where X is the number of that sensor record in the SDR area. The next line after the header is the sensor record data in hex format delineated by spaces. Each line holds up to 16 bytes. The data on each line is then followed by the same data in ASCII format, non/printable characters (ch < 32 || ch > 126) are substituted by a '.'.

Example:

```
Reading SDR Repository, please wait.........
Displaying SDR area
Reading SDR Record #1
 0E 00 10 01 37 20 00 0F 05 00 10 F1 F8 02 01 85       ....7 ..........
 02 00 00 00 04 00 00 C4 02 00 08 30 C2 07 91 95       ...........0....
 8E FF 00 1B 1B 00 99 95 00 8A 8E 02 02 00 01 CC       ................
 53 43 53 49 2D 42 2D 54 65 72 6D 33            SCSI-B-Term3
Reading SDR Record #2
 0E 40 10 01 30 20 00 13 05 00 10 F1 F8 04 01 05.@..0 ..........
 00 00 00 20 29 00 00 1E 02 00 00 00 00 00 00 00       ...  )...........
 00 FF 00 03 03 00 00 00 00 42 49 02 02 00 01 C5       .........BI.....
 46 41 4E 2D 32                                        FAN-2
```

User Specified CFG File

The utility is normally invoked with the command line parameter of /CFG ["Filename"] where the "filename" can be any accepted character filename string. This feature loads the indicated CFG file. The utility uses the entries in the configuration file to probe the hardware and to select the proper Sensor Data Records to be programmed into non-volatile storage. If the argument /CFG is used without a filename, then the default file 'MASTER.CFG' is used, if it exists.

Loads Specified FRU File

The normal method of loading one or more FRU files is through the use of a configuration file. Each FRU file name is specified using the FRUNAME configuration command. The first time a FRU file is programmed, all areas in the FRU file need to be written, and this initialization should be done in manufacturing. The FRUSDR utility does not support first time programming of FRU areas.

Once the FRU file has been initially programmed, then the FRUSDR utility may be used to update specific FRU areas and fields. The user may not change the size of any FRU area from the size defined in the original FRU Header. Through the use of a configuration file, each area of the FRU may selectively be programmed. The FRU information written to the non-volatile storage device is verified after programming and an appropriate message is displayed. For more detailed information on creating and using a configuration file see "Configuration File" on page 82.

In the FRU file header there exists a pad byte that may be any one-byte value without directly causing an error, this pad byte is used in calculating the header checksum. If the header checksum is incorrect, then a message is displayed so indicating.

Comparing the FRU File

The configuration "COMPARE" command allows the validation of information to what exists in the non-volatile storage device without programming that information. The "COMPARE" command is used in a configuration file, and placed on the same line after the FRU name to be compared.

The compare functionality does a byte-by-byte comparison of the non-volatile storage device and what was to be programmed. The internal use area is never compared; this utility considers all bytes of the internal use area to be dynamic and subject to change at will by the firmware. In the board area, the manufacturing date and time, and the board area checksum are also not compared, although the rest of the board area bytes are compared.

Loads Specified SDR File

The normal method of loading an SDR file is through the use of a configuration file. Typically all possible Sensor Data Records exist in one master SDR file. Each SDR file name is specified after the SDRNAME configuration command. Through the configuration file, tags may be use to selectively chose which records are to be programmed using tags. The maximum allowable length of any Sensor Data Record is 64 bytes. Any larger records are flagged as an error.

Example:

```
Writing SDR Record #36
Reading SDR Repository
SDR file was successfully written!
Programming complete, reboot server for normal operation
```

Comparing the SDR File

The configuration "COMPARE" allows the comparing of SDR information to what is in the SDR Repository without programming that information. The "COMPARE" command is used in a configuration file and placed on the same line after the SDR name to be compared. The compare feature does a byte-by-byte comparison of the non-volatile storage device and what was to be programmed. No checksum is used. During a comparison, the first two bytes of each Sensor Data Record are ignored, because when the repository was programmed, the first two SDR bytes were modified by the BMC and a pointer inserted.

Functional Operation

Display Utility Title and Version

The utility displays as its title during development:

```
FRUSDR Load Utility, Version 2.0 Build X where 'X' is the build number for the
particular version of the utility.
```

Upon final release, the banner is modified and the build status removed, therefore:

```
FRU & SDR Load Utility, EFI Version 2.0, Build 4
```

Will become the production release:

```
FRU & SDR Load Utility, EFI Version 2.0
```

Configuration File

A CFG file may be used by the utility. The configuration file is ASCII text and editable. The file is parsed, then pertinent information is stored internally by the utility. The information obtained from the configuration file is used to direct the execution path of the utility and to establish a configuration for the product. The configuration file allows the user to override values contained in an associated FRU file; it does not allow the user to add areas to a FRU file. One should think of the FRU in the non-volatile storage device as containing the default values. If the user decides to leave out FRU areas or fields during programming, then the information already contained in those FRU areas or fields on the Server will remain.

The utility executes commands formed by the strings present in the configuration file. These commands cause the utility to perform various tasks needed to ultimately load the proper Sensor Data Records into the non-volatile storage of the BMC and possibly generic FRU devices. Some of the commands are user interactive and require a choice to be made by the user.

For detailed information on the configuration file format, see the “FRU and SDR Load Utility Plus Configuration File Format EPS.”

Probing Product Configuration

Using the information in the configuration file, the utility can probe the product configuration. For more information see page 82 on the configuration file format of the “FRU and SDR Load Utility Plus Configuration File Format EPS.”

Checking the FRU Data Integrity

The utility needs the FRU Common Header offsets to be correct. The Utility checks the Common Header Area in each NVS device against the FRU file, and also runs a checksum on it. If the Common Header Area in the FRU file is correct and matches what is in the NVS device, then the information is programmed. An incorrect Common Header means the FRU area is corrupted or has never been initialized.

If the Internal Use Area of the BMC is loaded from the FRU file, then the BMC will be cold reset. This is so the BMC re-initializes its internal copy of the Internal Use area from the FRU. The effect of re-initializing the Internal Use Area is that both the SDR table and the SEL (System Event Log) table are cleared. All information in both areas is lost and the SDRs must be reprogrammed.

Updating the SDR Non-Volatile Storage Area

After the utility validates the header area of the supplied SDR file, then it updates the SDR repository area. Before programming begins, the utility clears the SDR repository area. When loading an SDR file from a Configuration File, the utility filters all tagged Sensor Data Records using a list of tags determined by the user, which represent the product’s configuration. Non-tagged Sensor Data Records are automatically programmed.

Updating the FRU Non-Volatile Storage Area

After the system configuration is determined, a typical configuration file updates the FRU non-volatile storage area. It will first verify the Common Header area and checksum from the specified FRU file with what is programmed in the FRU non-volatile storage device. If specified, the Internal Use Area is then read out of the specified FRU file and is programmed into the non-volatile storage device. Then Chassis, Board, and Product areas are read out of the specified FRU file and programmed into the non-volatile storage device. Lastly the Multi-Record Area is read out of the specified FRU file, and then the area is programmed into the FRU non-volatile storage device.

Cleanup and Exit

Finally, if any update was successfully performed, a single message is displayed and the utility exits.

If the utility fails, then it exits with an error message and exit code. See the “FRU and SDR Load Utility Plus Configuration File Format EPS” for a list of possible exit codes and error messages.

System Maintenance Utility

The System Maintenance Utility is an EFI-based program that provides the ability to view or modify the server management firmware configuration, which is maintained by the BMC. The executable program for the SMU is `smu.efi`.

The SMU lets the user:

- Configure serial/modem channels for remote server management over a modem or direct serial connection.
- Configure LAN channels for remote server management over the network.
- Configure users and associated passwords for channel access. Users and channels can be assigned privilege levels to further define the access levels.
- Configure platform events to define the actions that should take place when specific events occur.
- Configure serial over LAN and terminal mode capabilities.
- Configure the power restore policy for the server.
- View, save and clear the BMC System Event Log.
- View and save the BMC Sensor Data Records.
- View and save the Field Replaceable Unit records.

The SMU core components are installed as part of the service partition software installation process and the remote SMU application is part of the Intel® Server Management installation. SMU files are copied to a directory specified during that installation process. It is also possible to run the local SMU application from a CD without installing a service partition.

The SMU software consists of a user interface and core components. The user interface components present the user interface, gather user input, and send input to the core components. The core components interpret data and perform necessary actions to the hardware. The core components also maintain the state of the application and determine the screens to be shown. Specific state information is stored in the data that is exchanged between the user interface and core components.

The core components of the SMU are the same for the local and remote applications. If the SMU is run locally, the user interface component will be an EFI application that uses the Portable Embedded GUI (PEG) graphics library to present the user interface. When running remotely, the user interface component will be a Java application. Running the remote SMU requires the use of Intel Server Management.

NOTE

The local SMU application is available only in English.

Remote Keyboard Navigation

The remote SMU application requires a pointing device for operation; it does not support accelerator keys. Other keys work as described in Table 19.

Table 19. Keyboard Support for Remote SMU Client

Key	Function
`<Enter>`	Pressing `<Enter>` when focus is on a button causes the action associated with that button to occur.
`<Tab>`	Moves focus to the next control in the tab order in the primary information pane.
`<Shift><Tab>`	Moves focus to the previous control in the tab order.

Local Keyboard Navigation

The local SMU application provides keyboard support as follows:

Table 20. Keyboard Support for Local SMU Client

Key	Function
`<Enter>`	If the cursor is in an edit box, the `<Enter>` key moves the cursor to the next selectable control in the currently active pane. When the focus is on a task menu item, a task button, a radio button, or a check box, pressing `<Enter>` selects the control. If the focus is on a single-select control (combo box), pressing `<Enter>` has no effect.
`<Tab>`	Moves focus to the next control in the tab order in the primary information pane.
`<Up arrow>`	Moves the cursor to the previous selectable control in the currently active pane.
`<Down arrow>`	Moves the cursor to the next selectable control in the currently active pane. (Same as the `<Tab>` key.)
`<Right arrow>`	Moves the cursor to the next selectable control in the currently active pane. (Same as the `<Tab>` key.)
`<Left arrow>`	Moves the cursor to the previous selectable control in the currently active pane. (Same as the `<UP arrow>` key.)
`<F5> key`	If a horizontal scroll bar is in the active pane, pressing `<F5>` scrolls the display left.
`<F6> key`	If a horizontal scroll bar is in the active pane, pressing `<F6>` scrolls the display right.
`<F7> key`	If a vertical scroll bar is in the active pane, pressing `<F7>` scrolls the display up.
`<F8> key`	If a vertical scroll bar is in the active pane, pressing `<F8>` scrolls the display down.
`<F10> key`	Toggles the focus between the task pane and the primary information pane.
`<ESC> key`	Displays the Exit dialog.

The following are true when using the above keys while running the local SMU application:

- For single-select controls (combo boxes), the <up arrow> and <down arrow> keys can be used to move through the items in the list. To move to a different control, the <Tab>, <left arrow>, or <right arrow> keys are used.
- For a set of grouped radio buttons from which only one can be selected, the <up arrow>, <down arrow>, <left arrow>, and <right arrow> keys can be used to move between buttons in the group. To move to a different control, the <Tab> key is used.
- For edit box controls, the <left arrow> and <right arrow> keys can be used to move the cursor within the edit box. To move to a different control, the <Tab>, <Enter>, <up arrow>, or <down arrow> key are used.

About Box Information

The SMU includes an "About" item in the task pane when the task list is displayed. When "About" is selected, a dialog box is displayed showing information about the SMU application version. The information displayed consists of a set of four numbers, defined as follows:

- The major feature release number
- The minor platform or maintenance release number
- The variant, used for things like different operating systems or languages
- The build number

See the example below.

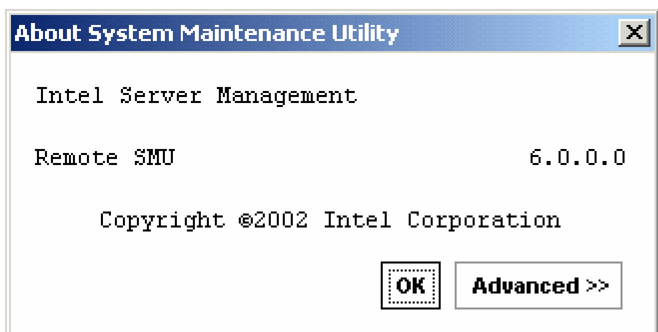


Figure 21. SMU Application About Box

The About box contains an `Advanced` button that can be used to show version information for components related to the SMU application. See the example below.

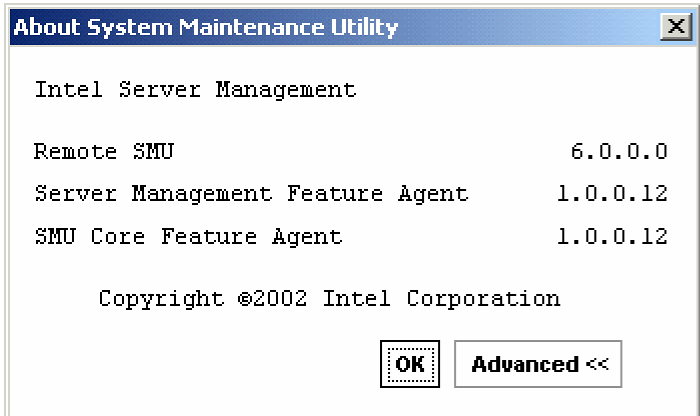


Figure 22. SMU Application About Box (Advanced button selected)

Server Discovery

The remote SMU application requires that the Intel Server Management software be installed on the client system. When the ISM software is run, it performs a discovery of all servers that support tools available within ISM. The discovered servers are displayed in the ISM Console. By clicking on a server name in the table, a list of tools supported on that server is displayed. The SMU is contained in the set of tools listed under the heading "Reboot to Service Partition".

Remote SMU Application

The path used to connect to a target server is defined by the ISM software, based on information it has about each server. After a LAN connection is established between the remote SMU application and SMU core components on the server, the application and the core components set up a socket connection to communicate through.

The sequence of steps that occur when starting the remote SMU application is listed below. These steps occur under the control of the ISM software, not the SMU software, and all errors are handled by the ISM software.

1. In the ISM Console software, click on `Reboot to Service Partition` under the list of tools for a server shown.
2. Enter the username and password for an out-of-band connection on the Service Partition Utilities screen.
3. Click `Login`.

4. When the server has been successfully rebooted to the service partition software, the supported service partition utilities are displayed, as shown below. Click on `System Maintenance Utility` to launch the SMU application. ISM passes connection information to the SMU so the SMU can communicate with the target server. Up to this point, all errors are handled by the ISM software, not the SMU.

Figure 23. Service Partition Utilities

The remote SMU application attempts to establish a socket connection to the server and uses the Service Partition Utilities services to execute the server-side SMU core components. If a connection is established, the application sends information to the SMU core components to request a session. If the connection fails, a dialog box is displayed to indicate an error condition. In the event of an error, the user can attempt to restart the SMU from the ISM console.

After the session with the SMU core components is established, a version check is made to determine if the remote SMU application is able to communicate with the SMU core components on the server. If the versions do not match, an error message is displayed, the SMU application is closed, and control is returned to the Service Partition Utilities application.

After the session between the SMU application and the core components is established, the window below is displayed. The primary information pane at the right directs the user to select an activity from the task pane at the left.

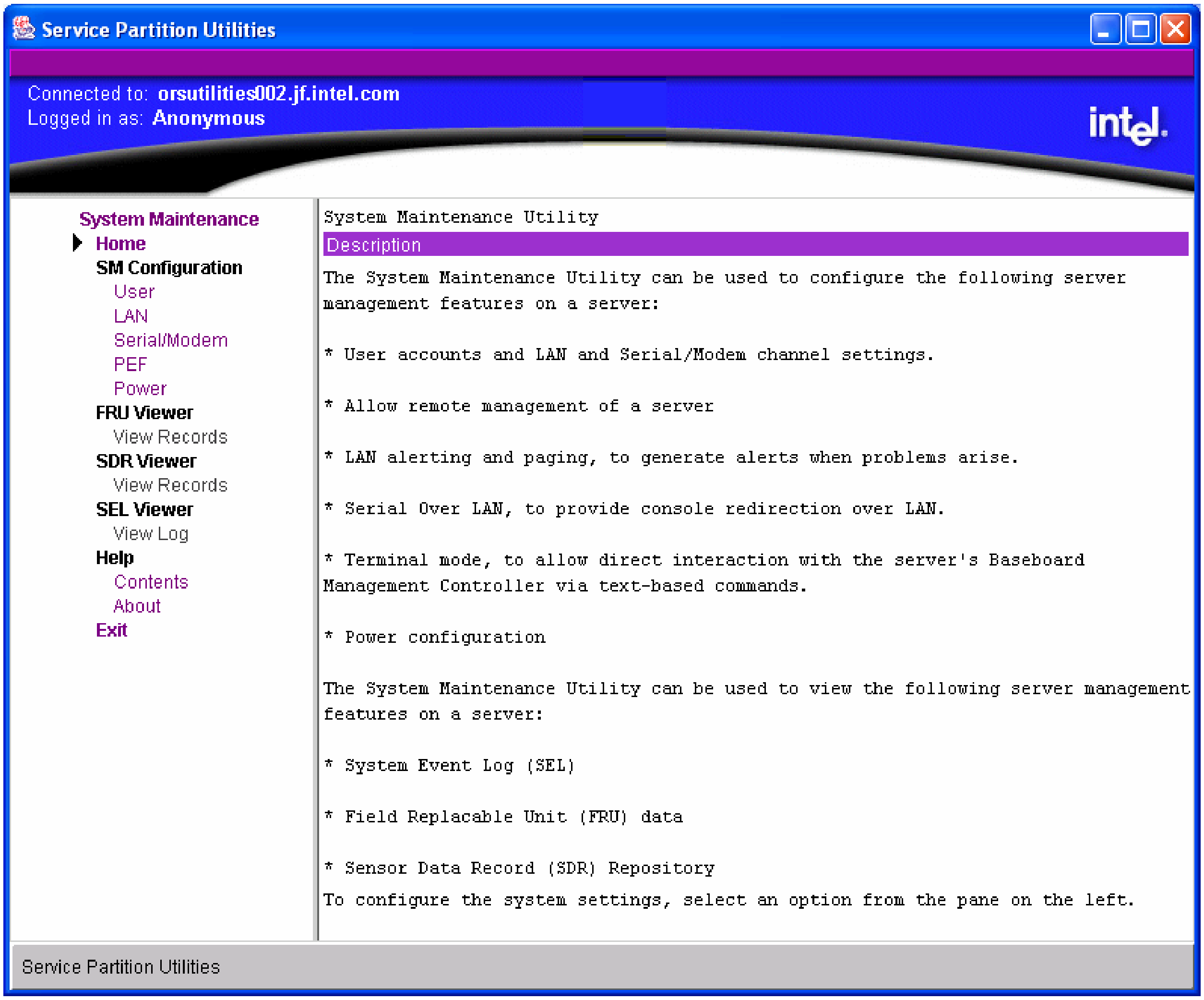


Figure 24. SMU Home

Local SMU Application

The local SMU application and the core components exchange XML documents using a procedural interface. There is no socket connection between the application and the core components.

The local SMU application can be run either from the system Resource CD or, if the SMU software has been installed locally, from the directory where it was installed on the system partition. The software can be run from a CD, regardless of whether it has been installed locally.

Running from CD

The target server must have a CD drive (EFI currently supports only CDs that contain information in the "El Torito" format). No network connection is required.

The following sequence of steps is followed to start the SMU locally (assuming the system Resource CD is being used):

1. Insert the system Resource CD into the CD drive on the target server and boot the server to the EFI shell. The Resource CD menu program begins running automatically and displays a splash screen followed by the main menu.
2. Use the arrow keys to move to the Utilities menu item. Press the `<Enter>` key.
3. Use the down arrow key to highlight the System Maintenance Utility menu item. Press the `<Enter>` key to start the local SMU application.

Running from the System Partition

To run the SMU application from a service partition on which it has been installed, follow the steps below:

1. If an EFI shell prompt is available on the local console and the files on the system partition can be accessed, skip to step three.
2. Reset the server and boot to the EFI shell.
3. Locate the file system (e.g. fs0:, fs1:) that contains the service partition software and change directory to `\efi\service\smu`.
4. Run `smu.efi`.

Shutdown SMU Application

Exit either the local or remote SMU application by clicking on the Exit item in the task pane or by clicking the Close button in the upper right hand corner of the container. A user can also use the `Close` option in the system menu of either container. An exit operation can be started at any time (unless the application is blocked while it waits for a response from the server). During the exit process, the following steps occur:

1. The application sends a message to the SMU core components asking to end the SMU session.
2. The SMU core components send a message to the application asking for user confirmation of the exit request. This message is displayed as a dialog box with an `OK` button and a `Cancel` button.
3. Clicking the `OK` button causes the SMU application to send another message to the server to confirm the exit request. If `Cancel` is clicked, the request to close is canceled.
4. A final message is sent to the application from the server before the application shuts down. When the local SMU application is used, it exits to the EFI shell. When the remote SMU application is used, control is returned to the Service Partition Utilities application.

Server Management Configuration Task

The server management configuration task appears in the task pane of the SMU. This task allows the user to configure server management settings maintained by the Baseboard Management Controller. The server management configuration task supports configuring of the following, which are displayed as sub-tasks:

- LAN Channel
- Users
- Platform Event Filtering (PEF)
- Serial/Modem Channel
- Power Settings

Upon selecting one of the above sub-tasks, a screen is displayed that contains some or all of the configuration items that pertain to the selected sub-task. The data that is initially displayed is read from the server management controller of the server. You can update the settings and save them back to the server.

Sub-tasks can be made up of one or more screens, depending on the server management configuration settings that are enabled. Buttons that are common to the server management configuration tasks are described in Table 21.

Table 21. Common Buttons for Configuration Management Sub-tasks

Button	Description
`Save`	Causes the current values of the settings in the current sub-task to be stored in non-volatile memory on the server.
`Edit`	Causes a screen to be displayed that allows settings related to a single entry in a table to be changed.

LAN Channel Configuration Sub-task

The LAN channel configuration sub-task allows settings related to the LAN channel to be modified. The initial screen for configuring the LAN channel is shown in the figure below. The configuration settings are described below the figure.

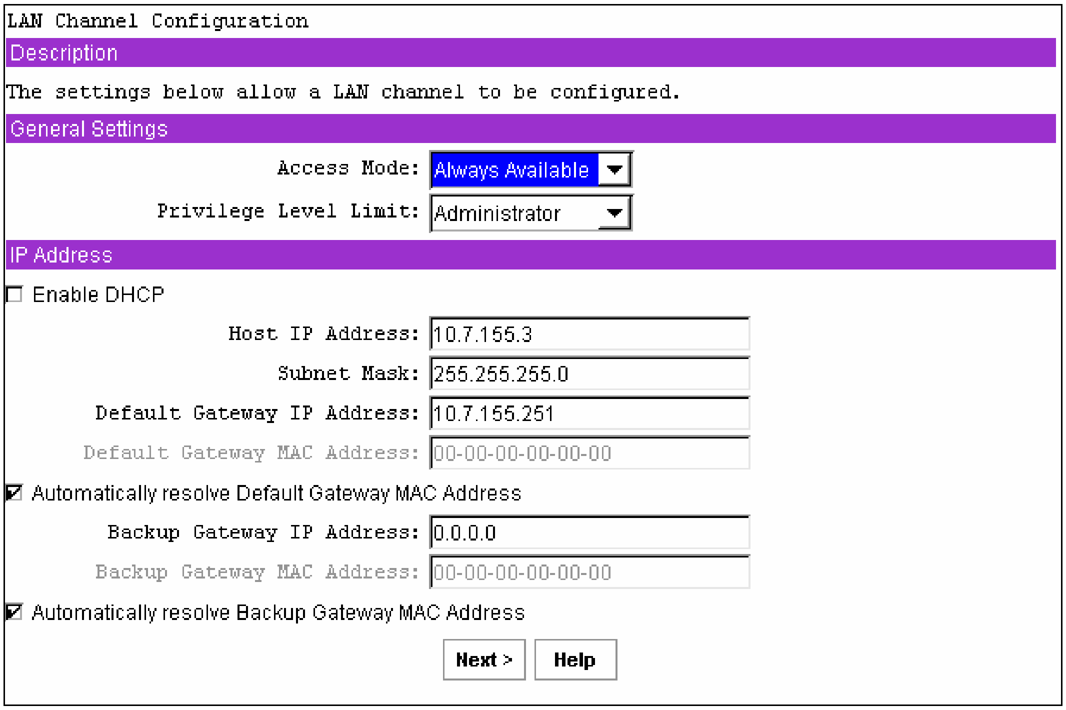


Figure 25. LAN Channel Configuration

After completing this screen, click `Next` to move to the next screen to continue this sub-task.

Default LAN Configuration Settings Set by the SMU

The SMU automatically configures some server management firmware settings. These are not displayed on the screen above, but are listed below. Before these settings are set by the SMU, the user must click through each LAN configuration screen by clicking the `Next` button until the `Save` button on the final LAN configuration screen is reached.

- Gratuitous ARPs may be enabled: This setting allows the BMC to generate gratuitous ARPs, which provide a mechanism for IP devices to locate the hardware addresses of other devices on the local network. If the server has a valid IP address and the LAN channel is enabled for messaging (the access mode is not set to Disabled) or alerting, then gratuitous ARPs are enabled.
- Authentication enables are enabled: These bits define what types of authentication are enabled to authenticate messages sent to the BMC by users of different privilege levels. The SMU enables authentication of type straight password, MD2, MD5, and none.
- User-level authentication is disabled: The SMU disables user-level authentication so that if a user is attached with a privilege level of User, no authentication is done on messages sent to or from the BMC. This improves the session performance.

Access Mode

This drop-down box configures the access mode for the LAN channel. The available options are:

- Always Available: The channel is dedicated to communication with the BMC and is available during all system states (powered-down, powered-up, pre-boot, sleep, run-time, etc.).
- Disabled: The channel is not allowed to communicate with the BMC.

Privilege Level Limit

This drop-down box determines the maximum privilege level at which communication on the channel can take place. It is a global privilege level that takes precedence over user privilege levels. For example, if a channel privilege level is set to the user level then only user-level commands can be executed, regardless of the user privilege level.

The meanings of the different privilege levels are described below:

- Callback: Only commands needed to initiate a callback session are allowed. Although ISM software does not support callback as a connection mechanism, it is still a valid privilege level because it defines a set of BMC commands that can be executed by a user.
- User: Only “benign” commands are allowed. These are primarily commands that read data structures and retrieve status. Commands that can be used to alter BMC configuration, write data to the BMC or other management controllers, or perform system actions such as resets, power on/off, and watchdog activation are disallowed.
- Operator: All BMC commands are allowed, except for configuration commands that can change the behavior of the out-of-band interfaces. For example, Operator privilege does not allow the capability to disable individual channels, or to change user access privileges.
- Administrator: All BMC commands are allowed, including configuration commands. An administrator can execute configuration commands that would disable the channel that the Administrator is communicating over.

Enable DHCP

The Enable Dynamic Host Configuration Protocol (DHCP) check box enables / disables the dynamic host configuration protocol to allow the server to automatically assign the Host IP address, Default Gateway IP address and Subnet Mask. DHCP is enabled when the box is checked.

When this option is enabled, the Host IP Address, Subnet Mask, and Default Gateway IP Address edit boxes are disabled. The system must be reset before this setting takes effect.

Host IP Address

This edit box is for the logical or Internet address of the host. The IP address is required when DHCP is disabled. The IP address is entered as a dotted notation, such as 192.168.0.2.

Subnet Mask

The edit box is for the host’s subnet mask. The server uses this to decide if alert destinations are in the local subnet or in another subnet relative to the client console. The Subnet Mask is required when DHCP is disabled. The Subnet Mask is entered as a dotted notation, such as 255.255.0.0.

Default Gateway IP Address

This edit box is for the IP address of the router used when the BMC sends a message or an alert to a system on a different subnet than the BMC is on. It is required when DHCP is disabled. The IP address is entered as a dotted notation, such as 192.168.0.2.

Default Gateway MAC Address

This edit box allows the MAC address of the default gateway router to be entered. The MAC address is entered as a series of six pairs of hex digits separated by dashes, such as 00-01-62-d0-3e-66. Alphabetic hex digits (a-f) can be entered in uppercase or lowercase. This edit box is disabled by default and is only activated if the check box for Automatically resolve Default Gateway MAC address is not checked. If the edit box is cleared (no address is supplied), a message is displayed asking that a valid address be entered. This edit box is disabled if DHCP is enabled.

Automatically Resolve Default Gateway MAC Address

This check box allows the user to specify whether the BMC should automatically attempt to resolve the MAC address of the default gateway router. This box is checked by default unless the MAC address edit box appears to include a valid MAC address.

If this box is not checked, the MAC address in the Default Gateway MAC Address field must be provided.

When the `OK` button is clicked, the firmware attempts to resolve the gateway MAC address. If the BMC cannot resolve the address, the screen is redisplayed with the box unchecked and the user is asked to provide the MAC address in the Default Gateway MAC Address field. If the screen is redisplayed due to a MAC address resolution issue, any user data previously entered, other than the MAC address information, remains in place.

This check box is disabled if DHCP is enabled.

Backup Gateway IP Address

This edit box allows the IP address of a backup gateway router to be entered. The IP address is entered as a dotted notation, such as 192.168.0.2.

Backup Gateway MAC Address

This edit box allows the MAC address of the backup gateway router to be entered. The MAC address is entered as a series of six pairs of hex digits separated by dashes, such as 00-01-62-d0-3e-66. Alphabetic hex digits (a-f) can be entered in uppercase or lowercase. This edit box is disabled by default and is only activated if the check box for Automatically resolve Backup Gateway MAC address is not checked. If the edit box is cleared (no address is supplied), a message is displayed asking that a valid address be entered. .

Automatically Resolve Backup Gateway MAC Address

This check box allows the user to specify whether the BMC should automatically attempt to resolve the MAC address of the backup gateway router. This box is checked by default unless the MAC address edit box appears to include a valid MAC address.

If this box is not checked, the MAC address in the Backup Gateway MAC Address field must be provided.

When the `OK` button is clicked, the firmware attempts to resolve the gateway MAC address. If the BMC cannot resolve the address, the screen is redisplayed with the box unchecked and the user is asked to provide the MAC address in the Backup Gateway MAC Address field. If the screen is redisplayed due to a MAC address resolution issue, any user data previously entered, other than the MAC address information, remains in place.

LAN Alert Configuration

The LAN Alert Configuration screen is displayed when the user clicks `Next` from the LAN Channel Configuration screen. The LAN Alert Configuration screen shows all configured destination IP addresses for LAN alerts and their associated settings. If no IP addresses are configured as alert destinations, the `Edit` and `Delete` buttons are disabled.

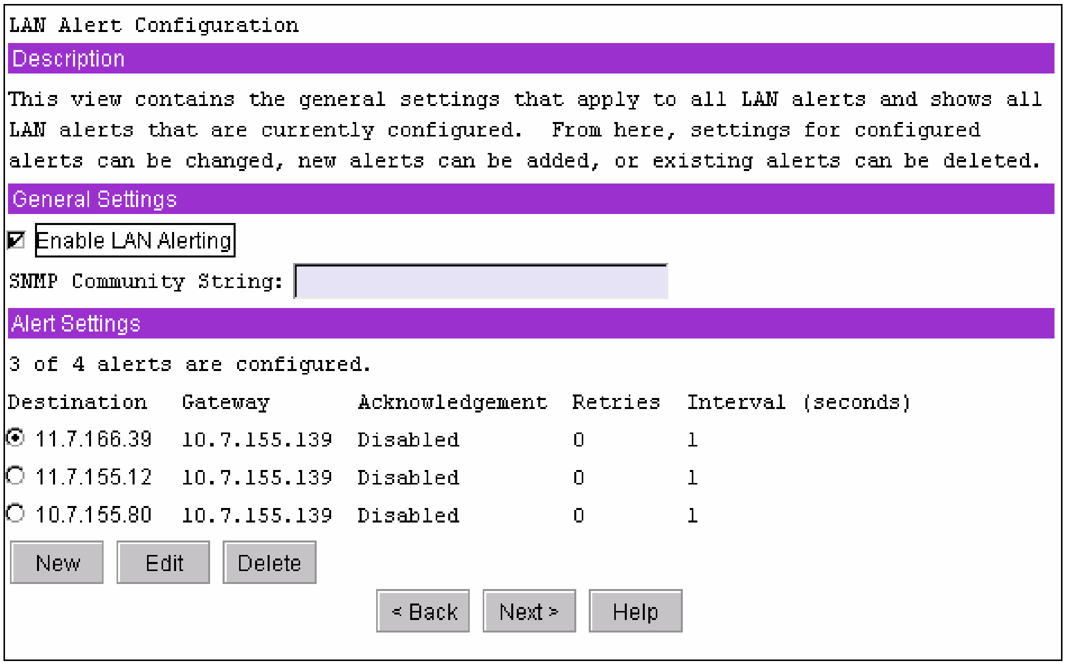


Figure 26. LAN Alert Configuration

After completing this screen, click `Next` to move to the next screen to continue this sub-task.

Enable LAN Alerting

This check box is used to enable or disable alerts on the LAN channel.

SNMP Community String

This edit box is used to enter a string for Platform Event Traps (PETs). This field can optionally be used for a vendor-specific string that is used to provide the network name identity of the system that generated the event. This string is restricted to a maximum of 18 bytes and it is typically set to `public`. This string can be null.

Alert Settings

Up to four LAN alert destinations can be configured. When one or more IP addresses are configured as alert destinations, this part of the screen shows those addresses, along with the following associated configuration settings:

- Gateway IP address for the destination IP address.
- Whether alert acknowledge is enabled for the alerts sent to this destination.
- The number of times the alert will be retried.
- The interval in milliseconds between retries.

New, Edit, and Delete Buttons

If no alerts are configured, only the `New` button is enabled.

- New: When the `New` button is clicked, the user is shown a screen on which a new LAN destination address can be configured. See the following section for details.
- Edit: If the user selects an IP address and then clicks the `Edit` button, screen where the user can edit the configuration for the selected IP address is shown. See the following section for details.
- Delete: If the user selects an IP address and then clicks the `Delete` button, the selected IP address is deleted. Before deleting the IP address, the user is prompted by a confirmation prompt. If the user clicks `OK` to confirm deleting the address, the LAN Alerting Configuration screen is redisplayed with the deleted address no longer shown.

These buttons affect only the copy of the firmware data internal to the SMU. Changes are written to non-volatile storage in the firmware only after the user selects the `Save` button in the last LAN configuration screen.

New/Edit LAN Alert

The New/Edit LAN Alert screen is displayed when teh user clicks either `New` or `Edit` on the LAN Alert Configuration screen. The New/Edit LAN alert screen allows the user to configure or change the settings related to an IP address that is to receive alerts. The screen displayed either to configure a new alert destination or to edit an existing alert is the same, except that when editing an existing alert destination, the current settings read from the firmware are automatically displayed.

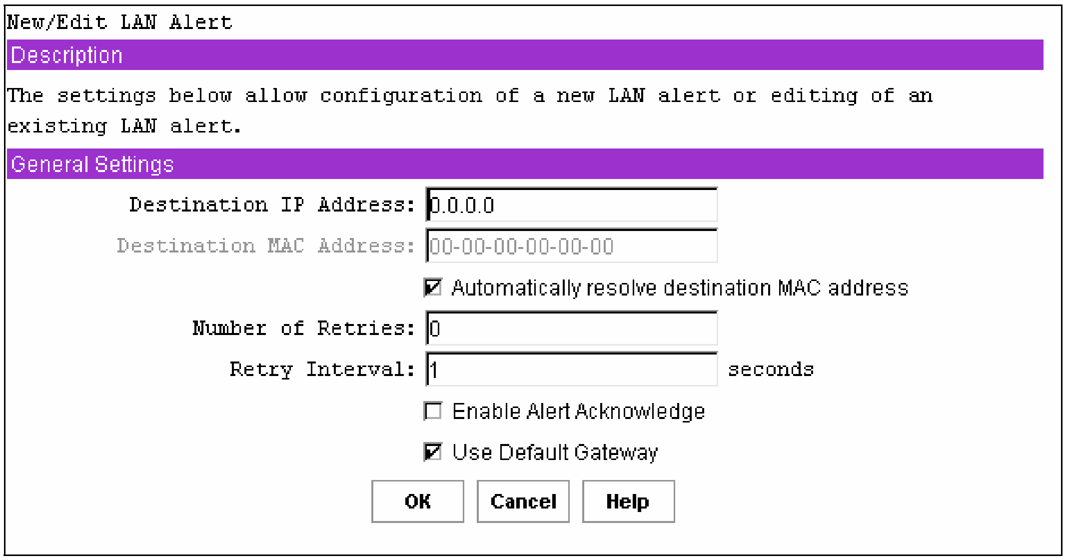


Figure 27. New / Edit LAN Alert

After completing this screen, click `OK` to return to the LAN Alert Configuration screen.

Destination IP Address

This edit box allows the user to enter the IP address to which an alert is to be sent. The IP address is entered as a dotted notation, such as 192.168.0.2. The SMU does not check whether an IP address matches a previously entered address.

Destination MAC Address

This edit box is used to enter the MAC address of the destination machine to which the alert should be sent. This box is used when the destination IP address is outside the subnet that the server is on. The MAC address should be entered as a series of six pairs of hex digits separated by dashes, such as 00-01-62-d0-3e-66. Alphabetic hex digits (a-f) can be entered in uppercase or lowercase. This edit box is disabled by default and is only activated if the check box is not checked for Automatically will resolve destination MAC address.

Automatically Resolve Destination MAC Address

This check box allows the user to specify whether the BMC should automatically attempt to resolve the MAC address of the destination system. This box is checked by default unless the MAC address edit box appears to include a valid MAC address.

If this box is not checked, the MAC address in the Destination MAC Address field must be provided.

When the `OK` button is clicked, the firmware attempts to resolve the destination MAC address. If the BMC cannot resolve the address, the screen is redisplayed with the box unchecked and the user is asked to provide the MAC address in the Destination Gateway MAC Address field. If the screen is redisplayed due to a MAC address resolution issue, any user data previously entered, other than the MAC address information, remains in place.

Number of Retries

This edit box allows the number of times to retry sending an alert to a given destination to be entered. If alert acknowledge is enabled, then retries are sent only if a timeout occurs while waiting for the acknowledgement. If alert acknowledge is disabled, the number of retries is equal to the number of times an unacknowledged alert is sent out.

If the number of retries is set to 0, only a single attempt is made to send the alert. When a number greater than 0 is entered, the alert will be retried only if a timeout occurs while waiting for the acknowledgement.

The number of retries must be between zero and seven.

Retry Interval

This edit box is used to set the retry interval for sending an alert or to set the acknowledge timeout when Enable Alert Acknowledge is enabled. The value entered into this field is disregarded if Enable Alert Acknowledge is disabled.

The retry interval is in seconds, with a recommended value of three seconds. The retry value must be between 1 and 255.

Enable Alert Acknowledge

This check box should be checked if the destination IP address should send an acknowledgement when an alert is received. If this box is checked, then an alert is only assumed to have been successfully sent if an acknowledgement is received.

Use Default Gateway

This check box should be checked if the IP address entered as the default gateway IP address for the LAN channel on the first LAN configuration screen should be used as the gateway for this destination IP address. If this box is not checked, the backup gateway IP address is used as the gateway IP address.

Serial Over LAN Configuration

The Serial Over LAN screen is displayed after the user clicks `Next` on the LAN Alert Configuration screen. The Serial Over LAN screen, shown in the following diagram, allows the user to configure the operation of the serial over LAN capability of the BMC.

The SMU sets up the SOL configuration such that SOL packets do not have to be authenticated. This enhances the performance of an SOL session.

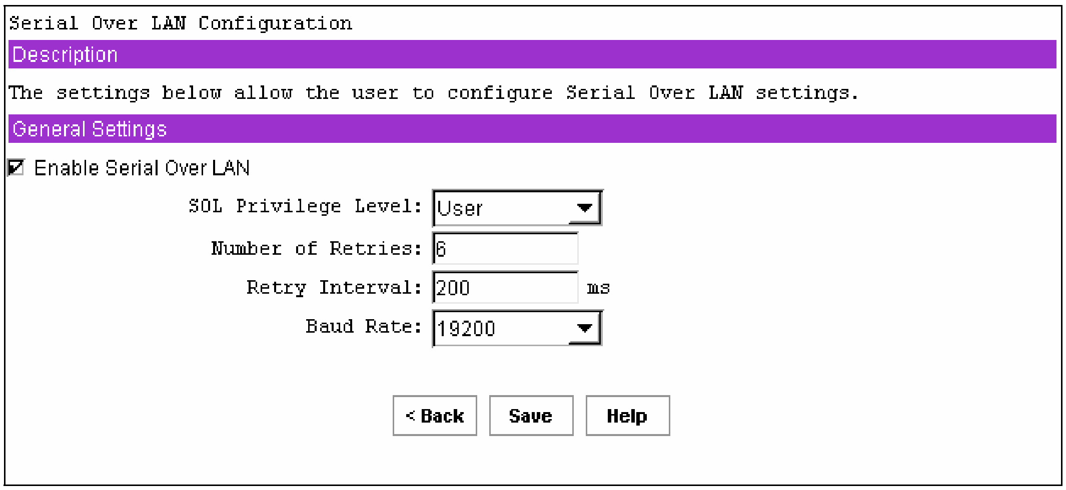


Figure 28. Serial Over LAN Configuration

After configuring the Serial Over LAN information, click `Save` to complete this sub-task.

Enable Serial Over LAN

This check box is used to enable or disable the serial over LAN capability.

SOL Privilege Level

This setting is used to select the minimum operating privilege level that is required to be able to activate SOL. The choices are `User`, `Operator`, and `Administrator`. For the best performance, `User` should be selected.

Number of Retries

This field sets the number of times that the BMC tries to resend a SOL message to a remote console.

The number of retries must be between zero and seven.

Retry Interval

This field sets the number of milliseconds that the BMC waits between trying to send SOL messages to a remote client.

The value entered must be between 0 and 2559. The SMU truncates the digit in the ones column from any input number because the firmware maintains this value in 10 millisecond intervals. Therefore, any value that is entered between 0 and 9 is displayed as 0.

Baud Rate

This field sets the baud rate at which serial data is transferred by the BMC when SOL is active. The choices are `Default IPMI`, `9600 bps`, `19.2 kbps`, `38.4 kbps`, `57.6`, and `115.2 kbps`. If `Default IPMI` is selected, the baud rate used is the rate currently set for BIOS serial redirection. When SOL is active, serial communication with the BMC always occurs with eight data bits, no parity, one stop bit, and RTS/CTS (hardware) flow control.

User Configuration Sub-task

The User Configuration sub-task provides a way to configure the user access to the LAN and Serial/Modem channels. Up to four users are allowed. Some of the options presented in these screens depend on how the channels have been configured; therefore, the channels should be configured before the user accesses these settings.

Sessions allow a framework for user authentication and allow multiple IPMI messaging streams on a single channel.

After clicking on the User Configuration sub-task, the screen displayed below is shown. This screen displays an entry for each possible user that can be configured. This screen shows:

- Whether a particular user is enabled or disabled for channel access
- Whether a password is set for the user
- The privilege level the user has for each of the available channels that supports sessions (users can only access channels that support sessions)

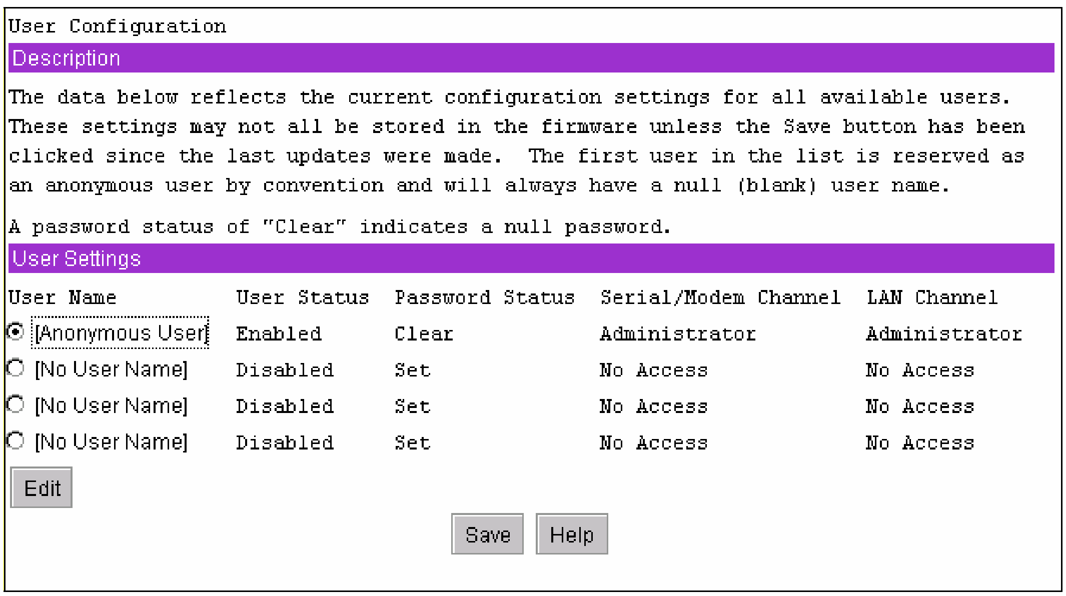


Figure 29. User Configuration

The first user is always present and is used to support an anonymous login. The username for this user is null (blank) and cannot be changed; the user name displays the text `Anonymous User`. The password can be set to a desired value.

It is possible for multiple user entries to have the same username. This occurs if a different password is needed for the same user on different channels. In this case, the privilege level for the channel that is not to be accessed with the associated password should be set to `No Access`. Otherwise, the firmware attempts to use the first entry in the user table that it finds that allows access to the specified channel and would expect the password associated with that entry to be the one entered to gain access to the specified channel.

The figure below shows the screen that is displayed when a User Name is selected and then the `Edit` button is clicked. Changes made to user settings do not take affect until the next time that the user establishes a session.

After configuring the user information, click `Save` to complete this sub-task.

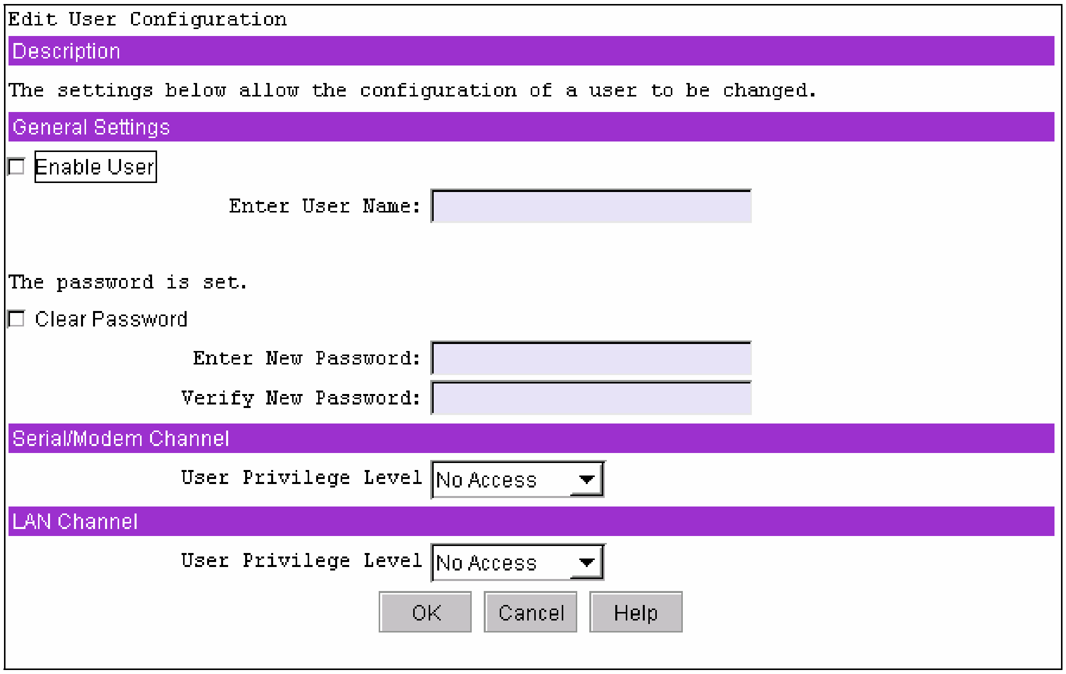


Figure 30. Edit User Configuration

After editing the user information, click `OK` to return to the User Configuration screen.

Enable User

This check box is used to enable the user to attempt to have access to the available channels. Leaving the box unchecked disables the user, preventing that user from accessing the channels.

Enter Username

This edit box is used to enter an out-of-band username. If the anonymous user is selected for modification, the screen displayed does not include this edit box because the user name cannot be changed.

The password can be from 1 to 16 ASCII characters long. The characters accepted by the SMU for usernames are the ASCII printable characters in the range 0x21 through 0x7e, except for left and right bracket characters ('[' and ']'). These characters are reserved for framing packets for terminal mode sessions.

Clear Password

This check box is used to clear the password for the user. If this box is checked, the Enter and Verify New Password edit boxes are disabled.

Enter/Verify New Password

These edit boxes allow the user to enter the password for the user. The Verify New Password edit box ensures that the password entered in the Enter New Password edit box is correct. As a user enters a password, asterisks are displayed. If a password already exists, these fields show `********` when the user enters this screen.

This password can be between 1 and 16 ASCII characters in length. The characters accepted by the SMU for user passwords are the ASCII printable characters in the range 0x21 through 0x7e, except for left and right bracket characters (`[` and `]`), since those characters are used for framing packets for terminal mode sessions.

Note that if the `Clear Password` check box is checked, these two edit boxes are disabled.

If a user password is currently set, the SMU user is not required to enter the current password before changing it.

User Privilege Level for LAN Channels

This combo box allows the user to select the privilege level for the LAN channel. The global privilege level set for the LAN channel access takes precedence over the user privilege level. For example, if the LAN channel is configured for user access only, then users are limited to user operations regardless of the user privilege level.

User Privilege Level for Serial/Modem Channel

This combo box allows the user to select the privilege level for serial/modem channel access. The privilege level set for the serial/modem channel takes precedence over the user privilege level. For example, if the serial/modem channel is configured for user access only, then users are limited to user operations regardless of the user privilege level.

Platform Event Filtering (PEF) Sub-task

The Platform Event Filtering (PEF) sub-task provides a way to configure the BMC to take selected actions on event messages that it receives or has internally generated. These actions include operations such as system power-off and system reset, and triggering an alert message.

The BMC maintains an event filter table that is used to select the events that will trigger an action. Each time the BMC receives an internally or externally generated event message it compares the event data against the entries in the event filter table. If it finds a match, it performs the configured action(s).

The initial PEF sub-task screen is shown in the figure below.

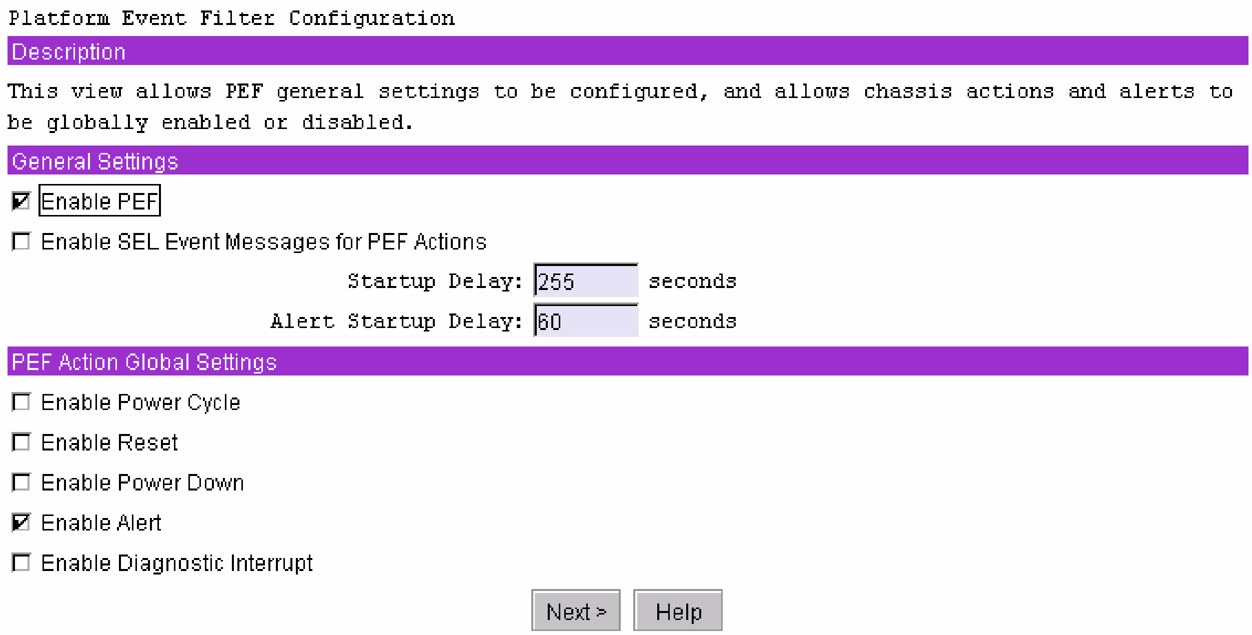


Figure 31. Platform Event Filter Configuration

After completing this screen, click `Next` to move to the next screen to continue this sub-task.

Enable PEF

This option is used to globally enable or disable platform event filtering.

Enable SEL Event Messages for PEF Actions

When this option is checked, each action triggered by a filter generates an event message for the action. This allows the occurrence of PEF-triggered events to be logged in the System Event Log if event logging is enabled.

PEF Startup Delay

This option is used to configure the time in seconds to delay platform event filtering after a system power up or reset.

The number of seconds allowed is between 60 and 255. The default is 255 seconds.

Alert Startup Delay

This setting is used to configure the time in seconds to delay sending out alerts after a system power up or reset.

The number of seconds allowed is between 60 and 255. Zero indicates no delay.

PEF Action Global Settings

This set of check boxes globally enables PEF actions that can occur when an event filter is triggered. For a filter to trigger a particular chassis action (power cycle, reset, power down, or diagnostic interrupt) the global setting must be enabled and the specific chassis action must be selected for the filter. The chassis actions are configured in the screen that appears after the user clicks `Next`.

The check boxes allow enabling or disabling of the following:

- Power Cycle: This check box globally enables / disables the Power Cycle action when an event filter is triggered. The action is enabled when the box is checked.
- Reset: This check box globally enables / disables the system reset action when an event filter is triggered. The action is enabled when the box is checked.
- Power Down: This check box globally enables / disables the system power down action when an event filter is triggered. The action is enabled when the box is checked.
- Diagnostic Interrupt: This check box globally enables / disables a diagnostic (non-maskable) interrupt when an event filter is triggered. The action is enabled with the box is checked.
- Alert: This check box globally enables / disables alerts when an event filter is triggered. The action is enabled when the box is checked.

Event Filter Settings

The PEF Event Filters Settings screen, shown in the figure below, displays the supported pre-configured event filters, along with settings associated with the event filters. These associated settings are:

- Whether the filter is enabled or disabled.
- The policy number associated with the filter (required only if alerts are enabled).
- A chassis action that occurs if the filter event occurs.
- Whether alerts are enabled or disabled if the filter event occurs.

The settings associated with a particular filter can be edited. Select the radio button next to a filter and then clicking the `Edit` button.

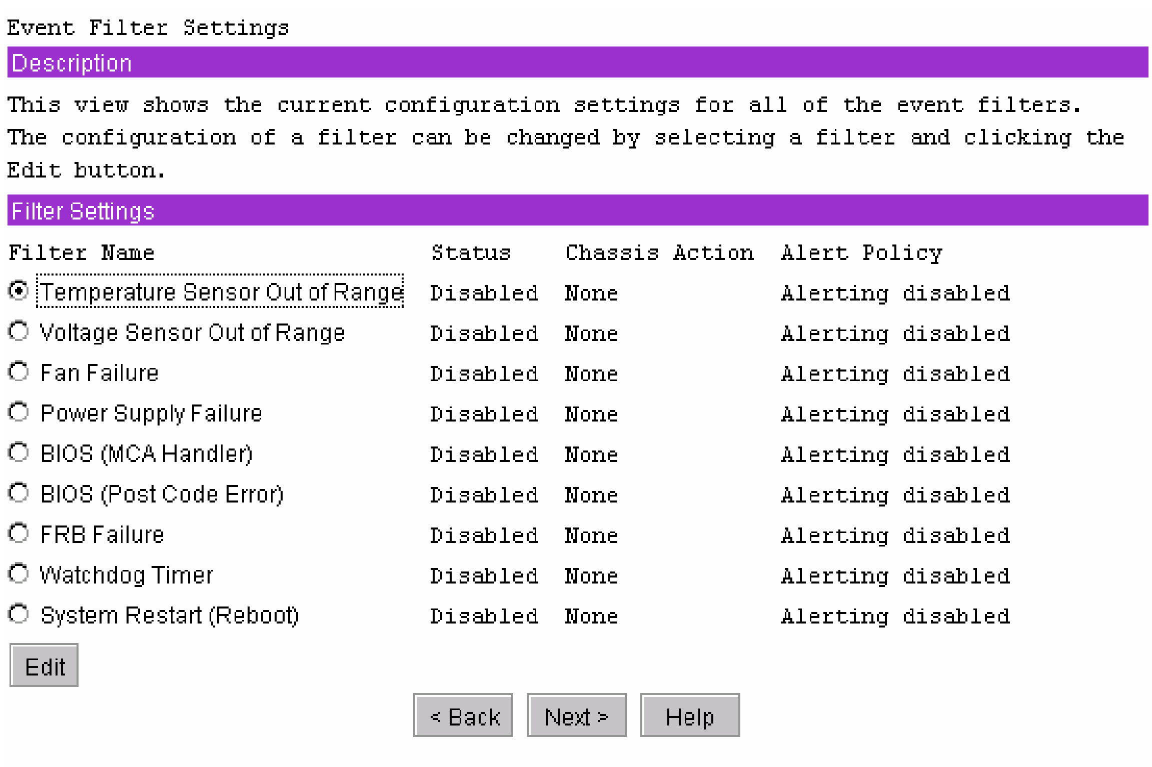


Figure 32. Event Filter Settings

If the user clicks in one of the radio buttons and then clicks Edit, the Edit Event Filter Settings screen is displayed for the selected event filter. After completing this screen, click `Next` to move to the next screen to continue this sub-task.

Edit Event Filter Settings

The screen shown below is displayed after the `Edit` button is clicked on the Event Filters Settings screen.

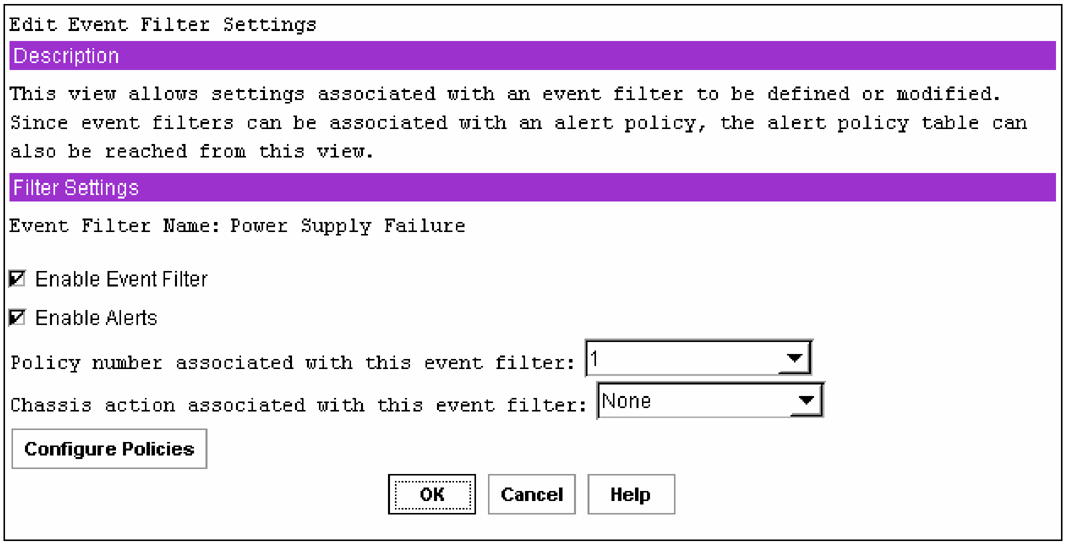


Figure 33. Edit Event Filter Settings

After completing this screen, click `Ok` to return to the Event Filter Setting screen.

Enable Event Filter

The Enable Event Filter enables / disables the selected filter. The filter is enabled when the box is checked.

Enable Alerts

This check box causes an alert to be sent when an event associated with the selected event filter occurs. If the box is not checked, or if the global enable for alerts is not enabled, no alert is sent.

Policy Number Associated With This Event Filter

This drop-down box allows the user to specify an alert policy number to be associated with the event filter. This setting is enabled only if the Enable Alerts box is checked; a valid policy number must be chosen if alerts are enabled.

The drop-down list shows the valid policy numbers, between 1 and 15. The user will assign policy numbers to policy table entries when the `Configure Policies` button is clicked.

Chassis Action Associated With This Event Filter

This drop-down box allows the user to select the chassis action that is associated with the selected event filter. Chassis actions include power down, power cycle, reset, diagnostic interrupt, and none. For any chassis action to occur, it must be globally enabled on the Platform Event Filter Configuration screen.

Configure Policies Button

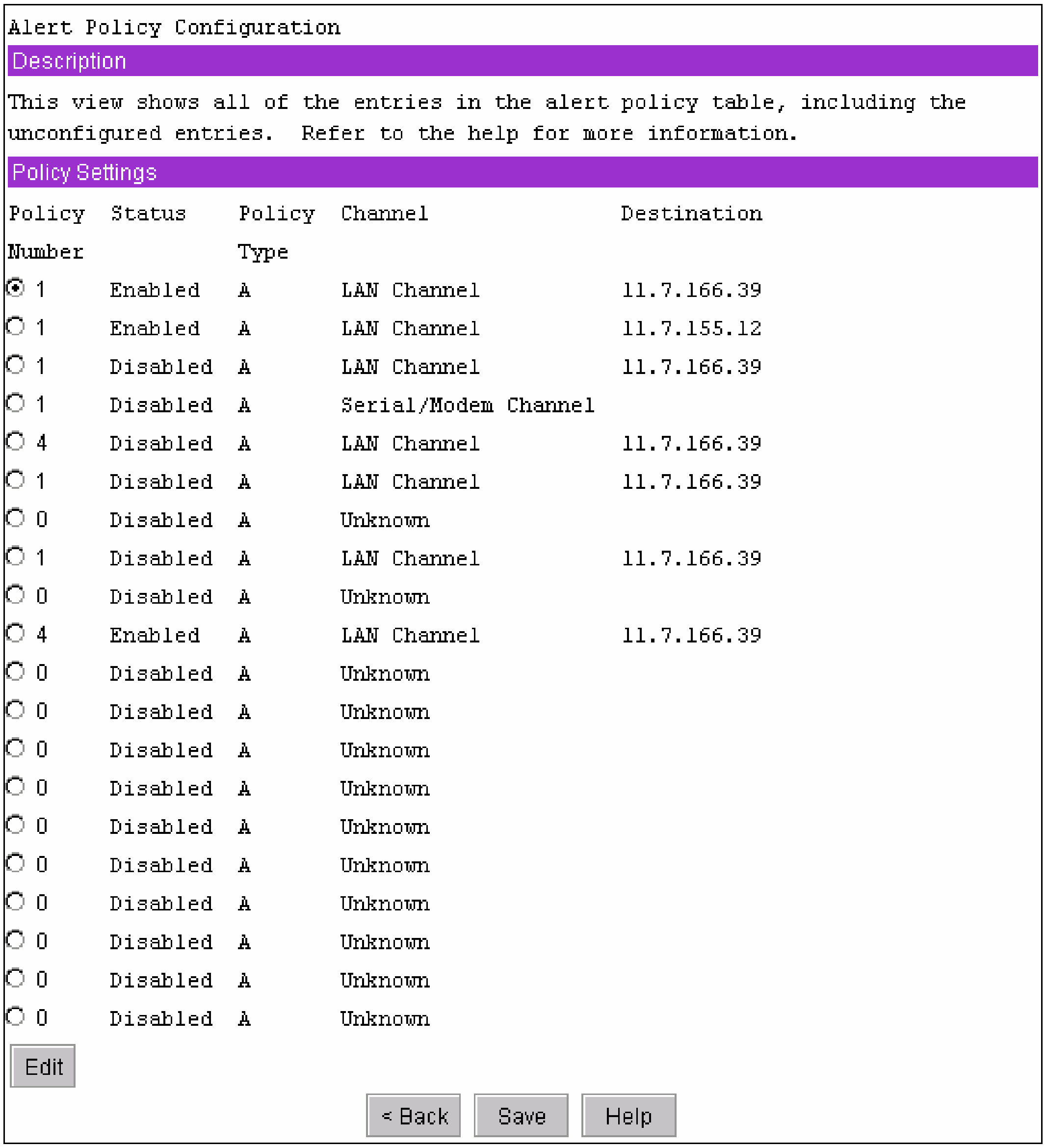
This button provides access to the screen that displays the current settings of all entries in the policy table, where the user defines the settings associated with the policy numbers used in the Policy number associated with this event filter drop-down box.

Alert Policy Table

The figure on the following page shows all the entries in the alert policy table, regardless of whether any settings are associated with a particular entry. All entries are shown because the entries in the table are order-dependent, so that when an alert occurs, entries in the table are processed from top to bottom as the firmware attempts to match table entries with the policy number associated with the event that caused the alert. By seeing all entries, the user is able to ensure that the entries are in the correct order.

One use of the policy table is to be able to specify multiple destinations for alerts that occur. This can be done by assigning the same policy number to multiple entries in the table; but specifying different destinations in the destination field. If one policy is associated with multiple entries in the policy table, the user can further refine the destinations that receive alerts by using the policy type.

Because the firmware goes through the table in order from top to bottom, when an event occurs, the table is searched in order for entries in which the policy number matches the policy number associated with the event filter. Therefore, the alert is sent to the destinations in the order in which they are encountered in the policy table. Make sure the destinations appear in the table in the desired order.


Alert Policy Configuration

Description

This view shows all of the entries in the alert policy table, including the unconfigured entries. Refer to the help for more information.

Policy Settings

Policy Number	Status	Policy Type	Channel	Destination
1	Enabled	A	LAN Channel	11.7.166.39
1	Enabled	A	LAN Channel	11.7.155.12
1	Disabled	A	LAN Channel	11.7.166.39
1	Disabled	A	Serial/Modem Channel	
4	Disabled	A	LAN Channel	11.7.166.39
1	Disabled	A	LAN Channel	11.7.166.39
0	Disabled	A	Unknown	
1	Disabled	A	LAN Channel	11.7.166.39
0	Disabled	A	Unknown	
4	Enabled	A	LAN Channel	11.7.166.39
0	Disabled	A	Unknown	
0	Disabled	A	Unknown	
0	Disabled	A	Unknown	
0	Disabled	A	Unknown	
0	Disabled	A	Unknown	
0	Disabled	A	Unknown	
0	Disabled	A	Unknown	
0	Disabled	A	Unknown	
0	Disabled	A	Unknown	
0	Disabled	A	Unknown	

Edit

< Back Save Help

Figure 34. Alert Policy Configuration

After completing this screen, click `Save` to complete this sub-task. The settings shown for each table entry are:

- Alert policy number
- Status indicating whether the table entry is enabled or disabled.
- Policy type determines how the firmware processes multiple entries that have the same policy number
- Channel on which the alert corresponding to the table entry would be sent.
- Destination IP address or phone number of the alert.

To edit a policy, click in the radio button next to the item and then click `Edit` to display the Edit Alert Policy Entry screen. After configuring the Alert Policy information, click `Save` to complete this sub-task.

Edit Alert Policy Entry

When the user selects an alert policy on the Alert Policy Configuration screen and then click the `Edit` button, the Edit Alert Policy Entry screen will be seen, as shown below. Changes made on this screen apply to the alert policy selected when the user clicked `Edit`.

After clicking `OK` on this screen, the user is returned to the Alert Policy Configuration screen

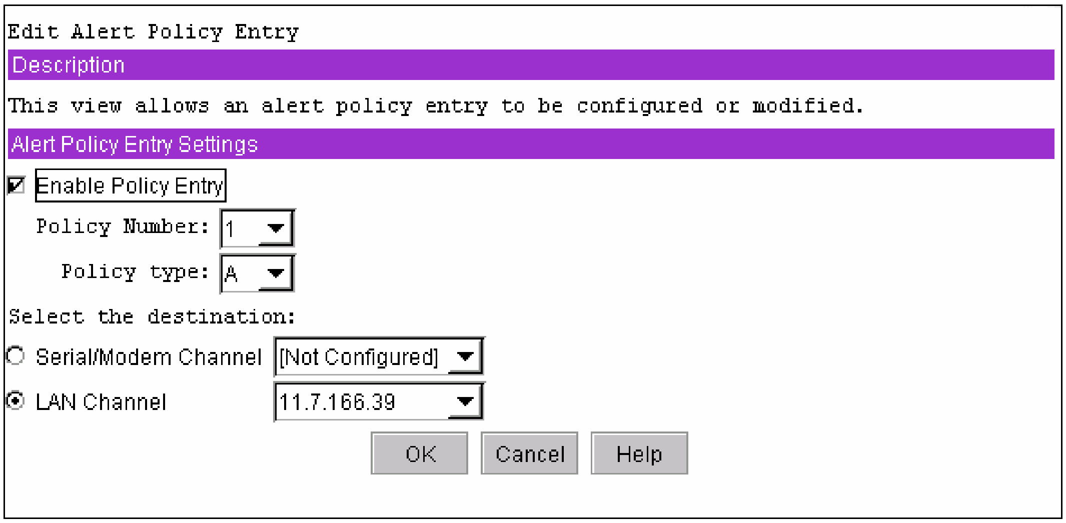


Figure 35. Edit Alert Policy Entry

After completing this screen, click `Ok` to return to the Alert Policy Configuration screen.

Enable Policy Entry

This check box enable / disables the selected policy table entry. If disabled, the firmware does not look at that table entry when attempting to match entries to the event that occurred. This option is enabled when the box is checked.

Policy Number

This edit box associates a policy number with a policy table entry. If the selected table entry is already associated with a policy number, that policy number is displayed. If a policy number is not associated with the selected table entry, `one` is displayed.

If alerts are associated with event filters, a valid policy number is required. Therefore, it is not possible to select zero as a policy number.

Policy Type

This drop-down box displays a list of letters that represent the policies that can be associated with an alert policy table entry. The policy type determines how the firmware processes multiple entries in the policy table that have the same policy number. For example, the policy type can be used to indicate whether an alert is to be sent to multiple destinations or to destinations involving the same channel. The policy choices are listed below:

- A: Always send an alert to the destination referenced in this policy table entry.
- B: If the alert to the previous destination was successful, do not send an alert to the destination referenced in the current policy table entry. Instead, proceed to the next entry in the policy table that has the same policy number.
- C: If the alert to the previous destination was successful, do not send an alert to the destination referenced in the current policy table entry. Stop processing policy table entries.
- D: If the alert to the previous destination was successful, do not send an alert to the destination referenced in the current policy table entry. Instead, proceed to the next policy table entry that has the same policy number, but has a different channel destination.
- E: If the alert to the previous destination was successful, do not send an alert to the destination referenced in the current policy table entry. Instead, proceed to the next policy table entry with the same policy number that has a different destination type.

Select the Destination

This set of radio buttons shows the possible channel destinations that can be associated with a policy table entry. Each radio button is associated with a drop-down list of destinations that have been configured for that channel. Only the selection made in the drop-down list associated with the active radio button (channel) is used.

Serial/Modem Channel Configuration Sub-task

The serial/modem channel configuration sub-task allows the user to modify settings that relate to the serial/modem channel, set up dial strings to which alerts are sent, and specify the settings related to sending alerts to those destinations.

This sub-task includes a screen that allows the user to configure the settings for the terminal mode of operation of the serial/modem channel.

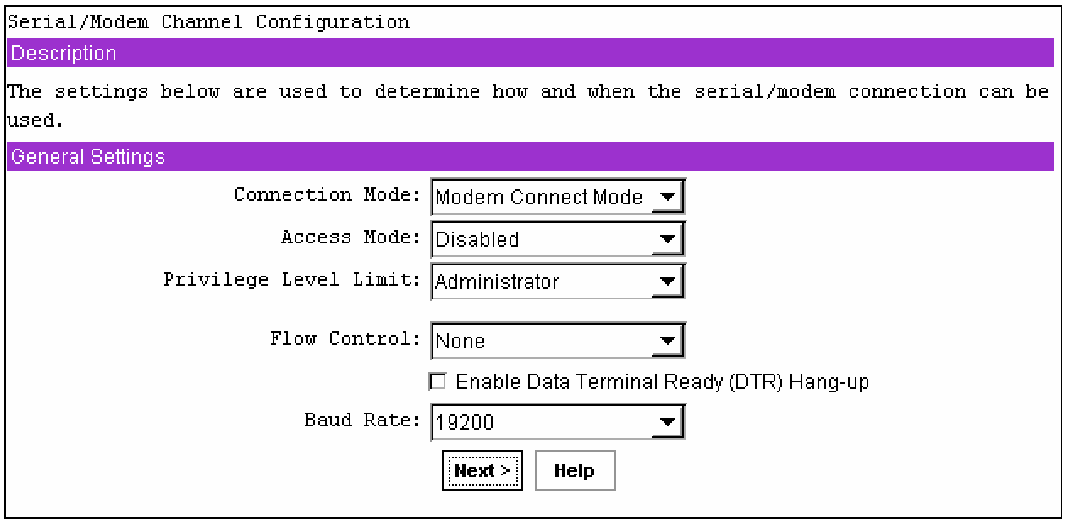


Figure 36. Serial / Modem Channel Configuration

After completing this screen, click `Next` to move to the next screen to continue this sub-task. The screen that is displayed when the `Next` button is clicked depends on which connection mode is chosen:

- If modem mode is selected, the next screen displayed allows setup of modem parameters
- If direct connect is selected, since there are no configuration parameters to set, the next screen displayed is the Destination Dial Strings screen.

Default Serial/Modem Configuration Settings Set By the SMU

The SMU sets some serial/modem configuration settings automatically. This information is listed below, but is not displayed on the screen. The list of these settings is given below. Before this information is set by the SMU, the user must click through the remaining Serial/Modem Channel Configuration sub-task screens to click the `Save` button on the last screen.

- Authentication type enables are enabled. These bits define what types of authentication are enabled to authenticate messages sent to the BMC by users of different privilege levels. The SMU enables authentication of type straight password, MD2, MD5, and none.
- Basic mode is enabled, allowing basic serial communications to take place over the serial/modem channel.
- Session inactivity timeout is set to one minute.
- Session termination bits are enabled to enable ending of a serial/modem session if an inactivity timeout occurs or if DCD is lost.

- Flow control and baud rate are set for IPMI messaging (flow control is set to hardware flow control; the baud rate is set to 19.2 kbps).
- The multiplexor that determines who controls the serial connector has various default settings enabled and disabled.

Connection Mode

The connection mode determines the protocols used when performing IPMI messaging to the BMC. After selecting a connection mode, clicking on the `Next` button displays the screen for the selected mode.

- Direct Connect Mode: When Direct Connect Mode is selected, the client console and target server are connected by a null modem cable attached between the serial ports of each system.
- Modem Mode: When Modem Mode is selected, the client system establishes a connection to the target server using a modem. Each system must have a modem attached, and the user on the client system must have the dial string for the modem connected to the target server.

Access Mode

This option is used to configure the access mode for the Serial/Modem channel. The choices are:

- Pre-boot only: The Serial/Modem channel is available only out-of-band while the machine is powered-off and during POST until the boot process is initiated. This option is primarily used with serial port sharing where it may be desirable to ensure that the BMC does not control the serial port while the operating system is running. The Pre-boot only setting does not affect Serial/Modem alerting. If alerting is enabled and software does not handle the event, the BMC takes control of the port for the time that it takes to deliver the alert.
- Always Available: The channel is dedicated to communication with the BMC and is available during all system states (powered-down, powered-up, pre-boot, sleep, run-time, etc.).
- Shared: Shared is the same as Always Available, but the BIOS leaves the serial port available for software use.
- Disabled: The channel is not allowed to communicate with the BMC except for alerting.

Privilege Level Limit

This is the maximum privilege level that users can have on this channel. It restricts users of the channel to a set of BMC commands that can be issued at that privilege level. For example, if the channel privilege limit is configured with a maximum privilege level of Operator, and a user is configured to have Administrator privilege, that user can still only execute Operator level commands over this channel. See the *LAN Channel Configuration Sub-task* for a description of the privilege levels.

IPMI Messaging Communication Settings

These parameters are the global settings for IPMI messaging, which include Direct Connect and Modem modes. IPMI messaging always occurs with 8 bits/character, no parity, and 1 stop bit. The COM settings that can be configured are:

- Flow Control: This option sets how the flow of data is controlled. Available choices are No Flow Control, CTS/RTS (hardware handshake), and XON/XOFF.
- Baud Rate: This option sets the maximum rate in bits per second at which the data can be transmitted through the serial port. Available baud rates are 9600, 19200, 38400, 57600, and 115200 bps. Support for baud rates higher than 19200 is optional and SMU will only display those that the BMC supports.
- Enable Data Terminal Ready (DTR) Hang-up: When DTR Hang-up is enabled, hang-up of a modem connection is based on when the DTR signal becomes inactive. When this is enabled, the modem settings Modem Hang-up and Escape Sequences are not used.

Modem Mode Configuration

If Modem Mode is chosen as the connection mode in Serial/Modem Channel Configuration screen and the user clicks `Next`, the Modem Mode Configuration screen is displayed. This mode is for applications that connect to the server via an external modem. The Modem Mode Configuration screen is displayed below.

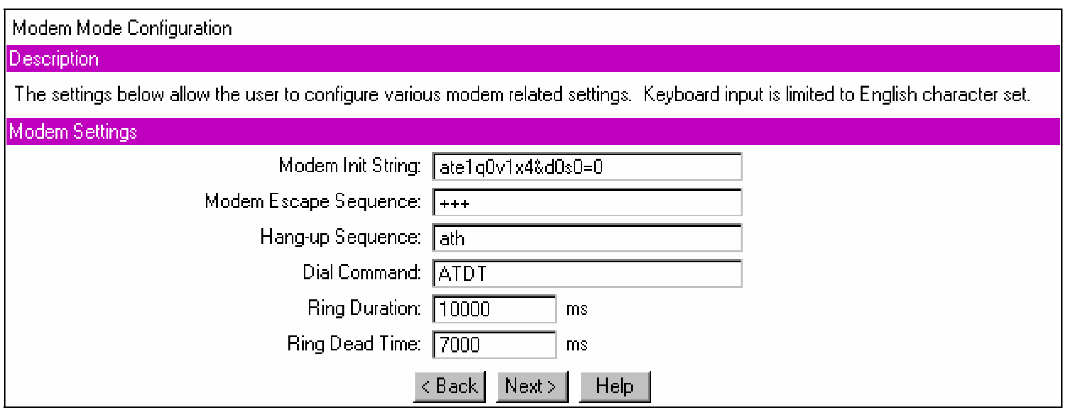


Figure 37. Modem Mode Configuration

After completing this screen, click `Next` to move to the next screen to continue this sub-task.

Modem Init String

Enter the ASCII string used to initialize the modem. This string is typically set to `ATE1Q0V1X4&D2&C1S0=0`. The length of this string is platform-dependent; for this server, the length is 48 bytes, including a termination character (this edit box will only allow a maximum of 47 characters to be entered because of the need for a termination character). The BMC automatically follows this string with an `<Enter>` character or carriage return.

Modem Escape Sequence

Enter the ASCII escape string to be sent to the modem before sending a command string. This string can be up to five characters long and is typically set to `+++`. If this field is left empty, the BMC uses `+++`. The modem escape sequence is not sent to the modem if DTR Hang-up is enabled on the initial *Serial/Modem Channel Configuration Sub-task* screen.

Hang-up Sequence

Enter the ASCII string that is sent to the modem to terminate the session. This string can be up to eight characters long is typically set to `ATH`. The BMC automatically follows this string with an `<Enter>` character when sending it to the modem. If this field is left empty, the BMC uses `ATH`. The hang-up sequence is not sent to the modem if DTR Hang-up is enabled on the initial *Serial/Modem Channel Configuration Sub-task* screen.

Dial Command

Enter the ASCII string for the modem string used to initiate a dial sequence with the modem. If this parameter is left empty, the BMC uses `ATD`.

Ring Duration

The Modem Ring Time setting specifies the time it takes the BMC to claim the serial connection after detecting the phone ringing while monitoring the Ring Indicator (RI) line. By configuring the Ring Duration, the user can specify the amount of time that the BMC takes to switch the mux when RI is first detected. The ring duration and ring dead time have meaning only when the serial/modem channel access mode is set to shared.

The default values that are stored in firmware need to be adjusted for the phone in the region where the server/modem is located. The suggested ring duration for a US phone is 10000 ms.

The ring duration value should be entered in 500 ms increments; the SMU will round entries down to the nearest 500 ms. A value of `0` configures the BMC to switch the mux immediately on the first detected transition of RI.

The range of values entered can be in the range between 0 and 31000; be aware that the SMU rounds values down to the nearest 500 ms.

Ring Dead Time

This setting allows the user to specify the amount of time that the RI signal must be deasserted before the BMC determines that ringing has stopped. The ring duration and ring dead time have meaning only when the serial/modem channel access mode is set to shared.

The ring duration value should be entered in 500 ms increments and the SMU will round entries down to the nearest 500 ms. A value of `0` configures the BMC to switch the mux immediately on the first detected transition of RI. The value entered should reflect any dependencies on modem type, location of server, and the phone line carrier.

The default values that are stored in firmware need to be adjusted for the phone in the region where the server/modem is located. The suggested ring dead time for a US phone is 7000 ms.

The range of values entered can be in the range between 500 and 8000; be aware that the SMU rounds values down to the nearest 500 ms.

Destination Dial Strings

The screen shown below displays the current setting of each destination dial string available on the target platform. For this server, up to six dial strings can be configured. The length of a destination dial string is 31 characters and a termination character added on.

A dial string can be modified or cleared by selecting the corresponding radio button and then clicking on the `Edit` button.

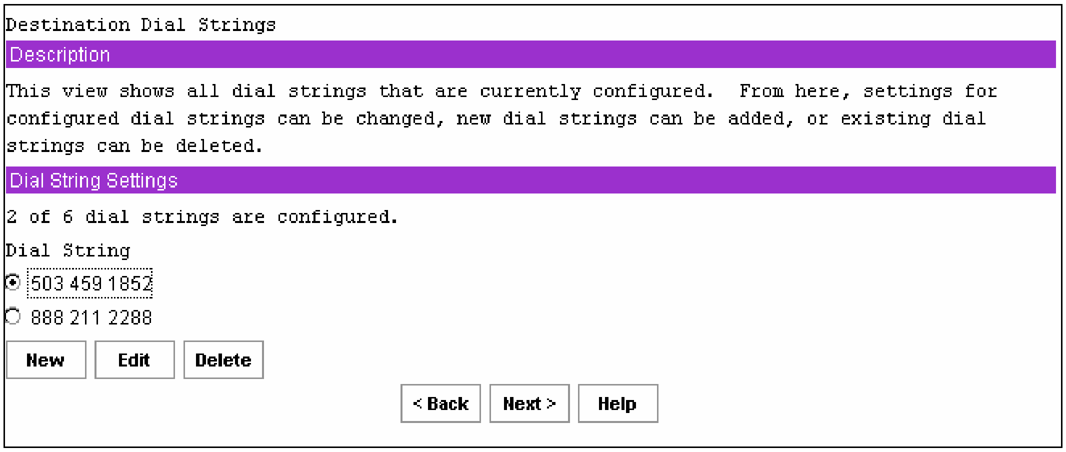


Figure 38. Destination Dial Settings

After completing this screen, click `Next` to move to the next screen to continue this sub-task.

New, Edit, and Delete Buttons

If no dial strings are configured, only the `New` button is enabled.

- New: When the New button is clicked, the user is shown a screen where a new dial string can be configured. See the following section for details.
- Edit: If the user selects a dial string and then clicks the Edit button, the user is shown a screen where the selected dial string can be edited. See the following section for details.
- Delete: If the user selects a dial string and then click the Delete button, the selected dial string is deleted. Before deleting the dial string, the user is prompted by a confirmation prompt. If the user clicks OK to confirm deleting the dial string, the Destination Dial Strings screen is redisplayed with the deleted dial string no longer shown.

New/Edit Dial String

The New/Edit Dial String screen is displayed when the user clicks either `New` or `Edit` on the Destination Dial Strings screen. The New/Edit Dial String screen allows the user to configure or change the settings related to dial string to which alerts are to be sent. The screen displayed either to configure a new dial string or to edit an existing dial string is the same, except that when editing an existing dial string, the current settings for that dial string are displayed.

If a dial string is changed to null (cleared), then when the `OK` button is clicked, that entry in the dial string list displays as `Not Configured`.

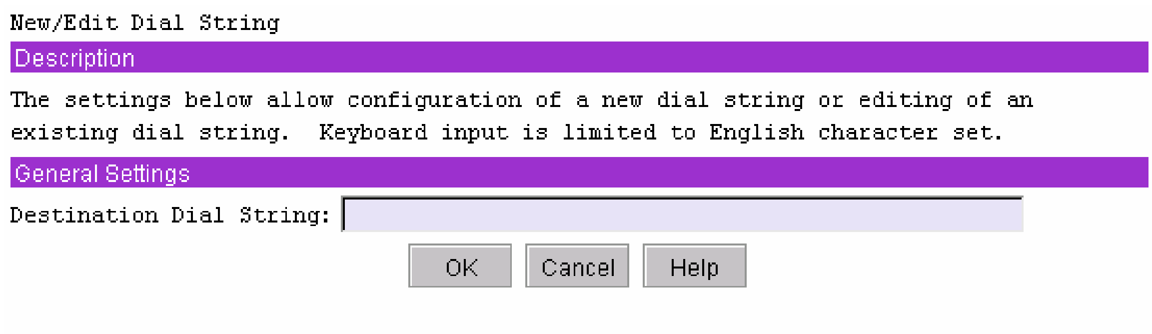


Figure 39. New / Edit Dial String

After completing this screen, click `OK` to return to the Destination Dial Strings screen.

Destination Dial String

When the BMC sends a dial string to a modem, it automatically precedes it with the currently defined Modem Init String sequence.

Valid dialing digits are `0-9`, `*`, `#`, `A`, `B`, `C`, `D`. The BMC can also recognize the following special characters:

- P – dial using pulse. Dialing digits following the P will be sent using pulse dialing.
- T – dial using tone. Dialing digits after the T will be sent using touch tones.
- R – reverse frequencies. Forces the modem to dial out at the answering frequency.
- S=n – dial a pre-stored phone number n.
- W – wait for dial tone.
- @ - wait for quiet (answer).
- , (comma) – pause 2 seconds.
- ; (Semi-colon) – return to command mode after dialing.
- ! (exclamation point) – flash the switch hook

Page Destination Configuration

The Page Destination Configuration screen, shown below, is displayed when the user clicks `Next` on the Destination Dial Strings screen. This screen allows the user to configure the settings for each page destination that can be reached by sending a page through the serial/modem channel. Up to eight page destinations can be configured; the Dial String column displays `Not Configured` for any entry that has not been configured.

A page destination is comprised of:

- A dial string to be used when a page is to be sent out
- Retry information for the page
- Configuration of the modem at the destination

The data shown for each page destination includes the dial string, call retries, flow control, baud rate, parity, data bits, and stop bits for the destination modem. These settings are described in more detail in the next section. This screen also displays general settings that apply to all alerts to be sent as dial pages.

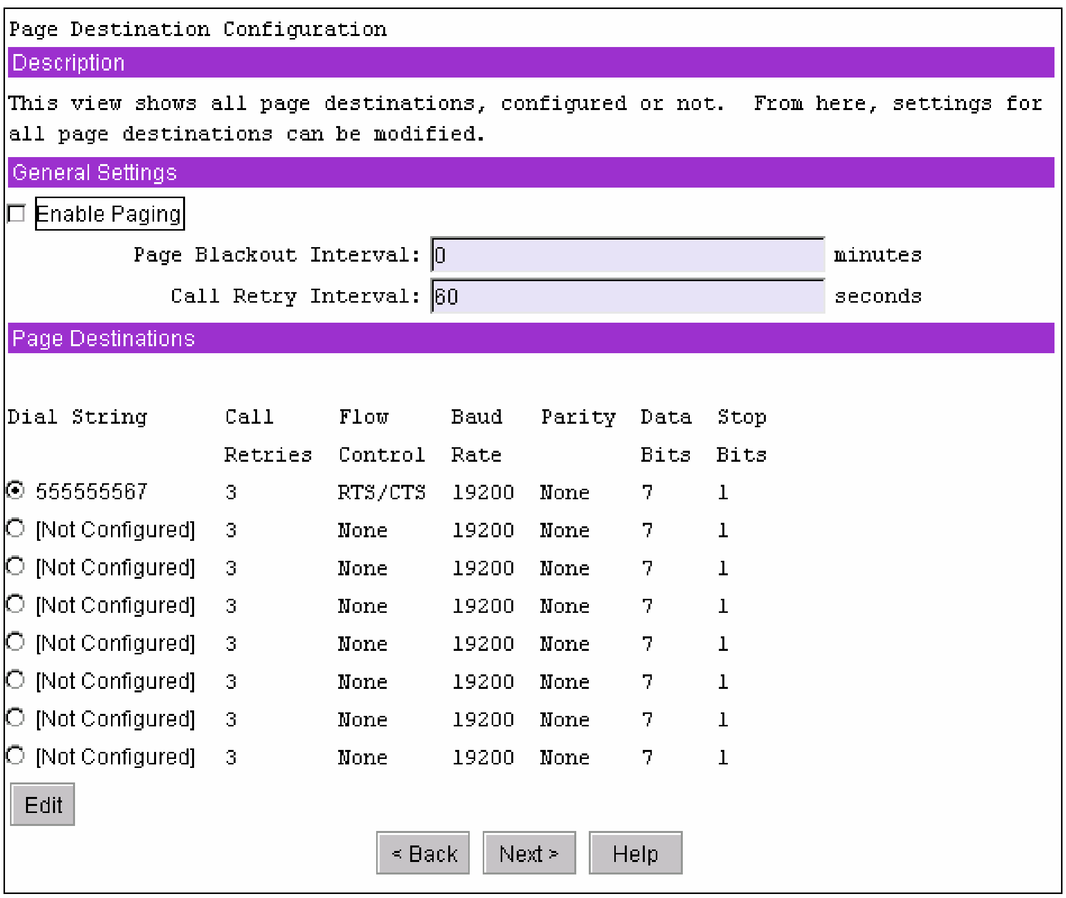


Figure 40. Page Destination Configuration

After completing this screen, click `Next` to move to the next screen to continue this sub-task. To configure or modify the settings for a page destination, select a radio button next to the entry and then click the `Edit` button to display the Edit Page Destination screen.

Enable Paging

This check box enables paging for the serial/modem channel.

Page Blackout Interval

The Page Blackout Interval determines the minimum number of minutes between pages. It provides a way to prevent back-to-back pages if a rapid series of events occurs. This parameter is entered in minutes; a value of 0 indicates no blackout.

Enter a value between 0 and 255.

Call Retry Interval

This setting gives the number of seconds between call retries when a busy signal is detected.

Enter a value between 0 and 255.

Edit Page Destination

When the user select a Dial String on the Page Destination Configuration screen and then clicks `Edit`, the Edit Page Destination screen is shown. On this screen, the user configures or modifys the settings for the selected page destination.

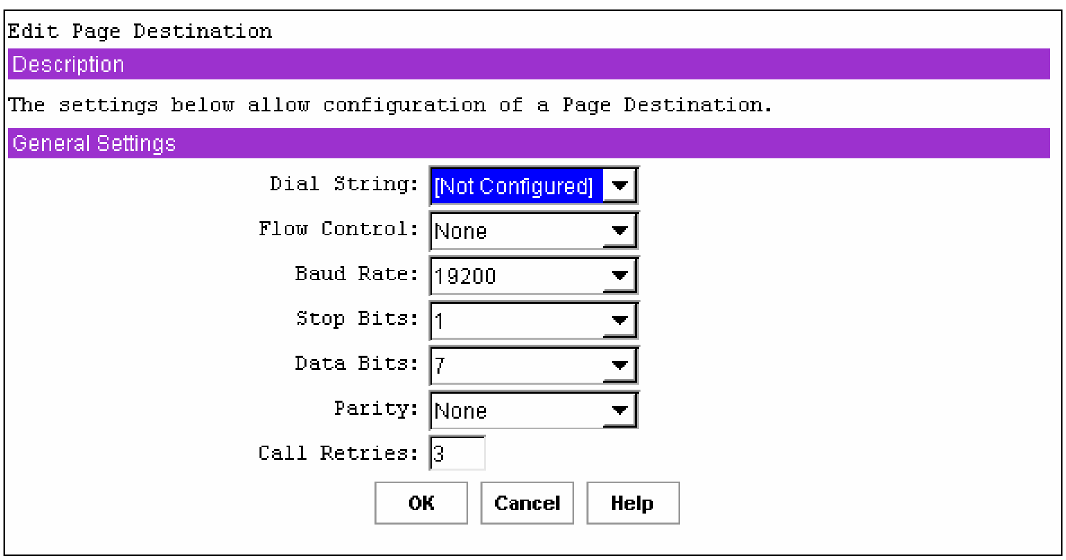


Figure 41. Edit Page Destination

After completing this screen, click `OK` to return to the Page Destination Configuration screen.

Dial String

This drop-down list shows all destination dial strings. The string selected before the user clicked Edit on the Page Destination Configuration screen is displayed.

Flow Control

This drop-down configures the data flow control. Available choices are `No Flow Control`, `CTS/RTS` (hardware handshake), and `XON/XOFF`.

Baud Rate

This drop-down determines the maximum rate in bits per second at which the data can be transmitted through the serial port. Available baud rates are `9600`, `19200`, `38400`, `57600`, and `115200` bps.

Stop Bits

This drop-down determines the number of stop bits to use when transmitting page data. The choices are `1` or `2` stop bits.

Data Bits

This drop-down determines the number of data bits to use when transmitting page data. The choices are `7` or `8` data bits.

Parity

This drop-down determines the parity type that is used when transmitting the page data. The choices are `None`, `Odd`, or `Even`.

Call Retries

This edit box is the number of times to retry calling the destination specified by the destination dial string. A value of zero indicates no retries (the call is only made once).

Enter a value between 0 and 7.

Terminal Mode Configuration

When the user clicks `Next` on the Page Destination Configuration screen, the Terminal Mode Configuration screen is displayed. This screen allows the user to configure the settings used when terminal mode is active.

Terminal mode is an operating mode of the BMC in which the BMC can accept and respond to commands via printable characters over a serial/modem channel. This includes a set of text commands that the BMC understands and IPMI commands in hex format. For more information about Terminal Mode, see ***Error! Reference source not found.***.

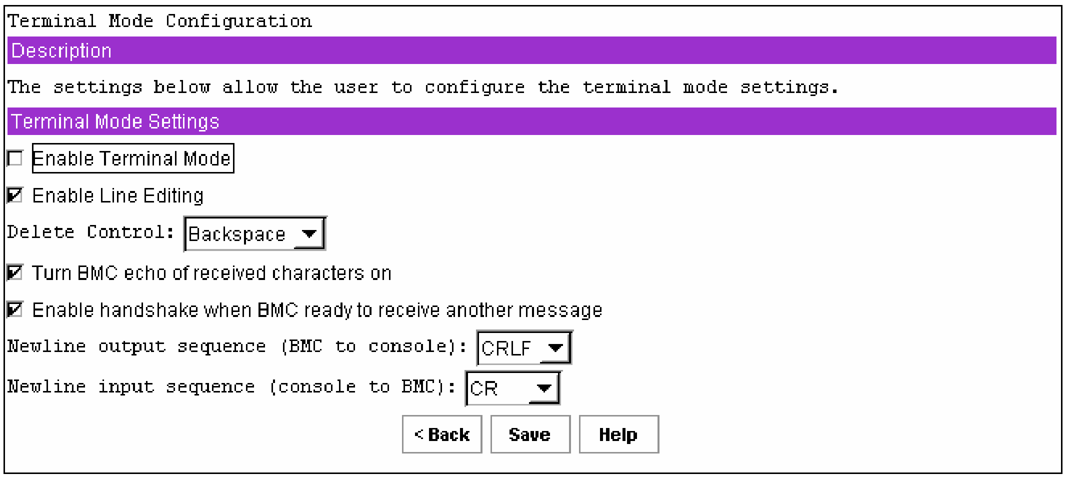


Figure 42. Terminal Mode Configuration

After completing this screen, click `Save` to complete this sub-task.

Enable Terminal Mode

This check box enables or disables terminal mode. Terminal mode is enabled with the box is checked.

Enable Line Editing

This check box enables or disables line editing during a terminal mode session if checked. Line editing is enabled with the box is checked. When line editing is enabled, echo should also be enabled. When line editing is enabled:

- The `<Backspace>` or `<Delete>` key can be used to delete the last character entered.
- The `<ESC>` key can be used to delete an entire line.
- Long message lines can be split across multiple-lines using a line continuation (\) character followed immediately by `<CR><LF>`.

Delete Control

This drop-down box is enabled only if the Enable Line Editing box is checked. This option allows the user to specify the delete control sequence for the BMC to use when `<Delete>` or `<Backspace>` is pressed. Users can choose from the following:

- The BMC outputs `<Delete>` when `<Backspace>` or `<Delete>` is received.
- The BMC outputs `<Backspace><Space><Backspace>` when `<Backspace>` or `<Delete>` is received.

Turn BMC Echo of Received Characters On

This check box allows the user to enable or disable the BMC echoing characters it receives when in terminal mode. This feature is enabled when the box is checked.

Enable Handshake When BMC Ready To Receive Another Message

This setting enables or disables whether the BMC handshakes when ready to receive another message from the user. When enabled, the BMC outputs the following string when it is ready to accept another message from the remote console:

`[SYS]<newline>`

Checking the box enables this feature.

Newline Output Sequence (BMC to console)

This setting allows the user to select the characters that the BMC uses as a newline sequence when the BMC writes a line to the console when in terminal mode. The choices are

- <CR><LF>
- <NULL>
- <CR>
- <LF><CR>
- <LF>
- No termination sequence

Newline Input Sequence (console to BMC)

This setting allows the user to select the characters the console uses as a newline sequence when writing to the BMC when the BMC is in terminal mode. The choices are

- <CR>
- <NULL>

Power Configuration Sub-task

The Power Configuration sub-task allows the user to configure the power restore policy for the server. The power restore policy determines the action that the system takes when power is removed and then reapplied. This screen is shown below.

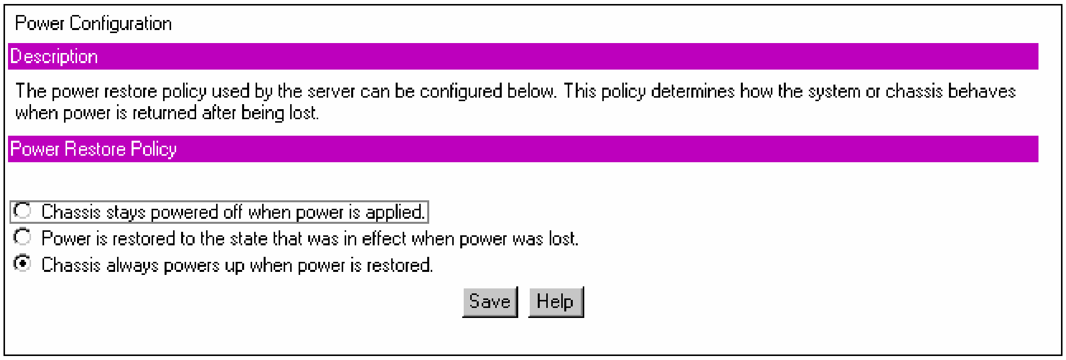


Figure 43. Power Configuration

After completing this screen, click `Save` to complete this sub-task.

The selected radio button is the current setting. However, it is possible for a policy value to be read from the firmware that does not correspond to any of these three settings. This value is classified as `unknown`. In this case, a dialog box informs the user that such a state was read.

Chassis stays powered off when power is applied

When power is reapplied to the server, the server will not power up.

Power is restored to the state that was in effect when power was lost

If the system power was on when power was lost, the server will power back on. If the server was powered down, it will remain powered down when power is reapplied.

Chassis always powers up when power is restored

When power is reapplied, the server will power up.

SEL Viewer

NOTE

The SEL Viewer task is available only on the local version of the SMU. This task is not available when running the remote version of the SMU.

The SEL Viewer task allows the user to view the System Event Log. The SEL Viewer task supports the following:

- Viewing the BMC SEL
- Saving a log to a file
- Viewing a saved log file
- Viewing the SEL properties
- Clearing the BMC SEL

The SEL Viewer is started by clicking the SEL task in the task pane of the SMU. This task allows the user to view the current system events logged in the SEL. Upon selecting the task, the entire SEL is loaded. During the load process, a dialog displays the progress. You cannot interrupt this process. After the load is completed the user will see a warning message displayed if the SEL is full.

If the SEL is empty, the following message is displayed:

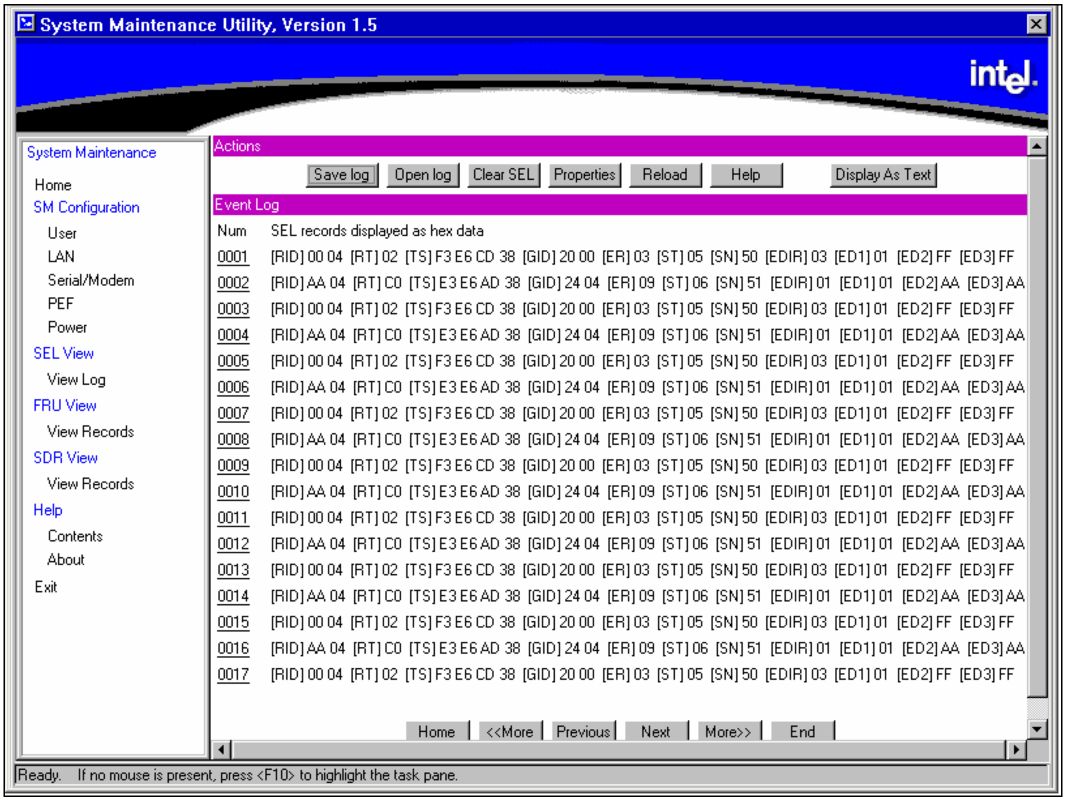
```
The SEL is empty, no records to display
```

After any messages have been dismissed, the user will see a page of events. This page contains column headers and as many events that can fit on screen without using scroll bars. In order to prevent long display strings from creating scrollbars in the SEL Viewer the list view restricts the length of the following fields:

- Sensor Type and Number to 20 characters
- Event Description field to 30 characters
- Generator ID field to 15 characters

Viewing Events in the SEL

When the SEL Viewer is opened, the first page of events is loaded from the log and displayed. To view the remaining events the user is provided with a series of buttons along the bottom of the screen. The <Tab> key can be use to access the screen buttons.



Acronym	Description
RID	Record ID
RT	Record Type
TS	Time Stamp
GID	Generator ID
ER	Event Message Format Revision
ST	Sensor Type
SN	Sensor Number
EDIR	Event Dir and Event Type
ED1	Event Data 1
ED2	Event Data 2
ED3	Event Data 3
MID	Manufacturer ID [1]
OEM	OEM defined [2]

Figure 44. SEL Viewer, Hex Display Mode

[1] Used when displaying OEM SEL Records Type C0h-DFh

[2] Used when displaying OEM SEL Records Type C0h-DFh and E0h-FFh

Home Button

The `Home` button displays the first segment of events. This button is disabled if the first event is displayed.

End Button

The `End` button displays the last segment of events. The number of events on this page varies based on the number of entries in the log; it may not fill the screen. This button is disabled if the last event is displayed.

Previous Button

This `Previous` button displays the prior segment of records. This button is disabled if the first event is displayed.

Next Button

This `Next` button displays the next segment of records. This button is disabled if the last event is displayed.

<<More Button

This `<<More` button backtracks by five segments of records. This is the equivalent of pressing the `Previous` button five times. If there are not five pages to backtrack, it goes to the first page of events. This button is disabled if the first event is displayed.

More>> Button

This button advances by five segments of records. This is the equivalent of pressing the `Next` button five times. If there are not five segments to advance through, it goes to the end segment. This button is disabled if the last event is displayed.

Viewing Single Events

Single events can be viewed in a modal popup window. The record to view is selected from the main screen by the link in the SEL ID field. The popup screen shows the hexadecimal view and the verbose text. The data is not limited in space, and no scrolling is required.

Sorting the SEL

The SEL can be sorted by clicking on the column header the user wishes to sort by. An arrow to the right of the column header indicates the sort-by column and whether the column is sorted in ascending or descending order. An up arrow indicates ascending order, and a down arrow indicates descending order. Clicking on the currently sorted column reverses the sort order of the column.

Whenever the SEL is sorted, the first segment is displayed.

Table 22. SEL Sort Order Definitions

Sort Field	Ascending Order	Descending Order
SEL ID	Numeric ascending	Numeric descending
Time Stamp	Pre-Init time stamps first, followed by the most recent time stamp. Pre-init time stamps are sorted by SEL ID.	Most recent time stamp last, followed by the pre-Init time stamps. Pre-init time stamps are sorted by SEL ID.
Sensor Name	Alphabetic ascending	Alphabetic descending
Event Description	Alphabetic ascending	Alphabetic descending
Generator ID	Alphabetic ascending	Alphabetic descending

Save Log Button

This allows the user to save the currently loaded SEL to a file. The user can choose to save the SEL as the decoded event data or as hexadecimal format. A different file extension is used for each type. In each case, the SEL properties and the entire log are written to the file. The SEL properties are saved at the top of the file and are saved as verbose text.

If the save fails because the file cannot be created, this error message is displayed:

`Unable to create save file`

If an error occurs while writing information to the file, this message is displayed:

`Error saving SEL to the file`

Open Log Button

This allows the user to load a currently saved log file. The loaded file can be in either decoded or hexadecimal format. Upon opening a log file, the SEL Viewer is loaded, showing the events from the file.

If the file to open is not a valid SEL file, this message is displayed:

`Invalid SEL file`

If there is an error while reading the events from the file, this message is displayed:

`Error reading SEL from file`

If the user loads a hexadecimal log file, the viewer interprets data as if it was loaded from the system. The user will have all of the functionality that is available when the data is loaded from the system, but the `Save Log` button is disabled when the log is loaded from a file.

Clear SEL Button

This allows the user to clear all the system SEL events. Before proceeding with the clear, the user is prompted with this message:

`Do you really want to clear the SEL?`

The user is given two options with this prompt, `OK` and `Cancel`. Choosing `Cancel` will return the user to the SEL Viewer main screen, choosing `OK` will clear the SEL. After the SEL is cleared, the log and properties are refreshed and the main screen is updated with the new SEL.

Properties Button

This shows the user the current properties of the SEL. Included in the properties are:

- IPMI version
- Number of Entries
- Last Add Time
- Last Erase Time
- Free Space Remaining (both in bytes and number of SEL events)

A message is displayed if there is an error retrieving the SEL properties.

Reload Button

This button forces a refresh of the SEL from the system. Both the event list and the properties are refreshed.

Display as Hex Button

This button is only visible when the SEL is displayed in verbose mode. This will change the event display to Hex mode.

Display as Text Button

This button is only visible when the SEL is displayed in Hex mode. This will change the event display to text mode.

SDR Viewer

The SDR task allows the user to view the current system SDR records stored in the BMC. It also provides the interface to opening and saving SDR files, and to viewing the SDR properties.

NOTE

The SDR Viewer task is only available on the local version of the SMU.
This task is not available when running the remote version of the application.

The SDR Viewer allows the user to view the current BMC SDRs on the target system. The SDR Viewer task supports the following:

- Viewing the BMC SDRs
- Viewing the SDR properties.
- Saving the SDRs to a file
- Viewing a saved SDR file

When the user selects the SDR task, the SDRs are retrieved from the system. As the load progresses, a dialog window updates the user on the status. The user is not allowed to interrupt this process.

After the load is completed, a tree view of the system SDRs is displayed. The top branches of the tree are the SDR types. Under the branches are the records of that type. Clicking on the branch will expand and collapse it, showing or hiding the SDRs of that type. Clicking on an SDR will open a window that contains the SDR title, value, and byte location for each field in the record.

Only SDR types that have entries are included in the SDR tree view. If the viewer determines that a SDR record is invalid, the record is ignored and the remainder of the records are added to the tree. After the tree is created, a message box displays the following message if invalid records have been identified:

```
The SDR data read from the system contained invalid records, these
records will not be displayed by the viewer. Updating your
system's SDRs may correct this problem
```

If all the records are valid, no message is displayed. If there was an error retrieving the SDRs from the system, the following message is displayed:

```
Error retrieving SDRs from the system
```

An error message is also displayed if there was an error reading the SDR properties.

The SDR tree is navigable by using the keypad. The `<left arrow>` key collapses a branch if the current selection is on a branch. If the current selection is on a leaf, the selection is moved to the branch that contains the leaf.

The <right arrow> key expands a branch if the selection is currently on a branch. If the selection is not on a branch, there is no affect. The <space bar> and <Enter> keys have identical functionality, as follows: If the current selection is on a branch, an expanded branch collapses, and a collapsed branch expands. If the current selection is on a leaf, the SDR for that selection is shown in the SDR screen popup. No other keys affect the SDR tree.

The SDR tree retains its expanded/collapsed state for each of the branches until the SDRs are reloaded or until the application is exited. If the tree view goes beyond the size of the screen a vertical scroll bar is added to allow the user to view all SDRs.

Viewing SDRs

SDR records can only be viewed one at a time. They are opened by clicking on the SDR in the SDR tree. No other actions are allowed once an SDR is opened for viewing. If the displayed data is too large to fit on the screen, the popup window is sized to the maximum viewable area and a vertical scroll bar is added. To view a new SDR or to issue another command, close the current window or use the `Next` and `Previous` buttons.

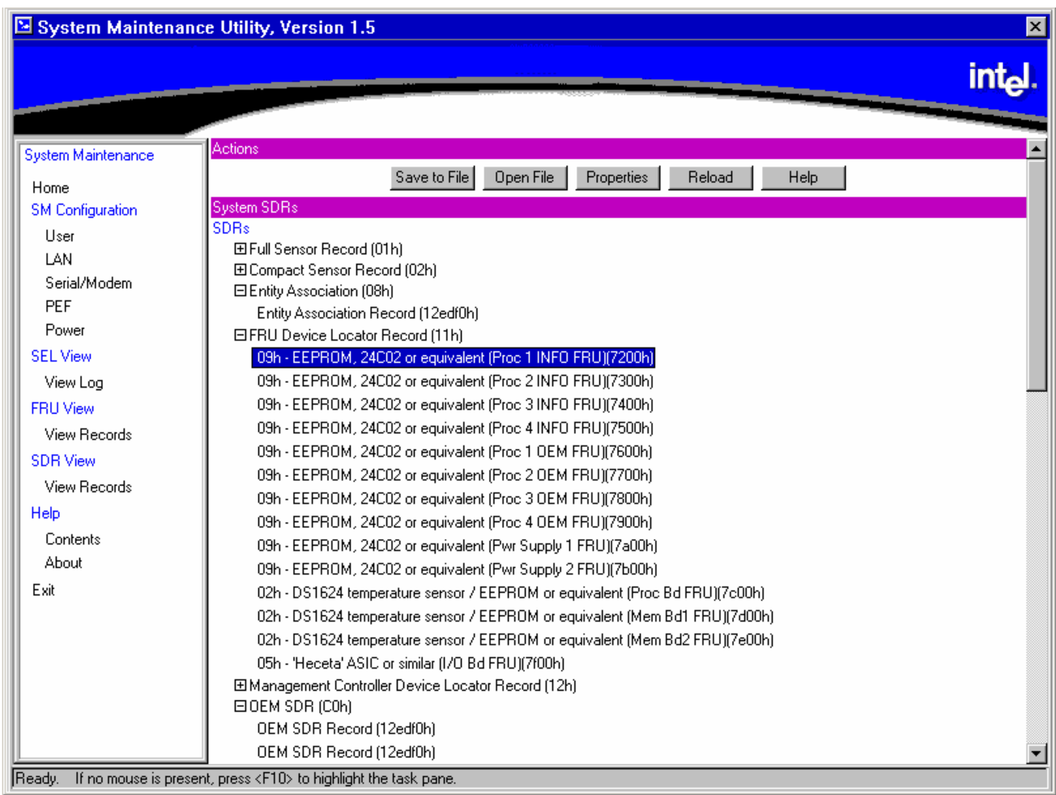


Figure 45. SDR Viewer

Individual SDRs of each type have their own display name format, as shown in the table below.

Table 23. SDR Type Name Format

SDR Type [Hex]	Display Name Format
Type 1	[sensor type HEX] – [sensor type text] ([ID string]) sensor #[sensor number]
Type 2	[sensor type HEX] – [sensor type text] ([ID string]) sensor #[sensor number]
Type 8	[sensor type HEX] – [sensor type text] ([ID string])
Type 9	[sensor type HEX] – [sensor type text] ([ID string])
Type 10	[sensor type HEX] – [sensor type text] ([ID string])
Type 11	[sensor type HEX] – [sensor type text] ([ID string])
Type 12	[Entity ID HEX] – [entity ID text] ([ID string])
Type 13	[sensor type HEX] – [sensor type text] ([ID string])
Type 14	[sensor type HEX] – [sensor type text] ([ID string])
Type C0	OEM SDR ([record ID])

The SDR type displays names in a single format: [SDR type hex] – [SDR type text] ([count of SDRs of this type]).

Under certain circumstances, the type C0 format does not follow the rules defined above. When all the characters of the data portion of the record are printable ASCII characters, the data area is considered to be a string and is used for the display name instead of the format defined in the table.

Close Button

This button closes the current SDR window and returns the user to the SDR selection screen.

Previous Button

This button closes the current SDR window and displays the previous SDR record, the previous record must be of the same type as the current record. If this is the first SDR record in the SDR type branch, this button is disabled.

Next Button

This button closes the current popup window and displays the next SDR record in the SDR tree, the next record must be of the same type as the current record. If this is the last SDR record in the SDR type branch, this button is disabled.

Save To File Button

This button allows the user to save the current SDRs to a file. If the save fails because the file cannot be created, the following message is displayed:

```
Unable to create save file
```

If an error occurs while writing information to the file, the following message is displayed:

```
Error saving SDRs to the file
```

Open File Button

This button allows the user to open a currently saved SDR file. Upon selecting this option, all currently loaded SDRs are deleted and only the SDR loaded from the file are displayed. If the file is not a valid SDR file, an error message is displayed.

Properties Button

This button will force a refresh of the SDR properties and display them in a dialog. Included in the properties are: IPMI version, Number of SDRs, Last Add Time, Last Erase Time, and Free Space Remaining in bytes. If there is an error retrieving the SDR properties, an error message is displayed.

Reload Button

This button will clear the screen of the currently loaded SDRs and reload the SDRs from the BMC. This load procedure is identical to the load procedure that occurs when the viewer is opened.

FRU Viewer

The FRU Viewer sub-task allows the user to view the current FRUs in the system.

NOTE

The FRU Viewer task is only available on the local version of the SMU.
This task is not available when running the remote version.

The FRU Viewer allows the user to view the current system FRUs on the target system. The FRU Viewer task supports the following:

- Viewing the current system FRUs
- Viewing the current system FRU properties.
- Saving the selected FRU to a file
- Viewing a saved FRU file

When the user selects the view records sub-task from the FRU menu, it immediately retrieves the system FRUs. In order to discover the system FRUs, the viewer must first scan the system SDRs and search the records for FRU locations.

After the scan of the SDRs is complete, the viewer starts loading the FRUs. If an error occurs while searching the SDRs, the viewer will try to load the FRUs based on the locator records found. The following error is displayed:

```
Error searching for FRU device locator records, not all FRUs may
be displayed. Updating your system’s SDRs may correct this problem
```

As the FRUs are loaded, a dialog window updates the user with the progress. A progress window is updated for every FRU read. The message displayed is updated for each FRU.

After the FRUs are loaded, the FRU list and FRU area viewer are displayed. By default, the first FRU in the list is selected and displayed. If there is an error while retrieving the FRUs, the following message is displayed:

```
Error reading FRU at Device D Bus B ID I
```

`D`, `B`, and `I` are the values from the device locator record. This message will vary depending on the FRU type, but it will display sufficient information for the user to display/update the FRU with the FRUSDR utility.

The user is unable to stop either the FRU locator search or the FRU load process.

Viewing FRUs

To view a FRU, click on the FRU title in the FRU display list. The FRU board, chassis, and product areas are displayed on the right of the screen. If the area does not exist for the selected FRU, the following message is displayed for that area:

```
Not present
```

Only the displayable FRUs are in the list. The name that is used in the list is taken from the device locator record. If no displayable FRUs are present in the system, the title and value areas will contain the following message:

```
Not present
```

The FRU list is replaced by the message:

```
No Displayable FRUs present in system
```

The FRU that is currently being shown on the right side of the screen will appear as a string in the FRU list. It is not selectable.

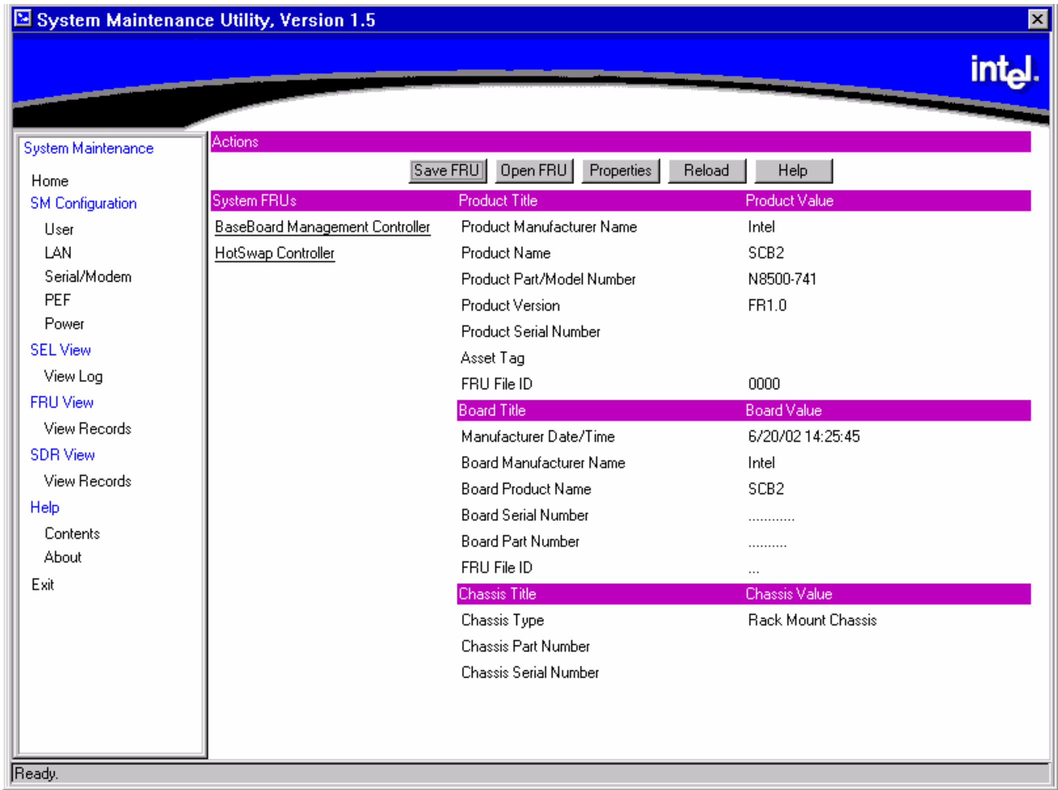


Figure 46. FRU Viewer

Save To File Button

This button allows the user to save the currently displayed FRU to a file. If the save fails because the file cannot be created, this message is displayed:

```
Unable to create save file
```

If an error occurs while writing information to the file, this message is displayed:

```
Error saving the FRU data to the file
```

Open File Button

This button allows the user to load a currently saved FRU file. Upon selecting this option, all currently loaded FRUs are deleted from the screen and the loaded FRU is displayed. If the file to open is not a valid FRU file, this message is displayed:

```
Invalid FRU file
```

If there is an error while reading the FRU from the file, this message is displayed:

```
Error reading FRU from file
```

Opening a FRU file will not affect the FRU properties.

Properties Button

This button will display the system FRU properties in a dialog. Included in the properties are: IPMI version, Number of FRUs in the system, and Number of IPMI formatted FRUs in the system. There is also a note to notify the user that only IPMI formatted FRUs are displayed.

Reload Button

This will clear the currently loaded FRUs and refresh the FRUs from the system. This load procedure is identical to the load procedure when the viewer is opened.

Help Button

This displays the SMU context sensitive help for the FRU Viewer.

Task Error Handling

During the execution of a task, it is possible for errors to occur. These errors may be handled in different ways depending on the type of error. This chapter describes how error handling operates during SMU task execution.

Data Entry Errors

Some screens will ask for user input using edit boxes. In some of these boxes, the allowable user input needs to meet certain requirements, such as use of certain characters, a maximum length, or data within a particular range of values. The application does not check user input for validity; instead, when the user clicks a button for the next screen, the current set of data is collected and sent to the SMU core components where it is checked. If a data entry error is found, a popup dialog box is displayed describing the error. In most cases the erroneous data is not cleared from the edit box in which it was entered. The user must clear the error and enter the correct information.

Internal Errors For Which a View Can Be Generated

Some errors may occur during task execution that result in an operation failing but are not fatal in that the user can still attempt to perform other tasks. These types of errors include writing the server management settings to the BMC's non-volatile storage area, for example. In such a case, a screen is displayed containing information about the error that occurred and indicating whether or not the user may attempt the operation again. These screens also have an `OK` button on them. When the user clicks `OK`, the last screen displayed is redisplayed. The user may also be informed as to whether the error was serious enough that the user should shut down the SMU software or reboot the server.

Data Corruption Errors that the SMU Application can Handle

Data corruption errors that the SMU may be able to handle include corruption of template files used by the SMU (files that represent UI screens to be sent from the core components to the application). In this type of case, the SMU can detect that there is a problem when it is not able to correctly parse such a file, which means the application is not able to correctly display a screen. For this type of error, a message is displayed, indicating that a data corruption error has been encountered and that the current action cannot be completed. You are asked to select a new task from the task list.

Internal Errors For Which a View Cannot Be Generated

In a few cases, errors may be serious enough to prevent the SMU core components from supplying error information to the user. These errors may include certain types of memory allocation errors or, in the remote case, the loss of the connection between the SMU application and the core components. In such cases, the SMU application (if possible), indicates to the user that a shutdown of the software should occur and the server be rebooted.

Help

Help for the Remote SMU Application

Help for the remote SMU application is HTML-based. This means SMU help is displayed in a separate instance of a browser. See the figure below for a sample help screen.

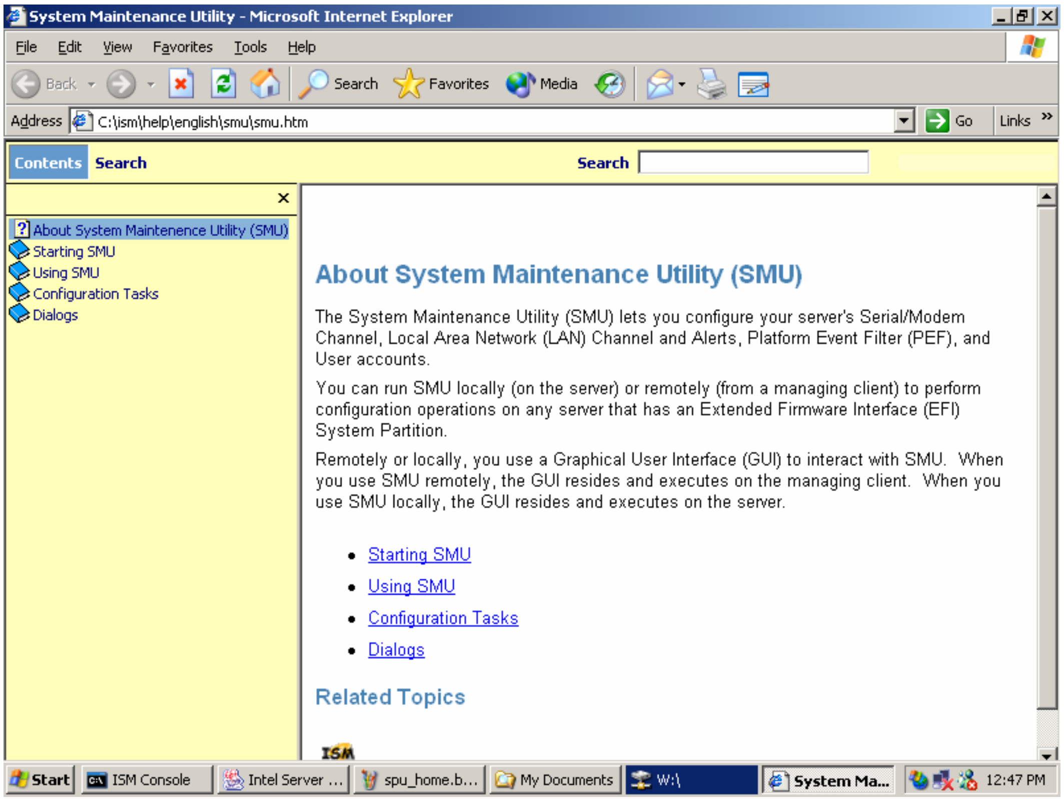


Figure 47. Remote SMU Help Window (browser based)

ISM Front-end Help

The front-end ISM help subsystem contains general information on the SMU. This help system does not provide details related to the screens displayed by the SMU. The ISM font-end help screens can be accessed by clicking on the Contents task in the task pane of the ISM Console.

SMU Table of Contents Help

After the SMU is launched, the SMU task pane provides a Help item with a Contents sub-task under it. The user cannot click on the Help item itself, but when the user clicks on Contents, a new browser window is launched. The Table of Contents pane at the left allows the user to view context-sensitive help for any screen displayed by the SMU.

Each page displayed in the information pane at the right contains links labeled About SMU and ISM x.x Help, where x.x is the revision number of the ISM release. Clicking on About SMU returns the user to a general front page for the SMU (is not context-specific). Clicking on ISM x.x Help launches a new browser that contains the front-end ISM help.

Most screens displayed by the SMU have a `Help` button. If no help is displayed, clicking `Help` launches a browser window that shows the context-sensitive help for the screen from which the user clicked `Help`; a table of contents is not displayed. If the link for About SMU link clicked, the help window is repainted with a table of contents pane and the About SMU information in the information pane. If the ISM x.x Help link is clicked, a separate browser window is launched and the front-end ISM help is displayed in that window.

If a help browser window was previously launched from the Contents task of the SMU application, when a `Help` button on an SMU screen is clicked, the information pane is replaced with the context-sensitive help for the screen containing the `Help` button.

Help for the Local SMU Application

Help for the local SMU application appears in a modeless window on the client console. This means that when the user wants to return to the local SMU application, click on the application window to bring it to the foreground. The `<F1>` can be used to toggle between the SMU application window and the help window. Since the application uses the entire screen and its container is not re-sizeable, the help window is hidden when the application window is brought to the front.

The help window is re-sizeable and can be moved. An example of the local help window is shown below.

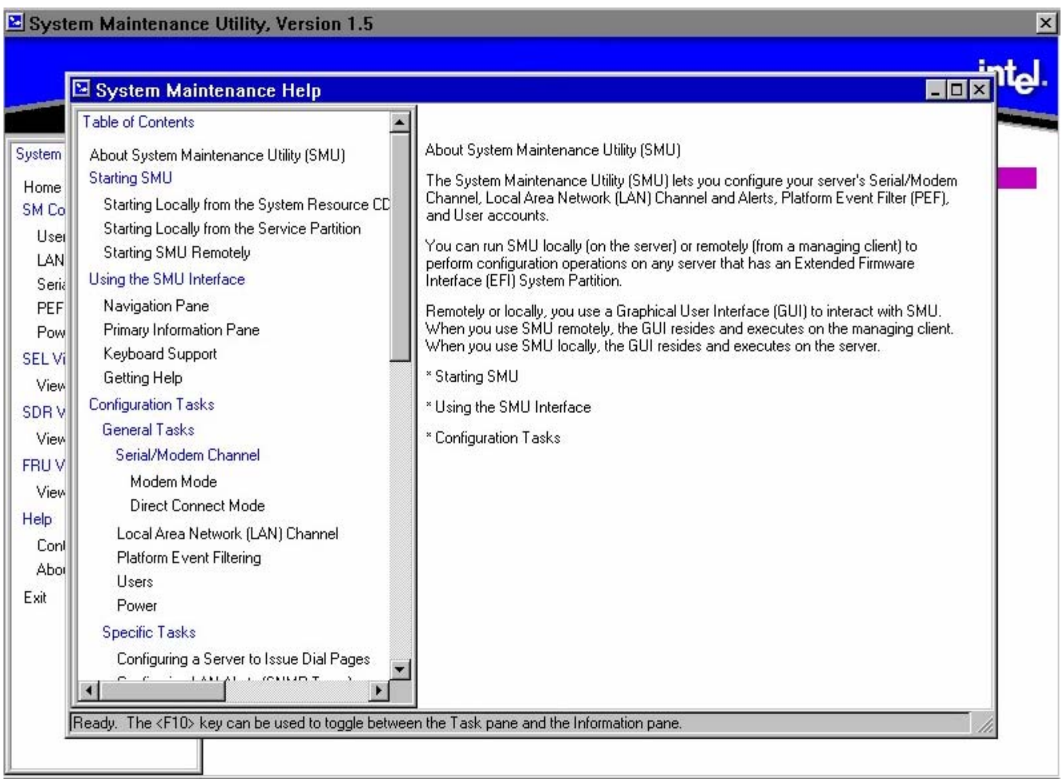


Figure 48. SMU Local Help Window

The Help window has a system menu that is available from the upper-left hand corner. This system menu allows the user to minimize and maximize the Help window. The Help window also has minimize, maximize, and close buttons in the upper right corner. The task pane of the help window can be resized and displays horizontal and vertical scroll bars when necessary.

The information shown in the help window is obtained by running the HTML version of the help through a translator. Therefore, while the content is the same, the appearance is different because the local SMU application is not as flexible as a browser.

Most individual screens displayed in the primary information pane have `Help` buttons. Clicking a `Help` button causes the help that is related to that screen to be displayed in the help window, with the help window appearing in the foreground.

If the Help window is minimized it can only be redisplayed by pressing the `<F1>` key or clicking a `Help` button. If the Help window is not active and the `<F1>` key is pressed, the About SMU screen is displayed in the information pane. In general, all keys described in the section on local SMU keyboard support work for the help window as well as the local SMU application container.

Shutting Down the Server

To shut down the server the user must exit the operating system (if applicable) and then use the power button to power down the server.

Follow these steps to power down the SR870BN4 server.

1. If the server is running an operating system, use its commands or GUI to logoff (if necessary) and exit the operating system. If the operating system does not automatically power down the server, then successfully exiting the operating system causes the following prompt to appear:

```
Shell>
```

2. After this prompt appears, press and hold the power button for several seconds. Holding the power button in powers down the server.

⚠ **CAUTION**

Powering down the server with the power button does not remove all power from the system. The +12 V standby power is still available to the system even when it has been powered down. To remove standby power from the system the user must unplug both power cords from the chassis.

EFI Platform Diagnostic Tests

EFI Platform Diagnostic Tests allow the user to quickly assess the server's hardware status, view test logs, and determine the server's current configuration. The user can run EFI Platform Diagnostic Tests from within the EFI environment. The remainder of this section explains how to run the EFI Platform Diagnostic Tests.

Starting the Application

Use the following steps to setup and run tests.

➡ **NOTE**

The user may also run this utility directly from the Resource CD. This causes the utility to run in a RAM drive which means log files are volatile and will need to be copied to write-able media if they need to be saved.

1. Boot to the EFI shell.
2. Create a directory "efi\service\diagnostics" on the target drive such as a hard drive.
3. Copy the distributed FieldDiags binary file (fielddiags.efi) to the root directory of the target.
4. Run the following command using the distributed FieldDiags binary file (fielddiags.efi):
   `fielddiags -d \efi\service\diagnostics` (it unpacks and installs the FieldDiags software).
5. Be sure your working directory is on the same drive that contains the test software, type in the following command and press the <Enter> key to load and run the tests:
   `\efi\service\diagnostics\fielddiags`
   Entering this command causes the tests to run regardless of your current working directory. You can also type a relative pathname that is based on your current working directory to execute the tests.

In addition to running tests, the user can display system configuration information or the current test log. To do either, highlight the appropriate option and then press the <Enter> key.

Understanding the General User Interface

The platform diagnostics application uses multiple screens from which the user can choose execution options, enable or disable tests for execution, and define test parameters. The initial screen consists of four pull down menus:

- File
- System Information
- Platform Test
- Help

Up and down arrows navigate vertically through all areas of the screen. During navigation, items that the user can modify become highlighted. Left and right arrow keys navigate horizontally through the menus.

- Pressing the <Enter> key with an execution option highlighted causes the action to occur.
- Pressing the <Enter> key from within a dialog box causes data to be entered.
- Pressing the <F1> key while a test is highlighted or has the greater-than character (>) to the left of it causes on-line help for that test to appear.
- Pressing the <ESC> key with on-line help displayed or with a dialog box displayed dismisses the information or dialog box.

Understanding Basic Testing

The Platform Test menu is set up in the order that is typically used:

- Test Setup allows the user to determine which tests to run and how thoroughly to test.
- Run Test starts test execution and provides some indication of test progress.
- View Results shows the results window and allows the user to view and clear the test log.

Enabling Tests For Execution

To enable one or more tests for execution, select Test setup from the Platform test menu. Use the up and down arrows to first select a test, and then press <Q> for a quick test, <C> for a complete test, or <D> to disable the test. When a test is enabled, the word "Quick" or “Complete” appears next to the test under the "Coverage" column. If a test is disabled, the word "Disabled" appears under that column. An individual test may be executed up to nine times for each run of the test suite. With the test highlighted, pressing a single digit 1 – 9 on the keyboard sets the number of iterations for an individual test.

Because of space limitations, the test area of the screen displays only six tests at a time. Using the arrow keys causes the test display to scroll completely through the list.

NOTE

By default on startup all tests are set to “Quick” test and single iteration.
You may go directly to “Run Test” if no changes are required.

Setting Test Options

The Test options pull down opens the Test Options window. In the Test Options window the user may determine if the test stops on one of two parameters; time or iterations. By navigating to the “Stop On” item in the window and hitting the <Enter> key the user is given the options of “Iterations” or “Minutes”. If Iterations is set, the testing stops after executing the full test suite, however many times is indicated by the number in the “Iterations” edit box. If minutes is selected, the test suite repeats until the number of minutes in the Minutes edit box have passed, and then stop after executing the final test of that suite.

Interpreting Results

Test results appear next to the enabled tests in the test area of the screen. Each time a test passes or fails during a loop, the appropriate pass or fail count increments. For failed tests, Field Replaceable Unit (FRU) information also appears under the "Details" column.

If the user wants greater detail for the test run, view the test log file. For information on how to view the test log file, refer to Section “Viewing the Test Log” below.

Getting Help On Individual Tests

To display on-line help text files for a particular test, use the arrow keys to highlight the desired test and then press the <F1> key. The application presents a scrollable text file that describes the sub-tests for the highlighted test.

Viewing System Information

To view system information, use the arrow keys to highlight the appropriate menu item, and press the <Enter> key. From the menu select the system information to be viewed.

After pressing the <Enter> key, the application displays a scrollable information box that contains system information.

Viewing the Test Log

By default, the diagnostic software keeps the log file in "efi\service\diagnostics" in a file named "fielddiags.log."

To view this file, use the arrow keys to highlight the Platform Test menu and select View Results from that menu, by pressing the <Enter> key. After pressing the <Enter> key, the application displays a scrollable information box that contains the sessions test log. Because the log file is a Unicode file, the user can also view it in the EFI shell by using the "type -u" command, and in the Windows operating system using the Notepad application.

All test results are appended to the previous log file. To clear the log file select the Clear log button on the View Results window. Note: because the log file is now always appended, it is recommended that the file be cleared a regular basis to keep the file size from getting too large.

EFI Service Partition

The EFI Service Partition provides the ability to remotely access an Intel® server running EFI, via modem or LAN, for the purpose of executing configuration/setup utilities, remote diagnostics, and any other software designed to be compatible with this environment.

Service Partition Requirements

1. The SP may reside on any of the EFI-recognized physical drives. Drives not supported by EFI cannot be used for a service partition or EFI System Partition.
2. An EFI System Partition cannot be installed on legacy MBR disks. The disk must be formatted as a GPT disk. (GUID Partition Table). This utility will not reinitialize a legacy MBR disk.
3. The SP requires at least 65 MB free on the chosen EFI System Partition.
4. For proper operation, there must be only one set of service partition files present.

Installing Service Partition Files

The service partition on an Intel Itanium 2-based platform is part of the Extensible Firmware Interface (EFI) System Partition. This partition is not a separate, dedicated partition as is its functional counterpart on an IA-32 platform. The presence of “service partition” files within the existing system partition defines the EFI Service Partition.

The service partition is established when the installation program copies service partition files into the existing system partition. These files comprise utilities, diagnostics, and other software required for remote management. You can run the utilities and diagnostics located on the service partition either locally or remotely. In order to run the utilities and diagnostics the user must boot the server from the partition. Applications that execute in the service partition run only on the managed server.

Installation Requirements

Be sure to adhere to the following requirements when installing the service partition files:

- The current ECO BIOS and FW are installed.
- You must use the installation software on the current System Resource CD or software downloaded from the Intel Business Link (IBL) to install the system partition files, thus defining the service partition.
- At least 125 MB or one percent of the selected drive must be available (as un-partitioned space).

Installing the Files

Follow these steps to install the service partition files onto a managed server whose operating system is already installed:

NOTE

You can also install the service partition directly from the Resource CD. For information, see "The SR870BN4 Resource CD" on page 67.

1. Insert the System Resource CD into the managed server's CD-ROM drive before booting to EFI Shell. Boot the system into EFI Shell, the EFI CD Menu program launches automatically. If the EFI CD Menu program does not launch in the EFI Shell, mount and map to the CD drive and type 'startup' and press <Enter> to launch the EFI CD Menu.

   Alternatively, the user can log into the Intel Business Link (IBL) site and download the software to install the service partition files. Follow the instructions from the downloaded package to install the service partition.
2. From the menu tab, use the arrow keys to navigate over to the Utility menu and hit <Enter> or the down arrow to expand the menu.
3. From the Utility menu, arrow down to "Install Service Partition" and hit <Enter> to launch the Service Partition Administration menu.
4. Choose 3 and press <Enter> to install the service partition files.
5. The installation software reports whether a system partition has been found. If so, it is recommended that the user choose to install the service partition files onto the existing system partition. Do so by choosing 1 and pressing <Enter>.
6. Choose the number for the system partition on which to install the partition files and press <Enter>.
7. After receiving the message indicating that all files were installed successfully, press any key.
8. Press <ESC> to exit the Service Partition Administration menu and return to the EFI CD menu.

Booting the Server from the Service Partition

The service partition contains utilities and diagnostics. To run these utilities or diagnostics, the user needs to boot the server from the service partition. The user can reboot a managed server from the service partition one of two ways: locally, or remotely. When the user reboots the server to the service partition remotely, the following can be done:

- Run EFI shell commands on the server
- Run a program from the service partition
- Run diagnostics specific to the server
- Run the SMU to configure the server for Server Management

Locally

Follow these steps to locally boot the server to the service partition:

1. Restart the managed server.
2. Monitor the boot process and press ‘F2’ to enter BIOS setup. Arrow over to the “System Management” menu, and select “Enabled” for the “Service Boot” option. Hit the <F10> to save the setting and exit out of the BIOS setup and the system automatically reboots to the Service Partition.

Console Redirection

The BIOS supports redirection of both video and keyboard via serial link. This section details the serial redirection scheme. For redirection over LAN (Serial over LAN or SOL), please refer to the ISM Users Guide.

When console redirection is enabled, local (host server) keyboard input and video output are passed both to the local keyboard and video connections, and to the remote console via the serial link. Keyboard inputs from both sources are considered valid and video is displayed to both outputs. Optionally, the system can be operated without a host keyboard or monitor attached to the system and run entirely via the remote console. Setup and any other text-based utilities can be accessed via console redirection. Note that serial redirection uses PC-ANSI and the UART settings assume 1 stop bit.

Operation

When redirecting through a modem (as opposed to a null modem cable), the modem needs to be configured with the following:

- Auto-answer (for example, ATS0=2, to answer after two rings).
- Modem reaction to DTR set to return to command state (e.g., AT&D1).

Failure to provide item #2 results in the modem either dropping the link when the server reboots (as in AT&D0) or becoming unresponsive to server baud rate changes (as in AT&D2).

The Setup/EMP option for handshaking must be set to CTS/RTS + CD for optimum performance. The CD refers to carrier detect. If EMP is sharing the COM port with serial redirection, the handshaking must be set to CTS/RTS+ CD. In selecting this form of handshaking, the server is prevented from sending video updates to a modem that is not connected to a remote modem. If this is not selected, video update data being sent to the modem inhibits many modems from answering an incoming call. An EMP option utilizing CD should not be used if a modem is not used and the CD is not connected.

Once console redirection is selected via Setup, redirection binary is loaded into memory and activated during POST. While redirection cannot be "removed" without rebooting, it can be inhibited and restarted. When inhibited, the serial port is released by redirection and might be used by another application. Restarting reclaims the serial port and continues redirection. Inhibiting/restarting is accomplished through the following INT 16h mechanism. The standard INT 16h (keyboard handler) function ah=05h places a keystroke in the key buffer, just as if an actual key had been pressed. Keystrokes so buffered are examined by redirection, and if a valid command string has been sent, it is executed. The following commands are supported in this fashion:

- Esc-CDZ0 - Inhibit Console Redirection
- Esc-CDZ1 - Restart Console Redirection

In order to inhibit redirection, the software must call INT 16h, function ah=05h five times to place the five keys in the key buffer. Keystrokes sent to the INT 16h buffers for purposes of invoking a command are buffered, and should be removed via the normal INT 16h calls to prevent these keystrokes from being passed on to another application.

Keystroke Mappings

During console redirection, the remote terminal (which may be a dumb terminal or a system with a modem running a communication program) sends keystrokes to the local server. The local server passes video back over this same link.

For keys that have an ASCII mapping, such as A and Ctrl-A, the remote simply sends the ASCII character. For keys that do not have an ASCII mapping, such as F1 and Alt-A, the remote must send a string of characters, as defined in the tables below. The strings are based on the ANSI terminal standard. Since the ANSI terminal standard does not define all the keys on the standard 101 key U.S. keyboard, mappings for these keys were created, such as F5 - F12, Page Up, and Page Down.

Alt key combinations are created by sending the combination ^[} followed by the character to be Alt modified. Once this Alt key combination is sent (^[}), the next keystroke sent is translated into its Alt-key mapping (that is, if ^[} is mapped to Shift-F1, then pressing Shift-F1 followed by 'a' would send an Alt-a to the server).

The remote terminal can force a refresh of its video by sending ^[{.

Presently, unusual combinations outside of the ANSI mapping and not in the table below, are not supported (for example: Ctrl-F1).

Table 24. Non-ASCII Key Mappings

Key	Normal	Shift	Ctrl	Alt
ESC	^[	NS	NS	NS
F1	^[OP	NS	NS	NS
F2	^[OQ	NS	NS	NS
F3	^[OR	NS	NS	NS
F4	^[OS	NS	NS	NS
F5	^[OT	NS	NS	NS
F6	^[OU	NS	NS	NS

Key	Normal	Shift	Ctrl	Alt
F7	^[OV	NS	NS	NS
F8	^[OW	NS	NS	NS
F9	^[OX	NS	NS	NS
F10	^[OY	NS	NS	NS
F11	^[OZ	NS	NS	NS
F12	^[O1	NS	NS	NS
Print Screen	NS	NS	NS	NS
Scroll Lock	NS	NS	NS	NS
Pause	NS	NS	NS	NS
Insert	^[[L	NS	NS	NS
Delete	(7Fh)	NS	NS	NS
Home	^[[H	NS	NS	NS
End	^[[K	NS	NS	NS
Pg Up	^[[M	NS	NS	NS
Pg Down	^[[2J	NS	NS	NS
Up Arrow	^[[A	NS	NS	NS
Down Arrow	^[[B	NS	NS	NS
Right Arrow	^[[C	NS	NS	NS
Left Arrow	^[[D	NS	NS	NS
Tab	(09h)	NS	NS	NS

NS = Not supported, (xxh) = ASCII character xx

Table 25. ASCII Key Mappings

Key	Normal	Shift	Ctrl	Alt
Backspace	(08h)	(08h)	(7Fh)	^[}(08h)
(accent) `	`	(tilde) ~	NS	^[}`
1	1	!	NS	^[}1
2	2	@	NS	^[}2
3	3	#	NS	^[}3
4	4	$	NS	^[}4
5	5	%	NS	^[}5
6	6	^	NS	^[}6
7	7	&	NS	^[}7
8	8	*	NS	^[}8
9	9	(	NS	^[}9
0	0	)	NS	^[}0
(dash) -	-	(under) _	(1Fh)	^[}-
=	=	+	NS	^[}=
a to z	a to z	A to Z	(01h) to (1Ah)	^[}a to ^[}z
[	[	{	(1Bh)	^[}[
]	]	}	(1Dh)	^[}]

Key	Normal	Shift	Ctrl	Alt
\	\	|	(1Ch)	^[}\
(semi-colon) ;	;	(colon) :	NS	^[};
(apostrophe) '	‘	(quote) "	NS	^[}'
(comma) ,	,	<	NS	^[},
(period) .	.	>	NS	^[}.
/	/	?	NS	^[}/
(space)	(20h)	(20h)	(20h)	^[}(20h)

NS = not supported, (xxh) = ASCII character xx

Limitations

Console redirection is a real mode BIOS extension, and has been modified to transition into EFI space. The transition is actually a parameter passing exercise whereby the serial redirection scheme native to the EFI takes over using the settings established in BIOS Setup.

Video is redirected by scanning for, and sending changes to, text video memory across the redirection channel. Thus, console redirection is unable to redirect video in graphics mode. Keyboard redirection functions via the BIOS INT 16h handler. Software bypassing this handler does not receive redirected keystrokes. After entering EFI, the redirection scheme changes somewhat, but the effect is the same.

Interface to Server Management

If BIOS determines that console redirection is enabled, reads the current baud rate from EMP, and passes this value to the appropriate management controller via the IPMB.

Sample Setup for Console Redirection

This is an example of how to configure the console/host and server for console redirection. In this example, the console is running under Windows XP with SP2. The console and server is directly connected through the serial ports of both systems using a serial null modem cable:

Server Configuration

1. Power on the server and when prompted, press the <F2> key to enter BIOS Setup.
2. The BIOS Setup menu displays the Main menu. Use the arrow keys move over to the “System Management” menu.
3. At “System Management” menu, arrow down to the “Console Redirection” submenu and press the <Enter> key to enter this menu.
4. Arrow to the “Serial Console Redirection” option and press <Enter>.
5. Chose “Enabled” by using the arrow key and press <Enter>.
6. The “Serial Port” menu should already have COM2 as the choice, if not, choose the “Serial Port” option and change it by using the arrow and <Enter> as described in steps 4 and 5 for the “Serial Console Redirection” menu.
7. Set the “Baud Rate” to 115.2K.
8. Set the “Flow Control” to CTS/RTS.
9. Set the “Terminal Type” to VT-UTF8.
10. Press the <F10> key to save the configuration changes and exit BIOS Setup.

11. At the prompt to save changes and exit, select "Yes" and pressing the <Enter> key.
12. This reboots the server with console redirection enabled. At this point, power down the server and configure the console.

Console Configuration

1. Boot the console into the OS.
2. Launch HyperTerminal by clicking on the "Start" button in the task bar.
3. Select "Programs>Accessories>Communications" and click on HyperTerminal.
4. At the Connection Description window, enter "guest" for the name and click "OK" to proceed.
5. At the Connect To window, select the COM port of the console that the Null modem is connected. In this example, it is COM1.
6. At the COM1 Properties window, select "115200" for the Bits per second (Baud rate) box to match what was configured via the SMU on the server.
7. Select "Hardware" for the Flow Control to match what was configured in the BIOS Setup (CTS/RTS is the Hardware flow control).
8. Leave the default settings for the other boxes. Click "OK" to accept the settings and enter the HyperTerminal screen.
9. At this point, power on the server. The console starts displaying the redirection once the video synchronizes on the server.

Terminal Mode Overview

Terminal mode is a feature that allows the user to directly interface to the server's Baseboard Management Controller (BMC) via a serial port connection and execute text-based commands. Two types of text commands are supported:

- A limited selection of text commands
- Standard binary IPMI 1.5 hex-ASCII commands

Using the terminal mode feature the user can do the following:

- Power the server on or off
- Reset the server
- Retrieve the server's health status
- Configure and retrieve the server management subsystems boot options
- Configure and retrieve the BMC's terminal mode configuration
- Execute any platform supported binary command specified in the Intelligent Platform Management Interface (IPMI) v1.5 specification using the hex-ASCII format

Setup and Configuration

Connection Mechanism

Two types of connection mechanisms are supported as follows:

- Direct connection, where a local host is connected to the target system "directly," or from one system's serial port to another, and;
- Modem connection, where the local host is connected to the target system via a modem.

Hardware Setup

Hardware setup is dependent upon the type of connection mechanism being employed as follows:

- For a direct connection, a null modem cable is all that is needed to connect the local host to the target system
- For a modem connection, the local host and target systems must both be connected to modems via serial cables

Configuration Using System Maintenance Utility (SMU)

Configuration of terminal mode requires proper configuration of the following: the serial channel, user login information (user name and password), and the terminal mode configuration parameters. SMU provides methods to access and manipulate all the necessary parameters for terminal mode configuration.

Serial Channel Configuration

The serial channel configuration setup is done with the SMU.

Set the connection mode to the desired connection mode and the rest of the options to the desired state for your application.

Direct Connection Mode
Set the options on the direct connection mode to the desired states for your application. It is highly recommended that the user disable the ping message or else the user will get serial ping message data from the BMC displayed on your terminal screen.

Modem Connection Mode
Set the options on the modem connection mode to the desired states for your application. It is highly recommended that the user disable the ping message or else the user will get serial ping message data from the BMC displayed on your terminal screen.

Be sure to save the new serial channel configuration when editing the serial channel settings is done.

Sample Setup for Terminal Mode

This is an example of how to configure the console/host and server for Terminal Mode. In this example, the console is running under Windows 2000 with SP2. The console and server is directly connected through the serial ports of both systems using a serial null modem cable:

Server Configuration:

1. Run the SMU to configure the BMC.
2. In the Navigation Pane of the SMU (located on the left side), click on the Serial/Modem option. This takes the user to the Serial/Modem configuration menu.
3. At the Connection Mode box, pull down the menu and select “Direct Connect Mode.”
4. Select “Always Available” for the Access Mode.
5. Select “Administrator” for the Privilege Level Limit.
6. Select “None” for Flow Control.
7. Leave the Enable Data Terminal Ready box unselected.
8. Select “19200” for the Baud Rate.
9. Click on the “Next” button to move to the next menu.

10. Click “Next” again to get to the Terminal Mode Configuration screen.
11. “Check” the Enable Terminal Mode box.
12. “Check” the Enable Line Editing box.
13. Select “Backspace” for the Delete Control.
14. “Check” the Turn BMC echo of received characters on box.
15. “Check” the Enable handshake when BMC ready to receive another message box.
16. Select the “CRLF” for the Newline output sequence (BMC to console) box.
17. Select the “CR” for the Newline input sequence (console to BMC) box.
18. Click “Save” to save your settings and “Ok” to return to the Home page of the SMU.
19. Click on the “User” option in the Navigation Pane to configure the user setup.
20. Select the “Anonymous User” box and click on the “Edit” button to configure this User.
21. In the Edit User Configuration screen, “check” the Enable User box.
22. In the Enter New Password box, enter your password. In this example the password is guest.
23. Enter the password again in the Verify New Password box.
24. Select “Administrator” for the User Privilege Level under the Serial/Modem Channel menu.
25. Click “OK” to exit out of this menu. Click “Save” to save the configuration.
26. Click “OK” at the User Save Result menu to return to the Home menu.
27. At the Home menu, click on the “Exit” option in the Navigation pane to exit SMU, click “OK” to confirm the exit.
28. Reboot the server.

Console Configuration:

1. Boot the console into the OS.
2. Launch HyperTerminal by clicking on the “Start” button in the task bar.
3. Select “Programs>Accessories>Communications” and click on HyperTerminal.
4. At the Connection Description window, enter “guest” for the name and click “OK” to proceed.
5. At the Connect To window, select the COM port of the console that the Null modem is connected. In this example, it is COM1.
6. At the COM1 Properties window, select “19200” for the Bits per second (Baud rate) box to match what was configured via the SMU on the server.
7. Select “None” for the Flow Control to match what was configured in the BMC.
8. Leave the default settings for the other boxes. Click “OK” to accept the settings and enter the HyperTerminal screen.
9. You will now see characters being displayed to the HyperTerminal screen. This is the PING message sent by the BMC.
10. Press the <ESC> key followed by the “(“ key to enable Terminal Mode and end the PING messages. “[`TMODE OK`]” is displayed.
11. Type “[`SYS TMODE`]”, it is case sensitive and must be in uppercase. The response back will be “[`OK TMODE`]” indicating that Terminal Mode is functioning.

Logging Into the Terminal Mode Session

1. Remember that “guest” was the password that we set for the Anonymous User in the BMC.
2. At the HyperTerminal screen enter “[`SYS PWD -N guest`]” to login. The “-N” represents the Anonymous User and “guest” is the password. These are case sensitive.
3. The screen returns “[`SYS`]” and “[`OK`]” to show a successful login.
4. At this point, the user can type any supported Terminal mode command.

5. To logout type “[`SYS PWD -X`]”.

User Configuration

A user must be configured via the SMU to make full use of terminal mode. To create a user, navigate to the SMU user configuration screen. Enter any username and password combinations desired. Make sure to check the box that enables a particular user for use on the serial channel. If this is not done, the username will not be useable on the serial channel for terminal mode. Configure the user with the desired maximum privilege level.

Username and Password Restrictions

Spaces, left bracket characters or right bracket characters are not allowed in usernames or passwords used with terminal mode.

Be sure to save the new user information when editing the user settings is done!

Terminal Mode Configuration

Terminal mode has several configuration parameters that determine behavioral characteristics of the terminal mode interactions with the remote console. They are outlined below and in the terminal mode configuration parameters table.
See the terminal mode configuration parameters table for the BMC default settings of each parameter.

Line Editing

When this option is enabled, it allows the user to make changes to the input line before submitting it to the BMC for processing. When line editing is enabled, it is recommended that echo be enabled as well.

Echo

When this option is enabled, the BMC echoes each character it receives to the remote console.

Handshaking

When this option is enabled, the BMC will output the following string as soon as the BMC is ready to accept another message from the remote console.

```
Handshake string:  [SYS]<newline sequence>
```

Delete Control Sequence

This option allows the user to specify the delete control sequence for the BMC to use when the delete or backspace key is pressed. The following delete control sequences are supported:

<DEL> - The BMC outputs a delete character

<BKSP><SP>< BKSP > - The BMC outputs a backspace, space, backspace character sequence

This delete control sequence is only valid when line editing is enabled. If line editing is not enabled, the delete key or backspace key are treated as illegal characters.

Input Newline Sequence

This option allows the user to specify the input newline sequence for the BMC to expect during remote console to BMC communications. The following input newline sequences are supported:

<NULL> - The NULL character (0x00)

<CR> - The carriage return character

Output Newline Sequence

This option allows the user to specify the output newline sequence for the BMC to output during BMC to remote console communications.

The following output newline sequences are supported:

- <no termination sequence> - No character sequence is used to indicate output newlines
- <CR-LF> - The carriage return – line feed character sequence
- <NULL> - The NULL character (0x00)
- <CR > - The carriage return character
- <LF-CR> - The line feed – carriage return character sequence
- <LF> - The line feed character

Be sure to save the new terminal mode configuration when editing the terminal mode settings done!

Security Information

Access to the BMC via terminal mode is governed by the proper setup of usernames and password via the SMU. A session must be established with the BMC prior to accepting any terminal mode commands. A limited selection of text commands and binary hex-ASCII commands that are assigned the lowest IPMI privilege level are available prior to session establishment with the BMC.

Since the terminal mode password is sent via clear text, it is highly desirable that the terminal mode session takes place in a secure location over a secure link, preferably via a direct connection. Connection via a modem is supported but not recommended.

Terminal Mode Commands

Input Restrictions

Terminal mode messages are bound by the restrictions listed in the following subsections.

Syntax

Terminal mode messages follow the general syntax below:

```
[<message data>]<newline sequence>
```

Each terminal mode message must be preceded with the left bracket "start" character and must be ended with a right bracket "stop" character and the appropriate input newline sequence.

No input characters are accepted until the start character has been received.

Terminal mode text commands are case sensitive, but hex-ASCII commands can either use upper or lower case letters for ASCII representations of hex digits.

Command Length

Terminal mode messages are limited to a maximum length of a 122 characters. This includes the left and right brackets, but not control characters.

Character Support

Terminal mode messages are allowed to be composed of standard printable ASCII characters. All other characters are treated as illegal characters.

Special Character Handling - <ESC> character

The <ESC> character can be used to delete an entire message prior to submission to the BMC for processing. If line editing is enabled, and the <ESC> key is followed by an input newline sequence, the BMC responds by outputting an output newline sequence. Otherwise, the BMC goes back to looking for the start character.

Special Character Handling - <DEL> or <BKSP> character

The <BKSP> or <DEL> key can be used to delete the last character entered if the message has not been submitted to the BMC yet.

Special Character Handling - Line Continuation character

Long IPMI messages can be split across multiple lines by using the line continuation <BACKSLASH> character followed immediately by an input newline sequence. Line continuation character usage is supported for both text and hex-ASCII commands.

Special Character Handling - Illegal characters

Any illegal characters received by the BMC clears the message in progress and forces the BMC back to looking for the start character.

Hex-ASCII Command Format

Binary IPMI commands are sent and received as a series of case insensitive hex-ASCII pairs, where each is optionally separated from the preceding pair by a single <space> character. The following is an example of a binary IPMI request message:

```
[18 00 22]<newline sequence>
```

The software ID and LUN for the remote console are fixed and implied by the command. The SWID for messages to the remote console is always 47h, and the Logical Unit Number (LUN) is 00b.

Instead, there is a ‘bridge’ field that is used to identify whether the message should be routed to the BMC’s bridged message tracking or not. See the Terminal Mode IPMI Message Bridging section for more information.

Table 26. Terminal Mode Request to BMC

Byte	Explanation
1	[7:2] – Net Function (even) [1:0] – Responder’s LUN
2	[7:2] – Requester’s Sequence Number [1:0] – Bridge field
3	Command Number
4:N	Data

Table 27. Terminal Mode Request from BMC

Byte	Explanation
1	[7:2] – Net Function (odd) [1:0] – Responder’s LUN
2	[7:2] – Requester’s Sequence Number [1:0] – Bridge field
3	Command Number
4	Completion Code
5:N	Data

Text Command Format

Text commands do not support the bridging and sequence number fields present in the hex-ASCII commands, are case sensitive, and are preceded by a prefix consisting of the string "SYS".

Examples

Hex-ASCII command example (IPMI Reset Watchdog Cmd):

[18 00 22]<CR>

[1C 00 22 00]<CR-LF>

Text command example:

[SYS TMODE]<CR>

[OK TMODE]<CR-LF>

Terminal Mode IPMI Message Bridging

Terminal mode supports the ability to bridge IPMI messages to another interface when binary hex-ASCII IPMI commands are used. The message bridge is determined by the following: the bridge field, whether the message is a request or a response, the message direction with respect to the BMC and the LUN. Table 28 lists the supported BMC combinations for IPMI message bridging. Any other combinations are unsupported.

Note that IPMI messages to and from the system interface are transferred using the BMC SMS (System Management Software) LUN, 10b, and with the bridge field set to 00b.

Table 28. Supported BMC Combinations for IPMI Message Bridging

Bridge Field	Request/ Response	Message Direction (to BMC)	LUN	Message Interpretation
00b	Request	In	00b, 01b, 11b	Remote Console request to BMC functionality Message is a request from the remote console to the BMC
00b	Response	Out	00b, 01b, 11b	Response to Remote Console from BMC functionality Message is a response to an earlier request from the remote console to the BMC
00b	Request	In	10b	Remote Console request to SMS Message is a request from the remote console to SMS via the Receive Message Queue
00b	Response	Out	10b	SMS Response to Remote Console Message is a response to an earlier request from SMS
01b	Response	Out	Any	Response to earlier Bridged Request from Remote Console Message is the asynchronous response from an earlier bridged request that was encapsulated in a Send Message command issued to the BMC by the remote console

Table 29. Terminal Mode Text Commands

Command	Switches	Description
SYS PWD	-U USERNAME <password>	Used to activate a terminal mode session. USERNAME corresponds to the ASCII text for the username. <password> represents a printable password (up to 16 characters). If <password> is not provided, then a Null password (all binary 0's) is submitted. Passwords are case sensitive. Either the SYS PWD command (or Activate Session IPMI message) must be successfully executed before any command or IPMI messages are accepted. Note that a modem connection may be automatically dropped if multiple bad passwords are entered.
	-N <password>	-N represents a Null username. <password> represents a printable password (up to 16 characters). If <password> is not provided, then a Null password (all binary 0's) is submitted. Passwords are case sensitive. Either the SYS PWD command (or Activate Session IPMI message) must be successfully executed before any command or IPMI messages are accepted. Note that a modem connection may be automatically dropped if multiple bad passwords are entered.
	-X	-X immediately 'logs out' any presently active session. Entering an invalid password with -U or -N also has the same effect.
SYS TMODE		Used as a 'no-op' confirm that Terminal Mode is active. BMC returns an OK response followed by "TMODE".
SYS SET BOOT XX YY ZZ AA BB		Sets the boot flags to direct a boot to the specified device following the next IPMI command or action initiated reset or power-on. XX…BB represent five hex-ASCII encoded bytes, which are the boot flags parameter in the Boot Option Parameters. See the Boot Option Parameters Table below for more information. Upon receiving this command, the BMC automatically sets the 'valid bit' in the boot options and sets all the Boot Initiator Acknowledge data bits to 1b.

continued

Table 29. Terminal Mode Text Commands (continued)

Command	Switches	Description
SYS SET BOOTOPT XX YY…NN		This is essentially a text version of the IPMI "Set System Boot Options" command. It allows any of the boot option parameters to be set, not just the boot flags. XX YY…NN represent the hex-ASCII encoding for the data bytes that are passed in the Set System Boot Options request. See the Boot Option Parameters Table below for more information. XX - Parameter valid [7] - 1b = Mark parameter invalid / locked 0b = Mark parameter valid / unlocked [6:0] - Boot option parameter selector YY…NN -– Boot Option Parameter Data Per Boot Option Parameters Table below. Passing 0-bytes of parameter data allows the parameter valid bit to be changed without affecting the present parameter setting.
SYS GET BOOTOPT XX YY ZZ		This is essentially a text version of the IPMI "Get System Boot Options" command. It allows any of the boot option parameters to be retrieved. XX YY ZZ represents the hex-ASCII for the data bytes that are passed in the Get System Boot Options request. The BMC returns the data from the command in hex-ASCII format. See the Boot Option Parameters Table below for more information. XX - Parameter selector [7] -Reserved [6:0] - Boot option parameter selector YY - Set Selector [7:0] -Selects a particular block or set of parameters under the given parameter selector Write as 00h if parameter does not use a Set Selector ZZ - Block Selector Selects a particular block within a set of parameters Write as 00h if parameter does not use a Block Selector. Note: As of this writing, there are no IPMI-specified Boot Options parameters that use the block selector. However, this field is provided for consistency with other configuration commands and as a placeholder for future extension of the IPMI specification.

continued

Table 29. Terminal Mode Text Commands (continued)

Command	Switches	Description
SYS SET TCFG		Returns the Terminal Mode Configuration bytes where XX and YY represent hex-ASCII encoding for the volatile version of data bytes 1 and 2 as specified in the Terminal Mode Configuration Table below, and AA BB represent hex-ASCII encoding of the non-volatile version. V:XX YY<output termination sequence> N:AA BB<output termination sequence>
	-V XX YY	This command sets the volatile Terminal Mode Configuration. XX and YY represent hex-ASCII encoding for data bytes 1 and 2 as specified in the Terminal Mode Configuration Table below. The BMC returns the same output as for SYS SET TCFG, above.
	-N XX YY	This command sets the non-volatile Terminal Mode Configuration. XX and YY represent hex-ASCII encoding for data bytes 1 and 2 as specified in the Terminal Mode Configuration Table below. The BMC returns the same output as for SYS SET TCFG, above.
SYS RESET		Directs the BMC to perform an immediate system hard reset.
SYS POWER OFF		Directs the BMC to perform an immediate system power off.
SYS POWER ON		Causes the BMC to initiate an immediate system power on.
SYS HEALTH QUERY		Causes the BMC to return a high level version of the system health status in 'terse' format. The BMC returns a string with the following format if the command is accepted. PWR:zzz H:xx T:xx V:xx PS:xx C:xx D:xx S:xx O:xx Where: PWR is system POWER state H is overall Health T is Temperature V is Voltage PS is Power Supply subsystem F is cooling subsystem (Fans) D is Hard Drive / RAID Subsystem S is physical Security O is Other (OEM) zzz is: "ON", "OFF" (soft-off or mechanical off), "SLP" (sleep - used when sleep level cannot be distinguished), "S4", "S3", "S2", "S1", "??" (unknown) and xx is: ok, nc, cr, nr, uf, or ?? where: "ok" = OK (monitored parameters within normal operating ranges) "nc" = non-critical ('warning': hardware outside normal operating range) "cr" = critical ('fatal': hardware exceeding specified ratings) "nr" = non-recoverable ('potential damage': system hardware in jeopardy or damaged) "uf" = unspecified fault (fault detected, but severity unspecified) "??" = status not available/unknown (typically because system power

		is OFF)
	-V	Causes the BMC to return a high level version of the system health status in multi-line 'verbose' format. The BMC returns a string of the following format: SYS Health:xx<output termination sequence> Power: "ON", "OFF" (soft-off or mechanical off), "SLEEP" (sleep - used when can't distinguish sleep level), "S4", "S3", "S2", "S1", "Unknown" Temperature:xx<output termination sequence> Voltage:xx<output termination sequence> PowerSystem:xx<output termination sequence> Cooling:xx<output termination sequence> Drives:xx<output termination sequence> Security:xx<output termination sequence> Other:xx<output termination sequence> Where xx is: "OK" (monitored parameters within normal operating ranges) "Non-critical" ('warning': hardware outside normal operating range) "Critical" ('fatal' :hardware exceeding specified ratings) "Non-recoverable" ('potential damage': system hardware in jeopardy or damaged) "Unspecified fault" (fault detected, but severity unspecified) "Unknown" (status not available/unknown (typically because system power is OFF)

Table 30. Boot Option Parameters

Parameter	#	Parameter Data (non-volatile unless otherwise noted)
Set In Progress (volatile)	0	Data 1 - This parameter is used to indicate when any of the following parameters are being updated, and when the updates are completed. The bit is primarily provided to alert software that some other software or utility is in the process of making changes to the data. The change shall take effect when the write occurs. [7:2] - Reserved [1:0] - 00b = Set complete. If a system reset or transition to powered down state occurs while 'set in progress' is active, the BMC goes to the 'set complete' state. If rollback is implemented, going directly to 'set complete' without first doing a 'commit write' causes any pending write data to be discarded. 01b = Set in progress. This flag indicates that some utility or other software is presently doing writes to parameter data. It is a notification flag only, it is not a resource lock. The BMC does not provide any interlock mechanism that would prevent other software from writing parameter data while. 10b = Reserved 11b = Reserved
Service partition selector (semi-volatile)[1]	1	Data 1 [7:0] - Service partition selector. This value is used to select which service partition BIOS should boot using. This document does not specify which value corresponds to a particular service partition. 00h = Unspecified

Service partition scan (semi-volatile)[1]	2	<u>Data 1</u> [7:2] - Reserved [1] - 1b = Request BIOS to scan for specified service partition. BIOS clears this bit after the requested scan has been performed. [0] - 1b = Service Partition discovered. The BIOS sets this bit to indicate it has discovered the specified service partition. The BIOS must clear this bit on all system resets and power ups, except when a scan is requested.

continued

Table 30. Boot Option Parameters (continued)

Parameter	#	Parameter Data (non-volatile unless otherwise noted)
BMC boot flag valid bit clearing (semi-volatile)[1]	3	<u>Data 1</u> - BMC boot flag valid bit clearing. Default = 0000b. [7:5] - Reserved [4] - 1b = Do not clear valid bit on reset/power cycle caused by PEF [3] - 1b = Do not automatically clear boot flag valid bit if IPMI *Chassis Control* command not received within 60-second timeout (countdown restarts when a IPMI *Chassis Control* command is received) [2] - 1b = Do not clear valid bit on reset/power cycle caused by watchdog timeout [1] - 1b = Do not clear valid bit on pushbutton reset / soft-reset (e.g. “Ctrl-Alt-Del”) [0] - 1b = Do not clear valid bit on power up via power pushbutton or wake event
Boot info acknowledge (semi-volatile)[1]	4	These flags are used to allow individual parties to track whether they’ve already seen and handled the boot information. Applications that deal with boot information should check the boot info and clear their corresponding bit after consuming the boot options data. <u>Data 1: Write Mask</u> (‘write-only’. This field is returned as 00h when read. This is to eliminate the need for the BMC to provide storage for the Write Mask field.) [7] - 1b = enable write to bit 7 of Data field [6] - 1b = enable write to bit 6 of Data field [5] - 1b = enable write to bit 5 of Data field [4] - 1b = enable write to bit 4 of Data field [3] - 1b = enable write to bit 3 of Data field [2] - 1b = enable write to bit 2 of Data field [1] - 1b = enable write to bit 1 of Data field [0] - 1b = enable write to bit 0 of Data field <u>Data 2: Boot Initiator Acknowledge Data</u> The boot initiator should typically write FFh to this parameter prior to initiating the boot. The boot initiator may write 0’s if it wants to intentionally direct a given party to ignore the boot info. This field is automatically initialized to 00h when the management controller is first powered up or reset. [7] - reserved. Write as 1b. Ignore on read [6] - reserved. Write as 1b. Ignore on read [5] - reserved. Write as 1b. Ignore on read [4] - 0b = OEM has handled boot info [3] - 0b = SMS has handled boot info [2] - 0b = OS / service partition has handled boot info [1] - 0b = OS Loader has handled boot info [0] - 0b = BIOS/POST has handled boot info

continued

Table 30. Boot Option Parameters (continued)

Parameter	#	Parameter Data (non-volatile unless otherwise noted)
Boot flags (semi-volatile)[1]	5	Data 1 [7] - 1b = Boot flags valid. The bit should be set to indicate that valid flag data is present. This bit may be automatically cleared based on the boot flag valid bit clearing parameter, above [6:0] - Reserved BIOS support for the following flags is optional. If a given flag is supported, it must cause the specified function to occur in order for the implementation to be considered to be conformant with this specification. The following parameters represent temporary overrides of the BIOS default settings. BIOS should only use these parameters for the single boot where these flags were set. If the bit is 0b, BIOS should use its default configuration for the given option. Data 2 [7] - 1b = CMOS clear [6] - 1b = Lock Keyboard [5:2] - Boot device selector 0000b = No override 0001b = Force PXE 0010b = Force boot from default Hard-drive[2] 0011b = Force boot from default Hard-drive, request Safe Mode[2] 0100b = Force boot from default Diagnostic Partition[2] 0101b = Force boot from default CD/DVD[2] 0110b-1110b = Reserved 1111b = Force boot from Floppy/primary removable media [1] - 1b = Screen Blank [0] - 1b = Lock out Reset buttons

continued

Table 30. Boot Option Parameters (continued)

Parameter	#	Parameter Data (non-volatile unless otherwise noted)
Boot flags (semi-volatile)[1] (continued)	5	Data 3 [7] - 1b = Lock out (power off/ sleep request) via Power Button [6:5] - Firmware (BIOS) Verbosity (Directs what appears on POST display) 00b = System default 01b = Request quiet display 10b = Request verbose display 11b = reserved [4] - 1b = Force progress event traps. When set to 1b, the BMC transmits PET traps for BIOS progress events to the LAN or serial/modem destination for the session that set the flag. Since this capability uses PET traps, this bit is ignored if for connection modes that do not support PET such as Basic Mode and Terminal Mode [3] - 1b = User password bypass. When set to 1b, the managed client's BIOS boots the system and bypasses any user or boot password that might be set in the system [2] - 1b = Lock Sleep Button. When set to 1b, directs BIOS to disable the sleep button operation for the system, normally until the next boot cycle [1:0] -00b = Console redirection occurs per BIOS configuration setting 01b = Suppress (skip) console redirection if enabled 10b = Request console redirection be enabled 11b = Reserved

continued

Table 30. Boot Option Parameters (continued)

Parameter	#	Parameter Data (non-volatile unless otherwise noted)
Boot flags (semi-volatile)[1] (continued)	5	Data 4 [7:4] - Reserved [3] - BIOS Shared Mode Override Can be used to request BIOS to temporarily place the channel into Shared access mode. Per the recommendations in the IPMI specification, 'Shared' access would cause the baseboard serial controller to both remain enabled after POST/start of OS boot, while also allowing the BMC to be accessible. This can be useful when booting to an alternative device such as a Diagnostic Partition since it means the partition can use the serial port but that communication with the BMC can remain available if the partition software fails. 1b = Request BIOS to temporarily set the access mode for the channel specified in parameter #6 to 'Shared'. This is typically accomplished by sending a 'Set Channel Access' command to set the *volatile* access mode setting in the BMC 0b = No request to BIOS to change present access mode setting [2:0] - BIOS Mux Control Override Can be used to request BIOS to force a particular setting of the serial/modem mux at the conclusion of POST / start of OS boot. This override takes precedence over the mux settings for the access mode even if the BIOS Shared Mode Override is set. 000b = BIOS uses recommended setting of the mux at the end of POST (See IPMI specification for more info) 001b = Requests BIOS to force mux to *BMC* at conclusion of POST/start of OS boot. If honored, this overrides the recommended setting of the mux at the end of POST (See IPMI specification for more info) 010b = Requests BIOS to force mux to *system* at conclusion of POST/start of OS-boot. If honored, this overrides the recommended setting of the mux at the end of POST. (See IPMI specification for more info) Data 5 - Reserved

continued

Table 30. Boot Option Parameters (continued)

Parameter	#	Parameter Data (non-volatile unless otherwise noted)
Boot initiator info (semi-volatile)[1]	6	Address & Identity information for the party that initiated the boot. The party that initiates the boot writes this parameter and the boot info acknowledge parameter prior to issuing the command that causes the system power up, power cycle, or reset. This data is written by the remote console application, not the BMC. Boot Source Data 1- Channel Number. Channel that delivers the boot command (e.g. chassis control). BIOS and boot software (e.g. service partition or OS loader) can use the *Get Channel Sessions* to find out information about the party that initiated the boot [7:4] - Reserved [3:0] - Channel Number Data 2:5 - Session ID. Session ID for session that the boot command will be issued over. This value can be used with the *Get Channel Sessions* command to find out information about the party that initiated the boot Data 6:9 - Boot Info Timestamp. This timestamp is used to help software determine whether the boot information is 'stale' or not. A service partition or OS loader may elect to ignore the boot information if it is older than expected The boot initiator should load this field with the timestamp value from the IPMI *Get SEL Time* command prior to issuing the command that initiates the boot.
Boot initiator mailbox (semi-volatile)[1][2]	7	This parameter is used as a 'mailbox' for holding information that directs the operation of the OS loader or service partition software. Note: Since this information is retained by the BMC and may be readable by other software entities, care should be taken to avoid using it to carry 'secret' data. Data1: Set Selector = Block selector Selects which 16-byte info block to access. 0-based. Data 2: (17) Block data The first three bytes of block #0 are required to be an IANA Enterprise ID Number (least significant byte first) for the company or organization that has specified the loader. Up to 16-bytes per block of information regarding boot initiator, based on protocol and medium. The BMC supports five blocks of storage for this command. Previous values are overwritten. The BMC does not automatically clear any remaining data bytes if fewer than 16 bytes are written to a given block.
All other parameters	All Others	Reserved

1. The designation 'semi-volatile' means that the parameter will be kept across system power cycles, resets, system power on/off, and sleep state changes, but will not be preserved if the management controller loses standby power or is cold reset. Parameters designated as 'semi-volatile' are initialized to 0's upon controller power up or hard reset, unless otherwise specified.
2. IPMI allows software to use the boot initiator mailbox as a way for a remote application to pass OEM parameters for additional selection of the boot process and direction of the startup of post-boot software. If additional parameters are not included, the system boots the primary/first-scanned device of the type specified.

Table 31. Terminal Mode Configuration

Byte	Explanation
1	[7:6] - Reserved [5] - Line Editing 0b = Disable 1b = Enable (Factory default) [4] - Reserved [3:2] - Delete control (only applies when line editing is enabled) 00b = BMC outputs a <DEL> character when <BKSP> or < DEL > is received 01b = BMC outputs a < BKSP >< SP >< BKSP > sequence when < BKSP > or < DEL > is received (Factory default) [1] - Echo control0b = No echo 1b = Echo (BMC echoes characters it receives) (Factory default) [0] - Handshaking - BMC outputs a [SYS]<newline> after receiving each terminal mode IPMI message and is ready to accept the next message 0b = Disable 1b = Enable (Factory default)
2	[7:4] - Output newline sequence (BMC to console). Selects what characters the BMC uses as the <newline> sequence when the BMC writes a line to the console in Terminal Mode 0h = no termination sequence 1h = <CR-LF> (Factory default) 2h = <NULL> 3h = <CR> 4h = <LF-CR> 5h = <LF> All other = reserved [3:0] - Input newline sequence (Console to BMC). Selects what characters the console uses as the <newline> sequence when writing to the BMC in Terminal Mode 0h = reserved 1h = <CR> (Factory default) 2h = <NULL> All other = reserved

4 Hot-swapping System Components

Tools and Supplies Needed

- Pen or pencil
- Antistatic wrist strap (recommended)

Equipment Log

To record the model and serial numbers of the server, all installed options, and any other pertinent information about the server, see Appendix B Equipment Log and Configuration Worksheet", on page 286.

Hot-swapping System Fans

The four 120-mm cooling fans are mounted in pairs below the back top cover of the chassis. You can remove and install these fans without turning the server system power off. Each fan uses an amber LED to indicate the failed fan. When an LED lights, the user needs to replace the fan.

⚠ **WARNING**

Make sure that the rack is anchored securely so it will not tilt forward when the server chassis is extended. A crush hazard exists should the rack tilt forward which could cause serious injury.

⚠ **CAUTION**

Do not leave the back top cover open or a system fan removed for longer than two minutes; system cooling is reduced.

1. If the chassis is rack-mounted, slide the chassis out far enough to expose the back top cover (see warning above).
2. Unlatch the back top cover by pressing the latches (A in Figure 49) and sliding the cover (B in Figure 49).

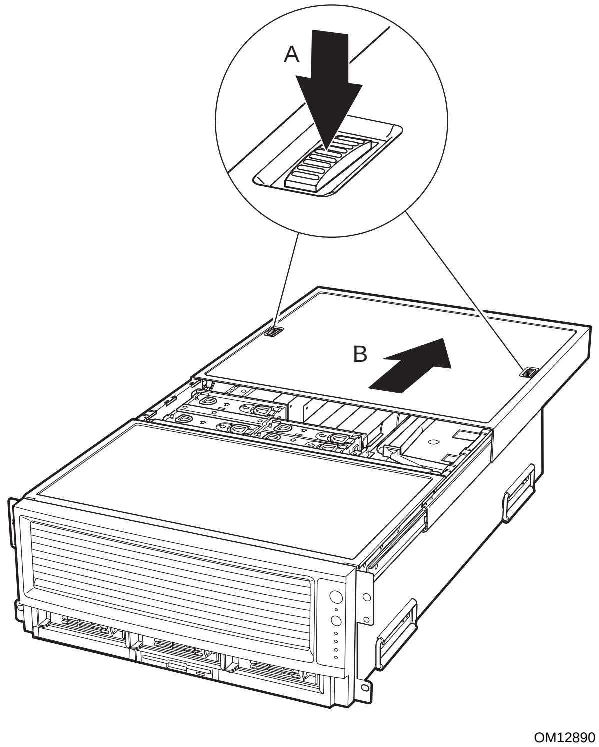
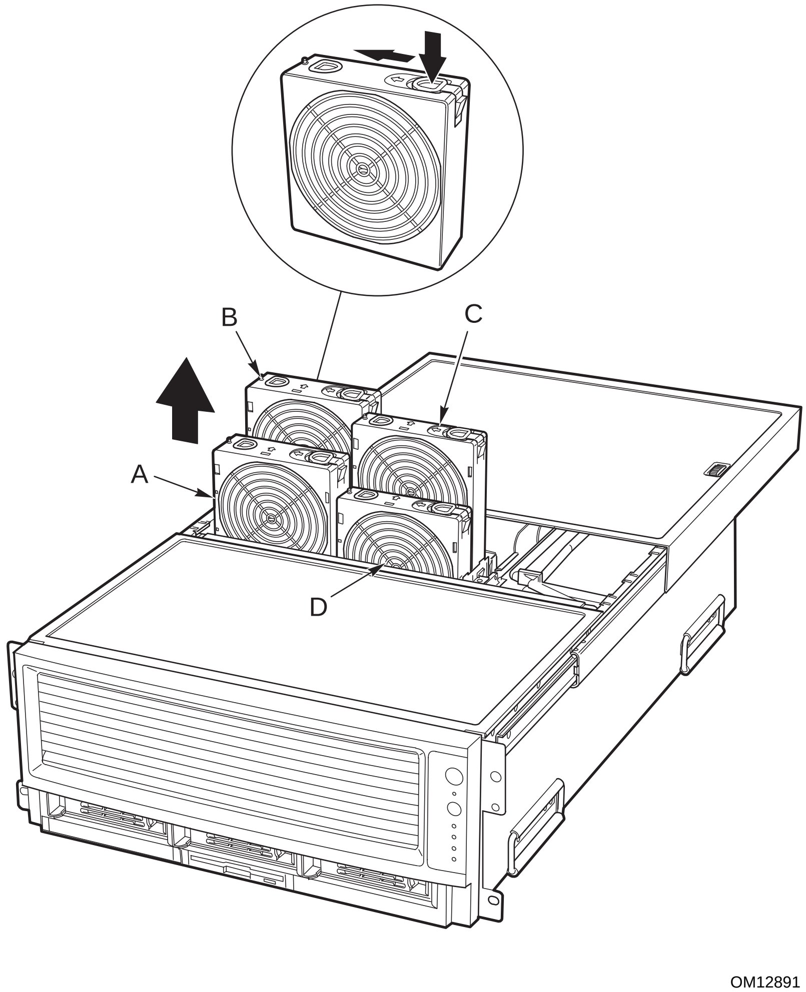


Figure 49. Opening the Back Top Cover

3. Locate the fan to be replaced. If it is a failed fan, the amber LED on the failed fan will be lit.
4. Place your fingers into the fan holes and squeeze your fingers together to release the fan latch and pull the fan out.



A and B 120 x 38 mm System Fans
C and D 120 x 25 mm System Fans

Figure 50. System Fan Location and Removal

Hot-swapping Hard Disk Drives

The procedures in this section describe how to determine drive status, remove a faulty drive, and install a new drive.

Determining Drive Status

The carriers contain light-pipes that allow dual color LED indicators to show through the bezel to display hard disk drive status as described in Table 32.

Table 32. SCSI Drive Status LED Descriptions

Feature	Description
Green, flashing	Indicates the hard drive is active
Yellow/Green flashing	Indicates a hard drive fault status and hard drive is active
Yellow/Blank flashing	Indicates a hard drive fault status
Not illuminated	Hard drive is powered

Removing a Hard Disk Drive

1. Examine the amber LEDs above the Hard Drive Bays to determine which drive has failed. See Table 32 for information on how to interpret the LEDs.
2. Pull the drive carrier latch open and use the handle to pull the drive assembly toward you as shown by the arrows in Figure 51.
3. Slide the assembly out of the bay and place it on a clean, static-free work surface.

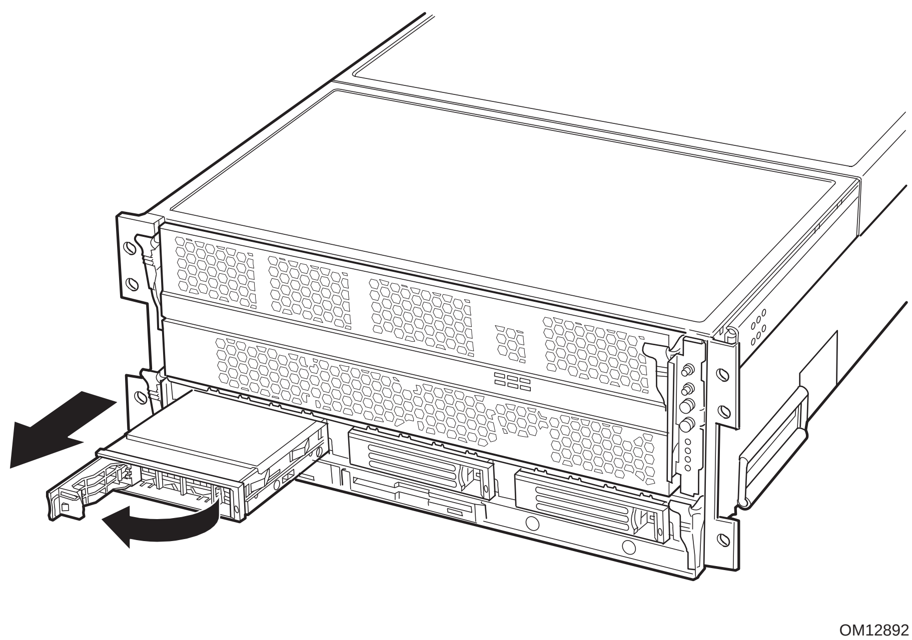


Figure 51. Removing a Hard Disk Drive

Installing a Hard Disk Drive

NOTE

If the user needs to mount the new drive into the hard drive carrier, see "Mounting a Hard Disk Drive in a Carrier" on Page 232.

1. With the drive carrier handle open fully, place the drive carrier in the peripheral drive bay and slide the drive carrier all the way into the drive bay.
2. Using the drive carrier handle, firmly push the assembly into the bay until the drive docks with the SCSI backplane connector.
3. Swing the drive carrier handle closed until it latches.

Hot-swapping Power Supplies

CAUTION

Because of chassis airflow disruption, a power supply bay should never be vacant (without a power supply or a filler panel) for more than five minutes when the server power is on. Exceeding five-minutes might cause the system to exceed the maximum acceptable temperature and possibly damage system components.

In a fully configured system (see Figure 52), the power system contains two 1200-watt auto ranging power supplies. If the user has only one power supply installed, it must occupy power supply bay A and a filler panel must be installed in power supply bay B. For 120 VAC input, two power supply modules must be installed for normal operation.

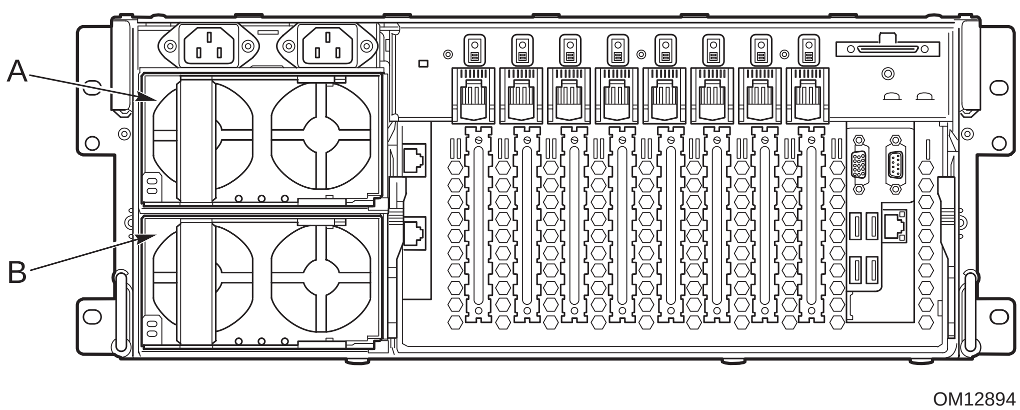


Figure 52. Power Supply Installation Order

Determining Power Supply Status

Each power supply has three LEDs that indicate whether power is supplied to the power supply and the health of the power supply. Table 33 provides more detail on the three LEDs. For location of the LEDs, see Figure 2 on page 20.

Table 33. Power Supply LEDs

PWR (Power) Green LED	PFAIL (Predictive Failure) Amber LED	FAIL (Power Supply Failure) Amber LED	Description
Off	Off	Off	No AC power to any power supplies
Off	Off	On	No AC power to a specific power supply or power supply failure
Blinking	Off	Off	AC present / Standby output on
On	Off	Off	DC outputs on and okay
On	Off	Blinking	Current limit
On	Blinking	Off	Predictive failure

Removing a Power Supply

⚠ **CAUTION**

Any unused power supply slots must be covered with a filler panel. Uncovered slots can disrupt the airflow used for cooling the system.

1. Locate the power supply you to be removed.
2. Push the thumb latch (A in Figure 53 to unlock the power supply handle and pull the handle (in direction B in Figure 53) to undock the supply.
3. Pull the power supply out of the chassis and set the power supply aside.

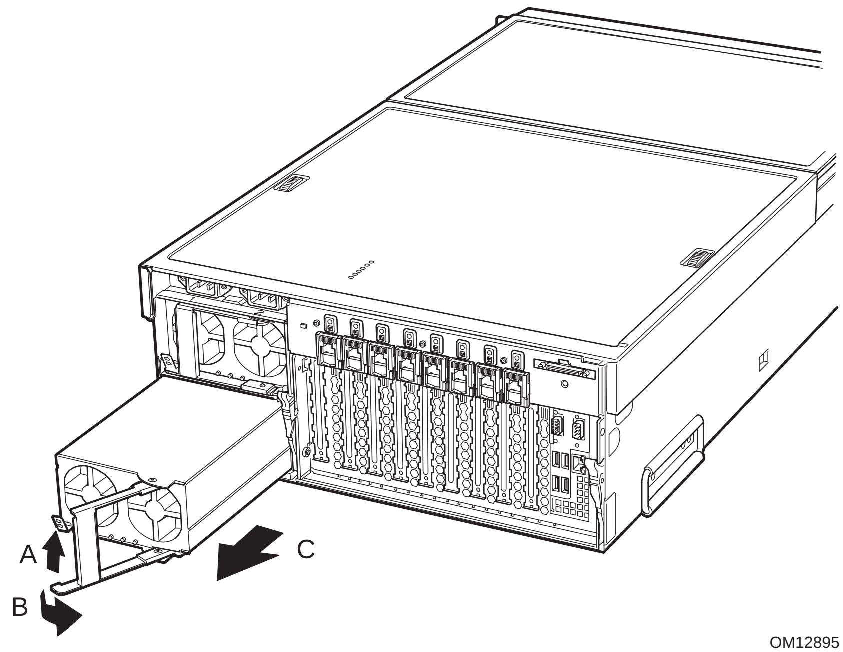


Figure 53. Removing a Power Supply

Installing a Power Supply

1. Remove the new power supply from the protective packaging, and place it on a clean ESD-protected work surface.
2. Record the model and serial numbers of the power supply in your equipment log. See Appendix B on page 286 for the equipment log.
3. Remove the filler panel from the back panel of the chassis if installed.
4. Slide the replacement power supply partway into the power supply bay (A in Figure 54).
5. Verify that the locking handle (B in Figure 54) is open.
6. With the handle in the open position, slide power supply into the power supply bay until it stops.
7. As shown by arrow B in Figure 54, rotate the handle to lock the power supply into place.
8. Check the new power supply's LEDs to verify proper power supply function.

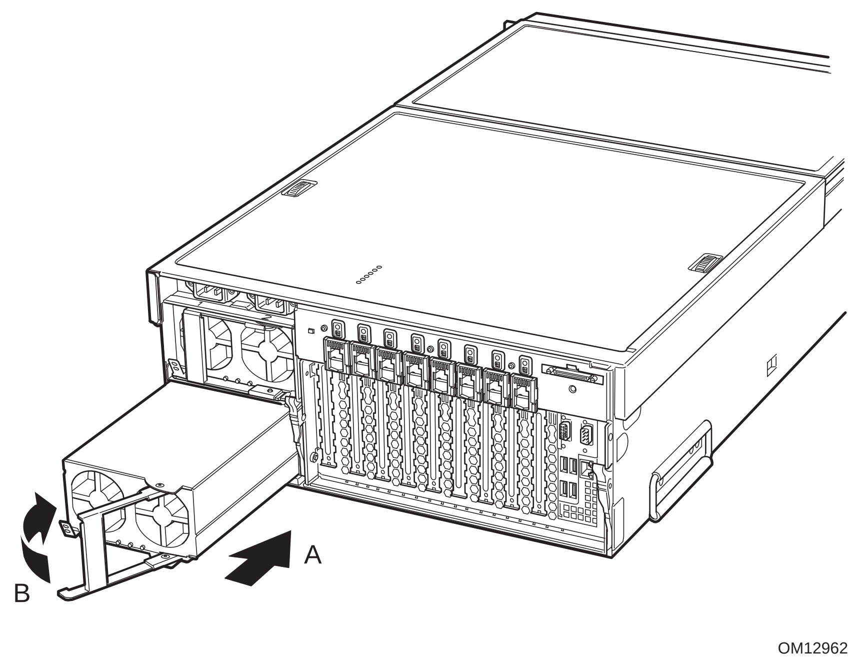


Figure 54. Installing a Power Supply

Hot Plugging PCI Add-in Cards

Before replacing a hot-plug PCI I/O card without shutting down the server, use the operating system or a resident GUI to shut down or power off the PCI I/O slot you are working on. Verify that the green power LED for the slot is off before replacing the card.

⚠ **CAUTION**

The I/O bay should not be extracted from the chassis to hot-plug PCI cards. Instead, slide the back top cover open to gain access.

Removing Hot-plug PCI Add-in Cards

⚠ **WARNING**

Make sure that the rack is anchored securely so it will not tilt forward when the server chassis is extended. A crush hazard exists should the rack tilt forward which could cause serious injury.

⚠ **CAUTION**

Expansion slot covers must be installed on all vacant slots to maintain the electromagnetic emission characteristics of the server and to ensure proper cooling of the system.

1. Observe the safety precautions, warnings, and cautions described in “Warnings and Cautions” on page 179.
2. If your server is operating, use your operating system or GUI application to power down the PCI slot that contains the board to be removed. NOTE: the Attention switch on the back of the chassis will not be supported until a Post Platform Release BIOS. Please check the BIOS release notes of the BIOS installed on the system to verify whether using the Attention button to initiate the slot power down is supported.
3. The green power LED blinks and turns OFF.
4. If the system is mounted in a rack, pull the chassis out of the rack as far as it’ll go.
5. Open the rear cover to expose the hot-plug PCI slots.
6. Verify the green power LED for the slot you are working with is turned off.
7. Disconnect any cables attached to the board to be removed.

8. Press the center of the retention latch that secures the end of the board nearest the rear of the I/O bay (A in Figure 55). When the mechanism clicks open, rotate it downward.
9. Release the plastic retaining mechanism that secures the end of the board nearest the front of the I/O bay (B in Figure 55).
10. Carefully pull the add-in card (C in Figure 55) up and out of the system. Make sure not to scrape the board against other components.

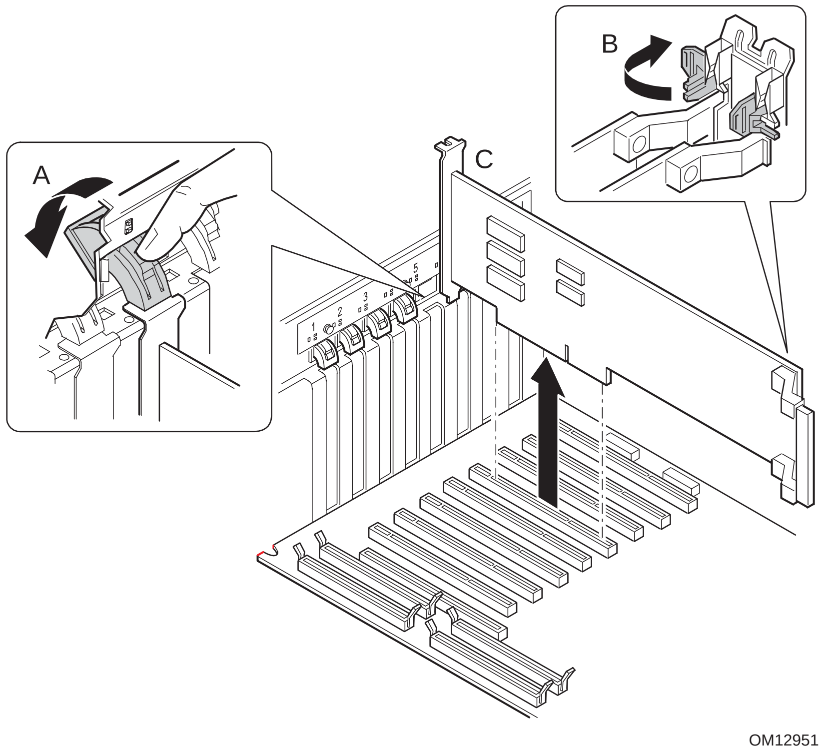


Figure 55. Removing a Hot-plug PCI Add-in Card

11. Store the board in an antistatic protective wrapper.
12. Install an expansion slot cover over the vacated slot by aligning the cover with the slot from the rear of the chassis and pressing the cover into the slot. To install a new board, begin with step 5 in Installing Hot-plug PCI Add-in Cards below.
13. Close the chassis top cover.
14. If the system is installed in a rack, push the system back into the cabinet rack.

Installing Hot-plug PCI Add-in Cards

1. Observe the safety precautions, warnings, and cautions described in "Warnings and Cautions" on page 179.
2. If your server is operating, use your operating system or GUI application to make sure the PCI slot being installing the board into is powered down.
3. If the system is mounted in a rack, pull the chassis out of the rack as far as it'll go.

WARNING

Make sure that the rack is anchored securely so it will not tilt forward when the server chassis is extended. A crush hazard exists should the rack tilt forward which could cause serious injury.

4. Open the top cover to expose the hot-plug PCI slots.
5. Being careful not to touch the components or gold edge connectors on the add-in board, remove it from its protective wrapper, and place it on a clean ESD-protected work surface.
6. Record in your log the serial number of the board and any jumpers or switch settings according to the board manufacturer's instructions. See Appendix B on page 286 for the equipment log.
7. Be sure that the plastic latches that secure the ends of the board (A and D in Figure 56) are open so that they will allow the add-in board to be inserted.

NOTE

Each PCI slot has four indicator LEDs: two on the outside and two on the inside of the system. The LEDs operate differently depending upon the operating system installed. Please refer to your operating system's manual.

8. If necessary, remove the expansion slot cover in the slot you're using by pushing it out from inside the chassis.
9. Align and press the add-in board down firmly until it seats in its slot.

CAUTION

Some accessory/option board outputs exceed Class 2 or limited power source limits and must use appropriate interconnecting cabling in accordance with the national electrical code during installation.

10. Rotate the retention latch (C in Figure 56) until it clicks into place. This position both secures the end of the board and allows it to be activated with the operating system or GUI application.
11. If the board is long enough to reach the front of the module. Ensure that it is in the slide, and that the securing latch is closed (D in Figure 56).

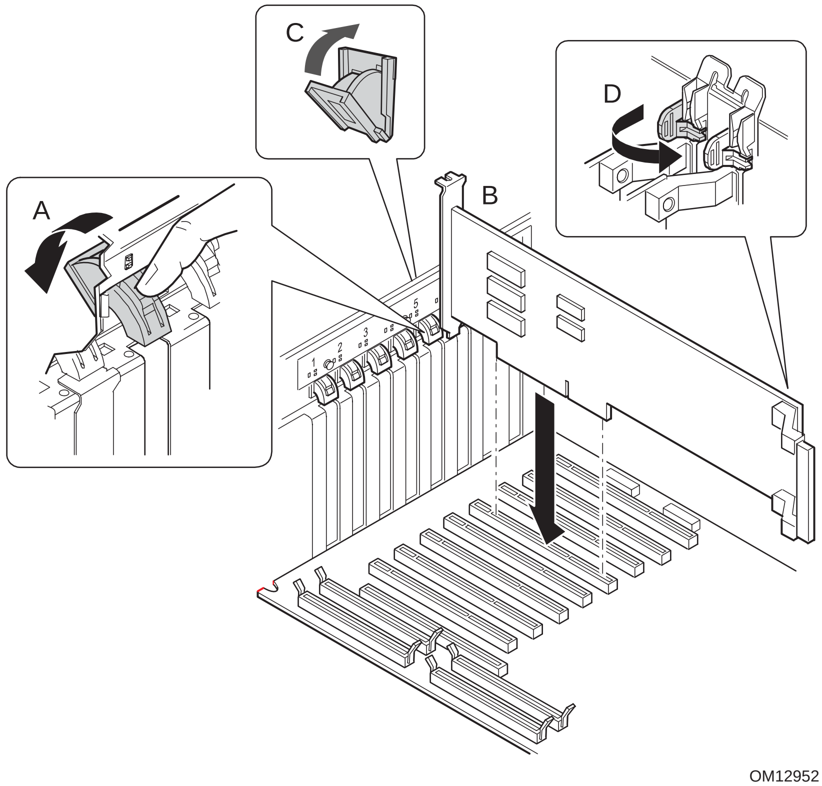


Figure 56. Installing a Hot-plug PCI Add-in Card

12. Connect any required cabling to the PCI add-in board.
13. Close the back top cover.
14. If your server is operating, use the operating system or GUI application to power up the PCI slot into which the PCI card is installed. NOTE: the attention switch on the back of the chassis will not be supported until a Post Platform Release BIOS. Please check the BIOS release notes of the BIOS installed on the system to verify whether using the attention button to initiate the slot power up is supported.
15. If the system is installed in an equipment rack, push the system back into place.

Part II: Service Technician's Guide

5 Working Inside the System

6 Servicing the I/O Bay

7 Servicing the Processor/Memory Module

8 Servicing the Peripheral Bay

9 Servicing the Power Supply Bay

10 Servicing the Chassis

11 Technical Reference

A POST Error Codes and Messages

B Equipment Log and Configuration Worksheet

C Warnings

D INI File Format

E SDRViewer Splash Screen File Format

F SELViewer Splash Screen File Format

G Glossary

H Troubleshooting

WARNING

Only a QUALIFIED SERVICE TECHNICIAN is authorized to remove the server covers and to access any of the components inside the server. Before removing the covers, see "Safety: Before Top Cover or Module Removal" on page 179 and "Warnings and Cautions" on page 179.

WARNING

Anchor the equipment rack: The equipment rack must be anchored to an unmovable support to prevent it from falling over when one or more servers are extended in front of it on slides. The anchors must be able to withstand a force of up to 113 kg (250 lbs.). You must also consider the weight of any other device installed in the rack. A crush hazard exists which could cause serious injury to personnel should the rack tilt forward.

Main AC power disconnects: An AC power disconnect for the entire rack unit must be installed. This main disconnect must be readily accessible, and it must be labeled as controlling power to the entire unit, not just to the server(s).

WARNING

Grounding the rack installation: To avoid the potential for an electrical shock hazard, a third wire safety-grounding conductor with the rack installation must be included. If the server power cord is plugged into an AC outlet that is part of the rack, then a proper grounding for the rack itself must be provided. If the server power cord is plugged into a wall AC outlet, the safety-grounding conductor in the power cord provides proper grounding only for the server. You must provide additional, proper grounding for the rack and other devices installed in it.

Overcurrent protection: The server is designed for an AC line voltage source with up to 20 amperes of overcurrent protection. If the power system for the equipment rack is installed on a branch circuit with more than 20 amperes of protection, supplemental protection for the server must be provided.

Do not attempt to modify or use an AC power cord that is not the exact type required. You must use a power cord that meets the following criteria:

- Rating: For U.S./Canada cords must be UL Listed/CSA Certified, 16/3, 75C type, VW-1, SJT/SVT, with NEMA 5-15P or NEMA 6-15P attachment plug and IEC 320 C13 input power connector rated 15 amps. For outside U.S./Canada cords must be flexible harmonized (<HAR>) rated 250 V, 1.0 mm minimum conductor size with IEC 320 C13 input power connector and rated for no less than 10 amps.
- AC Attachment Connector, wall outlet end, for outside U.S./Canada: The AC wall attachment plug should be a three conductor grounding type, rated 125 V, 15 amps or 250 V, 10 amps and must be for the configuration of the specific region or country. The AC wall attachment plug must bear at least an accepted safety agency certification mark for the specific region or country.
- Input Power Connector, server end: The connectors that plug into the AC receptacles on the server must be an IEC 320, sheet C13, type female connector and are rated for 125 V/250 V, 15 amps.
- Cord length and flexibility: Cords must be less than 4.5 meters (14.76 feet) long.

⚠ **CAUTION**

Temperature: The operating temperature of the server, when installed in an equipment rack, must not go below 5 °C (41 °F) or rise above 35 °C (95 °F). Extreme fluctuations in temperature can cause a variety of problems in your server.

Ventilation: The equipment rack must provide sufficient airflow to the front of the server to maintain proper cooling. The rack must also include ventilation sufficient to exhaust a maximum of 1500 (5,100 BTU/hr) per hour for the server. The rack selected and the ventilation provided must be suitable to the environment in which the server is used.

5 Working Inside the System

This chapter presents procedures that describe removal and installation of most components inside the system.

Tools and Supplies Needed

Procedures in this chapter require the following tools and supplies:

- Jumper-removal tool or needle-nosed pliers
- Small flat-bladed screwdriver
- Torqx screwdrivers (T-8 and T-15)
- Hex screwdriver for processor upgrades (2.5 mm)
- Pen or pencil
- Antistatic wrist strap and conductive foam pad (recommended)

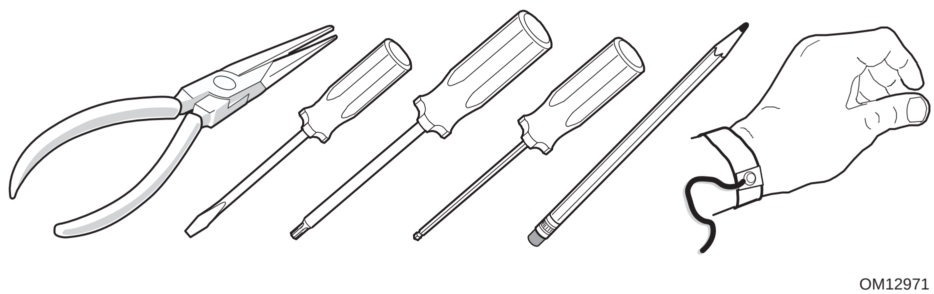


Figure 57. Tools and Supplies Needed

As the user integrates new parts into the system, add information about them to your equipment log (Appendix B on page 286). Record the model and serial number of the system, all installed options, and any other pertinent information specific to the system.

Safety: Before Top Cover or Module Removal

Before removing the top cover or system modules, observe these safety guidelines:

1. Turn off all peripheral devices connected to the system.
2. Power down the system by pressing and holding the power button on the front of the chassis for several seconds.
3. After the server shuts down, unplug both AC power cords to remove standby power from the server.
4. Provide some electrostatic discharge (ESD) protection by wearing an antistatic wrist strap attached to chassis ground of the system—any unpainted metal surface—when handling components.

Warnings and Cautions

These warnings and cautions apply whenever covers of the system are removed. Only a technically qualified person should integrate, configure, or service the system.

WARNINGS

Power button: Shutting down the server with the power button (a convex button) on the front of the chassis DOES NOT remove all power from the system. To remove all power from system, you must also unplug both AC power cords from the wall outlets or the system. Unplugging the power cords removes the +12 Volt standby power that is present when the server is powered down.

Hazardous conditions, power supply: Hazardous voltage, current, and energy levels are present inside the power supply. There are no user-serviceable parts inside the power supply; technically qualified personnel should do servicing.

Hazardous conditions, devices, and cables: Hazardous electrical conditions may be present on power, telephone, and communication cables. Turn off the system and disconnect the power cords, telecommunications systems, networks, and modems attached to the system before opening it. Otherwise, personal injury or equipment damage can result.

Hazardous conditions, processors and power pods: Thermal conditions may be present in the processor/memory module. Allow all fans to continue to run until they shut down on their own after power has been turned off. After the fans stop, remove the power cords.

CAUTIONS

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that all procedures in this chapter only be done at an ESD-protected workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

ESD and handling boards: Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from the system, place it on a grounded surface free of static electricity. Do not slide boards over any surface.

Cooling and airflow: For proper cooling and airflow, always install the chassis covers before turning on the system. Operating the system without the covers in place can damage system parts.

Torque Settings

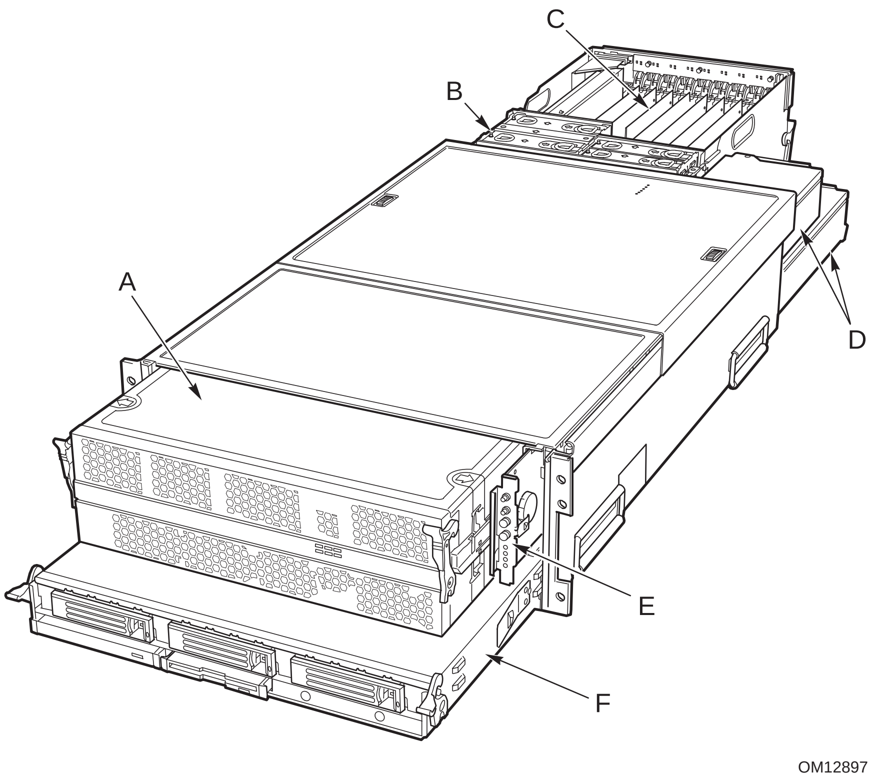
Screws securing certain components in the system require being tightened to specific torque values. Table 34 shows the chassis' torque settings.

Table 34. Torque Settings

Component	Torque	Component	Torque
Processor Heatsink	0.67 N-m (6 in-lb)	Front Panel Board	0.90 N-m (8 in-lb)
I/O Board Retaining Screw	0.90 N-m (8 in-lb)	Processor Board	0.90 N-m (8 in-lb)
I/O DC-to-DC Cover	0.90 N-m (8 in-lb)	Memory Board Handle	0.45 N-m (4 in-lb)
Hard Drive	0.90 N-m (8 in-lb)	Processor/Memory Complex Bay Retaining Screws	0.90 N-m (8 in-lb)
Sideplane Board Power Pod	0.90 N-m (8 in-lb)	I/O Board Plastic Shield	0.90 N-m (8 in-lb)
I/O Board	0.90 N-m (8 in-lb)	AC Bracket	0.90 N-m (8 in-lb)
Midplane Board		Hard Drive Bay	0.90 N-m (8 in-lb)
SCSI Backplane Board	0.90 N-m (8 in-lb)		

Identifying Chassis Modules

Figure 58 shows the chassis' modules partially withdrawn. These include the processor/memory module, the I/O bay, and the peripheral bay. Additionally, the chassis supports hot-swap power supplies, fans, PCI cards, and hard disk drives. The power supply bay, the front panel board, and the midplane board are the only non-modularized or non-hot-swap components in the chassis.



A Processor/memory module
B Hot-swap fans
C I/O bay with PCI add-in boards
D Hot-swap power supplies
E Front panel board
F Peripheral bay with hot-swap hard disk drives

Figure 58. Locating System Modules

Removing and Installing the Top Covers

WARNING

Make sure that the rack is anchored securely so it will not tilt forward when the server chassis is extended. A crush hazard exists should the rack tilt forward which could cause serious injury.

CAUTION

For proper cooling and airflow, do not operate the server with the cover removed. Always reinstall the cover before turning the server on.

CAUTION

Do not leave the chassis cover open or a system fan removed any longer than necessary; system cooling could be reduced.

The server comes with removable top covers that allow the PCI add-in cards and the system fans to be hot-swapped, and the midplane board to be serviced.

NOTE

Sliding the I/O bay out of the chassis also accesses the PCI add-in cards and system fans. However, power must first be removed from the system.

Removing the Back Top Cover

To remove the back top cover, follow these instructions:

1. If the chassis is rack-mounted, slide the chassis out far enough to expose the back top cover (see cautions and warnings above).
2. To open the back top cover, push the sliding latches (A in Figure 59) toward the back of the chassis and open the back top cover in the direction of the arrow (C in Figure 59).
3. To remove the cover, continue to slide the cover in the direction of the arrow until it reaches the end-stops.
4. Press the latch on the left rail slide (B in Figure 59) and pull the cover until it clears the chassis.

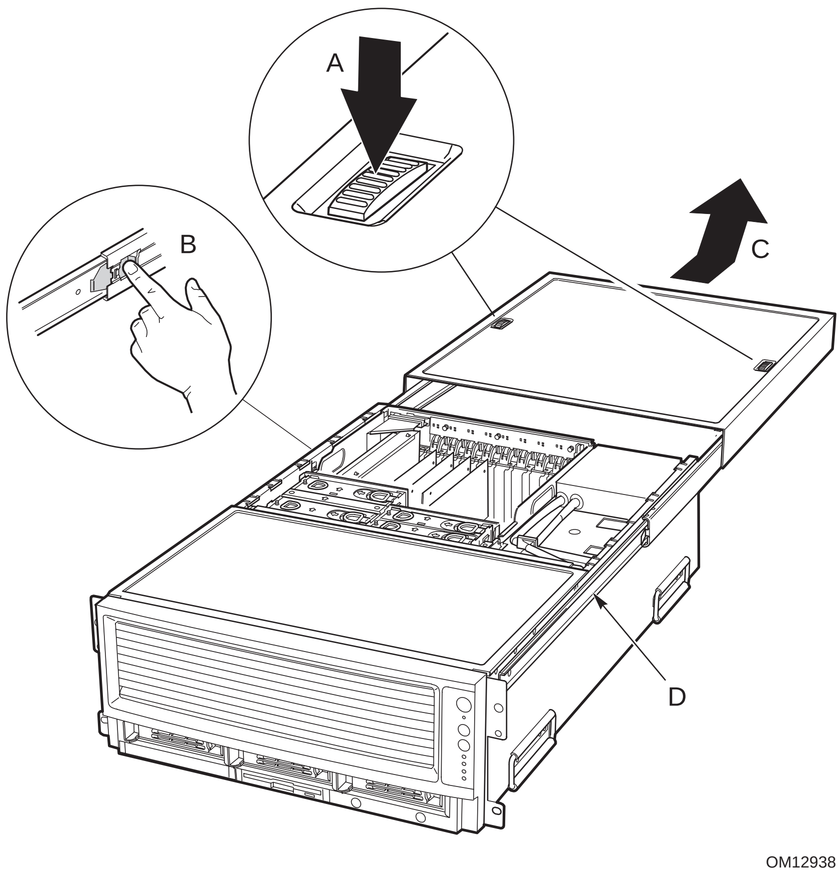


Figure 59. Removing the Back Top Cover

Installing the Back Top Cover

To install the back top cover, follow these instructions:

1. Slide the two bearing cages on the back top cover all the way to the end of the slides.
2. Place the top cover on the cover slides (D in Figure 59) and push the cover into place.

Removing the Front Top Cover

The front top cover does not require removal except to service the midplane board. To remove the front top cover:

1. Loosen the two captive screws on either side of the cover (A in Figure 60).
2. Slide the cover toward the front of the chassis until it stops and lift the cover off (B in Figure 60).

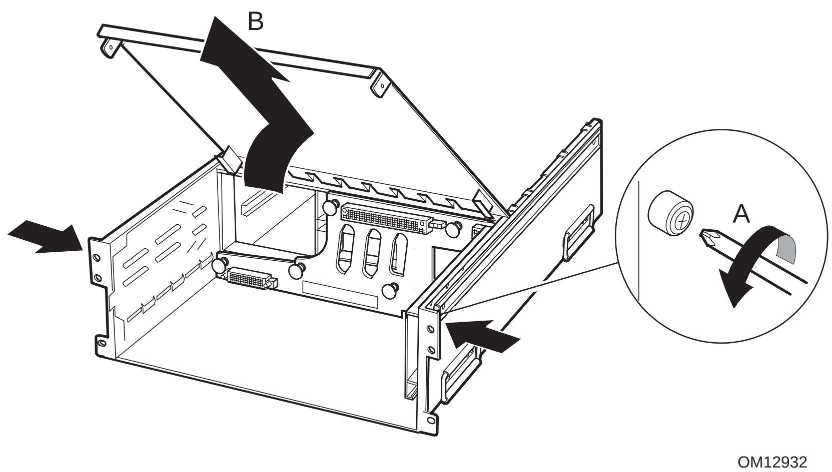


Figure 60. Removing the Front Top Cover

Installing the Front Top Cover

To install the front top cover, follow these instructions:

1. Attach the front top cover to the chassis (A in Figure 61).
2. Lower the cover (B in Figure 61).
3. Tighten the two captive screws on either side of the cover (C in Figure 61).

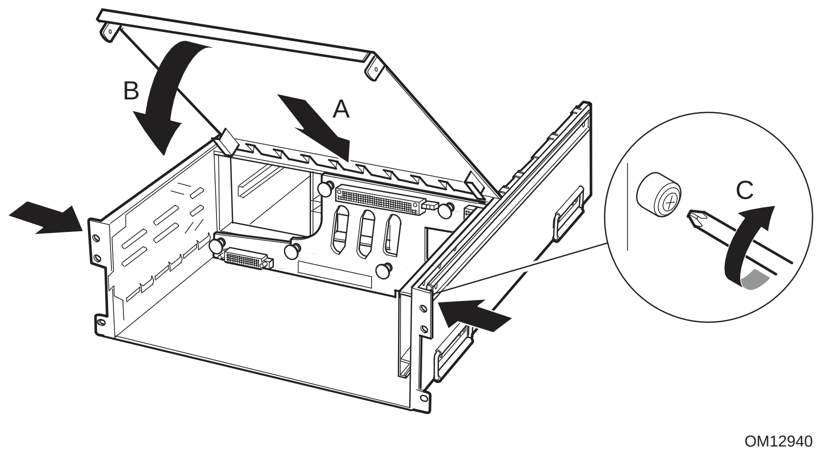


Figure 61. Installing the Front Top Cover

Removing Modules

⚠ **CAUTION**

Damage to the system occurs if power is not removed from the chassis prior to removal or installation of system modules.

The processor/memory module, the I/O bay, and the peripheral bay are all removed from the chassis as follows:

1. Push and hold the power button on the server's front panel for several seconds to power-down the system. Disconnect the power cords from the mains supply to remove standby power.
2. Push in and pull down on the uniform levers to release the catches (see Figure 62).
3. Continue to pull down on the levers to cam the module out of its housing.
4. Pull the module out of the chassis until it stops.
5. To remove the module completely, press in on the secondary latches on either side of the module and pull the module free of its slides.

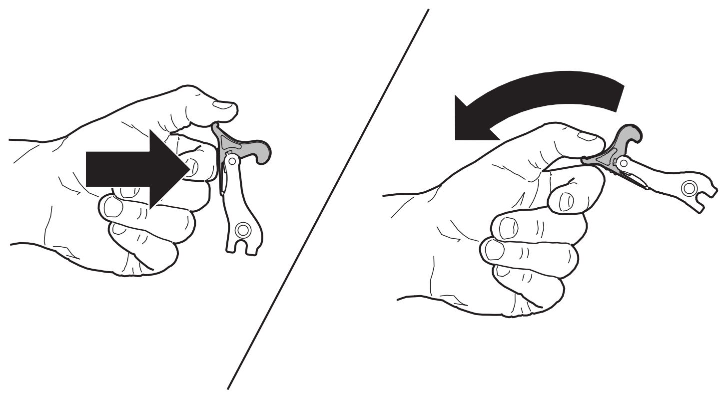


Figure 62. Releasing the Uniform Levers

Installing Modules

The processor/memory module, the I/O bay, and the peripheral bay are all installed in the chassis as follows:

1. With the uniform levers in the maximum open position, place the module into its housing and slide it until the uniform levers contact the front of the chassis.
2. Raise the uniform levers to the vertical position to clamp the module into the chassis.
3. Push in and lift up on the uniform levers to engage the catches (reverse of Figure 62).

6 Servicing the I/O Bay

Replacing the I/O Riser Card

⚠ **CAUTION**

Damage to the system occurs if power is not removed from the system prior to removal or installation of non-hot-plug boards.

Only the I/O riser card is non-hot-plug. Follow the procedures below to replace the I/O riser card.

Removing the I/O Riser Card

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Turn off all peripheral devices connected to the system.
3. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
4. Disconnect all peripheral cables attached to the I/O riser card.
5. Open the back top cover. (Alternatively, retract the I/O bay until it stops. You may remove the I/O bay completely if that’s more convenient.)
6. If the optional SCSI rear panel connector is installed, loosen the captive screw securing the connector (A in Figure 63) and place the connector and the attached ribbon cable (B in Figure 63) clear of the I/O riser card (C in Figure 63).

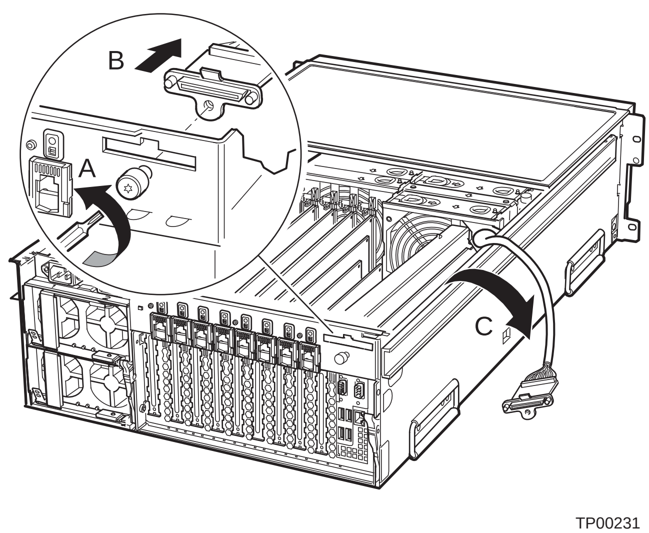


Figure 63. Removing the External SCSI Connector (Optional)

7. Loosen the captive screw (A in Figure 64) that secures the I/O riser bracket and swivel the bracket out of the chassis as shown by the arrow. Use caution when extracting the riser bracket to avoid damaging components on the I/O riser card.
8. Loosen the captive screw securing the I/O riser card to the back panel (B in Figure 64), and pull up on the I/O riser card to unplug it from the I/O board. As the user removes the card, be careful not to damage components on the card or components on surrounding boards.
9. Place the I/O riser card on a clean, static-free work surface or inside a static-free plastic bag.

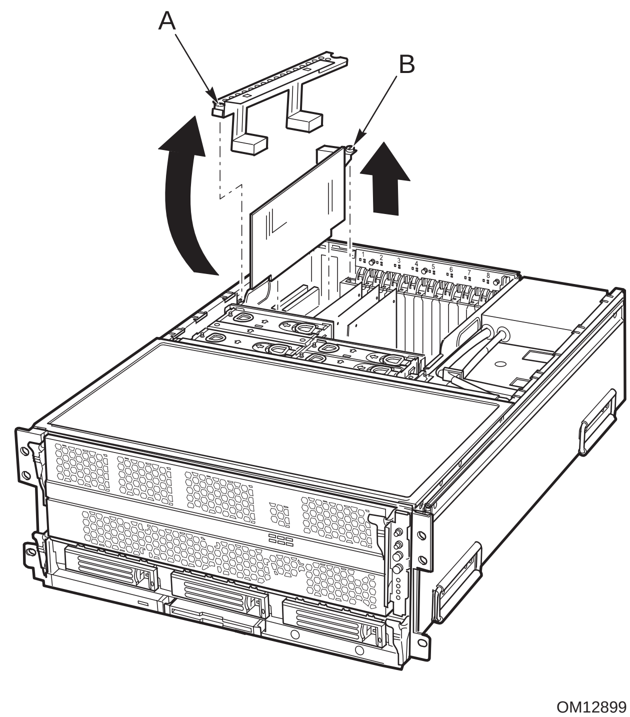


Figure 64. Removing the I/O Riser Card

Installing the I/O Riser Card

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Being careful not to touch the components or the gold edge connectors on the I/O riser card, remove it from its protective wrapper. Place the card component-side up on a clean, static-free work surface.
3. Record the serial number of the I/O riser card in your equipment log. See Appendix B on page 286 for the equipment log.
4. To install the I/O riser card, align the card with its mating slot on the I/O board and lower the card into position (See Figure 65).
5. Press the I/O riser card down firmly until it seats into its slot.
6. Tighten the rear captive screw (A in Figure 65) that secures the I/O riser card to the chassis. (See Torque Settings, on page 180.)
7. Install the riser bracket by inserting the bracket into the slotted hinge in the chassis housing and lowering in the bracket into position. Be careful not to damage components on the I/O riser card while installing the bracket. Secure the bracket with the captive screw (B in Figure 65). (See “Torque Settings” on page 180.)

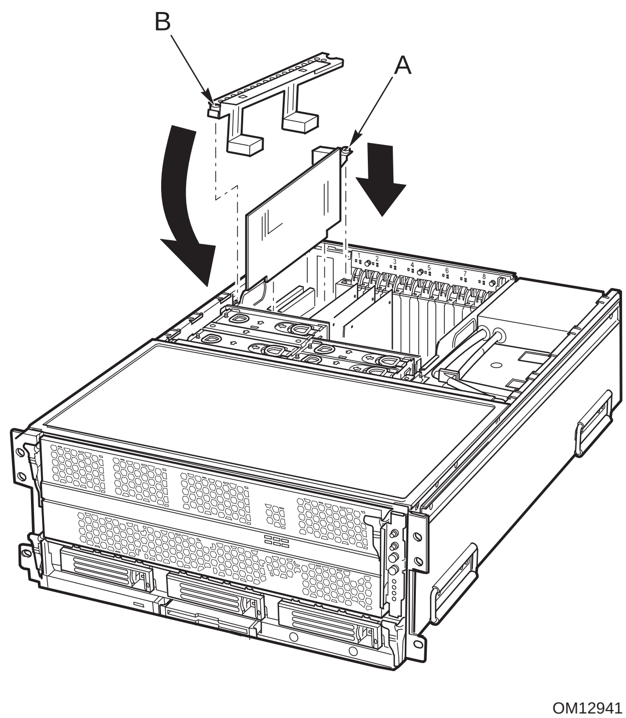


Figure 65. Installing the I/O Riser Card

8. If the optional SCSI rear panel connector is installed, place the connector and the attached ribbon cable (A in Figure 63) in position on the back of the I/O bay. Tighten the captive screw securing the connector (B in Figure 63).

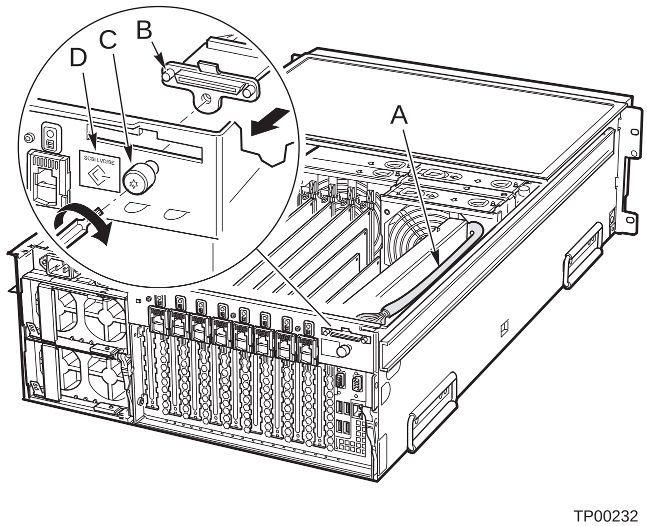


Figure 66. Installing the External SCSI Connector (Optional)

9. Close the rear top cover or reinstall the module.
10. Reconnect the peripheral devices previously disconnected and restore power to them.
11. Power-on the system.

Replacing the Battery on the I/O Riser Card

The lithium battery on the I/O riser card powers the real-time clock (RTC) for three to four years in the absence of power. When the battery weakens, it loses voltage and the system settings stored in CMOS RAM and the Real Time Clock (such as the date and time) can be wrong. Contact your customer service representative or dealer for a list of approved replacement batteries.

The following warning and translations are required by specific certifying agencies to be printed immediately adjacent to the procedure for removing the battery.

WARNING

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

ADVARSEL!

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

ADVARSEL

Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

VARNING

Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

VAROITUS

Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Removing the Battery

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Remove the I/O riser card as described in “Removing the I/O Riser Card” on page 187.
3. Insert the tip of a small flat-bladed screwdriver or equivalent under the plastic tab on the snap-on plastic retainer holding the battery on the I/O Board.
4. Gently push down on the screwdriver to lift the battery.

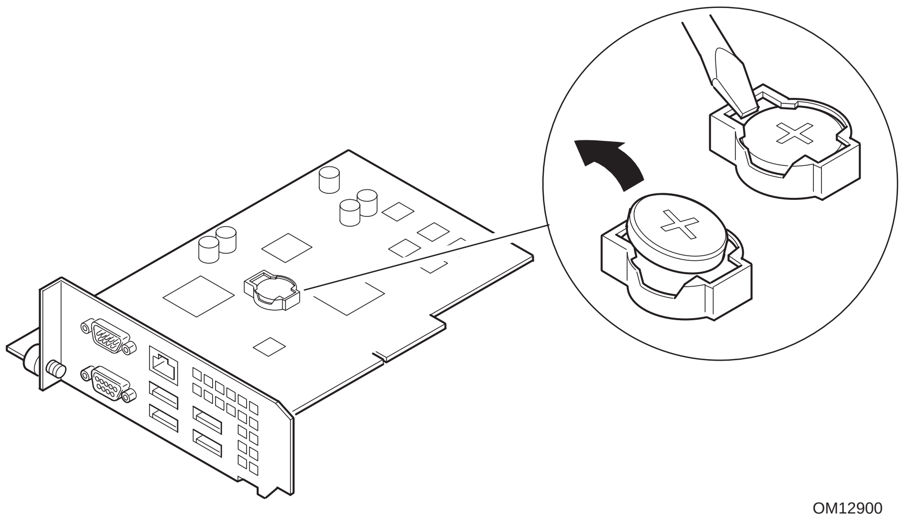


Figure 67. Removing the Battery

5. Remove the battery from its socket.
6. Dispose of the battery according to local ordinance.

Installing the Battery

1. Remove the new lithium battery from its package and, being careful to observe the correct polarity, insert it in the battery socket.
2. Install the I/O riser card as described in “Installing the I/O Riser Card” on page 189.
3. Close the rear portion of the top chassis cover.

Replacing I/O Board DC-to-DC Converters

There are four DC-to-DC converters plugged into the I/O board. The two DC-to-DC converters adjacent to the side of the I/O bay are 5 V DC output and the two next to the I/O riser card are 3.3 V DC output. Labels on the converters list their output voltage.

Removing I/O Board DC-to-DC Converters

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the I/O riser card as described in “Removing the I/O Riser Card” on page 187.
4. Remove the DC-to-DC converters from the I/O board by moving the two securing levers on the converter’s socket (A in Figure 68), and unplugging the converter as shown (B in Figure 68).

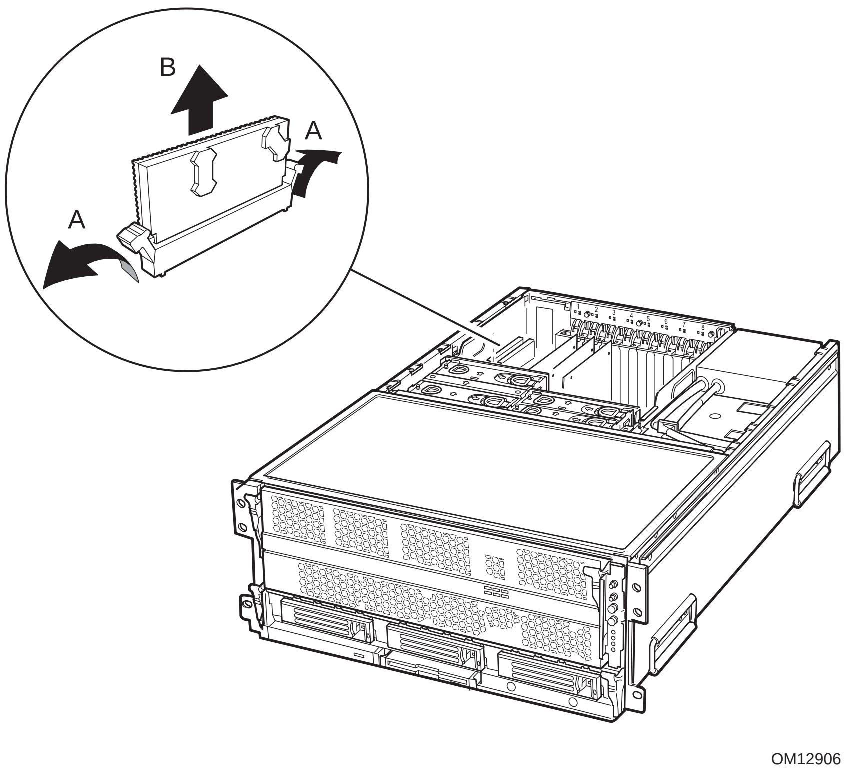


Figure 68. Removing DC-to-DC Converters from the I/O Board

Installing I/O Board DC-to-DC Converters

1. Verify that the connector of the DC-to-DC converter matches the socket type on the baseboard.

⚠ **CAUTION**

Do not exert excessive force if the DC-to-DC converter does not install easily. Notches in the DC-to-DC converter's connector and corresponding barriers on the I/O board's sockets prevent incorrect insertion. Forcing the wrong DC-to-DC converter into a connector can damage the DC-to-DC converter or the connector.

2. Install the DC-to-DC converters on the I/O board by inserting the converter into the correct socket and pressing down firmly (A in Figure 69). Be certain the DC-to-DC converter seats fully in its connector. If the DC-to-DC converter does not seat easily, double-check to see if the socket matches the type of DC-to-DC converter you're trying to install.
3. Move the two levers as indicated (B in Figure 69) to secure the converter.
4. Install the I/O riser card as described in "Installing the I/O Riser Card" on page 189.

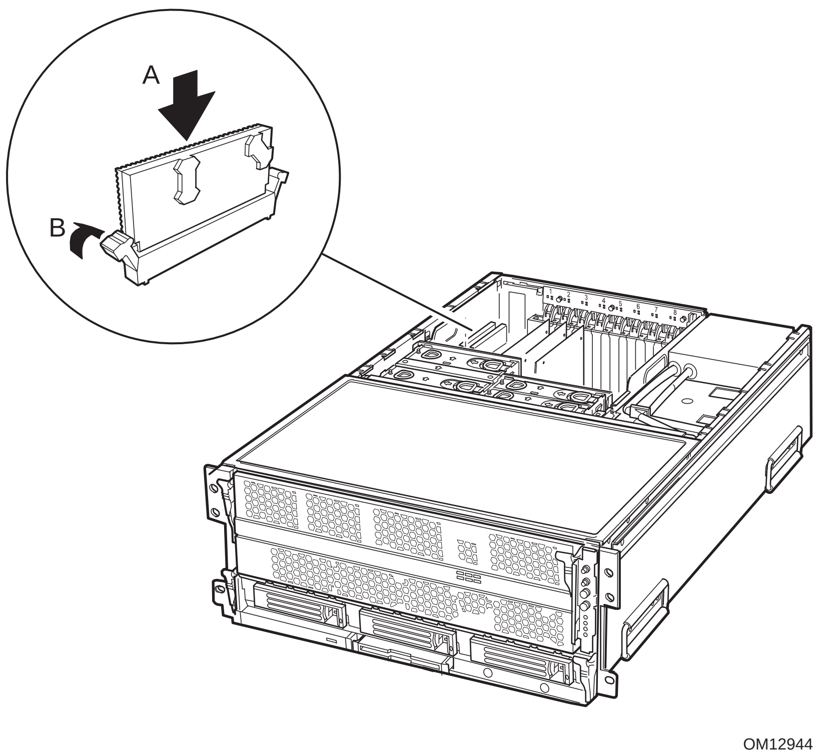


Figure 69. Installing DC-to-DC Converters on the I/O Board

Replacing the Fan Housing

The fan housing resides inside the I/O bay and provides power for the four system cooling fans.

Removing the Fan Housing

To remove the fan housing, loosen the two captive screws (A in Figure 70), and lift the housing out of the I/O bay as shown.

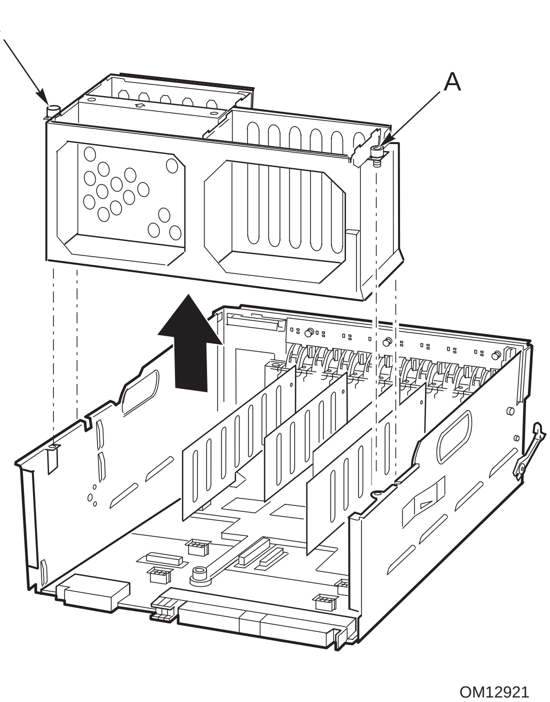


Figure 70. Removing the Fan Housing

Installing the Fan Housing

To install the fan housing, slide the housing into the I/O bay as shown, and tighten the captive screws (A in Figure 71).

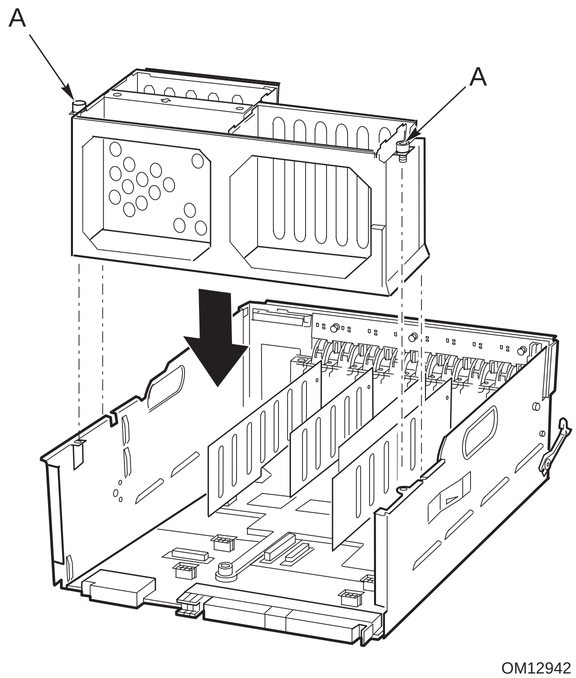


Figure 71. Replacing the Fan Housing

Replacing the I/O Board

The I/O board resides on the bottom of the I/O bay and plugs into the midplane board. The I/O board accepts the I/O riser card, the DC-to-DC converters, and the PCI add-in cards.

Removing the I/O Board

1. Observe the safety and ESD precautions described in "Removing the I/O Board" on page 197.
2. Turn off all peripheral devices connected to the system.
3. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
4. Disconnect all peripheral cables attached to the I/O bay.
5. Slide the I/O bay out of the chassis and place on a clean static-free work surface.
6. Remove all PCI add-in boards from the I/O bay as described in "Removing the I/O Board" on page 197.
7. Remove the I/O riser card as described in "Removing the I/O Riser Card" on page 187.
8. Remove the four DC-to-DC converters plugged into the I/O board as described in "Removing I/O Board DC-to-DC Converters" on page 193.
9. Remove the fan housing as described in "Removing the Fan Housing" on page 195.
10. The PCI slot plastic dividers (A in Figure 72) can be removed by pulling them in the direction of the arrow. Alternatively, they can be left in place and removed as an assembly (dividers and plastic base) in step 13.

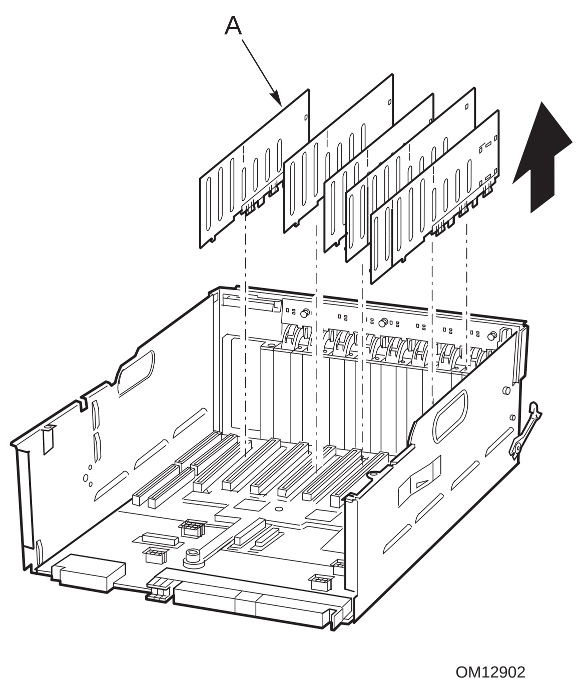


Figure 72. Removing the Plastic Dividers

11. If the optional external SCSI connector is installed, loosen the captive screw (A in Figure 73), remove the back panel SCSI connector (B in Figure 73) and drape the cable over the side of the chassis out of the way (C in Figure 73).

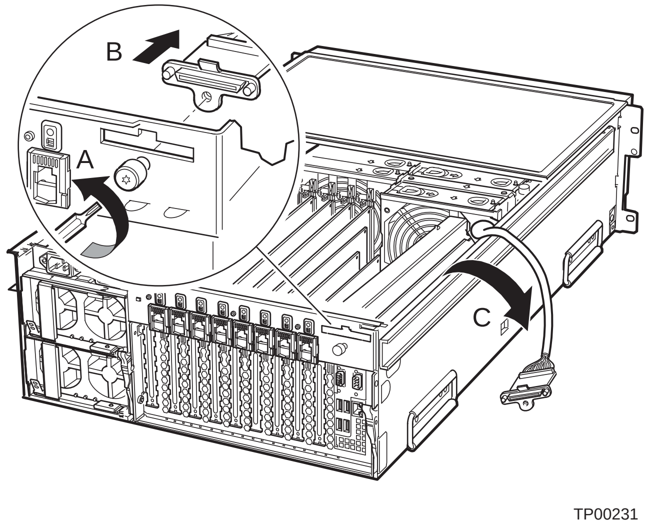


Figure 73. Disconnecting the External SCSI Connector Cable (If Installed)

12. Disconnect the HPIB hot-plug indicator board cable from the I/O board.
13. Loosen the four captive screws (A in Figure 74) that hold the plastic shield (B in Figure 74) over the I/O board. These screws also secure the I/O board into the server chassis. Lift the plastic shield in the direction of the arrow to remove.

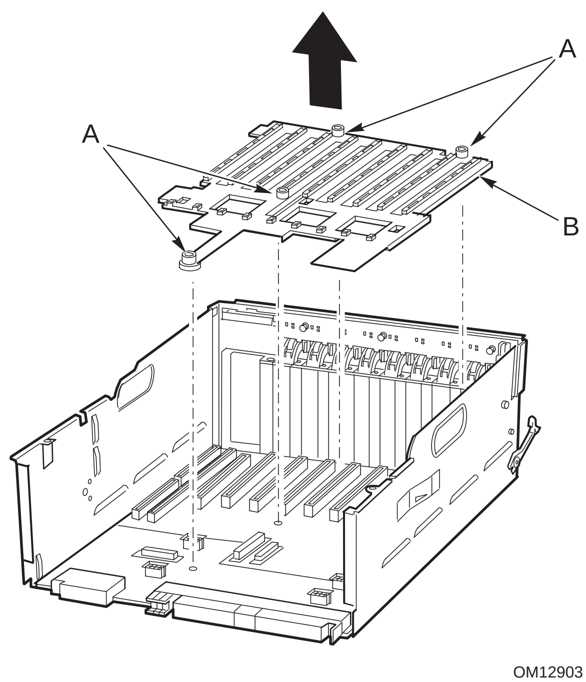


Figure 74. Removing the Plastic Shield

14. Slide the I/O board toward the front of the module as indicated (A in Figure 75).
15. Lift the I/O board out of the chassis as indicated (B in Figure 75).

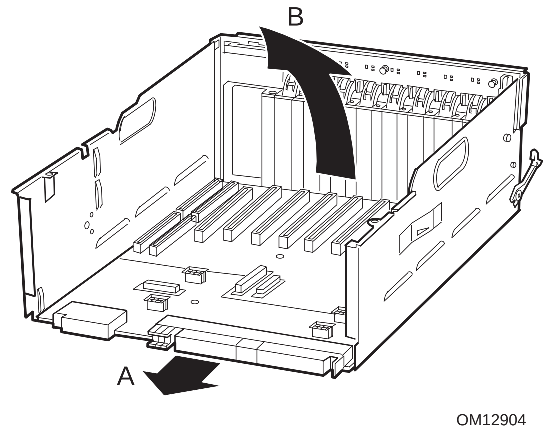


Figure 75. Removing the I/O Board

16. Place the I/O board on a clean ESD-protected work surface.

Installing the I/O Board

To install the I/O board, follow these instructions:

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Place the I/O board into the chassis as indicated (A in Figure 76).
3. Slide the I/O board to the rear of the module as indicated (B in Figure 76).

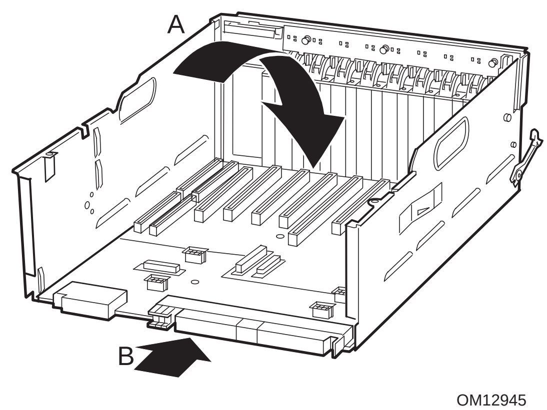


Figure 76. Placing the I/O Board in the Chassis

4. Place the plastic shield over the I/O board.
5. Tighten the four captive screws (A in Figure 77) that hold the plastic shield (B in Figure 77) over the I/O board. These screws also secure the I/O board into the server chassis.

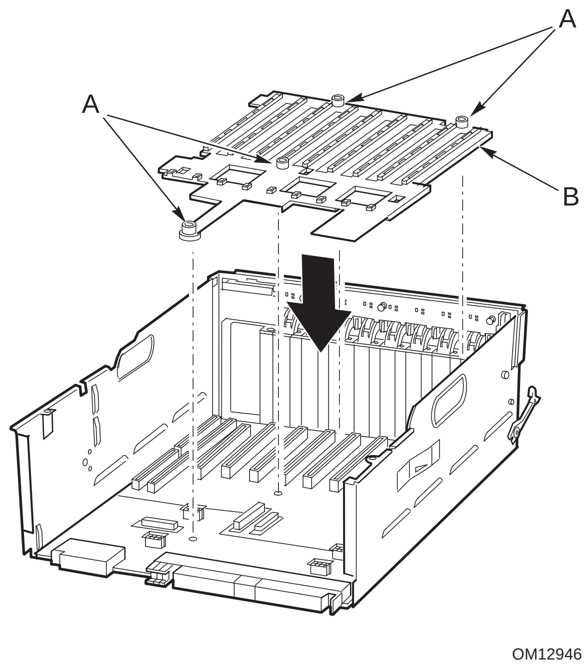


Figure 77. Replacing the Plastic Shield

6. Attach the HPIB cable to the I/O board.
7. Insert all PCI slot plastic dividers into the plastic shield as shown (A in Figure 78).

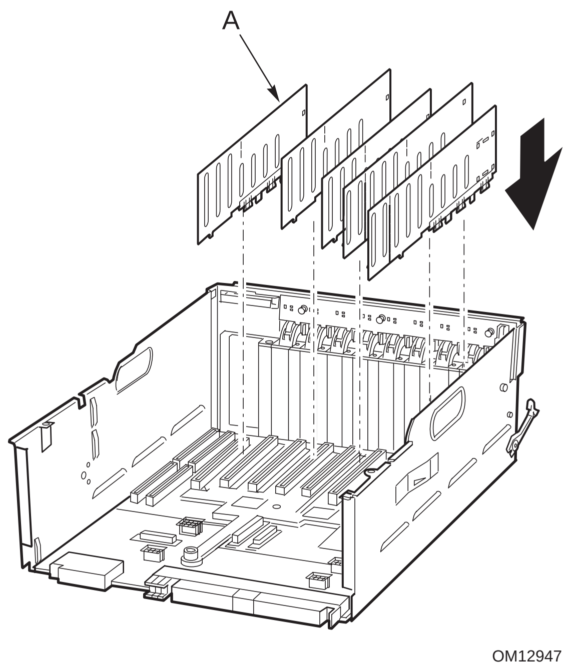


Figure 78. Replacing the Plastic Dividers

8. Install the four DC-to-DC converters in the baseboard as described in “Installing I/O Board DC-to-DC Converters” on page 194.
9. Connect the back panel SCSI connector cable (if installed) to the I/O board as shown Figure 73.

10. Install the fan housing in the I/O bay as described in "Installing the Fan Housing" on page 196.
11. Replace the I/O riser card as described in "Replacing the I/O Riser Card" on page 187.
12. Connect the optional external SCSI connector (if installed) on the back of the chassis with the captive screw.
13. Install all PCI add-in boards.
14. Slide the I/O bay into the chassis.
15. Connect all peripheral cables attached to the I/O board and any installed PCI cards.
16. Connect both AC power cords to the server.
17. Switch on all peripheral devices connected to the system.
18. Power up the system by pressing the power button on the front panel.

Replacing the Hot-plug Indicator Board

The PCI hot-plug LED board resides just on the inside of the top rear of the I/O bay. This board enables PCI hot-plug boards to be plugged into and out of the system without it being shut down.

Removing the Hot-plug Indicator Board

1. Observe the safety and ESD precautions described in "Warnings and Cautions" on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Open the back top cover or slide the I/O bay out of the chassis.
4. Disconnect all cables connected to PCI add-in cards.
5. Remove all PCI add-in cards as shown in "Removing Hot-plug PCI Add-in Cards" on page 171.
6. Open all eight PCI back panel switches.
7. Disconnect the cable attached to the PCI hot-plug LED Board (A in Figure 79).
8. Locate and pull the three small, black plastic retaining pins on the board. The pins are evenly spaced across the length of the board. To unlock the pin, grasp the head of the pin from the inside and pull it until it clicks (B in Figure 79).

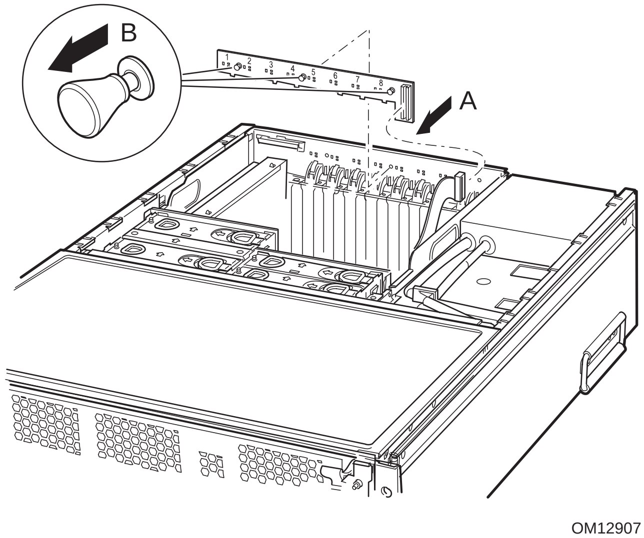


Figure 79. Removing the Hot-plug Indicator Board

9. Carefully pull the PCI hot-plug LED Board away from the inside of the chassis and place it on a clean, static-free work surface.

Installing the PCI Hot-plug Indicator Board

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Carefully place the hot-plug indicator board on the inside back of the server chassis such that:
   The tab on the bottom right side of the board engages the feature in the back of the chassis
   The three black pins line up with the matching holes in the chassis back
3. Press the pins through the holes in the chassis.
4. Push the heads of the pins until they lock in place securing the board.
5. Connect the cable from the I/O board to the hot-plug indicator board.
6. Close the rear part of the top cover.

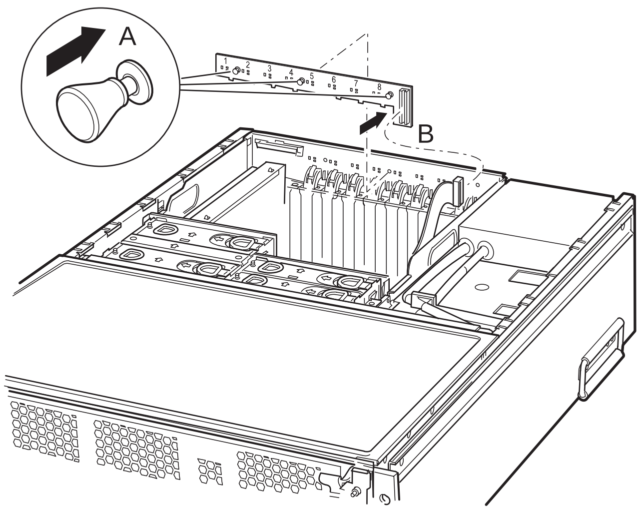


Figure 80. Installing the Hot-plug Indicator Board

Installing the External SCSI Cable Assembly (A21928)

The optional external SCSI cable assembly lets the user connect external SCSI components to the chassis.

To install the external SCSI cable assembly:

1. Switch off the server at the front panel and disconnect the AC power cords to remove standby power from the chassis.
2. Pull the I/O module out of the chassis and place on a clean, static free work surface.
3. Remove the I/O riser card bracket and the I/O riser card.
4. Remove any PCI cards that extend back into the card guides on the fan module. PCI cards not extending back into the card guides on the fan assembly can remain installed.
5. Remove the four cooling fans from the fan assembly.
6. Remove the fan module by loosening the two top-mounted captive screws and lifting the module out of the chassis.
7. Position the external SCSI cable assembly as shown in Figure 81 with the long end of the cable toward the back panel.
8. Register the three alignment features on the “L” shaped bracket into the I/O module’s sidewall (A in Figure 81) and snap in place.
9. Plug the short end of the SCSI cable into the external SCSI connector (B in Figure 81).
10. Hang the long end of the SCSI cable assembly over the side of the chassis out of the way for now.

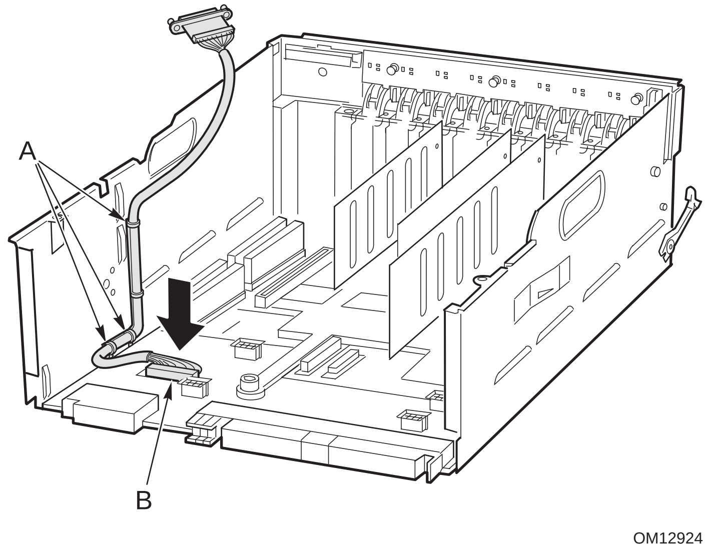


Figure 81. Installing the Three-tab "L" Bracket and Connecting the Short End of the Cable

11. Install the fan assembly and secure with the two captive screws.
12. Insert the four cooling fans.
13. Install the I/O riser card. Verify that the I/O riser card slides into the card guide mounted on the fan assembly before tightening the captive screw.
14. Install the I/O riser bracket and secure with the captive screw.
15. Route the external SCSI cable along the channel in the top of the I/O riser bracket (A in Figure 82) to the back panel.
16. Install the SCSI connector on the cable assembly in the back panel (B in Figure 82) and secure with the captive screw (C in Figure 82).
17. Install the SCSI Icon Label (A93957-001) on the back panel by removing the backing and placing as shown (D in Figure 82).

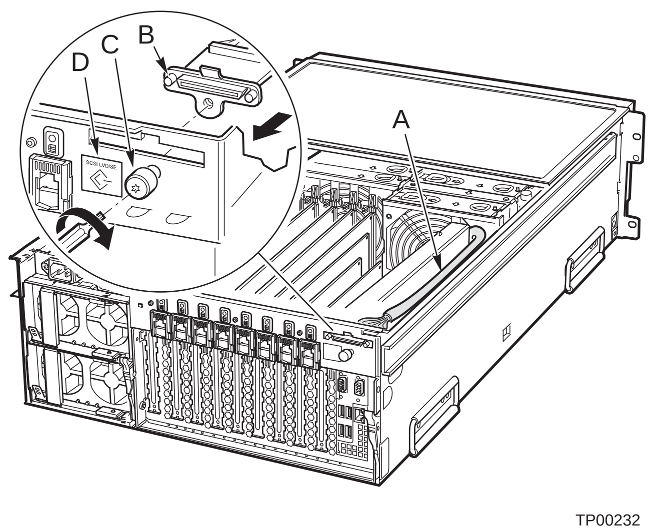


Figure 82. Routing the Cable and Installing the External SCSI Connector

18. Install any PCI cards removed during previous steps.

19. Replace the I/O module in chassis and secure the latches.
20. Install the back top cover.

Installing the RAID SCSI Cable Assembly (A80377)

The optional RAID SCSI cable assembly provides interconnection between the SCSI output connector on the I/O board and the SCSI connector on the installed RAID PCI card.

NOTE

While these instructions show how to install the RAID SCSI cable assembly, the illustrations shown represent only one possible configuration. The cable assembly has been designed to accommodate various RAID SCSI controllers located in any PCI slot.

Installing the SCSI RAID Cable Assembly

To install the SCSI RAID cable assembly:

1. Switch off the server at the front panel and disconnect the AC power cords to remove standby power from the chassis.
2. Open the top rear cover or slide the I/O module out of the chassis to expose the interior of the I/O module.
3. Install the RAID SCSI add-in card in any available PCI slot per manufacturer's recommendations.
4. Connect one end of the cable to the I/O board.
5. Connect the other end to the RAID SCSI card.
6. Fold the cable as shown in Figure 83.

CAUTION

Do not let the cable lay flat in front of a fan. Placing the cable flat in front of the fan reduces airflow through the chassis.

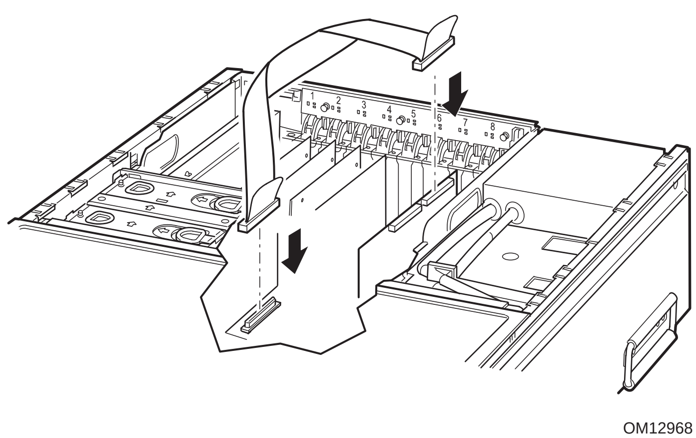


Figure 83. Installing the SCSI RAID Cable Assembly

7 Servicing the Processor/Memory Module

WARNINGS

Make sure that the rack is anchored securely so it will not tilt forward when the server chassis is extended. A crush hazard exists should the rack tilt forward that could cause serious injury.

Fully loaded, the processor/memory module weighs 16.33 kg (36 lbs). Minimally configured, the module weighs 10.89 kg (24 lbs). To avoid injury, exercise caution when lifting the module out of the system.

The module has two sides (designated primary and secondary) each of which contains a memory board, processors, power pods, and DC-to-DC converter(s). The relationship of the processor board (shown edge-on) to the power pods, processors, DC-to-DC converters, and memory boards is shown in Figure 84.

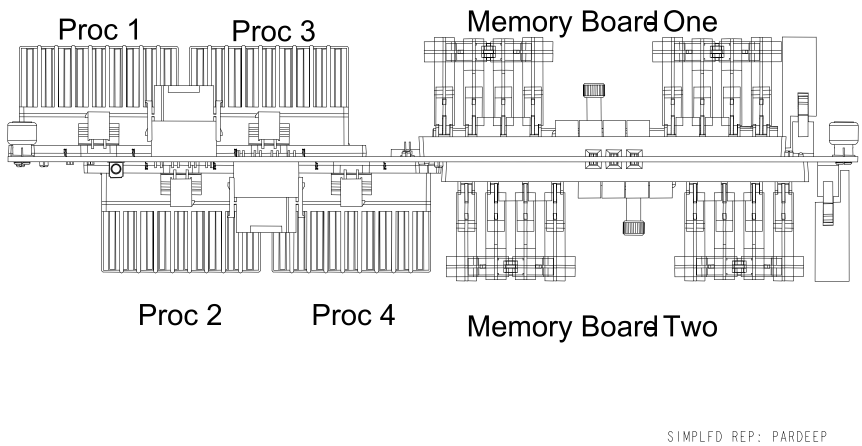


Figure 84. Processor Board with Processors and Memory Boards Installed

Removing the Processor/Memory Module

To access the processor/memory module:

1. Observe the safety and ESD precautions described in "Warnings and Cautions" on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the module from the chassis and place on a clean, static-free work surface.

Processor/Memory Module Primary Side Access

To access the interior of the primary side of the processor/memory module:

1. Place the module primary side up on a clean, static-free work surface. (The primary side is identified along the top, front edge of the case and on the label.)
2. Unlatch the fasteners by pulling them in the direction of the arrow (A in Figure 85).
3. Open the module in the direction of the arrow (B in Figure 85).

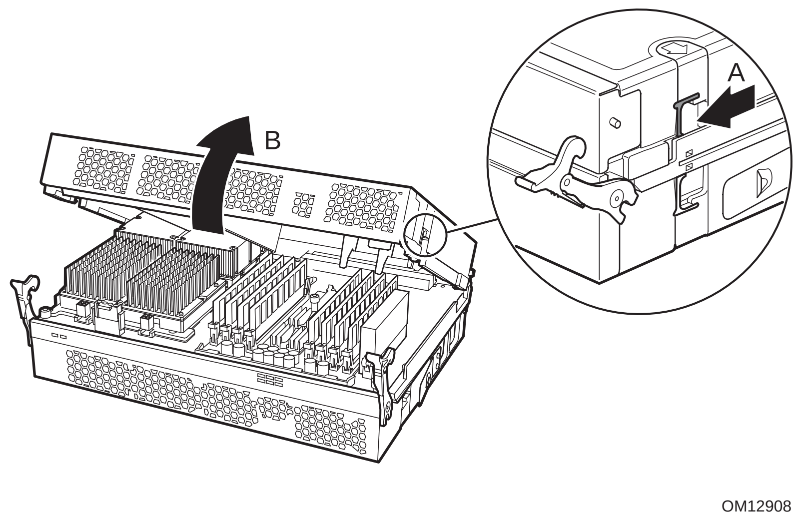
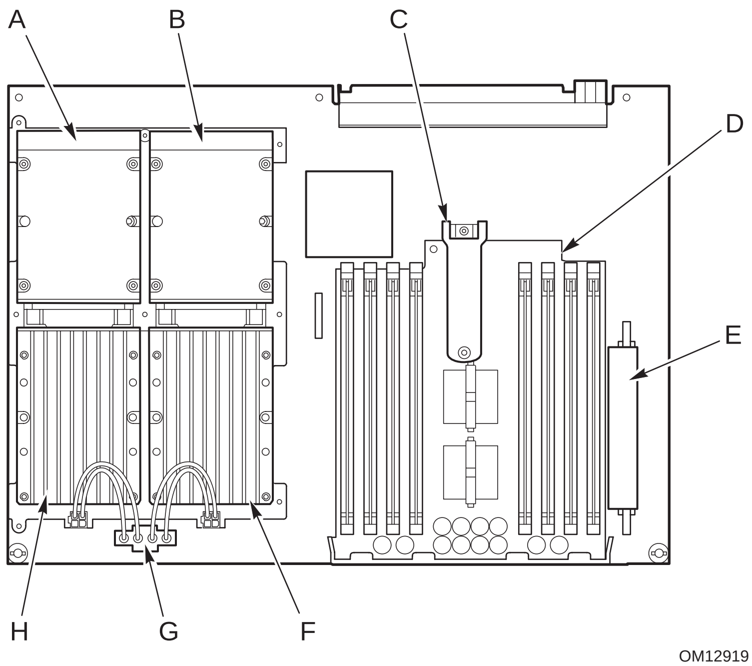


Figure 85. Opening the Primary Side of the Processor/Memory Module

Primary Side Component Location



A Processor 1
B Processor 3
C Memory board release mechanism
D Memory board 1
E 3.3 V DC-to-DC converter 1
F Power pod 3
G Power pod cable
H Power pod 1

Figure 86. Primary Side Processor/Memory Module Component Location

Processor/Memory Module Secondary Side Access

To access the interior of the secondary side of the processor/memory module:

1. Place the module secondary side up on a clean, static-free work surface. (The secondary side is identified along the top, front edge of the case and on the label.)
2. Unlatch the fasteners by pulling them in the direction of the arrow (A in Figure 87).
3. Open the module as shown (B in Figure 87).

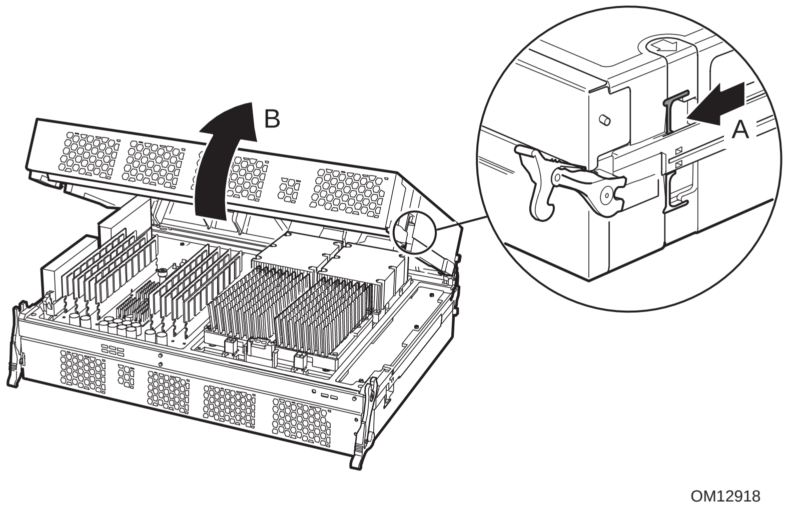
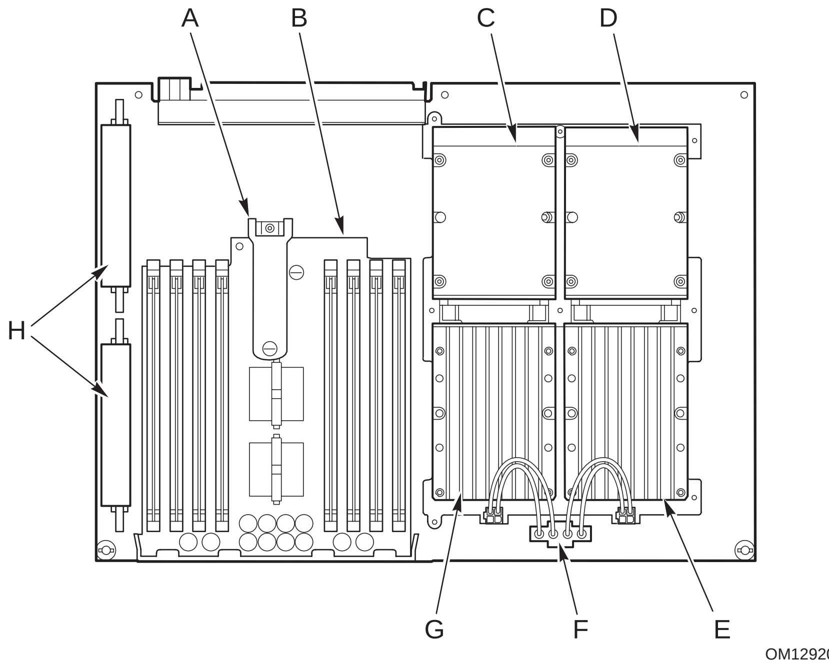


Figure 87. Opening the Secondary Side of the Processor/Memory Module

Secondary Side Component Location



A Memory board release mechanism
B Memory board 2
C Processor 4
D Processor 2
E Power pod 2
F Power pod cable
G Power pod 4
H 2.5 V DC-to-DC converters 1 and 2

Figure 88. Secondary Side Processor/Memory Module Component Location

Handling the Intel® Itanium® 2 Processors

Intel Itanium 2 processors require special shipping and handling procedures. Processors are shipped in a clear plastic “clamshell” package that is enclosed in a cardboard box. Be sure to follow these guidelines when handling the processors:

1. Ground yourself with a grounding heel or wrist strap, and an antistatic smock if possible.
2. Remove processors from the packaging at a clean ESD-protected work surface.
3. Contact your Intel representative if any incoming quality concerns exist with how the processors arrived in their packaging.
4. When removing processors from the packaging, first remove the clamshell from the cardboard box. Then, carefully separate each locking feature along the perimeter of the clamshell. Keep the package flat on the surface while opening it so that no processors fall out of the packaging.
5. Remove processors one at a time by using two fingers to touch the black plastic and the metal plate. Pick up the processor closer to the end with the white label.
6. Hold processors by their sides with the pins facing down after they have been removed from the packaging. Also, to avoid mechanical and/or ESD damage, do not touch the cartridge pin array, power tab edge connector, or PCB components.
7. When placing processors on the clean ESD-protected work surface, place them with their pins facing down. Do not stack cartridges on top of each other.
8. Use an ESD-safe bin to transfer processors between workstations.
9. To ship processors, place them into the clamshell and the cardboard box. Be sure that all pins face the center. Make sure that all locking features are fully mated along the perimeter of the clamshell.

Replacing Thermal Blanks, Power Pods and Processors

To prepare the system for the removal of a thermal blank, power pod, or processor:

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the processor/memory module from the chassis.
4. Position the module with the primary or secondary side up (depending upon which side requires service).
5. Unlatch and open the processor/memory module as described in “Removing the Processor/Memory Module” on page 207.

⚠ **CAUTION**

To ensure proper installation, be sure that the frame of the processor/memory module is resting completely flat on a smooth surface before installing or removing a power pod or processor.

Removing a Thermal Blank

Your server may have from one to four processors (B in Figure 89) installed in the processor/memory module. Each processor has its associated power pod (A in Figure 89). If a processor slot does not have a processor and its associated power pod installed, a thermal blank to properly direct cooling airflow must be installed.

To remove a thermal blank:

1. Squeeze the sides of the thermal blank together (C in Figure 89) to release the side tabs (D in Figure 89) from the power pod frame and lift the thermal blank up to remove.

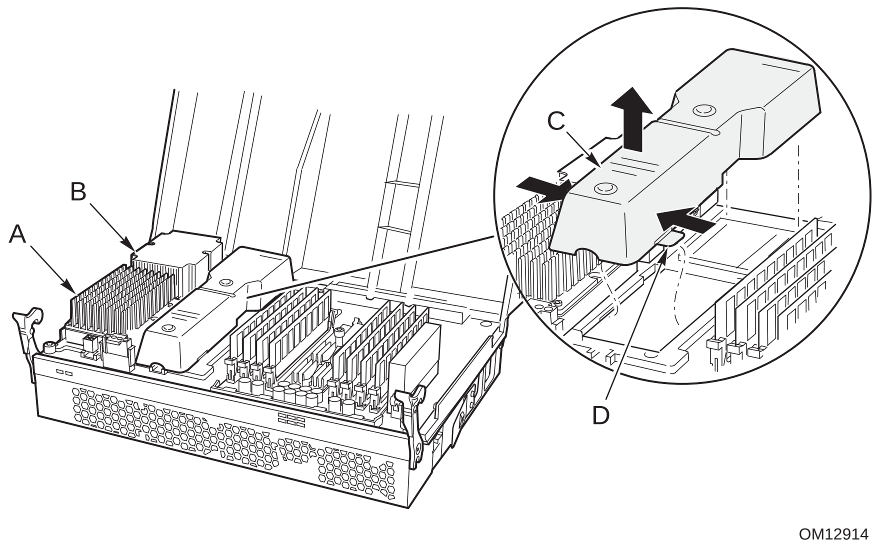


Figure 89. Thermal Blank Removal

Installing a Thermal Blank

Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.

To install a thermal blank:

1. Position the thermal blank on the processor board as shown in Figure 90.
2. Squeeze the sides of the thermal blank together and slip the tabs (A in Figure 90) in the notches under the metal power pod frame.

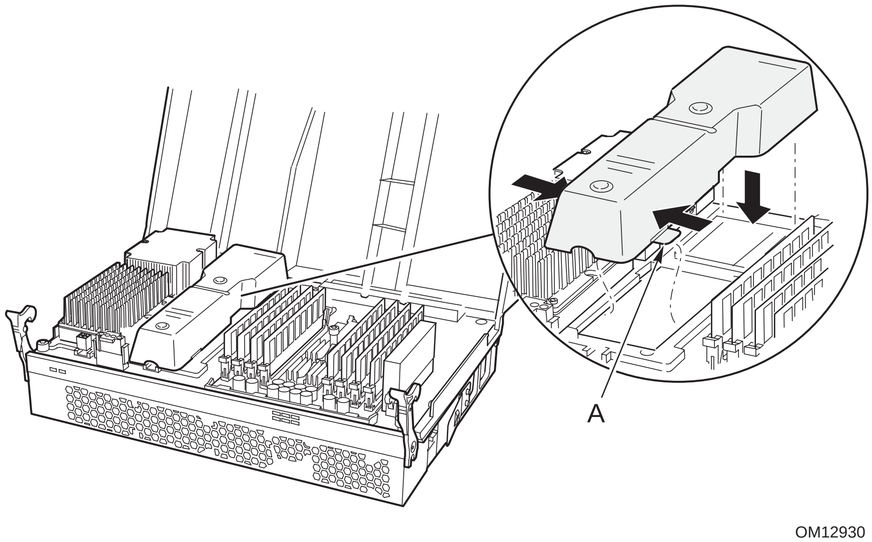


Figure 90. Installing a Thermal Blank

Removing a Power Pod

Power pod removal is the first step in removing a processor. To remove a power pod:

1. Disconnect the Y-cable to the power pod by releasing the connectors shown in Figure 91.

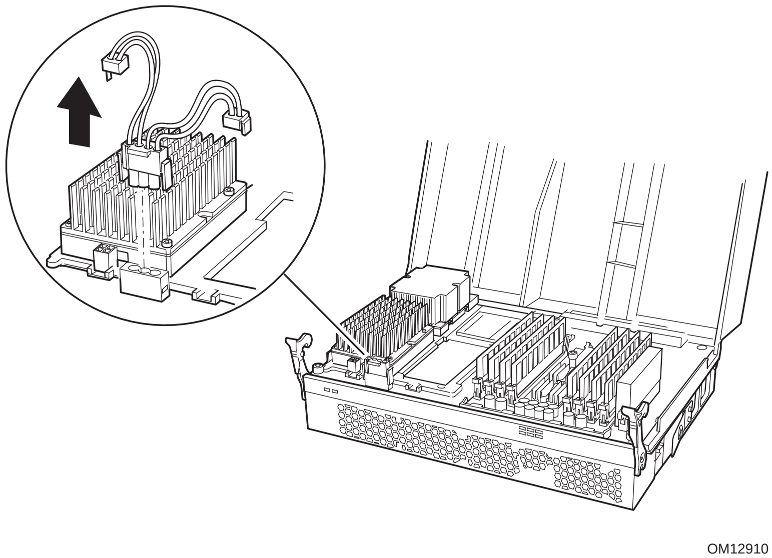


Figure 91. Disconnecting the Y-Cable

2. Loosen the captive screws on the power pod (A in Figure 92) and pull the power pod away from the processor (B in Figure 92) to disengage it from its connector.
3. Lift the power pod out of the system. (If only removing a power pod, stop here. To install a power pod, see "Installing a Power Pod" on page 218.)

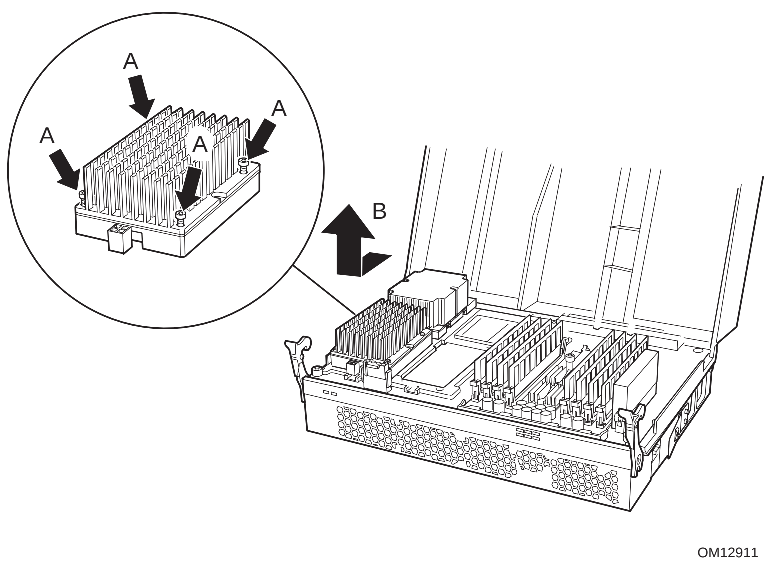


Figure 92. Removing a Power Pod

Removing a Processor

To remove a processor:

1. Remove the power pod associated with the processor to be removed as described in "Removing a Power Pod" on 215.
2. Loosen the four captive screws on the processor (B in Figure 93. Removing a Processor).
3. Using a 2.5 mm hex driver, rotate the processor release mechanism 90 degrees counter-clockwise (A in Figure 93. Removing a Processor) to release the processor's pins so that the processor can be lifted out of the socket.
4. Place the processor on a clean, ESD-protected work surface, in an antistatic bag, or in the processor's original "clamshell" container.

NOTE

Once the processor is removed, note that the release mechanism shows the socket is open (see inset). If not installing another processor at this time, use a 2.5 mm hex driver to rotate the hex screw clockwise to the closed position to release spring tension in the mechanism.

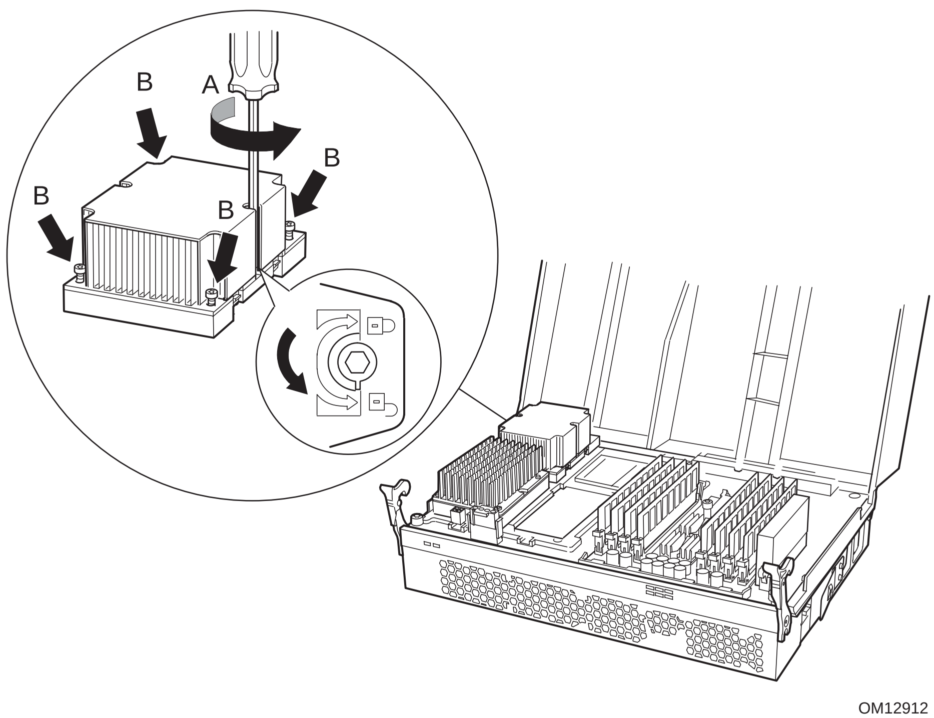


Figure 93. Removing a Processor

Installing a Processor

To install a processor:

1. Before trying to insert the processor, verify that the processor release mechanism is in the open or unlocked position (see inset in Figure 93. Removing a Processor).
2. Position the processor (with heat sink attached) inside the four posts on the processor board, pins toward the back and over the socket. Once centered in the socket, the weight of the processor/heat sink assembly should cause the processor to drop into the socket. Do not apply force. Once the processor is in the socket, gently press the processor to verify the processor has seated properly.
3. Using a 2.5 mm hex driver, rotate the processor release mechanism 90 degrees clock-wise (A in Figure 94) so that the indicator flag shows the processor socket is locked (see inset).
4. Tighten the four captive screws in a cross-pattern in this order, B1, B2, B3, and B4 as shown in Figure 94, to secure the processor to the processor board.

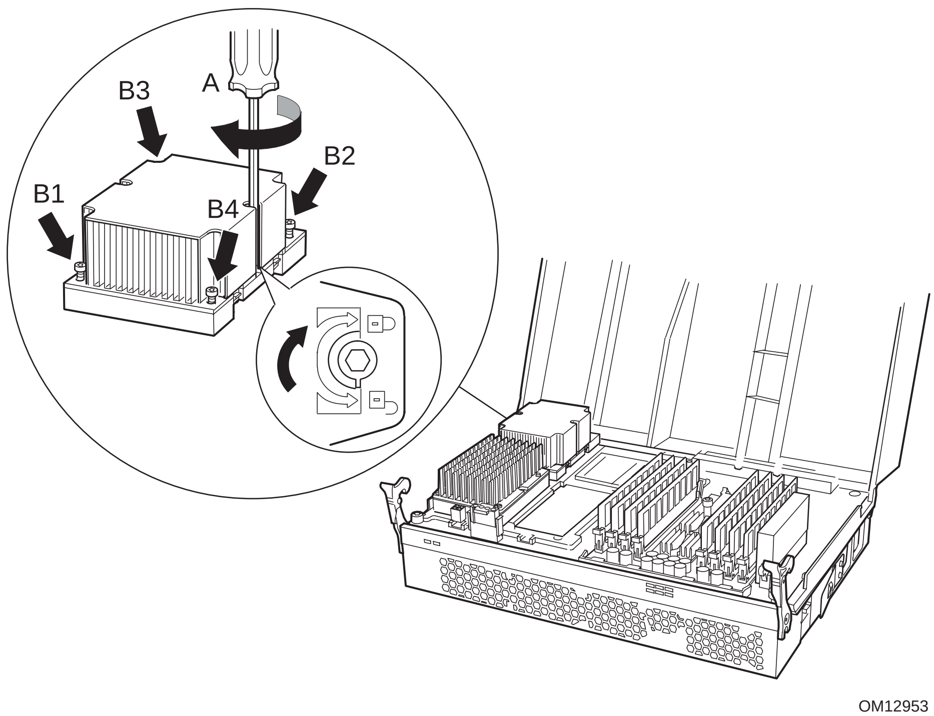


Figure 94. Installing a Processor

Installing a Power Pod

To install a power pod:

1. Place the power pod into position on the processor board as shown in Figure 95. Slide the power pod to engage the power pod's connector with the connector on the processor as shown by the arrow (A in Figure 95).
2. Tighten the four captive screws (B in Figure 95) on the power pod to secure it to the processor board.

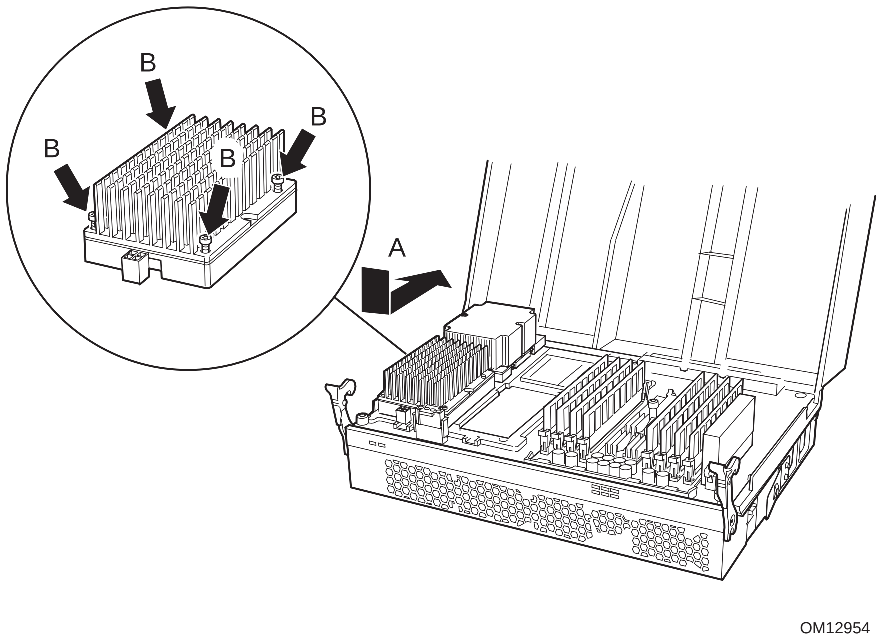


Figure 95. Installing a Power Pod

3. Connect one side of the Y-cable to the power pod and verify that the Y-cable connects to all installed power pods.
4. Close the processor/memory module and verify that the latches are secure.
5. Insert the processor/memory module into the chassis.

Replacing Memory Boards

Two memory boards reside in the processor/memory module. Memory board 1 is on the primary side of the processor board and memory board 2 is on the secondary side. Both must be in place for the system to operate correctly.

Removing a Memory Board

To remove a memory board:

1. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
2. Remove the processor/memory module from the chassis as shown in “Removing Modules” on Page 186.
3. If required, remove the DIMMs from the memory board as described in “Removing DIMMs” on Page 222.
4. Loosen the captive screw (A in Figure 96) that secures the memory board’s extraction lever. Lift the extraction lever as shown by the arrow (B in Figure 96). Lift the memory board out of the processor/memory module as indicated by arrow C in Figure 96.

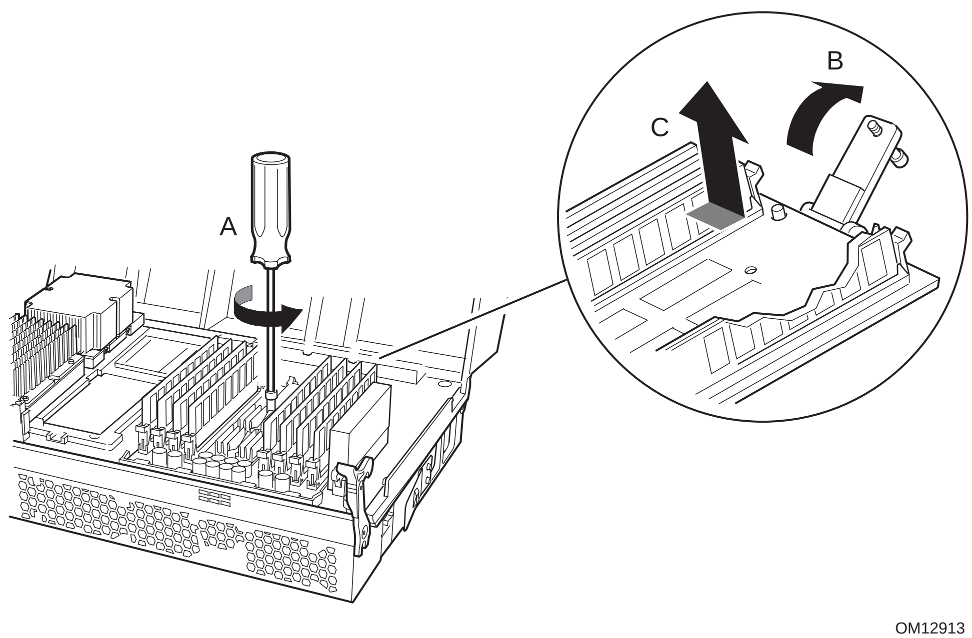


Figure 96. Removing a Memory Board

5. Place the memory board on a clean, ESD-protected work surface.

Installing a Memory Board

To install a memory board:

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Remove the processor/memory module from the chassis, and open the required side.

> **NOTE**
>
> Two memory boards are found in the processor/memory module, they are plugged into the primary and secondary sides of the processor board.

3. With the extraction lever in the open position, slip the memory board under the edge guide (A in Figure 97).
4. Lower the memory board onto the processor board as shown by the arrow (B in Figure 97).
5. Close the extraction lever (C in Figure 97) until the memory board connector fully engages the processor board.
6. Tighten the captive screw that secures the extraction handle assembly (D in Figure 97). (See “Torque Settings” on page 180.)

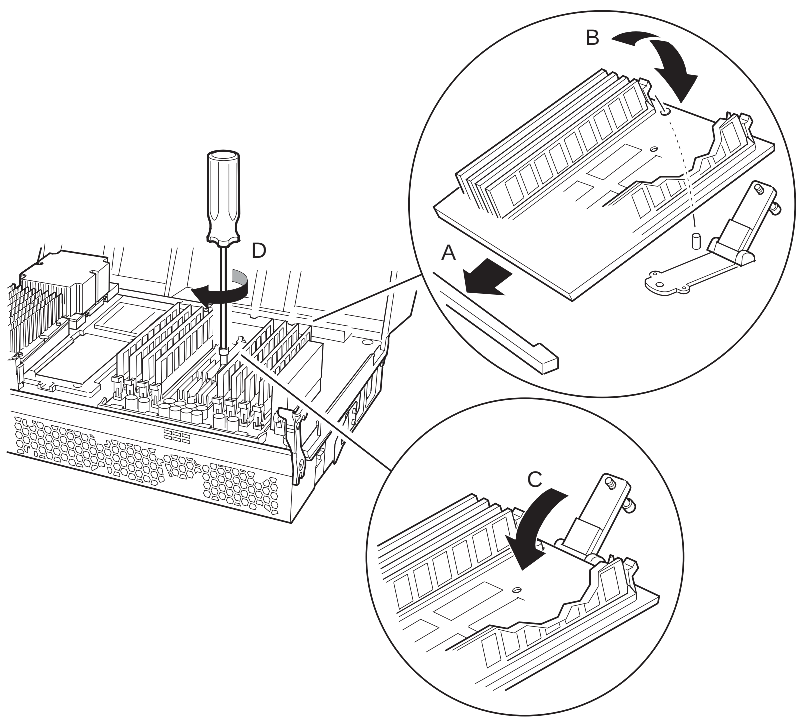


Figure 97. Installing a Memory Board

7. Replace the processor/memory module in the chassis.

Removing and Installing DIMMs

To understand the rules for adding memory, it helps to understand the basic architecture of the memory subsystem that drives the rules and the terminology used.

- The DIMMs reside on the memory board in the processor/memory module.
- Two Rambus channels run from the processor board to each memory board.
- There is one DMH device per Rambus channel.
- Each DMH supports two DDR branch channels.
- Each DDR branch channel supports two 184 pin DDR DIMMs.
- This results in eight DIMMs per memory board, for a total of 16 DIMM connectors in the system.
- A "row" consists of four DDR DIMMs, one off of each DMH, which collectively make-up a cache line.

To remove or install the DIMMs, remove the processor/memory module from the chassis and follow the Rules for Adding Memory.

Rules for Adding Memory

The following rules apply when adding memory to the memory boards:

- DIMMs must be populated in groups of four referred to as a "row." Each memory row requires population of DIMMs on both memory boards. The four rows of DIMMs are defined below and in Figure 98:

  Row A, DIMM connectors 1 and 3 on both memory boards

  Row B, DIMM connectors 6 and 8 on both memory boards

  Row C, DIMM connectors 2 and 4 on both memory boards

  Row D, DIMM connectors 5 and 7 on both memory boards
- Within a single row, all DIMMs must be identical. (Identical DIMM size AND identical number of devices on the DIMM).
- Each of the four possible DIMM rows can be populated with different technologies.
- However, for best performance, the amount of memory on each DMH DDR branch channel should be the same to enable the benefits of memory interleaving which means, the amount of memory in the "left" DIMMs in Figure 98 should equal the amount of memory in the "right" DIMMs.

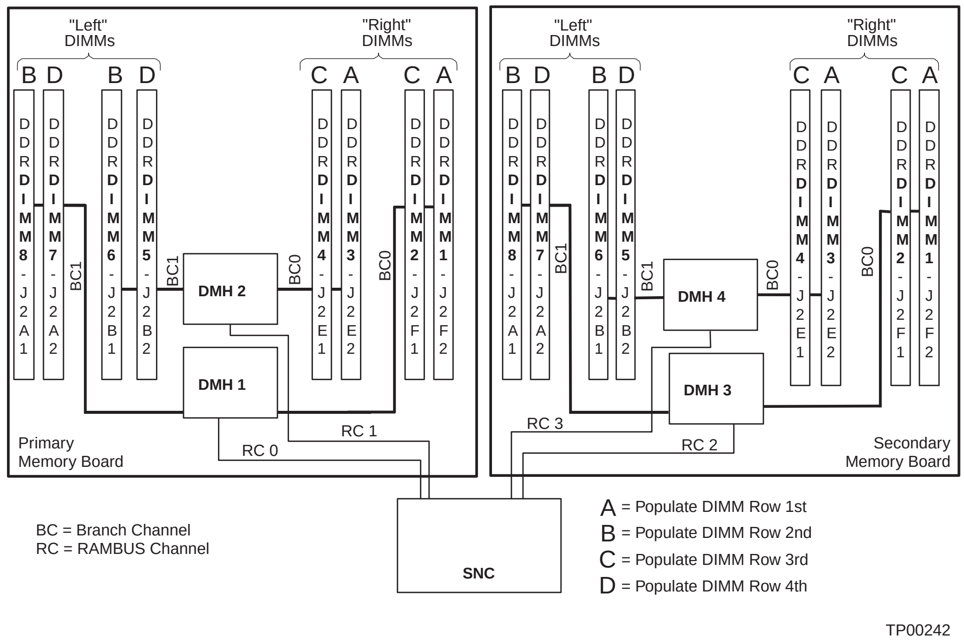


Figure 98. Memory Boards 1 and 2 DIMM Placement

Removing DIMMs

⚠ **CAUTION**

Use extreme care when removing DIMMs. Too much pressure can damage the connector. Apply only enough pressure on the plastic ejector levers to release the DIMM.

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the processor/memory module.
4. Access the memory boards by opening the primary or secondary side of the processor/memory module as required.

➡ **NOTE**

It is not necessary to remove the memory boards from the processor/memory module to add or replace DIMMs.

5. Gently push the plastic ejector levers out and down to eject the DIMM from its connector.
6. Hold the DIMM only by its upper edges (see Figure 99), being careful not to touch its components or gold edge connectors. Carefully lift it away from the connector and store it in an antistatic package.
7. Repeat steps five and six for each DIMM to be remove.

Installing DIMMs

⚠ **CAUTIONS**

- Use extreme care when installing a DIMM. Applying too much pressure can damage the connector. DIMMs are keyed and can be inserted in only one way.
- Mixing dissimilar metals might cause memory failures later, resulting in data corruption. Install DIMMs with gold-plated edge connectors only.
- Maximum DIMM height is 4.445 cm (1.75 inches). Do not install DIMMs that exceed this height.
- The system does not support mixed-sized DIMMs or DIMMs from different vendors within the same row.

➡ **NOTE**

DIMM slots on the memory module must be installed only in certain configurations. Numbers next to DIMM slots correspond to installation sequence. DIMMs must be installed by groups of four and must be inserted in the sequence shown in Figure 100.

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the processor/memory module.
4. Open the processor/memory module (primary or secondary side as required) to access the memory boards.
5. Holding the DIMM only by its upper edges, remove it from its antistatic package.

6. Referencing Figure 99, position the DIMM so that the notch in the bottom edge of the DIMM (A in Figure 99) aligns with the keyed DIMM connector on the memory board.
7. Insert the bottom edge of the DIMM into the DIMM connector, then press down firmly on the DIMM (B in Figure 99) until it seats correctly. When fully seated, the plastic ejector levers on the connector ends (C in Figure 99) snap into the upright position to secure the DIMM.

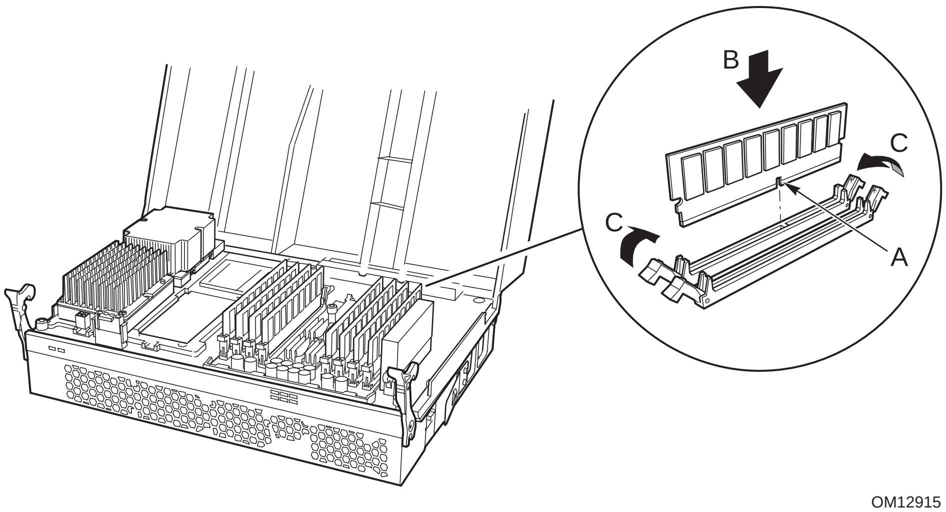


Figure 99. Installing DIMMs (Primary Side)

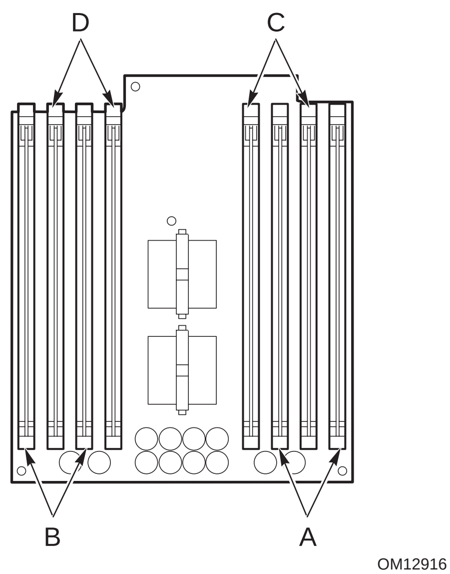


Figure 100. DIMM Installation Sequence

8. Repeat steps 5 through 8 for each DIMM to be installed.
9. Close the processor/memory module and verify that the latches are secure.
10. Insert the processor/memory module into the chassis.

Replacing Processor Board DC-to-DC Converters

The DC-to-DC converters are located on the both sides of the processor board. The server uses three DC-to-DC converters. One 3.3 V converter resides on the primary side of the processor board, and two 3.3 V converters reside on the secondary side.

Removing DC-to-DC Converters from the Processor Board

1. Observe the safety and ESD precautions described in "Warnings and Cautions" on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the processor/memory module as described in "Removing the Processor/Memory Module" on page 207.
4. Position the processor/memory module so that the primary or secondary side faces up as required.
5. Open the processor/memory module.
6. Press downward on the two latches that secure the DC-to-DC converter (A in Figure 101).
7. Pull the DC-to-DC converter straight out from its connector (see arrow B in Figure 101). Be sure to keep the converter level as it is removed from its connector.

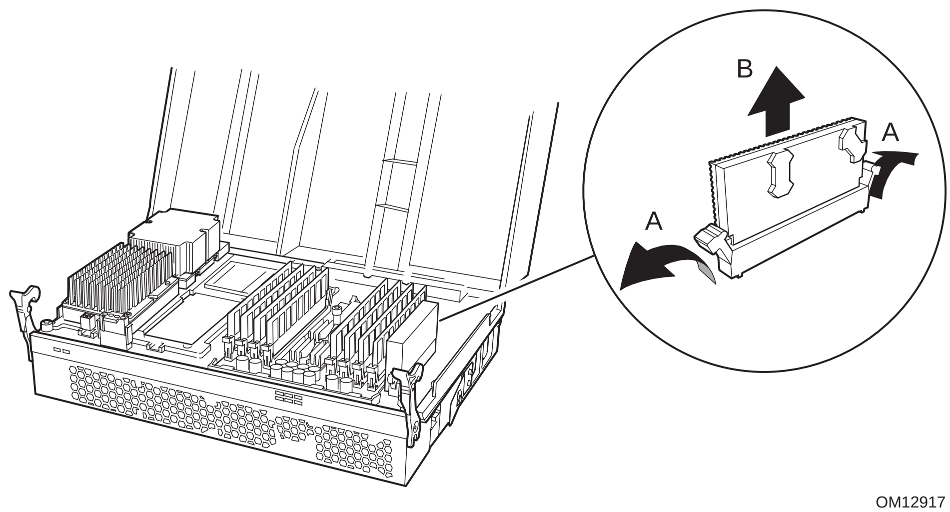


Figure 101. Removing Processor Board DC-to-DC Converters (Primary Side)

Installing DC-to-DC Converters on the Processor Board

➡ **NOTE**

Each DC-to-DC converter has a keyed guide in its connector. Align the corresponding slots in the converter's connector with these guides before reinstalling.

1. Observe the safety and ESD precautions described in "Warnings and Cautions" on page 179.
2. Remove the processor/memory module from the chassis.
3. Open the primary or secondary side of the processor/memory module as required.
4. Verify the DC-to-DC connector's latches are open.
5. Carefully align the DC-to-DC converter's edge with the connector on the processor board and press the converter firmly into place (A in Figure 102). Be sure to keep the converter level as is is aligned with the bottom edge of the PCB with the keyed guide.
6. Close the latches (B in Figure 102) on the sides of the DC-to-DC converter's connector to secure.
7. Close the processor/memory module.
8. Reinstall the processor/memory module in the chassis.

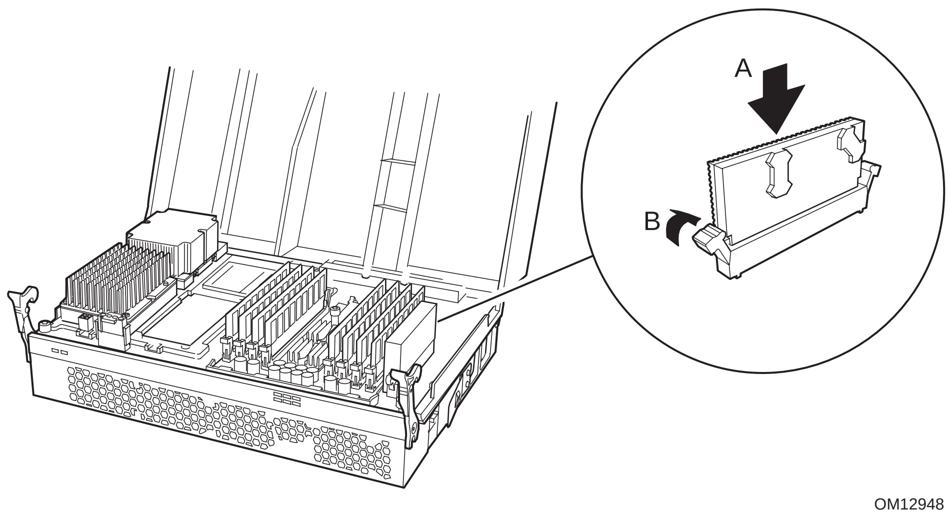


Figure 102. Installing a DC-to-DC Converter on the Processor Board (Primary Side)

Replacing the Processor Board

The processor board is mounted to the "spine" between the two halves of the processor/memory module. The board accommodates one to four processors and two memory boards. Removal of the processor board involves disassembly of the entire processor/memory module.

Removing the Processor Board

1. Observe the safety and ESD precautions described in "Warnings and Cautions" on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the processor/memory module from the chassis and place it on a clean, static free work surface secondary side up.
4. Open the secondary side of the processor/memory module.
5. Remove the secondary side memory board from the processor/memory module as described in "Replacing Memory Boards" on page 219.
6. Remove the secondary side processors, power pods, and thermal blanks as described in "Replacing Thermal Blanks, Power Pods and Processors" on page 212.
7. Remove the power Y cable from the processor board.
8. Remove the secondary side DC-to-DC converters as described in "Removing DC-to-DC Converters from the Processor Board" on Page 225.
9. Close the processor/memory module and turn it over to work on the primary side.
10. Open the processor/memory module and repeat steps 5 through 8 to remove components and hardware from the primary side of the processor board.
11. Loosen the two captive screws securing the processor board in the processor/memory module (A Figure 103).
12. To remove the processor board, lift the board up and pull back as shown (B in Figure 103).
13. Place the processor board on a clean ESD protected work surface.

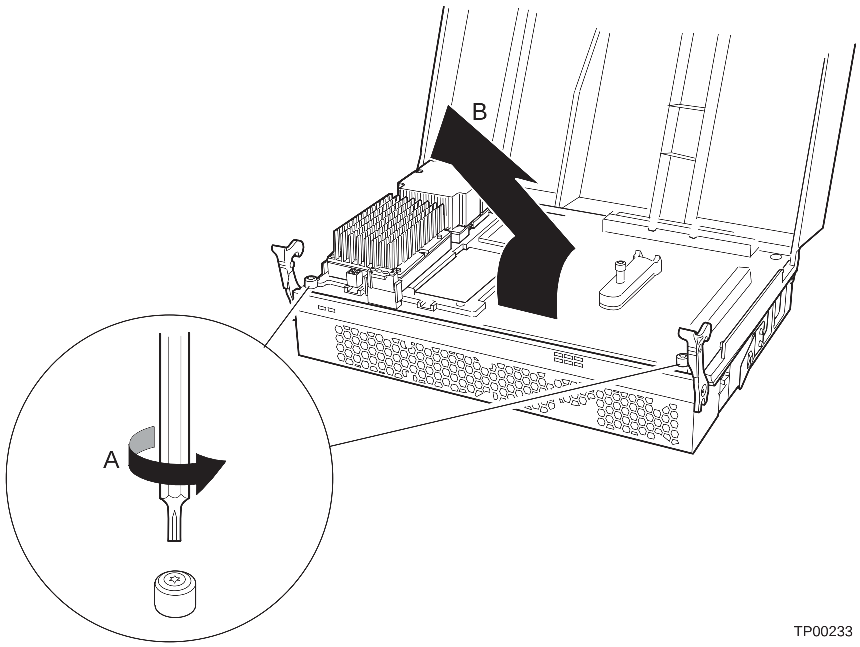


Figure 103. Removing the Processor Board

Installing the Processor Board

To install the processor board:

1. Place the processor/memory module on a clean, static free work surface primary side up.
2. Open the primary side of the processor/memory module.
3. Place the processor board in the processor/memory module and slide toward the back under the retaining features as shown (A in Figure 104).
4. Tighten the two captive screws securing the processor board in the processor/memory module (B Figure 104).
5. Replace the primary side memory board from the processor/memory module as described in "Replacing Memory Boards" on page 219.
6. Replace the primary side processors, power pods, and thermal blanks as described in "Replacing Thermal Blanks, Power Pods and Processors" on page 212.
7. Reattach the power Y cable from the processor board.
8. Close the processor/memory module and turn it over to work on the secondary side.
9. Open the processor/memory module and repeat steps 5 through 7 to replace components and hardware from the secondary side of the processor board.
10. Install the processor/memory module in the chassis.

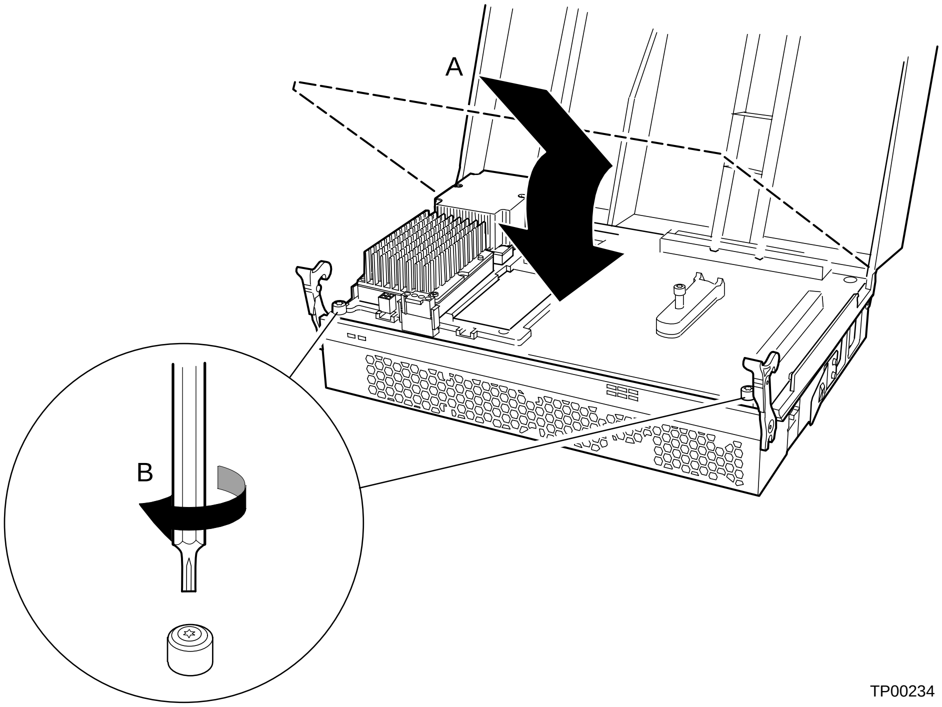


Figure 104. Installing the Processor Board

8 Servicing the Peripheral Bay

Removing the Peripheral Bay

The peripheral bay provides mounting features for three hot-swap hard drives, an LS240 floppy disk drive, and a DVD/CD-ROM drive.

To remove the peripheral bay:

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the front bezel.
4. Release the securing levers (A in Figure 105) and pull the module out of the chassis until it stops.
5. Release the catches on the slides (B in Figure 105).
6. Pull the module toward you to remove.
7. Place the module on a clean, static-free work surface.

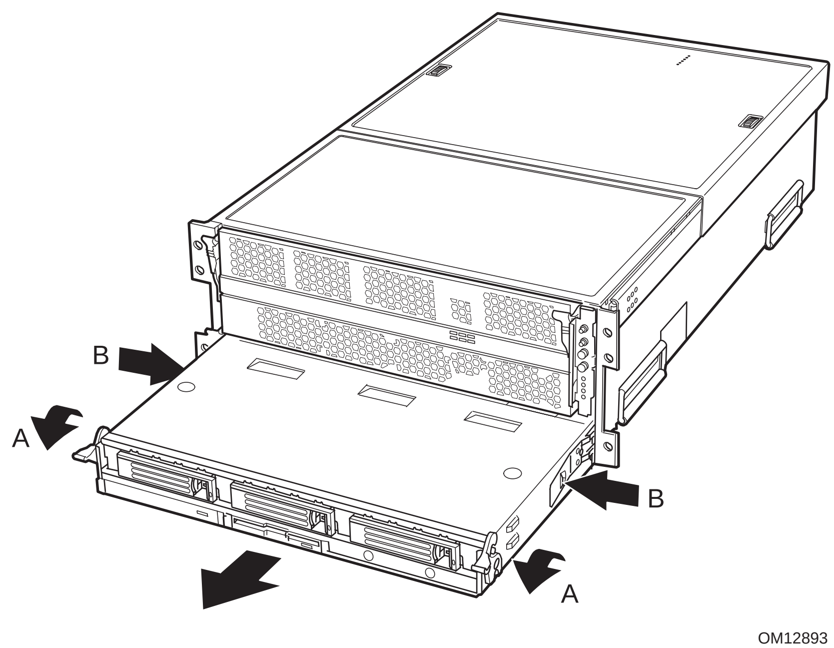
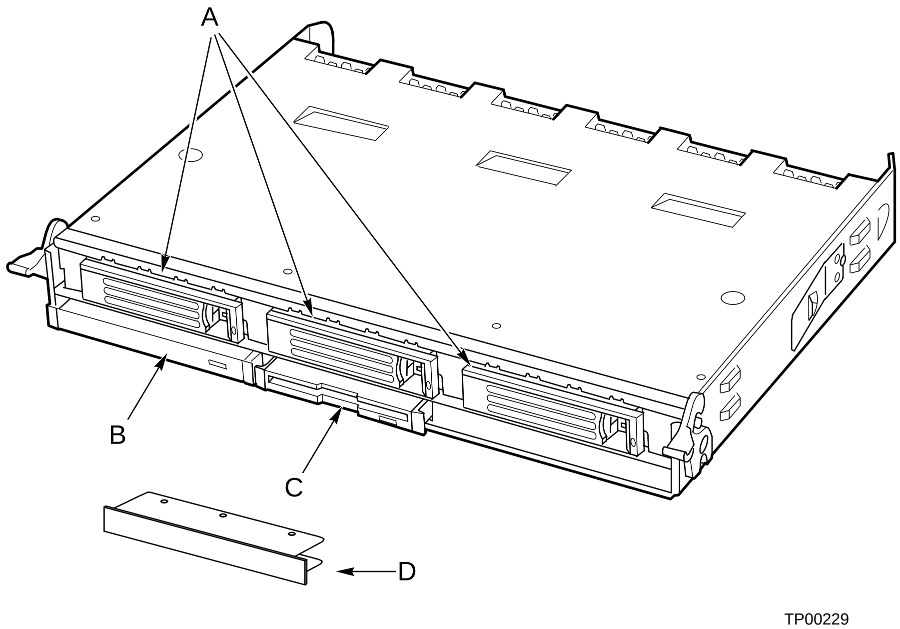


Figure 105. Peripheral Bay Removal

Locating Peripheral Bay Components

Figure 106 shows the peripheral bay and components.



A SCSI Hard Disk Drives (Hot-swap)

B DVD/CD-ROM (non-Hot-swap)

C LS-240 Floppy Disk Drive (non-Hot-swap)

D LS-240 Filler Panel

Figure 106. Peripheral Bay Components

Mounting a Hard Disk Drive in a Carrier

The server supports three hot-swap drive carriers in the peripheral bay. Each carrier houses a standard one-inch high SCSI-2 or SCSI-3 hard drive.

CAUTION

To allow proper airflow and server cooling, all drive bays must contain either a carrier with a hard drive installed or a carrier with an air baffle installed.

To mount a hard drive in a carrier:

1. Remove the hard disk drive from the protective wrapper and place it on a clean ESD-protected work surface.
2. Record the model and serial number of the drive in your equipment log (Appendix B Equipment Log and Configuration Worksheet).
3. Set any jumpers and/or switches on the drive according to the drive manufacturer's instructions.
4. If the drive carrier is installed in the drive bay, remove it and place it on a clean static-free work surface.
5. Remove the air baffle (A in Figure 107 from the drive carrier by removing the four screws (B in Figure 107) from the slide track (C in Figure 107).
6. Store the air baffle for future reinstallation in the event the server must be operated without a drive in one of the bays.

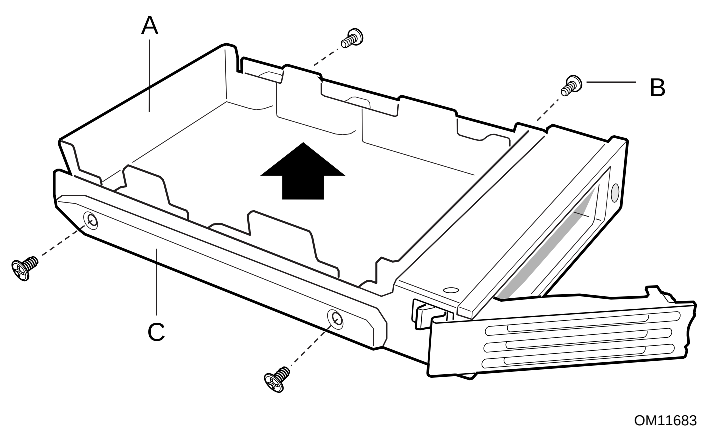


Figure 107. Removing the Air Baffle from the Hard Disk Drive Carrier

7. Position the carrier (B in Figure 108) as shown.
8. Position the drive (A in Figure 108) label-side up with the connector end of the drive (E in Figure 108) so that it is facing the back of the carrier.
9. Place the drive in the carrier.
10. Align the holes in the drive to the holes in the drive carrier slide track (C in Figure 108) insert the screws (D in Figure 108) that were previously removed, and attach the carrier to the drive. (See "Torque Settings" on page 180.)

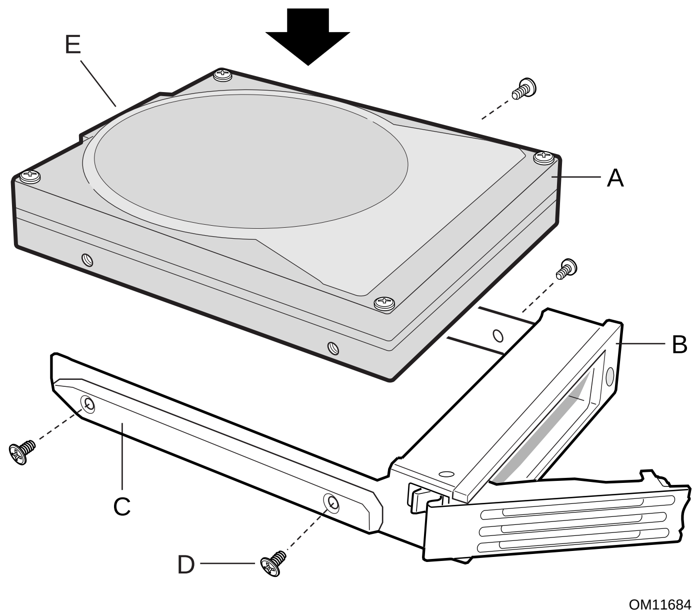
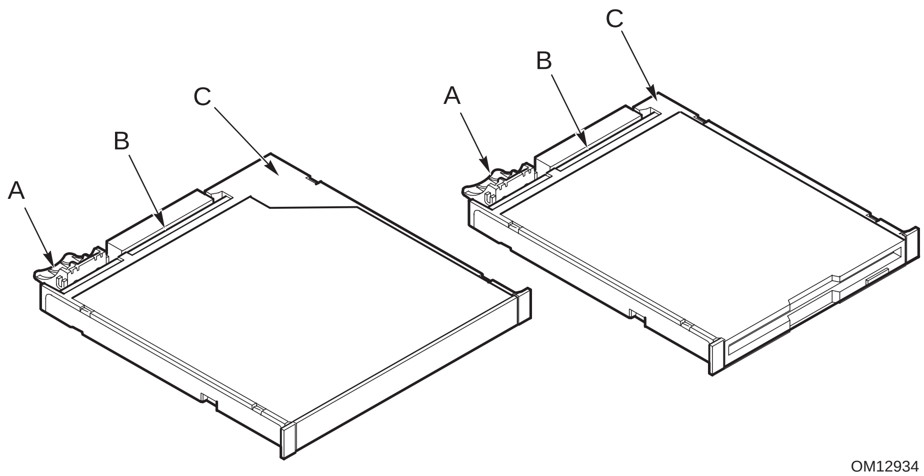


Figure 108. Attaching the Hard Disk Drive to the Carrier

11. Replace the drive in the peripheral drive bay by sliding the drive carrier all the way into the drive bay with the retention lever in the fully open position.
12. Push the retention lever closed to secure the drive carrier in the bay.
13. Reinstall a carrier with an air baffle in any open bays not occupied by hard drives.

Replacing Removable Media Drives

The peripheral bay accepts two removable media devices: the DVD/CD-ROM drive and the LS-240 floppy disk drive. Since these drives are not hot-swappable, the system must be powered down and the power cords removed from the chassis before the drives can be serviced. The drives are housed in carrier assemblies with metal shields to facilitate servicing and to reduce ESD and EMI susceptibility.



DVD/CD-ROM		LS-240 Floppy Disk Drive	
A	Latch	A	Latch
B	Adapter board with locking connector	B	Adapter board with locking connector
C	Plastic Carrier	C	Plastic Carrier

Figure 109. The DVD/CD-ROM and LS-240 Floppy Disk Drive Carriers

Removing the LS-240 Disk Drive from the Peripheral Bay

The LS-240 disk drive is housed in a drive carrier. The drive is accessible when the carrier is removed from the peripheral bay. To remove the LS-240 disk drive:

1. Observe the safety and ESD precautions described in "Warnings and Cautions" on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the peripheral bay from the chassis.
4. Turn the peripheral bay over to access the underside as shown in Figure 110.
5. Press down on the blue retaining lever and push the LS-240 drive carrier toward the front of the peripheral bay (A in Figure 110).
6. Release the blue lever so it can slide under the surrounding sheet metal and pull the LS-240 drive out through the front of the peripheral bay (B in Figure 110).

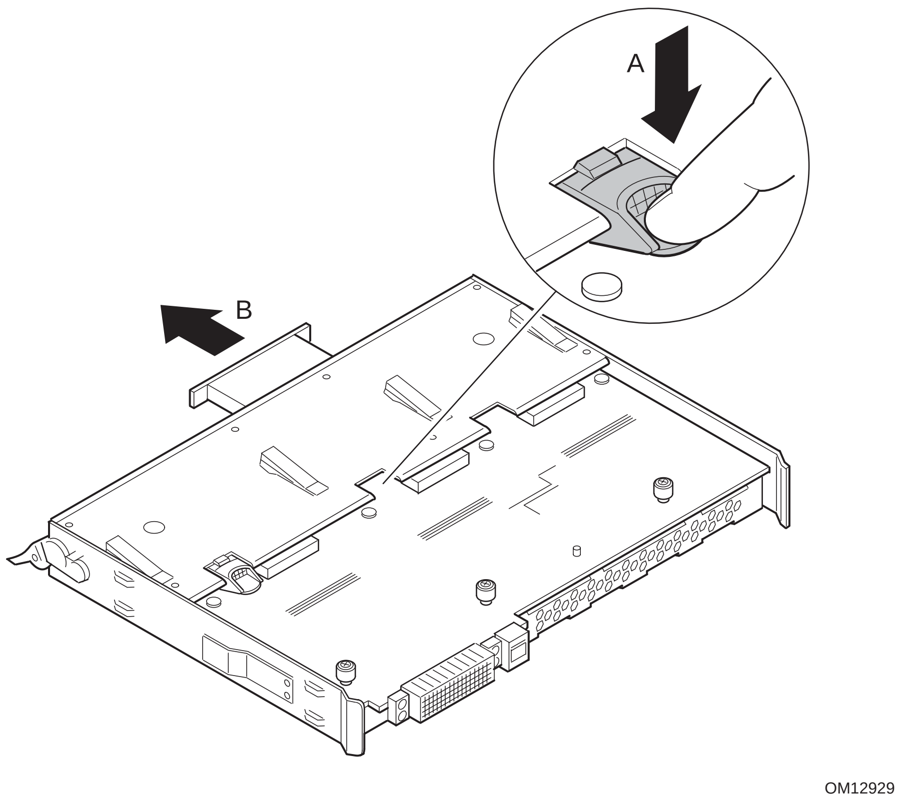


Figure 110. Removing the LS-240 Floppy Disk Drive

Removing the LS-240 Disk Drive from the Drive Carrier

1. Position the carrier assembly label-side up as shown in the upper left panel of Figure 111.
2. Using a small screwdriver, pry the EMI shield (A in Figure 111) far enough apart to free the side tabs (B in Figure 111).
3. Lift the drive carrier (C in Figure 111) from the EMI shield. Use care not to bend the EMI shield.
4. Spread the plastic tab (D in Figure 111) to free the end of the adapter board. Rotate the adapter board (E in Figure 111) as shown to unplug it from the LS-240 drive and free it from the drive carrier.
5. Carefully spread the sides of the drive carrier assembly (F in Figure 111) to free the dimples (G in Figure 111) so that the drive (H in Figure 111) can be removed.
6. Place the drive in an antistatic protective wrapper.

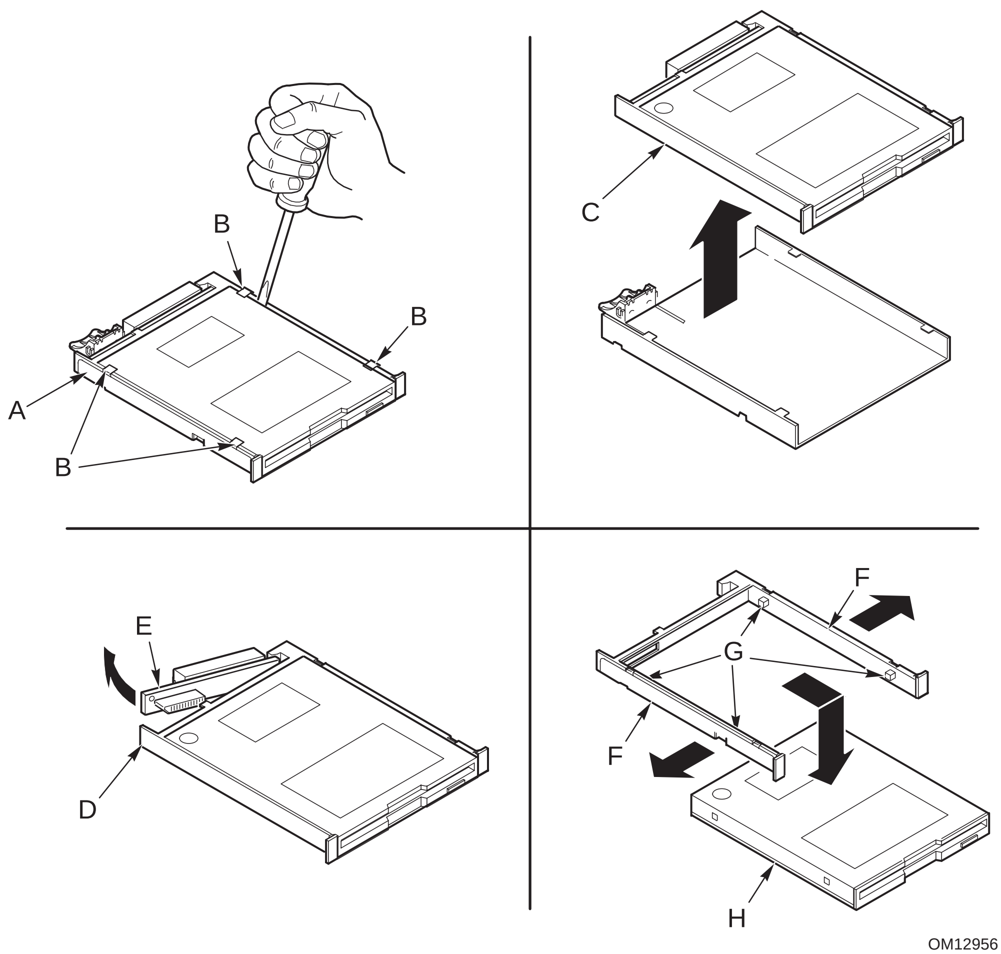


Figure 111. Removing the LS-240 Diskette Drive from the Carrier

Installing the LS-240 Disk Drive in the Drive Carrier

1. Remove the new drive from its protective wrapper, and place it component-side down on a clean ESD-protected work surface (A in Figure 112).
2. Record the drive model and serial numbers in your equipment log (Appendix B Equipment Log and Configuration Worksheet).
3. Place the drive (A in Figure 112) and the drive carrier as shown.
4. Assemble the drive in the drive carrier by spreading the sides of the drive carrier (B in Figure 112) and placing the carrier over the drive.
5. Verify all four of the dimples in the drive carrier (C in Figure 112) align with the corresponding holes in the drive.
6. Plug the adapter board (D in Figure 112) into the rear of the drive by hooking the end of the adapter board into the retaining notch in the drive carrier (see arrow E in Figure 112), and snapping the adapter board into position under the notch at the opposite end (F in Figure 112).
7. Assemble the drive carrier (G in Figure 112) in the EMI shield (H in Figure 112) and verify that the four metal tabs (two on each side of the EMI shield) are aligned with the notches in the drive carrier (I in Figure 112).

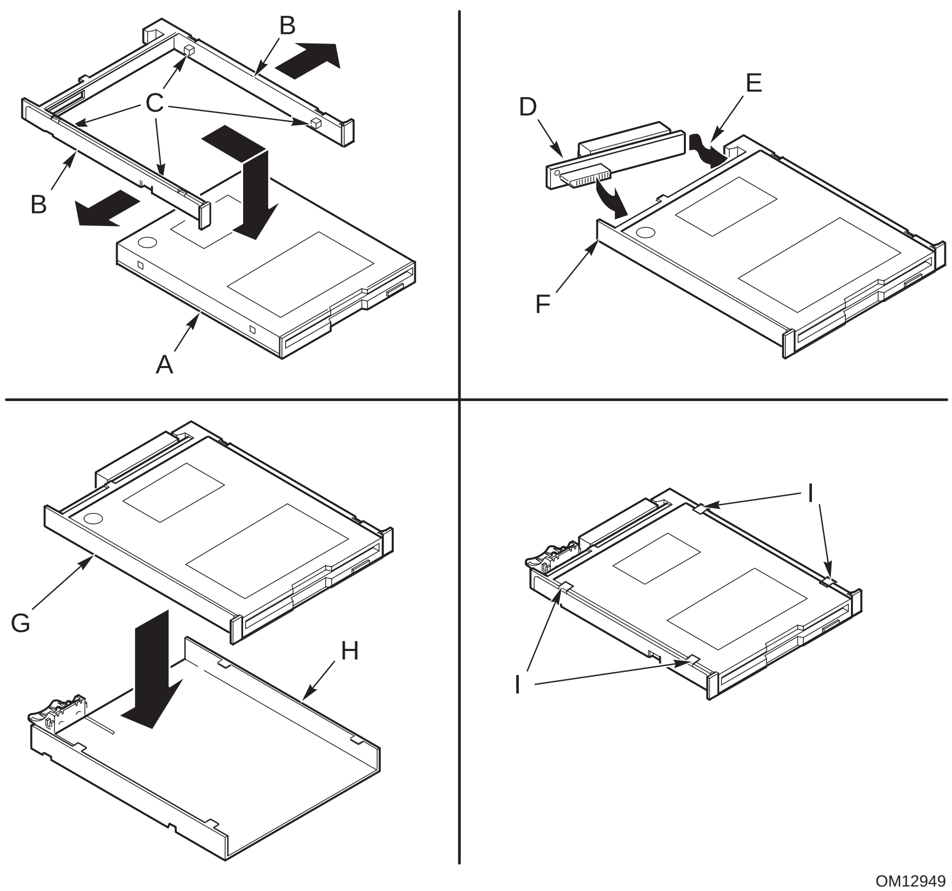


Figure 112. Assembling the LS-240 Floppy Disk Drive and Carrier

8. When the drive carrier is fully assembled, slide it rearward into the peripheral bay such that the blue tab aligns with the corresponding notch in the peripheral bay.
9. Verify that the sheet metal feature next to the blue latch engages the peripheral bay completely.
10. Install the peripheral bay in the chassis.

Removing the LS-240 Filler Panel from the Peripheral Bay

To remove the LS-240 filler panel:

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the LS-240 Filler Panel from the chassis by gently grasping edges of filler panel bezel and pulling LS-240 Filler Panel from slot.

Installing the LS-240 Filler Panel in the Peripheral Bay

To install the LS-240 filler panel:

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Install the LS-240 Filler Panel into the chassis by gently pressing top and bottom of filler panel sheet metal together and inserting filler panel, sheet metal first, into the LS-240 empty slot.

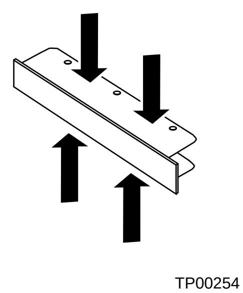


Figure 113. Installing the LS-240 Filler Panel

Removing the DVD/CD-ROM Drive from the Peripheral Bay

The DVD/CD-ROM floppy disk drive is housed in a drive carrier assembly. The drive is accessible when the carrier is removed from the peripheral bay. To remove the DVD/CD-ROM drive:

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the peripheral bay from the chassis.
4. Turn the peripheral bay over to access the underside as shown in Figure 114.
5. Press down on the blue retaining lever and push the DVD/CD-ROM drive carrier toward the front of the peripheral bay (A in Figure 114).

6. Release the blue lever so it can slide under the surrounding sheet metal and pull the DVD/CD-ROM drive out through the front of the peripheral bay (B in Figure 114).

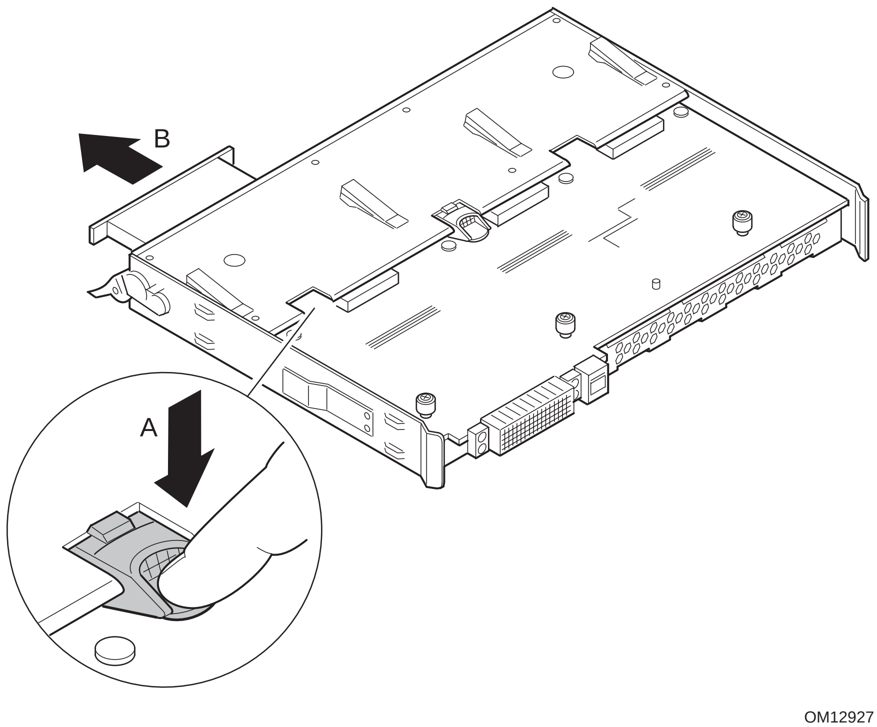


Figure 114. Removing the DVD/CD-ROM Drive from the Peripheral Bay

Removing the DVD/CD-ROM Drive from the Drive Carrier

1. Position the carrier assembly label-side up as shown in the upper left panel of Figure 115.
2. Using a small screwdriver, pry the EMI shield (A in Figure 115) apart far enough to free the side tabs (B in Figure 115) and lift the drive carrier (C in Figure 115) free of the EMI shield. Use care not to bend the EMI shield.
3. Spread the plastic tab (D in Figure 115) to free the end of the adapter board (E in Figure 115). Pull the adapter board until it is free of the carrier and remove.
4. Carefully spread the sides of the drive carrier assembly (F in Figure 115) to free the tabs (G in Figure 115) so that the drive (H in Figure 115) can be removed.
5. Place the drive in an antistatic protective wrapper if the same drive will not be reinstalled.

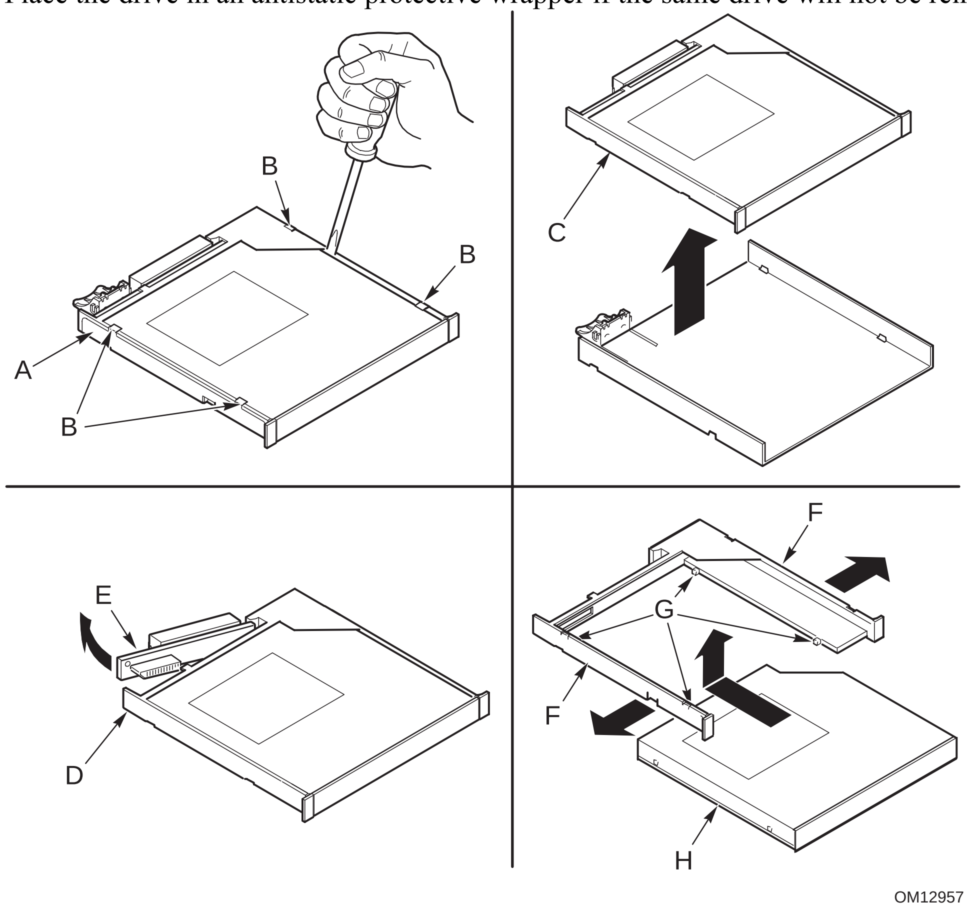


Figure 115. Removing the DVD/CD-ROM Drive from the Carrier

Installing the DVD/CD-ROM Drive in the Drive Carrier

1. Remove the new drive from its protective wrapper, and place it component-side down on a clean ESD-protected work surface.
2. Record the drive model and serial numbers in your equipment log (Appendix B Equipment Log and Configuration Worksheet).
3. Place the drive (A in Figure 116) and the drive carrier as shown.
4. Assemble the drive in the drive carrier by spreading the sides of the drive carrier (B in Figure 116) and placing the carrier over the drive.
5. Verify the all four of the tabs in the drive carrier (C in Figure 116) align with the corresponding holes in the drive.
6. Plug the adapter board (D in Figure 116) into the rear of the drive by hooking the end of the adapter board into the retaining notch in the drive carrier (see arrow E in Figure 116), and snapping the adapter board into position under the notch at the opposite end (F in Figure 116).
7. Assemble the drive carrier (G in Figure 116) in the EMI shield (H in Figure 116) and verify that the four metal tabs (two on each side of the EMI shield) are aligned with the notches in the drive carrier (I in Figure 116).

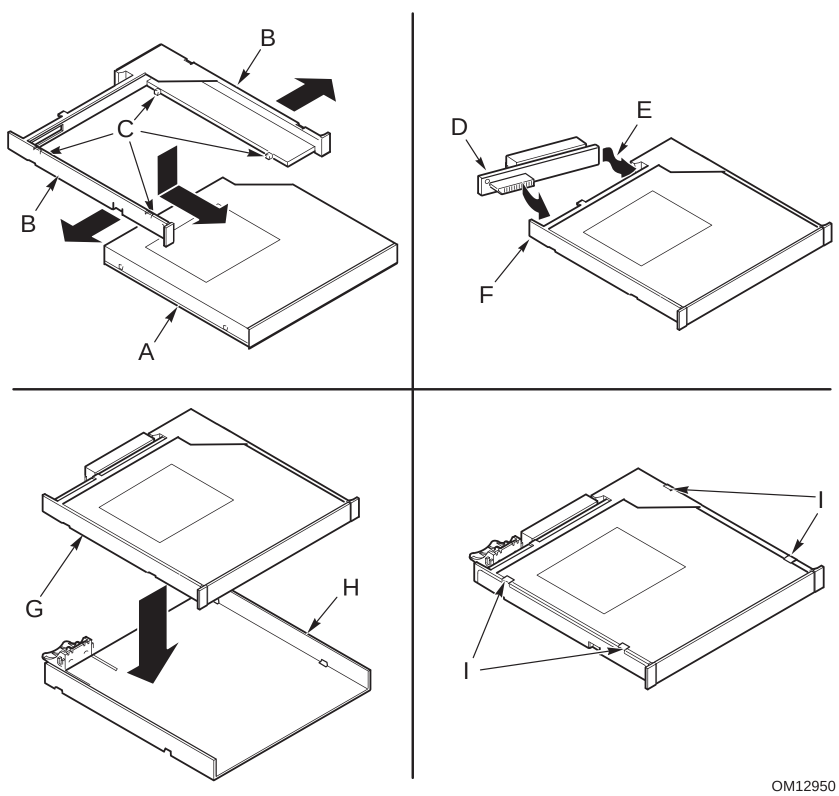


Figure 116. Assembling the DVD/CD-ROM Drive and Carrier

8. When the drive carrier is fully assembled, slide it rearward into the peripheral bay such that the blue tab aligns with the corresponding notch in the peripheral bay.
9. Verify that the sheet metal feature next to the blue latch engages the peripheral bay completely.
10. Install the peripheral bay in the chassis.

Replacing the SCSI Backplane Board

The SCSI backplane board is located behind the peripheral devices on the underside of the peripheral bay.

Removing the SCSI Backplane Board

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the hot-swap hard drive carriers.
4. Remove the peripheral bay from the chassis.
5. Turn the peripheral bay upside-down and place on a clean, static-free work surface.
6. Remove the DVD/CD-ROM drive carrier and the LS-240 disk drive carrier by lifting the blue tabs on each and sliding the carriers out of the peripheral bay.
7. To remove the SCSI backplane board (A in Figure 117), loosen the three captive screws that secure the SCSI backplane board to the peripheral bay (B in Figure 117).
8. Slide the SCSI backplane board rearward to disengage the locating pins (C in Figure 117).
9. Lift up the SCSI backplane board and pull out (D in Figure 117) to release the front mounting tabs.
10. Carefully place the SCSI backplane board on a clean, static-free work surface or in antistatic packaging.

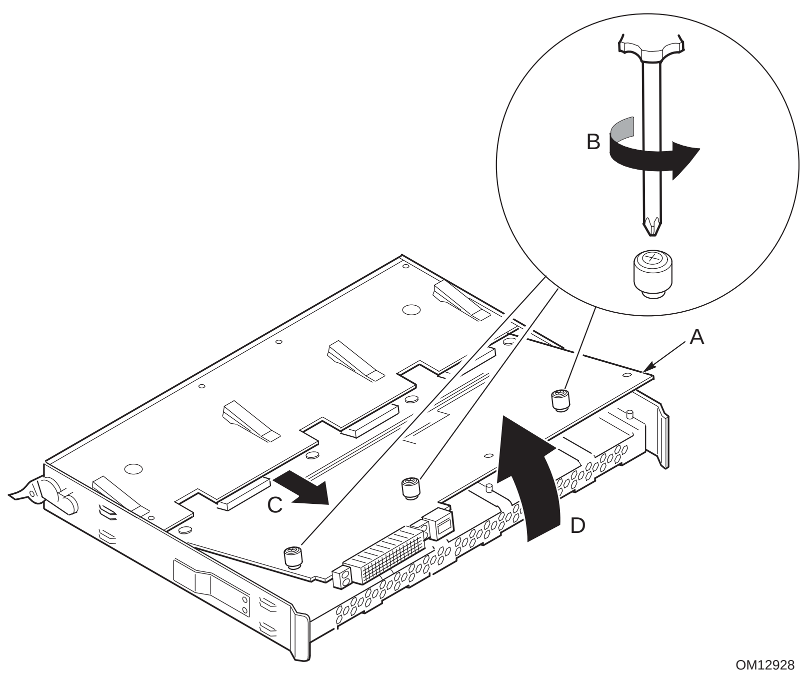


Figure 117. Removing the SCSI Backplane Board

Installing the SCSI Backplane Board

1. With the peripheral bay upside down, carefully align the SCSI backplane board (A in Figure 118) to the mounting tabs (C in Figure 118) in the center of the peripheral bay and the two alignment pins (B in Figure 118) near the back.
2. Lower the SCSI backplane board over the alignment pins and slide it forward (D in Figure 118. Installing the SCSI Backplane Board) to engage the board's mounting tabs.
3. Secure the SCSI backplane board in the peripheral bay using the three captive screws (E in Figure 118. Installing the SCSI Backplane Board). (See "Torque Settings" on page 180.)
4. Install the DVD/CD-ROM and the floppy disk drive carriers in the peripheral bay.
5. Install the peripheral bay in the chassis.
6. Install the hard disk drives in the peripheral bay.
7. Apply power to the system and verify that all peripheral bay components are functioning properly.

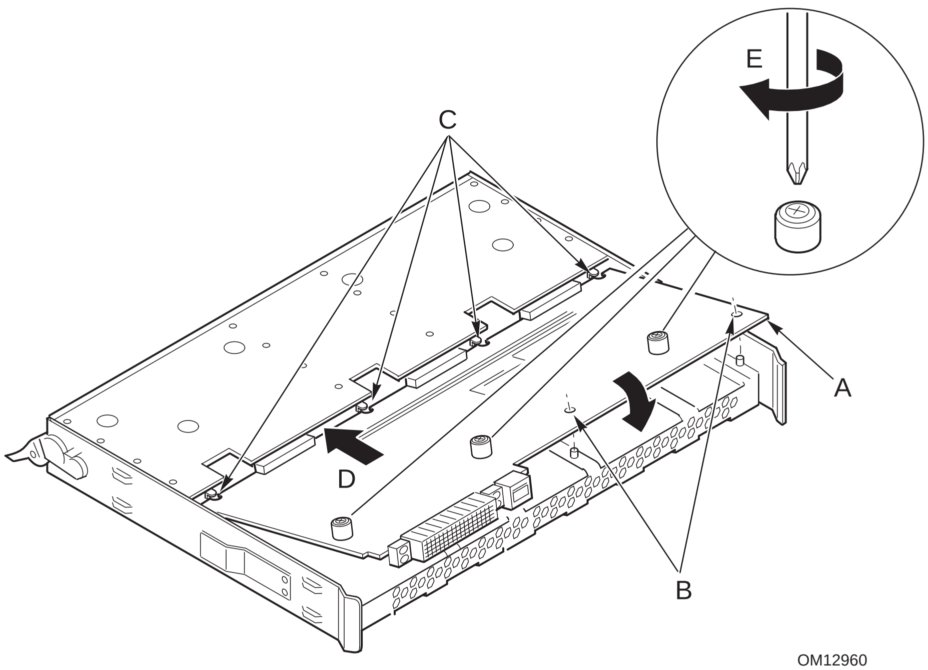


Figure 118. Installing the SCSI Backplane Board

9 Servicing the Power Supply Bay

The power supply bay mounts in the back of the chassis and provides space for two SSI compliant 48 VDC power supplies. The redundant AC power inputs enter the bay above the power supplies. The AC power is filtered with a combination 15 A power plug/filter. The cables are routed across, and mount behind, the power supplies.

Removing the Power Supply Bay

To remove the power supply bay:

1. Observe the safety and ESD precautions described in "Warnings and Cautions" on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the I/O bay.
4. Remove the top back cover.
5. Remove the hot-swap power supplies.
6. Loosen the two retaining screws (A in Figure 119).
7. Loosen the retaining screw (B in Figure 119) and lift the lever attached to retaining screw (C in Figure 119).
8. Pull the power supply bay toward the back of the chassis and verify pins (D in Figure 119) have cleared the slides.
9. Lift up the power supply bay and remove it from the chassis.

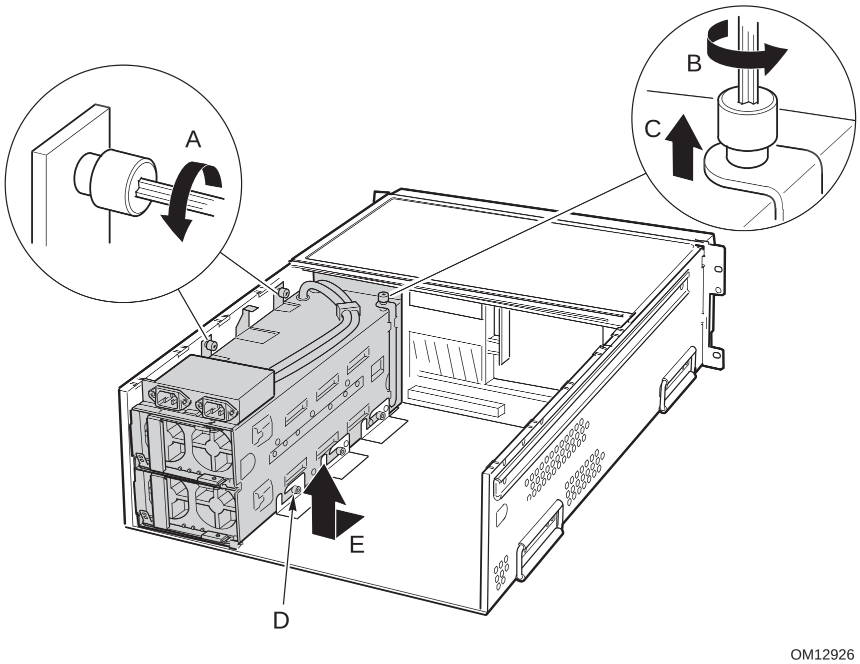


Figure 119. Removing the Power Supply Bay

Installing the Power Supply Bay

1. Verify that the hot-swap power supplies have been removed from the power supply bay.
2. Place the front of the power supply bay in the chassis as shown in Figure 120, and verify that the locating pins on the side of the power supply bay (A in Figure 120) engage the slots in the bottom of the chassis.
3. Grasp the captured retaining screw (B in Figure 120) and lift up the retaining bracket.
4. While holding the retaining bracket up, push the power supply bay forward until the locating pins reach the end of their travel in the slots (B in Figure 120).
5. Release the captured retaining screw and allow the retaining bracket to drop into place (C in Figure 120.
6. Tighten the retaining screw (D in Figure 120) securing the retaining bracket to securely dock the power supply bay.
7. Tighten the two retaining screws on the side of the chassis (E in Figure 120).

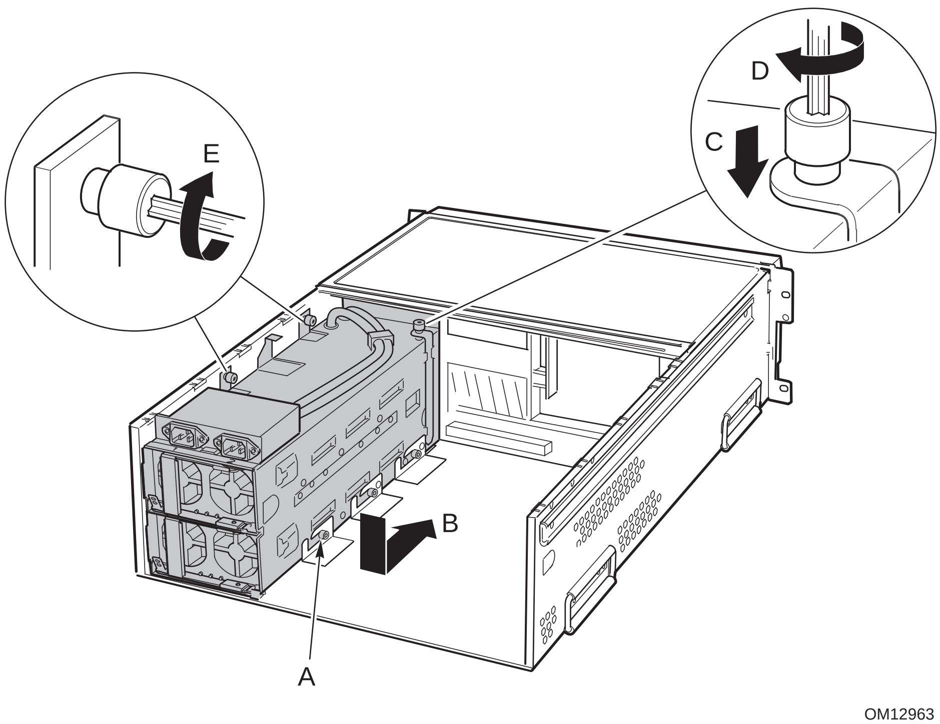


Figure 120. Installing the Power Supply Bay

8. Replace the hot-swap power supplies.
9. Replace the top back cover.
10. Replace the I/O bay.

Replacing the Power Distribution Board

The power distribution board provides the output power interface between the hot-swap power supplies and the midplane board. When the power supply bay is installed in the chassis, the power distribution board docks into the midplane board.

Removing the Power Distribution Board

To remove the power distribution board:

1. Remove the back top cover from the chassis.
2. Remove the I/O bay from the chassis and place it on a clean, static-free work surface.
3. Remove the hot-swap power supplies.
4. Remove the power supply bay from the chassis and place it on a clean, static-free work surface.
5. Loosen the captive screw inside the front of the power supply bay securing the power distribution board (A in Figure 121).
6. Remove the power distribution board as shown (B in Figure 121).

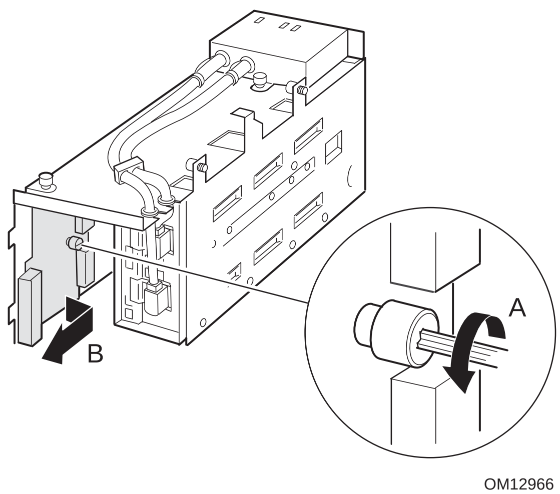


Figure 121. Removing the Power Distribution Board

Installing the Power Distribution Board

To install the power distribution board:

1. Place the power distribution board in the power supply bay as shown (A in Figure 122).
2. Tighten the captive screw inside the front of the power supply bay to secure the power distribution board (B in Figure 122).
3. Install the power supply bay in the chassis.
4. Install the hot-swap power supplies.
5. Install the I/O bay in the chassis.
6. Install the back top cover on the chassis.

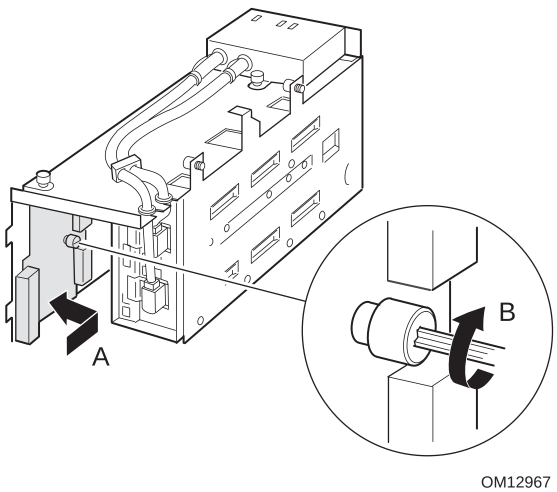


Figure 122. Installing the Power Distribution Board

Replacing the AC Input Filter Assembly

The AC input filter assembly provides redundant AC power connections from the back of the chassis to the back of the hot-swap power supply bay. It also preconditions the AC power and provides EMI isolation.

Removing the AC Input Filter Assembly

To remove the AC input filter assembly:

1. Remove the back top cover from the chassis.
2. Remove the I/O bay from the chassis and place it on a clean, static-free work surface.
3. Remove the hot-swap power supplies and place them on a clean, static-free work surface.
4. Remove the power supply bay from the chassis.
5. Remove the two screws and brackets (A in Figure 123) securing the two AC plugs in the front of the power supply bay.
6. Loosen the captive screw (B in Figure 123) that secures the filter assembly (C in Figure 123) to the chassis. Slide the filter assembly back to clear the retaining tab feature in the back of the power supply bay and lift the filter assembly upward (see arrow D in Figure 123).
7. Remove the two screws securing the grounding terminals (E in Figure 123).
8. Slide the two power cable grommets out of their respective slots in the power supply bay (F in Figure 123) and remove the AC input filter assembly.

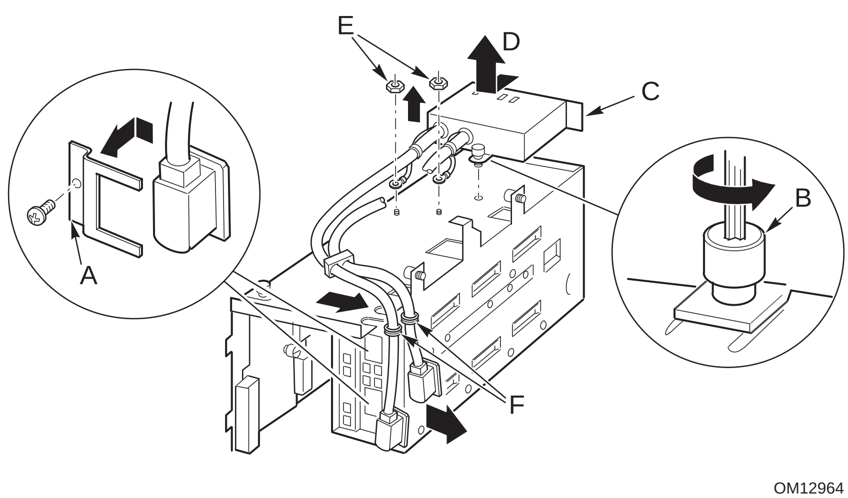


Figure 123. Removing the AC Input Filter Assembly

Installing the AC Input Filter Assembly

To install the AC input filter assembly:

1. Install the two screws securing the grounding terminals (A in Figure 124).
2. Slide the AC filter assembly under the retaining tab feature on top of the power supply bay and tighten the captive screw (B in Figure 124).
3. Slide the two power cable grommets into their respective slots in the power supply bay (C in Figure 124).
4. Install the two screws and brackets (D in Figure 124) that secure the two AC plugs in the front of the power supply bay.
5. Install the power supply bay in the chassis.
6. Install the hot-swap power supplies.
7. Install the I/O bay in the chassis.
8. Install the back top cover.

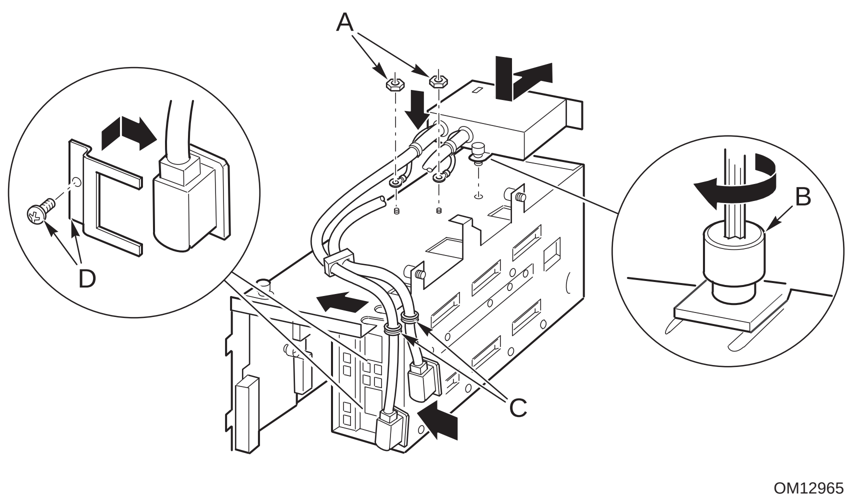


Figure 124. Installing the AC Input Filter Assembly

10 Servicing the Chassis

Replacing the Front Panel Board

The Front Panel Board resides next to the processor/memory module. You can access it by removing the bezel.

Removing the Front Panel Board

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the bezel by grasping the bezel by the flanges on either side and pulling the bezel forward.
4. If the chassis is installed in a rack, pull the chassis out of the rack far enough to access the front panel’s latch (A in Figure 125) on the side of the chassis.
5. Press the latch and simultaneously pull the front panel board forward (B in Figure 125).
6. Place the Front Panel Board on a clean ESD-protected work surface or in antistatic packaging.

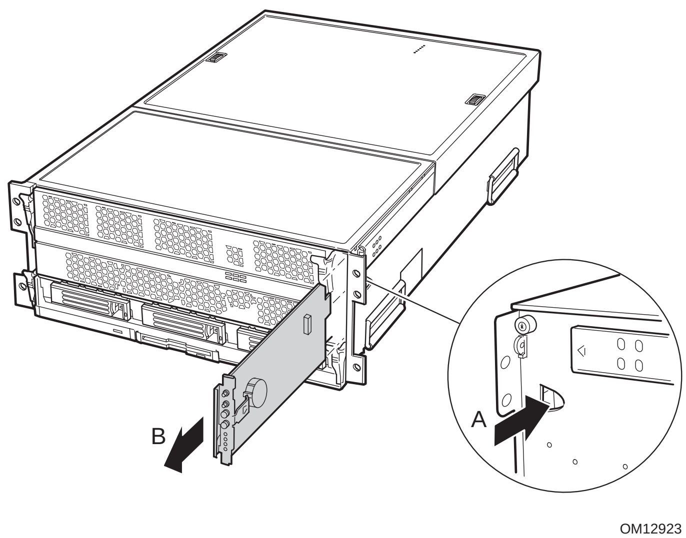


Figure 125. Removing the Front Panel Board

Installing the Front Panel Board

1. Carefully align the Front Panel Board in its slot on the front of the chassis.
2. Slide the Front Panel Board into the chassis.
3. Verify that the front panel board’s connector has seated properly.
4. Verify that the front panel board’s latch has seated properly.

Replacing the Midplane Board

The midplane board is attached to the inside wall dividing the front and back halves of the chassis. The midplane board receives the modules and provides signal and power paths to all components in the chassis.

Removing the Midplane Board

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
3. Remove the processor/memory module.
4. Remove the peripheral bay.
5. Remove the I/O bay.
6. Remove the front top cover.
7. Remove the front panel board.
8. Remove the power supply bay.
9. Grasp the pull-pin knobs (A in Figure 126) securing the midplane board and pull them toward the front of the chassis to release the midplane board.
10. Remove the midplane board from the chassis (see arrow B in Figure 126) and place it on a clean ESD protected work surface.

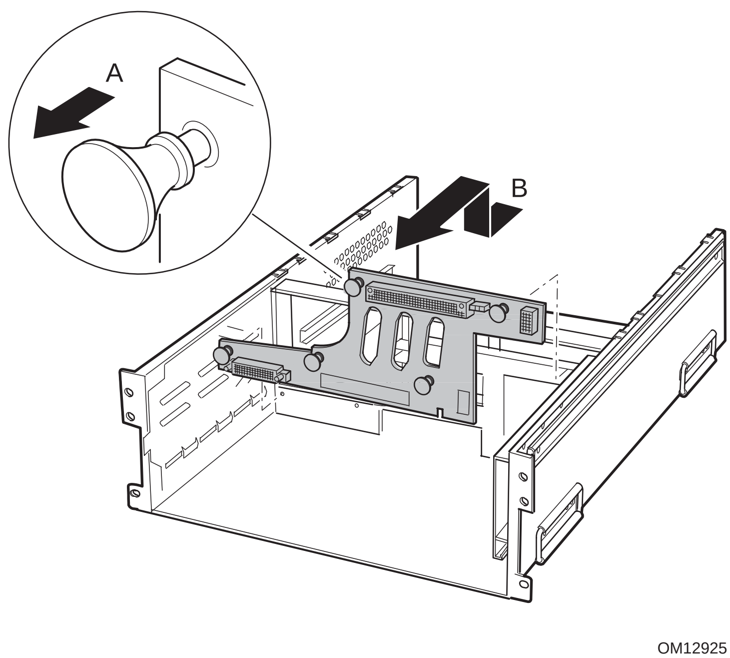


Figure 126. Removing the Midplane Board

Installing the Midplane Board

1. Position the midplane board and place in the chassis as shown (A in Figure 127).
2. Grasp the pull-pin knobs securing the midplane board and push them toward the back of the chassis (B in Figure 127) to attach the midplane board.

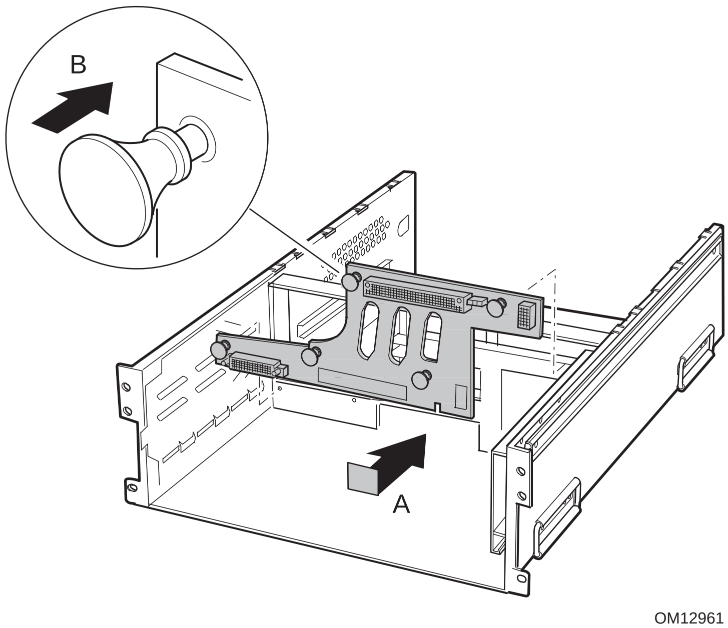


Figure 127. Installing the Midplane Board

3. Install the power supply bay.
4. Install the front panel board.
5. Install the front top cover.
6. Install the I/O bay.
7. Install the peripheral bay.
8. Install the processor/memory module.

11 Technical Reference

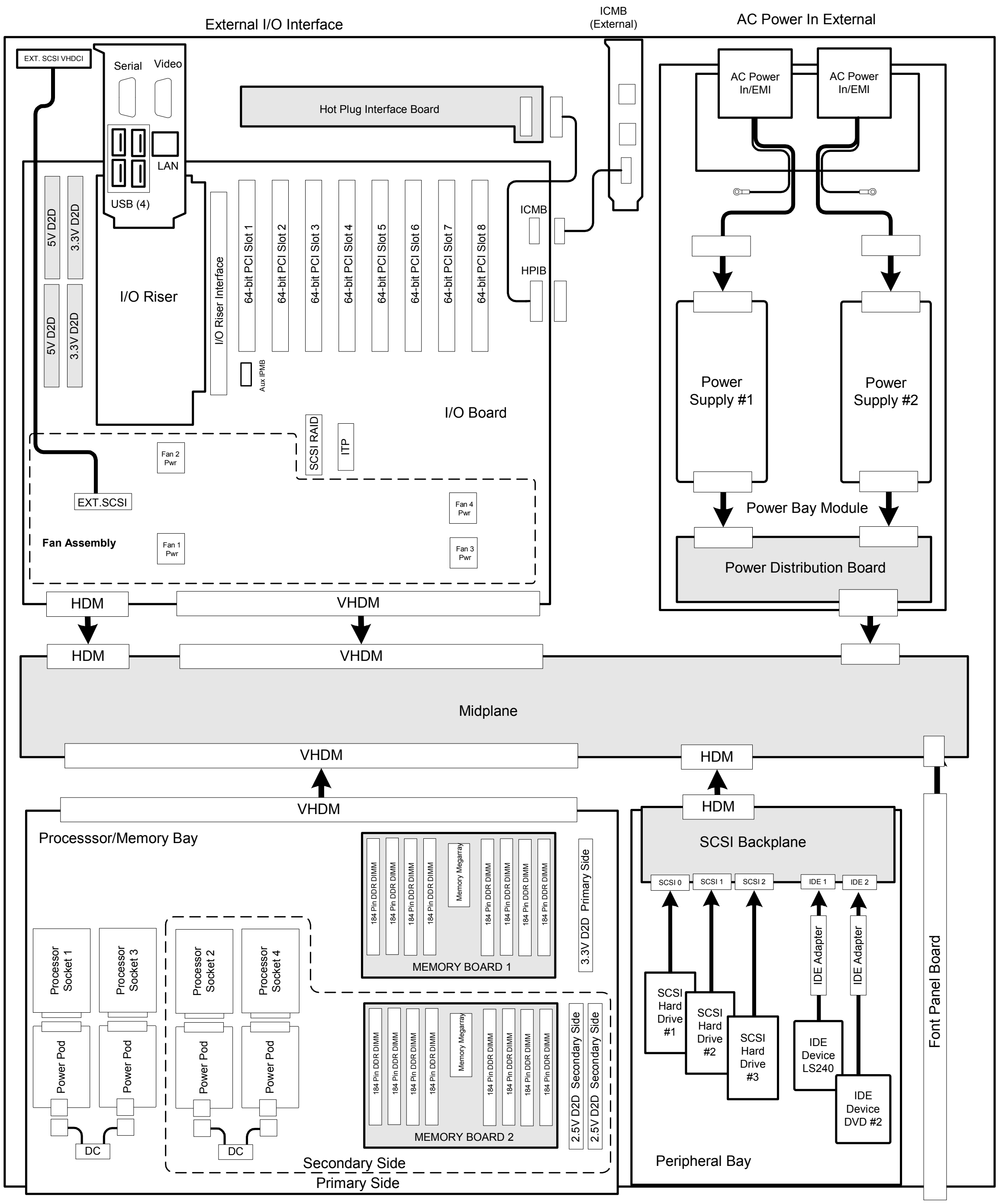


Figure 128. Interconnect Block Diagram

System Interconnection

Table 35 lists the system connectors. The system connectors are used to connect to mains power, supply power, and signals throughout the board set, and to provide interface with external components.

Table 35. Cable and Connector Descriptions

Type	Qty	From	To	Interconnect Description
Serial	1	I/O riser	External interface	9-pin serial port
USB	4	I/O riser	External interface	1x4 pin USB cables
Ethernet	1	I/O riser	External interface	RJ45 connector port
Video	1	I/O riser	External interface	15-pin, monitor device
I/O Riser Connector	1	I/O board	I/O riser	Slot 1, 242—pin card edge connector
External Wide Ultra320 SCSI, Port 2	1	I/O board	External interface	68-pin solid core twisted pair round cable to panel mounted external interface connector
ICMB internal	1	I/O board	ICMB board	2x5 pin ribbon cable
ICMB external (Optional)	2	ICMB board	External interface	6-pin SEMCONN* connector to shielded ICMB cable
HPIB	1	I/O board	HPIB board	2x20 flat ribbon cable
AC Distribution (Filter Side)	2	Power cord	Power supply cage	3-pin PVC double insulated power cordage (15-A AC filter on one side and 15A IEC320 Plug on Power Supply End)
AC Power	2	AC distribution (filter side)	External interface	Recommend 3-pin SJT power cord with IEC320-13 Receptacle
DC main power	2	Power supply	Power Distribution Board (PDB) board	4x6 pin signal + two blade SSI blind mate connector
DC main power	1	PDB board	Midplane	4x6 pin signal + two power blade SSI blind mate connector
VHDM (I/O Board)	1	I/O board	Midplane	6x60 signal pins + three power blades
VHDM (Processor board)	1	Processor board	Midplane	6x60 signal pins + three power blades
HDM (SCSI backplane)	1	I/O board	SCSI backplane	6x24 signal pins (NOTE: SCSI backplane side has four HDM power blades to Midplane only)
+5 V DC-to-DC (I/O board)	2	I/O board	+5 V DC-to-DC	2x35 ISA card edge connector (keyed for 5 V)
+3.3 V DC-to-DC (I/O board)	2	I/O board	VID DC-to-DC	2x35 ISA card edge connector (keyed for VID)

continued

Table 37. Cable and Connector Descriptions (continued)

Type	Qty	From	To	Interconnect Description
64-bit PCI-X connector	8	I/O board	PCI adapter card	188-pin PCI card edge connector
System Fan	4	I/O board	Fan module	2x3 Minifit Jr* blind mate connector
ITP	1	I/O board	Internal interface	2x13 header
Aux IPMB	1	I/O board	Internal interface	1x3 header
Front panel	1	Midplane	Front panel board	2x7 ISA card edge connector
Processor Signals	4	Processor	Processor board	700-pin Intel Itanium 2 Zero Insertion Force (ZIF) socket
Processor Power	4	Processor Power Pod	Processor	14-pin card edge connector
Processor Power Pod	2	Processor board	Processor Power Pod	Discrete cable (1x4 Mate-N-Lok on processor board and 1x4 Minifit Jr to processor power pod)
ISP	1	Processor board	Internal interface	2x4 header
ITP	1	Processor board	Internal interface	2x13 header
+3.3 V DC-to-DC (Processor board)	1	Processor board	VID DC-to-DC	2x35 ISA card edge connector (keyed for VID)
+2.5 V DC-to-DC (Processor board)	2	Processor board	VID DC-to-DC	2x35 ISA card edge connector (keyed for VID)
Memory Board Connector	2	Processor board	Memory board	400-pin MegArray† connector
Memory	16	Memory board	DDR memory	184-pin card edge connector
SCA-2 Hard Disk Drive (HDD) connectors	3	SCSI backplane	1-inch SCSI HDD	80-pin SCA-2 connector
½-inch IDE adapter	3	SCSI backplane	½-inch DVD adapter or ½-inch LS-240 adapter	(NOTE: SCSI backplane has three connectors but only two are used in the SR870BN4 system)
½-inch DVD device	1	½-inch DVD adapter	½-inch DVD (or RW-CD) device	2x25 pin JAE† connector
½-inch LS-240 device	1	½-inch LS-240 adapter	½-inch LS-240 device	2x25 pin JAE connector

User Accessible Interconnects

Serial Port

The I/O riser card provides one RS-232C serial port. The serial port uses a D-subminiature 9-pin connector. The serial port can be used either as an emergency management port or as a normal serial port. As an Emergency Management Port (EMP), the serial port is used as a communication path by the Server Management RS-232 connection to the BMC. This provides a level of emergency management through an external modem or direct serial connection. The RS-232 connection can be monitored by the BMC when the system is in a powered down (standby) state. Figure 129 shows the serial port connector, and Table 46 provides the pinout information.

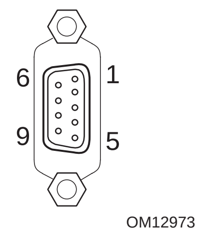


Figure 129. Serial Ports A and B

Table 36. Serial Port Connector Pinout

Pin	Signal	Description
1	DCD_L	Data carrier detected
2	RXD	Receive data
3	TXD	Transmit data
4	DTR_L	Data terminal ready
5	GND	Ground
6	DSR_L	Data set ready
7	RTS_L	Request to send
8	CTS_L	Clear to send
9	RI_L	Ring indicator

Video Port

The I/O riser card provides a video port interface with a standard VGA compatible 15-pin connector (see Figure 130). The connector pin assignments are found in Table 37.

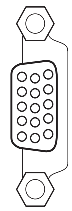


Figure 130. Video Connector

Table 37. Video Connector Pinout

Pin	Signal	Description
1	VID_R	Analog color signal red
2	VID_G	Analog color signal green
3	VID_B	Analog color signal blue
4	N/C	No connection
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	N/C	No connection
10	GND	Ground
11	N/C	No connection
12	MONID1	Supports DDCx, “ Display Data Channel Standard
13	VID_HSYNC	Horizontal sync
14	VID_VSYNC	Vertical sync
15	MONID2	Supports DDCx, “Display Data Channel Standard

Universal Serial Bus (USB) Interface

The I/O riser card provides two sets of double-stacked USB ports. These built-in USB ports permit the direct connection of four USB peripherals without an external hub. If more devices are required, an external hub can be connected to any of the built-in USB ports.

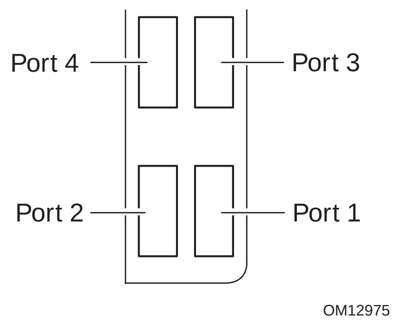


Figure 131. USB Connectors

Table 38. USB Connector Pinout

Port Designation	Pin Number	Signal Name	Signal Description
Port 1	A1	Fused Voltage Controlled Current (VCC)	+5 V with overcurrent monitor of both port 1 and 2
	A2	USBPxM	Differential data line
	A3	USBPxP	Differential data line
	A4	GND	Ground
Port 2	B1	Fused VCC	+5 V with overcurrent monitor of both port 1 and 2
	B2	USBPxM	Differential data line
	B3	USBPxP	Differential data line
	B4	GND	Ground
Port 3	P5	Fused Voltage Controlled Current (VCC)	+5 V with overcurrent monitor of both port 3 and 4
	P6	USBPxM	Differential data line
	P7	USBPxP	Differential data line
	P8	GND	Ground
Port 4	P1	Fused VCC	+5 V with overcurrent monitor of both port 3 and 4
	P2	USBPxM	Differential data line
	P3	USBPxP	Differential data line
	P4	GND	Ground

Note: ‘x’ indicates port in question.

Ethernet Connector

The I/O riser card provides one 10/100/1000 Ethernet port with a RJ45 network connector. The Intel 82540EM Gigabit Ethernet controller controls the Ethernet port.

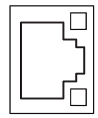


Figure 132. Ethernet Connector

Table 39. Video Connector Pinout

Pin	Signal	Description
9	VCT	Center tap
10	D1+	Data 1 plus
11	D1-	Data 1 minus
12	D2+	Data 2 plus
13	D2-	Data 2 minus
14	D3+	Data 3 plus
15	D3-	Data 3 minus
16	D4+	Data 4 plus
17	D4-	Data 4 minus
18	GND	Ground
19	LED1_AN	LINK
20	LED1_CA	ACTIVE
21	LED_COMB_1	Speed 100
22	LED_COMB_2	Speed 1000

Ultra320 SCA-2 HDD Connector

The SCSI backplane board provides three SCA-2 connectors for hot-swapping Ultra320 hard drives. SCSI port 0 of the dual-channel LSI† 53C1030 SCSI controller located on the I/O baseboard controls the ports. The connector pin assignments are listed in Table 40.

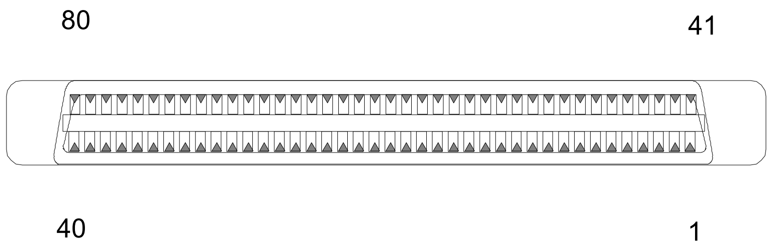


Figure 133. SCA-2 Connector

Table 40. SCA-2 Connector Pinout

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	12 V Charge	21	-DB(7)	41	12 V Ground	61	+DB(7)
2	12 V Charge	22	-DB(6)	42	12 V Ground	62	+DB(6)
3	12 V Charge	23	-DB(5)	43	12 V Ground	63	+DB(5)
4	12 V Charge	24	-DB(4)	44	Mated 1	64	+DB(4)
5	Reserved/ESI-1	25	-DB(3)	45	-EFW	65	+DB(3)
6	Reserved/ESI-2	26	-DB(2)	46	DIFFSNS	66	+DB(2)
7	-DB(11)	27	-DB(1)	47	+DB(11)	67	+DB(1)
8	-DB(10)	28	-DB(0)	48	+DB(10)	68	+DB(0)
9	-DB(9)	29	-DB(P1)	49	+DB(9)	69	+DB(P1)
10	-DB(8)	30	-DB(15)	50	+DB(8)	70	+DB(15)
11	-I/O	31	-DB(14)	51	+I/O	71	+DB(14)
12	-REQ	32	-DB(13)	52	+REQ	72	+DB(13)
13	-C/D	33	-DB(12)	53	+C/D	73	+DB(12)
14	-SEL	34	5 V Charge	54	+SEL	74	Mated 2
15	-MSG	35	5 V Charge	55	+MSG	75	5 V Ground
16	-RST	36	5 V Charge	56	+RST	76	5 V Ground
17	-ACK	37	Spindle Sync	57	+ACK	77	Active LED Out
18	-BSY	38	MTRON	58	+BSY	78	DLYD_START
19	-ATN	39	SCSI ID (0)	59	+ATN	79	SCSI ID (1)
20	-P_CRCA	40	SCSI ID (2)	60	+P_CRCA	80	SCSI ID (3)

External Ultra320 SCSI Connector (Optional)

The server system supports an optional shielded external SCSI connection on the back panel. This port is controlled by SCSI port 1 of the dual-channel LSI 53C1030 SCSI controller located on the I/O baseboard. To implement this feature, the optional External SCSI Cable must be installed.

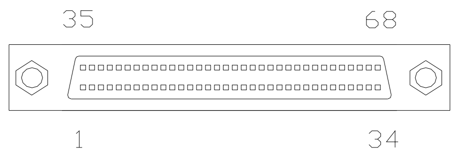


Figure 134. External SCSI Connector

Table 41. External SCSI Connector Pinout

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+DB(12)	18	TERMPWR	35	-DB(12)	52	TERMPWR
2	+DB(13)	19	NC	36	-DB(13)	53	NC
3	+DB(14)	20	GND	37	-DB(14)	54	GND
4	+DB(15)	21	+ATN	38	-DB(15)	55	-ATN
5	+DB(P1)	22	GND	39	-DB(P1)	56	GND
6	+DB(0)	23	+BSY	40	-DB(0)	57	-BSY
7	+DB(1)	24	+ACK	41	-DB(1)	58	-ACK
8	+DB(2)	25	+RST	42	-DB(2)	59	-RST
9	+DB(3)	26	+MSG	43	-DB(3)	60	-MSG
10	+DB(4)	27	+SEL	44	-DB(4)	61	-SEL
11	+DB(5)	28	+C/D	45	-DB(5)	62	-C/D
12	+DB(6)	29	+REQ	46	-DB(6)	63	-REQ
13	+DB(7)	30	+I/O	47	-DB(7)	64	-I/O
14	+P_CRCA	31	+DB(8)	48	+P_CRCA	65	-DB(8)
15	GND	32	+DB(9)	49	GND	66	-DB(9)
16	DIFFSENS	33	+DB(10)	50	GND	67	-DB(10)
17	TERMPWR	34	+DB(11)	51	TERMPWR	68	-DB(11)

ICMB (Optional)

The Intelligent Chassis Management Bus (ICMB) provides external access to Intelligent Management Bus (IMB) devices that are within the chassis. This makes it possible to externally access chassis management functions, alert logs, post-mortem data, etc. ICMB also provides a mechanism for chassis power control. As an option, the server can be configured with an ICMB adapter board to provide two SEMCONN† 6-pin connectors to allow daisy-chained cabling. The ICMB connectors support the connector ID feature. Figure 135 shows the connector at the I/O board side, while Table 42 provides the pinout information.

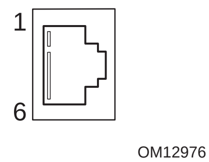


Figure 135. ICMB Connector

Table 42. ICMB Connector Pinout

Pin	Signal
1	GND (ground)
2	No connection
3	Tx/Rx+ (differential data line)
4	Tx/Rx- (differential data line)
5	Conn ID+ (differential connector ID line)
6	Conn ID- (differential connector ID line)

Jumper Information

This section provides general information on changing jumper settings as well as specific jumper configuration for individual boards in the system.

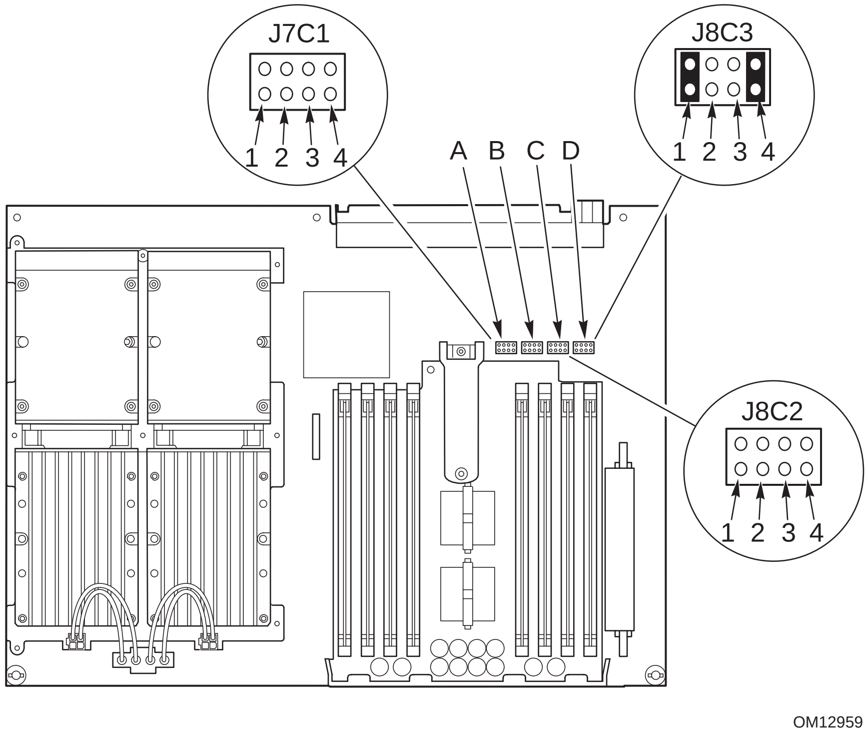
Changing Jumper Settings

To change a jumper setting:

1. Observe the safety and ESD precautions described in “Warnings and Cautions” on page 179.
2. Turn off all connected peripherals.
3. Power down the system by pressing and holding for several seconds the power button on the front of the chassis. After the server shuts down, unplug both AC power cords to remove standby power from the server.
4. Open the chassis and access the board with the appropriate jumper. Locate the configuration jumper blocks on the board. For specific jumper block locations, refer to the remaining sections in this chapter.
5. Move jumper to pins specified for the required setting. For specific jumper block settings, see below.
6. Reinstall any boards or components that was removed in order to access jumper blocks.

Configuring Processor Board Jumpers

The processor board has three jumper blocks: J7C1, J8C2, and J8C3. J8C1 is located among the jumper blocks but is the ISP header. Figure 136 shows the jumper blocks, and Table 43 describes the jumper pins.



A J7C1 – JTAG Scan Chain Select

B J8C1 - ISP Header Connector Interface Signals

C J8C2 – Processor Core Ratio Select

D J8C3 – Miscellaneous Jumpers

Figure 136. Jumpers J7C1 and J8C3

Table 43. Processor Board Jumpers

Signal	Description
J7C1	
TDI	TDI to SNC_TDI configuration (Pins 1-2) Jumper stuffed (default)= Shorts TDI to SNC_TDI (Pins 3 – 4 should not have a jumper) No Jumper = Nothing (expected Pins 3 – 4 to be stuffed)
TDI	TDI to SNC_TDO configuration. (Bypass SNC) (Pin 3 – 4) Jumper Stuffed = Shorts TDI to PROC4_TDI (Pins 1 – 2 should not be stuffed) No Jumper (default) = Nothing (expects Pins 1 – 2 to be stuffed)
JMPR_TRST_L	Drives JMPR_TRST_L low (Pins 5 – 6) Jumper stuffed = JMPR_TRST_L is asserted or active position Jumper not stuffed (default) = JMPR_TRST_L is pulled high
EXTERNAL_EN	Determines the level of EXTERNAL_EN Jumper stuffed (default) = EXTERNAL_EN is Low which adds the processor board to the global ISP chain and prevent local programming of the PLD's (active state) Jumper un-stuffed = EXTERNAL_EN is high which removes the processor board from the global ISP chain and allow local programming of the PLDs
J8C2 (see Table 44 for additional details)	
CPU_RATIO2	Bit 2 of CPU Core Ratio (active state is to stuff jumper) (Pins 1-2)
CPU_RATIO3	Bit 3 of CPU Core Ratio (active state is to stuff jumper) (Pins 3-4)
CPU_RATIO4	Bit 4 of CPU Core Ratio (active state is to stuff jumper) (Pins 5-6)
CPU_RATIO5	Bit 5 of CPU Core Ratio (active state is to stuff jumper) (Pins 7-8)
J8C3	
JMPR_FWH_ID_L	Swaps addresses between FWHs 0 and 1 (Pins 1-2) Stuffed jumper = FWHs IDs swapped (active state) No Jumper (default) = Normal operation
N/C	(Pins 3-4, 5-6)
FWH0TBL_L	Write protects the boot block for FWH0 Jumper stuffed = FWH0TBL_L is high, which allows the 64K boot block for FWh0 to be written to Jumper un-stuffed (default) = FWH0TBL_L is deasserted, which write protects the 64K boot block of FWH0 (active position)
N/C	N/A

✏ **NOTE**

Pins 6 and 8 on J7C1 are ground. Pins 1, 3, 5 and 7 on J8C2 are ground.
Pin 2 of J8C3 is ground.

Table 44. J8C2 CPU Core Ratio Jumpers

Ratio	CVDR 20 1-2	CVDR 19 3-4	CVDR 18 5-6	CVDR 17 7-8
2/8	1	0	0	0
2/9	1	0	0	1
2/10	1	0	1	0
BMC Control*	0	0	0	0

1=Jumper Installed

* Default = No jumpers installed

I/O Riser Card Settings

The I/O riser card has one 5-pin jumper (J1A2), and one DIP switch (S8A1) as shown in Figure 137. The jumper provides hot-plug disable and Fault Resilient Boot (FRB) disable. The DIP switch provides recovery boot, clear password, clear CMOS, and BMC update. Placing the switch in the on position enables the function. The default is all switches off. Refer to Table 45 for details.

NOTE

Return the DIP switches to their default settings and reboot the system before resuming normal operation.

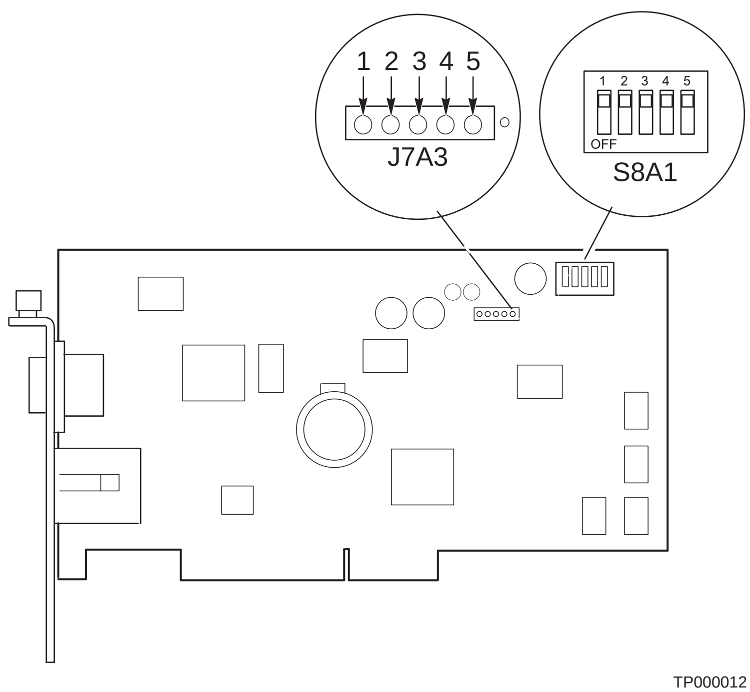


Figure 137. I/O Riser Card DIP Switch (S8A1) and Jumpers (J1A2)

Table 45. I/O Riser Card Settings

J7A3	PCI hot-plug disable (Jumper pins 1 and 2)

	Fault Resilient Boot (FRB3) disable (Jumper pins 4 and 5)	
S8A1	Switch 1 Recovery Boot:	Switch 1 controls whether the system attempts to boot using BIOS programmed in flash memory. By default, the system does not perform a recovery boot using the BIOS. OFF: System boots from BIOS programmed in flash memory. (Default Setting) ON: System initiates BIOS recovery boot procedure
	Switch 2 Clear Password:	Switch 2 controls whether a stored password is retained or cleared during a system reset. By default the system retains this password. OFF: Retains the System Password on Reset (Default Setting) ON: Clears the System Password on Reset
	Switch 3 Clear CMOS:	Switch 3 controls whether settings stored in CMOS non-volatile memory (NVRAM) are retained during a system reset. By default, the system does not keep the default values in this register. You can configure switch 3 to clear CMOS and restore the system defaults. OFF: Keep current values in the CMOS Register (Default setting) ON: Clear the CMOS Register and Restore the System Default Values
	Switch 4 Not Used	
	• Switch 5 BMC Update:	Switch 5 controls whether the BMC is in a firmware transfer mode and forces an update to the BMC code. OFF BMC Programming non-Forced (Default setting in production) ON: BMC Programming Forced (Default setting in pre-beta)

I^{2}C Post Code Headers

Both the I/O riser and the memory board have 5-pin headers (with the fourth pin removed) for the I^{2}C POST-code card. The headers are J3A1 on the I/O riser card and J6C1 on the memory board. The I^{2}C signals are from the ICH2's SMB bus. The data and clock signals are pulled up to 3.3 V standby. Table 46 shows the pin assignments.

Table 46. J3A1 and J6C1 I^{2}C Post Code Headers

Pin	Signal
1	12 V Standby
2	SMBDATA
3	SMBCLK
4	NC – pin removed
5	Ground

Determining DC-to-DC Converter Status

Each DC-to-DC converter has an LED indicator that shows power availability and status. The LED state indicators for embedded and plug-in converters are not the same. Refer to Table 47 and Table 48 for details about the appropriate converter.

Table 47. Embedded DC-to-DC Converter LED Indicators

AC Power not Present Amber LED	AC Power Present System Powered Off Amber LED	AC Power Present System Powered On Amber LED	Description
Off			No AC power to any power supply or DC-to-DC
	On		AC present / Standby output on
		Off	AC present / Standby output on DC-to-DC outputs on and okay
		On	AC present / Standby output on DC-to-DC failure DC-to-DC not installed

Table 48. Plug-In DC-to-DC Converter LED Indicators

AC Power not Present Amber LED	AC Power Present System Powered Off Amber LED	AC Power Present System Powered On Amber LED	Description
Off			No AC power to any power supply or DC-to-DC
	Off		AC present / Standby output on
		Off	AC present / Standby output on DC-to-DC outputs on and okay
		On	AC present / Standby output on DC-to-DC failure DC-to-DC not installed

A POST Error Codes and Messages

Table 49 lists POST codes issued by SAL to I/O Port 0x80/0x81 during boot. The POST codes are listed in the order of occurrence.

Depending on the code flow, some of the following POST codes will be displayed on an I^2C debug card connected to the memory board and/or I/O board. This port 80 card is a custom device attached to I^2C ports in two different places on the server. One port 80 device serves the north flash ROM and the other serves the south flash ROM.

NOTE

Some POST codes are not displayed here because of timing and interaction delays with the BMC.

The SR870BN4 server employs a novel POST code scheme utilizing port 80h and 81h. This gives the SR870BN4 16 bits to encode.

The following rules apply to the POST code encoding:

- Bit 15: 1 – IA64 code being executed, 0 – IA32 code being executed
- Bit 14: 1 – system stopped due to known failure, 0 – progress indication
- All other module bits remain unmodified
- Bit 13: 1 – fault or trap (no change in module numbers), 0 – normal execution

In case of fault or trap, only bit 13 is set and other bits are left on modified. This allows detection of which module produced the fault.

- Bit 12: Reserved
- Bit 11-4: Module type
- Bit 3-0: Sub module type

The module number and sub-module number are in 4-bit boundary to allow us to decode quickly by the numbers. The module number identifies the major module such as Memory, PCI, ACPI and etc. The sub-module identifies the sub-function such as SPD read in progress, ECC error, or DIMM mismatch for Memory module.

Module names and numbers are listed in the following tables.

(Secret Decoder: Bit 11:8 – 0xF stack-less code being executed, 0xD-0x0 – memory is available.)

POST Code Module Numbers

Table 49. General IA64 POST Code Module Numbers

Code Value (bit 8 = 1, bits 11:4 shown below)				Module	Display
0xFF				Reserved	North
0xFE				Reset Condition	North
0xFD				Node BSP selection	North
0xFC				Early node init (SNCPEIM)	North
0xFB				Processor health/setup (CVDR PEIM)	North
0xFA				PAL/FW health status	North
0xF9-F7				Memory Initialization	North
Sub Modules Bits				**Memory Initialization**	
15:12	11:8	7:4	3:0		North
8	F	7	0	Pass1 Entry	
8	F	7	1	RAC Initialization (Mem_DoRacInitialization())	
8	F	7	2	Validate DIMMs (Mem_ValidateInstalledConfiguration())	
8	F	7	3	Program MIRs/MITs (Mem_DoMirMitProgram())	
8	F	7	4	Calculate CAS (Mem_CalcSysCas())	
C	F	7	4	Calculate CAS Error Loop	
8	F	7	5	Program CAS (Mem_SetMrhdCasLatency())	
8	F	7	6	Set Mrhd DIMM Geometry (Mem_SetMrhdDimmGeometry())	
8	F	7	7	Perform SLEW rate calibration (Mem_DoSlewRateCalibration)	
8	F	7	8	Mem_InitDimmAndSetCasLatencyAndBurst()	
8	F	7	9	DDR delay Calibration (Mem_DoDdrDelayCalibration())	
8	F	8	0	DIMM path latency Calibration	
8	F	8	1	DIMM Strobe Delay Calibration	
8	F	8	2	Configure SNC timing	
8	F	8	3	Set timings for write pattern	
8	F	9	0	Levelization	
8	F	9	8	Reconfigure memory	
C	F	9	F	Levelization failed. No Memory Found	
0xF6				Memory Test	North
0xF5				Platform Discovery	North
0xF4-F3				SBSP selection & Platform Init	North
0xF2				Memory Autoscan (stackless)	North

continued

Table 49. General IA64 POST Code Module Numbers (continued)

Code Value (bit 8 = 1, bits 11:4 shown below)				Module	Display
Sub Modules Bits				**Memory Autoscan**	
15:12	11:8	7:4	3:0		North
8	F	2	0	Pass1 Entry	
8	F	2	1	Process Auto Scan Input	
8	F	2	2	Execute Auto scan (C- code)	
8	F	2	3	Process Auto Scan Output	
0xF1				Recovery stackless	North
0xF0				Reserved	North
0xEF-0xEE				Memory Autoscan C-code	North
0xED-E8				Recovery C-Code	
0xE8-0xE6				HOB	North
0xE5-0xC1				Reserved	North
0xC0				SALA to SALB/DXE handoff	North
0xB0-0xBF				Reserved	North
0xAF-80				Reserved for SAL MCA, INIT, PMI	North
0x7F to 0x60				SAL-B codes SAL-B SAL_C SAL_F	 South South South
0x60				SAL to EFI handoff	South
0x5F to 0x50				EFI	South
0x4F to 0x40				ACPI	South

Specific POST Code Modules

SAL-A Module

Table 50. SAL-A POST Codes (BSP Only)

Code Number	Meaning	Display
0x8FE0	Reset Condition	North
0x8FD0	Node BSP selection	North
0x8FC0	Early node init (SNCPEIM)	North
0x8FB0	Processor health/setup (CVDR PEIM)	North
0x8FA0	PAL/FW health status	North
0x8F70	Memory Initialization Entry	North
0x8F71	RAC Initialization (Mem_DoRacInitialization())	North
0x8F72	Validate DIMMs (Mem_ValidateInstalledConfiguration())	North
0x8F73	Program MIRs/MITs (Mem_DoMirMitProgram())	North
0x8F74	Calculate CAS (Mem_CalcSysCas())	North
0xCF74	Calculate CAS Error Loop	North
0x8F75	Program CAS (Mem_SetMrhdCasLatency())	North
0x8F76	Set Mrhd DIMM Geomentry (Mem_SetMrhdDimmGeometry())	North
0x8F77	Perform SLEW rate calibration (Mem_DoSlewRateCalibration)	North
0x8F78	Mem_InitDimmAndSetCasLatencyAndBurst()	North
0x8F79	DDR delay Calibration (Mem_DoDdrDelayCalibration())	North
0x8F80	DIMM path latency Calibration	North
0x8F81	DIMM Strobe Delay Calibration	North
0x8F82	Configure SNC timing	North
0x8F83	Set timings for write pattern	North
0x8F90	Levelization	North
0x8F98	Reconfigure memory	North
0xCF9F	Levelization failed. No Memory Found	North
0x8F60	Memory Test	North
0x8F50	Platform Discovery	North
0x8F40	SBSP selection; ICHx device detection	North
0xCF40	ICHx device not found	North
0x8F50	Platform Init	North
0x8F20	Memory Autoscan entry	North
0x8F21	Process Auto Scan Input	North
0x8F22	Process Auto Scan Output	North
0x8F10	Recovery code entry	North
0x8EC0	Recovery Process Started	South
0x8EC1	Searching for Recovery Media	South
0x8EC2	Loading Recovery File	South
0x8EC3	Validating Recovery File	South
0x8EC4	Unlocking Flash Devices	South
0x8EC5	Erasing Flash Contents	South

Code Number	Meaning	Display
0x8EC6	Programming Flash Contents	South
0x8EC7	Validating Flash Contents	South
0x8EC8	Recovery Process Complete	South
0xCEC1	Recovery Reading error(display toggles)	South
0xCECx	Recovery programming error (display toggels)	South
0x8E80	PEIM Handoff block entry	North
0x8C00	SALA to SALB/DXE handoff	North
0x8AF0 to 0x8800	Reserved for MCA, INIT, PMI	North

SAL-B Module

Table 51. SAL-B POST Codes

Code Number	BSP, APs, Both	Meaning	Display
0x87FF	BSP+APs	First check point. Initialize cr.iva/ar.eflag/ar.cflg/cr.lrr0/cr.lrr1/cr.ifa/cr.itir	South
0x87FE	BSP onlyAndBSP+ APs	Initialize io_base address, CPU#, health, etc. for CPU's Initialize min_state_area for all CPU's (cpu_data_base+cpu_bspstore_base+cpu_health) cpu_data_base points to min state save area. TOM below and above 4G Allocate sal_mp_info_table data and sal_efi stack area and legacy_stack (temp) Initialize legacy stack top and bottom for temporary use during POST only. INT_15,(FN# F788 in EM code) uses INT-8 timer tick for frequency calculation. (BSP+APs) Save ID, EID, Initialize BSPSTORE,SP	South
0x87FD	BSP only	Search FIT for legacy BIOS	South
0x07FD	BSP only	Then hang, if not found If found copy top 64K legacy boot block ROM at xxxx:0000	South
0x87FC	BSP only	Search for legacy_nvm module (sal_legacy_nvm_module_1d)	South
0x07FC	BSP only	Then hang, if not found Else continue by saving in RAM	South
0x87FB	BSP only	Search for efi_nvm module (sal_efi_nvm_module_1e)	South
0x07FB	BSP only	Then hang, if not found Else continue by saving in RAM Reserve 128k memory for NVM emulation	South
0x87FA	BSP only	Search for acpi_dsdt module (sal_acpi_data_module_16) Ask for Address, size, type	South
0x07FA	BSP only	Then hang, if not found Else continue by saving in RAM	South

Table 51. SAL-B POST Codes (continued)

Code Number	BSP, APs, Both	Meaning	Display
0x87F9	BSP only	Search for addition information acpi_dsdt module Ask for size, align, and scratch buff size	South
0x07F9	BSP only	Then hang, if not found Else continue by saving in RAM	South
0x87F8	BSP only	Search for addition information acpi_dsdt module Initialize scratch buffer	South
0x07F8	BSP only	Then hang, if not found Else continue by saving in RAM	South
0x87F7	BSP only	Reserve ACPI_64 and ACPI_32 data area Reserve MP table data area Save SAL database & size SAL shadow top (PELoader + SAL_F)	South
0x87F6	BSP only	Cache flush after PELoader shadow	South
0x07F6	BSP only	Hang, on ERROR	South
0x87F5	BSP only	Search for information on SAL_F module (sal_f_module_12) By size, align, and scratch buff size	South
0x07F5	BSP only	Then hang, if not found or Information ERROR SAL shadow bottom (PELoader + SAL_F) Find SAL_F page size Align to next 32K boundary and save address and size	South
0x87F4	BSP only	Search for addition information SAL_F module Initialize scratch buffer	South
0x07F4	BSP only	Then hang, if not found Else continue by saving in RAM	South
0x87F3	BSP only	Cache flush after SAL shadowed	South
0x07F3	BSP only	Hang on ERROR	South
*0x87F2	BSP only	Initialize sal data top address Physical equals to virtual for runtime use and above 4G Load callbacks for byte/word checkpoint display entry and Address SAL PMI address EFI to SAL call back address SAL procedure address SAL SST base and address SAL procedure entry base inside SST Buildtime address where SAL_PROC entry is stored Buildtime GP Runtime GP SAL SST size	South

continued

Table 51. SAL-B POST Codes (continued)

Code Number	BSP, APs, Both	Meaning	Display
0x87F1	BSP only	Load PAL module	South
0x87F0	BSP+APs	BSP Shadow PAL module, initialize PAL shadow base, size, proc ptr initialize PAL procedure address entry & checksum AP's PAL PMI base will be set	South
0x07F0	BSP+APs	Hang on ERROR	South
0x87EF	BSP only	Cache flush after PAL shadow	South
0x07EF	BSP only	Hang on ERROR	South
0x87EE	BSP only	Find PAL shadow size + align through SAL call	South
0x07EE	BSP only	Hang on ERROR	South
0x87ED	BSP only	Find # of CPU's present in the system, # of CPU, # of IOAPIC	South
0x07ED	BSP only	Hang on ERROR	South
0x87EC	BSP only	Search for addition information EFI module (sal_efi_module_15) size, align, and scratch buff size. Initialize scratch buffer	South
0x07EC	BSP only	Hang if ERROR	South
0x87EB	BSP only	Save maximum (PAL,EFI) shadow size and alignment. Save PAL(ia32)/EFI shadow top address, size, alignment. EFI module shadow base address (virtual/Physical), size, bottom address (DATA+SAL+PAL+EFI). Update virtual address entries in translation register descriptor, addresses in MDT	South
0x87EA	BSP+APs	Cache flush shadow	South
0x07EA	BSP + APs	Hang on ERROR	South
0x87E9	BSP + APs	PAL call for memory Test for SELF TEST (pal_mem_for_test_25)	South
0x07E9	BSP + APs	Hang, if Memory ERROR	South
0x87E8	BSP + APs	PAL call for PAL test (pal_test_proc_102) and save results	South
0x07E8	BSP + APs	Hang, if late self test. NOTE: This can be skipped by a build switch	South
0x87E7	BSP + APs	PAL Call for pal_bus_get_features function # (pal_bus_get_features_09)	South
0x07E7	BSP + APs	Hang if ERROR	South
0x87E6	BSP + APs	Set buslock mask=1 (non-atomic) By PAL Call PAL Bus Set Feature (pal_bus_set_features_0a)	South
0x07E6	BSP + APs	Hang if ERROR	South
0x87E5	BSP + APs	Set PMI entry pointPAL Call (pal_pmi_entrypoint_20)	South
0x07E5	BSP + APs	Hang if ERROR	South
0x87E4	BSP + APs	PAL Cache Summary by PAL Call (pal_cache_summary_04)	South
0x07E4	BSP + APs	Hang if ERROR	South
0x87E3	BSP + APs	PAL Cache Information set. PAL Call cache_info_02	South
0x07E3	BSP + APs	Hang, if ERROR	South

continued

Table 51. SAL-B POST Codes (continued)

Code Number	BSP, APs, Both	Meaning	Display
0x87E2	BSP + APs	pal_mc_register_mem_1b/find CPU min state pointer Should be able now to initialize health, bsp/ap, cache size line size, sapic ver, and cpuid Set minimal state save area, BSPSTORE and SP	South
0x87E1	BSP + APs	Cache flush shadow	South
0x07E1	BSP + APs	Hang if ERROR	South
0x87E0	BSP + APs	Program IVA,ITR(0) for PAL,SAL runtime code & data area cr.iva/cr.ifa/cr.itir/itr[r0]	South
0x87DF	BSP + APs	Clear semaphore and wait for all CPUs to synchronize	South
0x87DE	BSP + APs	Sort CPU health. Already sorted for 2nd level BSP selection. Store BSP/AP flag for respective CPU	South
0x87DD	APs	Setup for interrupt wakeup re-initialization of BSPSTORE and SP if needed. Wait for interrupt wakeup	South
0x87DC	BSP only	Switch to virtual address Control register programming SET in PSR bn(44), it(36), rt(27), dt(17), ic(13) Clear task priority register=cr.tpr Clear interruption function state register-cr.ifs Set legacy BIOS cs.base and ss.base Set es,ds,fs,gs=0 with 4G limit Legacy BIOS module (eip) Give control at xxxx:e05b to IA32 code	South

SAL-F Module

Table 52. SAL-F POST Codes

Code Value	BSP, APs, Both	Meaning	Display
0x87BF	BSP	First check point. Check point in v6b00_83_ip2x. Update EBDA entry inside SST Create EFI memory descriptor Update SST checksum	South
0x87BE	BSP	Check point near v6b00_83_5 Search FIT for ACPI module (SAL_C_module_17) and get size, align, scratch buff size	South
0x07BE	BSP	Hang if ERROR	South
0x87BD	BSP	Load image by module type (sal_c_module_17). Use PELoader	South
0x07BD	BSP	Hang if not found. Get entry point, and GP value	South
0x87BC	BSP	Load image by module type (sal_c_module_17). Flush cache	South
0x07BC	BSP	Hang on ERROR. Build MP & ACPI table	South
0x87BB	BSP	Initialize memory manager (0x0) by call to SAL_C	South
0x07BB	BSP	Hang on ERROR	South
0x87BA	BSP	Feed system information (0x1) with call to SAL_C	South
0x07BA	BSP	Hang on ERROR	South
0x87B9	BSP	Initialize MP table v1.4 (0x2) with call to SAL_C	South
0x07B9	BSP	Hang on ERROR	South

continued

Table 52. SAL-F POST Codes (continued)

Code Value	BSP, APs, Both	Meaning	Display
0x87B8	BSP	Initialize IA32 ACPI v1.1 (0x3) with call to SAL_C	South
0x07B8	BSP	Hang on ERROR	South
0x87B7	BSP	Initialize IA64 ACPI v1.1 (0x4) with call to SAL_C	South
0x07B7	BSP	Hang on ERROR	South
0x87B6	BSP	Initialize IA32&IA64 ACPI v2.0 (0x5) with call to SAL_C	South
0x07B6	BSP	Hang on ERROR	South
0x87B5	BSP	Clear scratch memory (0xFFF) with call to SAL_C	South
0x07B5	BSP	Hang on ERROR	South
0x87B4	BSP	Search FIT for EFI module with call to PELoader. Get Size, align, and scratch buff size	South
0x07B4	BSP	Hang on ERROR. Get entry point, and GP value	South
0x87B3	BSP	Load image by module type (sal_c_module_17)	South
0x07B3	BSP	Hang on ERROR. Get entry point, and GP value	South
0x87B2	BSP	Flush cache with PAL call	South
0x07B2	BSP	Hang on ERROR	South
0x87B1	BSP	Build EFI input parameter table. Get EFI stack, bspstore etc. with EFI call	South
0x07B2	BSP	Hang on ERROR	South
0x87B0	BSP	Build EFI input parameter table. Get EFI stack, bspstore etc. with EFI call. Store EFI stack, bspstore etc. with EFI call. Call EFI and that should be end	South
0x07B0	BSP	Hang on ERROR if OK come back from EFI	South

IA32 Module

The IA32 POST codes all have the most significant bit (MSB) cleared by the convention established above. Also, the IA32 POST codes do not fall into the IA64 module definition above. The codes shown here are consistent with the 7.0 AMI core.

Table 53. IA32 POST Codes

Code Value	Module	Display
0x00D0	Power on delay is starting. Next, the initialization code checksum is verified.	South
0x00D1	Initializing the DMA controller, performing the keyboard controller BAT test, starting memory refresh, and entering 4GB flat mode next.	South
0x00D3	Starting memory sizing next.	South
0x00D4	Returning to real mode. Executing any OEM patches and setting up the stack next.	South
0x00D5	Passing control to the uncompressed code in shadow RAM at E000 0000h. The initialization code is copied to segment 0 and control is transferred to segment 0.	South

continued

Table 53. IA32 POST Codes (continued)

Code Value	Module	Display
0x00D6	Control is in segment 0. If the system BIOS checksum is bad, next goes to checkpoint code E0h. Otherwise, goes to checkpoint code D7h.	South
0x00D7	Passing control to the interface module next.	South
0x00D8	The main system BIOS runtime code will be decompressed next.	South
0x00D9	Passing control to the main system BIOS in shadow RAM next.	South
0x0003	Next, checking for a soft reset or a power on condition.	South
0x0005	The BIOS stack has been built. Next, disabling cache memory.	South
0x0006	Uncompressing the POST code next.	South
0x0008	The CMOS checksum calculation is done next.	South
0x000B	Next, performing any required initialization before the keyboard BAT command is issued.	South
0x000C	The keyboard controller input buffer is free. Next, issuing the BAT command to the keyboard controller.	South
0x000E	The keyboard controller BAT command result has been verified. Next, performing any necessary initialization after the keyboard controller BAT command test.	South
0x000F	The initialization after the keyboard controller BAT command test is done. The keyboard command byte is written next.	South
0x0010	The keyboard controller command byte is written. Next, issuing the Pin 23 and 24 blocking and unblocking commands.	South
0x0011	Check for INS key pressed. Get POST info.	South
0x0012	Disable DMA controllers 1 and 2 and interrupt controllers 1 and 2.	South
0x0013	The video display has been disabled. Next, initializing the chipset.	South
0x0014	The 8254 timer test begins next.	South
0x0019	The 8254 timer test is over. Starting the memory refresh test next.	South
0x001A	The memory refresh line is toggling. Checking the 15-second on/off time next.	South
0x0023	Reading the 8042 input-port and disabling the MEGAKEY Green PC feature next. Making the BIOS code segment writeable and performing any necessary configuration before initializing the interrupt vectors.	South
0x0024	The configuration required before interrupt vector initialization has completed. Interrupt vector initialization is about to begin.	South
0x0025	Interrupt vector initialization is done. Clearing the password if the POST DIAG switch is on.	South
0x0027	Any initialization before setting video mode is to be done next.	South
0x0028	Initialization before setting the video mode is complete. Configuring the monochrome mode and color mode settings next.	South
0x002A	Bus initialization system, static, output devices is to be done next, if present. Starting LAN redirection, displaying redirection console message.	South

continued

Table 53. IA32 POST Codes (continued)

Code Value	Module	Display
Note that there are 15-bit postcodes in this area. These indicate Device Initialization Manager sub-codes	The convention for the DIM POST codes is as follows: Port 80 = 0x2A Port 81 = DIM Function number | DI number	South
0x002B	Passing control to the video ROM to perform any required configuration before the video ROM test.	South
0x002C	All necessary processing before passing control to the video ROM is done. Looking for the video ROM next and passing control to it.	South
0x002D	The video ROM has returned control to BIOS POST. Performing any required processing after the video ROM had control.	South
0x002E	Completed post-video ROM test processing. If the EGA/VGA controller is not found, performing the display memory read/write test next.	South
0x0037	The display mode is set. Displaying the power on message next.	South
0x0038	Initializing the bus input, IPL, and general devices next, if present.	South
0x0039	Late processor self test. Displaying bus initialization error messages.	South
0x003A	The new cursor position has been read and saved. Displaying the Hit F2 message.	South
0x0053	The memory size information and the CPU registers are saved.	South
0x0054	Shutdown was successful. Disabling the Gate A20 line, and parity next.	South
0x0057	The A20 address line, parity disabled. Adjusting the memory size depending on relocation and shadowing next.	South
0x0058	The memory size was adjusted for relocation and shadowing. Clearing the Hit F2 message.	South
0x0059	The Hit F2 message is cleared. Starting the DMA and interrupt controller test next.	South
0x0060	The DMA page register test passed. Performing the DMA Controller 1 base register test next.	South
0x0062	The DMA controller 1 base register test passed. Performing the DMA controller 2 base register test next.	South
0x0065	The DMA controller 2 base register test passed. Programming DMA controllers 1 and 2 next.	South
0x0066	Completed programming DMA controllers 1 and 2. Initializing the 8259 interrupt controller next.	South
0x007F	-	South

continued

Table 53. IA32 POST Codes (continued)

Code Value	Module	Display
0x0080	Mouse initialization of PS/2 mouse to program the IRQ level to edge triggered or level triggered. The keyboard test has started. Clearing the output buffer and checking for stuck keys. Issuing the keyboard reset command next.	South
0x0082	The keyboard controller interface test completed. Write the command byte and initializing the circular buffer next.	South
0x0083	The command byte was written and global data initialization has completed. Checking for a locked key next.	South
0x0084	Locked key checking is over. Identify ATAPI devices.	South
0x0089	The programming after Setup has completed. Displaying the power on screen message next.	South
0x008B	Init boot devices. Check for and reset mouse.	South
0x008C	Npost adjustments to setup. Form E820 tables. Program SETUP-selected chipset and Sup-IO parameters.	South
0x008D	The Setup options are programmed. Resetting the hard disk controller.	South
0x008E	OEM patches executed. Decompress INT13 module and init ATA & ATAPI devices.	South
0x0093	Done with ATA & ATAPI init. Set RS-232 time out.	South
0x0095	Initializing the bus option ROMs from C800 next. SCSI opt ROM init.	South
0x0091	Configuring the hard disk drive controller. Initializing the CD ROM drive.	South
0x0092	-	South
0x0098	The adaptor ROM had control and has now returned control to BIOS POST. Performing any required processing after the option ROM returned control. Restoring INT10 vector.	South
0x0008	Debugging code. To be removed later.	South
0x0099	Configuring the timer data area and printer base address.	South
0x009B	Returned after setting the RS-232 base address. Performing any required initialization.	South
0x009E	Initialization. Checking the extended keyboard, keyboard ID, and Num Lock key next. Issuing the keyboard ID command.	South
0x00A2	Displaying any soft errors.	South
0x00A3	The soft error display has completed. Setting the keyboard typematic rate.	South
0x00A4	The keyboard typematic rate is set. Programming the memory wait states next.	South
0x00A5	Memory wait state programming is over. Clearing the screen.	South
0x00A7	Performing any initialization required before passing control to the adaptor ROM at E000 next.	South
0x00AE	Setting up DMI structures.	South
0x0020	Talking to BMC.	South
0x0022	Talking to BMC.	South
0x00AC	Uncompressing the DMI data and initializing DMI POST.	South
0x00AB	Building the multiprocessor table.	South

continued

Table 53. IA32 POST Codes (continued)

Code Value	Module	Display
0x00AD	Prepare INT10 image. Update the necessary data in different modules.	South
0x00A8	Initialization before passing control to the adaptor ROM at E000h completed. Pass control to the adaptor ROM at E000h.	South
0x00A9	Returned from adaptor ROM at E000h control. Performing any initialization required after the E000 option ROM had control next.	South
0x00AA	Initialization after E000 option ROM control has completed. Displaying the system configuration.	South
0x00B1	Copying any runtime code to specific areas.	South
0x0000	Code copying to specific areas is done. Pass control to EFI.	South

Table 54. SAL Runtime POST codes

Code Value	Module	Display
0xAFCD	IA32 Intercept Trap due to an unsupported IA32 instruction	South
0xAFE8	Normal SAL Machine Check Handling in Progress	South
0xAFE9	Could Not Correct MC Error, Halting CPU	South
0xAFEA	MCA successfully completed, passing control back to PAL (Resume)	South
0xAFEB	Calling OS MCA for Machine Check error handling	South
0xAFEC	Machine Check Handler Processing Rendezvous Request	South
0xAFED	OS request for SAL Clear Processor/Platform Error/State Log in progress	South
0xAFEE	SAL Platform OEM MCA Error Handler In Control	South
0xAFEF	OS request for SAL Get Processor/Platform Error/State Log in progress	South
0xAFF0	SAL INIT Handler is in control	South
0xAFF1	Passing Control to IA32 OS Init Handler	South
0xAFF2	Found valid OS_INIT Ep, Passing Control to EM OS Init Handler	South
0xAFF3	Is a MP platform MCA condition, calling SAL_RENDZ	South
0xAFF4	Not a MP Platform MCA Init condition	South
0xAFF5	EM OS with no Init Handler or IA32OS-BSP detected, Soft Rebooting	South
0xAFF6	No OS Init Handle Registered, Checking OS Type...	South
0xAFF8	SAL PMI Handler is in Control	South
0xAFFA	OEM SAL PMI Handler is in Control	South
0xAFFB	Getting Source of PMI Event	South
0xAFFC	Power Management PMI Handler is in Control	South
0xAFFD	Platform Error PMI Handler is in Control	South
0xAFFE	Platform Flash Management PMI Handler is in Control	South
0xAFFF	Platform Emulation PMI Handler is in Control	South
0xAF71	Recover Reliable Update - verifies the boot block checksum and corrects if possible	South

Recovery Port 80 Codes

Table 55. Recovery POST Codes

Code Value	Module	Display
0x8EC0	Recovery Process Started	South
0x8EC1	Searching for Recovery Media	South
0x8EC2	Loading Recovery File	South
0x8EC3	Validating Recovery File	South
0x8EC4	Unlocking Flash Devices	South
0x8EC5	Erasing Flash Contents	South
0x8EC6	Programming Flash Contents	South
0x8EC7	Validating Flash Contents	South
0x8EC8	Recovery Process Complete	South

Error Codes – Video Display

The following error codes apply to this server. The system BIOS displays POST error messages on the video screen. POST error codes are logged in the system event log. The error codes are defined by Intel and, whenever possible, are backward compatible with error codes used earlier platforms.

The following table defines POST error codes and their associated messages. The SR870BN4 BIOS prompt the user to press a key in case of serious errors.

Some errors are displayed on the screen in red text. These are critical events that require user interaction and the BIOS POST pauses awaiting user input, prompting with a message requesting Press F1, F2, or ESC. This error code type is indicated in the table below as a Yes in the column heading *Pause On Boot*. This type of error causes the system to pause during system boot. Pausing for user interaction can be overridden in BIOS Setup.

Other error codes are displayed on the screen in yellow. These errors are non-critical and are displayed briefly, POST then continues. These errors are also logged to the SEL. This error code type is indicated in the table below as a No in the column heading *Pause On Boot*.

Table 56. POST Error Messages and Codes

Error Code	Error Message	Attributes	Pause on Boot*
103	CMOS Battery Failure	DFLT/RED_BLACK	Yes
104	CMOS Options not Set	DFLT/RED_BLACK	Yes
105	CMOS Checksum Failure	DFLT/RED_BLACK	Yes
109	Keyboard - Stuck key	DFLT/RED_BLACK	Yes
11B	Date/Time not set	DFLT/RED_BLACK	Yes
120	NVRAM cleared By jumper	DFLT/RED_BLACK	Yes
121	Password clear	WARN/YELLOW_BLACK	Yes
122	NVRAM cleared By Front panel	DFLT/RED_BLACK	Yes
140	PCI Error	DFLT/RED_BLACK	Yes
141	PCI Memory Allocation Error	DFLT/RED_BLACK	Yes
142	PCI IO Allocation Error	DFLT/RED_BLACK	Yes

Error Code	Error Message	Attributes	Pause on Boot*
143	PCI IRQ Allocation Error	DFLT/RED_BLACK	Yes
144	Shadow of PCI ROM Failed	DFLT/RED_BLACK	Yes
145	PCI ROM not found	DFLT/RED_BLACK	Yes
146	Insufficient Memory to Shadow PCI ROM	DFLT/RED_BLACK	Yes
8100	Processor 01 failed BIST	WARN/YELLOW_BLACK	Yes
8101	Processor 02 failed BIST	WARN/YELLOW_BLACK	Yes
8102	Processor 03 failed BIST	WARN/YELLOW_BLACK	Yes
8103	Processor 04 failed BIST	WARN/YELLOW_BLACK	Yes
8110	Processor 01 Internal error(IERR)	WARN/YELLOW_BLACK	Yes
8111	Processor 02 Internal error(IERR)	WARN/YELLOW_BLACK	Yes
8112	Processor 03 Internal error(IERR)	WARN/YELLOW_BLACK	Yes
8113	Processor 04 Internal error(IERR)	WARN/YELLOW_BLACK	Yes
8120	Processor 01: Thermal trip failure.	WARN/YELLOW_BLACK	Yes
8121	Processor 02: Thermal trip failure.	WARN/YELLOW_BLACK	Yes
8122	Processor 03: Thermal trip failure.	WARN/YELLOW_BLACK	Yes
8123	Processor 04: Thermal trip failure.	WARN/YELLOW_BLACK	Yes
8130	Processor 01: Disabled	WARN/YELLOW_BLACK	Yes
8131	Processor 02: Disabled	WARN/YELLOW_BLACK	Yes
8132	Processor 03: Disabled	WARN/YELLOW_BLACK	Yes
8133	Processor 04: Disabled	WARN/YELLOW_BLACK	Yes
8140	Processor 01: failed FRB level 3 timer	WARN/YELLOW_BLACK	Yes
8141	Processor 02: failed FRB level 3 timer	WARN/YELLOW_BLACK	Yes
8142	Processor 03: failed FRB level 3 timer	WARN/YELLOW_BLACK	Yes
8143	Processor 04: failed FRB level 3 timer	WARN/YELLOW_BLACK	Yes
8150	Processor 01: failed initialization on last boot	WARN/YELLOW_BLACK	Yes
8151	Processor 02: failed Initialization on last boot	WARN/YELLOW_BLACK	Yes
8152	Processor 03: failed initialization on last boot	WARN/YELLOW_BLACK	Yes
8153	Processor 04: failed initialization on last boot	WARN/YELLOW_BLACK	Yes
8192	L3 cache size mismatch	WARN/YELLOW_BLACK	No
8193	CPUID, Processor Steppings are different	WARN/YELLOW_BLACK	No
8196	Processor Models are Different	WARN/YELLOW_BLACK	No
8197	Processor speeds mismatched	DFLT/RED_BLACK	No
8210	Processor 1 Late Self Test Failed: Performance restricted	DFLT/RED_BLACK	Yes
8211	Processor 2 Late Self Test Failed: Performance restricted	DFLT/RED_BLACK	Yes
8212	Processor 3 Late Self Test Failed: Performance restricted	DFLT/RED_BLACK	Yes
8213	Processor 4 Late Self Test Failed: Performance restricted	DFLT/RED_BLACK	Yes

Error Code	Error Message	Attributes	Pause on Boot*
8220	Processor 1 Late Self Test Failed: Functionally restricted	DFLT/RED_BLACK	Yes
8221	Processor 2 Late Self Test Failed: Functionally restricted	DFLT/RED_BLACK	Yes
8222	Processor 3 Late Self Test Failed: Functionally restricted	DFLT/RED_BLACK	Yes
8223	Processor 4 Late Self Test Failed: Functionally restricted	DFLT/RED_BLACK	Yes
8230	Processor 1 Late Self Test Failed: Catastrophic failure	DFLT/RED_BLACK	Yes
8231	Processor 2 Late Self Test Failed: Catastrophic failure	DFLT/RED_BLACK	Yes
8232	Processor 3 Late Self Test Failed: Catastrophic failure	DFLT/RED_BLACK	Yes
8233	Processor 4 Late Self Test Failed: Catastrophic failure	DFLT/RED_BLACK	Yes
8300	Baseboard Management Controller failed to function	DFLT/RED_BLACK	Yes
8306	OS boot watchdog timer failure	DFLT/RED_BLACK	Yes
84F3	Baseboard Management Controller in Update Mode	DFLT/RED_BLACK	Yes
84FF	System Event Log Full	DFLT/RED_BLACK	Yes
8500	Multi-bit Error Detected Row1. Row mapped out.	WARN/YELLOW_BLACK	Yes
8501	Multi-bit Error Detected Row2. Row mapped out.	WARN/YELLOW_BLACK	Yes
8502	Multi-bit Error Detected Row3. Row mapped out.	WARN/YELLOW_BLACK	Yes
8503	Multi-bit Error Detected Row4. Row mapped out.	WARN/YELLOW_BLACK	Yes
8504	Persistent Single-bit Error Detected Row1. Row mapped out.	WARN/YELLOW_BLACK	Yes
8505	Persistent Single-bit Error Detected Row2. Row mapped out.	WARN/YELLOW_BLACK	Yes
8506	Persistent Single-bit Error Detected Row3. Row mapped out.	WARN/YELLOW_BLACK	Yes
8507	Persistent Single-bit Error Detected Row4. Row mapped out.	WARN/YELLOW_BLACK	Yes
8508	Memory Mismatch detected Row1. Row mapped out.	WARN/YELLOW_BLACK	Yes
8509	Memory Mismatch detected Row2. Row mapped out.	WARN/YELLOW_BLACK	Yes
850A	Memory Mismatch detected Row3. Row mapped out.	WARN/YELLOW_BLACK	Yes
850B	Memory Mismatch detected Row4. Row mapped out.	WARN/YELLOW_BLACK	Yes
850C	DIMM1, memory board 1 defective.	WARN/YELLOW_BLACK	Yes
850D	DIMM2, memory board 1 defective.	WARN/YELLOW_BLACK	Yes

Error Code	Error Message	Attributes	Pause on Boot*
850E	DIMM3, memory board 1 defective.	WARN/YELLOW_BLACK	Yes
850F	DIMM4, memory board 1 defective.	WARN/YELLOW_BLACK	Yes
8510	DIMM5, memory board 1 defective.	WARN/YELLOW_BLACK	Yes
8511	DIMM6, memory board 1 defective.	WARN/YELLOW_BLACK	Yes
8512	DIMM7, memory board 1 defective.	WARN/YELLOW_BLACK	Yes
8513	DIMM8, memory board 1 defective.	WARN/YELLOW_BLACK	Yes
8514	DIMM1, memory board 2 defective.	WARN/YELLOW_BLACK	Yes
8515	DIMM2, memory board 2 defective.	WARN/YELLOW_BLACK	Yes
8516	DIMM3, memory board 2 defective.	WARN/YELLOW_BLACK	Yes
8517	DIMM4, memory board 2 defective.	WARN/YELLOW_BLACK	Yes
8518	DIMM5, memory board 2 defective.	WARN/YELLOW_BLACK	Yes
8519	DIMM6, memory board 2 defective.	WARN/YELLOW_BLACK	Yes
851A	DIMM7, memory board 2 defective.	WARN/YELLOW_BLACK	Yes
851B	DIMM8, memory board 2 defective.	WARN/YELLOW_BLACK	Yes

Beep Codes

During POST, fatal problems can occur before video is enabled. These fatal errors are conveyed by encoded beeps, coupled with POST debug codes.

In order to extend the useful range of the beep codes, without the need to have dozens of codes, the beeps are classified, and the POST debug card makes the distinction within the class.

Table 57 details the various Beep Codes supported by the system.

Table 57. Error Beep Codes

Beeps	Error Message	Description
3	Memory failure	Memory test failure. See table below for additional error information.
4	System Timer	System timer is not operational.
5	Processor Failure	Processor failure detected.
7	Processor exception interrupt error	The processor generated an exception interrupt.
8	Display memory read/write error	The system video adapter is either missing or its memory is faulty. This is not a fatal error.
9	ROM Checksum error	System BIOS ROM checksum error.
11	Invalid BIOS	General BIOS ROM error.

Table 58. POST Memory Beep Error Codes – Debug Port Encoding List

Beep Code	Debug port error code (lower byte of North I^2C debug display)	Meanings	Detail
3	CF9Fh	No valid memory was found in the system.	This indicates that the memory test has found no valid memory in the system. The system will not boot. A SEL log entry will be made in this case.
3	CF64h	Mismatched	This indicates that only a single row is populated,

		DIMMs in a row, and no valid memory to boot.	and that row contains mismatched DIMMs, preventing booting. A SEL log entry will be made in this case.

Recovery Beep Codes

Table 59. Recovery Mode Beep Codes

Beeps	Description
1 short – medium tone	BIOS Flash Update Started
2 short – medium tone	BIOS Flash Update Complete
Repeating – low tone	BIOS Recovery Error Occurred

B Equipment Log and Configuration Worksheet

Equipment Log

Use the blank equipment log provided here to record information about your system. The user will need some of this information when BIOS Setup is run.

Table 60. Equipment Log

Item	Manufacturer Name and Model Number	Serial Number	Date Installed
System			
I/O Board			
Processor Board			
Memory Board (1)			
Memory Board (2)			
Midplane Board			
Power Distribution Board			
Hot-plug Interface Board			
Front Panel Board			
Processor Speed and Cache			
Video Display			
USB Keyboard			
USB Mouse			
LS-240 Drive			
DVD/CD-ROM Drive			
Hard Disk Drive (0)			

continued

Table 60. Equipment Log (continued)

Item	Manufacturer Name and Model Number	Serial Number	Date Installed
Hard Disk Drive (1)			
Hard Disk Drive (2)			
First Power Supply			
Second Power Supply			
Hot-plug PCI Slot (1)			
Hot-plug PCI Slot (2)			
Hot-plug PCI Slot (3)			
Hot-plug PCI Slot (4)			
Hot-plug PCI Slot (5)			
Hot-plug PCI Slot (6)			
Hot-plug PCI Slot (7)			
Hot-plug PCI Slot (8)			
I/O Board 5 V DC-to-DC Converter (1)			
I/O Board 5 V DC-to-DC Converter (2)			
I/O Board 2.5/3.3 V DC-to-DC Converters (1)			
I/O Board 2.5/3.3 V DC-to-DC Converters (2)			
Processor Board (Pri.) 2.5/3.3 V DC-DC Converter			
Processor Board (Sec.) 2.5/3.3 V DC-DC Converters (1)			
Processor Board (Sec.) 2.5/3.3 V DC-DC Converters (2)			

C Warnings

WARNING: English (USA)

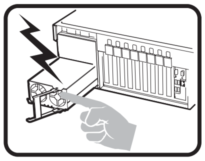
AVERTISSEMENTS : Français

WARNUNG: Deutsch

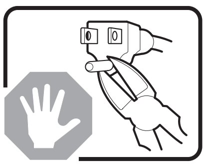
AVVERTENZA: Italiano

ADVERTENCIA: Español

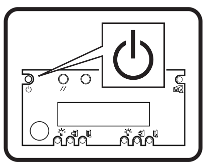
Warning: English (USA)



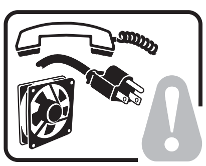
The power supply in this product contains no user-serviceable parts. There may be more than one supply in this product. Refer servicing only to qualified personnel.



Do not attempt to modify or use the supplied AC power cord if it is not the exact type required. A product might be equipped with more than one AC power cord.



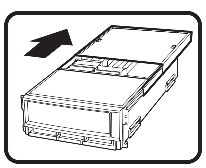
The power button on the system does not turn off all system AC power. To remove all AC power from the system, the user must unplug each AC power cord from the wall outlet or power supply.



To avoid injury from electrical and mechanical hazards, chassis covers should only be removed by qualified service personnel.

SAFETY STEPS: Whenever the user removes the chassis covers to access the inside of the system, follow these steps:

1. Turn off all peripheral devices connected to the system.
2. Turn off the system by pressing the power button.
3. Unplug all AC power cords from the system or from wall outlets.
4. Label and disconnect all telecommunication cables and all other cables connected to I/O connectors or ports on the back of the system.
5. Provide some electrostatic discharge (ESD) protection by wearing an anti-static wrist strap attached to chassis ground of the system—any unpainted metal surface—when handling components.
6. Do not operate the system with the chassis covers removed.



After haveing completed the six SAFETY steps above, remove the covers as follows:

To open the top *back* cover, push the sliding latches on the top of the cover and pull the cover toward the back of the chassis.

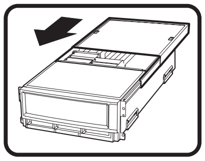
To remove the top back cover, continue to slide the cover toward the back of the chassis until it reaches the end-stops. Press the latch on the left rail slide and pull the cover until it clears the chassis.

To remove the top *front* cover, loosen the two captive screws on either side of the cover, slide the cover toward the front of the chassis until it stops, then lift the cover off.

Always replace the covers before operating the system.

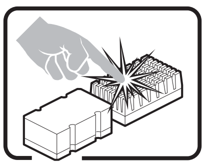
continued

Warning: English (continued)

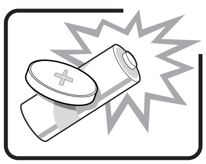


For proper cooling and airflow, unless hot swapping PCI cards or fans, always reinstall the chassis covers before turning on the system. Operating the system without the covers in place can damage system parts. To install the covers:

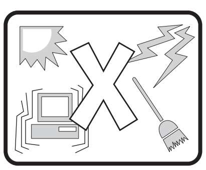
1. Check first to make sure no loose tools or parts were left inside the system.
2. Check that cables, add-in boards, and other components are properly installed.
3. To replace the top back cover, slide the two bearing cages on the back top cover all the way to the end of the slides.
4. Place the top cover on the cover slides and push the cover into place.
5. To replace the top front cover, attach the back edge of the front top cover to the chassis, lower the front edge of the cover onto the chassis, then push the cover into place.
6. Tighten the two captive screws on either side of the cover.
7. Connect all external cables and the AC power cord(s) to the system.



A microprocessor and heat sink might be hot if the system has been running. Also, there might be sharp pins and edges on some board and chassis parts. Contact should be made with care. Consider wearing protective gloves.



Danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.



The system is designed to operate in a typical office environment. Choose a site that is:

Clean and free of airborne particles (other than normal room dust).

Well-ventilated and away from sources of heat including direct sunlight.

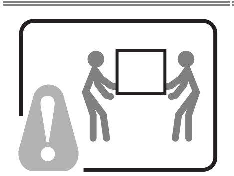
Away from sources of vibration or physical shock.

Isolated from strong electromagnetic fields produced by electrical devices.

Protected when in regions that are susceptible to electrical storms. We recommend the system be plugged into a surge suppresser and disconnect telecommunication lines to your modem during an electrical storm.

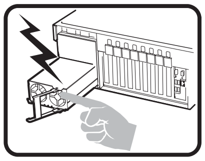
Provided with a properly grounded wall outlet.

Provided with sufficient space to access the power supply cords, because they serve as the product's main power disconnect.

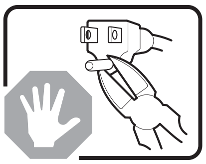


Servers can be too heavy for a single person to lift or move safely. Depending on the server, use two people or a mechanical assist to lift or move the server.

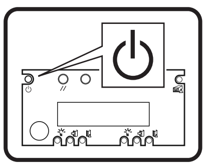
AVERTISSEMENTS : Français



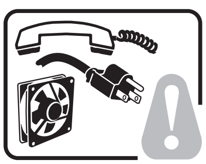
Le bloc d'alimentation de ce produit ne contient aucune pièce pouvant être réparée par l'utilisateur. Ce produit peut contenir plusieurs blocs d'alimentation. Veuillez contacter un technicien qualifié en cas de problème.



Ne pas essayer d'utiliser ni de modifier le câble d'alimentation CA fourni, s'il ne correspond pas exactement au type requis. Un produit peut être équipé de plus d'un câble d'alimentation CA.



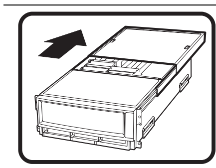
Le bouton d'alimentation du système n'éteint pas toutes les alimentations CA du système. Pour mettre complètement le système hors tension, vous devez débrancher chaque cordon d'alimentation CA de sa prise.



Pour éviter toute lésion à la suite de risques électriques et mécaniques, les panneaux du châssis ne doivent être démontés que par un personnel qualifié.

CONSIGNES DE SÉCURITÉ : Lorsque vous retirez les panneaux du châssis pour accéder à l'intérieur du système, suivez les étapes ci-dessous :

1. Mettez hors tension tous les périphériques connectés au système.
2. Mettez hors tension le système en appuyant sur le bouton d'alimentation.
3. Débranchez tous les cordons d'alimentation CA du système ou des prises murales.
4. Identifiez et déconnectez tous les câbles de télécommunications et tous les autres câbles reliés aux connecteurs E/S ou aux ports derrière le système.
5. Pour prévenir les décharges électrostatiques lorsque vous touchez aux composants, portez une bande antistatique pour poignet et reliez-la à la masse du système (toute surface métallique non peinte du boîtier).
6. Ne faites pas fonctionner le système si les panneaux du châssis sont enlevés.

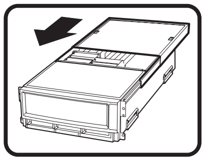


Une fois que vous avez effectué les six étapes de SÉCURITÉ, retirez les panneaux comme indiqué ci-dessous :

1. Pour ouvrir le panneau arrière supérieur, poussez sur les loquets coulissants placés sur le dessus du panneau et tirez ce dernier vers l'arrière du châssis.
2. Pour retirer le panneau arrière supérieur, continuez à le faire glisser vers l'arrière du châssis, jusqu'à ce qu'il atteigne les butées. Appuyez sur le loquet du rail gauche et retirez le panneau du châssis.
3. Pour retirer le panneau avant supérieur, desserrez les deux vis imperdables de chaque côté du panneau, faites glisser ce dernier vers l'avant du châssis au maximum, puis soulevez-le.
4. Remettez toujours le panneau en place avant de lancer le système.

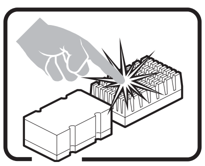
suite

Avertissements : Français (suite)

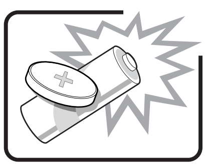


Pour un refroidissement et une circulation d'air efficaces, remettez toujours en place le panneau avant d'utiliser le système, sauf si vous disposez de cartes PCI ou de ventilateurs échangeables à chaud. Le fonctionnement du système sans les panneaux risque d'endommager ses composants. Pour installer les panneaux :

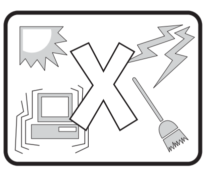
7. Assurez-vous en premier lieu de ne pas avoir oublié d'outils ou de composants à l'intérieur du système.
8. Vérifiez que les câbles, les cartes additionnelles et autres composants sont correctement installés.
9. Pour remettre en place le panneau supérieur arrière, faites glisser les cages à roulement du panneau jusqu'au bout des glissières.
10. Placez le panneau supérieur sur les glissières puis faites-le glisser jusqu'à la position fermée.
11. Pour remettre en place le panneau avant supérieur, accrochez la partie arrière du panneau sur le châssis, faites basculer ce dernier vers l'avant vers le châssis, puis poussez pour le bloquer en position fermée.
12. Serrez les deux vis imperdables de chaque côté du panneau.
13. Connectez tous les câbles externes et le ou les cordons d'alimentation au système.



Le microprocesseur et le dissipateur de chaleur peuvent être chauds si le système a été sous tension. Faites également attention aux broches aiguës des cartes et aux bords tranchants du capot. Les contacts doivent être établis avec soin. L'usage de gants de protection est conseillé.



Danger d'explosion si la batterie n'est pas remontée correctement. Remplacer uniquement par une pile du même type ou de type équivalent recommandé par le fabricant. Débarrassez-vous des piles usagées conformément aux instructions du fabricant.



Le système a été conçu pour fonctionner dans un cadre de travail normal. L'emplacement choisi doit être :

Propre et dépourvu de poussières en suspension (sauf la poussière normale).

Bien aéré et loin des sources de chaleur, y compris du soleil direct.

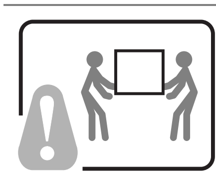
À l'abri des chocs et des sources de vibration.

Isolé des forts champs électromagnétiques générés par des appareils électriques.

Protégé s'il se trouve dans des régions sujettes aux orages magnétiques. Nous vous recommandons de connecter votre système à un suppresseur de surtension et de déconnecter les lignes de télécommunications de votre modem pendant un orage magnétique.

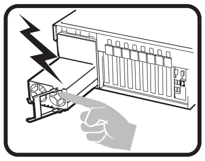
Muni d'une prise murale correctement mise à la terre.

Suffisamment spacieux pour vous permettre d'accéder aux câbles d'alimentation (ceux-ci étant le seul moyen de mettre le système hors tension).

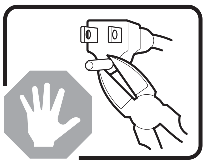


Il se peut que les serveurs soient trop lourds pour qu'une seule personne puisse les soulever et les déplacer en toute sécurité. En fonction du serveur, utilisez deux personnes ou utilisez un équipement mécanique auxiliaire pour soulever ou déplacer le serveur.

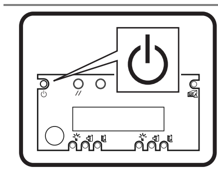
WARNUNG: Deutsch



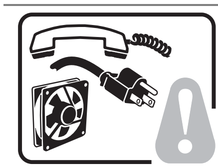
Das Netzteil dieses Computers enthält keine wartungsbedürftigen Teile. Dieses Produkt kann über mehrere Netzteile verfügen. Überlassen Sie Wartungsarbeiten nur qualifizierten Fachleuten.



Versuchen Sie nicht, das mitgelieferte Netzkabel zu verändern oder einzusetzen, wenn es nicht exakt dem benötigten Kabeltyp entspricht. Das Produkt kann über mehrere Netzkabel verfügen.



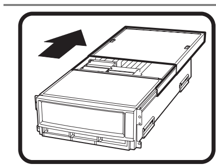
Durch Ausschalten des Netzschalters wird die Wechselstromversorgung des Systems nicht unterbrochen. Um das System vom Netz zu trennen, müssen Sie das Netzkabel aus der Steckdose oder vom Netzteil abziehen.



Vermeiden Sie Verletzungen aufgrund elektrischer oder mechanischer Gefahren; lassen Sie daher den Gehäusedeckel nur von technisch qualifiziertem Personal abnehmen.

SICHERHEITSHINWEISE: Beachten Sie beim Abnehmen der Gehäuseabdeckung und Arbeiten im Inneren des Systems folgende Schritte:

1. Schalten Sie alle am System angeschlossenen Peripheriegeräte ab.Drücken Sie den Netzschalter, um das System abzuschalten.
2. Ziehen Sie alle Wechselstromkabel vom System und den Steckdosen ab.
3. Kennzeichnen Sie alle Telekommunikationsleitungen und sonstigen Kabel an den E/A-Steckern bzw. Anschlüssen an der Rückseite des Systems, und trennen Sie diese vom Netz.
4. Um sich gegen elektrostatische Entladung zu schützen, sollten Sie eine Antistatik-Manschette tragen, die Sie beim Arbeiten mit Komponenten zur Erdung an einem beliebigen unlackierten Metallteil befestigen.
5. Nehmen Sie das System nicht ohne Abdeckung in Betrieb.

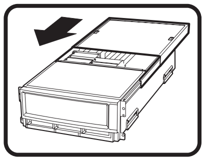


Nachdem Sie die sechs bereits beschriebenen Schritte zur SICHERHEIT befolgt haben, können Sie die Abdeckung, wie im folgenden erläutert, abnehmen.

1. Zum Öffnen der oberen, rückwärtigen Abdeckung, drücken Sie die Verriegelung oben an der Abdeckung und schieben die Abdeckung an das Ende des Gehäuses.
2. Um die obere, rückwärtige Abdeckung abzunehmen, schieben Sie die Abdeckung bis zum Anschlag an das Ende des Gehäuses. Drücken Sie die Verriegelung der linken Schienenkomponente, und ziehen Sie die Abdeckung vollständig vom Gehäuse ab.
3. Lösen Sie zum Abnehmen der oberen, vorderseitigen Abdeckung die beiden unverlierbaren Schrauben an beiden Seiten der Abdeckung. Schieben Sie dann die Abdeckung bis zum Anschlag Richtung Vorderseite des Gehäuses, und nehmen Sie sie ab.
4. Bringen Sie die Abdeckung vor Inbetriebnahme des Systems wieder an.

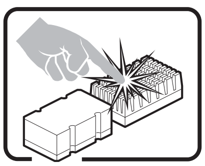
Fortsetzung

Warnung: Deutsch (Fortsetzung)

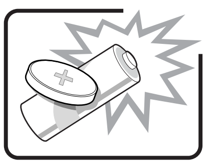


Bringen Sie die Gehäuseabdeckung vor Inbetriebnahme wieder an, um ordnungsgemäße Kühlung und Lüftung zu gewährleisten. Dies gilt nicht für das Hot-Swapping von PCI-Karten oder Ventilatoren. Die Inbetriebnahme des Systems ohne angebrachte Abdeckung kann zur Beschädigung von Systemkomponenten führen. So bringen Sie die Abdeckung wieder an:

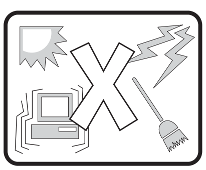
1. Vergewissern Sie sich zunächst, daß Sie keine Werkzeuge oder Teile im Gehäuse vergessen haben.
2. Prüfen Sie, ob Kabel, Erweiterungskarten sowie weitere Komponenten ordnungsgemäß angebracht sind.
3. Schieben Sie zur Anbringung der hinteren, rückwärtigen Abdeckung die beiden Haltekomponenten bis zum Anschlag an das Ende der Schiene.
4. Legen Sie die obere Abdeckung in die Schienen ein, und schieben Sie die Abdeckung in Position.
5. Bringen Sie dann die rückwärtige Kante der oberen, vorderseitigen Abdeckung am Gehäuse an, senken Sie die vordere Kante der Abdeckung auf das Gehäuse, und schieben Sie die Abdeckung in Position.
6. Ziehen Sie die zwei unverlierbaren Schrauben an beiden Seiten der Abdeckung fest.
7. Schließen Sie wieder alle externen Kabel und Netzstecker an das System an.



Mikroprozessor und Kühlkörper können heiß sein, wenn das System längere Zeit eingeschaltet war. Einige Platinen- und Gehäuseteile können scharfe Spitzen und Kanten aufweisen. Gehen Sie auf jeden Fall mit Vorsicht heran. Das Tragen von Schutzhandschuhen wird empfohlen.



Wird die Batterie unsachgemäß ausgewechselt, besteht Explosionsgefahr. Ersetzen Sie die Batterie nur durch denselben oder einen gleichwertigen Batterietyp, der vom Gerätehersteller empfohlen wird. Entsorgen Sie verbrauchte Batterien gemäß den Herstellerempfehlungen.



Das System ist für den Betrieb innerhalb normaler Büroumgebungen geeignet. Der Standort sollte folgende Anforderungen erfüllen:

Saubere, möglichst staubfreie Umgebung.

Gut belüftet und weit entfernt von Wärmequellen wie direkte Sonneneinstrahlung.

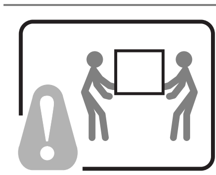
Vibrations- und erschütterungsfreie Umgebung.

Abgeschirmt von starken elektromagnetischen Feldern, die durch elektrische Geräte erzeugt werden.

Entsprechender Schutz bei Betrieb in gewittergefährdeten Gebieten. Es empfiehlt sich, den Computer über einen Überspannungsschutz anzuschließen und die Verbindung zwischen dem Modem und dem Telefonanschluß im Falle eines Gewitters zu trennen.

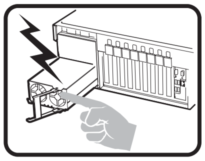
Ausgestattet mit einer ordnungsgemäß geerdeten Wandsteckdose.

Sorgen Sie für ausreichend Platz, damit das Servernetzkabel problemlos erreicht werden kann, da das Gerät nur über dieses Kabel vom Netz getrennt wird.

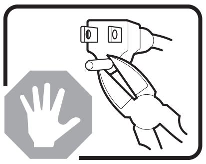


Um einen Server sicher anzuheben und zu bewegen ist eine Person nicht ausreichend. Bewegen Sie den Server, je nach Größe, entweder zu zweit oder mittels einer mechanischen Hilfe.

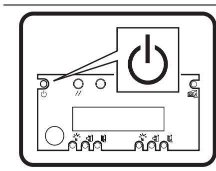
AVVERTENZA: Italiano



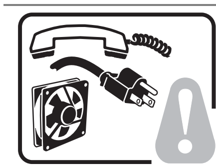
L'alimentatore contenuto nel computer non contiene parti riparabili dall'utente. Questo prodotto può essere fornito con più alimentatori. Per l'assistenza fare riferimento solo a personale qualificato.



Non tentare di modificare o utilizzare cavi di alimentazione in c.a. che non siano del tipo prescritto. Un prodotto potrebbe contenere più di un cavo di alimentazione in c.a.



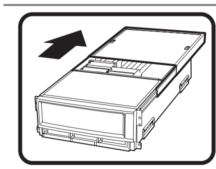
L'interruttore di accensione del sistema non scollega tutta l'alimentazione in c.a. del sistema. Per scollegare tutta l'alimentazione in c.a., è necessario disinserire ogni cavo di alimentazione in c.a. dalla presa a muro o dall'alimentatore.



Per evitare incidenti elettrici e meccanici, i coperchi del telaio devono essere rimossi da personale qualificato.

MISURE DI SICUREZZA: Nel caso sia necessario rimuovere i coperchi del telaio per accedere alle parti interne del sistema, procedere nel seguente modo:

1. Spegnere tutte le periferiche collegate al sistema.
2. Spegnere il sistema premendo il pulsante di accensione.
3. Scollegare tutti i cavi di alimentazione in c.a. dal sistema o dalle prese a muro.
4. Apporre un'etichetta e scollegare tutti i cavi di telecomunicazione e i cavi collegati ai connettori di I/O o alle porte sulla parte posteriore del sistema.
5. Assicurare un minimo di protezione da scariche elettrostatiche (ESD) indossando un bracciale antistatico collegato a un componente metallico non verniciato del telaio quando si maneggiano i componenti.
6. Non attivare il sistema nel caso in cui i coperchi del telaio siano stati rimossi.

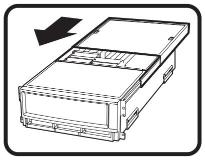


Dopo aver effettuato le sei operazioni di SICUREZZA descritte in precedenza, rimuovere i coperchi nel modo seguente:

1. Per aprire il coperchio superiore sul retro del sistema, premere le linguette di chiusura sulla parte superiore del coperchio e tirare il coperchio verso la parte posteriore del telaio.
2. Per rimuovere il coperchio superiore sul retro del sistema, continuare a far scorrere il coperchio verso la parte posteriore del telaio fino a raggiungerne le estremità. Premere la linguetta di chiusura sulla guida di scorrimento di sinistra e tirare il coperchio fino a liberare il telaio.
3. Per rimuovere il coperchio frontale superiore, svitare le due viti su entrambi i lati del coperchio, far scorrere il coperchio verso la parte frontale del telaio fino all'arresto, quindi togliere il coperchio.
4. Riposizionare sempre i coperchi prima dell'utilizzo del sistema.

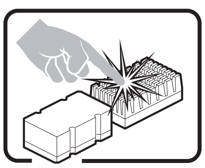
continua

Avvertenza: Italiano (continua)

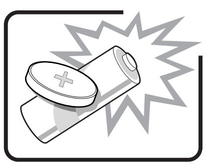


Per evitare che il sistema si surriscaldi e per garantire una ventilazione adeguata, in assenza di schede PCI e ventole sostituibili a computer acceso, reinstallare sempre i coperchi del telaio prima di attivare il sistema. Se si attiva il sistema senza aver riposizionato i coperchi correttamente, alcune parti del sistema potrebbero risultare danneggiate. Per installare i coperchi:

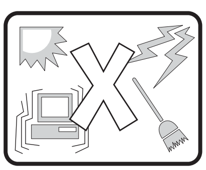
1. Verificare innanzitutto di non aver lasciato utensili o altre parti all'interno del sistema.
2. Verificare che i cavi, le schede aggiuntive e gli altri componenti siano stati installati correttamente.
4. Per riposizionare il coperchio superiore del retro del sistema, affiancare le due gabbie cuscinetto sul coperchio superiore del retro fino a raggiungere l'estremità delle guide di scorrimento.
5. Posizionare il coperchio superiore sulle guide di scorrimento del coperchio e premere il coperchio fino a raggiungere la posizione corretta.
6. Per riposizionare il coperchio frontale superiore, collegare al telaio l'estremità posteriore del coperchio frontale superiore, inserire l'estremità frontale del coperchio sul telaio, quindi spingere il coperchio fino a raggiungere la posizione corretta.
7. Stringere le due viti su entrambi i lati del coperchio.
8. Collegare tutti i cavi esterni e il cavo o i cavi di alimentazione in c.a. al sistema.



Se il sistema è stato in funzione, il microprocessore e il dissipatore di calore potrebbero essere caldi. Inoltre su alcune parti della scheda e del telaio potrebbero esserci piedini appuntiti e bordi taglienti. Prestare quindi molta attenzione nel toccarli. Indossare guanti protettivi.



Se sostituita in modo errato, la batteria potrebbe esplodere. Sostituire le batterie scariche solo con batterie originali o del tipo consigliato dal produttore dell'apparecchiatura. Per lo smaltimento delle batterie usate attenersi alle istruzioni del produttore.



Il sistema è concepito per l'utilizzo in ambienti adibiti a ufficio. Scegliere una postazione con le caratteristiche riportate di seguito.

Pulita, priva di particelle diverse dalla polvere normalmente presente nell'ambiente di lavoro.

Aerata e lontana da fonti di calore, compresa la luce solare diretta.

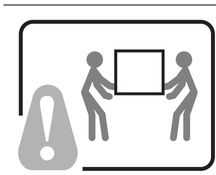
Lontana da fonti di vibrazione o urti.

Isolata da forti campi elettromagnetici prodotti da apparecchi elettrici.

Protetta nelle regioni soggette a temporali. Durante un temporale, si consiglia di collegare il sistema a un limitatore di corrente e di scollegare le linee di telecomunicazione dal modem.

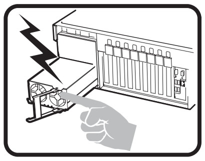
La posizione prescelta deve essere dotata di una presa a muro con adeguata messa a terra.

Deve inoltre esserci sufficiente spazio per accedere ai cavi di alimentazione nel caso sia necessario scollegare l'alimentazione principale.

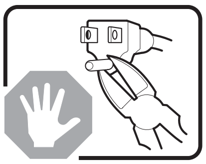


I server possono risultare troppo pesanti per essere sollevati o spostati da una sola persona. Alcuni server devono dunque essere sollevati o spostati da due persone o da un assistente tecnico.

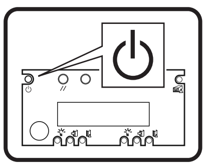
ADVERTENCIA: Español



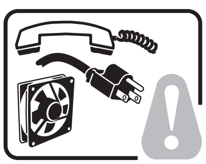
La fuente de alimentación de este producto no contiene piezas que puedan ser reparadas por el usuario. Puede que haya más de una fuente de alimentación en este producto. Para las reparaciones, consulte sólo con el personal cualificado.



No intente modifica ni utilizar el cable de alimentación de CA suministrado si no es del tipo exacto requerido. Un producto puede estar equipado con más de un cable de alimentación de CA.



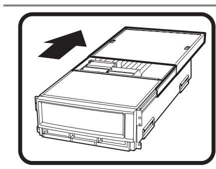
El botón de alimentación del sistema no desactiva toda la alimentación de CA del sistema. Para eliminar toda la alimentación de CA del sistema, deberá desenchufar todos los cables de alimentación de CA del enchufe de pared o de la fuente de alimentación.



Para evitar lesiones causadas por descargas eléctricas y mecánicas, únicamente puede retirar las cubiertas de las carcasas el personal técnico cualificado.

PASOS DE SEGURIDAD: Siempre que retire las cubiertas de las carcasas para acceder al interior del sistema, siga las instrucciones que se especifican a continuación:

1. Desactive todos los dispositivos periféricos conectados al sistema.
2. Pulse el botón de alimentación para desactivar el sistema.
3. Desenchufe todos los cables de alimentación de CA del sistema o de los enchufes de pared.
4. Etiquete y desconecte todas las líneas de telecomunicaciones y todos los cables conectados a los puertos o conectores de E/S de la parte posterior del sistema.
5. Para contar con cierto grado de protección contra descargas electrostáticas (ESD), utilice un brazalete antiestático conectado a la toma de tierra del sistema (cualquier superficie de metal que no esté pintada) al manipular sus componentes.
6. No utilice el sistema sin las cubiertas de la carcasa.

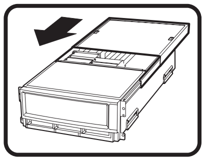


Después de haber realizado los seis pasos de seguridad anteriores, puede retirar las cubiertas del sistema de este modo:

1. Para abrir la cubierta posterior superior empuje los pestillos deslizantes de la parte superior de la cubierta y tire de ella hacia la parte posterior de la carcasa.
2. Para extraer la cubierta posterior superior, siga deslizando la cubierta hacia la parte posterior de la carcasa hasta que alcance los topes finales. Presione el pestillo del raíl de deslizamiento izquierdo y tire de la cubierta hasta que se separe de la carcasa.
3. Para retirar la cubierta frontal superior, afloje los dos tornillos de sujeción de cada lado de la cubierta, deslice la cubierta hacia la parte frontal de la carcasa hasta que se detenga y levante la cubierta para extraerla.
4. Recuerde siempre volver a colocar las cubiertas antes de utilizar el sistema.

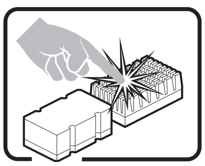
continuación

Advertencia: Español (continuación)

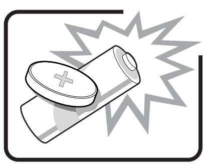


Para conseguir una refrigeración y corriente de aire adecuada, a excepción de las tarjetas PCI o de los ventiladores de intercambio activo, no olvide volver a instalar las cubiertas de la carcasa antes de encender el sistema. Si utiliza el sistema sin las cubiertas, podría dañar sus componentes. Para instalar las cubiertas:

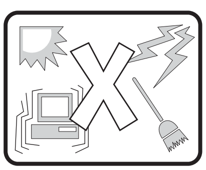
1. Compruebe primero que no ha dejado herramientas o piezas sueltas dentro del sistema.
2. Compruebe que los cables, tarjetas adicionales y otros componentes están instalados correctamente.
3. Para volver a colocar la cubierta posterior superior, ponga los dos cajetines de cojinetes de la cubierta posterior superior al lado del recorrido de los raíles hasta su extremo.
4. Coloque la cubierta superior en los raíles de la cubierta y empújela para colocarla en su lugar.
5. Para volver a colocar la cubierta frontal superior, acople el borde posterior de la cubierta a la carcasa, baje el borde frontal de la cubierta sobre la carcasa y empújela para colocarla en su lugar.
6. Apriete los tornillos de sujeción de cada lado de la cubierta.
7. Conecte todos los cables externos y los cables de alimentación de CA al sistema.



Puede que el microprocesador y el disipador de calor se recalienten si se ha estado ejecutando el sistema. Asimismo, puede que algunas tarjetas o piezas de la carcasa tengan patillas o bordes afilados. Los contactos deberán realizarse cuidadosamente. Puede que sea conveniente llevar guantes de protección.



Existe peligro de explosión si la batería se sustituye incorrectamente. Sustitúyala sólo por el mismo tipo o uno equivalente recomendado por el fabricante del equipo. Deseche las baterías usadas según las instrucciones del fabricante.



El sistema está diseñado para que funcione en un entorno de oficina típico. Elija un emplazamiento:

Limpio y libre de partículas de transportadas por aire (aparte del polvo normal de la habitación).

Bien ventilado y alejado de las fuentes de calor, incluida la luz del sol directa.

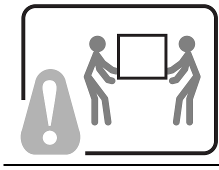
Alejado de las fuentes de vibración o de los golpes físicos.

Aislado de campos electromagnéticos fuertes producidos por dispositivos eléctricos.

Protegido, si se encuentra en regiones susceptibles de tormentas eléctricas. Se recomienda que enchufe el sistema a un supresor de sobretensiones y desconecte las líneas de telecomunicaciones al módem durante una tormenta eléctrica.

Que tenga un enchufe de pared correctamente conectado a tierra.

Con suficiente espacio para acceder a los cables de la fuente de alimentación, ya que éstos sirven como desconectador de alimentación principal del sistema.



Los servidores pueden ser demasiado pesados para que una sola persona los levante o los mueva de forma segura.

Dependiendo del servido, utilice dos personas o una ayuda mecánica para levantar o mover el servidor.

D INI File Format

Introduction

The FRUSDR utility for EFI allows the FRU information retrieved from the EEPROM to be displayed using user-defined strings. Through the use of an INI file the user can create strings to be displayed and insert information from the data retrieved from the EEPROM into the string. This allows the user a wide variety of customization.

INI File Structure

An INI file consists of two areas: the header area that is designated by the [INF_FILE] section header and the main body designated by the [DISPLAY] section header.

The [INF_FILE] Section

The [INF_FILE] must contain three items: Signature, FileFormatVersion, and ManufacturersID (LS byte first). The Signature is to let the utility know that this is an INI file for the FRUSDR utility. The FileFormatVersion is so that future changes to the INI Display format can be tracked and adapted to. The Manufacturer's ID indicates which of the Multi-record area records are to be displayed. The record within the multi-record area for a particular OEM is marked with that OEM's ID so that the data can be retrieved and interpreted correctly for that OEM. If the Manufacturers ID is not found, the utility exits.

The [DISPLAY] Section

The Display section consists of a list of entries that contain two components needed for the display. The first component is the "LINE" numbering component. This provides the mechanism for vertical formatting. Line number entries are executed in order. The Line numbers do not necessarily correspond to a particular line on the display and will depend on the format strings from each line entry that determine whether linefeed and carriage return are used. A maximum of 99 lines may be used. The /P command line argument may be used to pause the displayed data so that it will fit on the screen.

The other component of the Display entry is the format string and data markers. The format string is similar to a c-style format string. Text from the format string is displayed as written between a set of quotation marks, with the only exceptions being the formatting options. Formatting options allows the insertion of data and cursor control.

Currently supported options are as follows:

\n	Provides a carriage return and a line feed.
\r	Provides a carriage return only.
%s	Displays data from the EEPROM that corresponds to the data marker.
%x	Displays data in hex format.

Data markers provide a way of identifying which field from the EEPROM is to be displayed. A table is provided that lists all the supported fields and the data marker associated with each field.

Example of an INI File:

```
[INF_FILE]
Signature=FRUSDR_INI_FILE
FileFormatVersion = 01
ManufacturersID=000157
[DISPLAY]
LINE10= "Chassis Type              :%x \n"    C1
LINE11= "Chassis Part number       :%s \n"    C2
LINE03= "INTEL Serial number       :%s \n"    B4
LINE01= "ACME Part number          :%s \n"    M5
LINE04= "ACME Device info          :%s \n"    M6
LINE02= "ACME FRU number           :%s \n"    M7
```

Table 61. Data Markers

Area	Field	Marker
Chassis Area		
	Chassis Type	C1
	Chassis Part Number	C2
	Chassis Serial Number	C3
Board Area		
	Manufacture Date/Time	B1
	Board Manufacturer	B2
	Board Name	B3
	Board Serial Number	B4
	Board Part Number	B5
	Board FRU ID	B6
Product Area		
	Product Manufacturer	P1
	Product Name	P2
	Product Part Number	P3
	Product Serial Number	P4
	Product Asset Tag	P5
	Product Version	P6
	Product FRU ID	P7
Multi-record area		
	OEM DATA (part number)	M1
	OEM DATA	M2
	OEM DATA	M3
	OEM DATA	M4
	OEM DATA	M5
	OEM DATA	M6
	OEM DATA	M7
	OEM DATA	M8
	OEM DATA	M9

E SDRViewer Splash Screen File Format

The splash screen file contains a header and binary data that holds the Unicode characters and their color attributes that are displayed on the screen. The default file name extension of the splash screen files is *.sph. Table 62 summarizes the content of these files.

NOTES

The last character in the screen cannot be displayed, because it causes the screen to scroll up. Even though it is required in the file, it is not written to the screen.

The utility checks that the text mode resolution specified in the splash screen file is supported by the system. The splash screen is not displayed if the text mode is not supported. In addition, the current text mode is preserved after the splash screen is successfully displayed.

Table 62. SDRViewer Splash Screen File Format

Field	Size (bytes)	Description
Signature	8	ASCII string “*SPLASH*” that indicates it is a splash screen file.
Version	1	File format version: 1 for this specification.
Number of Columns (x)	2	Number of columns in the screen. This is text mode resolution of x (e.g., 80 for text mode 80x25).
Number of Rows (y)	2	Number of rows in the screen. This is the text mode resolution of y (e.g., 25 for text mode 80x25).
Screen Attribute	1	Text color and background attributes of entire splash screen (note that the attribute of each cell overrides this field).
Reserved	2	

Lines 1 through y	4 * x * y	Lines consist of all the Unicode characters and their color attributes. X refers to the number of columns; Y refers to the number of rows. Unicode character must be supported by EFI.
		All the lines are contiguous as a one-dimensional array. The first byte is reserved, the second is the character’s color attribute (text background | text color), and the last byte is the 2-byte Unicode character:
		`UINT8    Reserved;`
		`UINT8    attr;`
		`CHAR16   UnicodeChar;`

F SELViewer Splash Screen File Format

The splash screen file contains a header and binary data that holds the Unicode characters and their color attributes that are displayed on the screen. The default file name extension of splash screen files is *.sph. Table 63 and Table 64 summarizes the content of these files.

The following keyword is defined to support platform-dependent customizations of the SEL Viewer. Each of these keywords should appear in the section “[Splash Screen Files]”.

Table 63. Splash Screen File Section Keywords for the SEL.INI

Keyword	Default	Purpose
SPH.AA.BB	Selenus.sph	Indicates the binary file containing the splash screen referenced by the SEL Viewer. This file contains the splash screen of the language indicated by the alpha-2 code ‘AA’, in the locale/country indicated by the alpha-2 code ‘BB’. For example, the file selenus.sph would contain the splash screen for the English language and the United States locale.

NOTES

The last character in the screen cannot be displayed because it causes the screen to scroll up. Even thought it is required in the file, it is not written to the screen.

The utility checks that the text mode resolution specified in the splash screen file is supported by the system. The splash screen is not displayed if the text mode is not supported. In addition, the current text mode is preserved after the splash screen is successfully displayed.

Table 64. SELViewer Splash Screen File Format

Field	Size (bytes)	Description
Signature	8	ASCII string “*SPLASH*” that indicates it is a splash screen file.
Version	1	File format version: 1 for this specification.
Number of Columns (x)	2	Number of columns in the screen. This is text mode resolution of x (e.g., 80 for text mode 80x25).
Number of Rows (y)	2	Number of rows in the screen. This is the text mode resolution of y (e.g., 25 for text mode 80x25).
Screen Attribute	1	Text color and background attributes of entire splash screen (note that the attribute of each cell overrides this field).
Reserved	2	

Lines 1 through y	4 * x * y	Lines consist of all the Unicode characters and their color attributes. X refers to the number of columns; Y refers to the number of rows. Unicode character must be supported by EFI.
		All the lines are contiguous as a one-dimensional array. The first byte is reserved, the second is the character’s color attribute (text background | text color), and the last byte is the 2-byte Unicode character:
		`UINT8    Reserved;`
		`UINT8    attr;`
		`CHAR16   UnicodeChar;`

G Glossary

Term	Definition
BIOS	Basic Input/Output System. The code that controls the server system startup process.
CMOS	Complimentary Metal Oxide Semiconductor. Server system startup parameters are stored in CMOS memory. They can be changed using the system's Setup utility.
DIMM	Dual Inline Memory Module.
DMA	Direct Memory Access. DMA allows data to be sent directly from a component (such as a disk drive) directly to the memory on the motherboard. The processor does not take part in the data transfer, which improves system performance.
EFI	Extensible Firmware Interface.
EMI	Electromagnetic Interference.
IFB	I/O Firmware Bridge. A multifunction device on the I/O Board that acts as a PCI-based Fast IDE controller.
LED	Light Emitting Diode. The type of indicator used in this system.
LVDS	Low-Voltage Differential SCSI.
OS	Operating System.
PCI	Peripheral Component Interconnect. PCI is the interconnect system between processors and devices in the I/O expansion slots.
PIO	Programmed Input/Output moves data between components in a computer so that all data must pass through the processor.
POST	Power On Self-test. The POST runs automatically during the server system startup sequence.
RTC	Real Time Clock. Keeps track of the time and date in CMOS memory. A battery backup keeps the data intact when the server is off.
RFI	Radio Frequency Interference.
SBE	Single Bit Error.
SCSI	Small Computer System Interface.
SDRAM	Synchronous Dynamic Random Access Memory. SDRAM synchronizes with the bus frequency.
VHDM	Connectors used between the boards.

H Troubleshooting

Table 65. Symptom/Cause/Solution Troubleshooting Guide

Symptom	Cause(s)	Solution(s)
System does not power up	DC-to-DC converters not plugged in or bent pins. Boards not fully seated.	Check seating on all boards and DC-to-DC converters. Check the interconnect LED on the top cover.
System powers on, but then turns off, often with fault light	Bent pin on board set or DC-to-DC converters. Short on one of the boards due to conductive item touching it.	Check to make sure that no screw or other conductive item was dropped into the system during the upgrade. Check the connections on all boards and DC-to-DC converters. (Begin with those connections that gave you the most trouble during installation. That is typically where a pin may have gotten bent.) Check for bent pins on VHDM connectors. Check for bent pins on processors.
System powers up but does not post	Boards, power pods, or processors not fully seated. Wrong stepping of processor in system for the BIOS. System speed set higher than processors installed support. Memory not stuffed in documented order or unsupported/validated DIMMS used.	Check seating on all boards, DC-to-DC converters, power pods and processors. Make sure you have the FSB to CPU core ratio set appropriately for the processors you are using. Check the BIOS release notes to ensure the BIOS installed on the platform supports the stepping and family of the processors currently installed. Check that the memory banks are stuffed in the proper order. See system documentation for proper stuffing options. Use only validated DIMMS at least until you've made sure your upgrade has gone successfully prior to testing an unknown.
System does not recognize all the processors that were installed	Processors or power pods not fully seated. Power cable from processor board to power pod not fully seated. Power pod not fully engaged into processor. Bent pin(s) on processor(s).	Check seating on processors and power pods. Verify there are no any bent processor pins. Check the power cable from processor board to power pod connections.
No video, LED on top cover indicates still stuck in reset	Seating of processor, DC-to-DC converters, or any board. Bad power pod or DC-to-DC converter.	Check seating on all boards, DC-to-DC converters, and processors. Check for bent pins on all connectors. Replace power pod. Replace DC-to-DC converters.

continued

Table 67. Symptom/Cause/Solution Troubleshooting Guide (continued)

Symptom	Cause(s)	Solution(s)
No video, but the system is not stuck in reset	Memory board or DIMM not functional.	Check seating of memory board and DIMMs. Replace DIMMs. Ensure proper population of DIMM banks.
SCSI drives are not recognized during POST	Drive not fully seated.	Check seating of HDD.
LS-240 or CD ROM not recognized by BIOS/EFI	IDE cable or power cable not connected to drives.	Check seating of drive into adapter board. Check that BIOS setup has these devices enable.

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