

Intel® Server System SR870BH2 Product Guide

Order Number: C43378-003

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Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order.

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Important Safety Information

Important Safety Instructions

Read all caution and safety statements in this document before performing any of the instructions. See *Intel Server Boards and Server Chassis Safety Information* on the Resource CD and/or at <http://support.intel.com/support/motherboards/server/safecert.htm>.

Wichtige Sicherheitshinweise

Lesen Sie zunächst sämtliche Warn- und Sicherheitshinweise in diesem Dokument, bevor Sie eine der Anweisungen ausführen. Beachten Sie hierzu auch die Sicherheitshinweise zu Intel-Serverplatinen und -Servergehäusen auf der Ressourcen-CD oder unter <http://support.intel.com/support/motherboards/server/safecert.htm>.

重要安全指导

在执行任何指令之前，请阅读本文档中的所有注意事项及安全声明。参见 Resource CD（资源光盘）和/或 <http://support.intel.com/support/motherboards/server/safecert.htm> 上的 *Intel Server Boards and Server Chassis Safety Information*（《Intel 服务器主板与服务器机箱安全信息》）。

Important Safety Instructions Consignes de sécurité

Lisez attention toutes les consignes de sécurité et les mises en garde indiquées dans ce document avant de suivre toute instruction. Consultez *Intel Server Boards and Server Chassis Safety Information* sur le CD Resource CD ou bien rendez-vous sur le site <http://support.intel.com/support/motherboards/server/safecert.htm>.

Instrucciones de seguridad importantes

Lea todas las declaraciones de seguridad y precaución de este documento antes de realizar cualquiera de las instrucciones. Vea *Intel Server Boards and Server Chassis Safety Information* en el CD Resource y/o en <http://support.intel.com/support/motherboards/server/safecert.htm>.



WARNING

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, you must provide supplemental protection for the server.



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 700 W (2500 BTU/hr) for each server. The rack selected and the ventilation provided must be suitable to the environment in which the server will be used.

Regulatory and Certification Information

Product Regulatory Compliance

The Server System SR870BH2 complies with the following safety and electromagnetic compatibility (EMC) regulations.

Product Safety Compliance








- UL60950 - CSA 950 (US/Canada)
- GB4943 – CNCA (China)
- EN 60 950 (European Union)
- IEC60 950 (International)
- CE – Low Voltage Directive (73/23/EEC) (European Union)
- EMKO-TSE (74-SEC) 207/94 (Nordics)
- GOST R 50377-92 (Russia)
- IRAM (Argentina)

Product EMC Compliance

- FCC /ICES-003 - Class A Emissions (USA/Canada) Verification
- GB9254 – Class A Emissions (CNCA China)
- GB17625 – Harmonics (CNCA China)
- CISPR 22 - Class A Emissions (International)
- EN55022 - Class A Emissions (CENELEC Europe)
- EN55024 - Immunity (CENELEC Europe)
- EN61000-3-2 - Harmonics (CENELEC Europe)
- EN61000-3-3 - Voltage Flicker (CENELEC Europe)
- CE – EMC Directive 89/336/EEC (CENELEC Europe)
- VCCI - Class A Emissions (Japan)
- AS/NZS 3548 - Class A Emissions (Australia / New Zealand)
- BSMI CNS13438 - Class A Emissions (Taiwan)
- GOST R 29216-91 - Class A Emissions (Russia)
- GOST R 50628-95 - Immunity (Russia)
- RRL, MIC Notice No. 1997-41 (EMC) & 1997-42 (EMI) (Korea)

Product Regulatory Compliance Markings

The Server System SR870BH2 may be marked with the following regulatory compliance markings.

| Regulatory Compliance | Country | Marking |
|--------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| cULus Listing Marks | USA/Canada |  |
| CCC Mark | China |  |
| GS Mark | Germany |  |
| CE Mark | Europe |  |
| FCC Marking (Class A) | USA | <p>This device complies with Part 15 of the FCC Rules. Operation of this device 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. Manufactured by Intel Corporation</p> |
| EMC Marking (Class A) | Canada | <p>CANADA ICES-003 CLASS A CANADA NMB-003 CLASSE A</p> |
| VCCI Marking (Class A) | Japan | <p>この装置は、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。VCCI-A</p> |
| BSMI Registration Number / Marking & EMC Warning | Taiwan |  <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>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</p> </div> |
| GOST R Marking | Russia |  |
| RRL MIC Mark | Korea |  |

Electromagnetic Compatibility Notices

FCC Verification Statement (USA)

Intel® Server System SR870BH2

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.

Intel Corporation
5200 N.E. Elam Young Parkway
Hillsboro, OR 97124-6497
Phone: 1-800-628-8686

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 in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are 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 your authority to operate the equipment. The customer is responsible for ensuring compliance of the modified product.

Only peripherals (computer input/output devices, terminals, printers, etc.) that comply with FCC Class A or B limits may be attached to this computer product. Operation with noncompliant peripherals is likely to result in interference to radio and TV reception.

All cables used to connect to peripherals must be shielded and grounded. Operation with cables, connected to peripherals that are not shielded and grounded may result in interference to radio and TV reception.

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.

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.

VCCI (Japan)

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 (VCCI) from Information Technology Equipment. If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

BSMI (Taiwan)

The BSMI Registration Marking and Class A EMC warning is located on top cover of the product.

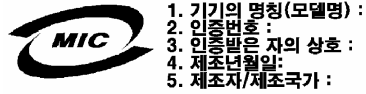


警告使用者：

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

RRL (Korea)

Following is the RRL certification information for Korea.



English translation of the notice above:

1. Type of Equipment (Model Name): SR870BH2
2. Certification No.: On RRL certificate. Obtain certificate from local Intel representative
3. Name of Certification Recipient: Intel Corporation
4. Date of Manufacturer: Refer to date code on product
5. Manufacturer/Nation: Intel Corporation/Refer to country of origin marked on product

Conventions

The following conventions are used in this manual:



WARNING

Warnings indicate conditions that, if not observed, can cause personal injury.



CAUTION

Cautions warn you about how to prevent damage to hardware or loss of data.



NOTE

Notes call attention to important information.

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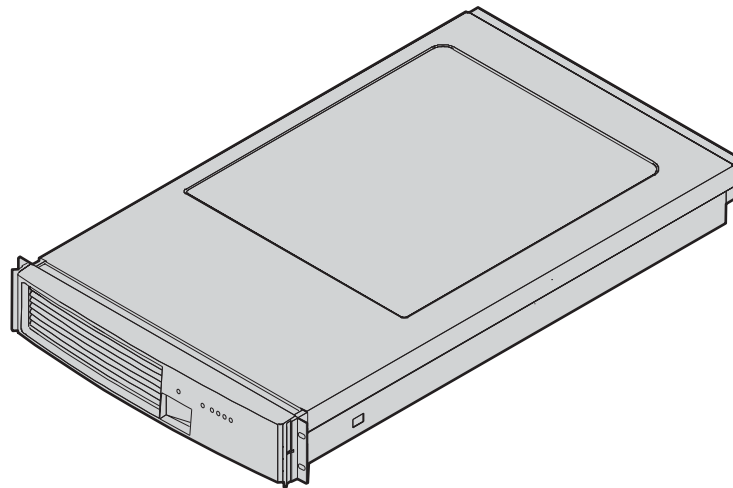
Part 1: System Description and Configuration

1 System Description

The Intel® Server System SR870BH2 is a compact, high-density, rack mount server system with support for one to two Intel® Itanium® 2 processors and 16-GB DDR SDRAM memory. The scalable architecture of the system supports Symmetric Multiprocessing (SMP) and a variety of operating systems.

The server system supports several high availability features, such as hot-swap and redundant power supply modules, hot-swap and redundant fans for cooling, and hot-swap hard drives. Serviceability features include LED indicators for system, reset, hard drive and LAN status and system identification. Additional features include video connector and dual USB ports accessible from the front panel. Color-coded parts differentiate hot-swap and non-hot-swap serviceable components.

Figure 1 provides a diagram of the front and top of the server system, with the chassis cover in place.



TP00299

Figure 1. Server System Front

Table 1 provides the system dimensions and weight.

Table 1. Physical Specifications

| Specification | Value |
|-----------------|----------------------|
| Height | 3.4 inches (87 mm) |
| Width | 17.7 inches (449 mm) |
| Depth | 29.4 inches (747 mm) |
| Front clearance | 3 inches (76 mm) |
| Side clearance | 1 inch (25 mm) |
| Rear clearance | 6 inches (152 mm) |
| Weight (note 1) | 65 lbs (30 kg) |

Note 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.

Table 2 provides a list and brief description of the features of the server system.

Table 2. Feature Summary

| Feature | Description |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Compact, high-density system | Rack-mount server with a height of 2U (3 1/2 inches) and a depth of 28 inches |
| Configuration flexibility | <ul style="list-style-type: none"> • 1-2 way capability in low profile and cost effective packaging • Stand-alone system including external I/O slots/disk expansion as needs grow • Intel Itanium 2 processor support • 16-GB Double Data Rate (DDR) Synchronous Dynamic Random Access Memory (SDRAM) memory support |
| Serviceability | <ul style="list-style-type: none"> • Front access to hot-swap hard drives • Hot-swap fans • Front access to hot-swap power supplies • Dockable power to main board • System power and reset status LEDs • System ID switch on front panel and LEDs on front and back • Color-coded parts to identify hot-swap and non-hot-swap serviceable components |
| Availability | <ul style="list-style-type: none"> • Three PCI-X slots • Three hot-swap 350-W power supplies in a redundant (2+1) configuration • Dual redundant power cords (1+1) when three power supplies are present • Six hot-swap system fans in a redundant (5+1) configuration • Two hot-swap 1-inch Ultra320 SCSI hard drives |
| Manageability | <ul style="list-style-type: none"> • Remote management • Emergency Management Port (EMP) • Intelligent Platform Management Interface (IPMI) 1.5 compliant • Wired For Management (WfM) 2.0 compliant • Remote diagnostics support |

| Feature | Description | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Upgradeability and investment protection | <ul style="list-style-type: none"> • Supports Intel Itanium 2 processors • Field upgradeable to next generation (Montecito) processor family • Multi-generational chassis | | |
| System-level scalability | <ul style="list-style-type: none"> • Up to 16-GB DDR SDRAM (using 2-GB DIMMs) • One to two Intel Itanium 2 processors • External I/O (3 slots) / disk expansion • External SCSI connector | | |
| Front panel | <table border="0"> <tr> <td> <ul style="list-style-type: none"> • System Power switch and LED • System Reset switch • System Diagnostic Interrupt (SDINT) switch • System ID switch and LED </td> <td> <ul style="list-style-type: none"> • System Status LED • Hard Drive Fault LED • LAN1 & LAN2 Status LEDs • Video Connector • Dual USB 1.1 Ports </td> </tr> </table> | <ul style="list-style-type: none"> • System Power switch and LED • System Reset switch • System Diagnostic Interrupt (SDINT) switch • System ID switch and LED | <ul style="list-style-type: none"> • System Status LED • Hard Drive Fault LED • LAN1 & LAN2 Status LEDs • Video Connector • Dual USB 1.1 Ports |
| <ul style="list-style-type: none"> • System Power switch and LED • System Reset switch • System Diagnostic Interrupt (SDINT) switch • System ID switch and LED | <ul style="list-style-type: none"> • System Status LED • Hard Drive Fault LED • LAN1 & LAN2 Status LEDs • Video Connector • Dual USB 1.1 Ports | | |
| Removable media | <ul style="list-style-type: none"> • DVD/CDRW • External USB floppy or key fob | | |

External Chassis Features

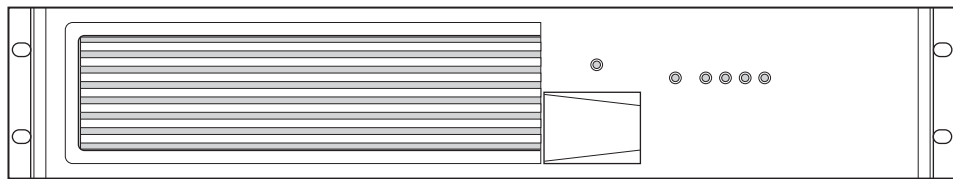
System controls and indicators are located in several places on the chassis as follows:

- Chassis front:
 - Front panel: Front panel switches and LEDs
 - Peripheral bay: Hard drive LEDs
 - Power bay: Power Module LEDs and Power Supply LEDs
- Chassis back panel: System ID LEDs and LAN port LEDs

Each of these areas is discussed below.

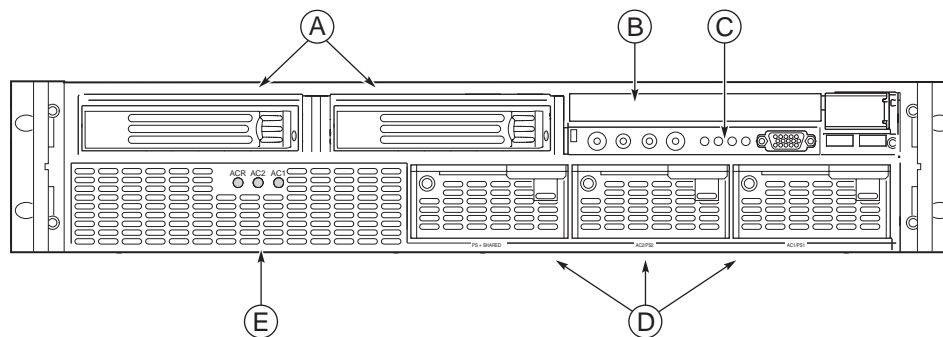
Chassis Front

The following figure shows the front of the chassis with the snap-on bezel in place. The bezel must be removed to access the front panel switches, power supplies, SCSI drives and DVD-CDRW devices. Figure 3 shows the front of the chassis with the bezel removed.



TP00300

Figure 2. Server System Front with Bezel Installed



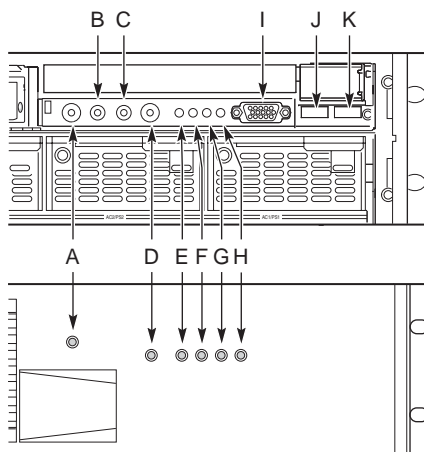
TP00301

- | | |
|-------------------------|-------------------------|
| A. Hard drives | D. Power supply modules |
| B. CD-ROM/DVD-ROM drive | E. Power bay |
| C. Front panel | |

Figure 3. Server System Front with Bezel Removed

Front Panel

The front panel is located at the right side of the server system, at the front of the chassis. The front control panel of the displays status lights for system status, hard drives, and power supplies.



TP00302

| Callout | Control, Connector, Indicator | Description | | | | | | | | | | | | | | | | | | |
|-----------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|-------------|-----|---------------|------------------------------------------|--------------|----------|--------------|-----------------|------------------|------------------------|--------------|----------------|--------------------------------------------------------------|-----------------|--------------------|--------------------------------------------------------------------------------------|
| A | System Power switch & LED | Toggles system power <table border="1"> <thead> <tr> <th>LED</th> <th>State</th> <th>ACPI</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Power off</td> <td>No</td> </tr> <tr> <td>On</td> <td>Power on</td> <td>No</td> </tr> <tr> <td>Off</td> <td>S5</td> <td>Yes</td> </tr> <tr> <td>On</td> <td>S0</td> <td>Yes</td> </tr> </tbody> </table> | LED | State | ACPI | Off | Power off | No | On | Power on | No | Off | S5 | Yes | On | S0 | Yes | | | |
| LED | State | ACPI | | | | | | | | | | | | | | | | | | |
| Off | Power off | No | | | | | | | | | | | | | | | | | | |
| On | Power on | No | | | | | | | | | | | | | | | | | | |
| Off | S5 | Yes | | | | | | | | | | | | | | | | | | |
| On | S0 | Yes | | | | | | | | | | | | | | | | | | |
| B | System Reset switch | Resets the system. | | | | | | | | | | | | | | | | | | |
| C | SDINT (System Diagnostic Interrupt) switch | Asserts SDINT | | | | | | | | | | | | | | | | | | |
| D | System ID switch and LED (Blue) | System identification switch and light | | | | | | | | | | | | | | | | | | |
| E | System Status/Fault LED (Green/Amber) | Indicates system status. <table border="1"> <thead> <tr> <th>LED</th> <th>State</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Not ready</td> <td>Post err/NMI Ev/CPU missing</td> </tr> <tr> <td>Green, solid</td> <td>Ready</td> <td>No Alarms</td> </tr> <tr> <td>Green, blinking</td> <td>Ready – Degraded</td> <td>CPU Fault, DIMM killed</td> </tr> <tr> <td>Amber, solid</td> <td>Critical Alarm</td> <td>Critical of Pwr Flt, Fan, Voltage, and Temperature failures.</td> </tr> <tr> <td>Amber, blinking</td> <td>Non-Critical Alarm</td> <td>Non-Critical of redundant Pwr Flt, redundant Fan, Voltage, and Temperature failures.</td> </tr> </tbody> </table> | LED | State | Description | Off | Not ready | Post err/NMI Ev/CPU missing | Green, solid | Ready | No Alarms | Green, blinking | Ready – Degraded | CPU Fault, DIMM killed | Amber, solid | Critical Alarm | Critical of Pwr Flt, Fan, Voltage, and Temperature failures. | Amber, blinking | Non-Critical Alarm | Non-Critical of redundant Pwr Flt, redundant Fan, Voltage, and Temperature failures. |
| LED | State | Description | | | | | | | | | | | | | | | | | | |
| Off | Not ready | Post err/NMI Ev/CPU missing | | | | | | | | | | | | | | | | | | |
| Green, solid | Ready | No Alarms | | | | | | | | | | | | | | | | | | |
| Green, blinking | Ready – Degraded | CPU Fault, DIMM killed | | | | | | | | | | | | | | | | | | |
| Amber, solid | Critical Alarm | Critical of Pwr Flt, Fan, Voltage, and Temperature failures. | | | | | | | | | | | | | | | | | | |
| Amber, blinking | Non-Critical Alarm | Non-Critical of redundant Pwr Flt, redundant Fan, Voltage, and Temperature failures. | | | | | | | | | | | | | | | | | | |
| F | Hard Drive Fault LED (Amber) | Indicates hard drive subsystem fault status. <table border="1"> <thead> <tr> <th>LED</th> <th>State</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Drive Missing</td> <td>Slot Empty, Online, Prepare for removal.</td> </tr> <tr> <td>On</td> <td>Inactive</td> <td>Drive Failed</td> </tr> </tbody> </table> | LED | State | Description | Off | Drive Missing | Slot Empty, Online, Prepare for removal. | On | Inactive | Drive Failed | | | | | | | | | |
| LED | State | Description | | | | | | | | | | | | | | | | | | |
| Off | Drive Missing | Slot Empty, Online, Prepare for removal. | | | | | | | | | | | | | | | | | | |
| On | Inactive | Drive Failed | | | | | | | | | | | | | | | | | | |

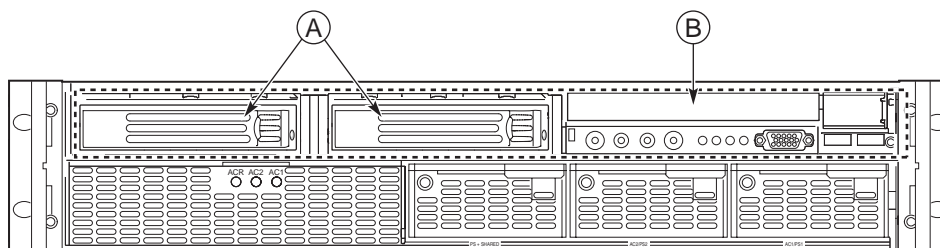
| Callout | Control, Connector, Indicator | Description | | | | | | | | | | | | |
|----------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|-------------|-----|------|--|----|----------|-----------|----------|--------|--------|
| | | Blinking Drive Identity, Rebuild, Predictive Fail, Rebuild Interrupt or Rebuild on empty slot. | | | | | | | | | | | | |
| G, H | LAN1, LAN2 Status LEDs (Green) | Indicates LAN activity status. <table border="1"> <thead> <tr> <th>LED</th> <th>State</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Idle</td> <td></td> </tr> <tr> <td>On</td> <td>Inactive</td> <td>No Access</td> </tr> <tr> <td>Blinking</td> <td>Active</td> <td>Access</td> </tr> </tbody> </table> | LED | State | Description | Off | Idle | | On | Inactive | No Access | Blinking | Active | Access |
| LED | State | Description | | | | | | | | | | | | |
| Off | Idle | | | | | | | | | | | | | |
| On | Inactive | No Access | | | | | | | | | | | | |
| Blinking | Active | Access | | | | | | | | | | | | |
| I | Video connector | Video port, standard VGA compatible, 15-pin connector | | | | | | | | | | | | |
| J | USB3 connector | USB port 3, 4-pin connector | | | | | | | | | | | | |
| K | USB4 connector | USB port 2, 4-pin connector | | | | | | | | | | | | |

Figure 4. Front Panel Controls, Indicators, and Connectors

Peripheral Bay

The peripheral bay supports up to two 1-inch hot-swap Ultra320 SCSI hard drives and one ½-inch ATA-33 IDE DVD/CD-ROM drive.

The peripheral bay supports Low Voltage Differential (LVD) SCSI disk drives only. Single-Ended (SE) SCSI devices are not supported in the peripheral bay, however SE device support is available via the secondary external SCSI channel located at the rear of the chassis.



TP00296

- A. Hard drives
- B. CD-ROM/DVD-ROM drive

Figure 5. Peripheral Bay

Hot-swap Hard Drive Carrier

The hot-swap hard drive carrier accepts 15,000-RPM and slower Ultra320 SCSI technology SCA-type hard drives. The peripheral bay supports 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. Refer to the *Intel® Server System SR870BH2 Hardware and Operating System Validation List* for details on tested devices. Contact your Intel representative to obtain this list.

Hard drive carriers that accommodate 3.5-inch by 1.0-inch SCSI disk drives are required as part of the hot-swap implementation. The disk drive is attached to the carrier with four fasteners, and is retained in the chassis by a locking handle. Figure 6 shows a hard drive carrier that has been removed from the peripheral bay. The drive is accessed by pressing the latch to release the drive carrier door, then pulling out on the door.

The SCSI backplane board contains a dual-color LED for each hard drive. The LED can be seen at the right edge of the carrier, as shown in the figure. The LED displays the drive status, as described in Table 3.

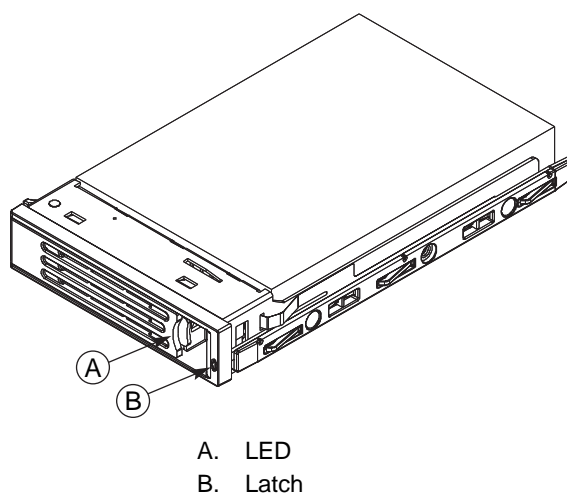


Figure 6. Hard Drive Carrier

Table 3. 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 Bay

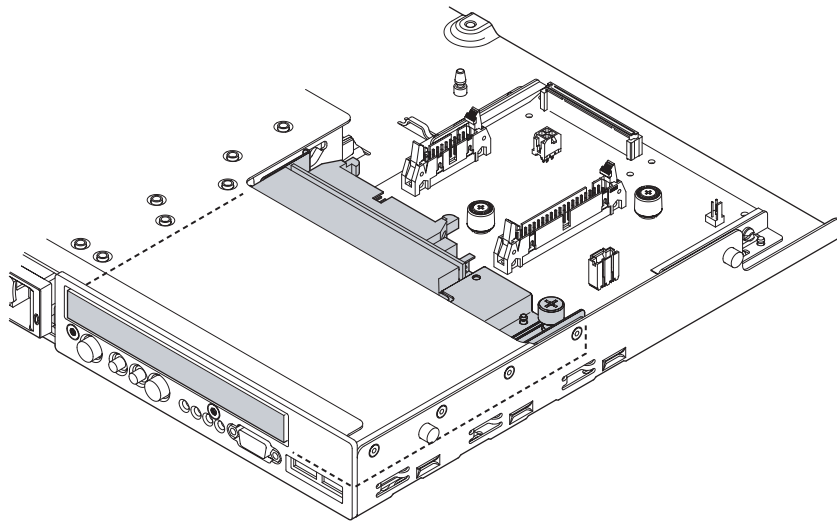


CAUTION

The DVD/CD-ROM drive cannot be hot-swapped. In order to add, remove or replace a DVD/CD-ROM drive, the system must be powered down, power sources unplugged and the top cover of the chassis must be removed to access the DVD/CD-ROM drive area.

The slim-line DVD/CD-ROM drive is installed in a drive carrier that is inserted from the rear of the peripheral bay. This device is not hot-swappable; you must switch off system power, remove all power cords, open the chassis and then remove the peripheral bay to remove or install a CD-ROM or DVD-ROM drive.

The CD-ROM/DVD-ROM drive snaps into the carrier as shown below and is secured by four raised points. The raised points line up with the mounting holes on the sides of the drive. Two of these mounting points are spring loaded and two are stationary.

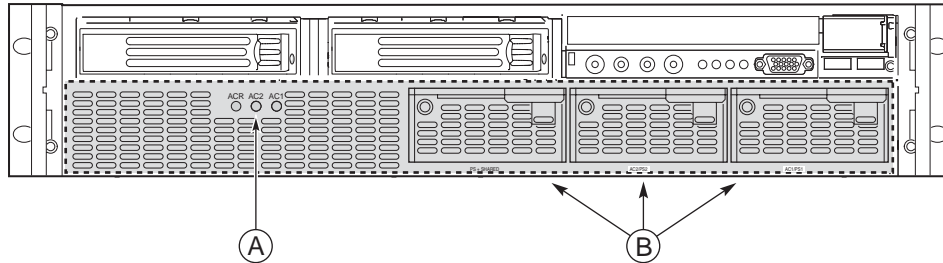


TP00303

Figure 7. DVD-ROM / CD-ROM Drive

Power Supply Bay

The power supply bay, shown below, is located in the lower front of the system. Redundant power status LED indicators are in the left portion of the power bay and three hot-swap power supply modules dock into the three bays on the right.



TP00295

- A. Power status LEDs
- B. Power supply modules

Figure 8. Power Supply Bay

The power subsystem can be configured as follows:

- Three power supply modules installed, (2+1) redundancy
- Two power supply modules installed, non-redundant



NOTE

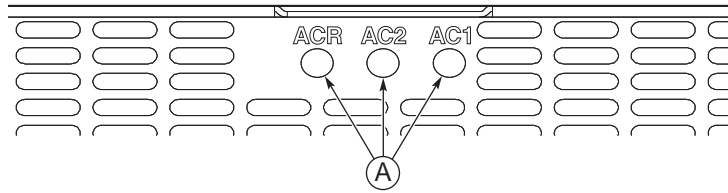
The power supply modules must be populated from right to left. The left power supply module is optional in a non-redundant configuration. If no module is installed in the left slot, a filler panel is required for proper system cooling.

Two power supply modules are capable of handling the worst-case power requirements for a fully configured server system. This includes two Intel Itanium 2 processors, 16 GB of memory, three PCI add-in cards, two hard drives, and a DVD-ROM / CD-ROM drive.

When the system is configured with three power supply modules, the hot-swap feature allows you to replace a failed power supply module while the system is running.

The power subsystem receives AC power through two power cords. When three power supply modules and two power cords are installed, the system supports (1+1) power cord redundancy. This feature allows the system to be powered by two separate AC sources. In this configuration, the system will continue to function without interruption if one of the AC sources fails.

The AC power status LEDs in the power supply module provide information on the status of the power sources. The LEDs are shown below, indicated by the letter “A” in the diagram. The possible LED states are described below the diagram.



TP00304

| LED | Description |
|-------------|-----------------------------------------------------------------------------------------------------------------|
| AC1 (green) | On - AC input #1 available. Off - AC input #1 unavailable or below voltage threshold to power up the system. |
| AC2 (green) | On - AC input #2 available. Off - AC input #2 unavailable or below voltage threshold to power up the system. |
| ACR (green) | On - redundant feature is available. Off - redundant feature is not available |

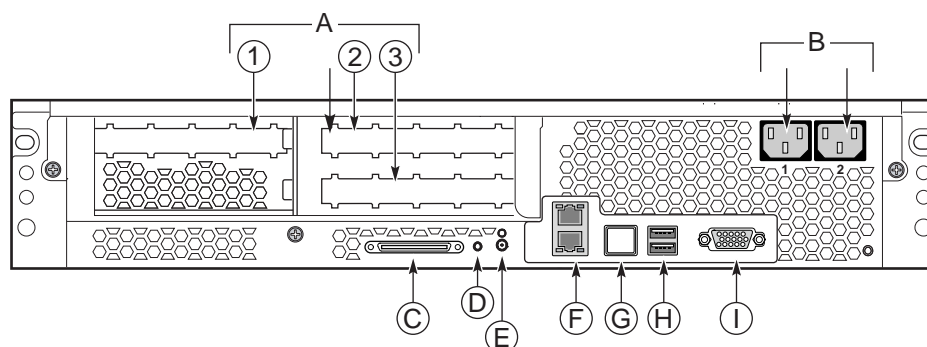
Figure 9. AC Power Status LEDs

The power redundancy feature requires each of the following conditions be present.

- AC input #1 available
- AC input #2 available
- Power good signals asserted from all three power supply modules
- TS-OK signal is asserted

Chassis Rear

The figure below shows the rear of the system.



TP00305

| Callout | Description |
|---------|-------------------------------------------------------------------|
| A | PCI Slots |
| | Slot 1 100 MHz, 64-bit PCI-X slot, full length |
| | Slot 2 100 MHz, 64-bit PCI-X slot, full length |
| | Slot 3 133 MHz, 64-bit PCI-X slot, full length |
| B | AC input power connectors (two) |
| C | External SCSI connector ¹ |
| D | System ID switch |
| E | System ID LED (blue) |
| F | Two LAN ports, RJ45 connector (LAN1 on bottom, LAN2 on top) |
| | LAN port LEDs: |
| | Status LED (Green) On – ethernet link is detected |
| | Off – no ethernet connection |
| | Blinking – ethernet link is active |
| | Speed LED |
| | (Green/Amber) Off – 10 Mbps |
| | Green On – 100 Mbps |
| | Amber On – 1000 Mbps |
| G | Serial port ² , RJ45 connector |
| H | Two USB 1.1 ports, 4-pin connectors (USB0 on bottom, USB1 on top) |
| I | Video port, standard VGA compatible, 15-pin connector |

Notes:

1. External SCSI bus supports both LVDS and SE signals via the external SCSI connector.
2. EMP access is provided via shared serial port.

Figure 10. Chassis Rear Features

Internal Chassis Features

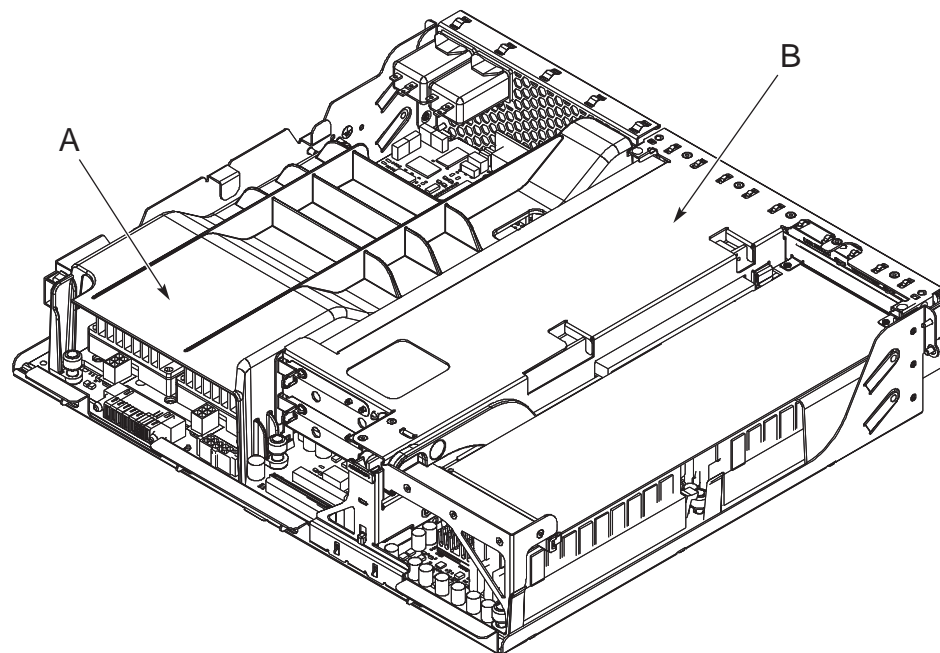
WARNING

Only qualified technical personnel should access any internal system component. Some exposed circuits exceed 240 VA and may cause injury if accidentally contacted.

Electronics Bay

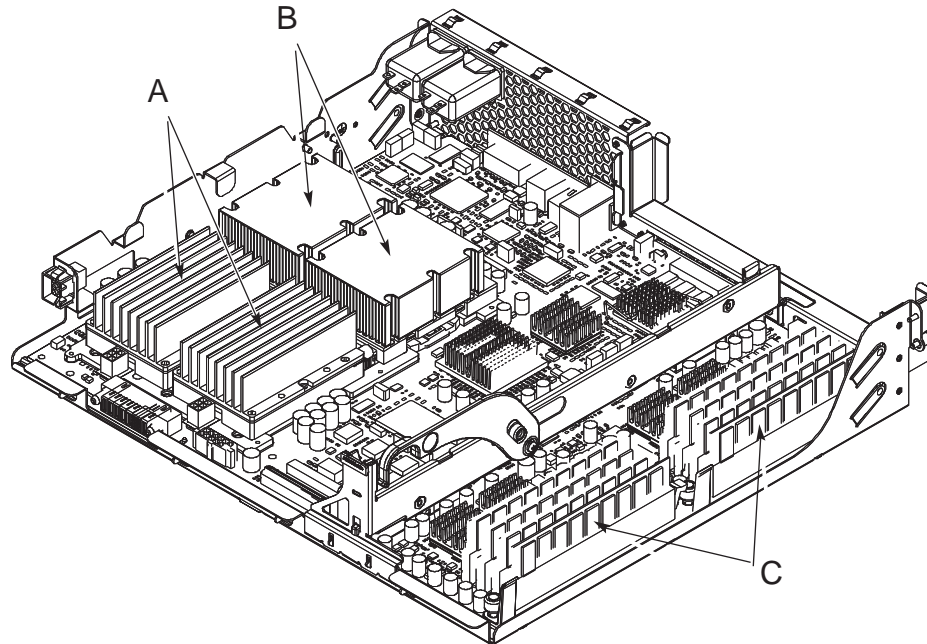
The electronics bay, shown in the two figures below, consists of the following:

- Main board
- PCI riser board
- Two processor locations and two power pod locations
- Eight DIMM slots
- Air duct for the processor area
- PCI riser bracket to support PCI riser board and PCI cards
- Connectors, switches and LEDs at the rear of the chassis (see *Figure 10*)



- A. Processor air duct with processor(s) installed underneath
- B. PCI riser sub-assembly with PCI cards installed

Figure 11. Electronics Bay



- A. Processor pods (2 shown installed)
- B. Processors (2 shown installed)
- C. DIMMs (8 shown installed)

Figure 12. Electronics Bay (sub-assembly removed)

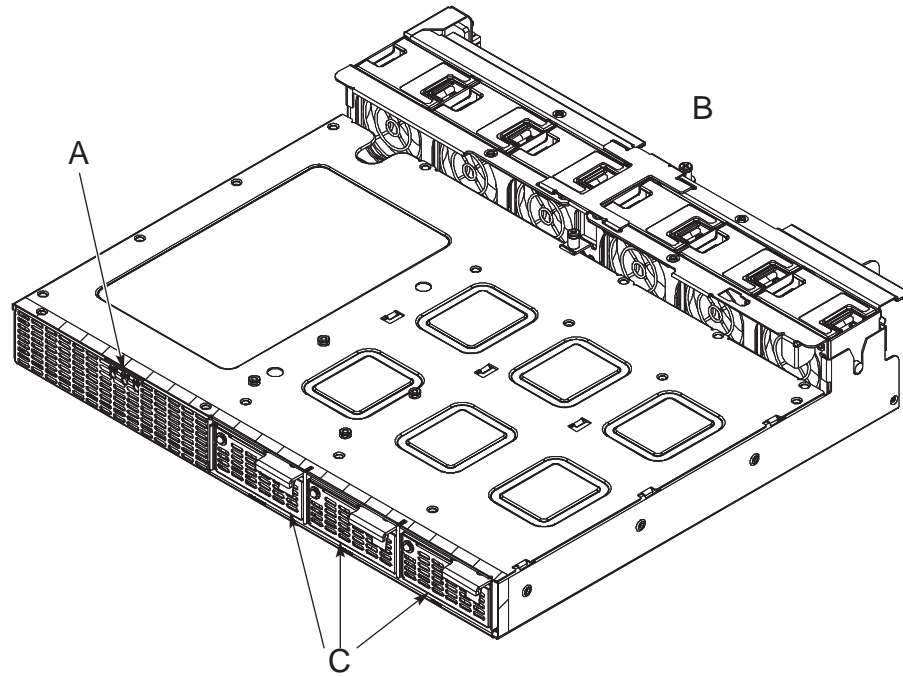
Cooling Subsystem



CAUTIONS

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

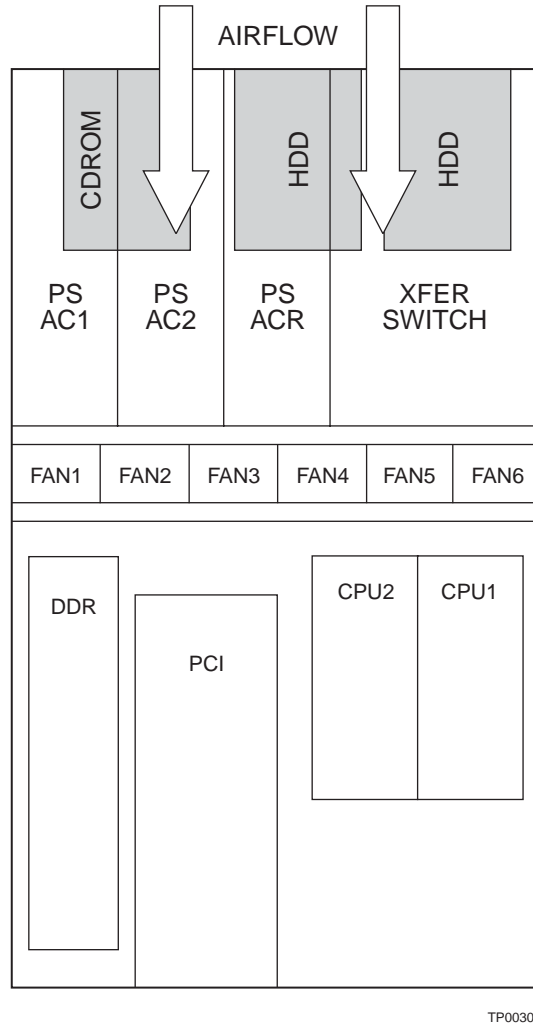
The cooling subsystem consists of a hot-swap, redundant (5+1) system fan array installed in the fan bay. The single bank of six Delta* FFB0612EHE-S18Z hot-swap system fans provide the airflow necessary to cool the system components. These fans are installed in the fan bay that is located within the power bay. The fans connect to the fan baseboard. The figure below shows the location of the fans in the power bay.



- A. AC power status LEDs (three)
- B. Fan bay (six installed fans)
- C. Power supply modules (three)

Figure 13. Power Bay (removed from chassis)

The figure below shows the cooling subsystem layout with the airflow direction indicated.



TP00309

Figure 14. Cooling Subsystem Layout

The server system supports only a fully populated system fan configuration. However, the system will continue to meet thermal specifications with either a system fan or a power supply failure. The power supply redundancy feature applies to systems with three power modules installed.

If a fan fails, system cooling is maintained and the system continues to operate while the failed fan is being hot-swapped. All system fans have tachometer output, internal speed control, and external Pulse Width Modulation (PWM) speed control.

A failure is detected when the RPM of a fan falls below a predetermined minimum threshold (Approx. 5000 RPM). If a system fan falls below this threshold, all fans will be boosted to operate at a higher speed (Approx. 8500 RPM)

The fans will also be boosted to the higher speed if a power supply fails for any reason (including loss of AC power). The fans will not be boosted if the Redundant (ACR) power supply fails. If the redundant power supply fails, the system fans will not be affected.

When boosted, all fans remain at high speed until the failed fan or power supply is replaced. When a fan replacement is detected by a change in state of the fan presence signal. After a failed fan is replaced, the fans return to the lower speed and fan failure monitoring at the lower speed levels is reactivated.

When a power supply fails and is replaced, the replacement is detected by server management.

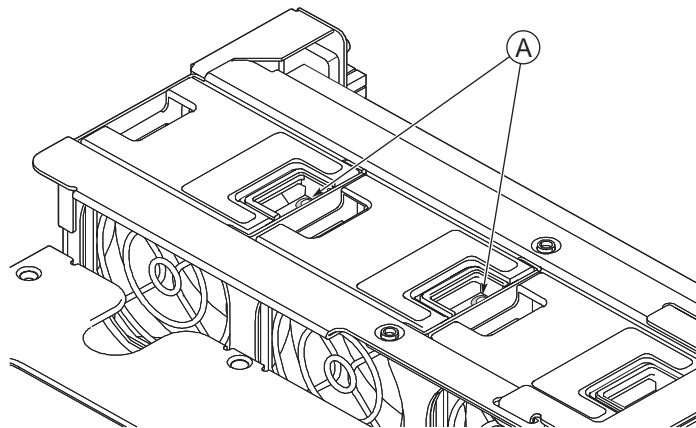


NOTES

Do not attempt to operate this system with less than a fully populated, six system fan configuration.

To maintain adequate cooling for system components, the swap process must be completed in two-minutes. This period only applies to the time that the fan or power supply is removed from the system, not from the time of failure.

A system fan failure is indicated by the corresponding fan LED and by the Cooling Fault LED on the front panel. The system fan LEDs are shown in the figure below. The LED is amber and turns on if a system fan failure occurs. These LEDs can be seen only when the top cover is removed from the chassis.



TP00310

A. Fan LEDs (two of six pointed out)

Figure 15. System Fan Status LED

Power Subsystem

Power Supply Modules

The power supply modules are Server System Infrastructure (SSI) compliant, universal AC input with Power Factor Correction (PFC) Thin Power Supplies (TPS). The power supply modules are auto-sens over the input range of 200-240 VAC and 100-127 VAC. They are rated at 350 W each. The combined continuous output power for all outputs has been designed such that they will not exceed 650W.

The DC output specification for the power supply is met by two power supply modules operating in the power bay. A third power module can be inserted to enable redundancy. When operated in parallel, the power modules share the total load currents equally within the limits specified, and meet all performance requirements. Two power supply modules are capable of handling the worst-case power requirements for a fully configured system: Two processors, 16 GB of memory, three PCI-X add-in cards, two hard drives and a DVD or CD drive.

In the unlikely event that a power module fails in a redundantly paralleled group, or upon the removal of an operational or failed supply from a redundantly paralleled group, the action will not cause DC output transients in excess of specified limits. Conversely, adding an operational or failed supply to a paralleled group will not cause DC output transients in excess of the limits specified.

Redundant AC Power Source Operation

The power bay has two AC inlets, labeled AC1 and AC2, located at the rear of the chassis. AC1 is connected to the inputs of power supply module PS1. AC2 is connected to module PS2 and the redundant power module PS-Shared, through normally closed transfer switch contacts.

- If AC1 input fails or exceeds the specified voltage range, AC2 will transfer power to the two modules located in the positions labeled PS2 and PS-Shared.
- If AC2 input fails, the AC transfer switch automatically switches from AC2 to AC1. As result, AC1 connects to the two power supply modules located in locations PS1 and PS-Shared. After AC2 recovers, the AC transfer switch resets to its original state. 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.

Processor Power Pods

Dedicated power pods supply power to each processor. The input connector of the power pod is connected to the 12 VDC power on the main board via a short 'Y' cable. The output connector of the power pod mates directly with the edge of the processor package.

2 Board Set Description

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

- Main board
- PCI riser board

In addition, the server contains the following system boards:

- SCSI board
- Front panel board

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

The figure on the following page displays a block diagram of the system and the board set within the system.

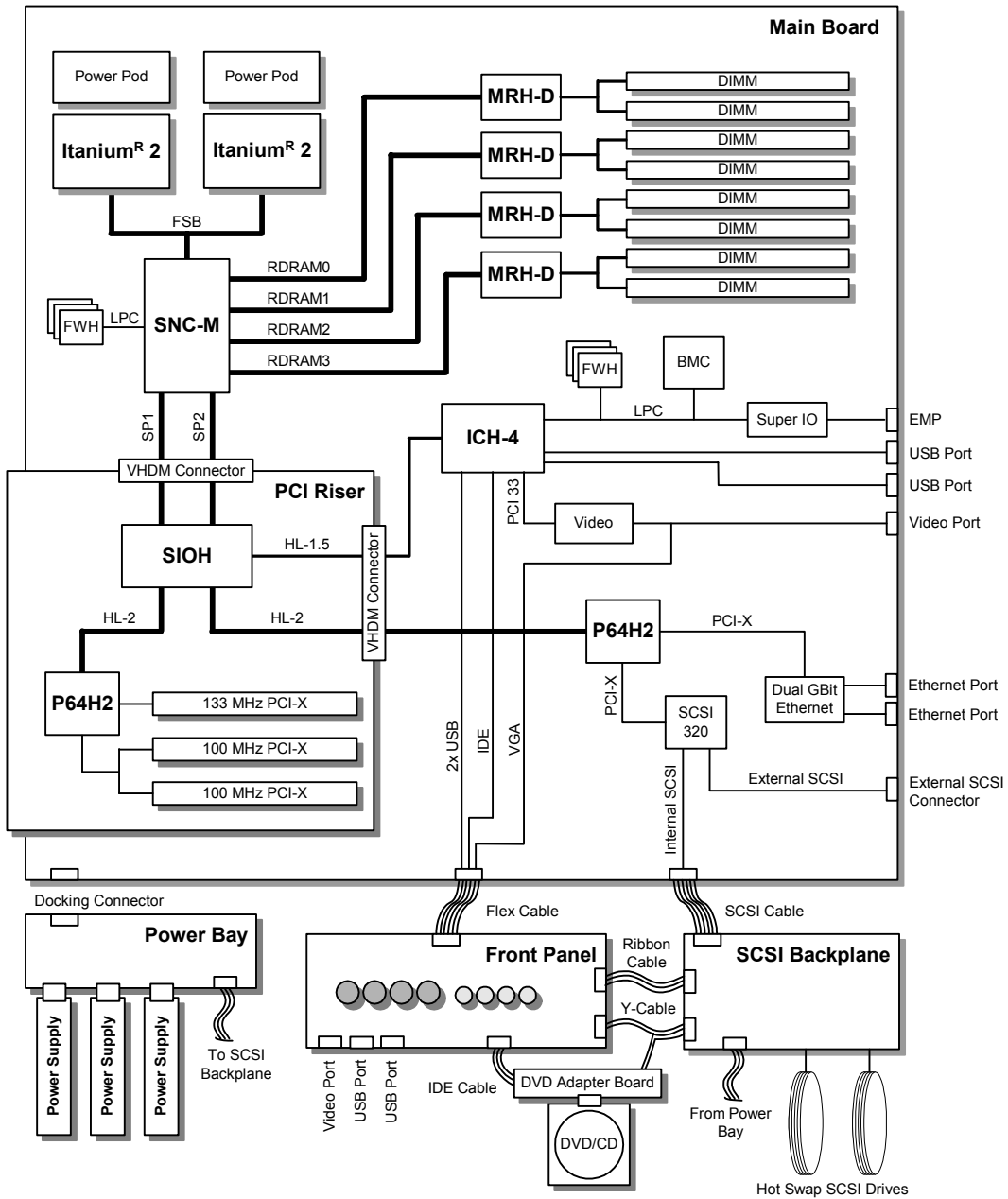
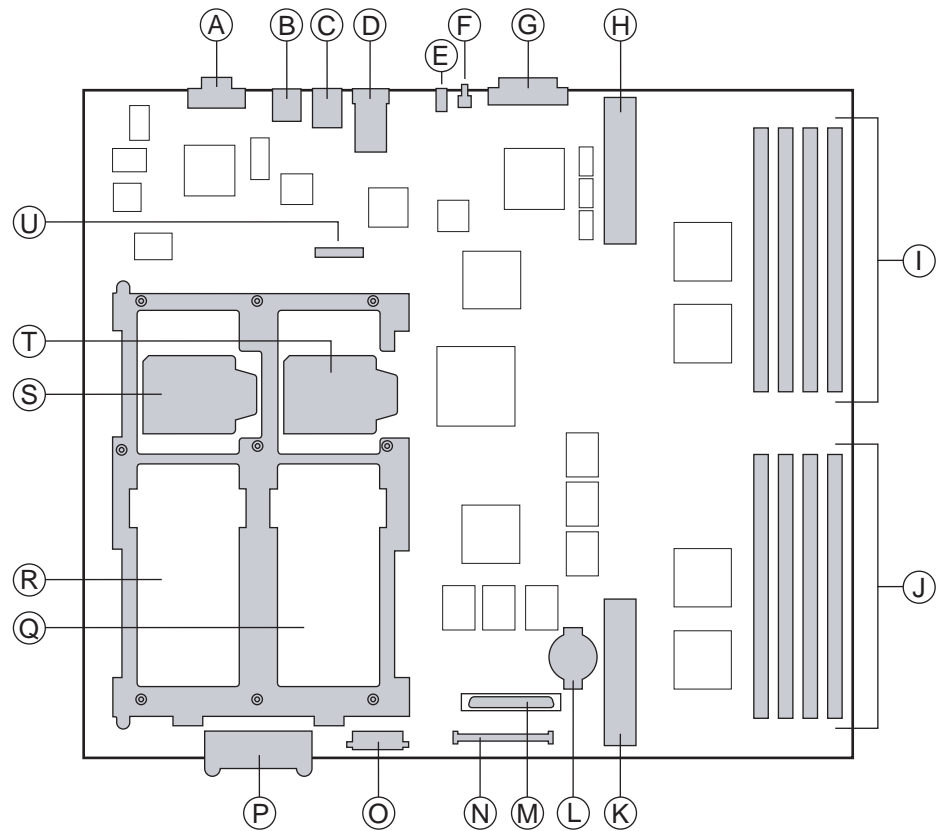


Figure 16. System Architecture Layout

Main Board

The main board connection layout is displayed in *Figure 17*. The main board supports the following features:

- Two Intel Itanium 2 processor sockets and power pod sites
- Eight 184-pin, DDR-SDRAM DIMM sockets
- SNC-M (Scalable Node Controller) of the E8870 chip set
- Four Memory Repeater Hubs – DDR (MRH-D) components of the E8870 chip set
- One P64H2 PCI-X bridge component (to drive SCSI controller and NIC)
- SCSI Ultra320 Controller
- Network Interface Controller (NIC) 10/100/1000 Ethernet controller that provides two LAN ports
- One I/O Control Hub 4 (ICH4) component
 - Four USB 1.1 ports (two at the rear, two through the front panel)
 - One IDE bus routed through the flex cable to the front panel board supporting one ATA33 master device
- Low Pin Count (LPC) Super I/O* with one external serial port and an internal header for a second port
- Integrated ATI* Rage* XL video controller and memory with two video ports – one at the rear and one through the front panel. The front panel video port supports resolutions up to 800x600.
- 8-MB Flash using four Firmware Hub (FWH) components
- Two VHDM connectors for PCI riser board
- One retention mechanism for processors and power pods
- In-Target Probe (ITP) port
- 200 MHz Front Side Bus (FSB)
- Four 400-MHz Rambus channels for memory interface
- Core ratio programming via the SNC-M
- Server management logic support
- Joint Test Action Group (JTAG) / boundary scan support through ITP or external source
- Clock buffering
- Six I²C system management buses (SMBus)
- Embedded D2D converters
- BMC server management controller
- Power control - Advanced Configuration and Power Interface (ACPI)
- Speaker control
- I²C logic
 - Includes Field Replaceable Unit (FRU) device ID that is accessed through a private I²C bus
 - Temperature sensors



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- | | |
|-----------------------------------------------|----------------------------|
| A. Video connector | K. VHDM 0 |
| B. COM2 connector | L. Battery |
| C. Dual USB connector | M. Internal SCSI connector |
| D. Dual gigabit Ethernet connector | N. 120-pin SM connector |
| E. System ID LED | O. PPOD connector |
| F. System ID PB | P. DC docking connector |
| G. External SCSI connector | Q. Processor power pod 2 |
| H. VHDM 1 | R. Processor power pod 1 |
| I. DIMM sockets 8, 4, 7, 3 from left to right | S. Processor 1 |
| J. DIMM sockets 6, 2, 5, 1 from left to right | T. Processor 2 |
| | U. ITP connector |

Figure 17. Main Board Layout

Processor Sockets

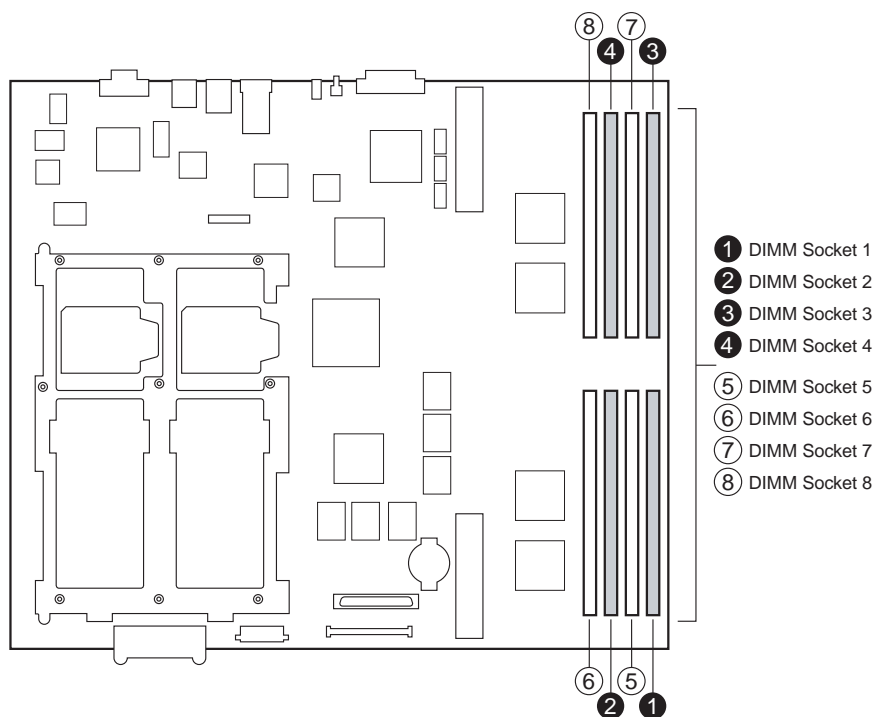
Each Intel Itanium 2 processor plugs into a 700-pin Zero Insertion Force (ZIF) socket. Each processor is powered by a 12 V power pod located adjacent to the processor on the main board. Attached to the top of each processor is a heat sink that dissipates thermal energy.

Memory Subsystem

The basic architecture of the memory subsystem is as follows:

- The DIMMs reside on the main board, between the PCI riser assembly and the chassis.
- Four Rambus channels run from the Scalable Node Controller (SNC) to each of the four Memory Repeater Hubs (MRH-D).
- There is one MRH-D device per Rambus channel.
- A single DDR branch channel is implemented off each MRH-D.
- Each DDR branch channel supports two 184 pin DDR DIMMs.
- The server system includes eight DIMM connectors in two rows.
- Each row of DIMM sockets supports four DDR DIMMs, one channel of each MRH-D, which collectively make-up a cache line.

The DIMM socket locations are shown in the figure below.



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Figure 18. Location of Memory DIMMS



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.

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

DIMMs must be populated in groups of four, referred to as a row. Row 1 consists of DIMM sockets 1-4 and row 2 consists of DIMM sockets 5-8. The DIMM sockets in each row are not side-by-side; see *Figure 18* to identify each socket and row.

Within a single row, all DIMMs must be identical, both in DIMM size and the number of devices on the DIMM. Each of the two DIMM rows can be populated with DIMMs that use different technologies, but for the best performance, the amount of memory on each MRH-D DDR branch channel should be the same to enable the benefits of memory interleaving.

SCSI Controller

The LSI-531030 SCSI controller (U320) on the main board provides one primary channel to internal SCSI backplane and a secondary channel via an external SCSI connector at the rear of the chassis. This device interfaces to the SIOH at clock frequencies up to 133MHz through one channel of the primary P64H2, also located on the main board. 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.

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.

Network Interface Controller

The onboard network interface is comprised of one Intel 82546EB Dual Port Gigabit Ethernet controller connected to the second channel of the primary P64H2 PCI-X bridge, located on the main board, at clock frequencies up to 133MHz. The 82546EB is a single component with two fully IEEE 802.3 compliant Ethernet interfaces. It provides two stacked RJ45 ports at the rear of the chassis.

This network interface supports Ethernet applications at 1000Base-T, 100Base-T, and 10Base-T (802.3, 802.3u and 802.3ab) and enables network manageability implementations required for remote control and alert over LAN.

Video Controller

The onboard, integrated ATI RAGE XL 64-bit SVGA chip contains an SVGA controller that is fully compatible with industry video standards. The video sub-system implements 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 and 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.

Video connectors are located at both the front and the rear of the chassis. The connectors are auto sensed and only one can be used at a time. The connector at the front of the chassis supports resolutions up to 800x600.

IDE Controller

The IDE controller is contained within the Intel® ICH4 (82801DA). The IDE controller is a multifunction device on the I/O board that acts as a PCI-based Fast IDE controller. Although the server system implements a single IDE channel on the front panel board, which supports a CD/DVD drive at ATA-33 speeds, the IDE controller supports the following:

- PIO and IDE DMA/bus master operations
- Mode 4 timing
- ATA-100 (100MB/sec using ultra DMA transfers)
- Buffering for PCI/IDE burst transfers
- Master/slave IDE mode

Baseboard Management Controller (BMC)

The Baseboard Management Controller and its associated circuitry reside on the main board. 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 provides the interface to the monitored information so system management software can pole and retrieve the present status of the platform.

The BMC 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:

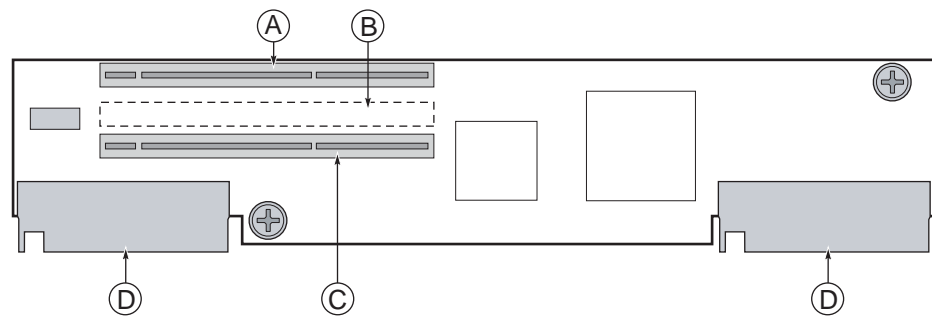
- System power control, including providing Sleep/Wake push-button interfaces for ACPI
- Platform Event Paging / Platform Event Filtering
- Power distribution board monitoring
- Temperature and voltage monitoring
- Fan failure monitoring
- Processor presence monitoring (no processors installed)
- Interlock monitoring
- Speaker beep capability on standby and when system is powered up
- Intel Itanium 2 processor SEEPROM interface (for processor information ROM and scratch EEPROM access)
- Processor temperature monitoring
- 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 interface
- Sensor Data Record 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 / System Diagnostic Interrupt status monitor
- Event receiver
- System interface to the IPMB (via system interface ports)
- IPMI Management Controller Initialization Agent
- Emergency Management Port interface
- Serial/modem and LAN alerting

The firmware for the BMC is field-upgradeable using the Firmware Update utility. For information on the Firmware Update Utility, see *Running the Firmware Update Utility*.

PCI Riser Board

The PCI riser board connection layout is displayed in *Figure 19*. It supports the following features:

- One Server I/O Hub (SIOH) component of the E8870 chip set
- One P64H2 component
- Three non-hot-plug PCI slots
 - One 64-bit, 133 MHz PCI-X, full length
 - Two 64-bit, 100 MHz PCI-X, full-length
- One integrated D2D
- Server management logic
- I²C logic
 - FRU device ID accessed through a private I²C bus
 - Temperature sensor



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- A. PCI slot 2
- B. PCI slot 1 (on reverse side of board)
- C. PCI slot 3
- D. VDHM1 (left), VDHM0 (right)

Figure 19. PCI Riser Board Layout

SCSI Backplane Board

The SCSI backplane board connection layout is shown in Figure 20. The SCSI backplane board communicates with the main board via a 68-pin SCSI cable and to the Front Panel board via a 20-pin ribbon cable. It contains two industry standard 80-pin Single Connector Attachment (SCA)-2 connectors for hot-swap hard drives. Ultra320 or lower SCSI technology SCA type hard drives can be installed in this carrier. The backplane board accepts hard drives up to 15,000-RPM.

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 during intra-chassis communications. “Dumb” I²C devices are those that have no bus mastering capability.



NOTE

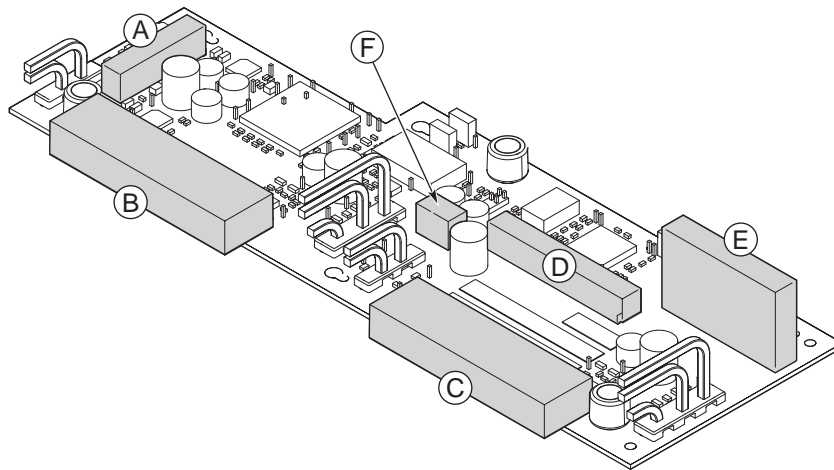
Because all hard drives have different cooling, power and vibration characteristics, Intel validates specific hard drive types in the system.

The SCSI backplane provides three main functions for the system:

- It passes the SCSI signals between the main board and the SCSI drives
- It provides hooks for enclosure management
- It provides an I²C server management interface

The SCSI backplane functional blocks include the following:

- Ultra320 LVD SCSI bus passes SCSI signals between the SCSI drives and the main board
 - A standard 68-pin SCSI connector provides the SCSI connection from the main board to the SCSI backplane
 - Two 80-pin (SCA-2 blind-mate) connectors are located on the SCSI backplane board to mate with hot-swap LVD SCSI drives in the drive bay
- Fault Tolerant Enclosure Management
 - SAF-TE
 - SCSI power control
 - LED control logic
- Server management
 - I²C interface
 - I²C Serial CMOS EEPROM (FRU)
 - Temperature sensor



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|---------------------------|---------------------------------------|
| A. Power bay connector | D. SCSI connector to main board |
| B. SCSI drive 1 connector | E. Front panel ribbon cable connector |
| C. SCSI drive 2 connector | F. Front panel power connector |

Figure 20. SCSI Backplane Board Layout

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 drive fault status, SCSI backplane temperature, and fan failure information via the IPMB
- Queries the status of the power distribution board by retrieving information from the BMC via the IPMB
- Controls hard drive power-on and power-down, facilitating hot-swapping

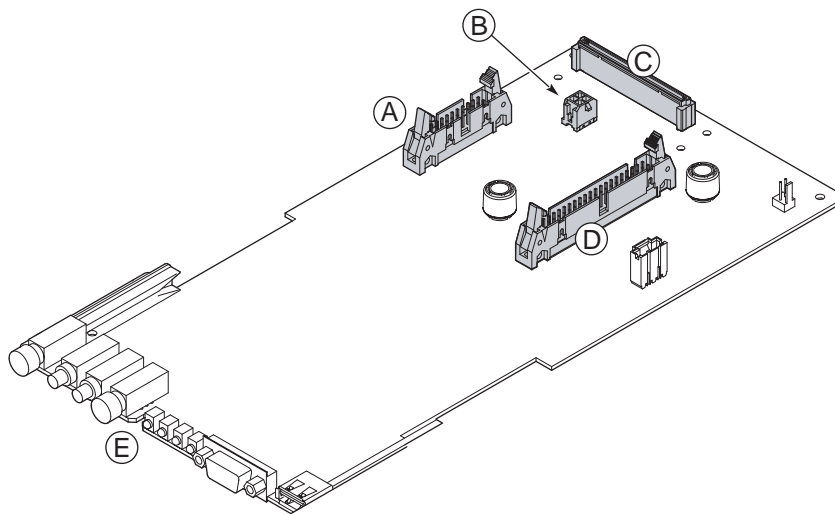
Front Panel Board

The front panel board connection layout is displayed in *Figure 21*. The front panel board provides three main functions for the system:

- It passes the IDE signals between the main board and the DVD drive
- It provides the front panel interface for the system
- It provides I²C server management interface

Front Panel Board Functional Blocks

- IDE bus passes IDE signals between the IDE DVD and the main board
 - The 120 pin flex cable connector from main board provides IDE connectivity and auxiliary signals
 - Single IDE channel pass-thru connection to IDE connector for support of an IDE peripheral
- Front panel functions
 - Two USB 1.1 connections
 - Power, Reset, SDINT and ID buttons
 - LEDs for power, both NIC channels, ID, system and drive failure
 - VGA connector providing video from main board controller
- Server management
 - I²C isolation to SCSI board
 - Temperature sensor



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- A. Ribbon connector to SCSI backplane board
- B. Power connector from SCSSO backplane board
- C. Flex cable to main board
- D. IDE connector
- E. Front panel buttons, LEDs, USB, video connector

Figure 21. Front Panel Board Layout

3 Configuration Software and Utilities

Utilities / Drivers on Resource CD

The Resource CD included with your server system includes the following utilities and drivers that can be used to configure your system:

- LSI Logic SCSI Driver for Linux (64-bit) and Windows* 2003 Server
- Utilities:
 - FRUSDR Loader
 - EFI Platform Diagnostics
 - System Maintenance Utility (SMU)
 - SDRViewer
 - SELViewer
- EFI Configuration Tool

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

- Create a diskette containing drivers for various operating systems.
- Install EFI Service Partition. The EFI service partition provides the ability to remotely access the server via modem or LAN for the purpose of executing configuration/setup utilities and diagnostics.
- Run EFI-based utilities.

Running Software Utilities Directly from the Resource CD

The following procedure allows you to run the software utilities directly from the 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 cursor to the Utilities and select the utility you want to run.

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, you can choose to invoke the Extensible Firmware Interface (EFI) Shell or you can choose to go to the Boot Maintenance menu.

The system follows the steps below when you press the power button on the front control panel to power up the server:

1. The server fans start.
2. POST begins running. POST is stored in flash memory. It 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 the memory depends on the amount of memory installed.
3. Video appears on the monitor that is attached to the server 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, you can use arrow keys to highlight the option that invokes the EFI shell operating system if it is installed, or you can highlight and select the Boot Maintenance menu. Selecting the Boot Maintenance menu lets you configure boot options and other boot environment variables. Booting to the EFI shell causes the following prompt to appear:
Shell>
6. When you see this prompt, you can load and start an operating system.

Extensible Firmware Interface Boot Manager

The EFI boot manager allows you to control the server's booting environment. Depending on how you have configured the boot options, after the server is powered up the boot manager presents you with different ways to bring up the system. For example, you can boot to one of the following:

EFI Shell: An interactive environment that allows EFI device drivers to be loaded, EFI applications to be launched, and operating systems to be booted. The EFI shell provides a set of basic commands used to manage files and the system environment variables. For more information on the EFI Shell, see

The Extensible Firmware Interface (EFI) Shell.

Boot Options: Files that you include as boot options. You add and delete 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, see *Table 4*.

Boot Maintenance Menu: A menu of items allowing you configure boot options and other boot environment variables. Table 4 describes each menu item in the Boot Maintenance menu.

Table 4. Boot Maintenance Menu Options

| Option | Description |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Boot from a File | <p>Automatically adds EFI applications as boot options or allows you to boot from a specific file.</p> <p>When you choose this option, the system searches for an EFI directory in all EFI System Partitions in the system. For each EFI directory that the system finds, it searches through that directory's subdirectories 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.</p> <p>With this option, you can launch a specific application without adding it as a boot option. In this case, the EFI Boot Manager searches the root</p> |

| Option | Description |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <p>directories of all of the EFI System Partitions present in the system for the specified EFI application.</p> <p>To boot from a file:</p> <ul style="list-style-type: none"> • At the menu, use the arrow key to select <code>Boot from a File</code>. • Press <code><Enter></code> to select the option. • Use the arrow key to choose the EFI file to boot from. • Press <code><Enter></code> to select the option. |
| Add a Boot Option | <p>Adds a boot option to the EFI Boot Manager. You specify the option by providing the name of the EFI application. You can provide either ASCII or UNICODE arguments that the file might use.</p> <p>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 <code>Boot from a File</code>. When the file is found, it is executed.</p> <p>To add a boot option:</p> <ul style="list-style-type: none"> • At the menu, use the arrow key to select <code>Add Boot</code>. • Press <code><Enter></code> to select the option. • Type in the name of the EFI application and press <code><Enter></code>. • Select <code>Save to NVRAM</code>. • Select <code>Exit</code> to return to the Boot Manager. |
| Delete Boot Options | <p>This feature allows you to delete a specific boot option or all boot options.</p> <p>To delete boot options:</p> <ul style="list-style-type: none"> • At the menu, use the arrow key to select <code>Delete Boot Option</code>. • Press <code><Enter></code> to select the option. • Use the arrow keys to select the boot option to delete. • Press <code><Enter></code> to select the option. • Press <code><Y></code> to confirm your selection. • Select <code>Save to NVRAM</code>. • Select <code>Exit</code> to return to the Boot Manager. |
| Change Boot Order | <p>This feature allows you to control the relative order in which the EFI Boot Manager attempts boot options. For help on the control key sequences you need for this option, refer to the help menu. To change the boot order:</p> <ul style="list-style-type: none"> • At the menu, use the arrow key to select <code>Change Boot Order</code>. • Use the arrow keys to select the Option to <code>move</code>. • Press <code><u></code> to move up in the boot order. • Press <code><d></code> to move down in the boot order. • Select <code>Save to NVRAM</code>. • Select <code>Exit</code> to return to the Boot Manager. |
| Manage BootNext Setting | <p>This feature allows you to select a boot option to use one time (the next boot operation).</p> <p>To manage boot next setting:</p> <ul style="list-style-type: none"> • At the menu, select <code>Manage Boot Next Setting</code> with the arrow key. • Select the Option to <code>boot next</code> with the arrow key. • Press <code></code> to make this option the next boot option. • Press <code><r></code> to reset. |

| Option | Description |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <ul style="list-style-type: none"> • Select <code>Save</code> to NVRAM. • Select <code>Exit</code> to return to the Boot Manager. |
| Set Auto Boot Timeout | <p>This feature allows you 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.</p> <p>To set auto boot timeout:</p> <ul style="list-style-type: none"> • At the menu, select <code>Set Auto Boot Timeout</code> with the arrow key. • Three options are available. • Select the <code>Choose Value</code> option with the arrow key and enter a value of "0" to disable auto boot. • Select the <code>Delete</code> option with the arrow key and select the <code>Delete</code> setting with the arrow key and press <code><Enter></code>. • Choose a time out value of 65535 (0xFFFF) to allow you to press any key while booting to EFI to disable timeout. |
| Select Console Output Device | <p>This feature allows you to select the device that the console output is sent to.</p> <p>To select the console output device:</p> <ul style="list-style-type: none"> • At the menu, select <code>Manage Boot Next Setting</code> with the arrow key. • Select the Option to <code>boot next</code> with the arrow key • Press <code></code> to make this option the next boot option. • Press <code><r></code> to reset. • Select <code>Save</code> to NVRAM. • Select <code>Exit</code> to return to the Boot Manager. |
| Select Console Input Device | <p>This feature allows you to select the device that the console receives input from.</p> <p>To select the console input device:</p> <ul style="list-style-type: none"> • At the menu, select <code>Manage Boot Next Setting</code> with the arrow key. • Select the Option to <code>boot next</code> with the arrow key. • Press <code></code> to make this option the next boot option. • Press <code><r></code> to reset. • Select <code>Save</code> to NVRAM. • Select <code>Exit</code> to return to the Boot Manager. |
| Select Standard Error Device | <p>This feature allows you to select the standard error device.</p> <p>To select the standard error device:</p> <ul style="list-style-type: none"> • At the menu, select <code>Manage Boot Next Setting</code> with the arrow key. • Select the Option to <code>boot next</code> with the arrow key. • Press <code></code> to make this option the next boot option. • Press <code><r></code> to reset. • Select <code>Save</code> to NVRAM. • Select <code>Exit</code> to return to the Boot Manager. |

| Option | Description |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cold Reset | Performs a platform-specific cold reset of the system. A cold reset means a full platform reset. To perform a cold reset: <ul style="list-style-type: none"> • At the menu, select <code>Set Auto Boot Timeout</code> with the arrow key. • Press <code><Enter></code>. • 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 application 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 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 5. Descriptions of the EFI shell commands are also available when operating in the EFI Shell. To access the descriptions, type `help` and press the `<Enter>` key.

A detailed description of the commands is available on the EFI website. To obtain the document, go to <http://developer.intel.com/technology/efi>. To download the files, click on `Tools` and then `EFI Sample Implementation 1.10.14.60`. The descriptions are in the Microsoft* Word* file named `EFI1.1ShellCommands.doc`.

In addition to the standard shell commands available in the EFI Shell, the EFI environment allows you 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* at <http://developer.intel.com/technology/efi>. Click on `Tools` and then `EFI Sample Implementation Version 1.02` to download the files to your hard drive. Review the Microsoft Word file `Efi_dg.doc`.

To develop your own shell commands, download the EFI Application Toolkit under the `Tools` link at <http://developer.intel.com/technology/efi>

Table 5. EFI Shell Commands

| Command | Description |
|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| <drive_name>: | Changes drives. For example, entering fs0: and pressing the <Enter> key changes the 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 Bklo Devices |
| devices [-b] [-lXXX] | 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 you 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 |

| Command | Description |
|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <code>if [not] condition then</code> | Provides conditional constructs (scripts only) |
| <code>load driver_name</code> | Loads a driver |
| <code>loadbmp [-c] [-t] [-i[UGA Instance]] file</code> | Displays a bitmap file on the screen |
| <code>loadpcirom romfile</code> | Loads a PCI option ROM |
| <code>ls [-b] [dir] [dir] ...</code> | Obtains directory listings |
| <code>map [-bdvr] [sname[:]] [handle]</code> | Maps <i>sname</i> to device path |
| <code>mem [address] [size] [;MMIO]</code> | Dumps Memory or Memory Mapped IO |
| <code>memmap [-b]</code> | Dumps memory map |
| <code>mkdir dir [dir]</code> | Creates a new directory |
| <code>mm address [Width] [;Type] [n]</code> | Memory Modify: type = Mem, MMIO, IO, PCI, [n] for non interactive mode when inside a .nsh file |
| <code>mode [col row]</code> | Sets or gets the current graphics mode |
| <code>mount BlkDevice [sname[:]]</code> | Mounts a file system on a block device |
| <code>mv [src...] [dst]</code> | Move one or more files/directories to destination |
| <code>pause</code> | Prompts to quit or continue (scripts only) |
| <code>pci [bus_dev] [func]</code> | Displays PCI device information |
| <code>rconnect DeviceHandle# [DriverHandle# [ChildHandle#]] [-r]</code> | Reconnects one or more drivers from a device |
| <code>reset [reset_string]</code> | Performs a cold reset |
| <code>rm file/dir [file/dir]</code> | Removes files or directories |
| <code>setsize file</code> | Sets size of a new file |
| <code>stall microseconds</code> | Delays for the specified number of microseconds |
| <code>time [hh:mm:ss]</code> | Gets or sets the time |
| <code>type [-a] [-u] [-b] file</code> | Displays the contents of a file |
| <code>ver</code> | Displays version information |
| <code>vol fs [volume_label]</code> | Sets or displays a volume label |

Firmware Upgrades

Use the Firmware Update Utility to upgrade the firmware. This utility is an EFI application 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 you can run it in non-interactive mode by supplying the command with any options. For information on the command-line options, see *Table 6*.



NOTE

Review the firmware release notes that comes with the software for additional instructions before updating either the boot code or the operational code.

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. .
2. Contact your Intel Sales Representative for the current release of the files:
 - 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. Write down the name of the HEX file because you will need it later.

You can update the firmware either by the FWUpdate utility's command-line interface or through the GUI interface.

Firmware Update with Command-line Interface

Table 6 describes the command-line options for the Firmware Update Utility.

Table 6. 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. |
| /uploadpia | Upload the FW flash with the Platform Information Area (PIA) contained in the hex file. |
| /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 or /uploadpia, 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 or /uploadpia, this switch has no effect. |
| /ignorerevs | When used in conjunction with /upload or /uploadpia, 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 or /uploadpia, this switch has no effect. |
| /nopc | When used in conjunction with /upload or /uploadpia, 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 or /uploadpia, 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 is required in order to enable the boot block to be uploaded. 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. This switch can 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. |

| Option or Parameter | Description |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| /secondary | Select secondary controller; e.g. second hot-swap controller. The primary and secondary controllers are identical, this switch indicates which one is being updated or verified. Without this switch the primary controller is assumed. When not used in conjunction with /upload or /verify, this switch has no effect. |
| /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. |

To run the Firmware Update Utility through the command-line interface:

1. Start the utility by typing: `fwupdate [HEX File Name] [Options]`
2. To view the command-line help, type:
`fwupdate /h`
or
`fwupdate /?`
3. To update boot block and the operational block of the firmware from the command-line interface, type `fwupdate [HEX File Name] /upload /bootena`
An external jumper is required in order to update the boot block.
4. To update the operational block only from the command-line interface, type `fwupdate [HEX File Name] /upload`

After the update completes successfully, the utility verifies the update by reading back the programmed code and comparing it to the HEX file.

5. Select the File menu and choose `Exit` to exit the utility.
6. If you need 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 with GUI Interface

To run the Firmware Update Utility through the GUI interface:

1. Start the utility by typing `fwupdate <name>.hex`
In the command, `<name>.hex` is the file you wrote down earlier.
2. Wait for the HEX file to load and the utility to display its menu items.
3. Use the arrow keys to select the Update Flash menu item.
4. Press the `<Enter>` key.
5. The utility asks you to update the boot code and/or the operational code.

After the update completes successfully, the utility verifies the update by reading back the programmed code and comparing it to the HEX file.

6. Select the File menu and choose `Exit` to exit the utility.
7. If you need to update the firmware for additional controllers, repeat the above steps for each controller.
8. Power down the system by pressing and holding the power button on the front control panel.
9. Disconnect the AC power cords from the system and wait 60 seconds.
10. Connect the AC power cords and power up the system by pressing the power button.

BIOS Upgrades

The BIOS is implemented as firmware that resides in flash ROMs. Use the EFI (Extensible Firmware Interface) based utility `IFlash64.EFI` to upgrade the BIOS.



NOTE

After you complete the `Iflash64` BIOS update, you must clear the CMOS.
For information on how to clear CMOS, refer to *CMOS Clear*.

BIOS Upgrade Procedure

A BIOS upgrade procedure can be done using the latest available System Update Package (SUP) for the Server System SR870BH2. This is a script file that automatically runs `IFlash64` and other firmware update utilities. You can also use the `IFlash64` utility to upgrade the BIOS using the following steps:

1. Boot to the EFI Shell. For information on how to boot the server, refer to
2. *The Extensible Firmware Interface (EFI) Shell*.
3. Copy `IFlash64.EFI` to a hard disk, CD-ROM disk, or EFI ramdisk (EFI ramdisk driver required). The binary file contains the new BIOS. Refer to the update instructions provided with each BIOS release for the most current instructions.

IFlash64 with Command-line Interface

Table 7 lists the command-line options for the IFlash64 Utility.

Table 7. 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 you 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. |

Running the IFlash64 utility through the command-line interface:

1. Start the utility by typing IFlash64 [File Name] [Options]
2. To view the command-line help, type:
IFlash64 /h
or
IFlash64 /?
3. To update System BIOS from the command-line interface, type, IFlash64 [File Name] /update
4. To verify System BIOS from the command-line interface, type, IFlash64 [File Name] /verify

IFlash64 with GUI Interface

Running the IFlash64 Utility through the GUI Interface:

1. Start the utility by typing IFlash64 or IFlash64 [File Name]
2. 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.
3. To update System BIOS from the GUI interface, select Update System BIOS.
4. 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 in *CMOS Clear*.

CMOS Clear

The CMOS must be cleared after the BIOS is updated. If using the automated System Update Package (SUP), the script will automatically clear the CMOS after the BIOS is updated. However if SUP is not used, the CMOS must be cleared manually. Clearing the CMOS involves

1. Restarting the server with the new jumper setting
2. Restoring the jumper setting to its original position
3. Restarting the server a final time

As an alternative, the CMOS clear button sequence can be used from the front panel. See the instructions that follow.



WARNING

Warnings and cautions apply whenever the top cover of the system is removed. Only a trained service technician should integrate, configure, or service this system. See *Important Safety Information* before opening your server system.

To clear the CMOS using the front panel button sequence follow these steps:

1. Power down the server by pressing and holding down the power button on the front control panel. Hold down the power button down for several seconds.
2. Assure that the system is off, but AC power is connected (5 V standby available).
3. Assure that the CMOS clear jumper is in the 'not clear' position.
4. Hold down the Reset button for at least 4 seconds. Without letting up on the Reset button, press the On/Off button.
5. Release both the On/Off button and Reset button simultaneously. The system will emit one beep.
6. Power on the server by pressing and holding the power button on the front control panel.

To clear the CMOS using the jumper on the main board follow these steps:

1. Power down the server by pressing and holding down the power button on the front control panel. Hold down the power button for several seconds.
2. Unplug both power cords from the server.
3. Remove the top cover from the chassis. See *Removing and Installing the Top Cover*.
4. Move the jumper at J5H3 from pins 1-2 to pins 2-3
5. Plug in the power cords.
6. Power on the server by pressing the power button on the front control panel.
7. Wait for the message NVRAM cleared by jumper to appear. When the following message appears, press <F1> to load the defaults:
Press <F1> to load defaults or <F2> to run SETUP or <ESC> to continue
8. Power down the server by pressing and holding the power button on the front control panel. To do so, hold down the power button for several seconds.
9. Unplug both power cords from the server.

10. Move the jumper at J5H3 from pins 2-3 to pins 1-2.
11. Install the chassis cover. See *Removing and Installing the Top Cover*.
12. Plug the power cords back in.
13. 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 sequence of events for automatic recovery is:

1. Insert recovery media and reset the system.
2. One beep indicates recovery media valid, and flash update started.
3. Approximately two minutes later, two beeps indicate flash update complete.
4. System automatically resets and starts the new BIOS.



WARNING

Warnings and cautions apply whenever the top cover of the system is removed. Only a trained service technician should integrate, configure, or service this system. See *Important Safety Information* before opening your server system.



NOTE

BIOS recovery requires an “El Torito” formatted CD; alternate forms of removable media including USB devices are not supported and will result in a continuous beep code (approximately 1 beep every 2 seconds until the system is powered down).

The BIOS Recovery Mode is initiated using the following procedure:

1. Unzip the recovery image and copy the SR870BH2.REC file onto the CD. SR870BH2.REC should be the only file on the disk.
2. Power down the server.
3. Unplug both power cords from the server.
4. Remove the top cover from the chassis. See *Removing and Installing the Top Cover*.
5. Move the jumper at J5H1 Labeled ‘RCV BOOT’ from pins 1-2 to pins 2-3.
6. Reconnect the AC power and switch server power on. CD Recovery activity begins. One full beep is emitted as the server begins to load SR870BH2.REC from disk to memory.
7. Wait two minutes. Two beeps indicate the BIOS recovery has completed successfully.
8. Remove the CD and power down the server.
9. Unplug both power cords from the server.
10. Move the jumper at J5H1 from pins 2-3 to pins 1-2.
11. Install the chassis cover. See *Removing and Installing the Top Cover*.
12. Reconnect AC power and power on the server.
13. Follow any other instructions in the BIOS release notes.

FRUSDR Load Utility

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

You should run the FRUSDR Load Utility each time you upgrade or replace the hardware in your server; excluding add-in boards, hard drives, and RAM. The utility programs the sensors that the server uses to monitor server management. Upon completing the programming of the FRU and/or SDR areas, the server should be rebooted.

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, 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, you can use the FRUSDR utility to update specific FRU areas and fields. You cannot 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*.

Within the FRU file header is a pad byte that can be any one-byte value. This pad byte is used in calculating the header checksum. If the header checksum is incorrect, then a message is displayed.

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 can be used 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.

Using the FRUSDR Load Utility, you 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

Use the FRUSDR Load Utility to manage the server management subsystem's product level FRU and SDR repository. 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 from the Service Partition*.
2. Copy the FRUSDR package to a removable media or to the hard drive. You will find the FRUSDR package on the CD-ROM that shipped with the server.
3. Load the IPMI driver by typing `load ipmi.efi`



NOTE

The IPMI driver file name may 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. You 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*.
5. After using the utility, reboot the system by powering off the server and then powering it back on. The reboot operation is necessary to reload the firmware and initialize the sensors.

FRUSDR Load Utility Command-line Options

The basic command-line format is:

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

Where:

| | |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>/? or /H</code> | Displays usage information |
| <code>/D SDR</code> | Displays the sensor data records |
| <code>/D FRU (Address)</code> | Displays the FRU located at a given address, allowing any FRU to be displayed. When the utility is invoked with the <code>/D FRU</code> or <code>/D SDR</code> 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. The parameters following <code>/D FRU</code> are: NVS_TYPE DEVICE_ID DEV_CNTR NVS_LUN DEV_BUS DEV_ADDRESS |

| | |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>/CFG</code> (filename.cfg) | Uses the specified custom configuration file. If not specified, the name of the CFG file defaults to <code>MASTER.CFG</code> . The configuration file can be used to load multiple FRU and SDR files. In the configuration file, each FRU and SDR file name must be called out. Each FRU area and field to be programmed must also be specified. The configuration file can be used to prompt or request information from you, and to ask which FRU areas to program. |
| <code>/P</code> | Pause the display between blocks of data to prevent the displayed data from scrolling off the screen. The <code>/P</code> command can 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. If there is not enough data to fill a screen, the pause command is ignored. |

There are two addressing modes for FRU devices:

- 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]`

| | |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>NVS_TYPE</code> | The type of EEPROM; Either AT24C02, DS1624S, or IMBDEVICE. If not specified, IMBDEVICE is assumed. |
| <code>DEV_CNTR</code> | The controller's IPMB device address; defaults to 'C20'. Must be prefixed by 'C' and must be three characters in length, including the 'C'. |
| <code>NVS_LUN</code> | The Logical Unit Number. Must be prefixed by 'L' and defaults to 'L00'. LUN value can be any number between 0 – 3, though any value except the default is uncommon. |
| <code>DEVICE_ID</code> | The Device ID; defaults to 00. Used only if <code>NVS_TYPE</code> is IMBDEVICE, (i.e. Indirect Addressing). |
| <code>DEV_BUS</code> | The device's bus number; it has no default. Required if <code>NVS_TYPE</code> is not IMBDEVICE (i.e. Direct Addressing). It has no default value. |
| <code>DEV_ADDR</code> | The device's address; it has no default. Required if <code>NVS_TYPE</code> 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 of 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 of 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. Therefore, the following command line would be interpreted as DEV_CNTR = 0xC0, NVS_LUN = 0, DEV_BUS 0x05, DEV_ADDR = 0xA9. Since NVS_TYPE is not IMBDEVICE, Direct addressing would be used:

```
FRUSDR /D FRU CC0 L0 5 AT24C02 A9
```

Command-line Precedence

Command-line precedence means that the first command found is operated on, followed by the next command, and so on. Commands can be divided into two categories:

- Flag commands. The only flag command is the pause (/P) flag command. This flag is used by the action commands.
- Action commands. The action commands are: /?, /D FRU, /D SDR, and /CFG.

The pause command affects only the execution of certain action commands. For example, the pause flag command 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. If more than one action command is listed on the command line, an error is displayed and the utility exits.

Displaying Usage Information

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

```
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.
```

Displaying the 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. Each FRU area is headed with the name of the area; 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 the SDR Area

The SDR non-volatile storage area is displayed in a 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 line after the header is the sensor record data in hex delineated by spaces. Each line holds up to 16 bytes. The data on each line is followed by the same data in ASCII format; non-printable characters (ch < 32 || ch > 126) are substituted by ‘.’.

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 FF 00 03 03 00 00 00 00 42 49 02 02 00 01 C5 .....BI.....
46 41 4E 2D 32                      FAN-2

```

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 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 not been initialized.

If the Internal Use Area of the BMC is loaded from the FRU file, then the BMC will be cold reset. This allows the BMC to 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 you, which represent the product's configuration. Non-tagged Sensor Data Records are automatically programmed.

After an update is successfully performed, a single message is displayed and the utility exits. If the utility fails, then it exits with an error message and an exit code.

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.

After an update is successfully performed, a single message is displayed and the utility exits. If the utility fails, then it exits with an error message and an exit code.

Configuration File

A configuration file can be used by the FRUSDR utility. The configuration file is ASCII text and editable. The file is parsed and 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 you to override values contained in an associated FRU file; it does not allow you to add areas to a FRU file. If you 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.

Compare Command

The configuration file compare command allows the validation of information to which 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 or SDR name to be compared.

For the FRU, 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.

For the SDR, 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.

BIOS Setup

This section describes the BIOS Setup Utility, which is used to change the server configuration defaults. You 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 and the rest in flash memory. The values take effect when you boot the server. POST uses these values to configure the hardware. If selected values and the hardware do not agree, POST generates an error message and you 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 (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. .
2. When POST shows the message “Press <F2> if you want to run SETUP,” press <F2>. If the server has an administrator password configured, the system prompts you to enter the password. If the server does not have a password configured, the main screen of the BIOS Setup Utility appears.

Recording Your Setup Settings

Before you make any changes, record the current values. If the default values need to be restored later, such as after a CMOS clear, you 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:

Main: Displays the BIOS version and details on processor type, and lets you configure the system time, date, and language.

Advanced: Lets you configure Option ROMs, configure peripheral devices, clear the event log, and disable POST error pauses.

Security: Lets you set a password.

System Management: Lets you configure Console Redirection, Quiet Boot, Serial Over LAN, and Service Partition options. Also displays BMC and HSC firmware revisions.

Exit: Exits the utility with or without saving utilities and allows management of custom settings.

Each menu occupies a single screen and presents a list of menu items. Some menu items are sub-menus, while others are settings that you can change from the screen.

Table 8 describes how to navigate between the utility screens and menus.

Table 8. Setup Screen Navigation

| 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. |

Setup Screens

Main

Table 9 describes the menu items available on the Main screen. Default values appear in brackets. Table 10 provides the settings for the processor. This submenu is available from the Processor Settings option on the Main menu.

Table 9. BIOS Setup Main Screen Menu Items

| Menu Item | Default Value | Description |
|-------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| System Time | HH:MM:SS | Set the System Time in <i>hour:minute:second</i> format. |
| System Date | MM/DD/YYYY | Set the System Date in <i>month/day/year</i> format. |
| Processor Configuration | Press <Enter> to present selection submenu | Selects the sub-menu. See Table 10. |
| Language | [English (US)] Spanish Italian French German | Selects the language that the BIOS displays. |
| BIOS Version | [<i>bios_version_number</i>] | The currently loaded version of BIOS. You cannot change this value. It appears for informational purposes only. |
| PAL Version | [<i>PAL_version_number</i>] | The currently loaded version of PAL. You cannot change this value. It appears for informational purposes only. |
| SAL Version | [<i>SAL_version_number</i>] | The currently loaded version of SAL. You cannot change this value. It appears for informational purposes only. |
| FPSWA Version | [<i>FPSWA_version_num</i>] | The currently loaded version of FPSWA. You cannot change this value. It appears for informational purposes only. |

Table 10. Processor Settings Submenu Items

| Menu Item | Default Value | Description |
|------------------------------|------------------|----------------------------------------------------------------------------------------------|
| Processor Retest | [No] Yes | If yes, BIOS clears historical processor status and retests all processors on the next boot. |
| Processor POST speed setting | Information Only | Displays measured processor speed. Shows common operating processor speed. |
| 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. |

Advanced

Table 11 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 11. BIOS Setup Advanced Screen Menu Items

| Primary Menu Item | Sub Menu Items | Value | Description |
|--------------------------|----------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Peripheral Configuration | Serial Port | [Auto] Enabled Disabled | Determines Serial Port configuration at boot time. Auto Causes the server to determine the Base I/O address and interrupt to use for the port. Enabled Requires you to supply the Base I/O address and the interrupt value. Disabled Causes the server to disable 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. |
| Event Log Configuration | SEL Event Logging | [Enabled] Disabled | Enabled allows logging of system events. |
| | Clear All Event Logs | [No] Yes | Instructs the BMC to clear the SEL log. |
| POST Error Pause | | [Enabled] Disabled | Select Disabled if you want the system to boot with no user intervention on critical POST errors. |

Security

Table 12 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 brief as compared to other server products. The two-level password has been replaced with a single-level password.

Table 12. BIOS Setup Security Screen Menu Items

| Menu Item | Default Value | Description |
|---------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Administrator Password Is | [Not Installed] Clear | Status only. Once set, can be disabled by setting to a null string, or clear password jumper on the main board. |
| Set Admin Password | Press <Enter> | When the <Enter> key is pressed, you are 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 the main board. |

System Management

Table 13 describes the menu items available on the System Management screen. Default values appear in brackets.

Table 13. BIOS Setup System Management Screen Menu Items

| Menu Item | Default Value | Description |
|---------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Quiet Boot | [Disabled] Enabled | 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 shaded if the BIOS does not detect a valid logo in the flash area reserved for this purpose. Enabling this option disables serial redirection. |
| OS Boot Timeout | [Disabled] 5 min 10 min 15 min 20 min | Sets the time allowed for booting an operating system, from media or PXE. |
| Service Boot | [Disabled] Enabled | Enabling this item allows you 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 you to configure for console redirection. |
| BMC Revision | [BMC_Rev] | The currently loaded version of Baseboard Management Controller firmware. Display only. |
| HSC Revision | No entry | Displays the revision of the hot swap controller. Display only. |

Table 14. Setup Console Redirection Sub Menu Items

| Sub Menu Item | Default Value | Description |
|----------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial Console Redirection | [Disabled] Enabled | When enabled, Console Redirection uses only COM2. Choosing "Disabled" completely disables Console Redirection. |
| Serial Port | No entry | Hardcoded value is COM2 2F8 IRQ3. If console redirection is enabled, then the Base I/O address and IRQ selection of Serial Port B should match this serial port setting under the Console Redirection submenu. To find this option, go to the Advanced menu, then Peripheral Configuration. |
| Baud Rate | 9600 [19.2K] 38,4K 57.6K 115.2K | When Console Redirection is enabled, use the baud rate specified. When the EMP is sharing the COM port as console redirection, the baud rate must be set to 19.2K to match the EMP baud rate. |
| Flow Control | No Flow Control [CTS/RTS] XON/XOFF CTS/RTS + CD | No flow control. CTS/RTS = Hardware based flow control. CTS/RTS +CD = Hardware based + Carrier Detect flow control. When the 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. |
| 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 |
| Remote Console Reset | [Disabled] Enabled | Enables remote reset via escape key sequence; ESC R ESC r ESC R |
| ACPI OS Headless Operation | Disabled Same as BIOS Serial Port | Passes information about serial redirection to ACPI OS. |
| ACIP OS Baud Rate | 9600 [19.2K] 38.4K 57.6K 115.2K | Available only when ACPI OS Headless Operation is the same as BIOS or serial port. |
| ACPI OS Flow Control | No Flow Control [CTS/RTS] XON/XOFF CTS/RTS + CD | Available only when ACPI OS Headless Operation is the same as BIOS or serial port. Options are passed to the operating system. |
| ACPI OS Terminal Type | PC-ANSI VT100+ VT-UTF8 | Available only when ACPI OS Headless Operation is the same as BIOS or serial port. Options are passed to the operating system. |

Exit

Table 15 describes the menu items available on the Exit screen. Default values appear in brackets.

Table 15. BIOS Setup Exit Screen Menu Items

| Menu Item | Description |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Exit Saving Changes | Lets you exit Setup with or without saving your changes in CMOS. Clicking on the menu item causes the system to prompt you 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 you exit Setup with or without discarding your changes. Clicking on the menu item causes the system to prompt you 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 you load Setup with factory defaults. Clicking on the menu item causes the system to prompt you for a Yes or No response. Yes Loads the system setup defaults. No Aborts the action. |
| Load Custom Defaults (This menu is not available until POST platform release) | Lets you load Setup with custom defaults. Clicking on the menu item causes the system to prompt you for a Yes or No response. Yes Loads setup values from a file previously saved through the Save Custom Defaults menu item. You must specify the file name. No Aborts the action. |
| Save Custom Defaults | Stores current CMOS settings in custom default CMOS area (flash). |
| Discard Changes | Lets you discard the changed values you have accumulated during this setup session. Clicking on the menu item causes the system to prompt you for a Yes or No response. Yes Discards the setup values for the current setup utility session. No Aborts the action. |

LSI Logic* SCSI Utility

The LSI Logic* SCSI utility allows you to configure the SCSI capabilities of the server. This configuration utility can be accessed using an EFI-based utility provided by Intel. The utility is available on the Server System SR870BH2 Resource CD. You can also obtain the utility you're your Intel representative.



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.

Launching the LSI SCSI Utility

To launch the LSI SCSI utility from the Resource CD:

1. The utility will auto-run if the server is booted with the CD in the CD-ROM/DVD-ROM drive. Otherwise, choose `Startup.nsh` from the root of CD-ROM/DVD-ROM drive.
2. After the CD menu is launched, select `Utility` at the top of the Main menu screen.
3. Select `EFI config tool` from the drop-down selections
4. Select `PCI Device` from the top of the next screen that is displayed.
5. Follow the instructions under *Running the LSI SCSI Utility*.

To launch the LSI SCSI utility from the command line:

1. From the EFI Shell, run `EFICnfg.efi` to enter the LSI Logic SCSI Utility.
2. At the Main menu, select `PCI Device` at the top of the screen.
3. Follow the instructions under *Running the LSI SCSI Utility*.

Running the LSI SCSI Utility

The instructions below walk you through creating a RAID 1 (Mirror) on the internal channel using the SCSI hard disk volumes in the hot swap drive bays.

1. From the PCI Device drop-down menu, select the LSI SCSI channel to configure: Select channel 0 to configure external attached storage or select channel 1 to configure onboard devices. The example here uses channel 1. The following information is displayed:

```
EFI Configuration program 1.0
OnBoard: Function0 ATI RageXL Video Adapter
OnBoard: Function0 USB Universal Host Controller
OnBoard: Function1 USB Universal Host Controller
OnBoard: Function0 DevicePath=ACPI (PNP0A03,0)/PCI (1F|0)
OnBoard: Function0 LSI Logic Ultra320 SCSI Controller
OnBoard: Function1 LSI Logic Ultra320 SCSI Controller
```

“LSI Logic Ultra320 SCSI Controller” is listed both as Function0 and Function1. The term “Function” represents the channel interfaces, Function0 is the rear or external channel; Function1 is the SCSI Hot Swap Bay located in the front of the server on the internal channel. One channel can be used for a RAID array at any one time.

2. Use the arrow keys to move to OnBoard: Function1 LSI Logic Ultra320 SCSI Controller; press <Enter> to select this option.
3. Press <Enter> at the Configure prompt. The screen displayed below is displayed.

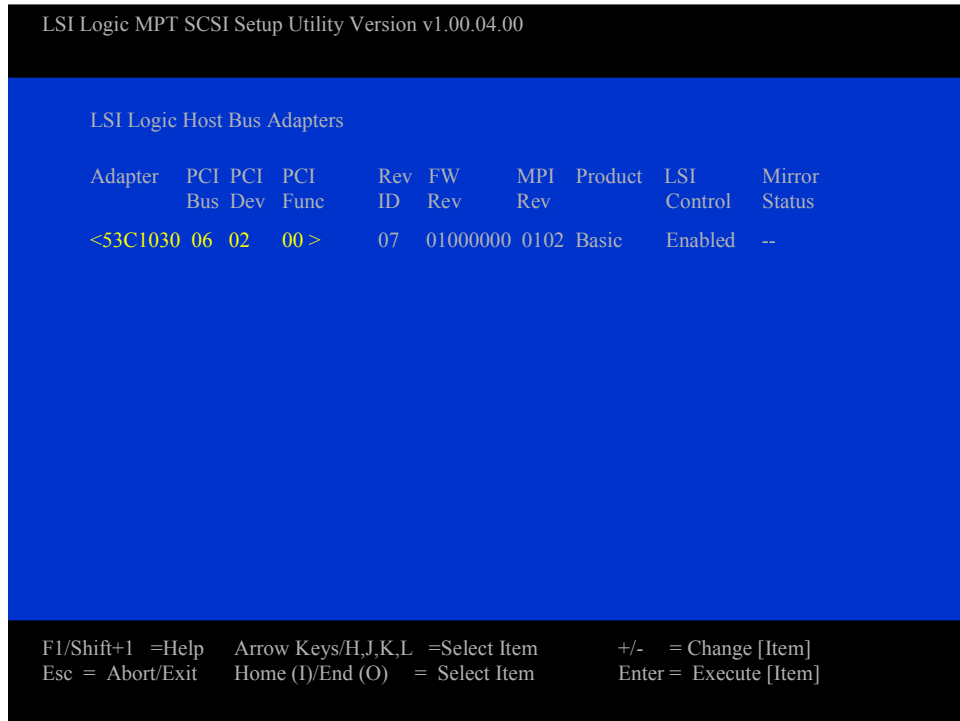


Figure 22. LSI SCSI Utility Main Menu

4. Use the arrow keys to highlight <53C1030 Bus3 Dev1 Fnc1>; press <Enter> to select this adapter. The screen clears and the following message is displayed:
Scanning for devices...

- Use the arrow keys to highlight Device Properties; press <Enter> to view and change the device properties. As shown by Figure 23, the screen displayed shows a list of devices found on the internal channel. Information includes the SCSI IDs and associated settings.

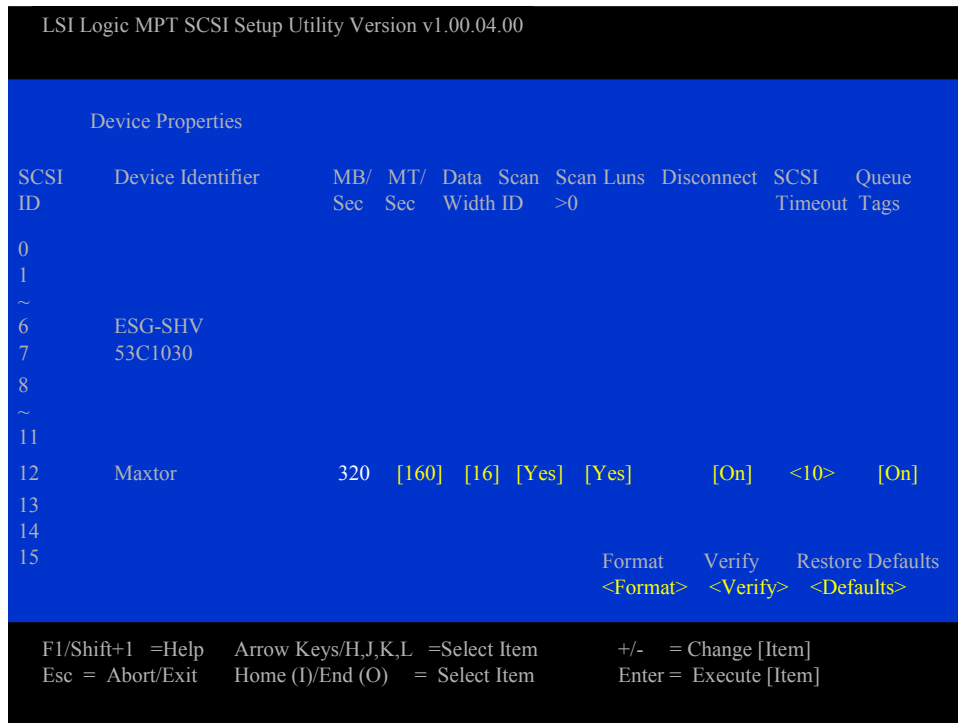


Figure 23. LSI SCSI Device Properties Screen

- Make appropriate changes to any options that are displayed by bright white type on the screen.
- Press <Esc> to return to the Adapter Properties menu.
- Use the arrow keys to highlight RAID Properties; press <Enter> to select RAID Properties.
- Use the arrow keys to highlight Modify; press <Enter> to select Modify.
- Use the arrow keys to select Disk 0; press the <+> key in the Array Disk field to change the selection to “Yes.”
- Use the arrow keys to select Disk 1; press the <+> key in the Array Disk field to change the selection to “Yes.”
- Press <Esc>
- Use the arrow keys to highlight <Sync>; press <Shift><S> to begin the synchronization process. When the synchronization phase is complete, the Array status will display as “Optimal.”



NOTE

The synchronization of the drives within this mirrored array may take several hours to complete. Use the Status option to view the progress.

14. Press <Esc> to exit to the Device utility exit screen.
15. Select Exit the Configuration Utility.
16. Select File / Exit at the EFI Configuration Main menu.
17. If you launched the utility from the Resource CD, Select File / Exit at the Resource CD main menu.
18. Restart the computer.

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 you:

- 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 and core components coexist on the same system and communicate using a procedural call interface. When run remotely, the user interface components and core components communicate use a socket interface. 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 16.

Table 16. 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 17. 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:

1. 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.
2. 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.
3. 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.

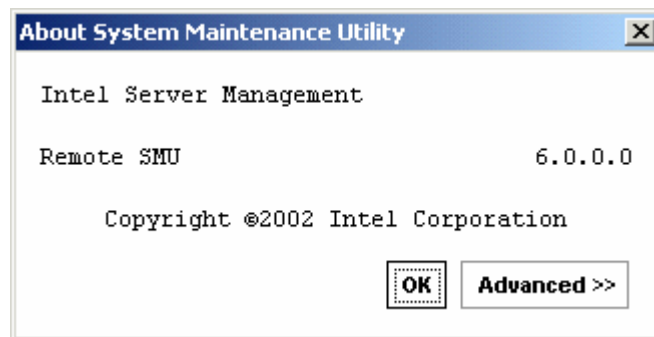


Figure 24. SMU Application About Box

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.

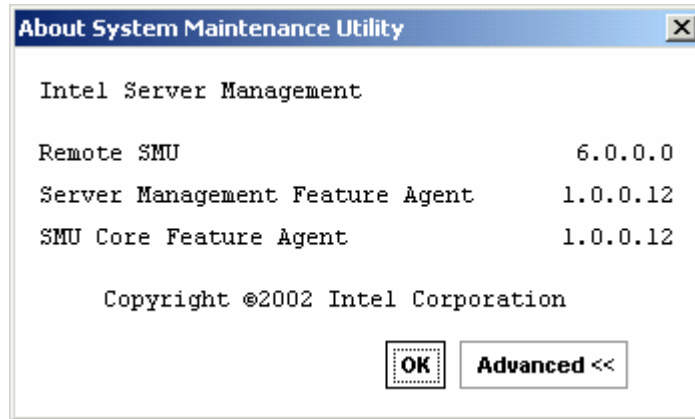


Figure 25. SMU Application About Box (Advanced button selected)

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`.

- 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.

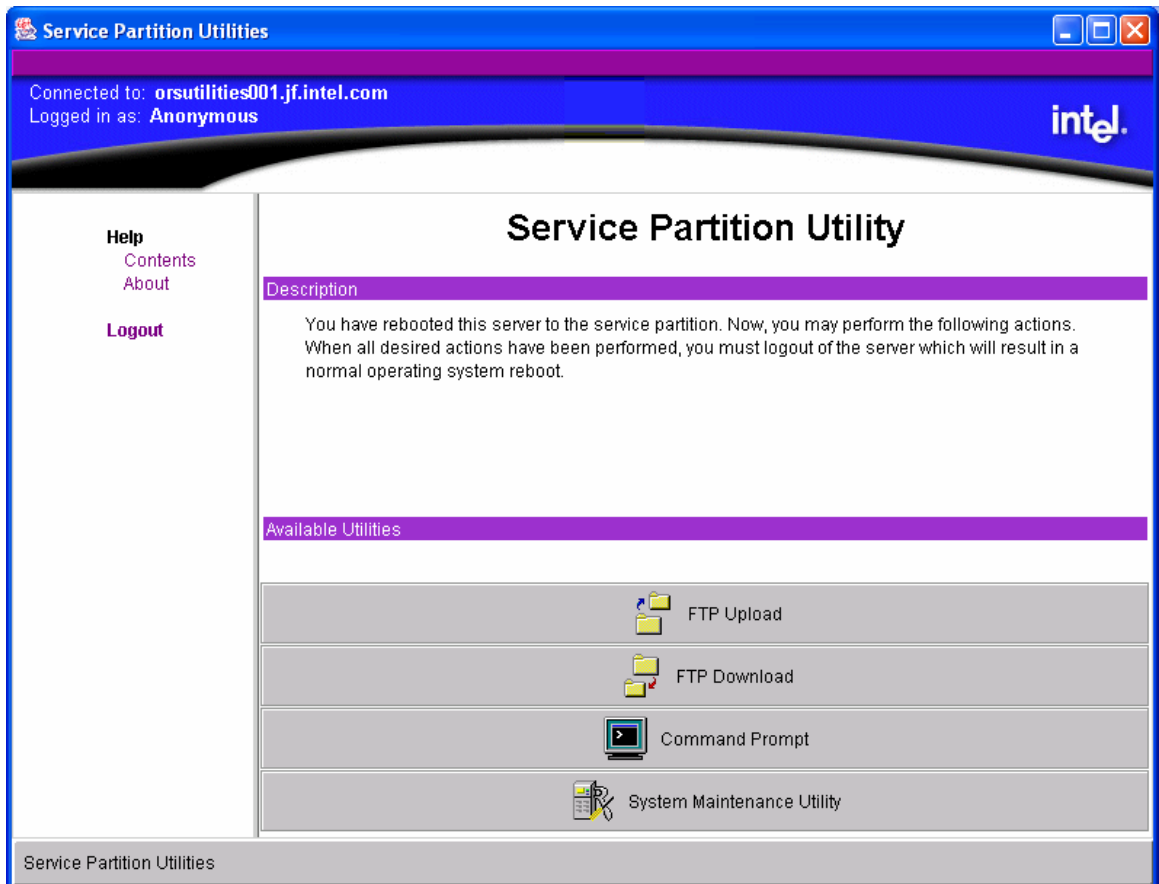


Figure 26. Service Partition Utilities

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, you 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 you to select an activity from the task pane at the left.

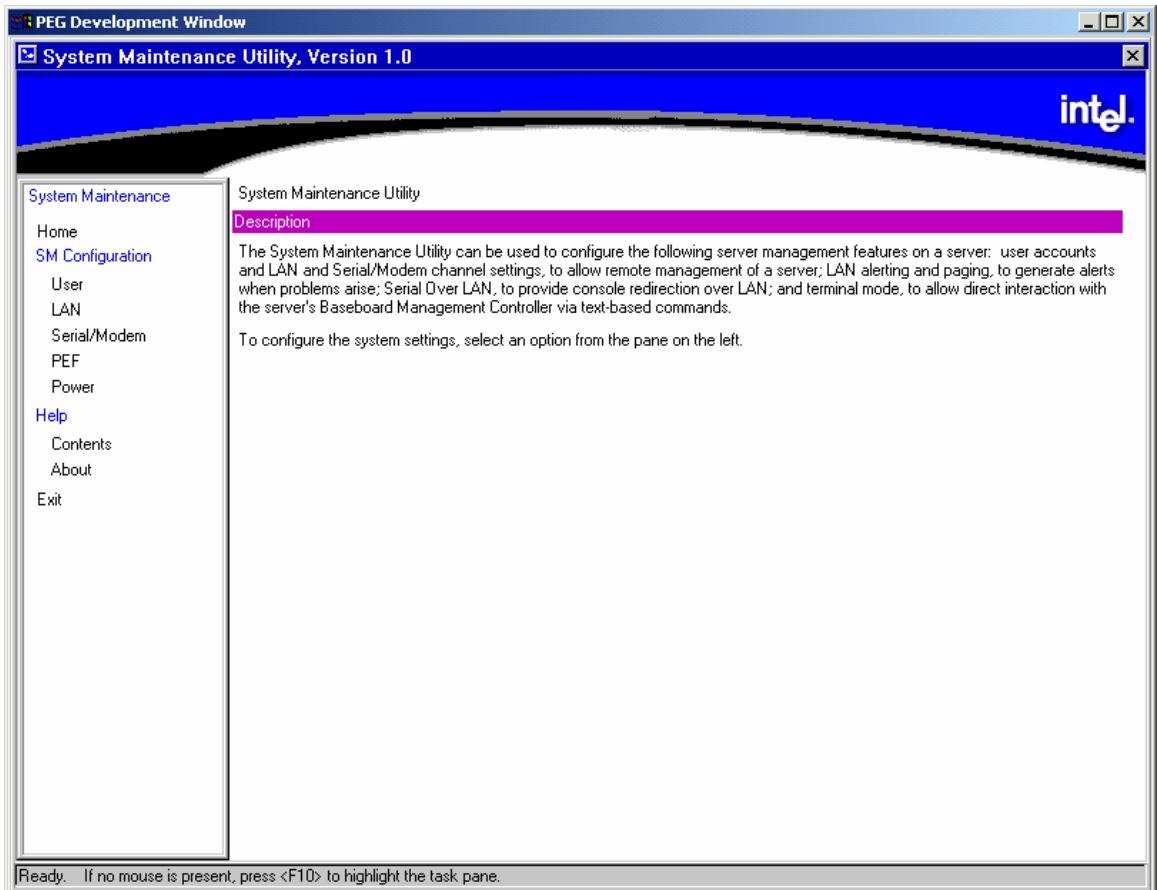


Figure 27. SMU Home

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 3.
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 you to configure server management settings maintained 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 you enabled. Buttons that are common to the server management configuration tasks are described in Table 18.

Table 18. 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 you to change settings related to a single entry in a table. |

LAN Channel Configuration Sub-task

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

LAN Channel Configuration

Description

The settings below allow a LAN channel to be configured.

General Settings

Access Mode: Always Available

Privilege Level Limit: Administrator

IP Address

Enable DHCP

Host IP Address: 10.7.155.3

Subnet Mask: 255.255.255.0

Default Gateway IP Address: 10.7.155.251

Default Gateway MAC Address: 00-00-00-00-00-00

Automatically resolve Default Gateway MAC Address

Backup Gateway IP Address: 0.0.0.0

Backup Gateway MAC Address: 00-00-00-00-00-00

Automatically resolve Backup Gateway MAC Address

Next > Help

Figure 28. 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, you must click through each LAN configuration screen by clicking the **Next** button until you reach the **Save** button on the final LAN configuration screen.

- **Gratuitous ARPs may be enabled:** This setting allows the BMC to generate gratuitous ARPs, which provides 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 you to enter the MAC address of the default gateway router. 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 you 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, you must provide the MAC address in the Default Gateway MAC Address field.

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 you are 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 you to enter the IP address of a backup gateway router. The IP address is entered as a dotted notation, such as 192.168.0.2.

Backup Gateway MAC Address

This edit box allows you to enter the MAC address of the backup gateway router. 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 you 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, you must provide the MAC address in the Backup Gateway MAC Address field.

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 you are 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 you click **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.

LAN Alert Configuration

Description

This view contains the general settings that apply to all LAN alerts and shows all LAN alerts that are currently configured. From here, settings for configured alerts can be changed, new alerts can be added, or existing alerts can be deleted.

General Settings

Enable LAN Alerting

SNMP Community String:

Alert Settings

3 of 4 alerts are configured.

| Destination | Gateway | Acknowledgement | Retries | Interval (seconds) |
|----------------------------------------------|--------------|-----------------|---------|--------------------|
| <input checked="" type="radio"/> 11.7.166.39 | 10.7.155.139 | Disabled | 0 | 1 |
| <input type="radio"/> 11.7.155.12 | 10.7.155.139 | Disabled | 0 | 1 |
| <input type="radio"/> 10.7.155.80 | 10.7.155.139 | Disabled | 0 | 1 |

Figure 29. 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, you are shown a screen on which you can configure a new LAN destination address. See the following section for details.
- `Edit`: If you select an IP address and then click the `Edit` button, you are shown a screen where you can edit the configuration for the selected IP address. See the following section for details.
- `Delete`: If you select an IP address and then click the `Delete` button, the selected IP address is deleted. Before deleting the IP address, you are prompted by a confirmation prompt. If you click `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 you select the `Save` button in the last LAN configuration screen.

New/Edit LAN Alert

The New/Edit LAN Alert screen is displayed when you click either **New** or **Edit** on the LAN Alert Configuration screen. The New/Edit LAN alert screen allows you 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.

New/Edit LAN Alert

Description

The settings below allow configuration of a new LAN alert or editing of an existing LAN alert.

General Settings

Destination IP Address: 0.0.0.0

Destination MAC Address: 00-00-00-00-00-00

Automatically resolve destination MAC address

Number of Retries: 0

Retry Interval: 1 seconds

Enable Alert Acknowledge

Use Default Gateway

OK Cancel Help

Figure 30. 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 you 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 resolve destination MAC address.

Automatically Resolve Destination MAC Address

This check box allows you 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, you must provide the MAC address in the Destination MAC Address field.

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 you are 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 you to enter the number of times to retry sending an alert to a given destination. If alert acknowledge is enabled, then retries are sent only when 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 between 0 and 7.

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 3 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 you click **Next** on the LAN Alert Configuration screen. The Serial Over LAN screen, shown in the following diagram, allows you 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.

Serial Over LAN Configuration

Description

The settings below allow the user to configure Serial Over LAN settings.

General Settings

Enable Serial Over LAN

SOL Privilege Level: User

Number of Retries: 6

Retry Interval: 200 ms

Baud Rate: 19200

< Back Save Help

Figure 31. 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 0 and 7.

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 8 data bits, no parity, 1 stop bit, and RTS/CTS (hardware) flow control.

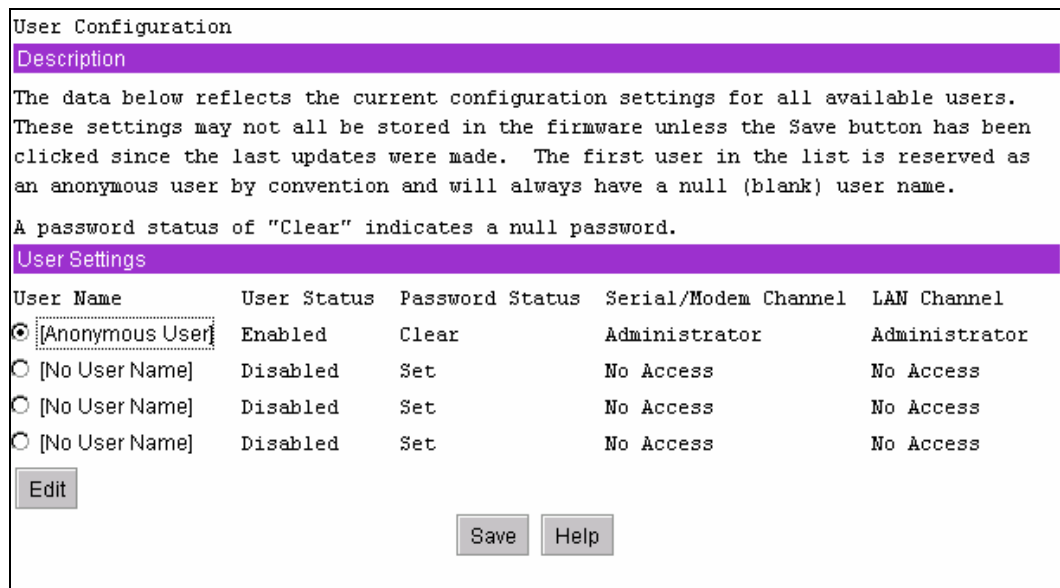
User Configuration Sub-task

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 you access 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)



The screenshot shows a window titled "User Configuration". It has a purple header bar with the word "Description" in white. Below the header, there is a paragraph of text explaining the configuration settings. Another purple header bar with the word "User Settings" in white is below the text. Underneath, there is a table with five columns: "User Name", "User Status", "Password Status", "Serial/Modem Channel", and "LAN Channel". The first row is selected with a radio button and shows "[Anonymous User]", "Enabled", "Clear", "Administrator", and "Administrator". The next three rows are unselected and show "[No User Name]", "Disabled", "Set", "No Access", and "No Access". At the bottom of the window, there are three buttons: "Edit", "Save", and "Help".

| User Name | User Status | Password Status | Serial/Modem Channel | LAN Channel |
|---------------------------------------------------|-------------|-----------------|----------------------|---------------|
| <input checked="" type="radio"/> [Anonymous User] | Enabled | Clear | Administrator | Administrator |
| <input type="radio"/> [No User Name] | Disabled | Set | No Access | No Access |
| <input type="radio"/> [No User Name] | Disabled | Set | No Access | No Access |
| <input type="radio"/> [No User Name] | Disabled | Set | No Access | No Access |

Figure 32. 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.

The screenshot shows a dialog box titled "Edit User Configuration". At the top, there is a description: "The settings below allow the configuration of a user to be changed." Below this, the "General Settings" section contains an unchecked checkbox for "Enable User" and a text input field labeled "Enter User Name:". The "Serial/Modem Channel" section features a dropdown menu for "User Privilege Level" currently set to "No Access". The "LAN Channel" section also has a dropdown menu for "User Privilege Level" set to "No Access". At the bottom of the dialog are three buttons: "OK", "Cancel", and "Help".

Figure 33. 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 you 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 you 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 you enter 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 you to select the privilege level for LAN channel. The global privilege level set for 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 you 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.

Platform Event Filter Configuration

Description

This view allows PEF general settings to be configured, and allows chassis actions and alerts to be globally enabled or disabled.

General Settings

Enable PEF

Enable SEL Event Messages for PEF Actions

Startup Delay: seconds

Alert Startup Delay: seconds

PEF Action Global Settings

Enable Power Cycle

Enable Reset

Enable Power Down

Enable Alert

Enable Diagnostic Interrupt

Figure 34. 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 number of seconds allowed is between 60 and 255. The default is 60 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 number of seconds allowed is between 60 and 255. 0 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 you click 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.

| Filter Name | Status | Chassis Action | Alert Policy |
|------------------------------------------------------------------|---------|----------------|--------------|
| <input checked="" type="radio"/> Temperature Sensor Out of Range | Enabled | Power Down | 2 |
| <input type="radio"/> Voltage Sensor Out of Range | Enabled | Power Down | 2 |
| <input type="radio"/> Fan Failure | Enabled | Power Down | 2 |
| <input type="radio"/> Chassis Intrusion Detection | Enabled | Power Down | 2 |
| <input type="radio"/> Power Supply Failure | Enabled | Power Down | 2 |
| <input type="radio"/> BIOS (MCA Handler) | Enabled | Power Down | 2 |
| <input type="radio"/> BIOS (Post Code Error) | Enabled | Power Down | 2 |
| <input type="radio"/> FRB Failure | Enabled | Power Down | 2 |
| <input type="radio"/> Watchdog Timer | Enabled | Power Down | 2 |

Figure 35. Event Filter Settings

If you click in one of the radio buttons and then click `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.

Edit Event Filter Settings

Description

This view allows settings associated with an event filter to be defined or modified. Since event filters can be associated with an alert policy, the alert policy table can also be reached from this view.

Filter Settings

Event Filter Name: Power Supply Failure

Enable Event Filter

Enable Alerts

Policy number associated with this event filter: 1

Chassis action associated with this event filter: None

Figure 36. 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` enable / 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 you 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. You will assign policy numbers to policy table entries when you click the `Configure Policies` button.

Chassis Action Associated With This Event Filter

This drop-down box allows you 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 you define 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, you are 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, you 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 |
|------------------------------------|----------|-------------|----------------------|-------------|
| <input checked="" type="radio"/> 1 | Enabled | A | LAN Channel | 11.7.166.39 |
| <input type="radio"/> 1 | Enabled | A | LAN Channel | 11.7.155.12 |
| <input type="radio"/> 1 | Disabled | A | LAN Channel | 11.7.166.39 |
| <input type="radio"/> 1 | Disabled | A | Serial/Modem Channel | |
| <input type="radio"/> 4 | Disabled | A | LAN Channel | 11.7.166.39 |
| <input type="radio"/> 1 | Disabled | A | LAN Channel | 11.7.166.39 |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 1 | Disabled | A | LAN Channel | 11.7.166.39 |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 4 | Enabled | A | LAN Channel | 11.7.166.39 |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |
| <input type="radio"/> 0 | Disabled | A | Unknown | |

Figure 37. 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 you select an alert policy on the Alert Policy Configuration screen and then click the `Edit` button, you will see the Edit Alert Policy Entry screen, as shown below. Changes made on this screen apply to the alert policy selected when you clicked `Edit`.

After you click `OK` on this screen, you are returned to the Alert Policy Configuration screen

Edit Alert Policy Entry

Description

This view allows an alert policy entry to be configured or modified.

Alert Policy Entry Settings

Enable Policy Entry

Policy Number: 1

Policy type: A

Select the destination:

Serial/Modem Channel [Not Configured]

LAN Channel 11.7.166.39

OK Cancel Help

Figure 38. 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, 1 is displayed.

If alerts are associated with event filters, a valid policy number is required. Therefore, it is not possible to select 0 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 you 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 you to configure the settings for the terminal mode of operation of the serial/modem channel.

Serial/Modem Channel Configuration

Description

The settings below are used to determine how and when the serial/modem connection can be used.

General Settings

Connection Mode: Modem Connect Mode

Access Mode: Disabled

Privilege Level Limit: Administrator

Flow Control: None

Enable Data Terminal Ready (DTR) Hang-up

Baud Rate: 19200

Next > Help

Figure 39. 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, you 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 you click **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.

| Modem Mode Configuration | |
|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Description | |
| The settings below allow the user to configure various modem related settings. Keyboard input is limited to English character set. | |
| Modem Settings | |
| Modem Init String: | <input type="text" value="ate1q0v1x4&d0s0=0"/> |
| Modem Escape Sequence: | <input type="text" value="+++"/> |
| Hang-up Sequence: | <input type="text" value="ath"/> |
| Dial Command: | <input type="text" value="ATDT"/> |
| Ring Duration: | <input type="text" value="10000"/> ms |
| Ring Dead Time: | <input type="text" value="7000"/> ms |
| <input type="button" value=" < Back"/> <input type="button" value=" Next > "/> <input type="button" value=" Help"/> | |

Figure 40. 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 string can be up to 64 ASCII characters long, including the 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, you 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.

Enter a value between 0 and 31509; be aware that the SMU rounds values down to the nearest 500 ms, so the maximum valued used is 31500.

Ring Dead Time

This setting allows you 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.

Enter a value between 0 and 7999; be aware that the SMU rounds values down to the nearest 500 ms, so the maximum valued used is 7500.

Destination Dial Strings

The screen shown below displays the current setting of each destination dial string available on the target platform. For the Server System SR870BH2, up to six dial strings can be configured.

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

Destination Dial Strings

Description

This view shows all dial strings that are currently configured. From here, settings for configured dial strings can be changed, new dial strings can be added, or existing dial strings can be deleted.

Dial String Settings

2 of 6 dial strings are configured.

Dial String

503 459 1852

888 211 2288

New **Edit** **Delete**

< Back **Next >** **Help**

Figure 41. 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, you are shown a screen where you can configure a new dial string. See the following section for details.
- **Edit:** If you select a dial string and then click the `Edit` button, you are shown a screen where you can edit the selected dial string. See the following section for details.
- **Delete:** If you select a dial string and then click the `Delete` button, the selected dial string is deleted. Before deleting the dial string, you are prompted by a confirmation prompt. If you click `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 you click either `New` or `Edit` on the Destination Dial Strings screen. The New/Edit Dial String screen allows you 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`.

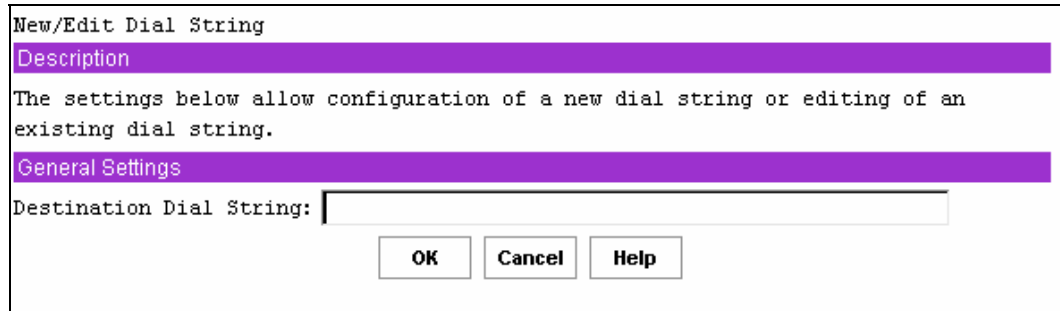


Figure 42. New / Edit Dial String

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-colan) – 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 you click **Next** on the Destination Dial Strings screen. This screen allows you 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.

Page Destination Configuration

Description

This view shows all page destinations, configured or not. From here, settings for all page destinations can be modified.

General Settings

Enable Paging

Page Blackout Interval: minutes

Call Retry Interval: seconds

Page Destinations

| Dial String | Call Retries | Flow Control | Baud Rate | Parity | Data Bits | Stop Bits |
|--------------------------------------------|--------------|--------------|-----------|--------|-----------|-----------|
| <input checked="" type="radio"/> 555555567 | 3 | RTS/CTS | 19200 | None | 7 | 1 |
| <input type="radio"/> [Not Configured] | 3 | None | 19200 | None | 7 | 1 |
| <input type="radio"/> [Not Configured] | 3 | None | 19200 | None | 7 | 1 |
| <input type="radio"/> [Not Configured] | 3 | None | 19200 | None | 7 | 1 |
| <input type="radio"/> [Not Configured] | 3 | None | 19200 | None | 7 | 1 |
| <input type="radio"/> [Not Configured] | 3 | None | 19200 | None | 7 | 1 |
| <input type="radio"/> [Not Configured] | 3 | None | 19200 | None | 7 | 1 |
| <input type="radio"/> [Not Configured] | 3 | None | 19200 | None | 7 | 1 |

Figure 43. 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 you select a Dial String on the Page Destination Configuration screen and then click `Edit`, you are shown the Edit Page Destination screen. On this screen, you configure or modify the settings for the selected page destination.

The screenshot shows a dialog box titled "Edit Page Destination". At the top, there is a "Description" section with a purple header and the text "The settings below allow configuration of a Page Destination." Below this is a "General Settings" section, also with a purple header. The settings are as follows:

- Dial String: [Not Configured] (dropdown menu)
- Flow Control: None (dropdown menu)
- Baud Rate: 19200 (dropdown menu)
- Stop Bits: 1 (dropdown menu)
- Data Bits: 7 (dropdown menu)
- Parity: None (dropdown menu)
- Call Retries: 3 (text input field)

At the bottom of the dialog are three buttons: "OK", "Cancel", and "Help".

Figure 44. 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 you 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 you click `Next` on the Page Destination Configuration screen, the Terminal Mode Configuration screen is displayed. This screen allows you 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 *Terminal Mode*.

Terminal Mode Configuration

Description

The settings below allow the user to configure the terminal mode settings.

Terminal Mode Settings

Enable Terminal Mode

Enable Line Editing

Delete Control:

Turn BMC echo of received characters on

Enable handshake when BMC ready to receive another message

Newline output sequence (BMC to console):

Newline input sequence (console to BMC):

Figure 45. 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 you 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 you 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 you. 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 you 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

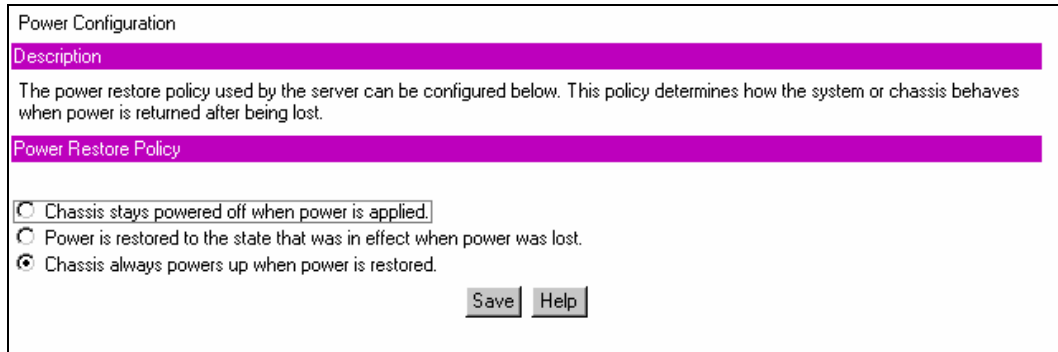
Newline Input Sequence (console to BMC)

This setting allows you 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 you 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.



Power Configuration

Description

The power restore policy used by the server can be configured below. This policy determines how the system or chassis behaves when power is returned after being lost.

Power Restore Policy

Chassis stays powered off when power is applied.

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

Chassis always powers up when power is restored.

Save Help

Figure 46. 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 you 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 you 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 you 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 you will see a warning message displayed if the SEL is full.

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

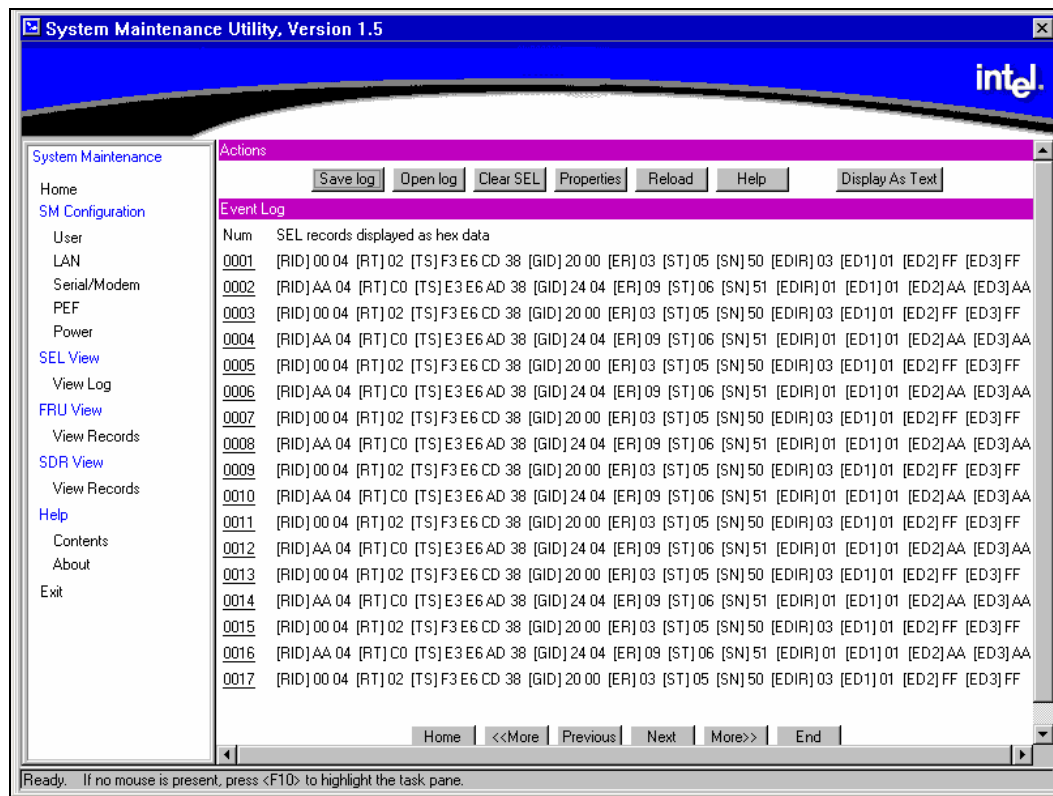
The SEL is empty, no records to display

After any messages have been dismissed, you 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 you are provided with a series of buttons along the bottom of the screen. You can use the <Tab> key 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 47. SEL Viewer, Hex Display Mode

A. _____

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 you wish 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 19. 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 you 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 you 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 you load a hexadecimal log file, the viewer interprets data as if it was loaded from the system. You 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 you to clear all the system SEL events. Before proceeding with the clear, you are prompted with this message:

```
Do you really want to clear the SEL?  These events will be
permanently removed from the system
```

You are given two options with this prompt, OK and Cancel. Choosing Cancel will return you 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 you 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 you 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 you 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 you select the SDR task, the SDRs are retrieved from the system. As the load progresses, a dialog window updates you on the status. You are 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 you 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.

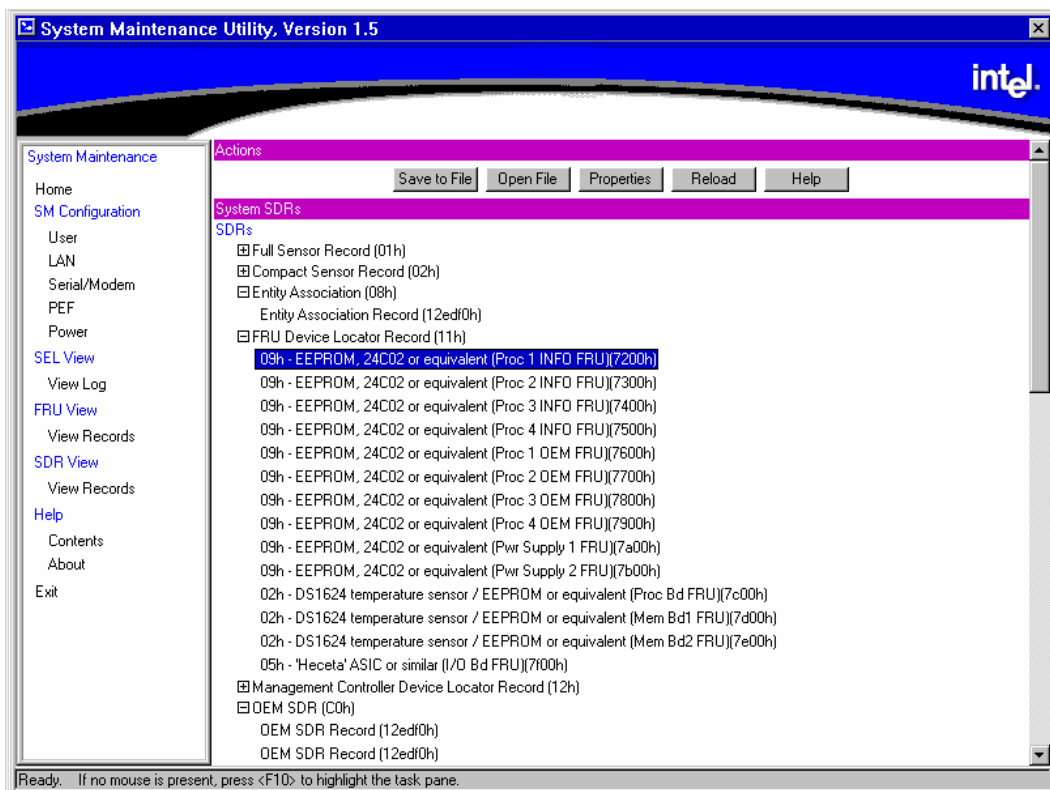


Figure 48. SDR Viewer

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

Table 20. 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 you 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 you 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 you 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 you 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 you 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 you select 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 you 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 you to display/update the FRU with the FRUSDR utility.

You are 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.

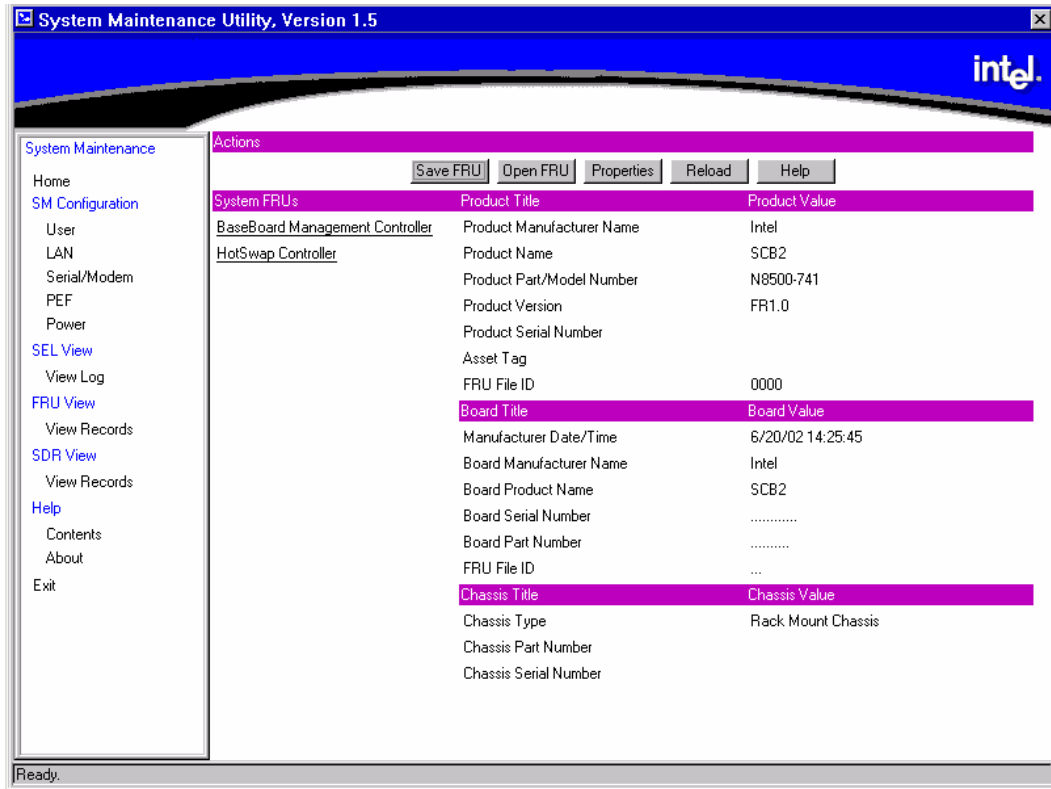


Figure 49. FRU Viewer

Save To File Button

This button allows you 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 you 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 you 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 you click 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 you 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 you may attempt the operation again. These screens also have an OK button on them. When you click OK, the last screen displayed is redisplayed. You may also be informed as to whether the error was serious enough that you 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 you. 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 you 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.

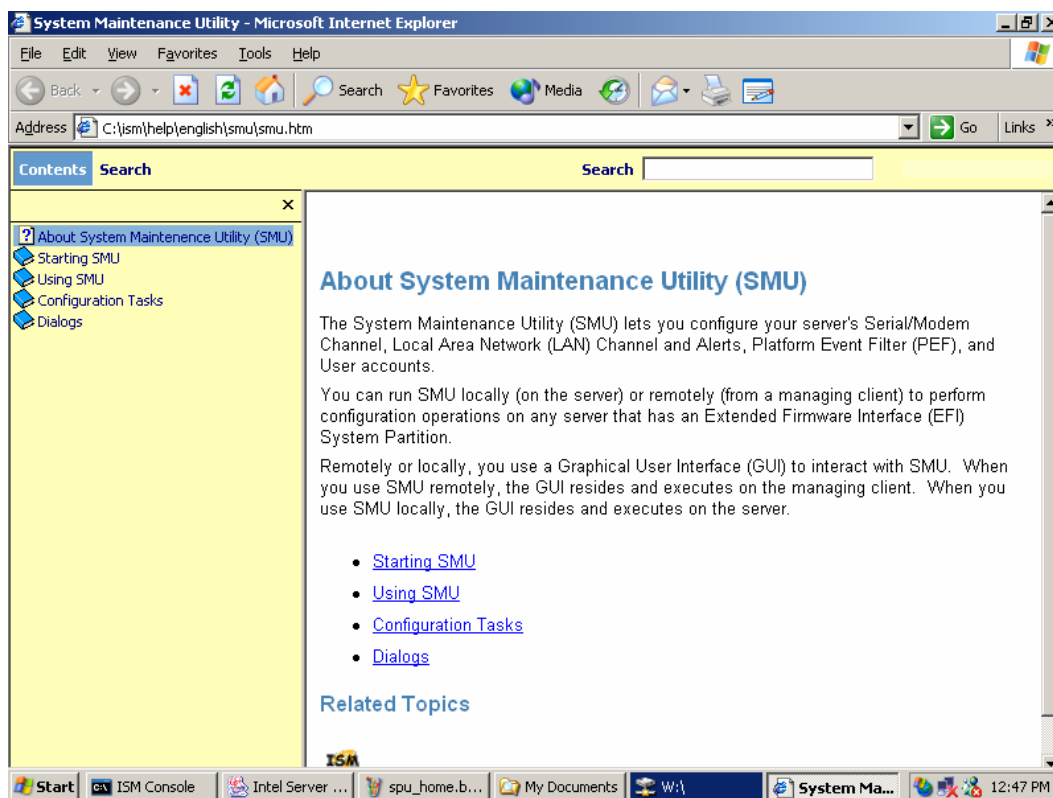


Figure 50. Remote SMU Help Window (browser based)

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 front-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. You cannot click on the Help item itself, but when you click on Contents, a new browser window is launched. The Table of Contents pane at the left allows you 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 you 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 you 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, then 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 you want to return to the local SMU application, click on the application window to bring it to the foreground. You can use <F1> 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.

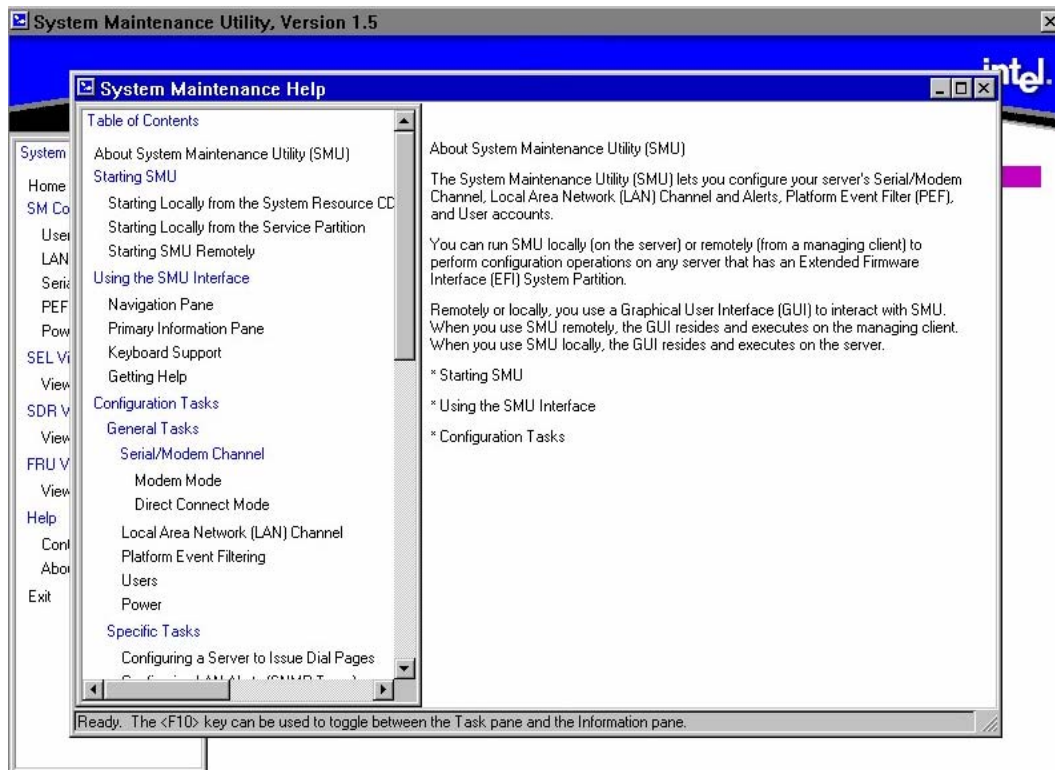


Figure 51. SMU Local Help Window

The Help window has a system menu that is available from the upper-left hand corner. This system menu allows you 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.

EFI Platform Diagnostic Tests

EFI Platform Diagnostic Tests allow you to quickly assess the server's hardware status, view test logs, and determine the server's current configuration. You can run EFI Platform Diagnostic Tests from within the EFI environment.

Starting the Application

Use the following steps to setup and run tests.



NOTE

You can also run this utility 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 the following directory on the target drive such as a hard drive:
`efi\service\diagnostics`
3. Copy the distributed FieldDiags binary file (`fielddiags.efi`) to the root directory of the target.
4. Run the following command to unpack and install the FieldDiags software:
`fielddiags -d \efi\service\diagnostics`

5. With your working directory on the same drive that contains the test software, type the following command to load and run the tests:

```
\efi\service\diagnostics\fielddiags
```

As an option, you can include a relative pathname in the command, based on your current working directory.

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

Understanding the General User Interface

The platform diagnostics application uses multiple screens from which you 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

The <up-arrow> and <down-arrow> keys navigate vertically through all areas of the screen. During navigation, items that you can modify become highlighted. <Left-arrow> 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 you 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 you 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-arrow> and <down-arrow> arrows to first select a test, and then press:

- <Q> for a quick test
- <C> for a complete test
- <D> to disable the test.

When a test is enabled, `Quick` or `Complete` appears next to the test under the `Coverage` column. If a test is disabled, the `Disabled` appears under that column. An individual test can be

executed up to nine times for each run of the test suite. With the test highlighted, use the number keys to set the number of iterations for an individual test.

The test area of the screen displays six tests at a time. Use the arrow keys to scroll 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 menu opens the Test Options window. In the Test Options window you can determine if the test stops on one of two parameters; time or iterations. If you navigate to the `Stop On` item in the window and press the `<Enter>` key you are given the options of `Iterations` or `Minutes`:

- If `Iterations` is selected, the test suite repeats until it has completed the number of iterations 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 has passed.

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 pass or fail count increments. For failed tests, Field Replaceable Unit information also appears under the `Details` column.

If you want greater detail for the test run, view the test log file. For information on how to view the test log file, refer to *Viewing the Test Log* below.

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. You will see 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 menu item, and press the `<Enter>` key. From the menu select the system information to be viewed.

After pressing the `<Enter>` key, you will see 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\fielddiags.log`.

To view this file, use the arrow keys to highlight the Platform Test menu. Select `View Results`, and press the `<Enter>` key. You will see a scrollable information box that contains the sessions test log. Because the log file is a Unicode file, you can also view it in the EFI shell by using the `type -u` command, and in the Windows operating system using the Notepad application.

Test results are appended to the previous log file. To clear the log file select the `Clear log` button in the View Results window. Because the log file is always appended, you should clear the file regularly to keep it 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. This provides a way to execute configuration/setup utilities, and run remote diagnostics and other software designed to be compatible with this environment.

Service Partition Requirements

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. An EFI System Partition cannot be installed on legacy MBR disks. The disk must be formatted as a GPT (GUID Partition Table) disk.

The SP requires at least 65 MB free on the chosen EFI System Partition and, 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 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 include 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, but in order to run the utilities and diagnostics, you must boot the server from the partition. Applications that execute in the service partition run only on the managed server.

Installation Requirements

Adhere to the following requirements when installing the service partition files:

- The current ECO BIOS and Firmware are installed.
- Use the installation software on the current System Resource CD or software obtained from your Intel field representative.
- 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:

1. Insert the System Resource CD into the managed server's CD-ROM drive. Alternatively, you can obtain the software from your Intel field representative. If you do so, follow the instructions included with the software package to install the service partition.
2. Boot the system into the 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, type `startup`, and press `<Enter>`.
3. From the menu tab, use the arrow keys to navigate to the Utility menu and press `<Enter>` or the use the `<down arrow>` to expand the menu.
4. From the Utility menu, arrow to `Install Service Partition` and press `<Enter>` to launch the Service Partition Administration menu.
5. Choose `3` and press `<Enter>` to install the service partition files.
6. The installation software reports whether a system partition has been found. If so, it is recommended that you install the service partition files onto the existing system partition. Do so by choosing `1` and pressing `<Enter>`.
7. Choose the number for the system partition on which to install the partition files and press `<Enter>`.
8. After receiving the message indicating that all files were installed successfully, press any key.
9. Press `<ESC>` to exit the Service Partition Administration menu and return to the EFI CD menu.

Booting from the Service Partition

The service partition contains utilities and diagnostics. To run these utilities or diagnostics, you need to boot the server from the service partition. You can reboot a managed server from the service partition either locally or remotely. When you reboot the server to the service partition remotely, you can do the following:

- 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> when prompted to enter BIOS setup.
3. Arrow to the System Management menu, and select `Enabled` for the Service Boot option.
4. Press <F10> to save the setting and exit out of the BIOS setup. The system automatically reboots to the Service Partition.

Console Redirection

The BIOS supports redirection of video output and keyboard input via serial link. This section details the serial redirection scheme. For redirection over LAN (Serial over LAN or SOL), see the ISM online help.

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.

With console redirection, you can operate the server system without having a keyboard or monitor attached to it. 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



NOTE

When console redirection is enabled, the text on the local console screen will draw slowly when it is operating under EFI. This is especially true when a low baud-rate modem is used, such as the default baud rate of 19.2K. This is because EFI is not an interrupt-driven environment and it uses a polling mechanism to communicate with the remote console.

When redirecting through a modem, as opposed to a null modem cable, the modem needs to be configured as follows:

- Auto-answer (for example, `ATS0=2`, to answer after two rings).
- Modem reaction to DTR set to return to command state (such as `AT&D1`). Failure to provide the modem reaction 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 the 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.

Inhibiting and restarting is accomplished through an INT 16h mechanism. The standard INT 16h (keyboard handler) function ah=05h places a keystroke in the key buffer, as if an actual key is pressed. Keystrokes buffered this way are examined by redirection; if a valid command string has been sent, it is executed. The following commands are supported:

- `Esc-CDZ0` - Inhibit 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 to invoking a command are buffered, and should be removed through normal INT 16h calls to prevent these keystrokes from being passed to another application. When redirection is inhibited, the serial port is released and can be used by other applications.
- `Esc-CDZ1` - Restart Console Redirection. Restarting reclaims the serial port and continues redirection

Keystroke Mappings

During console redirection, the remote terminal 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 sends the ASCII character. For keys that do not have an ASCII mapping, such as `<F1>` and `<Alt><A>`, the remote sends 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, such as `<F5>` - `<F12>`, `<Page Up>`, and `<Page Down>`, mappings for these keys are available.

`<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. In other words, if `a` is mapped to `<Shift><F1>`, then pressing `<Shift><F1>` followed by `^[]` sends `<Alt><a>` to the server.

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

Combinations outside of the ANSI mapping and not in the table below, such as <Ctrl><F1>, are not supported.

Table 21. 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 |
| 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 22. ASCII Key Mappings

| Key | Normal | Shift | Ctrl | Alt |
|------------|--------|-----------|-------|----------|
| Backspace | (08h) | (08h) | (7Fh) | ^[](08h) |
| (accent) ` | ` | (tilde) ~ | NS | ^[` |
| 1 | 1 | ! | NS | ^[1 |
| 2 | 2 | @ | NS | ^[2 |

| Key | Normal | Shift | Ctrl | Alt |
|----------------|--------|-----------|----------------|--------------|
| 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) | ^[]] |
| \ | \ | | (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. Therefore, console redirection cannot redirect video in graphics mode. Keyboard redirection operates through the BIOS INT 16h handler. Software that bypasses this handler does not receive redirected keystrokes. After entering EFI, the redirection scheme changes somewhat, but the effect is the same.

Server Management Interface

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

Sample Setup for Console Redirection

The following is an example of how to configure the console/host and server for BIOS console redirection. For Serial over LAN (SOL) console redirection, refer to the ISM documentation included on the ISM CD. In the example below, the console is running Windows* XP with SP3. The console and server are directly connected through the serial ports of both systems, using a 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 to the System Management menu.
3. At System Management menu, arrow to the Console Redirection submenu and press <Enter>.
4. Arrow to the Serial Console Redirection and press <Enter>.
5. Use the arrow key to select Enabled and press <Enter>.
6. The Serial Port menu should display COM2 as the selected. If it does not, choose Serial Port and use the arrow keys to change the selection.
7. Set the Baud Rate to 19.2K.
8. Set the Flow Control to CTS/RTS.
9. Set the Terminal Type to VT-100.
10. Press <F10> to save the configuration changes and exit BIOS Setup.
11. At the prompt to save changes and exit, select Yes and press <Enter>.
12. This reboots the server with console redirection enabled. Power down the server and configure the console.

Console Configuration

1. Boot the console into the operating system.
2. Launch HyperTerminal by clicking on the Start button in the task bar.
3. Select Programs>Accessories>Communications and click HyperTerminal.
4. At the Connection Description window, enter guest for the name and click OK.
5. At the Connect To window, select the COM port of the console where 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) to match the SMU configuration on the server.
7. Select Hardware for the Flow Control to match the configuration settings for 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. Power on the server. The console starts displaying the redirection once the video synchronizes on the server.

Terminal Mode

The Terminal Mode feature allows you to directly interface to the server's Baseboard Management Controller 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 you 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 IPMI v1.5 specification using the hex-ASCII format

See *Terminal Mode Configuration* for details about the terminal mode configuration screen.

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
- 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 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)
- The terminal mode configuration parameters

The SMU provides methods to access and manipulate all the necessary parameters for terminal mode configuration.

Serial Channel Configuration

The serial channel is configured through 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 correct states for your application. Disable the ping message to avoid receiving serial ping message data from the BMC on your terminal screen.
- **Modem Connection Mode:** Set the options on the modem connection mode to the desired states for your application. Disable the ping message to avoid receiving serial ping message data from the BMC on your terminal screen.

Save the new serial channel configuration when you are done editing the serial channel settings.

Sample Setup for Terminal Mode

The following is an example of how to configure the console/host and server for Terminal Mode. In this example, the console is running Windows 2000 with SP3. The console and server are directly connected through the serial ports of both systems. See *Serial/Modem Channel Configuration Sub-task* for details about the Serial / Modem configuration screens.

Server Configuration

1. Run the SMU to configure the BMC.
2. In the Navigation Pane at the left side of the SMU, click `Serial/Modem` to go 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 `Next` to move to the next menu.
10. Click `Next` again to reach the Terminal Mode Configuration screen.
11. Click in the `Enable Terminal Mode` box to select it.
12. Click in the `Enable Line Editing` box to select it.
13. Select `Backspace` for the Delete Control.
14. Select the box for `Turn BMC echo of received characters on`.
15. Select the box for `Enable handshake when BMC ready to receive another message box`.
16. Select `CRLF` for the `Newline output sequence (BMC to console)` box.
17. Select `CR` for the `Newline input sequence (console to BMC)` box.
18. Click `Save` to save your settings and click `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 operating system.
2. Launch HyperTerminal by clicking the Start button in the task bar.
3. Select Programs>Accessories>Communications and click HyperTerminal.
4. At the Connection Description window, enter guest for the name and click OK.
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 the SMU configuration on the server.
7. Select None for the Flow Control to match the BMC configuration.
8. Leave the default settings for the other boxes. Click OK to accept the settings and enter the HyperTerminal screen.
9. The PING message sent by the BMC is displayed as characters on the HyperTerminal screen.
10. Press the <ESC> key followed by < (> 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 is [OK TMODE] indicating that Terminal Mode is functioning.

Logging Into the Terminal Mode Session

Reminder: Guest was the password set for the Anonymous User in the BMC.

1. At the HyperTerminal screen enter [SYS PWD -N guest] to login. -N represents the Anonymous User; guest is the password. This text is case sensitive.
2. The screen returns [SYS] and [OK] to indicate a successful login.
3. Type any supported terminal mode command.
4. To logout type [SYS PWD -X]

User Configuration

A user must be configured through 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 is not useable on the serial channel for terminal mode. Configure the user with the desired maximum privilege level. See *User Configuration Sub-task* for details about the user configuration screens.

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

Security Information

Terminal mode access to the BMC is governed by the user name and password configuration through the SMU; before the server will accept terminal mode commands, a session must be established. However, a limited selection of text commands and binary hex-ASCII commands that are assigned the lowest IPMI privilege level are available before session establishment with the BMC.

Since the terminal mode password is sent via clear text, the terminal mode session should take 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 below.

Switching between Console Redirection and Terminal Mode

When in terminal mode, use the following key sequence to switch to console redirection:

<ESC><Q>

When in console redirection, use the following key sequence to switch to terminal mode:

<ESC>< (>

Syntax

Terminal mode messages follow the general syntax:

```
[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 - or <BKSP> character

The <BKSP> or 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 <\

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.

A bridge field 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* for information.

Table 23. 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 24. 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 25 lists the supported BMC combinations for IPMI message bridging. No other combinations are supported. 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 25. 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 26. 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) 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) 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 <i>Table 27</i> for 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. |

| Command | Switches | Description |
|----------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SYS SET BOOTOPT XX YY...NN | | <p>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 <i>Table 27</i> for information.</p> <p>XX - Parameter valid</p> <p>[7] - 1b = Mark parameter invalid / locked 0b = Mark parameter valid / unlocked</p> <p>[6:0] - Boot option parameter selector</p> <p>YY...NN -- Boot Option Parameter Data</p> <p>Passing 0-bytes of parameter data allows the parameter valid bit to be changed without affecting the present parameter setting.</p> |
| SYS GET BOOTOPT XX YY ZZ | | <p>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.</p> <p>The BMC returns the data from the command in hex-ASCII format. See <i>Table 27</i> for information.</p> <p>XX - Parameter selector</p> <p>[7] -Reserved</p> <p>[6:0] - Boot option parameter selector</p> <p>YY - Set Selector</p> <p>[7:0] -Selects a particular block or set of parameters under the given parameter selector</p> <p>Write as 00h if parameter does not use a Set Selector</p> <p>ZZ - Block Selector</p> <p>Selects a particular block within a set of parameters</p> <p>Write as 00h if parameter does not use a Block Selector.</p> <p>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.</p> |
| SYS SET TCFG | | <p>Returns the Terminal Mode Configuration bytes where XX and YY represent hex-ASCII encodings for the volatile version of data bytes 1 and 2 as specified in <i>Table 28</i>, and AA BB represent hex-ASCII encoding of the non-volatile version.</p> <p>V:XX YY<output termination sequence></p> <p>N:AA BB<output termination sequence></p> |
| | -V XX YY | <p>This command sets the volatile Terminal Mode Configuration. XX and YY represent hex-ASCII encodings for data bytes 1 and 2 as specified in <i>Table 28</i>. The BMC returns the same output as for SYS SET TCFG, above.</p> |
| | -N XX YY | <p>This command sets the non-volatile Terminal Mode Configuration. XX and YY represent hex-ASCII encodings for data bytes 1 and 2 as specified in <i>Table 28</i>. The BMC returns the same output as for SYS SET TCFG, above.</p> |
| SYS RESET | | <p>Directs the BMC to perform an immediate system hard reset.</p> |

| Command | Switches | Description |
|------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 | | <p>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.</p> <p>PWR:zzz H:xx T:xx V:xx PS:xx C:xx D:xx S:xx O:xx</p> <p>Where:</p> <ul style="list-style-type: none"> • 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) <p>zzz is: ON, OFF (soft-off or mechanical off), SLP (sleep - used when it cannot distinguish sleep level), S4, S3, S2, S1, ?? (unknown)</p> <p>xx is: ok, nc, cr, nr, uf, or ?? where:</p> <ul style="list-style-type: none"> • 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) |

| Command | Switches | Description |
|---------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | -v | <p>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:</p> <p>SYS Health:xx<output termination sequence> Power: ON, OFF (soft-off or mechanical off), SLEEP (sleep - used when it cannot 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></p> <p>Where xx is:</p> <ul style="list-style-type: none"> • 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 27. Boot Option Parameters

| Parameter | # | Parameter Data (non-volatile unless otherwise noted) |
|-----------------------------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set In Progress (volatile) | 0 | <p><u>Data 1</u> - 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.</p> <p>[7:2] - Reserved</p> <p>[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 doing a Commit Write causes pending write data to be discarded.</p> <p>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.</p> <p>10b = Reserved</p> <p>11b = Reserved</p> |
| Service partition selector (semi-volatile) ⁽¹⁾ | 1 | <p><u>Data 1</u></p> <p>[7:0] - Service partition selector. This value is used to select the service partition BIOS should boot using. This document does not specify which value corresponds to a particular service partition.</p> <p>00h = Unspecified</p> |
| Service partition scan | 2 | <p><u>Data 1</u></p> |

| Parameter | # | Parameter Data (non-volatile unless otherwise noted) |
|-----------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (semi-volatile) ^[1] | | <p>[7:2] - Reserved</p> <p>[1] - 1b = Request BIOS to scan for specified service partition. The BIOS clears this bit after the requested scan has been performed.</p> <p>[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.</p> |
| BMC boot flag valid bit clearing (semi-volatile) ^[1] | 3 | <p><u>Data 1</u> - BMC boot flag valid bit clearing. Default = 0000b.</p> <p>[7:5] - Reserved</p> <p>[4] - 1b = Do not clear valid bit on reset/power cycle caused by PEF</p> <p>[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)</p> <p>[2] - 1b = Do not clear valid bit on reset/power cycle caused by watchdog timeout</p> <p>[1] - 1b = Do not clear valid bit on push-button reset / soft-reset (e.g. <Ctrl><Alt>)</p> <p>[0] - 1b = Do not clear valid bit on power up via power push-button or wake event</p> |
| Boot info acknowledge (semi-volatile) ^[1] | 4 | <p>These flags are used to allow individual parties to track whether they have 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.</p> <p><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.)</p> <p>[7] - 1b = enable write to bit 7 of Data field</p> <p>[6] - 1b = enable write to bit 6 of Data field</p> <p>[5] - 1b = enable write to bit 5 of Data field</p> <p>[4] - 1b = enable write to bit 4 of Data field</p> <p>[3] - 1b = enable write to bit 3 of Data field</p> <p>[2] - 1b = enable write to bit 2 of Data field</p> <p>[1] - 1b = enable write to bit 1 of Data field</p> <p>[0] - 1b = enable write to bit 0 of Data field</p> <p><u>Data 2: Boot Initiator Acknowledge Data</u></p> <p>The boot initiator should typically write FFh to this parameter prior to initiating the boot. The boot initiator may write 0s 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.</p> <p>[7] - reserved. Write as 1b. Ignore on read</p> <p>[6] - reserved. Write as 1b. Ignore on read</p> <p>[5] - reserved. Write as 1b. Ignore on read</p> <p>[4] - 0b = OEM has handled boot info</p> <p>[3] - 0b = SMS has handled boot info</p> <p>[2] - 0b = OS / service partition has handled boot info</p> <p>[1] - 0b = OS Loader has handled boot info</p> <p>[0] - 0b = BIOS/POST has handled boot info</p> |
| Boot flags (semi-volatile) ^[1] | 5 | <p><u>Data 1</u></p> <p>[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</p> <p>[6:0] - Reserved</p> <p>BIOS support for the following flags is optional. If a given flag is supported, it must</p> |

| Parameter | # | Parameter Data (non-volatile unless otherwise noted) |
|-------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | <p>cause the specified function to occur in order for the implementation to be considered to be conformant with this specification.</p> <p>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.</p> <p><u>Data 2</u></p> <p>[7] - 1b = CMOS clear</p> <p>[6] - 1b = Lock Keyboard</p> <p>[5:2] - Boot device selector</p> <p>0000b = No override</p> <p>0001b = Force PXE</p> <p>0010b = Force boot from default Hard-drive^[2]</p> <p>0011b = Force boot from default Hard-drive, request Safe Mode^[2]</p> <p>0100b = Force boot from default Diagnostic Partition^[2]</p> <p>0101b = Force boot from default CD/DVD^[2]</p> <p>0110b-1110b = Reserved</p> <p>1111b = Force boot from Floppy/primary removable media</p> <p>[1] - 1b = Screen Blank</p> <p>[0] - 1b = Lock out reset buttons</p> |
| Boot flags (semi-volatile) ^[1] (continued) | 5 | <p><u>Data 3</u></p> <p>[7] - 1b = Lock out (power off/ sleep request) via power button</p> <p>[6:5] - Firmware (BIOS) Verbosity (Directs what appears on POST display)</p> <p>00b = System default</p> <p>01b = Request quiet display</p> <p>10b = Request verbose display</p> <p>11b = reserved</p> <p>[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</p> <p>[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</p> <p>[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</p> <p>[1:0] -00b = Console redirection occurs per BIOS configuration setting</p> <p>01b = Suppress (skip) console redirection if enabled</p> <p>10b = Request console redirection be enabled</p> <p>11b = Reserved</p> |
| Boot flags (semi-volatile) ^[1] (continued) | 5 | <p><u>Data 4</u></p> <p>[7:4] - Reserved</p> <p>[3] - BIOS Shared Mode Override</p> <p>Can be used to request BIOS to temporarily place the channel into Shared access mode.</p> <p>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</p> |

| Parameter | # | Parameter Data (non-volatile unless otherwise noted) |
|----------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | <p>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.</p> <p>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 <i>volatile</i> access mode setting in the BMC</p> <p>0b = No request to BIOS to change present access mode setting</p> <p>[2:0] - BIOS Mux Control Override</p> <p>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.</p> <p>000b = BIOS uses recommended setting of the mux at the end of POST.</p> <p>001b = Requests BIOS to force mux to <i>BMC</i> at conclusion of POST/start of OS boot. If honored, this overrides the recommended setting of the mux at the end of POST.</p> <p>010b = Requests BIOS to force mux to <i>system</i> at conclusion of POST/start of OS-boot. If honored, this overrides the recommended setting of the mux at the end of POST.</p> <p><u>Data 5</u> - Reserved</p> |
| Boot initiator info (semi-volatile) ^[1] | 6 | <p>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.</p> <p><u>Boot Source</u></p> <p><u>Data 1</u> - 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 <i>Get Channel Sessions</i> to find out information about the party that initiated the boot</p> <p>[7:4] - Reserved</p> <p>[3:0] - Channel Number</p> <p><u>Data 2:5</u> - Session ID. Session ID for session that the boot command will be issued over. This value can be used with the <i>Get Channel Sessions</i> command to find out information about the party that initiated the boot</p> <p><u>Data 6:9</u> - Boot Info Timestamp. This timestamp is used to help software determine whether the boot information is stale. A service partition or OS loader may elect to ignore the boot information if it is older than expected</p> <p>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.</p> |
| Boot initiator mailbox (semi-volatile) ^{[1][2]} | 7 | <p>This parameter is used as a mailbox for holding information that directs the operation of the OS loader or service partition software.</p> <p>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.</p> <p><u>Data 1</u>: Set Selector = Block selector</p> <p>Selects which 16-byte info block to access. 0-based.</p> <p><u>Data 2</u>: (17) Block data</p> <p>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.</p> <p>Up to 16-bytes per block of information regarding boot initiator, based on protocol and medium.</p> |

| Parameter | # | Parameter Data (non-volatile unless otherwise noted) |
|----------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | 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 is not preserved if the management controller loses standby power or is cold reset. Parameters designated as semi-volatile are initialized to 0s upon controller power up or hard reset, unless otherwise specified.
5. 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 28. Terminal Mode Configuration

| Byte | Explanation |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>[7:6] - Reserved</p> <p>[5] - Line Editing 0b = Disable 1b = Enable (Factory default)</p> <p>[4] - Reserved</p> <p>[3:2] - Delete control (only applies when line editing is enabled) 00b = BMC outputs a character when <BKSP> or is received 01b = BMC outputs a < BKSP >< SP >< BKSP > sequence when < BKSP > or < DEL > is received (Factory default)</p> <p>[1] - Echo control 0b = No echo 1b = Echo (BMC echoes characters it receives) (Factory default)</p> <p>[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)</p> |
| 2 | <p>[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</p> <p>[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</p> |

Shutting Down the Server

To shut down the server you 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 server.

1. If the server is running an operating system, use the operating system commands or GUI to logoff if necessary and exit the operating system. Successfully exiting the operating system causes the following prompt to appear:
Shell>
2. When this prompt appears, press and hold the power button for several seconds to power down the server.



CAUTION

Powering down the server with the power button does not remove all power from the system. The +5 V standby power is still available to the system even when it has been powered down. To remove standby power from the system you must unplug both power cords from the chassis.

Part 2: Servicing the System

This part of the manual provides procedures for the removal and installation of most components inside the server system.

Warnings and Cautions

Warnings and cautions apply whenever the top cover of the system is removed. Only a trained service technician should integrate, configure, or service this system.

Important Safety Instructions

Read all caution and safety statements in this document before performing any of the instructions. See *Intel Server Boards and Server Chassis Safety Information* on the Resource CD and/or at <http://support.intel.com/support/motherboards/server/safecert.htm>.

Wichtige Sicherheitshinweise

Lesen Sie zunächst sämtliche Warn- und Sicherheitshinweise in diesem Dokument, bevor Sie eine der Anweisungen ausführen. Beachten Sie hierzu auch die Sicherheitshinweise zu Intel-Serverplatinen und -Servergehäusen auf der Ressourcen-CD oder unter <http://support.intel.com/support/motherboards/server/safecert.htm>.

重要安全指导

在执行任何指令之前，请阅读本文档中的所有注意事项及安全声明。参见 Resource CD（资源光盘）和/或 <http://support.intel.com/support/motherboards/server/safecert.htm> 上的 *Intel Server Boards and Server Chassis Safety Information*（《Intel 服务器主板与服务器机箱安全信息》）。

Important Safety Instructions Consignes de sécurité

Lisez attention toutes les consignes de sécurité et les mises en garde indiquées dans ce document avant de suivre toute instruction. Consultez *Intel Server Boards and Server Chassis Safety Information* sur le CD Resource CD ou bien rendez-vous sur le site <http://support.intel.com/support/motherboards/server/safecert.htm>.

Instrucciones de seguridad importantes

Lea todas las declaraciones de seguridad y precaución de este documento antes de realizar cualquiera de las instrucciones. Vea *Intel Server Boards and Server Chassis Safety Information* en el CD Resource y/o en <http://support.intel.com/support/motherboards/server/safecert.htm>.

Before Top Cover or Module Removal

Before removing the top cover or system modules, follow all safety guidelines available in *Intel Server Boards and Server Chassis Safety Information*, found at <http://support.intel.com/support/motherboards/server/safecert.htm>. In addition, observe the safety guidelines below.



CAUTION

The Server System SR870BH2 exceeds the 240 VA energy hazard limits that define an operator-accessible area. As a result, only qualified technical individuals should access the processor, memory, and non-hot-swap areas while the system is energized.



NOTE

When replacing hot-swap components, it is not necessary to turn off all peripheral devices, power down the server, or unplug the AC power cords. It **is** necessary to provide ESD protection. See the instructions for the specific hot-swap component for any other safety guidelines.

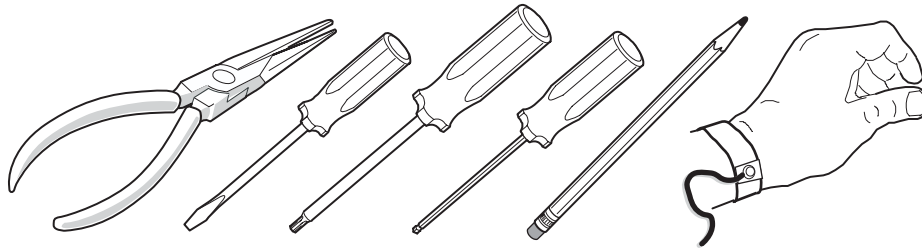
1. Turn off all peripheral devices connected to the system.
2. Power down the system by pressing and holding the power button on the front of the chassis for several seconds.
3. After the server shuts down, unplug both AC power cords to remove standby power from the server.
4. Provide electrostatic discharge (ESD) protection by wearing an antistatic wrist strap attached to chassis ground of the system—any unpainted metal surface—when handling components.

4 Working 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
- Torx screwdrivers (T-15)
- Hex screwdriver for processor upgrades (2.5 mm)
- Pen or pencil
- Antistatic wrist strap and conductive foam pad (recommended)



OM12971

Figure 52. Tools and Supplies Needed

As new parts are integrated into the system, the information about them should be added to an equipment log. Record the model and serial number of the system, all installed options, and any other pertinent information specific to the system.

Torque Settings

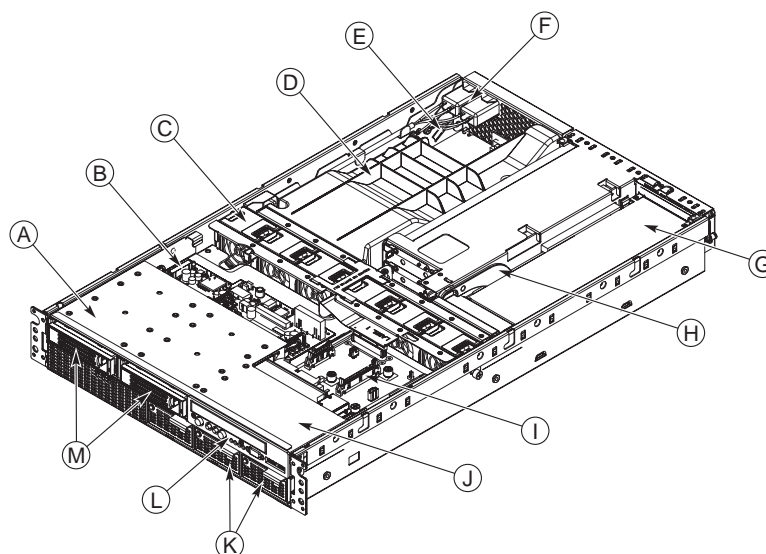
Screws securing certain components in the system require being tightened to specific torque values. Table 29 shows the chassis' torque settings.

Table 29. Torque Settings

| Component | Torque | Component | Torque |
|---------------------|--------------------|----------------------|--------------------|
| Processor heat sink | 0.67 N-m (6 in-lb) | Front panel board | 0.90 N-m (8 in-lb) |
| Main board | 0.67 N-m (6 in-lb) | SCSI backplane board | 0.67 N-m (6 in-lb) |
| Processor power pod | 0.67 N-m (6 in-lb) | Front panel board | 0.67 N-m (6 in-lb) |
| PCI riser board | 0.67 N-m (6 in-lb) | Processor air duct | 0.67 N-m (6 in-lb) |

Identifying Chassis Modules

The figure below shows the chassis with the top cover removed. Several component areas can be identified, including the processor air duct, memory area (eight DIMM sites, obscured), The PCI riser assembly, the electronics bay (E-Bay), and the peripheral bay. In addition, the chassis supports three hot-swap power supplies, six fans, three PCI cards, one ATA DVD / CD-ROM drive, and two SCSI (SCA-2) hard drives.



TP00312

- | | |
|-----------------------------------------------------------|-------------------------------------------------|
| A. Peripheral bay | G. DIMM sockets (underneath installed PCI card) |
| B. SCSI backplane | H. PCI riser assembly |
| C. Fan bay | I. Front panel board |
| D. Processor air duct (processor(s) installed underneath) | J. Power bay |
| E. Electronics bay | K. Hot swap power modules |
| F. Dual AC | L. Front panel |
| | M. Hot swap hard disk drives |

Figure 53. Locating System Modules

Removing and Installing the Top Cover

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.

CAUTION

Do not leave the chassis cover open or a system fan removed any longer than necessary; system cooling could be reduced. Do not operate the server with the cover removed.

Removing the Top Cover

To remove the top cover, refer to *Figure 54* and follow these instructions:

1. Observe the safety and ESD precautions described in *Warnings and Cautions* and in *Before Top Cover or Module Removal*.
2. If the chassis is rack-mounted, slide the chassis out far enough to expose the back area of the top cover (see cautions and warnings above).
3. To open the top cover, use a screwdriver or a coin to turn the locking mechanism to the unlocked position.
4. Push the top cover towards the back of the system until it stops, approximately 1-inch towards the rear.
5. Lift the cover up from the front and remove it from the chassis.

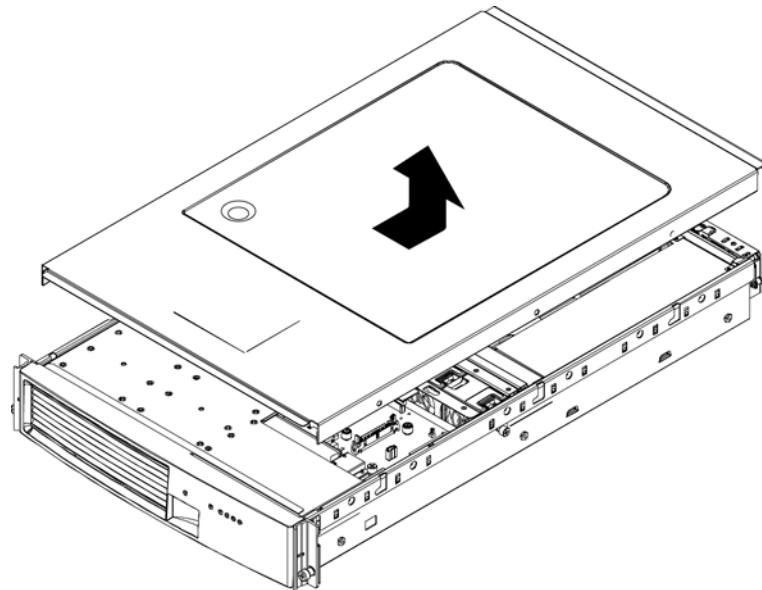


Figure 54. Removing the Top Cover

Installing the Top Cover

To install the top cover, refer to *Figure 55* and follow these instructions:

1. Carefully lower the top cover onto the chassis, inserting the interlock studs in the top cover into the corresponding slots in the chassis.
2. Slide the top cover forward until it engages underneath the front lip of the chassis and stops snug with the forward lip of the peripheral bay.
3. Use a screwdriver or a coin to turn the locking mechanism to the locked position to secure the cover.

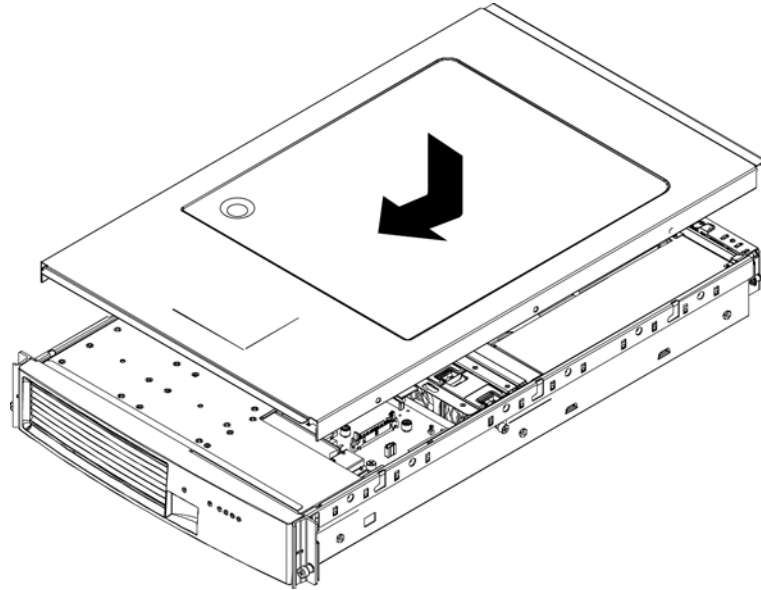


Figure 55. Installing the Top Cover

5 Hot-swapping System Components

Hot-swap Hard Drives

The procedures in this section describe how to determine drive status, remove a faulty drive, and install a new drive. For more information, see *Hot-swap Hard Drive Carrier*.

Determining Drive Status

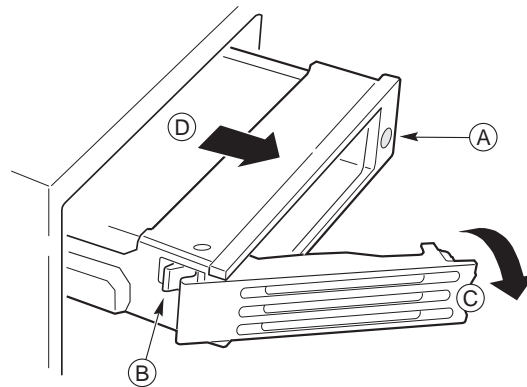
The carriers contain light-pipes that allow light from dual-color LED indicators on the SCSI backplane board to travel across the carrier and show through the bezel to display hard drive status. The status indicators are described in the table below.

Table 30. SCSI Drive Status LED Descriptions

| 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 nothing is installed in the bay |

Removing a Hard Drive Carrier

1. When replacing a failed drive, examine the amber LEDs to determine which drive has failed. See letter “A” in *Figure 56*. See *Table 30* 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. See letter “C” in the figure.
3. Slide the assembly from the bay and place it on a clean, static-free work surface. See letter “D” in the figure below.
4. To mount a new hard drive into the carrier, continue with *Mounting a Hard Drive into a Carrier*.



TP00315

- A. Hard drive led
- B. Release tab
- C. Carrier latch
- D. Slide assembly from bay

Figure 56. Removing a Hard Drive Carrier

Mounting a Hard Drive into a Carrier

The server system supports two hot-swap drive carriers in the peripheral bay. Each carrier houses a standard one-inch high SCSI-2 or SCSI-3 hard drive.

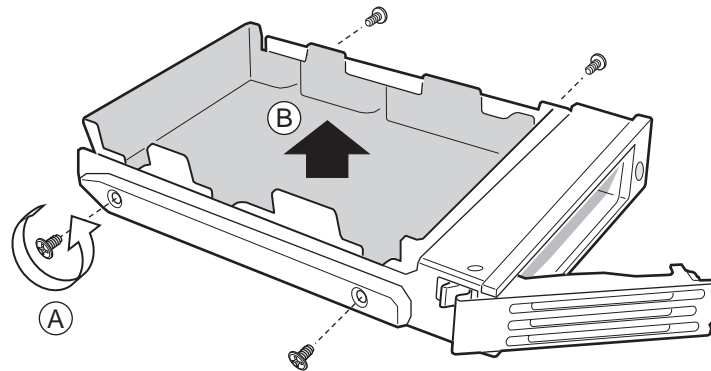


CAUTION

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 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
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. *Removing a Hard Drive Carrier* for instructions.
5. If you are installing a hard drive into a carrier that did not previously have a drive installed into it, remove the air baffle. The air baffle is removed by removing the four mounting screws from the drive rails. See letter "A" in *Figure 57*. Store the air baffle for future reinstallation in the event you operate your server without a drive in one of the bays.
6. If you are removing a failed hard drive, remove the four mounting screws that hold the drive into the carrier.

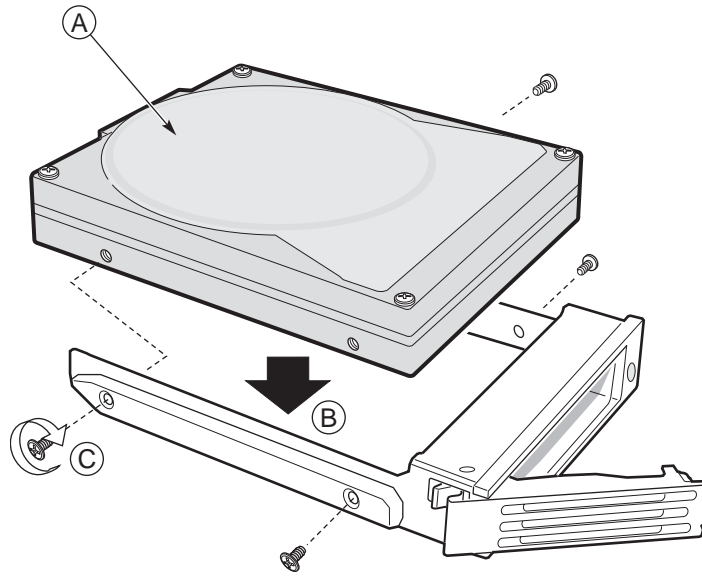


TP00316

- A. Screws
- B. Lift air baffle

Figure 57. Removing Air Baffle from Hard Drive Carrier

7. Position the carrier as shown *Figure 58*.
8. Place the drive in the carrier with the drive label-side up and the SCA (80 Pin) SCSI connector end of the drive facing the back of the carrier. See letter “A” in the figure.
9. Align the holes in the drive to the holes in the drive carrier and drive rails. Insert the mounting screws that were removed in the previous steps to and secure the carrier to the drive. See letter “C” in the figure below.
10. Continue with the instructions under *Installing a Hard Drive Carrier*.



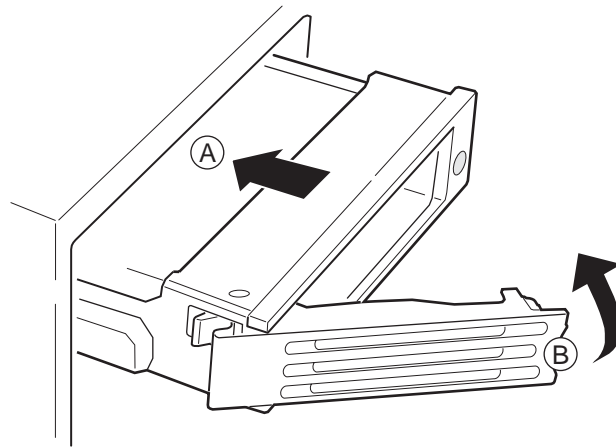
TP00317

- A. Hard drive
- B. Lower drive into carrier
- C. Screws

Figure 58. Attaching the Hard Drive to the Carrier

Installing a Hard Drive Carrier

1. With the drive carrier handle open fully, place the drive carrier into the peripheral drive bay. See letter “A” in *Figure 59*.
2. Slide the drive carrier all the way into the drive bay.
3. Using the drive carrier handle, firmly push the assembly into the bay until the drive docks with the SCSI backplane connector.
4. Swing the drive carrier handle closed until it latches. See letter “B” in the figure below.



TP00315A

- A. Slide drive carrier into chassis
- B. Carrier handle

Figure 59. Inserting a Hard Drive

Hot-swap System Fans

The six (60x60x38 mm) cooling fans provide 50CFM of airflow each. The server system supports only a fully populated system fan configuration. However, the server system will continue to meet the thermal specifications if a fan fails. The six fans are mounted side-by-side in the fan bay across the center section of the chassis. The fans can be hot-swapped; they can be removed and re-installed without turning the server system power off.

The procedures in this section describe how to identify a failed fan and replace a failed fan. See *Cooling Subsystem* for more information about the operation of the system fans.

Determining Fan Failure

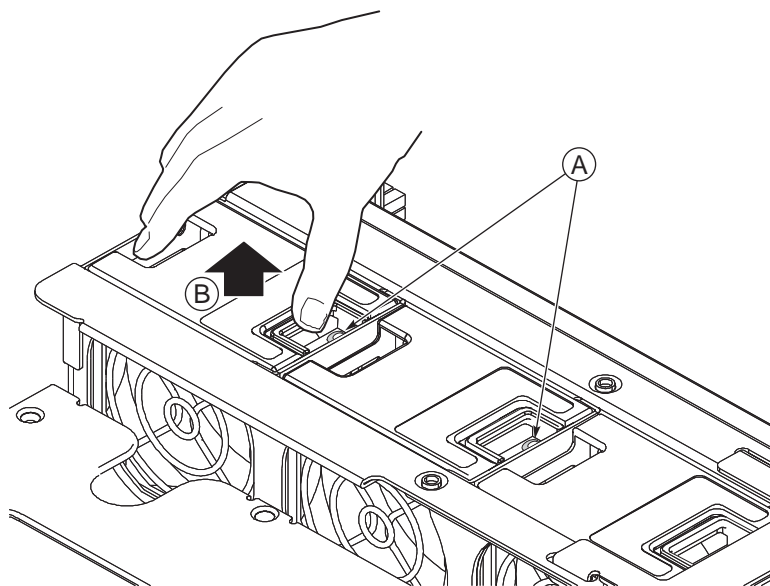
Each fan uses an amber LED to indicate the failed fan. The LED for each fan illuminates only when a fan fails. When an LED illuminates the associated fan should be replaced. To view the LEDs:

1. See the warnings and cautions under *Removing and Installing the Top Cover*.
2. Follow the instructions under *Removing the Top Cover*.
3. Locate the fan bay. See *Figure 53* for location information.
4. If a fan has failed, the LED for that fan will display an amber LED. See letter “A” in *Figure 60* for help in locating the LEDs.
5. To replace a failed fan, see *Replacing a System Fan*. If no fan has failed, follow the instructions under *Installing the Top Cover*.

Replacing a System Fan

Refer to *Figure 60* and use the instructions below to replace a hot-swap system fan:

1. See the warnings and cautions under *Removing and Installing the Top Cover*.
2. Follow the instructions under *Removing the Top Cover*.
3. Follow the instructions under *Determining Fan Failure* to identify the failed fan.
4. Place your fingers into the fan access points and squeeze your fingers together to release the fan latch and remove the fan. See letter “B” *Figure 60*.
5. Insert the replacement fan into place. It will fit only one way into the opening and will easily click into place.
6. Follow the instructions under *Installing the Top Cover*.



TP00318

- A. Fan LEDs (two of six pointed out)
- B. Access points

Figure 60. System Fan Location and Removal

Hot-swap Power Supplies

The power subsystem contains the power bay. The power bay includes the AC transfer switch, the power distribution logic, and locations for the three hot-swappable Thin Power Supply modules (TPS). TPS positions are labeled AC1/PS1, AC2/PS2, and PS Shared. The power system is rated at 650-watts; the requirements of a fully-loaded system require that at least two operational TPS modules (350-watts each) be installed at any one time. A fully redundant power configuration requires three modules be installed, with the third module (PS Shared) acting as standby module in case one of the first two modules fails.

When a failure occurs, the AC transfer switch will immediately fail-over to the standby TPS module in the PS-shared position. The failing TPS module can be removed and replaced without powering down the server. After replacing the failed TPS module, the AC transfer switch will engage the replaced module and set the module in the PS-Shared position back to standby.

See *Power Supply Bay* and *Power Subsystem* for more information.



NOTES

A system operating in a two TPS configuration should have a TPS filler panel installed in the PS-Shared position to optimize cooling. Server systems that are shipped with with two TPSs have a filler panel installed at the factory.

Determining Power Supply Status

Each TPS module has a bi-color LED at the top left corner of the module that indicates the status and health of the module. *Table 31* provides more detail on the LEDs.

Table 31. Power Supply LEDs

| Power Supply Condition | Power Supply LED |
|-------------------------------------------------------------------|------------------|
| No AC power to any PSU | Off |
| No AC power to this PSU only | Amber |
| AC present / Only standby outputs on | Blink green |
| Power supply DC outputs on and ok | Green |
| Power supply failure (includes over voltage and over temperature) | Amber |
| Current limit | Amber |

Power Module Removal and Replacement

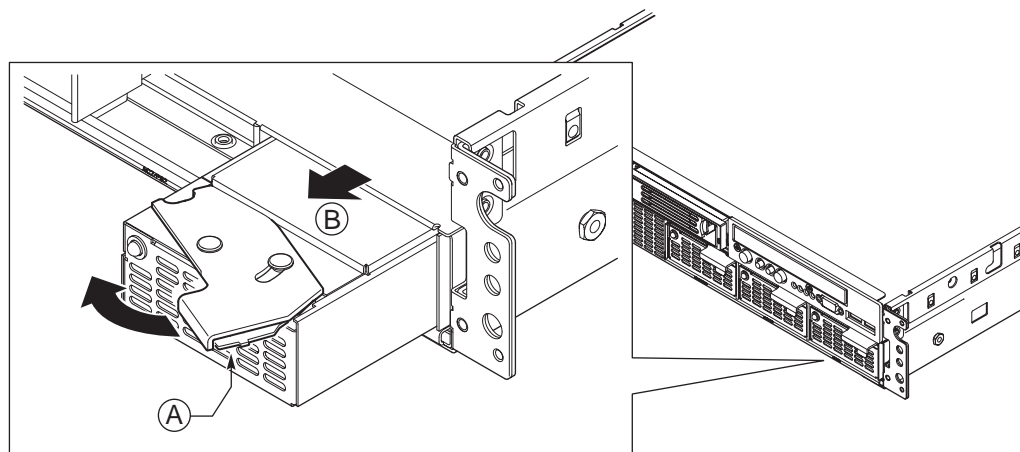


CAUTION

If your server system is operating in a non-redundant power supply configuration (without a power supply in the PS-Shared location), you need to power down your server system before replacing a failed power supply. Failure to do so will cause an immediate and uncontrolled power down.

Refer to *Figure 61* and use the following instructions to replace a power supply:

1. Locate the power module to be removed. Look at the LED at the top left corner of each module and refer to *Table 31* to determine the status of the modules.
2. Squeeze the thumb latch to unlock the power supply handle and pull the handle to undock the power supply. See letter “A” in *Figure 61*.
3. Pull the power supply out of the chassis and set it aside. See letter “B” in the figure below.
4. Align the replacement TPS module in the power bay, slide back until latched.



TP00319

- A. Latch
- B. Pull module from chassis

Figure 61. Removing and Replacing Power Module

6 Servicing the Electronics Bay

Adding or Replacing PCI Cards



CAUTION

Remove the AC power cords from the system. Damage to the system can occur if AC power is not disconnected from the system prior to removal or installation of the PCI riser assembly.

The PCI riser assembly contains the following active components:

- One server I/O Hub (SIOH) component of the E8870 chip set
- One P64H2 PCI-X bridge component
- Three non-hot-plug able PCI-X slots
 - One 64-bit, 133 MHz PCI-X, full length
 - Two 64-bit, 100 MHz PCI-X, full length
- An integrated DC-to-DC voltage converter
- Server management logic
- I²C logic
 - Field Replaceable Unit (FRU) device ID ROM
 - Temperature sensor

The PCI riser assembly needs to be removed from the chassis in order to add or remove PCI cards. Refer to the following instructions.

Removing the PCI Riser Assembly

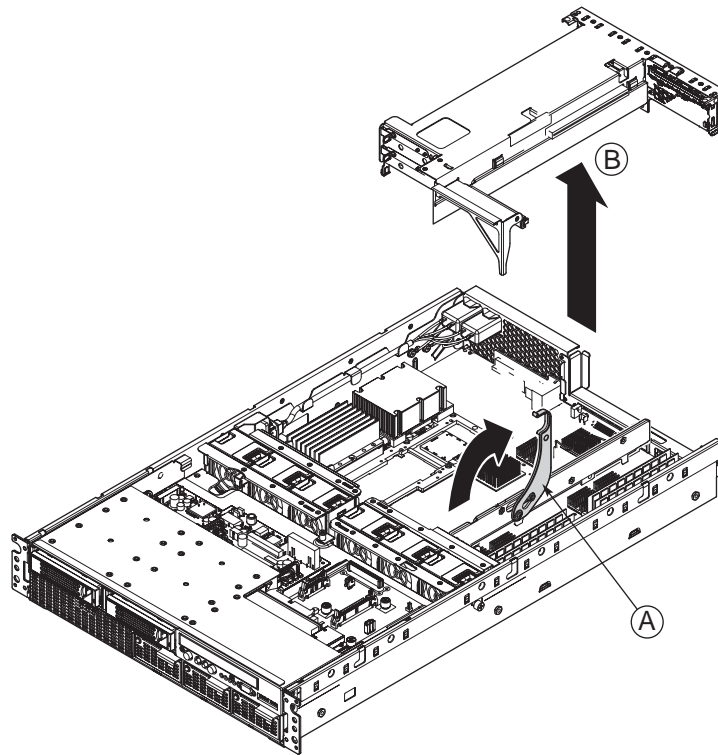
To remove the PCI riser assembly from the chassis, refer to *Figure 62* and follow these instructions:

1. See the warnings and cautions under *Removing and Installing the Top Cover*.
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. Follow the instructions under *Removing the Top Cover*.
5. Disconnect all peripheral cables attached to adapters that are installed in the PCI riser assembly.
6. Firmly grasp the riser release mechanism lever and slowly pull up and back on the lever. Some force may be required. See letter “A” in *Figure 62*. The riser assembly will disengage from the main board.
7. Lift the riser assembly straight up to remove it from the chassis. See letter “B” in the figure.



CAUTION

When removing the riser assembly, do not attempt to remove it at an angle. Removal at any other orientation other than vertical could result in damage to the VHDM connectors.



TP00320

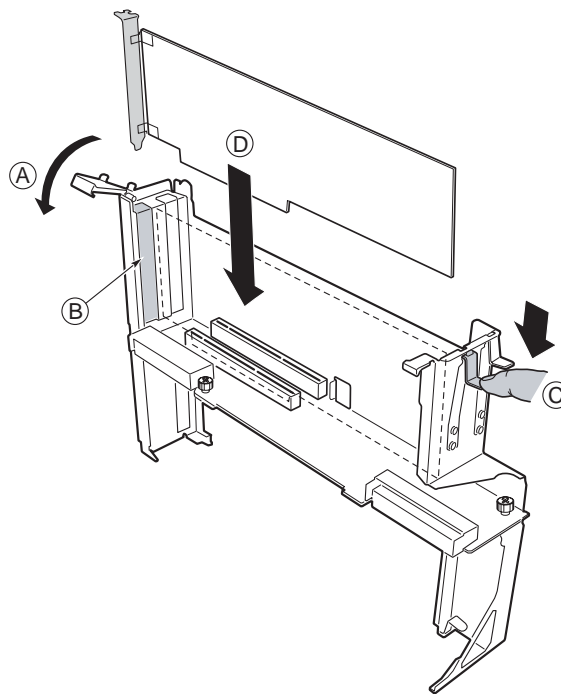
- A. Handle
- B. Lift assembly straight up

Figure 62. Removing PCI Riser Assembly

Installing PCI Cards

1. With the PCI riser assembly removed, locate the slot into which the card is to be installed. See the table below for information about the slots.
2. Open the lever over the shields (see letter “A” in *Figure 63*) to remove the shield (see letter “B” in *Figure 63*).
3. Press down on the touch point on the PCI retention lever for the slot and swing the lever open. See letter “C” in *Figure 63*.
4. Insert the adapter card and apply sufficient pressure to set the card into the slot. See letter “D” in *Figure 63*.
5. Move the touch point and shield levers to the closed positions and snap to secure them.
6. Repeat steps 1 – 5 for each card to be installed.

| Slot | Connector | PCI Bus | Key | Speed | Form Factor |
|--------|---------------------------------|---------|-------|---------------|-------------|
| Slot 1 | J9L1 (Pin Side) | Bus B | 3.3 V | 100 MHz PCI-x | Long |
| Slot 2 | J1A1 (Top Component Side) | Bus B | 3.3 V | 100 MHz PCI-x | Long |
| Slot 3 | J1A3 (Bottom Component Side) | Bus A | 3.3 V | 133 MHz PCI-x | Long |



TP00353

- | | |
|-----------------|----------------|
| A. Shield latch | C. Touch point |
| B. Shield | D. Insert card |

Figure 63. Inserting a PCI Card

Installing the PCI Riser Assembly



CAUTION

When inserting the riser assembly, do not attempt to insert it at an angle. Insertion at any other orientation other than vertical could result in damage to the VHDM connectors.

1. Align the PCI riser card assembly with its mating slot on the retention lever assembly.
2. Lower the PCI riser assembly into position.
3. Move the PCI riser retention lever forward and down to engage the VHDM connectors and seat the PCI riser assembly firmly into position.
4. Connect any peripheral cables that attached to PCI adapters installed in the riser assembly. See the documentation that came with your PCI adapter for information.
5. Follow the instructions under *Installing the Top Cover*.
6. Reconnect any peripheral devices previously disconnected.

Replacing the Battery

The lithium battery on the main board powers the real-time clock (RTC) for three to four years in the absence of power. When the battery weakens, the loss of voltage will cause the system settings and selections stored in CMOS RAM and Real Time Clock (such as the date and time) to lose their preselected values. 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.



WARNING

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.

7 Servicing the Main Board

Working with Intel® Itanium® 2 Processors

Intel® Itanium® 2 processors require special shipping and handling procedures. Processors, with heatsinks attached, 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:

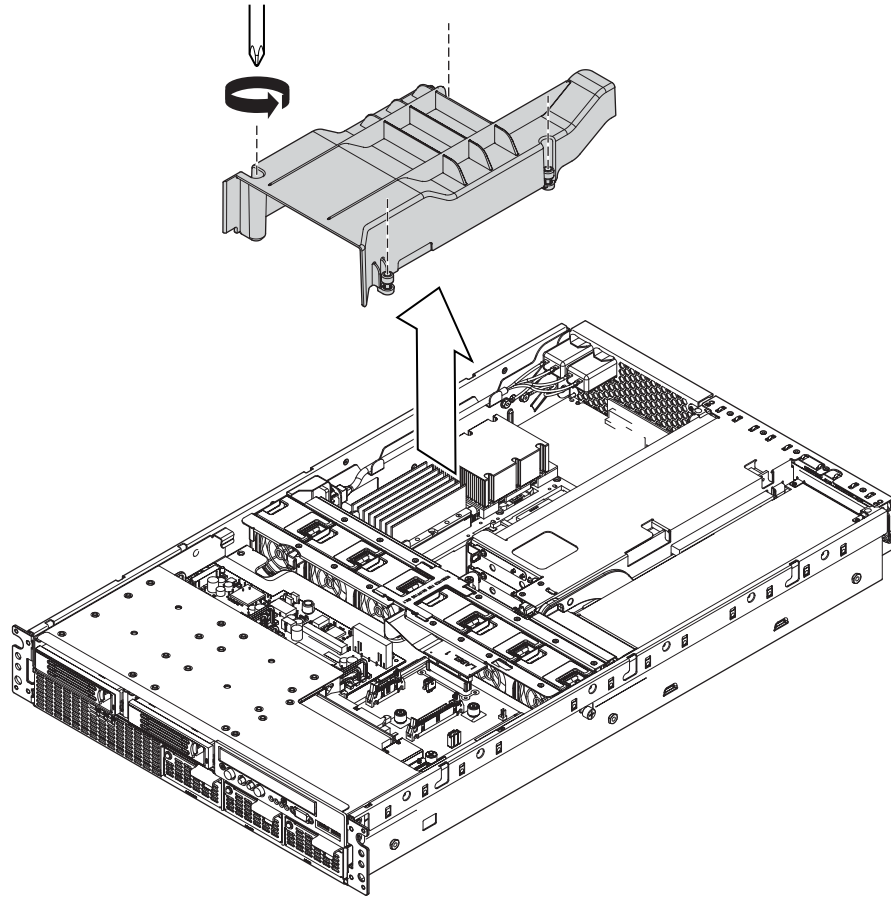
1. Ground yourself with a grounding heel or wrist strap, and an antistatic smock if possible.
2. Remove processors from the packaging at a clean ESD-protected work surface.
3. When removing processors from the packaging, first remove the clamshell from the cardboard box. Then, carefully separate each locking feature along the perimeter of the clamshell. Keep the package flat on your work surface while you open it so that no processors fall out of the packaging.
4. 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.
5. 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.
6. 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.
7. Use an ESD-safe bin to transfer processors between workstations.

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.

Removing the Processor Air Duct

The processor air duct must be removed to access the processor(s) and thermal blank that are installed beneath the processor air duct. To remove the processor air duct, refer to *Figure 64* and use the following instructions:

1. Loosen the four Phillips head screws that secure the air duct over the processors. See *Figure 64* for the screw locations.
2. Lift the processor air duct from the system and set it aside.



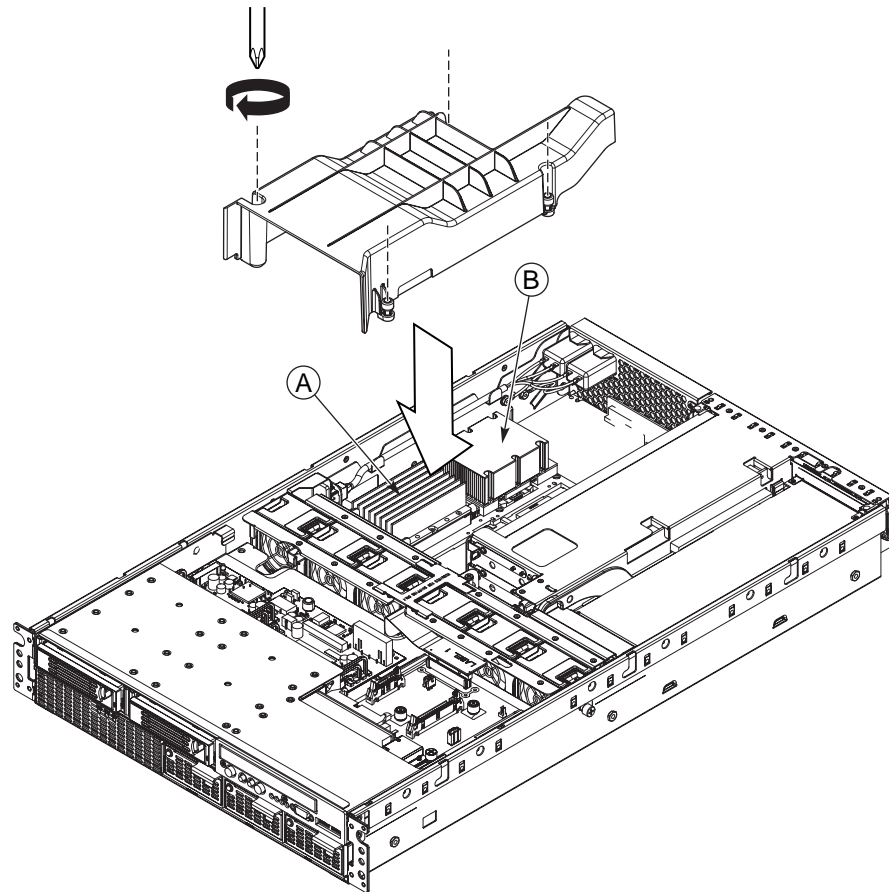
TP00321

Figure 64. Removing the Processor Air Duct

Installing the Processor Air Duct

When you have completed working with the processor area, replace the processor air duct to ensure proper system airflow is maintained. To install the processor air duct, refer to *Figure 65* and use the following instructions:

1. Set the processor air duct over the processor area as shown in *Figure 65*.
2. Tighten the four screws indicated by the drawing to secure the processor air duct to the system.
3. Follow the instructions under *Installing the Top Cover*.



TP00324

- A. Processor power pod
- B. Processor

Figure 65. Installing the Processor Air Duct

Replacing the Thermal Blank

Your server may have one to two processors with an associated power pod installed on the main board. The thermal blank is used when a single processor is installed in the server system. If your server system has two processors installed, it will not have a thermal blank installed. The thermal blank is removed only to replace it or when you wish to install an additional processor.



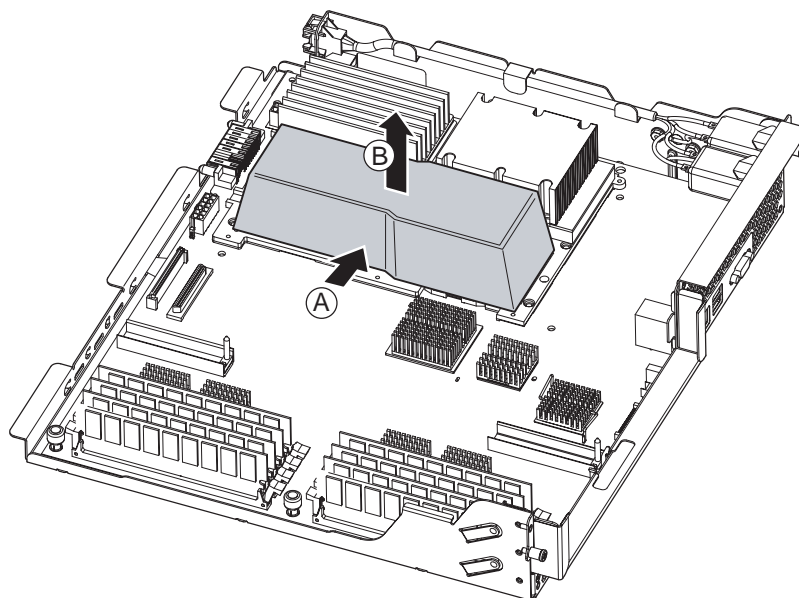
NOTE

If the system contains only one processor, that processor must be installed into the CPU1 slot for proper termination of the front side bus signals.

Removing the Thermal Blank

To remove the thermal blank:

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. See the warnings and cautions under *Removing and Installing the Top Cover*.
3. Follow the instructions under *Removing the Top Cover*.
4. Remove the processor air duct and set it aside. See the instructions under *Removing the Processor Air Duct*.
5. The thermal blank is installed only over the CPU2 socket. Push the thermal blank toward the single installed processor to release the side tabs. See letter “A” in *Figure 66*.
6. Lift the thermal blank to remove it. See letter “B” in the figure.



TP00322

A. Push thermal blank toward processor

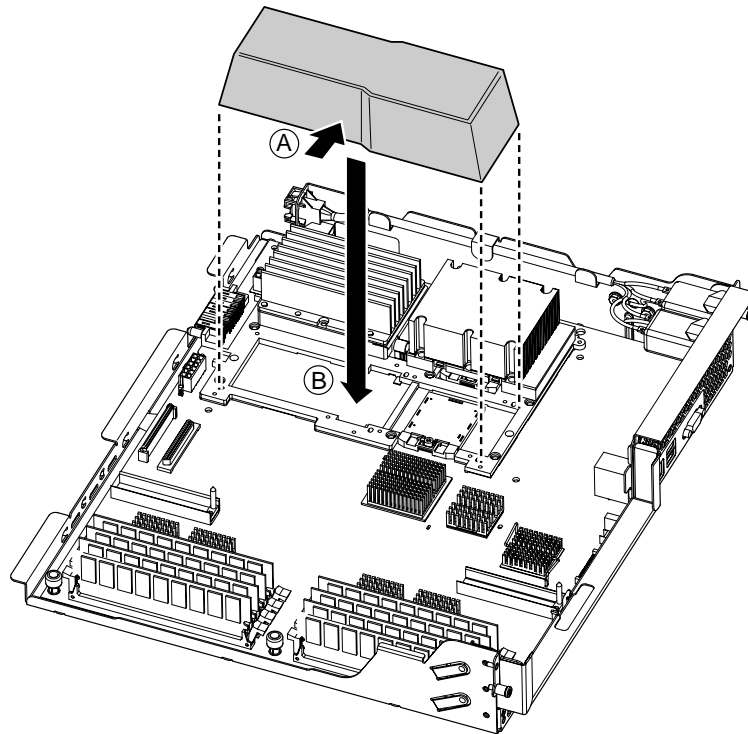
B. Lift thermal blank

Figure 66. Removing the Thermal Blank

Installing the Thermal Blank

A thermal blank is installed into a server system when only a single processor is to be installed. If a processor is removed, you must install a thermal blank into the processor 2 location. Refer to *Figure 67* and use the following instructions to install the thermal blank:

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. See the warnings and cautions under *Removing and Installing the Top Cover*.
3. Follow the instructions under *Removing the Top Cover*.
4. Follow the instructions under *Removing the Processor Air Duct*.
5. If you are removing a processor, follow the instructions under *Removing a Power Pod*.
6. If you are removing a processor, follow the instructions under *Removing a Processor*.
7. Position the thermal blank in the empty processor 2 and power pod position on the main board as indicated by letter “A” in *Figure 67*.
8. Lower the thermal blank into place, as indicated by letter “B” in the figure.
9. Squeeze the sides of the thermal blank together and slip the tabs in the notches under the metal power pod frame.
10. Follow the instructions under *Installing the Processor Air Duct*.



TP00323

A. Position thermal blank over CPU2 socket

B. Lower thermal blank into place

Figure 67. Installing the Thermal Blank

Replacing a Processor

In order to replace a processor, the power pod must first be removed. Follow the instructions below, in order, to:

1. Remove the power pod
2. Remove the processor
3. Install a replacement processor
4. Reinstall the power pod



NOTES

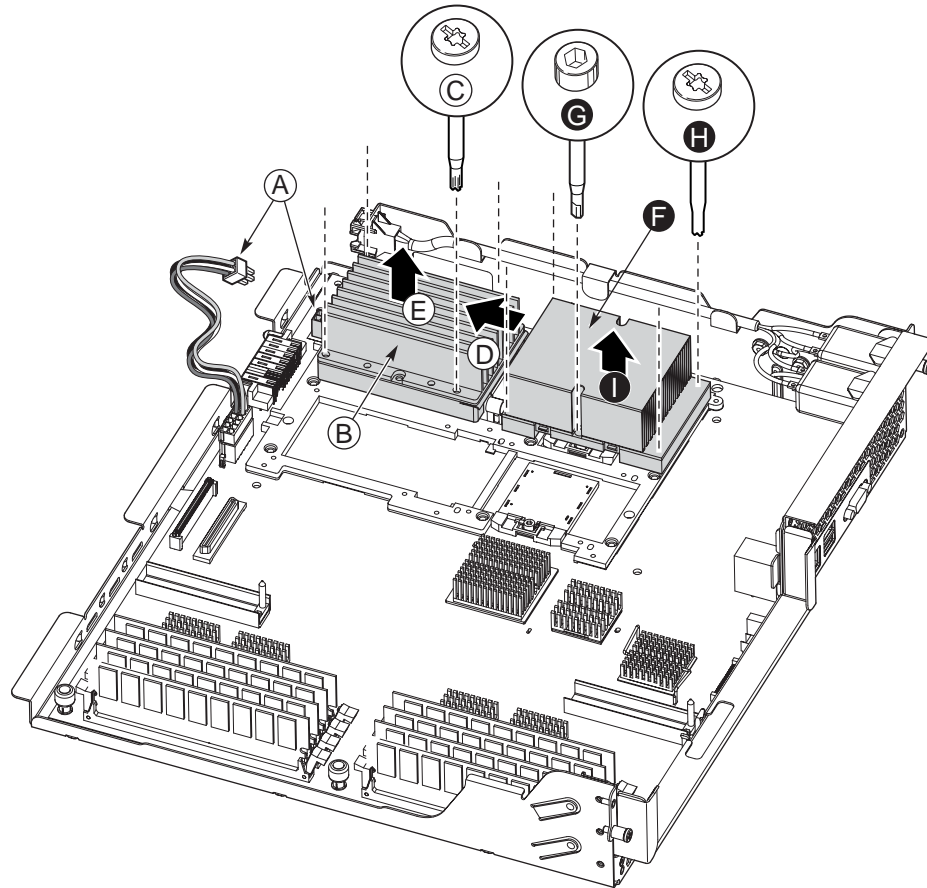
The heat sink / processor assembly included in your server system may vary slightly from the drawings in the instructions below. The assembly instructions are the same.

Removing a Power Pod

To remove a processor, the power pod must first be removed. Refer to letter “B” in *Figure 69* to identify the power pod. Use the following instructions to remove it:

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. See the warnings and cautions under *Removing and Installing the Top Cover*.
3. Follow the instructions under *Removing the Top Cover*.
4. Follow the instructions under *Removing the Processor Air Duct*.

5. Disconnect the Y-cable to the power pod by releasing the connectors. See letter “A” in *Figure 68*.
6. Loosen the four captive screws on the power pod. See letter “C” in the figure.
7. Slide the power pod away from the processor to disengage it from its connector. See letter “D” in the figure.
8. Lift the power pod out of the system. See letter “E” in the figure.



TP00325

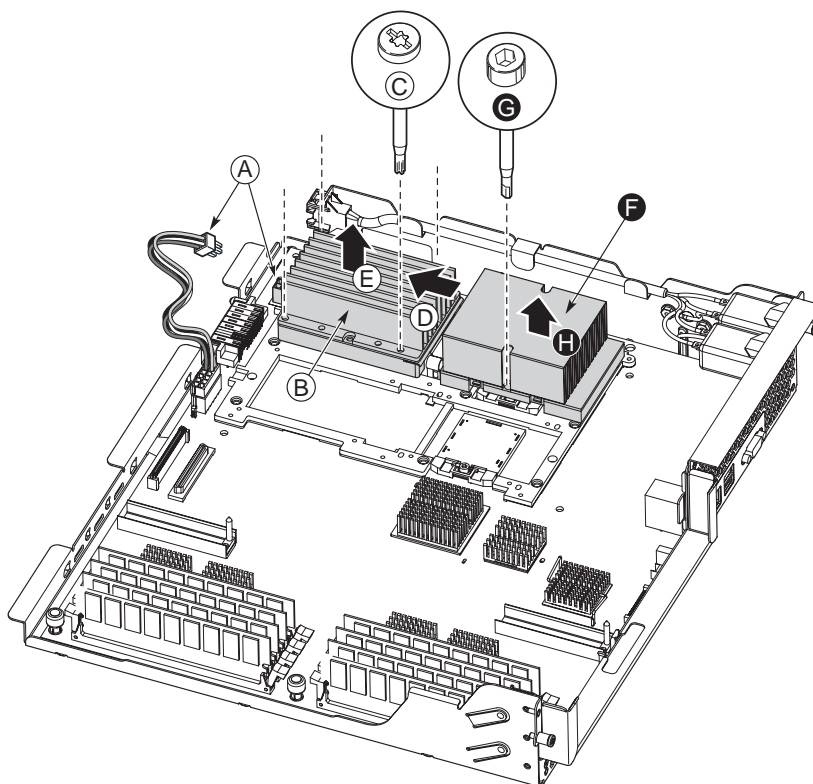
- | | |
|----------------------------------------|-------------------------------------------------------------|
| A. Y-Cable | F. Processor (See <i>Removing a Processor</i>) |
| B. Power pod | G. Processor pin release (See <i>Removing a Processor</i>) |
| C. Power pod screws | H. Processor screws (See <i>Removing a Processor</i>) |
| D. Slide power pod away from processor | I. Lift processor (See <i>Removing a Processor</i>) |
| E. Lift power pod | |

Figure 68. Removing a Processor Power Pod

Removing a Processor

After the power pod is removed, see letter “F” in *Figure 69* to identify the processor. Use the following instructions to remove the processor:

1. Use a 2.5 mm hex driver to rotate the processor release mechanism 90 degrees counter-clockwise to release the processor’s pins. See letter “G” in *Figure 69*.
2. Loosen the four captive screws on the processor. See letter “H” in *Figure 69*.
3. Lift the processor from the socket. See letter “I” in the figure below.
4. Place the processor on a clean, ESD-protected work surface, in an antistatic bag, or in the processor’s original container.
5. Install a replacement processor or a thermal blank:
 - To install a new processor, see *Installing a Processor*.
 - To install a thermal blank, see *Installing the Thermal Blank*.



TP00325

- | | |
|---------------------------------------------------------------------------|------------------------------------------------------|
| A. Y-Cable (See <i>Removing a Power Pod</i>) | E. Lift power pod (See <i>Removing a Power Pod</i>) |
| B. Power pod (See <i>Removing a Power Pod</i>) | F. Processor |
| C. Power pod screws (See <i>Removing a Power Pod</i>) | G. Processor pin release |
| D. Slide power pod away from processor (See <i>Removing a Power Pod</i>) | H. Processor screws |
| | I. Lift processor |

Figure 69. Removing a Processor



NOTE

Once the processor is removed, note that the release mechanism shows the socket is open (see figure inset). If you are not installing another processor, use a 2.5 mm hex driver to rotate the hex screw clockwise to the closed position to release spring tension in the mechanism.

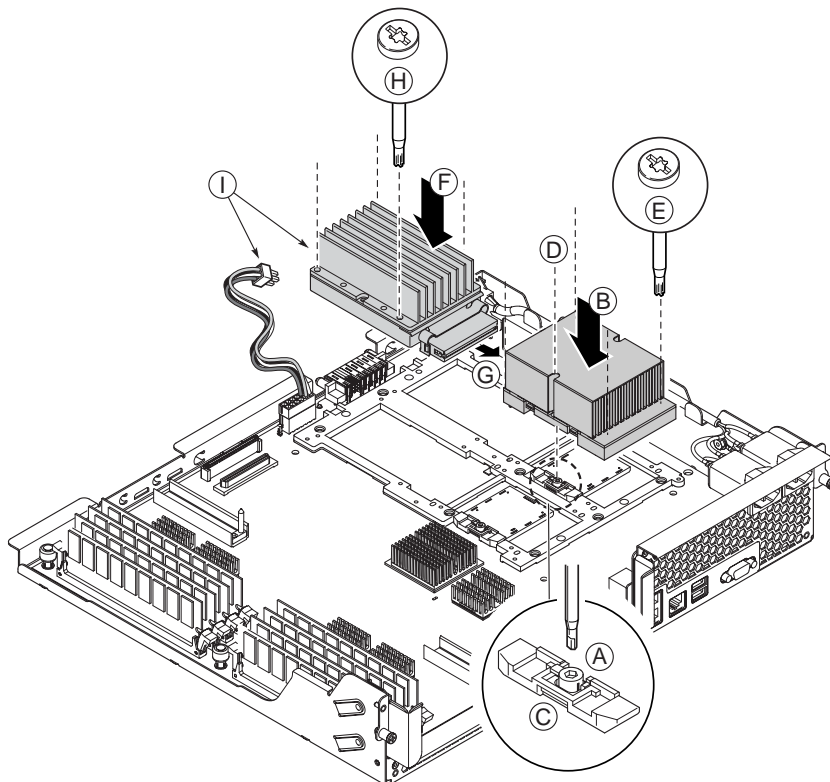
Installing a Processor



NOTE

If the system contains only one processor, that processor must be installed into the CPU1 slot for proper termination of the front side bus signals.

To install a processor, refer to *Figure 70* and follow the instructions on the following page:



TP00326

- | | |
|-----------------------------------------------------------------|--------------------------------------------------------------------------|
| A. 2.5 mm processor release mechanism | F. Lower power pod into place (See <i>Installing a Power Pod</i>) |
| B. Lower processor into place | G. Slide power pod toward processor (See <i>Installing a Power Pod</i>) |
| C. Expanded view of processor release mechanism on server board | H. Power pod screws (See <i>Installing a Power Pod</i>) |
| D. Access to processor release mechanism | I. Y-cable (See <i>Installing a Power Pod</i>) |
| E. Processor screws | |

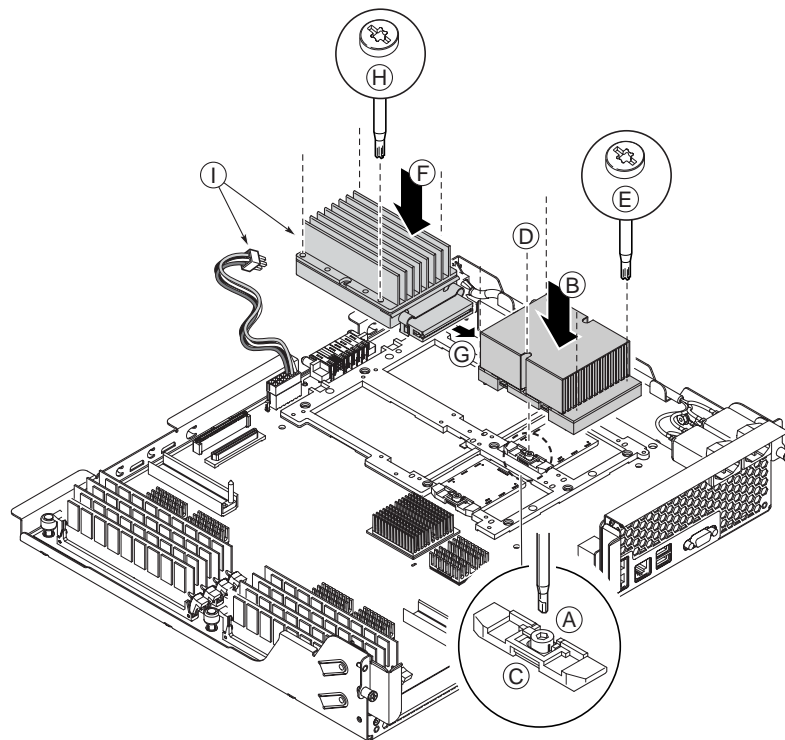
Figure 70. Installing a Processor

1. Before trying to insert the processor, verify that the processor release mechanism is in the open or unlocked position. See letter “C” in *Figure 70* to locate the release mechanism. See letter “A” in *Figure 70* to identify the 2.5 mm hex opening.
2. Position the processor, with its attached heat sink, over the processor socket, inside the four posts. See letter “B” in *Figure 70*. When the processor is centered in the socket, the weight of it will cause the processor to drop into the socket; do not apply force.
3. Once the processor is in the socket, gently press on it to verify it is seated.
4. Using a 2.5 mm hex driver, rotate the processor release mechanism 90 degrees clock-wise so that the indicator tab shows the processor socket is locked. The access to the release mechanism is through a slot along the side of the processor, as indicated by letter “D” in the diagram.
5. Tighten the four captive screws in a cross-pattern to 6-inch lbs to secure the processor to the processor mechanism on the main board. See letter “E” in *Figure 70*.
6. Install the power pod. See *Installing a Power Pod* for instructions.

Installing a Power Pod

To install a power pod, refer to *Figure 71* and follow these instructions:

1. Place the power pod into position on the main board processor retention mechanism. See letter “F” in *Figure 71*.
2. Slide the power pod toward the processor to engage the power pod connector with the connector on the processor as shown. See letter “G” in the figure below.
3. Tighten the four captive screws on the power pod to secure it to the processor mechanism on the main board. See letter “H” in the figure.
4. Connect one side of the Y-cable to the power pod and verify that the Y-cable connects to all installed power pods. See letter “I” in the figure below.
5. Install the thermal blank (in a single processor configuration only). See the instructions under *Installing the Thermal Blank*.
6. Install the processor air duct. See the instructions under *Installing the Processor Air Duct*.
7. Follow the instructions under *Installing the Top Cover*.



TP00326

- | | |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------|
| A. Processor release mechanism (See <i>Installing a Processor</i>) | D. Access to processor release mechanism (See <i>Installing a Processor</i>) |
| B. Lower processor into place (See <i>Installing a Processor</i>) | E. Processor screws (See <i>Installing a Processor</i>) |
| C. Processor release mechanism (See <i>Installing a Processor</i>) | F. Lower power pod into place |
| | G. Slide power pod toward processor |
| | H. Power pod screws |
| | I. Y-cable |

Figure 71. Installing a Power Pod

Adding or Replacing Memory DIMMs

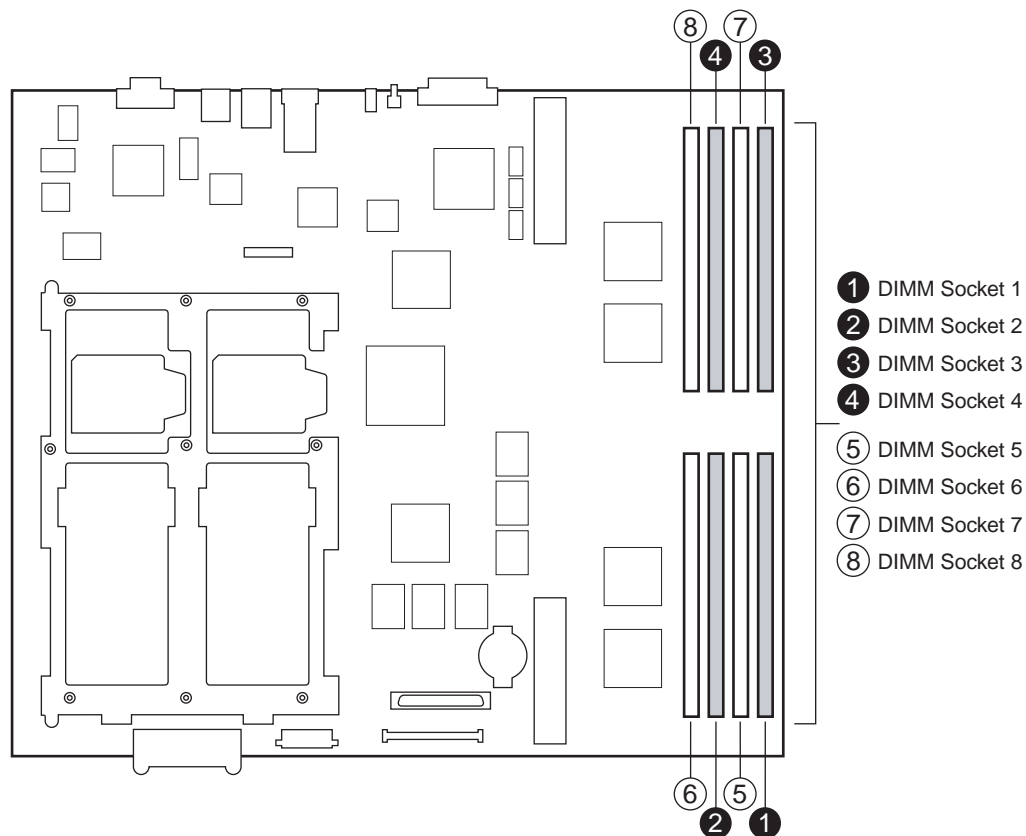


NOTE

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

The figure below shows the locations of the DIMMs on the main board. As shown by the diagram, row 1 consists of DIMM sockets 1 – 4; row 2 consists of DIMM sockets 5 – 8. When replacing DIMMs, the following rules must be followed:

- DIMMs must be populated in groups of four, referred to as a row.
- Within a single row, all DIMMs must be identical. (Identical DIMM size and identical number of devices on the DIMM).
- Each of the two possible DIMM rows can be populated with different technologies.
- For best performance, the amount of memory on each MRH-D DDR branch channel should be the same to enable the benefits of memory interleaving.



TP00311

Figure 72. Location of Memory DIMMS

Removing DIMMs

CAUTIONS

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.

DIMMs must be removed and added in groups of four, referred to as a row. To remove a DIMM, refer to *Figure 73* and use the following instructions:

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. See the warnings and cautions under *Removing and Installing the Top Cover*.
3. Follow the instructions under *Removing the Top Cover*.
4. Follow the instructions under *Removing the PCI Riser Assembly*.
5. Gently push the plastic ejector levers out and down to eject the DIMM from its connector. See *Figure 73*.
6. Hold the DIMM only by its upper edges, 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 5 and 6 for each DIMM you want to remove.
8. If you are not installing new DIMMs, follow the instructions under *Installing the PCI Riser Assembly*. Otherwise, continue with *Installing DIMMs*.

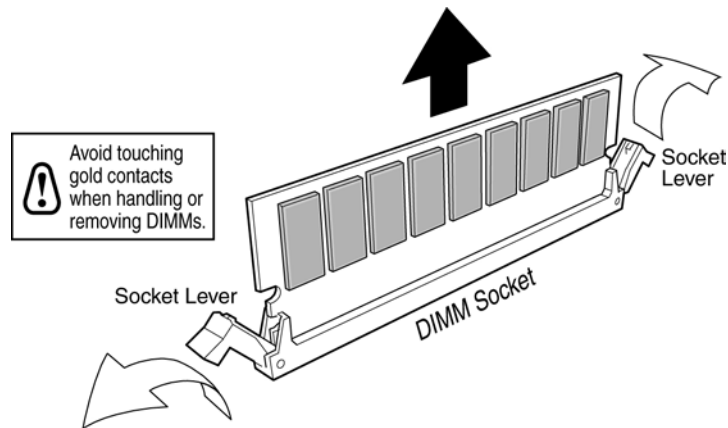


Figure 73. Removing DIMMs

Installing DIMMs

DIMMs must be installed in groups of four, referred to as a row. See *Adding or Replacing Memory DIMMs* for population information.

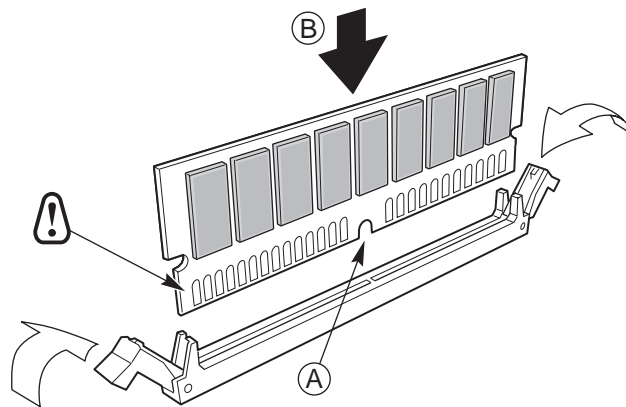


CAUTIONS

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

To install a DIMM, refer to Figure 74 and use the following instructions:

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. See the warnings and cautions under *Removing and Installing the Top Cover*.
3. Follow the instructions under *Removing the Top Cover*.
4. Follow the instructions under *Removing the PCI Riser Assembly*.
5. Gently push the plastic ejector levers out and down to open the DIMM slots.
6. Hold the DIMM only by its upper edges, being careful not to touch its components or gold edge connectors. Carefully insert the DIMM into the connector. Firmly press down on the DIMM until the latches engage.
7. Repeat steps 5 and 6 to install each additional DIMM in the row.
8. Follow the instructions under *Installing the PCI Riser Assembly*.



TP00327

Figure 74. Installing DIMMs

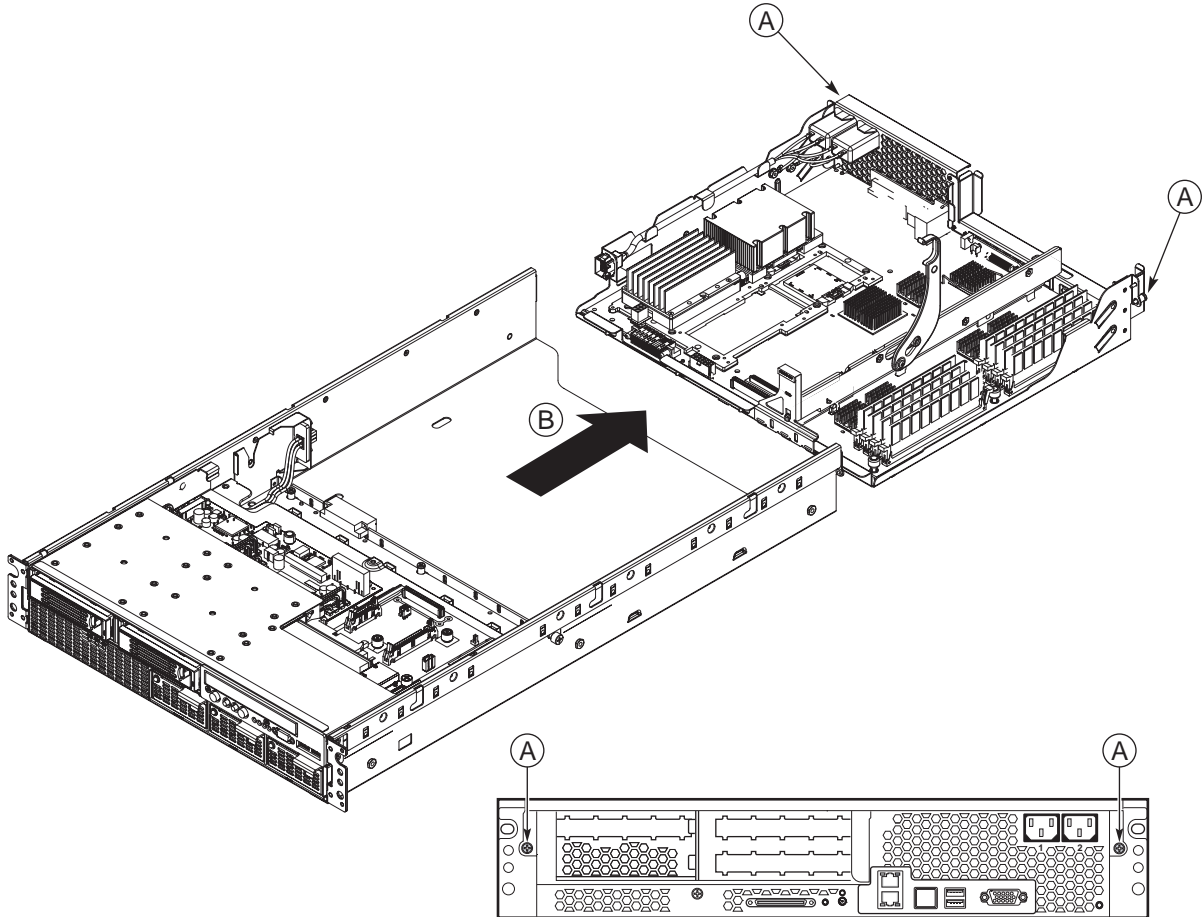
Replacing the Main Board

The main board is mounted to the electronics bay tray, which slides out from the rear of the chassis.

Removing the Main 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. See the warnings and cautions under *Removing and Installing the Top Cover*.
3. Follow the instructions under *Removing the Top Cover*.
4. Follow the instructions under *Removing the PCI Riser Assembly*.
5. Follow the instructions under *Removing the Processor Air Duct*.
6. Follow the instructions under *Removing a Power Pod*.
7. Follow the instructions under *Removing a Processor*. If two processors are installed, remove both.
8. Remove the thermal blank (if installed) and set it aside. For instructions, see *Removing the Thermal Blank*.
9. Follow the instructions under *Removing DIMMs*.
10. Disconnect all cables attached to the main board. Note the cables you are disconnecting so you can reconnect them later.

11. Locate and loosen two captive screws at the rear of the chassis securing the electronics bay to the main chassis. See letter “A” in *Figure 76* to locate the screws.
12. Slide the electronics bay tray from the rear of the chassis and place it on an ESD-safe workspace. See letter “B” in the figure below.

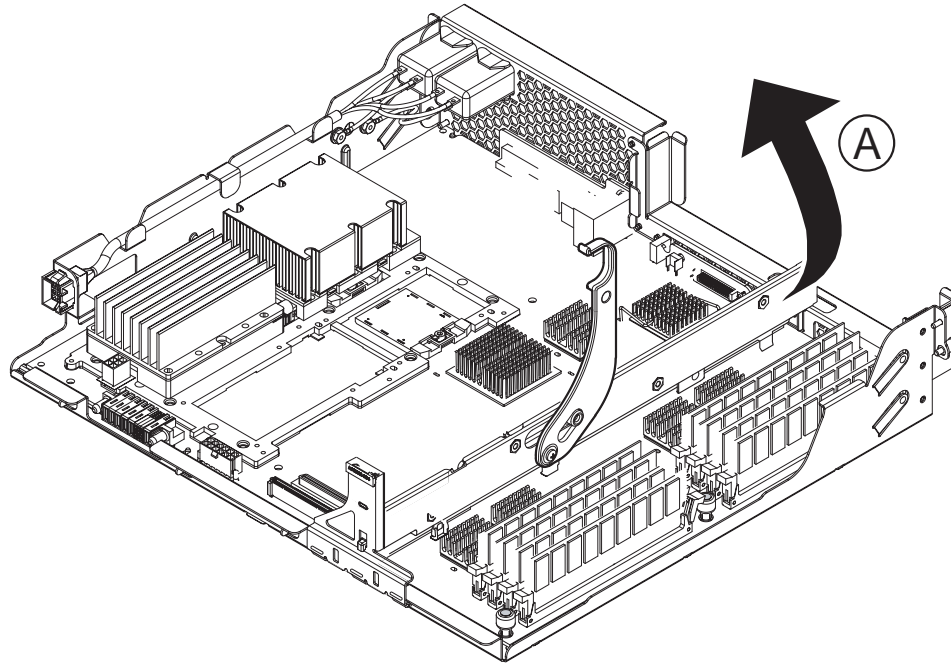


TP00330

- A. Loosen two screws at rear of electronics bay
- B. Slide electronics bay from chassis

Figure 75. Sliding out the Electronics Bay

13. Remove the single screw that attaches the PCI riser lever to the rear of the electronics bay.
14. Raise the rear side of the PCI riser lever assembly to disengage the clips at the front of the assembly from the front of the electronics bay. See letter "A" in *Figure 76*.

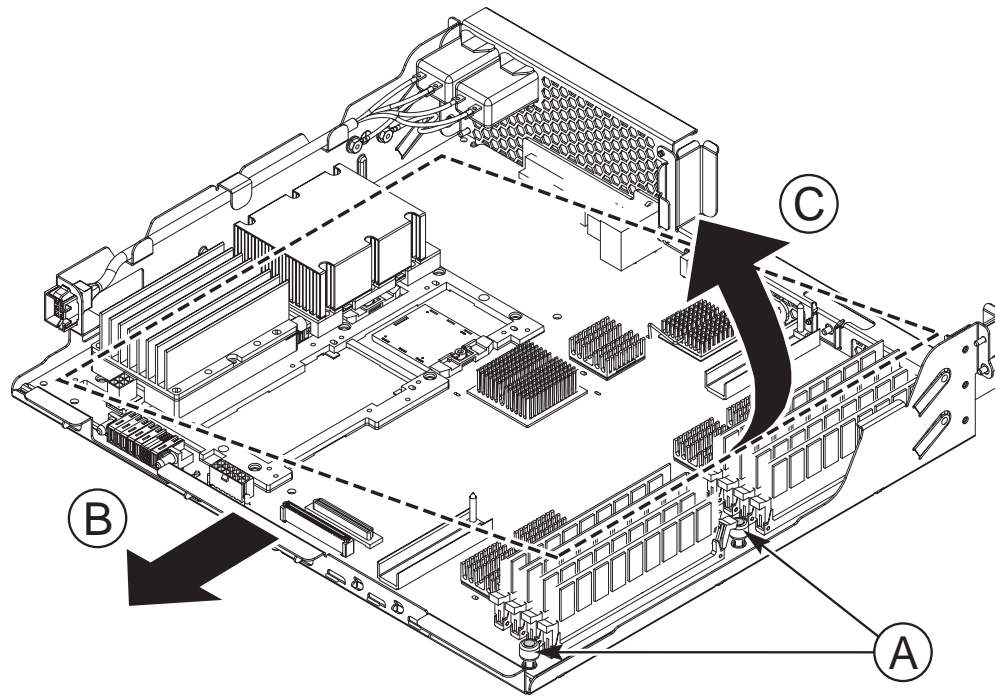


TP00330B

A. Lift rear of PCI lever

Figure 76. Removing the PCI Lever Assembly

15. Locate and loosen the two captive screws near the DIMM sites on the main board. See letter “A” in *Figure 77*.
16. Slide the main board forward to disengage the I/O ports at the rear. See letter “B” in the figure below.
17. Lift from the DIMM socket side of the board to remove the main board from the electronics bay tray. See letter “C” and the dashed lines in the figure. Place the board on an ESD safe surface.



TP00330C

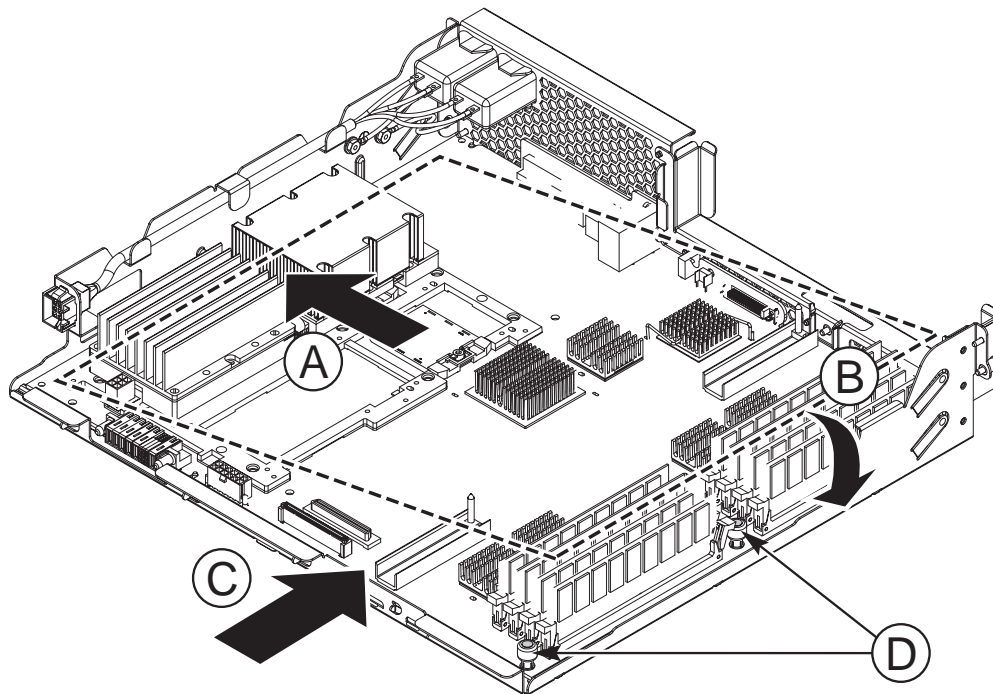
- A. Loosen two screws
- B. Slide board forward
- C. Lift board from DIMM side first

Figure 77. Removing the Main Board

Installing the Main Board

To install the main board:

1. Lower the side of the board opposite the DIMM sockets into the electronics bay. See letter “A” and the dashed lines in *Figure 78*.
2. Lower the DIMM socket side of the board into place. See letter “B” in the figure.
3. Push the board rearward to align it with the locating pins in the electronics bay and with the I/O cutouts at the rear of the tray. See letter “C” in the figure.
4. Secure the main board to the tray by tightening the two captive Phillips head screws near the DIMM sockets on the main board. See letter “D” in *Figure 78*.

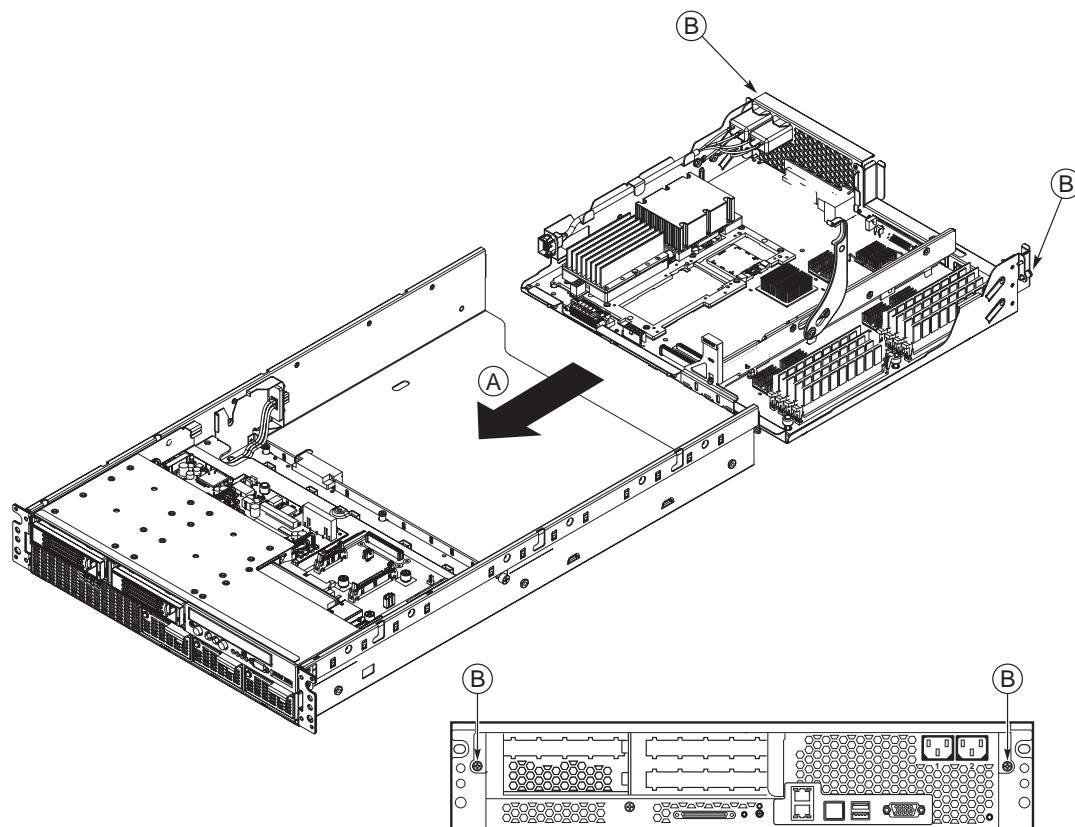


TP00330D

- A. Insert side opposite DIMMs first
- B. Lower DIMM side of board
- C. Slide board back
- D. Tighten screws

Figure 78. Inserting the Main Board

5. Insert the front of the PCI riser lever assembly into the notches at the front of the electronics bay.
6. Lower the PCI riser assembly into place, so that the screw hole matches the screw at the rear of the electronics bay.
7. Tighten the screw to secure the PCI riser assembly into place.
8. Slide the electronics bay tray into the chassis from the rear, checking to see that the two power connectors (AC and DC connectors) at the left side of the board align with the power bay and mate securely when the tray is fully inserted. See letter “A” in *Figure 79*.
9. Secure the electronics bay to the main chassis by tightening the two captive screws at the rear of the system. See letter “B” in the figure below.
10. Reinstall the memory DIMMs. For instructions see steps 5 – 7 under *Installing DIMMs*.
11. Reinstall the processor(s) and power pod(s). For instructions see *Installing a Processor*.
12. Install the thermal blank if necessary. For instructions, see *Installing the Thermal Blank*.
13. Reinstall the PCI riser assembly. For instructions see steps 1 – 4 under *Installing the PCI Riser Assembly*.
14. Reconnect all cables that you disconnected when you removed the old main board.
15. Follow the instructions under *Installing the Top Cover*.



TP00330A

- A. Slide electronics bay into chassis
- B. Tighten two screws at rear of chassis

Figure 79. Inserting the Electronics Bay

8 Servicing the Peripheral Bay

The peripheral bay provides mounting features for two hot-swap SCSI hard drive carriers and one non-hot swap IDE DVD/CD-ROM drive. Other components on the peripheral bay that may require service include the SCSI backplane board, the front panel board and the DVD-ROM / CD-ROM drive.

The peripheral bay does not need to be removed to replace a hot-swap hard drive. For instructions on replacing a hot-swap hard drive, see *Hot-swap Hard Drives*. For technical information about the peripheral bay, see *Peripheral Bay*.

The SCSI backplane board can be serviced without removing the peripheral bay from the chassis. To replace the SCSI backplane board, see *Replacing the SCSI Backplane Board*.

To service the front panel board or the DVD-ROM / CD-ROM drive, the peripheral bay must be removed from the chassis. To service one of these components, begin with *Removing and Installing the Peripheral Bay*.

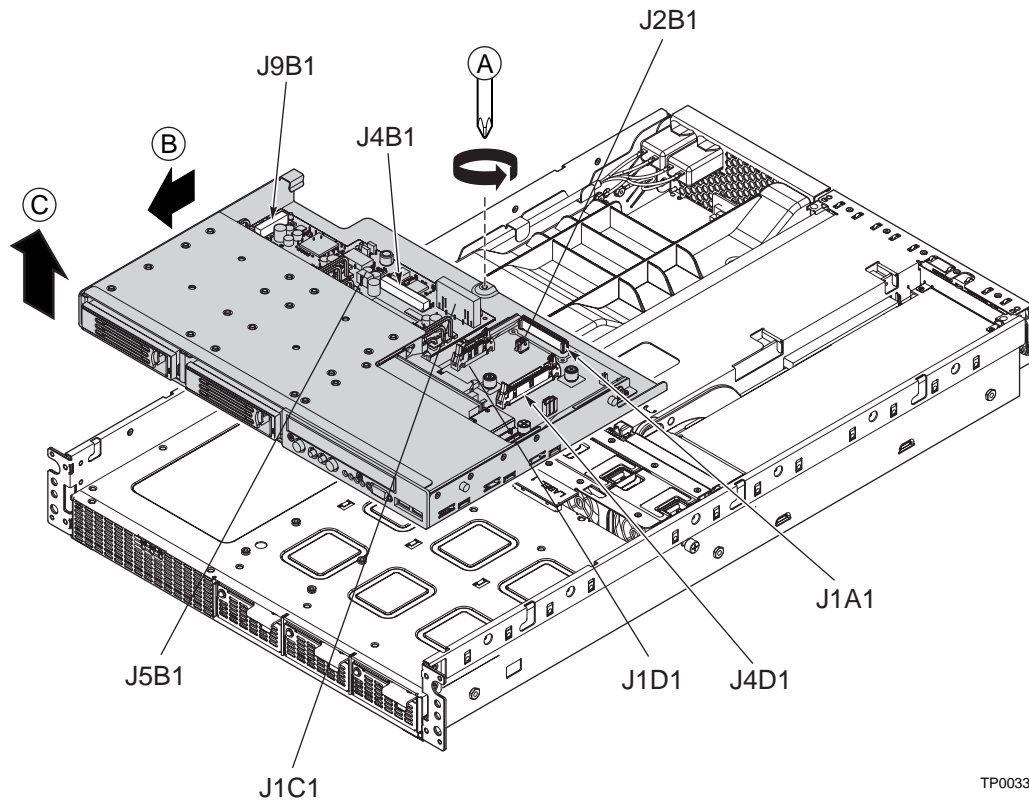
Removing and Installing the Peripheral Bay

Removing the Peripheral Bay

Remove the peripheral bay from the chassis to service the front panel board or the DVD-ROM / CD-ROM drive. To remove the peripheral bay, see *Figure 80* and perform the steps outlined below:

1. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both of the AC power cords to remove standby power from the server.
2. See the warnings and cautions under *Removing and Installing the Top Cover*.
3. Follow the instructions under *Removing the Top Cover*.

4. Locate and disconnect the following cables on the front panel board and SCSI backplane board (see *Figure 80*):
 - J1A1: Flex cable from the front panel to main board
 - J4D1: IDE ribbon cable from the front panel board to the DVD-ROM/CD-ROM interface
 - J9B1: Main DC power harness from the SCSI backplane board to the power bay
 - J4B1: SCSI backplane cable from the SCSI backplane to main board
 - J5B1: DC-Y cable from the SCSI backplane board
 - J2B1: DC-Y cable from the front panel board
 - J1C1: Peripheral interface ribbon cable from the SCSI backplane board
 - J1D1: Peripheral interface ribbon cable from the front panel board
5. Loosen the captive screw on the rear peripheral bay located near the center of the fan bay. See letter “A” in *Figure 80* to locate the screw.
6. Slide the peripheral bay forward about 1 inch until it stops. See letter “B” in the figure.
7. Lift the unit straight up to remove it from the chassis. See letter “C” in the figure.
8. Place the module on a clean, static-free work surface.
9. Continue with the appropriate task:
 - To replace the front panel board, see *Replacing the Front Panel Board*.
 - To replace or remove a CD-ROM or DVD-ROM drive, see *Servicing the DVD-ROM/CD-ROM Drive*.

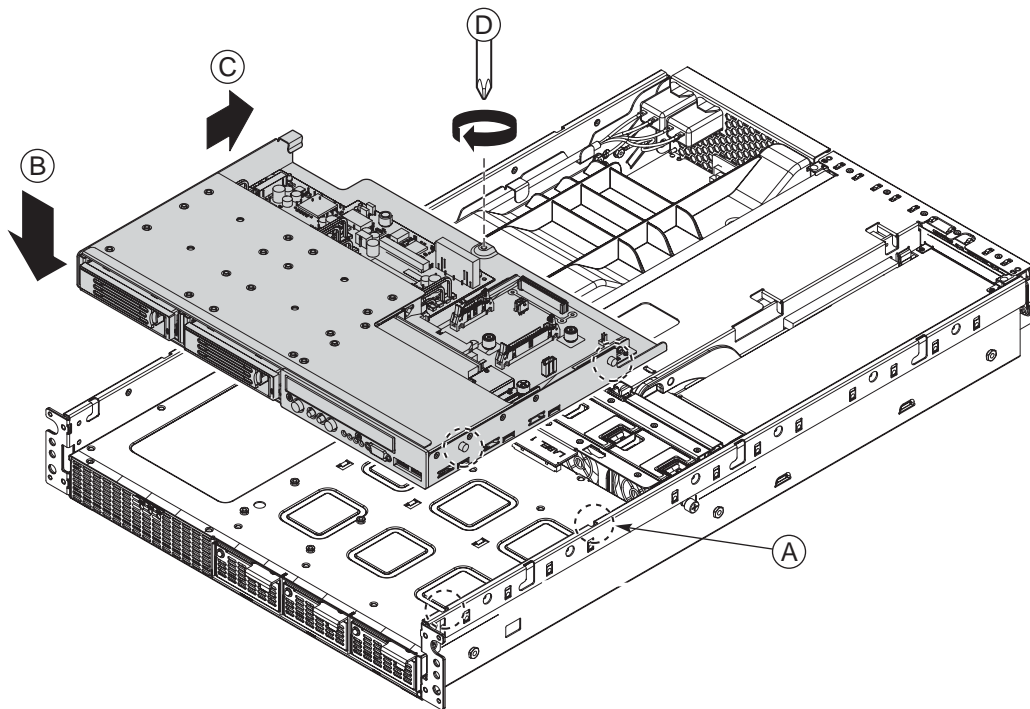


TP00331

Figure 80. Removing the Peripheral Bay

Installing the Peripheral Bay

1. Install the peripheral bay in the chassis by locating the four alignment studs (two each side) in the corresponding chassis cutouts and lower the assembly into position. See letter “A” and “B” in *Figure 81*.
2. Push the assembly rearward and fasten the retaining screw. See letter “C” in the figure.
3. Reconnect all cables that were removed. (See *Figure 80* for cable locations):
 - J1A1: Flex cable from the front panel to main board
 - J4D1: IDE ribbon cable from the front panel board to the DVD-ROM/CD-ROM interface
 - J9B1: Main DC power harness from the SCSI backplane board to the power bay
 - J4B1: SCSI backplane cable from the SCSI backplane to main board
 - J5B1: DC-Y cable from the SCSI backplane board
 - J2B1: DC-Y cable from the front panel board
 - J1C1: Peripheral interface ribbon cable from the SCSI backplane board
 - J1D1: Peripheral interface ribbon cable from the front panel board



TP00331A

- A. Alignment studs
- B. Lower bay
- C. Slide bay rearward
- D. Tighten screw

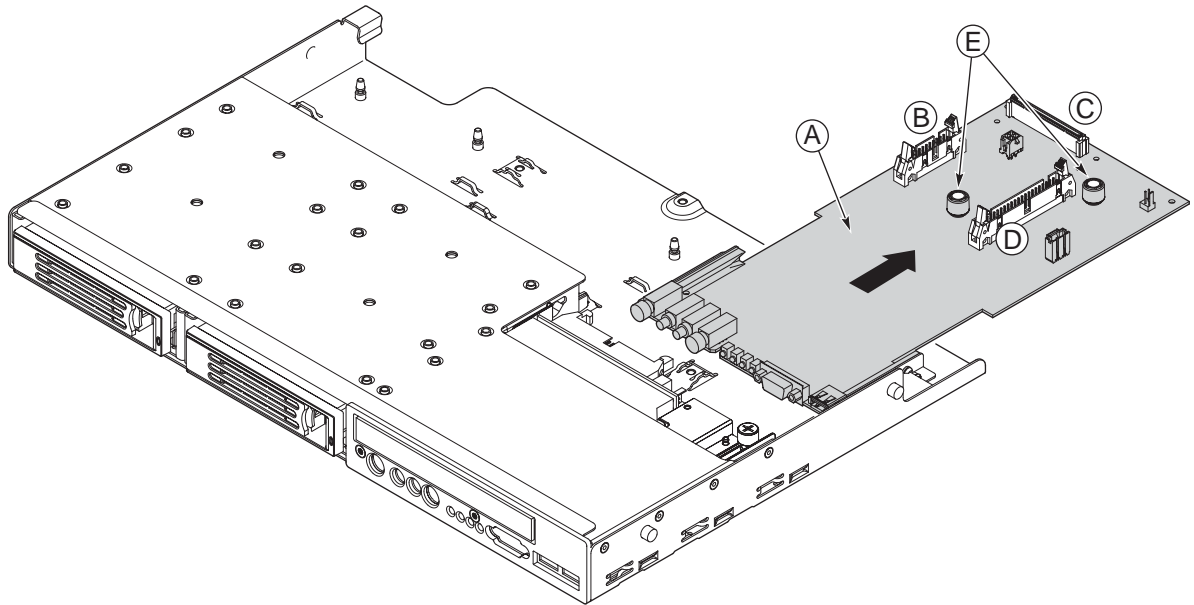
Figure 81. Installing the Peripheral Bay

Replacing the Front Panel Board

The front panel board is to the right of the SCSI backplane board. See letter “A” in *Figure 82* for help in locating the front panel board.

Removing the Front Panel Board

1. Remove the peripheral bay from the chassis. For instructions, see *Removing the Peripheral Bay*.
2. Disconnect all cables from the front panel board. See letters “B”, “C”, “D” in *Figure 82*.
3. Loosen the two retaining screws on the front panel board. See letter “E” in the figure.
4. Slide the board rearward to remove it.
5. Place the front panel board on a clean ESD-protected work surface or in antistatic packaging.
6. If you are replacing a DVD-ROM or CD-ROM drive, continue with *Servicing the DVD-ROM/CD-ROM Drive* before replacing the front panel board.



TP00332

- A. Identifying the front panel board
- B. J1D1 Connector to SCSI backplane
- C. Connector to main board
- D. IDE Connector
- E. Loosen screws

Figure 82. Removing the Front Panel Board

Installing the Front Panel Board

1. Align the front panel board in the two nylon slots from the rear of the peripheral bay.
2. Slide the front panel board into the peripheral bay.
3. Secure the front panel board in the peripheral bay by tightening the two captive screws. See letter “E” in *Figure 82*.
4. Reconnect the peripheral interface ribbon cable from the SCSI backplane board to J1D1 on the front panel board.
5. Reconnect the DC Y-cable from the SCSI backplane board to J2B1 on the front panel board.
6. Connect the CD-ROM/DVD-ROM drive DC power cable.
7. Connect the IDE ribbon cable at position J4D1 to the DVD/CD-ROM IDE interface.
8. Follow the instructions under *Installing the Top Cover*.

Servicing the DVD-ROM/CD-ROM Drive

The peripheral bay accepts one IDE DVD-ROM/CD-ROM drive. This IDE device interface is not hot-swappable. To replace this device, the system must be powered down and the peripheral bay must be removed from the chassis. The DVD-ROM/CD-ROM drive is housed in carrier assembly with metal shields to facilitate servicing and to reduce ESD and EMI susceptibility.

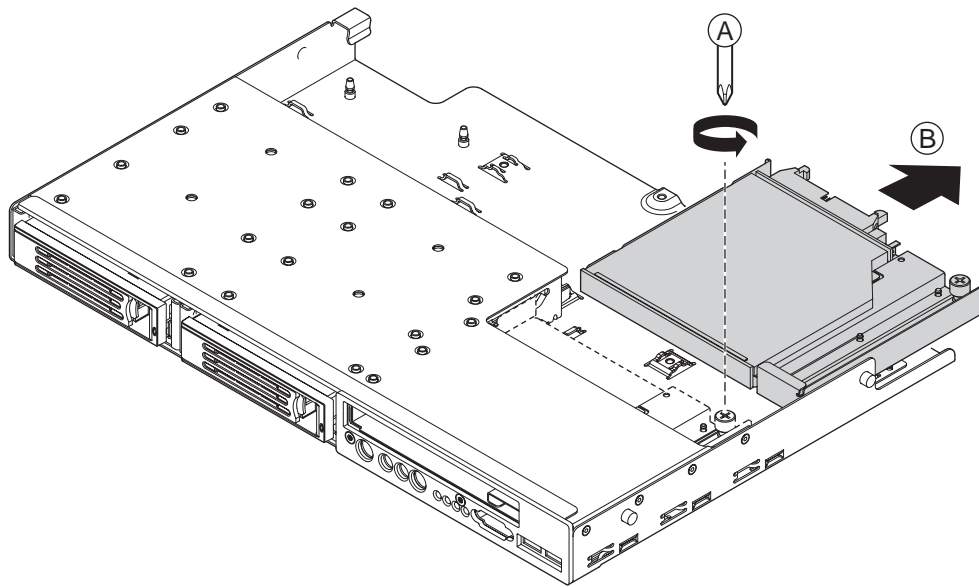
Removing the DVD/CD-ROM Drive from the Peripheral Bay

To access the DVD-ROM/CD-ROM drive, you must first do the following:

1. Remove the peripheral bay from the chassis
2. Remove the front panel board from the peripheral bay
3. Remove the DVD-ROM / CD-ROM carrier.

Refer to *Figure 83* and use the following steps:

1. Remove the peripheral bay from the chassis. For instructions, see *Removing the Peripheral Bay*.
2. Remove the front panel board from the peripheral bay. For instructions, see *Removing the Front Panel Board*.
3. Loosen the retaining screw on the DVD-ROM/CD-ROM carrier. See letter “A” in *Figure 83*.
4. Slide the carrier rearward to remove it from the peripheral bay. See letter “B” in *Figure 83*.
5. Continue with the appropriate task:
 - To replace or remove a DVD-ROM or CD-ROM drive, continue with *Removing the DVD-ROM/CD-ROM Drive from the Drive Carrier*.
 - To add a new DVD-ROM or CD-ROM drive (do not need to remove an existing drive from the carrier), continue with *Installing the DVD-ROM/CD-ROM Drive*.



TP00333

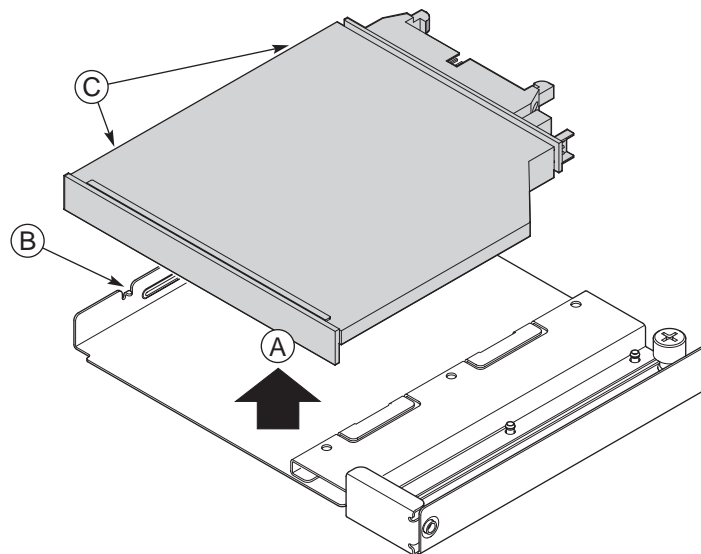
- A. Loosen screw
- B. Slide carrier to rear

Figure 83. Removing the DVD-ROM/CD-ROM Drive Carrier from the Peripheral Bay

Removing the DVD-ROM/CD-ROM Drive from the Drive Carrier

Refer to *Figure 84* and use these instructions to remove a DVD-ROM or CD-ROM drive from the drive carrier:

1. Position the carrier assembly with the label-side up.
2. The DVD-ROM/CD-ROM drive is attached to the carrier with snap fit tabs on the drive carrier. See letter “B” in *Figure 84*. These fit the corresponding mounting holes in the drive. See letter “C” in *Figure 84*. Carefully, disengage the drive from the carrier and remove the DVD-ROM/CD-ROM drive.
3. Place the drive in an antistatic protective bag if the drive will not be reinstalled.
4. Continue with the appropriate task:
 - To install a replacement drive, continue with *Installing the DVD-ROM/CD-ROM Drive*.
 - To replace the carrier into the server system without installing a DVD-ROM/CD-ROM drive, continue with *Installing the Front Panel Board*.



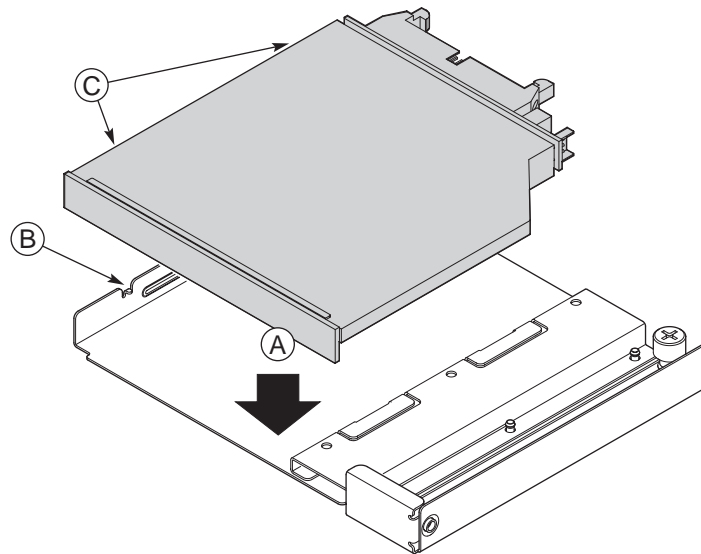
TP00334

Figure 84. Removing the DVD/CD-ROM Drive from the Peripheral Bay

Installing the DVD-ROM/CD-ROM Drive

Refer to *Figure 85* and use the following instructions to install a DVD-ROM/CD-ROM drive into the drive carrier.

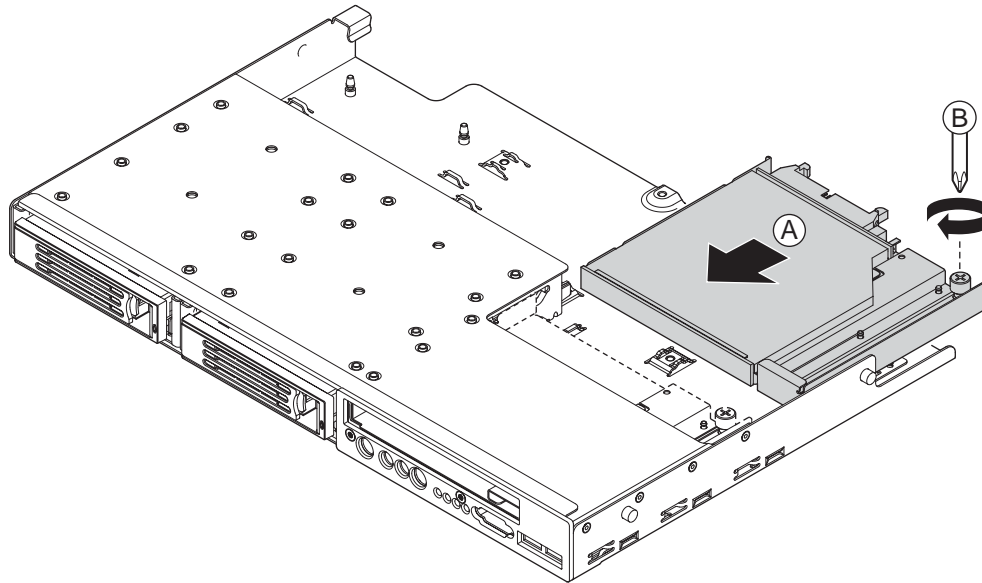
1. Place the drive and carrier on an ESD-protected work surface.
2. Record the drive model and serial numbers in your equipment log.
3. Place the drive in the drive carrier as shown in the figure. See letter “A” in *Figure 85*.
4. Verify the tabs in the drive carrier (letter “B” in the figure) align with the corresponding mounting holes in the drive (letter “C” in the figure).
5. Snap the drive into its position in the drive carrier.



TP00334

Figure 85. Assembling the DVD/CD-ROM Drive and Carrier

- Slide the DVD-ROM/CD-ROM drive assembly forward into the peripheral bay and fasten the carrier retaining screw. See *Figure 86*.
- Continue with *Installing the Front Panel Board*.



TP00333A

Figure 86. Inserting the DVD/CD-ROM Drive and Carrier into the Peripheral Bay

Replacing the SCSI Backplane Board

The SCSI backplane board is located directly behind the two hot swap SCSI drive positions on the peripheral bay. The peripheral bay does not need to be removed from the chassis for this procedure.

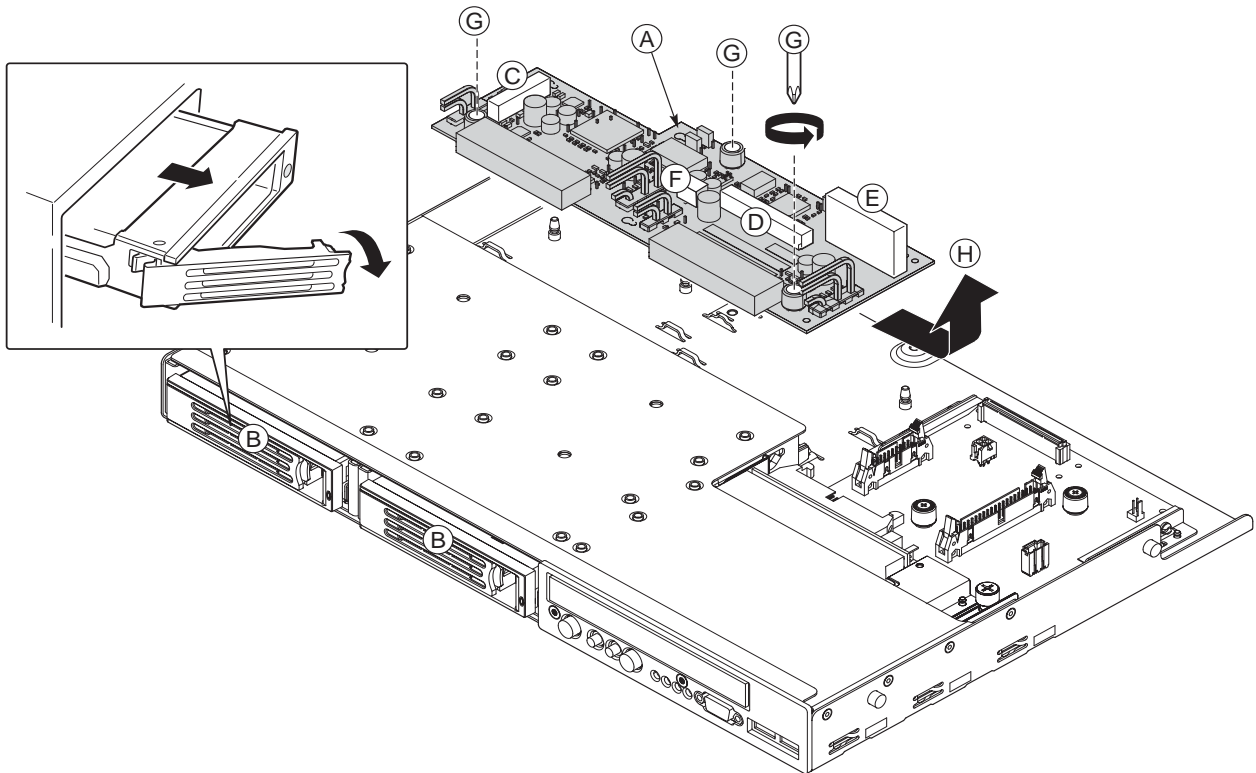
Removing the SCSI Backplane Board

To remove the SCSI backplane board, refer to letter “A” in

Figure 87 to identify the board and use the following instructions:

- 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.
- See the warnings and cautions under *Removing and Installing the Top Cover*.
- Follow the instructions under *Removing the Top Cover*.

4. Remove the hot-swap hard drive carriers. See letter “B” in Figure 87.
5. Disconnect all cables from the SCSI backplane board. See letters “C”, “D”, “E”, and “F” in the figure.
6. To remove the SCSI backplane board, loosen the three captive screws that secure the SCSI backplane board to the peripheral bay. See letter “G” in the figure.
7. Slide the SCSI backplane board sideways to right to disengage it and then lift it up. See letter “H” in the figure.
8. Carefully place the SCSI backplane board on a clean, static-free work surface or in antistatic packaging.
9. Follow the instructions under *Installing the SCSI Backplane Board*.



TP00335

- | | |
|---------------------------------|---------------------------------------|
| A. SCSI backplane board | E. Front panel ribbon cable connector |
| B. Remove drives | F. Front panel power connector |
| C. Power bay connector | G. Loosen screws |
| D. SCSI to main board connector | H. Slide board, then lift it |

Figure 87. Removing the SCSI Backplane Board

Installing the SCSI Backplane Board

1. Lower the SCSI backplane board onto the peripheral bay and align the board with the four mounting studs, slide the board firmly to the left.
2. Tighten the three captive screws to secure the SCSI backplane board into the peripheral bay. See letter “G” in Figure 87..
3. Reconnect the cables. See letters “C”, “D”, “E”, and “F” in Figure 87.
4. Install the hard drives in the peripheral bay.
5. Follow the instructions under *Installing the Top Cover*.
6. Apply power to the system and verify that all peripheral bay components are functioning properly.

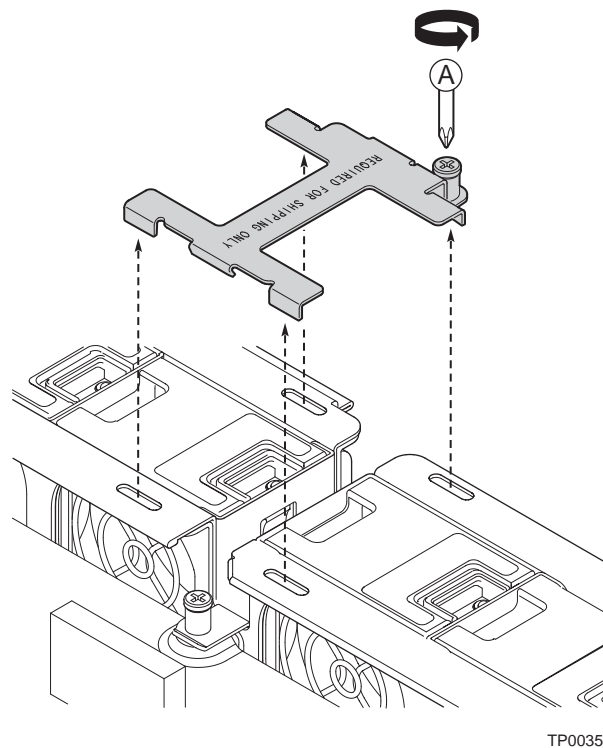
9 Servicing the Power Supply Bay

The power supply bay mounts in the lower front half of the chassis and provides space for three SSI compliant TPS power supplies. The dual line cord redundant AC power inputs enter the bay from the rear of the chassis. The AC power is filtered with a combination dual 10 Amp power receptacle/filter.

Removing the Power Supply Bay

To remove the power supply bay, refer to the figures below and follow these instructions:

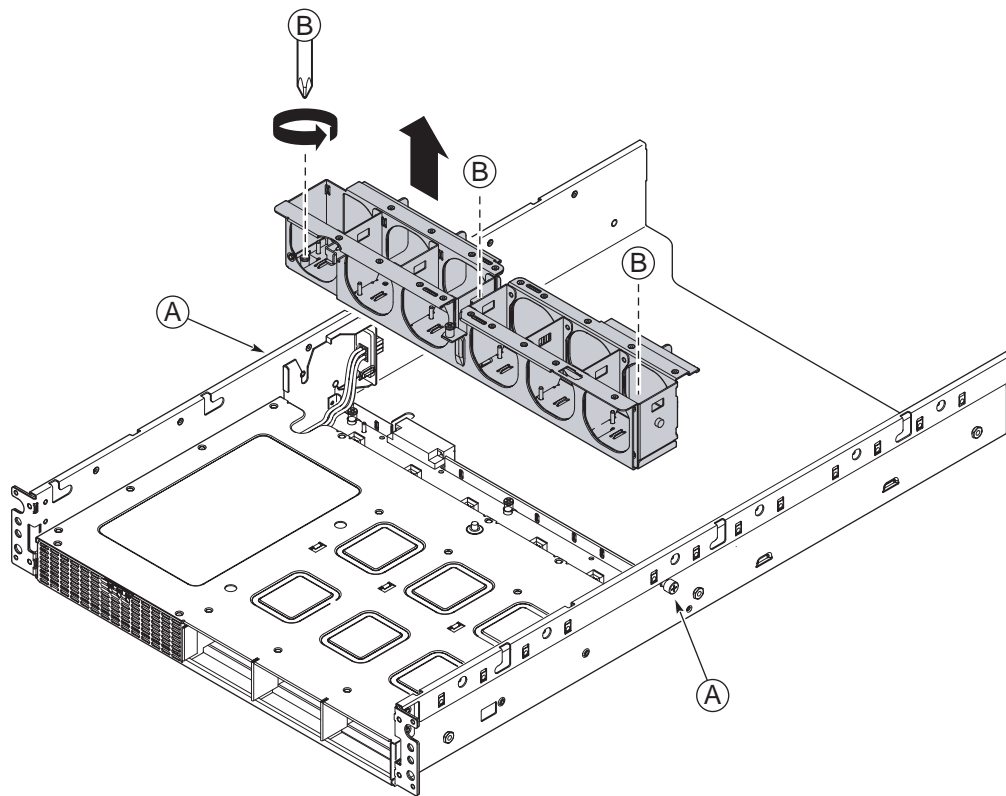
1. Power down the system by pressing and holding the power button on the front panel for several seconds. Unplug both AC power cords to remove standby power from the server.
2. See the warnings and cautions under *Removing and Installing the Top Cover*.
3. Follow the instructions under *Removing the Top Cover*.
4. Remove all hot-swap power modules. See *Power Module Removal and Replacement* for instructions.
5. Remove the cable management plate from the top center of the fan bay. See *Figure 88*.



TP00356

Figure 88. Removing the Cable Management Plate

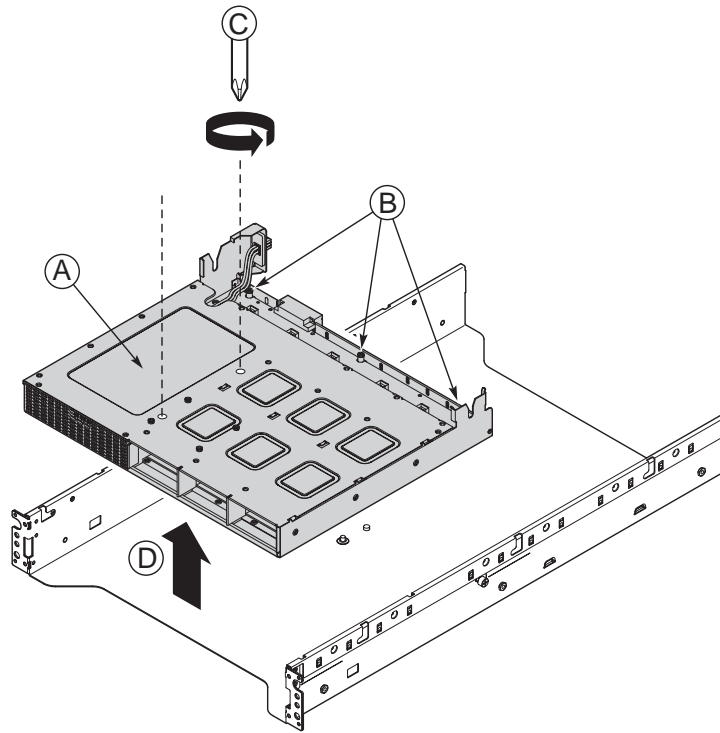
6. Follow the instructions under *Removing the Peripheral Bay*.
7. Slide the electronics bay partially from the chassis. For instructions, see steps 10 – 12 under *Removing the Main Board*. You do not need to fully remove the electronics bay from the chassis.
8. Remove the six hot-swap fans and set them aside. For instructions, see steps 4 and 5 under *Replacing a System Fan*.
9. Loosen the screws at each side of the chassis to remove the hot-swap fan bay. See letter “A” in *Figure 89*.
10. Loosen the three screws inside of the fan bay. One screw is in the center of the fan bay; the other two screws are at the outermost fan positions. See letter “B” in *Figure 89*.
11. Lift and remove the fan bay from the chassis. Set it aside.



- A. Retention screws at side of chassis
- B. Retention screws inside of fan bay

Figure 89. Removing the Fan Bay

12. Loosen the three power bay retention screws at the rear of the bay. See letter “B” in *Figure 90*.
13. Loosen the two retention screws at the top of the power bay. See letter “C” in *Figure 90*.
14. Remove the power supply bay from the chassis. See letter “D” in *Figure 90*.



TP00336

- A. Power supply bay
- B. Retention screws at rear of bay
- C. Screws at top of bay

Figure 90. Removing the Power Supply Bay

Installing the Power Supply Bay

1. Lower the power supply bay in at the front of the chassis.
2. Align and tighten the three captive screws at the rear of the bay and the two captive screws at the top of the bay. See letters “B” and “C” in *Figure 90*.
3. Replace the fan bay and tighten the three internal captive screws and the two captive at the outside of the chassis to secure the assembly. See letters “A” and “B” in *Figure 89*.
4. Insert the electronics bay into the chassis and reattach all cables to it. For instructions, see steps 8, 9, and 14 under *Installing the Main Board*.
5. Follow the instructions under *Installing the Peripheral Bay*.
6. Replace the cable management plate on to the fan bay. See *Figure 88*.
7. Replace all six fans into the fan bay.
8. Replace the power modules into their respective slots.
9. Follow the instructions under *Installing the Top Cover*.

10 Technical Reference

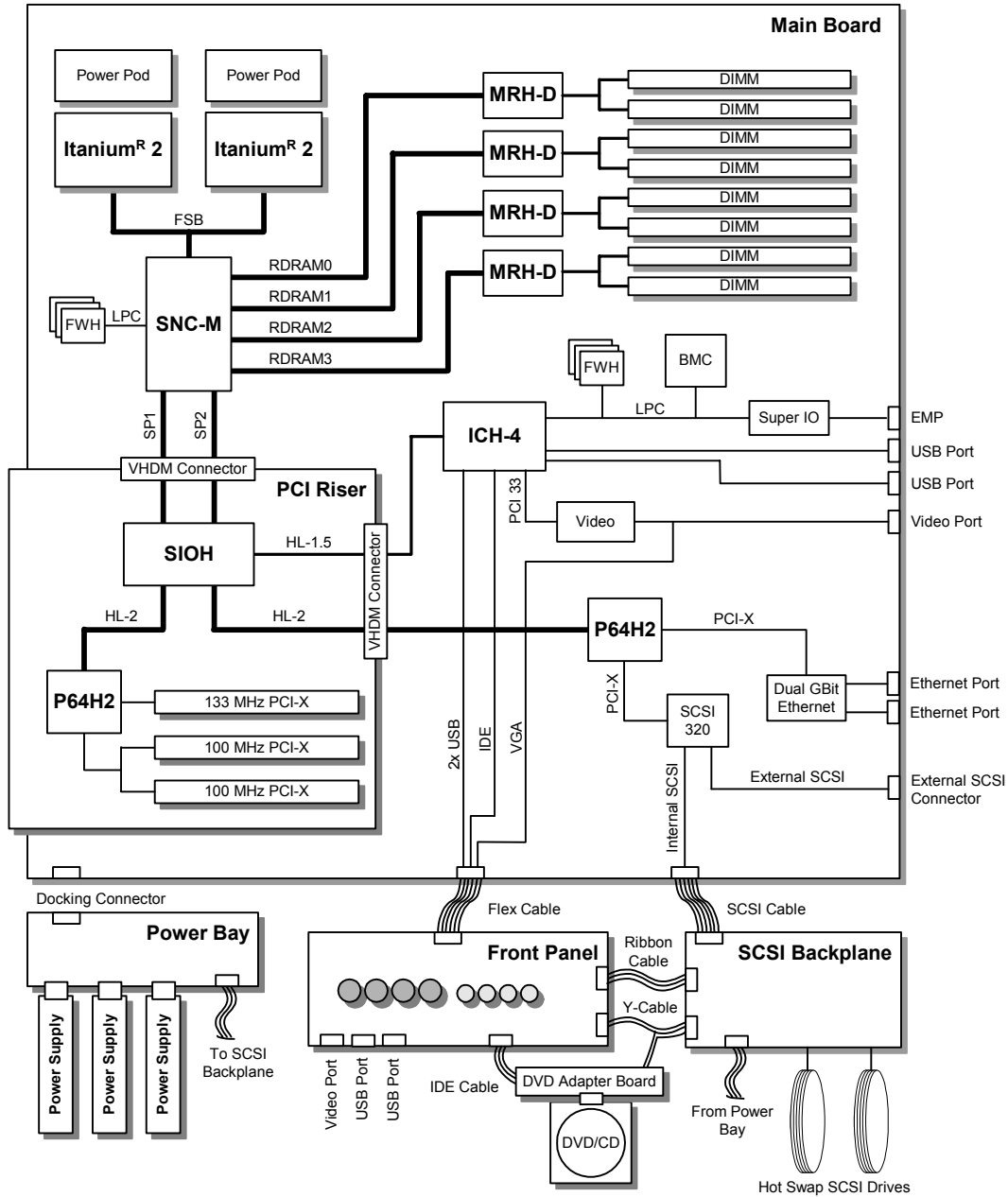


Figure 91. Interconnect Block Diagram

System Interconnection

The table below 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 32. Cable and Connector Descriptions

| Type | Qty | From | To | Interconnect Description |
|-------------------------------------|-----|-----------------------------------|-------------------------------------|-----------------------------------------------------------|
| USB | 2 | Front panel board | External interface | 1x4 pin USB connector |
| USB | 2 | Main board | External interface | 1x4 pin USB connector |
| Ethernet | 2 | Main board | External interface | RJ45 connector port |
| Video | 1 | Main board | External interface | 15-pin, monitor device |
| Video | 1 | Front panel board | External interface | 15-pin, monitor device |
| PCI Riser Connector | 2 | Main board | PCI riser | VHDM connector |
| External Wide Ultra320 SCSI, Port 2 | 1 | Main board | External interface | Right angle board mounted VHDCI connector |
| Emergency Management Port | 1 | Main board | External interface | RJ45 connector port |
| AC Power | 2 | Power cord | External interface | IEC filtered 15A receptacle |
| AC Power | 1 | IEC filter receptacle | Chassis mounted docking connector | Molex Mini Fit 2 X 3 panel mount connector |
| AC Power | 1 | Chassis mounted docking connector | Power bay mounted docking connector | Molex Mini Fit 2 X 3 panel mount connector |
| DC main power | 1 | Power supply bay | Main board | SSI power blade docking connector |
| DC peripheral power | 1 | Power supply bay | SCSI backplane | Molex Micro Fit 2 X 10 connector |
| BIOS/SM firmware update/recovery | 4 | Main board | Jumper | Group of 4 jumper blocks, 1 X 3 pin headers |
| System Fans | 6 | Power supply bay | Fan module | 2x3 Blind Mate micro connectors |
| ITP | 1 | Main board | Internal interface | 2x13 header |
| ISP | 1 | Main board | Internal interface | 2x4 header |
| Aux IPMB | 1 | Main board | Internal interface | 1x3 header |
| IDE/Front Panel Flex cable | 1 | Main board | Front panel board | 120 pin .7mm pitch surface mount header |
| SCSI | 1 | Main board | Front panel board | 68 pin wide SCSI Ultra-320 cable |
| Processor Signals | 4 | Processor | Main board | 700-pin Intel Itanium 2 Zero Insertion Force (ZIF) socket |
| Power Pod Power | 1 | Main board | Power Pod | Y-Cable, Molex* Mini Fit 2 X 6 to two 2 x 3 |
| Memory | 8 | Memory board | DDR memory | 184-pin card edge connector |
| SCA-2 Hard drive (HDD) | 2 | SCSI backplane | 1-inch SCSI HDD | 80-pin SCA-2 connector |

| Type | Qty | From | To | Interconnect Description |
|--------------------|-----|--------------------|------------------------------------------|-------------------------------------|
| connectors | | | | |
| Front panel Signal | 1 | Front panel board | SCSI Backplane | 20 pin ribbon cable |
| DVD/CDROM signal | 1 | Front panel board | DVD adaptor board | 40 pin ribbon cable |
| Peripheral power | 1 | SCSI backplane | Front panel board and DVD adaptor boards | Y cable, Molex micro fit connectors |
| ½-inch DVD device | 1 | ½-inch DVD adapter | ½-inch DVD (or RW-CD) device | 2x25 pin JAE* connector |

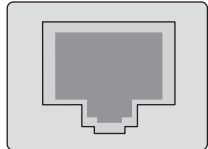
User-Accessible Interconnects

Serial Port

The main board provides a rear panel RJ45 serial port.

The COM serial port can be used either as an EMP or as a normal serial port. As an EMP, the COM port is used as a communication path by the server management RS-232 connection to the Sahalee. This provides a level of emergency management through an external modem. The RS-232 connection can be monitored by the Sahalee when the system is in a powered down (standby) state.

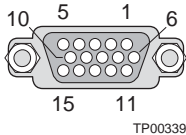
Table 33. Com Connector Pinout

| Signal Name | J3A2 Pin | COM Serial Connector |
|----------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| COM2_RTS_L | 1 |  <p style="text-align: right; font-size: small;">TP00338</p> |
| COM2_DTR_L | 2 | |
| COM2_TXD | 3 | |
| GND | 4 | |
| COM2_RI_L | 5 | |
| COM2_RXD | 6 | |
| COM2_DSR_DCD_L | 7 | |
| COM2_CTS_L | 8 | |
| GND | 9 | |
| GND | 10 | |

Video Port

The main and front panel boards provide a video port interface with a standard VGA-compatible, 15-pin connector. Only one port is enabled at a time through auto detection of a connected monitor. Onboard video is supplied by an ATI Rage XL video controller with 8 MB of onboard video SDRAM.



Table 34. Video Connector Pinout

| Pin | Signal | Video Connector |
|-----|----------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1 | VID_R (analog color signal red) |  <p>TP00339</p> |
| 2 | VID_G (analog color signal green) | |
| 3 | VID_B (analog color signal blue) | |
| 4 | No connection | |
| 5 | GND | |
| 6 | GND | |
| 7 | GND | |
| 8 | GND | |
| 9 | No connection | |
| 10 | GND | |
| 11 | No connection | |
| 12 | MONID1 (to support DDCx, Display Data Channel* Standard) | |
| 13 | VID_HSYNC (horizontal sync) | |
| 14 | VID_VSYNC (vertical sync) | |
| 15 | MONID2 (to support DDCx, Display Data Channel Standard) | |

Universal Serial Bus (USB) Interface

The main board provides a double-stacked USB port and the front panel board provides two single USB port connectors. 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 either of the built-in ports.

Table 35. USB Connector Pinout

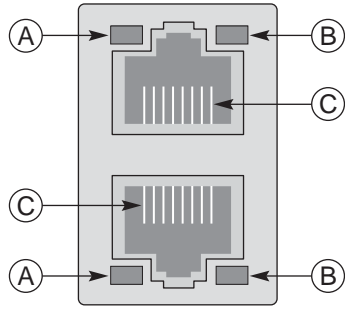
| Pin | Signal | Dual USB Connector | Single USB Connector |
|-----|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| A1 | Fused Voltage Controlled Current (VCC) (+5 V /w overcurrent monitor of both port 1 and 2) |  |  |
| A2 | USBPxM (differential data line) | | |
| A3 | USBPxP (differential data line) | | |
| A4 | GND (ground) | | |
| B1 | Fused VCC (+5 V /w overcurrent monitor of both port 1 and 2) | | |
| B2 | USBPxM (differential data line) | | |
| B3 | USBPxP (differential data line) | | |
| B4 | GND (ground) | | |

Ethernet Connector

The main board provides a dual-RJ45 connector (JA4A1) for Ethernet connection. Below are definitions of the speed/status LEDs.

- Speed LED: Yellow On, 1000-Mbps Ethernet
- Speed LED: Green On, 100-Mbps Ethernet
- Speed LED: Off, 10-Mbps Ethernet
- Status LED: Green On, Ethernet link detected
- Status LED: Off, Ethernet link not found
- Status LED: Green Flashing, Ethernet data activity

Table 36. Ethernet Connector Pinout

| Signal | Description | JA4A1 Pin | Ethernet Connector |
|--------------------------|---------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LED Signals: | | |  <p style="text-align: right;">TP00342</p> <p>A. Green LED B. Bi-color LED (green/yellow) C. Pin #J1</p> |
| NIC1_LED_CA_L | Lower (Port 1) green status LED cathode signal indicating Port 1 activity | 27 | |
| NIC1_LED_AN_L | Lower (Port 1) green status LED anode to 100-ohm pullup to 3.3V Standby | 28 | |
| LINK100A_L | Lower (Port 1) green speed LED cathode, yellow LED anode | 29 | |
| LINK1000A_L | Lower (Port 1) yellow speed LED cathode, green LED anode | 30 | |
| NIC2_LED_CA_L | Upper (Port 2) green status LED cathode signal indicating Port 2 activity | 31 | |
| NIC2_LED_AN_L | Upper (Port 2) green status LED anode to 100-ohm pullup to 3.3V Standby | 32 | |
| LINK100B_L | Upper (Port 2) green speed LED cathode, yellow LED anode | 33 | |
| LINK1000B_L | Upper (Port 2) yellow speed LED cathode, green LED anode | 34 | |
| Ethernet Signals: | | | |
| PORT1_MDI0P | Port 1 transceiver 0 positive of differential pair | 15 | |
| PORT1_MDI0M | Port 1 transceiver 0 negative of differential pair | 21 | |
| PORT1_MDI1P | Port 1 transceiver 1 positive of differential pair | 23 | |

| Signal | Description | JA4A1 Pin | Ethernet Connector |
|-----------------------|-------------------------------------------------------|--------------------------------------|--------------------|
| PORT1_MDI1M | Port 1 transceiver 1 negative of differential pair | 16 | |
| PORT1_MDI2P | Port 1 transceiver 2 positive of differential pair | 18 | |
| PORT1_MDI2M | Port 1 transceiver 2 negative of differential pair | 24 | |
| PORT1_MDI3P | Port 1 transceiver 3 positive of differential pair | 26 | |
| PORT1_MDI3M | Port 1 transceiver 3 negative of differential pair | 19 | |
| PORT2_MDI0P | Port 2 transceiver 0 positive of differential pair | 6 | |
| PORT2_MDI0M | Port 2 transceiver 0 negative of differential pair | 13 | |
| PORT2_MDI1P | Port 2 transceiver 1 positive of differential pair | 11 | |
| PORT2_MDI1M | Port 2 transceiver 1 negative of differential pair | 5 | |
| PORT2_MDI2P | Port 2 transceiver 2 positive of differential pair | 3 | |
| PORT2_MDI2M | Port 2 transceiver 2 negative of differential pair | 10 | |
| PORT2_MDI3P | Port 2 transceiver 3 positive of differential pair | 8 | |
| PORT2_MDI3M | Port 2 transceiver 3 negative of differential pair | 2 | |
| Power Signals: | | | |
| +2.5V Standby | | 4, 7, 9, 12, 14, 17, 22, 25 | |
| Chassis Ground | Ground | 1, 20, 35, 36, 37, 38 | |

Ultra320 SCA-2 HDD Connector

The SCSI backplane board provides two SCA-2 (80 pin) connectors for hot-swapping Ultra320 hard drives. These SCSI ports are controlled by SCSI port 1 of the LSI53C1030 LVDS controller component located on the main board.

Table 37. Ultra320 SCA-2 Connector Pinout

| 80-pin Connector Contact and Signal Name | | SCA-2 Connector | 80-pin Connector Contact and Signal Name | |
|------------------------------------------|----------------|-----------------|------------------------------------------|----|
| 1 | 12-V Charge | | 12-V Ground | 41 |
| 2 | 12-V Charge | | 12-V Ground | 42 |
| 3 | 12-V Charge | | 12-V Ground | 43 |
| 4 | 12-V Charge | | Mated 1 | 44 |
| 5 | Reserved/ESI-1 | | -EFW | 45 |
| 6 | Reserved/ESI-2 | | DIFFSNS | 46 |
| 7 | -DB(11) | | +DB(11) | 47 |
| 8 | -DB(10) | | +DB(10) | 48 |
| 9 | -DB(9) | | +DB(9) | 49 |
| 10 | -DB(8) | | +DB(8) | 50 |
| 11 | -I/O | | +I/O | 51 |
| 12 | -REQ | | +REQ | 52 |
| 13 | -C/D | | +C/D | 53 |
| 14 | -SEL | | +SEL | 54 |
| 15 | -MSG | | +MSG | 55 |
| 16 | -RST | | +RST | 56 |
| 17 | -ACK | | +ACK | 57 |
| 18 | -BSY | | +BSY | 58 |
| 19 | -ATN | | +ATN | 59 |
| 20 | -P_CRCA | | +P_CRCA | 60 |
| 21 | -DB(7) | | +DB(7) | 61 |
| 22 | -DB(6) | | +DB(6) | 62 |
| 23 | -DB(5) | | +DB(5) | 63 |
| 24 | -DB(4) | | +DB(4) | 64 |
| 25 | -DB(3) | | +DB(3) | 65 |
| 26 | -DB(2) | | +DB(2) | 66 |
| 27 | -DB(1) | | +DB(1) | 67 |
| 28 | -DB(0) | | +DB(0) | 68 |
| 29 | -DB(P1) | | +DB(P1) | 69 |
| 30 | -DB(15) | | +DB(15) | 70 |
| 31 | -DB(14) | | +DB(14) | 71 |
| 32 | -DB(13) | | +DB(13) | 72 |
| 33 | -DB(12) | | +DB(12) | 73 |

| 80-pin Connector Contact and Signal Name | SCA-2 Connector | 80-pin Connector Contact and Signal Name |
|------------------------------------------|-----------------|------------------------------------------|
| 34 5-V Charge | | Mated 2 74 |
| 35 5-V Charge | | 5-V Ground 75 |
| 36 5-V Charge | | 5-V Ground 76 |
| 37 Spindle Sync | | Active LED Out 77 |
| 38 MTRON | | DLYD_START 78 |
| 39 SCSI ID (0) | | SCSI ID (1) 79 |
| 40 SCSI ID (2) | | SCSI ID (3) 80 |

External Ultra320 SCSI Connector

As an option, the server system can support a shielded external (68 pin) SCSI connection. This SCSI port is controlled by SCSI port 2 of the LSI53C1030 LVDS controller component located on the main board.

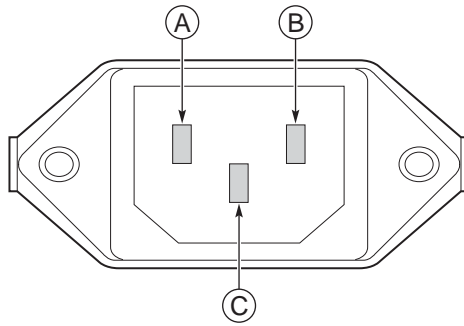
Table 38. External Ultra320 SCSI Connector Pinout

| Signal Name | Pin | Ultra320 SCSI Connector | Pin | Signal Name |
|-------------|-----|-------------------------|-----|-------------|
| +DB(12) | 1 | | 35 | -DB(12) |
| +DB(13) | 2 | | 36 | -DB(13) |
| +DB(14) | 3 | | 37 | -DB(14) |
| +DB(15) | 4 | | 38 | -DB(15) |
| +DB(P1) | 5 | | 39 | -DB(P1) |
| +DB(0) | 6 | | 40 | -DB(0) |
| +DB(1) | 7 | | 41 | -DB(1) |
| +DB(2) | 8 | | 42 | -DB(2) |
| +DB(3) | 9 | | 43 | -DB(3) |
| +DB(4) | 10 | | 44 | -DB(4) |
| +DB(5) | 11 | | 45 | -DB(5) |
| +DB(6) | 12 | | 46 | -DB(6) |
| +DB(7) | 13 | | 47 | -DB(7) |
| +P_CRCA | 14 | | 48 | +P_CRCA |
| GND | 15 | | 49 | GND |
| DIFFSENS | 16 | | 50 | GND |
| TERMPWR | 17 | | 51 | TERMPWR |
| TERMPWR | 18 | | 52 | TERMPWR |
| NC | 19 | | 53 | NC |
| GND | 20 | | 54 | GND |
| +ATN | 21 | | 55 | -ATN |
| GND | 22 | | 56 | GND |
| +BSY | 23 | | 57 | -BSY |
| +ACK | 24 | | 58 | -ACK |

| Signal Name | Pin | Ultra320 SCSI Connector | Pin | Signal Name |
|-------------|-----|-------------------------|-----|-------------|
| +RST | 25 | | 59 | -RST |
| +MSG | 26 | | 60 | -MSG |
| +SEL | 27 | | 61 | -SEL |
| +C/D | 28 | | 62 | -C/D |
| +REQ | 29 | | 63 | -REQ |
| +I/O | 30 | | 64 | -I/O |
| +DB(8) | 31 | | 65 | -DB(8) |
| +DB(9) | 32 | | 66 | -DB(9) |
| +DB(10) | 33 | | 67 | -DB(10) |
| +DB(11) | 34 | | 68 | -DB(11) |

AC Power Input

Two IEC320-C14 15A receptacles are provided at the rear of the server. It is recommended to use an appropriately-sized power cord and AC main. An external AC cord retention feature is supported by the chassis but is not supplied.



TP00345

Figure 92. AC Power Input Connector

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*.
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 you removed in order to access jumper blocks.

Configuring Main Board Jumpers

There are nine jumper blocks called out on the main board. The primary functions of these jumper blocks are as follows:

Table 39. Main Board Jumpers

| Jumper | Signal / Description |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| J1A1 | (RSRL_MODE0) Used to set Serial Port mode. The default is pins pins 1-2 for DSR devices Jumper pins 2-3 for DCD devices, such as a modem |
| J3A3 | (SMM_BB_UNPROT_L) Jumper 2-3 to enable programming of the BMC boot block. The default is pins 1-2 for BMC boot block protected. |
| J3B1 | (JTAG chain TDI/TDO) JTAG signal routing. The default is pins 3-4, 5-6, and 7-8 to include SNC-M, SIOH on the PCI riser board 1-3 and 5-7 to include SNC-M, SCSI, Processor 2, then Processor 1 1-3, 2-4, and 5-6 to include SNC-M, SIOH on the PCI riser board, SCSI, Processor 2, then Processor 1 |
| J6G2 | (FWH20_ID1_SWAP_L) Swaps North Bridge FWH ID0 and ID2. The default is pins 1-2 for ID0 To swap ID0 with ID2, jumper pins 2-3 |
| J5H4 | BMC Force Update. The default is pins 1-2 to operate the BMC in normal mode. Jumper pins 2-3 to force a BMC update |
| J5H3 | Clear CMOS. The default is pins 1-2 to operate the system in normal mode To clear the CMOS, jumper pins 2-3 |
| J5H2 | Clear Password The default is pins 1-2 to protect the password To clear the password, jumper pins 2-3 |
| J5H1 | RCV Boot (Recovery) The default is pins 1-2 for protected mode To force a recover boot, jumper pins 2-3 |



NOTE

As a security feature, J3A3 must be moved to pins 2-3, unprotected, for the PLD Update Utility to be able to update PLD2 on the main board and to update PLD3 on the SCSI board.

POST Error Codes and Messages

In order to indicate progress through BIOS POST, and in special cases where errors are encountered during BIOS POST, there are three common mechanisms that shall be employed by the server system BIOS. The first method is to display port 80/81 codes to an I²C adapter connected to the main board. The second common method is the use of beep codes, encoded beep sequences emitted by the PC speaker when an error is encountered. Beep codes are employed only before the display screen is enabled, and generally indicate *fatal* errors. Beep codes are coupled with special port 80 error codes. The final method is to display an error message to the display screen.

North and South Port 80/81 Cards

The port 80 card is a custom device that is attached to I²C 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. Both headers are located on the main board; the north bridge is at J6G1 and the south bridge is at J5G1.

POST Codes

POST Codes Module Map

The Server System SR870BH2 employs a novel POST code scheme. POST codes assigned make use of the fact that the server system utilizes port 80h and 81h. This gives the system 16 bits to encode. The following rules apply to the POST code encoding, except bit 14 and 15 encoding for SALB, SALC and SALF:

- Bit 15: 1 – Itanium-based code being executed, 0 – IA-32 code being executed
- Bit 14: 1 – system stopped due to known failure, 0 – progress indication

For SALB, SALC and SALF modules:

- Bit 15: 1 – Itanium-based code being executed
0 – system stopped due to known failure
- Bit 14: not used, always 0 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 us to detect which module produces the fault.

- Bit 12: Reserved
- Bit 11-4: Module number
- Bit 3-0: Sub module number

The module number and sub-module number are separated by a 4-bit boundary to allow us to decode quickly. The module number identifies the major module such as memory, PCI, ACPI, etc. The sub module number identifies the sub function such as SPD read in progress, ECC error, and DIMM mismatch for memory module.

Module names and numbers are listed in the following tables.

- Bit 11:8 – 0xF stack-less code being executed
0xE-0x0 – memory is available

Table 40. General POST Code Module Numbers for Itanium®-based Platforms

| 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 | Memory Initialization | |
| BITS | | |
| 15: 11 7: 3: 12 :8 4 0 | | |
| 8 F 7 0 | Pass1 Entry | |
| 8 F 7 1 | RAC Initialization (Mem_DoRaCInitialization()) | North |
| 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 |
| SUB MODULES | Memory Autoscan | North |
| BITS | | |

| Code Value (bit 8 = 1, bits 11:4 shown below) | Module | Display |
|----------------------------------------------------------|----------------------------------------|-------------------------|
| 15: 11 7: 3: 12 :8 4 0 | | |
| 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 | |
| 0xE7-0xE6 | 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

The SAL-A POST codes are defined in the following table.

Table 41. 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 |
| 0xCF64 | Mismatched DIMMs in a row, and no valid memory to boot | North |
| 0x8F60 | Memory Test | North |
| 0x8F50 | Platform Discovery | North |
| 0x8F40 | SBSP selection; ICHx device detection | North |
| 0xCF40 | ICHx device not found | North |
| 0x8F51 | Platform Init | North |
| 0x8F20 | Memory Autoscan entry | North |
| 0x8F21 | Process Auto Scan Input | North |
| 0x8F22 | Execute Auto Scan | North |
| 0x8F23 | Process Auto Scan Output | North |

| Code Number | Meaning | Display |
|------------------------|----------------------------------------------|---------|
| 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 |
| 0x8EC6 | Programming Flash Contents | South |
| 0x8EC7 | Validating Flash Contents | South |
| 0x8EC8 | Recovery Process Complete | South |
| 0xCEC1/0x8EC1 | Recovery Reading error (display toggles) | South |
| 0xCEC8/0x8EC8 | Recovery programming error (display toggles) | 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 42. SAL-B POST Codes

| Code Number | BSP, APs, Both | Meaning | Display |
|-------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 0x87FF | BSP+APs | First check point. Initialize cr.iva/ar.eflag/ar.cfg/cr.lrr0/cr.lrr1/cr.ifa/cr.itir | South |
| 0x87FE | BSP only And BSP+APs | Initialize io_base address, CPU#, health, etc. for CPUs. Initialize min_state_area for all CPUs (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 xxx:0000. | South |
| 0x87FC | BSP only | Search for legacy_nvme module (sal_legacy_nvme_module_1d). | South |

| Code Number | BSP, APs, Both | Meaning | Display |
|-------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 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 |
| 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 data base & size. SAL shadow top (PELoader + SAL_F). | South |
| 0x87F6 | BSP only | Cache flush after PEOloader 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 |

| Code Number | BSP, APs, Both | Meaning | Display |
|-------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 0x87F2 | BSP only | Initialize SAL data top address Physical equals to virtual for runtime use and above 4G Load Call backs 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 |
| 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 CPUs 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 ERROR | South |

| Code Number | BSP, APs, Both | Meaning | Display |
|-------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| | | NOTE: this can be skipped by a build switch. | |
| 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 point PAL 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 |
| 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 reinitialization 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 IA-32 code. | South |

SAL-F Module

Table 43. 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 |
| 0x87B8 | BSP | Initialize IA-32 ACPI v1.1 (0x3) with call to SAL_C | South |
| 0x07B8 | BSP | Hang on ERROR. | South |
| 0x87B7 | BSP | Initialize Itanium® -based ACPI v1.1 (0x4) with call to SAL_C | South |
| 0x07B7 | BSP | Hang on ERROR. | South |
| 0x87B6 | BSP | Initialize IA-32&Itanium® -based ACPI v2.0 (0x5) with call to SAL_C | South |
| 0x07B6 | BSP | Hang on ERROR. | South |
| 0x87B5 | BSP | Clear scratch memory (0xFFFF) 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 |
| 0x07B1 | 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 |

IA-32 Module

The IA-32 POST codes all have the Most Significant Bit (MSB) cleared by the convention established above in this document. The IA-32 POST codes do not fall into the module definition for Itanium-based platforms. The codes shown here are consistent with the 7.0 AMI core.

Table 44. IA-32 POST Codes

| Code Value | Module | Display |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 0x00D0 | Power-on delay is starting. Next, the initialization code checksum will be 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 will be transferred to segment 0. | South |
| 0x00D6 | Control is in segment 0. If the system BIOS checksum is bad, next will go to checkpoint code E0h. Otherwise, going 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 will begin 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 |

| Code Value | Module | Display |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 0x0023 | Reading the 8042 input-port and disabling the MEGAKEY Green PC feature next. Making the BIOS code segment writable 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 will 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 will be done next, if present. Starting LAN redirection, displaying redirection console message. | 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 Press F2 message. | South |
| 0x004B | Display memory test results. | South |
| 0x0053 | The memory size information and the CPU registers are saved. | South |
| 0x0054 | Shutdown was successful. | South |
| 0x0057 | 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 Press F2 message. | South |
| 0x0059 | The Press 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 | TBD. | South |

| 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 |
| 0x0086 | POST error codes displayed | South |
| 0x0087 | Entering Setup | 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 and 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 drive controller. Initializing the CD ROM drive. | South |
| 0x0092 | IA-32 Option ROM execution. | 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 |
| 0x0099 | Configuring the timer data area and printer base address. | South |
| 0x009B | Returned after setting the RS-232 base address. | South |
| 0x009E | 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 | Display the contents summary screen – proc data and PAL, SAL, revision. | 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 |
| 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 |

| Code Value | Module | Display |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------|
| 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 45. ACPI POST Codes

| Code Value | Module | Display |
|--------------------|-------------------|----------------|
| 0x0400 – 0x04FF | Reserved for ACPI | South |

Table 46. SAL Runtime POST Codes

| Code Value | Module | Display |
|-------------------|-------------------------------------------------------------------------------------|----------------|
| 0xAFCD | IA-32 Intercept Trap due to an unsupported IA-32 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 IA-32 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 IA-32OS-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 bootblock checksum and corrects if possible. | South |

Recovery Port 80 Codes

Table 47. 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 |
| 0xCEC1/0 x8EC1 | Recovery Reading error (display toggles). Will be accompanied by continuing low-tone beeps. | South |
| 0xCEC8/0 x8EC8 | Indicates that the recovery process failed (display toggles). Will be accompanied by continuing low-tone beeps. | South |

POST Error Codes and Messages

The system BIOS displays the POST error messages below on the video screen. These error codes are logged in the SEL. Critical events that require user interaction and BIOS POST will create a pause during POST, awaiting user input. The BIOS will prompt with a message requesting to Press F1, F2, or ESC. This error code type is indicated in the table below as “Yes” under the column heading “Pause On Boot”.



NOTE

Pausing for user interaction can be overridden via Setup item.

Along with the display of POST error codes there are two beep codes. The first is two mid-tone, brief beeps that indicates the presence of POST error codes. This happens in conjunction with POST code 0086 (south) and text on the screen prompting for user input. After you press either key one of the indicated keys, there is a single, mid-tone, brief beep indicating that POST is continuing.

Table 48. 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 Error | 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 |
| 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 |
| 8110 | Processor 01 Internal error(IERR) | WARN/YELLOW_BLACK | Yes |
| 8111 | Processor 02 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 |
| 8130 | Processor 01: Disabled | WARN/YELLOW_BLACK | Yes |
| 8131 | Processor 02: Disabled | WARN/YELLOW_BLACK | Yes |

| Error Code | Error Message | Attributes | Pause on Boot |
|-------------------|------------------------------------------------------------|-------------------|----------------------|
| 8140 | Processor 01: failed FRB level 3 timer | WARN/YELLOW_BLACK | Yes |
| 8141 | Processor 02: 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 |
| 8192 | L3 cache size mismatch | WARN/YELLOW_BLACK | No |
| 8193 | CPUID, Processor Steppings are different | WARN/YELLOW_BLACK | No |
| 8196 | Processor Models are Different | DFLT/RED_BLACK | Yes |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 8508 | Memory Mismatch detected Row1. Row mapped out. | WARN/YELLOW_BLACK | Yes |
| 8509 | Memory Mismatch detected Row2. Row mapped out. | WARN/YELLOW_BLACK | Yes |
| 850C | DIMM1 defective. | WARN/YELLOW_BLACK | Yes |
| 850D | DIMM2 defective. | WARN/YELLOW_BLACK | Yes |
| 850E | DIMM3 defective. | WARN/YELLOW_BLACK | Yes |
| 850F | DIMM4 defective. | WARN/YELLOW_BLACK | Yes |

| Error Code | Error Message | Attributes | Pause on Boot |
|------------|------------------|-------------------|---------------|
| 8510 | DIMM5 defective. | WARN/YELLOW_BLACK | Yes |
| 8511 | DIMM6 defective. | WARN/YELLOW_BLACK | Yes |
| 8512 | DIMM7 defective. | WARN/YELLOW_BLACK | Yes |
| 8513 | DIMM8 defective. | WARN/YELLOW_BLACK | Yes |

POST Beep Codes

During the course of executing POST, there are occasions where fatal problems happen before video is enabled. These fatal errors are conveyed with the use of the speaker via encoded beeps, coupled with POST debug codes. There are also beeps emitted in conjunction with the display of errors via the POST error manager.

Since the duration of the display-less POST execution is relatively short, there are fewer beep codes than displayed error 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 distinction within class is made via the POST debug card.

Table 49. 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 CPU generated an exception interrupt. |
| 8 | Display memory read/write error | The system video adapter is either missing or its memory is faulty. |
| 9 | ROM checksum error | System BIOS ROM checksum error |
| 11 | Invalid BIOS | General BIOS ROM error |

Table 50. POST Memory Beep Error Codes – Debug Port Encoding List

| Beep Code | Debug port error code (lower byte of North I2C debug display) | Meanings |
|-----------|---------------------------------------------------------------|--------------------------------------------------------|
| 3 | CF9Fh | No valid memory was found in the system |
| 3 | CF64h | Mismatched DIMMs in a row, and no valid memory to boot |

Memory Test Failure

No Memory Found in the System

This indicates that the memory test has found no valid memory in the system. The system will not boot. An SEL log entry is made.

Mismatched DIMMs Within Single Row Populated

This indicates that only a single row is populated, and that the row contains mismatched DIMMs, preventing booting. An SEL log entry is made.

Recovery Beep Codes

Table 51. Recovery Mode Beep Codes

| Beeps | Description |
|-------------------------|------------------------------|
| One short – medium tone | BIOS Flash Update Started |
| Two short – medium tone | BIOS Flash Update Complete |
| Repeating – low tone | BIOS Recovery Error Occurred |

Safety Warnings

WARNING: English (US)

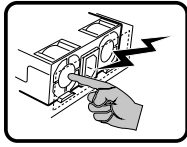
AVERTISSEMENT: Français

WARNUNG: Deutsch

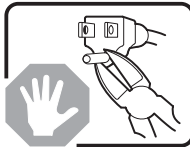
AVVERTENZA: Italiano

ADVERTENCIAS: Español

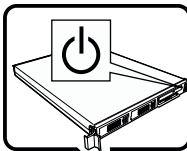
WARNING: English (US)



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 with more than one power supply will have a separate AC power cord for each supply.

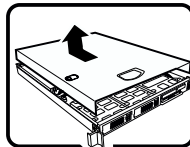


The power button on the system does not turn off system AC power. To remove AC power from the system, you must unplug each AC power cord from the wall outlet or power supply. The power cord(s) is considered the disconnect device to the main (AC) power. The socket outlet that the system plugs into shall be installed near the equipment and shall be easily accessible.



SAFETY STEPS: Whenever you remove 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 cables connected to I/O connectors or ports on the back of the system.
5. 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.
6. Do not operate the system with the chassis covers removed.

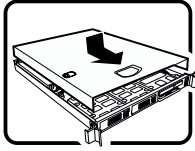


After you have completed the six SAFETY steps above, you can remove the system covers. To do this:

1. Unlock and remove the padlock from the back of the system if a padlock has been installed.
 2. Remove and save all screws from the covers.
 3. Remove the covers.
-

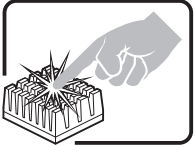
continued

WARNING: English (continued)

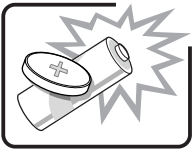


For proper cooling and airflow, always reinstall the chassis covers before turning on the system. Operating the system without the covers in place can damage system parts. To install the covers:

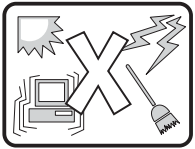
1. Check first to make sure you have not left loose tools or parts inside the system.
 2. Check that cables, add-in boards, and other components are properly installed.
 3. Attach the covers to the chassis with the screws removed earlier, and tighten them firmly.
 4. Insert and lock the padlock to the system to prevent unauthorized access inside the system.
 5. Connect all external cables and the AC power cord(s) to the system.
-



A microprocessor and heat sink may be hot if the system has been running. Also, there may be sharp pins and edges on some board and chassis parts. Contact should be made with care. Consider wearing protective gloves.



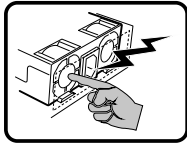
Danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Dispose of used batteries according to manufacturer's instructions.



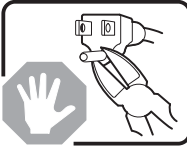
The system is designed to operate in a typical office environment. Choose a site that is:

- 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.
 - In regions that are susceptible to electrical storms, we recommend you plug your system 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 cord(s), because they serve as the product's main power disconnect.
-

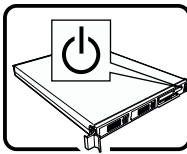
AVERTISSEMENT: Français



Le bloc d'alimentation de ce produit ne contient aucune pièce pouvant être réparée par l'utilisateur. Ce produit peut contenir plus d'un bloc d'alimentation. Veuillez contacter un technicien qualifié en cas de problème.



Ne pas essayer d'utiliser ni modifier le câble d'alimentation CA fourni, s'il ne correspond pas exactement au type requis. Le nombre de câbles d'alimentation CA fournis correspond au nombre de blocs d'alimentation du produit.

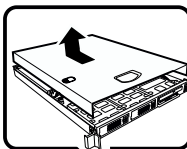


Notez que le commutateur CC de mise sous tension /hors tension du panneau avant n'éteint pas l'alimentation CA du système. Pour mettre le système hors tension, vous devez débrancher chaque câble d'alimentation de sa prise.



CONSIGNES DE SÉCURITÉ -Lorsque vous ouvrez le boîtier pour accéder à l'intérieur du système, suivez les consignes suivantes:

1. Mettez hors tension tous les périphériques connectés au système.
2. Mettez le système hors tension en mettant l'interrupteur général en position OFF (bouton-poussoir).
3. Débranchez tous les cordons d'alimentation c.a. du système et des prises murales.
4. Identifiez et débranchez tous les câbles reliés aux connecteurs d'E-S ou aux accès 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 tandis que le boîtier est ouvert.

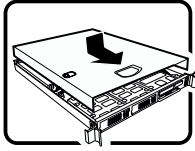


Une fois TOUTES les étapes précédentes accomplies, vous pouvez retirer les panneaux du système. Procédez comme suit:

1. Si un cadenas a été installé sur à l'arrière du système, déverrouillez-le et retirez-le.
2. Retirez toutes les vis des panneaux et mettez-les dans un endroit sûr.
3. Retirez les panneaux.

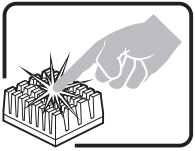
suite

AVERTISSEMENT: Français (suite)

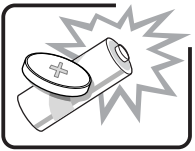


Afin de permettre le refroidissement et l'aération du système, réinstallez toujours les panneaux du boîtier avant de mettre le système sous tension. Le fonctionnement du système en l'absence des panneaux risque d'endommager ses pièces. Pour installer les panneaux, procédez comme suit:

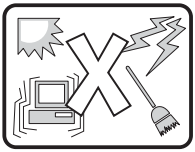
1. Assurez-vous de ne pas avoir oublié d'outils ou de pièces démontées dans le système.
 2. Assurez-vous que les câbles, les cartes d'extension et les autres composants sont bien installés.
 3. Revissez solidement les panneaux du boîtier avec les vis retirées plus tôt.
 4. Remettez le cadenas en place et verrouillez-le afin de prévenir tout accès non autorisé à l'intérieur du système.
 5. Rebranchez tous les cordons d'alimentation c. a. et câbles externes 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. Nous vous recommandons l'usage de gants de protection.



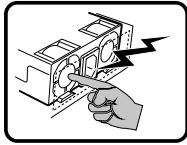
Danger d'explosion si la batterie n'est pas remontée correctement. Remplacer uniquement avec une batterie du même type ou d'un type équivalent recommandé par le fabricant. Disposez des piles usées selon les instructions du fabricant.



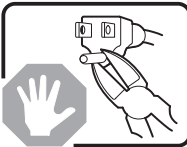
Le système a été conçu pour fonctionner dans un cadre de travail normal. L'emplacement choisi doit être:

- Propre et dépourvu de poussière en suspension (sauf la poussière normale).
 - Bien aéré et loin des sources de chaleur, y compris du soleil direct.
 - A l'abri des chocs et des sources de vibrations.
 - Isolé de forts champs électromagnétiques géenérés par des appareils électriques.
 - Dans les régions sujettes aux orages magnétiques il est recomandé de brancher votre système à un supresseur de surtension, et de débrancher toutes les lignes de télécommunications de votre modem durant un orage.
 - 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).
-

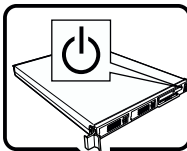
WARNUNG: Deutsch



Benutzer können am Netzgerät dieses Produkts keine Reparaturen vornehmen. Das Produkt enthält möglicherweise mehrere Netzgeräte. Wartungsarbeiten müssen von qualifizierten Technikern ausgeführt werden.



Versuchen Sie nicht, das mitgelieferte Netzkabel zu ändern oder zu verwenden, wenn es sich nicht genau um den erforderlichen Typ handelt. Ein Produkt mit mehreren Netzgeräten hat für jedes Netzgerät ein eigenes Netzkabel.

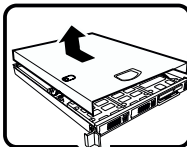


Der Wechselstrom des Systems wird durch den Ein-/Aus-Schalter für Gleichstrom nicht ausgeschaltet. Ziehen Sie jedes Wechselstrom-Netzkabel aus der Steckdose bzw. dem Netzgerät, um den Stromanschluß des Systems zu unterbrechen.



SICHERHEISSMASSNAHMEN: Immer wenn Sie die Gehäuseabdeckung abnehmen um an das Systeminnere zu gelangen, sollten Sie folgende Schritte beachten:

1. Schalten Sie alle an Ihr System angeschlossenen Peripheriegeräte aus.
2. Schalten Sie das System mit dem Hauptschalter aus.
3. Ziehen Sie den Stromanschlußstecker Ihres Systems aus der Steckdose.
4. Auf der Rückseite des Systems beschriften und ziehen Sie alle Anschlußkabel von den I/O Anschlüssen oder Ports ab.
5. Tragen Sie ein geerdetes Antistatik Gelenkband, um elektrostatische Ladungen (ESD) über blanke Metallstellen bei der Handhabung der Komponenten zu vermeiden.
6. Schalten Sie das System niemals ohne ordnungsgemäß montiertes Gehäuse ein.

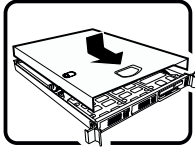


Nachdem Sie die oben erwähnten ersten sechs SICHERHEITSSCHRITTE durchgeführt haben, können Sie die Abdeckung abnehmen, indem Sie:

1. Öffnen und entfernen Sie die Verschlusseinrichtung (Padlock) auf der Rückseite des Systems, falls eine Verschlusseinrichtung installiert ist.
 2. Entfernen Sie alle Schrauben der Gehäuseabdeckung.
 3. Nehmen Sie die Abdeckung ab.
-

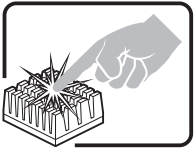
Fortsetzung

WARNUNG: Deutsch (Fortsetzung)

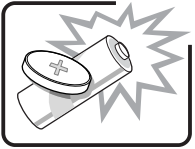


Zur ordnungsgemäßen Kühlung und Lüftung muß die Gehäuseabdeckung immer wieder vor dem Einschalten installiert werden. Ein Betrieb des Systems ohne angebrachte Abdeckung kann Ihrem System oder Teile darin beschädigen. Um die Abdeckung wieder anzubringen:

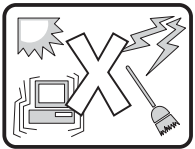
1. Vergewissern Sie sich, daß Sie keine Werkzeuge oder Teile im Innern des Systems zurückgelassen haben.
2. Überprüfen Sie alle Kabel, Zusatzkarten und andere Komponenten auf ordnungsgemäßen Sitz und Installation.
3. Bringen Sie die Abdeckungen wieder am Gehäuse an, indem Sie die zuvor gelösten Schrauben wieder anbringen. Ziehen Sie diese gut an.
4. Bringen Sie die Verschlusseinrichtung (Padlock) wieder an und schließen Sie diese, um ein unerlaubtes Öffnen des Systems zu verhindern.
5. Schließen Sie alle externen Kabel und den AC Stromanschlußstecker Ihres Systems wieder an.



Der Mikroprozessor und der Kühler sind möglicherweise erhitzt, wenn das System in Betrieb ist. Außerdem können einige Platinen und Gehäuseteile scharfe Spitzen und Kanten aufweisen. Arbeiten an Platinen und Gehäuse sollten vorsichtig ausgeführt werden. Sie sollten Schutzhandschuhe tragen.



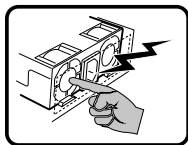
Bei falschem Einsetzen einer neuen Batterie besteht Explosionsgefahr. Die Batterie darf nur durch denselben oder einen entsprechenden, vom Hersteller empfohlenen Batterietyp ersetzt werden. Entsorgen Sie verbrauchte Batterien den Anweisungen des Herstellers entsprechend.



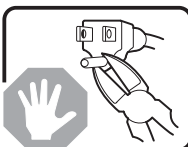
Das System wurde für den Betrieb in einer normalen Büroumgebung entwickelt. Der Standort sollte:

- sauber und staubfrei sein (Hausstaub ausgenommen);
 - gut gelüftet und keinen Heizquellen ausgesetzt sein (einschließlich direkter Sonneneinstrahlung);
 - keinen Erschütterungen ausgesetzt sein;
 - keine starken, von elektrischen Geräten erzeugten elektromagnetischen Felder aufweisen;
 - in Regionen, in denen elektrische Stürme auftreten, mit einem Überspannungsschutzgerät verbunden sein; während eines elektrischen Sturms sollte keine Verbindung der Telekommunikationsleitungen mit dem Modem bestehen;
 - mit einer geerdeten Wechselstromsteckdose ausgerüstet sein;
 - über ausreichend Platz verfügen, um Zugang zu den Netzkabeln zu gewährleisten, da der Stromanschluß des Produkts hauptsächlich über die Kabel unterbrochen wird.
-

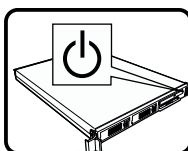
AVVERTENZA: Italiano



Rivolgersi ad un tecnico specializzato per la riparazione dei componenti dell'alimentazione di questo prodotto. È possibile che il prodotto disponga di più fonti di alimentazione.



Non modificare o utilizzare il cavo di alimentazione in c.a. fornito dal produttore, se non corrisponde esattamente al tipo richiesto. Ad ogni fonte di alimentazione corrisponde un cavo di alimentazione in c.a. separato.

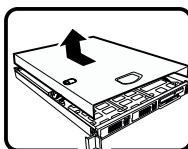


L'interruttore attivato/disattivato nel pannello anteriore non interrompe l'alimentazione in c.a. del sistema. Per interromperla, è necessario scollegare tutti i cavi di alimentazione in c.a. dalle prese a muro o dall'alimentazione di corrente.



PASSI DI SICUREZZA: Qualora si rimuovano le coperture del telaio per accedere all'interno del sistema, seguire i seguenti passi:

1. Spegner tutti i dispositivi periferici collegati al sistema.
2. Spegner il sistema, usando il pulsante spento/acceso dell'interruttore del sistema.
3. Togliere tutte le spine dei cavi del sistema dalle prese elettriche.
4. Identificare e sconnettere tutti i cavi attaccati ai collegamenti I/O od alle prese installate sul retro del sistema.
5. Qualora si tocchino i componenti, proteggersi dallo scarico elettrostatico (SES), portando un cinghia anti-statica da polso che è attaccata alla presa a terra del telaio del sistema – qualsiasi superficie non dipinta – .
6. Non far operare il sistema quando il telaio è senza le coperture.

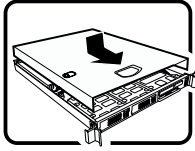


Dopo aver seguito i sei passi di SICUREZZA sopracitati, togliere le coperture del telaio del sistema come segue:

1. Aprire e rimuovere il lucchetto dal retro del sistema qualora ve ne fosse uno installato.
 2. Togliere e mettere in un posto sicuro tutte le viti delle coperture.
 3. Togliere le coperture.
-

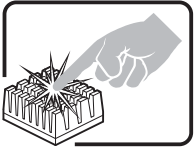
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AVVERTENZA: Italiano (continua)

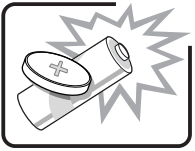


Per il giusto flusso dell'aria e raffreddamento del sistema, rimettere sempre le coperture del telaio prima di riaccendere il sistema. Operare il sistema senza le coperture al loro proprio posto potrebbe danneggiare i componenti del sistema. Per rimettere le coperture del telaio:

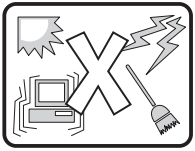
1. Controllare prima che non si siano lasciati degli attrezzi o dei componenti dentro il sistema.
 2. Controllare che i cavi, dei supporti aggiuntivi ed altri componenti siano stati installati appropriatamente.
 3. Attaccare le coperture al telaio con le viti tolte in precedenza e avvitarle strettamente.
 4. Inserire e chiudere a chiave il lucchetto sul retro del sistema per impedire l'accesso non autorizzato al sistema.
 5. Ricollegare tutti i cavi esterni e le prolunghe AC del sistema.
-



Se il sistema è stato a lungo in funzione, il microprocessore e il dissipatore di calore potrebbero essere surriscaldati. Fare attenzione alla presenza di piedini appuntiti e parti taglienti sulle schede e sul telaio. È consigliabile l'uso di guanti di protezione.



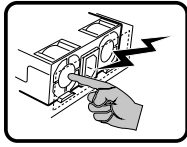
Esiste il pericolo di un'esplosione se la pila non viene sostituita in modo corretto. Utilizzare solo pile uguali o di tipo equivalente a quelle consigliate dal produttore. Per disfarsi delle pile usate, seguire le istruzioni del produttore.



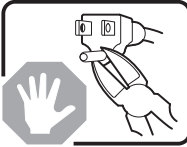
Il sistema è progettato per funzionare in un ambiente di lavoro tipo. Scegliere una postazione che sia:

- Pulita e libera da particelle in sospensione (a parte la normale polvere presente nell'ambiente).
 - Ben ventilata e lontana da fonti di calore, compresa la luce solare diretta.
 - Al riparo da urti e lontana da fonti di vibrazione.
 - Isolata dai forti campi magnetici prodotti da dispositivi elettrici.
 - In aree soggette a temporali, è consigliabile collegare il sistema ad un limitatore di corrente. In caso di temporali, scollegare le linee di comunicazione dal modem.
 - Dotata di una presa a muro correttamente installata.
 - Dotata di spazio sufficiente ad accedere ai cavi di alimentazione, i quali rappresentano il mezzo principale di scollegamento del sistema.
-

ADVERTENCIAS: Español

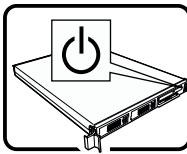


El usuario debe abstenerse de manipular los componentes de la fuente de alimentación de este producto, cuya reparación debe dejarse exclusivamente en manos de personal técnico especializado. Puede que este producto disponga de más de una fuente de alimentación.



No intente modificar ni usar el cable de alimentación de corriente alterna, si no corresponde exactamente con el tipo requerido.

El número de cables suministrados se corresponden con el número de fuentes de alimentación de corriente alterna que tenga el producto.

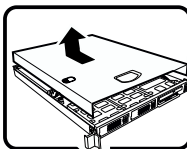


Nótese que el interruptor activado/desactivado en el panel frontal no desconecta la corriente alterna del sistema. Para desconectarla, deberá desenchufar todos los cables de corriente alterna de la pared o desconectar la fuente de alimentación.



INSTRUCCIONES DE SEGURIDAD: Cuando extraiga la tapa del chasis para acceder al interior del sistema, siga las siguientes instrucciones:

1. Apague todos los dispositivos periféricos conectados al sistema.
2. Apague el sistema presionando el interruptor encendido/apagado.
3. Desconecte todos los cables de alimentación CA del sistema o de las tomas de corriente alterna.
4. Identifique y desconecte todos los cables enchufados a los conectores E/S o a los puertos situados en la parte posterior del sistema.
5. Cuando manipule los componentes, es importante protegerse contra la descarga electrostática (ESD). Puede hacerlo si utiliza una muñequera antiestática sujeta a la toma de tierra del chasis — o a cualquier tipo de superficie de metal sin pintar.
6. No ponga en marcha el sistema si se han extraído las tapas del chasis.

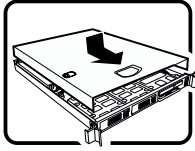


Después de completar las seis instrucciones de SEGURIDAD mencionadas, ya puede extraer las tapas del sistema. Para ello:

1. Desbloquee y extraiga el bloqueo de seguridad de la parte posterior del sistema, si se ha instalado uno.
2. Extraiga y guarde todos los tornillos de las tapas.
3. Extraiga las tapas.

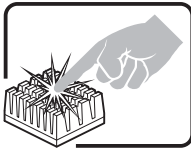
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ADVERTENCIAS: Español (continúa)

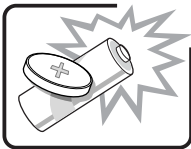


Para obtener un enfriamiento y un flujo de aire adecuados, reinstale siempre las tapas del chasis antes de poner en marcha el sistema. Si pone en funcionamiento el sistema sin las tapas bien colocadas puede dañar los componentes del sistema. Para instalar las tapas:

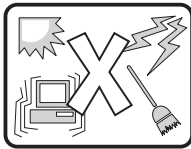
1. Asegúrese primero de no haber dejado herramientas o componentes sueltos dentro del sistema.
 2. Compruebe que los cables, las placas adicionales y otros componentes se hayan instalado correctamente.
 3. Incorpore las tapas al chasis mediante los tornillos extraídos anteriormente, tensándolos firmemente.
 4. Inserte el bloqueo de seguridad en el sistema y bloquéelo para impedir que pueda accederse al mismo sin autorización.
 5. Conecte todos los cables externos y los cables de alimentación CA al sistema.
-



Si el sistema ha estado en funcionamiento, el microprocesador y el disipador de calor pueden estar aún calientes. También conviene tener en cuenta que en el chasis o en el tablero puede haber piezas cortantes o punzantes. Por ello, se recomienda precaución y el uso de guantes protectores.



Existe peligro de explosión si la pila no se cambia de forma adecuada. Utilice solamente pilas iguales o del mismo tipo que las recomendadas por el fabricante del equipo. Para deshacerse de las pilas usadas, siga igualmente las instrucciones del fabricante.



El sistema está diseñado para funcionar en un entorno de trabajo normal. escoja un lugar:

- Limpio y libre de partículas en suspensión (salvo el polvo normal).
 - Bien ventilado y alejado de fuentes de calor, incluida la luz solar directa.
 - Alejado de fuentes de vibración.
 - Aislado de campos electromagnéticos fuertes producidos por dispositivos eléctricos.
 - En regiones con frecuentes tormentas eléctricas, se recomienda conectar su sistema a un eliminador de sobrevoltage y desconectar el módem de las líneas de telecomunicación durante las tormentas.
 - Provisto de una toma de tierra correctamente instalada.
 - Provisto de espacio suficiente como para acceder a los cables de alimentación, ya que éstos hacen de medio principal de desconexión del sistema.
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