

NOVASCALÉ

R421-E1

# Installation and User's Guide



REFERENCE  
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# NOVASCALE

## R421-E1

### Installation and User's Guide

**Hardware**

April 2008

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# Preface

## About This Manual

This manual is written for professional system integrators and PC technicians. It provides information for the installation and use of the NovaScale R421-E1. Installation and maintenance should be performed by experienced technicians only.

The NovaScale R421-E1 is a 1U rackmount server chassis with an integrated S5400SF serverboard. The serverboard supports dual Intel® 5400/5300LV/5200/5100LV Series processors.

## Manual Organization

### **Chapter 1: Introduction**

The first chapter provides a checklist of the main components included with the server system and describes the main features of the NovaScale R421-E1 serverboard and the NovaScale R421-E1 chassis.

### **Chapter 2: Server Installation**

This chapter describes the steps necessary to install the NovaScale R421-E1 into a rack and check out the server configuration prior to powering up the system. If your server was ordered without the processor and memory components, this chapter will refer you to the appropriate sections of the manual for their installation.

### **Chapter 3: System Interface**

Refer to this chapter for details on the system interface, which includes the functions and information provided by the control panel on the chassis as well as other LEDs located throughout the system.

## **Chapter 4: System Safety**

You should thoroughly familiarize yourself with this chapter for a general overview of safety precautions that should be followed when installing and servicing the NovaScale R421-E1.

## **Chapter 5: Advanced Serverboard Setup**

Chapter 5 provides detailed information on the R421-E1 serverboard, including the locations and functions of connectors, headers and jumpers. Refer to this chapter when adding or removing processors or main memory and when reconfiguring the serverboard.

## **Chapter 6: Advanced Chassis Setup**

Refer to Chapter 6 for detailed information on the R421-E1 1U rackmount server chassis. You should follow the procedures given in this chapter when installing, removing or reconfiguring SAS/SATA or peripheral drives and when replacing system power supply units and cooling fans.

## **Chapter 7: BIOS**

The BIOS chapter includes an introduction to BIOS and provides detailed information on running the CMOS Setup Utility.

## **Appendix A: Integration and Usage Tips**

## **Appendix B: POST Code Diagnostic LED Decoder**

## **Appendix C: POST Error Beep codes**

## Notes



# Table of Contents

## **Chapter 1. Introduction**

1-1	Overview .....	1-1
1-2	Serverboard Features .....	1-1
1-3	Server Chassis Features .....	1-2
1-4	System Views.....	1-4
1-5	Server Board Overview.....	1-6

## **Chapter 2. Server Installation**

2-1	Overview .....	2-1
2-2	Unpacking the System.....	2-1
2-3	Preparing for Setup.....	2-1
	Choosing a Setup Location.....	2-1
	Rack Precautions .....	2-2
	Server Precautions.....	2-2
	Rack Mounting Considerations .....	2-3
	Ambient Operating Temperature .....	2-3
	Reduced Airflow .....	2-3
	Mechanical Loading .....	2-3
	Circuit Overloading.....	2-3
	Reliable Ground .....	2-3
2-4	Installing the System into a Rack .....	2-4
2-5	Checking the Serverboard Setup.....	2-4
	Accessing the Inside of the System.....	2-4
	Checking the Components and Setup .....	2-5
2-6	Preparing to Power On .....	2-6
	Checking the SATA drives.....	2-6
	Checking the Airflow .....	2-6
	Providing Power .....	2-6

## **Chapter 3. System Interface**

3-1	Overview .....	3-1
3-2	Control Panel Buttons .....	3-4
3-3	Control Panel LED indicators.....	3-5
	Power/Sleep LED .....	3-6
	System Status LED .....	3-7
	Drive Activity LED .....	3-8
	System Identification LED .....	3-8

**Chapter 4. System Safety**

4-1	Electrical Safety Precautions .....	4-1
4-2	General Safety Precautions .....	4-2
4-3	ESD Precautions.....	4-3
4-4	Operating Precautions .....	4-4
4-5	Replacing the Backup Battery .....	4-4

**Chapter 5. Advanced Serverboard Setup**

5-1	Handling the Serverboard .....	5-1
	Precautions .....	5-1
5-2	Serverboard Installation .....	5-2
	Accessing the Inside of the System.....	5-2
	Check Compatibility of Serverboard Ports and I/O Shield .....	5-2
	Mounting the Serverboard onto the Serverboard Tray .....	5-2
	Unpacking .....	5-2
5-3	Connecting Cables.....	5-3
5-4	I/O Ports.....	5-5
5-5	Processor and Heat Sink Installation.....	5-6
	Installing the Processor .....	5-6
	Removing a Processor .....	5-8
	Installing the Heat Sink.....	5-8
5-6	Installing Memory .....	5-10
	Installing DIMMs.....	5-11
	Removing DIMMs.....	5-11
	Supported Memory.....	5-11
	Dimm Population Rules and Supported DIMM Configurations.....	5-12
5-7	Adding PCI Cards .....	5-14
	Installing a PCI Add-in Card .....	5-14
	Removing a PCI Add-in Card.....	5-14
5-8	Serverboard Details .....	5-15
5-9	Connector Definitions.....	5-16
	Power Connector (Backplane to Power Supply Harness).....	5-16
	Control Panel USB Interface Connector (Backplane to Control Panel) .....	5-16
	Hot-Swap SATA/SAS Drive Connectors .....	5-17
	SATA/SAS Drive Control Connectors (Model 0 only) .....	5-18
	USB Floppy Drive Connector.....	5-18
	System Fan Connectors .....	5-19
	System Management Connectors.....	5-20

Serial Port .....	5-20
Ethernet NIC1, NIC2 Connectors.....	5-20
5-10 Jumper Settings .....	5-21
5-11 Light Guided Diagnostics .....	5-22
<b>Chapter 6. Advanced Chassis Setup</b>	
6-1 Devices.....	6-1
Static-Sensitive Devices.....	6-1
Precautions .....	6-1
Unpacking .....	6-1
Peripheral Devices .....	6-2
Rear of Server System .....	6-2
6-2 Control Panel .....	6-3
Replacing the Control Panel Module in the Model 0 Option HS (Hot-swap Drive System).....	6-3
Replacing the Control Panel Module in the Model 0 (Fixed Drive System).....	6-5
6-3 System Fans .....	6-7
System Fan Failure.....	6-7
6-4 Drive Bay Installation/Removal .....	6-9
In the Model 0 Option HS (Hotswap Drives) .....	6-9
In the Model 0 (Fixed Hard Drives) .....	6-12
6-5 Power Supply .....	6-14
<b>Chapter 7. BIOS</b>	
7-1 Using the BIOS Setup Utility.....	7-1
If You Cannot Access Setup .....	7-1
Setup Menus .....	7-1
7-2 Upgrading the BIOS.....	7-4
Recording the Current BIOS Settings.....	7-4
Obtaining the Upgrade .....	7-4
Upgrading the BIOS .....	7-5
7-3 Clearing the CMOS and resetting the Password.....	7-5
7-4 Advanced Setup.....	7-7
Main Screen .....	7-8
Advanced Screen.....	7-12
Processor Screen.....	7-13
ATA Controller Screen .....	7-20
Mass Storage Controller Screen .....	7-23
Serial Ports Screen .....	7-24
USB Configuration Screen .....	7-25

PCI Screen .....	7-26
Security Screen.....	7-29
Server Management System Information Screen.....	7-35
Boot Options Screen.....	7-36
Hard Disk Order Screen.....	7-37
CDROM Order Screen .....	7-38
Floppy Order Screen.....	7-38
Network Device Order Screen .....	7-39
BEV Device Order Screen .....	7-39
Boot Manager Screen .....	7-40
Error Manager Screen .....	7-41
Exit Screen.....	7-41
<b>Appendix A. Integration and Usage Tips.....</b>	<b>A-1</b>
<b>Appendix B. POST Code Diagnostic LED Decoder.....</b>	<b>B-1</b>
<b>Appendix C. POST Error Beep Codes.....</b>	<b>C-1</b>

## Chapter 1. Introduction

### 1-1 Overview

The NovaScale R421-E1 is a rackmount 1U server system with features that are designed to support the high-density high performance computing server market. The system is integrated with an Intel® Server Board S5400SF and is offered in two different system configurations: one which supports up to two fixed SATA hard drives, and one which supports hot-swap backplane options capable of supporting up to three hot-swap SAS or SATA hard drives.

This chapter provides a high-level overview of the system features. Greater detail for each major system component or feature is provided in the following chapters.

### 1-2 Serverboard Features

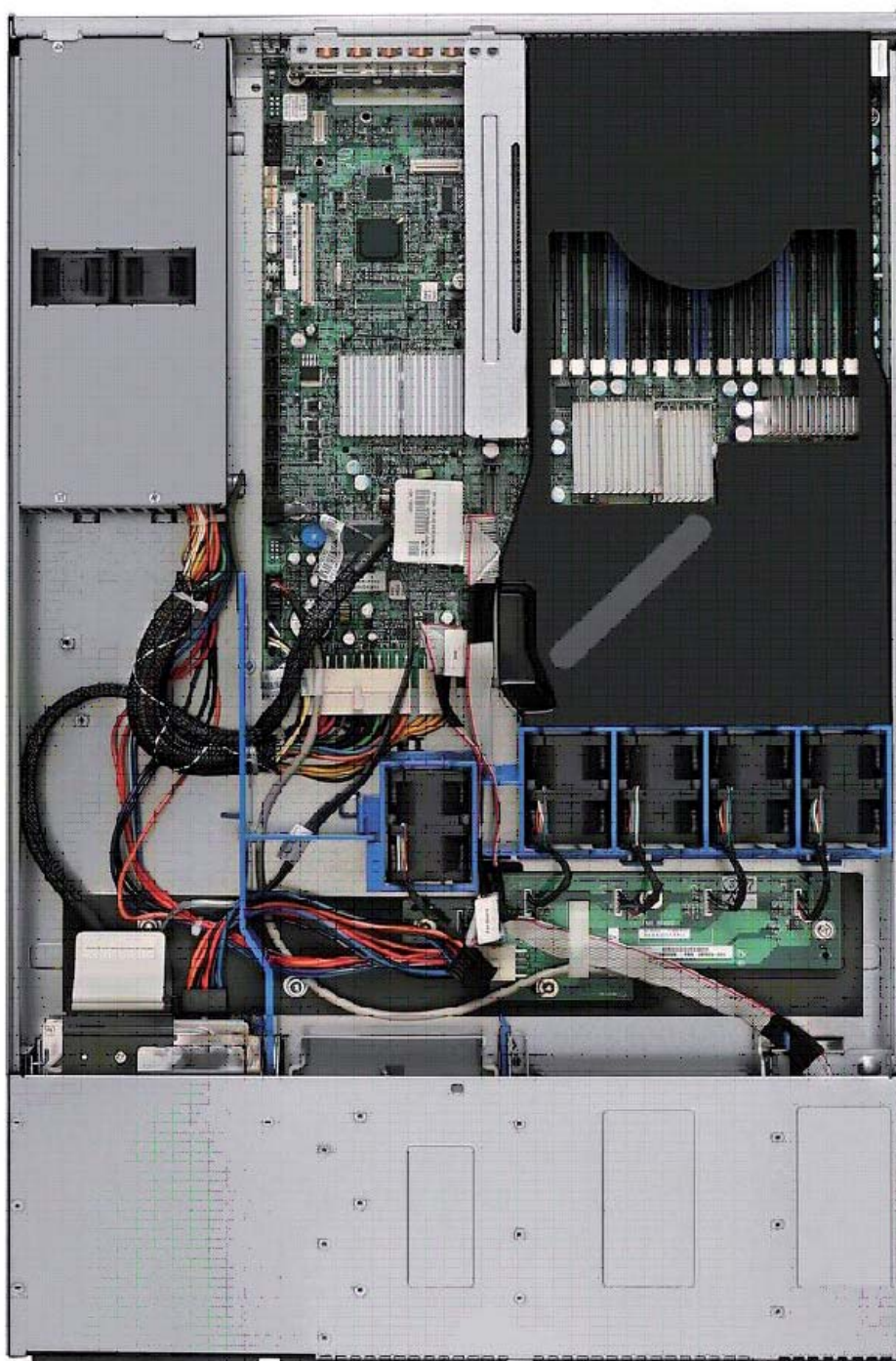
Feature	Description
Processors	771-pin LGA sockets supporting 1 or 2 Multi-Core Intel® Xeon® processors 5000 sequence, with system bus speeds of 1066 MHz, 1333 MHz, and 1600 MHz
Memory	16 Keyed DIMM slots supporting fully buffered DIMM technology (FBDIMM) memory. Only 240-pin DDR2 667 or DDR2 800 FBDIMMs will be supported in this server system
Chipset	Intel® Chipset which includes the following components: <ul style="list-style-type: none"> <li>• Intel® 5400 Memory Controller Hub</li> <li>• Intel® 6321ESB I/O Controller Hub</li> </ul>
On-board Video	ATI* ES1000 video controller with 32MB DDR SDRAM
LAN Support	Two 10/100/1000 Intel® 82563EB PHYs supporting Intel® I/O Acceleration Technology
Hard Drive Controller Options	<ul style="list-style-type: none"> <li>• Integrated ESB2-E 3Gb/s SATA ports, for use in Fixed Drive</li> <li>• LSI* LSISAS1064E SAS/SATA controller RAID Controller, integrated on Active SAS backplane option for use in hot swap backplane configuration</li> </ul> <p>Support for Intel® Embedded Server RAID Technology II with SW RAID levels 0/1/10. Optional support for SW RAID 5 with activation key.</p>
System Management	Support for Intel® System Management Software

## 1-3 Server Chassis Features

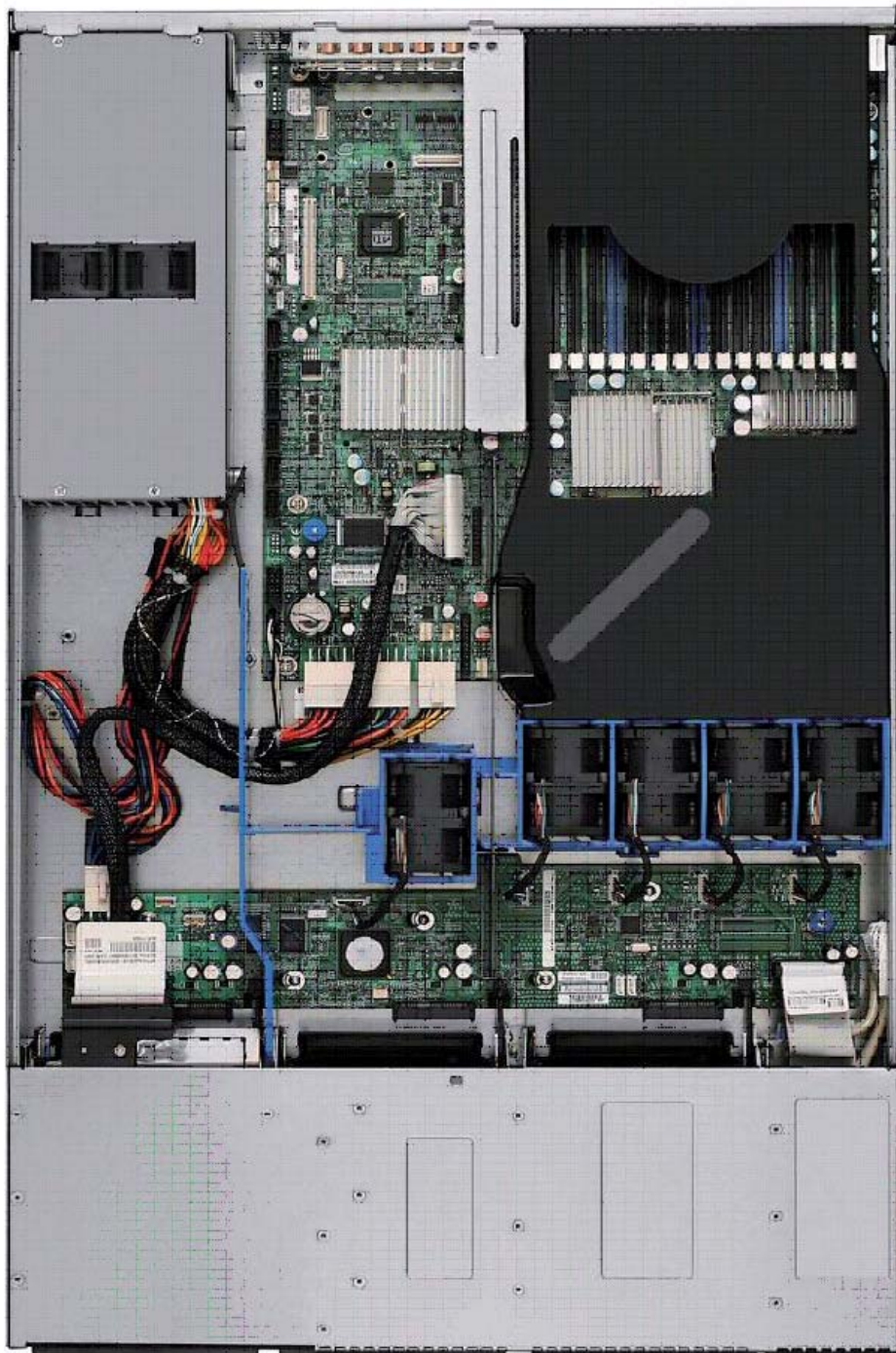
Feature	Description
System Connectors / Headers	<p>External I/O connections:</p> <ul style="list-style-type: none"><li>• Stacked PS/2* ports for keyboard and mouse</li><li>• RJ45 Serial B port</li><li>• Two RJ45 NIC connectors for 10/100/1000 Mb connections</li><li>• Two USB 2.0 ports</li><li>• Video Connector</li></ul> <p>Internal connectors/headers:</p> <ul style="list-style-type: none"><li>• One USB port header, capable of providing two USB 2.0 ports</li><li>• One DH10 Serial A header</li><li>• SATA ports via the ESB2-E supporting 3Gb/s and integrated SW RAID 0/1/10 support</li><li>• One 44pin (power + I/O) ATA/100 connector for optical drive support</li><li>• One Intel® Remote Management Module-2 (Intel® RMM2) connector (Intel® RMM2 use is optional)</li><li>• One Intel® I/O Expansion Module Connector supporting any of the following:<ul style="list-style-type: none"><li>○ Dual GB NIC Intel® I/O Expansion Module (Optional)</li><li>○ External SAS Intel® I/O Expansion Module (Optional)</li><li>○ Infiniband* I/O Expansion Module (Optional)</li></ul></li></ul>
System Fan Support	<ul style="list-style-type: none"><li>• Non-redundant fan assembly with five managed dual rotor variable speed fans</li><li>• Two Non-redundant power supply fans</li></ul>
Add-in Adapter Support	One full height riser card slot supporting PCIe* x16 Gen 2 riser card
Hard Drive Support	<ul style="list-style-type: none"><li>• Up to two fixed SATA drives in Fixed Drive SKU</li><li>• Up to three SATA / SAS Drives in Hot Swap Drive SKU</li></ul>

Feature	Description
Peripheral Drive Support	<ul style="list-style-type: none"><li>• One Slim-line IDE optical drive</li><li>• Slim-line USB Floppy Drive option (Hot Swap Backplane configurations Only)</li></ul>
System Power	600 Watt Non-redundant
Front Panel Options	Intel Standard Control Panel <ul style="list-style-type: none"><li>• System Control Buttons – Power, Reset, System ID, NMI</li><li>• System LEDs – System Power, NIC Activity, HDD Activity, System Status, System ID</li><li>• USB Port</li><li>• Video Connector (Hot-Swap Backplane Configurations only)</li></ul>

## 1-4 System Views



**Figure 1-1. Top Down View - Fixed Mount Hard Drive SKU**



**Figure 1-2. Top Down View -Hot-Swap Drive SKU**

## 1-5 Server Board Overview

The architecture and design of the Intel® Server Board S5400SF is based on the Intel® 5400 Chipset. The chipset is designed for systems using the Multi-Core Intel® Xeon® processor 5000 sequence with front side bus speeds of 1066 MHz, 1333 MHz, or 1600 MHz. The chipset is made up of two main components: the Intel® 5400 Memory Controller Hub (MCH) for the host bridge and the ESB2-E I/O controller hub for the I/O subsystem. This chapter provides a high-level description of the functionality associated with each chipset component and the architectural blocks that make up this server board.



**Figure 1-3. Intel® Server Board S5400SF**

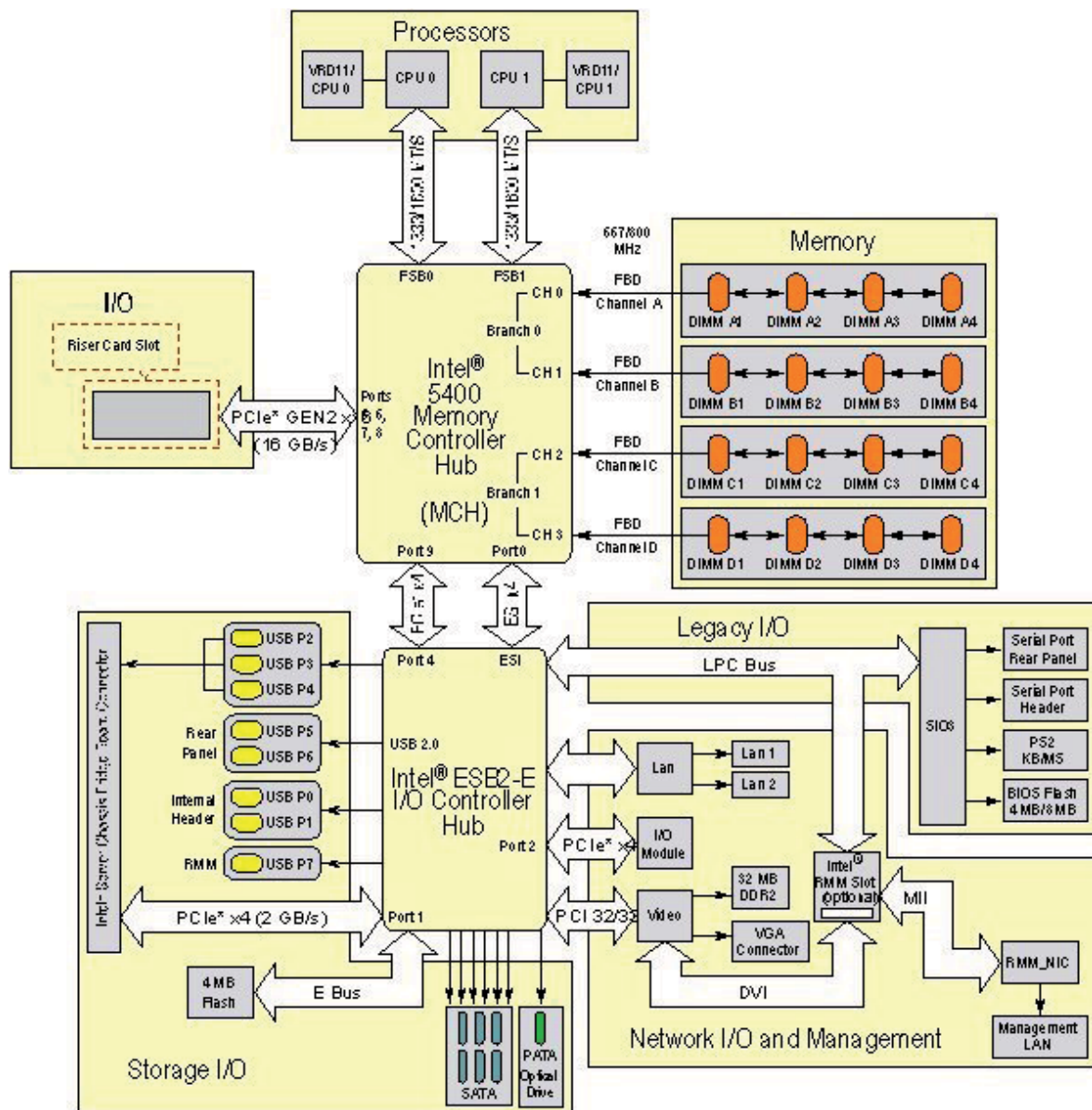


Figure 1-4. Server Board Functional Block Diagram



## Chapter 2. Server Installation

### 2-1 Overview

This chapter provides a quick setup checklist to get your NovaScale R421-E1 up and running. Following these steps in the order given should enable you to have the system operational within a minimum amount of time. This quick setup assumes that your system has come to you with the processors and memory preinstalled. If your system is not already fully integrated with a serverboard, processors, system memory etc., please turn to the chapter or section noted in each step for details on installing specific components.

### 2-2 Unpacking the System

You should inspect the box the NovaScale R421-E1 was shipped in and note if it was damaged in any way. If the server itself shows damage you should file a damage claim with the carrier who delivered it.

Decide on a suitable location for the rack unit that will hold the NovaScale R421-E1. It should be situated in a clean, dust-free area that is well ventilated. Avoid areas where heat, electrical noise and electromagnetic fields are generated. You will also need it placed near a grounded power outlet. Be sure to read the Rack and Server Precautions in the next section.

### 2-3 Preparing for Setup

The box the NovaScale R422-E1/R422-INF-E1 was shipped in should include two sets of rail assemblies, two rail mounting brackets and the mounting screws you will need to install the system into the rack. Follow the steps in the order given to complete the installation process in a minimum amount of time. Please read this section in its entirety before you begin the installation procedure outlined in the sections that follow.

#### Choosing a Setup Location

- Leave enough clearance in front of the rack to enable you to open the front door completely (~63 cm/~25 inches).
- Leave approximately 76 cm (30 inches) of clearance in the back of the rack to allow for sufficient airflow and ease in servicing.

- This product is for installation only in a Restricted Access Location (dedicated equipment rooms, service closets and the like).
- This product is not suitable for use with visual display work place devices according to §2 of the the German Ordinance for Work with Visual Display Units.

## Rack Precautions



### Warnings and Precautions!



- Ensure that the leveling jacks on the bottom of the rack are fully extended to the floor with the full weight of the rack resting on them.
- In single rack installation, stabilizers should be attached to the rack.
- In multiple rack installations, the racks should be coupled together.
- Always make sure the rack is stable before extending a component from the rack.
- You should extend only one component at a time - extending two or more simultaneously may cause the rack to become unstable.

## Server Precautions

- Review the electrical and general safety precautions in Chapter 4.
- Determine the placement of each component in the rack *before* you install the rails.
- Install the heaviest server components on the bottom of the rack first, and then work up.
- Use a regulating uninterruptible power supply (UPS) to protect the server from power surges, voltage spikes and to keep your system operating in case of a power failure.
- Allow the hot plug SATA drives and power supply modules to cool before touching them.

- Always keep the rack's front door and all panels and components on the servers closed when not servicing to maintain proper cooling.
- Make sure all power and data cables are properly connected and not blocking the chassis airflow. See Chapter 5 for details on cable connections.

## Rack Mounting Considerations

### ***Ambient Operating Temperature***

If installed in a closed or multi-unit rack assembly, the ambient operating temperature of the rack environment may be greater than the ambient temperature of the room. Therefore, consideration should be given to installing the equipment in an environment compatible with the manufacturer's maximum rated ambient temperature (T<sub>mra</sub>).

### ***Reduced Airflow***

Equipment should be mounted into a rack so that the amount of airflow required for safe operation is not compromised.

### ***Mechanical Loading***

Equipment should be mounted into a rack so that a hazardous condition does not arise due to uneven mechanical loading.

### ***Circuit Overloading***

Consideration should be given to the connection of the equipment to the power supply circuitry and the effect that any possible overloading of circuits might have on overcurrent protection and power supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

### ***Reliable Ground***

A reliable ground must be maintained at all times. To ensure this, the rack itself should be grounded. Particular attention should be given to power supply connections other than the direct connections to the branch circuit (i.e. the use of power strips, etc.).

## 2-4 Installing the System into a Rack

Your NovaScale R421-E1 can be mounted into a rack. Bull provides three options to mount this server into a rack. When installing the chassis into a rack, Intel recommends you install systems from the bottom of the rack to the top. In other words, install the first system in the rack into the bottom position of the rack, the second system in the second position from the bottom, and so on. Instructions for installing your chassis into a rack are included in each rackmount option kit.

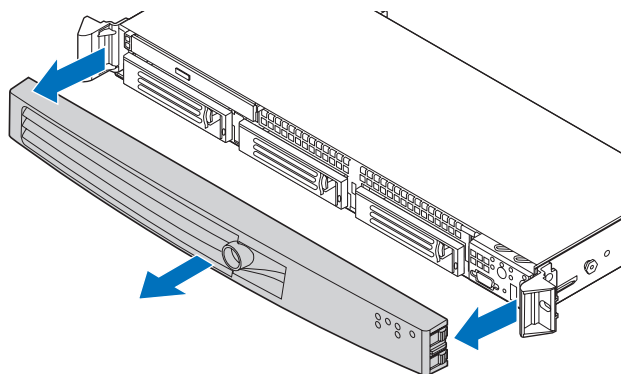
## 2-5 Checking the Serverboard Setup

After you install the NovaScale R421-E1 in the rack, you will need to open the top cover to make sure that the serverboard is properly installed and all the connections have been made.

### Accessing the Inside of the System

1. Remove the front bezel.

Unlock the bezel and pull the bezel from the server system.



**Figure 2-1. Removing the Front Bezel**

2. Remove the system cover.

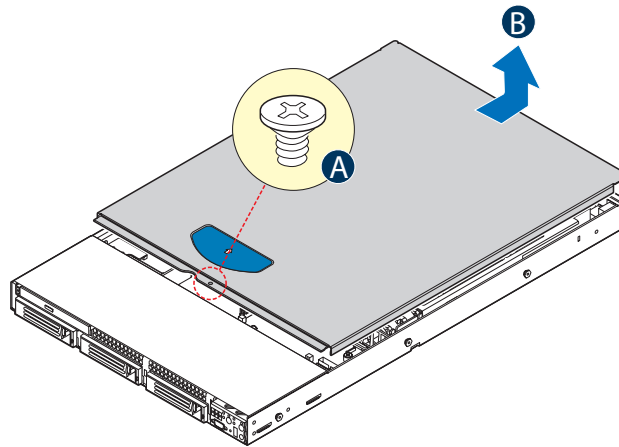
The server system must be operated with the system cover in place to ensure proper cooling. You will need to remove the top cover to add or replace components inside of the server.

---

**Note:** A nonskid surface or a stop behind the server system may be needed to prevent the server system from sliding on your work surface.

---

- a. Remove the top cover screw (see letter “A”).
- b. Slide the cover back until it stops and lift the cover upward to remove it (see letter “B”).



**Figure 2-2. Removing the Server System Cover**

## Checking the Components and Setup

1. You may have one or two processors already installed in each of the two serverboards. Each processor needs its own heatsink. See Chapter 5 for instructions on processor and heatsink installation.
2. Your server system may have come with system memory already installed. Make sure all DIMMs are fully seated in their slots. For details on adding system memory, refer to Chapter 5.
3. You can install two add-on cards to the system. See Chapter 5 for details on installing PCI add-on cards.
4. Make sure all power and data cables are properly connected and not blocking the chassis airflow.

## 2-6 Preparing to Power On

Next, you should check to make sure the peripheral drives and the SATA drives and SATA backplane have been properly installed and all connections have been made.

### Checking the SATA drives

1. All drives are accessible from the front of the server. The SATA disk drives can be installed and removed from the front of the chassis without removing the top chassis cover.
2. Depending upon your system's configuration, your system may have one or two drives already installed. If you need to install SATA drives, please refer to Chapter 6.

### Checking the Airflow

1. Airflow is provided by six sets of 4-cm fans (each set of fans consists of two fans that are mounted back to back) and an air shroud. The system component layout was carefully designed to direct sufficient cooling airflow to the components that generate the most heat.
2. Note that all power and data cables have been routed in such a way that they do not block the airflow generated by the fans.

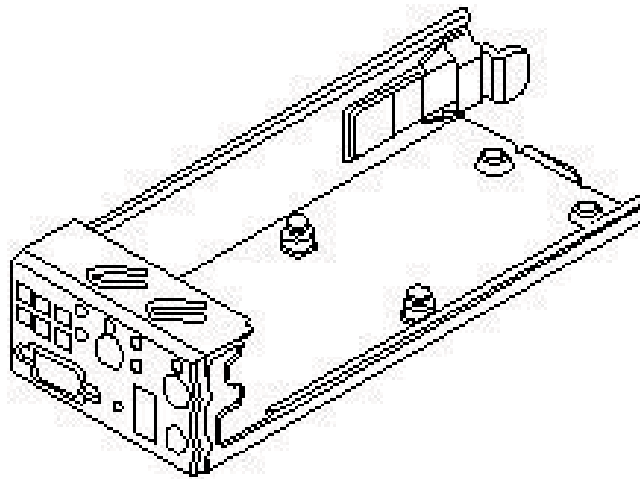
### Providing Power

1. Plug the power cords from the power supplies unit into a high-quality power strip that offers protection from electrical noise and power surges.
2. It is recommended that you use an uninterruptible power supply (UPS).
3. Finally, depress the power on button on the front of the chassis.

## Chapter 3. System Interface

### 3-1 Overview

The NovaScale R421-E1 can support either of two standard control panels; one each for the fixed drive and hot-swap backplane configurations. The control panel assemblies are pre-assembled and modular in design. The entire module assembly slides into a predefined slot in the front of the chassis



**Figure 3-1. Control Panel Module**

For fixed drive configurations, the standard control panel supports several push buttons and status LEDs, along with a single USB 2.0 port to centralize system control, monitoring, and accessibility to within a common compact design. The following diagram overviews the layout and functions of the control panel.

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**Note:** This control panel option has no video.

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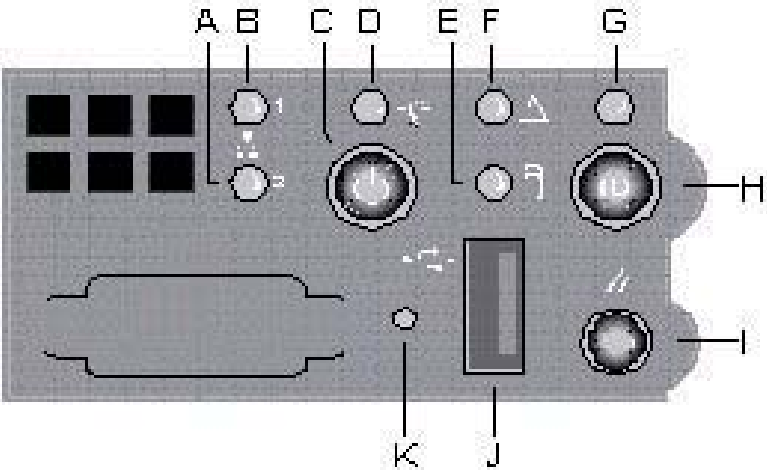
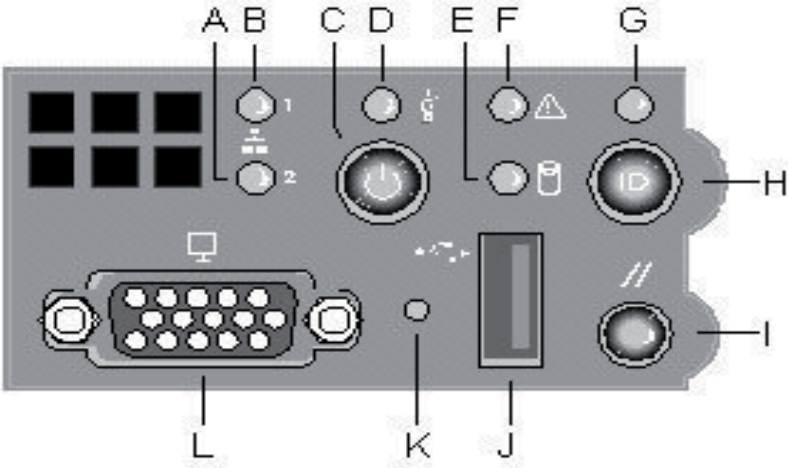


Figure 3-2. Control Panel Module

A	NIC 2 Activity LED	G	System Identification LED
B	NIC 1 Activity LED	H	System Identification Button
C	Power / Sleep Button	I	System Reset Button
D	Power / Sleep LED	J	USB 2.0 Connector
E	Hard Drive Activity LED	K	Recessed NMI Button (Tool Required)
F	System Status LED		

For systems configured with a hot-swap backplane, the standard control panel supports several push buttons and status LEDs, along with USB and video ports to centralize system control, monitoring, and accessibility to within a common compact design. The following diagram overviews the layout and functions of the control panel.



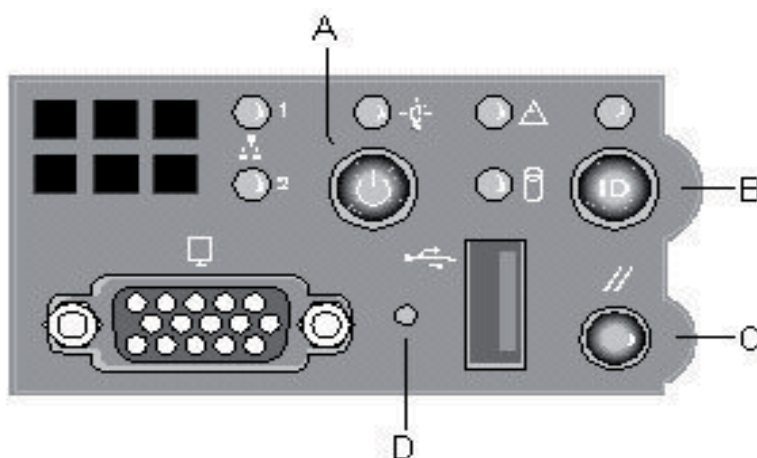
**Figure 3-3. Standard Control Panel Overview**

A	NIC 2 Activity LED	G	System Identification LED
B	NIC 1 Activity LED	H	System Identification Button
C	Power / Sleep Button	I	System Reset Button
D	Power / Sleep LED	J	USB 2.0 Connector
E	Hard Drive Activity LED	K	Recessed NMI Button (Tool Required)
F	System Status LED	L	Video Connector

The following sections described the features of the standard control panels. Differences between control panels for the fixed hard drive and hot-swap hard drive configurations will be noted.

## 3-2 Control Panel Buttons

The standard control panel assembly houses several system control buttons. Each of their functions is listed in the table below..



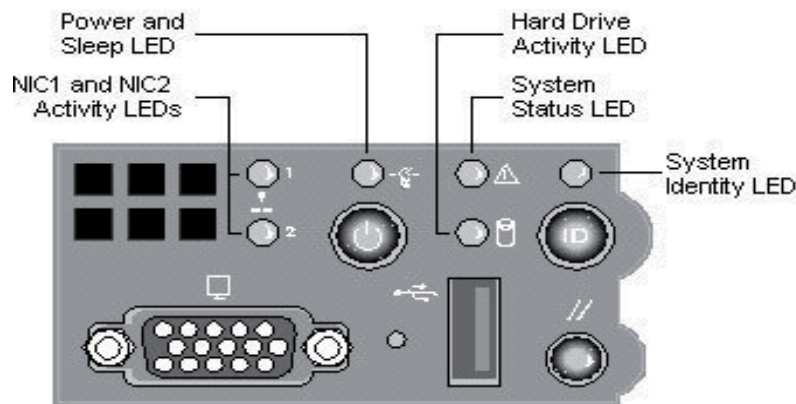
**Figure 3-4. Control Panel Buttons**

**Table 3-1. Control Button and Intrusion Switch**

Reference	Feature	Function
A	Power / Sleep Button	Toggles the system power on/off. This button also functions as a Sleep Button if enabled by an ACPI-compliant operating system.
B	ID Button	Toggles the front panel ID LED and the baseboard ID LED on/off. The baseboard ID LED is visible through the rear of the chassis and allows you to locate the server you're working on from behind a rack of servers.
C	Reset Button	Reboots and initializes the system.
D	NMI Button	Pressing the recessed button with a paper clip or pin puts the server in a halt state for diagnostic purposes and allows you to issue a non-maskable interrupt. After issuing the interrupt, a memory download can be performed to determine the cause of the problem.

### 3-3 Control Panel LED indicators

The control panel houses six LEDs, which are viewable with or without the front bezel to display the system's operating state.



**Figure 3-5. Control Panel LED indicators**

The following table identifies each LED and describes their functionality.

**Table 3-2. Control Panel LED Functions**

LED	Color	State	Description
NIC1 / NIC2 Activity	Green	On	NIC Link
	Green	Blink	NIC Activity
Power / Sleep (on standby power)	Green	On	Legacy power on / ACPI S0 state
		Blink <sup>1,4</sup>	Sleep / ACPI S1 state
	Off	Off	Power Off / ACPI S4 or S5 state
System Status (on standby power)	Green/Amber	Alternating Blink	Pre DC Power On – 15-20 second BMC Initialization
		On	Running / normal operation
	Amber	Blink <sup>1,2</sup>	Degraded
		On	Critical or non-recoverable condition.
	Off	Off	POST / system stop.
Disk Activity	Green	Random blink	Provides an indicator for disk activity.
	Off	Off <sup>3</sup>	No hard disk activity
System Identification	Blue	On	Identify active via command or button.
	Off	Off	No Identification.

**Notes:**

1. Blink rate is ~1 Hz with at 50% duty cycle.
2. The amber status takes precedence over the green status. When the amber LED is on or blinking, the green LED is off.
3. Also off when the system is powered off (S4/S5) or in a sleep state (S1).
4. The power LED sleep indication is maintained on standby by the chipset. If the system is powered down without going through BIOS, the LED state in effect at the time of power off will be restored when the system is powered on until the BIOS clears it. If the system is not powered down normally, it is possible that the Power LED will be blinking at the same time that the system status LED is off due to a failure or configuration change that prevents the BIOS from running.

The current limiting resistors for the power LED, the system fault LED, and the NIC LEDs are located on the R421-E1 main board.

## Power/Sleep LED

**Table 3-3. SSI Power LED Operation**

State	Power Mode	LED	Description
Power Off	Non-ACPI	Off	System power is off, and the BIOS has not initialized the chipset.
Power On	Non-ACPI	On	System power is on, but the BIOS has not yet initialized the chipset.
S5	ACPI	Off	Mechanical is off, and the operating system has not saved any context to the hard disk.
S4	ACPI	Off	Mechanical is off. The operating system has saved context to the hard disk.
S3-S1	ACPI	Slow blink 1	DC power is still on. The operating system has saved context and gone into a level of low-power state.
S0	ACPI	Steady on	System and the operating system are up and running.

**Note:** Blink rate is ~ 1Hz with at 50% duty cycle.

## System Status LED

**Table 3-4. Control Panel LED Operation**

Color	State	Criticality	Description
Off	N/A	Not ready	AC power off
Green/ Amber		Not ready	Pre DC Power On – 15-20 second BMC Initialization when AC is applied to the server. Control Panel buttons are disabled until BMC initialization is complete.
Green	Solid on	Ok	System booted and ready
Green	Blink	Degraded	<p>System degraded</p> <ul style="list-style-type: none"> <li>• Unable to use all of the installed memory (more than one DIMM installed).</li> <li>• Correctable errors over a threshold of 10 and migrating to a spare DIMM (memory sparing). This indicates that the user no longer has spared DIMMs indicating a redundancy lost condition. Corresponding DIMM LED should light up.</li> <li>• In mirrored configuration, when memory mirroring takes place and system loses memory redundancy. This is not covered by (2).</li> <li>• Redundancy loss such as power-supply or fan. This does not apply to non-redundant sub-systems.</li> <li>• PCIe* link errors</li> <li>• CPU failure / disabled – if there are two processors and one of them fails</li> <li>• Fan alarm – Fan failure. Number of operational fans should be more than minimum number needed to cool the system</li> <li>• Non-critical threshold crossed – Temperature and voltage</li> </ul>
Amber	Blink	Non-critical	<p>Non-fatal alarm – system is likely to fail</p> <ul style="list-style-type: none"> <li>• Critical voltage threshold crossed</li> <li>• VRD hot asserted</li> <li>• Minimum number of fans to cool the system not present or failed</li> <li>• In non-sparing and non-mirroring mode if the threshold of ten correctable errors is crossed within the window</li> </ul>

Color	State	Criticality	Description
Amber	Solid on	Critical, non-recoverable	<p>Fatal alarm – system has failed or shutdown</p> <ul style="list-style-type: none"><li>• DIMM failure when there is one DIMM present, no good memory present</li><li>• Run-time memory uncorrectable error in non-redundant mode</li><li>• IERR signal asserted</li><li>• Processor 1 missing</li><li>• Temperature (CPU ThermTrip, memory TempHi, critical threshold crossed)</li><li>• No power good – power fault</li><li>• Processor configuration error (for instance, processor stepping mismatch)</li></ul>

### Drive Activity LED

The drive activity LED on the control panel indicates drive activity from the onboard hard disk controllers.

### System Identification LED

The blue system identification LED is used to help identify a system for servicing. This is especially useful when the system is installed in a high density rack or cabinet that is populated with several similar systems.

The blue “System ID” LED can be illuminated using either of two mechanisms.

- By pressing the system ID button on the system control panel the ID LED will display a solid blue color, until the button is pressed again.
- By issuing the appropriate hex IPMI “Chassis Identify” value, the ID LED will either blink blue for 15 seconds and turn off or will blink indefinitely until the appropriate hex IPMI Chassis Identify value is issued to turn it off.

## Chapter 4. System Safety

### 4-1 Electrical Safety Precautions



Basic electrical safety precautions should be followed to protect yourself from harm and the NovaScale R421-E1 from damage:

- Be aware of the locations of the power on/off switch on the chassis as well as the room's emergency power-off switch, disconnection switch or electrical outlet. If an electrical accident occurs, you can then quickly remove power from the system.
- Do not work alone when working with high voltage components.
- Power should always be disconnected from the system when removing or installing main system components, such as the serverboard, memory modules and floppy drive. When disconnecting power, you should first power down the system with the operating system first and then unplug the power cords of all the power supply units in the system.
- When working around exposed electrical circuits, another person who is familiar with the power-off controls should be nearby to switch off the power if necessary.
- Use only one hand when working with powered-on electrical equipment. This is to avoid making a complete circuit, which will cause electrical shock. Use extreme caution when using metal tools, which can easily damage any electrical components or circuit boards they come into contact with.
- Do not use mats designed to decrease static electrical discharge as protection from electrical shock. Instead, use rubber mats that have been specifically designed as electrical insulators.
- The power supply power cords must include a grounding plug and must be plugged into grounded electrical outlets.

- Serverboard Battery: **CAUTION** - There is a danger of explosion if the onboard battery is installed upside down, which will reverse its polarities (see Figure 4-1). This battery must be replaced only with the same or an equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.
- Mainboard replaceable soldered-in fuses: Self-resetting PTC (Positive Temperature Coefficient) fuses on the mainboard must be replaced by trained service technicians only. The new fuse must be the same or equivalent as the one replaced. Contact technical support for details and support.

## 4-2 General Safety Precautions



Follow these rules to ensure general safety:

- Keep the area around the NovaScale R421-E1 clean and free of clutter.
- The NovaScale R421-E1 weighs approximately 40 lbs (~18.2 kg) when fully loaded. When lifting the system, two people at either end should lift slowly with their feet spread out to distribute the weight. Always keep your back straight and lift with your legs.
- Place the chassis top cover and any system components that have been removed away from the system or on a table so that they won't accidentally be stepped on.
- While working on the system, do not wear loose clothing such as neckties and unbuttoned shirt sleeves, which can come into contact with electrical circuits or be pulled into a cooling fan.
- Remove any jewelry or metal objects from your body, which are excellent metal conductors that can create short circuits and harm you if they come into contact with printed circuit boards or areas where power is present.
- After accessing the inside of the system, close the system back up and secure it to the rack unit with the retention screws after ensuring that all connections have been made.

### 4-3 ESD Precautions



Electrostatic discharge (ESD) is generated by two objects with different electrical charges coming into contact with each other. An electrical discharge is created to neutralize this difference, which can damage electronic components and printed circuit boards. The following measures are generally sufficient to neutralize this difference before contact is made to protect your equipment from ESD:

- Use a grounded wrist strap designed to prevent static discharge.
- Keep all components and printed circuit boards (PCBs) in their antistatic bags until ready for use.
- Touch a grounded metal object before removing the board from the antistatic bag.
- Do not let components or PCBs come into contact with your clothing, which may retain a charge even if you are wearing a wrist strap.
- Handle a board by its edges only; do not touch its components, peripheral chips, memory modules or contacts.
- When handling chips or modules, avoid touching their pins.
- Put the serverboard and peripherals back into their antistatic bags when not in use.
- For grounding purposes, make sure your computer chassis provides excellent conductivity between the power supply, the case, the mounting fasteners and the serverboard.

## 4-4 Operating Precautions



Care must be taken to assure that the chassis cover is in place when the NovaScale R421-E1 is operating to assure proper cooling. Out of warranty damage to the system can occur if this practice is not strictly followed.

## 4-5 Replacing the Backup Battery

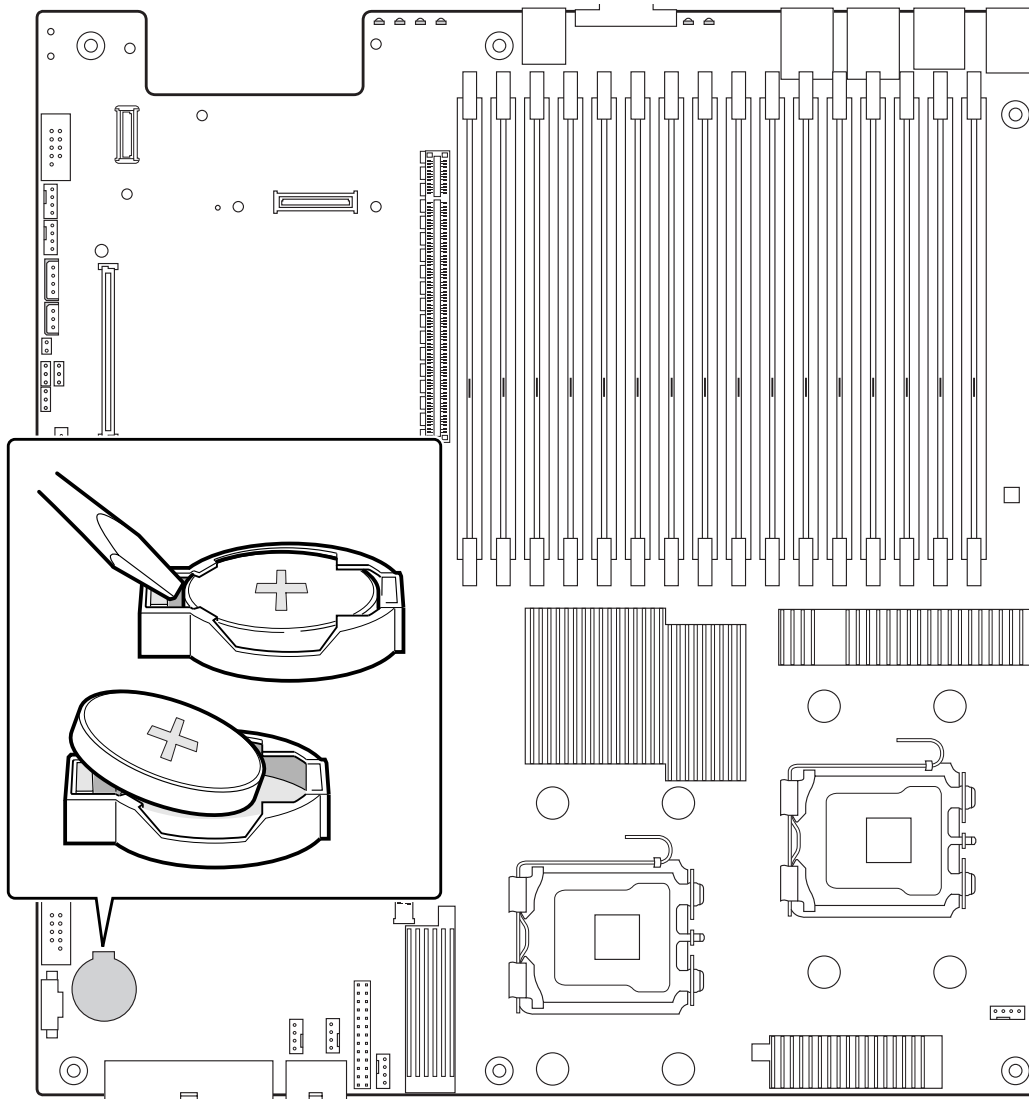
The lithium battery on the server board powers the RTC for up to 10 years in the absence of power. When the battery starts to weaken, it loses voltage, and the server settings stored in CMOS RAM in the RTC (for example, the date and time) may be wrong. Contact your customer service representative or dealer for a list of approved devices.

---

***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.***

---

1. Locate the battery and insert the tip of a small flat bladed screwdriver, or an equivalent, under the tab in the plastic retainer. Gently push down on the screwdriver to lift the battery.
2. Remove the battery from its socket.



**Figure 4-1. Replacing the Backup Battery**

3. Dispose of the battery according to local ordinance.
4. Remove the new lithium battery from its package, and, being careful to observe the correct polarity, insert it in the battery socket.

---

**Note:** You will need to run BIOS Setup to restore the system configuration settings to the RTC.

---



## Chapter 5. Advanced Serverboard Setup

This chapter covers the steps required to install the NovaScale R421-E1 serverboard into the chassis, connect the data and power cables and install add-on cards. All serverboard jumpers and connections are also described. A layout and quick reference chart are included in this chapter for your reference. Remember to completely close the chassis when you have finished working with the serverboard to better cool and protect the system.

### 5-1 Handling the Serverboard

Electrostatic discharge (ESD) can damage electronic components. To prevent damage to any printed circuit boards (PCBs), it is important to handle them very carefully (see previous chapter). To prevent the serverboard from bending, keep one hand under the center of the board to support it when handling. The following measures are generally sufficient to protect your equipment from electric static discharge.

#### Precautions

- Use a grounded wrist strap designed to prevent Electrostatic Discharge (ESD).
- Touch a grounded metal object before removing any board from its antistatic bag.
- Handle a board by its edges only; do not touch its components, peripheral chips, memory modules or gold contacts.
- When handling chips or modules, avoid touching their pins.
- Put the serverboard, add-on cards and peripherals back into their antistatic bags when not in use.
- For grounding purposes, make sure your computer chassis provides excellent conductivity between the power supply, the case, the mounting fasteners and the serverboard.

## Unpacking

The serverboard is shipped in antistatic packaging to avoid electrostatic discharge. When unpacking the board, make sure the person handling it is static protected.

## 5-2 Serverboard Installation

This section explains the first step of physically mounting the serverboard into the chassis. Following the steps in the order given will eliminate the most common problems encountered in such an installation. To remove the serverboard, follow the procedure in reverse order.

### Accessing the Inside of the System

1. Remove all four screws securing the top cover of the chassis: two at the top rear of the cover and one on each side lip, also near the back.
2. Place both thumbs in the indentations and push the cover back until it slides off.
3. Lift the top cover from the chassis to gain full access to the inside of the server. (If already installed in a rack, you must first release the retention screws that secure the unit to the rack, then grasp the two handles on either side and pull the unit straight out until the rails lock into place.)

### Check Compatibility of Serverboard Ports and I/O Shield

Make sure that the I/O ports on the serverboards align properly with their respective holes in the I/O shield at the back of the chassis when installing.

### Mounting the Serverboard onto the Serverboard Tray

1. Carefully mount the serverboards by aligning the board holes with the raised metal standoffs that are visible in the chassis.
2. Insert screws into all the mounting holes on your serverboards that line up with the standoffs and tighten until snug (if you screw them in too tight, you might strip the threads).
3. Metal screws provide an electrical contact to the serverboard ground to provide a continuous ground for the system.

## 5-3 Connecting Cables

When you add or remove components from your server system, make sure your cables are routed correctly before reinstalling the server system cover. Use caution to make sure no cables or wires are pinched and that the airflow from the fans is not blocked. Use the figures below to determine the correct cable routing for a hot-swap drive system.

- |  |                                       |
|--|---------------------------------------|
| (A) Intel® Remote Management Module (optional) | (G) Power to Server Board (Aux. - P4) |
| (B) Intel® RMM NIC Module (optional)           | (H) Power to Server Board (Main - P1) |
| (C) I/O Module (optional)                      | (I) Power to Server Board (CPU - P2)  |
| (D) Power Supply                               | (J) Power to Backplane Board (P3)     |
| (E) Bridge Board                               | (K) Control Panel USB                 |
| (F) Backplane Board (passive shown)            | (L) Control Panel Data                |
|  | (M) Fan Power Cables                  |

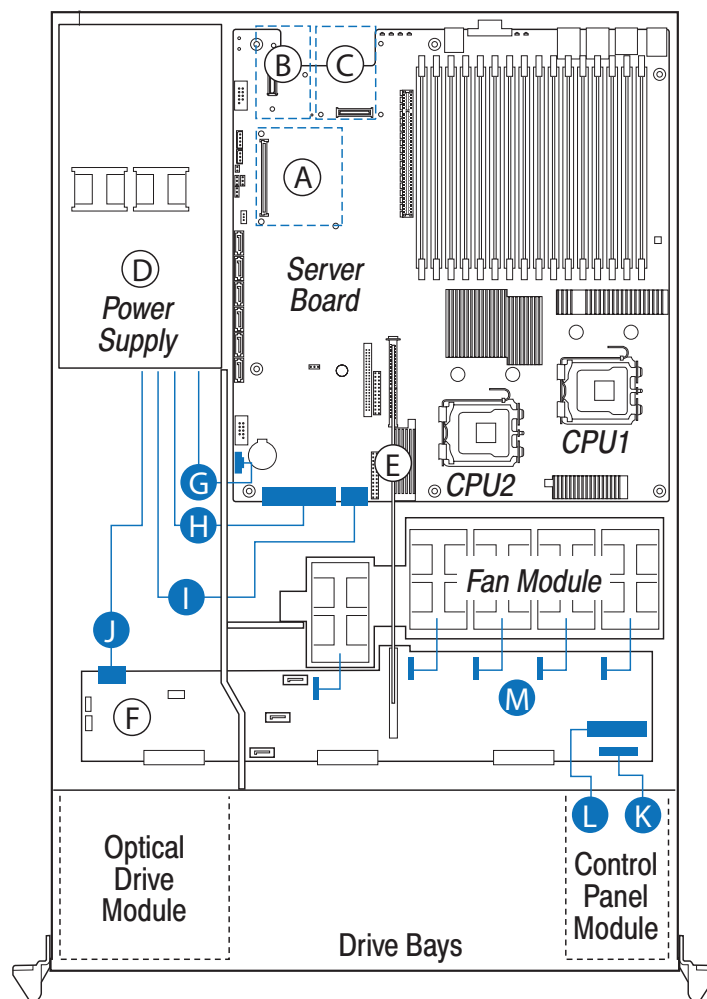


Figure 5-1. Cable Routing for Hot-Swap Drive System

When you add or remove components from your server system, make sure your cables are routed correctly before reinstalling the server system cover. Use caution to make sure no cables or wires are pinched and that the airflow from the fans is not blocked. Use the figures below to determine the correct cable routing for a fixed drive system.

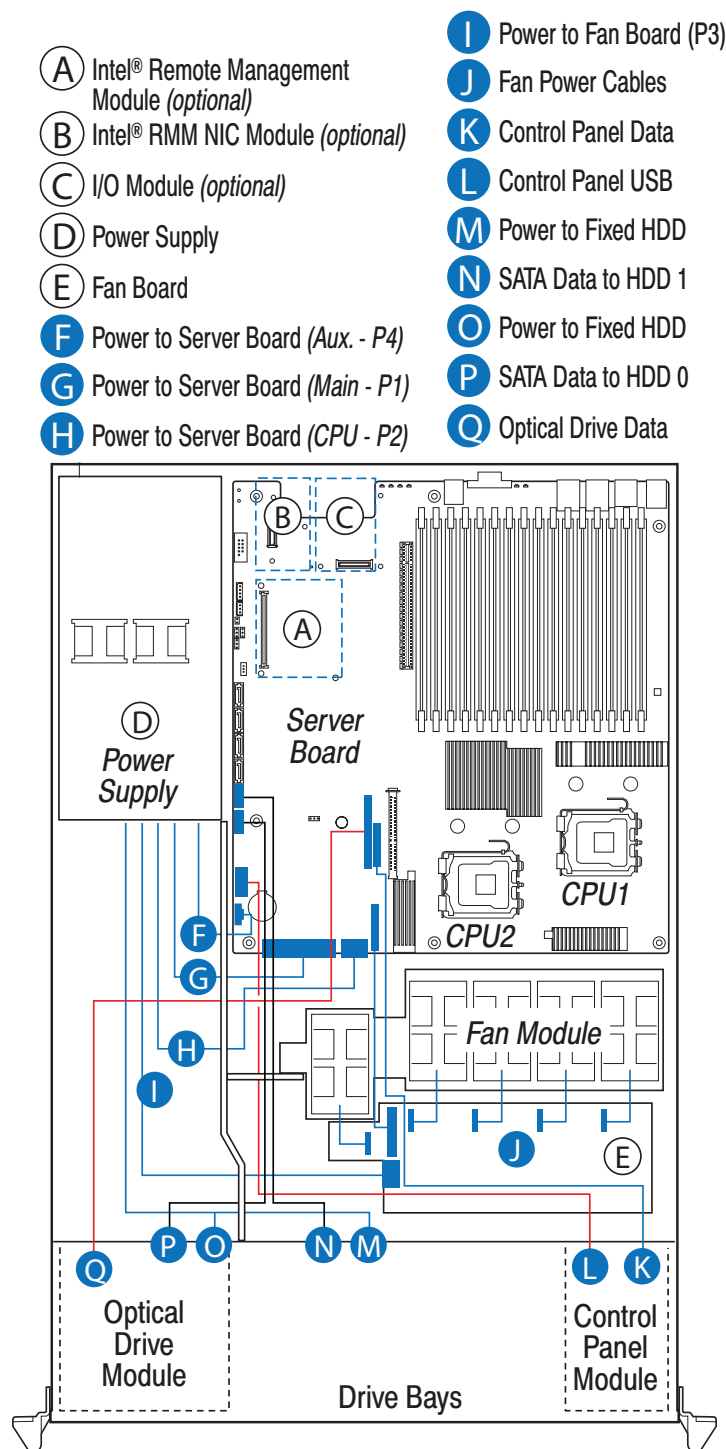
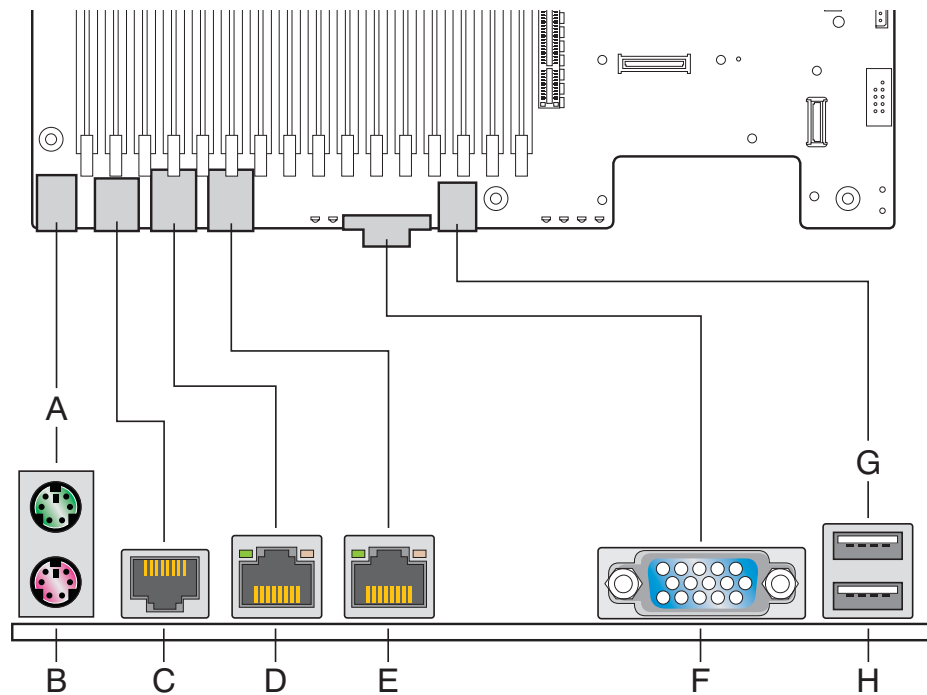


Figure 5-2. Cable Routing for Fixed Drive System

## 5-4 I/O Ports



A) Mouse	B) Keyboard
C) Serial Port (RJ45)	D) NIC 1 (10/100/1000 Mb)
E) NIC 2 (10/100/1000 Mb)	F) Video
G) USB Port 6	H) USB Port 5

The NIC LEDs at the right and left of each NIC provide the following information:

**Table 5-1. NIC LED descriptions**

LED	LED State	Description
Left	Off	No network connection
	Solid Amber	Network connection in place
	Blinking Amber	Transmit/receive activity
Right	Off	10 Mbps connection (if left LED is on or blinking)
	Solid Amber	100 Mbps connection
	Solid Green	1000 Mbps connection

## 5-5 Processor and Heat Sink Installation

---

**Caution: Processor must be appropriate:** You may damage the server board if you install a processor that is inappropriate for your server.

---

**Caution: ESD and handling processors:** Reduce the risk of electrostatic discharge (ESD) damage to the processor by doing the following: (1) Touch the metal chassis before touching the processor or server board. Keep part of your body in contact with the metal chassis to dissipate the static charge while handling the processor. (2) Avoid moving around unnecessarily.

---

### Installing the Processor

1. Locate the processor socket and raise the socket handle completely.

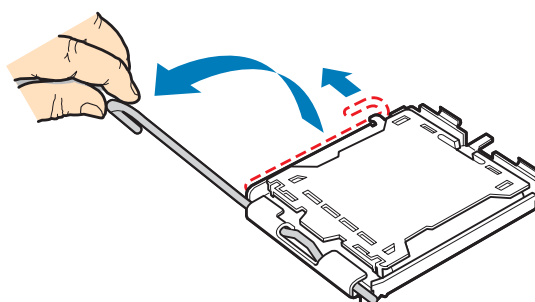


Figure 5-3. Lifting the Processor Socket Handle

2. Raise the CPU load plate.

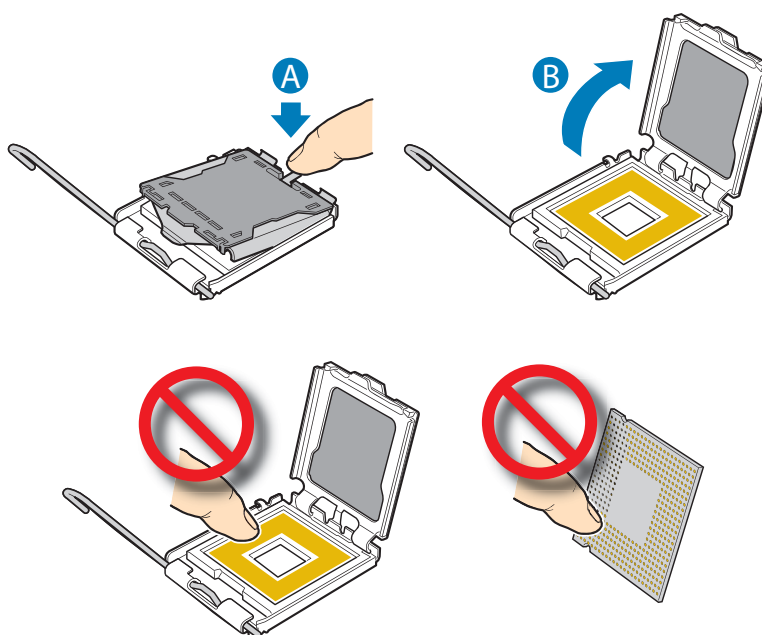


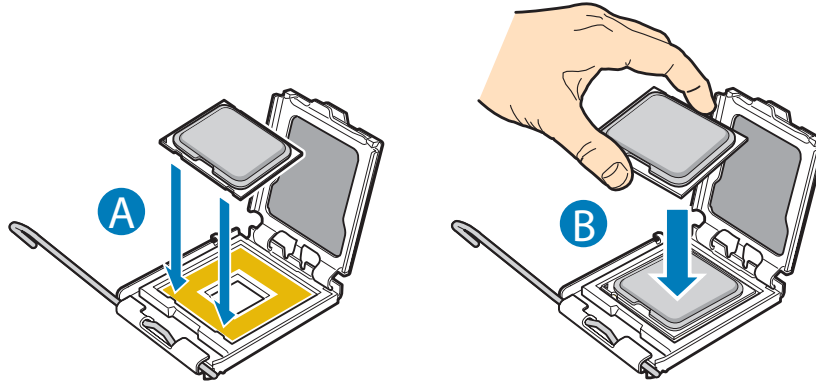
Figure 5-4. Installing the Processor

---

**Note:** Do not touch the socket pins; they are very sensitive and easily damaged

---

3. Line up the alignment marks on the processor and the socket, and insert the processor into the socket.



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**Note:** Make sure the alignment triangle mark and the alignment triangle cutout align correctly.

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4. Remove the protective socket cover.

---

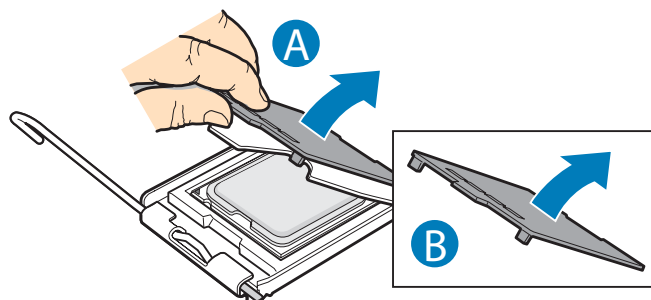
**Caution:** Protective socket cover needs to be removed for proper cooling of the processor; failure to remove the cover could result in damage to the system.

---

---

**Note:** Retain the protective socket cover for use when removing a processor that will not be replaced.

---



**Figure 5-5. Removing the Socket Cover**

5. Lower the CPU load plate and lower the socket lever completely.

## Removing a Processor

1. Loosen the four captive screws on the corners of the heat sink.
2. Twist the heat sink slightly to break the seal between the heat sink and the processor.
3. Lift the heat sink from the processor. If it does not pull up easily, twist the heat sink again. Do not force the heat sink from the processor. Doing so could damage the processor.
4. Lift the processor lever.
5. Raise the CPU load plate.
6. Remove the processor.

## Installing the Heat Sink

The heat sink has Thermal Interface Material (TIM) located on the bottom of it. Use caution when you unpack the heat sink so you do not damage the TIM.

---

**Note:** New unused heat sinks have adequate TIM on the bottom. If you are re-using a heat sink from replacing a processor, make sure there is adequate TIM present on the heat sink to support processor cooling.

---

1. Set the heat sink over the processor, lining up the four captive screws with the four posts surrounding the processor.
2. Loosely screw in the captive screws on the heat sink corners in a diagonal manner. Do not fully tighten one screw before tightening another.
3. Gradually and equally tighten each captive screw until each is firmly tightened.

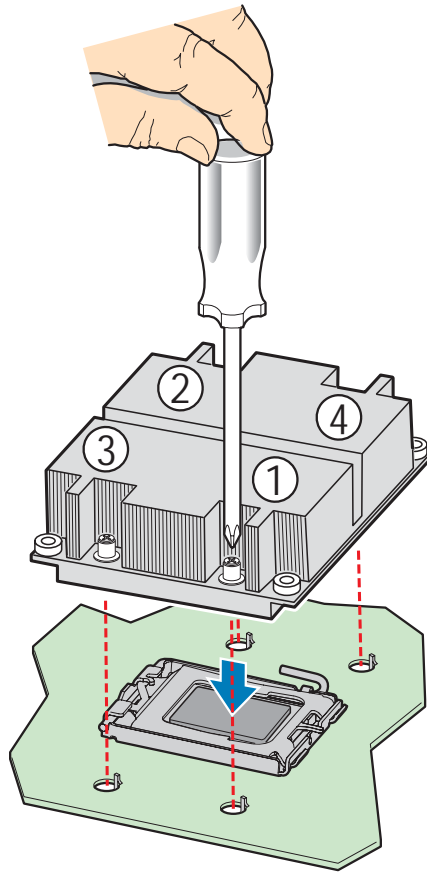


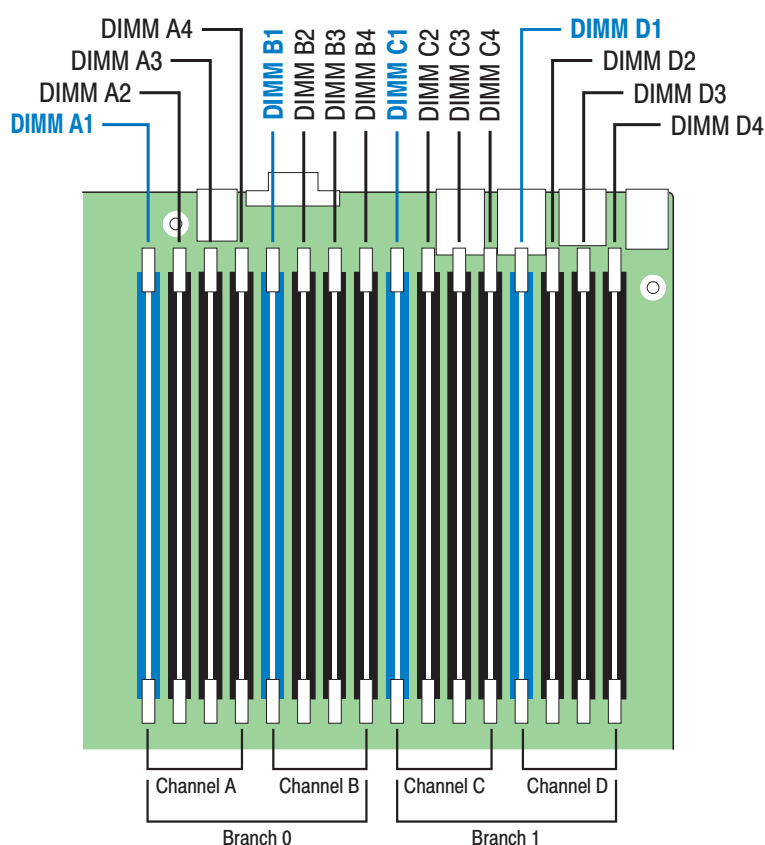
Figure 5-6. Installing the Heat Sink (1U Passive Heat sink Shown)

**Thermal Grease Reference: Shin-Etsu G751**

## 5-6 Installing Memory

The silkscreen on the board for the DIMMs displays DIMM A1, DIMM A2, DIMM A3, DIMM A4, DIMM B1, DIMM B2, DIMM B3, DIMM B4, DIMM C1, DIMM C2, DIMM C3, DIMM C4, DIMM D1, DIMM D2, DIMM D3, and DIMM D4, starting from the center of the board.

Figure 5-7 shows the supported DIMM configuration that is recommended because it allows both memory branches from the MCH to operate independently and simultaneously.



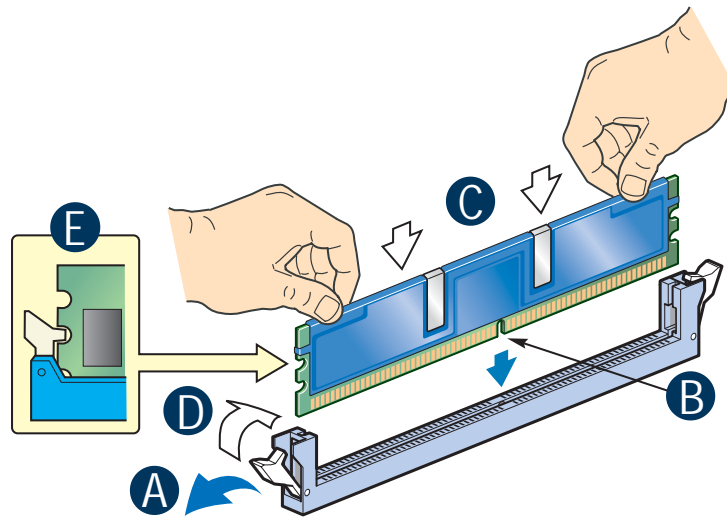
**Figure 5-7. Installing the Initial Four DIMMs**

**Note:** The initial four DIMMs installed must be populated in the blue slots: DIMM A1, DIMM B1, DIMM C1, and DIMM D1.

**Note:** Thermal requirement note: If x4 FBDIMMs are used, and the FBDIMMs do not have thermal sensors, you must install DIMM Blanks when installing less than 8 FBDIMMs. DIMM Blanks can be ordered through your preferred distributor.

## Installing DIMMs

1. Make sure the clips at either end of the DIMM socket(s) are pushed outward to the open position (see letter “A”).
2. Holding the DIMM by the edges, remove it from its anti-static package and position the DIMM above the socket. Align the notch on the bottom edge of the DIMM with the key in the DIMM socket. The arrow in the inset in Figure 22 is pointing to the key in the socket (see letter “B”).
3. Insert the bottom edge of the DIMM into the socket (see letter “C”).
4. When the DIMM is inserted, push down on the top edge of the DIMM until the retaining clips snap into place (see letter “D”).
5. Make sure the clips are firmly in place (see letter “E”).



**Figure 5-8. Installing the Memory**

## Removing DIMMs

Gently spread the retaining clips at each end of the socket. Holding the DIMM by the edges, lift it from the socket, and store it in an anti-static package.

## Supported Memory

The server board can support up to sixteen DDR2-667 or DDR2-800 Fully Buffered DIMMs (FBD memory). Using 4GB GB DIMMs, the maximum supported memory configuration will equal 64 GB of physical memory (validated).

---




**Note:** Fully populated, the NovaScale R421-E1 server board is capable of supporting up to a maximum of 128 GB of memory using 8 GB FBDIMMs. However, as of the writing of this document, 8 GB FBDIMMs have not been validated for use on this server board.

---

**Note:** DDR2 DIMMs that are not fully buffered are NOT supported on this server board.

## Dimm Population Rules and Supported DIMM Configurations

Intel supported DIMM population configurations for this server board are shown in the following table.

	Supported and Validated configuration : Slot is populated
	Supported but not validated configuration : Slot is populated
	Slot is not populated

Branch 0								Branch 1								Sparing Possible
Channel A				Channel B				Channel C				Channel D				
DIMM_A1	DIMM_A2	DIMM_A3	DIMM_A4	DIMM_B1	DIMM_B2	DIMM_B3	DIMM_B4	DIMM_C1	DIMM_C2	DIMM_C3	DIMM_C4	DIMM_D1	DIMM_D2	DIMM_D3	DIMM_D4	
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<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	No
<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	No
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### Notes:

- Single channel mode is only tested and supported with a 512MB x8 FBDIMM installed in DIMM Slot A1.
- The supported memory configurations must meet population rules defined below.
- For best performance, the number of DIMMs installed should be balanced across both memory branches. For Example: a four DIMM configuration will perform better than a two DIMM configuration and should be installed in DIMM Slots A1, B1, C1, and D1. An eight DIMM configuration will perform better than a six DIMM configuration.

- Although mixed DIMM capacities between channels is supported, Intel does not validate DIMMs in mixed DIMM configurations.

DIMM population rules for this server board are as follows:

- Within a branch, DIMMs must be populated in slot order starting with Slot 1 for each channel, followed by slot 2, then slot 3 and ending with slot 4.
- DIMMs must be populated in matching pairs across channels within a given branch. Therefore, when populating DIMM pairs, the population order would be as follows:

A1 & B1; C1 & D1; A2 & B2; C2 & D2; A3 & B3; C3 & D3; A4 & B4; C4 & D4

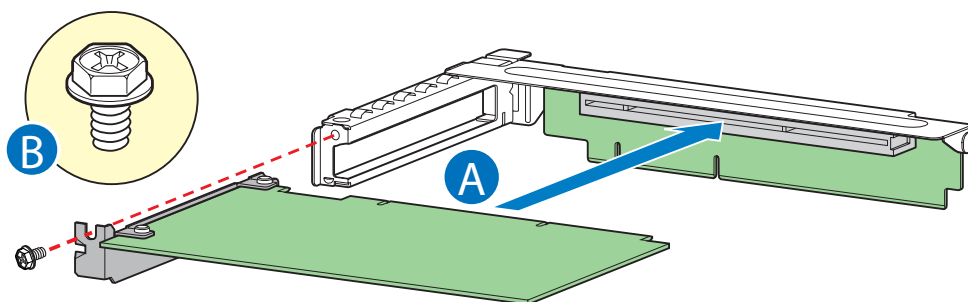
- DIMMs that makeup a given pair must match with respect to size, speed, and organization
- DIMM size from one DIMM pair to another can be different. However, speed and organization must be the same. For example: DIMM Pair A1 & B1 are populated with x8 1GB DDR2-667 DIMMs. DIMM Pair C1 and D1 can be populated with x8 2GB DDR2-667 DIMMs.

## 5-7 Adding PCI Cards

The instructions below describe how to install and remove a PCI add-in card.

### Installing a PCI Add-in Card

1. Remove the filler panel from the add-in card slot.
2. Insert add-in card until it seats in riser card connector (see letter “A”).
3. Screw the add-in card in place (see letter “B”).



**Figure 5-9. Installing a Full Height Add-in Card**

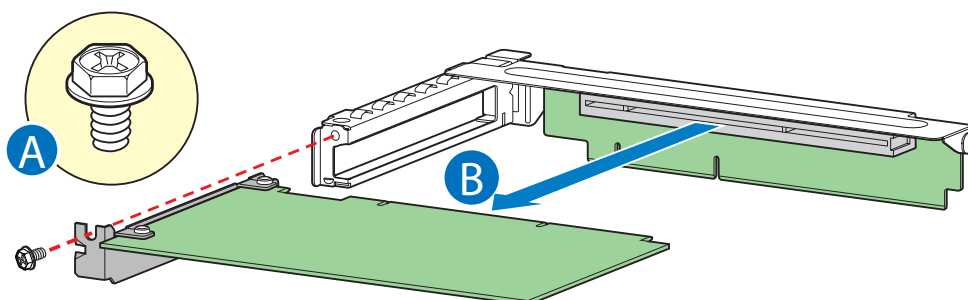
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**Note:** Make sure that all empty add-in card slots have filler panels installed.

---

### Removing a PCI Add-in Card

1. Remove the screw holding the add-in card in place (see letter “A”).
2. Remove the PCI add-in card from the riser card connector (see letter “B”).



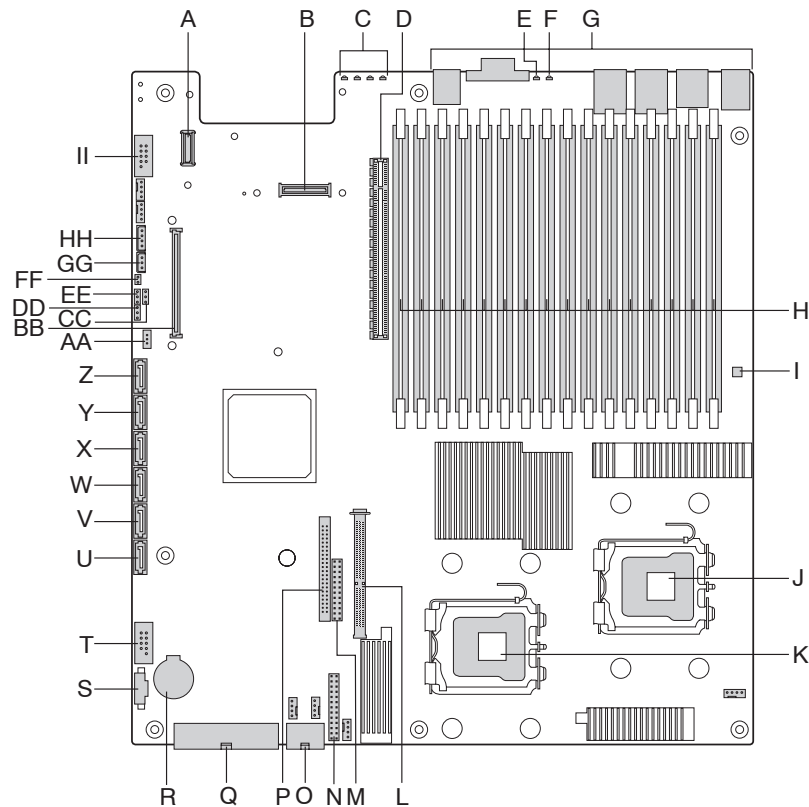
**Figure 5-10. Removing a Full Height Add-in Card**

---

**Note:** Make sure that all empty add-in card slots have filler panels installed.

---

## 5-8 Serverboard Details



A	Intel® RMM2 NIC Connector	B	IO Module Option Connector	C	POST Code Diagnostic LEDs
D	PCI Express* Riser Connector (x16 Gen2)	E	System Identification LED - Blue	F	Status LED - Green / Amber
G	External IO Connectors	H	FBDIMM Memory Sockets	I	Serial 'B' Port Configuration Jumper
J	Processor 1 Socket	K	Processor 2 Socket	L	Bridge Board Connector
M	SSI 24-pin Control Panel Header	N	Fan Board Connector	O	CPU Power Connector
P	ATA-100 Optical Drive Connector (Power+IO)	Q	Main Power Connector	R	Battery
S	Power Supply Management Connector	T	Dual Port USB 2.0 Header	U	SATA0
V	SATA1	W	SATA 2	X	SATA 3
Y	SATA 4	Z	SATA 5	AA	SATA SW RAID 5 Activation Key Connector
BB	Intel® Remote Management Module 2 2 Connector	CC	BMC FRU Update Jumper	DD	CMOS Clear Jumper
EE	Password Clear Jumper	FF	Chassis Intrusion Switch Header	GG	3-pin IPMB Header
HH	4-pin IPMB Header	II	Serial 'A' Header		

**Figure 5-11. Serverboard Connector and Component Location**

## 5-9 Connector Definitions

### Power Connector (Backplane to Power Supply Harness)

The backplane provides power to the three hard drive bays and the slim-line drive bay. An 8-pin power cable is routed from the power supply and plugs into a 2x4 shrouded plastic PC power connector on the backplane. The following table shows the power connector pin-out.

**Table 5-2. Backplane Power Connector Pin-out (J1B1)**

Pin	Name	Pin	Name
1	Ground	5	+12V
2	Ground	6	+12V
3	+5V	7	5VSB
4	+5V	8	+3.3V

### Control Panel USB Interface Connector (Backplane to Control Panel)

The backplanes provide a pathway for control panel USB signals from the bridge board connector to the control panel USB interface connector. The pin-out for the 10-pin control panel USB connector is shown in the following table.

**Table 5-3. 1x10 Pin Control Panel USB Connector Pin-out (J6B1)**

Pin#	Description
1	P5V_USB_P1
2	USB_P1N
3	USB_P1P
4	GROUND
5	GROUND
6	P5V_USB_P2
7	USB_P2N
8	USB_P2P
9	GROUND
10	GROUND

## Hot-Swap SATA/SAS Drive Connectors

The backplanes provide three hot-swap SATA/SAS connectors, which provide power and signals using a single docking connector. Each drive attaches to the backplane using one of these connectors.

**Table 5-4. SAS/SATA Hard Drive Connector Pin-out (J8N1, J6N1, J3N1)**

Pin#	Signal Description
SI	Ground
S2	SAS#_TX_DP (# = 0...2)
S3	SAS#_TX_DN (# = 0...2)
S4	Ground
S5	SAS#_RX_DN (# = 0...2)
S6	SAS#_RX_DP (# = 0...2)
S7	Ground
S8	Not Used
S9	Not Used
S10	Not Used
S11	Not Used
S12	Not Used
S13	Not Used
S14	Not Used
P1	Not Used
P2	Not Used
P3	Not Used
P4	Ground
P5	Ground
P6	P3V3
P7	P5V
P8	P5V
P9	P5V
P10	Ground
P11	LED_SAS#_ACT_L (# = 0...2)
P12	Ground
P13	P12V
P14	P12V
P15	P12V
PTH0	Ground
PTY1	Ground

## SATA/SAS Drive Control Connectors (Model 0 only)

The passive backplane includes three drive control connectors. These are used to attach SATA/SAS cables from the backplane to either the SATA ports on the server board, or to SAS/SATA ports from an add-in card. Each drive control connector has the following pin-out..

**Table 5-5. SAS/SATA Hard Drive Connector Pin-out (J3C1, J4B2, J4A1)**

Pin#	Description
1	GROUND
2	SATA # TX_DP (# = 0,1,2)
3	SATA # TX_DN (# = 0,1,2)
4	GROUND
5	SATA # RX_DN (# = 0,1,2)
6	SATA # RX_DP (# = 0,1,2)
7	GROUND

## USB Floppy Drive Connector

With a slim-line USB floppy drive installed (using the optional floppy drive kit) into either the slim-line drive bay or in one of the hard drive bays, the USB floppy cable is routed from the drive to a 4-pin connector on the backplane. The following table provides the pin-out for the floppy drive connector.

**Table 5-6. 4-pin Floppy Connector Pin-out (J2B1)**

Pin#	Name
1	P5V_USB_P3
2	USBP3N
3	USBP3P
4	GROUND

## System Fan Connectors

The backplanes provides a pathway for signals from the server board to monitor and control five system fans. A 1x10 mini connector is provided for each of the fans. The pin-out for each connector is provided in the following table.

**Table 5-7. SAS/SATA Hard Drive Connector Pin-out (J3C1, J4B2, J4A1)**

<b>J9A5 - FAN_1</b>		<b>J8A1- FAN_2</b>		<b>J7A1- FAN_3</b>	
<b>PIN</b>	<b>SIGNAL NAME</b>	<b>PIN</b>	<b>SIGNAL NAME</b>	<b>PIN</b>	<b>SIGNAL NAME</b>
1	FAN_TACH5	1	FAN_TACH6	1	FAN_TACH7
2	FAN_PWM_CPU1	2	FAN_PWM_CPU1	2	FAN_PWM_CPU2
3	P12V	3	P12V	3	P12V
4	P12V	4	P12V	4	P12V
5	FAN_TACH1_H7	5	FAN_TACH2_H7	5	FAN_TACH3_H7
6	GND	6	GND	6	GND
7	GND	7	GND	7	GND
8	FAN_PRSNT1_N	8	FAN_PRSNT2_N	8	FAN_PRSNT3_N
9	LED_FAN1_FAULT	9	LED_FAN2_FAULT	9	LED_FAN3_FAULT
10	LED_FAN1	10	LED_FAN2	10	LED_FAN3

<b>J6A1- FAN_4</b>		<b>J4B1- FAN_5</b>		
<b>PIN</b>	<b>SIGNAL NAME</b>	<b>PIN</b>	<b>SIGNAL NAME</b>	
1	FAN_TACH8	1	PCI_FAN_TACH10	
2	FAN_PWM_CPU2	2	FAN_PWM3	
3	P12V	3	P12V	
4	P12V	4	P12V	
5	FAN_TACH4_H7	5	FAN_TACH9	
6	GND	6	GND	
7	GND	7	GND	
8	FAN_PRSNT4_N	8	FAN_PRSNT5_N	
9	LED_FAN4_FAULT	9	LED_FAN5_FAULT	
10	LED_FAN4	10	LED_FAN5	

## System Management Connectors

The backplanes provide connectors to interface with system management buses. The following tables define the pin-out for each of these connectors.

**Table 5-8. IPMB Connector Pin-out (J1C1)**

Pin #	Description
1	SMB_IPMB_5VSB_DAT
2	GND
3	SMB_IPMB_5VSB_CLK
4	SMB_PWR_IPMB_CONN

**Table 5-9. Add-in Card Connector Pin-out (J4B3 – Passive Only)**

Pin #	Description
1	SMB_3V3_SAS_SDA
2	GND
3	SMB_3V3_SAS_SCL

## Serial Port

One serial port is included on the serverboard: COM1 is a port located near the back panel connector. See the following table for pin definitions.

**Table 5-10. Serial Port Pin Definition (COM1)**

Pin #	Definition	Pin #	Definition
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	Ground	10	NC

---

**Note:** NC indicates no connection.

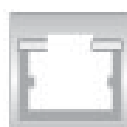
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## Ethernet NIC1, NIC2 Connectors

Two gigabit Ethernet ports (designated NIC1 and NIC2) are located near the back panel connector on the I/O backplane. These ports accept RJ45 type cables.

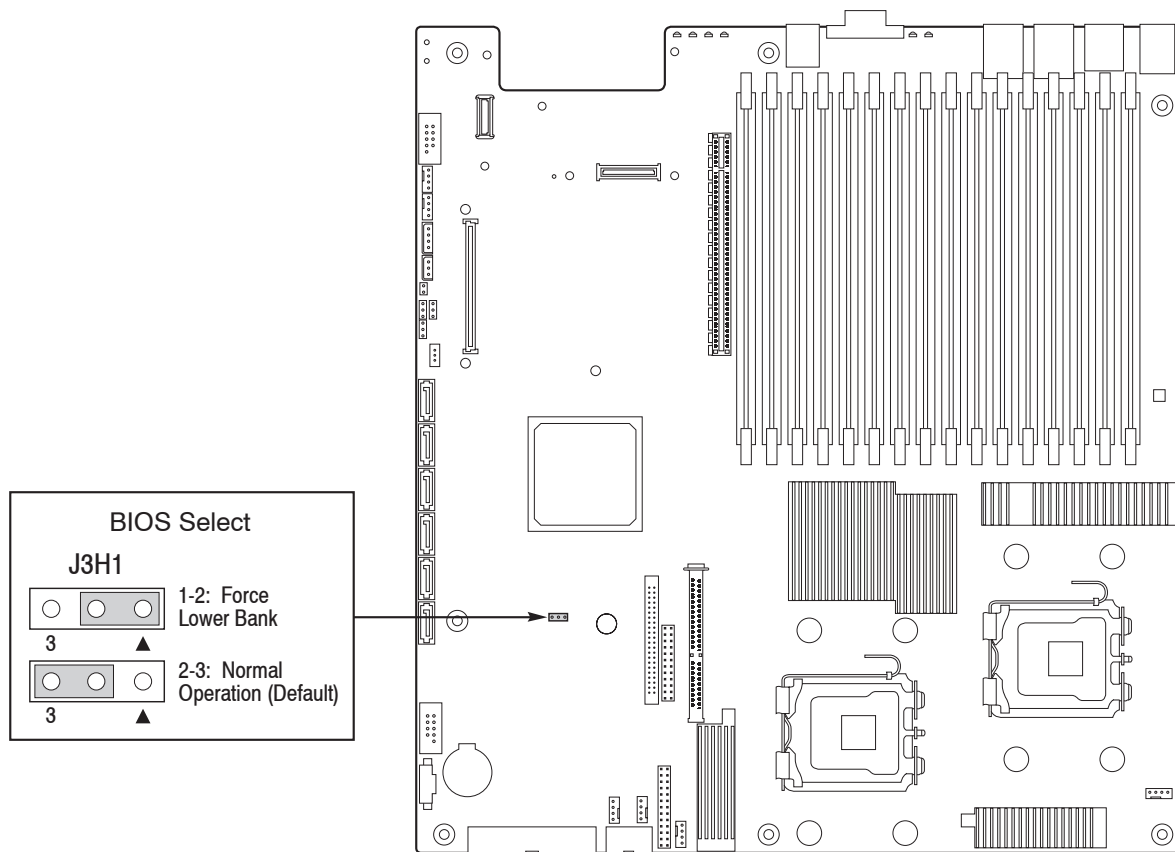


**NIC 1**



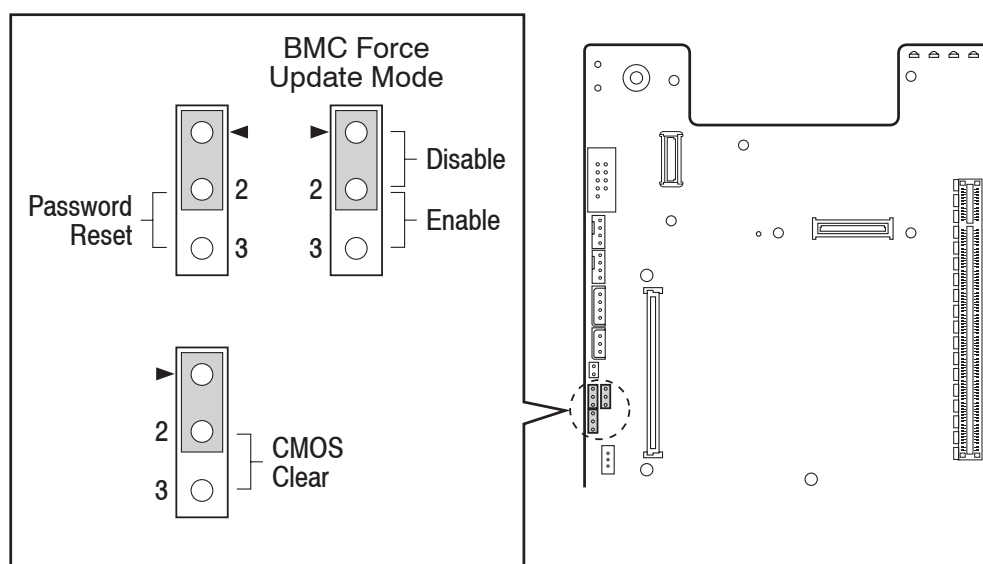
**NIC 2**

## 5-10 Jumper Settings



Jumper Name	Jumper Purpose
BIOS Select	If pins 1-2 are jumpered, the BIOS in the lower bank will be selected on the next reset. These pins should be jumpered on 2-3 for normal operation.

**Figure 5-11. BIOS Select Jumpers**



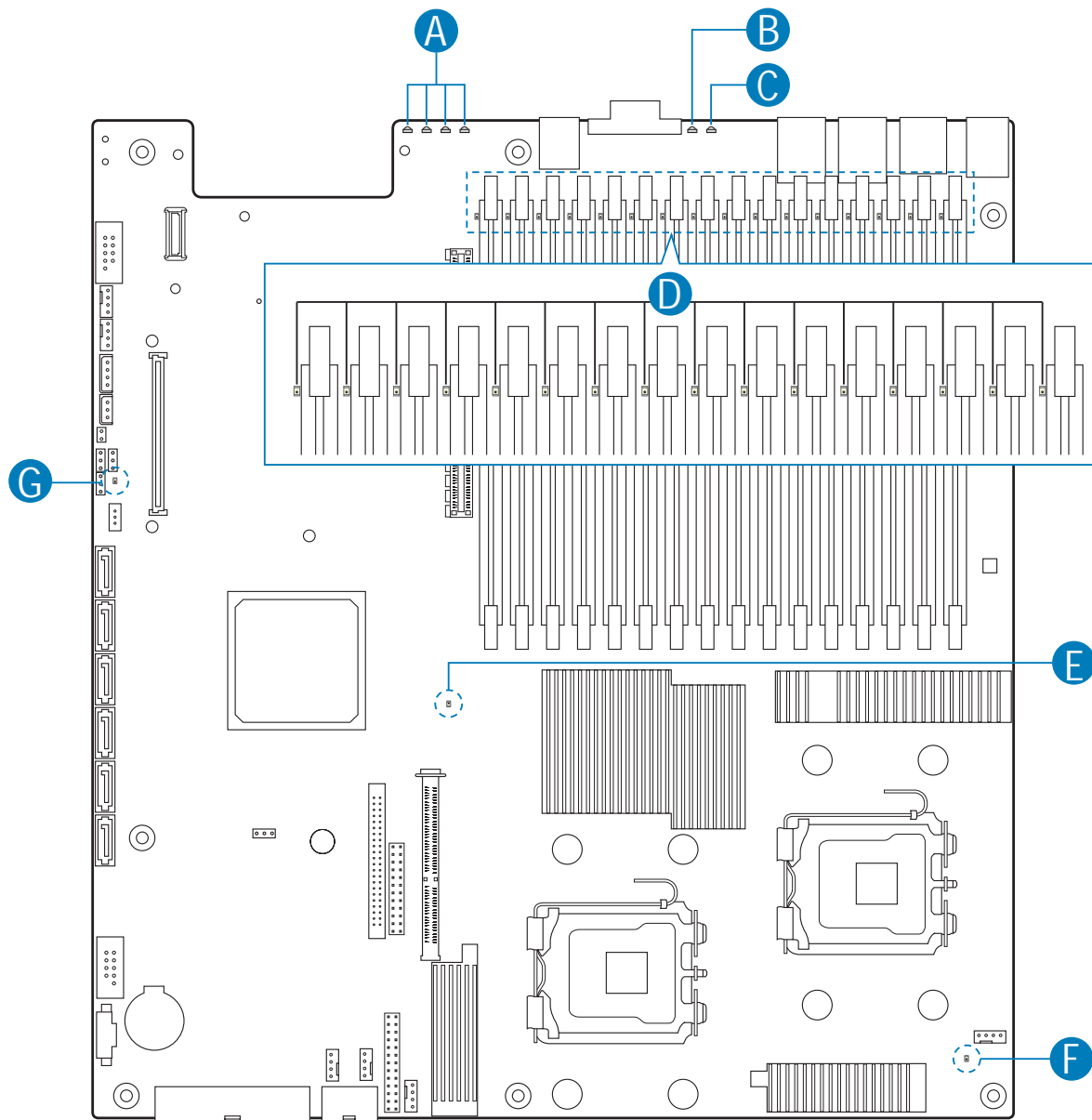
Jumper Name	Jumper Purpose
CMOS Clear	If pins 2-3 are jumpered, the CMOS settings will be cleared on the next reset. These pins should be jumpered on 1-2 for normal operation.
Password Clear	If pins 2-3 are jumpered, administrator and user passwords will be cleared on the next reset. These pins should be jumpered on 1-2 for normal operation.
BMC Force Up-date Mode	If pins 2-3 are jumpered, BMC Force Update Mode is enabled. These pins should be jumpered on 1-2 for normal operation.

**Figure 5-12. Recovery Jumpers**

## 5-11 Light Guided Diagnostics

The server board contains numerous LEDs providing the following functions:

- Fault LEDs help identify failed and failing components. The fault LEDs turn on (amber) if there is a memory or processor fault.
- The System Status LED that shows the over all health of the system (green, blinking green, blinking amber, amber).
- POST Code Diagnostic LEDs change color or state (off, green, red, amber) according to the POST sequence.
- The ID LED helps identify the server from among several servers. The ID LED is off by default, and blue when activated by button or software.
- The 5V-STBY LED is always illuminated (green) when AC power is applied.



POST Code Diagnostic LEDs	CPU 2 Fault LED
A ID LED	E CPU 1 Fault LED
B Status LED	F 5VSB LED
C Memory Fault LEDs	

Figure 5-13. Light Guided Diagnostic LEDs



## Chapter 6. Advanced Chassis Setup

This chapter covers the steps required to install components and perform maintenance on the NovaScale R421-E1 chassis. For component installation, follow the steps in the order given to eliminate the most common problems encountered. If some steps are unnecessary, skip ahead to the step that follows. The only tool you will need to install components and perform maintenance is a Philips screwdriver.

### 6-1 Devices

#### Static-Sensitive Devices

Electrostatic Discharge (ESD) can damage electronic components. To prevent damage to any printed circuit boards (PCBs), it is important to handle them very carefully. The following measures are generally sufficient to protect your equipment from ESD discharge.

##### Precautions

- Use a grounded wrist strap designed to prevent static discharge.
- Touch a grounded metal object before removing any board from its antistatic bag.
- Handle a board by its edges only; do not touch its components, peripheral chips, memory modules or gold contacts.
- When handling chips or modules, avoid touching their pins.
- Put the serverboard, add-on cards and peripherals back into their antistatic bags when not in use.
- For grounding purposes, make sure your computer chassis provides excellent conductivity between the power supply, the case, the mounting fasteners and the serverboard.

##### Unpacking

The serverboard is shipped in antistatic packaging to avoid static damage. When unpacking the board, make sure the person handling it is static protected.

Peripheral Devices

The server system provides locations and hardware for installing hard drives, a USB floppy drive, and an optical drive. The drives must be purchased separately. The following figure shows the available options.

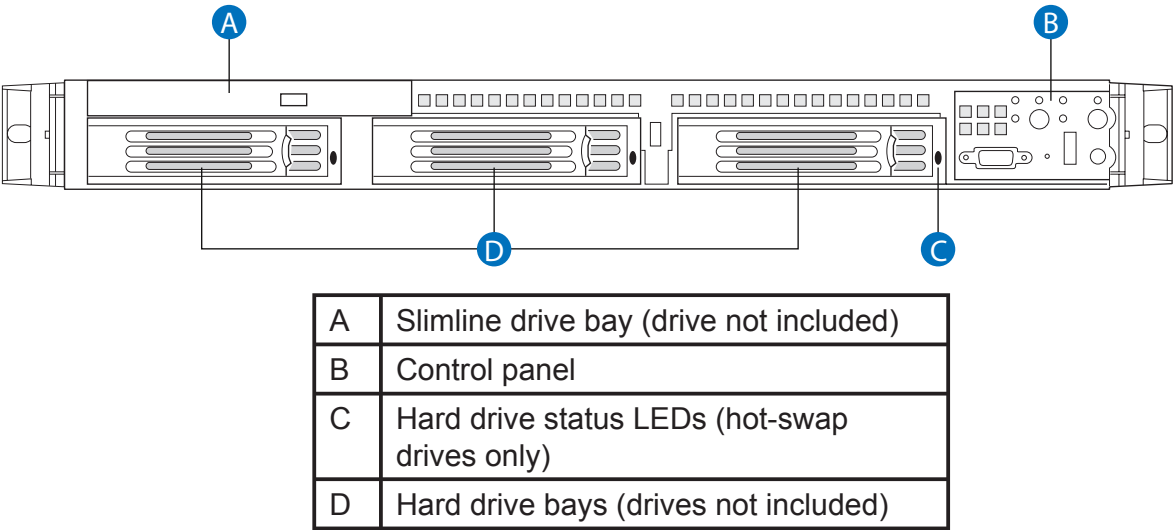


Figure 6-1. Optional Peripherals

Rear of Server System

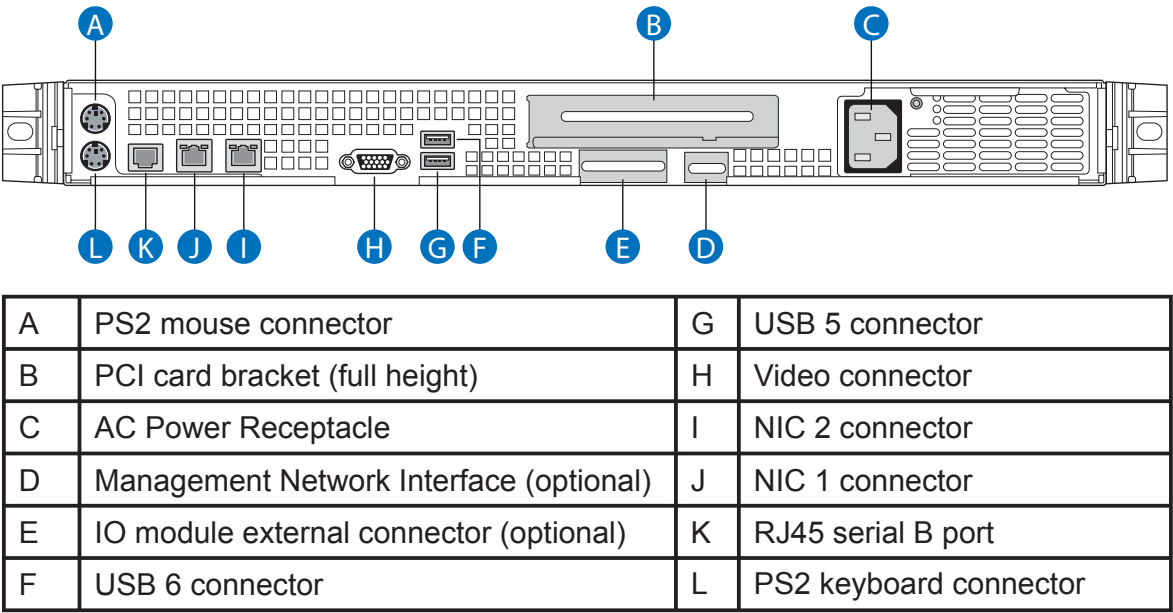


Figure 6-2. Server System Back

## 6-2 Control Panel

Each control panel on the front of the chassis must be connected to the JF1 connector on its associated serverboard to provide you with system control buttons and status indicators. (When viewed from the front of the chassis, the serverboard on the left is referred to as the primary serverboard and the serverboard on the right as the secondary.)

These wires have been bundled together in a ribbon cable to simplify the connection. Connect the cable from JF1 on the serverboard to the control panel PCB (printed circuit board). Make sure the red wire plugs into pin 1 on both connectors. Pull all excess cabling out of the airflow path. The LEDs inform you of system status for the serverboard it is connected to. See Chapter 3 for details on the LEDs and the control panel buttons.

Your server must be operated with a control panel installed.

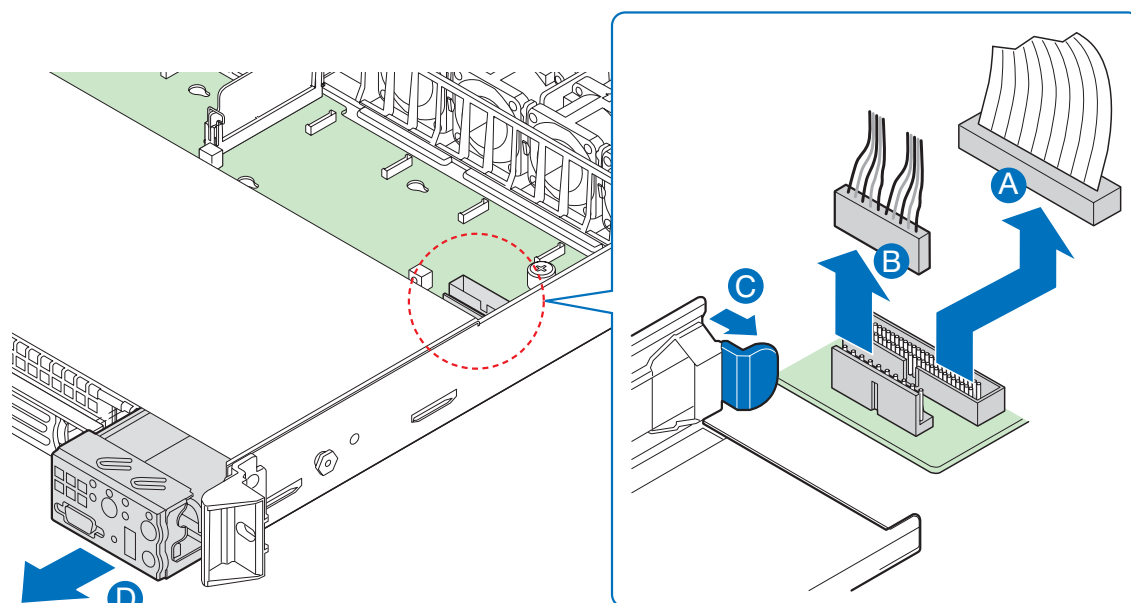
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***CAUTION: The control panel is NOT hot-swappable. Before removing or replacing the control panel, you must first take the server out of service, turn off all peripheral devices connected to the system, turn off the system by pressing the power button, and unplug the AC power cord from the system or wall outlet.***

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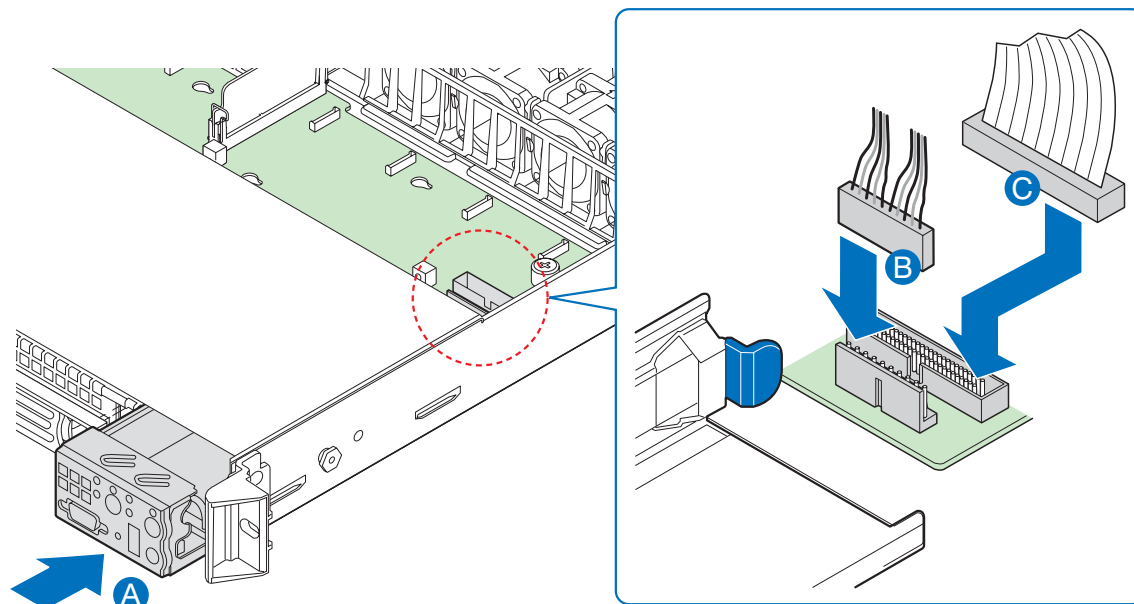
### Replacing the Control Panel Module in the Model 0 Option HS (Hot-swap Drive System)

1. Unplug the front panel and USB cables from the backplane (see letters “A” and “B”).
2. Press the latch at the back of the control panel (see letter “C”).



**Figure 6-3. Removing the Control Panel Module (Hot-swap Drive System)**

3. Slide the control panel out through the front of the server system (see letter “D”).
4. Slide the replacement control panel into the server system (see letter “A”) until it clicks into place.



**Figure 6-4. Installing the Control Panel Module into the Server System (Hot-swap Drive System)**

## Replacing the Control Panel Module in the Model 0 (Fixed Drive System)

1. Unplug the USB cable from the server board (see letter “A”).
2. Unplug the front panel cable from the server board (see letter “B”).
3. Remove the cables from the retaining clip on the fan board (see letter “C”).
4. Press the latch at the back of the control panel (see letter “D”).

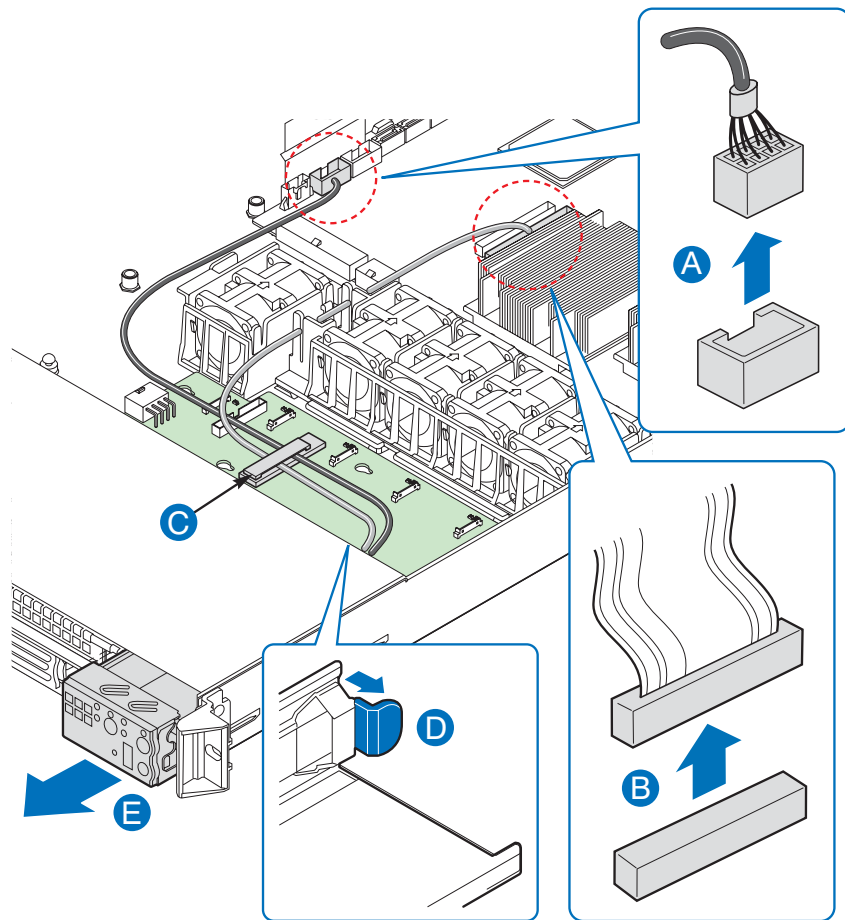
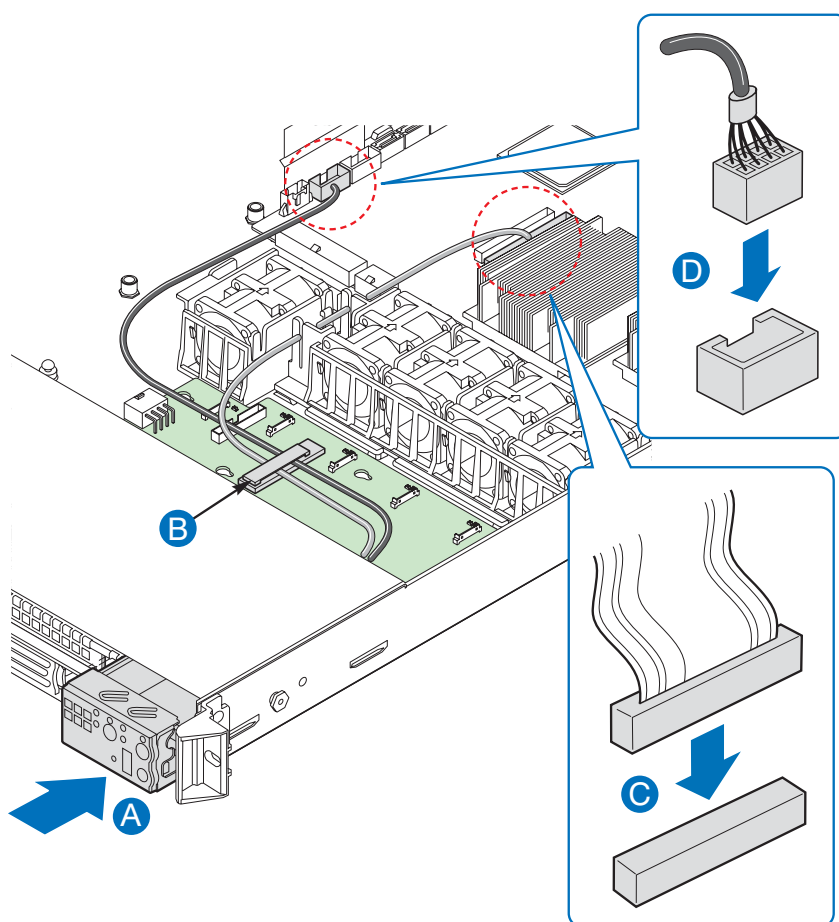


Figure 6-5. Removing the Control Panel Module (Fixed Drive System)

5. Slide the control panel out through the front of the server system (see letter “E”).
6. Slide the replacement control panel into the server system (see letter “A”) until it clicks into place.
7. Route the USB and front panel cables through the retaining clip on the fan board (see letter “B”).
8. Connect the front panel cable to the connector on the server board (see letter “C”).



**Figure 6-6. Installing the Control Panel Module into the Server System (Fixed Drive System)**

## 6-3 System Fans

Each serverboard has its own set of three 4-cm high-performance fans (for a total of six in the chassis) to provide the cooling for the NovaScale R421-E1. Fan speed may be controlled by a setting in BIOS (see Chapter 7).

### System Fan Failure

If a fan fails, the remaining fans will ramp up to full speed and the overheat/fan fail LED on the control panel will blink on and off. Replace any failed fan at your earliest convenience with the same type and model (the system can continue to run with a failed fan). Remove the top chassis cover while the system is still running to determine which of the fans has failed. Then power down the system before replacing a fan. Removing the power cord is also recommended as a safety precaution.

---

***CAUTION: The system fans operate at extremely fast speeds; the fans are NOT hot-swappable. Before removing or replacing a fan, you must first take the server out of service, turn off all peripheral devices connected to the system, turn off the system by pressing the power button, and unplug the AC power cord from the system or wall outlet.***

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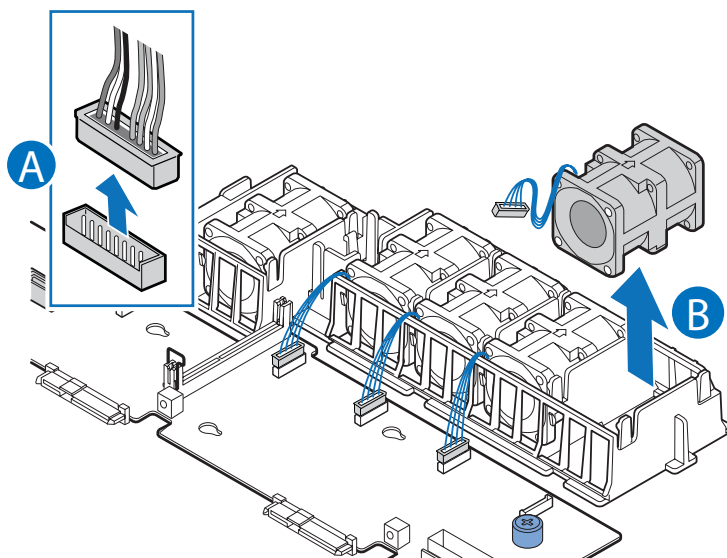
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Note: The fans that are integrated into the power supply cannot be replaced separately. If one of the fans in the power supply fails, the power supply must be replaced.

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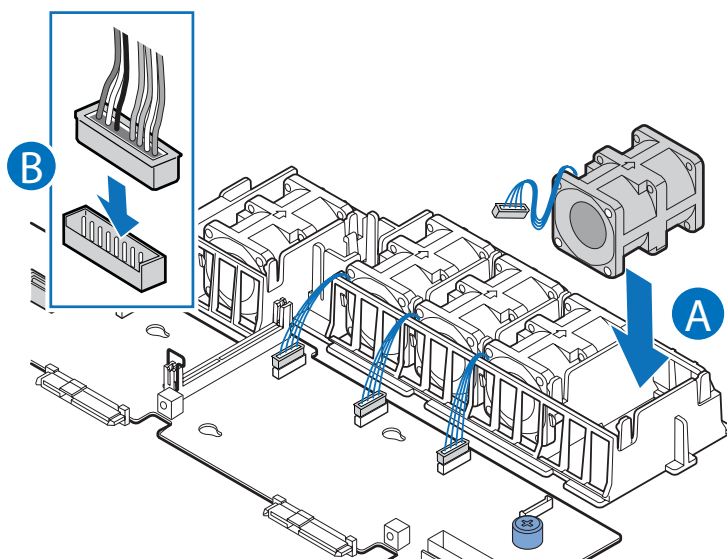
The system fans at the front of the NovaScale R421-E1 can be individually replaced if one of them fails. Use the steps below to replace a fan:

1. Disconnect the fan cable from the backplane or fan board (see letter “A”). Lift the failed fan from the module (see letter “B”).



**Figure 6-7. Removing a Fan from the Fan Module**

2. Position the replacement fan so the connector on the fan is at the right and pointing down.
3. With the fan oriented correctly, insert the fan into the fan module (see letter “A”), and insert the fan cable into the matching connector on the backplane or fan board (see letter “B”).



**Figure 6-8. Installing a Fan into the Fan Module**

## 6-4 Drive Bay Installation/Removal

### In the Model 0 Option HS (Hotswap Drives)

Up to three hot-swap SAS or SATA drives can be installed in the NovaScale R421-E1 Model 0 option HS.

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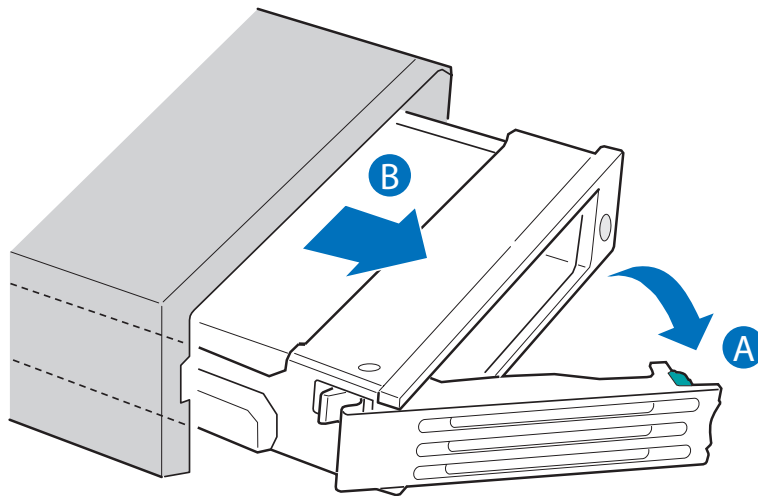
**CAUTION:** *If you install less than three drives or devices, the empty drive bays must be occupied by carriers with drive blanks to maintain proper system cooling.*

*To avoid possible damage to your server system, use only the drive carriers that came with your system.*

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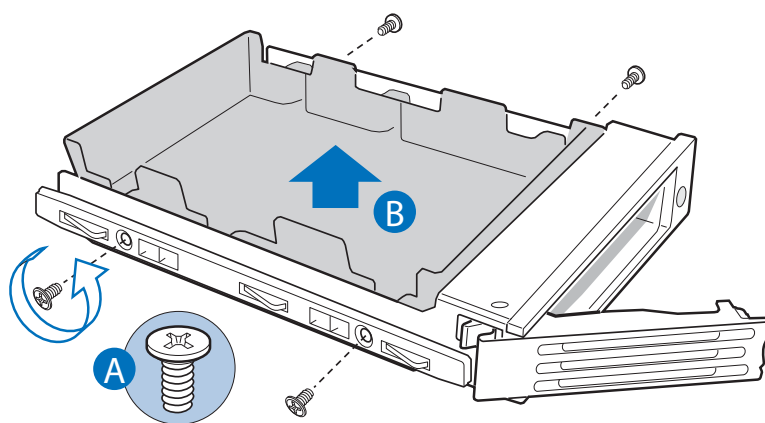
### Installing a SAS or SATA Hot-Swap Hard Disk Drive

1. Open the latch at the front of the hard drive carrier (see letter “A”).
2. Pull out on the black lever and slide the carrier from the server system (see letter “B”).



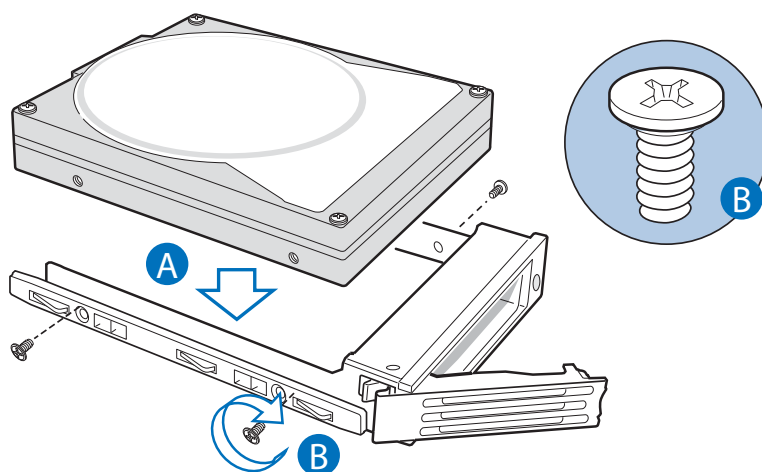
**Figure 6-9. Removing Hot-swap Disk Carrier from the Server System**

3. Remove the four screws that attach the plastic retention device or the previously installed hard drive to the drive carrier (see letter “A”). Two screws are at each side of the retention device or the hard drive. Remove the drive blank (see letter “B”) and store it for future use.



**Figure 6-10. Removing Drive Blank from Drive Carrier**

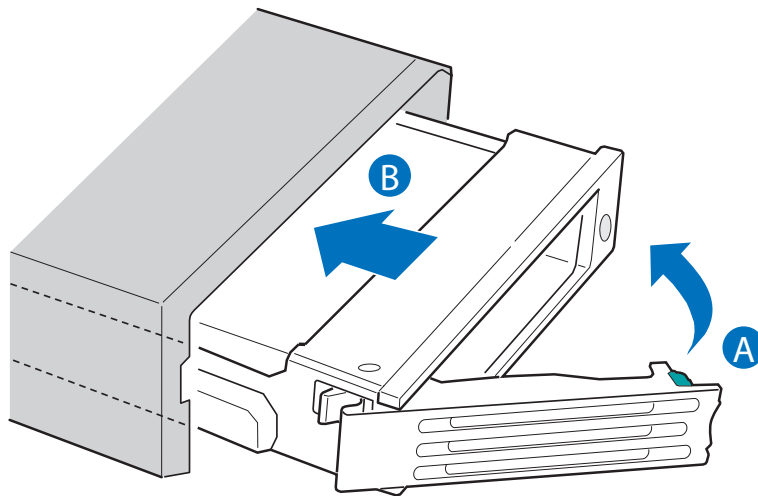
4. Remove the hard drive from its wrapper and place it on an antistatic surface.
5. Set any jumpers and/or switches on the drive according to the drive manufacturer's instructions.
6. With the drive circuit-side down, position the connector end of the drive so that it is facing the rear of the drive carrier.
7. Align the holes in the drive to the holes in the drive carrier and attach it to the carrier with the screws that were attached to the drive blank.



**Figure 6-11. Installing Hard Drive into Carrier**

8. With the black lever in the fully open position, slide the drive assembly into the server system. The green latch at the front of the drive carrier must be to the right. Do not push on the black drive carrier lever until the lever begins to close by itself.

9. When the black drive carrier lever begins to close by itself, push on it to lock the drive assembly into place.



**Figure 6-12. Install Drive Assembly into the Server System**

### Removing a SAS or SATA Hot-Swap Hard Disk Drive

1. Press in on the green latch at the front of the hard drive carrier, and pull out on the black lever to slide the carrier from the server system.
2. Remove the four screws that attach the hard drive to the drive carrier. Lift the drive from the carrier and store the drive in an anti-static bag.
3. If you are not installing a new drive, place the drive blank into the drive carrier, using the four screws you removed from the hard drive.
4. With the black lever in the fully open position, slide the drive carrier into the server system. The green latch must be to the right. Do not push on the black lever until the lever begins to close by itself.

---

**Note:** All hard drive carriers must be installed in the server system and populated with either a drive or a drive blank to maintain system thermals.

---

5. When the black lever begins to close by itself, push on it to lock the drive carrier into place.

## In the Model 0 (Fixed Hard Drives)

Up to two fixed SATA hard drives can be installed in the NovaScale R421-E1 Model 0.

---

**CAUTION:** *Fixed mount hard drives are NOT hot-swappable. Before removing or replacing the drive, you must first take the server out of service, turn off all peripheral devices connected to the system, turn off the system by pressing the power button, and unplug the AC power cord from the system or wall outlet.*

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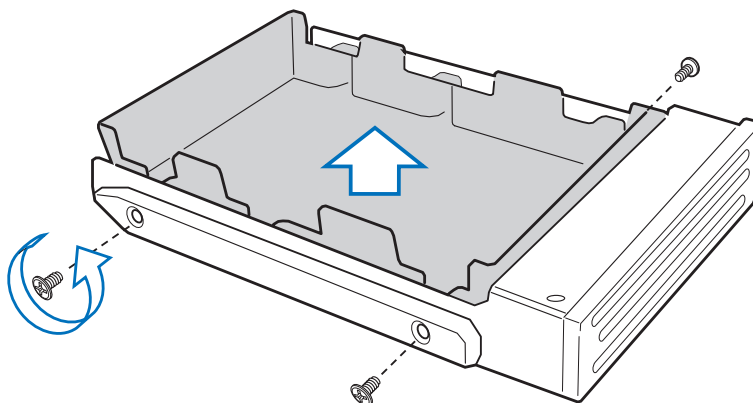
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Note: The extraction of fixed mount hard drives can only be performed by accessing the drive carrier latch from inside the chassis.

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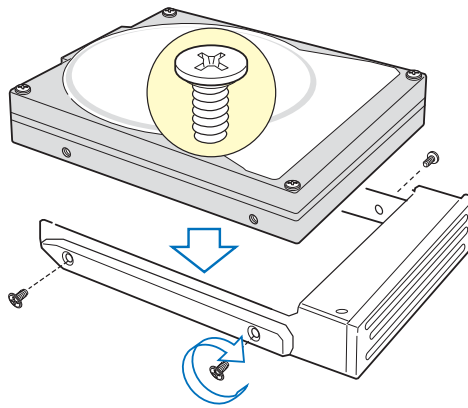
### Installing a Fixed Hard Disk Drive

1. Unlatch drive carrier from drive bay by pressing the latch at the end of the black drive rail and remove the hard drive carrier from the server system.
2. Remove the four screws securing the drive blank in place. Save the screws; you will use them to install the hard drive into the carrier.



**Figure 6-13. Removing the Drive Blank from the Fixed Hard Drive Carrier**

3. Install the hard drive into the hard drive carrier using four screws (see the figure below).



**Figure 6-14. Installing Fixed Hard Drive into the Carrier**

4. Install the hard drive carrier into the server system until it clicks into place.

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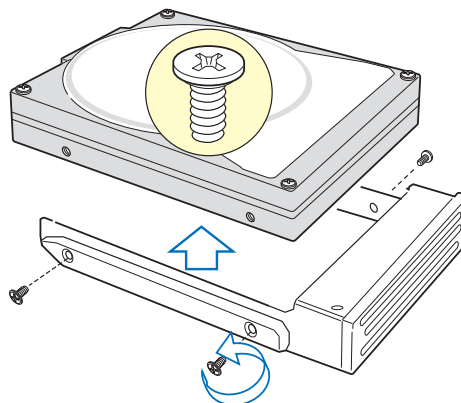
Note: All hard drive carriers must be installed in the server system and populated with either a drive or a drive blank to maintain system thermals.

---

5. Connect power to hard drive(s).
6. Connect SATA cables between the hard drive(s) and the server board.

### Installing a Fixed Hard Disk Drive

1. Disconnect all cables to the hard drive(s).
2. Unlatch drive carrier from drive bay by pressing the latch at the end of the black drive rail and remove the hard drive carrier(s) from the server system.
3. Remove the four screws that attach the hard drive to the carrier. Remove the drive from the carrier and store the drive in an anti-static bag.



**Figure 6-15. Removing Fixed Hard Drive from the Server System**

4. If replacing the hard drive, install the replacement drive using the four screws you just removed. For instructions, see “Installing a Fixed Hard Disk Drive”.
5. If the hard drive will not be replaced, install a drive blank into the carrier using the four screws you just removed.
6. Install the hard drive carrier into the server system until it clicks into place..

## 6-5 Power Supply

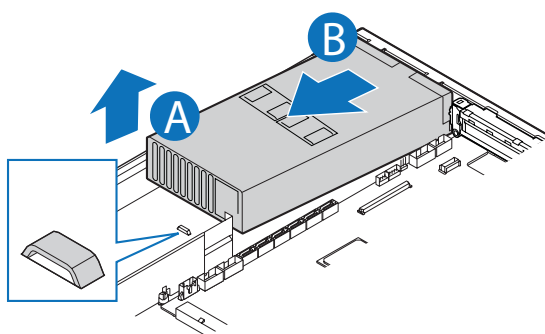
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***CAUTION: The power supply is not hot-swappable. Before removing or replacing the power supply, you must first take the server out of service, turn off all peripheral devices connected to the system, turn off the system by pressing the power button, and unplug the AC power cord from the system or wall outlet.***

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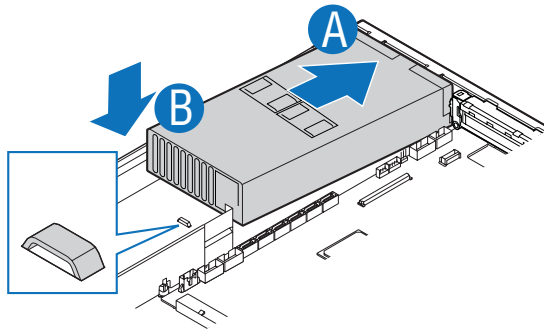
The power supply can be replaced if it fails or if one of the fans that is integrated into it fails. To replace the power supply, use the following instructions.

1. Disconnect all power cables.
2. Lift the power supply to disengage it from the latch (see letter “A”) and remove the power supply by sliding it out (see letter “B”).



**Figure 6-16. Removing Power Supply from the Server System**

3. Insert the replacement power supply module (see letter “A”) until it clicks into place behind the latch (see letter “B”). Reconnect all power cables.



**Figure 6-17. Installing Power Supply into the Server System**



## Chapter 7. BIOS

### 7-1 Using the BIOS Setup Utility

This section describes the BIOS Setup Utility options, which is used to change server configuration defaults. You can run BIOS Setup with or without an operating system being present. See “Server System References” for a link to the Intel® Server Board S5400SF Technical Product Specification where you will find details about specific BIOS setup screens.

#### Starting Setup

You can enter and start BIOS Setup under several conditions:

- When you turn on the server, after POST completes the memory test.
- When you have moved the CMOS jumper on the server board to the "Clear CMOS" position (enabled).

In the two conditions listed above, during the Power On Self Test (POST), you will see this prompt:

Press <F2> to enter SETUP

In a third condition, when CMOS/NVRAM has been corrupted, you will see other prompts but not the <F2> prompt:

Warning: CMOS checksum invalid

Warning: CMOS time and date not set

In this condition, the BIOS will load default values for CMOS and attempt to boot.

#### If You Cannot Access Setup

If you are not able to access BIOS Setup, you might need to clear the CMOS memory. For instructions on clearing the CMOS, see "Clearing the CMOS".

#### Setup Menus

Each BIOS Setup menu page contains a number of features. Except for those features that are provided only to display automatically configured information, each feature is associated with a value field that contains user-selectable parameters. These parameters can be changed if the user has adequate security rights. If a value cannot be changed for any reason, the feature's value field is inaccessible.

“Setup Menu Key Use” describes the keyboard commands you can use in the BIOS Setup menus

**Table 7-1. Setup Menu Key Use**

Key to Press	Description
<F1>	Pressing <F1> on any menu invokes the general help window.
Left and right arrows	The left and right arrow keys are used to move between the major menu pages. The keys have no affect if a submenu or pick list is displayed.
Up arrow	Select Item up - The up arrow is used to select the previous value in a menu item's option list, or a value field pick list. Pressing the <Enter> key activates the selected item.
Down arrow	Select Item down - The down arrow is used to select the next value in a menu item's option list, or a value field pick list. Pressing the <Enter> key activates the selected item.
<F5> or <->	Change Value - The minus key or the <F5> function key is used to change the value of the current item to the previous value. This key scrolls through the values in the associated pick list without displaying the full list.
<F6> or <+>	Change Value - The plus key or the <F6> function key is used to change the value of the current menu item to the next value. This key scrolls through the values in the associated pick list without displaying the full list. On 106-key Japanese keyboards, the plus key has a different scan code than the plus key on the other keyboard, but it has the same effect.
<Enter>	Execute Command - The <Enter> key is used to activate submenus when the selected feature is a submenu, or to display a pick list if a selected feature has a value field, or to select a sub-field for multi-valued features like time and date. If a pick list is displayed, the <Enter> key will undo the pick list, and allow another selection in the parent menu.

<Esc>	<p>Exit - The &lt;Esc&gt; key provides a mechanism for backing out of any field. This key will undo the pressing of the &lt;Enter&gt; key. When the &lt;Esc&gt; key is pressed while editing any field or selecting features of a menu, the parent menu is re-entered. When the &lt;Esc&gt; key is pressed in any submenu, the parent menu is re-entered. When the &lt;Esc&gt; key is pressed in any major menu, the exit confirmation window is displayed and the user is asked whether changes can be discarded.</p>
<F9>	<p>Setup Defaults - Pressing &lt;F9&gt; causes the following to appear:</p> <pre>                 Setup Confirmation           Load default configuration now?                 [Yes] [No] </pre> <p>If "Yes" is selected and the &lt;Enter&gt; key is pressed, all Setup fields are set to their default values. If "No" is selected and the &lt;Enter&gt; key is pressed, or if the &lt;Esc&gt; key is pressed, the user is returned to where they were before &lt;F9&gt; was pressed without affecting any existing field values.:</p>
<F10>	<p>Save and Exit - Pressing &lt;F10&gt; causes the following message to appear:</p> <pre>                 Setup Confirmation           Save Configuration changes and exit now?                 [Yes] [No] </pre> <p>If "Yes" is selected and the &lt;Enter&gt; key is pressed, all changes are saved and Setup is exited. If "No" is selected and the &lt;Enter&gt; key is pressed, or the &lt;Esc&gt; key is pressed, the user is returned to where they were before &lt;F10&gt; was pressed without affecting any existing values.</p>

## 7-2 Upgrading the BIOS

The upgrade utility allows you to upgrade the BIOS in flash memory. The code and data in the upgrade file include the following:

- On-board system BIOS, including the recovery code, BIOS Setup Utility, and strings.
- On-board video BIOS, and other option ROMs for devices embedded on the server board.
- OEM binary area
- Microcode
- A way to change the BIOS language.

### Preparing for the Upgrade

The steps below explain how to prepare to upgrade the BIOS, including how to record the current BIOS settings and how to obtain the upgrade utility.

#### Recording the Current BIOS Settings

1. Boot the computer and press <F2> when you see the message:

```
Press <F2> Key if you want to run SETUP
```

2. Write down the current settings in the BIOS Setup program.

---

**Note:** Do not skip step 2. You will need these settings to configure your server at the end of the procedure.

---

#### Obtaining the Upgrade

Download the BIOS image file to a temporary folder on your hard drive. See “Server System References” for a link to the update software.

---

**Note:** Review the instructions and release notes that are provided in the readme file distributed with the BIOS image file before attempting a BIOS upgrade. The release notes contain critical information regarding jumper settings, specific fixes, or other information to complete the upgrade.

---

## Upgrading the BIOS

Follow the instructions in the readme file that came with the BIOS upgrade. When the update completes, remove the bootable media from which you performed the upgrade.

---

**CAUTION:** Do not power down the system during the BIOS update process! Doing so may corrupt the system BIOS.

---

**Note:** You may encounter a CMOS Checksum error or other problem after reboot. If this happens, shut down the system and boot it again. CMOS checksum errors require that you enter Setup, check your settings, save your settings, and exit Setup.

---

## 7-3 Clearing the CMOS and resetting the Password

### Clearing the CMOS

If you are not able to access the BIOS setup screens, the CMOS Clear jumper will need to be used to reset the configuration RAM.

1. Power down the system; do not disconnect the AC power.
2. Open the server.
3. Move the jumper from the normal operation position, CMOS Protect at pins 1 and 2, to the CMOS Clear Force Erase position, covering pins 2 and 3.

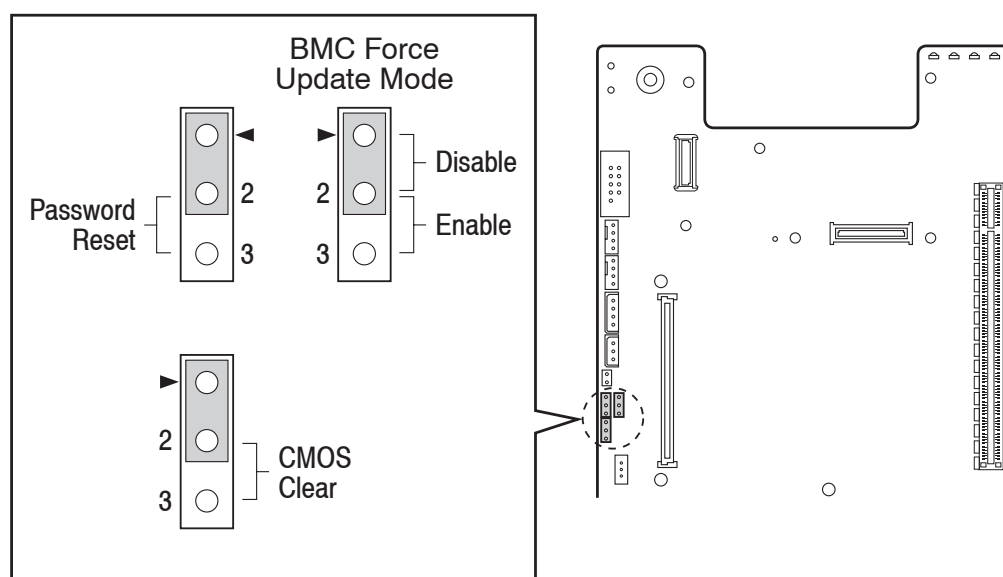


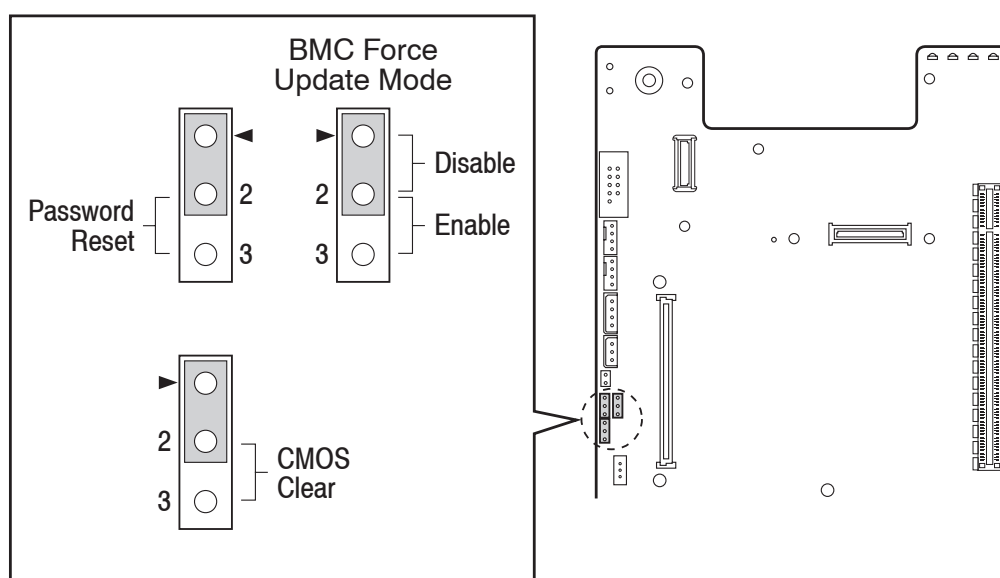
Figure 7-1. Clear CMOS Jumper

4. Wait five seconds.
5. Return the CMOS Clear jumper to the CMOS Protect location, covering pins 1 and 2.
6. Close the server chassis.
7. Power up the system.
8. The CMOS is now cleared and can be reset by going into the BIOS setup.

## Resetting the Password

If the user or administrator password(s) is lost or forgotten, moving the password reset jumper into the "clear" position clears both passwords. The password reset jumper must be restored to its original position before a new password(s) can be set.

1. Power down the system; do not disconnect the AC power.
2. Open the server system.
3. Move the jumper from the normal operation position, Password Clear Protect, at pins 1 and 2 to the Password Clear Erase position, covering pins 2 and 3.



**Figure 7-2. Password Reset Jumper**

4. Wait five seconds.
5. Return the Password Reset jumper to the Password Clear Protect position, covering pins 1 and 2.
6. Close the server system.
7. Power up the server.
8. The password is now cleared and can be reset by going into BIOS setup.

## 7-4 Advanced Setup

The following sections describe the screens available for the configuration of a server platform. In these sections, tables are used to describe the contents of each screen. These tables follow the following guidelines:

- The text and values in the Setup Item, Options, and Help columns in the tables are displayed on the BIOS Setup screens.
- **Bold text** in the Options column of the tables indicates default values. These values are not displayed in bold on the setup screen. The bold text in this document is to serve as a reference point.
- The Comments column provides additional information where it may be helpful. This information does not appear in the BIOS Setup screens.
- Information in the screen shots that is enclosed in brackets (< >) indicates text that varies, depending on the option(s) installed. For example <Current Date> is replaced by the actual current date.
- Information that is enclosed in square brackets ([ ]) in the tables indicates areas where the user needs to type in text instead of selecting from a provided option.
- Whenever information is changed (except Date and Time) the systems requires a save and reboot to take place. Pressing <ESC> will discard the changes and boot the system according to the boot order set from the last boot.

Main Screen

The Main screen is the screen that is first displayed when BIOS Setup is entered, unless an error has occurred. If an error has occurred, the Error Manager screen will be displayed instead.



Figure 7-3. Setup Utility — Main Screen Display

Table 7-2. Setup Utility — Main Screen Fields

Setup Item	Options	Help Text	Comments
Logged in as			<b>Information only.</b> Displays password level that setup is running in, Administrator or User. With no passwords set Administrator is the default mode.
Platform ID			<b>Information only.</b> Displays the Platform ID. (example: S5400SF)
System BIOS			
Version			<b>Information only.</b> Displays the current BIOS version.  xx = major version yy = minor version zzzz = build number
Build Date			<b>Information only.</b> Displays the current BIOS build date.
Processor			
<ID string from the Processor>			<b>Information only.</b> Displays Intel processor name and the speed of the CPU. This information is retrieved from the processor.
Core Frequency			<b>Information only.</b> Displays the current speed of the boot processor in GHz or MHz.
Count			<b>Information only.</b> Number of physical processors detected.
Memory			

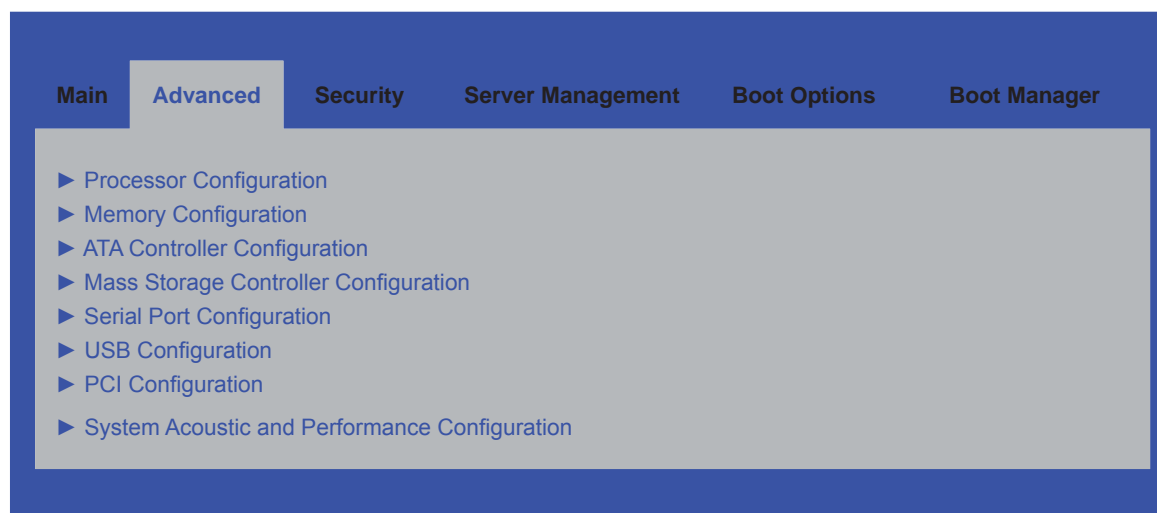
Setup Item	Options	Help Text	Comments
Size			<b>Information only.</b> Displays the total physical memory installed in the system, in MB or GB. The term physical memory indicates the total memory discovered in the form of installed FBDIMMs.
Quiet Boot	<b>Enabled</b> Disabled	[Enabled] – Display the logo screen during POST.  [Disabled] – Display the diagnostic screen during POST.	
POST Error Pause	Enabled <b>Disabled</b>	[Enabled] – Go to the Error Manager for critical POST errors.  [Disabled] – Attempt to boot and do not go to the Error Manager for critical POST errors.	The POST error pause will take the system to the error manager to review the errors when Major errors occur. Minor and Fatal error displays are not affected by this setting.
System Date	[Day of week MM/DD/YYYY]	System Date has configurable fields for Month, Day, and Year.  Use [Enter] or [Tab] key to select the next field.  Use [+] or [-] key to modify the selected field.	

Setup Item	Options	Help Text	Comments
System Time	[HH:MM:SS]	<p>System Time has configurable fields for Hours, Minutes, and Seconds.</p> <p>Hours are in 24-hour format.</p> <p>Use [Enter] or [Tab] key to select the next field.</p> <p>Use [+] or [-] key to modify the selected field.</p>	

## Advanced Screen

The Advanced screen provides an access point to configure several options. On this screen, the user selects the option that is to be configured. Configurations are performed on the selected screen, not directly on the Advanced screen.

To access this screen from the Main screen, press the right arrow until the Advanced screen is chosen.



**Figure 7-4. Setup Utility — Advanced Screen Display**

**Table 7-3. Setup Utility — Advanced Screen Display Fields**

Setup Item	Options	Help Text	Comments
Processor Configuration		View/Configure processor information and settings.	
Memory Configuration		View/Configure memory information and settings.	
ATA Controller Configuration		View/Configure ATA Controller information and settings.	
Mass Storage Controller Configuration		View/Configure mass storage controller information and settings.	
Serial Port Configuration		View/Configure serial port information and settings.	
USB Configuration		View/Configure USB information and settings.	
PCI Configuration		View/Configure PCI information and settings.	
System Acoustic and Performance Configuration		View/Configure system acoustic and performance information and settings.	

Processor Screen

The Processor screen provides a place for the user to view the processor core frequency, system bus frequency, and enable or disable several processor options. The user can also select an option to view information about a specific processor. To access this screen from the Main screen, select Advanced | Processor.



Figure 7-5. Setup Utility — Processor Configuration Screen Display

**Table 7-4. Setup Utility — Processor Configuration Screen Fields**

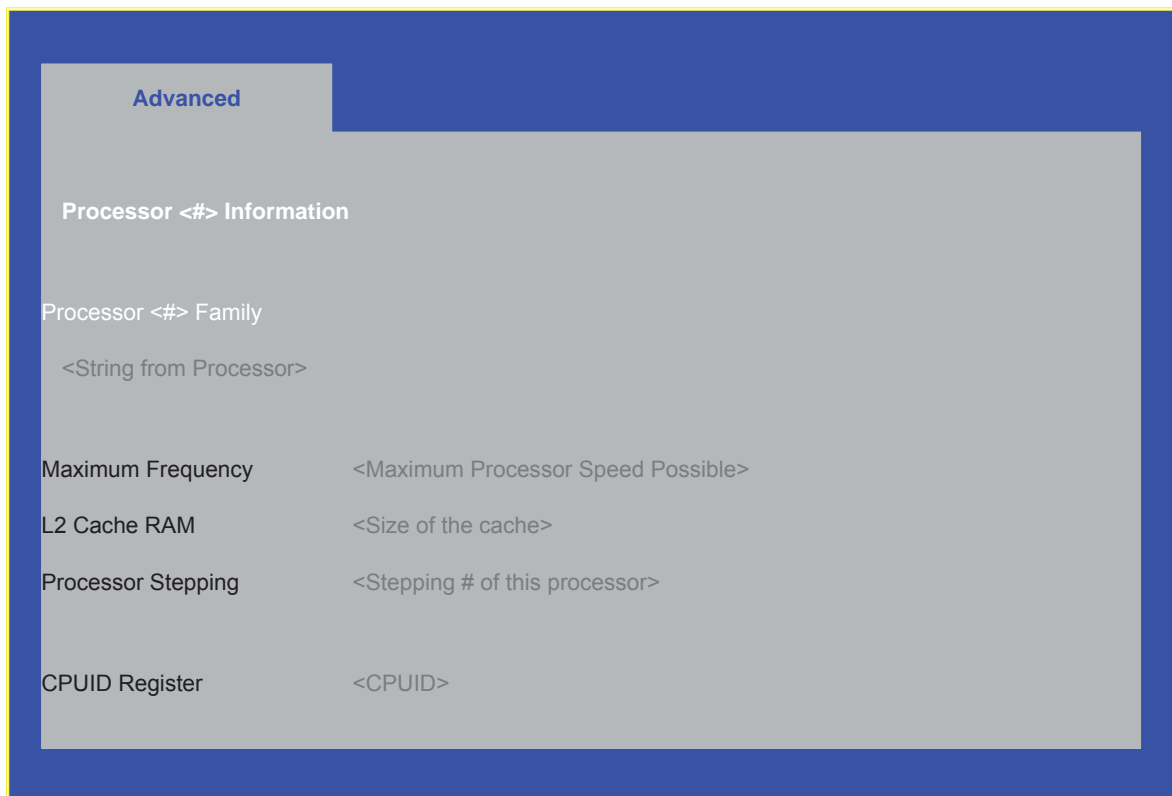
Setup Item	Options	Help Text	Comments
Core Count			<b>Information only.</b> Total number of processor cores in the system
Core Frequency			<b>Information only.</b> Frequency at which processors currently run.
System Bus Frequency			<b>Information only.</b> Current frequency of the processor front side bus.
Enhanced Intel® SpeedStep Technology	<b>Enabled</b> Disabled	Enhanced Intel SpeedStep® Technology allows the system to dynamically adjust processor voltage and core frequency, which can result in decreased average power consumption and decreased average heat production.  Contact your OS vendor regarding OS support of this feature.	
Core Multi-processing	<b>Enabled</b> Disabled	Core Multi-processing sets the state of logical processor cores in a package. [Disabled] sets only logical processor core 0 as enabled in each processor package.  Note: If disabled, Hyper-Threading Technology will also be automatically disabled.»	
Intel® Virtualization Technology	Enabled <b>Disabled</b>	Intel® Virtualization Technology allows a platform to run multiple operating systems and applications in independent partitions.  Note: A change to this option requires the system to be powered off and then back on before the setting will take effect.	
Intel® Virtualization Technology for Directed I/O	Enabled <b>Disabled</b>	Enable/Disable Intel® Virtualization Technology for Directed I/O. Report the I/O device assignment to VMM through DMAR ACPI Tables	When VT is disabled this question will be hidden.
Simulated MSI Support	Enabled <b>Disabled</b>	Enable or Disable simulation of Message Signaled Interrupt (MSI) support.  This feature can be Enabled in the case where there is no OS support for Message Signaled Interrupts.	
Execute Disable Bit	<b>Enabled</b> Disabled	Execute Disable Bit can help prevent certain classes of malicious buffer overflow attacks.  Contact your OS vendor regarding OS support of this feature.	
Hardware Prefetcher	<b>Enabled</b> Disabled	Hardware Prefetcher is a speculative prefetch unit within the processor(s).  Note: Modifying this setting may affect system performance.	

Setup Item	Options	Help Text	Comments
Adjacent Cache Line Prefetch	Enabled Disabled	[Enabled] - Cache lines are fetched in pairs (even line + odd line). [Disabled] - Only the current cache line required is fetched. Note: Modifying this setting may affect system performance.	
Processor Retest	Enabled Disabled	Activate and retest all processors during next boot only. Note: This option will automatically reset to [Disabled] on the next boot, after all processors are retested.	
Processor 1 Information		View Processor 1 information	Select to view information about processor 1. This takes the user to a different screen.
Processor 2 Information		View Processor 2 information	Select to view information about processor 2. This takes the user to a different screen.

### Processor #n Information Screen

The Processor # Information screen provides a place for the user to view information about a specific processor.

To access this screen from the Main screen, select Advanced | Processor | Processor # Information, where # is the processor number you want to see.



**Figure 7-6. Setup Utility — Specific Processor Information Screen Display**

**Table 7-5. Setup Utility — Specific Processor Information Screen Fields**

Setup Item	Options	Help Text	Comments
Processor <#> Family			<b>Information only.</b> Identifies family or generation of the processor.
Maximum Frequency			<b>Information only.</b> Maximum frequency the processor core supports.
L2 Cache RAM			<b>Information only.</b> Size of the processor L2 cache.
Processor Stepping			<b>Information only.</b> Stepping number of the processor.
CPUID Register			<b>Information only.</b> CPUID register value identifies details about the processor family, model, and stepping.

### Memory Screen

The Memory screen provides a place for the user to view details about the system memory FBDIMMs that are installed. On this screen, the user can select an option to open the Configure Memory RAS and Performance screen.

To access this screen from the Main screen, select Advanced | Memory.

**Note:** the following screenshot is for reference purposes only. The actual BIOS setup screen will accurately reflect the number of DIMM slots found on the server board.

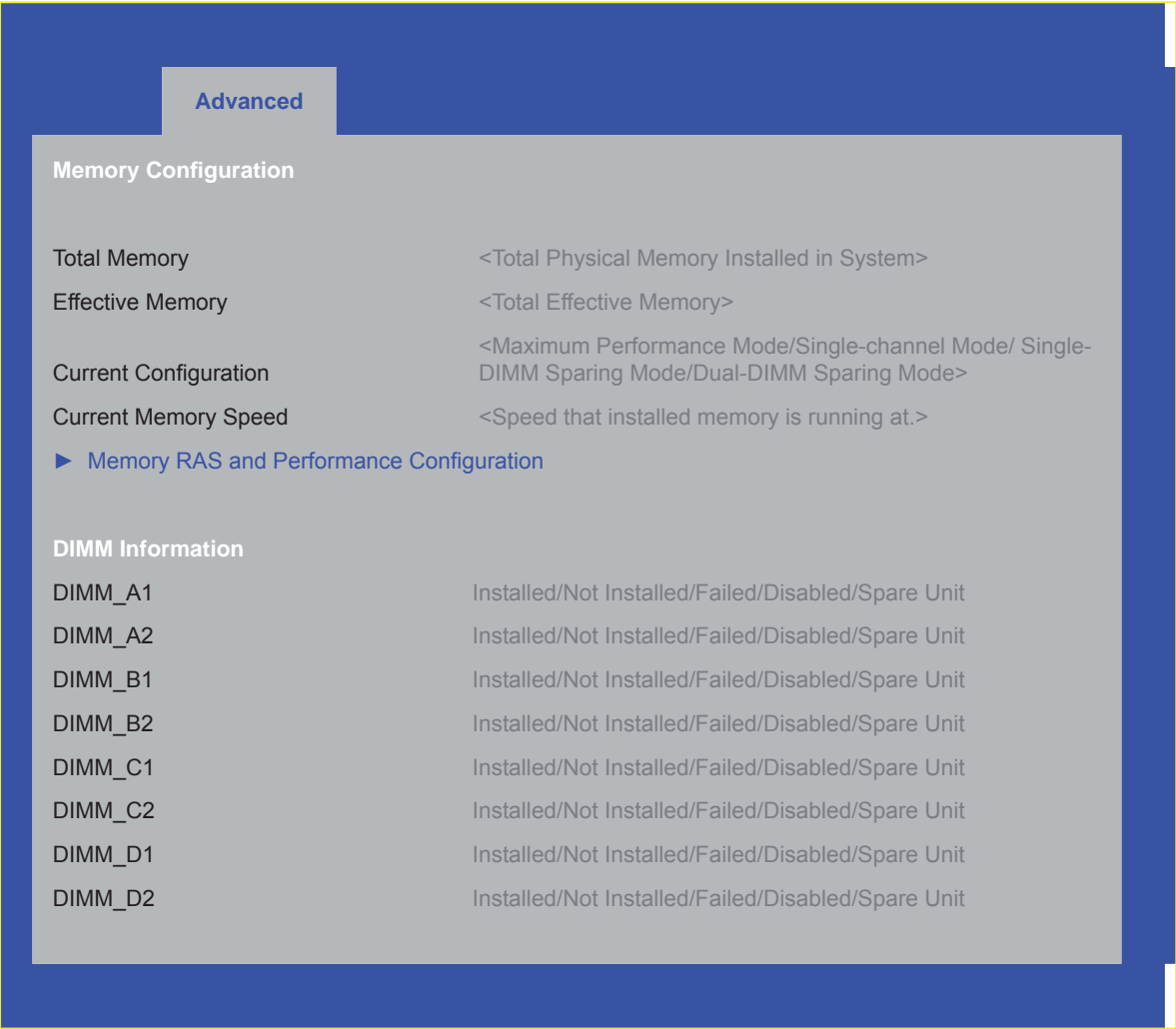


Figure 7-7. Setup Utility — Memory Configuration Screen Display

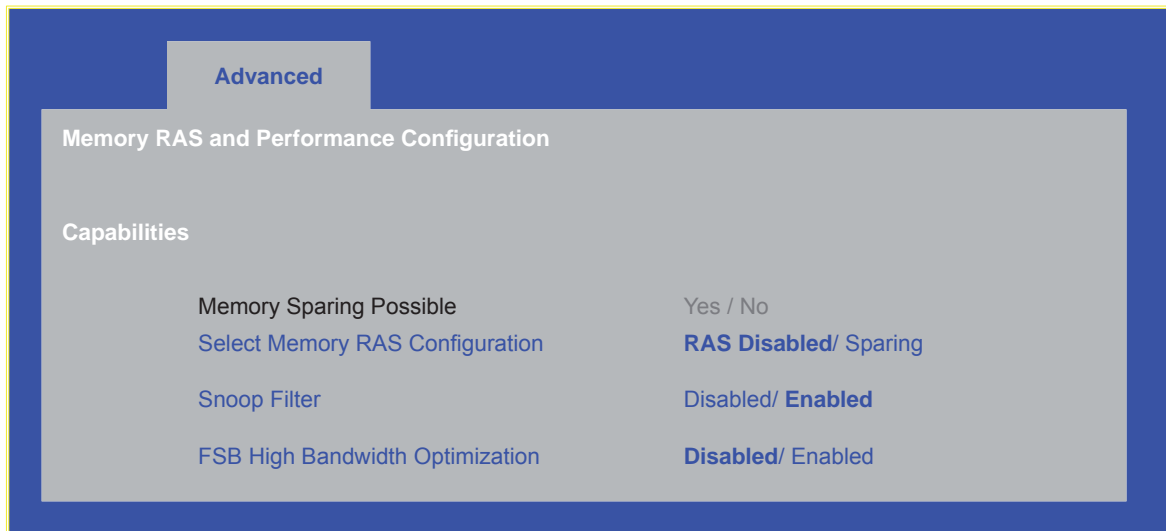
**Table 7-6. Setup Utility — Memory Configuration Screen Fields**

Setup Item	Options	Help Text	Comments
Total Memory			<b>Information only.</b> The amount of memory available in the system in the form of installed FBDIMMs, in units of MB or GB.
Effective Memory			<p><b>Information only.</b> The amount of memory effective in MB or GB.</p> <p>The Effective Memory is the difference between Total Physical Memory and the sum of all memory reserved for internal usage, RAS redundancy and SMRAM. This difference includes the sum of all FBDIMMs that failed Memory BIST during POST, or were disabled by the BIOS during memory discovery phase in order to optimize memory configuration.</p>
Current Configuration			<p><b>Information only.</b> Displays one of the following:</p> <ul style="list-style-type: none"> <li>▪ <b>Maximum Performance Mode:</b> System memory is configured for optimal performance and efficiency and no RAS is enabled.</li> <li>• <b>Single-Channel Mode:</b> System memory is functioning in a special, reduced efficiency mode.</li> </ul>
Current Memory Speed			<b>Information only.</b> Displays speed the memory is running at.
Memory RAS and Performance Configuration		Configure memory RAS (Reliability, Availability, and Serviceability) and view current memory performance information and settings.	Select to configure the memory RAS and performance. This takes the user to a different screen.
DIMM_#			<p>Displays the state of each DIMM socket present on the board. Each DIMM socket field reflects one of the following possible states:</p> <ul style="list-style-type: none"> <li>▪ <b>Installed:</b> There is a FBDIMM installed in this slot.</li> <li>▪ <b>Not Installed:</b> There is no FBDIMM installed in this slot.</li> <li>▪ <b>Disabled:</b> The FBDIMM installed in this slot has been disabled by the BIOS in order to optimize memory configuration.</li> <li>▪ <b>Failed:</b> The FBDIMM installed in this slot is faulty / malfunctioning.</li> <li>▪ <b>Spare Unit:</b> The FBDIMM is functioning as a spare unit for memory RAS purposes.</li> </ul>

## Memory RAS and Performance Configuration Screen

The Configure Memory RAS and Performance screen provides fields to customize several memory configuration options, such as whether to use Memory Sparing.

To access this screen from the Main screen, select Advanced | Memory | Configure Memory RAS and Performance.



**Figure 7-8. Setup Utility — Configure RAS and Performance Screen Display**

**Table 7-7. Setup Utility — Configure RAS and Performance Screen Fields**

Setup Item	Options	Help Text	Comments
Memory Sparing Possible	Yes / No		Information only
Select Memory RAS Configuration	<b>RAS Disabled/ Sparing</b>	<p>Available modes depend on the current memory population.</p> <p>[RAS Disabled] - Optimizes system performance.</p> <p>[Sparing] - Improves reliability by reserving memory for use as a replacement in the event of DIMM failure.</p>	<p>Provides options for configuring Memory RAS.</p> <p>The BIOS will dynamically configure this menu to display only those RAS modes that can be supported with the current layout and positioning of the FBDIMMs on the board. If no RAS mode is possible for the current FBDIMM configuration/layout, this setup item will not be provided.</p> <ul style="list-style-type: none"> <li>▪ <b>RAS Disabled:</b> The default in normal mode of operation. In this mode, no Memory RAS is supported.</li> <li>▪ <b>Sparing:</b> Available and displayed only when the FBDIMM population can support memory sparing.</li> </ul>
Snoop Filter	<b>Enabled</b> Disabled	The Snoop Filter component monitors and controls the data transactions between memory and the processor(s).	

Setup Item	Options	Help Text	Comments
FSB High Bandwidth Optimization	Enabled <b>Disabled</b>	[Enabled] – Optimize Front Side Bus for higher bandwidth when 1333 MHz FSB processor(s) installed.  <b>Note:</b> Some applications will benefit from this option [Enabled]. Configure based on performance results.	Configure based on performance results.  Must have processor(s) installed with 1333 MHz Front Side Bus frequency.

## ATA Controller Screen

The ATA Controller screen provides fields to configure PATA and SATA hard disk drives. It also provides information on the hard disk drives that are installed.

To access this screen from the Main screen, select Advanced | ATA Controller.



**Figure 7-9. Setup Utility — ATA Controller Configuration Screen Display**

**Table 7-8. Setup Utility — ATA Controller Configuration Screen Fields**

Setup Item	Options	Help Text	Comments
Onboard PATA Controller	<b>Enabled</b> Disabled	Onboard Parallel ATA (PATA) controller.	
Onboard SATA Controller	<b>Enabled</b> Disabled	Onboard Serial ATA (SATA) controller.	When enabled, the SATA controller can be configured in IDE, RAID, or AHCI Mode. RAID and AHCI modes are mutually exclusive.
SATA Mode	<b>Enhanced</b> Legacy	<p>[Enhanced] - Configures all SATA ports as individual ports. This is also known as native mode.</p> <p>[Legacy] - Configures SATA ports to be primary and/or secondary channels. This is also known as compatibility mode.</p>	<p>In Legacy Mode, BIOS can enumerate only four drives. It provides four options to choose a mix of SATA and PATA drives (see Legacy IDE Channel option below).</p> <p>In Enhanced Mode, the BIOS is not limited to legacy PATA four-drive limitations, and can enumerate the two PATA drives and four SATA drives (totaling six drives) regardless of AHCI mode, and can list/boot to the remaining two SATA drives as well with AHCI Support.</p> <p>AHCI and RAID Modes are supported only when SATA Mode is selected as "Enhanced".</p>
Legacy IDE Channel	<b>SATA Only</b> Secondary SATA Primary SATA PATA Only	<p>[SATA Only] - Master/slave for primary are SATA port 0/2. For secondary they are port 1/3.</p> <p>[Secondary SATA] - Master/slave for primary are PATA. For secondary they are SATA port 1/3.</p> <p>[Primary SATA] - Master/slave for primary are SATA port 0/2. For secondary they are PATA.</p> <p>[PATA Only] - Master/slave for primary are PATA. SATA ports are disabled.</p>	Displayed only when Legacy is chosen for the SATA Mode.

Setup Item	Options	Help Text	Comments
AHCI Mode	Enabled  <b>Disabled</b>	Advanced Host Controller Interface (AHCI) option ROM will enumerate all AHCI devices connected to the SATA ports.  Contact your OS vendor regarding OS support of this feature.	Unavailable if the SATA mode is "Legacy" or if RAID Mode is selected.  When AHCI is enabled:  The identification and configuration is left to the AHCI Option ROM. Only devices supported by the AHCI Option ROM will be displayed in setup (SATA HDD and SATA CDROM) other devices are available in the OS after their drivers are loaded.  SATA 4 and SATA 5 will appear in the HDD information listing.
Configure SATA as RAID	Enabled  <b>Disabled</b>	SATA controller will be in RAID mode and the Intel® RAID for Serial ATA option ROM will execute.	Unavailable when AHCI mode is enabled. This mode can be selected only when the SATA controller is in Enhanced Mode.  When this mode is enabled, no SATA drive information is displayed.
Primary IDE Master	<Not Installed / Drive information>		<b>Information only</b>
Primary IDE Slave	< Not Installed / Drive information>		<b>Information only</b>
SATA Port 0	< Not Installed / Drive information>		<b>Information only</b> ; Unavailable when RAID Mode is enabled.
SATA Port 1	< Not Installed / Drive information>		<b>Information only</b> ; This field is unavailable when RAID Mode is enabled.
SATA Port 2	< Not Installed / Drive information>		<b>Information only</b> ; This field is unavailable when RAID Mode is enabled.
SATA Port 3	< Not Installed / Drive information>		<b>Information only</b> ; This field is unavailable when RAID Mode is enabled.
SATA Port 4	< Not Installed / Drive information>		<b>Information only</b> ; This field is only available when AHCI Mode is enabled.
SATA Port 5	< Not Installed / Drive information>		<b>Information only</b> ; This field is only available when AHCI Mode is enabled.

Mass Storage Controller Screen

The Mass Storage screen provides fields to configure when a SAS controller is present on the baseboard, mid-plane or backplane of an Intel® system.

To access this screen from the Main menu, select Advanced | Mass Storage.

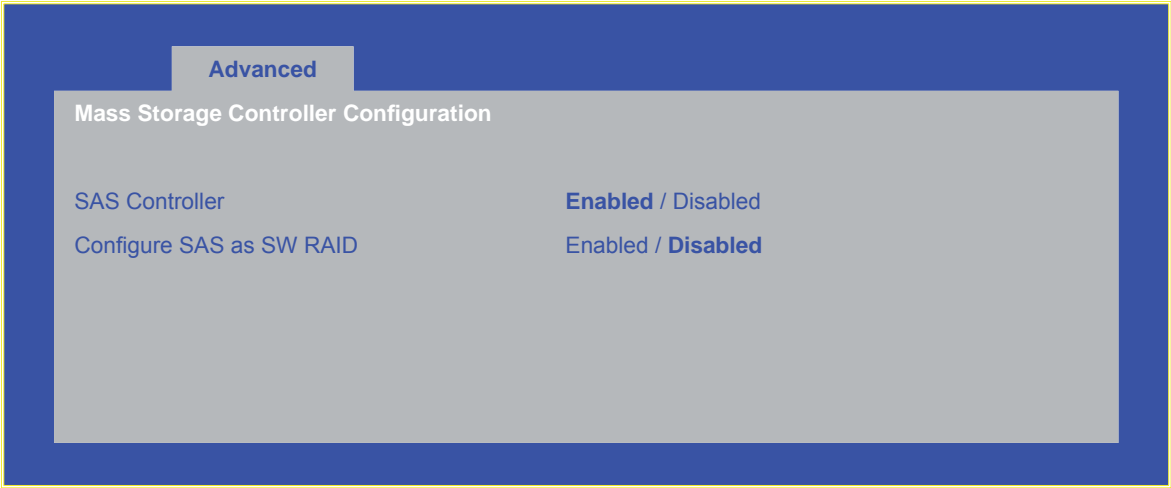


Figure 7-10. Setup Utility — Mass Storage Controller Configuration Screen Display

Table 7-9. Setup Utility — Mass Storage Controller Configuration Screen Fields

Setup Item	Options	Help Text	Comments
SAS Controller	<b>Enabled</b> Disabled	Enable or Disable the onboard Serial Attached SCSI (SAS) Controller.	
Configure SAS as SW RAID	Enabled <b>Disabled</b>	SAS ports will be configured for Intel® Embedded Server RAID Technology.	Unavailable if device is disabled

Serial Ports Screen

The Serial Ports screen provides fields to configure the Serial A [COM 1] and Serial B [COM2].

To access this screen from the Main screen, select Advanced | Serial Port.



Figure 7-11. Setup Utility — Serial Port Configuration Screen Display

Table 7-10. Setup Utility — Serial Port Configuration Screen Fields

Setup Item	Options	Help Text	Comments
Serial A Enable	Enabled Disabled	Enable or Disable Serial port A.	
Address	3F8h 2F8h 3E8h 2E8h	Select Serial port A base I/O address.	
IRQ	3 4	Select Serial port A base interrupt request (IRQ) line.	
Serial B Enable	Enabled Disabled	Enable or Disable Serial port B.	
Address	3F8h 2F8h 3E8h 2E8h	Select Serial port B base I/O address.	
IRQ	3 4	Select Serial port B base interrupt request (IRQ) line.	

### USB Configuration Screen

The USB Configuration screen provides fields to configure the USB controller options.

To access this screen from the Main screen, select Advanced | USB Configuration.



Figure 7-12. Setup Utility — USB Controller Configuration Screen Display

**Table 7-11. Setup Utility — USB Controller Configuration Screen Fields**

Setup Item	Options	Help Text	Comments
Detected USB Devices			<b>Information only:</b> shows number of USB devices in system
USB Controller	<b>Enabled</b> Disabled	[Enabled] - All onboard USB controllers will be turned on and accessible by the OS.  [Disabled] - All onboard USB controllers will be turned off and inaccessible by the OS.	
Legacy USB Support	<b>Enabled</b> Disabled Auto	PS/2 emulation for USB keyboard and USB mouse devices.  [Auto] - Legacy USB support will be enabled if a USB device is attached.	
Port 60/64 Emulation	Enabled <b>Disabled</b>	I/O port 60h/64h emulation support.  Note: This may be needed for legacy USB keyboard support when using an OS that is USB unaware.	
Device Reset timeout	10 sec <b>20 sec</b> 30 sec 40 sec	USB Mass storage device Start Unit command timeout.	
Storage Emulation			Header for next line.
One line for each mass storage device in system	<b>Auto</b> Floppy Forced FDD Hard Disk CD-ROM	[Auto] - USB devices less than 530MB will be emulated as floppy.  [Forced FDD] - HDD formatted drive will be emulated as FDD (e.g., ZIP drive).	This setup screen can show a maximum of 8 devices on this screen. If more than 8 devices are installed in the system, the 'USB Devices Enabled' will show the correct count, but only the first 8 devices can be displayed here.
USB 2.0 controller	<b>Enabled</b> Disabled	Onboard USB ports will be enabled to support USB 2.0 mode.  Contact your OS vendor regarding OS support of this feature.	

## PCI Screen

The PCI Screen provides fields to configure PCI add-in cards, the onboard NIC controllers, and video options.

To access this screen from the Main screen, select Advanced | PCI.



Figure 7-13. Setup Utility — PCI Configuration Screen Display

Table 7-12. Setup Utility — PCI Configuration Screen Fields

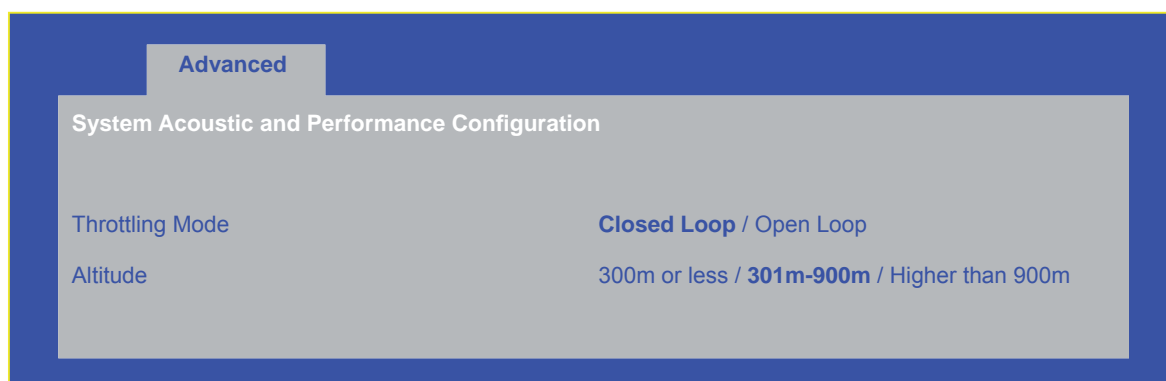
Setup Item	Options	Help Text	Comments
Memory Mapped I/O Start Address	1.5GB 1.75GB 2.00GB 2.25GB <b>2.5GB</b> 2.75GB 3.00GB 3.25GB 3.50GB	Select the start of the reserved memory region for PCI memory mapped I/O space that ends at 4GB.  Warning: Depending on the system configuration, this option may impact the amount of system memory detected by an OS without Physical Address Extension (PAE) support.	For all PAE (Physical Address Extension) aware Operating Systems, 2.5GB should be selected. The system will remap memory and the OS will detect all memory installed in the system. If the installed OS does not support PAE, the maximum memory size detected is linked to the setup option selected. For example, if 2.5GB is selected, only 2.5GB will be detected by the OS.
Memory Mapped I/O above 4GB	Enabled <b>Disabled</b>	Enable or disable memory mapped I/O of 64-bit PCI devices to 4GB or greater address space.	

Setup Item	Options	Help Text	Comments
Onboard Video	<b>Enabled</b> Disabled	Onboard video controller.  Warning: System video will be completely disabled if this option is disabled and an add-in video adapter is not installed.	When disabled, the system requires an add-in video card in order for video to be seen.
Dual Monitor Video	Enabled <b>Disabled</b>	Both the onboard video controller and an add-in video adapter will be enabled for system video. The onboard video controller will be the primary video device.	
Onboard NIC ROM	<b>Enabled</b> Disabled	Load the embedded option ROM for the onboard network controllers.  Warning: If [Disabled] is selected, NIC1 and NIC2 can not be used to boot or wake the system.	
I/O Module NIC ROM	Enabled <b>Disabled</b>	Load the embedded option ROM for the onboard network controller on the I/O module.	Option only displays when a Dual GigE I/O Module is Installed
NIC 1 MAC Address	No entry allowed		<b>Information only.</b> 12 hex digits of the MAC address.
NIC 2 MAC Address	No entry allowed		<b>Information only.</b> 12 hex digits of the MAC address.
Intel® I/OAT	<b>Enabled</b> Disabled	Intel® I/O Acceleration Technology version 2 (I/OAT-2) accelerates TCP/IP processing for onboard NICs, delivers data-movement efficiencies across the entire server platform, and minimizes system overhead.	

## System Acoustic and Performance Configuration

The System Acoustic and Performance Configuration screen provides fields to configure the thermal characteristics of the system.

To access this screen from the Main screen, select Advanced | System Acoustic and Performance Configuration.



**Figure 7-14. Setup Utility — System Acoustic and Performance Configuration Screen Display**

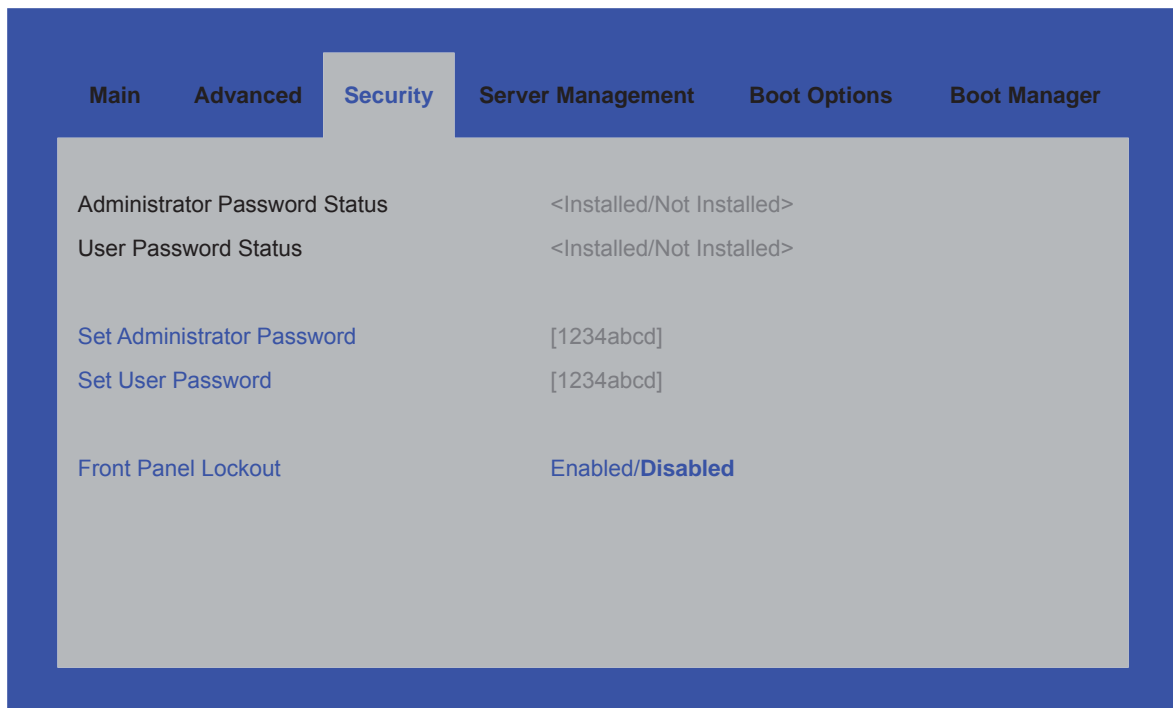
**Table 7-13. Setup Utility — System Acoustic and Performance Configuration Screen Fields**

Setup Item	Options	Help Text	Comments
Throttling Mode	<b>Closed Loop</b> Open Loop	Open Loop does not rely on a thermal sensor on the board and sets up a static level which equates in a fixed bandwidth. Closed Loop will allow the system to achieve higher performance by monitoring system temps and adjusting bandwidth.	When CLTT fails Throttling Mode will default to OLTT. Profile will be Performance for OLTT.
Altitude	<b>300m or less</b> <b>301m-900m</b> <b>Higher than 900m</b>	[300m or less] (980ft or less) Optimal performance setting near sea level.  [301m - 900m] (980ft - 2950ft) Optimal performance setting at moderate elevation.  [Higher than 900m] (Higher than 2950ft) Optimal performance setting at high elevation.	Available only if CLTT failed and running in OLTT throttling mode

## Security Screen

The Security screen provides fields to enable and set the user and administrative password and to lockout the front panel buttons so they cannot be used.

To access this screen from the Main screen, select the Security option.

**Figure 7-15. Setup Utility — Security Configuration Screen Display**

**Table 7-14. Setup Utility — Security Configuration Screen Fields**

Setup Item	Options	Help Text	Comments
Administrator Password Status	<Installed Not Installed>		<b>Information only.</b> Indicates the status of administrator password.
User Password Status	<Installed Not Installed>		<b>Information only.</b> Indicates the status of user password.
Set Administrator Password	[123abcd]	Administrator password is used to control change access in BIOS Setup Utility.  Only alphanumeric characters can be used. Maximum length is 7 characters. It is not case sensitive.  <b>Note:</b> Administrator password must be set in order to use the user account.	This option is only to control access to setup. Administrator has full access to all setup items. Clearing the Admin password will also clear the user password.
Set User Password	[123abcd]	User password is used to control entry access to BIOS Setup Utility.  Only alphanumeric characters can be used. Maximum length is 7 characters. It is not case sensitive.  <b>Note:</b> Removing the administrator password will also automatically remove the user password.	Available only if Administrator Password is installed. This option only protects setup. User password only has limited access to setup items.
Front Panel Lockout	Enabled <b>Disabled</b>	Locks the power button and reset button on the system's front panel. If [Enabled] is selected, power and reset must be controlled via a system management interface.	

## Server Management Screen

The Server Management screen provides fields to configure several server management features. It also provides an access point to the screens for configuring console redirection and displaying system information.

To access this screen from the Main screen, select the Server Management option.



Figure 7-16. Setup Utility — Server Management Configuration Screen Display

**Table 7-15. Setup Utility — Server Management Configuration Screen Fields**

Setup Item	Options	Help Text	Comments
Assert NMI on SERR	<b>Enabled</b> Disabled	On SERR, generate an NMI and log an error.  Note: [Enabled] must be selected for the Assert NMI on PERR setup option to be visible.	
Assert NMI on PERR	<b>Enabled</b> Disabled	On PERR, generate an NMI and log an error.  Note: This option is only active if the Assert NMI on SERR option is [Enabled] selected.»	
Resume on AC Power Loss	<b>Stay Off</b> Last state Reset	System action to take on AC power loss recovery. [Stay Off] - System stays off. [Last State] - System returns to the same state before the AC power loss. [Reset] - System powers on.	
Clear System Event Log	Enabled <b>Disabled</b>	Clears the System Event Log. All current entries will be lost.  <b>Note:</b> This option will be reset to [Disabled] after a reboot.	
Windows Hardware Error Architecture	Enabled <b>Disabled</b>	During HW errors, in addition to BIOS SMI Error Handlers, OS Error Handlers will be signaled	
FRB-2 Enable	<b>Enabled</b> Disabled	Fault Resilient Boot (FRB).  BIOS programs the BMC watchdog timer for approximately 6 minutes. If BIOS does not complete POST before the timer expires, the BMC will reset the system.	
O/S Boot Watchdog Timer	Enabled <b>Disabled</b>	BIOS programs the watchdog timer with the timeout value selected. If the OS does not complete booting before the timer expires, the BMC will reset the system and an error will be logged.  Requires OS support or Intel Management Software.	
O/S Boot Watchdog Timer Policy	<b>Power Off</b> Reset	If the OS watchdog timer is enabled, this is the system action taken if the watchdog timer expires. [Reset] - System performs a reset. [Power Off] - System powers off.	
O/S Boot Watchdog Timer Timeout	5 minutes <b>10 minutes</b> 15 minutes 20 minutes	If the OS watchdog timer is enabled, this is the timeout value BIOS will use to configure the watchdog timer.	
Console Redirection		View/Configure console redirection information and settings.	Takes user to Console Redirection Screen.
System Information		View system information	Takes user to System Information Screen.

### Console Redirection Screen

The Console Redirection screen provides a way to enable or disable console redirection and to configure the connection options for this feature.

To access this screen from the Main screen, select Server Management. Select the Console Redirection option from the Server Management screen.

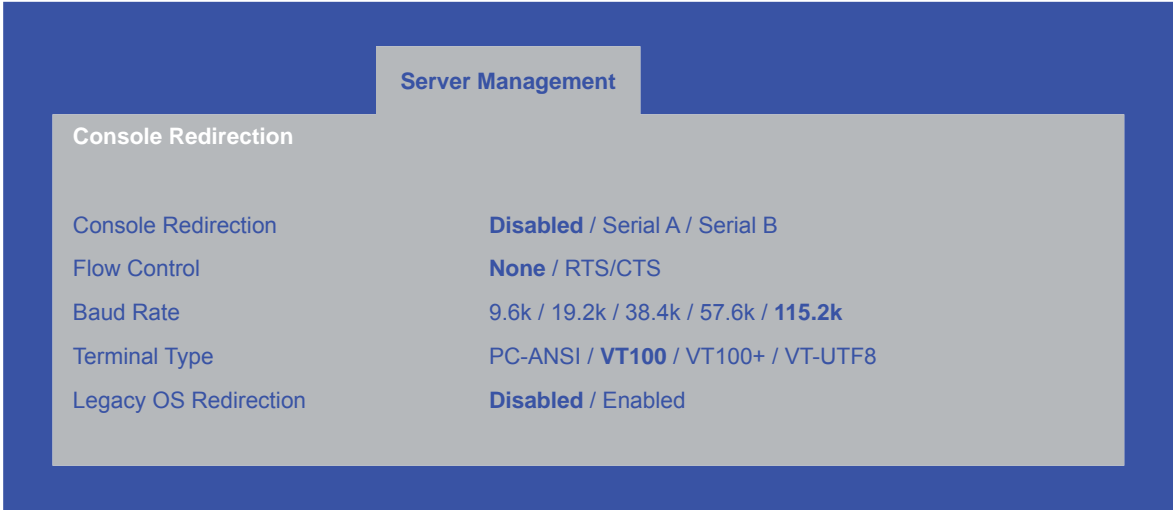


Figure 7-17. Setup Utility — Server Management Configuration Screen Display

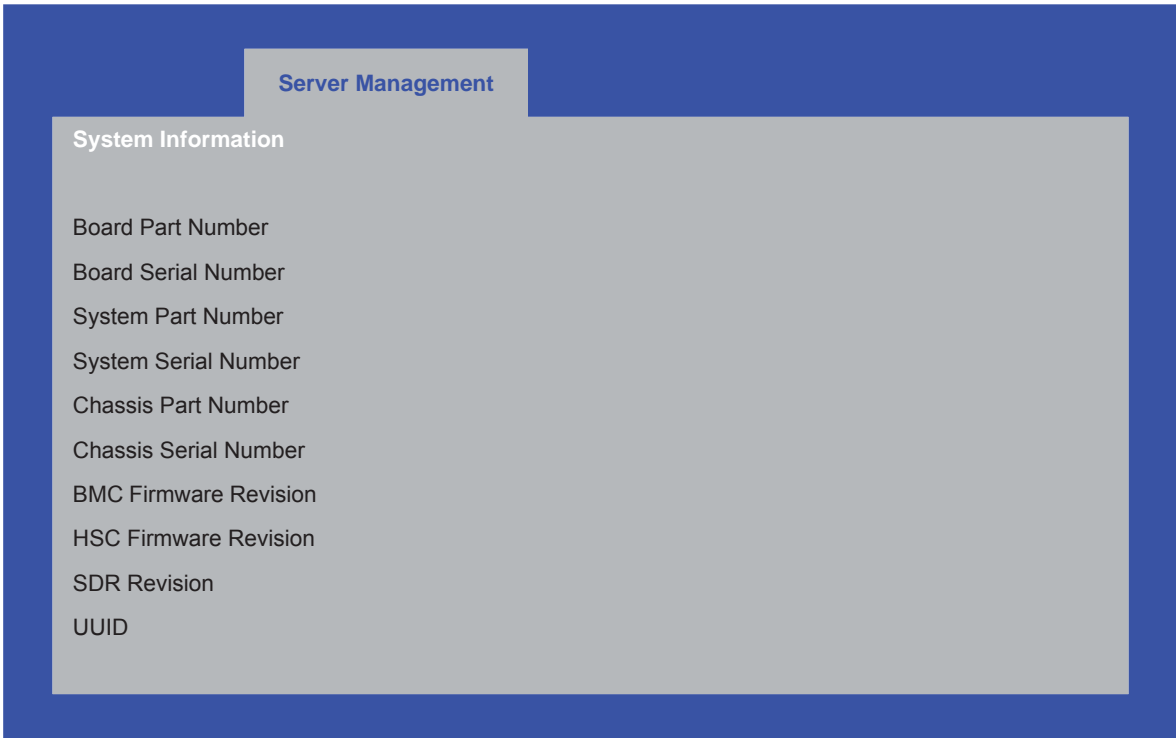
**Table 7-16. Setup Utility — Server Management Configuration Screen Fields**

Setup Item	Options	Help Text	Comments
Console Redirection	<b>Disabled</b> Serial A Serial B	Console redirection allows a serial port to be used for server management tasks. [Disabled] - No console redirection. [Serial Port A] - Configure serial port A for console redirection. [Serial Port B] - Configure serial port B for console redirection. Enabling this option will disable display of the Quiet Boot logo screen during POST.	
Flow Control	<b>None</b> RTS/CTS	Flow control is the handshake protocol. Setting must match the remote terminal application. [None] - Configure for no flow control. [RTS/CTS] - Configure for hardware flow control.	
Baud Rate	9600 19.2K 38.4K 57.6K <b>115.2K</b>	Serial port transmission speed. Setting must match the remote terminal application.	
Terminal Type	PC-ANSI <b>VT100</b> VT100+ VT-UTF8	Character formatting used for console redirection. Setting must match the remote terminal application.	
Legacy OS Redirection	<b>Disabled</b> Enabled	This option will enable legacy OS redirection (i.e., DOS) on serial port. If it is enabled the associated serial port will be hidden from the legacy OS.	

### Server Management System Information Screen

The Server Management System Information screen provides a place to see part numbers, serial numbers, and firmware revisions.

To access this screen from the Main screen, select Server Management. Select the System Information option from the Server Management screen.



**Figure 7-18. Setup Utility — Server Management System Information Screen Display**

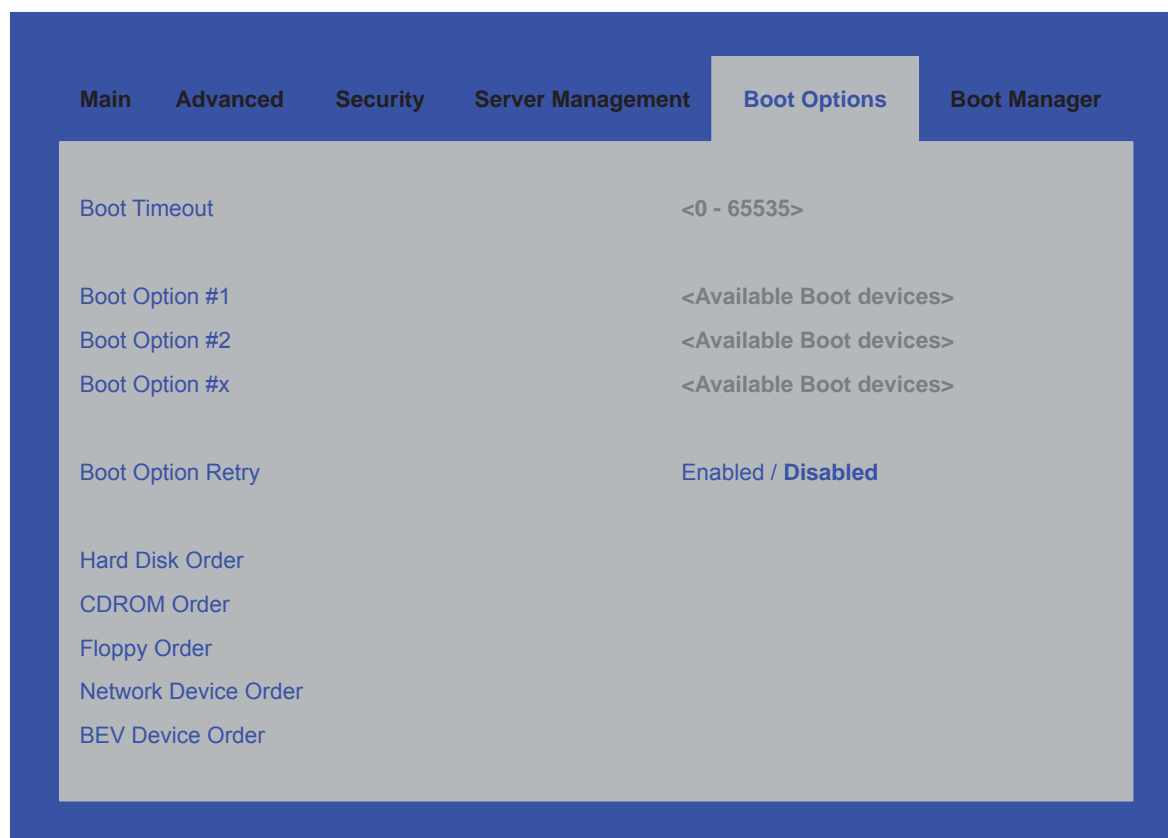
**Table 7-17. Setup Utility — Server Management System Information Screen Fields**

Setup Item	Options	Help Text	Comments
Board Part Number			Information Only
Board Serial Number			Information Only
System Part Number			Information Only
System Serial Number			Information Only
Chassis Part Number			Information Only
Chassis Serial Number			Information Only
BMC Firmware Revision			Information Only
HSC Firmware Revision			Information Only
SDR Revision			Information Only
UUID			Information Only

## Boot Options Screen

The Boot Options screen displays any bootable media encountered during POST, and allows the user to configure desired boot device.

To access this screen from the Main screen, select Boot Options.



**Figure 7-19. Setup Utility — Boot Options Screen Display**

**Table 7-18. Setup Utility — Boot Options Screen Fields**

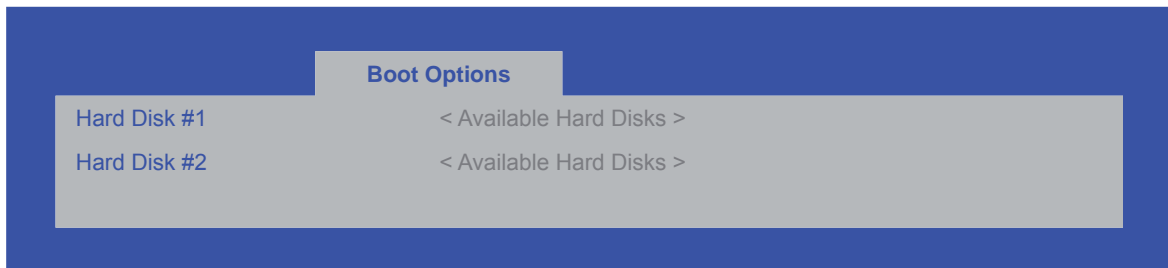
Setup Item	Options	Help Text	Comments
Boot Timeout	0 - 65535	The number of seconds BIOS will pause at the end of POST to allow the user to press the [F2] key for entering the BIOS Setup Utility.  Valid values are 0-65535. Zero is the default. A value of 65535 will cause the system to go to the Boot Manager menu and wait for user input for every system boot.	After entering the desired timeout, press enter to register that timeout value to the system. These settings are in seconds.
Boot Option #x	Available boot devices.	Set system boot order by selecting the boot option for this position.	
Boot Option Retry	Enabled Disabled	This will continually retry NON-EFI based boot options without waiting for user input.	
Hard Disk Order		Set hard disk boot order by selecting the boot option for this position.	Appears when more than 1 hard disk drive is in the system.

Setup Item	Options	Help Text	Comments
CDROM Order		Set CDROM boot order by selecting the boot option for this position.	Appears when more than 1 CDROM drive is in the system.
Floppy Order		Set floppy disk boot order by selecting the boot option for this position.	Appears when more than 1 floppy drive is in the system.
Network Device Order		Set network device boot order by selecting the boot option for this position. Add-in or onboard network devices with a PXE option ROM are two examples of network boot devices.	Appears when more than 1 of these devices is available in the system.
BEV Device Order		Set the Bootstrap Entry Vector (BEV) device boot order by selecting the boot option for this position.  BEV devices require their own proprietary method to load an OS using a bootable option ROM. BEV devices are typically found on remote program load devices.	Appears when more than 1 of these devices is available in the system.

## Hard Disk Order Screen

The Hard Disk Order screen provides a way to control the hard disks.

To access this screen from the Main screen, select Boot Options | Hard Disk Order.



**Figure 7-20. Setup Utility — Hard Disk Order Screen Display**

**Table 7-19. Setup Utility — Hard Disk Order Screen Fields**

Setup Item	Options	Help Text	Comments
Hard Disk #1	Available hard disks	Set hard disk boot order by selecting the boot option for this position.	
Hard Disk #2	Available hard disks	Set hard disk boot order by selecting the boot option for this position.	

CDROM Order Screen

The CDROM Order screen provides a way to control the CDROM devices.

To access this screen from the Main screen, select Boot Options | CDROM Order.



Figure 7-21. Setup Utility — CDROM Order Screen Display

Table 7-20. Setup Utility — CDROM Order Screen Fields

Setup Item	Options	Help Text	Comments
CDROM #1	Available CDROM devices	Set CDROM boot order by selecting the boot option for this position.	
CDROM #2	Available CDROM devices	Set CDROM boot order by selecting the boot option for this position.	

Floppy Order Screen

The Floppy Order screen provides a way to control the floppy drives.

To access this screen from the Main screen, select Boot Options | Floppy Order.

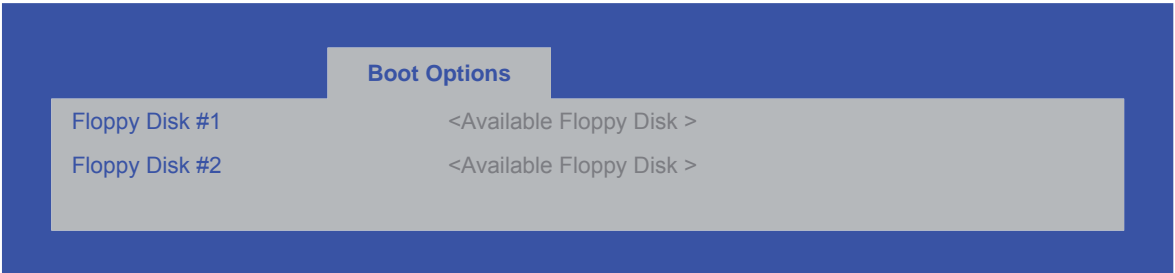


Figure 7-22. Setup Utility — Floppy Order Screen Display

Table 7-21. Setup Utility — Floppy Order Screen Fields

Setup Item	Options	Help Text	Comments
Floppy Disk #1	Available floppy disk	Set floppy disk boot order by selecting the boot option for this position.	
Floppy Disk #2	Available floppy disk	Set floppy disk boot order by selecting the boot option for this position.	

Network Device Order Screen

The Network Device Order screen provides a way to control the Network bootable devices.

To access this screen from the Main screen, select Boot Options | Network Device Order.

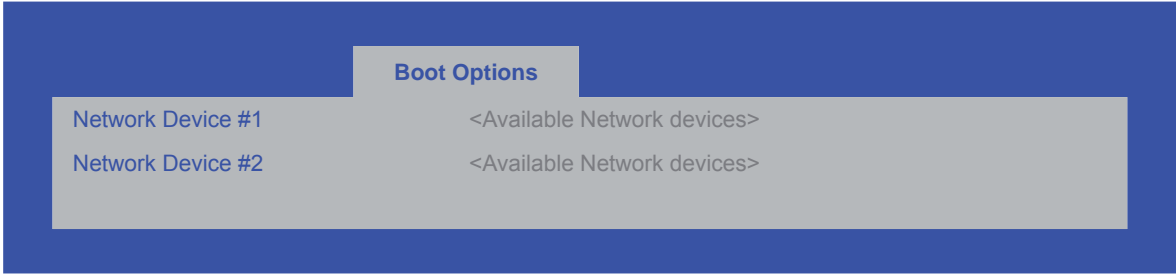


Figure 7-23. Setup Utility — Network Device Order Screen Display

Table 7-22. Setup Utility — Network Device Order Screen Fields

Setup Item	Options	Help Text	Comments
Network Device #1	Available network devices	Set network device boot order by selecting the boot option for this position. Add-in or onboard network devices with a PXE option ROM are two examples of network boot devices.	
Network Device #2	Available network devices	Set network device boot order by selecting the boot option for this position. Add-in or onboard network devices with a PXE option ROM are two examples of network boot devices.	

BEV Device Order Screen

The BEV Device Order screen provides a way to control the BEV bootable devices.

To access this screen from the Main screen, select Boot Options | BEV Device Order.

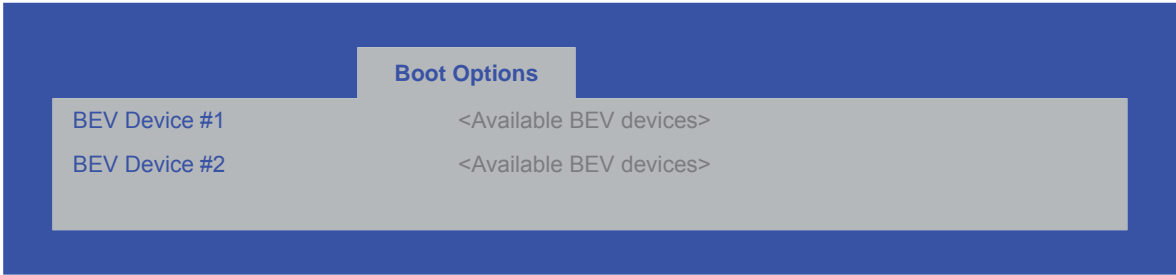


Figure 7-24. Setup Utility — BEV Device Order Screen Display

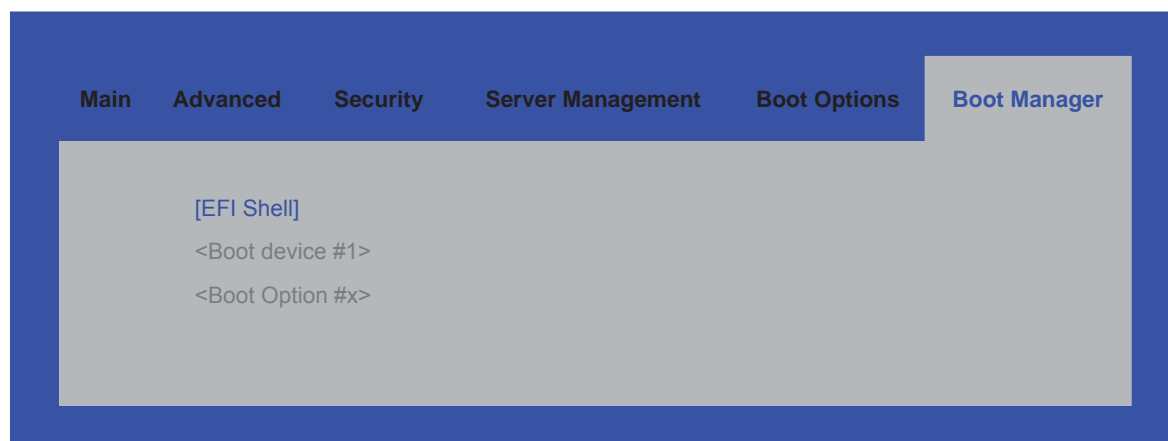
**Table 7-23. Setup Utility — BEV Device Order Screen Fields**

Setup Item	Options	Help Text	Comments
BEV Device #1	Available BEV devices	Set the Bootstrap Entry Vector (BEV) device boot order by selecting the boot option for this position.  BEV devices require their own proprietary method to load an OS using a bootable option ROM. BEV devices are typically found on remote program load devices.	
BEV Device #2	Available BEV devices	Set the Bootstrap Entry Vector (BEV) device boot order by selecting the boot option for this position.  BEV devices require their own proprietary method to load an OS using a bootable option ROM. BEV devices are typically found on remote program load devices.	

## Boot Manager Screen

The Boot Manager screen displays a list of devices available to boot from, and allows the user to select a boot device for this boot.

To access this screen from the Main screen, select Boot Manager.

**Figure 7-25. Setup Utility — Boot Manager Screen Display****Table 7-24. Setup Utility — Boot Manager Screen Fields**

Setup Item	Options	Help Text	Comments
Launch EFI Shell		Select this option to boot now.  Note: This list is not the system boot option order. Use the Boot Options menu to view and configure the system boot option order.	
Boot Device #x		Select this option to boot now.  Note: This list is not the system boot option order. Use the Boot Options menu to view and configure the system boot option order.	

### Error Manager Screen

The Error Manager screen displays any errors encountered during POST.



Figure 7-26. Setup Utility — Error Manager Screen Display

Table 7-25. Setup Utility — Error Manager Screen Fields

Setup Item	Options	Help Text	Comments
Displays System Errors			<b>Information only.</b> Displays errors that occurred during this POST.

### Exit Screen

The Exit screen allows the user to choose to save or discard the configuration changes made on the other screens. It also provides a method to restore the server to the factory defaults or to save or restore a set of user defined default values. If Restore Defaults is selected, the default settings, noted in bold in the tables in this chapter, will be applied. If Restore User Default Values is selected, the system is restored to the default values that the user saved earlier, instead of being restored to the factory defaults.



Figure 7-27. Setup Utility — Exit Screen Display

**Table 7-26. Setup Utility — Exit Screen Fields**

Setup Item	Help Text	Comments
Save Changes and Exit	Exit BIOS Setup Utility after saving changes. The system will reboot if required. The [F10] key can also be used.	User is prompted for confirmation only if any of the setup fields were modified.
Discard Changes and Exit	Exit BIOS Setup Utility without saving changes. The [Esc] key can also be used.	User is prompted for confirmation only if any of the setup fields were modified.
Save Changes	Save changes without exiting BIOS Setup Utility. <b>Note:</b> Saved changes may require a system reboot before taking effect.	User is prompted for confirmation only if any of the setup fields were modified.
Discard Changes	Discard changes made since the last save changes operation was performed.	User is prompted for confirmation only if any of the setup fields were modified.
Load Default Values	Load factory default values for all BIOS Setup Utility options. The [F9] key can also be used.	User is prompted for confirmation.
Save as User Default Values	Save current BIOS Setup Utility values as custom user default values. If needed, the user default values can be restored via the Load User Default Values option below. <b>Note:</b> Clearing CMOS or NVRAM will cause the user default values to be reset to the factory default values.	User is prompted for confirmation.
Load User Default Values	Load user default values.	User is prompted for confirmation.

## Appendix A. Integration and Usage Tips

This section provides a list of useful information that should be referenced before attempting to integrate and configure your NovaScale R421-E1.

- After the system is integrated with processors, memory, and peripheral devices, the FRUSDR utility **must** be run to load the proper Sensor Data Record data to the integrated Server Management subsystem. Failure to run this utility may prevent Server Management from accurately monitoring system health and may affect system performance. The FRUSDR utility for this server system can either be run from the Intel Deployment CDROM that came with your system, or can be downloaded from the Intel website referenced at the bottom of this page.
- To ensure the highest system reliability, make sure the latest system software is loaded on the server before deploying the system onto a live networking environment. This includes system BIOS, FRUSDR, BMC firmware, and hot-swap controller firmware. The system software can be updated using the Intel Deployment CDROM that came your system or can be downloaded from the Intel website referenced at the bottom of this page.
- Only supported memory validated by Intel should be used in this server system. A list of supported memory can be found in the Intel® Server System SR1560SF Tested Memory List which can be downloaded from the Intel website referenced at the bottom of this page.
- This system supports the Dual-Core Intel® Xeon® processor 5000 sequence. A list of supported processors is provided in Table 2 of this document, or can be downloaded from the Intel website referenced at the bottom of this page. Intel® Xeon® processors not referenced on the supported processor list cannot be used in this server system.
- The air dam on the CPU air duct must be in place for single processor configurations. Once the air dam is removed, it cannot be re-installed.
- The CPU air duct and air baffle must be used to maintain system thermals.
- To maintain system thermals, all hard drive bays must be populated with either a hard drive or drive blank.
- System fans are not hot-swappable.
- In systems configured with a backplane, a USB floppy accessory kit is available for installing a slim-line USB floppy drive in either the slim-line bay or in the first 3.5" hard drive bay.



## Appendix B. BIOS POST Codes

During the system boot process, BIOS executes a number of platform configuration processes, each of which is assigned a specific hex POST code number. As each configuration routine is started, BIOS will display the given POST code to the POST Code Diagnostic LEDs found on the back edge of the server board. To assist in troubleshooting a system hang during the POST process, the Diagnostic LEDs can be used to identify the last POST process to be executed.

Each POST code will be represented by a combination of colors from the four LEDs. The LEDs are capable of displaying three colors: green, red, and amber. The POST codes are divided into two nibbles, an upper nibble and a lower nibble. Each bit in the upper nibble is represented by a red LED and each bit in the lower nibble is represented by a green LED. If both bits are set in the upper and lower nibbles then both red and green LEDs are lit, resulting in an amber color. If both bits are clear, then the LED is off.

In the below example, BIOS sends a value of ACh to the diagnostic LED decoder. The LEDs are decoded as follows:

- red bits = 1010b = Ah
- green bits = 1100b = Ch

Since the red bits correspond to the upper nibble and the green bits correspond to the lower nibble, the two are concatenated to be ACh.

**Table B-1. POST Progress Code LED Example**

	8h		4h		2h		1h	
LEDs	Red	Green	Red	Green	Red	Green	Red	Green
ACh	1	1	0	1	1	0	0	0
Result	Amber		Green		Red		Off	
	MSB						LSB	

Figure B-1. Diagnostic LED Placement Diagram

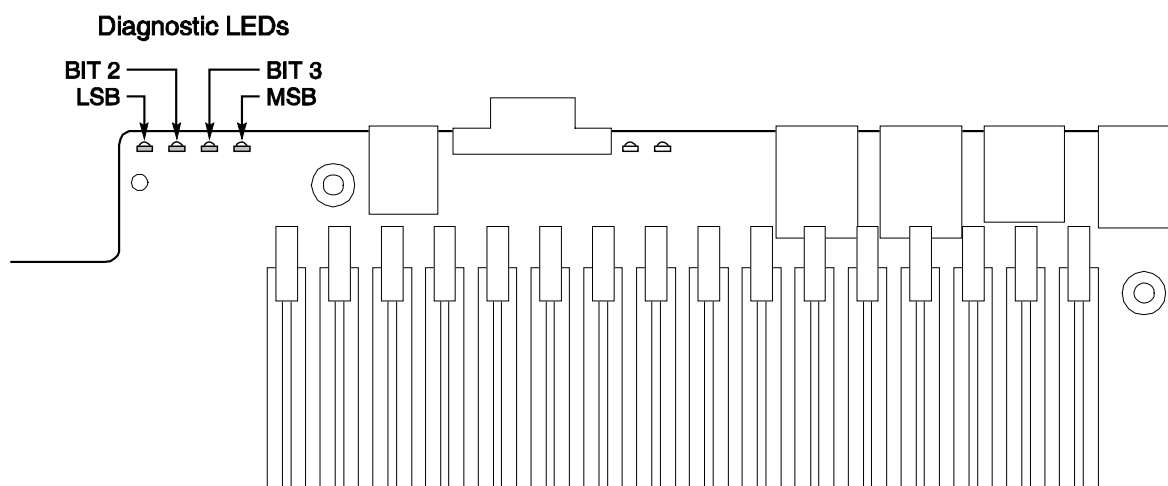


Table B-2. Diagnostic LED POST Code Decoder

Checkpoint	Diagnostic LED Decoder				Description
	G=Green, R=Red, A=Amber				
	MSB			LSB	
Host Processor					
0x10h	OFF	OFF	OFF	R	Power-on initialization of the host processor (bootstrap processor)
0x11h	OFF	OFF	OFF	A	Host processor cache initialization (including AP)
0x12h	OFF	OFF	G	R	Starting application processor initialization
0x13h	OFF	OFF	G	A	SMM initialization
Chipset					
0x21h	OFF	OFF	R	G	Initializing a chipset component
Memory					
0x22h	OFF	OFF	A	OFF	Reading configuration data from memory (SPD on DIMM)
0x23h	OFF	OFF	A	G	Detecting presence of memory
0x24h	OFF	G	R	OFF	Programming timing parameters in the memory controller
0x25h	OFF	G	R	G	Configuring memory parameters in the memory controller
0x26h	OFF	G	A	OFF	Optimizing memory controller settings
0x27h	OFF	G	A	G	Initializing memory, such as ECC init
0x28h	G	OFF	R	OFF	Testing memory
PCI Bus					
0x50h	OFF	R	OFF	R	Enumerating PCI busses
0x51h	OFF	R	OFF	A	Allocating resources to PCI busses
0x52h	OFF	R	G	R	Hot Plug PCI controller initialization
0x53h	OFF	R	G	A	Reserved for PCI bus
0x54h	OFF	A	OFF	R	Reserved for PCI bus
0x55h	OFF	A	OFF	A	Reserved for PCI bus
0x56h	OFF	A	G	R	Reserved for PCI bus
0x57h	OFF	A	G	A	Reserved for PCI bus

Checkpoint	Diagnostic LED Decoder				Description
	G=Green, R=Red, A=Amber				
	MSB			LSB	
USB					
0x58h	G	R	OFF	R	Resetting USB bus
0x59h	G	R	OFF	A	Reserved for USB devices
ATA / ATAPI / SATA					
0x5Ah	G	R	G	R	Resetting PATA / SATA bus and all devices
0x5Bh	G	R	G	A	Reserved for ATA
SMBUS					
0x5Ch	G	A	OFF	R	Resetting SMBUS
0x5Dh	G	A	OFF	A	Reserved for SMBUS
Local Console					
0x70h	OFF	R	R	R	Resetting the video controller (VGA)
0x71h	OFF	R	R	A	Disabling the video controller (VGA)
0x72h	OFF	R	A	R	Enabling the video controller (VGA)
Remote Console					
0x78h	G	R	R	R	Resetting the console controller
0x79h	G	R	R	A	Disabling the console controller
0x7Ah	G	R	A	R	Enabling the console controller
Keyboard (PS2 or USB)					
0x90h	R	OFF	OFF	R	Resetting the keyboard
0x91h	R	OFF	OFF	A	Disabling the keyboard
0x92h	R	OFF	G	R	Detecting the presence of the keyboard
0x93h	R	OFF	G	A	Enabling the keyboard
0x94h	R	G	OFF	R	Clearing keyboard input buffer
0x95h	R	G	OFF	A	Instructing keyboard controller to run Self Test (PS2 only)
Mouse (PS2 or USB)					
0x98h	A	OFF	OFF	R	Resetting the mouse
0x99h	A	OFF	OFF	A	Detecting the mouse
0x9Ah	A	OFF	G	R	Detecting the presence of mouse
0x9Bh	A	OFF	G	A	Enabling the mouse
Fixed Media					
0xB0h	R	OFF	R	R	Resetting fixed media device
0xB1h	R	OFF	R	A	Disabling fixed media device
0xB2h	R	OFF	A	R	Detecting presence of a fixed media device (IDE hard drive detection, etc.)
0xB3h	R	OFF	A	A	Enabling / configuring a fixed media device
Removable Media					
0xB8h	A	OFF	R	R	Resetting removable media device
0xB9h	A	OFF	R	A	Disabling removable media device
0xBAh	A	OFF	A	R	Detecting presence of a removable media device (IDE CDROM detection, etc.)
0xBCh	A	G	R	R	Enabling / configuring a removable media device

Checkpoint	Diagnostic LED Decoder				Description
	G=Green, R=Red, A=Amber				
	MSB			LSB	
Boot Device Selection					
0xD0	R	R	OFF	R	Trying boot device selection
0xD1	R	R	OFF	A	Trying boot device selection
0xD2	R	R	G	R	Trying boot device selection
0xD3	R	R	G	A	Trying boot device selection
0xD4	R	A	OFF	R	Trying boot device selection
0xD5	R	A	OFF	A	Trying boot device selection
0xD6	R	A	G	R	Trying boot device selection
0xD7	R	A	G	A	Trying boot device selection
0xD8	A	R	OFF	R	Trying boot device selection
0xD9	A	R	OFF	A	Trying boot device selection
0XDA	A	R	G	R	Trying boot device selection
0xDB	A	R	G	A	Trying boot device selection
0xDC	A	A	OFF	R	Trying boot device selection
0xDE	A	A	G	R	Trying boot device selection
0xDF	A	A	G	A	Trying boot device selection
Pre-EFI Initialization (PEI) Core					
0xE0h	R	R	R	OFF	Started dispatching early initialization modules (PEIM)
0xE2h	R	R	A	OFF	Initial memory found, configured, and installed correctly
0xE1h	R	R	R	G	Reserved for initialization module use (PEIM)
0xE3h	R	R	A	G	Reserved for initialization module use (PEIM)
Driver Execution Environment (DXE) Core					
0xE4h	R	A	R	OFF	Entered EFI driver execution phase (DXE)
0xE5h	R	A	R	G	Started dispatching drivers
0xE6h	R	A	A	OFF	Started connecting drivers
DXE Drivers					
0xE7h	R	A	A	G	Waiting for user input
0xE8h	A	R	R	OFF	Checking password
0xE9h	A	R	R	G	Entering BIOS setup
0xEAh	A	R	A	OFF	Flash Update
0xEEh	A	A	A	OFF	Calling Int 19. One beep unless silent boot is enabled.
0xEFh	A	A	A	G	Unrecoverable boot failure / S3 resume failure
Runtime Phase / EFI Operating System Boot					
0xF4h	R	A	R	R	Entering Sleep state
0xF5h	R	A	R	A	Exiting Sleep state
0xF8h	A	R	R	R	Operating system has requested EFI to close boot services (ExitBootServices ( ) has been called)
0xF9h	A	R	R	A	Operating system has switched to virtual address mode (SetVirtualAddressMap ( ) has been called)
0xFAh	A	R	A	R	Operating system has requested the system to reset (ResetSystem ( ) has been called)

Checkpoint	Diagnostic LED Decoder				Description
	G=Green, R=Red, A=Amber				
	MSB			LSB	
Pre-EFI Initialization Module (PEIM) / Recovery					
0x30h	OFF	OFF	R	R	Crisis recovery has been initiated because of a user request
0x31h	OFF	OFF	R	A	Crisis recovery has been initiated by software (corrupt flash)
0x34h	OFF	G	R	R	Loading crisis recovery capsule
0x35h	OFF	G	R	A	Handing off control to the crisis recovery capsule
0x3Fh	G	G	A	A	Unable to complete crisis recovery.



## Appendix C. POST Error Beep Codes

The following table lists POST error beep codes. Prior to system video initialization, BIOS uses these beep codes to inform users on error conditions. The beep code is followed by a user visible code on POST progress LEDs.

**Table C-1. POST Error Beep Codes**

Beeps	Error Message	POST Progress Code	Description
3	Memory error		System halted because a fatal error related to the memory was detected.
6	BIOS rolling back error		The system has detected a corrupted BIOS in the flash part, and is rolling back to the last good BIOS

The BMC may generate beep codes upon detection of failure conditions. Beep codes are sounded each time the problem is discovered, such as on each power-up attempt, but are not sounded continuously. Codes that are common across all NovaScale R42x serverboards and systems that use the Intel® S5000 chipset are listed in Table C-2. Each digit in the code is represented by a sequence of beeps whose count is equal to the digit.

**Table C-2. BMC Beep Codes**

Code	Reason for Beep	Associated Sensors	Supported?
1-5-2-1	CPU: Empty slot / population error – Processor slot 1 is not populated.	CPU Population Error	Yes
1-5-2-2	CPU: No processors (terminators only)	N/A	No
1-5-2-3	CPU: Configuration error (e.g., VID mismatch)	N/A	No
1-5-2-4	CPU: Configuration error (e.g., BSEL mismatch)	N/A	No
1-5-4-2	Power fault: DC power unexpectedly lost (power good dropout)	Power Unit – power unit failure offset	Yes
1-5-4-3	Chipset control failure	N/A	No
1-5-4-4	Power control fault	Power Unit – soft power control failure offset	Yes



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