NovaScale 9006 Server

Installation Guide

NOVASCALE

REFERENCE
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NOVASCALE

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Installation Guide

Hardware

September 2009

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Preface

This guide explains how to install and start NovaScale 9006 Servers for the first time.

Note The Bull Support Web site may be consulted for product information, documentation, updates and service offers:
http://support.bull.com

Intended Readers

This guide is intended for use by qualified personnel in charge of installing the NovaScale 9006 Server drawer in a Bull Cabinet.

Highlighting

The following highlighting conventions are used in this guide:

Bold	Identifies the following: • Interface objects such as menu names, labels, buttons and icons. • File, directory and path names. • Keywords to which particular attention must be paid.
Italics	Identifies references such as manuals or URLs.
`monospace`	Identifies portions of program codes, command lines, or messages displayed in command windows.
< >	Identifies parameters to be supplied by the user.
	Identifies the FRONT of a component.
	Identifies the REAR of a component.

Related Publications

- *Site Preparation Guide,* 86A140FA
  explains how to prepare a Data Processing Center for Bull Systems, in compliance with the standards in force. This guide is intended for use by all personnel and trade representatives involved in the site preparation process.
- *R@ck'n Roll & R@ck-to-Build Installation and Service Guide*, 86A117FA
  explains how to install and service the cabinets. This guide is intended for use by qualified support personnel.
- *NovaScale 9006 Server Hardware Console User's Guide,* 86A170FA
  explains how to use the console to manage your server. This guide is intended for use by server administrators, operators and qualified support personnel.
- *NovaScale 9006 Service Guide*, 86A768FA
  explains how to service the server. This guide is intended for use by qualified support personnel.
- *iCare Console User's Guide,* 86A171FA
  explains how to use the console to monitor and maintain Bull Systems. This guide is intended for use by Bull System Administrators and Operators and qualified support personnel.
- *Resource and Documentation CD*
  contains the tools and documentation required to configure, operate and maintain the equipment.

Legal Information

Regulatory Declarations and Disclaimers

Declaration of the Manufacturer or Importer

We hereby certify that this product is in compliance with:

- European Union EMC Directive 2004/108/EC, using standards EN55022 (Class A) and EN55024 and Low Voltage Directive 2006/95/EC, using standard EN60950
- International Directive IEC 60297 and US ANSI Directive EIA-310-E

Safety Compliance Statement

- UL 60950 (USA)
- IEC 60950 (International)
- CSA 60950 (Canada)

European Community (EC) Council Directives

This product is in conformity with the protection requirements of the following EC Council Directives:

Electromagnetic Compatibility

- 2004/108/EC

Low Voltage

- 2006/95/EC

EC Conformity

- 93/68/EEC

Telecommunications Terminal Equipment

- 1999/5/EC

Neither the provider nor the manufacturer can accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product.

Compliance with these directives requires:

- An EC declaration of conformity from the manufacturer
- An EC label on the product
- Technical documentation

Mechanical Structures

- IEC 60297
- EIA-310-E

FCC Declaration of Conformity

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

Federal Communications Commission (FCC) Statement

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

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Neither the provider nor the manufacturer are responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

Pursuant to Part 15.21 of the FCC Rules, any changes or modifications to this equipment not expressly approved by Bull SAS may cause harmful interference and void the FCC authorization to operate this equipment.

An FCC regulatory label is affixed to the equipment.

Canadian Compliance Statement (Industry Canada)

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

This product is in conformity with the protection requirements of the following standards:

- ICES-003
- NMB-003

Laser Compliance Notice (if applicable)

This product that uses laser technology complies with Class 1 laser requirements.

A CLASS 1 LASER PRODUCT label is affixed to the laser device.

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

Safety Information

Definition of Safety Notices

DANGER
A *Danger* notice indicates the presence of a hazard that has the potential of causing death or serious personal injury.

CAUTION
A *Caution* notice indicates the presence of a hazard that has the potential of causing moderate or minor personal injury.

WARNING
A *Warning* notice indicates an action that could cause damage to a program, device, system, or data.

Electrical Safety

The following safety instructions shall be observed when connecting or disconnecting devices to the system.

DANGER
The Customer is responsible for ensuring that the AC electricity supply is compliant with national and local recommendations, regulations, standards and codes of practice.
An incorrectly wired and grounded electrical outlet may place hazardous voltage on metal parts of the system or the devices that attach to the system and result in an electrical shock.
It is mandatory to remove power cables from electrical outlets before relocating the system.

CAUTION
This unit has more than one power supply cable. Follow procedures for removal of power from the system when directed.

Laser Safety Information (if applicable)

The optical drive in this system unit is classified as a Class 1 level Laser product. The optical drive has a label that identifies its classification.

The optical drive in this system unit is certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products. Elsewhere, the drive is certified to conform to the requirements of the International Electrotechnical Commission (IEC) 60825-1: 2001 and CENELEC EN 60825-1: 1994 for Class 1 laser products.

CAUTION

Invisible laser radiation when open. Do not stare into beam or view directly with optical instruments.

Class 1 Laser products are not considered to be hazardous. The optical drive contains internally a Class 3B gallium-arsenide laser that is nominally 30 milliwatts at 830 nanometers. The design incorporates a combination of enclosures, electronics, and redundant interlocks such that there is no exposure to laser radiation above a Class 1 level during normal operation, user maintenance, or servicing conditions.

Data Integrity and Verification

WARNING

Bull product are designed to reduce the risk of undetected data corruption or loss. However, if unplanned outages or system failures occur, users are strongly advised to check the accuracy of the operations performed and the data saved or transmitted by the system at the time of outage or failure.

Waste Management

This product has been built to comply with the Restriction of Certain Hazardous Substances (RoHS) Directive 2002/95/EC.

This product has been built to comply with the Waste Electrical and Electronic (WEEE) Directive 2002/96/EC.

Installation Flowchart

This flowchart summarizes the main installation and setup procedures for a server drawer delivered ready to be mounted in a Bull Cabinet.

Checking Site Conformity and Correct Cabinet Installation	
Step	OK
• Check that the site is compliant with the requirements set out in the *Site Preparation Guide*, 86A140FA • Check that cabinet installation is compliant with the requirements set out in the *R@ck'n Roll & R@ck-to-Build Installation and Service Guide*, 86A117FA • Check that sufficient space and connection outlets are available in the cabinet, as set out in Cabinet Requirements, on page 3-2	

Opening Packing and Checking Contents	
Step	OK
• Inspect the server drawer packing • Open the packing and store packing items • Check that the server drawer and accessories are not damaged and are compliant with the Purchase Order	

Installing the Server Drawer in the Cabinet	
Step	OK
• Read Getting to know the Server, on page 2-1 and the safety recommendations in the *R@ck'n Roll & R@ck-to-Build Installation and Service Guide*, 86A117FA • Prepare the server drawer rack-mount kit • Install the rack-mount kit rails on the server drawer • Install the rack-mount kit rails in the cabinet • Install and secure the server drawer into place	

Connecting the Server Drawer to the Site Power Supply and Checking Operation	
Step	OK
• Connect the power cord(s) to the Power Distribution Unit(s) (PDU) inside the cabinet, in compliance with the safety recommendations set out in the *R@ck'n Roll & R@ck-to-Build Installation and Service Guide*, 86A117FA • Connect the PDU(s) to the site power supply • Power on the server drawer from the Local Control Panel (LCP) • Check power status on the Local Control Panel (LCP) display • Power off the server drawer from the Local Control Panel (LCP) • Check power status on the LCP display	

Connecting the Server Drawer to the Enterprise LAN and Testing Network Connections	
Step	OK
• Connect the server drawer to the Enterprise LAN • Test LAN connections • Set up the server for remote access via the Hardware Console and iCare	

Completing Installation	
Step	OK
• Power on the server from the Server Hardware Console • Check Hardware status • Power off the server from the Server Hardware Console • Refer to the *NovaScale 9006 Server Hardware Console User's Guide* to complete Server Drawer setup.	

Chapter 1. Delivery

This chapter explains delivery, unpacking and inspection procedures. It includes the following topics:

- Introduction, on page 1-2
- Inspecting Server Packing, on page 1-3
- Unpacking the Server, on page 1-4
- Checking the Server, on page 1-5

Important **Site preparation must be completed by the pre-arranged delivery date. Any delay due to non-completion of the site by the pre-arranged date will be considered as the Customer's responsibility.**

1.1. Introduction

Bull servers for business and scientific applications are based upon the MESCA architecture (Multiple Environments on a SCalable Architecture), leveraging the latest generation of Intel Itanium processors.

Figure 1. NovaScale 9006 Server

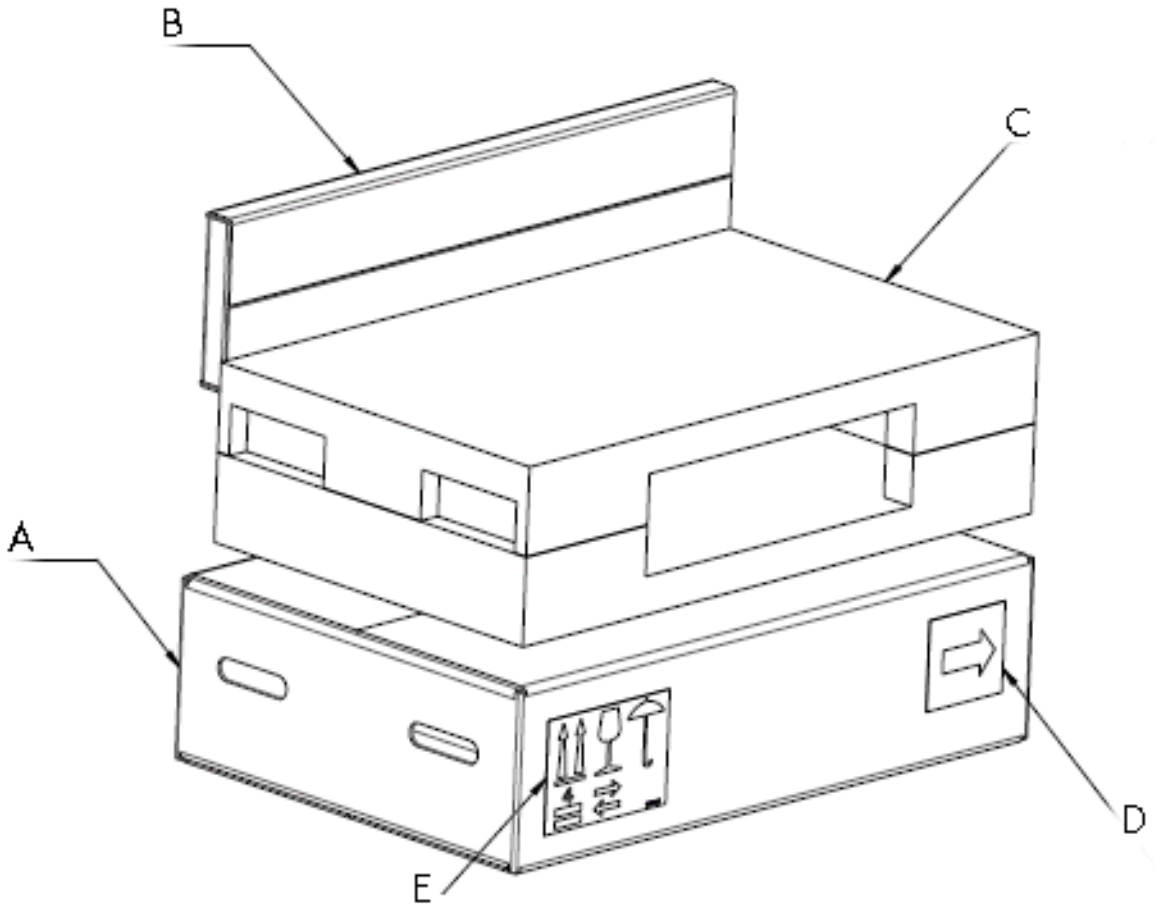
Note See Appendix B. NovaScale 9006 Server Specifications

The server is delivered ready to be rack-mounted in a Bull Cabinet 24 hours in advance of the scheduled installation date. On arrival, the server must be placed, in its packing, in the Computer Room so that it reaches room temperature before powering up.

CAUTION
It is mandatory for the server to be transported vertically.

1.2. Inspecting Server Packing

Before unpacking, inspect the server packing for eventual damage. In particular, check shockwatch and tiltwatch label indicators. If one or more indicators are RED, packing contents may be damaged.



Mark	Item
A	Server drawer box
B	Accessory box
C	Foam protection
D	Logo
E	Shipping label

Figure 2. Server drawer packing items

1.3. Unpacking the Server

Once you have checked that the server packing for damage, you can unpack the server drawer and store the packing in an appropriate place.

WARNING
To avoid condensation and incorrect handling, the server must be removed from its packing by authorized Service peronnel ONLY, on the scheduled installation date.

WARNING
The server must not be unpacked before it has reached the room temperature (24 hours in the computer room).

Required Tools

- Cutter

Procedure

DANGER
The Server Drawer weighs 40 kg when fully populated. 3 people are required to unpack it and install it in the cabinet.

1. Cut the packing straps.
2. Remove the top cover.
3. Remove the box containing the rack-mount kit and set aside.
4. Remove the foam protection from the server drawer.
5. Lift the server drawer from the packing and set aside on a clean, flat surface.
6. Store packing items.

1.4. Checking the Server

Once the server has been unpacked, a preliminary visual inspection must be performed:

- Check that the server delivered is compliant with the Purchase Order
- Check covers for sharp edges, damage or alterations

Figure 3. Server Drawer - front view

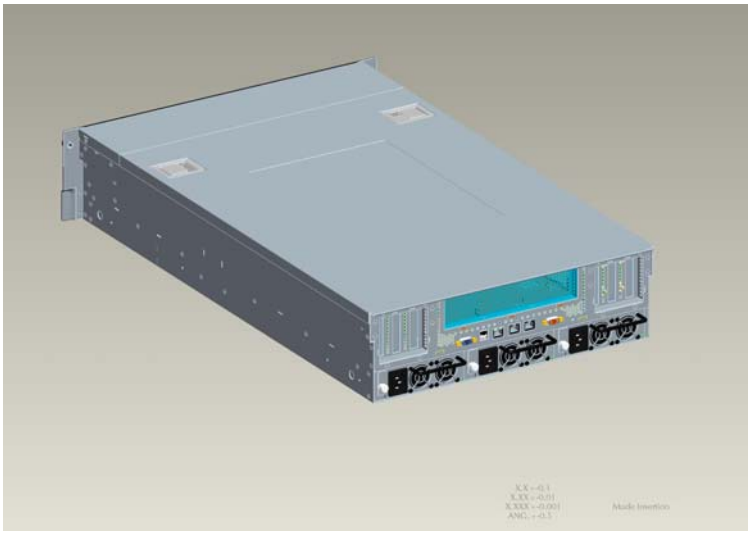


Figure 4. Server Drawer - rear view

WARNING
If the inspection indicates an unacceptable safety condition, the condition must be corrected before powering up the server.

Chapter 2. Getting to know the Server

This chapter gives an overview of server features and components. It includes the following topics:

- NovaScale 9006 Server Overview, on page 2-2
- Reliability, Availability, Serviceability (RAS), on page 2-3
- Features, on page 2-4
- Components, Controls and LEDs, on page 2-5

2.1. NovaScale 9006 Server Overview

Bull servers for business and scientific applications are based upon the MESCA architecture (Multiple Environments on a SCalable Architecture), leveraging the latest generation of Intel Itanium processors.

The NovaScale 9006 Server provides up to 4 processor sockets, 32 memory DIMMs, 8 hard disk drives and 6 PCI-e boards per 3U.

Figure 5. Bull NovaScale 9006 Servers

For future reference, you are advised to record the following data indicated on the labels affixed to the server drawer:

System	Data
Product Name	
Product Code	
Product Number	
Serial Number	

2.2. Reliability, Availability, Serviceability (RAS)

The NovaScale 9006 Server is designed to meet the highest quality standards and support a comprehensive offering of Reliability, Availabitlity and Serviceability (RAS) features, guaranteeing maximum system uptime.

The main RAS features supported by the server are:

- Redundant power supplies
- Redundant cooling fan units
- Built-in hardware monitoring
- Dynamic error codes and messages
- Fault-resistant start-up
- Remote management
- Remote firmware upgrade
- Memory sparing
- Memory hot-plug
- Core sparing
- Disk drive hot-swap
- PCIe hot plug

2.3. Features

The main features offered by NovaScale 9006 Servers are:

Intel Itanium Processor Family (IPF) Architecture

- Modularity, predictable performance, and growth

High Availability

- Component redundancy
- Capacity to isolate or replace a faulty component without service disruption
- Global and unified system visibility
- Round-the-clock operation

Scalability

- Static partioning

Simultaneous Support of Multiple Environments

- Linux Red Hat

High Performance Computing Capabilities

- Technical and scientific applications
- Business Intelligence
  - Datawarehousing
  - Datamining
  - ...
- Large enterprise applications
  - ERP
  - CRM
  - SCM
  - ...
- Large database applications for Internet transactions
- Large business sector applications
  - Online billing, reservations, banking
  - ...

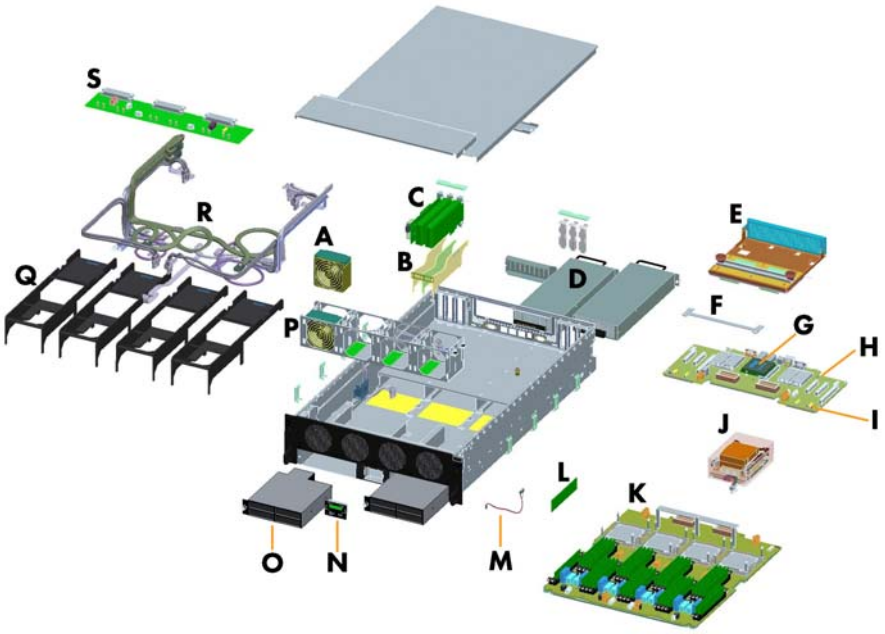
Software Suites

- Built-in Server Hardware Console
- iCare Centralized Hardware Tools Console
- Bull System Manager (BSM)

2.4. Components, Controls and LEDs

Components

The following diagram shows an exploded view of server drawer components:

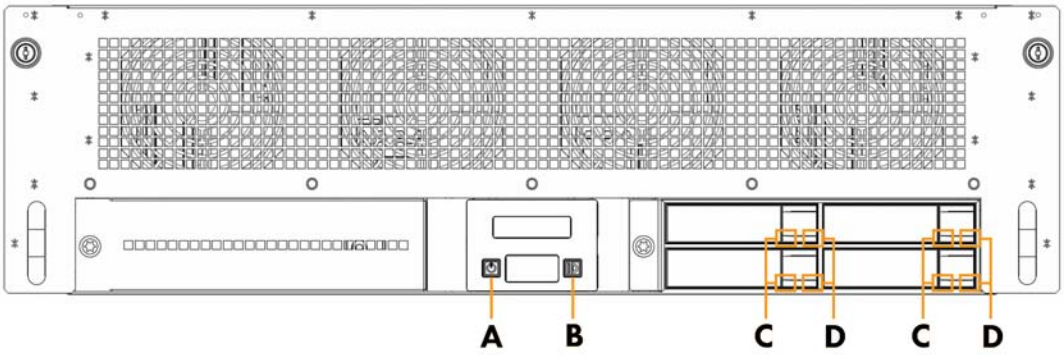


Label	Description	Quantity
A	Fan Unit	Up to 8
B	PCIe Separator	
C	PCIe Card	Up to 6
D	Power Supply Unit	2 or 3
E	Dummy CSI Interconnect Board (DSIB)	
F	Prepositioner	
G	Embedded Management Board (OPMA)	
H	I/O Legacy Board (ILB)	
I	ICH battery	
J	Tukwila Processor Assembly	Up to 4
K	Memory Tukwila Board (MTB)	
L	Memory Module	Up to 32
M	Anti_Intrusion Switch	
N	Local Control Panel (LCP)	
O	Hard Disk Box (HDX)	1 or 2
P	Fan Box	
Q	Air Duct	4
R	Internal Cable Kit	
S	Power Distribution Board (PDB)	

Figure 6. Server Drawer components - Exploded view

Controls and LEDs (Front view)

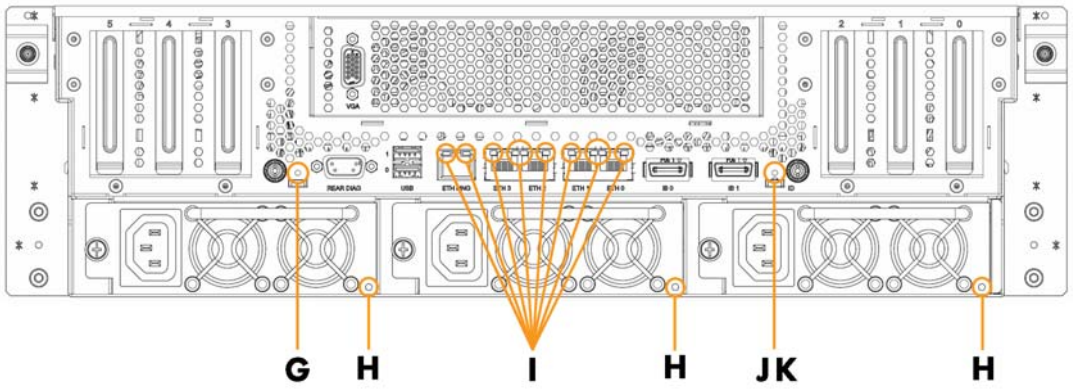
The server drawer is equipped with LEDs and buttons on both the front and rear.



Label	Name	Description
A	Power LED/Button	**Flashing Green**: server drawer power on stand-by. **Still Green**: server drawer powered up.
B	ID LED/Button	**Flashing Blue**: ID button pressed or activated from the Server Hardware Console. Simultaneously lights the BLUE ID LED (G) on the rear of the server drawer.
C	Disk Cooling LED	**Flashing Amber**: disk cooling fault.
D	Disk Activity LED	**Flashing Green**: disk active.

Figure 7. Server drawer LEDs and buttons - Front view

Control and LEDs (Rear view)



Label	Name	Description
G	Return to Defaults Button	Returns the Embedded Management Controller settings to default values.
H	Power Supply Unit LED	**Still Green**: power supply unit powered up. **Flashing Green**: power supply unit on stand-by. **Flashing Amber**: power supply unit fault.
I	Ethernet Activity LEDs	Indicates network activity status. There is one management port and 4 Gbit ports. For the **management** port: **Left LED: Still Green**: link active. **Flashing Green** : link inactive. **Right LED: Still Orange** : rate 100MB/s **Extinguished**: rate 10 MB/s For the **Gbit** ports: (to the right of each port) **Left LED: Green** : rate 1GB/s **Orange**: 100 MB/s **Extinguished**: 10 MB/s **Right LED: Still Green** : link established. **Flashing Green** : link active.
J	Reset Button	Resets the Embedded Management Controller.
K	ID LED	**Flashing Blue**: ID button (**B**) on the front of the server drawer pressed or activated from the Server Hardware Console.

Figure 8. Server drawer LEDs and buttons - Rear view

For details about LCP screen display options see Appendix A LCP DisplayMessages

Chapter 3. Installing the Server in the Cabinet

This chapter explains how to install a NovaScale 9006 Server drawer in a Bull Cabinet. It includes the following topics:

- Cabinet Requirements, on page 3-2
- Installing the Server Drawer Rack-Mount Kit, on page 3-3
- Installing and Securing the Server Drawer in Position, on page 3-11

DANGER

The Server Drawer weighs 40 kg when fully populated. 3 people are required to unpack it and install it in the cabinet.

3.1. Cabinet Requirements

The server drawer is designed for installation in a 42U or 19U Bull Cabinet. Before installing the server drawer, please check that the following points:

- A 3U free space must be available in the cabinet per server drawer. If you are only installing one server drawer in the cabinet, you are advised to used position 16-17-18U.
- Depending on the number of power supplies, two or three C13 sockets per server drawer must be available on the PDU(s) to connect each server drawer to the site power supply.
- 1 Ethernet cable must be available per server drawer to connect the ETH MNG outlet to the Enterprise network.

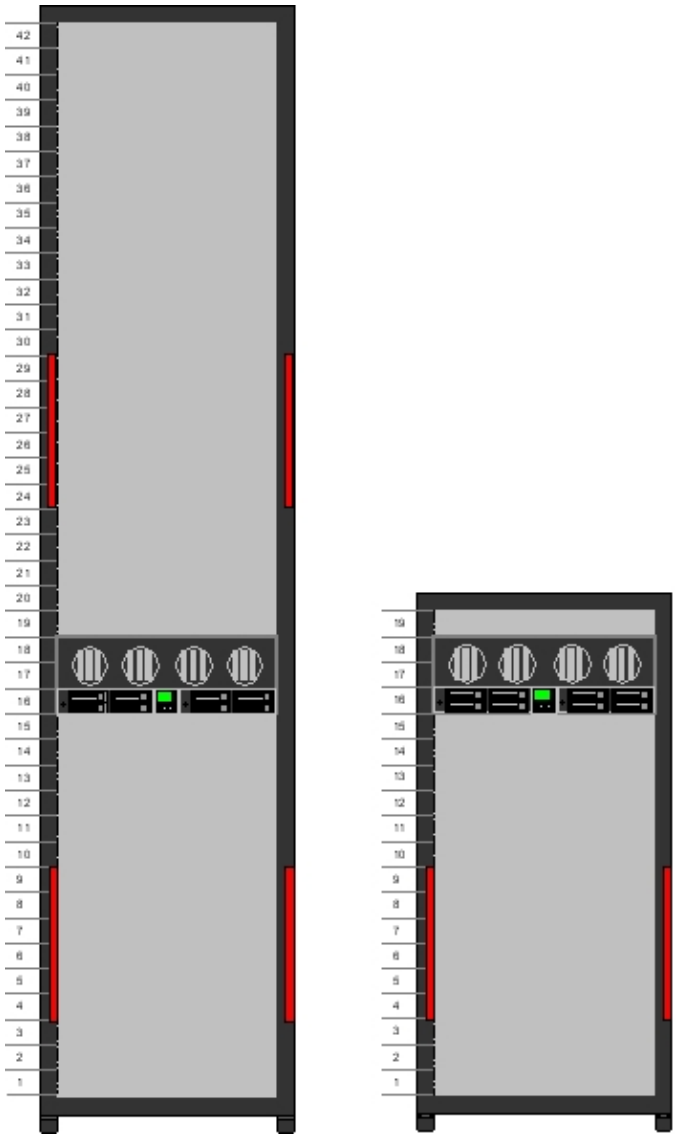


Figure 9. Positioning the server drawer in the cabinet

3.2. Installing the Server Drawer Rack-Mount Kit

The server drawer is delivered with a rack-mount kit for installation in a Bull Cabinet. The rack-mount kit contains the items listed in the following table:

Quantity	Item
2	Slide Rail Assembly
4	Slide Rail Bracket
16	M4x6 Slotted Head Screw
1	Rear Cabler Hanger
2	M3x6 Countersunk Torx Screw
2	Rear Cable Hanger Bracket
6	M5 Cage Nut
12	M5x16 Torx Screw
8	D5 Tapered Washer

Table 1. Rack-mount kit items

The following tools are required to install the rack-mount kit on the server drawer and on the cabinet rack:

- T10 Torx screwdriver (M3 screws)
- T1mm flat screwdriver (M4 screws)
- T25 Torx screwdriver (M5 screws)

3.2.1. Disassembling Rack-Mount Kit Rails

Each slide rail assembly comprises two parts, Part A and Part B, as shown in the following figure:

- Part A is installed on the server drawer and is referred to as **drawer rail**,
- Part B is installed on the cabinet rack and is referred to as **rack rail**.

Figure 10. Slide rail assembly: Parts A and B

1. Take the first slide rail assembly and disassemble the two parts by lowering the thumb lever and pulling the drawer rail out and away from the rack rail.

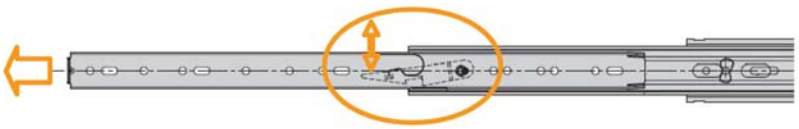


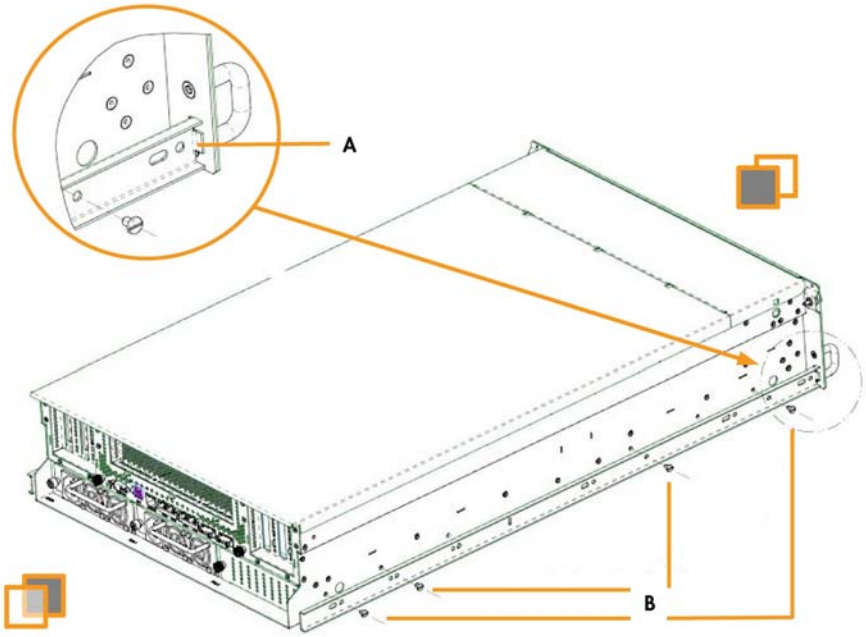
Figure 11. Slide rail assembly: Disassembling the drawer and rack rails

2. Repeat Step 1 for the second slide rail assembly.

3.2.2. Mounting the Rails on the Server Drawer

Once the rails have been disassembled, you can proceed to mount the drawer rails on the server drawer.

1. Align the drawer rail mount holes with the four mount holes along the left side of the drawer, taking care to place the right-angle rail bend (A) against the front panel of the server drawer.
2. Secure the left drawer rail to the server drawer by tightening the four M4x6 slotted head screws (B).

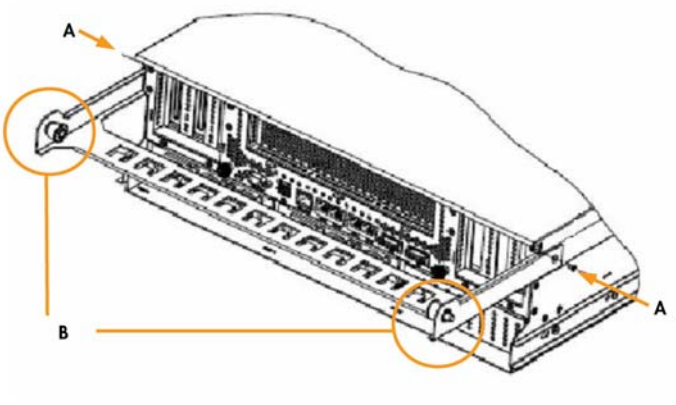


Label	Description
A	Right-angle bend
B	M4x6 slotted head screws

Figure 12. Installing drawer rails on the server drawer

3. Repeat Steps 1 and 2 for the right side of the server drawer.

4. Align the cable hanger mount holes with the rear mount holes on either side of the drawer.
5. Secure the cable hanger to the drawer by tightening the two M3x6 Torx screws (A).



Label	Description
A	M3 Torx screws
B	Stop pins

Figure 13. Installing the cable hanger on the drawer

6. Check that the two red stop pins (Mark B) are retracted. If this is not the case, pull the stop pins outward and turn 90° to block them in the retracted position.

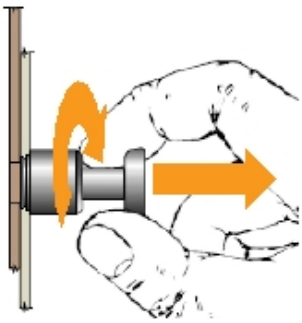


Figure 14. Retracting cable hanger stop pins

3.2.3. Mounting the Rails on the Cabinet Rack

Once the rails have been disassembled and the drawer rail has been mounted on the server, you can proceed to mount the cabinet rails on the cabinet rack.

Note The rack rails each comprise a fixed part and a mobile part.

1. Fully extend the left rack rail.

Figure 15. Fully extending the left rack rail

2. Prepare two support brackets. Note the right-angle bracket bend (A).

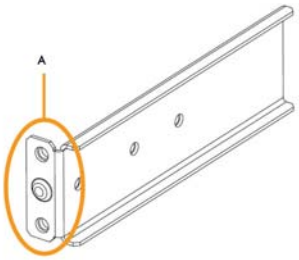


Figure 16. Rack rail support bracket

3. Pre-assemble the two brackets on the fixed part of the rack rail, taking care to place the right-angle bracket bends toward the front and rear ends of the fixed part:
   a. Rear end: insert the two M4x6 slotted head screws without tightenng (A) so that the bracket can slide freely.
   b. Front end: insert and tighten the two M4x6 slotted head screws (B).

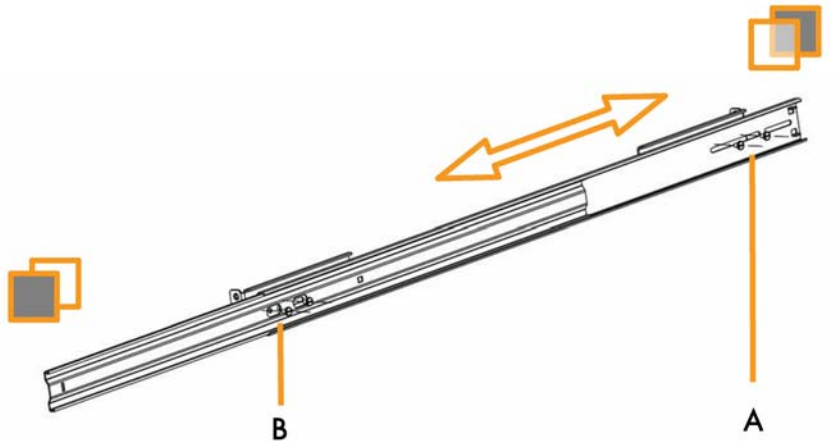


Figure 17. Pre-installing support brackets on the fixed part of the rack rail

4. Secure the rack rail into place on the front cabinet rack:
   a. Insert the bracket stub (A) in the rack mount hole.
   b. Secure the rail into place by tightening the M5x16 screw and D5 tapered washer (B).

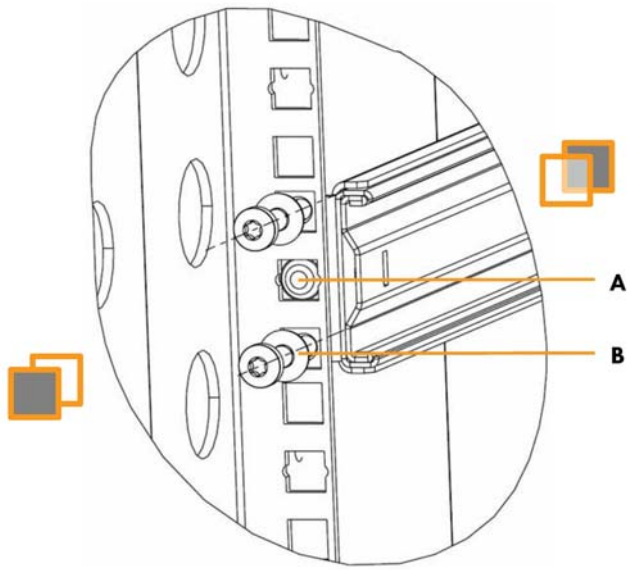


Figure 18. Securing the rack rail to the cabinet rack - 1

5. Secure the rack rail into place on the rear cabinet rack:
   a. With the front bracket secured to the front cabinet rack (A), as explained in Step 4, slide the rear bracket to the rear cabinet rack (B).
   b. Secure the rear bracket to the rear cabinet rack (C), as explained in Step 4.
   c. Fully extend the mobile part of the rack rail (D).
   d. Tighten the two screws securing the rear bracket to the rack rail (E).

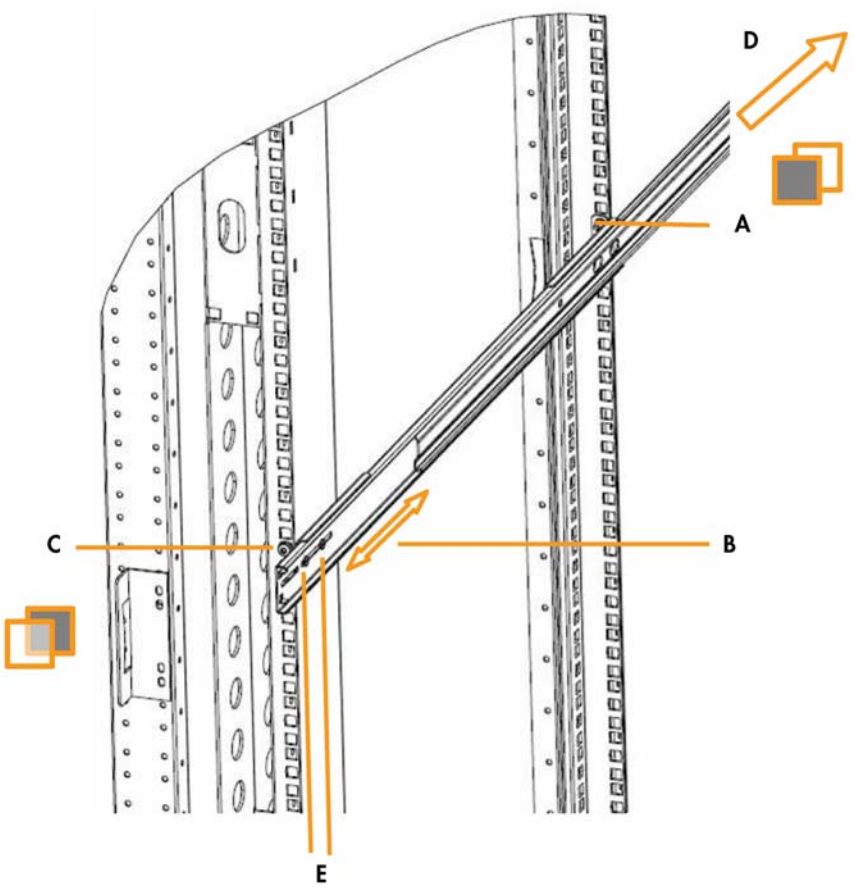
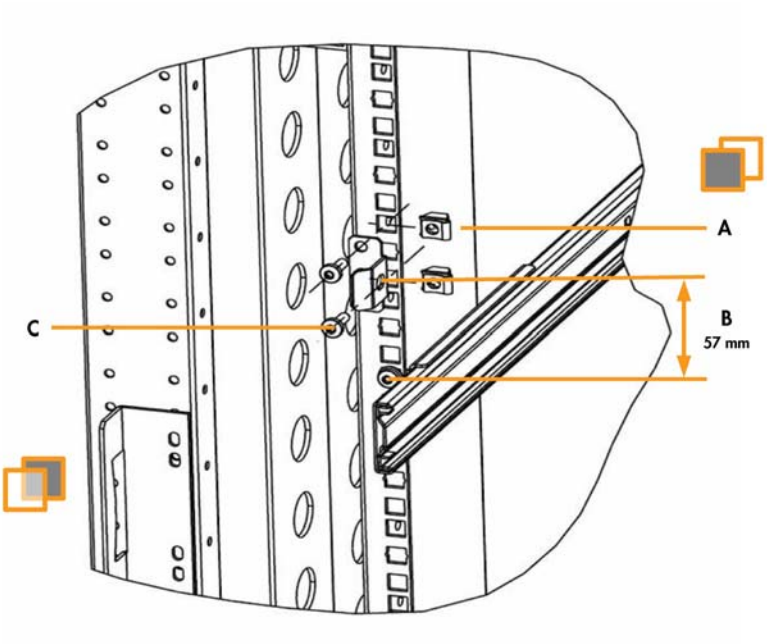


Figure 19. Securing the rack rail to the cabinet rack - 2

6. Secure the rear cable hanger bracket to the rear cabinet rack with the two M5x16 Torx screws.



Label	Description
A	M5 cage screw position
B	Bracket centre to rail centre - 57mm.
C	M5x16 Torx screws

Figure 20. Installing cable hanger brackets to the rear cabinet rack

7. Install the two cage nuts on the front cabinet rack, at the same level as the rear cable hanger brackets (centre to centre - 57 mm). These cage nuts will be used to lock the drawer into position on the cabinet rack.

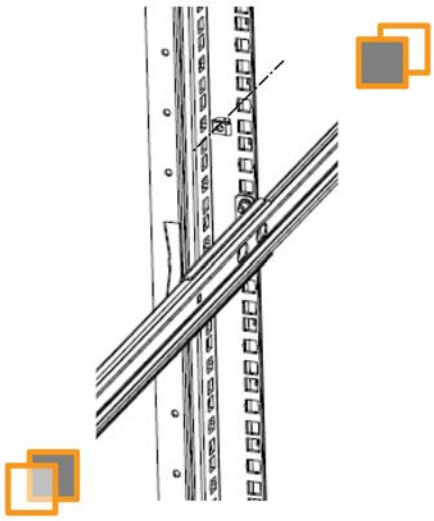


Figure 21. Installing the two cage nuts on the front cabinet rack

8. Repeat Steps 1 to 7 for the right rack rail.

3.3. Installing and Securing the Server Drawer in Position

DANGER

The Server Drawer weighs 40 kg when fully populated. 3 people are required to unpack it and install it in the cabinet.

1. From the front of the cabinet, pull the rack rails fully forward until they lock into place.

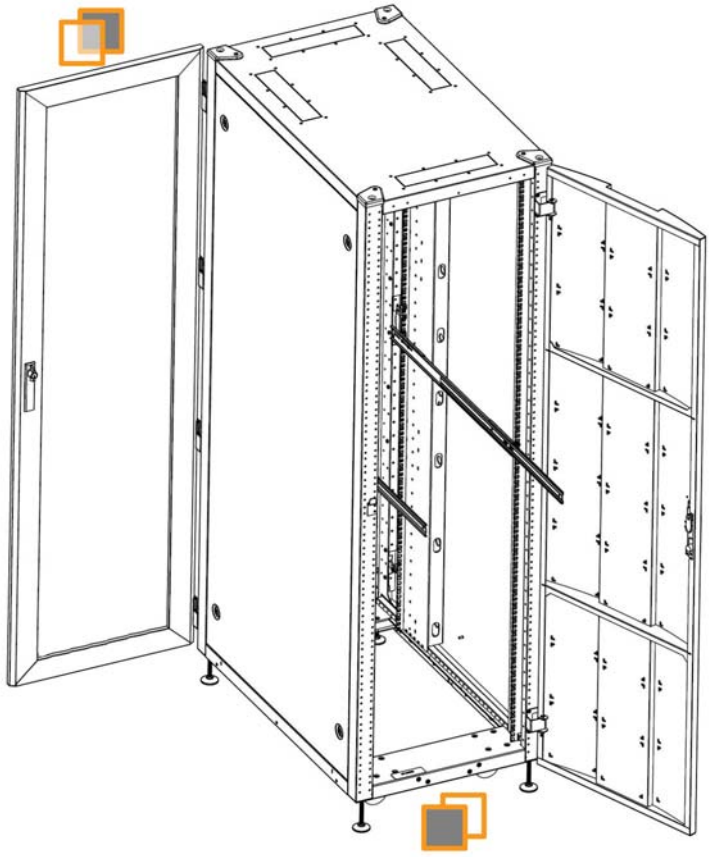


Figure 22. Fully extending and locking rack rails

2. Engage the server drawer rails into the rack rails and push to the rear of the cabinet until you hear the two thumb levers on the rail assemblies click. The server drawer can no longer be freely pulled forward.

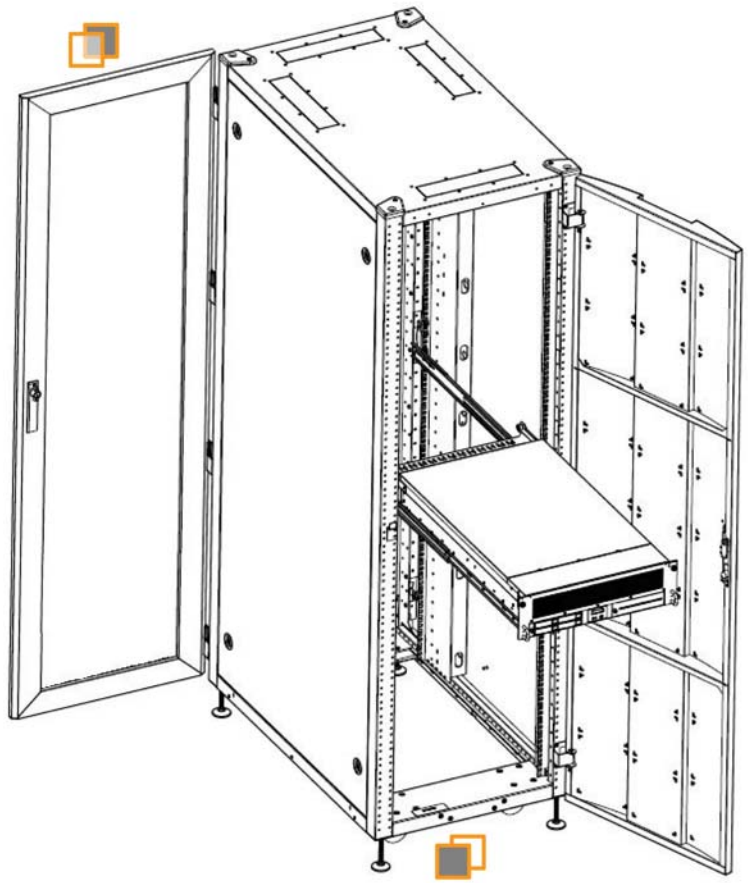


Figure 23. Installing the server drawer in the cabinet

3. Raise the two thumb levers on the rail assemblies.

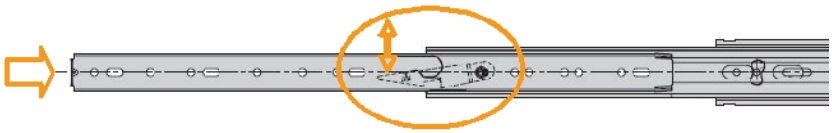
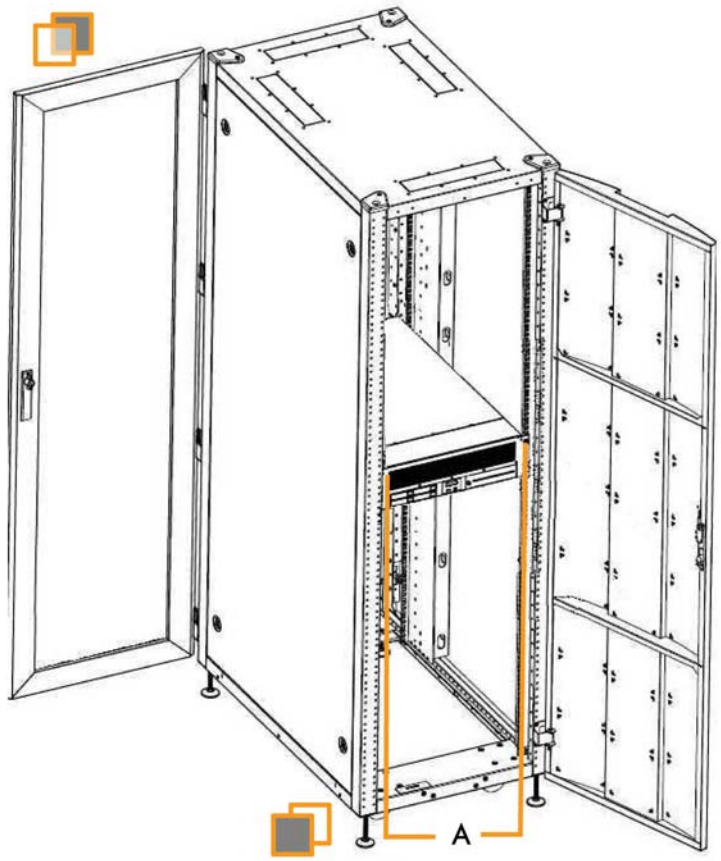


Figure 24. Raising the thumb levers

4. Push the server drawer fully backward until it is flush with the cabinet frame.
5. Tighten the two captive screws (A) securing the server drawer to the cabinet rack.



Label	Description
A	Server drawer captive screws

Figure 25. Securing the server drawer to the cabinet rack

6. From the rear of the cabinet, unlock the two red cable hanger stop pins by turning them 90°.

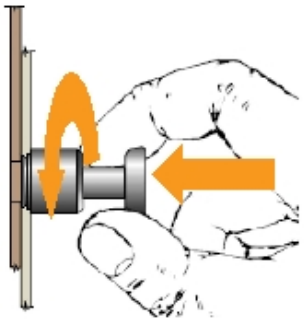


Figure 26. Unlocking cable hanger stop pins

Chapter 4. Connecting and Testing the Server

This chapter explains how to connect a NovaScale 9006 Server drawer to the site power supply and to the enterprise LAN. It includes the following topics:

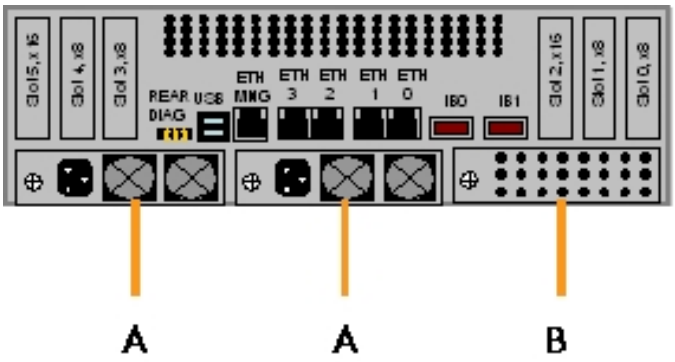
- Connecting the Server to the Power Distribution Unit(s) (PDU), on page 4-2
- Connecting the PDU(s) to the Site Power Supply, on page 4-4
- Powering On the Server from the Local Control Panel (LCP), on page 4-4
- Checking Power Status on the Local Control Panel (LCP) Display, on page 4-5
- Powering Off the Server from the Local Control Panel, on page 4-6
- Connecting the Server to the Enterprise LAN, on page 4-7
- Testing Enterprise LAN Connections, on page 4-8
- Setting up the Management Board for Remote Access via the Console, on page 4-8

4.1. Connecting the Server to the Power Distribution Unit(s) (PDU)

The NovaScale 9006 Server can be configured with two Power Supplies (PS) (standard configuration), or with three Power Supplies (redundant configuration).

The connections to the Power Supplies are located on the rear of the Server Drawer.

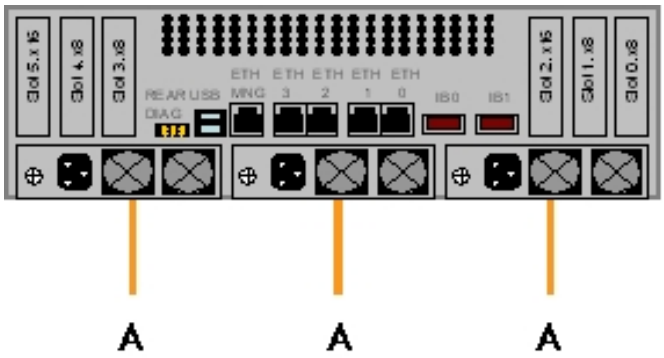
Standard Power Supply Configuration



Mark	Description
A	Power Supply 0 and 1
B	Missing Power Supply

Figure 27. Power Supply minimum configuration (rear view)

Redundant Power Supply Configuration



Mark	Description
A	Power Supply 0, 1 and 2

Figure 28. Power Supply redundant configuration (rear view)

According to configuration, two (standard) or three (redundant) power cords are used to connect the NovaScale 9006 Server power supplies to the Power Distribution Units (PDU).

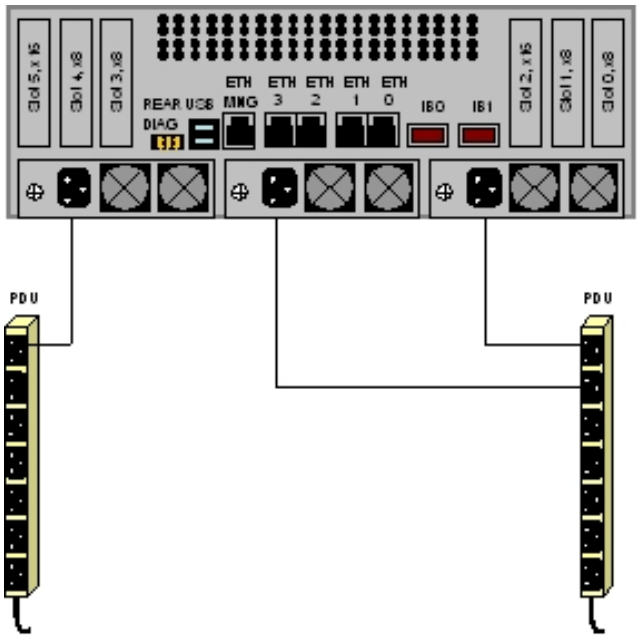


Figure 29. Connecting Power Supplies redundant configuration (rear view)

4.2. Connecting the PDU(s) to the Site Power Supply

Procedure

1. Route the AC power cord along the cabinet flange to the Power Distribution Unit (PDU).
2. Plug the AC power cord into the PDU.
3. Request the customer to plug the PDU into the site power supply.

Note For information on how to install a PDU in a cabinet, see the *R@ck'n Roll & R@ck-to-Build Installation and Service Guide*, 86A117FA

The Server Drawer is now connected to the site power supply.

4. Check the server status display sequence on the LCP screen:
   a. "*Bull Architect of an Open World*".
   b. MAC address, IP address, name in scrolling mode on the first line.
   c. Serial number (*XAN-Syy-nnnnn)* on the second line.
   d. Green light on and blinking.

4.3. Powering On the Server from the Local Control Panel (LCP)

Press the green power button (A) located on the Local Control Panel (LCP) on the front of the Server Drawer.

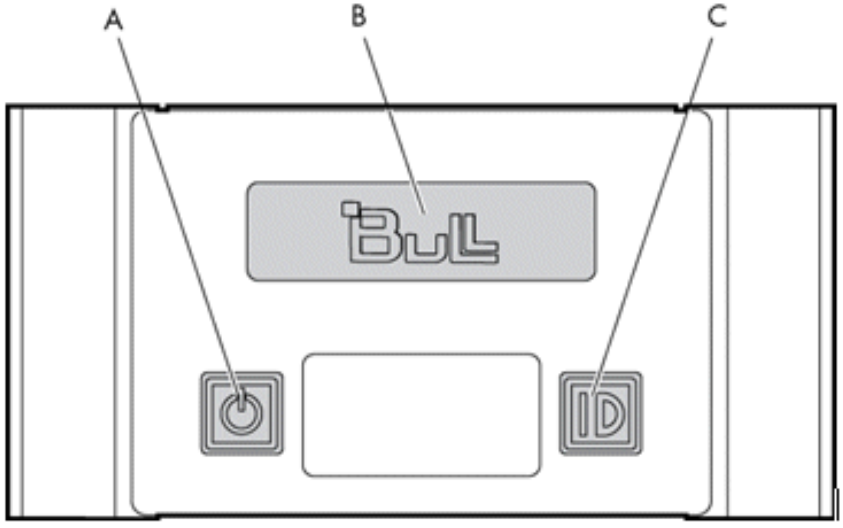


Figure 30. Powering on the server from the LCP

Label	Description
A	Power On/Off button
B	Display Screen
C	Identification button

Table 2. LCP buttons

4.4. Checking Power Status on the Local Control Panel (LCP) Display

1. Check the server status on the LCP screen during the power-on sequence:
   a. LCP screen backlight ON
   b. Server MAC address, IP address, name in scrolling mode on the first line
   c. POWERING ON message on the second line
   d. Green LED ON and BLINKING
2. Check server status once the power-on sequence is completed:
   a. BIOS INIT message on the second line
   b. Green LED ON and FIXED

Note If an error occurs, the DEEP STDBY message appears on the second line of the display, the green LED is ON and BLINKING and the LCP screen backlight is OFF.

What to Do if an Error Occurs ?

Continue the installation procedure and when possible, connect to the Hardware Console and view the System Event Log (SEL) messages (See Viewing and Clearing the System Event Log (SEL), on page 5-8).

Fore more information see Troubleshooting the NovaScale 9006 Server Drawer in the *NovaScale 9006 Service Guide* , 86A768FA.

4.5. Powering Off the Server from the Local Control Panel

Procedure

1. From the front of the Server Drawer., press the power button (A) located on the Local Control Panel (LCP) for at least 4 seconds.

Note If the power button (A) is not pressed at least 4 seconds, a "graceful" shutdown is launched.

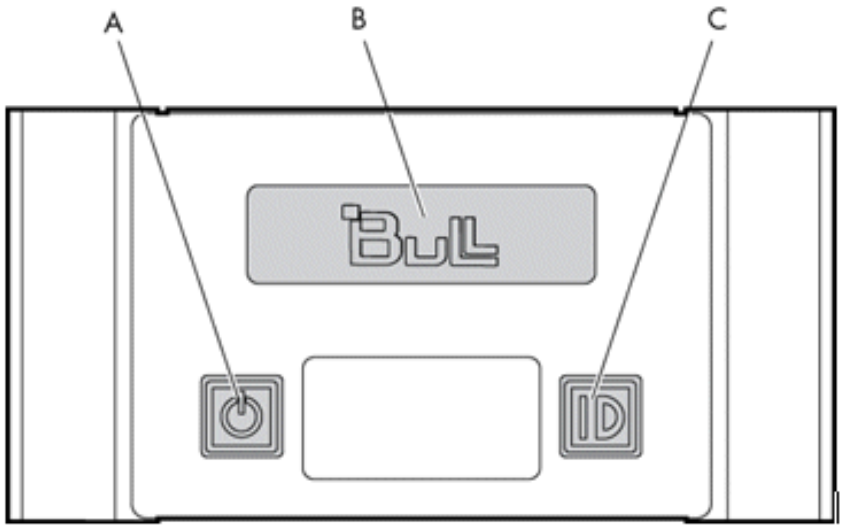


Figure 31. Powering off the server from the LCP

2. Check that the following server status indications are displayed on the LCP display screen (B):
   a. MAC address, IP address, name in scrolling mode on the first line
   b. DEEP STDBY message on the second line
   c. Green light ON and BLINKING
   d. LCP screen backlight OFF

4.6. Connecting the Server to the Enterprise LAN

The connections to the network are located on the rear of the drawer.

From the rear of the Server Drawer, connect the ETH MNG port (RJ45 outlet) (A) to the Enterprise LAN. (If the Administration and Enterprise are managed through different networks, use the Administration network).

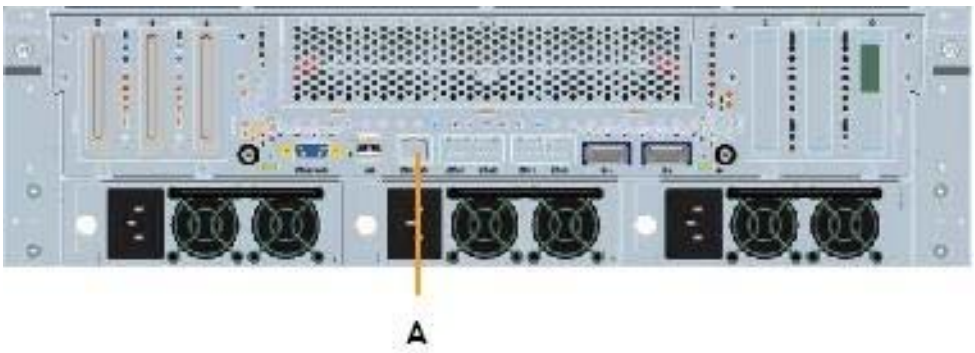


Figure 32. Connecting the server to the enterprise LAN

Note You can connect directly the Ethernet MNG port to a computer, in order to set up the embedded management board from this computer. See *Setting up the Management Board for Remote Access via the Console*, on page 4-8.

According to the customer configuration the other ports may be used as follows:

- The four ETH ports (RJ 45 outlets) may be connected to the ENTERPRISE network
- The two InfiniBand ports (CX4 or QSFP outlets) may be connected to the InfiniBand network
- The two USB ports may be connected to the local keyboard and mouse.
- The VGA port (HD15 outlet) may be connected to a local display

Note The DIAG port (DB9 outlet) is reserved for internal use.

In the following figure the ADMINISTRATION and ENTERPRISE networks are shown as two different Ethernet networks, but they can be the same network.

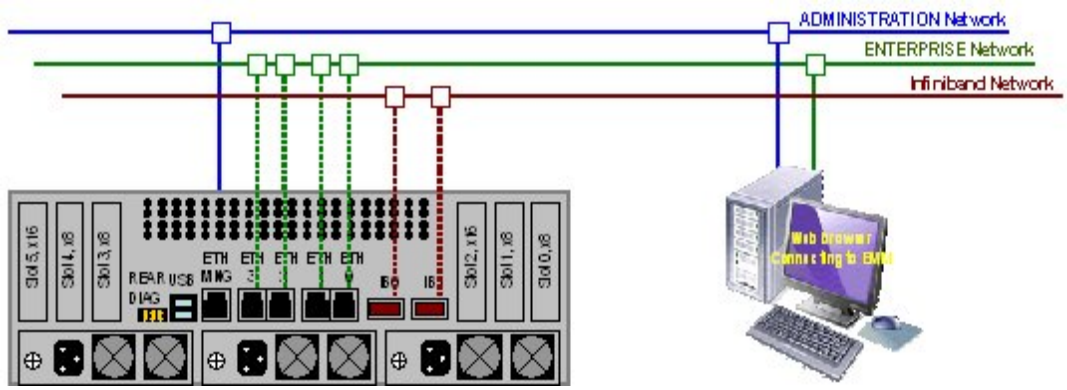


Figure 33. Connecting the different ports of the server

4.7. Testing Enterprise LAN Connections

LAN connections can be tested from a remote workstation connected to the same network by launching the PING command.

Windows Workstation

1. Click **Start** > **Run** and enter **cmd**
2. Enter **ping <IP_address>**, (where <IP_address is the IP address of the server).

Linux Workstation

1. Open a Shell command window.
2. Enter **ping <IP_address>**, (where <IP_address is the IP address of the server).

4.8. Setting up the Management Board for Remote Access via the Console

The embedded management board's communication interface is based on TCP/IP. On delivery, it is configured with the following factory-default network parameters:

Parameter	Value
IP Auto-Configuration	DHCP
Static IP Address	192.168.1.22
Gateway	255.255.255.0
MAC Address	No default value. Stored in the Flash memory of the embedded management board.
Admin user	Name = super, password = pass
Date and Time	No value

Table 3. Embedded Management Board factory-default network parameters

The *psetup (Windows)* tool delivered on the *Resource and Documentation CD* is used to retrieve and change the embedded management board's factory-default network configuration. There are two ways for the *psetup (Windows)* tool to access the embedded management board:

- Remotely: by connecting the Ethernet MNG port to the Enterprise LAN and running the *psetup (Windows)* tool from any computer connected to the same network subnet (Recommended).
- Locally: by directly connecting the Ethernet MNG port to a computer and running the *psetup (Windows)* tool from this computer.

Note Two buttons located at the rear of the Server Drawer allow to force a hard reset or to restore the default values of the configuration data. Refer to Components, Controls and LEDs, on page 2-5

Prerequisites

- The server is connected to the site power supply.
- You have access to two RJ45 Ethernet network outlets connected to the same network subnet (if you use Remote access).
- The DHCP server (where applicable) is installed on the same network subnet.
- You have the *Resource and Documentation CD*.

Procedure

Note *psetup* screenshots only are shown in this procedure.

1. If not already done, connect the Ethernet MNG port to a computer or to the Enterprise LAN.
2. Insert the *Resource and Documentation CD* in the drive of the computer that will be used for the operation (remote or local).
3. (Linux) Install the *mc-setup-1.2.1.BD.1-1.fc<x>.i386.rpm* package from the *Resource and Documentation CD*. Note that <x> is the version number.
4. Start the *psetup (Windows)* tool from the *Resource and Documentation CD*. The following screen appears:

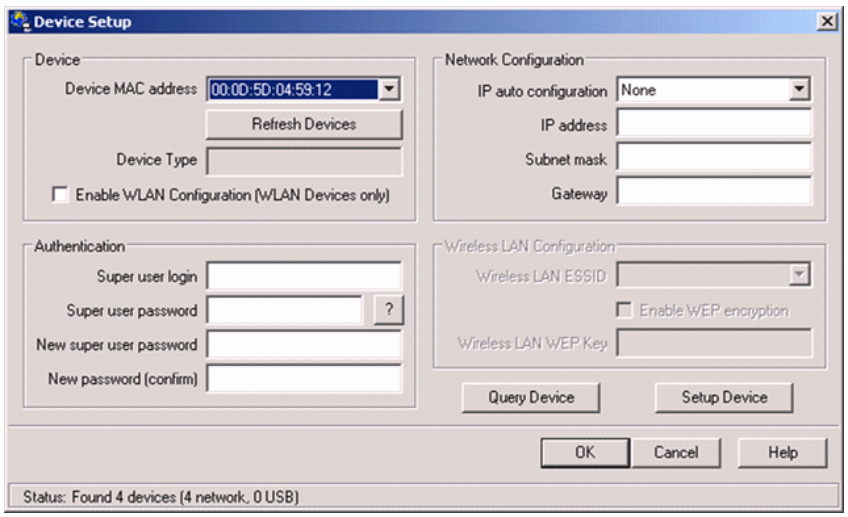


Figure 34. Device setup screen - *psetup*

5. Click the **Refresh Devices** button. The *psetup (Windows)* tool automatically detects all the embedded management boards connected to the network subnet.
6. Select the embedded management board's MAC address from the drop-down list.

Note The MAC address is displayed continuously in scrolling mode on the first line of the Local Control Panel (LCP).

Note If the computer is directly connected to the Ethernet MNG port (local), only one MAC address is displayed.

7. Click **Query Device**. The current network settings appear in the **Network Configuration** box.

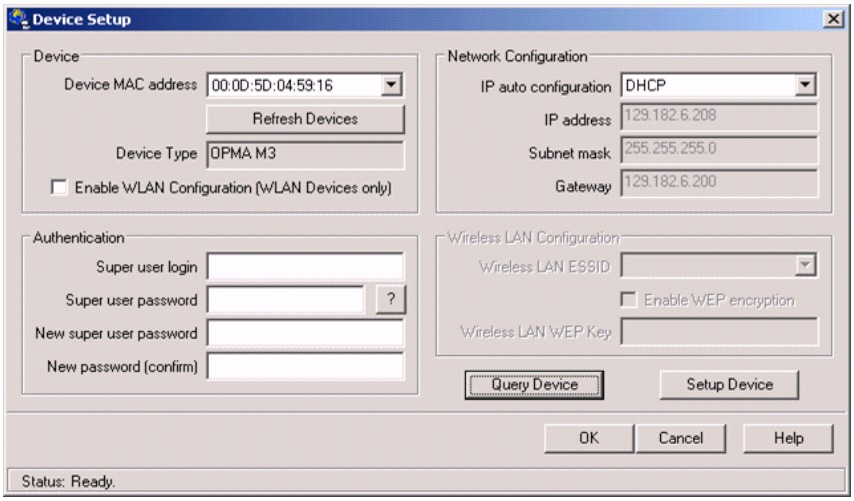


Figure 35. DHCP auto-configuration - *psetup*

8. To change network settings (Static IP address configuration), proceed as follows (else go directly to Step 9):

   a. Complete the following fields.

      . Super user login: super

      . Super user password: pass

      . IP autoconfiguration: None

      . IP address, Subnet mask and Gateway: to be completed according to your network settings.

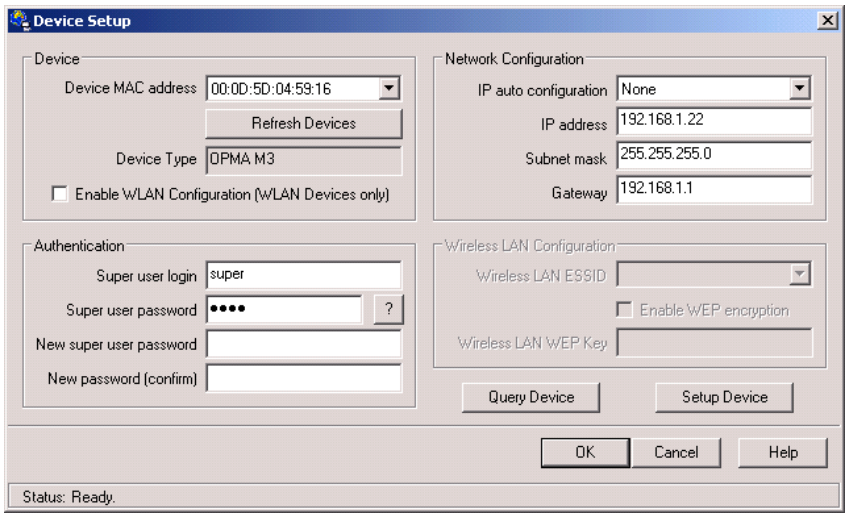


Figure 36. Example of a static IP address configuration - *psetup*

   b. Click Setup Device.

Important **Although the super user password can be changed using the *psetup (Windows)* tool, you are advised to log on to the Hardware Console for the first time with the default super user logon and password. The default super user logon and password can be changed by the Customer once installation is completed.**

---

9. If the Ethernet MNG port is connected to a computer for local configuration, connect it to the Enterprise LAN.

10. Check that you access the console correctly by opening a Web browser and entering the IP address that has just been configured. The authentication page opens. For details, see *NovaScale 9006 Server Hardware Console User's Guide*.

11. If required, to back up configuration data, use the KiraTool Environment utility provided on the *Resource and Documentation CD*. Refer to *Backup Configuration Data* in Appendix A. of the *NovaScale 9006 Server Hardware Console User's Guide*.

Chapter 5. Completing the Installation Report

This chapter explains how to check the hardware correct operation in the following topics:

- Starting the Hardware Console, on page 5-2
- Powering On the Server, on page 5-3
- Viewing Monitoring Sensors, on page 5-5
- Viewing and Clearing the System Event Log (SEL), on page 5-8
- Viewing Board and Security Messages, on page 5-9
- Powering Off the Server, on page 5-11

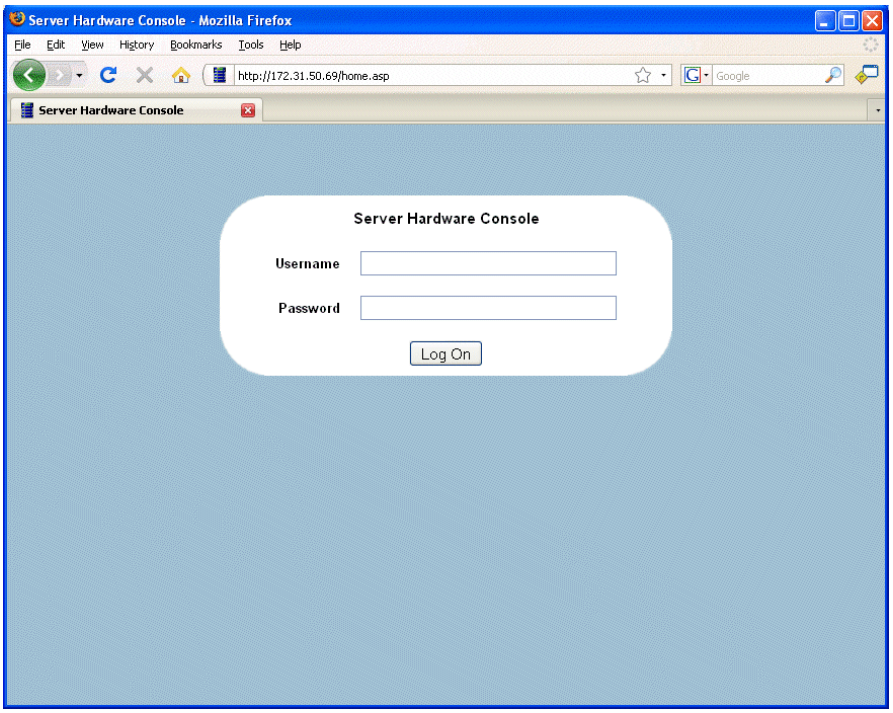
5.1. Starting the Hardware Console

Prerequisites

- The server is connected to the site power supply and to the enterprise LAN.

Procedure

1. Launch your web browser and enter the IP address that you have just configured using the *psetup (Windows)* tool (example: **http://192.x.x.x**) provided on the *Resource and Documentation CD*. The authentication page opens.



Hardware Console	
Username	Factory-default name: **super**
Password	Factory-default password: **pass**

Figure 37. Authentication page description

2. Complete the **Username** and **Password** fields and click **Log On**. Once you are authenticated, the **Power Management** page opens.

Important **It is strongly recommended to change the factory-default super user password once initial setup is completed, taking care to record your new account details for subsequent connections. You are advised to use the same password for all your managed resources. This will enable you to interface easily with the iCare Console.**
If you lose your account details and are unable to connect to the console, please contact your Customer Service Representative.

What To Do if an Incident Occurs?

If you cannot connect to the console or if the web pages are displayed incorrectly, one of the following problems may be the cause:

- Network failure.
- Incorrect network settings.
- Incorrect browser settings (proxy configuration).

5.2. Powering On the Server

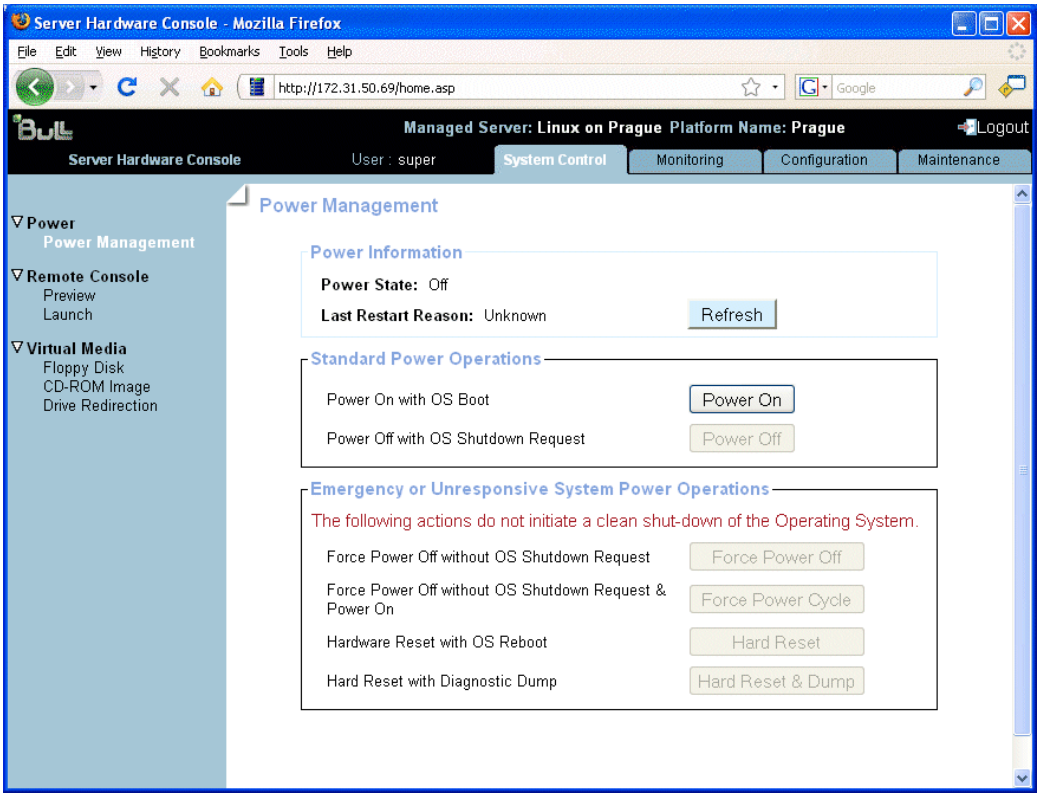
The system can be powered on from the Power Management page Standard Operations box.

Important **The Power status display is not updated dynamically, therefore displayed status may not reflect actual status and the Power On button may not be enabled although the system is powered off. You can update power status by using the Refresh button.**

- You have Power Control permission.
- The Power On button is enabled.

Procedure

1. From the System Control tab, click Power > Power Management to open the Power Management page.



Standard Power Operations Box	
Note: For details on other power management features, see the *NovaScale 9006 Server Hardware Console User's Guide*.	
Power On button	Launches the power up sequence. During this sequence, hardware is powered up from the standby power mode to the main power mode and the Operating System is booted. Note: If an error occurs during this sequence, the system is automatically powered down to standby.
Power Off button	Accessible only when the system is powered on.

Figure 38. Standard Power Operations box - Power On

2. From the **Standard Power Operations** box, click **Power On** to launch the power up sequence, which may take a few minutes to complete.
3. From the **Power Information** box, click the **Refresh** button to update power status. Once the power up sequence has completed, the **Power State** value switches from **Off** to **On** and the **Power Off** button is enabled.
4. Connect to the Remote System Console to follow the power on sequence, as explained in Previewing and Launching the Remote System Console in the *NovaScale 9006 Server Hardware Console User's Guide*.

Important **The physical power button located on the Local Control Panel device should only be used for servicing operations and/or in the event of an emergency or a network failure.**

What To Do if an Incident Occurs?

- The power cable may be detached.
- The power sequence has not completed.
- The power supply may be damaged.

5.3. Viewing Monitoring Sensors

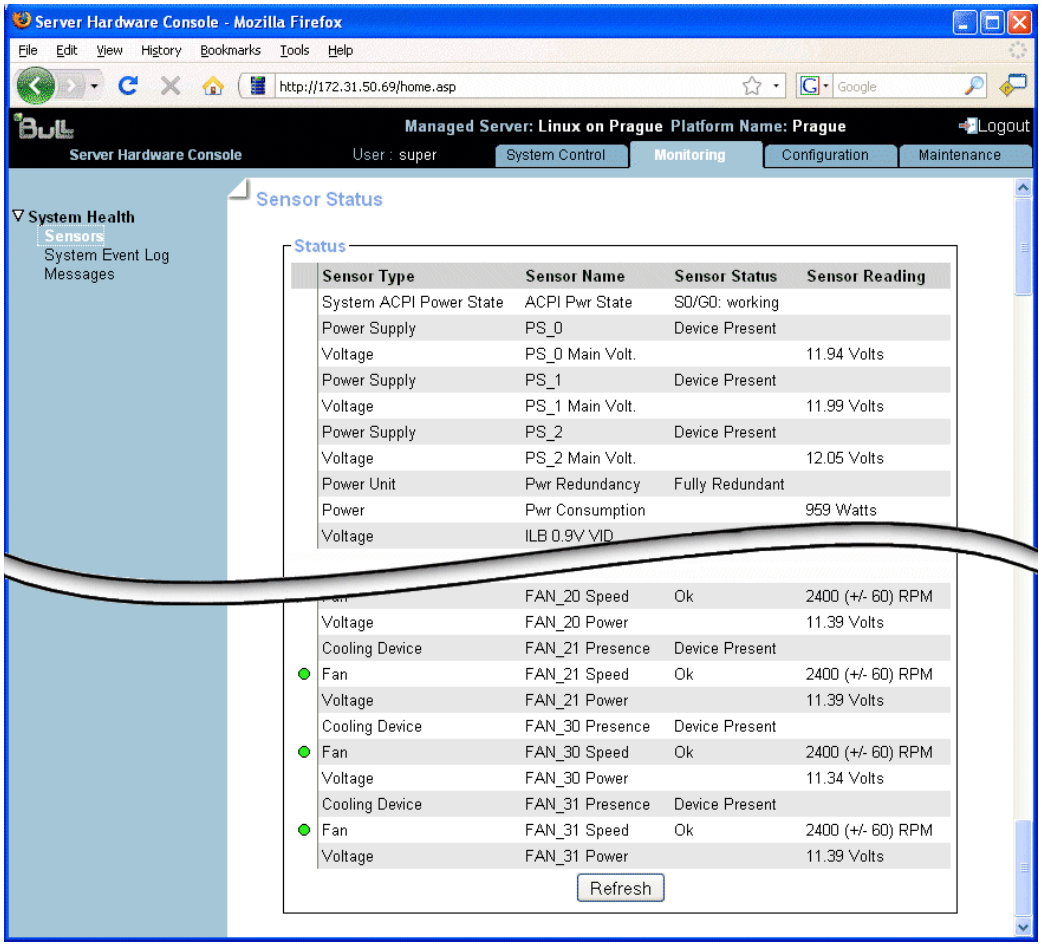
The server is equipped with various sensors that monitor:

- Power status
- Presence, absence, redundancy of components
- Voltage values
- Temperature values
- Fan speed

Procedure

1. From the **Monitoring** tab, click **System Health > Sensors** to display the **Sensor Status** page.
2. Click **Refresh** and check that all component icons are green.

Note Tables 4 and 5 explain sensor status page icons, values and readings.



Sensor Status Page	
Refresh button	The **Sensor Status** page is not automatically updated, therefore the display may not reflect current sensor status. Use this button, located at the bottom of the page, to update the display.

Figure 39. Sensor Status page

Status Icons Description	
The status icons to the left of certain components indicate the status of this component with regard to nominal threshold values.	
Green	NORMAL This component is operating correctly. No problem has been detected.
Red	CRITICAL This component is not operating correctly. A problem has been detected. **Immediate preventive or corrective action** is required.

Table 4. Status Icons Description

Sensor Status Page - Icons, Values and Readings				
Icon	Type	Name	Status	Reading
–	System ACPI Power State	ACPI Pwr State	• No reading • S0/G0: working • S4/S5: soft off	–
–	Power Supply	PS_X	• No reading • Device Present • Device Absent • Failure detected • Input lost or out of range	–
–	Power Unit	Pwr Redundancy	• No reading • Fully redundant • Redundancy Lost • Non redundant: insufficient resources	–
–	Power	Pwr Consumption	–	Value in Watts
–	Voltage	PS_X Main Volt. ILB XXX MTB XXX P0 XXX P1 XXX P2 XXX P3 XXX FAN_XX Power	• No reading • Ok • Limit exceeded	Value in Volts
–	Processor	PROC_X	• No reading • Device Present • Device Absent • Processor disabled • Thermal trip • Processor automatically throttled	–
Green Red	Temperature	MTB Temperature ILB Temperature PDB Temperature LCP Temperature	• No reading • Ok • Below/Above lower critical threshold	Value in °C
–	Cooling Device	FANBX_X Redund. FAN_X Presence	• No reading • Fully redundant • Redundancy lost • Non redundant: insufficient resources • Device Present • Device Absent	–
Green Red	Fan	FAN_X Speed	• No reading • Ok • Below/Above lower critical threshold	Value in RPM

Table 5. Sensor Status page description

5.4. Viewing and Clearing the System Event Log (SEL)

The System Event Log records events compliant with the IPMI standard, in particular those concerning:

- Power supplies
- FANs
- Temperature sensors

Notes
- Events recorded in this log can be transmitted via the event alerting system to an SNMP Manager or to offline personnel by email.
- You can access another log, which is called the Board and Security Messages log. This log records non-IPMI events.

WARNING
The System Event Log can only store up to 512 entries at a time.
Once this limit is reached, the LOG IS NOT AUTOMATICALLY EMPTIED to allow for the arrival of new events. Beyond the 512-entry limit, NEW EVENTS ARE NOT RECORDED.
It is strongly recommended to empty this log regularly, using the Clear button, so that the latest events can be logged.
Note that cleared entries are deleted and cannot be retrieved.

Prerequisites

- Viewing: none.
- Clearing: you have Alert Settings & Clear SEL permission.

Procedure

- From the **Monitoring** tab, click **System Health** > **System Event Log** to open the **System Event Log** page.

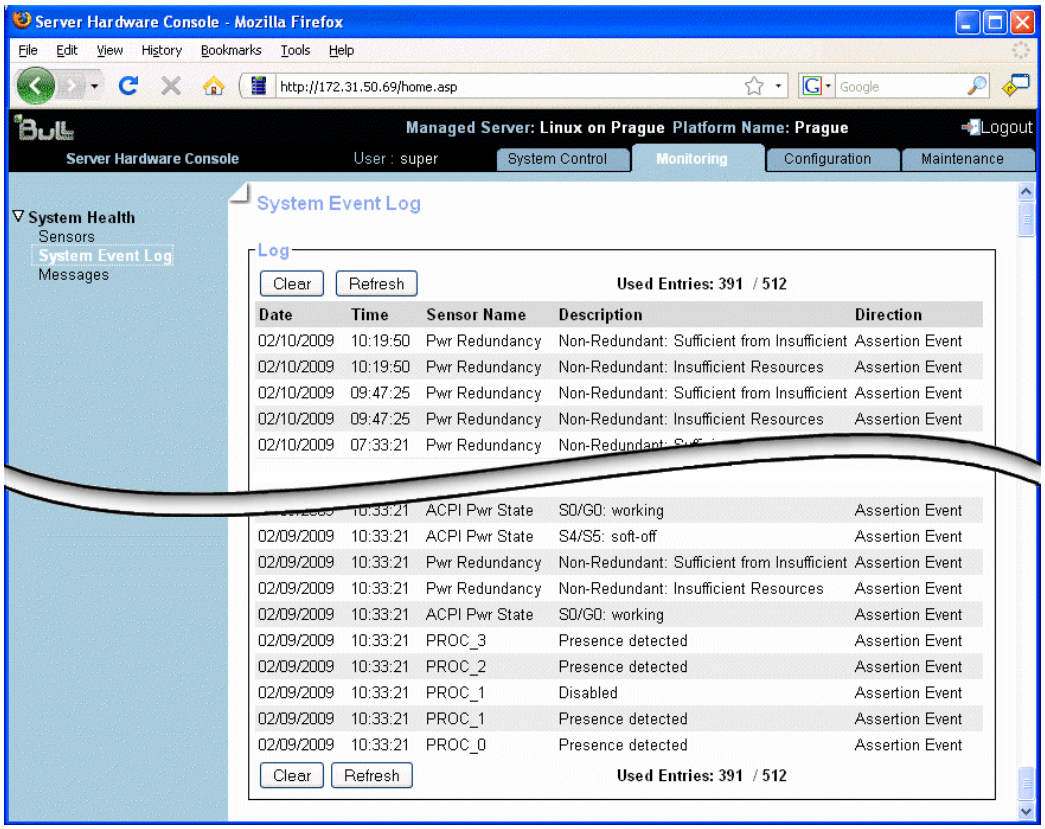


Figure 40. System Event Log page

- Use the **Refresh** button to update the display at any time.
- Use the **Clear** button to empty the log. Entries are deleted and cannot be retrieved.

Note SEL messages and associated operation to recover are explained in the *NovaScale 9006 Service Guide* in the Troubleshooting the NovaScale 9006 Server Drawer chapter.

5.5. Viewing Board and Security Messages

The Board and Security Messages log records non-IPMI events, such as power-on errors, user authentication, connection to the remote console, security violation, log deletion or firmware upgrade.

Note Events compliant with the IPMI standard are recorded in the System Event log.

Prerequisites

- You have **Security/Log/Authentication Settings** permission.

Procedure

1. From the Monitoring tab, click System Health > Messages to open the Board & Security Messages page.

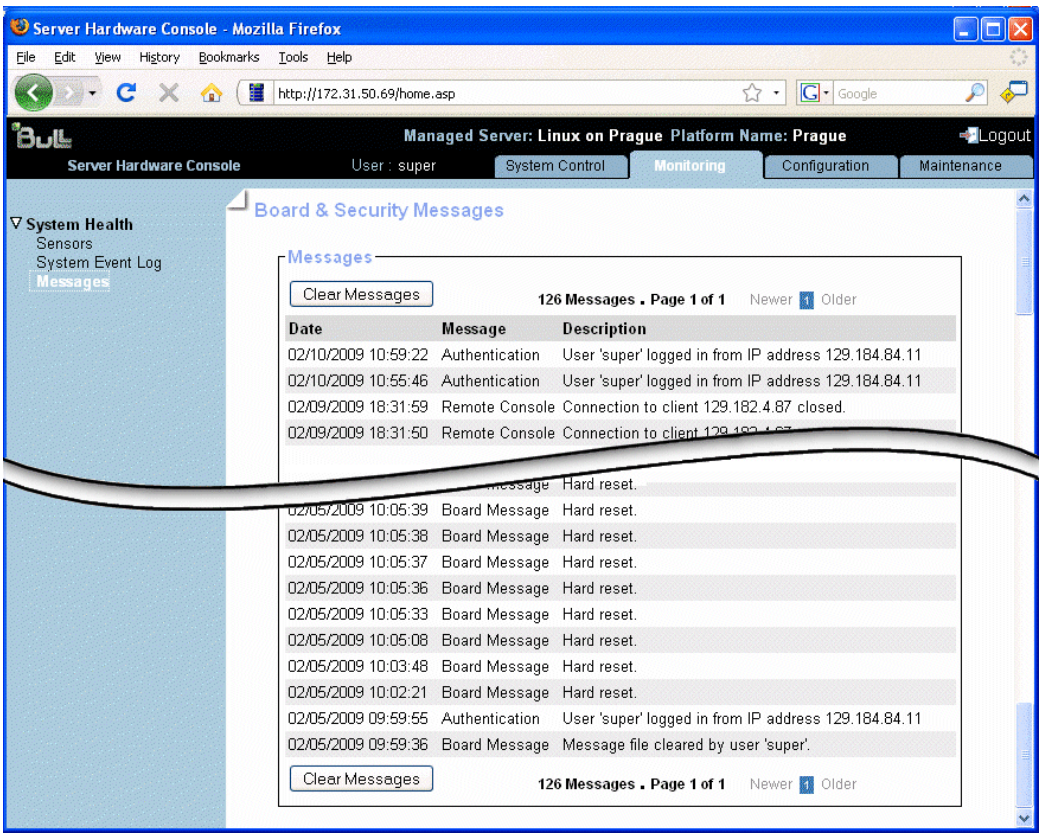


Figure 41. Board & Security Messages page

2. Browse messages, as required, using the Newer and Older buttons.

Important **This log can record up to 1.000 events. Once this limit is reached, the arrival of new messages will automatically delete the oldest messages in the log.**

Related Topics

- Setting Up Board and Security Messaging Policies, in the *NovaScale 9006 Server Hardware Console User's Guide*

5.6. Powering Off the Server

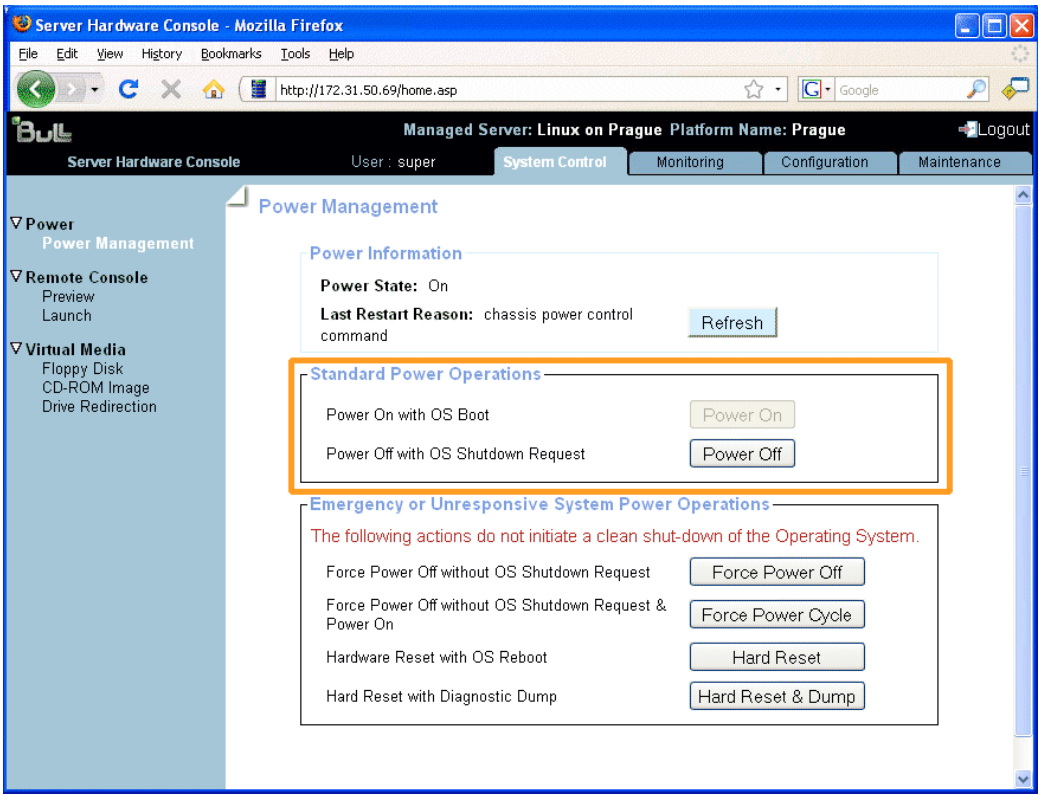
The system can be powered off from the Power Management page Standard Operations box.

Important **The Power status display is not updated dynamically, therefore displayed status may not reflect actual status and the Power Off button may not be enabled although the system is powered up. You can update power status by using the Refresh button.**

- You have Power Control permission.
- The Power Off button is enabled.

Procedure

1. From the System tab, click Power > Power Management to open the Power Management page.



Standard Power Operations Box	
Note: For details on other power management features, see the *NovaScale 9006 Server Hardware Console User's Guide*.	
Power On button	Accessible only when the system is powered off.
Power Off button	Requests the Operating System to perform a graceful power down. During this sequence the Operating System saves data, closes open applications and shuts down, and hardware is powered down from the main power mode to the standby power mode. Note: The Operating System must be configured to accept the power off request.

Figure 42. Standard Power Operations box - Power Off

2. From the **Power Operations** box, click **Power Off** to launch the routine power down sequence, which may take a few minutes to complete.
3. From the **Power Information** box, click the **Refresh** button to update power status. Once the power down sequence has completed, the **Power State** value switches from **On** to **Off** and the **Power On** button is enabled.
4. Connect to the Remote System Console to follow the power off sequence, as explained in Previewing and Launching the Remote System Console in the *NovaScale 9006 Server Hardware Console User's Guide*.

Important The physical power button located on the Local Control Panel device should only be used for servicing operations and/or in the event of an emergency or a network failure.

What To Do if an Incident Occurs?

If the system remains in the **Power On** state after a **Power Off** operation, one of the following problems may be the cause:

- The power sequence has not completed.
- The system has frozen.

You may need to forcibly power down the system using one of the power off buttons accessible from the **Emergency or Unresponsive System Power Operations Box**.

Appendix A. LCP DisplayMessages

This section describes the messages that may be displayed on the Local Control Panel (LCP).

The LCP displays two lines (L1 and L2) of 16 characters (C1 to C16) each.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
L1																
L2																

First line (L1)

The fist line shows the following information in scrolling mode:

<MAC Address> <IP Address> <System Name>

- <MAC Address>: is the MAC Address of the server's embedded management board (BMC).
- <IP Address>: is the IP Address of the server's embedded management board (BMC).
- <System Name>: is the Primary Operating System name.
  As the message length is limited to 48 characters long, the system name will be truncated to fit the size of 48 characters.

Second line (L2)

The second line displays a message.

This message is limited to 48 characters. If the length of a message is greater than or equal to 48 characters, the scrolling mode is automatically triggered.

Displayed Message	Server Status	Comments
POWERING ON	Power Up Phase Running	
BIOS INIT	Power Up Phase Over with a correct status	The server is started correctly
POWERING DOWN	Power Down Phase Running	
DEEP STDBY	Power Up Phase Over with an error status	The server is not started
BIOS TIME OUT	Power Up Phase Over after a time out.	The server is not started.

Table 6. Server Power Messages

Appendix B. NovaScale 9006 Server Specifications

The following Web site may be consulted for general site preparation information:
`http://www.cs.bull.net/aise`

Dimensions / Weight	
Height	3U - 13,35 cm (13.97 in)
Width	44 cm (17.32 in)
Depth	75 cm (29.52 in)
Weight (maximum)	40 kg (88 lb)
Operating Limits	
Dry bulb temperature range	+15°C to + 30°C (+59°F to + 86°F) Gradient 5°C/h (41°F)
Relative humidity (non condensing)	35 to 60 % (Gradient 5%/h)
Moisture content	0,011 kg water/kg dry air
Pressure / Elevation	Sea level $\leq$ 3000 m
Non-Operating Limits	
Dry bulb temperature range	+5°C to + 50°C (+41°F to + 122°F) Gradient 25°C/h (77°F)
Relative humidity (non condensing)	5 to 95% (Gradient 30%/h)
Moisture content	0,024 kg water/kg dry air
Shipping Limits	
Dry bulb temperature range	-35°C to + 65°C (+31°F to + 149 °F) Gradient 25°C/h (77 °F)
Power Cables	
PDU-xxxxx	
AC (32A) Cable Type Connector Type	1 per PDU C13-C14
It is mandatory for power lines and terminal boxes to be located within the immediate vicinity of the system and to be easily accessible. Each power line must be connected to a separate, independant electrical panel and bipolar circuit breaker. PDUs require an extra cable length of 1.5 meters for connection inside the cabinet.	
Electrical Specifications (power supplies are auto-sensing and auto-ranging)	
Current draw Power consumption Thermal dissipation	7,7 A max at 200 VAC input 1500 W 1500W
Nominal Voltage Voltage Range	200 - 240 V 90 - 140 180-264 VAC (Phase / Neutral) (Hz) 47 min 63 max 50/60 Typ

Table 7. NovaScale 9006 Server Specifications

Glossary

A

AC: Alternating Current generated by the power supply. See DC.

ACPI: Advanced Configuration and Power Interface. An industry specification for the efficient handling of power consumption in desktop and mobile computers. ACPI specifies how a computer's BIOS, operating system, and peripheral devices communicate with each other about power usage.

Address: A label, name or number that identifies a location in a computer memory.

AMI: American Megatrends Incorporated.

ANSI: American National Standards Institute.

API: Application Program Interface. The specific method prescribed by a computer operating system or by an application program by which a programmer writing an application program can make requests of the operating system or another application.

Archive: (Archive file). A file that is a copy of a history file. When a history file is archived, all messages are removed from the history file.

ASCII: American National Standard Code for Information Interchange. A standard number assigned to each of the alphanumeric characters and keyboard control code keys to enable the transfer of information between different types of computers and peripherals.

B

Backup: A copy of data for safe-keeping. The data is copied form computer memory or disk to a floppy disk, magnetic tape or other media.

Backup battery: The battery in a computer that maintains real-time clock and configuration data when power is removed.

Baud rate: The speed at which data is transmitted during serial communication.

BERR: Bus Error signal pin used to signal a global machine check abort condition.

BINIT: Bus Initialization signal pin used to signal a global fatal machine check condition.

BIOS: Basic Input / Output System. A program stored in flash EPROM or ROM that controls the system startup process.

BIST: Built-In Self-Test. See POST.

Bit: Derived from BInary digiT. A bit is the smallest unit of information a computer handles.

BTU: British Thermal Unit.

Byte: A group of eight binary digits (bit) long that represents a letter, number, or typographic symbol.

C

Cache Memory: A very fast, limited portion of RAM set aside for temporary storage of data for direct access by the microprocessor.

CD-ROM: Compact DisK Read-Only Memory. High-capacity read-only memory in the form of an optically readable compact disk.

Cell: The smallest set of hardware components allocated to a single OS. A cell is functionally defined by:
- the number of available processors
- memory capacity
- I/O channel capacity.

CellBlock: A group of interconnected cells within a single domain. See Central Subsystem.

Central Subsystem: A group of interconnected cells gathered within a single domain. See CellBlock.

Chained DIBs: Two DIBs can be inter-connected to house 4 SCSI RAID disks, 1 DVD-ROM drive, 1 USB port. See DIB and IPD.

Chip: Synonym for integrated circuit. See IC.

Clipping: A PAM Event filter criterion. Clipping is defined on a Count / Time basis aimed at routing a pre-defined number of messages only. Identical messages are counted and when the number of messages indicated in the **Count** field is reached within the period of time indicated in the **Time** field, no other messages will be selected for routing.

CMC: Corrected Memory Check condition is signaled when a hardware corrects a machine check error or when a MCA condition is corrected by firmware.

CMCI: Corrected Memory Check Interrupt.

CMCV: Corrected Memory Check Vector.

CMOS: Complementary Metal Oxide Semiconductor. A type of low-power integrated circuits. System startup parameters are stored in CMOS memory. They can be changed via the system setup utility.

COM: Component Object Model. Microsoft technology for component based application development under Windows.

COM +: Component Object Model +. Microsoft technology for component based application development under Windows. The external part of the PAM software package is a COM+ application.

COM1 or COM2: The name assigned to a serial port to set or change its address. See Serial Port.

Command: An instruction that directs the computer to perform a specific operation.

Configuration: The way in which a computer is set up to operate. Configurable options include CPU speed, serial port designation, memory allocation, ...

Configuration Tasks: A PAM feature used to configure and customize the server.

Control Pane: One of the three areas of the PAM web page. When an item is selected in the **PAM Tree** pane, details and related commands are displayed in the **Control** pane. See PAM Tree pane and Status pane.

Core Unit: A main CSS module unit interconnecting the MIO, MQB, MSX and MFL boards. See MIO, MQB, MSX, MFL.

COS: Cluster Operating System.

CPE: Corrected Platform Error.

CPEI: Corrected Platform Error Interrupt.

CPU: Central Processing Unit. See Microprocessor and Socket.

CSE: Customer Service Engineer.

CSS: Central Sub-System. See CellBlock.

CSS Module: A MidPlane with all its connected components (QBBs, IO boards, PMB) and utility devices. See Module.

D

D2D: DC to DC converter.

DC: Direct Current generated by the power supply. See AC.

Default Setting: The factory setting your server uses unless instructed otherwise.

Density: The capacity of information (bytes) that can be packed into a storage device.

Device Driver: A software program used by a computer to recognize and operate hardware.

DIB: Device Interface Board. The DIB provides the necessary electronics for the Internal Peripheral Drawer. See IPD and Chained DIBs.

DIG64: Developer Interface Guide for IA64.

DIM Code: Device Initialization Manager. Initializes different BUSes during the BIOS POST.

DIMM: Dual In-line Memory Module - the smallest system memory component.

Disk Drive: A device that stores data on a hard or floppy disk. A floppy disk drive requires a floppy disk to be inserted. A hard disk drive has a permanently encased hard disk.

DMA: Direct Memory Access. Allows data to be sent directly from a component (e.g. disk drive) to the memory on the motherboard). The microprocessor does not take part in data transfer enhanced system performance.

DMI: Desktop Management Interface. An industry framework for managing and keeping track of hardware and software components in a system of personal computers from a central location.

DNS: Domain Name Server. A server that retains the addresses and routing information for TCP/IP LAN users.

Domain: is the coherent set of resources allocated to run a customer activity, i.e. the association -at boot time- of a Partition, an OS instance (including applications) and associated LUNs and an execution context including execution modes and persistent information (e.g. time, date of the OS instance). Domain definitions and initializations are performed via PAM. A Domain can be modified to run the same OS instance on a different Partition. When a Domain is running, its resources are neither visible nor accessible to other running Domains.

Domain Identity: a PAM Domain management logical resource. This resource contains context information related to the Customer activity running in a domain. The most visible attribute of this resource is the name that the Customer gives to the activity. For each domain created, the Domain management feature allows the operator to define a new activity or choose an activity from the list of existing activities. See Domain.

Domain Manager: A PAM feature used to power on / off and manage server domains. See Domain.

DPS: Distributed Power Supply.

DRAM: Dynamic Random Access Memory is the most common type of random access memory (RAM).

E

ECC: Error Correcting Code.

EEPROM: Electrically Erasable Programmable Read-Only Memory. A type of memory device that stores password and configuration data. See also EPROM.

EFI: Extensible Firmware Interface.

EFIMTA: EFI Modular Test Architecture.

EFI Shell: The EFI (Extensible Firmware Interface) Shell is a simple, interactive user interface that allows EFI device drivers to be loaded, EFI applications to be launched, and operating systems to be booted. In addition, the EFI Shell provides a set of basic commands used to manage files and the system environment variables. See Shell.

EMI: Electro-Magnetic Interference.

EPROM: Erasable Programmable Read-Only Memory. A type of memory device that is used to store the system BIOS code. This code is not lost when the computer is powered off.

ERC: Error and Reset Controller. This controller allows PAM software to control error detection and reset propagation within each pre-defined CSS partition. The ERC is initialized by PAM software to ensure a partition-contained distribution of the reset, error, interrupt and event signals; and to contribute to error signaling and localization at platform level.

ERP: Error Recovery Procedure.

ESD: ElectroStatic Discharge. An undesirable discharge of static electricity that can damage equipment and degrade electrical circuitry.

Event: The generation of a message (event message) by a software component and that is directed to the Event Manager.

Event address: Defines the destination for a message sent over a specified event channel. An address is one of: the name of a history file (for the HISTORY channel), an e-mail address (for the EMAIL channel), the name of a user group (for the WEB channel), the SNMP Manager IP address (for the SNMP channel).

Event channel: Defines how the Event Manager sends an event message. An event channel is one of: HISTORY (the message is logged in a history file), EMAIL (the message is sent to an e-mail address), WEB (the message is stored for analysis from the PAM web user interface), SNMP (the message is sent as an SNMP trap to the selected SNMP application).

Event filter: A list of selected messages among all possible event messages. If an event message is not included in the filter, the Event Manager discards the message.

Event Manager: A PAM feature used to forward event messages over a configured event channel. See Event.

Event message: A message sent by a software component to the Event Manager for routing to a destination that is configured by an administrator.

Event subscription: An object that defines the event channel, address, and filter for sending an event message. If no such object is defined, the event message is discarded.

Exclusion: Logical removal of a redundant faulty hardware element until it has been repaired or replaced. The hardware element remains physically present in the configuration, but is no longer detected by PAM software and can no longer be used by a domain.

External Disk Subsystem: Disk subsystem housed inside the NovaScale cabinet.

F

Fail-over: Failover is a backup operational mode in which the functions of a system component (such as a processor, server, network, or database, for example) are assumed by secondary system components when the primary component becomes unavailable through either failure or scheduled down time.

FAME: Flexible Architecture for Multiple Environments.

FAST WIDE: A standard 16-bit SCSI interface providing synchronous data transfers of up to 10 MHz, with a transfer speed of 20M bytes per second.

FC: Fibre Channel.

FCAL: Fibre Channel Arbitrated Loop.

FCA: Fibre Channel Adapter.

FCBQ: Fan Control Board for QBB.

FCBS: Fan Control Board for SPS.

FDA: Fibre Disk Array.

FDD: Floppy Disk Drive.

Flash EPROM: Flash Erasable Programmable Read-Only Memory. A type of memory device that is used to store the the system firmware code. This code can be replaced by an updated code from a floppy disk, but is not lost when the computer is powered off.

Firewall: A set of related programs, located at a network gateway server, that protects the resources of a private network from users from other networks.

Firmware: an ordered set of instructions and data stored to be functionally independent of main storage.

Format: The process used to organize a hard or floppy disk into sectors so that it can accept data. Formatting destroys all previous data on the disk.

FPB: FAME Power Board (FAME: Flexible Architecture for Multiple Environments).

FPGA: Field Programmable Gate Array. A gate array that can reprogrammed at run time.

FRB: Fault Resilient Boot. A server management feature. FRB attempts to boot a system using the alternate processor or DIMM.

FRU: Field Replaceable Unit. A component that is replaced or added by Customer Service Engineers as a single entity.

FSS: FAME Scalability Switch. Each CSS Module is equipped with 2 Scalability Port Switches providing high speed bi-directional links between server components. See SPS.

FTP: File Transfer Protocol. A standard Internet protocol: the simplest way of exchanging files between computers on the Internet. FTP is an application protocol that uses Internet TCP/IP protocols. FTP is commonly used to transfer Web page files from their creator to the computer that acts as their server for everyone on the Internet. It is also commonly used to download programs and other files from other servers.

FWH: FirmWare Hub.

G

GB: GigaByte: 1,073,741,824 bytes. See Byte.

Global MCA: Machine Check Abort is visible to all processors, in a multiprocessor system and will force all of them to enter machine check abort.

GUI: Graphical User Interface.

GTS: Global Telecontrol Server.

H

HA: High Availability. Refers to a system or component that is continuously operational for a desirably long length of time.

HAL: Hardware Abstraction Layer.

HA CMP: High Availability Clustered MultiProcessing.

Hard Disk Drive: HDD. See Disk Drive.

Hardware: The physical parts of a system, including the keyboard, monitor, disk drives, cables and circuit cards.

Hardware Monitor: A PAM feature used to supervise server operation.

HBA: Host Bus Adapter.

HDD: Hard Disk Drive. See Disk Drive.

History File: A file in which the History Manager logs informative messages or error messages relating to system activity. Messages are sent from source components to target components.

History Manager: The component running on the PAP Windows operating system that logs messages to history files.

HMMIO Space: High Memory IO Space.

HPB: Hot Plug Board. This board provides an interlock switch on each IO Box PCI slot for hot- swapping PCI boards. See P-HPB.

HPC: High Performance Computing.

Hot plugging: The operation of adding a component without interrupting system activity.

Hot swapping: The operation of removing and replacing a faulty component without interrupting system activity.

HTTP: HyperText Transfer Protocol. In the World Wide Web, a protocol that facilitates the transfer of hypertext-based files between local and remote systems.

HW Identifier: Number (0 - F) used to identify Cellblock components. This number is identical to PMB code-wheel position.

I

I2C: Intra Integrated Circuit. The I2C (Inter-IC) bus is a bi-directional two-wire serial bus that provides a communication link between integrated circuits (ICs).
The I2C bus supports 7-bit and 10-bit address space devices and devices that operate under different voltages.

IA64: is a 64-bit Intel processor Architecture based on Explicitly Parallel Instruction Computing (EPIC). The Itanium processor is the first in the Intel line of IA-64 processors.

IB: Infini Band.

IC: Integrated Circuit. An electronic device that contains miniaturized circuitry. See Chip.

ICH2: I/O Controller Hub 2, component that contains the fundamental I/O interfaces required by the system. Flash memory, Keyboard, USB and IDE device interface.

ICH4: I/O Controller Hub 4.

ICMB: Intelligent Chassis Management Bus.

ID: A number which uniquely identifies a device on a bus.

IDE: Integrated Drive Electronics. A type of hard disk drive with the control circuitry located inside the disk drive rather than on a drive controller card.

Identity: See Domain Identity.

IIS: Internet Information Server. A group of Internet servers (including a Web or HTTP server and a FTP server) with additional capabilities for Microsoft® Windows® NT and Microsoft Windows (and later) operating systems.

I/O: Input /Output. Describes any operation, program, or device that transfers data to or from a computer.

Interface: A connection between a computer and a peripheral device enabling the exchange of data. See Parallel Port and Serial Port.

Internal Disk Subsystem: Disk subsystem housed inside the NovaScale Internal Peripheral Drawer (IPD).

IOB: Input / Output Board. The IOB connects up to 11 PCI-X boards.

IOC: Input / Output Board Compact. The IOC connects up to 6 PCI-X boards.

IOL: I/O Board Legacy. The IOL provides:
- I/O controller Hub
- USB ports
- 10/100/1000 Ethernet controller
- Video controller
- Serial / debug port

IOR: I/O Board Riser. The IOR provides:
- I/O controller Hub
- USB ports
- 10/100/1000 Ethernet controller
- Video controller
- Serial / debug port

IP: Internet Protocol. The protocol by which data is sent from one computer to another via the Internet. Each computer (known as a host) on the Internet has at least one IP address that uniquely identifies it from all other computers on the Internet.

IPD: Internal Peripheral Drawer. The IPD houses legacy peripherals (DVD-Rom drive, USB port) and SCSI system disks. See DIB and Chained DIBs.

IPF: Itanium Processor Family.

IPL: Initial Program Load. It defines the firmware functional phases during the system initialization.

IPMB: Intelligent Platform Management Bus.

IPMI: Intelligent Platform Management Interface.

ISA: Industry Standard Architecture. An industry standard for computers and circuit cards that transfer 16 bits of data at a time.

J

Jumper: A small electrical connector used for configuration on computer hardware.

K

KVM: Keyboard Video Monitor.

KVM switch: the Keyboard Video Monitor switch allows the use of a single keyboard, monitor and mouse for more than one module.

L

LAN: Local Area Network. A group of computers linked together within a limited area to exchange data.

LD: Logical Disk. A Storeway FDA 1x00/2x00 logical disk (or LUN) is visible to the OS as a Disk. See LUN and PD (Physical Disk).

LED: Light Emitting Diode. A small electronic device that glows when current flows through it.

Legacy Application: An application in which a company or organization has already invested considerable time and money. Typically, legacy applications are database management systems (DBMSs) running on mainframes or minicomputers.

Licensing Number: When you install an application protected by a system serial number, you are requested to supply this serial number.For optimum flexibility, PAM software allows you to replace the physical serial number by a logical licensing number so that you can run the application on any physical partition and, in the case of extended systems, on any of the Central Subsystems within the extended configuration.

LID: Local Interrupt Identifier (CPU).

Local Disk Subsystem: Disk subsystem housed inside the NovaScale cabinet and not connected to a SAN.

Local MCA: Machine Check Abort is detected and handled by a single processor and is invisible to the other processor.

Locking: Means of functionally limiting access to certain hardware elements. Locked hardware elements can no longer be accessed by the current domain, but are still physically available for use by other domains. Previously locked elements can be unlocked so that they can be accessed by the domain.

LPT1 or LPT2: The name assigned to a parallel port to specify its address. See Parallel Port.

LS240: Laser Servo super diskette holding up to 240 Mb.

LUN: Logical Unit Number. Term used to designate Logical Storage Units (logical disks) defined through the configuration of physical disks stored in a mass storage cabinet.

LVDS: Low Voltage Differential SCSI.

M

MAC address: Media Access Control.
Physical identification stored on a network interface board.

MAESTRO: Machine Administration Embedded Software Real Time Oriented.
Part of the PAM software package embedded on the PMB board.

MCA: Machine Check Abort.
See also Local MCA and Global MCA.

Memory: Computer circuitry that stores data and programs. See RAM and ROM.

Memory bank: The minimum quantity of memory used by the system. It physically consists of four memory DIMMs.

MFL: Midplane Fan & Logistics board. The MFL houses the Fan Boxes and is connected to the MIO and MQB. See MIO, MQB.

Microprocessor: An integrated circuit that processes data and controls basic computer functions.

Midplane: Mid-Plane. All system hardware components are connected to the Midplane.

MIMD: Multiple Instruction Multiple Data

MIO: Midplane Input / Output board. The MIO connects one or two IOC boards and the PMB. See Core Unit.

Mirrored volumes: A mirrored volume is a fault-tolerant volume that duplicates your data on two physical disks. If one of the physical disks fails, the data on the failed disk becomes unavailable, but the system continues to operate using the unaffected disk.

Module: a Midplane Board with all its connected components and utility devices. See CSS Module and MP.

MQB: Midplane QBB board. The MQB connects one or two QBBs and one or two IPDs. See QBB and IPD.

MSX: Midplane SPS & XPS board. The MSX houses a B-SPS switch and is connected to the MIO and the MQB. There are two MSX boards in a CSS module. All SP connections between a QBB and an IOC use an MSX. See B-SPS, MIO, MQB.

MTBF: Mean Time Between Failure. An indicator of expected system reliability calculated on a statistical basis from the known failure rates of various components of the system. Note: MTBF is usually expressed in hours.

Multicore: Presence of two or more processors on a single chip.

Multimedia: Information presented through more than one type of media. On computer systems, this media includes sound, graphics, animation and text.

Multitasking: The ability to perform several tasks simultaneously. Multitasking allows you to run multiple applications at the same time and exchange information among them. See Task.

Multithreading: The ability of a processor core to execute more than one independent instruction thread simultaneously. As the core comprises two complete context registers, it is able to switch rapidly from one instruction thread to another.

N

NFS: Network File System. A proprietary distributed file system that is widely used by TCP/IP vendors. Note: NFS allows different computer systems to share files, and uses user datagram protocol (UDP) for data transfer.

NMI: Non-Maskable Interrupt.

NUMA: Non Uniform Memory Access. A method of configuring a cluster of microprocessors in a multiprocessing system so that they can share memory locally, improving performance and the ability of the system to be expanded.

nsh: nsh stands for new shell. See Shell and EFI Shell.

NVRAM: Non Volatile Random Access Memory. A type of RAM that retains its contents even when the computer is powered off. See RAM and SRAM.

O

OF: Open Firmware. Firmware controlling a computer prior to the Operating System.

Operating System: See OS.

OS: Operating System. The software which manages computer resources and provides the operating environment for application programs.

P

PAL: Processor Abstraction Layer: processor firmware that abstracts processor implementation differences. See also SAL.

PAM: Platform Administration & Maintenance.

PAM software: Platform Administration & Maintenance software. One part (PAP application and the PamSite WEB site) runs on the PAP unit. The other part (MAESTRO) is embedded on the PMB board.

PAM Tree pane: One of the three areas of the PAM web page. Server hardware presence and functional status are displayed in the PAM Tree pane. See Status pane and Control pane.

PAP unit: Platform Administration Processor unit. The PC hosting all server administration software.

PAP application: Platform Administration Processor application. Part of PAM software, PAP application is a Windows COM+ application running on PAP unit.

Parallel Port: Connector allowing the transfer of data between the computer and a parallel device.

PARM request: the PARM application is designed to handle Requests issued by the CSE (Customer Service Engineer)

Partition: Division of storage space on a hard disk into separate areas so that the operating system treats them as separate disk drives.

Password: A security feature that prevents an unauthorized user from operating the system.

PCI: Peripheral Component Interconnect. Bus architecture supporting high-performance peripherals.

PD: Physical Disk. A Storeway FDA 1300/2300 physical disk is not visible to the OS. See LD.

PDU: Power Distribution Unit. Power bus used for the connection of peripheral system components.

Permanence: Property of a history file that determines whether or not the history file can be modified or deleted from the PAM user interface. Permanence is either *Static* (cannot be modified) or *Dynamic* (can be modified).

P-HPB: PCI Hot Plug Board. This board provides an interlock switch on each IO Box PCI slot for hot-swapping PCI boards. See HPB.

PIC: Platform Instrumentation Control.

ping: A basic Internet program that lets you verify that a particular IP address exists and can accept requests. The verb "to ping" means the act of using the ping utility or command.

PIROM: Processor Information ROM. Processor Information ROM (PIROM) contains information about the specific processor in which it resides. This information includes robust addressing headers to allow for flexible programming and forward compatibility, core and L2 cache electrical specifications, processor part and S-spec numbers, and a 64-bit processor number.

PMB: Platform Management Board. Links the server to the PAP unit.

PNP: Plug aNd Play. The ability to plug a device into a computer and have the computer recognize that the device is there.

POST: Power On Self Test. When power is turned on, POST (Power-On Self-Test) is the diagnostic testing sequence (or "starting program") that a computer runs to determine if hardware is working correctly.

PROM: Programmable Read-Only Memory.

PUID: PAM Universal/Unique IDentifier. PAM software allocates a PUID (PAM Universal / Unique Identifier) to each hardware / software object to guarantee unambiguous identification.
The PUID for each hardware element can be obtained by hovering the mouse over the corresponding element in the PAM tree, e.g.: PAM:/CELLSBLOCK_<NAME>/MODULE_x/QBB_y/CPU_y.

Q

QBB: Quad Brick Board. The QBB is the heart of the Bull NovaScale Server, housing 4 Itanium ® 2 processors and 16 DIMMs. Each QBB communicates with other CSS Module components via 2 high-speed bidirectional Scalability Port Switches.
See SPS or FSS.

R

RAID: Redundant Array of Independent Disks. A method of combining hard disk drives into one logical storage unit for disk-fault tolerance.

RAM: Random Access Memory. A temporary storage area for data and programs. This type of memory must be periodically refreshed to maintain valid data and is lost when the computer is powered off. See NVRAM and SRAM.

RAS: Reliability, Availability, Serviceability.

Real-time clock: The Integrated Circuit in a computer that maintains the time and date.

RFI: Radio Frequency Interference.

Ring: The CSS module interconnection ring comprises the cables used to interconnect two, three or four CSS modules.

RJ45: 8-contact regular jack.

RMC: Remote Maintenance Console.

ROM: Read-Only Memory. A type of memory device that is used to store the system BIOS code. This code cannot be altered and is not lost when the computer is powered off. See BIOS, EPROM and Flash EPROM.

RS-232 Port: An industry standard serial port. See Serial Port.

RSF: Remote Service Facilities.

RTC: Real Time Clock.

S

S@N.IT: SAN Administration Tool.

SAL: System Abstraction Layer. Firmware that abstract system implementation differences in IA-64 platform. See also PAL.

SAN: Storage Area Network. A high-speed special-purpose network that interconnects different kinds of data storage devices with associated data servers on behalf of a larger network of users.

SAPIC: Streamlined Advanced Programmable Interrupt Controller message.

SBE: Single Bit Error.

Scheme: Configuration file ensuring optimum use and compatibility of the physical and logical resources used to simultaneously run multiple domains.

SCI: Scalable Coherent Interface.

SCSI: Small Computer System Interface. An input and output bus that provides a standard interface used to connect peripherals such as disks or tape drives in a daisy chain.

SDR: Sensor Data Record.

SDRAM: Synchronous Dynamic Random Access Memory. A type of DRAM that runs at faster clock speeds than conventional memory. See DRAM.

SEL: System Event Log. A record of system management events. The information stored includes the name of the event, the date and time the event occurred and event data. Event data may include POST error codes that reflect hardware errors or software conflicts within the system.

Serial Communication: Data sent sequentially, one bit at a time.

Serial Port: Connector that allows the transfer of data between the computer and a serial device. See COM1 or COM 2.Shell is a Unix term for the interactive user interface with an operating system.

SIO: Server I/O / Super I/O.

Shell: The Shell is the layer of programming that understands and executes the commands a user enters. As the outer layer of an operating system, the Shell can be contrasted with the kernel, the inmost layer or core of services of an operating system. See EFI Shell.

SIOH: Server I/O Hub. This component provides a connection point between various I/O bridge components and the Intel 870 chipset.

Sideband: This part of the CSS module inter-connection ring comprises logistic cables (errors, commands, resets). See Ring.

SMBIOS: System Management BIOS.

SM-BUS: System Management Bus.

SMIC: Server Management Interface Chip.

SMP: Symmetrical Multi Processor. The processing of programs by multiple processors that share a common operating system and memory.

SNC: Scalable Node Controller. The processor system bus interface and memory controller for the Intel870 chipset. The SNC supports both the Itanium2 processors, DDR SDRAM main memory, a Firmware Hub Interface to support multiple Firmware hubs, and two scalability ports for access to I/O and coherent memory on other nodes, through the FSS.

SNM: System Network Module.

SNMP: Simple Network Management Protocol. The protocol governing network management and the monitoring of network devices and their functions.

Socket: Central Processing Unit mutlticore interface. Each socket can house 1 or 2 processor cores. See Microprocessor and CPU.

Source: Each message refers to a source (the resource that generated the message) and a target (the component referred to in the message). This feature can be allows messages to be filtered according to one or more **Source** string(s) and is particularly useful for debugging and troubleshooting. See Target.

SPD: Serial Presence Detect. DIMM PROM.

SPS: Scalability Port Switch. Each CSS Module is equipped with 2 Scalability Port Switches providing high speed bi-directional links between system components. See FSS.

SRAM: Static RAM. A temporary storage area for data and programs. This type of memory does not need to be refreshed, but is lost when the system is powered off. See NVRAM and RAM.

SSI: Server System Infrastructure.

Status Pane: One of the three areas of the PAM web page. Provides quick access to CSS Module availability status, server functional status, and pending event message information. See also Control pane and PAM Tree pane.

SVGA: Super Video Graphics Array.

T

Target: Each message refers to a target (the component referred to in the message), identified by its PUID, and a source (the component that generated the message).This feature allows messages to be filtered according to one or more **Target** string(s) and is particularly useful for debugging and troubleshooting. See Source and PUID.

Task: Each message refers to a target (the component referred to in the message), identified by its PUID, and a source (the component that generated the message).This feature allows messages to be filtered according to one or more **Target** string(s) and is particularly useful for debugging and troubleshooting. See Source and PUID.

TCP: Transmission Control Protocol. A set of rules (protocol) used along with the Internet Protocol (IP) to send data in the form of message units between computers over the Internet.

TCP/IP: Transmission Control Protocol / Internet Protocol. The basic communication language or protocol of the Internet.

T&D: Tests and Diagnostics.

Thresholding: A PAM Event filter criterion. Thresholding is defined on a Count / Time basis aimed at routing significant messages only. Identical messages are counted and when the number of messages indicated in the **Count** field is reached within the period of time indicated in the **Time** field, this message is selected for routing.

U

UART: a Universal Asynchronous Receiver Transmitter. The microchip with programming that controls a computer interface to its attached serial devices.

ULTRA SCSI: An enhanced standard 16-bit SCSI interface providing synchronous data transfers of up to 20 MHz, with a transfer speed of 40M bytes per second. It is also called Fast-20 SCSI.

UML: Unified Modeling Language. A standard notation for the modeling of real-world objects as a first step in developing an object-oriented design methodology.

UPS: Uninterruptible Power Supply. A device that allows uninterrupted operation if the primary power source is lost. It also provides protection from power surges.

URL: Uniform / Universal Resource Locator. The address of a file (resource) accessible on the Internet.

USB: Universal Serial Bus. A plug-and-play interface between a computer and add-on devices. The USB interface allows a new device to be added to your computer without having to add an adapter card or even having to turn the computer off.

V

VCC: Voltage Continuous Current.

VGA: Video Graphics Array.

VI: Virtual Interface.

Visibility: A property of a history file. Visibility is either *System* (the history file is predefined by the PAM software and is visible only to an administrator) or *User* (the history file is created by an administrator and is visible to both an administrator and an operator).

VLAN: Virtual Local Area Network. A local area network with a definition that maps workstations on some other basis than geographic location (for example, by department, type of user, or primary application).

VxWORKS: Platform Management Board Operating System.

W

WAN: Wide Area Network. Geographically dispersed telecommunications network. The term distinguishes a broader telecommunication structure from a local area network (LAN).

WBEM: Web Based Enterprise Management.

WMI: Windows Management Interface.

WOL: A feature that provides the ability to remotely power on a system through a network connection.

X

XML: eXtended MarkUp Language. A flexible way to create common information formats and share both the format and the data on the World Wide Web, intranets, and elsewhere.

XSP: eXtended Scalable Port.

Y

No entries.

Z

No entries.

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