



PixelStor 5000

High Performance and Reliable
MegaPixel IP Storage Array
User Manual

1st Edition
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Manufacturer of this product has the right to change specifications and product descriptions at any time without notice.

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About This Manual

Conventions

Safety Symbols

Safety Precautions

Regulatory and Integration Information

About This Manual 關於本手冊

Conventions 符號規範

To make sure that you perform certain tasks properly, take note of the following symbols used throughout this manual.

為確保您能夠正確執行特定工作，請注意本手冊中所使用的下列符號。

**Warning:****警告：**

Provides Information to prevent injury in the process of completing a task.

在完成工作過程中所提供的傷害預防資訊。

**Caution:****注意：**

Provides Information to prevent damage to the components in the process of completing a task.

在完成工作過程中所提供的元件損壞預防資訊。

**Important:****重要事項：**

Provides Information required for completing a task.

提供完成工作的必要資訊。

**Note:****附註：**

Provides Tips to aid in completing a task.

提供協助完成工作的提示。

Safety Symbols 安全性符號

The following symbols are placed on some components of the system to alert the user to potential hazards,

系統的某些元件會放置下列符號，以警告使用者注意潛在危險：



WARNING: Electric Shock Hazard – To reduce risk of injury from electric shock hazards, do not open this component.

警告：觸電危險—為降低可能導致觸電傷害的風險，請勿開啟本元件。



WARNING: Contains no user or field serviceable parts – To reduce the risk of injury from electric shock hazards, do not open this component.

警告：不含可供使用者維修或可現場維修之零件—為降低可能導致觸電傷害的風險，請勿開啟本元件。



WARNING: Hot Surface or Component - To reduce risk of injury from a hot component; allow the surface to cool before touching.

警告：高熱表面或元件—為降低因高熱元件而受傷的風險，在碰觸前請先待表面冷卻。



WARNING: Insert Network Interface Only - Any receptacle (e.g. RJ45) marked with this symbol indicates a network interface connection. To reduce the risk of electric shock, fire or damage to equipment, do not plug telephone or telecommunications connectors into this receptacle.

警告：僅能插入網路介面—任何標示本符號的插座(例如 RJ45)，皆代表為網路介面連線。為降低觸電、火災或設備損壞的風險，請勿將電話或電信接頭插入本插座。



WARNING: This symbol, on power supplies or systems, indicates that the equipment is supplied by multiple sources of power. To reduce the risk of injury from electric shock, remove all power cords to completely power down the system.

警告：在電源供應器或系統上若出現本符號，代表該設備包含多重電源供電。為降低可能導致觸電傷害的風險，請將所有電源線拆除，以完全關閉系統電源。



WARNING: This symbol indicates that the component exceeds the recommended weight for one individual to handle safely. To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manual material handling.

警告：本符號代表此元件包含超過單獨一人可安全處理的建議重量。為降低人身傷害或設備損壞的風險，請遵守當地有關手動處理材料的職業健康及安全性規定和指導原則。

Safety Precautions 安全注意事項



Technician Notes 技術人員須知

- Only authorized technicians should attempt to repair this equipment.
請僅交由經授權的技術人員修理本設備。
- Before installing this system, carefully read all the manuals included with the system.
在安裝本系統前，請仔細閱讀系統所隨附的各項手冊。
- All repair procedures allow only module replacement. Because of the complexity of the individual boards and sub-assemblies, no one should attempt to make repairs at the component level or make modifications to any printed wiring board. Improper repairs can create a safety hazard.
所有修理程序皆僅能進行模組更換。由於個別電路板及子組件極為複雜，任何人皆不應執行元件層級的修理，或對任何印刷電路板進行修改。不當的修理可能會造成安全性危險。
- To reduce the risk of personal injury from electric shock and hazardous energy levels, do not exceed the level of repairs specified in these procedures.
為降低因觸電及危險能量等級所導致人身傷害或設備損壞的風險，請勿超出維修程序所規定的維修等級。
- The system is designed to be electrically grounded. To ensure proper operation, plug the AC power cord into a properly grounded AC outlet only.
系統原始設計採取電力接地。為確保正常運作，請僅將 AC 電源線插入適當接地的 AC 插座。



Electrostatic Discharge Precautions 靜電放電注意事項

- Electrostatic discharge (ESD) can damage static sensitive devices or micro circuitry. Proper packaging and grounding techniques are required to prevent damage.

靜電放電(ESD)可能會損壞對靜電敏感的裝置或微型電路。故必須採用適當的包裝及接地技術，以防止靜電損壞。

- Keep electrostatic-sensitive parts in their containers until they arrive at a static free work area.

請將對靜電敏感的零件放置於其容具中，直到抵達無靜電工作區域後再行取出。

- Use a wrist strap connected to the work surface as well as properly grounded tools and equipment

請使用已連結至工作表面的腕帶，以及適當接地的工具及設備。

- Keep the area free of nonconductive materials such as ordinary plastic tools and foam packing.

請清除工作區域中的所有非傳導性材質，例如一般的塑膠工具及泡棉包裝材料。

- Avoid touching pins, leads, or circuitry.

請避免碰觸任何接腳、導線或電路。

- Always place drives with printed circuit board (PCB) assembly-side down.

請以印刷電路板(PCB)組件側朝下放置磁碟機。

- Grasp cards and boards by the edges. Hold drives by the frame. Avoid touching the solder joints or pins.

請由邊緣握住卡片及電路板，手持磁碟機的邊架，並避免碰觸焊接點或接腳。

- If you need to lay the device down while it is out of the antistatic bag, lay it on the antistatic bag. Before picking it up again, touch the antistatic bag and the metal frame of the system unit at the same time.

若您將裝置由防靜電袋中取出後需要另行置放，請置放於防靜電袋上。在下次拿起裝置前，請同時觸碰防靜電袋及系統機組的金屬邊架。



Battery Replacement Safety 電池更換安全性

- This storage is provided with an internal Lithium battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated.

本儲存裝置提供內建鋰離子電池或電池套件。若未正確更換或不當處理電池，則可能有爆炸的危險及產生人身傷害的風險。

- For more information about battery replacement or proper disposal, contact an authorized reseller or your authorized service provider.

若想瞭解更多有關更換或適當處置電池的資訊，請聯絡授權經銷商或授權之服務供應商。



Rack Warnings

If you plan to rack mount the PixelStor 5000, follow the rack manufacturer's safety instructions.

- Install the enclosure only in a rack that has been properly secured in an area with suitable environmental conditions.
- Have someone assist you during physical installation.
- To properly ventilate the system, you must provide at least 7.6 cm of clearance at the front and back of the system.
- To reduce the risk of personal injury or damage to equipment, always ensure that the rack is adequately stabilized prior to extending a component outside the rack. A rack may become unstable if more than one component is extended. Extend only one at a time.
- Do not stand or step on any components in the rack.
- If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (T_{ma}) specified by the manufacturer.
- Do not overload the AC power supply branch circuit that provides power to the rack. Observe extension cable and power strip ratings. Ensure that the total ampere rating of all equipment plugged into the extension cable or power strip does not exceed 80 percent of the ampere ratings limit for the extension cable or power strip.



System Warnings

- Avoid dust, humidity, and extreme temperatures; place the system on a stable surface.
- To reduce the risk of personal injury from hot surfaces, allow the hot-plug disk modules and other system modules to cool before touching them.
- To reduce the risk of electric shock or damage to the equipment, do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Ensure the power cord is inserted into a grounded electrical outlet that is easily accessible

at all times. Unplug the power cord from the power supply module to shut off power to the equipment

- Protect the storage system from power fluctuations and temporary power interruptions with a regulating uninterruptible power supply (UPS). This device protects the hardware from damage caused by power surges and voltage spikes and keeps the system operational during a power failure.
- The storage system must always be operated with all hot plug modules installed or slot covers in place to ensure proper cooling.
- Route power cords so that they will not be walked on or pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cords exit from the product.

Regulatory and Integration Information

Regulatory Compliance Identification Numbers

For the purpose of regulatory compliance certifications and identification, this system is assigned a serial number. This system serial number can be found on the product label, along with the required approval markings and information. When requesting certification information for this product, always refer to this serial number. This serial number should not be confused with the marketing name or model number.

Product Regulatory Compliance

Product Safety Compliance

This system complies with the following safety requirements:

Table i Product Safety Requirements

IEC 60950-1	Safety of Information Technology Equipment
EN 60950-1	Safety of Information Technology Equipment Including Electrical Business Equipment, European Committee for Electro-technical Standardization (CENELEC)
UL 60950-1	Safety of Information Technology Equipment
UL 94	Tests for Flammability of Plastic Materials for Parts in Devices & Appliances
GB4943	Safety of Information Technology Equipment

Worldwide Safety approvals can be supplied upon request. Please contact your sales representative for approvals.

Product EMC Compliance

This product has been tested and verified to comply with the following electromagnetic compatibility (EMC) regulations.

Communications Commission Notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their

intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device, as well as additional operating instructions for the user.

The rating label on the device shows which class (A or B) the equipment falls into. Class A devices do not have an FCC logo or FCC ID on the label. Class B devices have an FCC logo or FCC ID on the label. Once the class of the device is determined, refer to the following corresponding statement.

Class A Equipment

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 instructions, 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 personal expense.

Declaration of Conformity for Products Marked with the FCC Logo—United States Only

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

For questions regarding your product, please contact your sales representative.

To identify this product, refer to the Part, Series, or Model number found on the product.

European Union Notice

Products with the CE Marking comply with both the EMC Directive (89/336/EEC) and the Low-Voltage Directive (73/23/EEC) issued by the Commission of the European Community. Compliance with these directives implies conformity to the following European Norms (items in brackets are the equivalent international standards):

Table ii European Union Safety Requirements

EN55022 (CISPR 22)	Electromagnetic Interference
EN55024 (IEC61000-4-2,3,4,5,6,8,11)	Electromagnetic Immunity
EN61000-3-2 (IEC61000-3-2)	Power Line Harmonics
EN61000-3-3 (IEC61000-3-3)	Power Line Flicker
EN60950 (IEC950)	Product Safety

Canadian Notice (Avis Canadien)

Class A Equipment

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

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Japanese Notice

VCCIマークが付いていない場合には、次の点にご注意下さい。

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Power Cords

The power cord set included in the system meets the requirements for use in the country where the system was purchased. If this system is to be used in another country, contact your sales representative to purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product's electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the cross-sectional area of the wires must be a minimum of 1.00mm² or 18AWG, and the length of the cords must be between 1.8m (6 feet) and 3.6m (12 feet). If you have questions about the type of power cord to use, contact your sales representative.

The following statement applies only to rack-installed products that are GS-Marked:

This equipment is not intended for use at workplaces with visual display units, in accordance with §2 of the German ordinance for workplaces with visual display units."

Chapter 1

Introduction

Audience Assumptions

About This Guide

Description

Features

Specifications

1 Introduction

1.1 Audience Assumptions

This manual assumes that you are a service technician or network administrator familiar with computer hardware, data storage and network administration terminology and tasks.

1.2 About This Guide

This user guide provides step by step instructions on how to install, use and maintain the PixelStor 5000 SAN RAID Array. This manual is generally organized as follows:

Table 1-1 Manual Organization

Introduction	General introduction to the PixelStor 5000 and its components.
Preparation	What you need to do before you start.
Installation	Detailed description of each hardware module and instructions for installation and removal.
Configuration	Initializing your system, setting up your system on a network, configuring your storage, and connecting hosts.
Operation	Ongoing usage and maintenance information provided in a reference format and organized by major system component.

1.3 System Description

PixelStor 5000 is a low cost, high bandwidth and high availability RAID array. Unlike most arrays designed to support a single controller with proprietary architectures, the PixelStor 5000 can be configured as a single or dual controller system. It is built around a flexible and open architecture utilizing dual active-active storage controllers, and a custom tuned Linux operating system. It is offered in a 2U rack mount form factor and can be populated with 12 hot plug SATAII hard disk drives.

The PixelStor 5000 offers direct attach iSCSI SAN host connectivity. Each controller module on the PixelStor 5000 comes with three Gigabit Ethernet ports that are bonded together for higher performance and connectivity. The PixelStor 5000 is equipped with a battery backed cache module(s), redundant power supplies, redundant fans and a serviceable mid-plane.

The capacity of the PixelStor 5000 can be expanded by connecting multiple 2U/12 bay PixelStor 100e/312e or multiple PixelStor 324e 4U/24 bay expansion enclosures. The PixelStor 100e/312e is provided in single or dual controller configurations while the PS324e is a single controller on product. The PixelStor 100e/312e enclosures can also be populated with 12 hot plug SATAIII or SAS hard disk drives while the PS324e can be populated with 12 hot plug SATAIII or SAS hard disk drives. These can be daisy chained to a PixelStor 5000 via fast 24 Gbps SAS connectors for low cost high performance scalability.

1.4 System Features

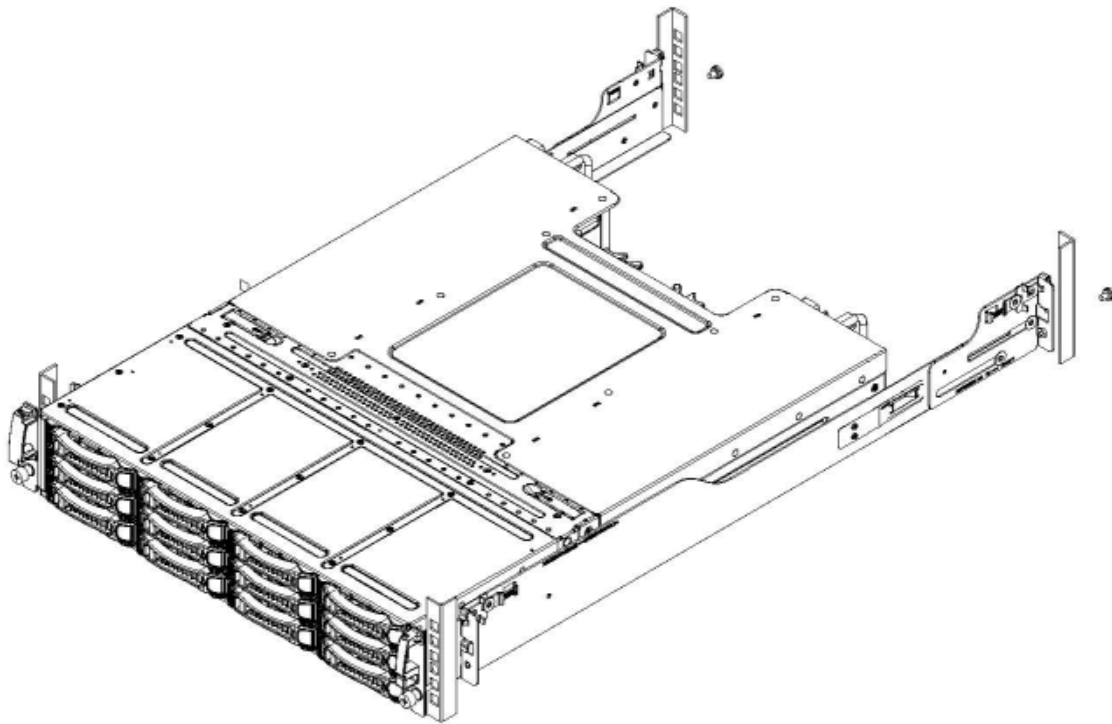


Figure 1-1 PixelStor 5000

Unparalleled Flexibility – The PixelStor 5000 offers iSCSI SAN host connectivity within the same box. This functionality makes the PixelStor 5000 one of the most flexible storage building blocks on the market today. The flexibility inherent in the PixelStor 5000 allows customers to address diverse needs in the storage space without the need for multiple specialized platforms.

Zero Down-Time Architecture - In the PixelStor 5000, every active component, including drives, controllers, fan trays, and power supplies, are hot swappable without interruption in service or loss of data. Its active-active dual controllers, sophisticated mirrored and battery backed cache and path failover capabilities give the PixelStor 5000 best-in-class system fault

tolerance.

Active-Active Controllers & Transparent Fail-over & Fail-back - Fast throughput and data availability are paramount for dedicated storage systems. This is why PixelStor 5000 is designed with active-active controllers to improve both performance and data availability. Each Disk Group has an assigned “primary” controller to take advantage of the fastest route to the drives. So, optimal performance is achieved when traffic goes through both controllers to their associated Disk Groups. For availability, both controllers can serve any Disk Groups within the system. When there is a controller failure Disk Groups assigned to the failed controller will automatically “migrate” to the surviving controller without user intervention. When the failed controller is replaced, the systems will automatically fail-back to its original state. In PixelStor 5000, the relationship between two controllers is tight. Each controller has the precise status of the other, which results in quick and accurate actions when failure happens.

Mirrored Cache - With Dual controllers, the “auto cache” option puts a mirrored copy of the write cache on the redundant controller. The data is fully protected. If there is a failure in any controller, the system flushes the mirrored copy and automatically switches to the “write-through” setting. This is the best compromise between performance and protection.

Multi-Path IO and Cache Coherency - The PixelStor 5000 makes no assumption regarding the behavior of the hosts since they can switch from one path to the other. This is normally referred as “multi-path IO” – a technology to ensure the end-to-end high availability for path failure. RASILIENT Systems patent-pending technology supports path failure with our cache coherency features. In the extreme case, the host can send commands to either controller randomly.

Dedicated SATA Channels - PixelStor 5000’s multi-path design provides a dedicated drive channel from each controller. The elimination of inter-drive dependencies enhances performance. The independent controller access provides additional data availability.

Disk Roaming - In the PixelStor 5000, the concept of Disk Groups is introduced, which represents a set of drives that share similar characteristics. The Disk Group configuration, including RAID, and volume, roams with the drives. Once inserted, the Disk Group can be discovered and the service can start with a mouse click. Within the enclosure, the drives can also be moved around. The roaming operation can be carried out while the system is on-line. Users can take advantage of this flexibility to arrange their storage for different on-line and off-line tasks. This feature provides a basic and inexpensive way to upgrade a system and retain your data or move drives to another system for basic system recovery.

Capacity Expansion – The PixelStor 5000 has the best capacity expansion capability on the

market. The 2U/12 bay controller unit can be expanded with up to eight 2U/12 bay PixelStor 100e/312e/324e expansion enclosures for a total capacity of 108 SATAII drives. The PixelStor 100e/312e provide 2U and 12 bays single or dual controller expansion enclosures and PixelStor 324e 4U/24 bay single controller expansion enclosure. These enclosures can be hot added to the system via the PixelStor 5000 24Gbps SAS connectors. The capacity expansion feature simplifies the task of adding additional storage capacity. You can expand Disk Groups across enclosures. The user can expand the LUN capacity on-line within the Disk Group, or expand the Disk Group by adding disks from the pool of global spare disks.

Software RAID - The PixelStor 5000 architecture focuses on the critical performance elements of protocol processing and data movement. The powerful multi-core processor and server chipset (high-speed front-side bus and DDR3) present a data mover architecture that is superior over embedded processor solutions found in traditional storage arrays. Traditional embedded solutions tend to be a generation behind in memory technology and require special chips to enhance performance. With a dedicated IA processor with multiple cores in our array, there is little benefit of using expensive “hardware” RAID. “Hardware” RAID is important in general-purpose servers to off-load the CPU. In an external array with dedicated controllers and memory, “hardware” RAID only adds cost.

Global Spares - In PixelStor 5000, any drives not assigned to a Disk Group are automatically available as global hot spares. If a drive fails, the RAID controller can automatically rebuild its data on the spare drive without requiring intervention by the administrator. The rebuild operation occurs in the background while the controller processes normal operations.

LUN Masking - Authentication and Access Control List (ACL) - Enterprise data must be secured and closely guarded. In PixelStor 5000, LUNs are only exposed to the hosts that have authority to access them. This is generally referred to as LUN masking. In addition, CHAP authentication is used for each iSCSI session login. All management access is also protected with the access control list, which filters out the machines that are not on the list.

Active Mid-plane - PixelStor 5000 is built around an active mid-plane. This permits the PixelStor 5000 to achieve a shorter chassis length and a smaller foot-print. Additionally, a single component failure only affects one drive of a Disk Group.

Robust Enclosure - Both the enclosure and the drive carriers are designed for operation without IO errors in various temperature and vibration conditions. The whole enclosure is built in one piece. Extensive thermal and vibration testing has been conducted on the enclosure by itself and in a densely populated rack. Special attention has been taken to recover the data path failure due to signals stuck at zero or one. In addition, each active component such as the drives and controllers monitor the incoming current and shut down power in case of a

short-circuit.

Simple, Intuitive Configuration - The web based management utility called the PixelStor Storage Manager has been designed to be intuitive and extremely easy to use. It requires little to no training. With the PixelStor Storage Manager, a system administrator can set up a system in 6 simple steps. The utility allows you to:

- Assign System IP address(s)
- Select and name multiple drive groups and establish different RAID levels for each group.
- Create and size virtual drives for each drive group. The system supports up to 256 LUNs.
- Create a list of available hosts with WWN's and IP addresses
- Present Volumes to Hosts
-
- Establish access rights to each virtual drive with the option to enable powerful security policies to each virtual disk. Add capacity, check system status, set email alerts in the event of system problems.

System Management and Full Monitoring Capability - RASILIENT Systems is committed to developing storage arrays that reduce administrative complexity and management costs. PixelStor 5000 comes with powerful remote management software that dramatically simplifies setup and monitoring of storage volumes. The robust self-monitoring technology and automatic notification service maximizes storage availability while minimizing the pressure on system administrators. In the event of a hardware failure, PixelStor 5000 can automatically notify you via email. The user interface also provides monitoring for each hardware module. The log and all system information are kept in persistent memory, which can be recovered after reboot. For remote diagnostics, the administrator can dump the whole log to a remote email address with a single mouse click.

Non-disruptive On-Line Firmware Update - Using PixelStor 5000, there is no need to take your system down when upgrading the firmware. As part of the high-availability design, PixelStor 5000 keeps mirrored copies of its System Software in flash on each controller. You can upgrade the kernel on-line with no disruption of service.

Table 1-2 Product Features

Product Features for Storage	
Chassis	➤ 2U/12 bay, rack-mounted chassis
Power	➤ Support dual 600W redundant power supplies equipped with universal AC input that includes PFC
Storage	<ul style="list-style-type: none"> ➤ Twelve 3.5" SATAII/SAS drives per PixelStor 5000 ➤ Can add up to 8 additional PixelStor 100e/312e 2u/12 bay or 4 Addition PixelStor 324e expansion enclosures to increase capacity to a maximum of 108 SATAIII or SAS drives
Mid-Plane	<ul style="list-style-type: none"> ➤ Controller backplane ➤ Hard drive backplane
Controller Module	➤ One or two controller modules
Product Features for each Controller Module	
Processor	<ul style="list-style-type: none"> ➤ Intel Ivy Bridge processor ➤ CPU Socket Type LGA 1155
Chipset	➤ Panther Point C216
Memory	<ul style="list-style-type: none"> ➤ Two 240-pin UDIMM sockets ➤ Supports 2GBx2, 4GBx2 or 8GBx2 of unbuffered DDR3 1600MHz DIMMs ➤ Supports ECC
External I/O Ports	<ul style="list-style-type: none"> ➤ Two mini-serial port ➤ Five Gigabit Ethernet RJ45 ports (LAN) <ul style="list-style-type: none"> ■ 5 GE ports can be bonded together for performance or assigned individual IP address for additional connectivity ■ 1 of the 5 Gigabit Ethernet ports can be configured as out-of-band management port. ➤ One SFF-8470 SAS expansion connectors ➤ Two USB ports ➤ One Mini Display Port

1.5 System Overview

1.5.1 System Layout

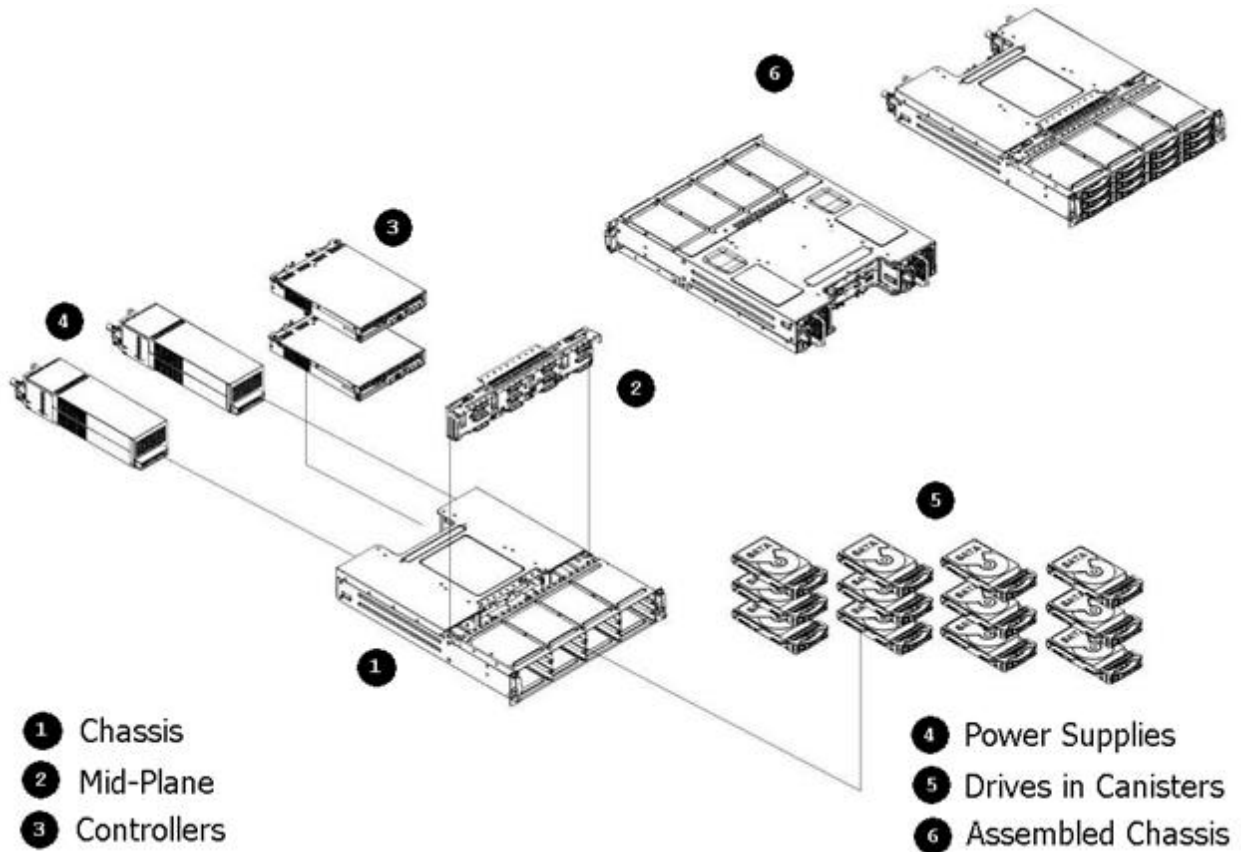


Figure 1-2 Chassis Layout

1 Chassis	4 Power Supplies
2 Mid-Plane	5 3.5" Drives 0-11
3 Controller Modules	6 Assembled Chassis



Depending on your purchased configuration, the PixelStor 5000 may have one or multiple controller, power supply or hard drive modules installed. When one of these module slots does not contain a module, a corresponding slot cover must be installed to maintain proper airflow.

1.5.2 Module Locations - Front

The front of the PixelStor 5000 allows easy access to the 12 hot plug drive canisters. Each drive canister has a status multi-color LED located to the right of the release handle (see figure 1-4).

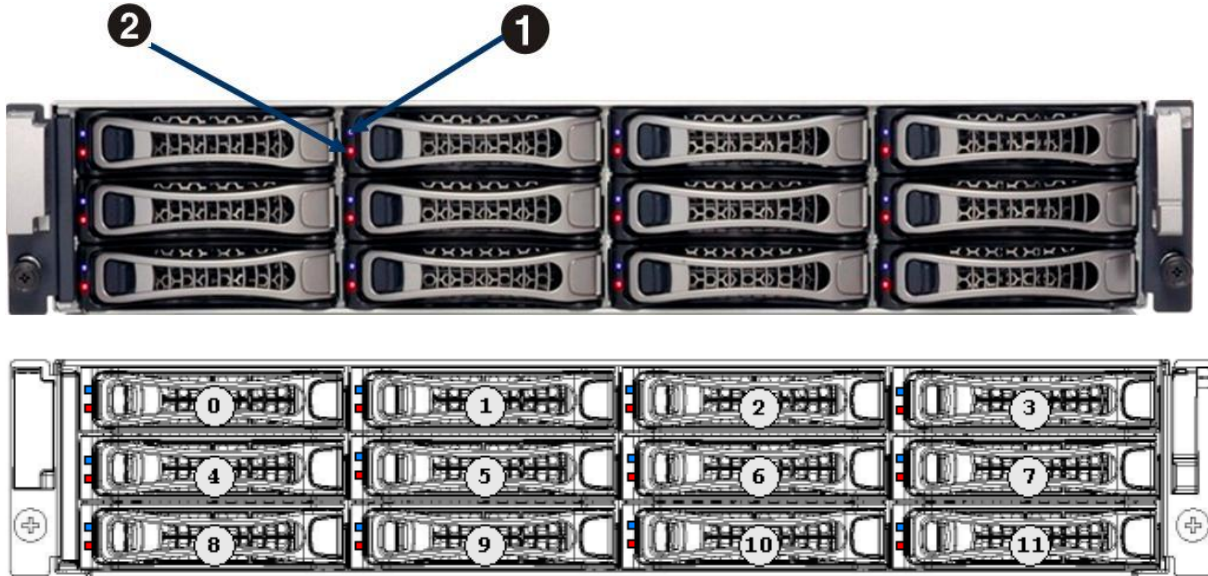


Figure 1-3 Front View – Hot -plug Modules

Type of LED	Color	Status
HDD Tray LEDs	① Blue (upper)	On: HDD present
		Off: HDD not present
		Blinking: HDD data access
	② Red (lower)	On or Blinking (individually): Drive Faulty
On or Blinking (all 12 together): System Component failure		



Hard disk drives are numbered 0 through 11 as the shown in figure above.

1.5.3 Module Locations - Back

The back of the PixelStor 5000 provides easy access to the hot plug RAID controller modules, fan modules and power supply modules. All of the device and power connections are externally accessible and are located in the back of the system.

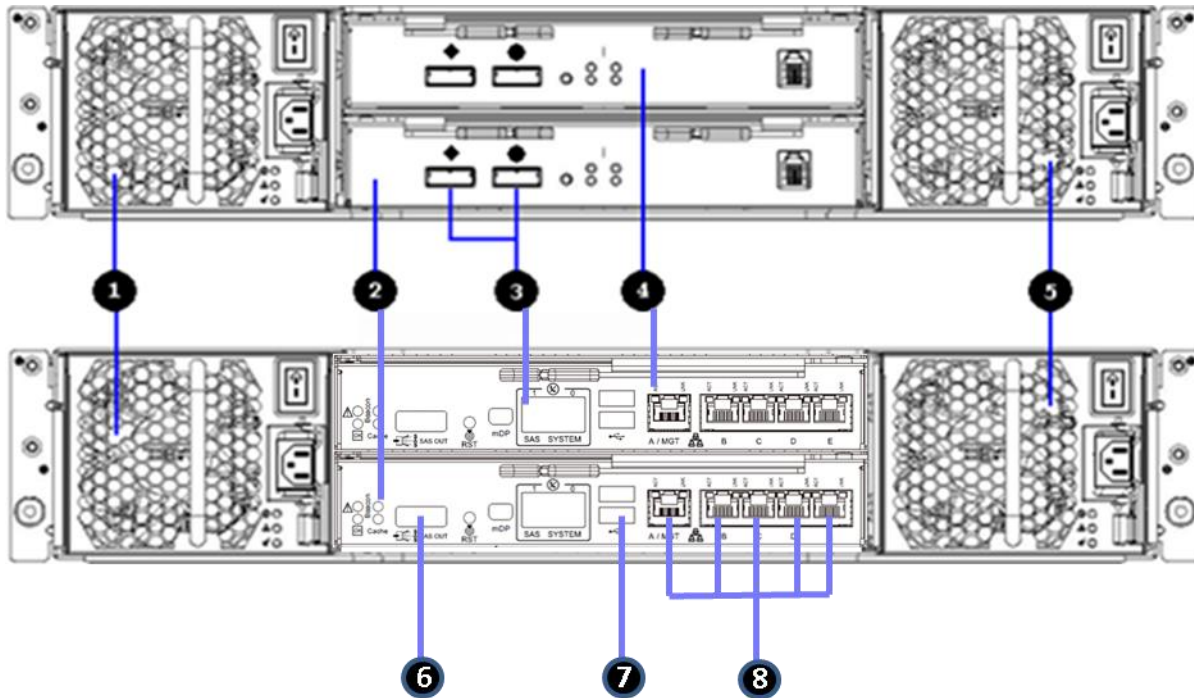


Figure 1-4 Rear Panel

1.- Power Supply 0	5.- Power Supply 1
2.- Controller 0	6.- COM 0 (rightmost)
3.- SAS Connectors (◆ = Out ● = In)	7.- USB Port
4.- Controller 1	8.- 5 NIC Ports RJ45)

Figure 1-5 Rear Panel

Status Indicators & System Alerts

The PixelStor 5000 is equipped with a full complement of status indicators and system alerts.

System Health Alert - PixelStor 5000 has a general alert that enables an administrator to identify an unhealthy system in a rack of systems. When a PixelStor 5000 system encounters operational problems with any hardware component all of the red LEDs on the hard drives flash in sequence to identify the unhealthy system in a rack.

System Log Notifications – PixelStor 5000 also captures status and health alerts in the system log. These alerts are viewable by the administrator in the PixelStor Storage Manager. The alerts can be viewed through the “System Log” or “System Health Alert” sub-menus. For proactive notification, the administrator can set up to 8 email addresses to receive system log notifications.

Status Indicators (LEDs) - PixelStor 5000 has multi-color LEDs located on all the removable modules. These provide system administrators visual cues to the status of all major components. The LEDs are located on:

- Controllers
- Ethernet Interface Ports
- Power Supplies
- Hard Drives

•



When the system is started for the first time or in cases when the system is improperly shutdown, the system waits 2 minutes to initialize and run a full system check. If initialization sequence is interrupted, the process starts over from the beginning. Please allow the system to finish its initialization sequence to avoid system startup delays.

1.5.4 LED Location and Information

The PixelStor 5000 is equipped with LED indicators for all major components of the system. These LEDs provide visual cues to the status of each of these components.

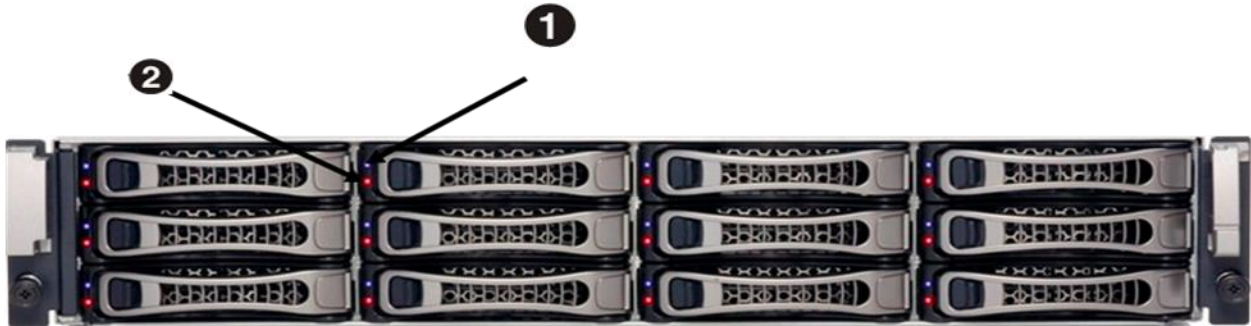


Figure 1-6 Front Panel

Type of LED	Color	Status
HDD Tray LEDs	① Blue (upper)	On: HDD present
		Off: HDD not present
		Blinking: HDD data access
	② Red (lower)	On or Blinking (individually): Drive Faulty
On or Blinking (all 12 together): System Component failure		

Figure 1-7 HDD LED Status

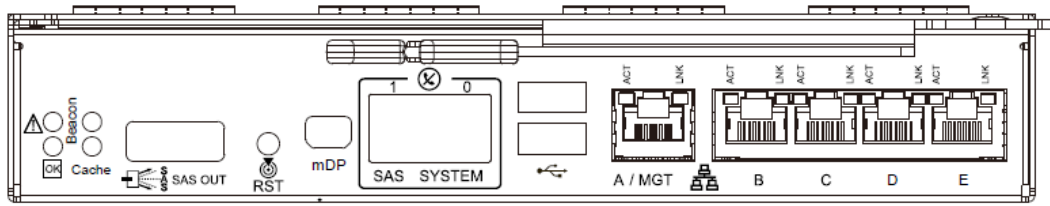


Figure 1-8 PS 5000

Type of LED	Color	Status
Beacon (1)	White	On: Identify Unit Off: Normal
Cache (2)	Yellow	On: Cache contents “Dirty” Off: Normal
[OK] (3)	Blue	On (blinking): Normal (Heart Beat) Off: Controller Problem
!! (4)	Red	On: Controller Fault Off: Normal

Figure 1-9 LED Status

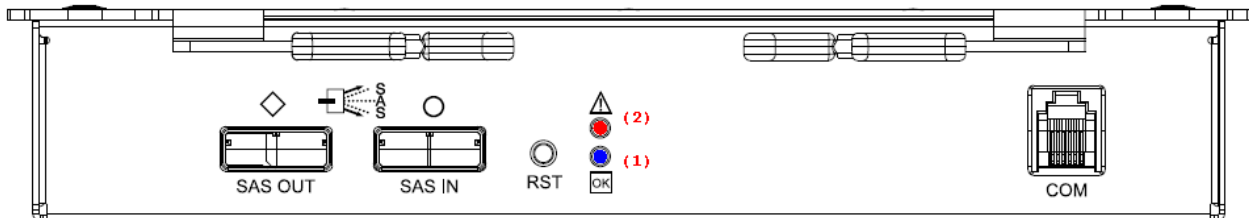


Figure 1-10 –PS 100e/312e/324e

Type of LED	Color	Status
[OK] (1)	Blue	On (blinking): Normal (Heart Beat) Off: Controller Problem
!! (2)	Red	On: Controller Fault Off: Normal

Figure 1-11 Back View LEDs

1.6 System Specifications

Dimensions	➤	Height: 8.75cm
	➤	Width: 43.00cm
	➤	Length: 68.70cm
Weight	➤	Max-weight: 30.96kg±5% (12xHDDs)
Temperature	➤	Operating System: +10°C~+35°C
	➤	Non-operating System: -40°C~+70°C
Humidity	➤	Operating System: 20%~80%
	➤	Non-operating System: 10%~95%
Power	➤	100-240Vac input, 50/60Hz
	➤	600 watts
Current	➤	Typical - 5/2.5A max 8.6A

Table 1-3 PixelStor 5000 Specifications

Chapter 2

Before You Begin

Packing Checklist
Rules for Adding Storage

2 Before You Begin

Thoroughly research and establish an installation and configuration plan for your specific network environment. You should also plan how you want to configure your storage.

The system has the ability to be set with one or multiple IP addresses. The simple online configuration procedures will allow you to set-up your system on your network using these IP addresses. Be sure to ask your network administrator to provide you with sufficient IP addresses for your planned configuration. Your administrator should provide the following information so that you can properly configure your system on your network:

- IP Address(s)
- Gateway address
- Net mask address
- DNS server information.

2.1.1 Packing Checklist

Make sure you have all the components that shipped with your system. If any item is damaged or missing, please contact your sales representative for a replacement. The PixelStor 5000 is shipped with the following:

Chassis	➤	2U/12 bay rack-mounted chassis
Controllers Module(s)	➤	One or two RAID controller modules
Power Supply Modules	➤	Two power supply modules.
Chassis Brackets	➤	Two chassis brackets for rack installation.
Hard Disk Drives (HDDs)	➤	Up to twelve hot plug 3.5" SATAII drive canisters with or without drives depending on the configuration.
Cables	➤	One RS232 Console Cable
Power Cords	➤	Two power cords

Table 2-1 Packing Checklist

2.1.2 Rules for Adding Storage

PixelStor 5000 and PixelStor 100e/312e/324e expansion enclosures follow the concept of “disk groups”. A “disk group” (DG) is composed of an associated group of disks with similar RAID properties. All DGs must be assigned a RAID level. The system supports RAID 0, 1, 5, 6, 50, 60 10. The following rules must be followed when creating DGs for a PixelStor 5000/100e/312e/324e system:



- To improve the utilization of the available storage capacity and ensure reliability, it is recommended that all disk drive modules within a DG be the same size and from the same manufacturer. This is because for each RAID Group, the system scales down to the size of the smallest drive (except for RAID 0).
- A DG can span across interconnected PixelStor 5000 and PixelStor 100e/312e/324e systems.
- Drives within a DG can reside in any order across any of the enclosures in a system.
- Capacity of a DG can be expanded by adding disks from the available pool of global spare disks. (Adding disks to a disk group may require multiple disks.)
- DGs can be accessed by either controller, but must be assigned a primary controller.
- Drives not assigned to a disk group will be classified as “Global Spares”
- Global spare(s) can reside on any of the interconnected chassis to protect any DG. A Global Spare cannot be added to RAID 0 DG.
- Failed disks or disks disassociated from their disk group will be classified as “Orphans” by the system.

Table 2-2 Disk Group Parameters

Disk Group (DG) Parameters	RAID 0	RAID5	RAID50	RAID6	RAID60	RAID1	RAID 1+0
Minimum # of Drives per DG	2	3	6	4	8	2	4
Maximum # of Drives per DG	108	108	108	108	108	108	108
Maximum # of Drives per System (PixelStor 5000)	108	108	108	108	108	108	108
DGs Allowed per System	1-16	1-16	1-16	1-16	1-16	1-16	1-16
RAID Levels Allowed per DG	1	1	1	1	1	1	1
Drives Must be Added in	Singles	Three's	Group 6	Four's	Group 8	Pairs	Pairs
Global Spare Capability	N/A	Yes	Yes	Yes	Yes	Yes	Yes
Access to DG by both	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Chapter 3

Hardware Installation

Power Off

Installing in a Rack

Installing Hardware Modules

Adding Expansion Enclosures

Powering On

3 Hardware Preparation and Installation

This chapter describes the hardware setup procedures that you have to perform when installing or removing system components. The PixelStor 5000 is designed with tool less modules which allow users to remove or install modules without any tools. The tool less modules are listed below:

- Controller Modules
- Controller Fan Board
- Power Supply Modules
- Fan Modules
- Mid-plane
- SATAII Hard Drive Modules

3.1 Make sure power is off

Before any installation or replacement, you must power off the storage completely. Follow the steps below to power off the storage completely.



Moving the Power On/Off switch to the Off position does not completely remove power from the system. Some portions of the power supply and some internal circuitry remain active. Disconnect all power cords from the storage to completely remove power from the system.

To shut down power supply:

Press the power switch \ to the off position. This will turn off the green AC power LED ②, AC power fault ③ and chassis power DC on ④.



Figure 3-1 Shut Down Power Supply

To unplug the power cords:

First unplug the power cords from the AC outlet and then from the storage.

3.2 Installing in a Rack

The rail kit included with the system can be used to mount the PixelStor 5000 in 4-post racks with square holes or with round holes.

3.2.1 Rack preparation

Review the rack manufacturer's documentation to become familiar with their installation requirements. Locate the chassis brackets that are supplied with the PixelStor 5000. Have them ready for use in the rack installation. If you are installing more than one PixelStor 5000 into the rack, start at the lowest available position, and work upward. You may need to remove the rack's power distribution unit (PDU) before you install the PixelStor 5000. Refer to rack manufacturer's instructions for further instructions



- A stabilizer must be attached to the bottom, front of the rack to prevent the rack from tipping forward while the enclosure is being removed or installed. Do not remove or install any enclosure if a stabilizer is not attached to the rack.
- Do not attempt to lift the enclosure by yourself. Ask another person for aid.
- Do not use the handles from the controller or power supply modules to carry the enclosure. These handles are not intended to support the weight of the enclosure.

- 1 Install the brackets as shown in the example below.

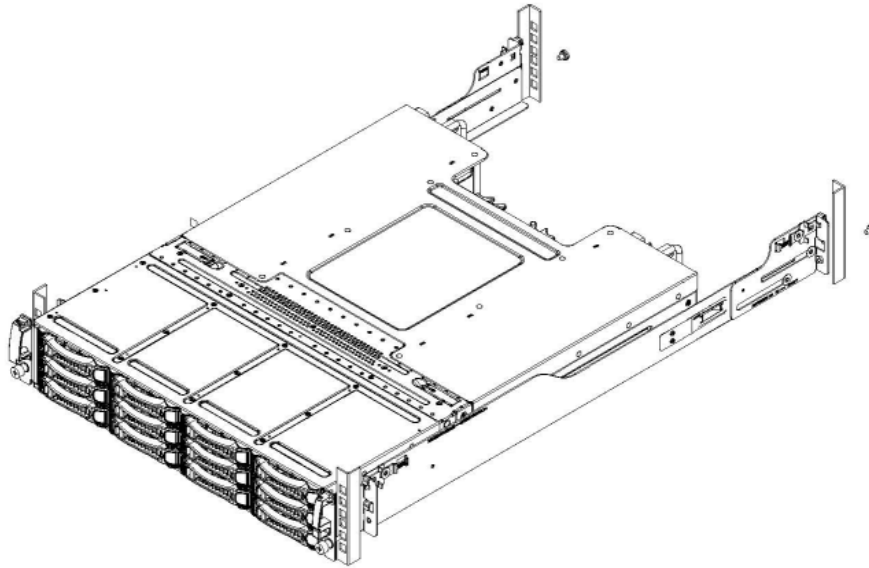


Figure 3-2 Installing the Mounting Brackets in the Rack

- 2 The Chassis slides along the support edges of the Bracket.

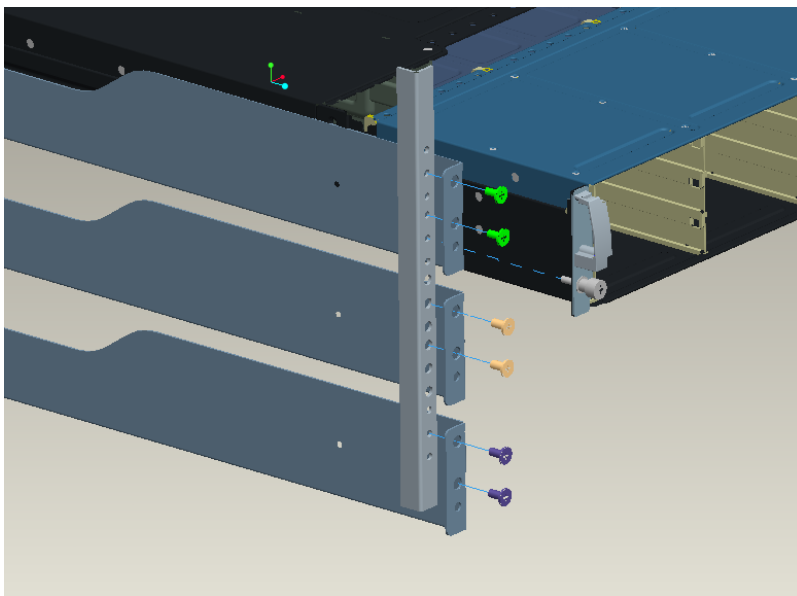


Figure 3-3 Secure the Mounting Brackets

- Each pair of Brackets is supplied with a set of screws: 10-32, 12-24, M6. Use the size appropriate for your Rack. For those Racks with square holes use the included flanged nuts to secure the screws. Note the pair of screws that are attached to the chassis. Use these screws to secure the chassis into the Rack.



Make sure the Brackets are installed at the level where you wish to install your PixelStor 5000 system.

- Lift the system to the desired position on the rack with the help of a second person.



For best results, start installing systems from the bottom of the rack and move up.

- Tighten the screws to fix the chassis to the rack.

3.3 Installing Hardware Modules

3.3.1 Controller Modules

This PixelStor 5000 is designed to operate with one or two controller modules. When the PixelStor 5000 is equipped with dual controller modules, the hot-swappable redundant function is enabled. If one controller module fails, the surviving controller takes over all storage volumes and host connections. With redundant controllers, you can replace the failed controller module without powering off the PixelStor 5000, because the surviving controller module takes the place of the failed one.

The location of the controller modules on the chassis is shown below:

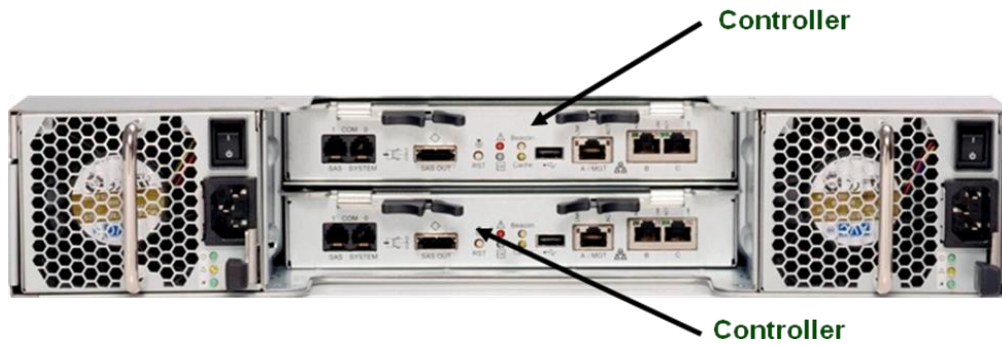


Figure 3-4 Location of Controller Modules

To install the controller module

- 1 Carefully insert the controller module into the bay until it completely enters the bay and the latches engage.



Figure 3-5 Inserting the Controller Module



Make sure that the controller modules are fully inserted and the connectors firmly seated to the backplane.

To remove the controller module

- 1 Pull latches to release controller



Figure 3-7 Inserting the Controller Fan Board

To remove the Power Supply/Fan assembly

- 1 Press the latch and pull the handle to remove the Power Supply/Fan assembly.



Figure 3-8 Pressing the Locking Button

3.3.3 Hard Drive Modules

This PixelStor 5000 system supports installation of 3.5" SATAII drives. The drives are housed in SATA hot plug drive canister and can be installed in the following slots on the PixelStor 5000:

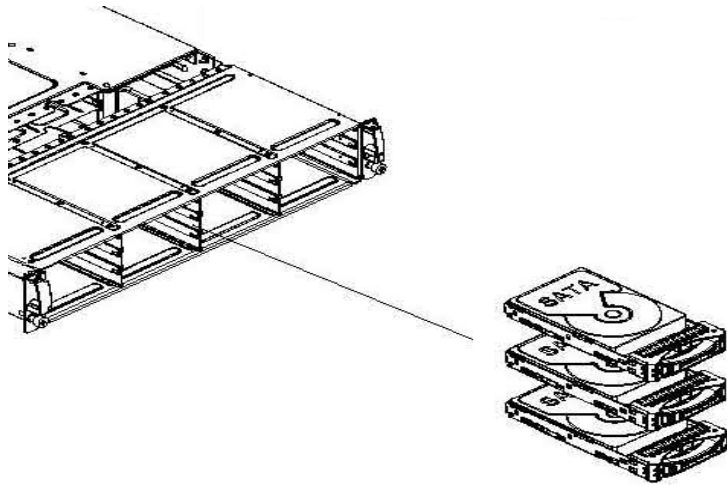


Figure 3-9 Hard Drive Module Location

The layout of hard drive modules is shown below:

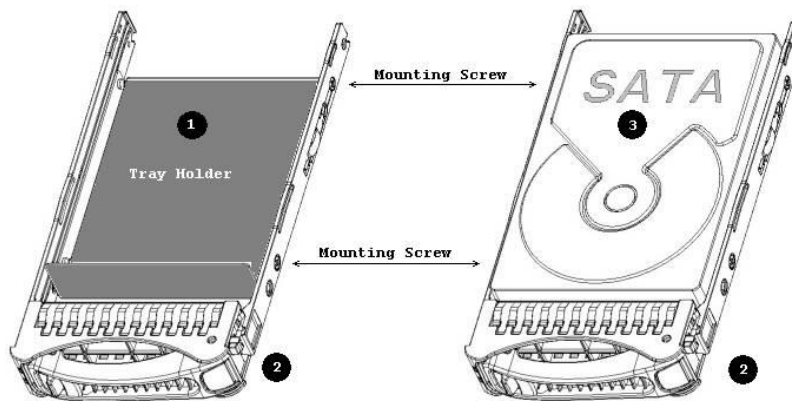


Figure 3-10 Hard Drive Module Assembly

- | | |
|---|-----------------|
| ❶ | Tray Holder |
| ❷ | Drive Carrier |
| ❸ | Installed Drive |



- The drive must be inserted into the drive slot with the drive label facing up.
-

To install the hard drive module

- ❶ Place Tray holder as shown in Figure 3-11
- ❷ Position the hard drive into the carrier.
- ❸ Secure the hard drive with four screws.

- ④ Carefully insert the HDD assembly into the PixelStor 5000 chassis as shown below.



Figure 3-11 HDD Assembly installed in Chassis



There must be a minimum of 2 to 3 drives (depending on RAID type) to configure a Disk Group in the system. (See “Rules for Adding Storage”)

To remove the hard drive module

- ① Reverse the above process to remove the drive from the chassis.
- ② Slide the released button to the right to release the drive handle.
- ③ Pull the handle to unseat the drive and slide the hard drive module out of the drive bay.



When removing the hard drive module, pull the drive out slightly until disconnected. Do not pull it out completely. Wait at least 30 seconds to allow the drive to stop spinning before remove drive completely.

3.3.4 Mid-plane

The Mid-plane consists of the drive backplane, controller backplane and mid-plane bracket. The drive backplane can support twelve 3.5” SATA drives. The system uses a controller backplane to connect the drive backplane with the controller modules and power supply modules. The shape of drive backplane is shown below:

The location of mid-plane is shown below:

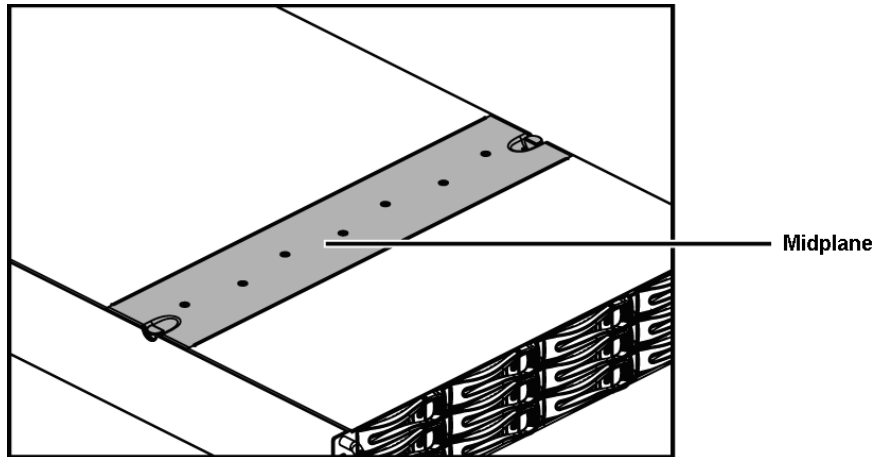


Figure 3-12 Mid-plane Location

 **Reminder**

Before you remove or install the mid-plane, you must remove all modules connected to the mid-plane. Please follow the steps below:

Step 1: Make sure the PixelStor 5000 is turned off and not connected to AC power.

Step 2: Remove the controller module.

Step 3: Remove the power supply module.

Step 4: Remove the drives.

To install the Mid-plane

- 1 Insert the Mid-plane into the chassis.

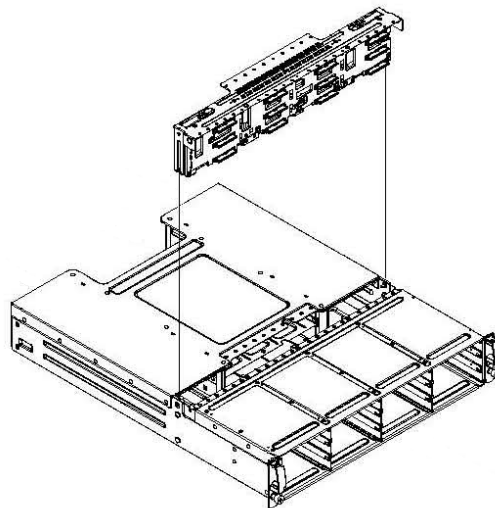


Figure 3-13 Installing the Mid-plane

To remove the mid-plane

- ➊ Push both locking buttons in the direction of the arrow below.
- ➋ Lift the mid-plane straight up from the chassis.

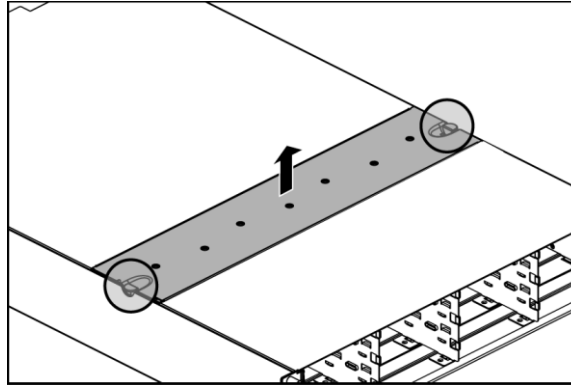


Figure 3-14 Removing the Mid-plane

3.4 Adding Expansion Enclosures (PixelStor 100e/312/324e)

The PixelStor 100e/312e/324e functions as an expansion enclosure for the PixelStor 5000 RAID system. Up to eight PixelStor 100e/312e's and up to four PixelStor 324e's expansion enclosures can be added to a PixelStor 5000 in a daisy chain fashion using the supplied SAS IO cables to enable a maximum capacity of 108 drives. PixelStor 100e/312e/324e enclosures can be added while the system is running (hot-added).

PixelStor 100e/312e are 2U/12 bay single or dual controller expansion enclosures while the PixelStor 324e 4U/24 bay single controller only expansion enclosure.

The PixelStor 100e/312e/324e is designed with external SAS connectors to connect with the PixelStor 5000 RAID system and to other 100e/312e/324e enclosures. These SAS connectors can be used for upstream connection (subtractive routing) or downstream cascading (table routing). Upstream and downstream connections are required to be connected to different SAS connectors. Please see illustration below for details.

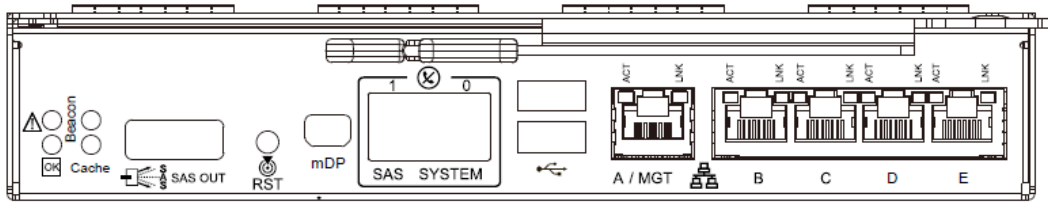


Figure 3-15 - PS 5000

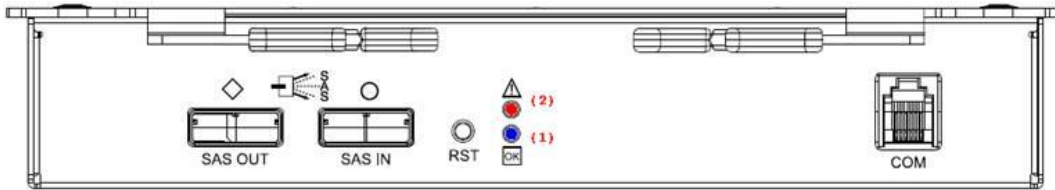


Figure 3-16 100e/312e/324e SAS Connectors

-
- ◆ SAS OUT - SFF-8470 Connector
 - SAS IN - SFF-8470 Connector
-

Figure 3-21 SAS Cable Connections - Shows the supported cabling configuration for PixelStor 5000 RAID system and 100e/312e/324e expansion enclosures. Start from the PixelStor 5000 chassis at the top of the diagram and connect to the first 100e/312e/324e enclosure below it. Then add additional 100e/312e/324e enclosures.

Note in the single controller configuration only the bottom controller should be installed and SAS cable connections should never be made between bottom and top controller.



The PixelStor 324e is a single controller only product should and should be connect as such.

1. Each RAID controller on the PixelStor 5000 has a SAS connector marked with the ◆ icon. Connect one end of one of the included SAS cables to SAS connector with ◆ icon on the PixelStor 5000.



◆ icon SAS OUT always connects to ● icon SAS IN.

2. Each IO module on the PixelStor 100e/312e/324e has 2 SAS connectors. One is marked with a ◆ icon (SAS OUT) and one is marked with a ● icon (SAS IN). Connect the other end of the SAS cable from Step 1 to the right-most module SAS connector

- marked with a ● icon on SAS IO module 0 of the 1st PixelStor 100e/312/324e.
3. For a dual controller configuration, follow the same exact process described above to connect RAID controller 1 on the PixelStor 5000 to SAS IO module 1 on the 1st 312e/100e. You have now properly connected the PixelStor 5000 RAID system to the 1st 300e expansion enclosure.
 4. If you have additional 100e/312e/324e enclosures to add to this RAID system, follow the rest of these steps to daisy chain them to the 1st 100e/312e/324e.
 5. Connect one end of another of the included SAS cables to the SAS connector marked with an ◆ icon on the SAS IO module 0 of the 1st 100e/312e/324e expansion chassis. Connect the other end of the SAS cable to the SAS connector marked with an ● icon on SAS IO module 0 of the 2nd 100e/312e/324e expansion enclosure.
 6. Follow the same exact instructions above for connecting SAS IO module 1 on the 1st 300e expansion enclosure to SAS IO module 1 on the 2nd 300e expansion enclosure. You have now properly connected a 2nd 100e/312e/324e expansion enclosure to the first 300e enclosure.
 7. To add additional 100e/312e/324e expansion enclosures to this RAID array system, repeat steps 5 and 6.

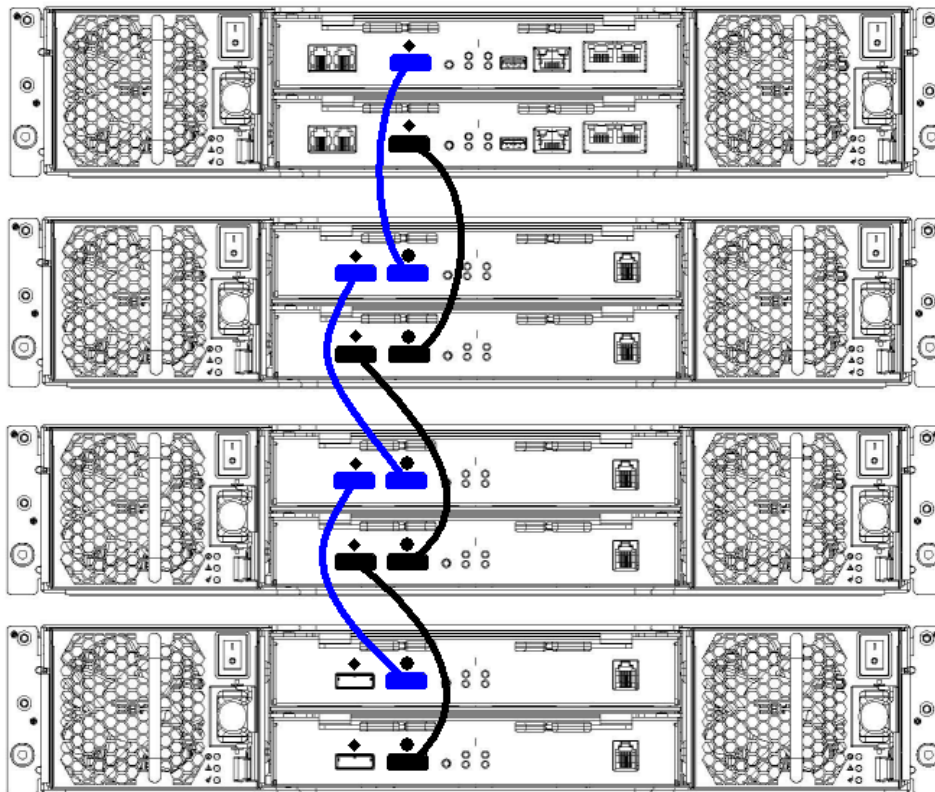


Figure 3-21 SAS Cable Connections

3.5 Powering on the System



PixelStor 5000 is equipped with a 3-wire power cable and plug for user safety. Use only the cable provided with the system. Ensure that the electrical outlet is correctly grounded to avoid electric shock.

At the back of the enclosure, plug the power cords to the power supplies. Plug the other end of the power cord into the power source of the rack. Make sure the power source is fully grounded. It is recommended you plug each of the two power cords into separate power sources on the rack to increase availability. It is recommended that you always use a regulating uninterruptible power supply (UPS) to protect your system. Now that all the hardware has been installed power on your system by toggling the power switches **1** on each power supply to the on position.



Figure 3-17 Turn on Power Supply

Chapter 4

System Configuration

Initialize the System

Configure the System

Additional Configuration Options

4 System Configuration

Once the physical hardware components are installed, you are ready to start configuring your storage. First you will need to set up the PixelStor 5000 on your network.



It is always recommended that you set up the PixelStor 5000 on protected storage network separate from your data network for security and performance reasons.

4.1 Initialize the System

The PixelStor 5000 ships with 5 to 10 Gigabit Ethernet (GE) ports per system depending on your purchased configuration. These are bonded together using RASILIENT's IP redirect technology. RASILIENT offers additional flexibility by offering the ability to set one of these GE link links as a separate out-of-band management port.

By default the system ships with all the included GE links bonded together into one IP address. This provides the best performance because the system intelligently balances IO requests across the multiple bonded GE links. This approach also offers the best fault tolerance because if any link goes down, hosts can continue to access the PixelStor 5000 via the surviving GE links.

With the physical hardware components installed, you are now ready to initialize the system and start configuring your storage. The first step in setting up the PixelStor 5000 is to get it ready to connect to your network. There are two options for setting up the PixelStor 5000 on your network.

4.1.1 Option 1 – Use Pre-configured IP Address to Connect to System

Each PixelStor 5000 comes pre-configured with an IP address. Once you have connected your PixelStor 5000 to your network and started the system, you can use the web based PixelStor Storage Manager included with your system to configure your storage. Using the PixelStor Storage Manager and default IP addresses instead of the CLI is recommended, especially if this is your first time setting up a PixelStor 5000 . The PixelStor Storage Manager is designed to get your system up and running in six simple steps.



There will be only one base System IP address regardless of number of physical GE ports or number of controllers.

1. Power-on PixelStor 5000, using the DC power/standby switch-on each power supply. The green DC power light on the power supply will turn on and stay on. The green activity light on each installed disk drive should be on. The PixelStor 5000 comes with its own pre-installed system software. When the system is powered on, the system software boots automatically.



When PixelStor 5000 is started for the first time, the system may take 1-2 minutes as it does a full system check. This only happens on the first start-up or after an improper power shut down. If the system is restarted during the initialization sequence, the process starts over from the beginning. Please wait for the system to finish its initialization sequence to avoid start-up delays.

2. Move to a workstation with a web browser such as Microsoft Internet Explorer on the same subnet as PixelStor 5000 . Type `http://192.168.0.1` into the web browser address window to access the PixelStor Storage Manager.



The workstation that will be used for system configuration should be on the same subnet as PixelStor 5000 . Set the Workstation IP address to `192.168.0.x` and the net mask to `255.255.255.0` before trying to access the PixelStor Storage Manager.

3. You will see the PixelStor 5000 login. Enter the following login information when prompted.
 - Password: root
 - User Name: root
4. This will take you to Systems Properties page. Use the Setup Wizard on the far right side of the browser window (Steps 1-6) to guide you through the setup process.

4.1.2 Option 2 – Configure Private IP Address to Connect to System

Before connecting the PixelStor 5000 to your network, you will first need to access the built-in Command Line Interface (CLI) that is included with your system. The PixelStor 5000 is designed with one mini-serial port on the back of each controller module. This can be used to

connect a serial console to the PixelStor 5000 to manage the system. The CLI can be accessed via a terminal emulator running on a PC or laptop connected directly to the mini Serial port on the back of the PixelStor 5000 .



See Appendix B – Using the Command Line Interface, for more information on the CLI and a full list of commands. The mini-serial port is configured for 115.2K Baud, N81.

1. To minimize any IP address conflicts, make sure the PixelStor 5000 is not connected to your network.
2. Connect the supplied serial cable to the COM port on either controller.
3. Connect the opposite end of the cable to a workstation or laptop with a terminal emulation program (i.e. Microsoft Windows HyperTerminal).
4. You must use the following terminal emulation settings on the workstation/laptop to access the CLI:
 - Baud Rate – 115,200
 - Data Bits – 8
 - Parity - None
 - Stop Bits – 1
 - Flow Control Off
5. Power-on the PixelStor 5000, using the DC power/standby switch-on each power supply. The green DC power light on the power supply should turn on and stay on. The green activity light on each installed disk drive should be on. The PixelStor 5000 comes with its own pre-installed CLI and system software. When the system is powered on, the software boots automatically.



When the PixelStor 5000 is started for the first time, the system may take 1-2 minutes as it does a full system check. This only happens on the first start-up or after an improper power shut down. If the system is restarted during the initialization sequence, the process starts over from the beginning. Please wait for the system to finish its initialization sequence to avoid start-up delays. The mini-serial connector can be connected to monitor information sent to the console during the boot process.

6. Once connected and running the PixelStor 5000 will prompt you for the following login information on the workstation/laptop terminal screen:
 - Login – root
 - Password – root



If you have not done so already, consult with your network administrator for IP addresses that you can use to set up PixelStor 5000 on your network

- This will start the CLI setup wizard.

```

RAStor - HyperTerminal
File Edit View Call Transfer Help

Setting raid5_force_reconstruct to 0
itoring

Starting UPS monitoring:[ OK ]
After daemolize
Starting snmpd
Starting snmpd: [ OK ]
Starting cfsys
da_host register to the KEM successfullylogger: dalun -R succeeded
<ISCSI>: Set portal group 0 ip 192.168.0.2

Portal 192.168.0.2 with tag 0 is set
Starting httpd: [ OK ]
Starting crond: [ OK ]

Battery present and fully charged
Battery charger is good
Main Chassis: Power Supply 0 present
Main Chassis: Power Supply 0 FAN is OK
Main Chassis: Power Supply 0 DC is OK
Main Chassis: Power Supply 1 is present
Main Chassis: Power Supply 1 FAN is OK
Main Chassis: Power Supply 1 DC is OK
Fan board is present.
expander 0, Power Supply 0 present
expander 0, Power Supply 0 DC is OK
expander 0, Power Supply 0 FAN is OK
expander 0, Power Supply 1 is present
expander 0, Power Supply 1 DC is OK
expander 0, Power Supply 1 FAN is OK

login: root
Password:

This wizard will walk you through the network configuration.
You can configure the rest of the system using the web GUI.
The default values are in the bracket, you can press "Enter" to
select the default value. If you make any mistake, you can
press "ctrl-c", then logout and login to run this wizard again.

Enter IP address for system [192.168.0.11:192.168.123.60]
Enter netmask [255.255.255.0]:
Enter NIC1 IP [1:192.168.123.61]
Enter NIC2 IP [1:192.168.123.62]
Enter NIC3 IP [1:192.168.123.63]
Enter NIC4 IP [1:192.168.123.64]
Enter NIC5 IP [1:192.168.123.65]
Enter NIC6 IP [1:192.168.123.66]
Enter default gateway for system [1:255.255.255.0]
Invalid IP Address 255.255.255.0
Enter default gateway for system [1:192.168.123.254]
Enter DNS address for system [1:192.168.123.4]
Portal 192.168.123.60 with tag 0 is set
[root@none] ~#
[root@none] ~#
[root@none] ~#

```

Figure 4-1 CLI Setup Wizard



This wizard will only run automatically when you log in from the serial terminal as "root". It will NOT run when you login using telnet or log in as a non-root user. Once the network is configured, the wizard will not run automatically again. However, you can run the wizard manually by issuing the command 'dasetup' from the CLI (See Appendix B – Using the Command Line Interface for more information)

- Once launched, the wizard will walk your through the network configuration. The default values are in the brackets. You can hit your enter key to accept the default value or type in the private network information you received from your network administrator to

change the default value. Here is a sample of the what you will be asked to provide:

- Configure NIC1 as dedicated management port [no]:
 - Enter the IP address for system [192.168.0.1]:
 - Enter netmask [255.255.255.0]:
 - Enter MTU [1500 - Jumbo frame disabled]:
 - Enter NIC1 []:
 - Enter NIC2 []:
 - Enter NIC3 []:
 - Enter default gateway for system []:
 - Enter DNS address for system []:
9. Once wizard is complete, connect the PixelStor 5000 to your network (RJ45 network cables not provided). You are now ready to launch the PixelStor web based management utility to install and configure your PixelStor 5000.

4.2 Configure the System

4.2.1 Storage Manager Overview

PixelStor 5000 ships with a comprehensive web based management console, “PixelStor Storage Manager”. The web based management console enables users to install, configure and maintain the PixelStor 5000 from an intuitive easy to use web interface. To access the PixelStor Storage Manager:

1. Login to the PixelStor 5000 from any laptop or workstation on the same subnet as the one you assigned to your PixelStor 5000 in step 8 above. You do this by opening a browser window and typing in any of the IP addresses you setup on the PixelStor 5000 in the previous section.



The workstation that will be used for system configuration should be on the same subnet as PixelStor 5000 .



Be sure to add the IP address to your Local Intranet access list in Internet Explorer otherwise your browser may not generate the correct output..

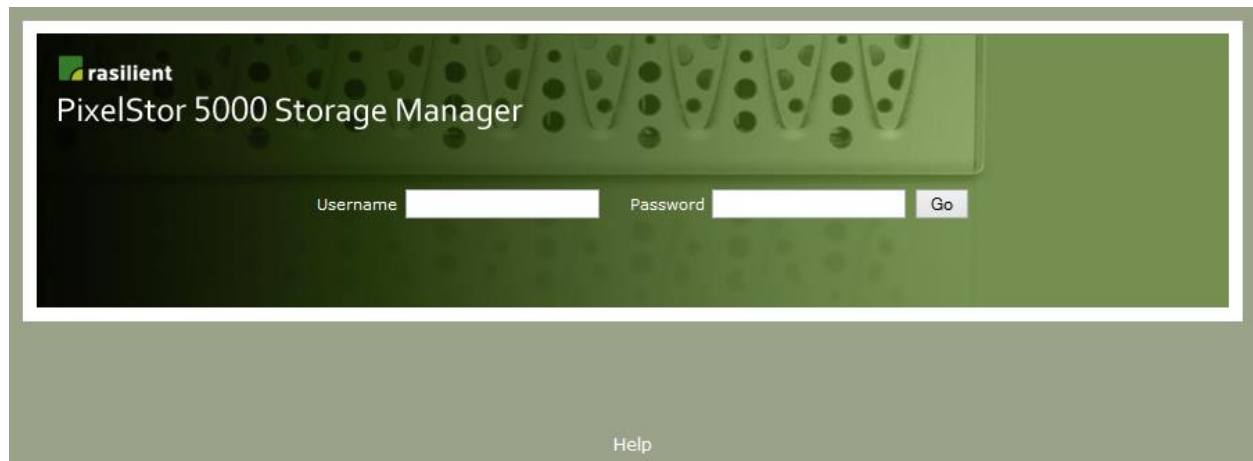


Figure 4-2 Storage Manager Login

2. Enter the following login information when prompted.

- User Name: root
- Password: root

This will take you to Systems Properties page of the management console.

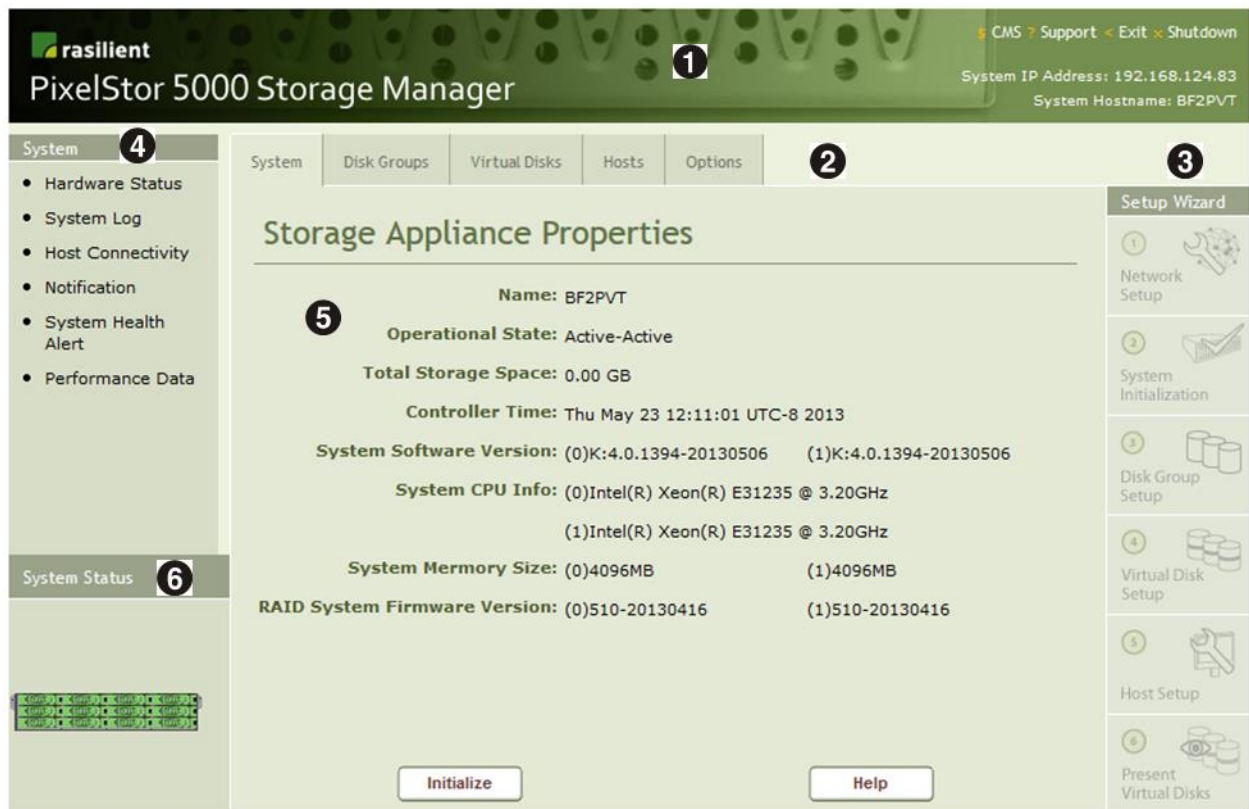


Figure 4-3 Management Console Layout

There are 6 primary sections within the Storage Manager (see Figure 4-3 Management Console Layout)

- ① Console Banner
- ② Navigation Tabs
- ③ Setup Wizard
- ④ Navigation Tree
- ⑤ Work Area
- ⑥ System Status Icon

The Console Banner provides links to the support page, an exit link and a link to the Shutdown page. For easy reference, the System IP address and the Storage System name are displayed as shown in Figure 4-4.



Figure 4-4 Console Banner

The Navigation Tabs provide quick access to utilities that allow you to manage the PixelStor 5000 as shown in Figure 4-5. Each is discussed in greater detail in subsequent sections of this document.

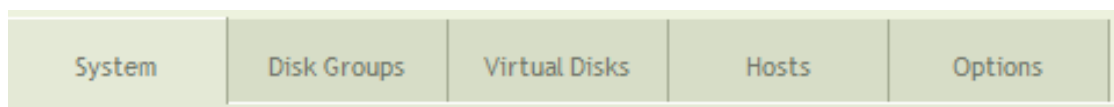


Figure 4-5 Navigation Tabs

The Setup Wizard shown in

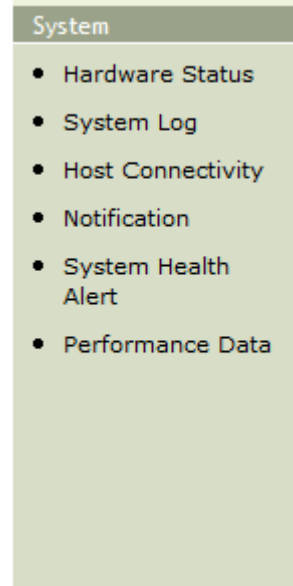
serves as a setup guide and progress bar that takes you through the six basic steps needed to configure and use your PixelStor 5000 .

These steps include:

1. Network Setup
2. System Initialization
3. Disk Group Setup
4. Virtual Disk Setup
5. Host Setup
6. Present Virtual Disks



Figure 4-6 Setup Wizard



The Navigation tree shown in

Figure 4-7 provides a second level of navigation associated with the tab that is currently selected. For example, when System tab is selected, you can go to 5 additional sub categories.

These include:

1. Hardware Status
2. System Log
3. iSCSI Statistics
4. Notification
5. System Health Alert

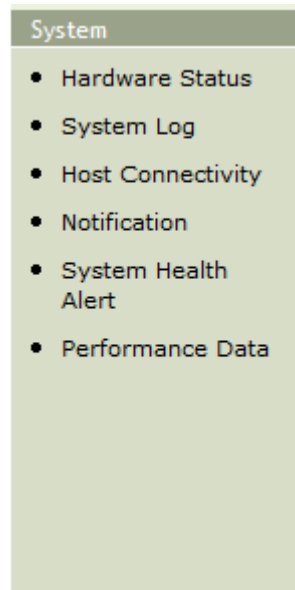


Figure 4-7 Navigation Tree

The Work Area, shown in Figure 4-8, changes depending on the Navigation tab you have selected. For each Navigation tab you will find information, input fields and action buttons associated with the specific Navigation tab/Navigation tree you have selected.

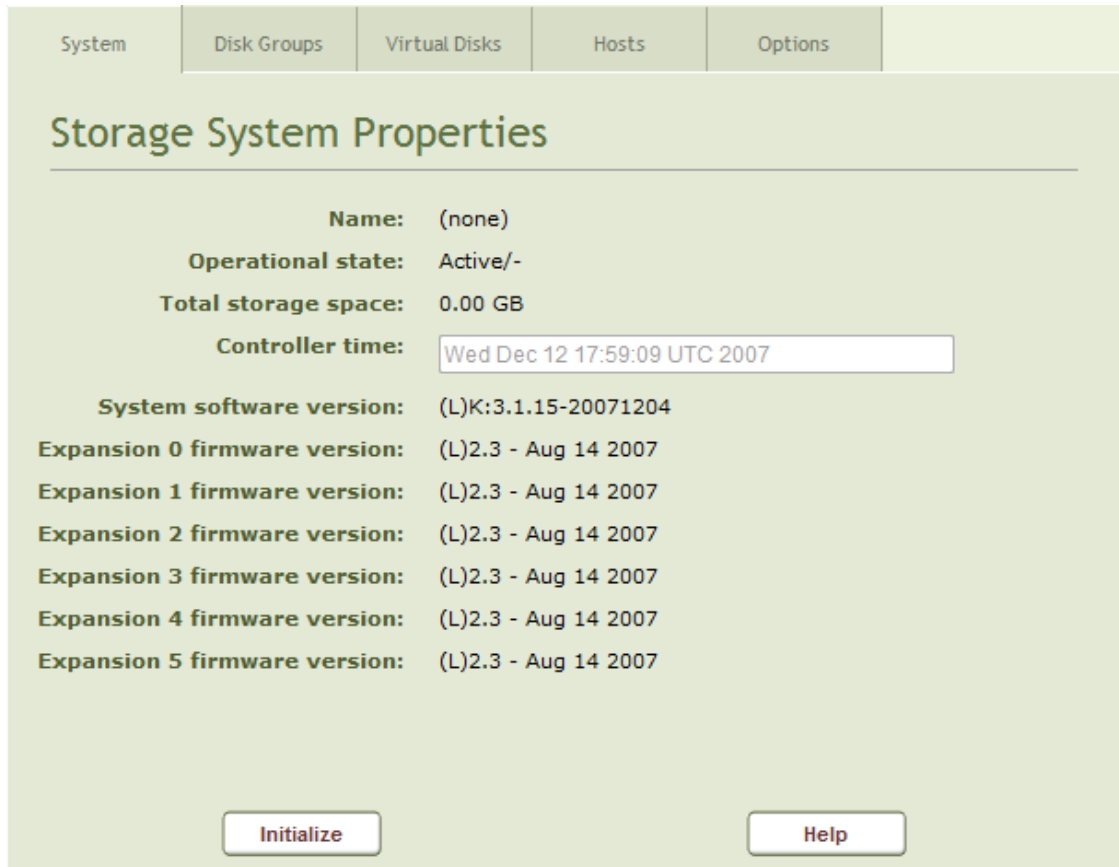


Figure 4-8 Work Area

The System Status Icons shown in Figure 4-9 provides a visual representation of the hardware status for the PixelStor 5000 . Healthy components are presented in green and faulty components are represented in Red. Figure 4-9 shows how a drive color changes when a drive has a fault condition.



Figure 4-9 System Status Icon

4.2.2 Using the Setup Wizard

The Setup Wizard which is located on the right hand side of the Storage Manager serves as a setup guide and a progress bar for the six basic steps for setting-up a PixelStor 5000 (See When you click on any of the steps in the Setup Wizard, that step is highlighted and the work area opens the associated pages for that step. Upon completion of a step, that step in the setup wizard is shaded to show that you completed that step in the setup procedure.

Once you have completed the initial setup, you can use the Setup Wizard to jump to any of the steps you care to repeat. Those familiar with the system may choose to use the Navigation tabs to get to the same pages.

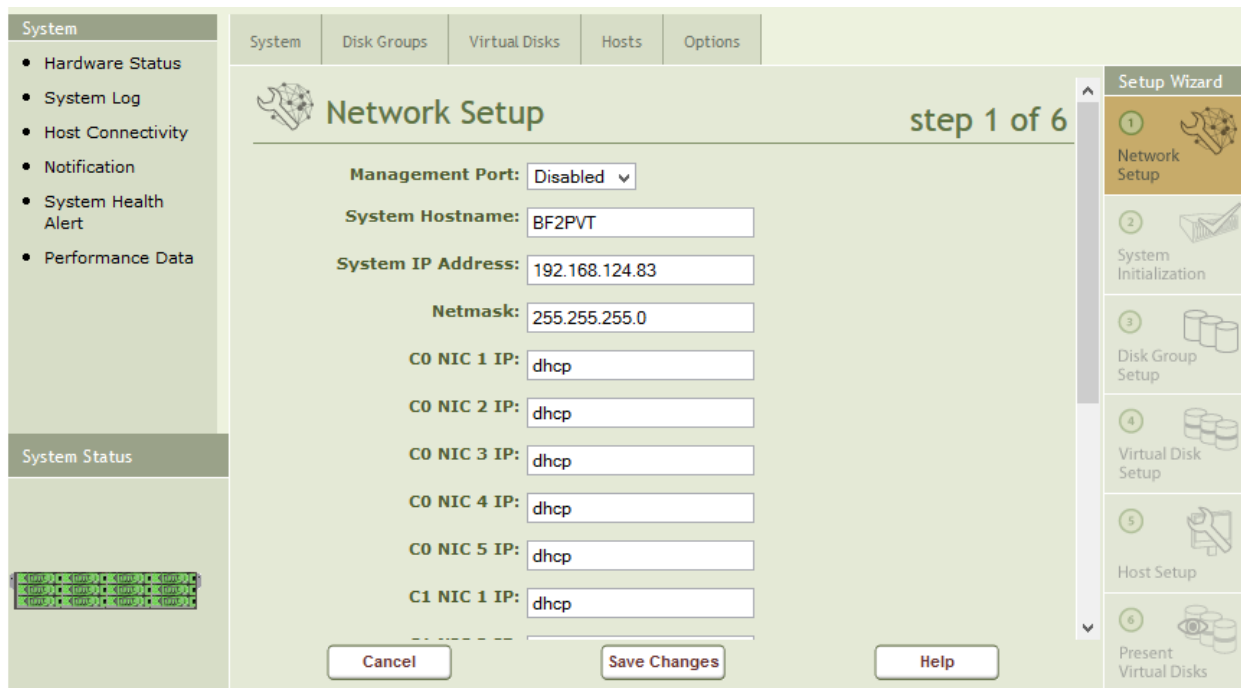


Figure 4-10 Network Setup – Top of Page



Figure 4-11 Network Setup – Bottom of Page

4.2.3 Step 1 – Network Setup

Use Network Setup (see Figure 4-10) to configure network connectivity to the system. If you logged-in using the default IP address or if you changed the default IP address using the CLI wizard, you can make adjustments using this step. This step allows you to make the following changes:

1. Set System Name?
2. Enter a system IP address. This bonds all the installed GE ports. Then, assign individual IP addresses to each GE port.



All IP addresses must be assigned in order for port bonding to operate properly.

3. Enter Net-mask value
4. Enter Default Gateway (GW) address
5. Enter Domain Name Server (DNS) IP address
6. Check the box to activate Jumbo Frames
7. Or Check the box to de-select Jumbo Frames
8. Click on Save Changes for your settings take effect.



If you change the IP address or netmask value you used to log into the controller, you will have to login again after clicking on Save Changes with your new IP Address.

4.2.4 Step 2 – System Initialization

Step 2 System Initialization, shown in Figure 4-12 and Figure 4-13, is used to define a system name and to set the date and time on the system. Once you have entered the system name, you can click on Finish to save these settings or click on Next to set the date and time.

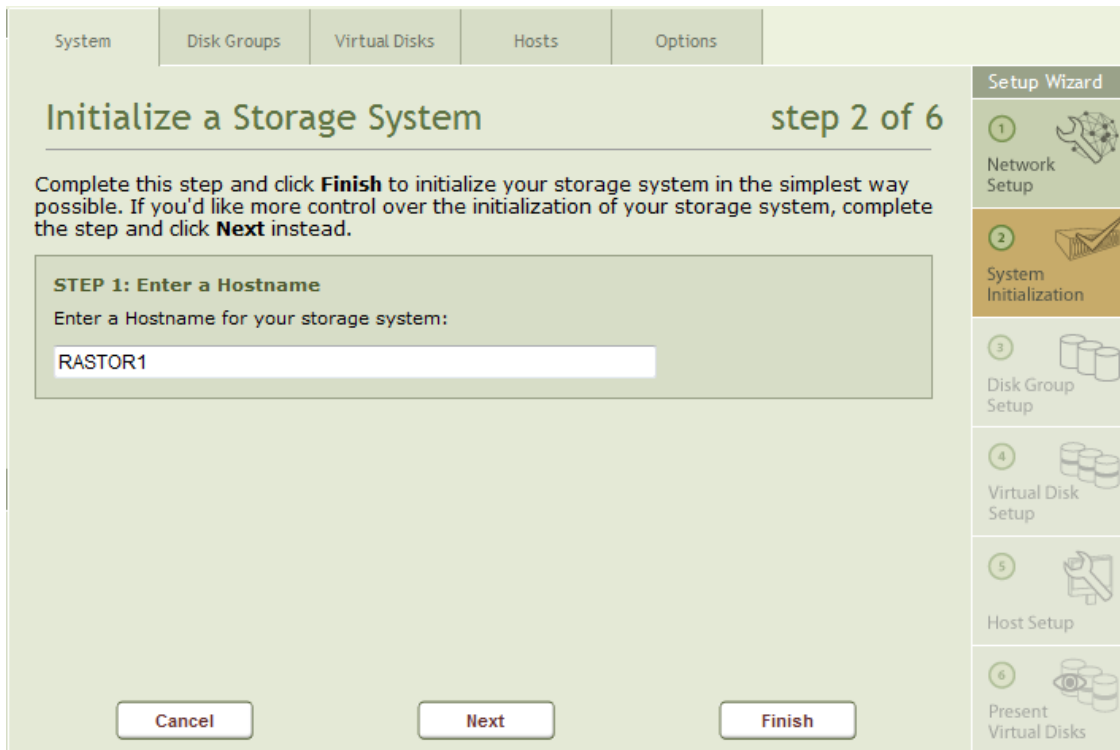


Figure 4-12 System Initialization – Step 1

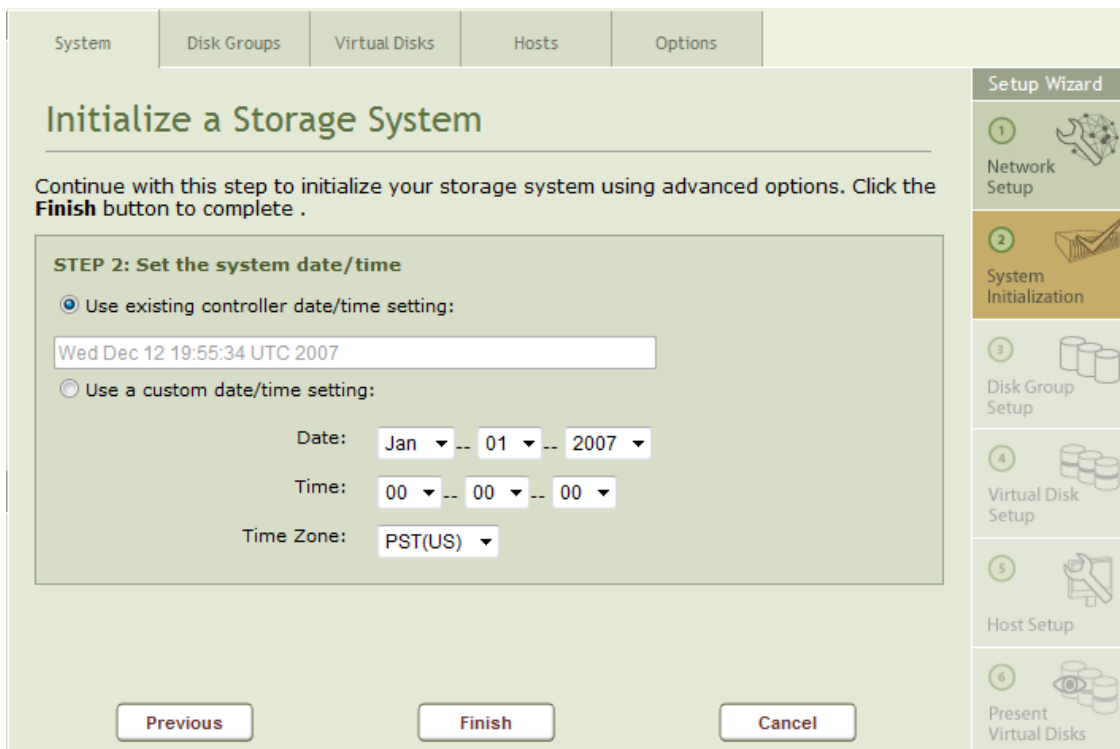


Figure 4-13 System Initialization – Step 2

4.2.5 Step 3 – Disk Group Setup

A Disk Group is a collection of disk drives that is created by selecting disks to become members of the Disk Group and building a RAID device with the selected disks. Clicking on Step 3, Disk Group Setup, shown in Figure 4-14, opens the Disk Group Properties page where you see an overview of the Disks in the system.

The fields displayed on the Disk Group Properties page are:

- Operational State - Shows the status of the Disk Groups
- Total Disk Groups - Shows the number of Disk Groups created
- Total Grouped Disks - Shows the number of disk drives that are members of a Disk Group
- Total Spare Disks - Shows the number of spare disks that are eligible to become members of a Disk Group
- Total Orphan Disks - Shows the number of disks that have Disk Group information, but are not currently a member of a Disk Group
- Total Not-Owner Disks - Shows the number of disks that belong to a Disk Group owned by the remote controller. (This state is possible for dual configurations only). Disks are shown as Not-Owner disks when the remote controller is not available. This condition may occur when the remote controller is in the process of booting. You may wait for the remote controller to boot or use the Takeover DG to reassign these disks to the local controller.
- Total Faulty Disks - Shows the number of disks that have been declared faulty in the storage system.
- Total Unqualified Disks - Shows the number of disks that have been produced by Rasilent in the storage system and are not usable.
- Total Physical Disks - Shows the number of disks installed in the storage system.

Buttons

- Cancel - Return to the Storage Systems Properties page.
- Create DG - Create a new Disk Group.
- Discover DG - Manually discover Disk Groups.
- Orphan to Spare - Convert Orphan disks into Spare Disks. This removes all Disk Group information from the selected disks.
- Takeover DG - Reassign Not-Owner disks to the local controller
- Help - Display the help page.

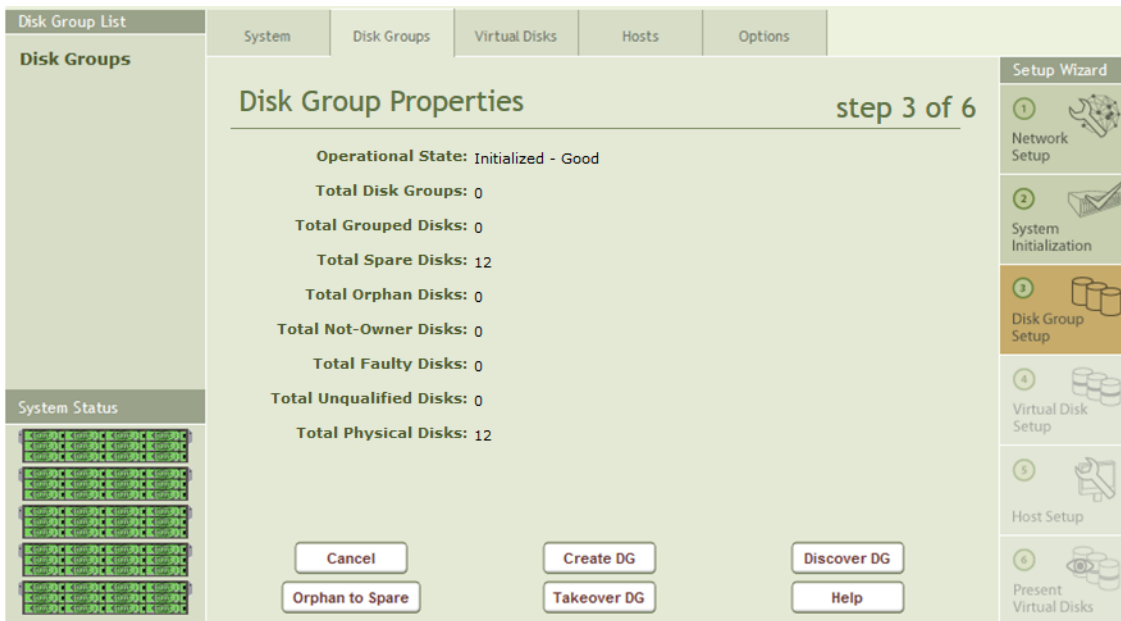


Figure 4-14 Disk Group Setup - Properties

To create a Disk Group, click on the Create DG button of the Disk Group Properties page. This will open the Create a Disk Group page shown in Figure 4-15.

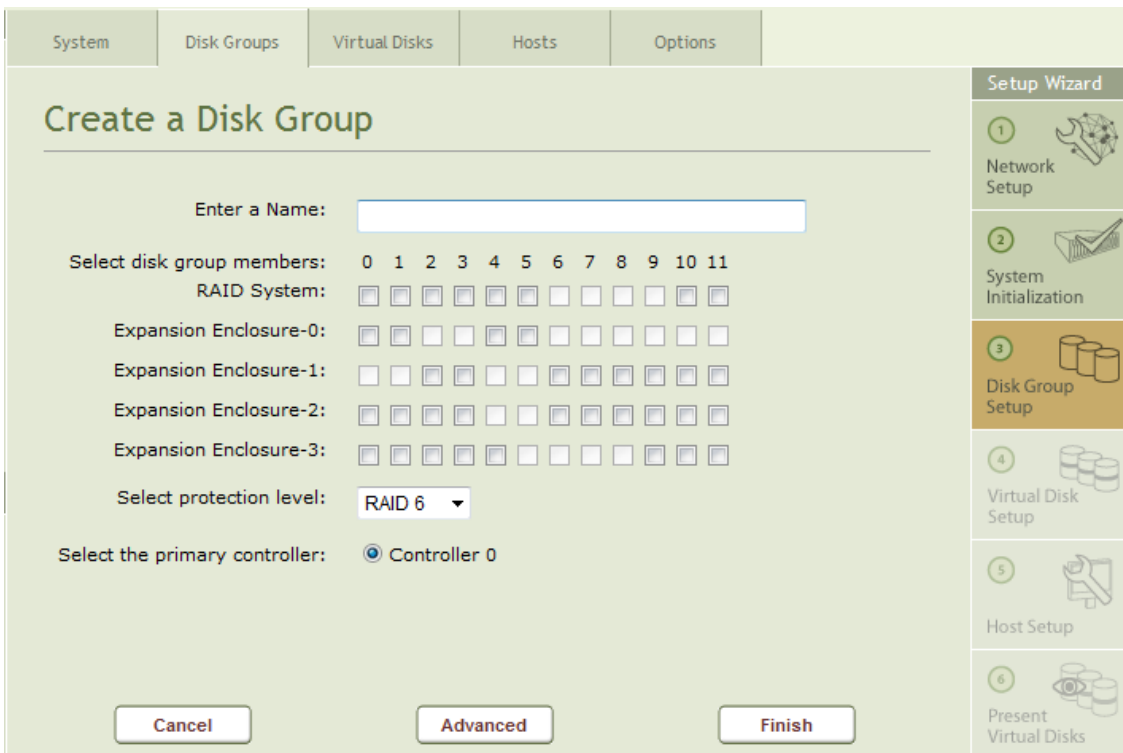


Figure 4-15 Create Disk Group

Once you open the Create a Disk Group page, you need to enter a name for the Disk Group (see Figure 4-16). The Disk Group name should not contain spaces or special characters. You will also need to select the drives to be used as members of the Disk Group. Then select a RAID level from the pull down menu by clicking on the down arrow of “Select protection level:”. The RAID level selected for the Disk Group further imposes requirements associated with that RAID level.

The following table describes the requirements for each RAID level:

Table 4-1 Disk Group Parameters

Disk Group (DG) Parameters	RAID 0	RAID5	RAID50	RAID6	RAID60	RAID1	RAID 1+0
Minimum # of Drives per DG	2	3	6	4	8	2	4
Maximum # of Drives per DG	108	108	108	108	108	108	108
Maximum # of Drives per System (PixelStor 5000)	108	108	108	108	108	108	108
DGs Allowed per System	1-16	1-16	1-16	1-16	1-16	1-16	1-16
RAID Levels Allowed per DG	1	1	1	1	1	1	1
Drives Must be Added in	Singles	Three's	Group 6	Four's	Group 8	Pairs	Pairs
Global Spare Capability	N/A	Yes	Yes	Yes	Yes	Yes	Yes
Access to DG by both	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Drives that are not assigned to a Disk Group are available as Global Spares unless they are in an Orphan state or Failed Disk state. A Disk Group built as RAID 0 cannot use a global spare.

It is recommended that for a RAID 1, RAID 5, RAID 6, RAID 50, RAID 60 or RAID 10 Disk Groups, the drives the same size. The usable space on any given drive in the Disk Group will be equal to the size of the smallest drive in the Disk Group (except for RAID 0).

Next, you select a primary controller for the new Disk Group on the Create a Disk Group page. When using an iSCSI initiator, this setting will associate the Disk Group with the IP address of the controller you select as defined in the network setup. Simply click on the button for the controller you wish to associate with the Disk Group.

Figure 4-16 shows the selection of Controller 0 for the new Disk Group. Clicking on the Finish button will create the Disk Group. Clicking on the advanced button will open the Advanced Features page shown in Figure 4-17, where you can set an Occupancy Warning level and add any comments to the Disk Group attributes.

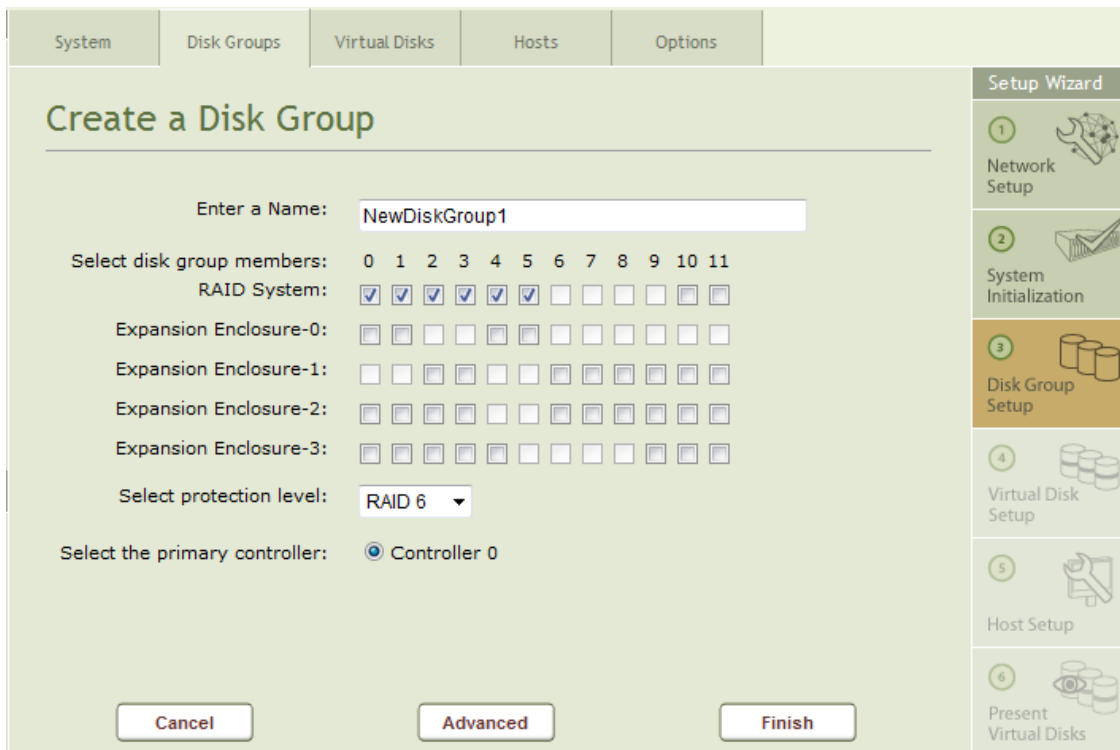


Figure 4-16 Disk Name, RAID & Controller Selections

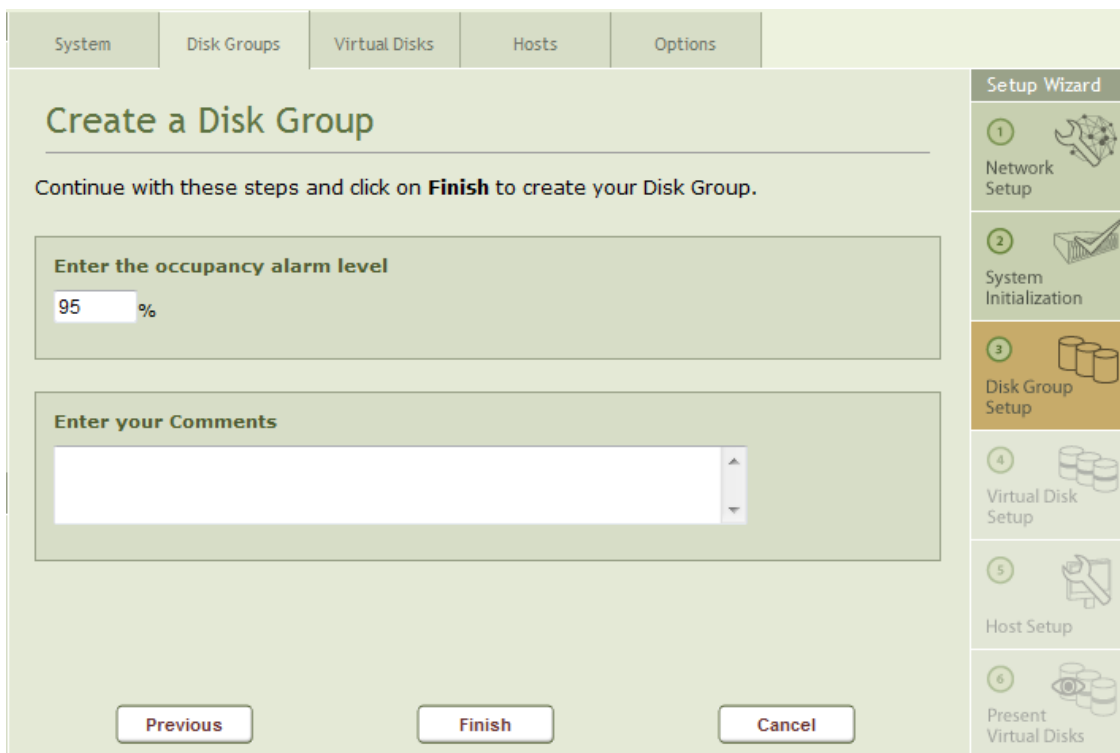


Figure 4-17 Create Disk Group - Advanced Features

Once you click on Finish, a progress page will open, shown in Figure 4-18.

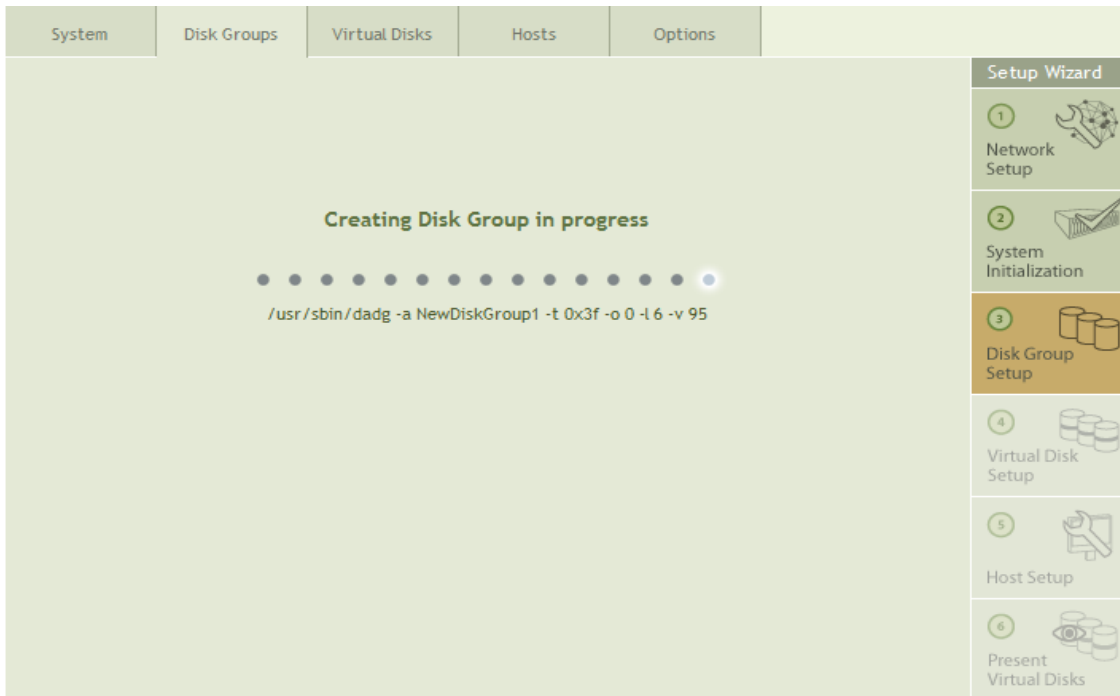


Figure 4-18 Create Disk Group – Progress Page



You can continue to create additional Disk Groups or start using the Disk Group while it is being created.

When the Disk Group has been created, a properties page for the newly created Disk Group is opened. You can get to any specific Disk Group Properties page by selecting the Disk Group you are interested in from the Disk Group List on the left hand side of the Management Console. The currently selected Disk Group is highlighted in the Disk Group List as shown in Figure 4-19.

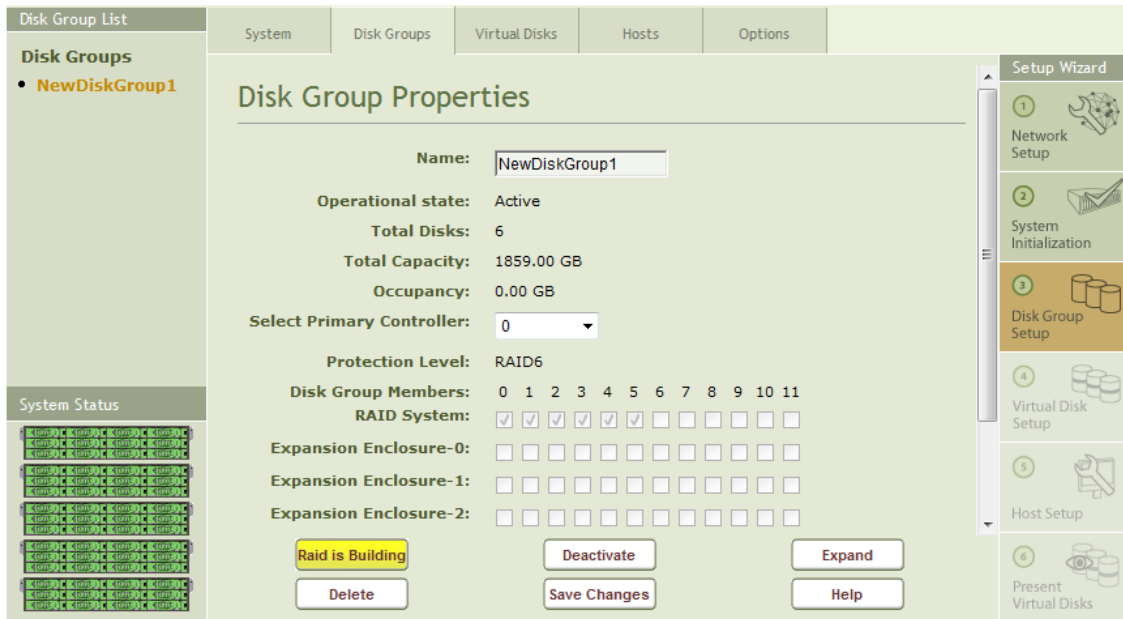


Figure 4-19 Disk Group Properties

A RAID build is automatically started on the Disk Group when it is created according to the RAID level specified. The RAID is Building button is highlighted while the RAID is building. You can use the Disk Group while the RAID is building. You may also click on the RAID is Building button to open the RAID Build Progress page shown in Figure 4-20.

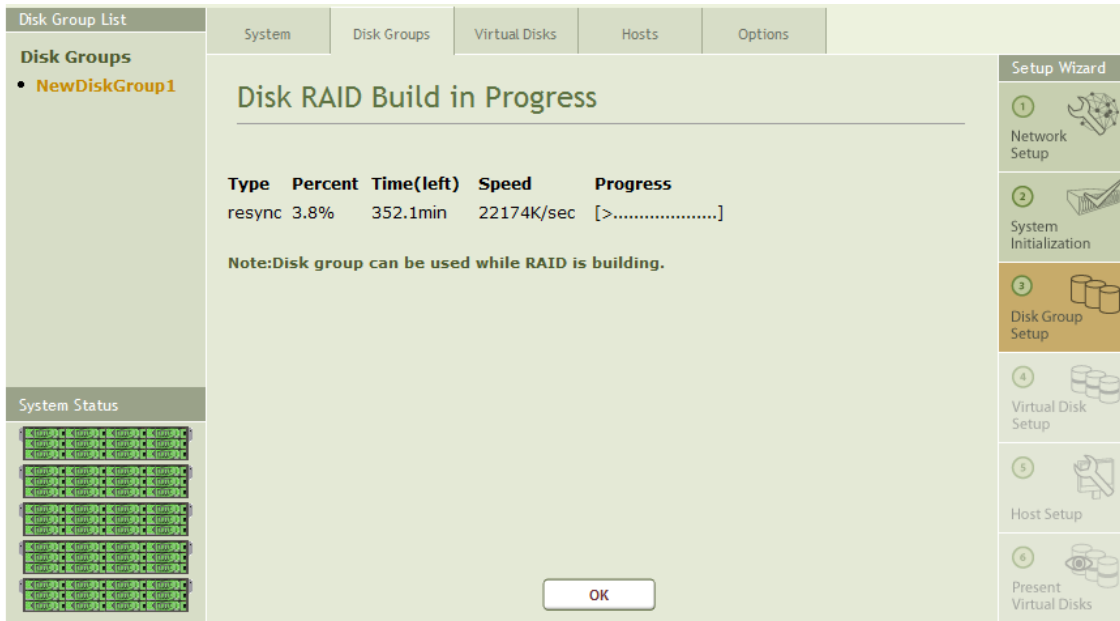


Figure 4-20 RAID Build Progress

The Disk Group Properties page for a specific Disk Group shows:

- **Name** - The name of the Disk Group
- **Operational State** - A Disk Group may be in one of the following states:
 - **Active** is where the Disk Group is up and running with all member disks with no faults on any of the disks in the Disk Group.
 - **Inactive** is where the Disk Group has been deactivated and is not running or unavailable to any host.
 - **RAID Degraded** is where the Disk Group is up and running but is either missing one or more Disk Group Members or where one or more of the Disk Group members has been declared faulty. In this state, the Disk Group is usable but without RAID protection.
 - **RAID Unhealthy** is where the Disk Group is missing two or more disk members. An Unhealthy Disk Group is not usable.
- **Total Disks** - Shows the total number of disks in the Disk Group
- **Total Capacity** - Shows the Disk Group capacity in Gigabytes
- **Occupancy** - Shows the percentage of the capacity of the Disk Group that has been allocated to Virtual Disks
- **Select Primary Controller** - Shows the current Primary controller selection or allows you to change the primary controller selection through the pull down menu. Selecting an alternative primary controller will not take effect until you click on the Save Changes Button.
- **Protection Level** - Shows the RAID protection level of the Disk Group
- **Disk Group Members** - Shows the disk drives that are members of the Disk Group
- **Comments** - Shows any comments that were entered from the advance features of the Create Disk Group page or allows you to enter comments for the specific Disk Group. Comments will not be associated with the Disk Group until you click on the Save Changes button.

Buttons

- **RAID is Building** - The RAID is Building button is shown while a RAID is building. This occurs during the initial creation of a Disk Group or when the RAID is being reconstructed. A RAID device is reconstructed when a member has been declared faulty and has been replaced by a global spare drive or by physically replacing the faulty drive.
- **Deactivate/Activate** - Clicking on the Deactivate button will take a Disk Group off line, making all of the Virtual Disks unavailable to host on the network. For Disk Groups that have been deactivated, clicking on Active will make the Disk Group and all the Virtual Disks contained in the Disk Group available to hosts.

- **Expand** - Click on Expand to increase the capacity of a Disk Group. You add members to the Disk Group in sets that are consistent with the RAID type.
- **Delete** - Click on Delete to remove a Disk Group from the system. You must remove any Virtual Disk from the Disk Group before deleting the Disk Group.
- **Save Changes** - Click on save changes to apply any changes to the Disk Group.
- **Help** - Displays the Help page

When the RAID build is done the RAID is Building button is no longer visible.

Disk Group Discovery

Disk Groups may be moved between chassis. When disks belonging to a Disk Group are installed in a new chassis, they may appear as Orphaned Disks. The Discovery process, shown in Figure 4-21, will examine disks to determine if they belong to a Disk Group, if all the Disk Group members are present, the Disk Group will be reactivated.



You should de-activate a Disk Group before moving the disks to a new or different chassis. Removing multiple drives from an active Disk Group without deactivation can create a failure scenario that makes the Disk Group unhealthy and unusable

You may select to Force Disk Group(s) online to bring a Disk Group online even when it is in a degraded state. You cannot use Force Disk Group(s) online to bring an unhealthy Disk Group online.



Figure 4-21 Disk Group Discovery

Orphan Disks

An Orphan Disk is a disk that contains information about membership in a Disk Group that has either been removed from the Disk Group or is designated as an Orphan because there are not enough of the Disk Group members available in the system to build the Disk Group.

This condition can occur when a disk has been improperly removed from the system and a hot spare disk has replaced the Orphan Disk in the Disk Group. Since the Disk Group is rebuilt using the Spare Disk, the Orphan cannot be used in the Disk Group.

This condition may also occur when some of the disks from a Disk Group are moved to a new chassis. Without enough Disk Group members present to reassemble the Disk Group, the system labels the disks as orphans. In this case, you can either locate and add the missing Disk Group members or convert the Orphan Disks to Spare Disks and rebuild the Disk Group from available Spare Disks. In this case all information on the disks will be lost.

Converting an Orphan Disk to a Spare will remove all data from the disks. Only those disks that are in an Orphan state may be selected to be converted. Click on the Convert button in the Orphan Disk to Spare disk page, shown in , to convert the disks.

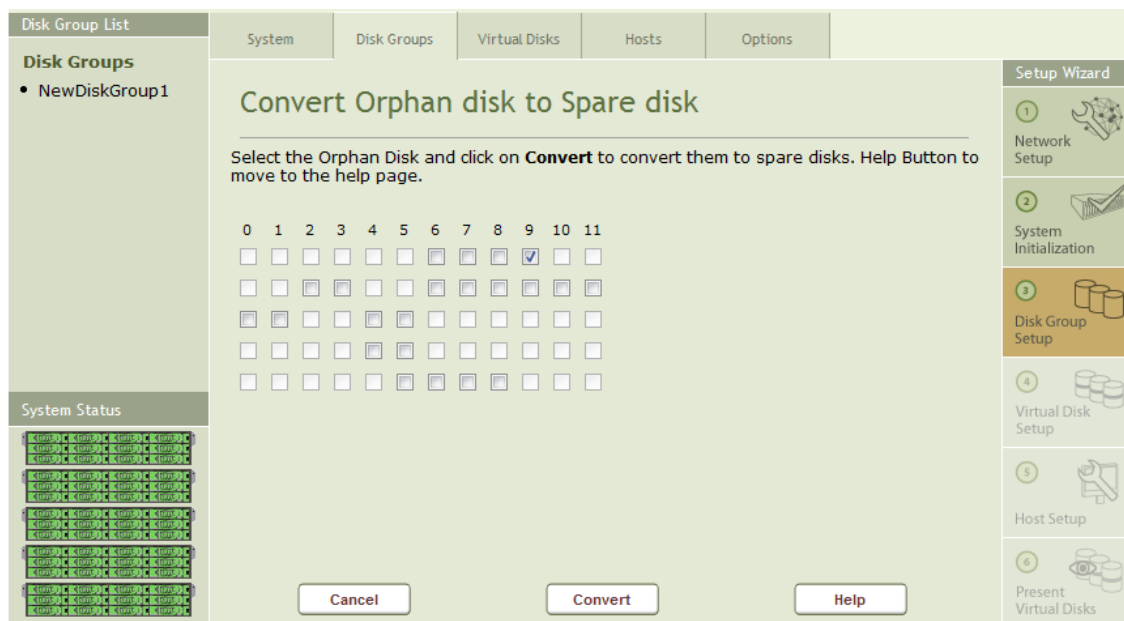


Figure 4-22 Convert Orphan Disk to Spare

Expanding a Disk Group

The ability to expand a Disk Group depends upon the number of drives and the type of RAID used in the Disk Group and having enough spare drives to complete the expansion. Expanding Disk Groups follows the same rules for each RAID type as when you created the Disk Group (See Table 4-1 Disk Group Parameters).



When expanding a RAID 5 DG, the expansion set will be appended to the original set and the total size adjusted accordingly. The striping of the original RAID 5 set will not be re-arranged.

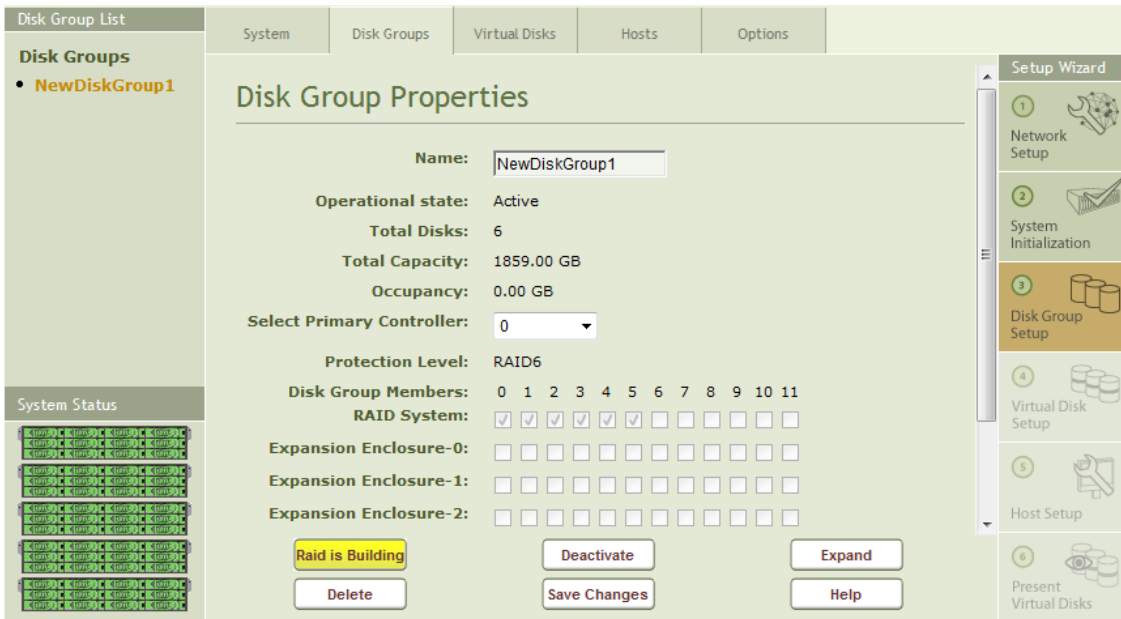


Figure 4-23 Disk Group Properties - Expand

To expand a Disk Group, select the Disk Group you wish to expand from the Disk Group List on the left hand side of the Management Console and click on the Expand button at the bottom of the properties page for that Disk Group shown in Figure 4-23.

This will open the Expand a Disk Group window shown in Figure 4-24, where you select the additional drives for the Disk Group.

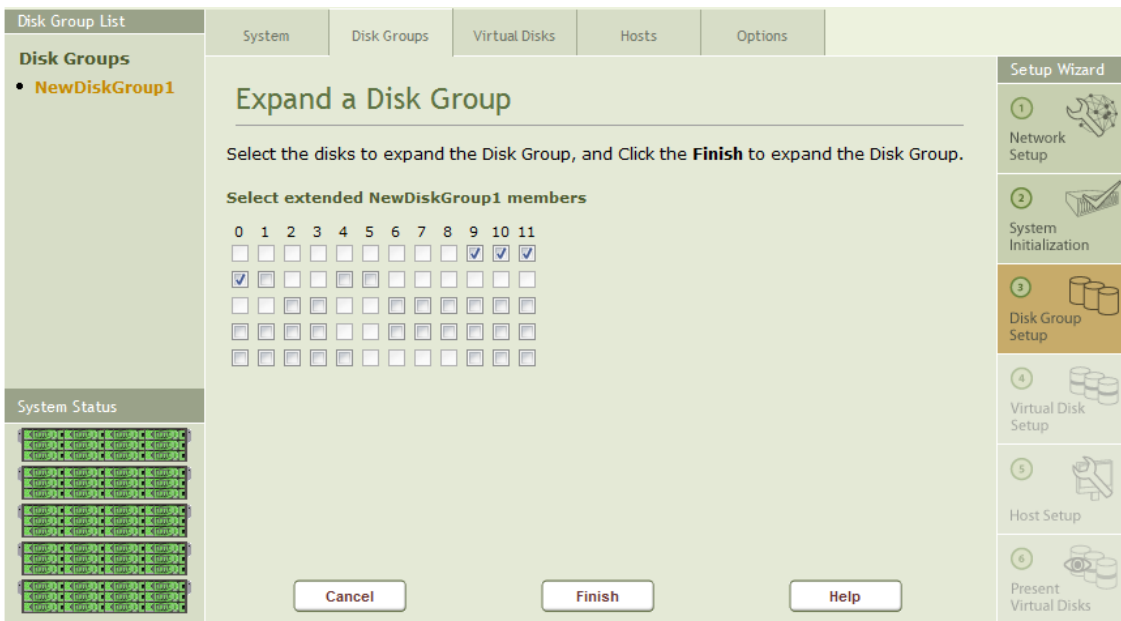


Figure 4-24 Expand a Disk Group

Once you have selected the drives to add to the Disk Group, click the Finish button to start the expansion.

4.2.6 Step 4 – Virtual Disk Setup

Once you have built at least one Disk Group, clicking on Step 4, Virtual Disk Setup will open the Virtual Disk Properties pages shown in Figure 4-25.



The number of Virtual Disks (also known as logical volumes or LUNs) in all the Disk Groups in the system must not exceed 256.

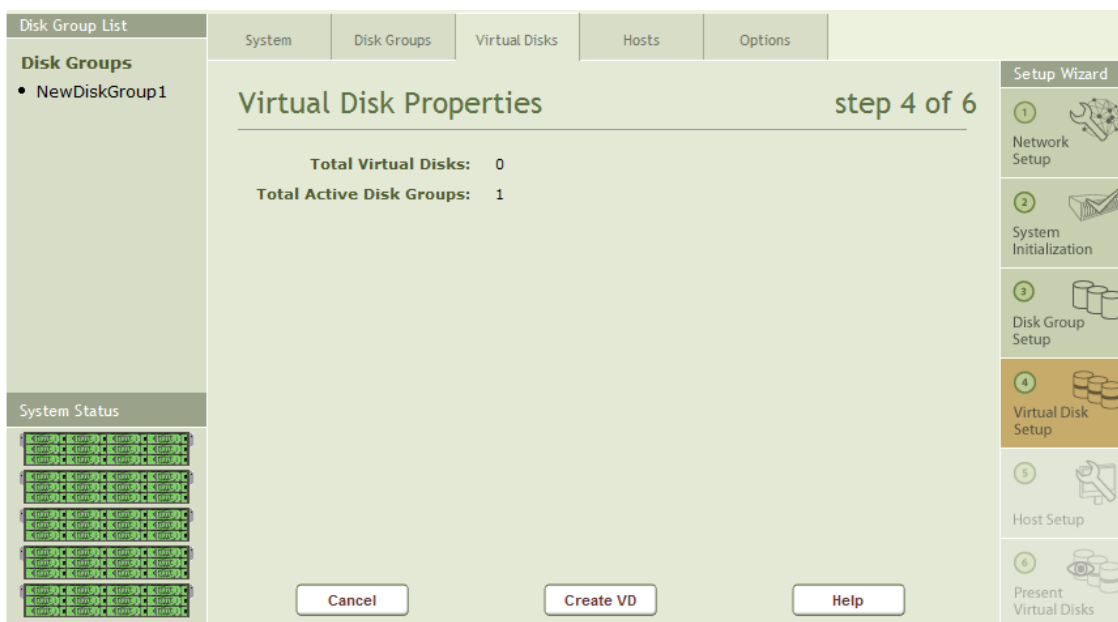


Figure 4-25 Virtual Disk Setup

The Virtual Disk Properties page in Figure 4-25, shows the Total number of Virtual Disk and Total active Disk Groups in the work area.

Buttons on the page include:

- Cancel - Returns the user to the System Properties Page
- Create VD - Opens the page to create a Virtual Disk
- Help - Displays help information.

Clicking on Create VD will open the page shown in Figure 4-26.

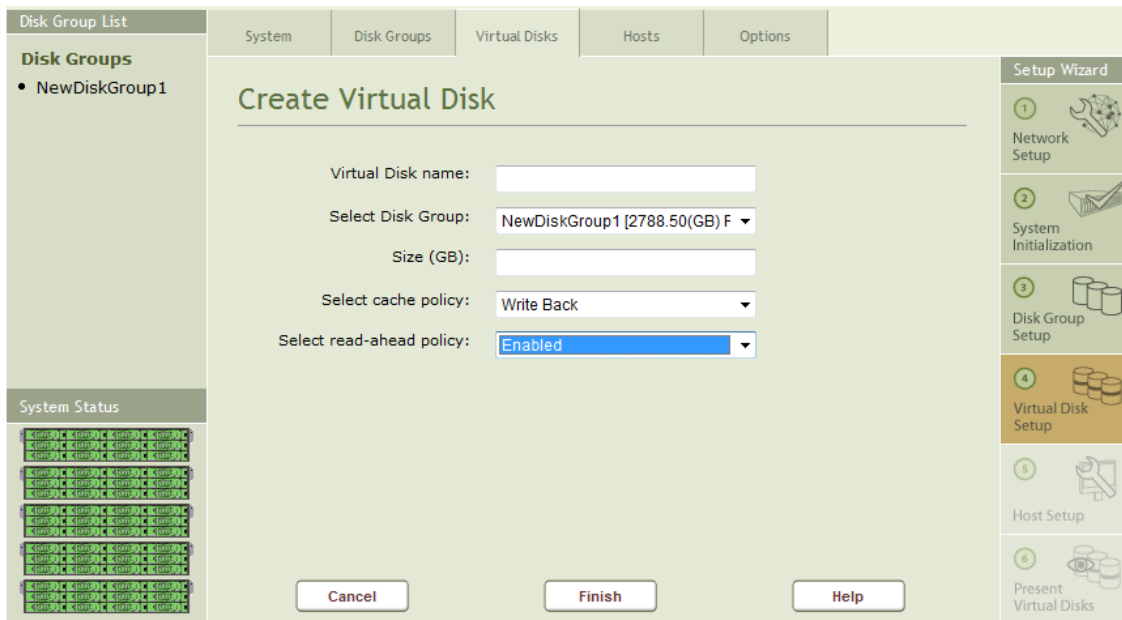


Figure 4-26 Initial Create VD Page

To create a Virtual Disk, do the following as shown in Figure 4-27:

1. Enter a name for the Virtual Disk.
2. Select the source Disk Group for the Virtual Disk as shown.

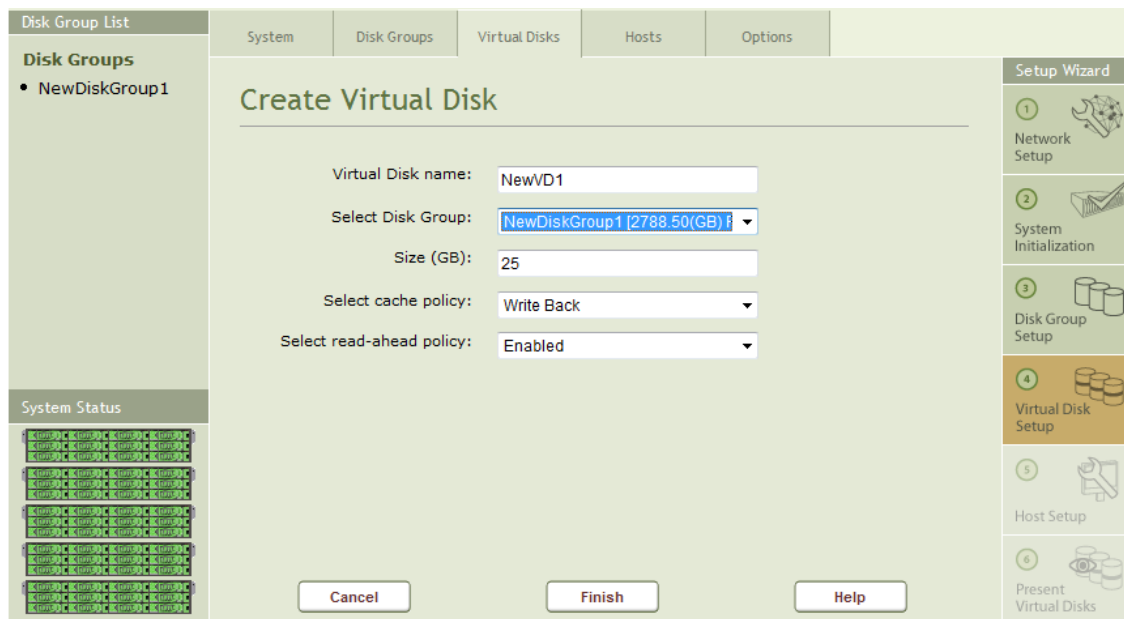


Figure 4-27 Create VD – Enter Parameters

3. Enter the size in Gigabytes (GB) from the available free space in the Disk Group
4. Select the cache policy for the Virtual Disk
 - Auto – provides mirrored cache and write back policies while two controllers are present and operational. Should one controller fail, or be removed the cache policy is switched to write through. Default setting
 - Write Through – passes data to the disk and cache simultaneously.
 - Write Back – does not provide mirrored cache. Write Back stores data in battery protected cache and writes to disks as cycles are available.
5. Select the read-ahead policy
 - Enable – allows read ahead operations. The read-ahead logic adjusts for traffic patterns to improve bandwidth. Default setting
 - Disable – turns off read ahead operations. It may be desirable to disable read-ahead in environments with highly random small block read and write operations.



Figure 4-28 Virtual Disk Properties

The Virtual Disk Properties page shown in Figure 4-28 displays:

- Name - The name of the VD
- Date/Time Created - Displays the date and time the Virtual Disk was created
- Operational State
 - Active when available
 - Inactive when the Disk Group is deactivated or doesn't have an owner
- Disk Group - The name of the Disk Group in which the Virtual Disk resides
- Cache Policy - Auto, Write Through or Write Back.
- Capacity - The size of the Virtual Disk in GB
- Read Ahead Policy - Enabled or Disabled
- Extend to new capacity - For expanding the capacity of the VD. You need to press the "Save Changes button" to take effect.

Buttons

- Cancel - Returns you to the Storage System Properties Page
- Save Changes - Works with Name, Cache Policy, Read Ahead policy and Extend Capacity field to make changes effective
- Presentation - Used to open the Presentation window where you specify the host or hosts to connect to the LUN in SAN environments.
- Take Snapshot - Opens the Snapshot window where you can take point in time read only snapshots (if option is installed).

- **Delete** - Remove the Virtual Disk from the system.
- **Help** - Displays the help page



Figure 4-29 Extending VD Capacity

Once you have created a Virtual Disk you can change several operational characteristics by entering a new value in a field on the Virtual Disk properties page and then clicking on the Save Changes Button. Figure 4-29 shows how to expand the capacity for the Virtual disk. The additional space must be available in the Disk Group to allow the Virtual Disk to expand.

4.2.7 Step 5 – Host Setup

Clicking on Step 5 in the Setup Wizards opens the Host Properties page that is used to describe a Host to the Storage array as shown in Figure 4-29. On PixelStor 5000, there is no need to create a Host definition because the VD is presented to all hosts by default. Only if presentation is intentionally limited to one host will a host need to be defined.

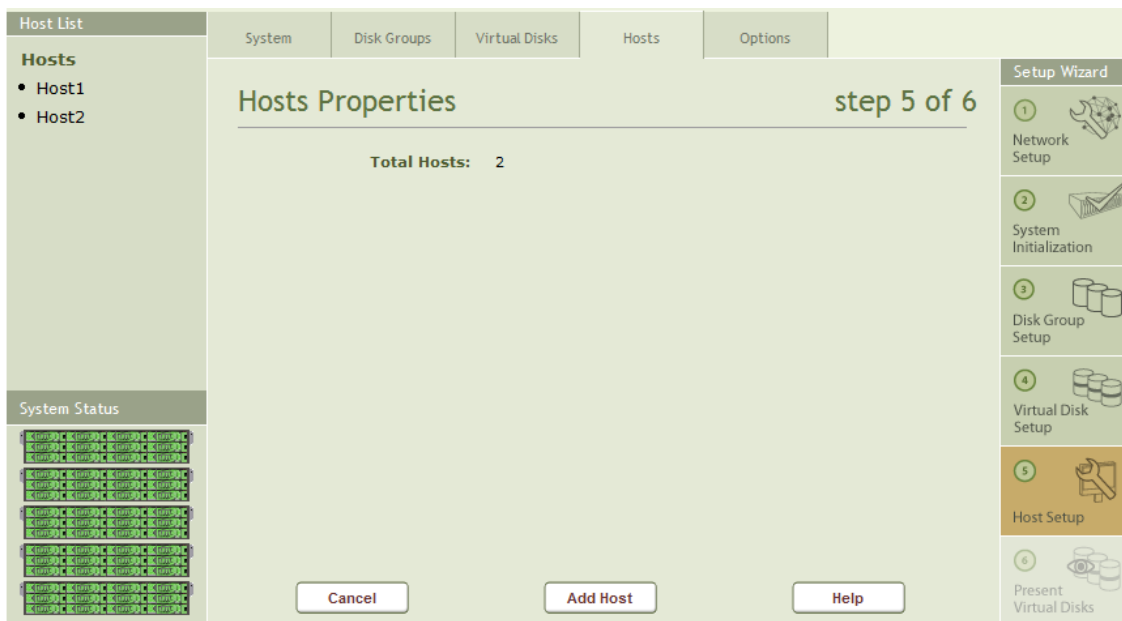


Figure 4-30 Host Properties Page

The left hand side of the screen shows any Hosts that have been defined in the system. Clicking on the Add Host button will launch the Add Host wizard to guide you through the 4 simple steps to describe a Host to the system. Figure 4-31 shows the first 2 steps to add a host. Enter a Name for the new host in Step 1. Then in Step 2, select the interface to the host and enter the iqn name of the iSCSI initiator.

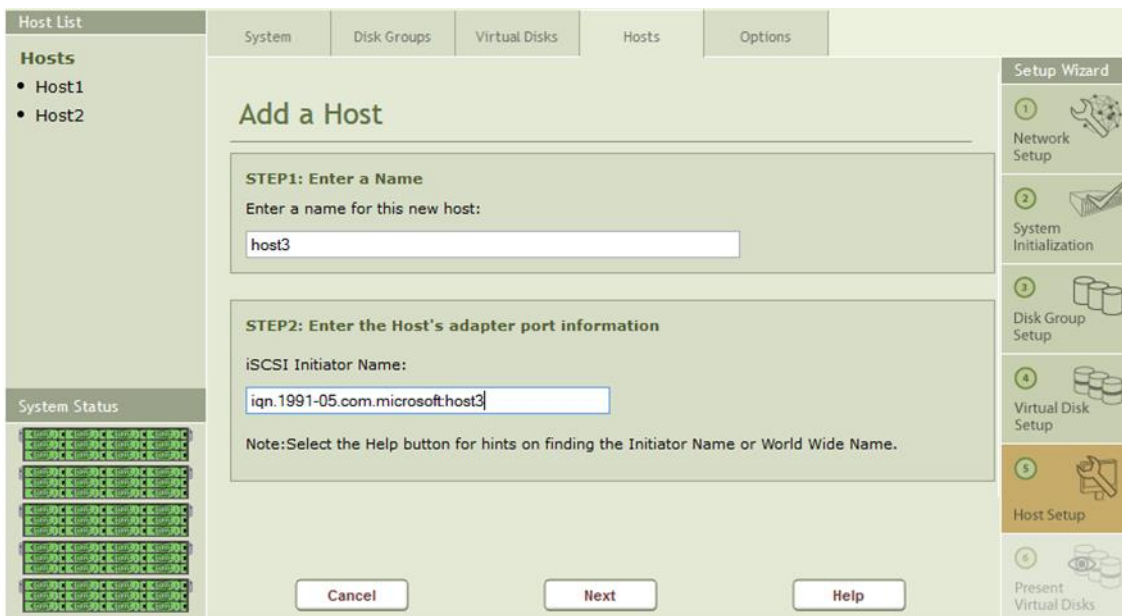


Figure 4-31 Adding a Host - Step 1 & 2

Figure 4-32 shows Steps 3 & 4 of adding a host. Use Step 3 to set up CHAP security. Enter the Target Secret and the Initiator Secret in the associated fields. Use Step 4 to add any comments about the Host that will be displayed when you select the host from the Host List.

Click on Finish to complete the process of describing a Host to the system.

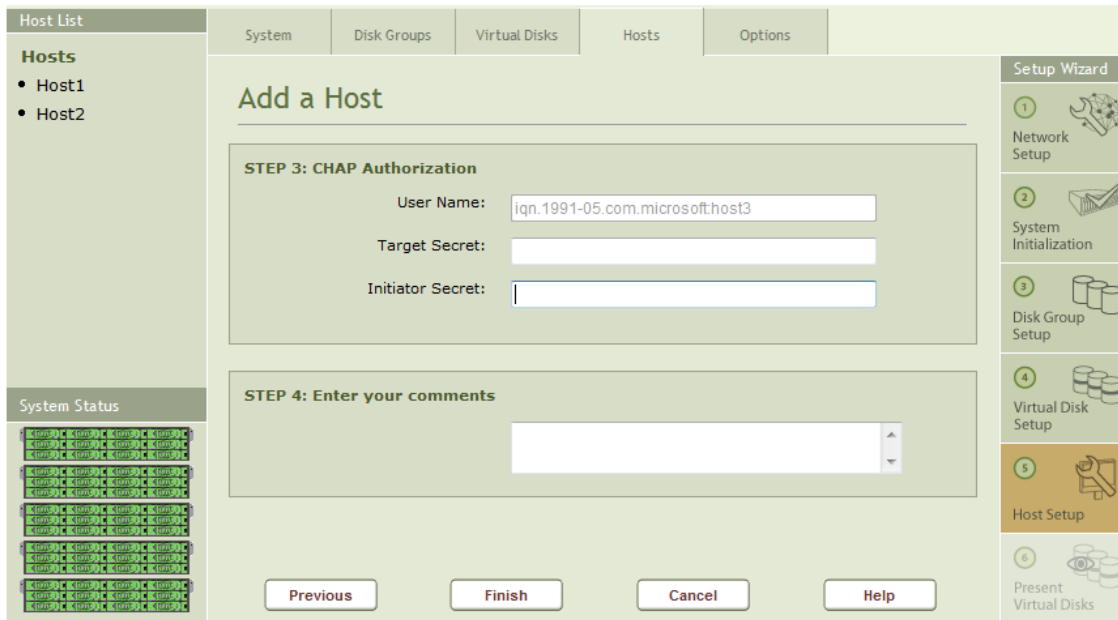


Figure 4-32 Adding a Host - Step 3 & 4

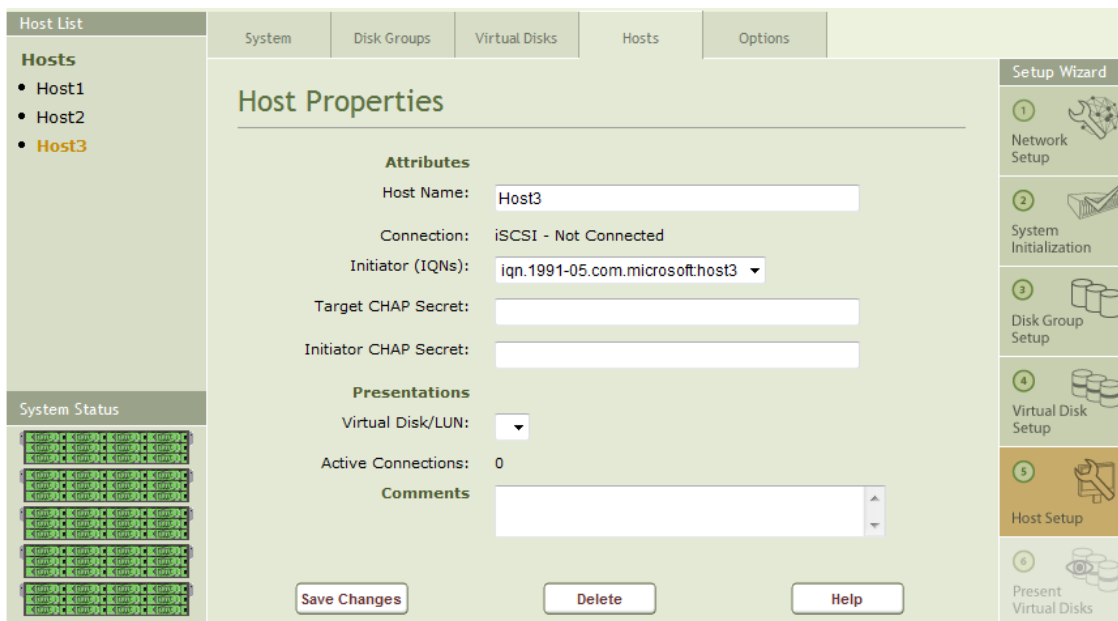


Figure 4-33 Host Properties

The Host Properties page for each host, shown in Figure 4-33, contains the following information about the host selected from the Host List:

- Name - Displays the current Host Name, or may be used with the Save Changes button to change the Host Name.
- Connection - Show the connection type and status
- Initiator (IQNs/WWNs) - Shows a list of iSCSI or Fibre channel ports that have been defined for the Host (if installed)
- Target CHAP Secret - Shows the target CHAP secret or works with Save Changes button to add a target CHAP secret.
- Initiator CHAP Secret - Shows the Initiator CHAP secret or works with Save Changes button to add an initiator CHAP secret.
- Presentations - Shows a list of LUNS that have been presented to the host
- Active Connections - Shows the number of active connections to the Host
- Comments - Displays any comments that were added when the Host was defined or works with the Save Changes button to add comments to a Host

Buttons

- Save Changes - Works with Name, Target CHAP Secret, Initiator Secret and comment fields to make changes take effect
- Delete - Host will be deleted.
- Help - Displays the Help page

4.2.8 Step 6 – Present Virtual Disks

The final step in setup is to present the Virtual Disk to the Host(s). Clicking on Step 6 Present Virtual Disks opens the page shown in Figure 4-34. On this page, you select a VD to present from the pull down menu that shows available VDs and click on the Ok button.

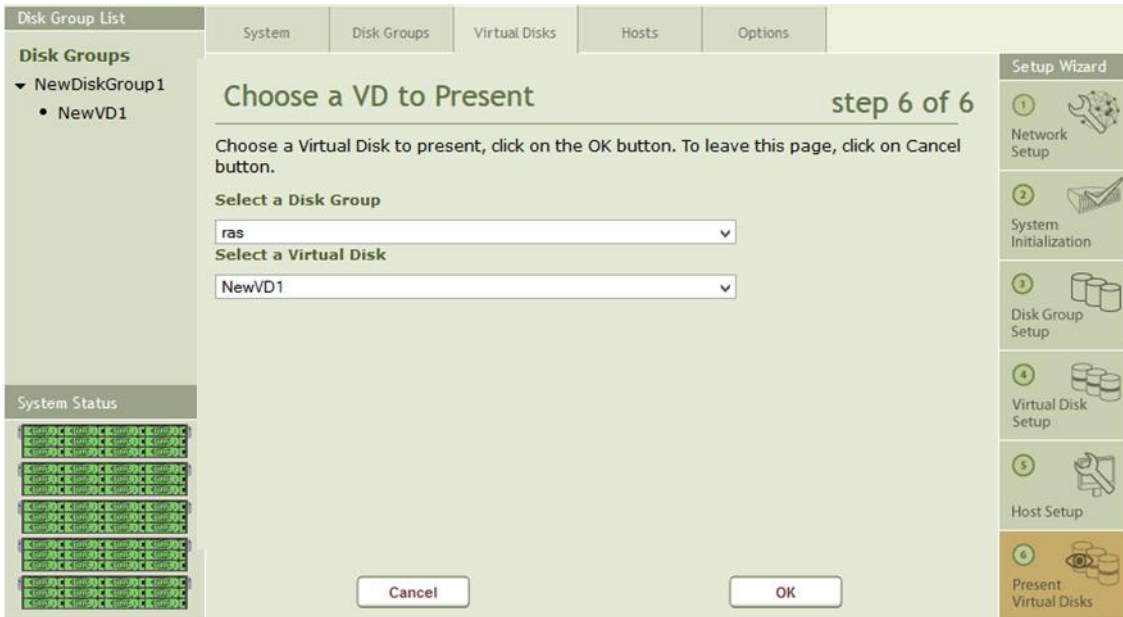


Figure 4-34 Choose a VD/DG to Present

The VD presentation page, shown in Figure 4-35, provides details about the presentations of the VD selected in the Disk Group List. Any host that the VD is currently presented to will show in the list box. Since the current VD is new, the default setting is to present the VD to all hosts. If you wish to present to a specific host, select the “present VD to a specific host” option and hit save changes.

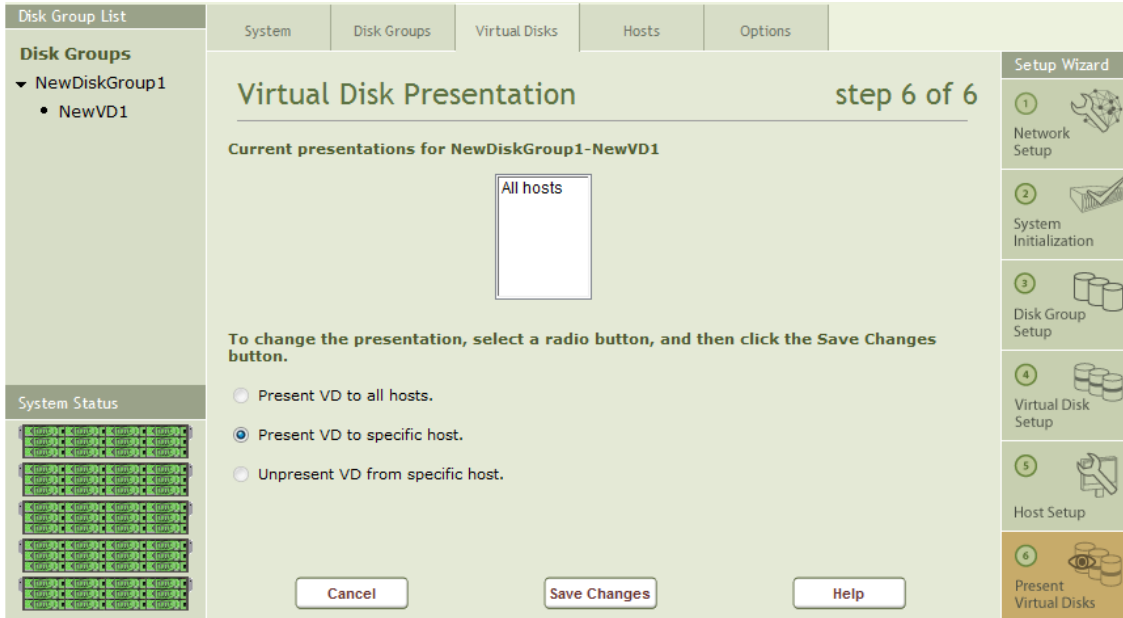


Figure 4-35 VD Presentation

To Present the Virtual Disk to a specific host, select the Host from the pull down list as shown in Figure 4-36 and click on the “Finish” button.

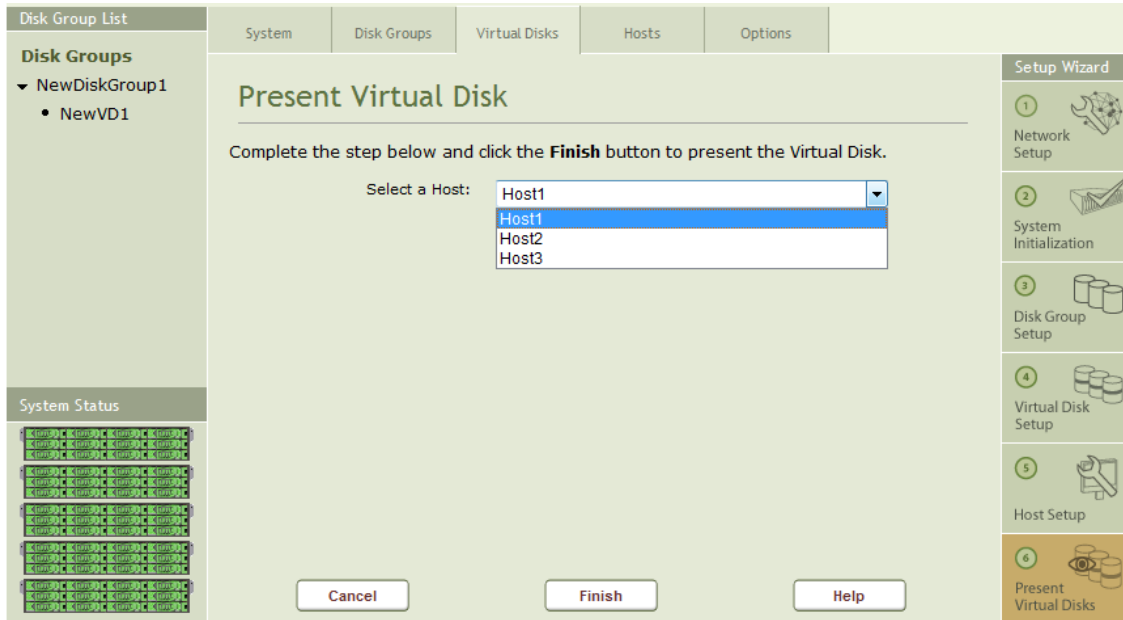


Figure 4-36 Present Virtual Disk Page

After you hit the finish button, the current presentations for the selected VD are shown (see Figure 4-37).

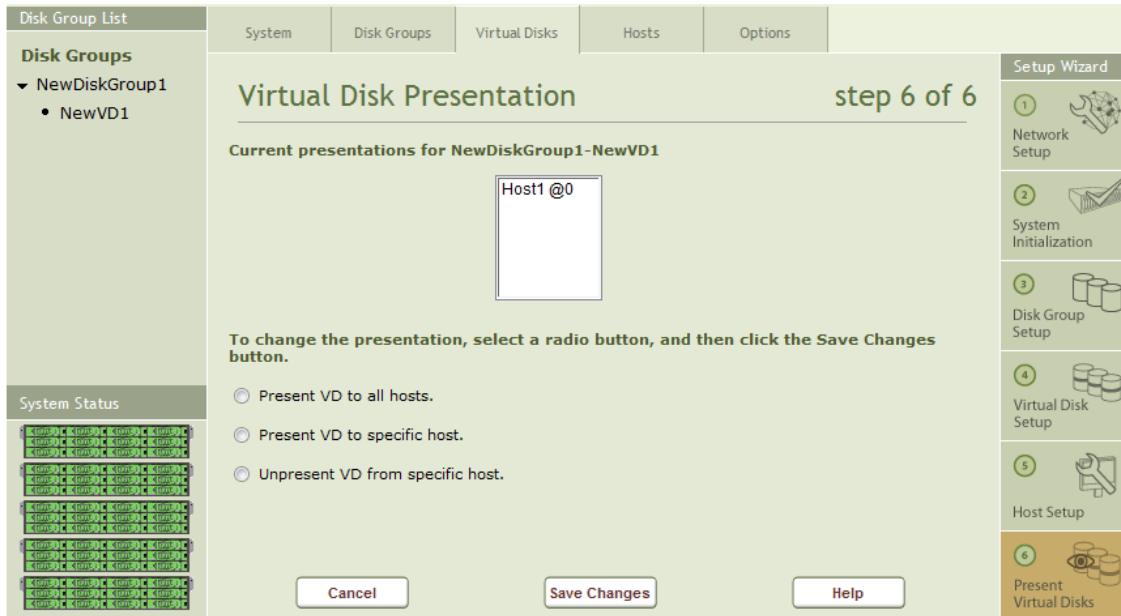


Figure 4-37 Current Presentations

4.3 Additional Configuration Options

The PixelStor 5000 allows you to perform additional tasks through the Options Tab. These include:

- Changing the system administrator password
- Changing the refresh rate to the browser
- Enable or disable System Health Alerts
- System Beacon LED Options
- Manage iSNS services
- Upgrade system software from the Web Management Console
- Set and schedule Inspection Read Feature
- Language settings
- Enable or disable the hard drive cache
- Performance Data
- Disk power management
- Advanced Logging Mode
- Firmware Upgrade
- SSD Cache Drive Configuration

You can access the options by clicking on the Options tab of the system toolbar in the Management Console. From the Options window you can select the area of interest by clicking on “Go Now” for the option you desire or by clicking on the item in the Option List on the left hand side of the Management Console.

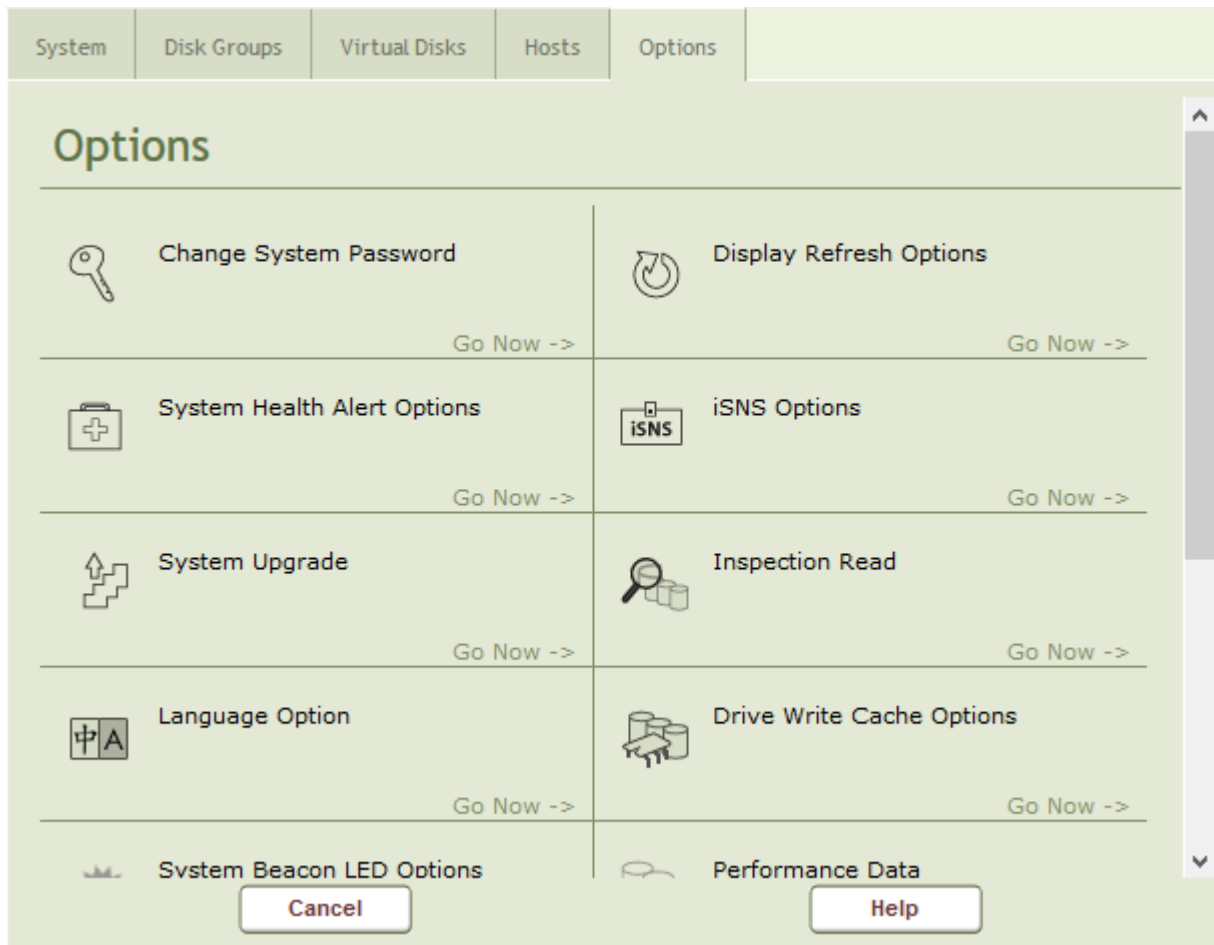


Figure 4-38 Options top of page

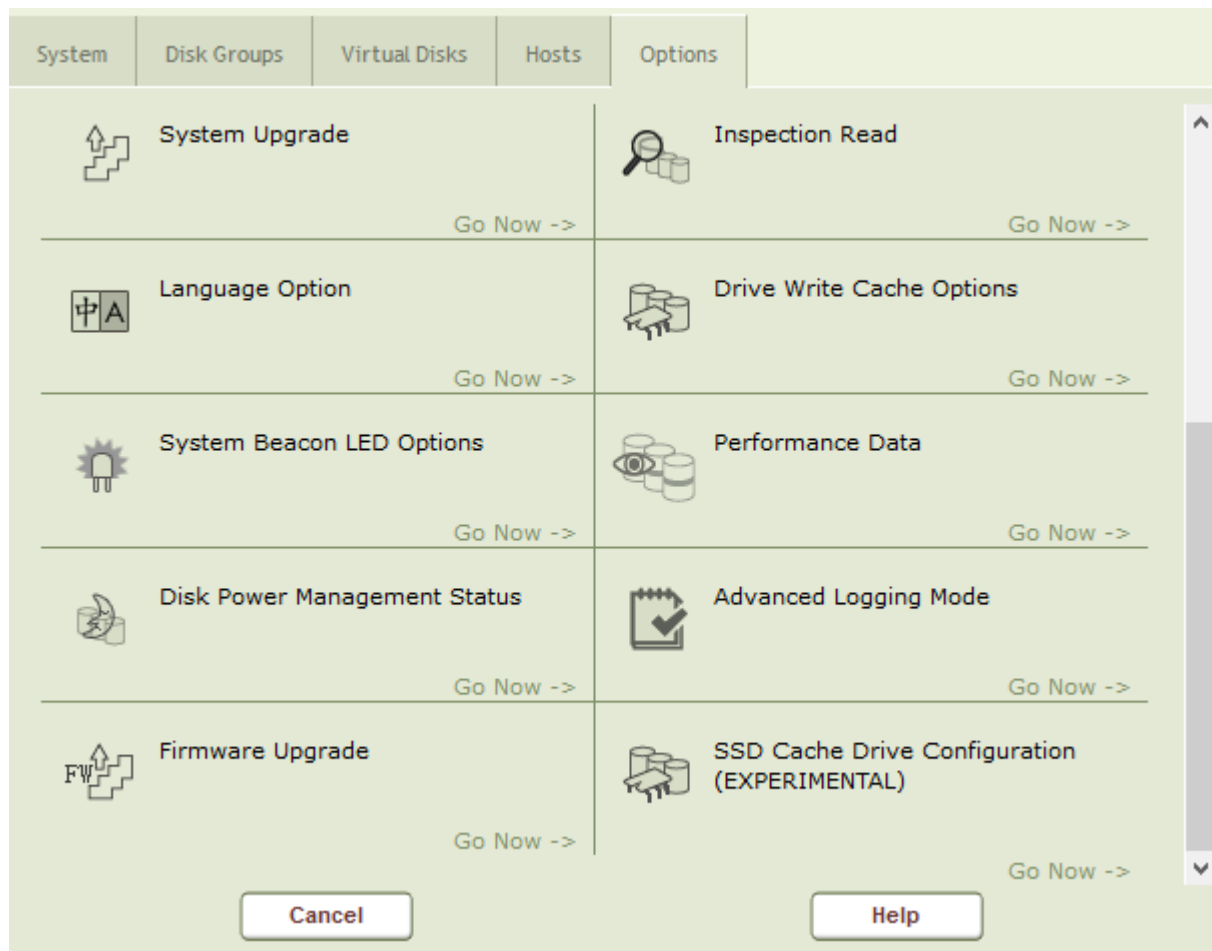


Figure 4-39 Options tab top of page

4.3.1 Change Storage System Password

To change passwords on the system, click on the Change storage system password icon in the options window to bring up the table shown in **Error! Reference source not found.** You may change the password for root or guest through this menu.

Figure 4-40 Change Storage System Password

To change the password:

1. Enter the user name
2. Enter the old password
3. Enter the new password
4. Re-enter the new password
5. Click on the update button

4.3.2 Change the Display Refresh Options

By default, the Management Console is refreshed every 5 seconds. You can change the refresh interval by clicking on the Display refresh options icon in the Options window. This will bring up the Display Refresh Options as shown in **Error! Reference source not found.**

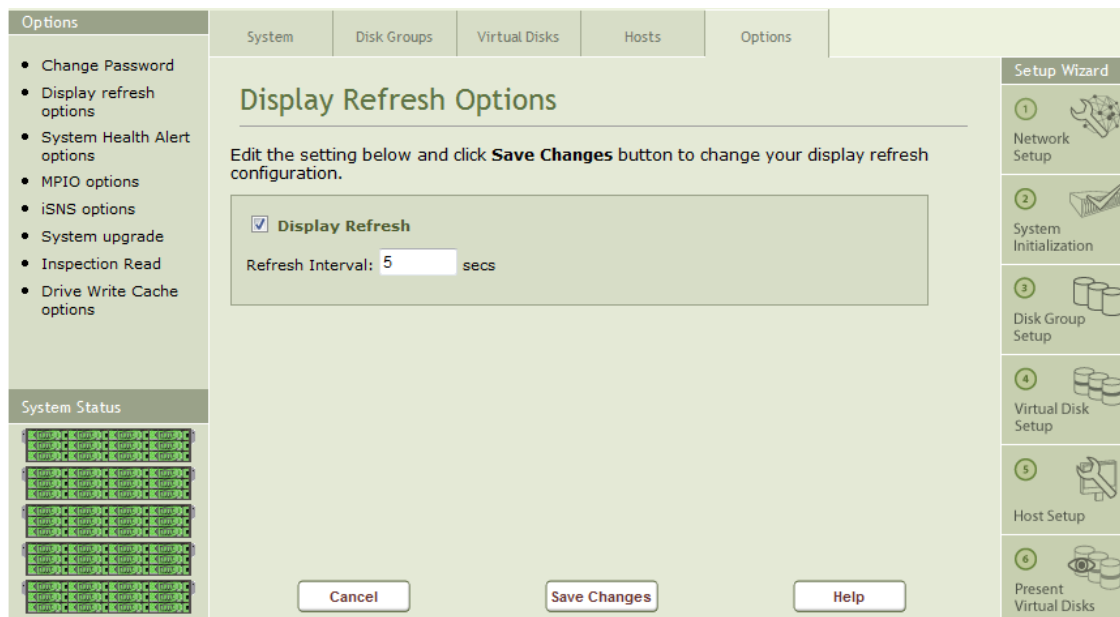


Figure 4-41 Display Refresh Options

To change the refresh interval:

1. Enter a new value in seconds
2. Click on the Save Changes button

4.3.3 Change System Health Alert Options

System Health Alert Options may be enabled or disabled through the System Health Alert Options page. You can reset the alerts status by temporarily disabling them and enabling the System Health Alerts. Click on the System Health Alert Option icon on the Options page to bring up the System Health Alert page shown in Figure 4-42.

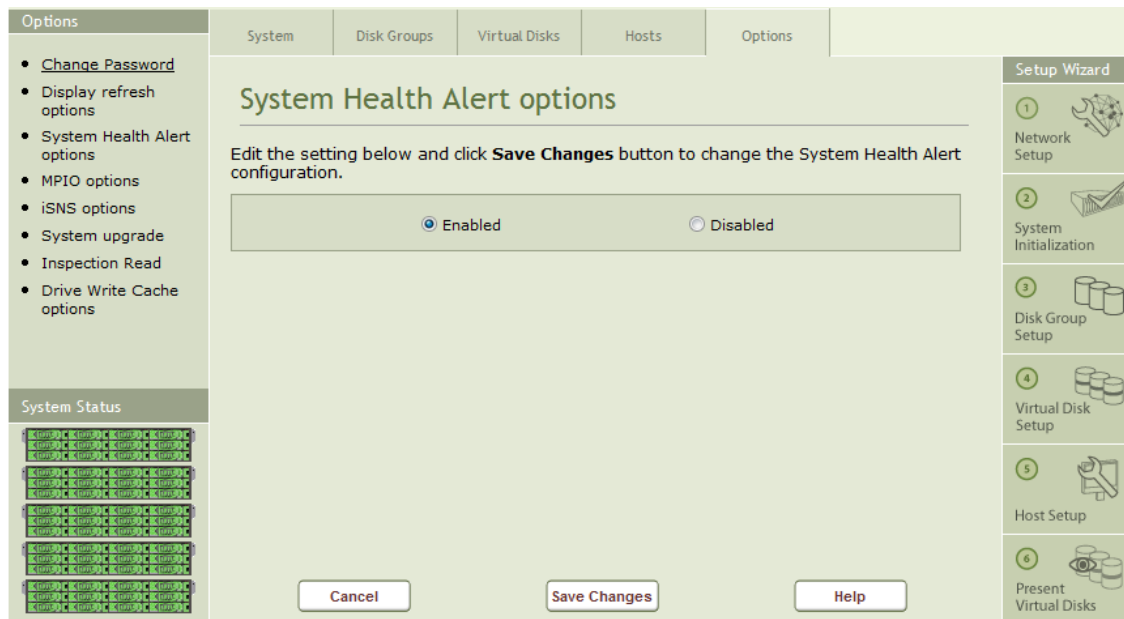


Figure 4-42 System Health Alert Options

To change health alert options

1. Select Enable or Disable on the System Health Alert Options page
2. Click on the Save Changes button

4.3.4 Configuring the iSNS Client

The PixelStor 5000 provides an iSNS client for registration with an iSNS server. To fully utilize the iSNS service you must configure an iSNS server and configure your iSCSI initiator to use the iSNS server.

Once you have defined the IP address and alias for the iSNS Server, you must start the iSNS client on the target. Starting the iSNS client and saving changes will enable automatic iSNS client start up on any subsequent reboot.

To configure and use the iSNS target client, click on the iSNS Options icon on the Options page to bring up the iSNS Configuration page shown in Figure 4-43.

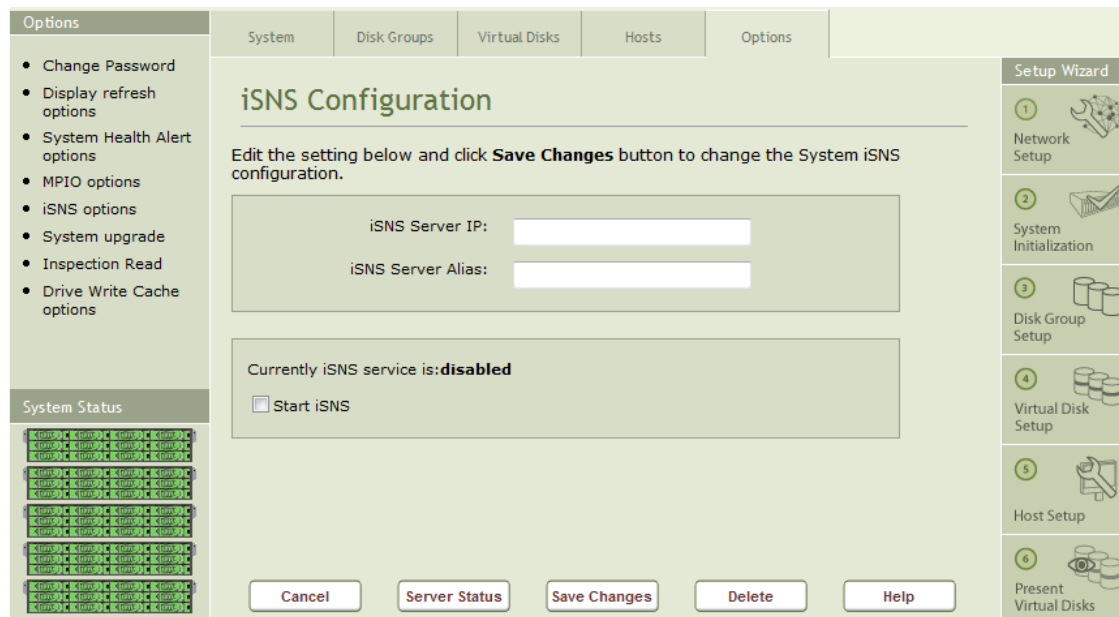


Figure 4-43 iSNS Configuration

To configure the iSNS client:

1. Click on the iSNS Options icon on the Options page
2. Enter the IP Address of the iSNS server
3. Enter the Server Alias of the iSNS Server
4. Select Start iSNS
5. Click on the Save Changes button

You can also determine the iSNS Server Status by Clicking on the Server Status button of the iSNS Configuration page. This will open a pop up window that will indicate whether the iSNS server you have defined is online or offline.

4.3.5 System Upgrade Options

The PixelStor 5000 supports a system upgrade from the Storage Manager (this is supported after Kernel Downloadable Image (KDI) version 2.6.4). This feature allows you to select the new KDI from your local machine or another system on the same subnet as the system.

The upgrade process is initiated through the Upgrade Manager shown in Figure 4-44. The upgrade process executes the following actions.

- Load a copy of the specified KDI into memory
- Copy the KDI to the remote controller backup location (typically takes 3-4 minutes).

- Reboot the remote controller with the backup copy moving IP address and Disk Groups to the local controller
- Load the KDI into the backup location on the local controller (typically takes 3-4 minutes).
- Reboot the local controller moving IP address and Disk Groups to the remote controller
- Restore IP addresses
- Restore Disk Groups to primary controller assignments (assuming minimal or no traffic)
- Synchronize backup copy with new KDI (typically takes 3-4 minutes).

Messages are presented in the Upgrade Manger page Upgrade Status area showing the progress throughout the upgrade process. Command response and Storage Manager Refresh will slow during the final step that synchronizes the copies of the KDI.

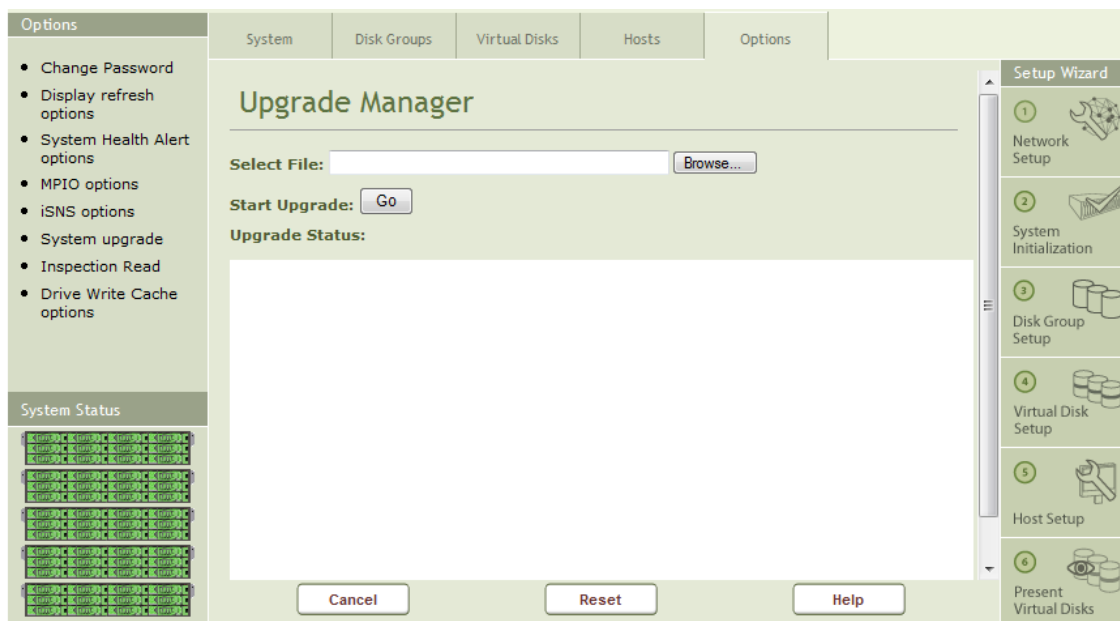


Figure 4-44 Upgrade Manager

To upgrade the system software:

1. Click on the System Upgrade icon in the Options page
2. Enter the software filename or use the Browse button to select a new software image
3. Start the upgrade by clicking on the GO button

4.3.6 Inspection Read Options

Inspection Read is a utility designed to proactively scan the disks in the storage array to identify any faulty disks before the user attempts to access them.

Priority

Inspection Read may be run in the background at one of three different priority levels. This determines how much time is allocated to Inspection Read by the system. Inspection Read will automatically relinquish the CPU during heavy CPU activity.

Logging

The Inspection Read process reports errors only on the local controller where the process was initiated. Errors and process output is recorded in `/var/log/messages` and KEM log files.

Inspection Read creates a log message after each device has been successfully inspected.

Devices to Read

Inspection Read will access all sectors within each healthy, non-building; non RAID-0 Disk Group and spare disk drives.

Device Type	Action
RAID 0 Device	Do Not Read
Healthy RAID Device (not RAID 0, Not during initial build)	Read
Healthy RAID Device (not RAID 0, During initial build)	Do Not Read
Degraded RAID Device (not rebuilding on spare disk)	Do Not Read
Degraded RAID Device (During rebuild on spare disk)	Do Not Read
Unhealthy RAID Device	Do Not Read
Orphan disk	Do Not Read
Spare disk	Read

Table 4-2 Inspection Read Action Table

Inspection Read monitors the status of Disk Groups and will stop an inspection if the status of the Disk Group changes to a “Do Not Read” state listed in the previous table.

Starting Inspection Read

Inspection Read may be started from the Storage Manger or from the CLI. This section describes using Inspection Read through the Console Manager. To learn how to use Inspection read from the command line interface, issue the command `daisnpread -h` from the CLI console.

To start Inspection Read from the PixelStor Storage Manager, select the Options Tab and click on Go Now under Inspection Read as shown in Figure 4-45.

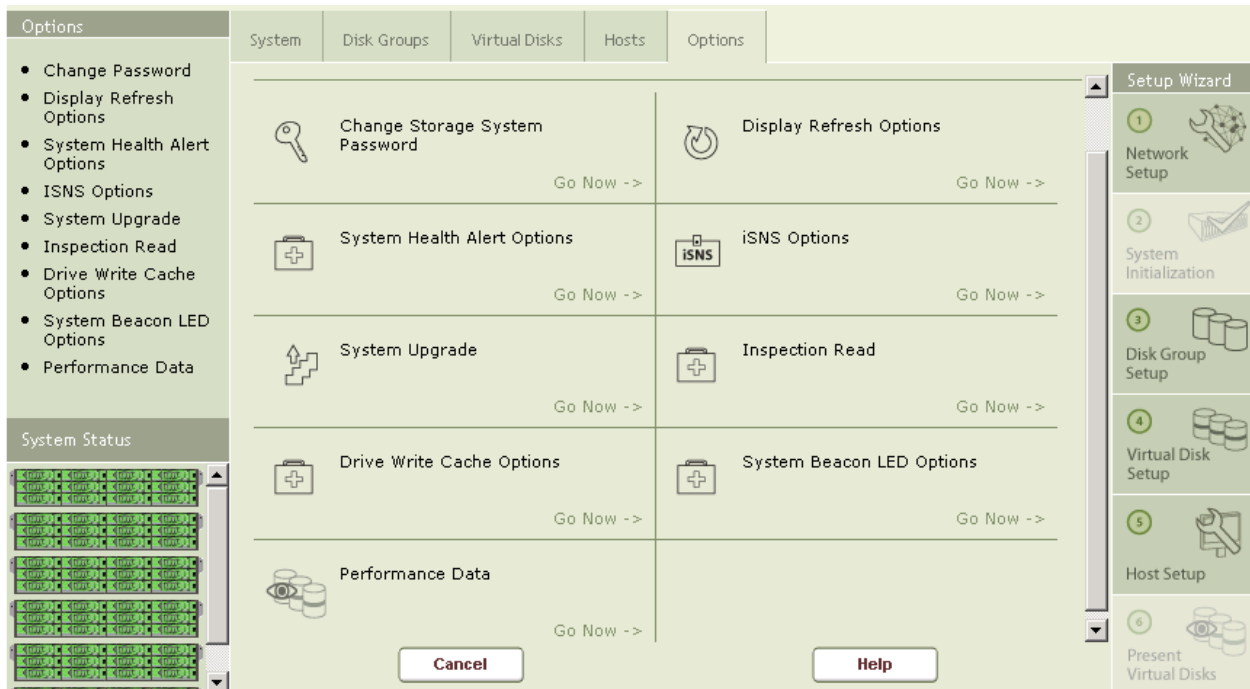


Figure 4-45 Options Tab

Inspection Read Interface

To run Inspection Read from the Management Console shown in Figure 4-46 , you must select the priority and any other options you desire then either click on the Start button or the Schedule button to start Inspection Read at a later time.

- Once Inspection Read has started you can use the Stop and Resume buttons to pause or restart Inspection Read from the point it was stopped.
- You can use the Progress button to see information about the progress of Inspection Read on the system as shown in.
- Checking the Repeat box will cause Inspection Read to run continuously until the user clicks on the Stop button.
- Checking the Set Maximum Duration button allows the user to specify a maximum number of hours to run Inspection Read in the Maximum Duration field.

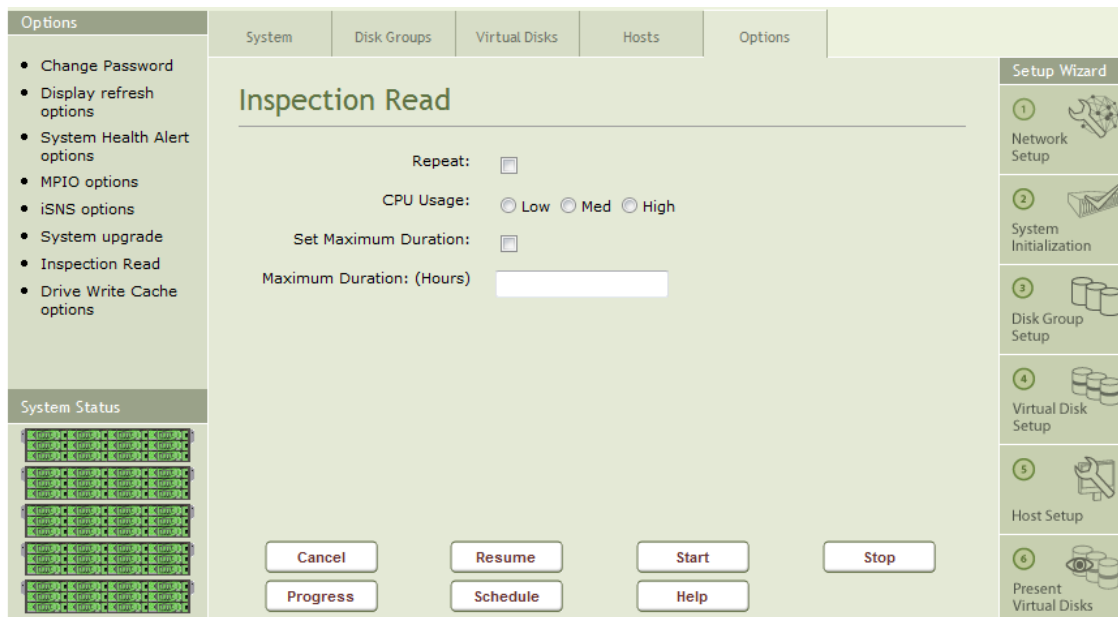


Figure 4-46 Inspection Read Interface

Inspection Read Progress

Figure 4-47 shows the Inspection Read progress pages. The display fields include:

- Running – Shows yes if Inspection Read is currently running
- Execution Time – Shows the amount of time that Inspection Read has been running
- Maximum Duration – Shows the total time allocated to run Inspection Read when Maximum duration has been set.
- Device list – Shows the devices and slots for each device under inspection. The Number of blocks inspected, total blocks to be inspected and percentage completed are listed for each device.

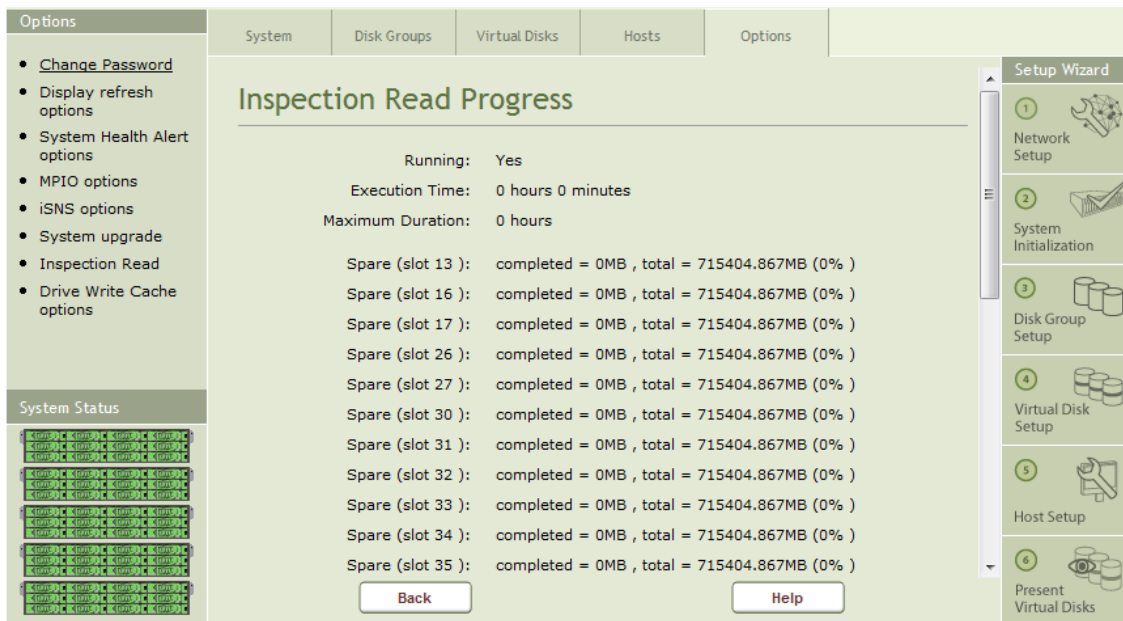


Figure 4-47 Inspection Read Progress

4.3.7 Language Options

You can select English or Chinese languages as shown in Figure 4-49.

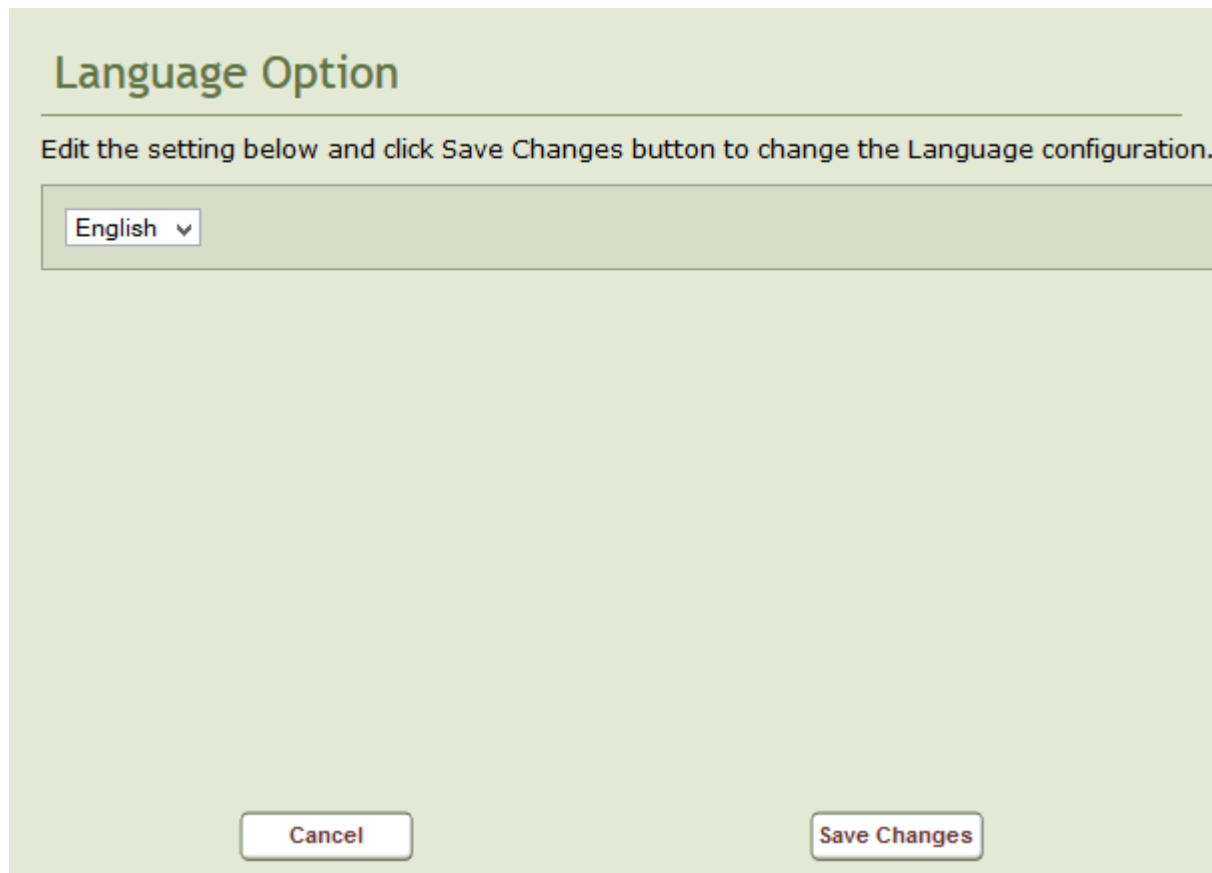


Figure 4-48 Language Options

4.3.8 Drive Write Cache Options

You can enable or disable the cache on the installed disk drives as shown in Figure 4-499. Enabling the cache increases performance. It is recommended that you have a UPS installed to protect the data that may be in the drive cache in the event of a power failure. If you do not have a UPS installed, it is recommended that you disable the drive cache to maintain data protection.

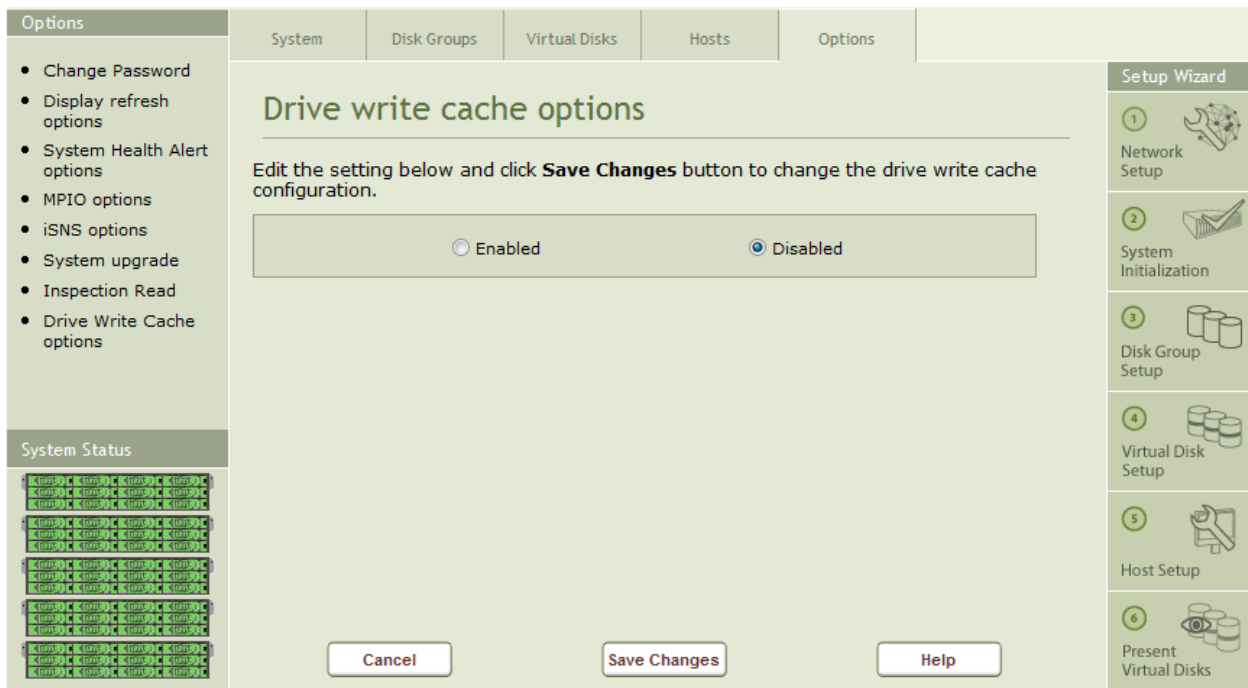


Figure 4-49 Drive Write Cache Options

To enable/disable drive cache:

1. Click on the Drive Write Cache Options icon in the Options page
2. Select the Enabled or Disabled button
3. Select the Save Changes button

4.3.9 System Beacon LED Options

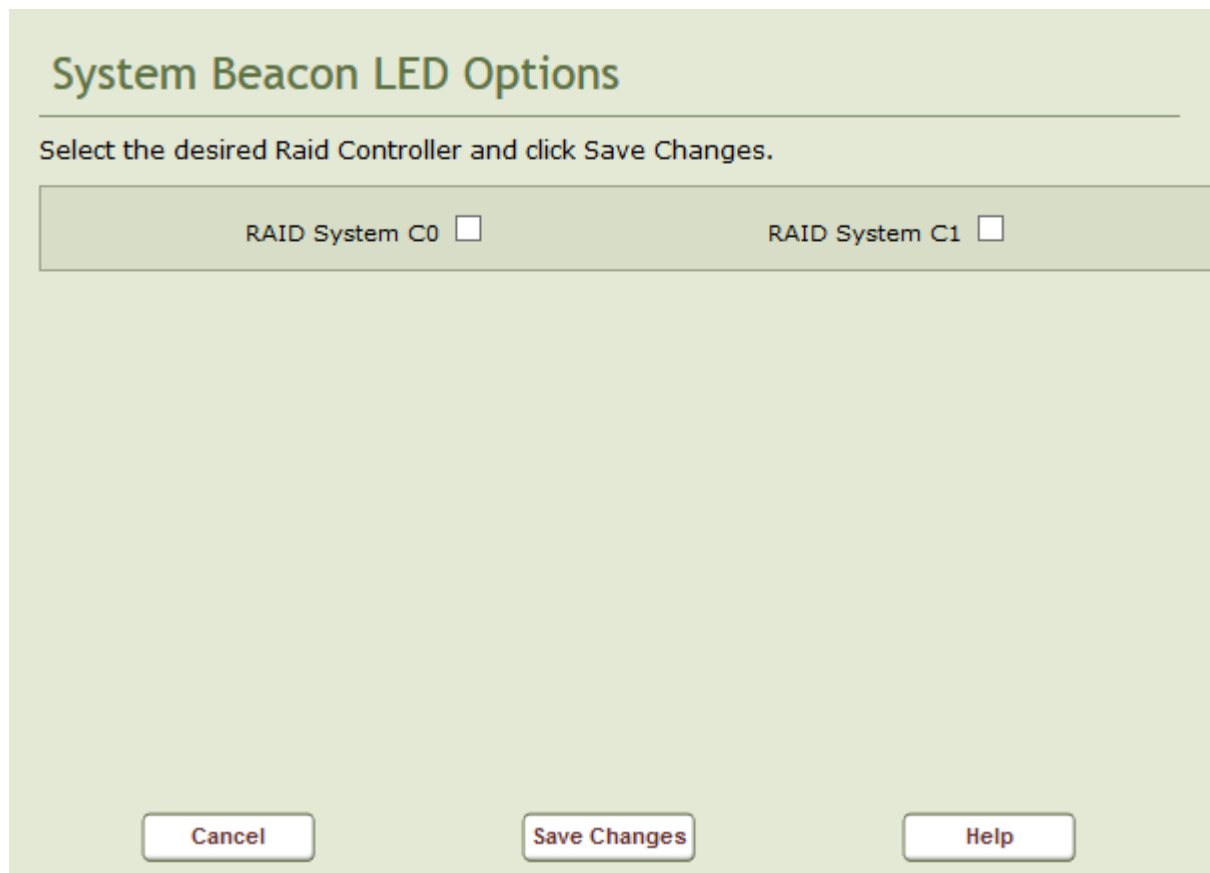


Figure 4-50 Drive Write Cache Options

4.3.10 Performance Data

The PixelStor 5000 supports diagnostic data. This data is used to diagnose and monitor the performance of the Storage system and its interaction with the host computers.



In order to view diagnostic information recording must be started.

1. Select the Performance Data page from the 'Options' menu.

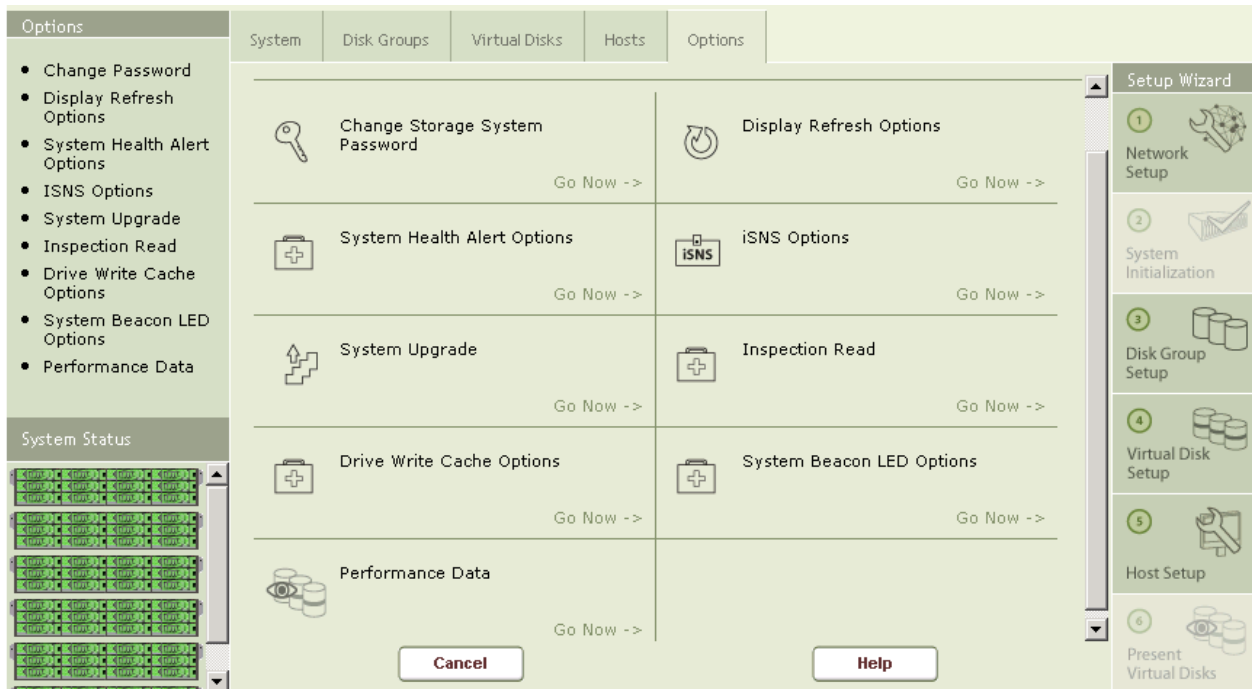


Figure 4-51 Recording data

2. Select on “Start” and select sample time as shown in Figure 4-52. The default of 0.5 seconds will normally be used.

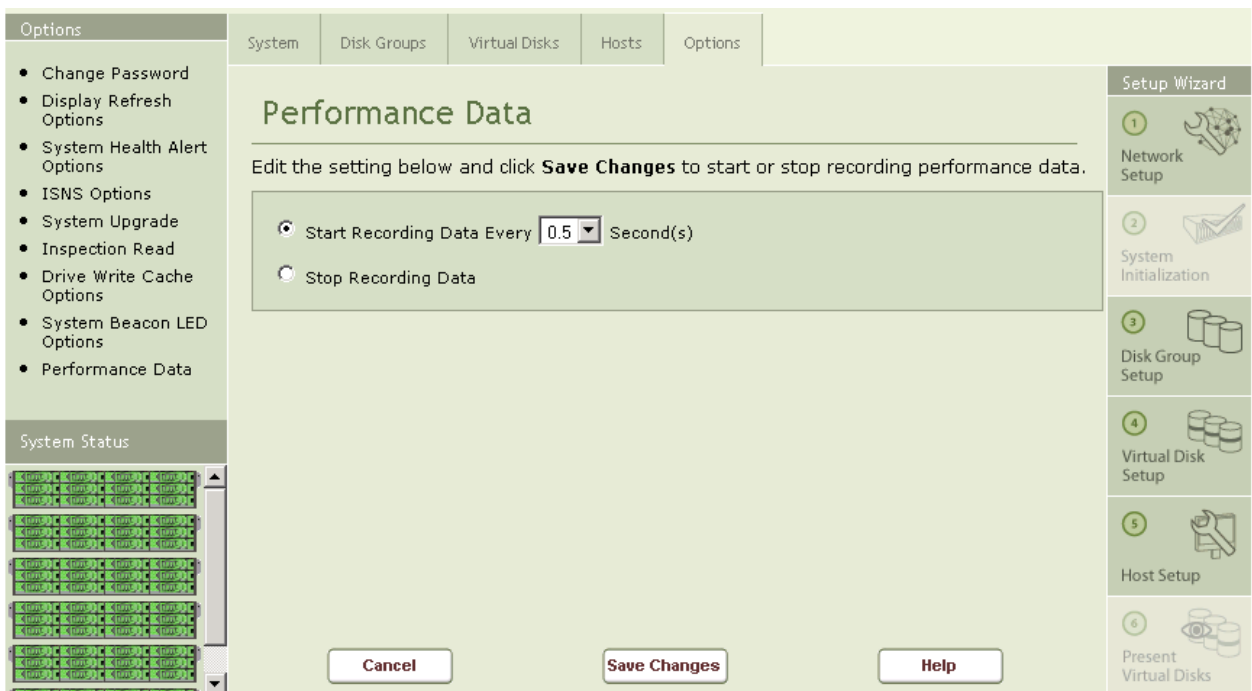


Figure 4-52 Start recording data

Now Performance Data under the system tab may be used.

4.3.11 Disk Power Management Status

Disk Groups

Disk Group Name or Spare/Orphan disks.

Management Mode

This field indicates the current power management status for the disks belonging to this group. If the status is "off", then the system will not manage the power status of the drives in this group. The drives in this group remain in the active state all the time. If the status is "on", then the system will manage the power status of the drives in this group. The drives will go into standby mode after the specified inactivity period.

Inactivity Timer

This field specifies how long the drive should wait before it transits from active mode to standby mode if there is no activity. Valid values: 0, 10, 20, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300 and 330 minutes. A value of 0 disables spin down.

Scheduling Information

This field specifies whether power management scheduling is enabled for this group. If power management scheduling is enabled, it displays the time interval that the drives remain in the active mode. Outside of this time interval, the drives will go to standby mode after the specified period of inactivity.

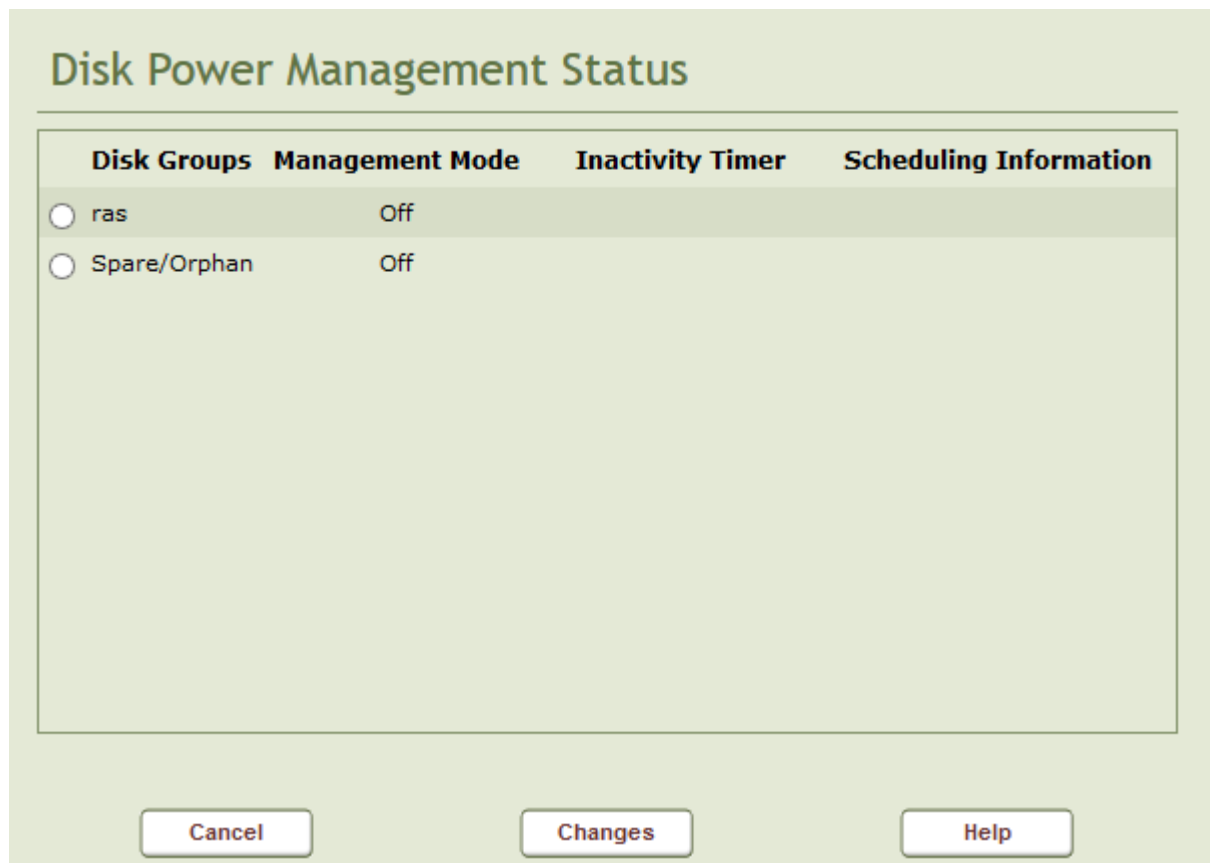


Figure 4-53 Start recording data

4.3.12 Advanced Logging Mode

Disabled (default) - This is the default logging mode. We recommend to use it when the system is normally running.

Enabled - More detailed log information will be recorded. Please use it only when debugging problems.

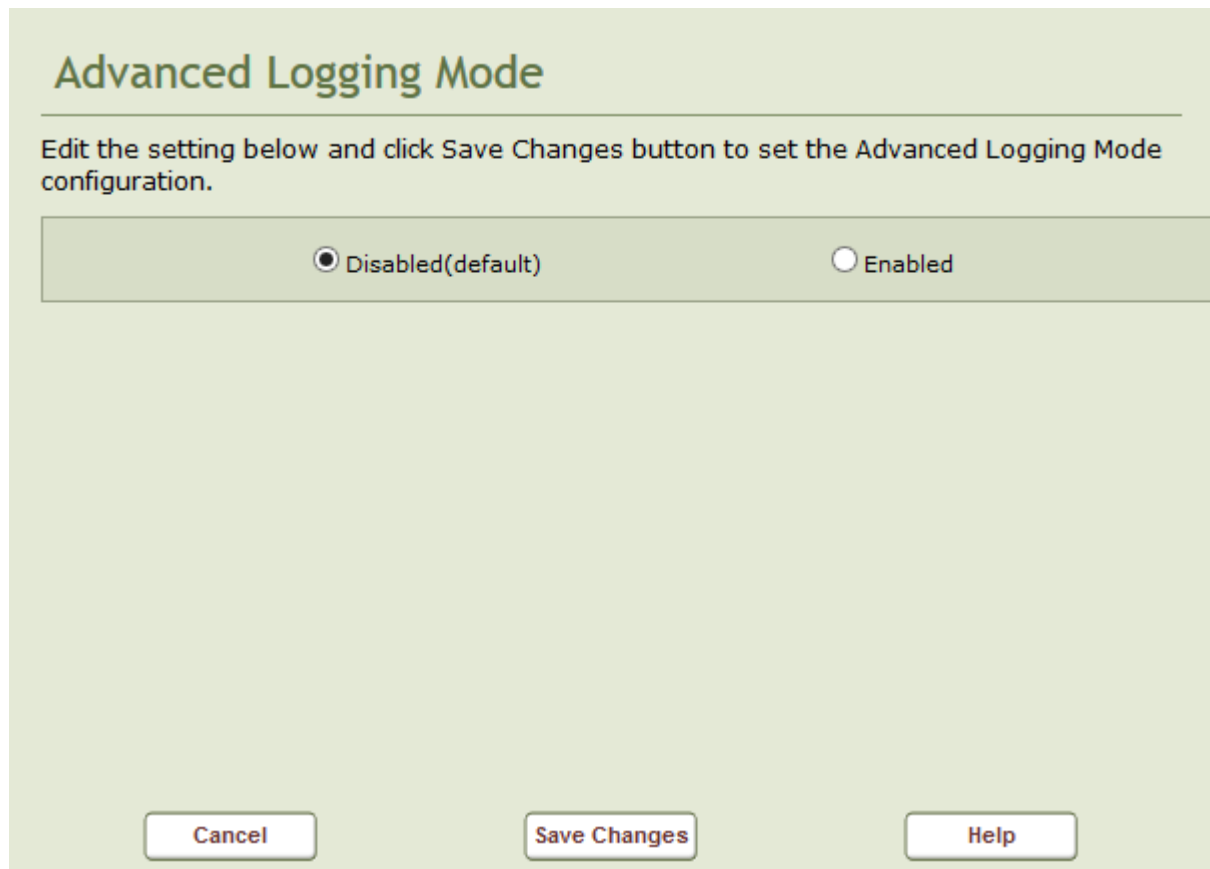


Figure 4-54 Advanced Logging Mode

4.3.13 Firmware Upgrade Manager

Select File

Enter the absolute path to the firmware file or use the "Browse" button to locate the file. You may obtain the file from another server by entering the IP address of the server and the path to the file in the following format: \\192.168.0.250\home\firmware.fuf

Start Upgrade

Click on the "Go" button to begin the upgrade

Upgrade Status

Display status messages and relative progress

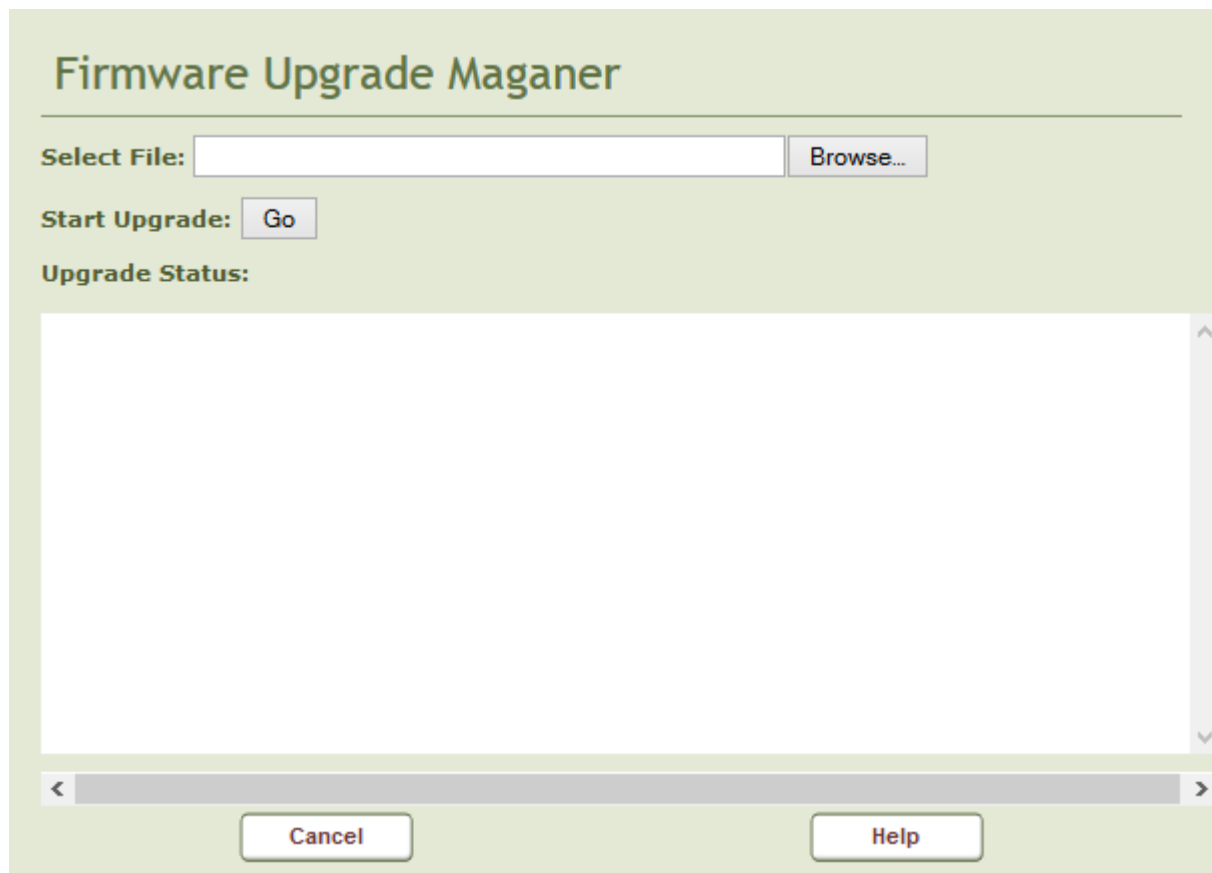


Figure 4-55 Firmware Upgrade Manager

4.3.14 SSD Cache Drive Configuration (EXPERIMENTAL)

Select a Primary Controller

Select the owner of this disk group.

Block size(KB)

Change block size in KB (64 ~ 8192)

Total Capacity

Total Capacity of the SSD Cache Drive

Hit Rate

Last measured Hit Rate of SSD Cache Drive

SSD Cache Drive Configuration (EXPERIMENTAL)

Select the primary controller:

Block size(KB): 512~8192

Total Capacity: 0(GB)

Hit Rate: 0%

Select the owner of the SSD Cache Drive: 0 1 2 3 4 5 6 7 8 9 10 11

RAID System:

Figure 4-56 SSD Cache Drive Configuration

4.3.15 Configuring Notification

The PixelStor 5000 supports email notification for alerts and major/critical events. You specify email subscribers to be notified through the notification page of the Management Console.



In order to receive email, you need to make sure you have correctly set up the default Gateway and DNS server in the network setup.

3. Select the Email Notification page from the 'System Status' menu.

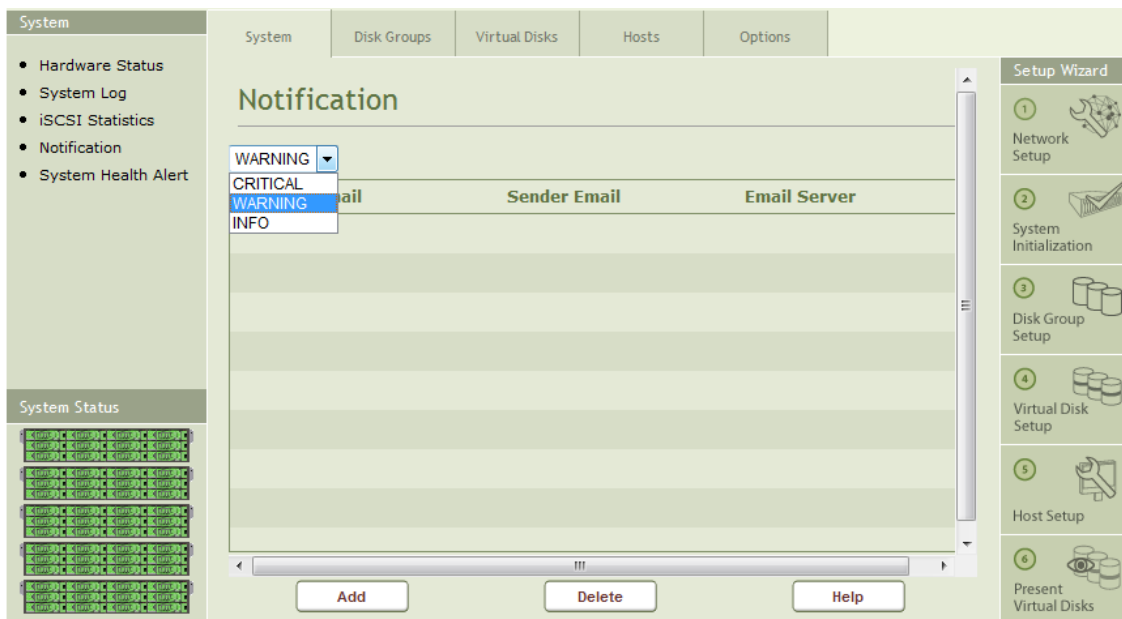


Figure 4-57 Email Notification

4. Click on “Add” to bring up the add user page as shown in Figure 4-52.

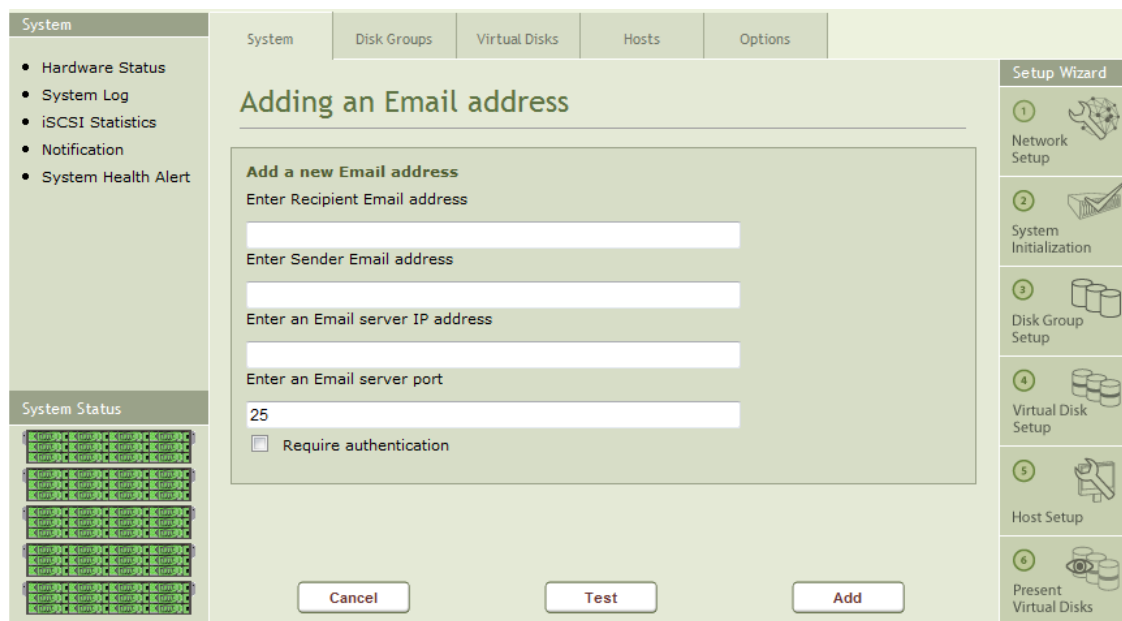


Figure 4-58 Adding Email Addresses

Enter

- Recipient’s Email Address
- Sender’s Email Address

- IP address of the mail server
- Port number for the email service on the email server
- Click on the “Add” button as shown in Figure 4-52.

Chapter 5

Using and Maintaining the System

5 Using and Maintaining the System

5.1 System Status

This section includes instructions for using, maintaining and servicing your PixelStor 5000 . It is organized from a reference perspective and gives details on each major configuration screen and hardware module and its associated configuration features. This section also reviews placement of LEDs and what they indicate.

5.1.1 Properties Page

The System Properties Page is displayed when you log onto the system. This page provides an overview of the system as shown in Figure 5-1.

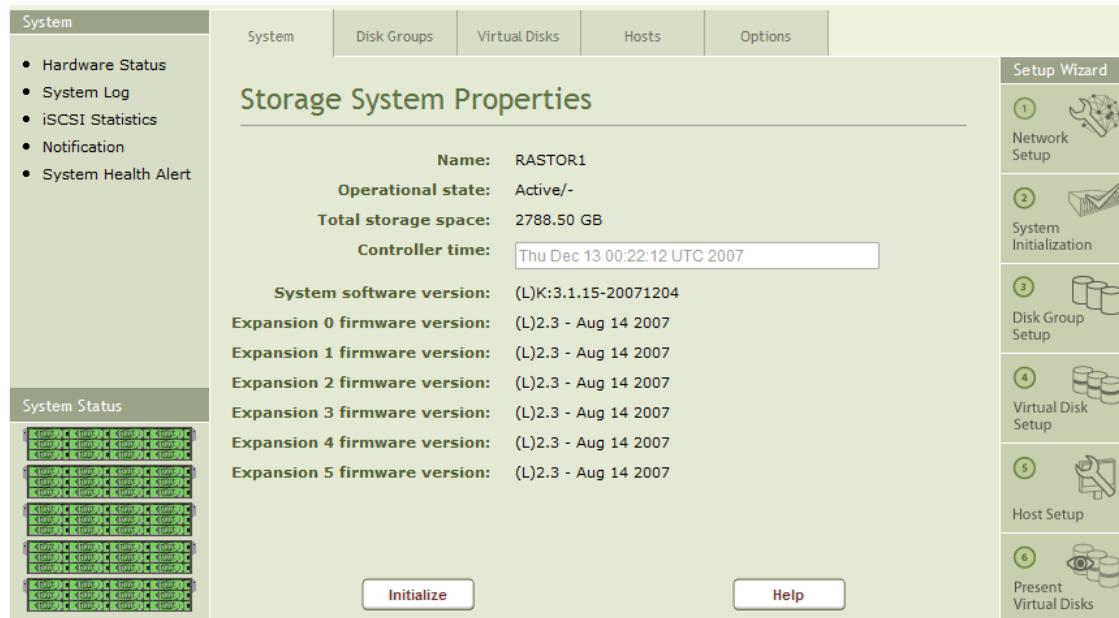


Figure 5-1 Storage System Properties

The fields in the Storage System Properties page are:

- **Name** - The hostname of the system
- **Operational State** - Describes the operational state of each controller in the system
 - Active/Active – Both controllers active running normally.
 - Active/Takeover – One Controller in takeover state. Its IP addresses and disk groups have been taken over by the other controller.
 - Active/- - Single controller active
- **Total Storage Space** - Displays the total capacity of the system in Gigabytes
- **System Software Version** - Describes the software version of the local (L) and remote (R) controllers (if two controllers installed)
- **Expansion Firmware Version** - Describes the F/W version of each enclosure installed in the system.

5.1.2 Hardware Status Page

The hardware status page provides a visual representation of the system status. Moving the mouse over individual components provides additional details about the component. For example moving the mouse over a disk drive will display the manufacturer, model, size and firmware revisions as shown in

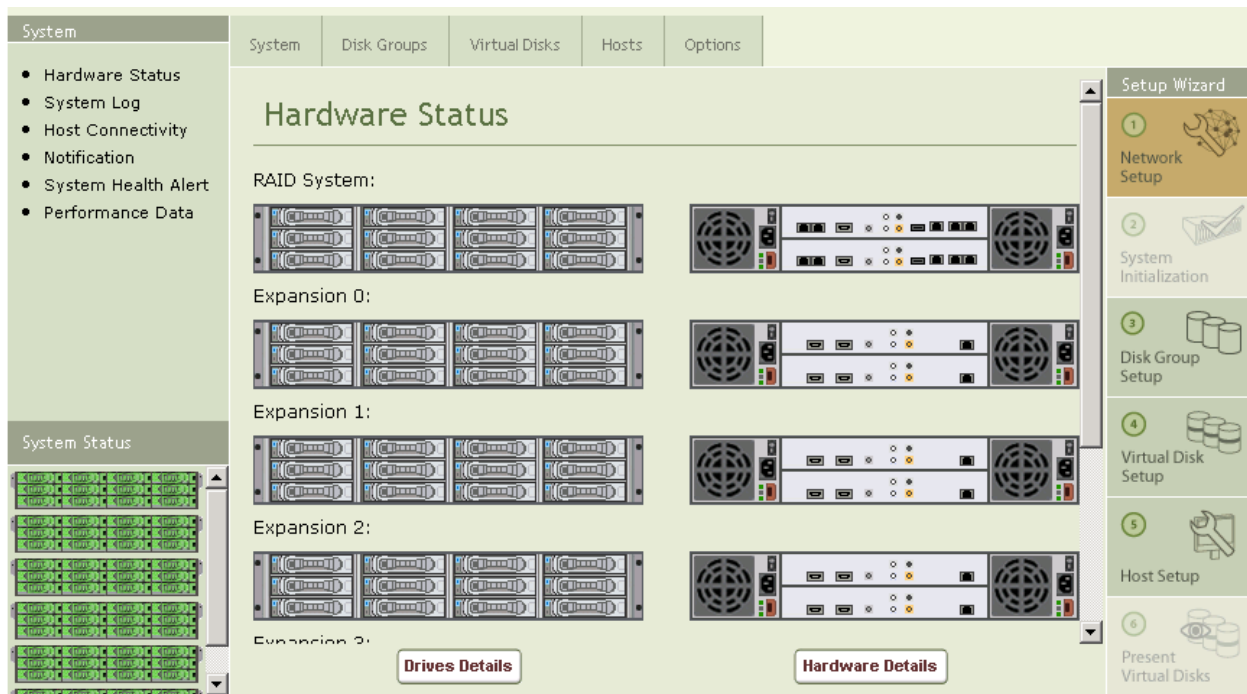


Figure 5-2 Hardware Status

Additionally a failed component will display in red.

5.1.3 System Log

The System Log is accessible through the Storage Manager. To get to the System Log display, select System Log in the System list on the left hand side of the Storage Manager. This will bring up the Log viewing screen as shown in Figure 5-3. You can select the level of detail through the pull down menu. Your choices include, info, warning or critical messages.

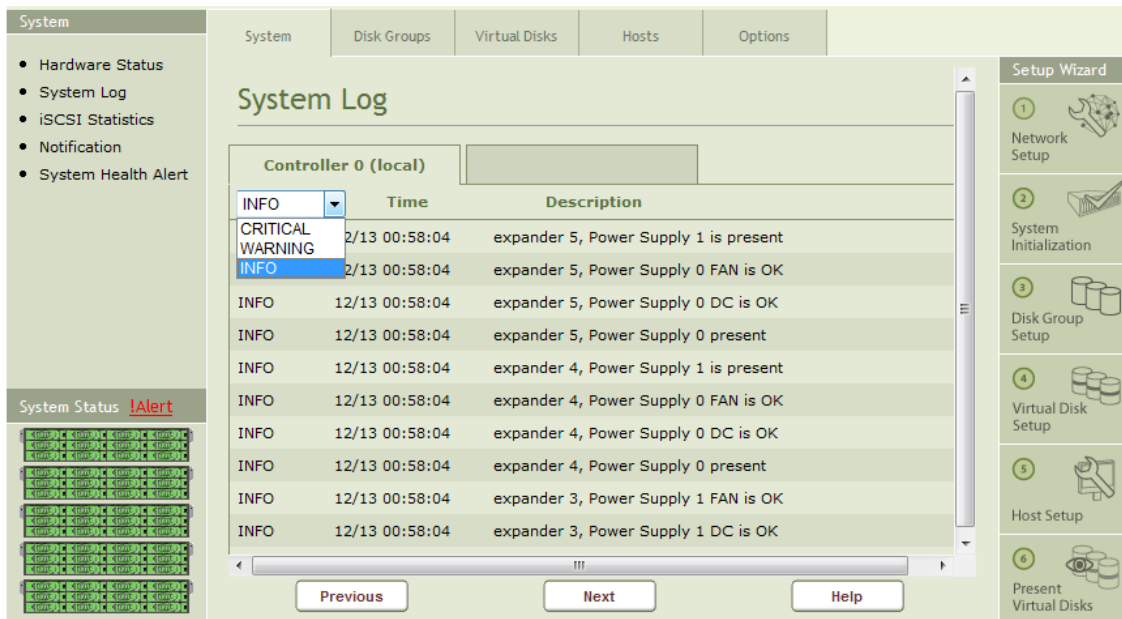


Figure 5-3 System Logs

5.1.4 Support Menu

A support menu is offered for the PixelStor 5000 . The support menu can be viewed by selecting the support link at the top right had corner of the web management console. The support window includes information on how to contact technical support. In addition, there are two buttons at the bottom of the menu for saving and sending logs to support contacts.

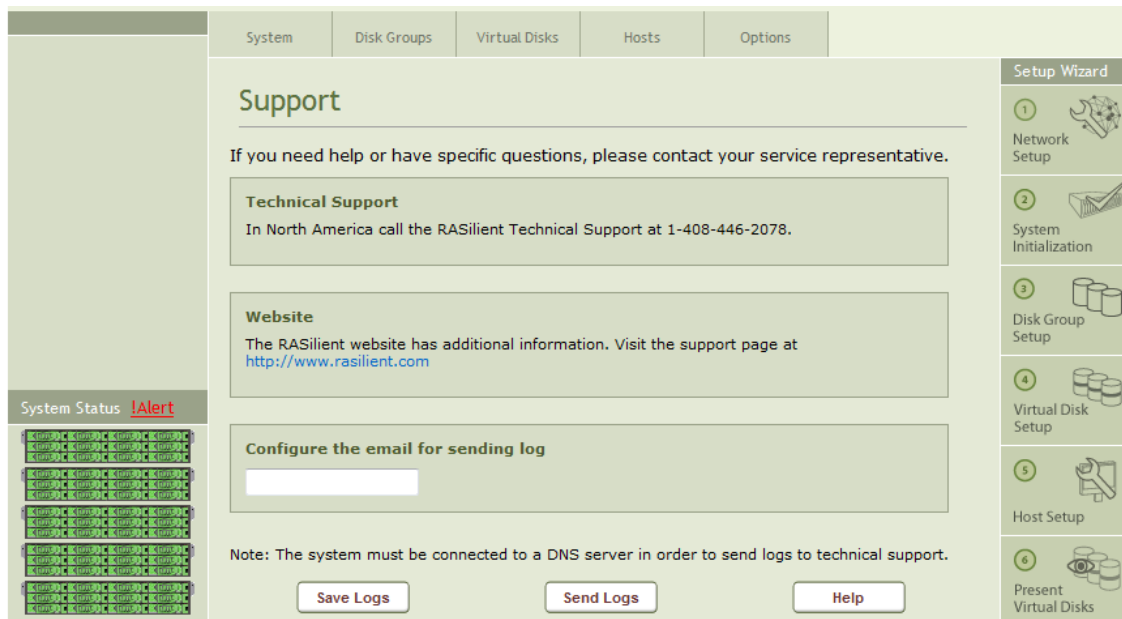


Figure 5-4 Support Menu

- **Save Logs** - To save logs to a local or network drive, just select the “Save Logs” button at the bottom of the support menu. Once selected a window will pop up asking if you wish to open or save the file. Select save and choose a location to save the file. The saved file contains logs from one or both controllers (depending on your configuration) and an inventory of the system. This can be used as a record of the status of the system or emailed to a support representative.

5.1.5 Performance Data

Figure 5-5 shows the Performance Data page. A wide variety of data can be monitored for the storage system. There are 4 selections that can be made Virtual Disk Performance, Cache Count, iSCSI Busy Percentage and CPU Idle. Within the Virtual Disk Performance selection each individual VD can be select to see how it is performing. This performance is measure with Write Data Rate, Read Data Rate, Command Completion Time and Command LBA.

Cache Count monitors the system cache usage. iSCSI Busy monitors busy messages sent to the host computers. CPU Idle monitors CPU usage.



The information displayed in the graphs is actual data derived from the PixelStor 5000.

In Figure 5-5 is an example the selects the Raid-N1 DG and NVR 1 VD. It also selects the write data rate for that VD. Figure 5-6 shows the output of this selection.

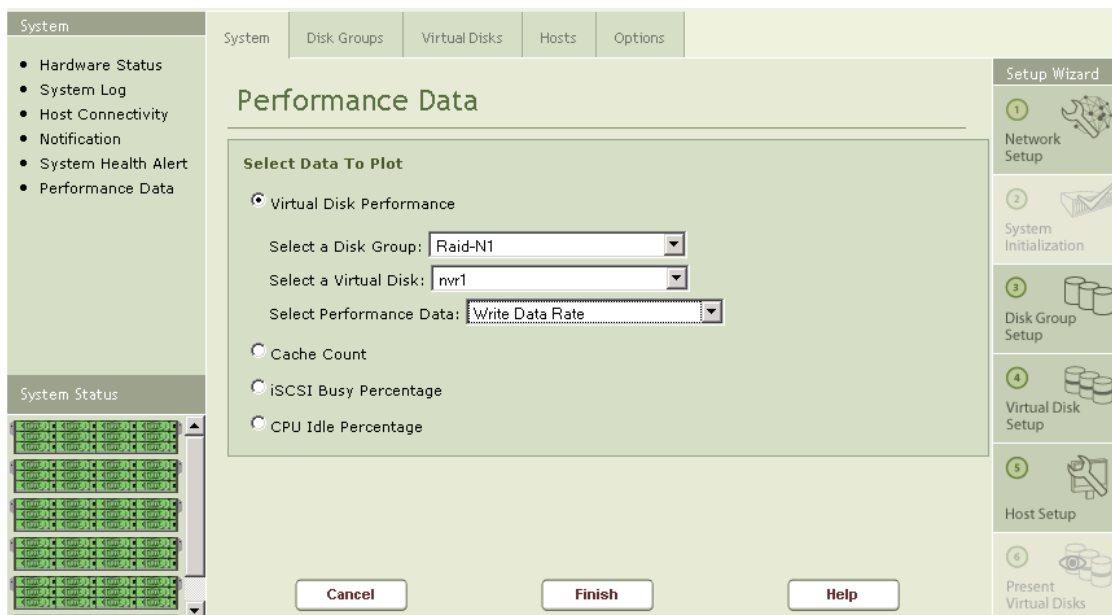


Figure 5-5 iSCSI Statistics Page

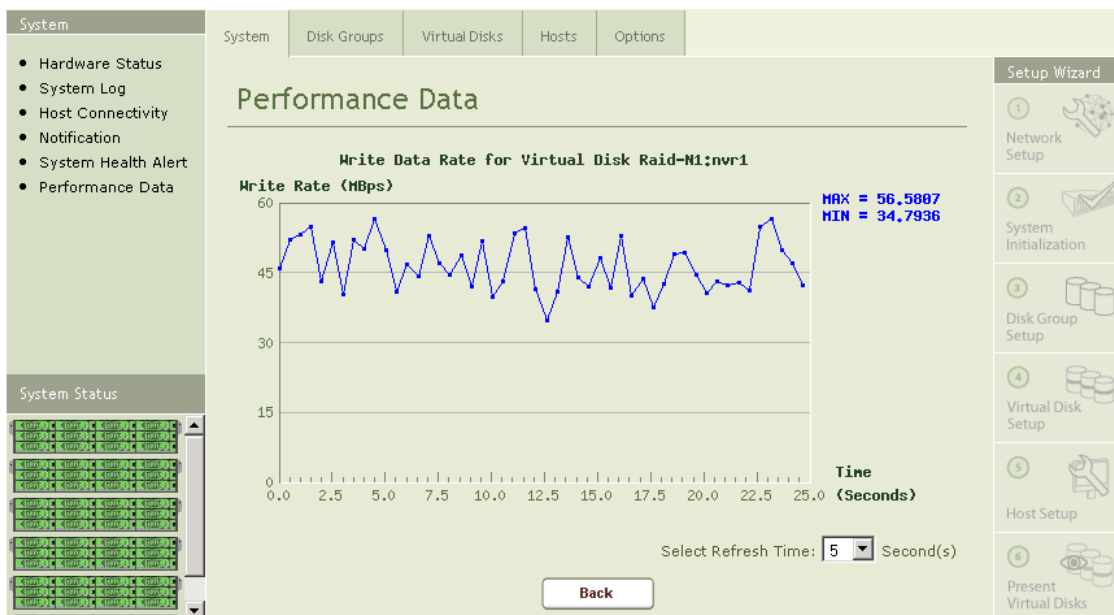


Figure 5-6 iSCSI Bandwidth Display

5.1.6 System Health Alert

RASILIENT Systems also equips PixelStor 5000 with a System Health Alert which is a flashing alert visible from the front of the system.

Description – The System Health Alert lets administrators know that the system needs attention. The System Health Alert utilizes all the disk drive LEDs and uses them to flash a warning signal. All the LEDs on the disk drives blink approximately once per second. These lights continue to flash until redundancy is restored or the unhealthy condition is corrected. This visible alert is especially useful in dense rack implementations or situations where it is not easy to see or access the back of the system. Once alerted, you can log-on to the web-based PixelStor Storage Manager to ascertain the cause of the problem and use the system’s Status Indicators (LEDs) to pinpoint the failed component and take corrective action.

Policy – The System Health Alert is triggered whenever system availability degrades. For example, the Health Alert lights flash when component failure or removal causes system availability to drop below its original startup condition. It is also triggered by an unhealthy system state such as an exceeded temperature threshold.



PixelStor 5000 does not require redundant components to operate. If the system boots up without redundant power supplies, network links or controllers, the System Health Alert is NOT triggered.

To View the System Health Alerts, click on System Health Alerts in the navigation area of the System tab.

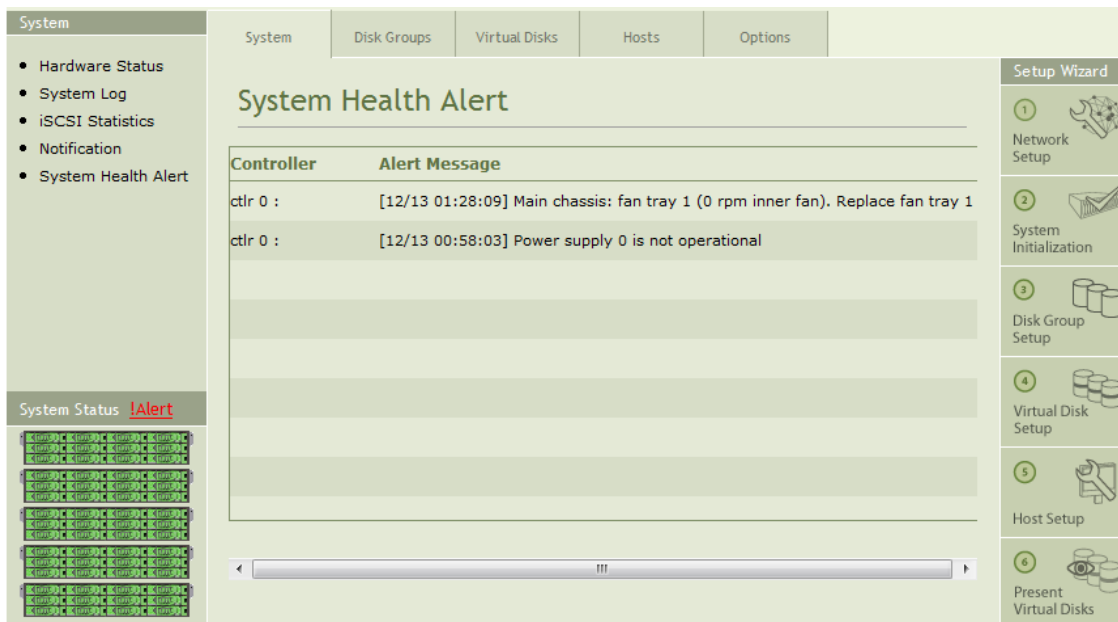


Figure 5-7 System Health Alert Page

5.2 Failure Conditions and Corrective Action

This section describes specific events in the system that requires corrective action and the corresponding event or alarm.

5.2.1 Degraded System Availability

When the PixelStor 5000 is turned on, it captures an inventory of installed components and connected interfaces. Once the user configures Disk Groups, the system also tracks the RAID configuration information. If at any time, the system falls to lower system availability than at startup, the System Health Alert is triggered. This can happen if a redundant component fails or a RAID 1, 5, 6 or 10 disk(s) fail or if an interface fails to respond.

Corrective action:

- Check the PixelStor Storage Manager for the source of the problem.
- Restore redundancy by replacing the failed controller, power supply or failed drive. Once system availability is restored the System Health Alert will stop flashing.
- If the system has a global spare, the System Health Alert will stop flashing once the RAID group is automatically rebuilt by the system.

5.2.2 Turning the System Health Alert Off

Once a system administrator identifies the problem and schedules corrective action, he may want to turn off the System Health Alert. To shut off the flashing lights, the administrator needs to:

- Log-on to the PixelStor Storage Manager.
- Once logged-in, click the “Options” menu.
- In the options menu, click “System Health Alert Options”
- There are two option buttons “enable and “disable”. Hit the disable button to shut off the System Health Alert.



Although the System Health Alert is disabled, the system will continue to log error notifications in PixelStor 5000 's system log. Administrators can view the notifications in PixelStor Storage Manager's “System Log” or “System Health Alert” sub-menus.

5.2.3 RAID Controller Failure

When a RAID controller fails in the PixelStor 5000 with redundant controllers, all drives including those on interconnected PixelStor 100e enclosures will fail-over to the surviving controller without interruption to data access. If the PixelStor 5000 is in a single controller configuration the system will shut down and all data will not be available

Corrective action:

- Dual Controllers - replace the failed controller and the system will automatically fail-back to original state.
- Single controller - replace the failed controller, reconfigure the host access and rediscover the drives groups.

5.2.4 SAS IO Expander Failure (Lost Connection to Expansion Enclosure)

PixelStor 5000 capacity can be expanded by adding up to 5 additional capacity expansion enclosures for a maximum capacity of 72 SATAII drives. These enclosures are daisy chained to the PixelStor 5000 SAS IO expanders and 12Gbps SAS connections.

In the event a SAS IO expander fails, all expansion enclosures and corresponding drives connected to the failed IO expander will become unavailable. Under this scenario, the system will treat all drives associated with that SAS expander as failed. Since disk groups can span across the PixelStor 5000 and interconnected expansion enclosures, a loss of one or more expansion enclosures can affect multiple disk groups. If one drive for RAID 1/5/10 or two drives for RAID 6 are missing from the associated Disk Groups, the system will rebuild them using any available global spare. If multiple drives (2+ for RAID 1/5/10 or 3+ drives for RAID 6) are missing then all writes to the DG will be suspended and the DG will be made available to the system in a read-only state.

Corrective action:

- Dual Controller - the system will fail over and the controller with healthy IO expanders and cable links will take over all the disks without disruption to data access. The administrator can replace the failed expander and the system will automatically fail-back to regain redundancy.
- Single Controller - all connected expansion enclosures (and drives) will become unavailable. The administrator will need to replace the IO expander and do a Disk Group Restore to reactivate all the disk groups brought off-line by the failure.

5.2.5 SAS Cable Disconnect (Lost Connection to Expansion Enclosure)

If a cable fails or is accidentally disconnected, the system will react as if the SAS IO Module failed. (See 5.2.4 “SAS IO Expander Failure” in previous section)

Corrective action:

- Dual Controller - the system will fail over and the controller with healthy a SAS IO connections will take over all the disks without disruption to data access. The administrator can reconnect the SAS cable and the system will automatically fail-back to regain redundancy.
- Single Controller - all connected expansion enclosures (and drives) will become unavailable. The administrator will need to reconnect the SAS cable and do a Disk Group Restore to reactivate all the disk groups brought off line by the failure.

5.2.6 Drive Failure

If a one drive fails in a RAID 1/5/10 DG, or two drives in a RAID 6 DG, the DG will go into degraded mode. If a global spare is present in the system, the spare will be automatically be added to the DG and a rebuild of the DG will be initiated. (Note: RAID 0 by definition has no protection and therefore cannot be rebuilt.)

Corrective action:

- No Spare – Replace the failed drive and the system will automatically start a rebuild of the DG. (It is recommended that a global spare is always installed in the system to insure data availability.
- Spare Present - Replace failed drive. This will automatically be added to the system as a global spare.

5.2.7 Unhealthy RAID Disk Group

If a RAID Group experiences a drive fault that is unrecoverable, the System Health Alert is triggered. For example, this can happen if a RAID 0 Disk Group experiences a drive failure or a RAID 5 Disk Group experiences two consecutive drive failures.

Corrective action:

- Recover the Disk Group from a recent back-up.

5.2.8 ECC Memory Error

The system uses ECC memory on each controller. If an ECC memory error is detected by the system, the System Health Alert is triggered.

Corrective action:

- Check the Web-based console for the source of the problem.
- Replace the controller if necessary.

5.2.9 Faulty Cache Battery/Charger

Each controller comes with a battery backup unit to protect the cache. If the battery fails or stops holding a charge, the System Health Alert is triggered. The backup battery subsystem includes a charger for the backup battery. If the charger becomes defective, the System Health Alert is triggered.

Corrective action:

- Check the Web-based console for the source of the problem.
- Replace the controller if necessary.

5.2.10 Network Connection Lost

If a network link is lost, the System Health Alert is triggered.

Corrective action:

- Check the Web-based console for the source of the problem.
- If there are no system problems, check your network devices or initiators for the source of the problem.

5.2.11 Temperature Threshold Exceeded

The system has multiple temperature sensors with factory thresholds. If any temperature sensor indicates an abnormal value beyond the threshold, the System Health Alert is triggered. The Health Alert signals the fault by flashing all the red drive LEDs every 3 seconds.

Corrective action:

- Log-on to PixelStor Storage Manager. Follow the menu tree on the left side of the screen to “System Status” and click on it. Check the graphical representation of the system for errors or click on the “System Health Alert” sub-menu for details on the alert.

- If the PixelStor Storage Manager indicates a faulty module, go to the system and look for a module with a red Status Indicator. Replace the component (drive, fan, controller, power supply). Once the faulty module is replaced, the System Health Alert will stop flashing.
- Check for missing slot covers. Module slot covers are required to ensure proper system airflow. Replace missing slot covers to ensure temperature stays within specified system limits.
- If the PixelStor Storage Manager indicates a temperature fault and there are no faulty system modules, check for a sudden rise or drop in the room temperature. If the room temperature is beyond those listed in the system specifications section of this manual (See System Specifications) shut down the system until you are able to correct the problem.

5.2.12 Voltage Threshold Exceeded

The system is also equipped with voltage sensors. If any voltage sensor reading indicates an abnormal value beyond the factory threshold, the System Health Alert is triggered.

Corrective action:

- Check the Web-based console for the source of the problem.
- Check Status Indicator on each power supply. Replace if faulty.
- Ensure that the system is connected to an appropriate power source such as the rack's power distribution unit (PDU) or an uninterruptible power supply (UPS).

5.2.13 Fan Failure

Fan state and fan speed are also monitored. If a fan fails or if the fan speed falls below the factory threshold, the System Health Alert is triggered.

Corrective Action:

- Check the Web-based console for the source of the problem.
- If the Power Supply fan has dropped below the recommended RPM that Power Supply should be replaced.

5.2.14 List of Health Alert Notifications:

- The other controller is down
- RAM ECC error is detected

- Battery not present or not in normal charging state
- Battery is discharging unexpectedly
- The charger is bad
- Temp sensor reading T1 of xx.xx C > alarm threshold 65 C
- Temp sensor reading T2 of xx.xx C > alarm threshold 55 C
- Temp sensor reading T3 of xx.xx C > alarm threshold 55 C
- Voltage sensor reading V4 of xx.xx out of range [2.37, 2.62]
- Voltage sensor reading V4 of xx.xx out of range [1.35, 1.60]
- Voltage sensor reading V4 of xx.xx out of range [3.00, 3.60]
- Voltage sensor reading V4 of xx.xx out of range [4.60, 5.25]
- Voltage sensor reading V4 of xx.xx out of range [11.40, 12.60]
- A Disk Group becomes degraded or unhealthy
- Power supply 0 is not operational
- Power supply 1 is not operational
- Ethernet link on eth0 is down
- Ethernet link on eth1 is down
- Ethernet link on eth2 is down
- Ethernet link on eth3 is down
- Incompatible KDI – The other controller is upgrading me
- Incompatible KDI – The other controller is syncing itself
- Disk Group ([name]) ([raid 1/10]) has x degraded raid devices, cannot be discovered if rebooted

5.3 Controller Modules

The controller modules are designed to hot plug into the chassis and they fit into one of the two controller slots of the PixelStor 5000 . The controller modules monitor and control every aspect of the storage subsystem. They control chassis management, control path and storage data path.

Controller Features

- Intel Core Ivy bridge CPU.
- Mirrored copy of the PixelStor OS “system software”
- Five RJ45 Gigabit Ethernet ports (per Ctrl.)
- One 24Gbps SAS ports (per Ctrl.)
- Two DDR3 DIMM slots that support up to 16GB of memory (controller ships with 4GB)
- One Lithium-ion battery to protect the write cache against any power failure for 72 hours.
- SAS/SATA controllers
- One Mini Serial Port (per Ctrl.)

- Two USB 3.0 ports (per Ctrl.)
- One Mini Display port

This chapter provides the detailed information and removal steps for controller module, including processor, system memory and battery.

5.4 Storage

Disk Roaming:

PixelStor 5000 and PixelStor 300e/100e have the unique capability of allowing disk groups and their properties to roam with the drives. The user can physically remove the drives that make up a disk group and install in different locations within the same array or in a different array and the system will recognize the disk group configuration including the RAID volume.

LUN Masking and host information are stored on the disks of the roamed disk group and are maintained when the disk group is roamed into the new system.

Disk roaming is possible because when a disk group is created, the system automatically creates a small 128MB partition on each drive. This partition contains the disk group configuration. In this way, all the information regarding a disk group can be recognized by any PixelStor 5000 controller during the automatic boot up discovery or during a manual discovery using the PixelStor Storage Manager or CLI.

The drives can be reinserted in different slots and they can be rediscovered while the system is on-line. You can take advantage of this flexibility to arrange your storage for different on-line and off-line tasks. This feature provides a basic and inexpensive way to upgrade a system and retain your data or move drives to another system for basic system recovery.



- All drives in a DG need to be present for the disk group discovery to take place. A disk group with one missing member can be forced online using the PixelStor Storage Manager or CLI discovery command.
-

Disk Orphans:

If some of the drives from a disk group are not re-inserted or a drive from the disk group goes bad and the disk group is not reconstructed before it roams to a new system, the new system will not be able to discover that disk group. It will know that one or more drives are missing and will designate the drives in the incomplete disk group as orphans. The data in the incomplete

disk group is maintained, however user intervention is required to recover the data on the drives. This ensures that the data on the remaining drives is not overwritten. If the drives are designated as orphans, the user has the following options:

Complete the Set – You can track down the remaining drives from the disk group, insert them in any order into the same PixelStor 5000 /300e/100e enclosure and use the PixelStor Storage Manager to do a discovery. Once the whole set is discovered, the disk group will be restored.

Rebuild a Disk Group – If the original group is part of a RAID 1, 5, 6, or 10 disk group, a bad drive maybe the reason for an orphan classification by the system. If this is the case, make sure you have a global spare in the system and then use the PixelStor Storage Manager to do forced discovery of the disk group. Once the disk group is discovered and the bad drive is identified, the system will start the RAID rebuild using the global spare. This will restore the disk group.

Re-configure the Drives – If you cannot complete the disk group or rebuild it, then you will not be able to recreate the disk group (RASILIANT recommends you always back up your data to recover from such a scenario). Alternatively you may just want to reuse drives from an old disk group where the data on the drives is no longer needed. In either case you can create a new disk group or turn the drives into global spares by using the PixelStor Storage Manager.

6 Appendix A – RAID Concepts & Cache Configurations

6.1 RAID Levels Defined

RAID 0 - Data Striping without Protection - This technique has striping but no redundancy of data. The data is broken down into blocks and each block is written to a separate disk.

- Pros - I/O performance is improved by spreading the I/O across many channels/drives.
- Cons- Not "true" RAID because it is NOT fault-tolerant. The failure of just one drive will result in all data in an array being lost.
- Ideal applications - those that require high bandwidth without need for data protection.

RAID 1 - Disk Mirroring - Consists of at least two drives that duplicate the storage of data. There is no striping.

- Pros- Read performance is improved since either disk can be read at the same time. Write performance is the same as for single disk storage. It provides the best

performance and the best fault-tolerance in a multi-user system. 100% redundancy of data means no rebuild is necessary in case of a disk failure, just a copy to the replacement disk. Also, under certain circumstances, RAID 1 can sustain multiple simultaneous drive failures.

- Cons - highest disk overhead of all RAID types (100%).
- Ideal applications - those that require very high availability.

RAID 5 - Distributed Parity - RAID-5 stores parity information but not redundant data. The parity information can be used to reconstruct data. RAID-5 requires at least three disks for the array.

- Pros - This is the best combination of performance and cost.
- Cons – Disk failure has some impact on throughput.
- Ideal Applications - this is the most versatile RAID level and is applicable to a broad range of applications. It is best for multi-user systems in which performance is not critical or applications that require few write operations.

RAID 6 – Block-level striping with *dual* distributed parity – Like RAID 5, RAID 6 stripes data and parity across an array of drives with the additional capability to calculate two sets of data parity for each volume of data. Requires at least 4 disks for the array.

- Pros - Extremely high data fault tolerance. Provides protection against double disk failures and failures while a single disk is rebuilding while other RAID levels can handle at most one fault.
- Cons – RAID 6 performance can be slightly worse than RAID 5 in terms of writes due to the added overhead of more parity calculations. RAID 6 is inefficient when used with a small number of drives due to need for 2 parity drives.
- Ideal Applications – Complex, higher capacity SATA arrays (12-24 drives) where higher availability is critical.

RAID 10 - Combination of mirroring and striping - This type offers an array of stripes in which each stripe is a RAID-1 array of drives.

- Pros -This offers higher performance than RAID-1
- Cons- but at much higher cost.
- Ideal Applications- those requiring high performance and fault tolerance.

6.2 Cache Settings Defined

Write-back Cache Option - Data normally written to disk is first written into the cache. During idle machine cycles, the data is written from the cache into disk.

- Pros- Improves performance because a write to the cache is faster than to disk. Reduces the number of write operations to disk.
- Cons- With this performance improvement comes a risk that data may be lost if the system crashes. The write back cache configuration should only be selected if you have the battery-backed option installed.

Write Through Cache Option - Data is written to disk and also written into the cache.

- Pros – This method ensures complete data integrity and good performance for sequential access, which relies on less cache. If a subsequent read operations need that same data, read performance is improved, because the data is already in the cache.
- Cons- Write performance is not improved with this method.

Auto Cache Setting - This RASILIENT setting automatically turns on write back cache and enables the mirrored cache feature with two controllers installed. If the second controller is removed or fails, the system automatically switches to a write through cache configuration.

- Pros - Good cache performance and complete data protection.
- Cons – Less optimized performance for sequential access due to mirrored cache system overhead.

7 Appendix B – Using the Command Line Interface (CLI)

7.1 Preparing to use the CLI

The following information is for experienced users that wish to manage the PixelStor 5000 with the built in Command Line Interface using:

- A terminal connected to the Serial port of the PixelStor 5000 or
- A Telnet session to the PixelStor 5000

This section describes how to access the CLI and provides a list of commands that can be used for system configuration, array management and administrative functions.

7.2 Connecting a Terminal to Access the CLI

Connect the supplied Serial cable to the Serial management port on either controller. Connect the opposite end of the cable to a workstation or laptop with a terminal emulation program. A DB9 connector is provided for the workstation or laptop.

Use the following terminal emulation settings to access the CLI:

- Baud Rate – 115,200
- Data Bits – 8
- Parity None
- Stop Bits – 1
- Flow Control Off

7.3 Accessing the CLI – Serial Port or Telnet Session

Once connected to the Serial port with the PixelStor 5000 is running, you will be prompted for the following information:

- Login – root
- Password – root

When connecting through a telnet session connect to the PixelStor 5000 with “telnet <IP Address>”. You will be prompted for the following information:

- Login – guest
- Password – welcome

Enter SuperUser mode by executing the “su” command (pwd is “root”). CLI commands must be executed as a SuperUser.

7.4 dahelp Command

The “dahelp” command lists all available CLI commands for the PixelStor 5000 . Detailed information for each CLI command is listed on the screen by simply executing the specific command without parameters or by specifying the “?” parameter.

7.5 Local/Remote Option

Some commands have a local or remote option. This enables the local controller to invoke an action onto the remote controller. The function of the local or the remote operation is specified in the command description. Command option *local* means you are invoking an action on the local controller, and command option *remote* means you are invoking an action on the remote controller.

Some commands don't have local or remote options. Setting the configuration on the local controller with these commands will set the same configuration on the both controllers.

7.6 Index of CLI Commands

The following table lists the PixelStor 5000 commands available through the command line interface.

command	description
daacl	used to manage access control list
daaddrbk	used to add email address to notification list
dacomment	used to add comments to configuration
daconnstat	used to display connection statistics
dadate	used to display or set time and date
dadg	used to manage Disk Groups
dadiskload	download firmware for Seagate hard drives
dadsktst	measure disk baseline IO performance
dafwdwnld	used to download expander firmware
dahelp	used to display information about commands
dahost	used to define and manage host
dahostname	allows user to set the name of the storage array
dahwstat	used to display hardware status
dainspread	used to manage Inspection Read
daisns	used to manage isns registration
dakem	used to display the event log
dalun	used to manage the lun masking table
dantpdate	used to configure an NTP server
dapasswd	used to change the user password
daphyinfo	get expander phy status information
dapm	configure the drive power management
dareboot	used to reboot the local or remote controller
daroute	used to display or set the gateway address
dasavelog	saves the log file to the /pub/ directory
daselblk	select a chassis or a hard drive to blink
dasetup	used to set IP addresses, netmask, gateway and name server
dashutdown	used to shutdown the local or remote controller
dasmartinfo	used to view disk smart information
dasnmp	used to manage snmp groups
dastat	used to display system information
dastonith	used to forcibly reboot the remote controller

dasysalert	used to enable or disable health alerts
daum	used to upgrade or manage kernel images
davd	used to manage virtual disks
daversion	used to display version information of kernel images or boot images

Figure 7-1 CLI command list

7.7 The CLI Commands

The CLI Commands for the PixelStor 5000 have the prefix “da” as part of the command name. The commands and their descriptions are listed below.

7.7.1 daacl

Use daacl to manage the access control list on at a system level.

daacl - manage access control list.

Usage:

daacl [Options]

Options:

-h/--help:	help
-L/--list:	list all allowed addresses
-a [address/prefixlen]:	add an address into the allowed list
-d [address/prefixlen]:	delete an address from the allowed list

Command Examples:

daacl -a 0.0.0.0/0:	allow access from all
daacl -a 192.168.1.0/24:	allow access from one subnet
daacl -a 192.168.1.1/32:	allow access from one IP

7.7.2 daaddrbk

Use daaddrbk to manage the email addresses for notification.

daaddrbk - add email address to notification list.

Usage:

```
daaddrbk [-hL] [-ad <email_address>]
```

Options:

```
-a [recipient_email] :    add an recipient email to the address book
-d [recipient_email] :    delete an recipient email from the address book
-o [sender_email]    :    set the sender email
-s [smtp_server_ip] :    set the smtp server ip address
-S [1/0]             :    set whether the smtp server support SSL
-p [smtp_server_port]:    set the smtp server port, default is 25
-u [user_name]       :    set the user name
-w [password]        :    set the password
-h/help:             help
-L:                  list all the current email address
```

Command Examples:

```
daaddrbk -a steve@foo.com -o test@test.com -s 1.1.1.1 -p 25
    add a notification email address.
daaddrbk -d steve@foo.com
    delete a notification email address.
```

Note:

To receive email notification, you need to make sure the default gateway/router and name server are setup properly. The system needs to be able to talk to the mail server for the email address you entered.

7.7.3 dacomment

Use dacomment to add or display comments on a system.

```
dacomment    - add comments to configuration.
```

Usage:

```
dacomment [Options]
-h:          help
-g:          get the comment
-s ["comments"] :    set the comment
```

Examples:

```
dacomment -s "this is storage system for \"server A\""
dacomment -g
```

7.7.4 daconnstat

Use **daconnstat** to display the iSCSI connection statistics.

```
daconnstat - display connection statistics.
```

Usage:

```
daconnstat [Options]
```

Options:

```
?/-help:      help
-show:        show statistics
-reset sid:   reset rx/tx counters of session "sid" to zero
```

Command Examples:

```
daconnstat -help
daconnstat
daconnstat -show
daconnstat -reset 0xffff81004e409000
```

Notes:

The "daconnstat" without any option has the same effect as "daconnstat -show".

7.7.5 dadate

Use **dadate** to display or set the system date and time on one or two controllers. Without any option specified, the current date is printed out.

```
dadate - Use dadate to display or set the system date and time on
one or two controllers
```

Usage:

dadate [Options]

Options:

?/-help: help information
-s [MMDDhhmmYY.ss]: set date and time specified
-z [GMT|gmt|UTC|utc] offset: set time zone by offset to GMT/UTC

Command Examples:

dadate: prints out the current date and time
dadate -s 1216183005.32: sets the date and time
dadate -z GMT: set as Greenwich Mean Time
dadate -z GMT +8: set as 8th zone east to GMT
dadate -z GMT -8: set as 8th zone west to GMT

Notes:

For offset value for your location, please check out the following sites
<http://www.greenwichmeantime.com>
<http://www.worldtimezone.com>

7.7.6 dadg

Use dadg to manage the Disk Groups.

dadg - manage disk groups.

Usage:

dadg [Options] [Parameter Options] [Device List]

Options:

-h: help
-help: help
-ldisk: list disk information
-ldg [disk-group name]: list disk-group information
-lall: list generic information for all disk groups
-a [disk-group name]: create a disk group
-d [disk-group name]: delete a disk group
-D [disk-group name]: deactivate a disk group
-A [disk-group name]: activate a disk group
-s [disk-group name]: restore unhealthy disk group to degraded/healthy
-r: discover new disk groups

-e [disk-group name]: expand a disk group
-c [disk-group name]: change a disk-group parameter
-y [single device name]: recycle an orphan disk to a spare disk
-EC [disk-group name]: check and correct RAID consistency

Parameter Options:

-o [controller owner]: [0, 1] for controller 0, controller 1
-l [RAID level]: [0, 1, 5, 6, 10] for RAID-0,1,5,6,10
-v [alarm level]: [1-100] for disk-space alarm threshold
-n [new disk-group name]: new disk-group name
-m [comment string]: explanatory comment
-f: force deletion of disk group with virtual disks,
force activation of degraded disk group,
force restoration of unhealthy disk group,
force discovery to find degraded disk groups,
force name change of disk group

Option Requirements:

option a requires: o, l, v, and device list. m is optional
option d requires: f is optional
option A requires: o. f is optional
option s requires: f
option r requires: o. f is optional
option e requires: device list
option c requires: at least one of v, n, or m. f is required with n
option y requires: one device only

Device List Mapping:

/dev/xda: slot 0 (the leftmost slot of head chassis)
/dev/xdb - /dev/xdk: slot 1 - slot 10 of head chassis
/dev/xdl: slot 11 (the rightmost slot of head chassis)
/dev/xdaa - /dev/xdal: slot 0 - slot 11 of expansion enclosure 0
/dev/xdba - /dev/xdbl: slot 0 - slot 11 of expansion enclosure 1
/dev/xdca - /dev/xdcl: slot 0 - slot 11 of expansion enclosure 2

Device List Requirements:

RAID-0 requires: 2 to 24 devices in device list
RAID-5 requires: 3 to 24 devices in device list
RAID-6 requires: 4 to 24 devices in device list
RAID-1 requires: 2, 4, 6, ..., 24 devices in device list
RAID-10 requires: 4, 6, 8, ..., 24 devices in device list

Device List Examples:

/dev/xda /dev/xdb /dev/xdc /dev/xdg /dev/xdh /dev/xdo
/dev/xd[a-c,g-h,o]


```
/dev/xd[a,b,c,g-h,o]
/dev/xdaa /dev/xdab /dev/xdac /dev/xdad
/dev/xda[c-f]
/dev/xdb[a-d,i-l] /dev/xdc[a-d]
```

Command Examples:

```
dadg -help
dadg -ldisk
dadg -ldg dg1
dadg -lall
dadg -a dg1 -o 0 -l 5 -v 100 -m "comment" /dev/xd[a-e]
dadg -d dg1
dadg -d dg1 -f
dadg -D dg1
dadg -A dg1 -o 1
dadg -A dg1 -o 1 -f
dadg -s dg1 -f
dadg -r -o 0
dadg -r -o 0 -f
dadg -e dg1 /dev/xd[f-i]
dadg -c dg1 -m "comment new" -v 90
dadg -c dg1 -n dg1new -f
dadg -y /dev/xdo
dadg -EC dg1
```

7.7.7 dadiskcache

Use dadiskcache to enable or disable the use of the write cache on the drives.

```
dadiskcache - turns on/off all the disk write caches.
```

Usage:

```
dadiskcache [-h | -e | -d | -s ]
```

Options:

```
-h : Help
-e : Enable all the disk write caches.
-d : Disable all the disk write caches.
-s : Display the current disk write cache state.
```

7.7.8 dadiskload

Use dadiskload to download the f/w for Seagate drives.

dadiskload - download firmware for Seagate SATA hard drive

Usage:

dadiskload [Options]

Options:

-n [URL or file]: URL or file name for the firmware, the firmware file
 must be in the format: drivemodel_firmwareversion
-d [devices/all]: specify the hard drives for download, for example
 /dev/xd[a-h] or specify 'all' to download for all
 available hard drives
-i: display drive information
-s: only display Seagate drive information (-i required)
-h: display this help information
-u: skip firmware version check for download(in downgrade)
-q: hide download progress information on console

Required options: -d, -n

Command Examples

```
dadiskload -d /dev/xda /dev/xdi /dev/xdd[a-h] -n joe:passwd@192.168.1.1/  
                  images/ST3400633AS_3.AAD  
dadiskload -d /dev/xda /dev/xdi /dev/xdd[a-h] -n joe:passwd@192.168.1.1/  
                  images/ST3400633AS_0.AAD -u  
dadiskload -d all -n joe:passwd@192.168.1.1/images/ST3750640NS_3.AEK  
dadiskload -i  
dadiskload -i -s
```

7.7.9 dadsktst

Use dadsktst to measure the baseline data transfer performance for disk drives.

dadsktst - measure hard drive baseline performance

Usage:

```
dadsktst [Options]
```

Options:

```
-f [filename]:      store test results in a file
-d [devices/all]:  specify the hard drives to test, for example xda
                   or specify 'all' to test all available hard drives
-t [r/w/rw]:       specify 'r', 'w' or 'rw' for read only, write only
                   or both tests write test can only be performed for
                   'spare' drives
-v:                hide test information on console
-h:                help information
```

Required options: -d, -t

Command Examples

```
dadsktst -d xda xdi xdg -t rw
dadsktst -d all -f results.dat -t w
```

Disk List Mapping:

```
/dev/xda:          slot 0 (the top-left slot of RAID System
                   (main chassis))
/dev/xdb - /dev/xdk: slot 1 - slot 10 of RAID System (main chassis)
/dev/xdl:          slot 11 (the bottom-right slot of RAID System
                   (main chassis))
/dev/xdaa - /dev/xdal: slot 0 - slot 11 of expansion enclosure 0
/dev/xdba - /dev/xdbl: slot 0 - slot 11 of expansion enclosure 1
/dev/xdca - /dev/xdcl: slot 0 - slot 11 of expansion enclosure 2
```

7.7.10 dafwdwnld

Use `dafwdwnld` to download the f/w into the Expanders (PixelStore 100e). This command downloads the f/w automatically into both controllers and all the Expanders.

```
dafwdwnld - download target system's main chassis and expander firmware
```

Usage:

```
dafwdwnld [Options]
```

Options:

```
-g/--gui:          this tool is called from GUI
-h/--help:        display help information
-i/--info:        display information of the system's main chassis
                  and expander firmware
-n [URL]/--new [URL]: specify the firmware file name and it's location
-u               download the firmware, even if it is older than the
                  firmware on the main chassis or expander
-q               hide download progress information
```

Option Requirements:

URL is in the following format:

```
username:passwd@ip_address/path_name/file_name
```

The host specified with 'ip_address' must be a FTP site. If the FTP server accepts 'anonymous' user, the 'username:passwd' can be omitted.

Command Examples

```
dafwdwnld -n joe:passwd@192.168.1.1/images/vsc7513.fuf
dafwdwnld -n joe:passwd@192.168.1.1/images/vsc7513.fuf -u
dafwdwnld -n 192.168.1.1/pub/vsc7514.fuf
dafwdwnld -I
```

7.7.11 dapm

Use **dapm** to display the drive power management state and to set the inactivity period for drive spin-down.

```
dapm    - Use dapm to display drive power management state.
        - Use dapm to set inactivity period for drive to spin down.
```

Usage:

```
dapm [Options]
```

Options:

```
-help:          Display help information.
-s             Display drive power management state.
-l [inactivityPeriod] Set inactivity period for drive to spin down.
                  Valid values: 0, 10, 20, 30, 60, 90, 120, 150,
```

180, 210, 240, 270, 300 or 330 minutes.
A value of 0 disables spin down.

-i Display current inactivity timeout value.

-z schedule time of day to spin up and spin down disks in a disk group.

-y stop current schedule in a disk group.

Parameter options:

-g [disk group name]: disk group name.

-n : spare or orphan drives.

-b [time of day]: time of day [0-23] to spin up the drives.

-e [time of day]: time of day [0-23] to spin down the drives.

Option requirement:

option l requires: g or n.

option i requires: g,n optional.

option y requires: g.

option z requires: g,b,e.

Command Examples:

dapm -s Display power management state for all drives.

dapm -l 30 -n Set inactivity period for spare/orphan drives to 30 minutes. Drive has no activities for 30 minutes will spin down to enter standby state.

dapm -l 30 -g dg1 Set inactivity period for disk group dg1 to 30 minutes. Drives in this disk group has no activities for 30 minutes will spin down and enter standby states.

dapm -i Display current inactivity timeout value for all disk groups and spare orphan drives.

dapm -i -n Display current inactivity timeout value for spare or orphan drives.

dapm -i -g dg1 Display current inactivity timeout value for disk group dg1.

dapm -z -g dg1 -b 8 -e 20 Set disk group dg1 to spin up drives at 8AM and spin down its drives at 8PM.

dapm -y -g dg1 Stop current scheduling for disk group dg1.

7.7.12 dahelp

Use dahelp to display a list of CLI commands

dahelp - display command usage page

Usage:

dahelp [Options]

Options:

-h/help: display this help page
[command]: display usage for the specified command
-s [pattern]: display usage for all the commands that match the pattern

Command List:

daacl - manage access control list
daaddrbk - add email address to notification list
dacomment - add comments to configuration
daconnstat - display connection statistics
dadate - display or set the date and time
dadg - manage disk groups
dadiskcache - Turn on/off disk write caches for all drives
dadiskload - download firmware for Seagate hard drives
dadsktst - measure disk baseline IO performance
dafwdwnld - download expander firmware
dahelp - display help information about commands
dahost - define or manage host
dahostname - display or set hostname for the storage array
dahwstat - display hardware status
dainspread - manage Inspection Read
daisns - manage iSNS client
dakem - display event log
dalun - manage the lun masking table
dantpdate - configure NTP server
dapasswd - set the password for the user
daphyinfo - get expander phy status information
dapm - configure the drive power management
dareboot - reboot local or remote controller
daroute - display or set gateway address
dasavelog - save the complete log file from the target to the local PC.
daselblk - select a chassis or a hard drive to blink
dasetup - set IP addresses, netmask, gateway and name server
dashutdown - shutdown local or remote controller
dasmartinfo - used to view disk smart information
dasnmp - Add/Delete SNMP managers to send traps to
dastat - display the system information

dastonith - force reboot of remote controller
dasysalert - enable or disable blinking lights
daum - upgrade or manage kernel images
david - manage virtual disks
daversion - display versions of kernel images and boot image

7.7.13 dahost

Use dahost to add or delete host entries from the system.

dahost - define or manage host.

Usage:

```
dahost [Options] [Parameter Options]
```

Options:

-a: add a new entry
-m: modify an entry
-d: delete an entry
-l: print out all the entries

Parameter Options:

-b [type]: 0 is iSCSI, 1 is FC, 2 is SAS
-w [host's WWN]: World Wide Name
-u [user name]: empty by default
-o [host OS type]: 0 is Windows by default, 1 is Linux, 2 is Others
-n [host name]: host name
-i [host ip address]: empty by default
-p [initiator secret]: empty by default
-s [target secret]: empty by default
-t ["comments"]: empty by default

Option Requirements:

option a requires: w and n are mandatory. i,u,p,s and t is optional
option d requires: w or n
option m requires: w are mandatory, u,o,n,i,p,s and t is optional
WWN (-w) can not be changed

Command Examples:

```
dahost -a -w 0x0210000E0802DE2f -b 1 -n server2
```

```
dahost -a -w iqn.test3 -o 0 -n test3 :          add a host
dahost -d -w iqn.test3 :                    delete a host
dahost -d -n test3 :                       delete a host
dahost -a -w iqn.test2 -o 0 -n server2 -t "Server 2": add a host with comments
dahost -m -w iqn.test2 -n newhost :         modify a hostname
dahost -m -w iqn.test2 -t "\"\" :          clear host comments
dahost -m -w iqn.test2 -s "\"\" :          clear target secret
```

7.7.14 dahostname

Use the dahostname to change the system name for the PixelStor 5000 . For those systems that build an iSCSI target name with this name, you must use the `-f` (force) flag to change the name because target names may be affected.

dahostname - display or set hostname for the storage array.

Usage:

```
dahostname [-h | -f] [hostname]
```

Options:

```
-h/help:          display syntax
-f:              force hostname change. This flag must be specified to
                change host name for system supporting multiple
                iSCSI targets.
```

Command Examples:

```
dahostname:          Display current hostname
dahostname -f newhost: Change hostname to newhost
```

7.7.15 dahwstat

Use dahwstat to display the hardware status for the local controller.

dahwstat - show hardware status.

Usage:

```
dahwstat [Options]
```


Options:

-help: display help information
-drives | -drive: show properties of all the drives
-drive [no.]: show properties of a specified drive [0-23]
-chassis: show information of chassis components, including controller ID, second controller installed, Second controller presence, fan readings, temperature readings, voltage readings and battery information
-alert show alert messages if any

Command Examples:

```
dahwstat -alert
dahwstat -drive 0
dahwstat -drives
dahwstat -chassis
```

7.7.16 dainspread

Use dainspread to manage the Inspection Read operation.

dainspread - manage Inspection Read.

Usage:

```
dainspread [Options] [Option Parameters]
```

Options:

-h/-help: Show help information
-start: Immediately start Inspection Read
-stop: Immediately stop Inspection Read
-resume: Immediately start Inspection Read from last inspected block
-schedule: Add, delete or show Inspection Read schedule. When no parameters are provided, -schedule shows the current schedule
-progress: Show the progress of Inspection Read

Option Parameters:

-repeat: Run continuously until dainspread is issued with the stop option or the specified -duration is satisfied.
-cpu [priority]: Set the Inspection Read priority based upon cpu

load [1-3]. Where High is 1, Medium is 2, Low is 3.
The default priority is low unless otherwise specified.

-duration [hours]: The maximum of hours to run [1 - 10000]. Inspection Read will stop after running for the specified number of hours.

-add: Add a new schedule or change the current schedule.

-del: Delete the current schedule.

-sch_resume: Schedule Inspection Read to resume from last inspected block.

-day [Day]: Used to specify the day of week to start Inspection Read [0 - 6], where 0 specifies Sunday.

-hour [hour]: Specifies the hour to start Inspection Read [0 - 23], where 0 specifies midnight.

Option Requirements:

start: repeat, cpu and duration are optional.

stop: no parameters should be specified with stop.

resume: repeat, cpu and duration are optional.

schedule: add or del required. If add, then day and hour are required. sch_resume, repeat, cpu and duration are optional. If del, then no other parameters should be specified.

progress: no parameters should be specified with progress.

Examples:

1. dainspread -start
Start Inspection Read.
2. dainspread -start -repeat
Start Inspection Read and run continuously until dainspread is issued with the -stop option.
3. dainspread -start -repeat -cpu 2 -duration 6
Start Inspection Read at a medium priority and repeat until 6 hours have passed.
4. dainspread -stop
Stop Inspection Read
5. dainspread -resume
Resume Inspection Read from the last inspected block.
6. dainspread -resume -cpu 1
Resume Inspection Read from the last inspected block at a high priority.
7. dainspread -resume -repeat -cpu 2 -duration 6
Resume Inspection Read at a medium priority and repeat until Inspection

- Read has run for 6 hours.
8. `dainspread -schedule`
Show the current Inspection Read schedule.
 9. `dainspread -schedule -add -day 0 -day 1 -hour 23`
Schedule Inspection Read to start every Sunday and Monday at 11 PM.
 10. `dainspread -schedule -add -day 0 -hour 23 -duration 6`
Schedule Inspection Read to start every Sunday at 11 PM and run for 6 hours.
 11. `dainspread -schedule -add -day 0 -hour 23 -duration 6 -sch_resume`
Schedule Inspection Read to resume from the last inspected block every Sunday at 11 PM and run for 6 hours.
 12. `dainspread -schedule -add -day 0 -hour 23 -repeat -cpu 2 -duration 6`
Schedule Inspection Read to start every Sunday at 11 PM at a medium priority and repeat until Inspection Read has run for 6 hours.
 13. `dainspread -schedule -del`
Delete the current Inspection Read schedule.
 14. `dainspread -progress`
Show the progress of the current Inspection Read.

7.7.17 daisns

Use daisns to manage isns registration.

`daisns` - manage iSNS client service

Usage:

`daisns [Options] [Option Parameters]`

Options:

`-h/-help:` help page
`-l/-list:` list iSNS server IP and alias name
`-start:` start iSNS service
`-stop:` stop iSNS service
`-setserver:` save iSNS server ip and alias name
`-delserver:` delete iSNS server ip and alias name
`-display:` display the iSNS server online or offline
`-show:` display whether the iSNS service is started

Parameters:

-addr: iSNS server IP address
-alias: iSNS server alias name

Option Requirements:

option setserver: addr and alias are mandatory.

Comand Examples:

```
daisns -start  
daisns -stop  
daisns -l  
daisns -display  
daisns -setserver -alias test3 -addr 10.4.1.3  
daisns -delserver
```

7.7.18 dakem

Use dakem to display the event log.

dakem - display event log.

Usage:

dakem [Options] [Option parameters]

Options:[-hvEi] [-s severity] [-C n]

-h : help
-v : version
-E : display KEM messages
-i : suppress the special char display
-T : set the alert level for snmptrap/email notification.
valid option parameters are info,warning,critical
-G : get the alert level for snmptrap/email notification

Option Parameters:

-s [severity]: [info][warning][critical][all(default)]
-C [n]: number of messages to be displayed, maximum of 6000

Command Examples

dakem -E: Display the last 256 KEM messages.

```
dakem -E -C 6000:           Display all the KEM messages.
dakem -E -C 6000 -s warning: Display all the KEM message of severity
                           warning and above.
dakem -T warning           Set alert level to warning.
```

7.7.19 dalun

Use `dalun` to manage the lun masking table. This pertains to Virtual Drive presentation.

```
dalun    - manage the lun masking table.
```

Usage:

```
dalun [options] [fields...]
```

Options:

```
-h:          help
-a:          add a new lunmask entry
-d:          delete a lunmask entry. You should log off at
             the host initiator before performing a delete.
             This ensures the host has sent all data to
             the storage array.
-p:          print out all the existing lunmask entries
```

Required fields:

```
-n [host]
-g [disk_group_name]
-k [virtual_disk_name]
-P [parent_virtual_disk_name]
```

Notes:

The `-P parent_virtual_disk_name` is only required if the virtual disk presented is a snapshot virtual disk.

Command Examples:

```
dalun -a -n host1 -g dg1 -k vd1:
           presents virtual disk vd1 in disk group dg1
           to host1
```

```
dalun -d -n host1 -g dg1 -k vd1:
    un-present virtual disk vd1 in disk group dg1
    from host1.
```

```
dalun -d -n host2 -g dg1 -k snap1 -P vd1:
    un-present snapshot snap1 of virtual disk vd1
    in disk group dg1 from host2
```

7.7.20 dantpdate

Use dantpdate to configure an NTP server.

dantpdate - Configure NTP servers

Usage:

```
dantpdate [Options]
```

Options:

```
-help                help
-list                list current NTP servers
-add hostName/IPAddress  add a NTP server to list
-del hostName/IPAddress  delete a NTP server from list
-sync                synchronize the system clock on both
                    controllers with the NTP server
```

Command Examples:

```
dantpdate -help        display this help page
dantpdate -list        list current list of NTP servers
dantpdate -sync        synchorinize the system clock on both
                    controllers with the NTP server
dantpdate -add myntpserver  add myntpserver to the list of NTP servers
dantpdate -del 65.78.1.1  delete 65.78.1.1 from the list of NTP servers
```

7.7.21 dapasswd

Use dapasswd to change the passwords on the system.

dapasswd - set the password for the user.

Usage:

```
dapasswd [Options] [Option Parameters]
```

Options:

```
-help:          display help page
-p:             new passwd
```

Option Parameters:

```
username:      Specify username. It is mandatory.
```

Command Examples:

```
dapasswd -p passwd John:  sets password for a user John
```

7.7.22 daphyinfo

Use daphyinfo to get Expander (PixelStor 100e) phy status information for the local controller.

```
daphyinfo          - get expander phy information
```

Usage:

```
daphyinfo [Options]
```

Options:

```
-s:             get expander phy status information
-l:             get error log information for phy
-c:             clear error log information for phy
-e:             specify the expander to get the information:
                rs -- RAID System (main chassis)
                eeN -- expander enclosure, N is the enclosure
                    number starting from 0
                    (default is all expanders)
-p:             specify the phy number to get the information
                (default is all phys)
-h:             display this help information
```

Required options: -s or -l

Command Examples

```
daphyinfo -s -e rs -p 2
daphyinfo -l -e ee3
daphyinfo -s
```

7.7.23 dareboot

Use **dareboot** to reboot the local or remote controller. If no parameters are specified, **dareboot** will reboot the local controller.

```
dareboot - reboot local or remote controller.
```

Usage:

```
dareboot
dareboot [Options]
```

Options:

```
-help:          help
-local:         reboot local controller
-remote:       reboot remote controller
```

Command Examples:

```
dareboot -help
dareboot
dareboot -local
dareboot -remote
```

Notes:

The "dareboot" without any option has the same effect as "dareboot -local".

7.7.24 dashutdown

Use **dashutdown** to shutdown the local or remote controller. If local or remote are not specified, **dashutdown** operates on the local controller.

dashutdown - shutdown local or remote controller.

Usage:

dashutdown [Options] [Option parameters]

Options:

local: shutdown local controller.
Default is local controller
remote: shutdown remote controller

Option Parameters:

-t [seconds]: execute at now plus seconds specified
now: shutdown now

Notes:

dashutdown requires a time be specified, either "now" or -t <seconds>.

7.7.25 dasmartinfo

Use dasmartinfo to save the smart data from all of the non-faulty disks to the file /tmp/smartinfo.log. This command requires no options.

Usage:

dasmartinfo - used to view disk smart information

7.7.26 daroute

Use daroute to display or set the gateway IP address.

daroute - display or set the gateway address.

Usage:

daroute [Options] [{add | del} default gw <gwIPAddr>]

Options:

-h: help

Option Parameters:

add: add a default gateway
del: delete default gateway

<gwIPAddr>: gateway IP address to add or delete
Command Examples:
daroute add default gw 192.168.123.254

7.7.27 dasavelog

Use `dasavelog` to save the controller logs to the `/pub/` directory. managers

`dasavelog` - Save complete logs from the target to the local PC.

Usage:

```
dasavelog [Options]
```

Options:

`-s`: Creat and save the `logyymddhmmss.zip` file to `/pub/`
User can use `ftp` from a client machine to retrieve this file.
Please log in as an anonymous user, and get this file directly.

`-h/-help`: help page

7.7.28 daselblk

Use `daselblk` to select a chassis or hard drive to blink its LED(s). The selected item will flash its Red LED(s). If a single drive is selected, only one LED will flash. If a chassis is selected, all 12 Red LEDs will flash. Select the “-i” option to list the names of the selectable items.

`daselblk` - select a hardware item to blink

Usage:

```
daselblk [Options]
```

Options:

`-s [item]`: specify the hardware item to blink
`-o [blink/cancel]`: blink or cancel the blink
`-i`: list all available hardware items, which can be selected

```
-f:          find the hardware item selected to blink
-h:          help information
```

Required options: -s, -o

Command Examples

To blink a hard drive in slot 4 on RAID System (main chassis):

```
daselblk -s hdm4 -o blink
```

To blink the Expansion Enclosure-0:

```
daselblk -s ee0 -o blink
```

7.7.29 dasetup

Use `dasetup` to assign the IP addresses, netmask, gateway and dns servers for the PixelStor system. This command may automatically start when you log into the Serial Port for the first time. Invoke this command whenever a NIC port IP address needs to be changed. The output of the `dasetup` command is shown below. Refer to the PixelStor 5000 Quick Start Guide for additional setup information.

```
dasetup V2.7 is running for a dual controller system.
```

This wizard will walk you through the network configuration.

You can configure the rest of the system using the web GUI.

The default values are in the bracket, you can press "Enter" to

select the default value. If you make any mistake, you can

press "ctrl-c", then logout and login to run this wizard again.

Items with optional values are:

```
dedicated management port: [yes,no]
```

```
mtu: [1500, 9000]
```

```
NIC IP: [a.b.c.d, dhcp, disable]
```

```
Configure NIC1 as dedicated management port [no]:
```

```
Enter IP address for system [192.168.0.1]:
```

```
Enter netmask [255.255.255.0]:
```

```
Enter mtu [1500, 9000]:
```

```
Enter C0 NIC1 IP [ ]:
```

```
Enter C0 NIC2 IP [ ]:
```

```
Enter C0 NIC3 IP [ ]:
```

```
Enter C0 NIC4 IP [ ]:  
Enter C0 NIC5 IP [ ]:  
Enter C1 NIC1 IP [ ]:  
Enter C1 NIC2 IP [ ]:  
Enter C1 NIC3 IP [ ]:  
Enter C1 NIC4 IP [ ]:  
Enter C1 NIC5 IP [ ]:  
Enter default gateway IP [ ]:  
Enter DNS address for system [ ]:
```

7.7.30 dashutdown

Use dashutdown to shutdown the local or remote controller.

dashutdown - shutdown local or remote controller.

usage:

```
dashutdown [Options] time
```

Options:

```
-help:      help  
-local:     shutdown local controller. This is by default.  
-remote:    shutdown remote controller
```

The time argument is mandatory. It specifies the number of minutes to wait before shutdown happens. "now" indicates immediate shutdown.

Command Examples:

```
dashutdown -help:      display usage page  
dashutdown now:       shutdown the local controller now  
dashutdown -remote 10: shutdown the remote one after 10 minutes
```

7.7.31 dasnmp

Use dasnmp list, add or delete SNMP managers

dasnmp - Add/Delete SNMP managers to send traps to.

Usage:

dasnmp [Options]

Options:

-h/--help: help
-L/--list: list all SNMP managers
-a/--add [address]: add a SNMP manager with/without community
-d/--delete [address]: delete a SNMP manager
-c [community string]: community string of a SNMP manager
-i/--inform [0, 1]: set to informed(1) or non-informed(0) SNMP trap

Option Requirements:

option c requires: a

Command Examples:

dasnmp -a 192.168.1.1: add a SNMP manager without community
dasnmp -a 10.0.0.1 -c pub: add a SNMP manager with community "pub"
dasnmp -d 10.0.0.1: delete a SNMP manager
dasnmp -i 1: set to informed SNMP trap

7.7.32 dastat

Use dastat to display status information for the local controller.

dastat - display the system information.

Usage:

dastat
dastat -help

7.7.33 dastonith

Use dastonith to force a reboot on the remote controller. Make sure a "dastonith 0" command is executed soon after the "dastonith 1" command, otherwise the remote controller will not reboot.

dastonith - force reboot of remote controller

Usage:

```
dastonith [-h/help] [0/1]
```

Options:

```
-h/help:      print this help page.
1:           set the stonith condition to the remote controller.
0:           release the stonith condition to the remote controller.
```

Command Examples:

```
dastonith 1
dastonith 0
```

Notes:

To stonith the remote controller, issue the dastonith commands in the following sequence.

```
dastonith 1
dastonith 0
```

The remote controller will reboot after you issue dastonith 0.

7.7.34 dasysalert

Use dasysalert to display system Health Alert setting or to change setting - enable or disable. There are two components in the system Health Alert mechanism. Red LEDs on the hard drives blink 3 times when there is a system Health Alert in the specific chassis. Disabling system Health Alerts only turns off the blinking red LEDs and the red Alert! Indication in the GUI. This command does not affect the health messages viewable on the system health page or in the system logs.

```
dasysalert - turn on/off system alert
```

Usage:

```
dasysalert [-h] [on | off]
```

Options:

```
-h:           help and print this page
-s/-show:    the current status, 'on' or 'off'
```

On: turn on system alert
Off: turn off system alert

Command Examples:

```
dasysalert on
dasysalert off
dasysalert -show
```

7.7.35 daum

Use daum to upgrade or manage kernel images.

daum - upgrade or manage kernel images.

Usage:

```
daum [Options]
```

Options:

```
-h/--help:            help information
-i/--info:            display information about the system images,
-s/--switch:          switch the image pointer for next boot operation
-y/--sync:            synchronize current and backup images
-n URL/--new URL:     upgrade with a new system image
-v                    show version information of daum
```

Option Requirements:

URL is in the following format:

```
username:passwd@ip_address/path_name/file_name
```

The host specified with 'ip_address' must be an FTP site. If the FTP server accepts an 'anonymous' user, the 'username:passwd' can be omitted.

Command Examples

```
daum -n joe:passwd@192.168.1.1/images/newkdi
daum -n 192.168.1.1/pub/kdi.0.1
```

7.7.36 `davd`

Use `davd` to manage the Virtual Disks of each Disk Group.

`davd` - manage virtual disks.

Usage:

```
davd [Options] [Parameter Options]
```

Options:

```
-h:                help
-help:            help
-L [virtual-disk name]:  list virtual-disk information
-a [virtual-disk name]:  create a data virtual disk
-d [virtual-disk name]:  delete a virtual disk
-e [virtual-disk name]:  expand a virtual disk
-c [virtual-disk name]:  change a virtual-disk parameter
```

Parameter Options:

```
-g [disk-group name]:  disk group containing the virtual disk
-s [size]:             size in MB. Append G or g, T or t for GB, TB
-m [cache policy]:    [0, 1, 2] for auto, write-through, write-back
-r [read ahead policy]: [0, 1] for enable, disable
-n [virtual-disk name]: new virtual-disk name
-f:                   force deletion of virtual disk
                    force name change of virtual disk
-io_stat:             extra information on IO stat
-io_stat_perf:        extra information on IO performance(default interval
is 5 seconds)
-interval [seconds]:  interval seconds with option io_stat_perf
```

Option Requirements:

```
option L requires:    g
option a requires:    g, s, m, r
option d requires:    g, f
option e requires:    g, s
option c requires:    g, one of (n,f), m, r
```

Option Notes:

```
option e:             -s [size] specifies the capacity increment
option c:             Name changes (-n option) require the -f option,
```


Command Examples:

```
davd -help
davd -L lv1 -g dg1
davd -L lv1 -g dg1 -io_stat
davd -L lv1 -g dg1 -io_perf
davd -L lv1 -g dg1 -io_perf -interval 5
davd -a lv1 -g dg1 -s 10240 -m 2 -r 0
davd -a lv1 -g dg1 -s 10G -m 2 -r 1
davd -d lv1 -g dg1 -f
davd -e lv1 -g dg1 -s 8192
davd -e lv1 -g dg1 -s 8G
davd -c lv1 -g dg1 -m 1
davd -c lv1 -g dg1 -r 1
davd -c lv1 -g dg1 -n lv1new -f
```

7.7.37 daverasion

Use **daverasion** to display version information of the kernel images (KDI) and other components of the PixelStor 5000 system.

daverasion - displays the boot image and kdi versions.

Usage:

```
daverasion [Options]
```

Options

```
-h/--help:      help information
local:          print out version information of local controller
remote:        print out version information of remote controller
```

Command Examples:

```
daverasion -help
daverasion
daverasion local
daverasion remote
```