PROMISE® TECHNOLOGY, INC.

VTRAK
E-Class
E830f/i, E630f/i
PRODUCT MANUAL

Version 1.1

Copyright

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Recommendations

In this *Product Manual*, the appearance of products made by other companies, including but not limited to software, servers, and disk drives, is for the purpose of illustration and explanation only. PROMISE Technology does not recommend, endorse, prefer, or support any product made by another manufacturer.

Contents

Chapter 4: Management with WebPAM PROe, cont.

Chapter 1: Introduction

This chapter covers the following topics:

About This Manual

This *Product Manual* describes how to setup, use, and maintain the VTrak E830f, E830i, E630f, and E630i external disk array subsystems. It describes how to use the:

- Built-in command-line interface (CLI)
- Built-in command-line utility (CLU)
- Embedded Web-based Promise Array Management – Professional (WebPAM PROe) software.

This manual includes a full table of contents, index, chapter task lists and numerous cross-references to help you find the specific information you are looking for.

Also included are four levels of notices:

Warning

A *Warning* notifies you of probable equipment damage or loss of data, or the possibility of physical injury, and how to avoid them.

Caution

A *Caution* informs you of possible equipment damage or loss of data and how to avoid them.

Important

An *Important* message calls attention to an essential step or point required to complete a task, including things often missed.

Note

A *Note* provides helpful information such as hints or alternative ways of doing a task.

VTrak Overview

The PROMISE VTrak Ex30 series support for 6 Gb/s SAS and SATA disks and a next-generation embedded storage I/O processing platform out to set a new performance standard while providing a reliable, flexible and easy to manage RAID storage system.

The VTrak E830f and E630f are coupled with high speed 8 Gb/s Fibre Channel host connectivity.

The VTrak E830i and E630i are coupled with high speed 1 Gb/s iSCSI host connectivity.

Performance

The PROMISE VTrak Ex30 series is built using the Intel's next-generation storage platform, the Intel Xeon processor C5500/C3500 series to keep pace with performance demands with four data ports per RAID controller and support for 6 Gb/s SAS and SATA hard disk drives and solid state drives. Delivered in a Storage Bridge Bay (SBB) 2.0 compliant package, the Ex30f offers the full redundancy that is expected of an enterprise solution. Dual active-active controller modules with cache mirroring over a PCIe Gen 2 link allow for redundant data paths to ensure data availability while dual power supply/cooling units minimize downtime and any disruption to business continuity.

GreenRAID

PROMISE cares about the environment. VTrak products utilize environmentally friendly production methods and materials and are designed with high-efficiency in mind. Powered by 80Plus certified power supplies that offer up to 85% power efficiency, all VTrak Ex30 products improve total cost of ownership by conserving power, reducing heat output and improving cooling costs. Additionally, the PROMISE as GreenRAID story includes advanced power management support for hard disk drives providing up to 65% energy savings.

Service and Support

Every VTrak Ex30 subsystem is backed by the PROMISE Three-Year limited warranty with 24-hour, 7-day telephone and e-mail support. In addition to our

industry leading warranty, PROMISE offers extended warranty and onsite parts replacement options with service levels with response times as low four hours.

Architectural Description

The VTrak Ex30 series subsystems are suitable for Direct Attached Storage (DAS), Storage Area Network (SAN), and Expanded Storage.

Model	RAID Controllers	Drives Supported	Rack Units
VTE830fS, VTE830iS	1	24	4U
VTE830fD, VTE830iD	2	24	4U
VTE630fS, VTE630iS	1	16	3U
VTE630fD, VTE630iD	2	16	3U

Figure 1. VTrak E830f/i front view

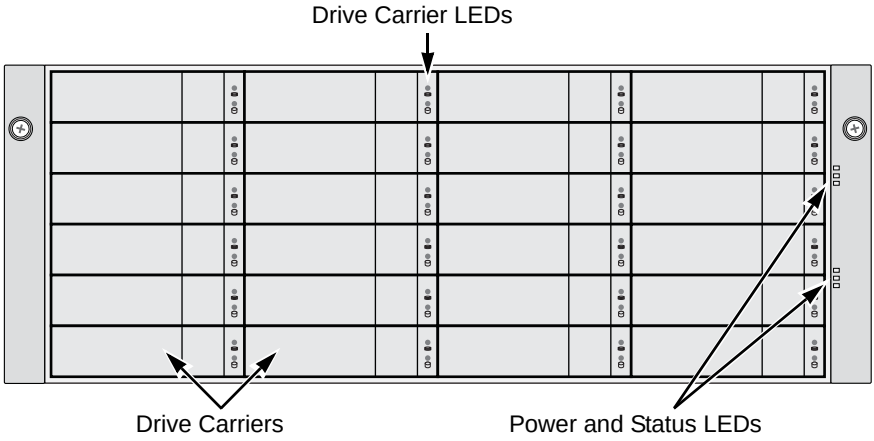


Figure 2. VTrak E630f/i front view

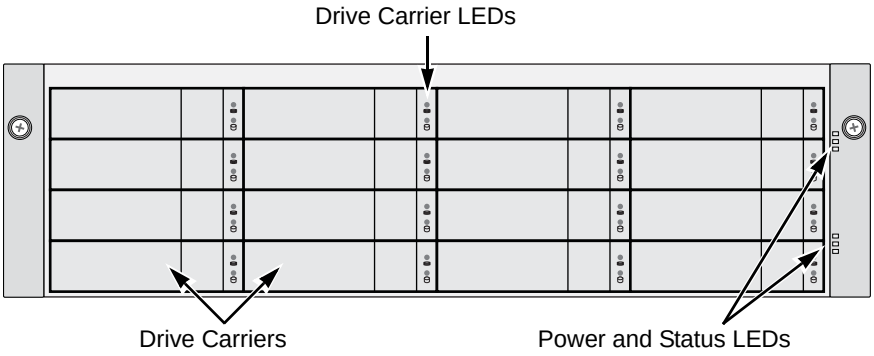


Figure 3. VTrak E830f back view

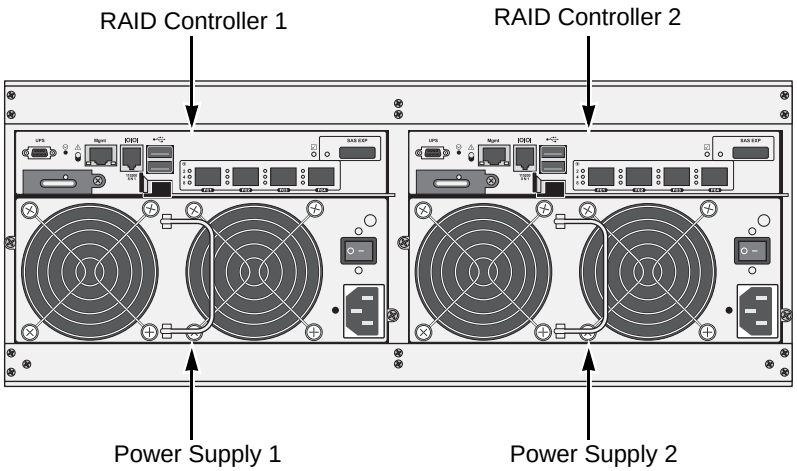


Figure 4. VTrak E630f back view

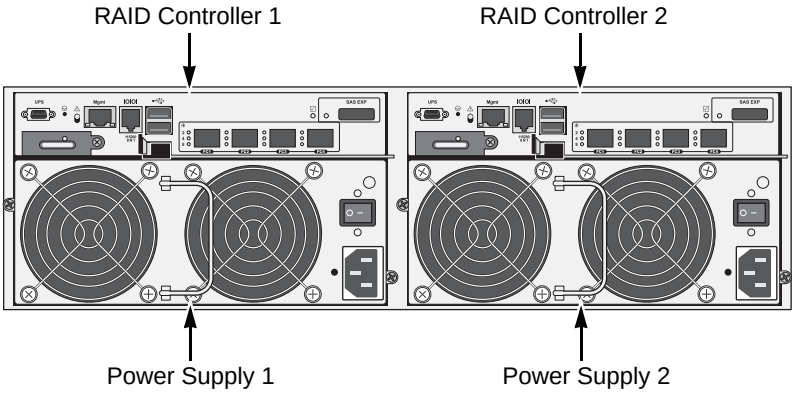


Figure 5. VTrak E830i back view

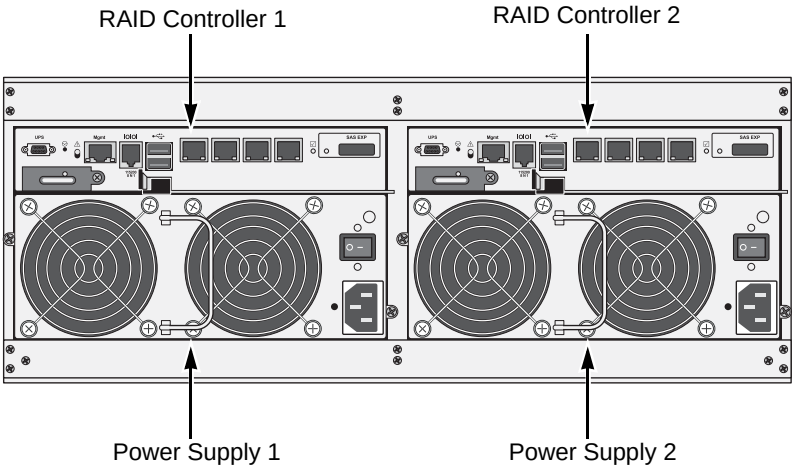
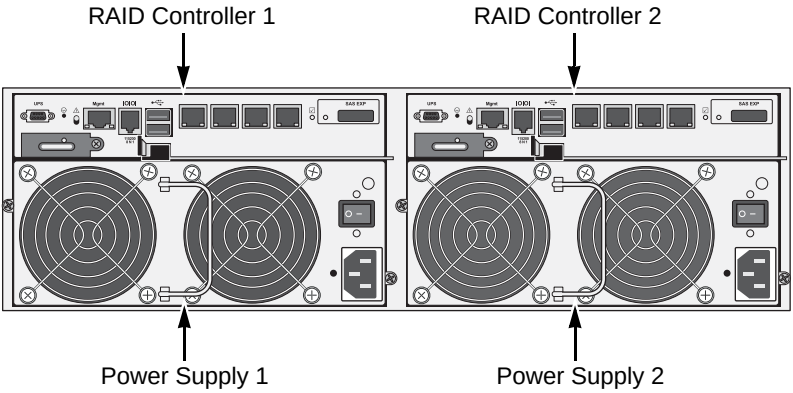


Figure 6. VTrak E630i back view



Features

Controller Module Features

Drive Support

- 3.5-inch and 2.5-inch form factor
- Hard disk drives (HDDs) and Solid State drives (SSDs)
- SAS, 6 Gb/s and 3 Gb/s
- SATA, 6 Gb/s and 3 Gb/s
- Supports any mix of SAS and SATA drives simultaneously in the same enclosure

  For a list of supported drives, go to PROMISE support: http://www.promise.com/support/

  SATA physical drives require a SAS-to-SATA adapter, available from PROMISE.

External I/O Ports per Controller

- E830f and E630f: Four 8 Gb/s Fibre Channel ports, compatible with 4 Gb/s and 2 Gb/s
- E830i and E630i: Four 1 Gb/s iSCSI ports
- All models: One external SAS port with an SFF-8088 SAS connector, supports up to 7 cascading JBOD expansion units

Data Cache

- 2 GB data cache per controller.
  A portion of the data cache is shared with the controller firmware
- Protected with hot-swappable battery backup unit (BBU)

Operational Features

RAID Level Support

- 0, 1, 1E, 5, 6, 10, 50, and 60

RAID Stripe Size Support

- 64K, 128K, 256K, 512K, and 1MB

Hot Spare Drives

- Global
- Dedicated
- Revertible option

Maximum LUNs Supported

- LUNs: 1024
- Array: 32

Advanced Storage Features

- Advanced Cache Mirroring over PCIe Gen2
- Simple, drag-and-drop LUN Masking and Mapping
- Asymmetric LUN Unit Access (ALUA)
- Volume Copy
- PerfectFlash - Non-Disruptive Software Update
- I/O performance & power monitoring tools
- Guaranteed Latency Technology (an advanced OEM feature)
- USB Service Log
- LDAP Support for central user management

Background Activities

- Media Patrol
- Background Synchronization
- Foreground Initialization
- Rebuild
- Redundancy Check

- Disk SMART Polling
- Online Capacity Expansion (OCE)
- RAID Level Migration (RLM)
- UPS Monitoring
- Feature rich task scheduler for background activities

PerfectRAID Features

- Predictive Data Migration (PDM)
- Intelligent Bad Sector Remapping
- SMART Error Handling
- NVRAM Error Logging
- Disk Slot Power Control
- Read/Write Check Table
- Write Hole Table

GreenRAID Features

- Four levels of advanced power management disk drive (MAID) support
- Efficient 80Plus Bronze Certified power supplies

System Management

Management Interfaces

- Browser-based management with WebPAM PROe over Ethernet
- Command Line Interface (CLI) over Serial Port, Ethernet via Telnet, or SSH
- Command Line Utility (CLU) over Serial Port, Ethernet via Telnet, or SSH
- Third Party Management Support via SNMP and CIM

Supported Operating Systems

Operating systems run on the Host PC, from which you monitor and manage the VTrak subsystem.

Supported Operating Environments		
Core Platform	**Type**	**Notes**
Microsoft		
Windows Server 2008 with SP2	x86/x64	ALUA support with PerfectPath v4.00 or later
Windows Server 2008 Hyper-V with SP2	x64	
Windows Server 2008 R2	x64	
Oracle		
Enterprise Linux 5.3	x64	No LUN Affinity/ALUA support
Enterprise Linux 5.5	x64	LUN Affinity/ALUA natively supported
RedHat		
Enterprise Linux 5.3	x86/x64	No LUN Affinity/ALUA support
Enterprise Linux 5.4	x86/x64	LUN Affinity/ALUA natively supported
Enterprise Linux 5.5	x86/x64	
SuSE		
Linux Enterprise Server 10.2	x86/x64	LUN Affinity/ALUA natively supported
Linux Enterprise Server 10.3	x86/x64	
Enterprise Server 11	x64	
VMware		
ESX Server v4.0 Update 2	x64	LUN Affinity/ALUA natively supported
ESX Server v4.1	x64	
ESX Server has been qualified by PROMISE and then certified by VMware to be compatible with VTrak. For the latest list of supported operating systems, go to PROMISE support: http://www.promise.com/support/		

Supported Browsers

Browsers run on the host PC or server, from which you monitor and manage the VTrak subsystem using WebPAM PROe. The browsers listed here meet the minimum version requirements for browser compatibility:

- Internet Explorer – 8.0.7600.16385
- Firefox for Windows – 3.6.13
- Firefox for RHEL – 3.0.18
- Firefox for SLES 11.1 – 3.5.9
- Safari for MacOS – 4.0.5 (6531.22.7)
- Safari for Windows – 5.0.2 (7533.18.5)

For the latest list of supported browsers, go to PROMISE support: http://www.promise.com/support/

General Specifications

Power Supplies

- 4U/24 Bay: Dual 750W, 100-240 Vac auto-ranging, 50-60 Hz, dual hot swap and redundant with PFC, N+1 design. Meets 80Plus bronze.
- 3U/16 Bay: Dual 580W, 100-240 Vac auto-ranging, 50-60 Hz, dual hot swap and redundant with PFC, N+1 design. Meets 80Plus bronze.

Voltage

- 100-240 VAC
- Auto-Ranging

Current (Maximum)

- 10 A @ 100 VAC
- 5 A @ 200 VAC

Power Conversion Efficiency

- >80% @ 110V (>20% load)
- >80% @ 240V (>20% load)

Operating Environment

Temperature Range

- Operational: 5° to 35°C (41° to 95°F)
- Non-Operational: -40° to 60°C (-40° to 140°F)

Humidity Range

- Operational: 10% to 90% (Non-Condensing)
- Non-Operational: 5% to 95% (Non-Condensing)

Noise, Shock, and Vibration

Acoustic Noise Levels

- Typical: 55 dB
- Maximum: 65 dB

Shock

- Operational: 5G, 11 ms duration
- Non-Operational: 10G, 11ms duration

Vibration

- Operational: 0.3G, 5 to 500 Hz
- Non-Operational: 1G, 5 to 500 Hz

Dimensions

(Height, Width, Depth)

- 4U/24 Bay: 17.4 x 44.7 x 50.7 cm (6.9 x 17.6 x 19.96 in)
- 3U/16 Bay: 13.1 x 44.7 x 50.7 cm (5.2 x 17.6 x 19.96 in)

Weight

- 4U/24 Bay: 27 kg / 60 lbs (w/o drives)
- 3U/16 Bay: 25 kg / 56 lbs (w/o drives)

Safety and Environmental

EMI/RFI Statements

BSMI

警告使用者：

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

CE

Warning: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC

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

GOST-R

Предупреждение. Данный продукт относится к классу А. В домашних условиях он может быть причиной возникновения радиопомех, в этом случае пользователю, возможно, потребуется принять соответствующие меры.

KCC

A 급 기기 (업무용 방송통신기기)

이 기기는 업무용(A 급)으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이점을 주의하시 기 바라며, 가정 외의 지역에서 사용하는 것을 목적으로 합니다.

VCCI

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Environmental Standards

- RoHS
- GreenPC
- WEEE

Warnings and Cautions

Warnings and Cautions are placed in this *Product Manual* beside the user actions to which they apply.

You can find these warnings and cautions under:

- “Unpacking the VTrak” on page 15
- “Mounting VTrak in a Rack” on page 17
- “Installing Your Drives” on page 22
- “Logging onto a Subsystem” on page 75
- “Restoring Factory Default Settings” on page 78 and page 306
- “Importing a Configuration Script” on page 82
- “Exporting a Configuration Script” on page 82
- “Reconditioning a Battery” on page 90 and page 223
- “Silencing the Buzzer” on page 91, page 313, and page 376
- “Making Virtual Management Port Settings” on page 100 and page 250
- “Importing a User Database” on page 106
- “Changing a Background Activity Schedule” on page 116 and
- “Enabling or Disabling a Scheduled Background Activity” on page 117
- “Battery Reconditioning” on page 123 and page 223
- “Forcing a Physical Drive Offline” on page 146 and page 227
- “Deleting a Disk Array” on page 156 and page 233
- “Deleting a Logical Drive” on page 166 and page 243
- “Initializing a Logical Drive” on page 167 and page 245
- “Deleting an FC Initiator” on page 178 and page 279
- “Updating with WebPAM PROe” on page 315
- “Updating with the CLU” on page 317
- “Updating with USB Support” on page 319
- “Updating Physical Drive Firmware” on page 321
- “Replacing a Cache Backup Battery” on page 324
- “Replacing a RAID Controller – Single Controller” on page 327
- “Initialization” on page 354

- “USB Support Reports a Problem” on page 390
- “Unsaved Data in the Controller Cache” on page 398

Warranty and Support

Warranty

- Three year complete system limited warranty with advanced parts replacement
- Optional extended warranty
- Optional onsite parts replacement program

Support

- 24 hour, 7 days a week, 365 days a year e-mail and phone support (English only)
- 24 hour, 7 days a week, 365 days a year access to PROMISE support site
- Firmware and compatibility lists

Chapter 2: Installation

This chapter covers the following topics:

Unpacking the VTrak

The VTrak box contains the following items:

- VTrak Unit
- Left and right mounting rails
- RJ11-to-DB9 serial data cable
- Screws for physical drives (for VTraks that ship without drives)
- 1.5m (4.9 ft) Power cords (2)

Warning

The electronic components within the VTrak enclosure are sensitive to damage from Electro-Static Discharge (ESD). Observe appropriate precautions at all times when handling the VTrak or its subassemblies.

Cautions

- There is a risk of explosion if battery is replaced by an incorrect type.
- Dispose of used batteries according to the instructions.

Important

Existing VTrak J330s, J630s, or J830s JBOD expansion units require two critical updates to support the VTrak E630f/i and E830f/i RAID subsystems:

- If you have SATA physical drives, replace the existing AMUX adapters with the new SAS-to-SATA adapters, available from PROMISE Technology at http://www.promise.com
- Download the latest firmware image file available from PROMISE support: http://www.promise.com/support/ and flash your existing VTrak JBOD units. Follow the instructions in “Chapter 6: Maintenance” on page 315.

Mounting VTrak in a Rack

Cautions

- Do not install the VTrak unit into a rack without rails to support the subsystem.
- Do not lay one VTrak unit on top of another. Mount each enclosure supported by its own set of rails.
- Only a qualified technician who is familiar with the installation procedure should mount and install the VTrak unit.
- Be sure all switches are OFF before installing the VTrak unit or exchanging components.
- Mount the rails to the rack using the appropriate screws and flange nuts, fully tightened, at each end of the rail.
- Do not load the rails unless they are installed with screws as instructed.
- The rails that ship with the PROMISE VTrak unit are designed to safely support that PROMISE VTrak unit when properly installed. Additional loading on the rails is at the customer's risk.
- PROMISE Technology, Inc. cannot guarantee that the mounting rails will support your PROMISE VTrak unit unless you install them as instructed.
- Verify that the maximum ambient temperature in the rack system is less than the VTrak's maximum environment temperature. See page 10.
- Verify that there is ample airflow around the VTrak unit.
- Install all of your devices in the rack with their weight spread as evenly as possible.
- Determine the maximum amperage draw of all devices in the rack and verify that it is less than the maximum amperage for the rack's power circuit. See page 10.
- Verify that all devices in the rack are properly grounded, especially any devices attached to power strips.

Note

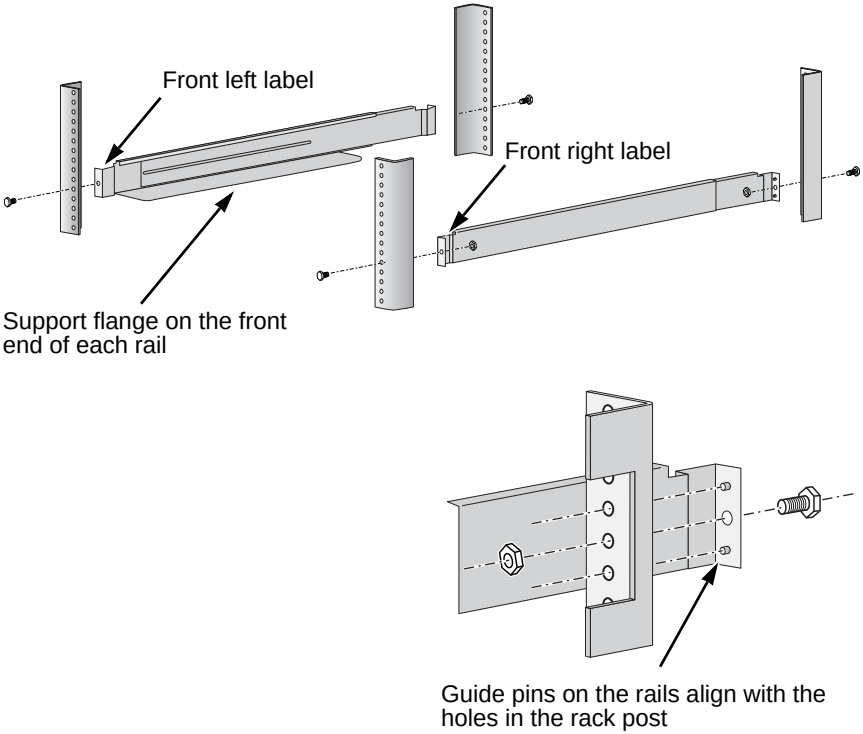
To lighten the VTrak enclosure, remove the power supplies. If your VTrak shipped with physical drives installed, remove all of the drive carriers, also.

Mounting rails are included with the VTrak.

To install the VTrak subsystem into your rack:

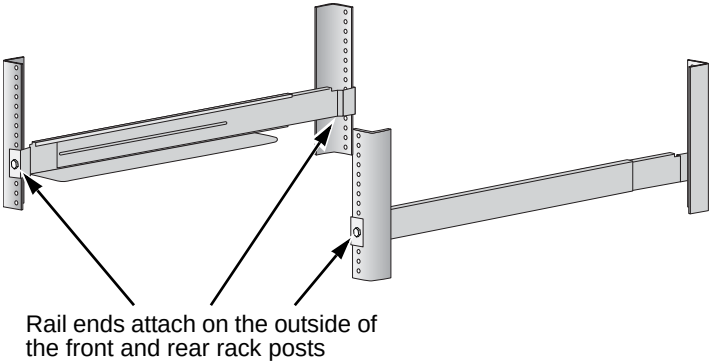
1. Attach the mounting rail assemblies to the rack posts, using screws and nuts from your rack system.
   - The rail halves are riveted together and use no adjustment screws.
   - The front-left and front-right mounting rail ends are labeled.

Figure 1. Installing the rails onto your rack



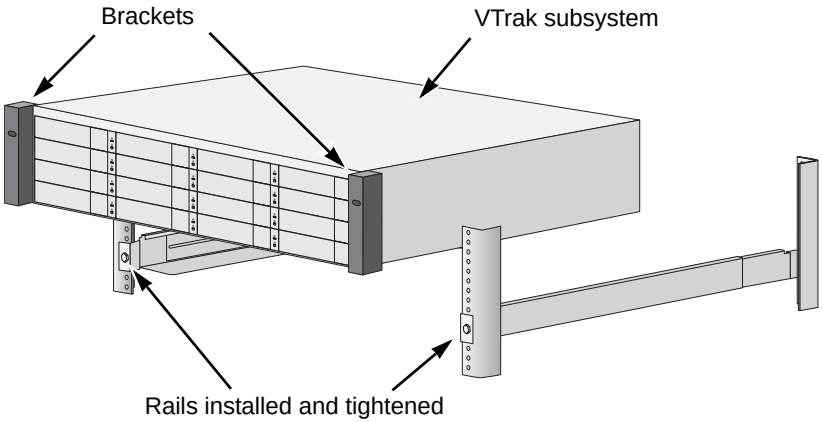
   - All rail ends, front and rear, attach at the outside of the rack posts.
   - The guide pins at the rail ends align with the holes in the rack posts.
   - Tighten the screws and nuts according to instructions for your rack system.

Figure 2. Rail ends attach to the outside of each post



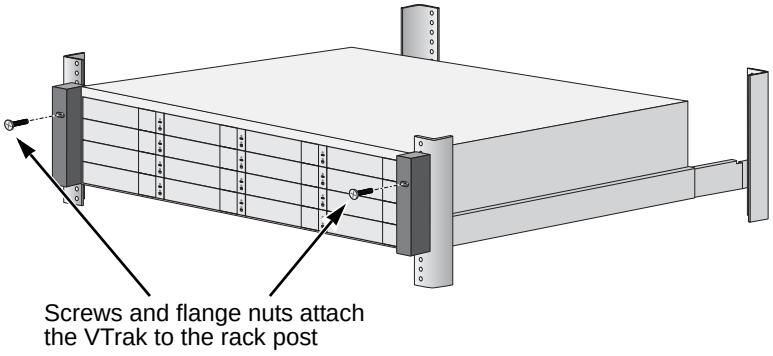
2. Place the VTrak subsystem onto the rails.
   - At least two persons are required to safely lift the VTrak.
   - Lift the VTrak subsystem itself. Do not lift the VTrak by its brackets.

Figure 3. Placing the VTrak subsystem onto the rack rails



3. Secure the VTrak subsystem to the rack.
   - The VTrak attaches to the rack posts using the included screws and flange nuts.
   - Use the attaching screws and flange nuts that came with the VTrak.

Figure 4. Placing the VTrak subsystem onto the rack rails



Installing Physical Drives

If your VTrak subsystem shipped with the drives installed at the factory, you can skip this section and go to “Making Management and Data Connections” on page 25.

The VTrak Ex30 RAID subsystems and JBOD expansion units support:

- SAS and SATA physical drives
- 2.5-inch and 3.5-inch physical drives
- Hard disk drives (HDD) and solid state drives (SSD)

For a list of supported physical drives, download the latest compatibility list from PROMISE support: http://www.promise.com/support/.

Number of Drives Required

The table below shows the number of drives required for each RAID level.

Level	Number of Drives		Level	Number of Drives
RAID 0	1 or more		RAID 6	4 to 32
RAID 1	2 only		RAID 10	4 or more*
RAID 1E	2 or more		RAID 50	6 or more
RAID 5	3 to 32		RAID 60	8 or more
* Must be an even number of drives.				

Drive Slot Numbering

You can install any suitable disk drive into any slot in the enclosure. The diagram below shows how VTrak’s drive slots are numbered. Slot numbering is reflected in the WebPAM PROe and CLU user interfaces.

Figure 5. VTrak E830f/i drive slot numbering

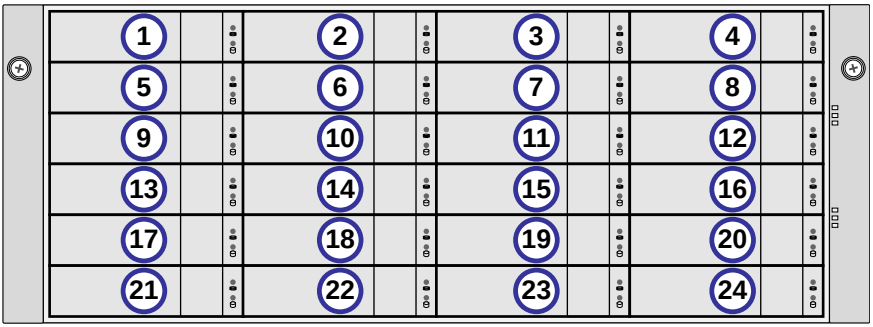
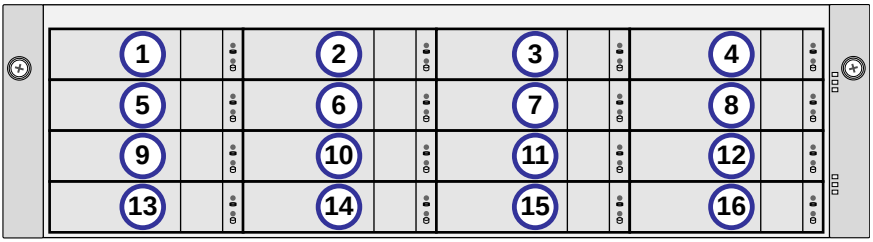


Figure 6. VTrak E630f/i drive slot numbering



Install all of the drive carriers into the VTrak enclosure to ensure proper airflow, even if you do not populate all the carriers with physical drives.

Installing Your Drives

The VTrak drive carrier accommodates 2.5-inch and 3.5-inch drives, with or without a SAS-to-SATA adapter.

Cautions

- Swing open the drive carrier handle before you insert the drive carrier into the enclosure.
- To avoid hand contact with an electrical hazard, remove only one drive carrier a time.

Important

SATA drives require a SAS-to-SATA adapter, available from PROMISE Technology at http://www.promise.com

SAS drives do not require adapters.

1. Press the drive carrier release button.

   The handle springs open.
2. Grasp the handle and gently pull the empty drive carrier out of the enclosure.

Figure 7. Drive carrier front view

3. If you are installing SATA drives, attach a SAS-to-SATA adapter onto the power and data connectors of each drive.
4. Carefully lay the drive into the carrier with the power and data connectors facing away from the carrier handle.
5. Position the drive in the carrier so the mounting holes line up.
   - 2.5-inch drive mounting screws go through the bottom of the carrier.
   - SAS-to-SATA adapter mounting screws go through the bottom of the carrier.
   - 3.5-inch drive mounting screws go through the sides of the carrier.

Figure 8. Drive carrier bottom view

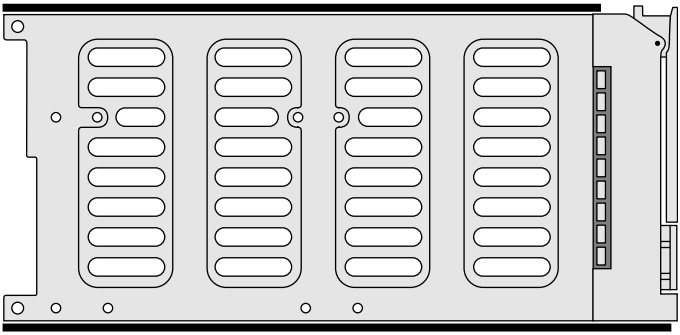


Figure 9. Drive carrier side view

6. Insert the screws through the proper holes in the carrier and into the drive or adapter.
   - Use the screws supplied with the VTrak or the SAS-to-SATA adapter.
   - Install four screws per drive.

- Install two screws per adapter.
- Snug each screw. Be careful not to over tighten.

7. With the drive carrier handle in open position, gently slide the drive carrier into the enclosure.

Important

- Press the release button to push the drive carrier into position. Do not push the handle. See page 23, Figure 7.
- Proper drive installation ensures adequate grounding and minimizes vibration. Always attach the drive to the carrier with four screws.

Making Management and Data Connections

Examples of VTrak configurations include:

- Fibre Channel SAN (below)
- Fibre Channel DAS (page 28)
- Fibre Channel with JBOD Expansion (page 30)
- Fibre Channel SAN – No Single Point of Failure (page 31)
- iSCSI Storage Area Network (SAN) (page 34)
- iSCSI Direct Attached Storage (DAS) (page 37)
- iSCSI with JBOD Expansion (page 39)

Fibre Channel SAN

Important

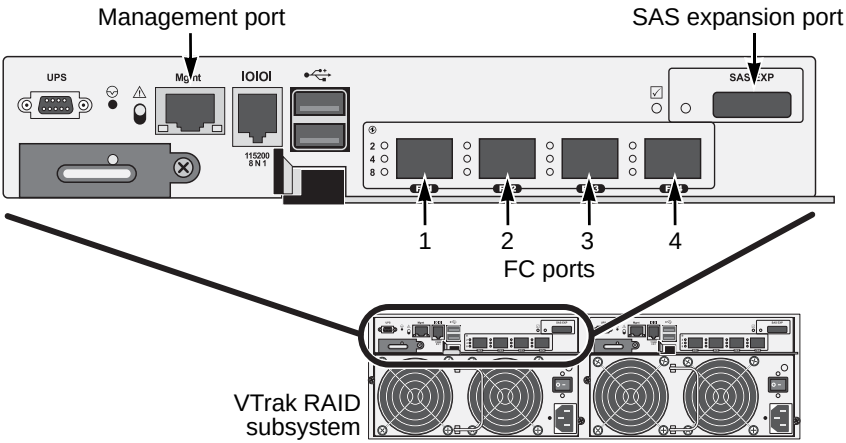
For a list of supported HBAs, Switches, and SFP transceivers, download the latest compatibility list from PROMISE support: http://www.promise.com/support/.

Note

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 363.
- “Appendix C: Multipathing on Linux” on page 385.

Figure 10. FC data and management ports on the RAID controller



A Fibre Channel storage area network (SAN) requires:

- An FC HBA card in each host PC or server
- An SFP transceiver for each connected FC port on the subsystem
- An FC switch
- A network switch

Data Path

To establish the data path:

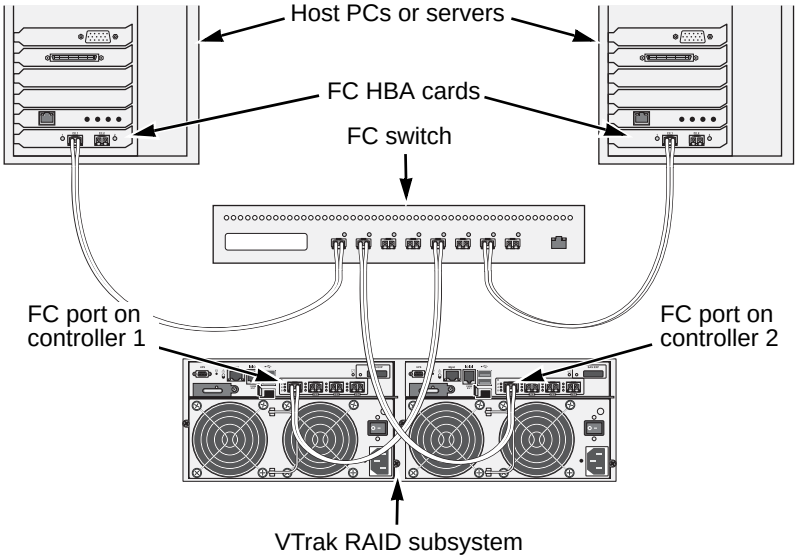
1. Connect FC cables between at least one FC data port on each RAID controller and the FC switch.

   See Figure 11.

2. Connect FC cables between the FC switch and the FC HBA cards in both host PCs or servers.

   If you have multiple VTrak subsystems, repeat steps 1 and 2 as required.

Figure 11. FC SAN data connections



The VTrak RAID subsystem is shown with SFP transceivers installed.

Management Path

To establish the management path:

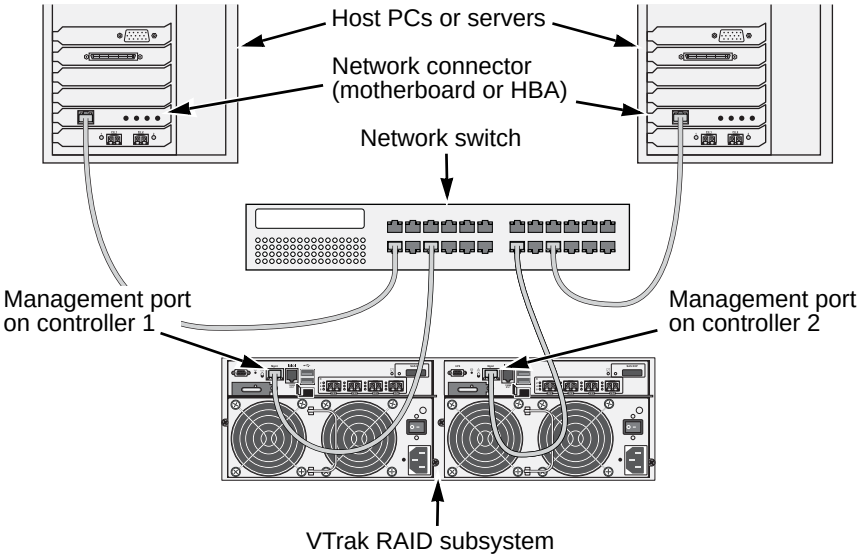
1. Connect Ethernet cables between the Management ports on both RAID controllers and the network switch.

   See Figure 12.

2. Connect Ethernet cables between the network ports on both host PCs or servers and the network switch.

   If you have multiple VTrak subsystems, repeat steps 1 and 2 as required.

Figure 12. FC SAN management connections



The VTrak RAID subsystem is shown with SFP transceivers installed.

Fibre Channel DAS

Important

For a list of supported HBAs, switches, and SFP transceivers, download the latest compatibility list from PROMISE support: http://www.promise.com/support/.

Note

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 363.
- “Appendix C: Multipathing on Linux” on page 385.

Fibre Channel direct attached storage (DAS) requires:

- An FC HBA card in the host PC or server
- An SFP transceiver for each connected FC port on the subsystem
- A network switch

Data Path

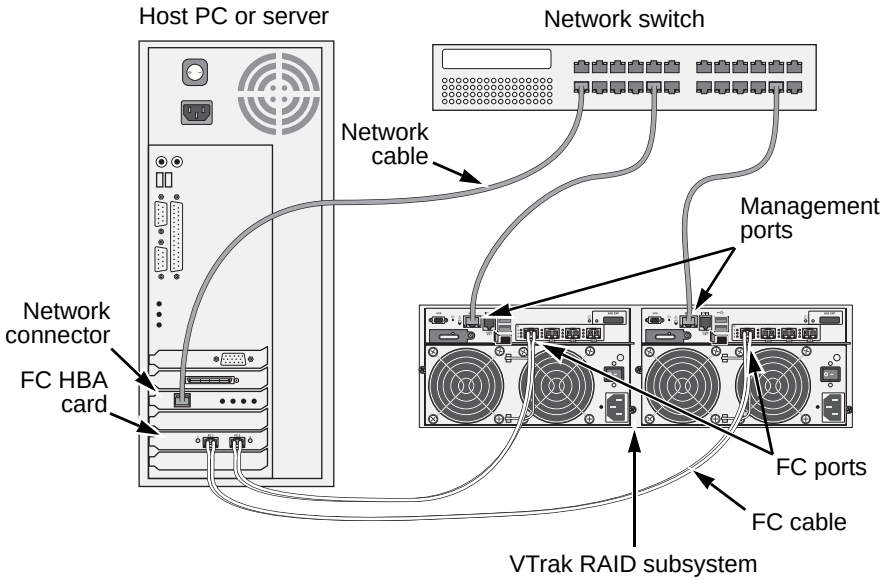
To establish the data path:

1. Connect an FC cable between a data port on the left RAID controller and the FC HBA card in your host PC or server.

   See page 29, Figure 13.

2. Connect an FC cable between a data port on the right RAID controller and the FC HBA card in your host PC or server.

Figure 13. FC DAS data and management connections



The VTrak RAID subsystem is shown with SFP transceivers installed.

Management Path

To establish the management path:

1. Connect Ethernet cables between the Management ports of both RAID controllers and the network switch.

   See Figure 13.

2. Connect an Ethernet cable between the network port on the host PC or server and the network switch.

Fibre Channel with JBOD Expansion

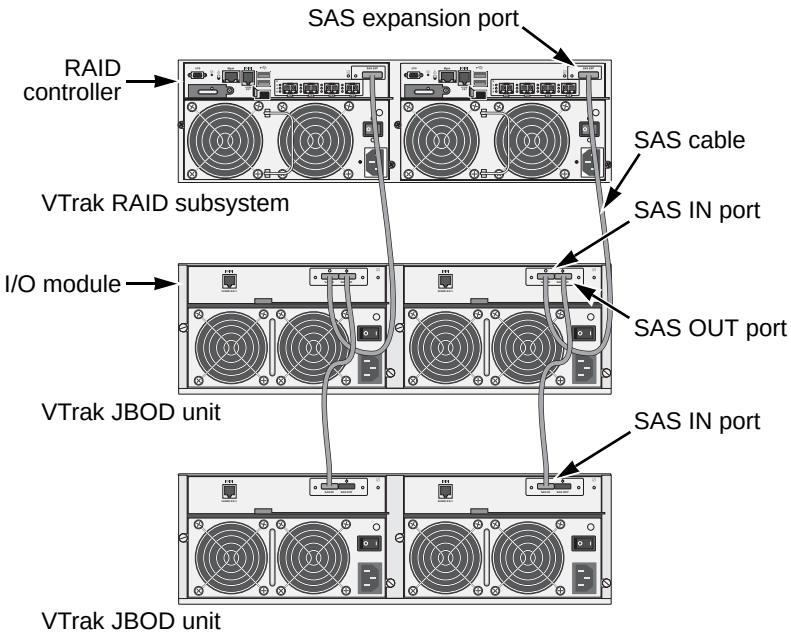
JBOD expansion requires at least one SFF-8088 4X to SFF-8088 4X external SAS cable for each JBOD unit.

To add JBOD units:

1. Connect the SAS expansion port on the **left** controller of the RAID subsystem to the SAS data IN port on the **left** I/O module of the first JBOD unit.

   See Figure 14.
2. Connect the SAS expansion port on the **right** controller of the RAID subsystem to the SAS data IN port on the **right** I/O module of the first JBOD unit.
3. Connect the SAS data OUT port on **left** I/O module of the first JBOD unit to the SAS data IN port on the **left** I/O module of the second JBOD unit.
4. Connect the SAS data OUT port on **right** I/O module of the first JBOD unit to the SAS data IN port on the **right** I/O module of the second JBOD unit.
5. Connect the remaining JBOD units in the same manner.
   - Keep your data paths organized to ensure redundancy.
   - JBOD expansion supports up to nine (9) JBOD units.

Figure 14. FC JBOD expansion connections



Fibre Channel SAN – No Single Point of Failure

Important

For a list of supported HBAs, switches, and SFP transceivers, download the latest compatibility list from PROMISE support: http://www.promise.com/support/.

Note

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 363.
- “Appendix C: Multipathing on Linux” on page 385.

An FC SAN with no single point of failure (NSPF) requires:

- An FC HBA card in each host PC or server
- An SFP transceiver for each connected FC port on the subsystem
- Two SFF-8088 4X to SFF-8088 4X SAS external cables for each JBOD unit
- Two FC switches
- A network switch

Data Path

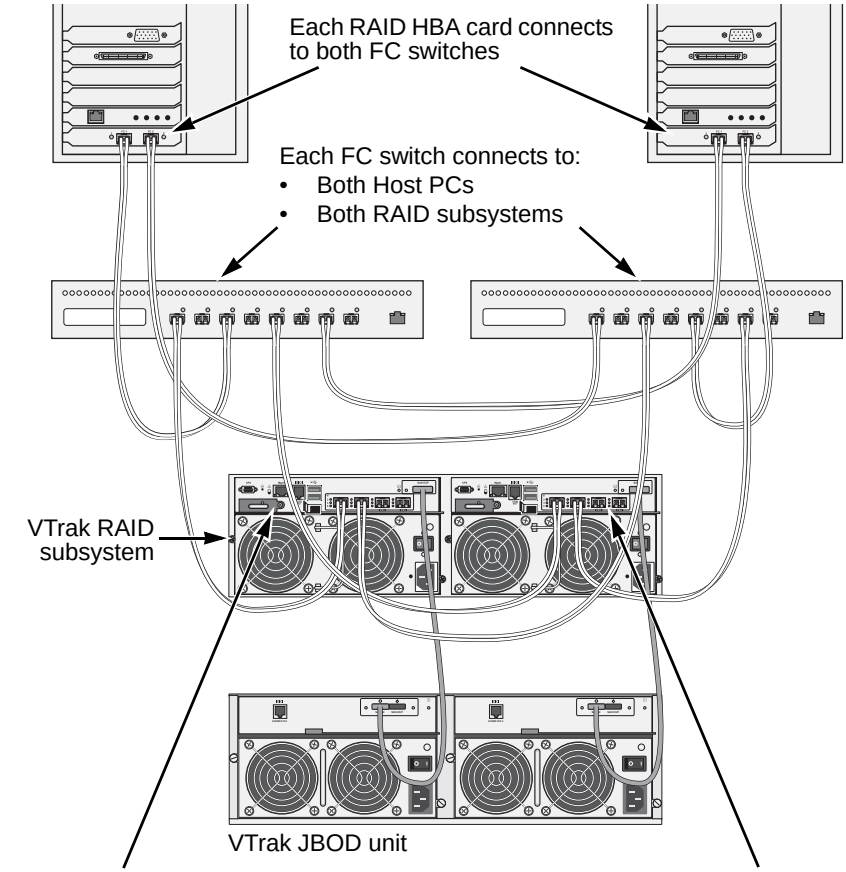
To establish the data path:

1. Connect an FC cable between an FC data port on the left RAID controller and one of the FC switches.

   See page 32, Figure 15.
2. Connect an FC cable between an FC data port on the left RAID controller and the other FC switch.
3. Connect an FC cable between an FC data port on the right RAID controller and one of the FC switches.
4. Connect an FC cable between an FC data port on the right RAID controller and the other FC switch.
5. Connect FC cables between one of the FC switches and the FC HBA cards in both of the host PCs or servers.
6. Connect FC cables between the other FC switch and the FC HBA cards in both of the host PCs or servers.

   If you have multiple VTrak subsystems, repeat steps 1 through 6 as required.

Figure 15. FC SAN NSPF data connections



The VTrak RAID subsystem is shown with SFP transceivers installed.

Management Path

To establish the management path:

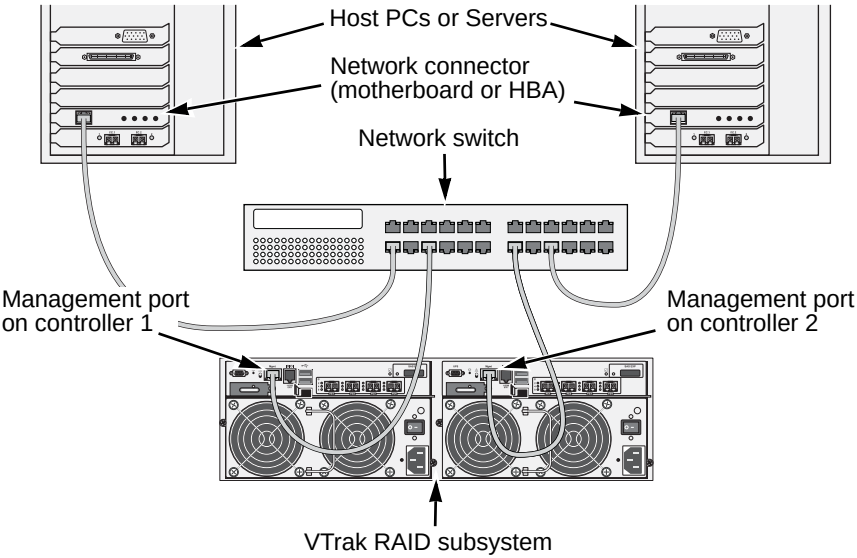
1. Connect an Ethernet cable between the Management port on each RAID controller and the network switch.

   See page 33, Figure 16.

2. Connect an Ethernet cable between the network port on each host PC or server and the network switch.

If you have multiple VTrak subsystems, repeat steps 1 and 2 as required.

Figure 16. FC SAN NSPF management connections



The VTrak RAID subsystem is shown with SFP transceivers installed.

JBOD Expansion

JBOD connections are the same for all FC SAN and DAS configurations. See “Fibre Channel with JBOD Expansion” on page 30.

iSCSI Storage Area Network (SAN)

Important

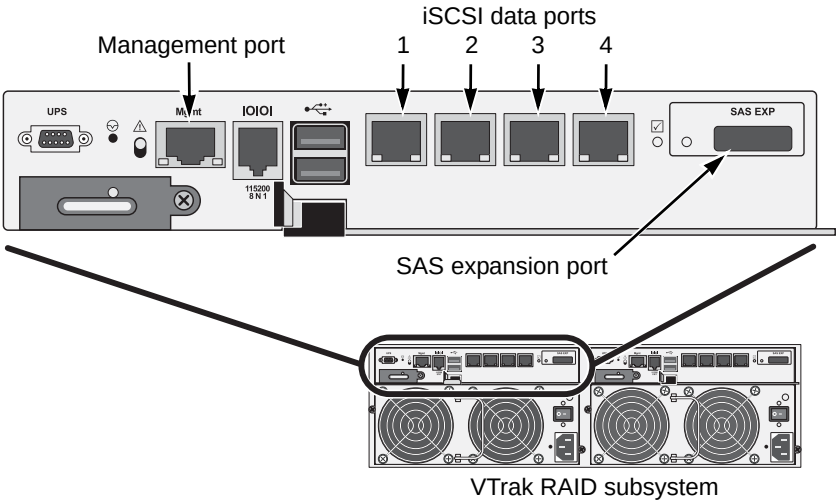
For a list of supported HBA NICs and switches, download the latest compatibility list from PROMISE support: http://www.promise.com/support/.

Note

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 363.
- “Appendix C: Multipathing on Linux” on page 385.

Figure 17. iSCSI data and management ports on the RAID controller



This arrangement requires:

- An iSCSI HBA network interface card (NIC) in the host PC or server
- A GbE network switch
- A standard network switch

Data Path

Each VTrak RAID controller has four (4) RJ45 iSCSI data port connectors. See page 34, Figure 17.

To establish the data path:

1. Connect Ethernet cables between the iSCSI NIC in both host PCs or servers and the GbE network switch.

   See Figure 19.

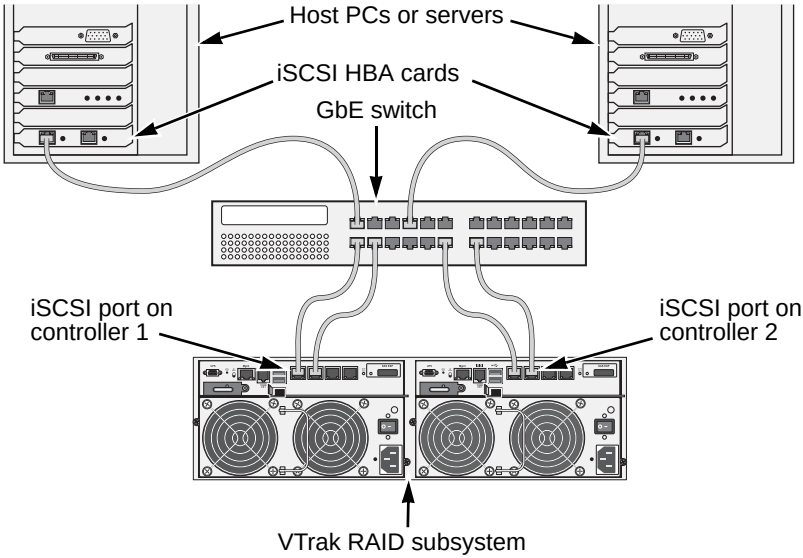
2. Connect an Ethernet cable between at least one iSCSI data port on the left RAID controller and the GbE network switch.
3. Connect an Ethernet cable between at least one iSCSI data port on the right RAID controller and the GbE network switch.

   If you have multiple VTrak subsystems, host PCs or servers, repeat steps 1 through 3 as required.

Note

Only one iSCSI data cable is required between each RAID controller and the GbE network switch. However, you can attach multiple cables to create redundant data paths or trunking.

Figure 18. iSCSI SAN data connections



Management Path

Each VTrak RAID controller has one (1) Ethernet RJ45 management port connector. See page 34, Figure 17.

To establish the management path:

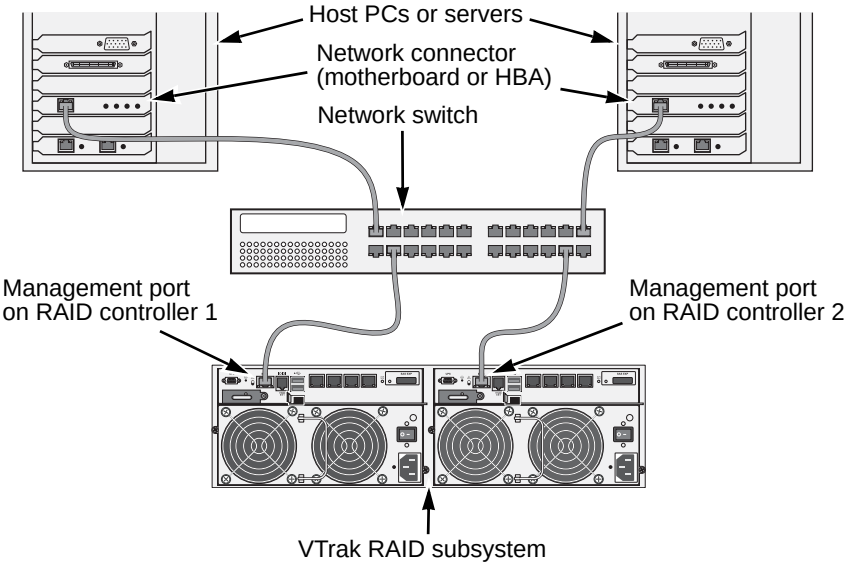
1. Connect Ethernet cables between the network connector on both host PCs or servers and the standard network switch.

   See Figure 19.

2. Connect Ethernet cables between the Management port on both RAID controllers to the standard network switch.

   If you have multiple VTrak subsystems, repeat steps 1 and 2 as required.

Figure 19. iSCSI SAN management connections



iSCSI Direct Attached Storage (DAS)

Important

For a list of supported HBAs and switches, download the latest compatibility list from PROMISE support: http://www.promise.com/support/.

Note

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 363.
- “Appendix C: Multipathing on Linux” on page 385.

This arrangement requires:

- An iSCSI HBA network interface card (NIC) in the host PC or server
- A standard network switch

Data Path

Each VTrak RAID controller has four (4) RJ45 iSCSI data port connectors. See page 34, Figure 17.

To establish the data path:

1. Connect an Ethernet cable between the iSCSI NIC in the host PC or server and an iSCSI data port on one of the RAID controller.

   See page 38, Figure 20.

2. Connect an Ethernet cable between the iSCSI NIC in the host PC or server and an iSCSI data port on the other RAID controller.

Management Path

Each VTrak RAID controller has one (1) Ethernet RJ-45 management port connector. See page 34, Figure 17.

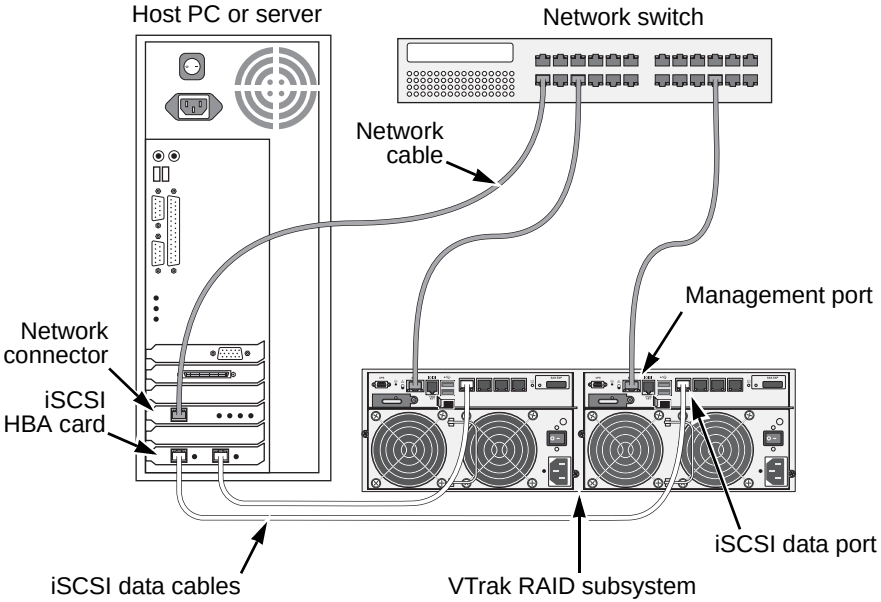
To establish the management path:

1. Connect an Ethernet cable between the network connector on the host PC or server and the standard network switch.

   See page 38, Figure 20.

2. Connect Ethernet cables between the standard network switch and the Management ports on both RAID controllers.

Figure 20. iSCSI DAS data and management connections



iSCSI with JBOD Expansion

JBOD expansion requires at least one SFF-8088 4X to SFF-8088 4X external SAS cable for each JBOD unit.

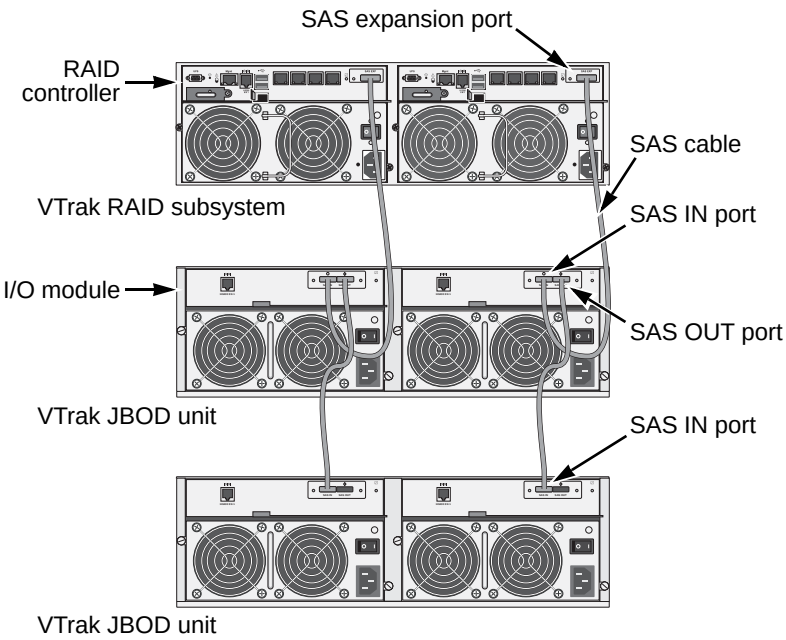
To add JBOD units:

1. Connect the SAS expansion port on the **left** controller of the RAID subsystem to the SAS data IN port on the **left** I/O module of the first JBOD unit.

   See Figure 14.

2. Connect the SAS expansion port on the **right** controller of the RAID subsystem to the SAS data IN port on the **right** I/O module of the first JBOD unit.
3. Connect the SAS data OUT port on **left** I/O module of the first JBOD unit to the SAS data IN port on the **left** I/O module of the second JBOD unit.
4. Connect the SAS data OUT port on **right** I/O module of the first JBOD unit to the SAS data IN port on the **right** I/O module of the second JBOD unit.
5. Connect the remaining JBOD units in the same manner.
   - Keep your data paths organized to ensure redundancy.
   - JBOD expansion supports up to nine (9) JBOD units.

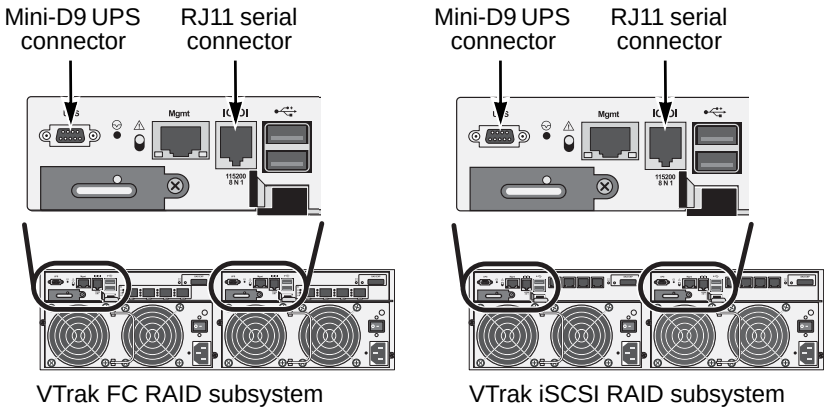
Figure 21. iSCSI JBOD expansion connections



Making Serial Cable Connections

Serial communication enables the terminal emulation application on your host PC or server to access the VTrak's Command Line Interface (CLI) to set up a network connection. The VTrak package includes one RJ11-to-DB9 serial data cable for each controller.

Figure 22. UPS and Serial connectors



To set up a serial cable connection:

1. Attach the RJ11 end of the serial data cable to the RJ11 serial connector on one of the RAID controllers.
2. Attach the DB9 end of the serial data cable to a serial port on the host PC or server.

Optional UPS Serial Connection

If your deployment plan calls for one or more UPS units and management via serial communication, connect a UPS control cable to the Mini-D9 UPS connector on the RAID controller.

UPS control cables are available from PROMISE Technology at http://www.promise.com

To complete the UPS management setup, see "Making UPS Settings" on page 79 or page 227 when your subsystem is running.

Chapter 3: Setup

This chapter covers the following topics:

Connecting the Power

Plug in the power cables and turn on the switches on both power supplies.

Important

If you have a SAN, DAS, or Cascade with JBOD Expansion, always power on the JBOD expansion units first.

When the power is switched on, the LEDs on the right handle light up.

When boot-up is finished and the VTrak is functioning normally:

- Power, FRU, and Logical Drive LEDs display steady green.
- Each controller activity LED flashes green when there is activity on that controller.
- The controller heartbeat LED blinks green once per second for five seconds, goes dark for ten seconds, then blinks green once per second for five seconds again.

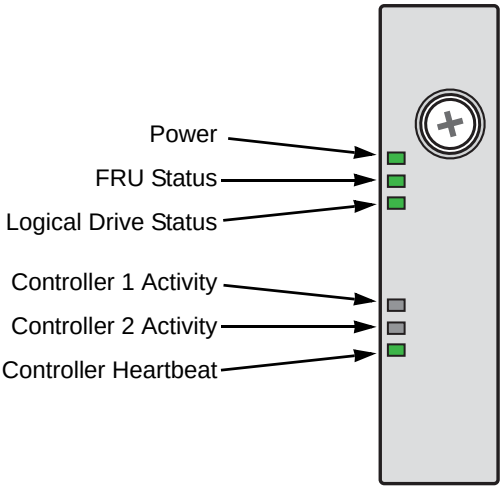
  Steady means the LED is on.

  Blinking means a regular on/off pattern.

  Flashing means an intermittent and irregular on/off pattern.

  See page 42, Figure 1.

Figure 1. Front panel LED display



Also see the table below.

Enclosure Front LEDs					
State	**Power**	**FRU**	**Logical Drive**	**Controller Activity**	**Controller Heartbeat**
Dark	No power	No power	—	No Activity	—
Steady green	Normal	Normal	Normal	—	—
Blinking green	—	—	—	—	Normal**
Flashing green	—	—	—	Activity	—
Amber	—	Problem*	Critical	—	—
Red	—	Failure*	Offline	—	—

* Check the LEDs on the back of the VTrak enclosure.

** Blinks blinks green once per second for five seconds, goes dark for ten seconds, then blinks green once per second for five seconds again.

For more information on LEDs, see “Chapter 8: Troubleshooting” on page 375.

Drive Status Indicators

The VTrak spins up the disk drives sequentially to equalize power draw during start-up. After a few moments:

- The Power/Activity LED displays blue when a physical drive is present.
- The Drive Status LED displays green when the physical drive is configured as a member of a disk array or as a spare. When the physical drive is unconfigured, the LED is dark.

  Steady means the LED is on.

  Blinking means a regular on/off pattern.

  Flashing means intermittent and irregular on/off pattern.

  See the table on the next page.

Figure 2. Drive carrier LEDs

Drive Carrier LEDs		
State	**Power/Activity**	**Drive Status**
Dark	No drive in carrier	Drive is unconfigured
Steady Blue	Drive is present	—
Flashing Blue	Activity on drive	—
Steady green	—	Drive is configured
Blinking green	—	Locator feature
Amber	—	Drive is rebuilding
Red	—	Drive error or failure
* Configured means the physical drive either belongs to an array or it is assigned as a spare drive.		

For more information on LEDs, see “Chapter 8: Troubleshooting” on page 375.

Setting-up the Serial Connection

The initial connection accesses the VTrak's serial port using the serial cable connection you made. See "Making Serial Cable Connections" on page 40.

Use your PC's terminal emulation program, such as Microsoft HyperTerminal, to access the VTrak's Command Line Interface (CLI).

You can also use the serial connection to manage the VTrak through the Command Line Utility (CLU).

To make the initial serial connection:

1. Change your terminal emulation application settings to match the following specifications:
   - Bits per second: 115200
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: none
2. Start your PC's terminal VT100 or ANSI emulation program.
3. Press Enter once to launch the CLI.
4. At the Login prompt, type **administrator** and press Enter.
5. At the Password prompt, type **password** and press Enter.

   The screen displays:

```
login as: administrator
administrator@vtrak's password:
------------------------------------------------------------
Promise VTrak Command Line Interface (CLI) Utility
Version: 4.01.0000.xx Build Date: Mar 22, 2011
------------------------------------------------------------

------------------------------------------------------------
Type help or ? to display all the available commands
Type menu to enter Menu Driven Configuration Utility
------------------------------------------------------------

administrator@cli>
```

To see the full set of CLI commands, at the administrator@cli> prompt, type **help** and press Enter.

To see full information about a specific command, at the administrator@cli> prompt, type **help** followed by the command, then press Enter.

```
administrator@cli> help net
```

About IP Addresses

Choosing the appropriate IP addresses is essential to manage your VTrak subsystem over a network. You must change the VTrak's default IP addresses as required for your environment.

VTrak Default IP Addresses

The default *virtual* management port IP addresses are set to:

- IPv4 – 10.0.0.1
- IPv6 – 2001:1

The virtual management port IP address works with either RAID controller, enabling you to access a dual-controller VTrak over your network using a single IP address.

The default *physical* management port IP addresses are set to:

- Controller 1, IPv4 – 10.0.0.2
- Controller 1, IPv6 – 2001::2
- Controller 2, IPv4 – 10.0.0.3
- Controller 2, IPv6 – 2001::3

The physical management port IP address works with only one RAID controller and is used when the controller goes into *maintenance mode*. For more information, see "Maintenance Mode" on page 395.

Choosing DHCP or a Static IP Address

When you setup your VTrak, you have the option of:

- Enabling DHCP and letting your DHCP server assign the IP address to the VTrak's virtual management port.
- Specifying a static IP address for the VTrak's virtual management port.

DHCP is currently supported on IPv4 only. If you use IPv6, you must make your network settings manually.

If you choose to enable DHCP, have your Network Administrator dedicate an IP address for the VTrak, linked to the VTrak's MAC address. This action prevents the DHCP server from assigning a new IP address when the VTrak restarts, with the result that users can no longer log in.

Accessing the MAC Address in the CLI

To access the MAC address in the CLI:

At the command prompt, type **net -a list -v** and press Enter.

The following information displays:

```
administrator@cli> net -a list -v
------------------------------------------------------------------------------
ActiveCtrlId: 1                     Port: 1
MaxSupportedSpeed: 1000Mbps         LinkStatus: Up

ProtocolFamily: IPv4(Enabled)       DHCP: Disabled
IP: 10.0.0.1
IPMask: 0.0.0.0
MAC: 00:01:55:61:18:65
DNS: 0.0.0.0
Gateway: 0.0.0.0

ProtocolFamily: IPv6(Disabled)      DHCP: Disabled
IP: 2001::1
IPMask: ffff::
MAC: 00:01:55:61:18:65
DNS: ::
Gateway: ::
```

Accessing the MAC Address in the CLU

To access the MAC address in the CLU:

1. At the CLI command prompt, type **menu** and press Enter.

   The CLU screen appears.
2. Highlight *Network Management* and press Enter.
3. Highlight *IPv4* and press Enter.

   The following information displays:

```
Active Controller Id: 1             Port Id          : 1
Max Supported Speed : 1000Mbps      Link Status      : Up

Protocol Family                     : IPv4
Status                              : Enabled
MAC Address                         : 00:01:55:61:18:65
DHCP                                : Disabled
IP Address                          : 10.0.0.1
Subnet Mask                         : 0.0.0.0
Gateway IP Address                  : 0.0.0.0
DNS Server IP Address               : 0.0.0.0
```

Setting-up VTrak with the CLI

Setting up the VTrak in the CLI includes these actions:

Making Subsystem Date and Time Settings

To set the subsystem date and time:

1. Type **date -a mod -d** and the date in **yyyyy/mm/dd** format then press Enter.

   ```
   administrator@cli> date -a mod -d 2011/03/25
   ```

2. Type **date -a mod -t** and the time in **hh:mm:ss** format, then press Enter.

   ```
   administrator@cli> date -a mod -t 14:50:05
   ```

   You can combine date and time settings, such as:

   ```
   administrator@cli> date -a mod -d 2011/03/25 -t 14:50:05
   ```

Virtual Management Port Settings

Making Virtual Management Port Settings – Automatically

Automatic settings require a DHCP server on your network. DHCP is currently supported on IPv4 only.

To enable automatic management port settings:

1. At the command prompt, type **net -a mod -f ipv4 -s "dhcp=enable"** and press Enter.

   ```
   administrator@cli> net -a mod -f ipv4 -s "dhcp=enable"
   ```

   After a moment, the comand prompt reappears, indicating that your setting was successful.

   ```
   administrator@cli>
   ```

2. To verify the setting change, at the command prompt, type **net** and press Enter. The following information displays:

```
administrator@cli> net
=========================================
PF      Status      IP                  Link
=========================================
IPv4    Enabled     192.168.10.85       Up
IPv6    Disabled    2001::1             Up
```

In the above example:

- PF refers to IP protocol family, v4 or v6
- Status refers to whether the IP protocol is enabled. IPv4 is enabled by default.
- IP is the virtual management port IP address.
- Link indicates whether there is a working network connection.

By default, IPv4 is enabled and IPv6 is disabled. Currently IPv6 does not suppport DHCP.

Making Virtual Management Port Settings – Manually under IPv4

To make IPv4 settings manually on the management port:

1. At the command prompt, type **net -a mod -f ipv4 -s "** followed by:
   - **primaryip=** and the IP address **,**
   - **primaryipmask=** and the subnet mask **,**
   - **primarydns=** and the DNS server IP address **,**
   - **gateway=** and the Gateway server IP address

     " and press Enter.

   Example:

```
administrator@cli> net -a mod -f ipv4 -s "primaryip=192.168.10.85,
primaryipmask=255.255.255.0,primarydns=192.168.10.11,gateway=19
2.168.10.1"
```

   After a moment, the comand prompt reappears, indicating that your setting was successful.

```
administrator@cli>
```

2. To verify the settings, at the command prompt, type **net -a list -v** and press Enter.

   The following information displays:

```
administrator@cli> net -a list -v
--------------------------------------------------------------------------------
ActiveCtrlId: 1                         Port: 1
```

MaxSupportedSpeed: 1000Mbps LinkStatus: Up

ProtocolFamily: IPv4(Enabled) DHCP: Disabled
IP: 192.168.10.85
IPMask: 255.255.255.0
MAC: 00:01:55:61:18:65
DNS: 192.168.10.11
Gateway: 192.168.10.1

ProtocolFamily: IPv6(Disabled) DHCP: Disabled
IP: 2001::1
IPMask: ffff::
MAC: 00:01:55:61:18:65
DNS: ::
Gateway: ::

Making Virtual Management Port Settings – Manually under IPv6

To make IPv6 settings manually on the management port:

1. At the command prompt, type **net -a enable -f ipv6** and press Enter to enable IPv6 on the VTrak.

   After a moment, the comand prompt reappears, indicating that your setting was successful.

   administrator@cli>

2. At the command prompt, type **net -a mod -f ipv6 -s "** followed by:
   - **primaryip=** and the IP address **,**
   - **primaryipmask=** and the subnet mask **,**
   - **primarydns=** and the DNS server IP address **,**
   - **gateway=** and the Gateway server IP address

     " and press Enter.

   Example:

   administrator@cli> net -a mod -f ipv6 -s
   "primaryip=2001:0db8:85a3:0000:0000:8a2e:0370:7334,
   primaryipmask=2001:0db8:fedc:ba98:7654:3210:0246:8acf
   primarydns=2001:0db8:85a3:0000:0000:8a2e:0370:7001,
   gateway=2001:0db8:85a3:0000:0000:8a2e:0370:7002"

   After a moment, the comand prompt reappears, indicating that your setting was successful.

   administrator@cli>

3. To verify the settings, at the command prompt, type **net -a list -v** and press Enter.

The following information displays:

```
administrator@cli> net -a list -v
--------------------------------------------------------------------------------
ActiveCtrlId: 1                         Port: 1
MaxSupportedSpeed: 1000Mbps             LinkStatus: Up

ProtocolFamily: IPv4(Enabled)           DHCP: Disabled
IP: 192.168.10.85
IPMask: 255.255.255.0
MAC: 00:01:55:61:18:65
DNS: 192.168.10.11
Gateway: 192.168.10.1

ProtocolFamily: IPv6(Enabled)           DHCP: Disabled
IP: 2001:0db8:85a3:0000:0000:8a2e:0370:7334
IPMask: 2001:0db8:fedc:ba98:7654:3210:0246:8acf
MAC: 00:01:55:61:18:65
DNS: 2001:0db8:85a3:0000:0000:8a2e:0370:7001
Gateway: 2001:0db8:85a3:0000:0000:8a2e:0370:7002
```

Maintenance Mode Settings

For information on maintenance mode, see page 395.

You have the option to make maintenance mode settings at a later time in WebPRM PROe. See “Making Maintenance Mode Settings” on page 100.

Making Maintenance Mode Settings – Automatically

Automatic settings require a DHCP server on your network. DHCP is currently supported on IPv4 only.

You make maintenance mode settings for one controller at a time.

To enable automatic maintenance mode settings:

1. At the command prompt, type **net -a mod -m -c 1 -f ipv4 -s "dhcp=enable"** and press Enter.

   ```
   administrator@cli> net -a mod -m -c 1 -f ipv4 -s "dhcp=enable"
   ```

   After a moment, the comand prompt reappears, indicating that your setting was successful.

   ```
   administrator@cli>
   ```

2. To verify the settings changes, at the command prompt, type **net -a list -m** and press Enter.

   The following information displays:

   ```
   administrator@cli> net -a list -m
   ```

```
--------------------------------------------------------------------------------
CtrlId: 1                                Port: 1
ProtocolFamily: IPv4(Enabled)            DHCP: Enabled
IP: 192.168.10.94
IPMask: 255.255.255.0
MAC: 00:01:55:30:65:E9
DNS: 192.168.1.1
Gateway: 192.168.10.1

CtrlId: 1                                Port: 1
ProtocolFamily: IPv6(Disabled)           DHCP: Disabled
IP: 2001::2
IPMask: ffff::
MAC: 00:01:55:30:65:E9
DNS: ::
Gateway: ::

CtrlId: 2                                Port: 1
ProtocolFamily: IPv4(Enabled)            DHCP: Disabled
IP: 10.0.0.3
IPMask: 0.0.0.0
MAC: 00:01:55:30:65:E9
DNS: 0.0.0.0
Gateway: 0.0.0.0

CtrlId: 2                                Port: 1
ProtocolFamily: IPv6(Disabled)           DHCP: Disabled
IP: 2001::3
IPMask: ffff::
MAC: 00:01:55:30:65:D7
DNS: ::
Gateway: ::
```

3. Repeat steps 1 and 2 above but change **-c 1** (controller 1) to **-c 2** (contoller 2).

Making Maintenance Mode Settings – Manually under IPv4

You make these settings for one controller at a time.

To make maintenance mode settings:

1. At the command prompt, type **net -a mod -m -c 1 -s "** followed by:
   - **primaryip=** and the IP address **,**
   - **primaryipmask=** and the subnet mask **,**
   - **primarydns=** and the DNS server IP address **,**
   - **gateway=** and the Gateway server IP address **"** and press Enter.

Example:

```
administrator@cli> net -a mod -m -c 1 "primaryip=192.168.10.101,
primaryipmask=255.255.255.0,primarydns=192.168.10.11,gateway=19
2.168.10.1"
```

After a moment, the comand prompt reappears, indicating that your setting was successful.

```
administrator@cli>
```

2. To verify the settings changes, at the command prompt, type **net -a list -m** and press Enter. The following information displays:

```
administrator@cli> net -a list -m

--------------------------------------------------------------------------------
CtrlId: 1                              Port: 1
ProtocolFamily: IPv4(Enabled)          DHCP: Disabled
IP: 192.168.10.101
IPMask: 255.255.255.0
MAC: 00:01:55:30:65:E9
DNS: 192.168.1.1
Gateway: 192.168.10.1

CtrlId: 1                              Port: 1
ProtocolFamily: IPv6(Disabled)         DHCP: Disabled
IP: 2001::2
IPMask: ffff::
MAC: 00:01:55:30:65:E9
DNS: ::
Gateway: ::

CtrlId: 2                              Port: 1
ProtocolFamily: IPv4(Enabled)          DHCP: Disabled
IP: 10.0.0.3
IPMask: 0.0.0.0
MAC: 00:01:55:30:65:E9
DNS: 0.0.0.0
Gateway: 0.0.0.0

CtrlId: 2                              Port: 1
ProtocolFamily: IPv6(Disabled)         DHCP: Disabled
IP: 2001::3
IPMask: ffff::
MAC: 00:01:55:30:65:D7
DNS: ::
Gateway: ::
```

3. Repeat steps 1 and 2 above but change **-c 1** (controller 1) to **-c 2** (controller 2).

Making Maintenance Mode Settings – Manually under IPv6

You make these settings for one controller at a time.

To make maintenance mode settings:

1. At the command prompt, type **net -a enable -f ipv6 -m -c 1** and press Enter to enable IPv6.

   After a moment, the comand prompt reappears, indicating that your setting was successful.

   ```
   administrator@cli>
   ```

2. At the command prompt, type **net -a mod -m -c 1 -s "** followed by:
   - **primaryip=** and the IP address **,**
   - **primaryipmask=** and the subnet mask **,**
   - **primarydns=** and the DNS server IP address **,**
   - **gateway=** and the Gateway server IP address

     " and press Enter.

   Example:

   ```
   administrator@cli> iscsi -a mod -t portal -s
   "primaryip=2001:0db8:85a3:0000:0000:8a2e:0370:7336,
   primaryipmask=2001:0db8:fedc:ba98:7654:3210:0246:8acf,
   primarydns=2001:0db8:85a3:0000:0000:8a2e:0370:7001,
   gateway=2001:0db8:85a3:0000:0000:8a2e:0370:7002"
   ```

   After a moment, the comand prompt reappears, indicating that your setting was successful.

   ```
   administrator@cli>
   ```

3. To verify the settings, at the command prompt, type **net -a list -m** and press Enter.

   The following information displays:

   ```
   administrator@cli> net -a list -m

   ------------------------------------------------------------------------------
   CtrlId: 1                                Port: 1
   ProtocolFamily: IPv4(Enabled)            DHCP: Disabled
   IP: 192.168.10.101
   IPMask: 255.255.255.0
   MAC: 00:01:55:30:65:E9
   DNS: 192.168.1.1
   Gateway: 192.168.10.1
   ```

```
CtrlId: 1                                   Port: 1
ProtocolFamily: IPv6(Enabled)               DHCP: Disabled
IP: 2001:0db8:85a3:0000:0000:8a2e:0370:7336
IPMask: 001:0db8:fedc:ba98:7654:3210:0246:8acf
MAC: 00:01:55:30:65:E9
DNS: 2001:0db8:85a3:0000:0000:8a2e:0370:7001
Gateway: 2001:0db8:85a3:0000:0000:8a2e:0370:7002

CtrlId: 2                Port: 1
ProtocolFamily: IPv4(Enabled)               DHCP: Disabled
IP: 10.0.0.3
IPMask: 0.0.0.0
MAC: 00:01:55:30:65:E9
DNS: 0.0.0.0
Gateway: 0.0.0.0

CtrlId: 2                                   Port: 1
ProtocolFamily: IPv6(Disabled)              DHCP: Disabled
IP: 2001::3
IPMask: ffff::
MAC: 00:01:55:30:65:D7
DNS: ::
Gateway: ::
```

4. Repeat steps 1, 2, and 3 above but change **-c 1** (controller 1) to **-c 2** (controller 2).

This completes management port and maintenance mode setup. Go to “Logging into WebPAM PROe” on page 60.

Setting-up VTrak with the CLU

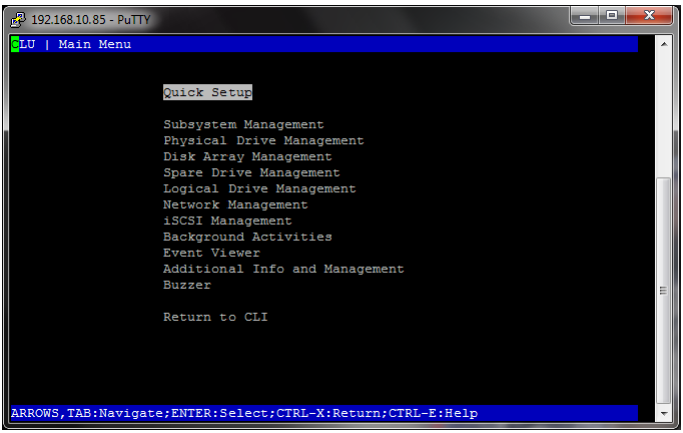
Setting up the VTrak in the CLU includes these actions:

Accessing the CLU Quick Setup Menu

To access the Quick Setup menu in the command line utility:

1. At the administrator@cli> prompt, type **menu** and press Enter.
   The CLU main menu appears. See Figure 3.

Figure 3. CLU main menu



2. Highlight **Quick Setup** and press Enter.

   The first Quick Setup screen enables you to make Date and Time settings.

Making Subsystem Date and Time Settings

To set the subsystem date and time:

1. Press the arrow keys to highlight **System Date**.
2. Press the backspace key to erase the current date.
3. Type the new date.
4. Follow the same procedure to set the **System Time**.
5. Press Control-A to save these settings and move to the Management Port settings screen.

Virtual Management Port Settings

Making Virtual Management Port Settings – Automatically

Automatic settings require a DHCP server on your network. DHCP is currently supported on IPv4 only.

Under Quick Setup, the Management Port IPv4 settings screen follows the System Date and Time settings screen.

To enable automatic management port settings:

1. Press the arrow keys to highlight **DHCP**.
2. Press the spacebar to toggle to **Enable**.
3. Press Control-A to save these settings and move to the Management Port IPv6 settings screen.

Viewing Virtual Management Port Settings

To view the current IP address and network settings when using DHCP:

1. Press the arrow keys to highlight **DHCP**.
2. Press the spacebar to toggle to **Disable**.

   The following information displays:

   ```
   IP Address              : 192.168.10.85
   Subnet Mask             : 255.255.255.0
   Gateway IP Address      : 192.168.10.1

   DNS Server IP Address   : 192.168.10.11
   ```

3. Press the spacebar to toggle DHCP back to **Enable**.
4. Press Control-A to save these settings and move to the Management Port IPv6 settings screen.

Making Virtual Management Port Settings – Manually under IPv4

To make IPv4 settings manually on the management port:

1. Press the arrow keys to highlight **IP Address**.
2. Press the backspace key to erase the current IP address.
3. Type the new Management Port IP address.
4. Follow the same procedure to specify the Subnet Mask, Gateway IP Address and DNS Server IP Address.

   If you do not have a DNS server, skip the DNS Server IP address.
5. Press Control-A to save your settings and move to the Management Port IPv6 settings screen.

Making Virtual Management Port Settings – Manually under IPv6

To make IPv6 settings manually on the management port:

1. Press the arrow keys to highlight **IP Address**.
2. Press the backspace key to erase the current IP address.
3. Type the new Management Port IP address.
4. Follow the same procedure to specify the Subnet Mask, Gateway IP Address and DNS Server IP Address.

   If you do not have a DNS server, skip the DNS Server IP address.
5. Press Control-A to save your settings and move to the Maintenance Mode screens.

Maintenance Mode Settings

For information on maintenance mode, see page 395.

You have the option to make maintenance mode settings at a later time in WebPAM PROe.

Under Quick Setup, maintenance mode settings are made in the following sequence:

1. Controller 1, IPv4
2. Controller 1, IPv6
3. Controller 2, IPv4
4. Controller 2, IPv6

Making Maintenance Mode Settings – Automatically

Automatic settings require a DHCP server on your network. DHCP is currently supported on IPv4 only.

To enable automatic maintenance mode settings:

1. From the CLU Main Menu, highlight **Network Management** and press Enter.
2. Highlight **Maintenance Mode Network Configuration** and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight **DHCP** and press the spacebar to toggle to **Enabled**.
5. Press Control-A to save your settings and move to the Maintenance Mode IPv6 settings screen.

Making Maintenance Mode Settings – Manually under IPv4

To make maintenance mode IPv4 manual settings:

1. From the CLU Main Menu, highlight **Network Management** and press Enter.
2. Highlight **Maintenance Mode Network Configuration** and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight **DHCP** and press the spacebar to toggle to **Disabled**.
5. Highlight each of the following and press the backspace key to erase the current value, then type the new value.
    - IP address
    - Subnet Mask
    - Default Gateway IP address
    - DNS Server IP address
6. Press Control-A to save your settings and move to the Maintenance Mode IPv6 settings screen.

Making Maintenance Mode Settings – Manually under IPv6

To make maintenance mode IPv6 manual settings:

1. From the CLU Main Menu, highlight **Network Management** and press Enter.
2. Highlight **Maintenance Mode Network Configuration** and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight **DHCP** and press the spacebar to toggle to **Disabled**.
5. Highlight each of the following and press the backspace key to erase the current value, then type the new value.
    - IP address
    - Subnet Mask
    - Default Gateway IP address
    - DNS Server IP address
6. Press Control-A to save your settings and:
    - If you made settings for Controller 1, move to the Maintenance Mode settings for Controller 2.

- If you made settings for Controller 2, move to the RAID Configuration menu.

Note

If you want to configure your RAID system now, using the CLU, see “Managing Disk Arrays” on page 229 for information about your choices.

Exiting the CLU

To exit the CLU from the Quick Setup RAID Configuration menu:

1. Highlight **Skip the Step and Finish** and press Enter.
2. Highlight **Return to CLI** and press Enter.

This completes management port and maintenance mode setup. Go to “Logging into WebPAM PROe” on page 60.

Logging into WebPAM PROe

1. Launch your browser.
2. In the browser address field, type in the virtual management port IP address of the VTrak subsystem.

   Use the virtual management port IP address you set in the CLI (page 47) or CLU (page 55). Example:

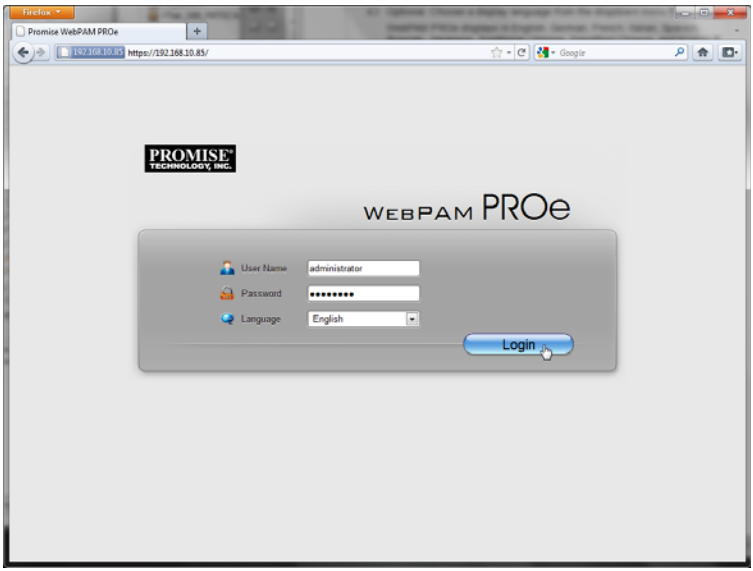
   - WebPAM PROe uses a secure HTTP connection . . . . . .https://
   - Enter the IP address of the VTrak 192.168.10.85

   Together, your entry looks like this: **https://192.168.10.85**
3. When the log-in screen appears:
   - Type **administrator** in the User Name field.
   - Type **password** in the Password field.

   The User Name and Password are case sensitive.
4. Optional. Choose a display language from the dropdown menu.

   WebPAM PROe displays in English, German, French, Italian, Spanish, Russian, Japanese, Traditional Chinese, Simplified Chinese, and Korean.
5. Click the **Login** button.

Figure 4. WebPAM PROe log-in screen



Important

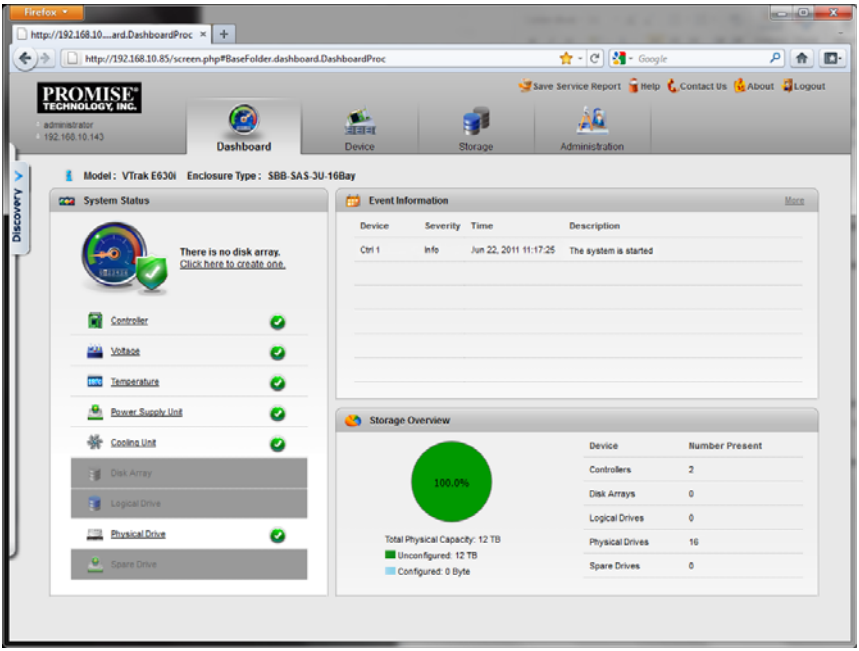
PROMISE recommends that you change the Administrator's default password immediately after setup is completed. See "Changing User Passwords" on page 105 or page 288.

Note

Make a Bookmark (Firefox) or set a Favorite (Internet Explorer) of the Login Screen so you can access it easily next time.

After log-in, the WebPAM PROe opens with the Dashboard tab. See page 61, Figure 5.

Figure 5. WebPAM PROe Dashboard tab



Creating Disk Arrays and Logical Drives

On a newly activated RAID system, there are no disk arrays or logical drives. The term “disk array” includes arrays composed of solid state drives.

To create your disk arrays and logical drives:

1. Click the **Storage** tab, then click the **Wizard** option.

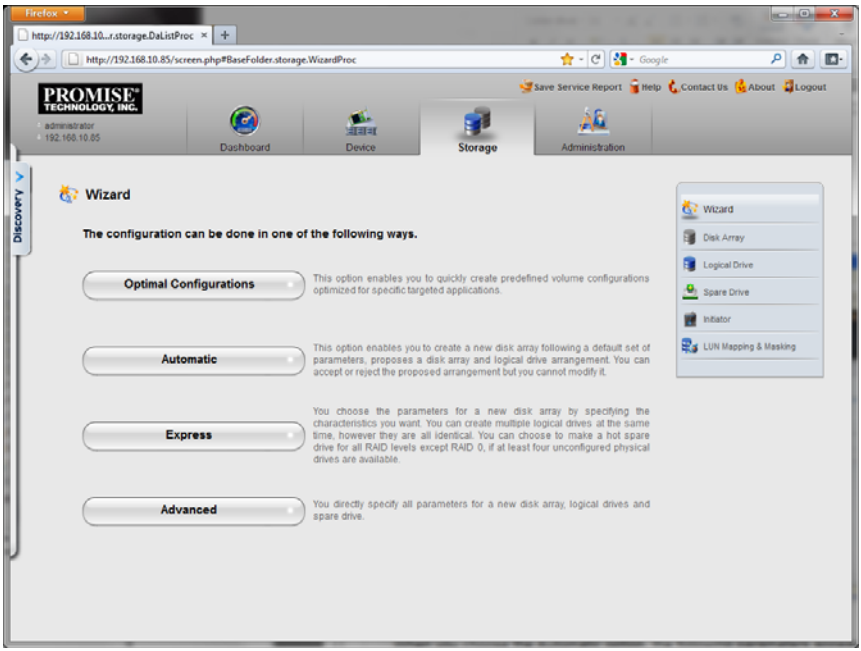
   Or, click **Disk Array** under System Status.

   The Wizard screen appears with three creation alternatives:

   - Optimal Configurations – See below
   - Automatic – See page 63
   - Express – See page 63
   - Advanced – See page 64

2. Click one of these buttons to continue.

Figure 6. The configuration wizard



Optimal Configurations

When you choose the Optimal Configurations option, you choose a script designed to set up your disk arrays, logical drives, and spare drives for a specific target application.

Each script requires a specific model of RAID subsystem. And most scripts require a specific model and number of JBOD expansion units. You cannot cannot modify these scripts.

Automatic

When you choose the Automatic option, the following parameters appear on the screen:

- **Disk Arrays** – The number of logical drives, number of physical drives, ID of each physical drive, configurable capacity, and the media type (hard disk drives or solid state drives).
- **Logical Drives** – The ID numbers of the logical drives, their RAID levels, capacity, sector size, and stripe size.
- **Spare Drives** – The ID numbers of the logical drives, type (global or dedicated) revertible option (enabled or disabled) and media type. A hot spare drive is created for all RAID levels except RAID 0, when five or more unconfigured physical drives are available

If you do NOT accept these parameters, use the Express (below) or Advanced (page 64) option to create your disk array.

If you accept these parameters, click the **Submit** button, and then click the **Finish** button.

The new disk array appears in the Disk Array List on the Storage tab, Disk Array option.

Express

When you choose the Express option, a set of characteristics and options appears on the screen.

1. Check the boxes to choose any one or a combination of:
    - **Redundancy** – The array remains available if a physical drive fails
    - **Capacity** – The greatest possible amount of data capacity
    - **Performance** – The highest possible read/write speed
    - **Spare Drive** – A hot spare drive is created when you choose Redundancy, Spare Drive, and five or more unconfigured physical drives are available

- **Mixing SATA/SAS Drive** – Check this box if you want to use both SATA and SAS drives in the same disk array

  If the box is unchecked, and you have both SATA and SAS drives, different arrays are created for each type of drive.

2. In the Number of Logical Drives field, enter the number of logical drives you want to make from this disk array.

   VTrak supports up to 32 logical drives per disk array.

3. From the Application Type menu, choose an application that best describes your intended use for this disk array:
   - File Server
   - Transaction Data
   - Other
   - Video Stream
   - Transaction Log

4. Click the **Next** button to continue.
5. The Summary screen appears with information on disk arrays, logical drives, and spare drives you are about to create.

   If you accept these parameters, proceed to the next step.

   If you do NOT accept these parameters, review and modify your selections in the previous steps.
6. When you are done, click the **Submit** button, and then click the **Finish** button.

   The new disk array appears in the Disk Array List on the Storage tab, Disk Array option.

Advanced

Note

For an explanation of the parameters under the Advanced option, see “Chapter 7: Technology Background” on page 331.

When you choose the Advanced option, the Create Disk Array screen appears.

Step 1 – Disk Array Creation

1. Enter your information and choose your options.
   - Enter a disk array alias in the field provided.
   - Check the box to enable Media Patrol
   - Check the box to enable Predictive Data Migration (PDM)
   - Check the box to enable Power Management
   - Choose a media type – Hard disk drive (HDD) or solid state drive (SSD)
2. Click the enclosure graphic to view information about physical drives.

Look for drives with a green LED dark, a blue LED lit, and no crosshatching over the carrier.

3. Click a physical drive to select it for your array.

   The physical drive's ID number is added to the Selected list.

4. Click the **Next** button to continue.

   The Create Logical Drive screen appears.

Step 2 – Logical Drive Creation

1. Enter your information and choose your options.
   - Enter a logical drive alias in the field provided.
   - Choose a RAID level from the dropdown menu.

     The choice of RAID levels depends on the number of physical drives in your array.
   - Note the **Max:** capacity value. Then enter a capacity value the field provided and choose a unit of measure from the dropdown menu.
   - Choose a stripe size from the dropdown menu.

     The choices are 64 KB, 128 KB, 256 KB, 512 KB, and 1 MB.
   - Choose a sector size from the dropdown menu.

     The choices are 512 B, 1 KB, 2 KB, and 4 KB.
   - Choose the Read Cache Policy from the dropdown menu

     The choices are Read Cache, Read Ahead (cache), and None.
   - Choose the Write Cache Policy from the dropdown menu

     The choices are WriteThru (write through) and WriteBack. Write back requires a Read Cache or Read Ahead Read Cache Policy.
2. Click the **Add** button to continue.

   The logical drive you just created appears in the New Logical Drives list.

3. Click the **Next** button to continue.

   The Create Spare Drive screen appears.

Step 3 – Spare Drive Creation

Creating a spare drive is optional but highly recommended.

1. Enter your information and choose your options.
   - Check the Revertible box if you want this spare drive to be revertible.

     For more information see the *VTrak E-Class Product Manual.*
   - Choose the option for the type spare drive you want.

     Global – Replaces a failed drive in any disk array.

     Dedicated – Replaces the failed drive only in the assigned disk array.

2. Click the enclosure graphic to view information about physical drives.
3. Click a physical drive to select it for your spare drive.

   The physical drive's ID number is added to the Selected list.
4. Click the **Next** button to continue.

   The Summary screen appears.

Step 4 – Summary

The Summary screen lists the disk arrays, logical drives, and spare drives that you specified.

If you accept these parameters, click the **Submit** button.

If you do NOT accept these parameters, review and modify your selections in the previous steps.

Enabling LUN Mapping and Masking

These features are optional for each logical drive. The Enable LUN Mapping dialog box appears after you create a logical drive.

To enable LUN Mapping:

1. Click the **OK** button in the Enable LUN Mapping dialog box.

   The LUN Mapping & Masking screen appears.
2. Check the **Enable LUN Masking** box to enable LUN Masking.
3. Click the **LUN Mapping** button to continue.

   The initiator list screen displays.
4. Choose the initiators you want to use from the dropdown menu and click the **Next** button.

   The screen displays a list of initiators and a list of logical drives.
5. Click and drag a logical drive from the logical drives list to the initiators list.
6. Click the **Next** button when you are done.

   The screen displays a list of initiator IDs and corresponding LUN maps that you specified.
7. Click the **Submit** button to create the LUN map.

   The screen displays a list of initiator IDs and corresponding LUN maps.

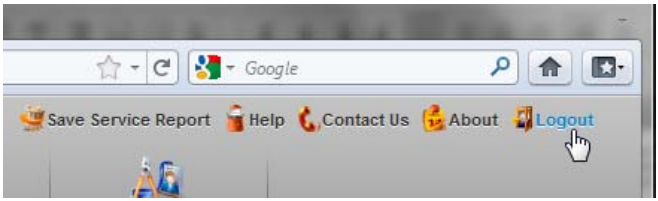
   You can also set LUN mapping and masking at a later time. Click the **Administration** tab, then click the **LUN Mapping & Masking** option.

Logging out of WebPAM PROe

There are two ways to log out of WebPAM PROe:

- Close your browser window
- Click **Logout** on the WebPAM PROe banner

Figure 7. Clicking "Logout" on the WebPAM PROe banner



Clicking **Logout** brings you back to the Login Screen. See page 60.

After logging out, you must enter your user name and password in order to log in again.

Using WebPAM PROe over the Internet

The above instructions cover connections between VTrak and your company network. It is also possible to connect to a VTrak from the Internet.

Your MIS Administrator can tell you how to access your network from outside the firewall. Once you are logged onto the network, you can access the VTrak using its IP address. See "Logging into WebPAM PROe" on page 60.

Chapter 4: Management with WebPAM PROe

This chapter contains the following topics:

Logging into WebPAM PROe

1. Launch your browser.
2. In the browser address field, type in the virtual management port IP address of the VTrak subsystem.

   Use the IP address you set in the CLI (page 47) or CLU (page 55). Example:

   - WebPAM PROe uses a secure HTTP connection. . . . . .https://
   - Enter the IP address of the VTrak 192.168.10.85

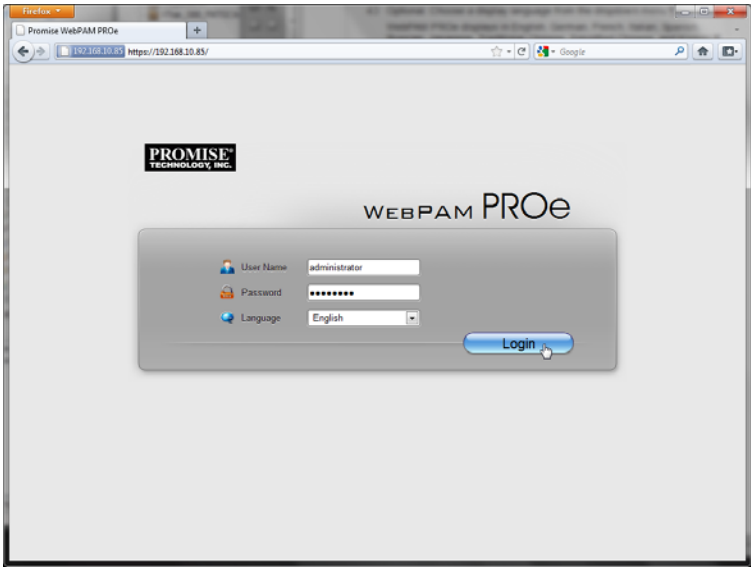
Together, your entry looks like this: **https://192.168.10.85**

3. When the login screen appears:
   - Type **administrator** in the User Name field.
   - Type **password** in the Password field.
   - Click the **Login** button.

   The User Name and Password are case sensitive.
4. Optional. Choose a display language from the dropdown menu.

   WebPAM PROe displays in English, German, French, Italian, Spanish, Russian, Japanese, Traditional Chinese, Simplified Chinese, and Korean.
5. Click the **Login** button.

Figure 1. WebPAM PROe log-in screen



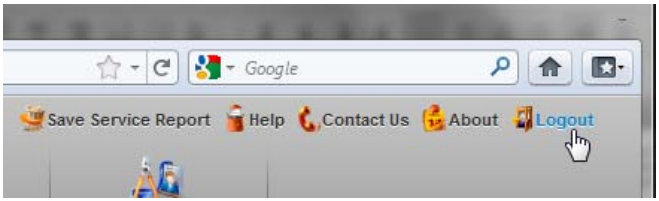
After login, the WebPAM PROe opening screen appears.

Choosing the Display Language

WebPAM PROe displays in multiple languages. You choose the display language when you log in.

If you are already logged in and you want to change the display language:

1. Click **Logout** at the top right corner of the screen.



   The Login screen appears.

2. Click the **Language** dropdown menu and highlight the language you prefer.

3. Reenter your user name and password.
4. Click the **Login** button.

   WebPAM PROe opens in the language you chose.

Perusing the Interface

The WebPAM PROe interface consists of a header and four tabs, each with specific functions.

- **Header**

  Top left corner of the window:

  - Name of logged-in user
  - IP address – Virtual IP address of the RAID subsystem

- **Top right corner** of the window
  - Save Service Report – Saves a detailed report to your Host PC
  - Help – Accesses the Help Welcome screen
  - Contact Us – Technical support contact information
  - About – Information about WebPAM PROe
  - Logout – Exits WebPAM PROe

- **Discovery** tab
  - Displays other RAID systems on your network
  - Enables direct login to other RAID systems

- **Dashboard** tab
  - RAID subsystem model and type of enclosure
  - System status
  - Event information – Most recent NVRAM events
  - Storage overview – Capacities, number of devices

- **Device** tab
  - Enclosure front and back views
  - Topology
  - Enclosure component list and settings
  - Physical drive management
  - UPS (unlimited power supply) management
  - Fibre Channel or iSCSI management

- **Storage** tab
  - Wizard – Automatic, Express, or Advanced configuration
  - Disk array management
  - Logical drive management
  - Initiator management
  - LUN mapping and masking

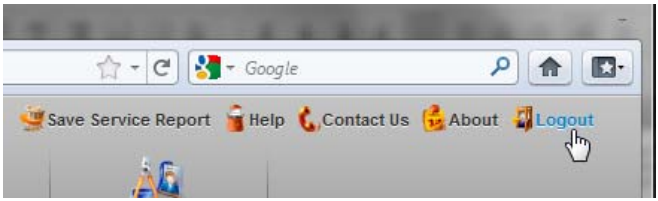
- **Administration** tab
  - Subsystem settings, clearing statistics, NTP, and controller lock
  - User management, including LDAP and role mapping
  - Software services
  - Runtime and NVRAM event logs
  - Background activity, settings and schedules
  - Firmware updates
  - Image version
  - Performance monitor
  - PSU wattage monitor
  - Restore factory default settings
  - Import/Export user database and configuration script
  - Network management

Logging out of WebPAM PROe

There are two ways to log out of WebPAM PROe:

- Close your browser window
- Click **Logout** on the WebPAM PROe banner

Figure 2. Clicking "Logout" on the WebPAM PROe banner



Clicking **Logout** brings you back to the Login Screen. See page 70.

After logging out, you must enter your user name and password in order to log in again.

Viewing the Storage Network

To view the other subsystems on your Storage Network, click the **Discovery** tab at the left edge of the WebPAM PROe window.

Logging onto a Subsystem

To log onto a subsystem in the list, double-click the subsystem.

Caution

The new subsystem displays in the same browser tab. Click your browser's back button to return to the original subsystem.

Filtering the Subsystem List

To filter the list, so it shows only specific subsystems, enter a characteristic into the **Filter By** field and press Enter.

Refreshing the List

To refresh the list, click the **Refresh** link.

Managing Subsystems

Subsystem management includes:

- Viewing Subsystem Information (below)
- Making Subsystem Settings (page 77)
- Locking or Unlocking the Subsystem (page 77)
- Restoring Factory Default Settings (page 78)
- Clearing Statistics (page 79)
- Saving a Service Report (page 79)
- Importing a Configuration Script (page 82)
- Exporting a Configuration Script (page 82)
- Restarting the Subsystem (page 83)
- Shutting Down the Subsystem (page 83)
- Restarting the Subsystem after a Shutdown (page 84)

Viewing Subsystem Information

To view subsystem information, click the **Administration** tab.

The list of subsystems and host controllers displays.

Subsystem information includes:

- Alias, if assigned
- Vendor
- Model
- WWN – World Wide Number
- Serial number
- Part number
- Revision number
- Number of JBOD expansion units connected
- Maximum number of JBOD expansion units supported
- Number of controllers present
- Maximum number of controllers supported
- Redundancy status
- Redundancy type
- System date and time

Making Subsystem Settings

To make subsystem settings:

1. Click the **Administration** tab.
2. Click the **Subsystem Information** icon.
3. Click the **Settings** button.
4. Make changes as required:
   - Enter an alias or change the existing alias in the field provided.
   - Choose a redundancy type from the dropdown menu.

     The choices are **Active-Active** and **Active-Standby**
   - Check the box to enable **Cache Mirroring**.
5. Click the **Save** button.

Locking or Unlocking the Subsystem

The lock prevents other sessions (including sessions with the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done. When the user who locked the controller logs out, the lock is automatically released.

Setting the Lock

To set the lock:

1. Click the **Administration** tab.
2. Click the **Subsystem Information** icon.
3. Click the **Lock/Unlock** button.
4. In the Lock Time field, type a lock time in minutes.

   1440 minutes = 24 hours
5. Click the **Lock** button.

Resetting the Lock

To reset the lock with a new time:

1. Click the **Administration** tab.
2. Click the **Subsystem Information** icon.
3. Click the **Lock/Unlock** button.
4. In the Lock Time field, type a new lock time in minutes.

   1440 minutes = 24 hours
5. Click the **Lock** button.

Releasing the Lock

To release a lock that you set:

1. Click the **Administration** tab.
2. Click the **Subsystem Information** icon.
3. Click the **Lock/Unlock** button.
4. Click the **Unlock** button.

Releasing a Lock set by another user

To release somebody else's lock:

1. Click the **Administration** tab.
2. Click the **Subsystem Information** icon.
3. Click the **Lock/Unlock** button.
4. Check the **Force Unlock** box.
5. Click the **Unlock** button.

Restoring Factory Default Settings

This feature restores settings to their default values.

Caution

Use this feature only when required and only on the settings that you must reset to default in order to set them correctly.

Note

To reset the Administrator's password to the factory default, see "Resetting the Default Password" on page 330.

To restore all settings to their default values:

1. Click the **Administration** tab.
2. Click the **Restore Factory Default** icon.
3. In the Restore factory default settings screen, check the boxes beside the settings you want to reset to default value:

Firmware Factory Default Settings

- Background activity settings
- Controller settings
- Enclosure settings
- FC port settings
- iSCSI port settings
- Management network settings
- Physical drive settings
- Subsystem settings

Software Factory Default Settings

- BGA scheduler settings
- Service settings
- Webserver settings
- SNMP settings
- Telnet settings
- SSH settings
- Email settings
- Netsend settings
- CIM settings
- NTP settings
- User settings
- UPS settings
- LDAP settings

4. Click the **Submit** button.
5. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Clearing Statistics

This function clears statistical data on the RAID controllers, Fibre Channel ports, physical drives, and logical drives.

To clear subsystem statistics:

1. Click the **Administration** tab.
2. Click the **Subsystem Information** icon.
3. Click the **Clear Statistics** button.
4. Type the word “confirm” in the field provided.
5. Click the **Confirm** button.

Saving a Service Report

A Service Report is a detailed report covering the configuration and status of all components in your RAID system. A support technician or field engineer might request a service report for the purpose of diagnosis and troubleshooting.

To save a system configuration file:

1. Click **Save Service Report** in the Header.

Information for the report is gathered and compiled. This action takes up to a few minutes, depending on the size of your RAID system

2. Click the **Save File** option, then click the **Save** button.

   The report saves to your Host PC as a compressed HTML file.

3. Double-click the downloaded file to decompress it.
4. Double-click the report to open it in your default browser.

   The Service Report includes the following topics:

   - About – Report utility
   - Battery Info – Cache backup batteries
   - BBM Info – Bad Block Manager
   - BGA Summary – Status and settings

   The Service Report includes the following topics, continued:

   - BGA Schedules – Scheduled activities
   - Buzzer Info
   - Controller Info
   - Debug Syslog – Diagnostic information
   - Disk Array Info – ID, alias, and capacities only
   - Disk Array Dump Info – Diagnostic information
   - Disk Array Verbose Info – All disk array information
   - Enclosure Info
   - Error Table Info – Read check, write check, and inconsistent blocks
   - Event Info – NVRAM – List of NVRAM events
   - Event Info – Runtime – List of Runtime events
   - FC Node Info
   - FC Device Info
   - FC Initiator Info
   - FC Port Info
   - FC SFP Info
   - FC Stats Info
   - Flash Image Version Info
   - iSCSI Info
   - LDAP Info
   - LogDrive Info – Basic logical drive information
   - LogDrive Dump Info – Diagnostic information
   - Logical Drive Verbose Info – Full logical drive information

- Lunmap Info – LUN map type, LUN masking status, and LUN entries
- Network Info – Virtual port
- Network Maintenance Info – Maintenance mode ports
- Phydriv Info – Basic physical drive information
- Phydriv Verbose Info – Full physical drive information
- PD SMART Info – Physical drive ID, model, type, and SMART status
- PSU Wattage Info – Enclosure power consumption, power supply input and output, and power on time
- SWMGT Info – Software management

The Service Report includes the following topics, continued:

- Service Setting – CIM
- Service Setting – Email
- Service Setting – Netsend
- Service Setting – NTP
- Service Setting – SLP
- Service Setting – SNMP
- Service Setting – SSH
- Service Setting – Telnet
- Service Setting – Webserver
- Sessions Info
- Spare Info – Basic spare drive information
- Spare Dump Info – Diagnostic information
- Spare Verbose Info – Full spare drive information
- Statistic Info
- Subsystem info
- UPS Info
- User Info

Importing a Configuration Script

You can write a CLI configuration script to automatically configure your VTrak subsystem. The script must be a plain, non-encrypted text file. From there, you can import the script from the Host PC and perform the configuration automatically.

Cautions

- Do NOT attempt to write or modify a configuration script until you receive guidance from Technical Support. See page 435.
- Importing a configuration script overwrites the current settings on your VTrak subsystem.

Or you can save the configuration from one VTrak RAID subsystem, export it, and then import it to automatically configure your other VTrak RAID subsystems.To import a configuration script:

1. Click the **Administration** tab.
2. Click the **Import/Export** icon.
3. Click the **Import** option.
4. Choose **Configuration Script** from the **Type** dropdown menu.
5. Click the **Browse** button and navigate to the configuration script and click the **OK** button.
6. Click the **Next** button.

   The system verifies that the file is a valid configuration script and displays any errors or warnings.
7. Click the **Submit** button to continue.
8. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

   The configuration script is imported and applied automatically.

Exporting a Configuration Script

You can save the configuration from one VTrak RAID subsystem, export it, and then import it to automatically configure your other VTrak RAID subsystems.

To export a configuration script:

1. Click the **Administration** tab.
2. Click the **Import/Export** icon.
3. Click the **Export** option.
4. Choose **Configuration Script** from the **Type** dropdown menu.

5. Click the **Submit** button.
6. In the Open dialog box, click the **Save File** option, then click the **OK** button.

   The file is saved to your PC as “Configscript.txt”.

Caution

Do NOT attempt to write or modify a configuration script until you receive guidance from Technical Support. See page 435.

Restarting the Subsystem

This function shuts down the subsystem and then restarts it.

Important

Do NOT turn off the power supply switches on the RAID subsystem or JBOD expansion units.

To restart the subsystem:

1. Click the **Administration** tab.
2. Click the **Subsystem Information** icon.
3. Click the **Shutdown/Restart** button.
4. Click the **Restart** button.
5. Type the word “confirm” in the field provided.
6. Click the **Confirm** button.

   When the controller shuts down, your WebPAM PROe connection is lost.
7. Wait no less than two minutes.
8. In your browser, click **Logout** in the WebPAM PROe Header, then log in again.

   If you cannot log in immediately, wait 30 seconds and try again.

Shutting Down the Subsystem

This function shuts down the RAID subsystem without restarting it.

To shutdown the subsystem:

1. Click the **Administration** tab.
2. Click the **Subsystem Information** icon.
3. Click the **Shutdown/Restart** button.
4. Click the **Shutdown** button.
5. Type the word “confirm” in the field provided.

6. Click the **Confirm** button.

   When the controller shuts down, your WebPAM PROe connection is lost.
7. Wait no less than two minutes.
8. Manually turn OFF the switches on both power supplies.

Important

If your RAID subsystem manages JBOD expansion units, you must follow the proper startup procedure.

Restarting the Subsystem after a Shutdown

Important

If your RAID subsystem manages JBOD expansion units, always power on the JBOD expansion units first. Then power on the RAID subsystem.

To start the RAID subsystem:

1. Manually turn ON the power supply switches on the back of the subsystem.
2. Wait no less than two minutes.
3. Open your browser and log into WebPAM PROe.

   If you cannot log in immediately, wait 30 seconds and try again.

Managing RAID Controllers

RAID controller management includes:

- Viewing Controller Information (below)
- Making Controller Settings (page 86)
- Viewing Controller Statistics (page 87)
- Locating a Controller (page 88)
- Viewing the Flash Image Information (page 88)
- Updating Firmware on a RAID Subsystem (page 89)
- Viewing Battery Information (page 89)
- Reconditioning a Battery (page 90)
- Making Buzzer Settings (page 91)
- Silencing the Buzzer (page 91)

Viewing Controller Information

To view controller information:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the controller you want, then click the **View** button.

   Controller information includes:

   - Controller ID
   - Readiness Status
   - Power On Time
   - Part Number
   - Hardware Revision
   - Cache Usage – Percentage
   - Boot Loader Version
   - Firmware Build Date
   - Software Build Date
   - Alias – If assigned *
   - Operational Status
   - SCSI Protocol Supported
   - Serial Number
   - WWN – Worldwide Number
   - Dirty Cache Usage – Percentage
   - Firmware Version
   - Software Version

4. Click the **Advanced Information** tab.

Advanced controller information includes:

- Slot 1 Memory Type
- Slot 2 Memory Type
- LUN Affinity *
- Controller Role
- Flash Size
- NVRAM Size
- Coercion *
- SMART *
- Write Back Cache Flush Interval *
- Adaptive Writeback Cache *
- Forced Read Ahead (cache) *
- Power Saving Standby Time *
- Cache Line Size
- Slot 1 Memory Size
- Slot 2 Memory Size
- ALUA *
- Flash Type
- NVRAM Type
- Preferred Cache Line Size
- Coercion Method *
- SMART Polling Interval *
- Enclosure Polling Interval *
- Host Cache Flushing *
- Power Saving Idle Time *
- Power Saving Stopped Time *

Items with an asterisk (*) are adjustable under Controller Settings.

Making Controller Settings

In a dual-controller RAID subsystem, settings made to one controller are applied to both controllers.

To make controller settings:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the controller you want, then click the **Settings** button.
4. Make settings changes as required:
   - Enter, change or delete the alias in the **Alias** field.
   - **LUN Affinity** – Choose an enable/disable option from the dropdown menu.

     RAID controllers must be set to Active-Active. See “Making Subsystem Settings” on page 77 and “LUN Affinity” on page 361.
   - **ALUA** – Choose an enable/disable option from the dropdown menu.

     RAID controllers must be set to Active-Active. See “Making Subsystem Settings” on page 77 and “ALUA” on page 361.
   - **SMART Log** – Check the box to enable or uncheck to disable.
   - **SMART Polling Interval** – Enter a value into the field, 1 to 1440 minutes

- **HDD Power Saving** – Choose time periods from the dropdown menus.

  After an HDD has been idle for the set period of time:

  - **Power Saving Idle Time** – Parks the read/write heads.
  - **Power Saving Standby Time** – Lowers disk rotation speed.
  - **Power Saving Stopped Time** – Spins down the disk (stops rotation).
- **Coercion** – Check the box to enable or uncheck to disable.
- **Coercion Method** – Choose a method from the dropdown menu:
  - GBTruncate
  - 10GBTruncate
  - GrpRounding
  - TableRounding
- **Write Back Cache Flush Interval** – Enter a value into the field, 1 to 12 seconds.
- **Enclosure Polling Interval** – 15 to 255 seconds.
- **Adaptive Writeback Cache** – Check the box to enable or uncheck to disable. See “Adaptive Writeback Cache” on page 363.
- **Host Cache Flushing** – Check the box to enable or uncheck to disable. See “Host Cache Flushing” on page 363**.**
- **Forced Read Ahead** (cache) – Check the box to enable or uncheck to disable. See “Forced Read-Ahead Cache” on page 362.

5. Click the **Save** button.

Notes

- Power Management must be enabled on the disk array for the HDD Power Saving settings to be effective. See “Making Disk Array Settings” on page 157.
- Power Management functions are limited to the features your HDDs actually support.

Viewing Controller Statistics

To view controller statistics:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the controller you want, then click the **View** button.
4. Click the **Statistics** tab.

Controller statistics include:

- Data Transferred
- Read Data Transferred
- Write Data Transferred
- Errors
- Non-Read/Write Errors
- Read Errors
- Write Errors
- IO Requests
- Non-Read/Write Requests
- Read IO Requests
- Write IO Requests
- Statistics Start date and time
- Statistics Collection date and time

Note

To clear controller statistics, see “Clearing Statistics” on page 79.

Locating a Controller

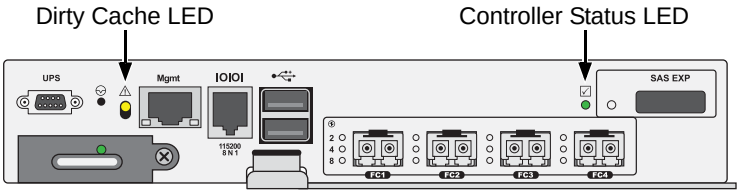
This feature causes the controller LEDs to blink for one minute to assist you in locating the controller on a RAID subsystem or JBOD expansion unit.

To locate a controller:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the controller you want, then click the **Locate** button.

   The controller LEDs blink for one minute.

Figure 3. FC RAID controller LEDs



Viewing the Flash Image Information

To view the flash image information for the RAID subsystem enclosure:

1. Click the **Administration** tab.
2. Click the **Image Version** icon.
3. Click the Enclosure you want to see and click the **triangular button**.

RAID subsystems have the following components in their flash image:

- Kernel
- Firmware
- Software
- Ramdisk
- SEP Firmware
- OEM Customization
- BIOS
- 6G Expander
- System Libraries
- Applications
- Mount Scripts
- PLX EEPROM Image

- **Running** – The version that is currently running on the subsystem or expansion unit.
- **Flashed** – This version was updated but does not run until the subsystem restarts.

See “Updating Firmware on a RAID Subsystem” on page 89.

JBOD expansion units have only one component in their flash image, SEP firmware. It only appears as running.

Updating Firmware on a RAID Subsystem

Use this function to flash (update) the firmware on the VTrak. See page 315 for the procedure.

Viewing Battery Information

Batteries maintain power to the controller cache in the event of a power failure, thus protecting any data that has not been written to a physical drive.

To view battery information:

1. Click the **Device** tab.
2. Click the **Component** List icon.
3. Click the battery you want, then click the **View** button.

   Battery information includes:

   - Battery ID
   - Operational status – Fully charged, recondition means a reconditioning is in process
   - Battery chemistry – LiON, etc.
   - Remaining capacity – Battery capacity as a percentage
   - Battery cell type – Number of cells
   - Estimated hold time – Time in hours that the battery can power the cache

- Temperature threshold discharge – Maximum temperature allowed when the battery is discharging
- Temperature threshold charge – Maximum temperature allowed when the battery is charging
- Battery temperature – Actual battery temperature
- Cycle count – Number of times the battery was reconditioned
- Voltage in millivolts
- Current in milliamps

Reconditioning a Battery

Batteries maintain power to the controller cache in the event of a power failure, thus protecting any data that has not been written to a physical drive. Reconditioning is the action of discharging and recharging a battery to preserve its capacity and performance.

Reconditioning is a background activity and does not affect I/O performance. When the recondition is completed, the battery's cycle count increments by one.

By default, each battery is reconditioned every two months. You can change the reconditioning schedule.

Caution

Disabling or deleting the battery recondition schedule is NOT recommended.

To recondition a battery immediately:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the battery you want, then click the **Recondition** button.

Battery operations status changes to "Recondition" and the battery's remaining capacity and estimated hold time fall and rise reflecting the discharge and recharge cycles of the reconditioning. That behavior is normal.

Making Schedule Changes

To make changes the scheduled battery reconditioning:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of Background Activities displays.
3. Click the **Scheduler** button.
4. Mouse-over Battery Reconditioning and click the **Settings** button.

5. Make settings changes as required:
   - Start Time
   - Uncheck the Enable This Schedule box to disable this activity.
   - Recurrence Pattern
   - Start From
   - End On
6. Click the **Save** button to apply the new settings.

Making Buzzer Settings

To make buzzer settings:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Buzzer and click the **Settings** button.
4. Check the **Enable Buzzer** box to enable the buzzer.
   Or uncheck the box to disable.
5. Click the **Save** button.

Silencing the Buzzer

Caution

This action disables the buzzer for all events.

To silence the buzzer:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Buzzer and click the **Settings** button.
4. Uncheck the **Enable Buzzer** box.
5. Click the **Save** button.

Managing Enclosures

Enclosure management includes the following functions:

- Viewing the Enclosures Summary (page 92)
- Making Enclosure Settings (page 93)
- Locating an Enclosure (page 93)
- Viewing FRU VPD Information (page 94)
- Viewing Power Supply Status (page 94)
- Viewing Fan Status (page 94)
- Viewing Temperature Sensor Status (page 95)
- Viewing Voltage Sensor Status (page 95)

Viewing Enclosure Topology

This feature displays the connection topology of the VTrak subsystem. Topology refers to the manner in which the data paths among the enclosures are connected. There are three methods:

- **Individual Subsystem** – A single subsystem
- **JBOD Expansion** – Managed through one subsystem or head unit
- **RAID Subsystem Cascading** – Managed through one subsystem or head unit

For more information about connections, see “Making Management and Data Connections” on page 25.

To view enclosure topology:

1. Click the **Device** tab.
2. Click the **Topology** icon.

   The topology or data connections of your system displays.

Viewing the Enclosures Summary

Enclosure Management includes information, status, settings and location. To access Enclosure Management:

1. Click the **Device** tab.
2. Click the **Component List** icon.

   The following information is shown:

   - Enclosure ID number
   - Status
   - Enclosure Type
   - Status Description (specific components in need of attention, if any)

Locating an Enclosure

To locate an enclosure:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the enclosure you want, then click the **Locate** button.

   The enclosure LEDs blink for one minute.

Viewing Enclosure Information

To view enclosure information:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Enclosure and click the **View** button.

   Enclosure information includes:

   - Enclosure ID
   - Enclosure Type
   - Enclosure Warning Temperature Threshold
   - Enclosure Critical Temperature Threshold
   - Controller Warning Temperature Threshold
   - Controller Critical Temperature Threshold
   - Max Number of Controllers
   - Max Number of Physical Drive Slots
   - Max Number of Fans
   - Max Number of Blowers
   - Max Number of Temperature Sensors
   - Max Number of Power Supply Units
   - Max Number of Batteries
   - Max Number of Voltage Sensors

For information on Enclosure problems, see “Diagnosing an Enclosure Problem” on page 391.

Making Enclosure Settings

To make Enclosure settings:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Enclosure and click the **Settings** button.

Enclosure settings include:

- Enclosure Warning Temperature Threshold
- Enclosure Critical Temperature Threshold
- Controller Warning Temperature Threshold
- Controller Critical Temperature Threshold

4. In the field provided, type the temperature in degrees C for each threshold value.
5. Click the **Save** button.

Viewing FRU VPD Information

FRU VPD refers to Vital Product Data (VPD) information about Field Replaceable Units (FRU) in the enclosure. The number and type of FRU depends on the subsystem model.

To view FRU VPD information:

To make Enclosure settings:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Enclosure and click the **FRU VPD** button.

   Use this information when communicating with Technical Support and when ordering replacement units. For contact information, see “Contacting Technical Support” on page 435.

Viewing Power Supply Status

To view the status of the power supplies:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Enclosure and click the **View** button.
4. Scroll down to view the power supplies.

   The screen displays the operational and fan status of VTrak’s two power supplies. If any status differs from normal or the fan speed is below the Healthy Threshold value, there is a fan/power supply malfunction. See “Replacing a Power Supply” on page 323.

Viewing Fan Status

The fans are located on the power supplies.

To view the status of the power supply fans:

1. Click the **Device** tab.

2. Click the **Component List** icon.
3. Click the Enclosure and click the **View** button.
4. Scroll down to view the Fans.

   The screen displays the status and speed of the fans on the power supplies. If fan speed is below the Healthy Threshold, there is a malfunction. See “Diagnosing an Enclosure Problem” on page 391.

Viewing Temperature Sensor Status

To view the status of the temperature sensors:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Enclosure and click the **View** button.
4. Scroll down to view the Temperature Sensors.

   If any temperature exceeds the Healthy Threshold value, there is an overheat condition in the enclosure. See “Making Enclosure Settings” on page 93 and See “Diagnosing an Enclosure Problem” on page 391.

Viewing Voltage Sensor Status

To view the status of the voltage sensors:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Enclosure and click the **View** button.
4. Scroll down to view the Voltage Sensors.

   If any voltage is outside the Healthy Threshold values, there is a voltage malfunction in the enclosure. See “Diagnosing an Enclosure Problem” on page 391.

Managing UPS Units

Uninterruptible Power Supply (UPS) Management includes the following functions:

- Viewing a List of UPS Units (below)
- Making UPS Settings (page 97)
- Viewing UPS Information (page 98)

Viewing a List of UPS Units

To view a list of UPS units supporting the VTrak:

1. Click the **Device** tab.
2. Click the **UPS** icon.

   Information in the UPS List includes:

   - **ID** – The ID number of the UPS
   - **Status** – OK means Normal.

     On AC means the UPS is connected to a viable external AC power source.

     On Battery means the external AC power source is offline and the UPS is running on battery power.
   - **Model** – Model name of the UPS
   - **Battery Capacity** – Backup capacity expressed as a percentage.
   - **Loading Ratio** – Actual output of UPS as a percentage of the rated output. See the Note below.
   - **Remaining Minutes** – Number of minutes the UPS is expected to power your system in the event of a power failure.

Note

The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%. If the reported Loading Ratio exceeds the recommended value for your UPS unit:

- Have fewer subsystems or peripherals connected to this UPS unit.
- Add more UPS units, or use a higher-capacity UPS unit, to protect your RAID systems.

Making UPS Settings

These settings control how the VTrak subsystem detects the UPS unit and responds to data reported by the UPS unit.

To make UPS settings:

1. Click the **Device** tab.
2. Click the **UPS** icon.
3. Click the **UPS Settings** button.
4. Perform the following actions as required:
   - Verify the Current UPS Communication method. See Note 1:
     - **SNMP** – Network connection.
     - **Serial** – Serial connection.
     - **Unknown** – No connection.
   - Choose a Detection Setting from the dropdown menu:
     - **Automatic** – Default. If a UPS is detected when the subsystem boots, the settings changes to Enable.
     - **Enable** – Monitors UPS. Settings changes, reports warnings, and logs events.
     - **Disable** – Monitors UPS only.
   - Type values into the Threshold fields. See Note 2:
     - **Running Time Remaining Threshold** – Actual time below this value resets adaptive writeback cache to writethrough.
     - **Warning Temperature Threshold** – Actual temperature above this value triggers a warning and logs an event.
     - **Loading Ratio Threshold** – Actual loading ratio (percentage) above this threshold triggers a warning and logs an event. See Note 3.
   - For UPS units with network cards, type the IP addresses or DNS names in fields UPS 1 and UPS 2. See Note 4.
5. Press Control-A to save your settings.

Note 1: VTrak supports multiple UPS units using network or serial connections, but not a combination of both methods.

Note 2: Detection Setting must be set to Auto. If a UPS is detected, the settings changes to Enable.

Note 3: The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%.

Note 4: To specify UPS units by DNS names, ask your IT administrator to add the DNS names to the DNS server, before you make UPS settings.

Viewing UPS Information

To view information about a specific UPS unit:

1. Click the **Device** tab.
2. Click the **UPS** icon.
3. Mouse-over UPS and click the **View** button.

   UPS information includes:

   - **UPS ID**
   - **Model Name**
   - **Serial Number**
   - **Firmware Version**
   - **Manufacture Date**
   - **Voltage Rating** – Output voltage of the UPS.
   - **Battery Capacity** – Backup capacity expressed as a percentage.
   - **Remaining Backup Time** – Number of minutes the UPS is expected to power your system in the event of a power failure.
   - **Loading Ratio** – Actual output of UPS as a percentage of the rated output. See the Note below.
   - **Temperature** – Reported temperature of the UPS unit.

Note

The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%. If the reported Loading Ratio exceeds the recommended value for your UPS unit:

- Have fewer subsystems or peripherals connected to this UPS unit.
- Add more UPS units, or use a higher-capacity UPS unit, to protect your RAID systems.

Managing Network Connections

Network Connections Management includes the following functions:

- Making Virtual Management Port Settings (page 100)
- Making Maintenance Mode Settings (page 100)

Making Virtual Management Port Settings

The VTrak subsystem has a virtual management port, enabling you to log into a VTrak with dual controllers using one IP address.

Before you change settings, please see “About IP Addresses” on page 45.

You initially made these settings during subsystem setup. You can change them later as required.

Caution

Changing virtual management port settings can interrupt your WebPAM PROe connection and require you to log in again.

To make virtual management port settings:

1. Click the **Device** tab.
2. Click the **Network Management** icon.
3. Click the **Virtual Management Port** tab.
4. Click the protocol family whose settings you want to change and click the **Configuration** button.
5. Make the following settings are needed:
   - Check the Enable box to enable this protocol family.
   - Check the Enable DHCP box to enable a DHCP server to make your network settings. DHCP is currently supported in IPv4 only.
   - For manual network settings, type the RAID subsystem’s IP address, subnet mask, gateway IP address, and DNS server IP address into the fields provided.
6. Click the **Submit** button.

Making Maintenance Mode Settings

Each controller has its own IP addresses for access when the controller goes into maintenance mode. For more information, see “Maintenance Mode” on page 395.

Before you change settings, please see “About IP Addresses” on page 45.

To make maintenance mode settings:

1. Click the **Device** tab.
2. Click the **Network Management** icon.
3. Click the **Maintenance Mode** tab.
4. Click the controller and protocol family whose settings you want to change and click the **Configuration** button.
5. Make the following settings are needed:
    - Check the Enable box to enable this protocol family.
    - Check the Enable DHCP box to enable a DHCP server to make your network settings. DHCP is currently supported in IPv4 only.
    - For manual network settings, type the controller's IP address, subnet mask, gateway IP address, and DNS server IP address into the fields provided.
6. Click the **Submit** button.

Managing Users

User management includes:

- Viewing User Information (below)
- Creating a User (page 102)
- Setting User Event Subscriptions (page 103)
- Changing User Passwords (page 105)
- Deleting a User (page 106)
- Importing a User Database (page 106)
- Exporting a User Database (page 107)

The Administrator or a Super User can perform these tasks.

Viewing User Information

To view user information:

1. Click the **Administration** tab.
2. Click the **User Management** icon.

   The list of users displays. User information includes:

   - User name
   - Status
   - Privilege level
   - Display name
   - Email address
   - User Type – local or LDAP user

Creating a User

This action requires Administrator or Super User privileges.

To create a user:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. Click the **Add User** button.
4. In the Add User dialog box, enter the information in the fields provided:
   - Name – This is the user's login name
   - Display Name
   - Password
   - Retype Password
   - User Email – Required for event notification

5. Choose a privilege level from the dropdown menu.
   See the table below.
6. (Optional) Uncheck the **Enable** box to disable this User account.
7. Click the **Save** button.
   The user is added to the list.

Important

- For this user to receive event notification, Click the new user and click the **Subscription** button.
- For this user to be an LDAP User, click the **LDAP Settings** button, enter information and make settings as required.

User Privileges	
Level	**Meaning**
View	Allows the user to see all status and settings but not to make any changes
Maintenance	Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
Power	Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller
Super	Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default “administrator” account is a Super User

Setting User Event Subscriptions

By default, all users have event notification:

- Enabled
- Set to the Major (severity) level for all events
  See the Table above

Subscribing users receive notification of events at the chosen severity level and all higher levels. See the table on the next page.

Note

Each user must have a valid Email address to receive events. See "Making User Settings" below.

Changing a user subscription requires Administrator or Super User privileges.

To set a user event subscription:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. In the User list, click the user you want, then click the **Subscription** button.
4. Make settings changes as required:
   - For the **Enable Event Notification** box, check to enable for this user, uncheck to disable.
   - Click to change the priority options for each category of event.
5. Click the **Save** button.

Making User Settings

This action requires Administrator or a Super User privileges.

To make user settings:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. In the User list, Click the user you want, then click **Settings**.
4. Make settings changes as required:
   - For the **Enable** box, check to enable this user account, uncheck to disable this user account
   - In the User Settings dialog box, enter a new **Display Name** or **User Email** address
   - Choose a new **Privilege** level from the dropdown menu. See the table on the next page.
5. Click the **Save** button.

User Privileges	
Level	**Meaning**
View	Allows the user to see all status and settings but not to make any changes
Maintenance	Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
Power	Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller
Super	Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default “administrator” account is a Super User

Changing User Passwords

This action requires Administrator or Super User privileges.

To change a user’s password:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. In the User list, Click the user you want, then click **Change Password**.
4. In the Change Password dialog box, enter the information in the fields provided:
   - New Password
   - Retype Password
5. Click the **Save** button.

Note

To reset the Administrator’s password to the factory default, see “Resetting the Default Password” on page 330.

Deleting a User

This action requires Administrator or Super User privileges.

Note

You cannot delete the Administrator.

To delete a user:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. In the User list, Click the user you want, then click the **Delete** button.
4. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Importing a User Database

You can save the user information and settings from one VTrak RAID subsystem, export it, and then import it to automatically configure your other VTrak RAID subsystems.

Caution

Importing a user database overwrites the current users and user settings on your VTrak subsystem.

To import a user database:

1. Click the **Administration** tab.
2. Click the **Import/Export** icon.
3. Click the **Import** option.
4. Choose **User Database** from the **Type** dropdown menu.
5. Click the **Browse** button and navigate to the user database file and click the **OK** button.
6. Click the **Next** button.

   The system verifies that the file is a valid user database and displays any errors or warnings.
7. Click the **Submit** button to continue.
8. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

   The user database is imported and applied automatically.

Exporting a User Database

You can save the user information and settings from one VTrak RAID subsystem, export it, and then import it to automatically configure your other VTrak RAID subsystems.

To export a user database:

1. Click the **Administration** tab.
2. Click the **Import/Export** icon.
3. Click the **Export** option.
4. Choose **User Database** from the **Type** dropdown menu.
5. Click the **Submit** button.
6. In the Open dialog box, click the **Save File** option, then click the **OK** button.

   The file is saved to your PC as “User.dat”.

Note

The user database file is not designed to be opened or edited in the field.

Managing LDAP

LDAP Management includes the following functions:

Viewing LDAP Information

Lightweight Directory Access Protocol (LDAP) is a protocol used to access a directory listings.

To view LDAP information:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. Click the **LDAP Settings** button.

   The LDAP Authorization screen appears. LDAP information includes:

   - **Enable LDAP** – Check the box to enable LDAP.
   - **Response Time Out** – Maximum time to allowed for communication with LDAP server.
   - **Base DN** – Distinguished name used as based object entry search. *dc=example, dc=com* is the default.
   - **LDAP Server** – Hostname or IP address of the LDAP server. *127.0.0.1* is the default.
   - **LDAP Port** – The port number of the LDAP server. *389* is the default.
   - **Server Type** – Windows Active Directory, Mac Open directory, or Unspecified.
   - **UID Attribute** – Stores user's ID in LDAP server. For Windows, a typical value is *sAMAccountName*. For Mac OS, a typical value is *uid*.
   - **Anonymous Bind** – Allows the system to bind to an LDAP server without providing Bind DN and password.
   - **Bind DN** – Distinguished name used to authenticate communication between subsystem and LDAP server. No default value.
   - **Bind Password** – Password for Bind DN. No default value.
   - **Email notification for Event** – Enables an email subscription for an LDAP authenticated user.

- **Object Class** – For email notification. The default is *person*.
- **Full Name Attribute** – Stores user's full name in LDAP server. *displayName* is the default.
- **Email Address Attribute** – Stores user's email address in LDAP server. *mail* is the default.
- **Privilege for LDAP Users** – Default Privilege or Using Role Mapping.
- **Default Privilege** – Applies to *Default* Role Policy. View, Maintenance, Power, or Super.
- **Base DN of Group** – The base DN for a group of users.
- **Object Class of Group** – The object class for a group of users. The default is *group*.
- **Group ID Attribute** – Identification for a group of users. The default is *CN*.

Making LDAP Settings

This action requires Administrator or a Super User privileges.

To make user LDAP settings:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. Click the **LDAP Settings** button.
4. Enter information and make settings as required:
   - **Enable LDAP** – Check the box to enable LDAP.
   - **Response Time Out** – Maximum time to allowed for communication with LDAP server.
   - **Base DN** – Distinguished name used as based object entry search. *dc=example, dc=com* is the default.
   - **LDAP Server** – Hostname or IP address of the LDAP server. *127.0.0.1* is the default.
   - **LDAP Port** – The port number of the LDAP server. *389* is the default.
   - **Server Type** – Choose a server type from the dropdown menu. Windows Active Directory, Mac Open directory, or Unspecified.
   - **UID Attribute** – Stores user's ID in LDAP server. For Windows, a typical value is *sAMAccountName*. For Mac OS, a typical value is *uid*.
   - **Anonymous Bind** – Allows the system to bind to an LDAP server without providing Bind DN and password.
   - **Bind DN** – Distinguished name used to authenticate communication between subsystem and LDAP server. No default value.
   - **Bind Password** – Password for Bind DN. No default value.

- **Email notification for Event** – Check the box to enable an email subscription for an LDAP authenticated user.
- **Object Class** – For email notification. The default is *person*.
- **Full Name Attribute** – Store user's full name in LDAP server. *displayName* is the default.
- **Email Address Attribute** – Store user's email address in LDAP server. *mail* is the default.
- **Privilege for LDAP Users** – Choose Using Default Privilege or Using Role Mapping. See the table below.
- **Default Privilege** – Choose a level from the dropdown menu. See the table on the previous page.
- **Base DN of Group** – The base DN for a group of users.
- **Object Class of Group** – The object class for a group of users. The default is *group*.
- **Group ID Attribute** – Identification for a group of users. The default is *CN*.

5. Click the **Save** button.

When LDAP is applied to a user, the User Type is **LDAP User**.

When LDAP is NOT applied to a user, the User Type is **local**.

User Privileges	
Level	**Meaning**
View	Allows the user to see all status and settings but not to make any changes
Maintenance	Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
Power	Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller
Super	Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default “administrator” account is a Super User

Testing LDAP Settings

To test your LDAP settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LDAP Management** and press Enter.

   The LDAP Settings screen appears.
3. Highlight **LDAP Auth** and press Enter.

   The LDAP Authorization screen appears. LDAP must be enabled to test the settings.
4. Highlight **Test** and press Enter.

Viewing a List of Role Maps

A Role Map is a method of mapping a group of users to an LDAP server. You must enable LDAP to use Role Mapping. You do not have to enable LDAP to manage Role Mapping.

You must enable LDAP to use Role Mapping. See “Making LDAP Settings” on page 109.

You do not have to enable LDAP to manage Role Mapping.

To view a list of role maps:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. Click the **LDAP Settings** button.
4. Click the **Role Mapping** button.

   The list of roles appears. Role information includes:
   - **External Group** – Enable and disables LDAP.
   - **Privilege** – Enables email subscription for the LDAP authenticated user.

Adding a Role Map

To add a role map:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. Click the **LDAP Settings** button.
4. Click the **Role Mapping** button.
5. Click the **Add Role Mapping** button.
6. From the LDAP Role dropdown menu, choose a group name for your Role Map.

Group names are for convenience only. A group name does not impose any role or limitation upon the group it represents. You can have multiple groups but each must have a different name.

7. From the Subsystem Privilege dropdown menu, choose a privilege level. See the table below.
8. Click the **Submit** button.

   The new Role Map is added to the list.

User Privileges	
Level	**Meaning**
View	Allows the user to see all status and settings but not to make any changes
Maintenance	Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
Power	Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller
Super	Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default “administrator” account is a Super User

Making Role Map Settings

To make role map settings:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. Click the **LDAP Settings** button.
4. Click the **Role Mapping** button.
5. Click a Role Map in the list (under LDAP Role and Subsystem Privilege) and click the **Settings** button.
6. From the Subsystem Privilege dropdown menu, choose a privilege level. See the table above.
7. Click the **Submit** button.

Deleting a Role Map

To delete a role map:

1. Click the **Administration** tab.
2. Click the **User Management** icon.
3. Click the **LDAP Settings** button.
4. Click the **Role Mapping** button.
5. Click a Role Map in the list (under LDAP Role and Subsystem Privilege) and click the **Delete** button.
6. Click the **Confirm** button.

   The Role Map is deleted from the list.

Managing Background Activities

Background activity management includes:

Background activities perform a variety of preventive and remedial functions on your physical drives, disk arrays, logical drives, and other components.

You can run a background activity immediately or schedule it to run at a later time. Scheduling options are described below.

Setting options for each activity are listed after the scheduling options. These settings determine how the background activity affects I/O performance.

Viewing Current Background Activities

To view a list of current background activities:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background appears.

   Currently running activities show a progress bar.

Viewing Scheduled Background Activities

To view a list of scheduled background activities:

1. Click the **Administration** tab.

2. Click the **Background Activities** icon.
   The list of background appears.
3. Click the **Scheduler** button.
   The list of currently scheduled background activities appears.

Adding a Scheduled Background Activity

To add a new scheduled background activity:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.
   The list of background appears.
3. Click the **Scheduler** button.
   The list of currently scheduled background act it viti es appears.
4. Click the **Add Schedule** button.
5. Check the **Enable Media Patrol** box to enable, uncheck to disable.
   This settings enables or disables Media Patrol for your entire RAID system.
6. Click the **Confirm** button.
7. Choose the option for the activity you want:
   - Media Patrol
   - Redundancy Check
   - Spare Check
   - Battery Recondition
8. Choose a **Start Time** from the dropdown menus.
   The menus have a 24-hour clock.
9. Choose a **Recurrence Pattern** option, daily, weekly, or monthly.
   - For the Daily option, enter an interval in the Every field.
   - For the Weekly option, enter an interval in the Every field and choose one or more days of the week.
   - For the Monthly option, choose,
     - Day of the Month option then choose a number from the dropdown menu.
     - The day of the week option then choose the day of the month from the dropdown menus.
10. Choose a **Start From** date from the dropdown menus.
11. Choose an **End On** option,
    - No end date or perpetual.
    - End after a specific number of activity actions.

- Until date from the dropdown menus.

12. For Redundancy Check, choose,
    - **Auto Fix** option – Attempts to repair the problem when it finds an error. Check to enable
    - **Pause on Error** option – The process stops when it finds a non-repairable error. Check to enable
    - **Select LD** – Check the boxes for the logical drives to run Redundancy Check. Check at least one logical drive
13. Click the **Save** button.

Changing a Background Activity Schedule

Caution

Disabling the battery recondition schedule is NOT recommended.

To change an existing scheduled background activity:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background appears.
3. Click the **Scheduler** button.

   The list of currently scheduled background act it viti es appears.
4. Click the background activity and click the **Settings** button.
5. Make settings changes as required:
   - Choose a **Start Time** from the dropdown menus.

     The menus have a 24-hour clock.
   - Choose a **Recurrence Pattern** option, daily, weekly, or monthly.
     - For the Daily option, enter an interval in the Every field.
     - For the Weekly option, enter an interval in the Every field and choose one or more days of the week.
     - For the Monthly option, choose the Day of the Month option or the day of the week option, and choose the day from the dropdown menu.
   - Choose a **Start From** date from the dropdown menus.
   - Choose an **End On** option,
     - No end date or perpetual.
     - End after a specific number of activity actions.

- Until date from the dropdown menus.
- For Redundancy Check, choose,
  - **Auto Fix** option – Attempts to repair the problem when it finds an error. Check to enable
  - **Pause on Error** option – The process stops when it finds a non-repairable error. Check to enable
  - **Select LD** – Check the boxes for the logical drives to run Redundancy Check. Check at least one logical drive

6. Click the **Save** button.

Enabling or Disabling a Scheduled Background Activity

Background activity schedules are enabled by default when you create the schedule. If you want to stop a background activity now but plan to use it again in the future, disable the scheduled activity rather than deleting it.

Caution

Disabling the battery recondition schedule is NOT recommended.

To enable or disable change an existing scheduled background activity:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.
   The list of background appears.
3. Click the **Scheduler** button.
   The list of currently scheduled background act it viti es appears.
4. Click the background activity and click the **Settings** button.
5. Uncheck the **Enable This Schedule** box to disable this schedule.
   Check the box to enable this schedule.
6. Click the **Save** button.

Deleting a Scheduled Background Activity

Caution

Deleting the battery recondition schedule is NOT recommended.

To change an existing scheduled background activity:

1. Click the **Administration** tab.

2. Click the **Background Activities** icon.

   The list of background appears.
3. Click the **Scheduler** button.

   The list of currently scheduled background act it viti es appears.
4. Click the background activity and click the **Delete** button.
5. In the confirmation box, click the **confirm** button.

Media Patrol

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks are enabled by default on all disk arrays and spare drives. Media Patrol is concerned with the media itself, not the data recorded on the media. If Media Patrol encounters a critical error, it triggers PDM if PDM is enabled on the disk array.

See “Making Disk Array Settings” on page 157, “Running Media Patrol on a Disk Array” on page 158, and “Media Patrol” on page 331.

Making Media Patrol Settings

To make Media Patrol settings:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background appears.
3. Click the **Settings** button.
4. Check the **Enable Media Patrol** box to enable, uncheck to disable.

   This settings enables or disables Media Patrol for your entire RAID system.
5. Click the **Confirm** button.

You can also enable or disable Media Patrol on individual disk arrays.

Redundancy Check

Redundancy Check is a routine maintenance procedure for fault-tolerant disk arrays (those with redundancy) that ensures all the data matches exactly. Redundancy Check can also correct inconsistencies.

See “Redundancy Check on a Logical Drive” on page 168.

Making Redundancy Check Settings

To make Redundancy Check settings:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.

3. Click the **Settings** button.
4. Click the **Redundancy Check Rate** dropdown menu and choose a rate:
   - **Low** – Fewer system resources to Redundancy Check, more to data read/write operations.
   - **Medium** – Balances system resources between Redundancy Check and data read/write operations.
   - **High** – More system resources to Redundancy Check, fewer to data read/write operations.
5. Click the **Confirm** button.

Initialization

Technically speaking, Initialization is a foreground activity, as you cannot access a logical drive while it is initiating.

Initialization is normally done to logical drives after they are created from a disk array. Initialization sets all data bits in the logical drive to zero. The action is useful because there may be residual data on the logical drives left behind from earlier configurations. For this reason, Initialization is recommended whenever you create a logical drive.

See “Initializing a Logical Drive” on page 167 and “Initialization” on page 354.

Making Initialization Settings

To make initialization settings:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.
3. Click the **Settings** button.
4. Click the **Logical Drive Initialization Rate** dropdown menu and choose a rate:
   - **Low** – Fewer system resources to Initialization, more to data read/write operations.
   - **Medium** – Balances system resources between Initialization and data read/write operations.
   - **High** – More system resources to Initialization, fewer to data read/write operations.
5. Click the **Confirm** button.

Rebuild

When you rebuild a disk array, you are actually rebuilding the data on one physical drive.

- When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array begins to rebuild automatically using the spare drive.
- If there is no spare drive of adequate capacity, but the **Auto Rebuild** function is ENABLED, the disk array begins to rebuild automatically as soon as you remove the failed physical drive and install an unconfigured physical drive in the same slot. See “Making Rebuild Settings” on page 120.
- If there is no spare drive of adequate capacity and the Auto Rebuild function is DISABLED, you must replace the failed drive with an unconfigured physical drive, then perform a **Manual Rebuild**.

See “Rebuilding a Disk Array” on page 160 and page 402 and “Spare Drives” on page 355.

Also see “Disk Array Degraded/Logical Drive Critical” on page 400 and “Disk Array Offline/Logical Drive Offline” on page 401.

Making Rebuild Settings

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Click the **Settings** button.
4. Click the **Rebuild Rate** dropdown menu and choose a rate:
   - **Low** – Fewer system resources to the Rebuild, more to data read/write operations.
   - **Medium** – Balances system resources between the Rebuild and data read/write operations.
   - **High** – More system resources to the Rebuild, fewer to data read/write operations.
5. Check the **Enable Auto Rebuild** box to enable Auto Rebuild (rebuilds when you swap out the failed drive with a new one).
6. Click the **Confirm** button.

Migration

The term “Migration” means either or both of the following:

- Change the RAID level of a logical drive.
- Expand the storage capacity of a logical drive.

See “Migrating a Logical Drive’s RAID Level” on page 169 and “RAID Level Migration” on page 347.

Making Migration Settings

To make migration settings:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Click the **Settings** button.
4. Click the Migration Rate dropdown menu and choose a rate:
   - **Low** – Fewer system resources to Migration, more to data read/write operations.
   - **Medium** – Balances system resources between Migration and data read/write operations.
   - **High** – More system resources to Migration, fewer to data read/write operations.
5. Click the **Confirm** button.

PDM

Predictive Data Migration (PDM) is the migration of data from the suspect physical drive to a spare drive, similar to rebuilding a logical drive. But unlike Rebuilding, PDM constantly monitors your physical drives and automatically copies your data to a spare drive *before* the physical drive fails and your logical drive goes Critical.

See “Running PDM on a Disk Array” on page 159 and “PDM” on page 331.

Making PDM Settings

To make PDM settings:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Click the **Settings** button.
4. Make the following settings are required:
   - Click the **PDM Rate** dropdown menu and choose a rate:
     - **Low** – Fewer system resources to PDM, more to data read/write operations.
     - **Medium** – Balances system resources between PDM and data read/write operations.

- **High** – More system resources to PDM, fewer to data read/write operations.

- Highlight the current values in the block threshold fields and input new values.

  Reassigned block threshold range is 1 to 512 blocks.

  Error block threshold range is 1 to 2048 blocks.

5. Click the **Confirm** button.

Transition

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare drive.

See “Running a Transition on a Spare Drive” on page 175 and “Transition” on page 356.

Making Transition Settings

To make Transition settings:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Click the **Settings** button.
4. Click the **Transition Rate** dropdown menu and choose a rate:
   - **Low** – Fewer system resources to Transition, more to data read/write operations.
   - **Medium** – Balances system resources between Transition and data read/write operations.
   - **High** – More system resources to Transition, fewer to data read/write operations.
5. Click the **Confirm** button.

Synchronization

Synchronization is automatically applied to logical drives when they are created. Synchronization recalculates the redundancy data to ensure that the working data on the physical drives is properly in sync.

Mouse-over on the logical drive, click the **View** button, and look under Logical Drive Information beside the line that says **Synchronized**. A **Yes** means the logical drive was synchronized. See “Viewing Logical Drive Information” on page 163.

Making Synchronization Settings

To make Synchronization settings:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Click the **Settings** button.
4. Click the **Synchronization Rate** dropdown menu and choose a rate:
   - **Low** – Fewer system resources to Synchronization, more to data read/write operations.
   - **Medium** – Balances system resources between Synchronization and data read/write operations.
   - **High** – More system resources to Synchronization, fewer to data read/write operations.
5. Click the **Confirm** button.

Battery Reconditioning

Batteries maintain power to the controller cache in the event of a power failure, thus protecting any data that has not been written to a physical drive. Reconditioning is the action of discharging and recharging a battery to preserve its capacity and performance.

By default, each battery is reconditioned every two months. When the recondition is completed, the battery's cycle count increments by one.

Caution

Disabling or deleting the battery recondition schedule is NOT recommended.

See "Reconditioning a Battery" on page 90.

Spare Check

Spare Check verifies the status of your spare drives. Because spare drives are not currently handling data, there are no settings for Spare Check.

See "Running Spare Check" on page 175.

Managing Storage Services

Storage service management includes:

- Viewing a List of Services (below)
- Email Service (page 124)
- SLP Service (page 125)
- Webserver Service (page 126)
- Telnet Service (page 127)
- SSH Service (page 128)
- SNMP Service (page 129)
- CIM Service (page 131)
- Netsend Service (page 132)

Viewing a List of Services

This feature displays all software services running on the RAID subsystem. See the table below.

To view the list of software services:

1. Click the **Administration** tab.
2. Click the **Services** icon.

   The list of services includes,

   - Service Name
   - Start type – Automatic or Manual

Email Service

Email service enables the RAID subsystem to send you Email messages about events and status changes. By default, Email service is set to Automatic.

Stopping Email Service

To stop the Email service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Email service and click the **Stop** button.
4. Click the **Confirm** button.

To start the Email service after stopping it:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Email service and click the **Start** button.

Restarting Email Service

To restart the Email service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Email service and click the **Restart** button.

Making Email Settings

To change Email service settings:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Email service and click the **Settings** button.
4. Make settings changes as required:
    - Choose a startup type,
        - Automatic – (default) Starts and runs with the subsystem.
        - Manual – You start the service when you need it.
    - SMTP Server IP address.
    - SMTP Authentication – The Yes option enables authentication. The No option disables.
    - SMTP Authentication Username – Required if SMTP authentication is enabled.
    - SMTP Authentication Password – Required if SMTP authentication is enabled.
    - Email Sender (From) Address – The sender's name shown on notification messages.
    - Email Subject – The subject line of the notification message.
5. Click the **Save** button.
6. Click the **Confirm** button.

Note

To verify your settings, send a test message.

SLP Service

Service Location Protocol (SLP) discovers services over the Internet. SLP applies to IPv4 protocol only.

Stopping SLP Service

To stop the SLP service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SLP service and click the **Stop** button.
4. Click the **Confirm** button.

To start the SLP service after stopping it:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SLP service and click the **Start** button.

Restarting SLP Service

To restart the SLP service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SLP service and click the **Restart** button.

Making SLP Settings

To change SLP service settings:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SLP service and click the **Settings** button.
4. Choose a startup type:
   - Automatic – (default) Starts and runs with the subsystem.
   - Manual – You start the service when you need it.
5. Click the **Save** button.
6. Click the **Confirm** button.

Webserver Service

Webserver service connects the WebPAM PROe interface to the RAID subsystem though your browser.

Stopping Webserver Service

To stop the Webserver service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Webserver service and click the **Stop** button.

4. Click the **Confirm** button.

To start the Webserver service after stopping it:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Webserver service and click the **Start** button.

Restarting Webserver Service

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Webserver service and click the **Restart** button.

Making Webserver Settings

To change Webserver service settings:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Webserver service and click the **Settings** button.
4. Make settings changes as required:
   - Choose a startup type,
     - Automatic – (default) Starts and runs with the subsystem.
     - Manual – You start the service when you need it.
   - Session Time Out – Default is 24 minutes.
5. Click the **Save** button.
6. Click the **Confirm** button.

Telnet Service

Telnet service enables you to access the RAID subsystem's Command Line Interface (CLI) through a network connection.

Stopping Telnet Service

To stop the Telnet service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Telnet service and click the **Stop** button.
4. Click the **Confirm** button.

To start the Telnet service after stopping it:

1. Click the **Administration** tab.
2. Click the **Services** icon.

3. Click the Telnet service and click the **Start** button.

Restarting Telnet Service

To restart the Telnet service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Telnet service and click the **Restart** button.

Making Telnet Settings

To change Telnet service settings:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Telnet service and click the **Settings** button.
4. Make settings changes as required:
    - Choose a startup type,
        - Automatic – (default) Starts and runs with the subsystem.
        - Manual – You start the service when you need it.
    - Port number – Default is 2300.
    - Max Number of Concurrent Connections – Default is 4. Maximum number is 4.
    - Session Time Out – Default is 24 minutes.
5. Click the **Save** button.
6. Click the **Confirm** button.

SSH Service

Secure Shell (SSH) service enables you to access the subsystem's Command Line Interface (CLI) through a network connection.

Stopping SSH Service

To stop the SSH service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SSH service and click the **Stop** button.
4. Click the **Confirm** button.

To start the SSH service after stopping it:

1. Click the **Administration** tab.
2. Click the **Services** icon.

3. Click the SSH service and click the **Start** button.

Restarting SSH Service

To restart the SSH service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SSH service and click the **Restart** button.

Making SSH Settings

To change SSH service settings:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SSH service and click the **Settings** button.
4. Make settings changes as required:
    - Choose a startup type,
        - Automatic – (default) Starts and runs with the subsystem.
        - Manual – You start the service when you need it.
    - Port number - Default is 22.
    - Max Number of Concurrent Connections – Default is 4. Maximum number is 4.
    - Session Time Out - Default is 24 minutes.
5. Click the **Save** button.
6. Click the **Confirm** button.

SNMP Service

Simple Network Management Protocol (SNMP) service enables the SNMP browser to obtain information from the RAID subsystem. The Trap Sink is where SNMP events are sent and can be viewed.

Stopping SNMP Service

To stop the SNMP service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SNMP service and click the **Stop** button.
4. Click the **Confirm** button.

To start the SNMP service after stopping it:

1. Click the **Administration** tab.
2. Click the **Services** icon.

3. Click the SNMP service and click the **Start** button.

Restarting SNMP Service

To restart the SNMP service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SNMP service and click the **Restart** button.

Making SNMP Settings

To change SNMP service settings:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SNMP service and click the **Settings** button.
4. Make settings changes as required:
    - Choose a startup type,
        - Automatic – (default) Starts and runs with the subsystem.
        - Manual – You start the service when you need it.
    - Port Number – Default is 161.
    - System Name – No default.
    - System Location – Default is USA.
    - System Contact – Default is admin@yourcompany.com.
    - Read Community – Default is public.
    - Write Community – Default is private. No changes are possible.
5. Click the **Save** button.
6. Click the **Confirm** button.

Adding an SNMP Trap Sink

To add a trap sink:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SNMP service and click the **Settings** button.
4. Enter a trap sink server IP address in the field provided.
5. Choose a trap filter (event severity level).
   See the table on the next page.
6. Click the **Add** button.
7. Click the **Confirm** button.

Event Severity Levels	
Level	**Description**
Fatal	Non-recoverable error or failure has occurred.
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Minor	Action is needed but the condition is not a serious at this time.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Deleting an SNMP Trap Sink

To delete a trap sink:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the SNMP service and click the **Settings** button.
4. In the Trap Sink list and click the Trap Sink you want to delete.
5. Click the **Trash** icon.

   The trap sink is deleted.
6. Click the **Save** button.
7. Click the **Confirm** button.

CIM Service

The Common Information Model (CIM) service provides a database for information about computer systems and network devices.

Stopping CIM Service

To stop the CIM service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the CIM service and click the **Stop** button.
4. Click the **Confirm** button.

To start the CIM service after stopping it:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the CIM service and click the **Start** button.

Restarting CIM Service

To restart the CIM service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the CIM service and click the **Restart** button.

Making CIM Settings

To change CIM service settings:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the CIM service and click the **Settings** button.
4. Make settings changes as required:
   - Choose a startup type,
     - Automatic – (default) Starts and runs with the subsystem.
     - Manual – You start the service when you need it.
   - CIM HTTP Enabled – Default is Yes.
   - CIM HTTP Port number – Default is 5988.
   - CIM HTTPS Enabled – Default is No.
   - CIM HTTPS Port number – Default is 5989.
   - CIM Authentication – Default is No.

   When CIM Authentication is Yes, these fields appear,
   - Change Password – Default is No.
   - CIM User Name – Default is cim. No changes are possible.

   When Change Password is Yes, these fields appear,
   - Old User Password
   - New User Password
   - Retype (new user) Password
5. Click the **Save** button.
6. Click the **Confirm** button.

Netsend Service

Netsend service sends RAID subsystem events in the form of text messages to the Host PC and other networked PCs configured to receive Netsend event messages by setting up Netsend server accounts.

This service is set to Manual startup by default. It does not run unless you start it manually or change the startup type to Automatic.

Starting Netsend Service

To restart the Netsend service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Netsend service and click the **Start** button.

Stopping Netsend

To stop the Netsend service:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Netsend service and click the **Stop** button.
4. Click the **Confirm** button.

Restarting Netsend Service

To start the Netsend service after stopping it:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Netsend service and click the **Start** button.

Making Netsend Settings

To change Netsend service settings:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Netsend service and click the **Settings** button.
4. Choose a startup type,
   - Automatic – Starts and runs with the subsystem.
   - Manual – (default) You start the service when you need it.
5. Click the **Save** button.
6. Click the **Confirm** button.

Adding Netsend Server Accounts

To add a Netsend server account:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Netsend service and click the **Settings** button.
4. Enter the recipient server IP address in the field provided.
5. Choose a recipient filter (event severity level).
   See the table on the next page.

6. Click the **Add** button.

   The recipient server is added to the list.
7. Click the **Save** button.
8. Click the **Confirm** button.

Event Severity Levels	
Level	**Description**
Fatal	Non-recoverable error or failure has occurred.
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Minor	Action is needed but the condition is not a serious at this time.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Deleting Netsend Server Accounts

To delete a Netsend server account:

1. Click the **Administration** tab.
2. Click the **Services** icon.
3. Click the Netsend service and click the **Settings** button.
4. In the Message Event Severity Filter list and click the recipient server you want to delete.
5. Click the **Trash** icon.

   The recipient server is deleted.
6. Click the **Save** button.
7. Click the **Confirm** button.

Working with the Event Viewer

Working with the Event Viewer includes the following functions:

- Viewing Runtime Events (page 135)
- Saving Runtime Events (page 136)
- Clearing Runtime Events (page 136)
- Viewing NVRAM Events (page 136)
- Saving NVRAM Events (page 137)
- Clearing NVRAM Events (page 137)

The Event Viewer displays log of subsystem events. Events are classified as:

- **Runtime Events** – A list of and information about the 1023 most recent runtime events recorded since the subsystem was started.
- **NVRAM Events** – A list of and information about the most important events over multiple subsystem startups. NVRAM events are stored in non-volatile memory.

Event Severity Levels	
Level	**Description**
Fatal	Non-recoverable error or failure has occurred.
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Minor	Action is needed but the condition is not a serious at this time.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Viewing Runtime Events

To display Runtime Events:

1. Click the **Administration** tab.
2. Click the **Events** icon.

   The log of Runtime Events appears. Events are added to the top of the list. Each item includes:

   - **Index number** – Begins with 0 at system startup.
   - **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
   - **Event ID** – Hexadecimal code for the specific event
   - **Severity** – See the Table above.

- **Timestamp** – Date and time the event happened.
- **Description** – A description of the event in plain language.

3. Press the up and down arrow keys to scroll through the log.

Saving Runtime Events

This feature saves a plain text file of runtime events to your host PC or server using your browser.

To save the Runtime Events log:

1. Click the **Administration** tab.
2. Click the **Events** icon.
3. Click the **Save** button.
4. Follow your browser's procedure to save the event file to the desired location.

Clearing Runtime Events

To clear the Runtime Events log:

1. Click the **Administration** tab.
2. Click the **Events** icon.
3. Click the **Clear** button.
4. In the Confirmation box, type the word "confirm" in the field provided and click the **Confirm** button.

Viewing NVRAM Events

This screen displays a list of and information about the most important events over multiple subsystem startups.

To display NVRAM events:

1. Click the **Administration** tab.
2. Click the **Events** icon.
3. Click the **NVRAM Events** button.

   The log of NVRAM Events appears. Events are added to the top of the list. Each item includes:

   - **Index number** – Begins with 0 at system startup.
   - **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
   - **Event ID** – Hexadecimal code for the specific event
   - **Severity** – See the Table on the previous page.
   - **Timestamp** – Date and time the event happened.

- **Description** – A description of the event in plain language.

4. Press the up and down arrow keys to scroll through the log.

Saving NVRAM Events

This feature saves a plain text file of NVRAM events to your host PC or server using your browser.

To save NVRAM Events:

1. Click the **Administration** tab.
2. Click the **Events** icon.
3. Click the **NVRAM Events** button.
4. Click the **Save** button.
5. Follow your browser's procedure to save the event file to the desired location.

Clearing NVRAM Events

To clear the Runtime Events log:

1. Click the **Administration** tab.
2. Click the **Events** icon.
3. Click the **Clear** button.
4. In the Confirmation box, type the word "confirm" in the field provided and click the **Confirm** button.

Monitoring Performance

Performance monitoring includes:

- Monitoring I/O Performance (below)
- Monitoring PSU Wattage (page 139)

Monitoring I/O Performance

The Performance Monitor displays real-time performance statistics for logical drives, physical drives, and Fibre Channel or iSCSI data ports. The vertical scale adjusts dynamically to accommodate the statistical data.

Because it reports performance in real-time, to see data in the monitor, there must be I/O data activity taking place between the VTrak subsystem and the Host.

To monitor performance:

1. Click the **Administration** tab.
2. Click the **Performance Monitor** icon.
3. Under Logical Drive, choose the metric you want to see from the **Measurement** dropdown menu.
    - Bandwidth in MB/s
    - Cache usage by %
    - Dirty cache usage by %
    - Maximum latency in ms
    - Average latency in ms
    - Minimum latency in ms
    - I/Os per second
4. Click the **Select Logical Drives** button and check the boxes for the logical drives you want to see.
    - Total of all logical drives
    - Up to 8 individual logical drives
5. Under Physical Drive, choose the metric you want to see from the **Measurement** dropdown menu.
    - Bandwidth in MB/s
    - Maximum latency in ms
    - Average latency in ms
    - Minimum latency in ms
    - I/Os per second

6. Click the **Select Physical Drives** button and check the boxes for the physical drives you want to see.
   - Total of all physical drives
   - Up to 8 individual physical drives
7. Under Port, choose the metric you want to see from the **Measurement** dropdown menu.
   - Bandwidth in MB/s
   - Maximum latency in ms
   - Average latency in ms
   - Minimum latency in ms
   - I/Os per second
8. Click the **Select Ports** button and check the boxes for the ports you want to see:
   - Total of all ports
   - Up to 8 individual ports

Since the Performance Monitor is a real-time display, it does not accumulate information and there is no clear or save function.

To save performance statistics for analysis or troubleshooting, save a Service Report, open the report, and look under Statistic Info. See “Saving a Service Report” on page 79.

Monitoring PSU Wattage

The PSU Wattage Monitor displays real-time performance statistics for logical drives, the input power of all enclosures and the input power of an individual. The vertical scale adjusts dynamically to accommodate the statistical data.

Because it reports performance in real-time, to see data in the monitor, there must be I/O data activity taking place between the VTrak subsystem and the Host.

To monitor performance and power use:

1. Click the **Administration** tab.
2. Click the **PSU Wattage Monitor** icon.
3. Under Logical Drive, choose the metric you want to see from the **Measurement** dropdown menu.
   - Bandwidth in MB/s
   - Cache usage by %
   - Dirty cache usage by %
   - Maximum latency in ms

- Average latency in ms
- Minimum latency in ms
- I/Os per second

4. Click the **Select Logical Drives** button and check the boxes for the logical drives you want to see.
   - Total of all logical drives
   - Up to 8 individual logical drives
5. Under **Input Power of an individual Enclosure**, click the **Select Enclosures** button and check the boxes for the enclosures you want to see.

Since the PSU Wattage Monitor is a real-time display, it does not accumulate information and there is no clear or save function.

To save performance and power statistics for analysis or troubleshooting, save a Service Report, open the report, and look under PSU Wattage Info. See “Saving a Service Report” on page 79.

Managing Physical Drives

Physical drive management includes:

- Viewing a List of Physical Drives (below)
- Viewing Physical Drive Information (page 141)
- Making Global Physical Drive Settings (page 143)
- Making Individual Physical Drive Settings (page 144)
- Viewing Physical Drive Statistics (page 144)
- Viewing Physical Drive SMART Log Information (page 145)
- Saving the Physical Drive SMART Log (page 145)
- Locating a Physical Drive (page 146)
- Forcing a Physical Drive Offline (page 146)
- Clearing a Stale or a PFA Condition (page 147)
- Clearing a Stale or a PFA Condition (page 147)
- Updating Firmware on a Physical Drive (page 147)
- Managing Physical Drive Problems, see “Physical Drive Problems” on page 399

Viewing a List of Physical Drives

To view a list of physical drives in the RAID system:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.

   The list of enclosures and the physical drives inside them displays.

   Physical drive information includes:

   - ID – ID number of the physical drive
   - Status – Green check  , yellow !  , and red X  icons
   - Model – Make and model of the drive
   - Type – SAS or SATA, HDD or SSD
   - Location – Enclosure number and slot number
   - Configuration – Array number and sequence number, spare number, unconfigured, or stale configuration
   - Capacity – In GB

Viewing Physical Drive Information

To view physical drive information:

1. Click the **Device** tab.

2. Click the **Physical Drive** icon.
3. Click the physical drive you want, then click the **View** button.

   Physical drive information includes:

   - Physical Drive ID – ID number of the physical drive
   - Location – Enclosure number and slot number
   - Alias – If assigned
   - Physical Capacity – Total capacity in GB
   - Configurable Capacity – Usable capacity in GB
   - Used Capacity – Capacity actually used in GB
   - Block Size – Typically 512 Bytes
   - Operational Status – OK is normal, Stale, PFA, Dead
   - Configuration – Array number and sequence number, spare number, Model – Make and model of the drive
   - Drive Interface – SATA 1.5Gb/s or 3Gb/s, SAS 3Gb/s or 6Gb/s
   - Serial Number – Serial number of the drive
   - Firmware Version – Firmware version on the drive
   - Protocol Version – ATA/ATAPI protocol version
   - Visible To – Controllers that can access this physical drive

   Advanced information for SATA physical drives includes:

   - Write Cache – Enabled or disabled
   - Read Look Ahead Cache – Enabled or disabled
   - Read Cache Support – Yes or No
   - SMART Feature Set – Yes or No
   - SMART Self Test – Yes or No
   - SMART Error Logging – Yes or No
   - Command Queuing Support – TCQ or NCQ
   - Command Queuing – Enabled or disabled
   - Queue Depth - Number of commands
   - Maximum Multiple DMA Mode Supported
   - Maximum Ultra DMA Mode Supported
   - DMA Mode
   - Power Saving Level – Enabled or disabled
   - ARM Support – Standby or Active
   - Medium Error Threshold
   - Drive Temperature

- Drive Reference Temperature

Advanced information for SAS physical drives includes:

- Read Cache – Enabled or disabled
- Read Cache Support – Yes or No
- Write Cache – Enabled or disabled
- Write Cache Support – Yes or No
- Enable Read Look Ahead Support – Yes or No
- Read Look Ahead Cache – Enabled or disabled
- Command Queuing – Enabled or disabled
- Command Queuing Support – Yes or No
- WWN – Worldwide Number
- Port 1 Negotiated Physical Drive Speed
- Port 1 SAS Address
- Port 2 Negotiated Physical Drive Speed
- Port 2 SAS Address
- Drive Temperature in ºC
- Drive Reference Temperature in ºC
- Power Saving Level – Enabled or disabled
- Medium Error Threshold
- SAS SATA Bridge Firmware Version
- SAS SATA Bridge Boot Loader Version

Making Global Physical Drive Settings

To make global physical drive settings:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.
3. Click the **Global Physical Drive Settings** button.
4. Check the boxes to enable, uncheck to disable.

   For SATA drives:

   - Enable Write Cache
   - Enable Read Look Ahead Cache
   - Enable Command Queuing

   For SAS drives:

   - Enable Write Cache
   - Enable Read Look Ahead Cache

- Enable Read Cache

5. Click the **Save** button.

Making Individual Physical Drive Settings

To make individual physical drive settings:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.
3. Click the physical drive you want, then click the **Settings** button.
4. On the **Settings** tab:
   - Enter, change, or delete the alias in the Alias field.
5. On the **SMART Log Settings** tab:
   - Check the box to enable the SMART log.
6. Click the **Save** button.

Viewing Physical Drive Statistics

To view physical drive statistics:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.
3. Click the physical drive you want, then click the **View** button.
4. Click the **Statistics** tab.

   Physical drive statistics include:

   - Data Transferred
   - Read Data Transferred
   - Write Data Transferred
   - Errors - Number of errors
   - Non Read/Write Errors
   - Read Errors
   - Write Errors
   - I/O Request – Number of requests
   - Non Read/Write Request – Number of requests
   - Read I/O Request – Number of requests
   - Write I/O Request – Number of requests
   - Statistics Start Time – Time and date
   - Statistics Collection Time – Time and date
   - Avg Response Time Ctrl 1 – Controller 1 average response time

- Avg Response Time Ctrl 2 – Controller 2 average response time
- Max Response Time Ctrl 1 – Controller 1 maximum response time
- Max Response Time Ctrl 2 – Controller 2 maximum response time

To clear physical drive statistics, see “Clearing Statistics” on page 79.

Viewing Physical Drive SMART Log Information

To view physical drive SMART Log information:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.
3. Click the physical drive you want, then click the **View** button.
4. Click the **SMART Log** tab.

   SMART Log information includes:

   - In progress
   - SMART Support – Yes or no, depends on the drive
   - SMART Log Enabled – Enabled or disabled, see Note below
   - SMART Health status – OK is normal
   - SCT Status Version
   - SCT Version
   - SCT Support Level
   - Device State
   - Current Temperature
   - Power Cycle Min Temperature
   - Power Cycle Max Temperature
   - Lifetime Min Temperature
   - Lifetime Max Temperature
   - Under Temperature Limit Count
   - Over Temperature Limit Count

   If the SMART Log is disabled, see “Making Controller Settings” on page 86.

Saving the Physical Drive SMART Log

To save the physical drive SMART Log:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.
3. Click the physical drive you want, then click the **View** button.
4. Click the **SMART Log** tab.

5. Click the **Save Advanced SMART Log** button.

   Your browser saves a text file containing the SMART Log to its designated download folder.

Locating a Physical Drive

This feature causes the drive carrier LEDs to blink for one minute to assist you in locating the physical drive, and is supported by RAID subsystems and JBOD expansion units.

To locate a physical drive:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.
3. Click the physical drive you want, then click the **Locate** button.

   The drive carrier status LED flashes for one minute.

Figure 4. Drive carrier status LED

Forcing a Physical Drive Offline

This feature applies only to physical drives assigned to disk arrays.

Caution

Forcing a physical drive offline is likely to cause data loss. Back up your data before you proceed. Use this function only when required.

Important

Forcing a physical drive offline causes your logical drives to become degraded. If Auto Rebuild is enabled and a spare drive is available, the disk array begins rebuilding itself automatically.

To force a physical drive offline:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.
3. Click the **down arrow** button to list the physical drives in the enclosure.

4. Mouse over the physical drive you want to force offline.
5. Click the **Force Offline** button.
6. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Clearing a Stale or a PFA Condition

Stale – The physical drive contains obsolete disk array information.

PFA – The physical drive has errors resulting in a prediction of failure.

Be sure you have corrected the condition by a physical drive replacement, rebuild operation, etc., first. Then clear the condition.

To clear a Stale or a PFA condition:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.
3. Click the physical drive you want, then click the **Clear PFA/Stale** button.

   If the physical drive has both a Stale condition and a PFA condition, the first click removes the Stale condition. Click the **Clear PFA/Stale** button a second time to remove the PFA condition.

Updating Firmware on a Physical Drive

This feature applies only to PROMISE-supported physical drives. For a list of supported drives, go to http://www.promise.com/support/.

Then see “Updating Physical Drive Firmware” on page 321.

If you have physical drives in your RAID system that are not PROMISE-supported, follow the firmware update procedure from the drive manufacturer.

Managing Disk Arrays

Disk array management includes:

- Viewing a List of Disk Arrays (below)
- Viewing Disk Array Information (page 148)
- Creating a Disk Array Manually (page 150)
- Creating a Disk Array with the Wizard (page 151)
- Deleting a Disk Array (page 156)
- Making Disk Array Settings (page 157)
- Locating a Disk Array (page 158)
- Running Media Patrol on a Disk Array (page 158)
- Running PDM on a Disk Array (page 159)
- Preparing a Disk Array for Transport (page 160)
- Rebuilding a Disk Array (page 160)

Also see Disk Array and Logical Drive Problems (page 400).

Viewing a List of Disk Arrays

To view a list of disk arrays:

1. Click the **Storage** tab.
2. Click the **Disk Array** icon.

   The list of disk arrays appears.

   Disk array information includes:

   - **ID** – DA0, DA1, DA2, etc.
   - **Alias** – If assigned
   - **Status** – A green check  icon means OK
   - **Capacity** – Data capacity of the array
   - **Free Capacity** – Unconfigured or unused capacity on the physical drives
   - **Media Patrol** – Enabled or disabled on this array
   - **No. of Logical Drives** – The number of logical drives on this array

Viewing Disk Array Information

To view disk array information:

1. Click the **Storage** tab.
2. Click the **Disk Array** icon.

The list of disk arrays appears.

3. Click the disk array you want, then click the **View** button.

   Array information displays, including:

   - **ID** – DA0, DA1, DA2, etc.
   - **Alias** – If assigned
   - **Operational Status** – OK is normal
   - **Media Patrol** – Enabled or disabled on this array
   - **PDM** – Enabled or disabled on this array
   - **Total Capacity** – Data capacity of the array
   - **Configurable Capacity** – Maximum usable capacity of the array
   - **Free Capacity** –Unconfigured or unused capacity on the physical drives
   - **Number of Physical Drives** – The number of physical drives in this array
   - **Number of Logical Drives** – The number of logical drives on this array
   - **Max Contiguous Free Capacity** – Unconfigured or unused capacity in contiguous sectors on the physical drives
   - **Available RAID Levels** – RAID levels you can specify on this array

Disk Array Operational Status

- **OK** – This is the normal state of a logical drive. When a logical drive is Functional, it is ready for immediate use. For RAID Levels other than RAID 0 (Striping), the logical drive has full redundancy.
- **Synchronizing** – This condition is temporary. Synchronizing is a maintenance function that verifies the integrity of data and redundancy in the logical drive. When a logical drive is Synchronizing, it functions and your data is available. However, access is slower due to the synchronizing operation.
- **Critical/Degraded** – This condition arises as the result of a physical drive failure. A degraded logical drive still functions and your data is still available. However, the logical drive has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it.
- **Rebuilding** – This condition is temporary. When a physical drive has been replaced, the logical drive automatically begins rebuilding in order to restore redundancy (fault tolerance). When a logical drive is rebuilding, it functions and your data is available. However, access is slower due to the rebuilding operation.
- **Transport Ready** – After you perform a successful Prepare for Transport operation, this condition means you can remove the physical drives of this disk array and move them to another enclosure or different drive slots. After you relocate the physical drives, the disk array status shows OK.

Creating a Disk Array Manually

This feature creates a disk array only. You can also use the Wizard to create a disk array with logical drives and spare drives at the same time.

This action requires Super User or Power User privileges.

To create a disk array:

1. Click the **Storage** tab.
2. Click the **Disk Array** icon.
3. Click the **Create Disk Array** button.
4. Accept the defaults or make changes:
   - Enter an alias in the **Alias** field

     Maximum of 32 characters; letters, numbers, space between characters, and underline.
   - **Media Patrol** – Uncheck to disable on this array.
     For more information, see “Media Patrol” on page 331.
   - **PDM** – Uncheck to disable on this array.
     For more information, see “PDM” on page 331.
   - **Power Management** – Uncheck to disable on this array.
   - **Choose a media type** – Hard disk drive (HDD) or solid state drive (SSD)

     You cannot mix drive types in the same array.
5. In the **Select Physical Drives** diagram, click the drives to add them to your array. Look for drives with a green LED dark, a blue LED lit, and no crosshatching over the carrier.

   The ID numbers of the chosen drives appear in the field below the diagram.
6. When you have finished your settings and choices, click the **Submit** button.

   The new array appears in the list.

   If you are done creating disk arrays, click the **Finish** button.

   To create additional disk arrays, click the **Create More** button.

   After you create a disk array, create a logical drive on it. See “Creating a Logical Drive Manually” on page 165.

Creating a Disk Array with the Wizard

The Wizard creates disk arrays and logical drives automatically. It has four options.

- **Optimal Configurations** – You choose a script designed to set up your disk arrays, logical drives, and spare drives for a specific target application.

  Each script requires a specific model of RAID subsystem. And most scripts require a specific model and number of JBOD expansion units. You cannot cannot modify these scripts.
- **Automatic** – Creates a new disk array following a default set of parameters. Creates a hot spare drive for all RAID levels except RAID 0, when five or more unconfigured physical drives are available. You can accept or reject the proposed arrangement but you cannot modify it.
- **Express** – You choose the parameters for a new disk array by specifying the characteristics you want. You can create multiple logical drives at the same time, however they are all identical. Creates a hot spare drive for all RAID levels except RAID 0.
- **Advanced** – Enables you to specify all parameters for a new disk array, logical drives and spare drives.

Wizard: Optimal Configurations

Important

Know how your RAID system is configured so you can choose an appropriate script. If a script cannot run on the RAID system, it displays an error message.

This action requires Super User or Power User privileges.

To use the Optimal Configurations Wizard:

1. Click the **Storage** tab.
2. Click the **Wizard** icon.
3. Click the **Optimal Configurations** button.
4. Click the option button next to the script you want to use.
5. Click the **Next** button and review the Summary page.
6. To use this script, click the **Submit** button.

   To choose a different script, click the **Back** button.
7. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Wizard: Automatic Configuration

This option proposes a disk array and logical drive arrangement. You can accept or reject the proposed arrangement but you cannot modify it.

This action requires Super User or Power User privileges.

To use the Automatic Configuration Wizard:

1. Click the **Storage** tab.
2. Click the **Wizard** icon.
3. Click the **Automatic** button.

   When you choose the Automatic option, the following parameters appear on the screen:

   - **Disk Arrays** – The number of logical drives, number of physical drives, ID of each physical drive, configurable capacity, and the media type (hard disk drives or solid state drives).
   - **Logical Drives** – The ID numbers of the logical drives, their RAID levels, capacity, sector size, and stripe size.
   - **Spare Drives** – The ID numbers of the logical drives, type (global or dedicated) revertible option (enabled or disabled) and media type. A hot spare drive is created for all RAID levels except RAID 0, when five or more unconfigured physical drives are available.

4. To accept the proposed configuration, click the **Submit** button.
5. Click the **Finish** button to clear the Automatic Configuration box.

Note

If you disagree with the proposed configuration, click the Cancel button, then click the **Express** button or the **Advanced** button and input your parameters manually.

Wizard: Express Configuration

When you choose the Express option, a set of characteristics and options appears on the screen.

This action requires Super User or Power User privileges.

To use the Express Configuration Wizard:

1. Click the **Storage** tab.
2. Click the **Wizard** icon.
3. Click the **Express** button.
4. Check the boxes to choose any one or a combination of:
   - **Redundancy** – The array remains available if a physical drive fails.
   - **Capacity** – The greatest possible amount of data capacity.
   - **Performance** – The highest possible read/write speed.
   - **Spare Drive** – A hot spare drive is created when you choose Redundancy, Spare Drive, and five or more unconfigured physical drives are available.
   - **Mixing SATA/SAS Drive** – Check this box if you want to use both SATA and SAS drives in the same disk array.

     If the box is unchecked, and you have both SATA and SAS drives, a separate array is created for each type of drive.
5. In the **Number of Logical Drives** field, enter the number of logical drives you want to make from this disk array.

   VTrak supports up to 32 logical drives per disk array.
6. From the **Application Type** menu, choose an application that best describes your intended use for this disk array:
   - File Server
   - Video Stream
   - Transaction Data
   - Transaction Log
   - Other

7. Click the **Next** button to continue.

   The Summary screen appears with information on disk arrays, logical drives, and spare drives you are about to create.
8. To accept the proposed configuration, click the **Submit** button.
9. Click the **Finish** button to clear the Express Configuration box.

Note

If you disagree with the proposed configuration, review and modify your selections in the previous steps.

Wizard: Advanced Configuration

This option enables you to directly specify all parameters for a new disk array, logical drives, and spare drives.

This action requires Super User or Power User privileges.

To use the Advanced Configuration Wizard:

1. Click the **Storage** tab.
2. Click the **Wizard** icon.
3. Click the **Advanced** button.

   The Create Disk Array screen displays.

Task 1 – Disk Array Creation

To create your disk array:

1. Accept the defaults or make changes:
   - Enter an alias in the **Alias** field.
   - **Media Patrol** – Uncheck to disable on this array.
     For more information, see “Media Patrol” on page 331.
   - **PDM** – Uncheck to disable on this array.
     For more information, see “PDM” on page 331.
   - **Power management** – Uncheck to disable on this array
   - **Choose a media type** – Hard disk drive (HDD) or solid state drive (SSD)
2. Click the enclosure graphic to view information about physical drives.

Look for drives with a green LED dark, a blue LED lit, and no crosshatching over the carrier.

3. Click a physical drive to select it for your array.

   The physical drive's ID number is added to the **Selected** list.

4. Click the **Next** button to continue.

   The Create Logical Drive screen displays.

Task 2 – Logical Drive Creation

To create your logical drive:

1. Enter your information and choose your options.
   - Enter a logical drive alias in the field provided
   - Choose a RAID level from the dropdown menu.

     Note the Max: capacity value. Then enter a capacity value the field provided and choose a unit of measure from the dropdown menu.
   - Choose a Stripe size.

     64 KB, 128 KB, 256 KB, 512 KB, and 1 MB are available.
   - Choose a Sector size.

     512 B, 1 KB, 2 KB, and 4 KB are available.
   - Choose a Read (cache) Policy.

     The choices are Read Cache, Read Ahead (cache), and None.
   - Choose a Write (cache) Policy.

     The choices are WriteThru (write through) and WriteBack. Write back requires a Read Cache or Read Ahead Read Cache Policy.
   - RAID 6 and 60 only. Choose a scheme from the dropdown menu.

     The choices are P+Q and Q+Q. If in doubt, use the default P+Q.
   - Choose a preferred controller ID from the dropdown menu.

     The choices are Controller 1, Controller 2, and Automatic. If in doubt, use the default Automatic.
2. Click the **Add** button.

   The new logical drive appears on the list at the right.

   If there is capacity remaining, you can create an additional logical drive.
3. Click the Next button to continue.

   The Create Spare Drive screen displays.

Task 3 – Spare Drive Creation

To create your spare drive:

1. For each of the following items, accept the default or change the settings as required:
   - Check the **Revertible** box if you want a revertible spare drive.

     A revertible spare drive returns to its spare drive assignment after you replace the failed physical drive in the disk array and run the Transition function.
   - **Global** – Can be used by any disk array
   - **Dedicated** to newly created disk array – The disk array you are now creating.
2. In the **Select Physical Drives** diagram, click a drive to choose it for your spare.

   The ID number for chosen drive appears in the field below the diagram.
3. Click the **Next** button.

   The Summary screen displays.

Task 4 – Summary

Review your choices of disk array, logical drives, and spare drive.

- To make a change, click the **Back** button to reach the appropriate screen.
- To accept, click the **Submit** button.

Click the **Finish** button to clear the Summary screen.

Deleting a Disk Array

Caution

If you delete a disk array, you also delete any logical drives that belong to it, along with the data in those logical drives. Back up any important data before deleting a disk array.

This action requires Administrator or Super User privileges.

To delete a disk array:

1. Click the **Storage** tab.
2. Click the **Disk Array** icon.
3. Click the disk array you want, then click the **Delete** button.
4. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Making Disk Array Settings

To make disk array settings:

1. Click the **Storage** tab.
2. Click the **Disk Array** icon.

   The list of disk arrays appears.
3. Click the disk array you want, then click the **Settings** button.
4. Make settings changes as required:
   - Enter, change or delete the alias in the **Alias** field

     Maximum of 32 characters; letters, numbers, space between characters, and underline.
   - **Media Patrol** – Check to enable, uncheck to disable on this array.
   - **PDM** – Check to enable, uncheck to disable on this array.
   - **Power Management** – Check to enable, uncheck to disable on this array.
5. Click the **Save** button.

Notes

- You can also enable or disable Media Patrol for the entire RAID system. See “Making Media Patrol Settings” on page 118.
- HDD Power Saving must be enabled on the RAID controller for the Power Management settings to be effective. See “Making Controller Settings” on page 86.
- Power Management functions are limited to the features your HDDs actually support.

Locating a Disk Array

This feature causes the drive carrier LEDs to flash for one minute to assist you in locating the physical drives that make up this disk array.

To locate a disk array:

1. Click the **Storage** tab.
2. Click the **Disk Array** icon.

   The list of disk arrays appears.
3. Click the disk array you want, then click the **Locate** button.

   The drive carrier status LEDs flash for one minute.

Figure 5. Drive carrier status LED

Running Media Patrol on a Disk Array

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. If Media Patrol encounters a critical error, it triggers PDM if PDM is enabled on the disk array.

For more information, see “Media Patrol” on page 118 and page 331. Also see “PDM” on page 121 and page 331.

Running Media Patrol

To run Media Patrol:

1. Click the **Administration** tab.

2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over Media Patrol and click the **Start** button.

Stopping, Pausing or Resuming Media Patrol

To stop, pause or resume Media Patrol:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background appears.
3. Mouse-over Media Patrol and click the **Stop**, **Pause** or **Resume** button.

Running PDM on a Disk Array

Predictive Data Migration (PDM) is the migration of data from the suspect disk drive to a spare disk drive.

For more information “PDM” on page 121 and page 331.

Running PDM

To run PDM on a disk array:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over PDM and click the **Start** button.
4. From the **Source Physical Drive** dropdown menu, choose a **Source** disk array and physical drive.
5. From the **Target Physical Drive** dropdown menu, choose a **Target** physical drive.
6. Click the **Confirm** button.

Stopping, Pausing or Resuming PDM

To stop, pause or resume PDM:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over PDM and click the **Stop**, **Pause**, or **Resume** button.

You can also enable or disable PDM on individual disk arrays. See “Making Disk Array Settings” on page 157.

Preparing a Disk Array for Transport

This feature prepares the physical drives that make up the disk array to be removed from the enclosure and installed in a different location.

To prepare a disk array for transport:

1. Click the **Storage** tab.
2. Click the **Disk Array** icon.

   The list of disk arrays appears.
3. Click the disk array you want, then click the **Transport** button.
4. Click the **Confirm** button.

   The status changes to Transport Ready.
5. Remove the physical drives and install them in their new location.

   For more information, see “Installing Physical Drives” on page 21.

Rebuilding a Disk Array

When you rebuild a disk array, you are actually rebuilding the data on one physical drive.

If there is no spare drive of adequate capacity and the Auto Rebuild function is DISABLED, you must replace the failed drive with an unconfigured physical drive, then perform a **Manual Rebuild**. See “Making Rebuild Settings” on page 120

Important

If your replacement disk drive was formerly part of a different disk array or logical drive, you must clear the configuration data on the replacement drive before you use it. See “Clearing a Stale or a PFA Condition” on page 147.

Performing a Manual Rebuild

To perform a manual rebuild:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over Rebuild and click the **Start** button.
4. From the **Source Physical Drive** dropdown menu, choose a **Source** disk array and physical drive.

   Arrays have an ID No. Physical drives have a Seq. No.(sequence number)

5. From the **Target Physical Drive** dropdown menu, choose a **Target** physical drive.
6. Click the **Confirm** button.

   When the disk array is rebuilding:

   - The disk array shows a green check icon and **Rebuilding** status.
   - Logical drives under the disk array continue to show a yellow ! icon and **Critical** status.

Stopping, Pausing or Resuming a Rebuild

To stop, pause or resume a Rebuild:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background appears.
3. Mouse-over Rebuild and click the **Stop**, **Pause**, or **Resume** button.

Managing Logical Drives

Logical drive management includes:

- Viewing a List of Logical Drives (below)
- Viewing Logical Drive Information (page 163)
- Viewing Logical Drive Statistics (page 164)
- Viewing Logical Drive Check Tables (page 164)
- Creating a Logical Drive Manually (page 165)
- Deleting a Logical Drive (page 166)
- Making Logical Drive Settings (page 166)
- Locating a Logical Drive (page 167)
- Locating a Logical Drive (page 167)
- Initializing a Logical Drive (page 167)
- Redundancy Check on a Logical Drive (page 168)
- Migrating a Logical Drive's RAID Level (page 169)
- Creating a LUN Clone (page 170)

Also see Disk Array and Logical Drive Problems (page 400).

Viewing a List of Logical Drives

To view a list of logical drives:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.

   The list of logical drives appears.

   Logical Drive information includes:

   - **ID** – LD0, LD1, LD2, etc.
   - **Alias** – If assigned.
   - **Status** – A green check icon means OK.
   - **Capacity** – Data capacity of the logical drive.
   - **RAID Level** – Set when the logical drive was created.
   - **Stripe** – Set when the logical drive was created.
   - **Cache Policy** – Read cache and Write cache settings.
   - **Array ID** – ID number of the disk array where this logical drive was created.

Viewing Logical Drive Information

To view logical drive information:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.

   The list of logical drives appears.
3. Click the logical drive you want, then click the **View** button.

   Logical Drive information displays, including:

   - **ID** – LD0, LD1, LD2, etc.
   - **Alias** – If assigned
   - **Array ID** –- ID number of the disk array where this logical drive was created
   - **RAID Level** – Set when the logical drive was created
   - **Operational Status** – OK means normal
   - **Capacity** – Data capacity of the logical drive
   - **Number of Axles** – For RAID 10, 2 axles. For RAID 50 and 60, 2 or more axles
   - **Physical Capacity** – Data capacity of the physical drives
   - **Number of Physical Drives** – The number of physical drives in the disk array
   - **Stripe size** – Set at logical drive creation
   - **Read Policy** – Adjustable
   - **Sector size** – Set at logical drive creation
   - **Write Policy** – Adjustable
   - **Preferred Controller ID** – For RAID subsystems with dual controllers
   - **Tolerable Number of Dead Drives** – Number of physical drives that can fail without the logical drive going offline
   - **Synchronized** – A new logical drive shows **“**No**”** until synchronizing is completed. See “Synchronization” on page 122
   - **Parity Pace** – Pertains to some RAID levels
   - **WWN** – Worldwide Number, a unique identifier assigned to this logical drive
   - **Codec Scheme** – Pertains to some RAID levels
   - **Serial Number** – Assigned to this logical drive

Viewing Logical Drive Statistics

To view logical drive statistics:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.
   The list of logical drives appears.
3. Click the logical drive you want, then click the **View** button.
4. Click the **Statistics** tab.
   Logical Drive statistics display, including:
   - Data Transferred – In bytes
   - Read Data Transferred – In bytes
   - Write Data Transferred – In bytes
   - Errors
   - Read Errors
   - Write Errors
   - I/O Requests
   - Non-Read/Write I/O Requests
   - Read I/O Requests
   - Write I/O Requests
   - Statistics Start Time
   - Statistics Collection Time

   To clear physical drive statistics, see “Clearing Statistics” on page 79.

Viewing Logical Drive Check Tables

This feature enables you to view error tables. Use this information to evaluate the integrity of the logical drive and to determine whether corrective action is needed.

To view logical drive check tables:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.
   The list of logical drives appears.
3. Click the logical drive you want, then click the **Check Table** button.
4. Choose an option:
   - **All** – All errors. The default choice.
   - **Read Check** – Read errors for this logical drive.
   - **Write Check** – Write errors for this logical drive.

- **Inconsistent Block** – Inconsistent blocks for this logical drive. Mirror data for RAID Levels 1, 1E and 10 or Parity data for RAID Levels 5, 6, 50, and 60. Identified by the Redundancy Check.

The Check Table lists:

- **Entry Number** – A number assigned to each block of entry.
- **Table Type** – Read Check, Write Check or Inconsistent Block.
- **Start Logical Block Address** – LBA of the first block for this entry.
- **Count** – Number of errors or continuous blocks starting from this LBA.

To clear the check tables, see “Clearing Statistics” on page 79.

Creating a Logical Drive Manually

This feature creates a logical drive only. You can also use the Wizard to create a disk array with logical drives and spare drives at the same time. See “Creating a Disk Array with the Wizard” on page 151.

This action requires Super User or Power User privileges.

To create a logical drive manually:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.
3. Click the **Create Logical Drive** button.
4. Click the option button of the disk array you want to use and click the **Next** button.
5. Optional. Enter an alias in the **Alias** field.

   Maximum of 32 characters; letters, numbers, space between characters, and underline.
6. Choose a **RAID level**.

   The choice of RAID levels depends the number of physical drives in the disk array.
7. RAID 50 and 60 only. Specify the number of axles for your array.
8. In the Capacity field, accept the default maximum capacity or enter a lesser capacity and size in MB, GB or TB.

   Any remaining capacity is available for an additional logical drive.
9. For each of the following items, accept the default or change the settings as required:
   - Choose a Stripe size.

     64 KB, 128 KB, 256 KB, 512 KB, and 1 MB are available.
   - Choose a Sector size.

     512 B, 1 KB, 2 KB, and 4 KB are available.

- Choose a Read (cache) Policy.

  Read Cache, Read Ahead, and No Cache are available.
- Choose a Write (cache) Policy.

  Write Back and Write Through (Thru) are available.

10. Click the **Add** button.

    The new logical drive appears on the list at the right.

    If there is capacity remaining, you can create an additional logical drive.
11. When you are finished, click the **Submit** button.

    The new logical drive or drives appear in the logical drive list.

    New logical drives are automatically synchronized. See “Synchronization” on page 122. You can access the logical drive during synchronization.

Deleting a Logical Drive

Caution

If you delete a logical drive, you also delete all the data in the logical drive. Back up any important data before deleting the logical drive.

This action requires Administrator or Super User privileges.

To delete a logical drive:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.
3. Click the logical drive you want, then click the **Delete** button.
4. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Making Logical Drive Settings

To make logical drive settings:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.

   The list of logical drives appears.
3. Click the logical drive you want, then click the **Settings** button.
4. Make settings changes as required:
   - Enter, change, or delete the alias in the Alias field.

     Maximum of 32 characters; letters, numbers, space between characters, and underline.

- Choose a Read (cache) Policy.
  Read Cache, Read Ahead, and No Cache are available.
- Choose a Write (cache) Policy.
  Write Back and Write Through (Thru) are available.

5. Click the **Save** button.
   For more information, see “Cache Policy” on page 362.

Note

The Write Cache is always set to **WriteThru** when Read Cache is set to **NoCache**.

Locating a Logical Drive

This feature causes the drive carrier LEDs to flash for one minute to assist you in locating the physical drives that make up this logical drive.

To locate a logical drive:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.
   The list of logical drives appears.
3. Click the logical drive you want, then click the **Locate** button.
   The drive carrier status LEDs flash for one minute.

Figure 6. Drive carrier status LED

Initializing a Logical Drive

Initialization is normally done to logical drives after they are created from a disk array.

Warning

When you initialize a logical drive, all the data on the logical drive is lost. Backup any important data before you initialize a logical drive.

To initialize a logical drive:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over Initialization and click the **Start** button.
4. Check the box to the left of the logical drive you want to initialize.
5. Choose the initialization option you want:
   - **Quick Initialization** – Check the box and enter a value in the Quick Initialization Size field. This value is the size of the initialization blocks in MB.
   - **Full Initialization** – Do not check the box. Enter a hexadecimal value in the Initialization Pattern in Hex field or use the default 00000000 value.
6. Click the **Confirm** button.

Stopping, Pausing or Resuming an Initialization

To stop, pause or resume Initialization:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over Initialization and click the **Stop**, **Pause**, or **Resume** button.

Redundancy Check on a Logical Drive

Redundancy Check is a routine maintenance procedure for fault-tolerant disk arrays (those with redundancy) that ensures all the data matches exactly. Redundancy Check can also correct inconsistencies.

To run Redundancy Check on a logical drive:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over Redundancy Check and click the **Start** button.
4. Check the boxes to the left of the logical drives you want to run.
5. Check the options you want:
   - **Auto Fix** – Attempts to repair the problem when it finds an error
   - **Pause on Error** – The process stops when it finds a non-repairable error
6. Click the **Confirm** button.

Stopping, Pausing or Resuming a Redundancy Check

To stop, pause or resume Redundancy Check:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over Redundancy Check and click the **Stop**, **Pause**, or **Resume** button.

Migrating a Logical Drive's RAID Level

The term "Migration" means either or both of the following:

- Change the RAID level of a logical drive.
- Expand the storage capacity of a logical drive.

Before you begin a migration, examine your current disk array to determine whether:

- The physical drives in your array can support the target RAID level.
- There is sufficient capacity to accommodate the target logical drive size.

If you need to add physical drives to your array, be sure there are unassigned physical drives are installed in your RAID system before you begin migration.

See "Migration" on page 120, "RAID Levels" on page 333 and "RAID Level Migration" on page 347.

Migrating a Logical Drive

To migrate a logical drive:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over Migrate and click the **Start** button.
4. In the **Select Disk Array** dropdown menu, choose the source disk array.
5. In the **Select Physical Drives** diagram, click the drives to add them to your array.

   The ID numbers of the chosen drives appear in the field below the diagram.
6. Click the **Next** button.
7. Check the box next to the logical drive you want to modify.
8. From the dropdown menu, choose a **target RAID level**.

   The choice of RAID levels depends the number of physical drives in the disk array. See the Note below.

9. In the **Capacity** field, accept the current capacity.

   Or check the **Expand Capacity** box and enter a greater capacity and size in MB, GB or TB.

   If there is capacity remaining, you can create an additional logical drive.

10. Click the **Next** button.

    The logical drive ID numbers, with the original and target RAID levels and capacities are shown

11. To accept the proposed target values, click the **Confirm** button.

Note

When you add physical drives to a RAID 10 array, it becomes a RAID 1E array by default.

If you are adding an even number of physical drives to a RAID 10 array and you want the target array to be RAID 10, you must specify RAID 10 under RAID level.

Creating a LUN Clone

A LUN clone is an exact copy of the original LUN or logical drive, including all the data it contains, at one point in time. Use a LUN clone as a backup or to migrate a LUN from one system to another.

Important

The action of creating a LUN momentarily takes the original LUN or logical drive offline, meaning nobody can read or write to it.

A LUN clone has the same capacity, stripe size, read and write policies as the orignal LUN. However, the LUN clone can be a different RAID level. The choice of RAID levels depends on the disk array. And if you have multiple disk arrays, you can create the LUN clone on a different disk array than the original LUN.

This action requires Super User or Power User privileges.

To create a LUN clone of a logical drive:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.

   The Logical Drive list appears.

3. Click the logical drive you want, then click the **LUN Clone** button.
4. Make settings as required:

- From the **Choose a RAID level** dropdown menu, choose the RAID level of the LUN clone.
- From the **Number of Copies** dropdown menu, choose the number of LUN clones you want to create.

  You can make up to 8 clones of a LUN at a time.
- Check the box to the left of the Disk Array on which you want to create the LUN clone.

5. Click the **Next** button and review your choices.
6. Click the **Start** button to begin the cloning process.

   The cloning progress bar displays.

   Note the **Target Logical Drive ID**. Use this number to identify the LUN clone in the Logical Drive list.

   If you chose a redundant RAID level, the LUN clone is automatically synchronized after creation.

   After the LUN clone is created, you can manage it like any other logical drive. See “Making Logical Drive Settings” on page 166, “Locating a Logical Drive” on page 167, and “Deleting a Logical Drive” on page 166.

   For users to access the LUN clone, you must map it to an initiator. See “Managing LUNs” on page 180.

Managing Spare Drives

Spare drive management includes:

- Viewing a List of Spare Drives (below)
- Viewing Spare Drive Information (page 172)
- Creating a Spare Drive Manually (page 173)
- Creating a Spare Drive with the Wizard, see “Creating a Disk Array with the Wizard” on page 151
- Deleting a Spare Drive (page 174)
- Making Spare Drive Settings (page 174)
- Locating a Spare Drive (page 174)
- Running Spare Check (page 175)
- Running a Transition on a Spare Drive (page 175)

Viewing a List of Spare Drives

To view a list of spare drives:

1. Click the **Storage** tab.
2. Click the **Spare Drive** icon.

   Spare Drive information displays, including:

   - **ID** – Spare0, Spare1, etc.
   - **Operational Status** – OK means normal
   - **Configurable Capacity** – Usable capacity of the spare drive
   - **Physical Drive ID** – ID number of the physical drive chosen for this spare
   - **Revertible** – Yes or No
   - **Spare Type** – Global or Dedicated
   - **Dedicated to Array** – ID number of the disk array to which the spare is dedicated

Viewing Spare Drive Information

To view spare drive information:

1. Click the **Storage** tab.
2. Click the **Spare Drive** icon.

   The list of spare drives appears.
3. Click the spare drive you want, then click the **View** button.

   Spare Drive information displays, including:

   - **Spare Drive ID** – Spare0, Spare1, etc.

- **Physical Drive ID** – ID number of the physical drive chosen for this spare
- **Operational Status** – OK means normal
- **Spare Type** – Global or Dedicated
- **Physical Capacity** – Total data capacity of the spare drive
- **Revertible** – Yes or No
- **Configurable Capacity** – Usable capacity of the spare drive
- **Spare Check Status** – Not Checked or Healthy
- **Media Patrol** – Enabled or Not Enabled
- **Dedicated to Array** – ID number of the disk array to which the spare is dedicated

For more information, see “Spare Drives” on page 355.

Creating a Spare Drive Manually

This feature creates a spare drive only. You can also use the Wizard to create a disk array with logical drives and spare drives at the same time. See Spare Drives for more information.

This action requires Super User or Power User privileges.

To create a spare drive:

1. Click the **Storage** tab.
2. Click the **Spare Drive** icon.
3. Click the **Create Spare Drive** button.
4. For each of the following items, accept the default or change the settings as required:
   - Check the **Revertible** box if you want a revertible spare drive.

     A revertible spare drive returns to its spare drive assignment after you replace the failed physical drive in the disk array and run the Transition function.
   - **Global** – Can be used by any disk array
   - **Dedicated to newly created disk array** – The disk array you are now creating.
5. In the **Select Physical Drives** diagram, click a drive to choose it for your spare.

   The ID number for chosen drive appears in the field below the diagram.
6. Click the **Submit** button.

   If you are done creating spare drives, click the **Finish** button.

   To create another spare drive, click the **Create More** button.

Deleting a Spare Drive

This action requires Administrator or a Super User privileges.

To delete a spare drive:

1. Click the **Storage** tab.
2. Click the **Spare Drive** icon.
3. Click the spare drive you want, then click the **Delete** button.
4. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Making Spare Drive Settings

For more information on settings options, see “Spare Drives” on page 355.

To make spare drive settings:

1. Click the **Storage** tab.
2. Click the **Spare Drive** icon.
3. Click the spare drive you want, then click the **Settings** button.
4. For each of the following items, accept the default or change the settings as required:
   - In the **Revertible** dropdown menu, choose Yes or No.
   - Check the **Media Patrol** box to enable Media Patrol on this spare drive. Uncheck to disable.
   - In the **Spare Type** dropdown menu, choose **Global** or **Dedicated**.
   - If you use chose a Dedicated spare, check the box beside the disk array to which this spare drive is assigned.
5. Click the **Save** button.

Locating a Spare Drive

Spare drives are located the same as individual physical drives.

To locate a spare drive:

1. Click the **Storage** tab.
2. Click the **Spare Drive** icon.

   The list of spare drives appears.
3. In the spare drive list, identify the physical drive ID number.
4. Click the **Device** tab.
5. Click the **Physical Drive** icon.

   The list of physical drives appears.

6. Click the physical drive with the matching ID number and click the **Locate** button.

   The drive carrier LED blinks for one minute.

Running Spare Check

Spare Check verifies the status of your spare drives.

To run spare check:

1. Click the **Storage** tab.
2. Click the **Spare Drive** icon.

   The list of spare drives appears.
3. Click the spare drive you want, then click the **Spare Check** button.
4. Click the **Confirm** button.

   After the “Spare Check completed” message appears, click the **View** button to see Spare Check Status.

Running a Transition on a Spare Drive

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. You must specify an unconfigured physical drive of the same or larger capacity and same media type as the revertible spare drive.

See “Transition” on page 122 and page 356.

Running a Transition

To run a transition on a revertible spare drive:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over Transition and click the **Start** button.
4. From the **Source Physical Drive** dropdown menu, choose a **Source** disk array and the revertible spare drive.

   Arrays have an ID No. The revertible spare has a Seq. No. (sequence number).

5. From the **Target Physical Drive** dropdown menu, choose a **Target** unconfigured drive.
6. Click the **Confirm** button.

Stopping, Pausing or Resuming a Transition

To stop, pause or resume Transition:

1. Click the **Administration** tab.
2. Click the **Background Activities** icon.

   The list of background activities appears.
3. Mouse-over Transition and click the **Stop**, **Pause**, or **Resume** button.

Managing Initiators

Initiator management includes:

- Viewing a List of Initiators (below)
- Adding an FC Initiator (page 177)
- Deleting an FC Initiator (page 178)
- Adding an iSCSI Initiator (page 178)

Viewing a List of Initiators

The VTrak's initiator list displays initiators available for mapping to a LUN or logical drive. You must add initiators to the VTrak's initiator list to make them available for mapping to a LUN.

To view a list of initiators:

1. Click the **Storage** tab.
2. Click the **Initiator** icon.

   The list of initiators appears. Initiator information includes:

   - **Index** – Initiator 0, Initiator 1, Initiator 2, etc.
   - **Initiator Name**

     Fibre Channel – The World Wide Port Name of the initiator, composed of a series of eight, two-digit hexadecimal numbers.

     iSCSI – The iSCSI name of the initiator device, composed of a single text string.

Also see "Viewing a List of FC Initiators on the Fabric" on page 186.

Adding an FC Initiator

You must add an initiator to the VTrak's initiator list in order to map your LUN or logical drive to the initiator.

Method 1: Inputting the Initiator Name

This action requires Administrator or Super User privileges.

To add a Fibre Channel initiator to the list:

1. Click the **Storage** tab.
2. Click the **Initiator** icon.
3. Click the **Add Initiator** button.
4. Input the initiator name in the fields provided.

   An FC initiator name is the World Wide Port Name of the initiator, composed of a series of eight, two-digit hexadecimal numbers.

5. Click the **Submit** button.

   The initiator is added.

Method 2: Adding from a List

This action requires Administrator or Super User privileges.

To add a Fibre Channel initiator to the list:

1. Click the **Device** tab.
2. Click the **Fibre Channel Management** icon.
3. Click the **Logged In Device** tab.
4. Check the box next to the initiator you want to add.
5. Click the **Add to Initiator List** button.

   The initiator is added, and its check box grays out.

Deleting an FC Initiator

Caution

If you delete an initiator, you delete the LUN map associated with that initiator. Verify that the LUN map is no longer needed before deleting the initiator

This action requires Administrator or Super User privileges.

To delete an FC initiator:

1. Click the **Storage** tab.
2. Click the **Initiator** icon.
3. Click the initiator you want, then click the **Delete** button.
4. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

   The initiator is removed from VTrak’s initiator list.

Adding an iSCSI Initiator

To add an iSCSI initiator to the list:

1. Click the **Storage** tab.
2. Click the **Initiator** icon.
3. Click the **Add Initiator** button.
4. Input the initiator name in the fields provided.

   An iSCSI initiator name is the iSCSI name of the initiator device, composed of a single text string.

Example: *iqn.1991-05.com.microsoft:promise-29353b7.*

Obtain the initiator name from the initiator utility on your host system.

Note that the initiator name you input must match exactly in order for the connection to work.

5. Click the **Submit** button.

   The initiator is added to the list.

Managing LUNs

LUN management includes:

- Viewing a List of LUN Maps (below)
- LUN Mapping and Masking (page 180)
- Adding a LUN Map (page 180)
- Editing a LUN Map (page 182)
- Deleting a LUN Map (page 182)
- Changing the Active LUN Map Type (page 182)
- Enabling and Disabling LUN Masking (page 183)

Viewing a List of LUN Maps

To view a list of LUN maps:

1. Click the **Storage** tab.
2. Click the **LUN Mapping & Masking** icon.

   The list of LUN maps appears.

LUN Mapping and Masking

This feature applies to Fibre Channel and iSCSI subsystems and controls user access to storage resources.

- **LUN Mapping** – Maps LUNs to an initiators, so that the initiator can only access only the specified LUNs.
- **LUN Masking** – The process of applying a LUN Map.

To access LUN mapping:

1. Click the **Storage** tab.
2. Click the **LUN Masking & Mapping** icon.

   On this screen, you can:

   - Add an FC or iSCSI initiator to the VTrak's initiator list.
   - Enable LUN masking.
   - Map a LUN to one or more initiators, targets, or ports.

Adding a LUN Map

For FC systems, you can set up an Initiator or Port type LUN map.

For iSCSI systems, you can set up an Initiator or Target type LUN map.

You can set up both LUN map types on the same subsystem but only one LUN map type can be active at a time.

A maximum of 1024 logical drives can be mapped to an FC initiator or port, or to an iSCSI initiator or target.

To assign a LUN to an initiator, add the initiator first. See “Adding an FC Initiator” on page 177 or “Adding an iSCSI Initiator” on page 178.

LUN masking must be enabled in order to map a LUN. See “Enabling and Disabling LUN Masking” on page 183.

To add a LUN map:

1. Click the **Storage** tab.
2. Click the **LUN Mapping & Masking** icon.
3. Beside Active LUN Mapping Type,
   - FC subsystems, choose the **Initiator** or **Port** option.
   - iSCSI subsystems, choose the **Initiator** or **Target** option.

   If you change the LUN Mapping Type, in the popup message type “confirm” and click the **Confirm** button.
4. Click the **LUN Mapping** button.

   The first LUN Mapping screen appears.

   This screen lets you choose initiators, ports, or targets, depending on the Active LUN Mapping Type.
5. Click the dropdown menu to choose the initiators, ports, or targets you want for the LUN map.

   Choose your initiators, ports, or targets individually or choose all of them.
6. Click the **Next** button.

   The second LUN Mapping screen appears.
7. Click a logical drive to highlight it. Then click the **<** button to assign the logical drive to an initiator or port.

   Or click the **<<** button to assign all logical drives to an initiator or port.

   The logical drive moves to the Initiator, Port, or Target list with a default LUN of 0. Type the LUN you want to assign to this initiator, from 0 to 255.

   Each logical drive can have only one *unique* LUN.
8. Click the **Next** button.

   The final LUN Mapping screen appears showing the initiator or port and LUN map.
9. Click the **Submit** button.

   The new LUN map is created.

Editing a LUN Map

Editing a LUN map is the action of assigning a logical drive or LUN to an initiator. By changing the assignment, you change the initiator's access.

To edit a LUN map:

1. Click the **Storage** tab.
2. Click the **LUN Mapping & Masking** icon.

   The list of LUN maps appears.
3. Click the LUN map you want, then click the **Setting** button.
4. Beside Active LUN Mapping Type,
   - FC subsystems, choose the **Initiator** or **Port** option.
   - iSCSI subsystems, choose the **Initiator** or **Target** option.

   If you change the LUN Mapping Type, in the popup message type "confirm" and click the **Confirm** button.
5. Drag a logical drive from the **Logical Drive** list and drop it onto the **Initiator** list.
6. Click the **Next** button.

   The LUN Mapping screen shows the edited LUN map.
7. Click the **Submit** button.

Deleting a LUN Map

Deleting a LUN map prevents the initiator from accessing the LUN while LUN masking is enabled.

To delete a LUN map:

1. Click the **Storage** tab.
2. Click the **LUN Mapping & Masking** icon.

   The list of LUN maps appears.
3. Click the LUN map you want, then click the **Delete** button.
4. In the Confirmation box, type the word "confirm" in the field provided and click the **Confirm** button.

Changing the Active LUN Map Type

For FC systems, you can set up an Initiator or Port type LUN map.

For iSCSI systems, you can set up an Initiator or Target type LUN map.

You can set up both LUN map types on the same subsystem but only one LUN map type can be active at a time.

To change the active LUN mapping type:

1. Click the **Storage** tab.
2. Click the **LUN Mapping & Masking** icon.

   The list of LUN maps appears.
3. Beside Active LUN Mapping Type:
   - FC subsystems, choose the **Initiator** or **Port** option.
   - iSCSI subsystems, choose the **Initiator** or **Target** option.

   When you change the LUN map type, a popup message appears.
4. In the popup message type “confirm” and click the **Confirm** button.

Enabling and Disabling LUN Masking

LUN masking must be enabled in order to assign map your LUNs to your initiators and to use your existing LUN maps.

Disabling LUN masking allows all initiators to access all LUNs in your data storage. However, disabling LUN masking does not delete existing LUN maps.

These actions require Administrator or Super User privileges.

To enable or disable LUN masking:

1. Click the **Storage** tab.
2. Click the **LUN Mapping & Masking** icon.
3. Check the box to enable LUN Masking.

   Or uncheck the box to disable LUN Masking.

   LUN Masking starts or stops as soon as you make your setting.

Managing Fibre Channel Connections

Fibre Channel management includes:

- Viewing FC Node Information (below)
- Viewing FC Port Information (page 184)
- Making FC Port Settings (page 185)
- Viewing FC Port Statistics (page 186)
- Viewing a List of FC Initiators on the Fabric (page 186)
- Viewing a List of FC Logged-in Devices (page 186)
- Viewing a List of FC SFPs (page 186)

Also see “Adding an FC Initiator” on page 177 and “Deleting an FC Initiator” on page 178.

Viewing FC Node Information

To view Fibre Channel node information:

1. Click the **Device** tab.
2. Click the **FC Management** icon.
3. Click the **Node** tab.

   Node information includes:

   - Worldwide Node Number (WWNN)
   - Maximum Frame Size
   - Supported FC Class
   - Supported speeds

Viewing FC Port Information

To view Fibre Channel port information:

1. Click the **Device** tab.
2. Click the **FC Management** icon.
3. Click the **Port** tab.
4. Mouse-over an FC port to access and click the **View** button.

   Port information includes:

   - FC Port ID number
   - Controller ID number
   - Identifier (hexadecimal)
   - Link status
   - Hard ALPA

- Worldwide Port Number (WWPN)

Making FC Port Settings

To make Fibre Channel port settings:

1. Click the **Device** tab.
2. Click the **FC Management** icon.
3. Click the **Port** tab.
4. Click the FC port you want to access and click the **Settings** button.
5. Make these changes as required:
   - Choose a configured link speed from the dropdown menu.
     The choices are Auto (default), 2 Gb/s, 4 Gb/s, and 8 Gb/s.
   - Choose a topology from the dropdown menu.
   - Enter a Hard ALPA in the field provided.
     Enter 255 to disable Hard ALPA.
6. Click the **Save** button.

Port Setting Information

The table below shows the type of attached topology you achieve based on your connection type and the configured topology you select.

Fibre Channel Attached Topology		
	Configured Topology	
Connection Type	N-Port	NL-Port
Switch	Fabric Direct	Public Loop
Direct	Point-to-Point	Private Loop

Example 1: If you connect the VTrak to an FC switch and choose NL-Port topology, you create a Public Loop attached topology.

Example 2: If you have a Point-to-Point attached topology, you made a direct connection (no FC switch) and selected N-port topology.

Note

In some cases, HBA settings to N-Port only work if connected to the switch. Refer to your HBA manual for more information.

Viewing FC Port Statistics

To view Fibre Channel port statistics:

1. Click the **Device** tab.
2. Click the **FC Management** icon.
3. Click the **Statistics** tab.
4. Mouse over the FC port you want to access and click the **View** button.

To clear FC port statistics, see “Clearing Statistics” on page 79.

Viewing a List of FC Initiators on the Fabric

To view a list Fibre Channel initiators on the fabric:

1. Click the **Device** tab.
2. Click the **FC Management** icon.
3. Click the **Initiators on Fabric** tab.

Also see “Viewing a List of Initiators” on page 177.

Viewing a List of FC Logged-in Devices

Logged-in devices refers to all Fibre Channel devices currently logged into the VTrak. The device list includes:

- FC ports
- FC switches, if attached
- FC initiators

To view a list FC logged-in devices:

1. Click the **Device** tab.
2. Click the **FC Management** icon.
3. Click the **Logged In Device** tab.

Viewing a List of FC SFPs

The term SFP refers to Small Form Pluggable transceivers used in Fibre Channel ports. The SFPs convert electrical signals to optical signals and send them over the Fibre Channel fabric, where another transceiver converts the optical signal back to an electrical signal again.

To view a list FC SFPs:

1. Click the **Device** tab.
2. Click the **FC Management** icon.
3. Click the **SFP** tab.

SFP information includes:

- FC port ID
- Controller ID
- Connector type
- Transceiver type
- Transceiver code
- Vendor name

Managing iSCSI Connections

iSCSI management includes:

Also see:

- “Adding an iSCSI Initiator” on page 178
- “iSCSI Management” on page 366

A detailed explanation of iSCSI functions and how to best use them is beyond the scope of this document. For more information, contact the Internet Engineering Task Force at http://www.ietf.org/.

Making Global iSCSI Settings

This setting enables and disables the Keep Alive feature on all iSCSI sessions. You can also enable and disable Keep Alive on individual sessions. See page 200.

To make global iSCSI settings:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Global iSCSI Settings** button.
4. Check the box to enable the Keep Alive feature.

   Uncheck the box to disable.
5. Click the **Submit** button.

Viewing a List of iSCSI Targets

A *target* is a logical drive on the VTrak subsystem. The default target exposes all logical drives and is associated with all portals on the subsystem.

To view a list of iSCSI targets:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Target** tab.

   Target information includes:

   - **ID** – ID number of the target
   - **Alias** – If assigned
   - **Assigned Portals** – Portals assigned under this target

Viewing iSCSI Target Information

To view information about a target:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Target** tab.
4. Click the target you want, then click the **View** button.

   Target information includes:

   - **ID** – ID number of the target.

- **Name** – iSCSI qualified name (iqn) of this target.
- **Alias** – Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.*
- **Status** – Up or down.
- **Error Recovery Level** – Error recovery level supported.
- I**nitial R2T** – Allows initiator to begin sending data to a target without receiving a ready to transfer command.
- **Max Outstanding R2T** – Maximum number of R2T PDUs the target can have outstanding for a single iSCSI command.
- **Max Burst Length** – Maximum length of a solicited data sequence in bytes.
- **Data Digest** – Adds a data digest (CRC).*
- **Header Digest** – Enables the use of header digest (CRC).*
- **Data Sequence in Order** – Enables placement of data in sequence order
- **Data PTU in Order** – Enables placement of data in PDU order
- **Default Time to Wait** – After a dropped connection, the number of seconds to wait before attempting to reconnect
- **Default Time to Retain** – Number of seconds after time to wait (above) before reassigning outstanding commands
- **Uni-directional CHAP Authentication** – Uni-directional (peer) CHAP authentication, enabled or disabled*
- **Bi-directional CHAP Authentication** – Bi-directional (local) CHAP authentication, enabled or disabled*
- **Maximum Connections** – The maximum number of concurrent connections
- **Immediate Data** – Enables the initiator to send unsolicited data with the iSCSI command PDU.
- **First Burst Length** – In bytes.
- **Assigned Portal Ids** – Portals assigned to this target.**

Items marked with an asterisk (*) are adjustable under “Making iSCSI Target Settings” on page 191.

Items marked with a double asterisk (**) are adjustable under “Assigning a Portal to an iSCSI Target” on page 192.

Adding iSCSI Targets

If you plan to enable authentication on the new target, create a CHAP first, then add the target. See “Adding iSCSI CHAPs” on page 201.

Header and data digests work best with initiators equipped with a TCP Offload Engine (TOE). For more information, see your iSCSI HBA user documentation.

VTrak supports a maximum 2048 iSCSI targets. A maximum of 1024 logical drives can be mapped to a target.

To add a target:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Target** tab.
4. Click the **Create Target** button.
5. Optional. In the Alias field, type an alias for this target.
6. Check the boxes to enable, uncheck to disable:
   - Enable Header Digest – Adds a header digest (CRC)
   - Enable Data Digest – Adds a data digest (CRC)
   - Enable uni-directional (peer) CHAP authentication
   - Enable bi-directional (local) CHAP authentication
7. Click the **Submit** button.

Making iSCSI Target Settings

To make target settings:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Target** tab.
4. Click the target you want, then click the **Settings** button.
5. Make settings changes are required:
   - Alias
   - Enable Header Digest
   - Enable Data Digest
   - Enable Uni-directional CHAP Authentication
   - Enable Bi-directional CHAP Authentication
6. Click the **Submit** button.

Deleting an iSCSI Target

You cannot delete the default target.

To delete a target:

1. Click the **Device** tab.

2. Click the **iSCSI Management** icon.
3. Click the **Target** tab.
4. Click the target you want, then click the **Delete** button.
5. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

   The target is removed from the list.

Assigning a Portal to an iSCSI Target

Before you can assign a portal to a target, you must create the portal. See “Adding iSCSI Portals” on page 194.

To assign a portal to an iSCSI target:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Target** tab.
4. Click the target you want, then click the **Assign Portal to Target** button.
5. In the Portal list, click the portal you want assign, then click the **<** button.

   Choose additional portals as needed.
6. When you are done choosing portals, click the **Next** button.
7. Click the **Submit** button.

Un-assigning a Portal from an iSCSI Target

To un-assign a portal from an iSCSI target:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Target** tab.
4. Click the target you want, then click the **Assign Portal to Target** button.
5. In the Assign Portal to Target list, click the portal you want to un-assign, then click the **>** button.

   Choose additional portals as needed.
6. When you are done choosing portals, click the **Next** button.
7. Click the **Submit** button.

Viewing a List of iSCSI Portals

To view a list of iSCSI portals:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.

3. Click the **Portal** tab.

   Portal information includes:

   - **ID** – Portal number. Starts at 0.
   - **IP Address** – IP address of the portal.
   - **Controller ID** – RAID controller ID, 1 or 2.
   - **Port ID** – Physical port on the RAID controller, 1 to 4.
   - **Trunk ID** – Trunk ID, 1 to 8. Refers to portals associated with a trunk (link aggregation). N/A means this portal is not asscciated with a trunk.
   - **VLAN Tag** – VLAN Tag, 0 to 4094. Refers to portals associated with a Virtual Local Area Network (VLAN). N/A means this portal is not associated with a VLAN.

Viewing iSCSI Portal Information

To view information about a portal:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Portal** tab.
4. Click the portal you want, then click the **View** button.

   Portal information includes:

   - **Portal ID** – Portal number. Starts at 0.
   - **Trunk ID** – 1 to 8. Refers to portals associated with a trunk (link aggregation). N/A means this portal is not asscciated with a trunk.
   - **Controller ID** – RAID controller ID, 1 or 2.
   - **VLAN Tag** – 0 to 4094. Refers to portals associated with a Virtual Local Area Network (VLAN). N/A means this portal is not associated with a VLAN.
   - **Port ID** – Physical port on the RAID controller, 1 to 4.
   - **Interface Name** – Ethernet interface names.
   - **Associated Type** – PHY, VLAN, or Trunk.
   - **DHCP** – Enabled or disabled.*

     DHCP is currently supported only for IPv4.
   - **TCP Port Number** – TCP port number. 3260 is the default and recommended number.
   - **Assigned Targets** – IDs of the targets to which this Portal is assigned. N/A means no target is assigned.

     See “Adding iSCSI Targets” on page 190 and “Assigning a Portal to an iSCSI Target” on page 192.

Items marked with an asterisk (*) are adjustable under “Making iSCSI Portal Settings” on page 194.

Adding iSCSI Portals

VTrak supports up to 32 iSCSI portals per iSCSI port. Each iSCSI portal can belong to a different VLAN for a maximum of 32 VLANs.

If you plan to associate the new portal with a trunk, create the trunk first. See “Adding iSCSI Trunks” on page 197.

For more information about iSCSI VLANs, see “iSCSI on a VLAN” on page 368.

To add a portal:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Portal** tab.
4. Click the **Create Portal** button.
5. Make your choices and inputs as required:
   - Choose an Association type from the option list.

     The choices are *PHY*, *Trunk*, or *VLAN*.
   - If you are creating a *PHY* or *VLAN* association, choose
     - Controller ID (1 or 2) from the dropdown menu.
     - Choose a Port ID (1 to 4) from the dropdown menu.
   - If you are creating a *Trunk* association, choose a Trunk ID (1 to 8) from the dropdown menu.
   - Type the IP address of the portal in the field provided.
   - Type the subnet mask of the portal in the field provided.
   - If you are creating a *VLAN* association, enter a VLAN tag (0 to 4094) in the field provided.
   - From the IP Type dropdown menu, choose IPv4 or IPv6.

     DHCP is currently supported only for IPv4.
6. Click the **Submit** button.

   The new portal is added to the list.

   To assign a portal to a target, see “Assigning a Portal to an iSCSI Target” on page 159.

Making iSCSI Portal Settings

To make iSCSI portal settings:

1. Click the **Device** tab.

2. Click the **iSCSI Management** icon.
3. Click the **Portal** tab.
4. Click the portal you want, then click the **Settings** button.
5. Make settings changes as needed:
   - If you have a *Trunk* association, choose a Trunk ID (1 to 8) from the dropdown menu.
   - Type the IP address of the portal in the field provided.
   - Type the subnet mask of the portal in the field provided.
   - If you have a *VLAN* association, enter a VLAN tag (0 to 4094) in the field provided.
   - From the IP Type dropdown menu, choose IPv4 or IPv6.

     DHCP is currently supported only for IPv4.
6. Click the **Submit** button.

Deleting iSCSI Portals

To delete an iSCSI portal:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Portal** tab.
4. Click the portal you want, then click the **Delete** button.
5. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

   The portal is removed from the list.

Viewing a List of iSCSI Ports

An iSCSI port is the physical iSCSI connection on the VTrak. There are four iSCSI ports on each RAID controller for a total of eight per subsystem.

To view a list of ports:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Port** tab.

   Port information includes:
   - **Port ID** – ID number of the port
   - **Controller ID** – 1 or 2
   - **Link Status** – Up or down, active or Inactive
   - **Port Status** – Enabled or disabled*

- **Jumbo Frames** – Enabled or disabled*
- **Current Speed** – In Mb/s
- **Assigned Portals** – Portals to which this port is assigned

Items marked with an asterisk (*) are adjustable under “Making iSCSI Port Settings” on page 196

Viewing iSCSI Port Information

To view information about a port:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Port** tab.
4. Click the port you want, then click the **View** button.

   Port information includes:

   - **Controller ID** – ID of the RAID controller where the port is located
   - **Status** – Enabled or disabled*
   - **Jumbo Frames** – Enabled or disabled*
   - **Link Status** – Up or down, active or inactive
   - **MAC Address** – MAC address of the target port
   - **Max Supported Speed** – Maximum speed supported (1 Gb/s)
   - **Current Speed** – Current or actual speed of the target port
   - **Relative Portals** – The portals corresponding to this target port

   Items marked with an asterisk (*) are adjustable under “Making iSCSI Port Settings” on page 196.

Making iSCSI Port Settings

To make iSCSI port settings:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Port** tab.
4. Click the port you want, then click the **Settings** button.
5. Make settings changes as required:
   - **Enable Port** – Check to enable this port. Uncheck to disable.
   - **Jumbo Frames** – Check to enable jumbo frame support on this port. Uncheck to disable.
6. Click the **Submit** button.

Viewing a List of iSCSI Trunks

A trunk is the aggregation of two or more iSCSI ports to increase bandwidth.

To view a list of trunks:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Trunk** tab.

   Trunk information includes:

   - **Trunk ID** – ID number of the trunk
   - **Controller ID** – ID of the RAID controller, 1 or 2
   - **Master Port** – ID of the master port
   - **Slave Ports** – IDs of the slave ports
   - **Failed Ports** – IDs of any ports that are not working
   - **State** – Optimal, Sub-Optimal, or Failed

   Failed ports result in sub-optimal and failed trunks.

Adding iSCSI Trunks

Ports must be *enabled* to add them to a trunk. See “Making iSCSI Port Settings” on page 196. VTrak supports a maximum of eight trunks.

You cannot use an iSCSI port that has portals configured to it. See “Viewing a List of iSCSI Portals” on page 192 and “Deleting iSCSI Portals” on page 195.

To add an iSCSI trunk:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Trunk** tab.
4. Click the **Create Trunk** button.
5. Make your choices as required:
   - **Controller ID** – ID of the RAID controller, 1 or 2
   - **Master Port number** – ID of the master port
   - **Slave Port number** – IDs the slave ports
6. Click the **Submit** button.

   The new trunk is added to the list.

   Specify the trunk when your create a portal. See “Adding iSCSI Portals” on page 194.

Making iSCSI Trunk Settings

To make trunk settings:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Trunk** tab.
4. Click the trunk you want, then click the **Settings** button.
5. Make changes as required:
   - **Controller ID** – ID of the RAID controller, 1 or 2
   - **Master Port number** – ID of the master port
   - **Slave Port number** – IDs the slave ports
6. Click the **Submit** button.

Deleting iSCSI Trunks

Before you can delete a trunk, you must delete any portals configured on it. See “Deleting iSCSI Portals” on page 195.

To delete an iSCSI trunk:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Trunk** tab.
4. Click the trunk you want, then click the **Delete** button.
5. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

   The trunk is removed from the list.

Viewing a List of iSCSI Sessions

To view a list of iSCSI sessions:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Session** tab.

   iSCSI session information includes:
   - **ID** – ID number of the session
   - **Target Name** – Alias of the target
   - **Initiator Name** – Part of the IQN
   - **Portal ID** – ID number of the portal
   - **Status** – Active or inactive.

Viewing iSCSI Session Information

To view a list of iSCSI sessions:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Session** tab.
4. Click the iSCSI session you want and click the **View** button.

   Information includes:

   - **Session ID** – ID number of the session
   - **Status** – Active or inactive
   - **Target Alias**
   - **Initiator Name** – iSCSI qualified name (iqn)
   - **Portal IP** – IP address of the portal
   - **Device Type** – Initiator or target
   - **Target Portal Group** – ID number
   - **TSIH** – Target session identifying handle
   - **Execution Throttle** – Max number of outstanding commands on any one port
   - **Max Outstanding R2T** – Number of PDUs ready to transfer
   - **Default Time to Retain** – In seconds
   - **Max Burst Length** – In bytes
   - **Initial R2T** – Enabled or disabled
   - **Data Digest** – Enabled or disabled
   - **Data PDU in Order** – Enabled or disabled
   - **Portal ID** – ID number of the portal
   - **Keep Alive** – Enabled or disabled
   - **Target Name –** iSCSI qualified name (iqn)
   - **Initiator IP** – IP address of the initiator
   - **Device Access Control** – Enabled or disabled
   - **Initiator Source Port** – ID number
   - **ISID** – Initiator session ID number
   - **Max Rcv Data Seg Length** – Receive data segment length
   - **First Burst Length** – In bytes
   - **Default Time to Wait** – In seconds
   - **Immediate Data** – Enabled or disabled
   - **Header Digest** – Enabled or disabled
   - **CHAP Authentication Type** – None, Local, Peer
   - **Data Seq in Order** – Enabled or disabled

Making iSCSI Session Settings

To make iSCSI session settings:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Session** tab.
4. Click the iSCSI session you want and click the **Settings** button.
5. Check the box to enable the Keep Alive feature.

   Uncheck the box to disable.
6. Click the **Submit** button.

You can also enable and disable the Keep Alive as a global setting. See page 189.

Deleting an iSCSI Session

To delete an iSCSI session:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Session** tab.
4. Click the iSCSI session you want and click the **Delete** button.
5. Type “confirm” in the field provided, then click the **Confirm** button.

Viewing iSCSI iSNS Information

To view information about iSNS:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **iSNS** tab.

   The information includes:

   - **Auto iSNS IP** – Yes means the IP address is assigned automatically
   - **iSNS Enabled** – Yes means the iSNS feature is enabled*
   - **iSNS Server IP Address** – IP address of the iSNS Server*
   - **iSNS Port** – 3205 is the default and recommended value*

   Items marked with an asterisk (*) are adjustable under “Making iSCSI iSNS Settings” on page 201.

Making iSCSI iSNS Settings

To make iSNS settings:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **iSNS** tab.
4. Click the **iSNS Settings** button.
5. Make settings changes are required:
   - Check the box to enable iSNS. Uncheck to disable.
   - Enter the iSNS server IP address.
   - Enter a new iSNS Port number. The range is 1 to 65535.
6. Click the **Submit** button.

Viewing a List of iSCSI CHAPs

To view a list of iSCSI CHAPs:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **CHAP** tab.

   CHAP information includes:
   - **Index** – ID number of the CHAP
   - **Name** – User assigned name of the CHAP
   - **Type** – Peer or local
     - Peer is one-way or uni-directional.
     - Local is two-way or bi-directional.
   - **Target ID** – ID number of the target (logical drive) where the CHAP is used. N/A means that no target is assigned.

Adding iSCSI CHAPs

To add an iSCSI CHAP:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **CHAP** tab.
4. Click the **Create CHAP** button.
5. Make your choices and inputs as required:
   - Enter a name in the Name field.
   - Choose a CHAP type.

- Peer is one-way or uni-directional.
- Local is two-way or bi-directional.

- Enter a secret of 12 to 99 characters in the Secret field.
- Enter the secret again in the Retype Secret field.

6. Click the **Submit** button.
   The new CHAP is added to the list.

Making iSCSI CHAP Settings

When you change CHAP settings, you must change the secret. You cannot change the type (peer or local).

To make iSCSI CHAP settings:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **CHAP** tab.
4. Click the CHAP you want, then click the **Settings** button.
5. Make settings changes are required:
   - Enter a name in the Name field.
   - Enter the current secret in the Current Secret field.
   - Enter a new secret of 12 or more characters in the Secret field.
   - Enter the new secret again in the Retype Secret field.
6. Click the **Submit** button.

Deleting iSCSI CHAPs

To delete an iSCSI CHAP:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **CHAP** tab.
4. Click the CHAP you want, then click the **Delete** button.
5. Click the **Confirm** button.
   The CHAP is removed from the list.

Pinging a Host or Server on the iSCSI Network

This function enables you to ping other network nodes through any one of the VTrak's iSCSI ports.

To ping a host or server on the network:

1. Click the **Device** tab.
2. Click the **iSCSI Management** icon.
3. Click the **Ping** tab.
4. Type the IP address of the host or server into the IP Address field.
5. Choose the port **Type** from the dropdown menu.
   - iSCSI means an iSCSI port
   - Mgmt means the VTrak's virtual management port
6. If you chose iSCSI port, choose the RAID controller and port number from the dropdown menus.
7. Type the number of packets you want to send in the Number of Package to Ping field.

   Four packets are commonly used for a ping.
8. Click the **Start** button.

   In a few moments, the result displays under the Device tab as *Ping succeeded* or *Ping failed*.

Chapter 5: Management with the CLU

This chapter covers the following topics:

For information about the VTrak audible alarm and LEDs, see “Chapter 8: Troubleshooting” on page 375.

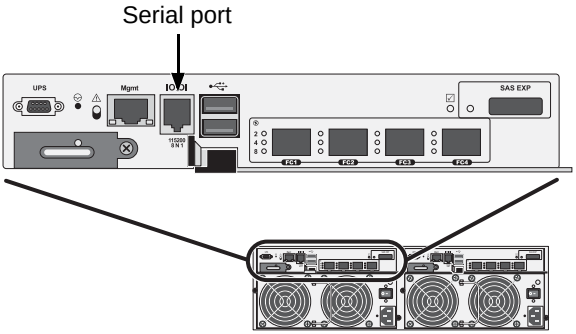
Initial Connection

Making an initial connection includes the following functions:

Making a Serial Connection

Before you begin, be sure the RJ11-to-DB9 serial data cable is connected between the Host PC and VTrak, and that both machines are booted and running.

Figure 1. Serial port on the controller



Then do the following actions:

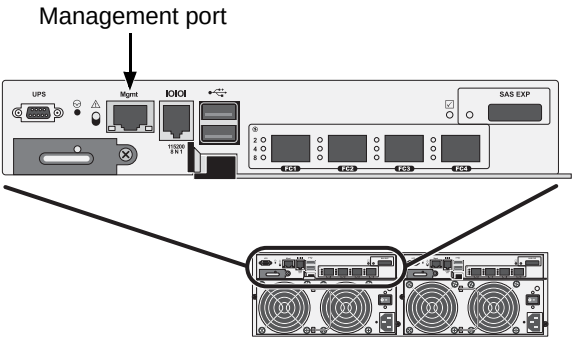
1. Change your terminal emulation program settings to match the following specifications:
   - Bits per second: 115200
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: none
2. Start your PC's terminal VT100 or ANSI emulation program.

3. Press Enter once to launch the CLI.

Making a Telnet Connection

A Telnet connection requires a network connection between the Host PC and the Management (Ethernet) port on the VTrak controller.

Figure 2. Management port on the RAID controller



To start the telnet program:

1. Go to the command line prompt (Windows) or click the terminal icon (Linux).
2. Type **telnet 192.168.1.56 2300** and press Enter.

   The IP address above is only an example.
   Use the Management port IP address of your VTrak.
   The Telnet default port number is 2300.
3. Press Enter once to launch the CLI.

Making a SSH Connection

A Secure Shell (SSH) connection requires a network connection between the Host PC and the Management (Ethernet) port on the VTrak controller.

See above, Figure 2.

Windows PCs require you to install a SSH application on the PC.

Windows

To start the Windows SSH program:

1. Open the SSH application from the Start menu.
2. Enter the IP address and SSH port number of the VTrak in the fields provided.

   The SSH default port number is 22.

3. Press Enter once to launch the CLI.

Linux

To start the Linux SSH program:

1. Click the terminal icon.
2. Type **ssh 192.168.1.56 22** and press Enter.

   The IP address above is only an example.
   Use the Management port IP address of your VTrak.
   The SSH default port number is 22.
3. Press Enter once to launch the CLI.

Logging Into the CLI

1. At the Login prompt, type the user name and press Enter.

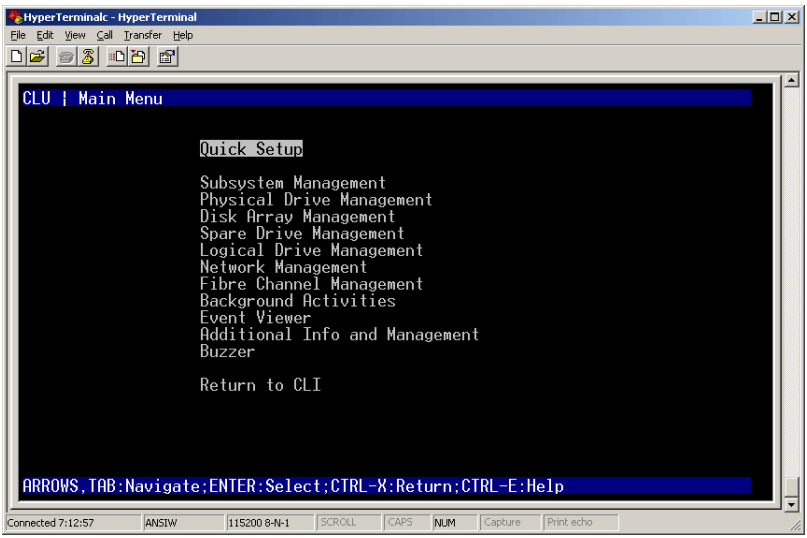
   The default user name is **administrator**.
2. At the Password prompt, type the password and press Enter.

   The default password is **password**.

   The CLI screen appears.
3. At the administrator@cli> prompt, type **menu** and press Enter.

   The CLU Main Menu appears.

Figure 3. CLU main menu



Quick Setup – A sequence of four steps to setup system date and time, Management port, and RAID configuration. See “Setting-up VTrak with the CLU” on page 55.

Subsystem Management – Subsystem settings, Controller settings, statistics, lock/unlock the subsystem, set date and time, Enclosure settings, FRUs and Topology.

Physical Drive Management – Assign an alias, force a physical drive offline or online, clear a Stale or PFD condition, change global physical drive settings, and locate a physical drive.

Disk Array Management – Assign an alias, view array information, create and delete disk arrays, transport, rebuild, PDM, and transition functions, accept and incomplete array, locate a disk array, create, and delete logical drives.

Spare Drive Management – View a list of spare drives, create, modify, and delete spare drives, and run Spare Check.

Logical Drive Management – Assign an alias, set cache policies, view logical drive information, run initialization and Redundancy Check, create a LUN clone, and locate a logical drive.

Network Management – Set IP addresses for Virtual and Maintenance Mode Ports, gateway, and DNS server; subnet mask.

Fibre Channel Management – Node information, Port information, settings, SFPs, and statistics, Logged-in devices, add intiator to the list.

iSCSI Management – Targets, Ports, Portals, Sessions, iSNS options, CHAPs, Ping, Trunks, Logged-in devices, add intiator to the list.

Background Activities – Summary of running and scheduled activity, settings for Media Patrol, Auto Rebuild, Rebuild, Migration, PDM, Transition, Synchronization, Initialization, Redundancy Check rate, and thresholds.

Event Viewer – View runtime and NVRAM event logs.

Additional Info and Management – LUN mapping, UPS management, User management, Software services management, Flash through TFTP (Firmware update), Clear Statistics, Restore Default Settings, Shutdown or Restart the subsystem.

Buzzer – Enable, disable or silence the buzzer (audible alarm).

Accessing Online Help

To access online help on any CLU screen, press Control-AE.

To return to the CLU, press Enter.

Exiting the CLU

1. Highlight **Return to Previous Menu** and press Enter.

   Repeat this action until you arrive at the Main Menu.
2. From the Main Menu, highlight **Return to CLI** and press **Enter** to exit
3. Close the terminal emulation, Telnet, SSH, or terminal window.

Logging Out of the CLI

When you shut down or restart the VTrak subsystem, you are automatically logged out of the CLI.

To manually log out of the CLI (no shut down or restart):

At the username@cli> prompt, type **logout** and press Enter.

The prompt changes to cli>.

Logging Back Into the CLI and CLU

To log into the CLI and CLU after a manual logout:

1. At the cli:> prompt, type **login** followed by your user name and press Enter.
2. At the Password: prompt, type your password and press Enter.
3. At the username@cli> prompt, type **menu** and press Enter to open the CLU.

Managing the Subsystem

Subsystem Management includes the following functions:

Making Subsystem Settings

An alias is optional. To set an Alias for this subsystem:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Subsystem Settings** and press Enter.
3. Make changes as required:
   - Type and alias into the Alias field.

     Maximum of 48 characters. Use letters, numbers, space between words and underscore.
   - Highlight **Redundancy Type** and press the spacebar to toggle between Active-Active and Active-Standby.

     Active-Active – Both RAID controllers are active and can share the load

     Active-Standby – One RAID controller is in standby mode and goes active if the other fails
   - Highlight **Cache Mirroring** and press the spacebar to toggle between Enabled and Disabled.
4. Press Control-A to save your settings.

Running Media Patrol

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks all physical drives assigned to disk arrays and spare drives. It does not check unconfigured drives.

To start, stop, pause or resume Media Patrol:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Media Patrol** and press enter.
3. Highlight **Start**, **Stop**, **Pause**, or **Resume** and press Enter.
4. If you chose Stop, press Y to confirm.

Locking or Unlocking the Subsystem

The lock prevents other sessions (including sessions with the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done. When the user who locked the controller logs out, the lock is automatically released.

Setting the Lock

To set the lock:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Lock Management** and press Enter.
3. In the Lock Time field, type a lock time in minutes.

   1440 minutes = 24 hours
4. Highlight **Lock** and press Enter.

Resetting the Lock

To reset the lock with a new time:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Lock Management** and press Enter.
3. In the Lock Time field, type a lock time in minutes.

   1 to 1440 minutes (24 hours)
4. Highlight **Renew** and press Enter.

Releasing the Lock

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Lock Management** and press Enter.
3. Highlight **Unlock** and press Enter.

Releasing a Lock set by another user

To release somebody else's lock:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Lock Management** and press Enter.
3. Highlight **Force Unlock** and press the Spacebar to change to **Yes**.
4. Highlight **Unlock** and press Enter.

Setting Subsystem Date and Time

Use this screen to make Date and Time settings:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Modify System Date & Time** and press Enter.

3. Highlight the **System Date** or **System Time** setting.
4. Press the backspace key to erase the current value.
5. Type in a new value.
6. Press Control-A to save your settings.

Making NTP Settings

After you have made Network Time Protocol (NTP) settings, the VTrak subsystem synchronizes with a NTP server.

- At startup
- Every night
- When you synchronize manually

To make NTP settings for the subsystem:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **NTP Management** and press Enter.
3. Highlight **NTP Settings** and press Enter.
4. Make the following settings as required:
   - Highlight **NTP Service** and press the spacebar to toggle between **Enabled** and **Disabled**.
   - Highlight **Time Server (1)**, **Time Server (2)**, or **Time Server (3)** and type a server name.

     Example: 0.us.pool.ntp.org
     You can have up to 3 NTP servers.
   - Highlight **Time Zone** and press the spacebar to toggle through GMT, GMT+, and GMT-.

     For GMT+ and GMT-, type the hour from 0:00 to 13:00 GMT for your time zone.
   - Highlight **Daylight Savings Time** and press the spacebar to toggle between **Enable** and **Disable**.

     If Daylight Savings Time is Enabled, highlight the **Start Month** and **End Month** and enter a number from 1 to 12.

     Then highlight the **Week** and **Day** and toggle to make your choices.
5. Press Control-A to save your settings.

Notes

- The NTP server name shown is an example only. You must find and enter your local NTP server name.
- GMT is the older designation for UTC.

Synchronizing with a NTP Server

The VTrak subsystem automatically synchronizes with a NTP server every night and a startup. You have the option of synchronizing manually at any time.

To manually synchronize the VTrak with a NTP server:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **NTP Management** and press Enter.
3. Highlight **Start Time Sync** and press Enter.
4. Press Y to confirm.

To verify, check Last Synchronization Time and Last Synchronization Result.

Managing the RAID Controllers

RAID controller management includes the following functions:

- Viewing Controller Information (page 215)
- Clearing an Orphan Watermark (page 215)
- Making Controller Settings (page 216)
- Locating the Controller (page 217)

Viewing Controller Information

Controller Management includes information, settings and statistics.

To access Controller Management:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Controller Management** and press Enter.

   The Controller summary information includes:

   - **Controller ID** – 1 or 2
   - **Alias** – if assigned
   - **Operational Status** – OK means normal. Might show BGA running. Not present indicates a malfunction or no controller is installed
   - **Readiness Status** – Active or Standby is normal. N/A means not accessible
3. Highlight the controller you want and press Enter.

To access additional controller information, highlight **Advanced Information** and press Enter.

To access controller statistics, highlight **Controller Statistics** and press Enter.

Clearing Statistics

To clear controller statistics, see “Clearing Statistics” on page 305.

Clearing an Orphan Watermark

This condition is the result of a disk drive failure during an NVRAM RAID level migration on a disk array.

To clear an orphan watermark:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Controller Management** and press Enter.
3. Highlight one of the controllers and press Enter.
4. Highlight **Clear Orphan Watermark** and press Enter.

The condition is cleared. See “Physical Drive Problems” on page 399 for more information.

Making Controller Settings

If your subsystem has two controllers, any settings you make to one controller automatically apply to the other controller.

To make Controller settings:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Controller Management** and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight **Controller Settings** and press Enter.
5. Make the following settings as required:
   - Type an alias into the Alias field.

     Maximum of 48 characters. Use letters, numbers, space between words and underscore. An alias is optional.
   - Highlight **LUN Affinity** and press the spacebar to toggle between **Enabled** and **Disabled**.

     RAID controllers must be set to **Active-Active**. See“Making Subsystem Settings” on page 211 and “LUN Affinity” on page 361.
   - Highlight **Coercion** and press the spacebar to toggle between **Enabled** and **Disabled**.

     For more information, see “Capacity Coercion” on page 364.
   - Highlight **Coercion Method** and press the spacebar to toggle through:

     GB Truncate – Reduces the capacity to the nearest 1 GB boundary.

     10 GB Truncate – Reduces the capacity to the nearest 10 GB boundary.

     Grp (group) Rounding – Uses an algorithm to determine truncation. Results in the maximum amount of usable drive capacity.

     Table Rounding – Applies a predefined table to determine truncation.
   - Highlight **Host Cache Flushing** and press the spacebar to toggle between **Enable** and **Disable**.

     For more information, see “Host Cache Flushing” on page 363.
   - Highlight **Cache Flush Interval** and press the backspace key to erase the current value. Type a new interval value.

     The range is 1 to 12 seconds. For more information, see “Cache Policy” on page 362.
   - Highlight **SMART** and press the spacebar to toggle between **Enable** and **Disable**.

- Highlight **SMART Poll Interval** and press the backspace key to erase the current value. Type a new interval value (1 to 1440 minutes).
- Highlight **Poll Interval** and press the backspace key to erase the current value. Type a new interval value (15 to 255 seconds).
- Highlight **Adaptive Writeback Cache** and press the spacebar to toggle between **Enabled** and **Disabled**.

  For more information, see “Adaptive Writeback Cache” on page 363.
- Highlight **Forced Read Ahead Cache** and press the spacebar to toggle between **Enabled** and **Disabled**.

  For more information, see “Forced Read-Ahead Cache” on page 362.
- Highlight **HDD Power Saving** and the spacebar to choose a time period. After an HDD has been idle for a set period of time:

  Power Saving Idle Time – Parks the read/write heads

  Power Saving Standby Time – Lowers disk rotation speed

  Power Saving Stopped Time – Spins down the disk (stops rotation)

  You must also enable Power Management on the disk array. See “Creating a Disk Array – Advanced” on page 232 and “Enabling Media Patrol, PDM, and Power Management on a Disk Array” on page 235.

6. Press Control-A to save your settings.

Notes

- Power Management must be enabled on the disk array for the HDD Power Saving settings to be effective. See“Making Disk Array Settings” on page 233.
- Power management is limited to the features your HDDs actually support.

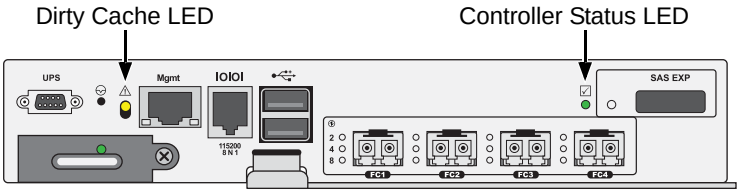
Locating the Controller

To locate this controller:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Controller Management** and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight **Controller Settings** and press Enter.
5. Highlight **Locate Controller** and press Enter.

   The controller LEDs blink for one minute.

Figure 4. FC RAID controller LEDs



Managing the Enclosure

Enclosure Management includes the following functions:

Viewing the Enclosures Summary

Enclosure Management includes information, status, settings and location. To access Enclosure Management:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Enclosure Management** and press Enter.

   The following information is shown:

   - Enclosure ID number
   - Enclosure Type
   - Operational Status
   - Status Description (specific components in need of attention, if any)

Viewing Enclosure Information

To view enclosure information:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Enclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.

   You can monitor power supplies, cooling units, enclosure temperatures and voltages, and the battery.

Adjustable items

You can set or adjust the following items:

- Enclosure Warning and Critical temperature thresholds
- Controller Warning and Critical temperature thresholds

See “Making Enclosure Settings” below.

For information on Enclosure problems, see “Enclosure Problems” on page 391.

Making Enclosure Settings

To make Enclosure settings:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Enclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.
4. Highlight **Enclosure Settings** and press Enter.
5. Highlight the Temperature Warning threshold you want to change.
6. Press the backspace key to erase the current value.
7. Type a new interval value in degrees C.
8. Press Control-A to save your settings.

Viewing FRU VPD Information

FRU VPD refers to Vital Product Data (VPD) information about Field Replaceable Units (FRU) in the enclosure. The number and type of FRU depends on the subsystem model.

To view FRU VPD information:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Enclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.
4. Highlight **FRU VPD Information** and press Enter.

   Use this information when communicating with Technical Support and when ordering replacement units. For contact information, see “Contacting Technical Support” on page 435.

Viewing Power Supply Status

To view the status of the power supplies:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight E**nclosure Management** and press Enter.

3. Highlight the enclosure you want and press Enter.
4. Highlight **Power Supplies** and press Enter.

   The screen displays the operational and fan status of VTrak's two power supplies. If any status differs from normal or the fan speed is below the Healthy Threshold value, there is a fan/power supply malfunction. See "Replacing a Power Supply" on page 323.

Locating a Power Supply

To locate a power supply:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight E**nclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.
4. Highlight **Power Supplies** and press Enter.
5. Highlight **Locate Power Supply** and press Enter.

   The LED on the selected power supply blinks for one minute.

Viewing Cooling Unit Status

To view the status of the power supply fans:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight E**nclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.
4. Highlight **Cooling Units** and press Enter.

   The screen displays the status and speed of VTrak's cooling units, which are the power supply fans. If fan speed is below the Healthy Threshold, there is a malfunction. See "Power Supplies" on page 393.

Viewing Temperature Sensor Status

To view the status of the temperature sensors:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight E**nclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.
4. Highlight **Temperature Sensors** and press Enter.

   If any temperature exceeds the Healthy Threshold value, there is an overheat condition in the enclosure. See "Making Enclosure Settings" on page 220 and See "Diagnosing an Enclosure Problem" on page 391.

Viewing Voltage Sensor Status

To view the status of the voltage sensors:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight E**nclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.
4. Highlight **Voltage Sensors** and press Enter.

   If any voltage is outside the Healthy Threshold values, there is a voltage malfunction in the enclosure. See “Diagnosing an Enclosure Problem” on page 391.

Viewing Battery Information

This feature enables you monitor and recondition the subsystem battery or batteries.

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Enclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.
4. Highlight **Batteries** and press Enter.
5. Highlight the battery you want to monitor and press Enter.

Battery Notes

If a battery does not reflect normal conditions and it is not currently under reconditioning, run the Recondition function before you replace the battery. See “Reconditioning a Battery” on page 223.

Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller cache is set to **Write Thru**. After reconditioning, the cache is reset to **Write Back**. See “Making Controller Settings” on page 216.

If a battery reaches the threshold temperature while charging or discharging, the charge or discharge pauses and the blower runs at high speed until the battery temperature falls below the threshold.

If the battery does not maintain normal values after a Recondition, replace the battery. See “Replacing a Cache Backup Battery” on page 324.

By default, VTrak automatically reconditions the batteries every two months.

When you install a new battery, the cycle count shows 0. VTrak automatically runs a recondition on the battery to verify it. If you restart the subsystem or controller before reconditioning is finished, the battery is charged to 100%, then reconditioning starts again.

Reconditioning a Battery

To recondition the subsystem battery:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Enclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.
4. Highlight **Batteries** and press Enter.
5. Highlight the battery you want to recondition and press Enter.
6. Highlight **Start Reconditioning** and press Enter.
7. Press Y to confirm.

   Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller cache is set to **Write Thru**. After reconditioning, the cache is reset to **Write Back**. See “Making Controller Settings” on page 216.

Caution

Disabling or deleting the battery recondition schedule is NOT recommended.

Locating an Enclosure

This feature helps you identify the physical VTrak enclosure you are working with through the CLU.

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Enclosure Management** and press Enter.
3. Highlight the enclosure you want and press Enter.
4. Highlight **Locate Enclosure** and press Enter.

   The LEDs on the front of the VTrak blink for one minute.

Viewing Enclosure Topology

This feature displays the connection topology of the VTrak subsystem. Topology refers to the manner in which the data paths among the enclosures are connected. There are three methods:

- **Individual Subsystem** – A single subsystem
- **JBOD Expansion** – Managed through one subsystem or head unit
- **RAID Subsystem Cascading** – Managed through one subsystem or head unit

For more information about connections, see “Making Management and Data Connections” on page 25.

To view enclosure topology:

1. From the Main Menu, highlight **Subsystem Management** and press Enter.
2. Highlight **Enclosure Topology** and press Enter.

   The following information applies to the Head Unit:

   - **Enclosure number** – 1
   - **Controller number** – 1 or 2
   - **Port number**
   - **Status** – OK is normal. N/C is not connected
   - **Link Width**

   The following information applies to RAID cascaded units or JBOD expansion units:

   - **Connected EnclWWN** – The subsystem identified by its World Wide Number (WWN)
   - **Connected(Encl,Ctrl,Port)** – The subsystem’s enclosure, controller, and port numbers where the data connection was made

     If there is no connection, the value shows N/A.

Managing Physical Drives

Physical Drive Management includes the following functions:

- Viewing a List of Physical Drives (page 225)
- Making Global Physical Drive Settings (page 225)
- Viewing Physical Drive Information (page 226)
- Viewing Physical Drive Statistics (page 226)
- Setting an Alias (page 227)
- Clearing Stale and PFA Conditions (page 227)
- Forcing a Physical Drive Offline (page 227)
- Locating a Physical Drive (page 228)

Viewing a List of Physical Drives

To view a list of physical drives:

From the Main Menu, highlight **Physical Drive Management** and press Enter.

The list of physical drives displays.

Making Global Physical Drive Settings

All physical drive settings are made globally, except for setting an alias, which applies to individual drives.

To make global physical drive settings:

1. From the Main Menu, highlight **Physical Drive Management** and press Enter.
2. Highlight **Global Physical Drives Settings** and press Enter.
3. Change the following settings as required.

   For SATA drives:

   - Highlight **Write Cache** and press the spacebar to toggle between **Enabled** and **Disabled**.
   - Highlight **Read Look Ahead Cache** and press the spacebar to toggle between **Enabled** and **Disabled**.
   - Highlight **CmdQueuing** and press the spacebar to toggle between **Enabled** and **Disabled**.
   - Highlight **MediumErrorThreshold** and press the backspace key to remove the current value, then type a new smaller value.

     See the comments on the next page.
   - Highlight **DMA Mode** and press the spacebar to toggle through UDMA 0 to 6 and MDMA 0 to 2.

For SAS drives:

- Highlight **Write Cache** and press the spacebar to toggle between **Enabled** and **Disabled**.
- Highlight **Read Look Ahead Cache** and press the spacebar to toggle between **Enabled** and **Disabled**.
- Highlight **CmdQueuing** and press the spacebar to toggle between **Enabled** and **Disabled**.
- Highlight **MediumErrorThreshold** and press the backspace key to remove the current value, then type a new smaller value.

  See the comments below.
- Highlight **Read Cache** and press the spacebar to toggle between **Enabled** and **Disabled**.

4. Press Control-A to save your settings.

   See “Viewing Physical Drive Information” below to determine which functions your physical drives support.

   Medium Error Threshold is the number of bad blocks tolerated before the controller marks the drive as Dead. The default setting is 64 blocks. A setting of zero disables the function. When disabled, no drives are marked offline even when errors are detected.

Viewing Physical Drive Information

To view information about a physical drive:

1. From the Main Menu, highlight **Physical Drive Management** and press Enter.
2. Highlight the physical drive you want and press Enter.

   Basic information displays.
3. Highlight **Advanced Information** and press Enter.

   Advanced information displays.

Viewing Physical Drive Statistics

To view the statistics for the selected physical drive:

1. From the Main Menu, highlight **Physical Drive Management** and press Enter.
2. Highlight the physical drive you want and press Enter.
3. Highlight **Physical Drive Statistics** and press Enter.

Clearing Statistics

To clear physical drive statistics, see “Clearing Statistics” on page 305

Setting an Alias

An alias is optional. To set an Alias for a physical drive:

1. From the Main Menu, highlight **Physical Drive Management** and press Enter.
2. Highlight the physical drive you want and press Enter.
3. Type an alias into the field provided.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore.
4. Press Control-A to save your settings.

Clearing Stale and PFA Conditions

The Clear Stale and Clear PFA functions only appear when those conditions exist on the physical drive. To clear a Stale or PFA condition on a physical drive:

1. From the Main Menu, highlight **Physical Drive Management** and press Enter.
2. Highlight the physical drive you want and press Enter.
3. Highlight **Clear Stale** or **Clear PFA** and press Enter.

   If a physical drive is still online and shows a PFA error but “Clear PFA” does not appear, use PDM to copy the data to a new physical drive. See “Running PDM on a Disk Array” on page 237.

   If a physical drive is offline and shows a PFA error, rebuild the disk array. See “Rebuilding a Disk Array” on page 236. After rebuilding, the drive shows Stale. Run **Clear Stale** then run **Clear PFA**.

   If the physical drive with a PFA error is a spare, you must delete the drive as a spare, then **Clear PFA** is available.

   After you clear a PFA error, watch for another PFA error to appear. If it does, replace the physical drive.

Forcing a Physical Drive Offline

This function enables you to force an online physical drive to go Offline.

The Force Offline function appears only for physical drives that are assigned to disk arrays.

Caution

Forcing a physical drive offline is likely to cause data loss. Back up your data before you proceed. Use this function only when required.

Important

Forcing a physical drive offline causes your logical drives to become degraded. If Auto Rebuild is enabled and a spare drive is available, the disk array begins rebuilding itself automatically.

To force a physical drive offline:

1. From the Main Menu, highlight **Physical Drive Management** and press Enter.
2. Highlight **Global Physical Drives Settings** and press Enter.
3. Highlight the physical drive you want and press Enter.
4. Highlight **Force Offline** and press Enter.
5. Press Y to confirm.

Locating a Physical Drive

This feature helps you identify a physical drive within the VTrak enclosure you are working with through the CLU. To locate a physical drive:

1. From the Main Menu, highlight **Physical Drive Management** and press Enter.
2. Highlight **Global Physical Drives Settings** and press Enter.
3. Highlight the physical drive you want and press Enter.
4. Highlight **Locate Physical Drive** and press Enter.

   The drive carrier status LED flashes for one minute.

Figure 5. Drive carrier status LED

Managing Disk Arrays

Disk Array Management includes the following functions:

Viewing a List of Disk Arrays

To view a list of disk arrays:

From the Main Menu, highlight **Disk Array Management** and press Enter.

The list of disk arrays displays.

Creating a Disk Array

The CLU provides three methods of creating a disk array:

- **Automatic** – Creates a new disk array following a default set of parameters. Creates a hot spare drive for all RAID levels except RAID 0, when five or more unconfigured physical drives are available. You can accept or reject the proposed arrangement but you cannot modify it. See “Creating a Disk Array – Automatic” on page 230.
- **Express** – You choose the parameters for a new disk array by specifying the characteristics you want. You can create multiple logical drives at the same time, however they are all identical. Creates a hot spare drive for all RAID levels except RAID 0. See “Creating a Disk Array – Express” on page 231.
- **Advanced** – Enables you to specify all parameters for a new disk array, logical drives and spare drives. See “Creating a Disk Array – Advanced” on page 232.

Creating a Disk Array – Automatic

To create a disk array using the Automatic feature:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight **Create New Array** and press Enter.
3. Highlight **Configuration Method** and press the spacebar to toggle to **Automatic**.
4. Press Control-A to save your settings and move to the next screen.
5. Review the proposed configuration of disk array and logical drives.
   - To accept the proposed configuration and create the disk array and logical drives, highlight **Save Configuration** and press Enter.
   - To reject the proposed configuration, highlight **Cancel Array Configuration** and press Enter. You return to the Disk Arrays Summary screen.

     To create a disk array with different characteristics, repeat the steps above specifying different parameters but choose the **Express** or **Advanced** option.

Creating a Disk Array – Express

To create a disk array using the Express feature:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight **Create New Array** and press Enter.
3. Highlight **Configuration Method** and press the spacebar to toggle to **Express**.
4. Highlight the following options and press to spacebar to choose **Yes** or **No**:
   - Redundancy
   - Capacity
   - Performance
   - Spare Drive
   - Mixing SATA/SAS Drive

     If you choose No, and you have both SATA and SAS drives, a separate array is created for each type of drive.
5. Highlight **Number of Logical Drives** and press the backspace key to erase the current value, then enter the number of logical drives you want.
6. Highlight **Application Type** and press the spacebar to toggle though the applications and choose the best one for your disk array.
   - File Server
   - Video Stream
   - Transaction Data
   - Transaction Log
   - Other
7. Press Control-A to save your settings and move to the next screen.
8. Review the proposed configuration of disk array and logical drives.

   To accept the proposed configuration and create the disk array and logical drives, highlight **Save Configuration** and press Enter.

   To reject the proposed configuration, highlight **Cancel Array Configuration** and press Enter. You return to the Disk Arrays Summary screen.

   To create a disk array with different characteristics, highlight **Create New Array** and press Enter. Repeat the steps above specifying different parameters. Or choose the **Advanced** option.

Creating a Disk Array – Advanced

For more information on the choices below, see “Chapter 7: Technology Background” on page 331.

To create a disk array using the Advanced feature:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight **Create New Array** and press Enter.
3. Highlight **Configuration Method** and press the spacebar to toggle to **Advanced**.

Step 1 – Disk Array Creation

1. If you want to specify an alias to the disk array, highlight **Alias** and type a name.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore.
2. Choose whether to enable Media Patrol, PDM, and Power Management.
3. Choose a Media Type, HDD or SSD.
4. Highlight **Save Settings** and Continue and press Enter.
5. Highlight a physical drive you want to add to your array and press the spacebar to choose it.

   Repeat this action until you have selected all the physical drives for your array.
6. Highlight **Save Settings and Continue** and press Enter.

Step 2 – Logical Drive Creation

1. If you want to specify an alias to the logical drive, highlight **Alias** and type a name.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore.
2. Highlight **RAID Level** and press the spacebar to toggle though a list of available RAID levels.
3. If you want to create multiple logical drives, highlight **Capacity**, press the backspace key to remove the current value, then type a new smaller value.
4. RAID 50 and 60 only. Highlight **Number of Axles** and press the spacebar to choose the number of axles.

   See “RAID 50 Axles” on page 342 or “RAID 60 Axles” on page 345.
5. For the following items, accept the default value or highlight and press the spacebar to choose a new value:
   - Highlight **Stripe** and press the spacebar to toggle through stripe sizes and choose 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB.

- Highlight **Sector** and press the spacebar to toggle through sector sizes and choose 512 B, 1 KB, 2 KB, or 4 KB.
- Highlight **Write Policy** and press the spacebar to toggle write cache policy between **WriteBack** and **WriteThru** (write though).
- Highlight **Read Policy** and press the spacebar to toggle read cache policy though **ReadCache**, **ReadAhead**, and **NoCache**.
- Highlight **Preferred Controller ID** and press the spacebar to toggle among **1**, **2**, or **Automatic**. Applies to dual-controller capable Fibre Channel models only.

6. Highlight **Save Logical Drive** and press Enter.

Step 3 – Summary

Review logical drives you are about to create for your new array. Then do one of the following actions:

- If you agree with the logical drives as specified, highlight **Complete Disk Array Creation** and press Enter.
- If you specified less than the full capacity for the logical drive in the previous screen, and you want to add another logical drive now, highlight **Create New Logical Drive** and press Enter.
- If you do not agree with the logical drives, highlight **Return to Previous Screen** and press Enter to begin the process again.

Deleting a Disk Array

Caution

When you delete a disk array, you delete all the logical drives and the data they contain. Back up all important data before deleting a disk array.

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*****) to the left of the listing.
3. Highlight **Delete Marked Arrays** and press Enter.
4. Press Y to confirm the deletion.
5. Press Y again to reconfirm.

Making Disk Array Settings

To make disk array settings:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.

The list of disk arrays appears.

2. Highlight the disk array you want and press the Enter.
3. Make settings changes as required:
   - Enter, change or delete the alias in the **Alias** field

     Maximum of 32 characters; letters, numbers, space between characters, and underline.
   - **Media Patrol** – Highlight and press the spacebar to toggle between enable and disable.
   - **PDM** – Highlight and press the spacebar to toggle between enable and disable.
   - **Power Management** – Highlight and press the spacebar to toggle between enable and disable.
4. Press Control-A to save your settings.

Notes

- You can also enable or disable Media Patrol for the entire RAID system. See “Making Background Activity Settings” on page 273.
- Power Management must be enabled on the disk array for the HDD Power Saving settings to be effective. See “Making Disk Array Settings” on page 233.
- Power management is limited to the features your HDDs actually support.

Viewing Disk Array Information

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want and press Enter.

   The information and settings screen appears.
3. Highlight any of the following and press Enter to view a list of:
   - Physical drives in this array
   - Logical drives in this array
   - Spare drives in this array, dedicated and global

Disk Array Operational Status

- **OK** – This is the normal state of a logical drive. When a logical drive is Functional, it is ready for immediate use. For RAID Levels other than RAID 0 (Striping), the logical drive has full redundancy.

- **Synchronizing** – This condition is temporary. Synchronizing is a maintenance function that verifies the integrity of data and redundancy in the logical drive. When a logical drive is Synchronizing, it functions and your data is available. However, access is slower due to the synchronizing operation.
- **Critical/Degraded** – This condition arises as the result of a physical drive failure. A degraded logical drive still functions and your data is still available. However, the logical drive has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it.
- **Rebuilding** – This condition is temporary. When a physical drive has been replaced, the logical drive automatically begins rebuilding in order to restore redundancy (fault tolerance). When a logical drive is rebuilding, it functions and your data is available. However, access is slower due to the rebuilding operation.
- **Transport Ready** – After you perform a successful Prepare for Transport operation, this condition means you can remove the physical drives of this disk array and move them to another enclosure or different drive slots. After you relocate the physical drives, the disk array status shows OK.

Accepting an Incomplete Array

This condition is the result of a missing physical drive. See “Incomplete Array” on page 403 before you use this function.

To accept an incomplete array:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight **Accept Incomplete Array** and press Enter.

Enabling Media Patrol, PDM, and Power Management on a Disk Array

Media Patrol checks the magnetic media on physical drives. Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare drive *before* the physical drive fails. Power Management parks the heads, spins down, and stops rotation after a set period of time to reduce power consumption.

Media Patrol, PDM, and Power Management are enabled by default. Enabled is the recommended setting for both features.

To enable Media Patrol, PDM, and Power Management on a disk array:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want and press Enter.

3. Highlight **Media Patrol** and press the spacebar to toggle between **Enable** and **Disable**.
4. Highlight **PDM** and press the spacebar to toggle between **Enable** and **Disable**.
5. Highlight **Power Management** and press the spacebar to toggle between **Enable** and **Disable**.
6. Press Control-A to save your settings.

See “Running PDM on a Disk Array” on page 237 and “Making Background Activity Settings” on page 273.

For Power Management settings, see “Making Controller Settings” on page 216.

Preparing the Disk Array for Transport

To run the Transport function on a disk array:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight **Transport** and press Enter.
4. Press Y to confirm.

Rebuilding a Disk Array

Before you can rebuild, you must have a replacement or target physical drive of adequate capacity for your disk array.

To rebuild a disk array:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight **Background Activities** and press Enter.
4. Highlight **Rebuild** and press Enter.

   Default source and target drives are shown with possible alternative choices.
5. To choose different drive, highlight the drive, press the backspace key to remove the current number, then type a new number.
6. Highlight **Start** and press Enter.

For rebuild rate, see “Making Background Activity Settings” on page 273.

Running Media Patrol on a Disk Array

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. If Media Patrol encounters a critical error, it triggers PDM if PDM is enabled on the disk array.

See “Enabling Media Patrol, PDM, and Power Management on a Disk Array” on page 235.

For Media Patrol rate, see “Making Background Activity Settings” on page 273.

For more information, see page 331.

Running PDM on a Disk Array

Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare drive *before* the physical drive fails.

Before you can run PDM, you must have a replacement or target physical drive of adequate capacity for your disk array.

To run PDM on a disk array:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight **Background Activities** and press Enter.
4. Highlight **Predictive Data Migration** and press Enter.

   Default source and target drives are shown with possible alternative choices.
5. To choose different drive, highlight the drive, press the backspace key to remove the current number, then type a new number.
6. Highlight **Start** and press Enter.

See “Enabling Media Patrol, PDM, and Power Management on a Disk Array” on page 235.

For PDM rate, see “Making Background Activity Settings” on page 273.

Running Transition on a Disk Array

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare drive. For more information, see “Transition” on page 356.

In order to run Transition:

- The spare drive must be Revertible.
- You must have an unconfigured physical drive of the same or larger capacity to replace the spare drive.

To run Transition on a disk array:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight **Background Activities** and press Enter.
4. Highlight **Transition** and press Enter.

Default source and target drives are shown with possible alternative choices.

5. To choose different drive, highlight the drive, press the backspace key to remove the current number, then type a new number.
6. Highlight **Start** and press Enter.

For transition rate, see “Making Background Activity Settings” on page 273.

Locating a Disk Array

This feature helps you identify the physical drives assigned to the disk array you are working with in the CLU.

To locate a disk array:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight **Locate Disk Array** and press Enter.

   The drive carrier status LEDs flash for one minute.

Figure 6. Drive carrier status LED

Managing Spare Drives

Spare Drive Management includes the following functions:

- Viewing a list of Spare Drives (page 239)
- Creating a Spare Drive (page 239)
- Making Spare Drive Settings (page 240)
- Running Spare Check (page 240)
- Deleting a Spare Drive (page 241)

Viewing a list of Spare Drives

To view a list of spare drives:

From the Main Menu, highlight **Spare Drive Management** and press Enter.

A list of the current spare drives appears, including the following parameters:

- **ID number**
- **Operational Status**
- **Physical Drive ID number**
- **Configured Capacity**
- **Revertible** – The spare drive returns to spare status after you replace the failed drive in the disk array. See “Transition” on page 356 for more information.
- **Type** – Global (all disk arrays) or Dedicated (to specified disk arrays)
- **Dedicated to Array** – The array to which a dedicated spare is assigned

For more information, see “Spare Drives” on page 355.

Creating a Spare Drive

Only unconfigured physical drives can be used to make spares. Check your available drives under Physical Drive Management. See “Managing Physical Drives” on page 225.

1. From the Main Menu, highlight **Spare Drive Management** and press Enter.
2. Highlight **Create New Spare Drive** and press Enter.

   A default physical drive is shown with possible alternative choices.
3. To choose different drive, highlight the drive, press the backspace key to remove the current number, then type a new number.
4. Highlight **Revertible** and press the spacebar to toggle between **Yes** and **No**.

   A revertible drive can be returned to spare status after you replace the failed drive in a disk array. See “Transition” on page 356 for more information.

5. Highlight **Spare Type** and press the spacebar to toggle between **Dedicated** and **Global**.

   Dedicated means this spare drive can only be used with the specified disk arrays. Global means this spare drive can be used by any disk array.

   If you chose Dedicated, a default disk array is shown with possible alternative choices.

   To choose different array, highlight the array and press the backspace key to erase the current number, then type the new number.
6. Press Control-A to save the spare drive.

Making Spare Drive Settings

To change spare drive settings:

1. From the Main Menu, highlight **Spare Drive Management** and press Enter.

   A list of the current spare drives appears, including the following parameters:
2. Highlight the spare drive you want to change and press Enter.
3. Highlight the setting you want to change:
   - **Revertible** – A revertible drive can be returned to spare status after you replace the failed drive in a disk array. See “Transition” on page 356 for more information.
   - **Type** – Dedicated means this spare drive can only be used with the specified disk arrays. Global means this spare drive can be used by any disk array.
4. Press the spacebar to toggle between the choices.
5. For dedicated spares, type the array number the spare is assigned to.
6. Press Control-A to save your settings.

Running Spare Check

To run Spare Check:

1. From the Main Menu, highlight **Spare Drive Management** and press Enter.

   A list of the current spare drives appears.
2. Highlight the spare drive you want to check and press Enter.
3. Highlight **Start Spare Check** and press Enter.

   The results appear next to Spare Check Status in the same window. Healthy means normal.

Deleting a Spare Drive

Caution

If the spare drive you delete is the only spare, the controller does not rebuild a critical array until you provide a new spare drive.

To delete a spare drive:

1. From the Main Menu, highlight **Spare Drive Management** and press Enter.

   A list of the current spare drives appears.
2. Highlight the spare drive you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*****) to the left of the listing.
3. Highlight **Delete Marked Spare Drives** and press Enter.
4. Press Y to confirm the deletion.

Managing Logical Drives

Logical drive management includes:

- Creating a Logical Drive (page 242)
- Deleting a Logical Drive (page 243)
- Viewing Logical Drive Information (page 243)
- Viewing Logical Drive Statistics (page 244)
- Viewing the Logical Drive Check Table (page 244)
- Making Logical Drive Settings (page 245)
- Initializing a Logical Drive (page 245)
- Running Redundancy Check (page 246)
- Locating a Logical Drive (page 246)
- Migrating a Logical Drive (page 247)
- Creating a LUN Clone (page 248)

For LUN mapping, see “Working with LUN Mapping” on page 277.

Creating a Logical Drive

You can create logical drives on existing disk arrays if there is available space in the array. For more information on the choices below, see “Logical Drives” on page 333.

To create a logical drive from an existing disk array:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array in which you want to create a logical drive and press Enter.
3. Highlight **Logical Drives in the Disk Array** and press Enter.
4. Highlight **Create New Logical Drive** and press Enter.

   The Disk Array ID number and Maximum capacity available for the new logical drive are displayed.
5. Highlight the following parameters and press the backspace key to erase the current value:
   - **Alias** – Type an alias into the field, if desired. Maximum of 32 characters. Use letters, numbers, space between words and underscore.
   - **Capacity** – Maximum capacity shown. Enter a smaller capacity if desired.
6. Highlight the following parameters and press the spacebar to toggle though the available choices:

- **Stripe size** – Press the spacebar to choose: 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB.
- **Sector size** – Press the spacebar to choose: 512 B; 1 KB, 2 KB, or 4 KB.
- **Write Policy** – Press spacebar to choose: Write Back or Write Through.
- **Read Policy** – Press spacebar to choose: No Cache, Read Cache, or Read Ahead Cache.

7. Highlight **Preferred Controller ID** and press the spacebar to toggle among **1**, **2**, or **Automatic**. Applies to dual-controller capable Fibre Channel models only.
8. RAID 50 and 60 only. Highlight **Number of Axles** and press the spacebar to choose the number of axles.
9. Highlight **Save Logical Drive** and press Enter.

Note

If you did not use all of the available capacity of the disk array, you can create an additional logical drive at this point.

Deleting a Logical Drive

Caution

When you delete a logical drive, you delete all the data it contains. Back up all important data before deleting a logical drive.

To delete a logical drive from a disk array:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array that contains the logical drive you want to delete and press Enter.
3. Highlight **Logical Drives in the Disk Array** and press Enter.
4. Highlight the logical drive you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*****) to the left of the listing.
5. Highlight **Delete Marked Logical Drives** and press Enter.
6. Press Y to confirm the deletion.

Press Y again to re-confirm.

Viewing Logical Drive Information

To view logical drive information:

1. From the Main Menu, highlight **Logical Drive Management** and press Enter.
2. Highlight the logical drive you want and press Enter.

   The information and settings screen appears.
3. Highlight any of the following and press Enter to view more information:
   - **Check Table** – Read Check, Write Check, and Inconsistency Check Tables
   - **Logical Drive Statistics**

Viewing Logical Drive Statistics

To view logical drive information:

1. From the Main Menu, highlight **Logical Drive Management** and press Enter.
2. Highlight the logical drive you want and press Enter.

   The information and settings screen appears.
3. Highlight **Logical Drive Statistics** and press Enter.

   The statistics screen appears.

Clearing Statistics

To clear logical drive statistics, see “Clearing Statistics” on page 305.

Viewing the Logical Drive Check Table

To view logical drive information:

1. From the Main Menu, highlight **Logical Drive Management** and press Enter.
2. Highlight the logical drive you want and press Enter.
3. Highlight **Check Table** and press Enter.
4. Highlight one of the following options and press Enter:
   - Show All Records
   - Read Check Table
   - Write Check Table
   - Inconsistent Check Table

Making Logical Drive Settings

To make Logical Drive settings:

1. From the Main Menu, highlight **Logical Drive Management** and press Enter.
2. Highlight the logical drive you want and press Enter.
3. For the following items, accept the existing setting choose a new one:
   - Highlight **Alias** and type an alias into the field provided.

     Maximum of 32 characters. Use letters, numbers, space between words and underscore. An alias is optional.
   - Highlight **WritePolicy** and press the spacebar to toggle between **WriteBack** and **WriteThru** (write though).
   - Highlight **ReadPolicy** and press the spacebar to toggle though **ReadCache**, **ReadAhead** and **None**.
   - Highlight **Preferred Controller ID** and press the spacebar to toggle between **1** and **2**.
4. Press Control-A to save your settings.

Initializing a Logical Drive

This function sets all data bits in the logical drive to zero.

Warning

When you initialize a logical drive, all the data on the logical drive is lost. Backup any important data before you initialize a logical drive.

To initialize a logical drive:

1. From the Main Menu, highlight **Logical Drive Management** and press Enter.
2. Highlight the logical drive you want and press Enter.
3. Highlight **Background Activities** and press Enter.
4. Highlight **Start Initialization** and press Enter.

   The initialization parameters appear.
   - **Initialization pattern** – The default 00000000 is best for most applications
   - **Quick Initialization** – Yes means only the first and last sections of the logical drives are initialized. No means the entire logical drive is initialized.

To change a parameter, highlight it and press the backspace key to erase the current value, then type the new value.

5. Highlight **Start** and press Enter.

   If necessary, you can pause and resume or stop and restart the Initialization. You cannot access the logical drive until Initialization has finished.

For initialization rate, see “Making Background Activity Settings” on page 273.

Running Redundancy Check

Redundancy Check is a maintenance procedure for logical drives in fault-tolerant disk arrays that ensures all the data matches exactly.

To run Redundancy Check:

1. From the Main Menu, highlight **Logical Drive Management** and press Enter.
2. Highlight the logical drive you want and press Enter.
3. Highlight **Background Activities** and press Enter.
4. Highlight **Start Redundancy Check** and press Enter.

   The redundancy check parameters appear.

   - **Auto Fix** – Corrects inconsistencies automatically
   - **Pause On Error** – Pauses the Redundancy Check when an error is found

   To change a parameter, highlight it and press the backspace toggle between **Yes** and **No**.

5. Highlight **Start** and press Enter.

   If necessary, you can pause and resume or stop and restart the Redundancy Check. You can use the logical drive while Redundancy Check is running.

For Redundancy Check rate, see “Making Background Activity Settings” on page 273.

Locating a Logical Drive

This feature helps you identify the physical drives assigned to the logical drive you are working with in the CLU. To locate a logical drive:

1. From the Main Menu, highlight **Logical Drive Management** and press Enter.
2. Highlight the logical drive you want and press Enter.
3. Highlight **Locate Logical Drive** and press Enter.

   The drive carrier status LEDs flash for one minute.

Figure 7. Drive carrier status LED

Migrating a Logical Drive

In order to migrate RAID level, you may have to add physical drives. For more information, see “RAID Level Migration” on page 347.

To migrate a logical drive:

1. From the Main Menu, highlight **Disk Array Management** and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight **Background Activities** and press Enter.
4. Highlight **Migration** and press Enter.
5. Highlight the physical drives you want to add and press the spacebar to choose them.

Notes

- You can add physical drives to a RAID 50 or 60 array but you cannot change the number of axles.
- If you add an odd number of physical drives to a RAID 10 array, it becomes a RAID 1E array by default.

6. Highlight **Save Settings and Continue** and press Enter.
7. Highlight a logical drive in the list that you want to migrate and press Enter.
8. Highlight **RAID Level** and press the spacebar to toggle through the available RAID levels.
9. Optional. If you want to increase capacity of the logical drive, highlight **Expand Capacity** and press the spacebar to toggle to **Yes**.

   Highlight **Capacity**, press the backspace key to erase the current capacity and type in the new value.

   The new value must be equal or larger than the current capacity.
10. Highlight **Save Logical Drive** and press Enter.

    The screen returns to Disk Array Migration Logical Drives.

    At this point, if you have other logical drives in the same disk array, you can choose them for migration at the same time.
11. Highlight **Complete Disk Array Migration** and press Enter.

12. Press Y to confirm.

    The screen returns to Disk Arrays Summary.

For migration rate, see “Making Background Activity Settings” on page 273.

Creating a LUN Clone

A LUN clone is an exact copy of the original LUN or logical drive, including all the data it contains, at one point in time. Use a LUN clone as a backup or to migrate a LUN from one system to another.

Important

The action of creating a LUN momentarily takes the original LUN or logical drive offline, meaning nobody can read or write to it.

A LUN clone has the same capacity, stripe size, read and write policies as the orignal LUN. However, the LUN clone can be a different RAID level. The choice of RAID levels depends on the disk array. And if you have multiple disk arrays, you can create the LUN clone on a different disk array than the original LUN.

This action requires Super User or Power User privileges.

To create a LUN clone of a logical drive:

1. From the Main Menu, highlight **Logical Drive Management** and press Enter.
2. Highlight the logical drive you want to clone and press Enter.
3. Highlight **LUN Clone** and press Enter.
4. Highlight the RAID Level of Copies field, type the RAID level you want.
5. Highlight **Save Settings and Continue** and press Enter.
6. Highlight the disk array you want to use and press the Spacebar to mark it.
7. Highlight **Save Settings and Continue** and press Enter.
8. Highlight the Number of Copies field and type the number of LUN clones you want to create.

   You can create up to 8 clones of a LUN at a time.
9. Highlight **Start** and press enter to begin the cloning process.
10. Press eny key to continue.
11. Press Y to confirm LUN clone creation.

    The cloning progress bar displays.

    Note the **Target Logical Drive ID**. Use this number to identify the LUN clone in the Logical Drive list.

If you chose a redundant RAID level, the LUN clone is automatically synchronized after creation.

After the LUN clone is created, you can manage it like any other logical drive. See “Making Spare Drive Settings” on page 240, “Locating a Logical Drive” on page 246, and “Deleting a Logical Drive” on page 243.

For users to access the LUN clone, you must map it to an initiator. See “Working with LUN Mapping” on page 277.

Managing the Network Connection

Network Management deals with network connections and settings for the VTrak's Management ports. Each Management Port can be configured:

- Making Virtual Management Port Settings (page 250)
- Making Maintenance Mode Settings (page 251)

Making Virtual Management Port Settings

The VTrak subsystem has a virtual management port, enabling you to log into a VTrak with dual controllers using one IP address.

Before you change settings, please see "About IP Addresses" on page 45.

You initially made these settings during subsystem setup. You can change them later as required.

Caution

Changing virtual management port settings can interrupt your network connection and require you to log in again.

Making Automatic Settings

Automatic settings require a DHCP server on your network. DHCP is currently supported on IPv4 only.

To enable automatic management port settings:

1. From the Main Menu, highlight **Network Management** and press Enter.
2. Highlight the protocol family (IPv4 or IPv6) you want and press Enter.
3. Highlight **Network Settings** and press Enter.
4. Highlight **DHCP** and press the spacebar to toggle to **Enabled**.
5. Press Control-A to save your settings.

Making Manual Settings

1. From the Main Menu, highlight **Network Management** and press Enter.
2. Highlight the protocol family (IPv4 or IPv6) you want and press Enter.
3. Highlight **Network Settings** and press Enter
4. Highlight **DHCP** and press the spacebar to toggle to **Disabled**.

   DHCP is currently supported by and does not appear under IPv6.
5. Highlight each of the following and press the backspace key to erase the current value, then type the new value.
   - IP Address

- Subnet Mask
- Default Gateway IP Address
- DNS Server IP Address

6. Press Control-A to save your settings.

Making Maintenance Mode Settings

Each controller has its own IP addresses for access when the controller goes into maintenance mode. For more information, see “Maintenance Mode” on page 395.

Before you change settings, please see “About IP Addresses” on page 45.

Making Automatic Settings

1. From the Main Menu, highlight **Network Management** and press Enter.
2. Highlight **Maintenance Mode Network Configuration** and press Enter.
3. Highlight the controller (CId 1 or 2) and protocol family (IPv4 or IPv6) you want and press Enter.
4. Highlight **DHCP** and press the spacebar to toggle to **Enabled**.
5. Press Control-A to save your settings.

Making Manual Settings

1. From the Main Menu, highlight **Network Management** and press Enter.
2. Highlight **Maintenance Mode Network Configuration** and press Enter.
3. Highlight the controller (CId 1 or 2) and protocol family (IPv4 or IPv6) you want and press Enter.
4. Highlight **DHCP** and press the spacebar to toggle to **Disabled**.
5. Highlight each of the following and press the backspace key to erase the current value, then type the new value.
   - IP Address
   - Subnet Mask
   - Default Gateway IP Address
   - DNS Server IP Address
6. Press Control-A to save your settings.

Managing Fibre Channel Connections

The Fibre Channel Management option appears only with VTrak Fibre Channel models. Fibre Channel Management includes the following functions:

- Viewing Node Information (page 252)
- Viewing Fibre Channel Port Information (page 252)
- Viewing Fibre Channel Logged-in Devices (page 252)
- Making Fibre Channel Port Settings (page 253)
- Viewing Fibre Channel Port Statistics (page 254)
- Viewing SFP Information (page 254)
- Viewing Fibre Channel Port Statistics (page 254)
- Viewing Fibre Channel Initiators (page 255)

Also see: “Adding an Initiator” on page 278 and “Deleting an Initiator” on page 279.

Viewing Node Information

These functions affect both VTrak Fibre Channel ports.

1. From the Main Menu, highlight **Fibre Channel Management** and press Enter.
2. Highlight **Fibre Channel Node** and press Enter.

   Node information appears. There are no user settings on this screen.

Viewing Fibre Channel Port Information

To view Fibre Channel port information:

1. From the Main Menu, highlight **Fibre Channel Management** and press Enter.
2. Highlight **Fibre Channel Ports** and press Enter.

   Highlight the port you want and press Enter.

Viewing Fibre Channel Logged-in Devices

To view a list of logged-in devices:

1. From the Main Menu, highlight **Fibre Channel Management** and press Enter.
2. Highlight **Fibre Channel Ports** and press Enter.
3. Highlight the port you want and press Enter.
4. Highlight **Logged In Devices** and press Enter.

   If a Fibre Channel switch is attached, it also appears in this list.

Making Fibre Channel Port Settings

To make Fibre Channel port settings:

1. From the Main Menu, highlight **Fibre Channel Management** and press Enter.
2. Highlight **Fibre Channel Ports** and press Enter.
3. Highlight the port you want and press Enter.
4. Highlight **Fibre Channel Port Settings** and press Enter.
5. Highlight the following parameters and press the spacebar to toggle though the choices:
   - **Configured Link Speed** – 8 Gb/s, 4 Gb/s, 2 Gb/s, or Automatic selection
   - **Configured Topology** – NL-Port (Arbitrated Loop), N-Port (Point to Point) or Automatic selection
6. Highlight **Hard ALPA** and press the backspace key to erase the current value, then type the new value.

   The range is 0 to 255. 255 disables this feature.
7. Press Control-A to save your settings.

The table below shows the type of attached topology you achieve based on your connection type and the configured topology you choose:

Fibre Channel Attached Topology		
	Configured Topology	
Connection Type	N-Port	NL-Port
Switch	Fabric Direct	Public Loop
Direct	Point-to-Point	Private Loop

Example 1: If you connect the VTrak to a Fibre Channel switch and choose NL-Port topology, you create a Public Loop attached topology.

Example 2: If you have a Point to Point attached topology, you made a direct connection (no switch) and chose N-port topology.

Note

In some cases, HBA settings to N-Port only work if connected to the switch. Refer to your HBA manual for more information.

Viewing Fibre Channel Port Statistics

To view Fibre Channel port statistics:

1. From the Main Menu, highlight **Fibre Channel Management** and press Enter.
2. Highlight **Fibre Channel Ports** and press Enter.

   Highlight the port you want and press Enter.
3. Highlight **Fibre Channel Port Statistics** and press Enter.

Viewing SFP Information

To view information about the SFPs (small form-factor pluggable transceivers):

1. From the Main Menu, highlight **Fibre Channel Management** and press Enter.
2. Highlight **Fibre Channel Ports** and press Enter.
3. Highlight the port you want and press Enter.
4. Highlight **Fibre Channel Port SFP** and press Enter.

   The screen displays information about the SFP transceiver. There are no user settings on this screen.

Viewing Fibre Channel Port Statistics

To view port statistics:

1. From the Main Menu, highlight **Fibre Channel Management** and press Enter.
2. Highlight **Fibre Channel Ports** and press Enter.
3. Highlight the port you want and press Enter.
4. Highlight **Fibre Channel Port Statistics** and press Enter.

   This screen displays statistics for this port. There are no user settings on this screen.

Clearing Statistics

To clear Fibre Channel statistics, see “Clearing Statistics” on page 305.

Property Definitions

Definitions of the properties for which statistical information is reported appears in the list below.

- **TimeLastReset** – Time in minutes since the system has been running.
- **FramesSent** – Number of frames sent since last reset.
- **FramesReceived** – Number of frames received since last reset.

- **WordsSent** – Number of words sent since last reset.
- **WordsReceived** – Number of words received since last reset.
- **LIPCount** – Loop Initialization Primitive Sequence. This primitive sequence applies only to the arbitrated loop topology. It is transmitted by an L_Port to initialize or re-initialize the loop.
- **NOSCount** – Not Operational Primitive Sequence. This primitive sequence is used during link initialization between two N_Ports in the point-to-point topology or an N_Port and an F_Port in the fabric topology.

  NOS is sent to indicate that the transmitting port has detected a link failure or is offline. The expected response to a port sending NOS is the OLS primitive sequence.
- **ErrorFrames** – FC devices propagate handshake signals back-and-forth requesting and acknowledging each byte transferred. FC transfers occur in one frame of data at a time. In this case, the value reflects the number of frames with errors.
- **DumpedFrames** – This field specifies the number of frames dumped due to a lack of host buffers.
- **LinkFailureCount** – Number of times the link has failed. Can be caused by a disconnected link or a bad fiber element.
- **LossSyncCount** – Number of times a loss of sync has occurred since last reset.
- **PrimitiveSeqErrorCount** – An ordered set transmitted repeatedly and used to establish and maintain a link.

  LR, LRR, NOS, and OLS are primitive sequences used to establish an active link in a connection between two N_Ports or an N_Port and an F_Port.

  LIP, LPB, and LPE are primitive sequences used in the Arbitrated Loop topology for initializing the loop and enabling or disabling an L_Port.
- **InvalidWordSentCount** – Number of invalid words sent since last reset.
- **InvalidCRCCount** – Invalid Cyclical Redundancy Count. Number of frames received with an invalid CRC since last reset.
- **InitiatorIOCount** – I/O Count on the initiator on the host side.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 305.

Viewing Fibre Channel Initiators

LUN Mapping must be enabled in order for VTrak to recognize a Fibre Channel. See “Enabling LUN Mapping” on page 277.

To view Fibre Channel initiators:

1. From the Main Menu, highlight **Fibre Channel Management** and press Enter.
2. Highlight **Fibre Channel Initiators** and press Enter.

   A list of all currently logged-in initiators appears on the screen.

Managing iSCSI Connections

The iSCSI Management option appears only with VTrak iSCSI models. iSCSI Management includes the following functions:

Also see “Adding an Initiator” on page 278 and “iSCSI Management” on page 366.

A detailed explanation of iSCSI functions, how and when they are used, and their relationship to one another is beyond the scope of this document. For more information, contact the Internet Engineering Task Force at http://www.ietf.org/

Making Global iSCSI Settings

Keep Alive recovers from intermittent disconnects that interrupt your iSCSI session.

To make global iSCSI settings:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **Global iSCSI Settings** and press Enter.
3. Highlight **KeepAlive** and press the spacebar to toggle between **Enabled** and **Disabled**.
4. Highlight **Save Global Settings** and press Enter.
5. Press **Y** to confirm.

Viewing a List of iSCSI Targets

A *target* is a logical drive on the VTrak subsystem.

The default target exposes all logical drives and is associated with all portals on the subsystem.

To view a list of iSCSI targets:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Targets** and press Enter.

   The list of iSCSI Targets displays.

   - **Id** – Target number. 0 is the default target.
   - **Alias** – User assigned name of the target
   - **AssignedPortals** – iSCSI portals assigned to the target

Viewing iSCSI Target Information

To view information for an iSCSI target:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Targets** and press Enter.

   The list of iSCSI Targets displays.
3. Highlight the target you want to change and press Enter.

   The target information screen displays. Information includes:

   - **TargetName** – iSCSI qualified name (iqn) of this target.

- **TargetAlias** – Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.*
- **TargetStatus** – Up or down.
- **ErrorRecovLevel** – Error recovery level supported.
- **ImmediateData** – Enables the initiator to send unsolicited data with the iSCSI command PDU.
- **MaxConnection** – Maximum number of connections.
- **DataPDUInOrder** – Enables placement of data in PDU order.
- **InitialR2T** – Allows initiator to begin sending data to a target without receiving a ready to transfer command.
- **DataSeqInOrder** – Enables placement of data in sequential order.
- **OutStandingR2T** – Maximum number of R2T PDUs the target can have outstanding for a single iSCSI command.
- **MaxBurstLen** – Maximum length of a solicited data sequence in bytes.
- **DefTimeToWait** – After a dropped connection, the number of seconds to wait before attempting to reconnect.
- **DefTimeToRetain** – Number of seconds after time to wait (above) before reassigning outstanding commands.
- **HeaderDigest** – Enables the use of header digest (CRC). Enabled or disabled.*
- **DataDigest** – Enables the use of a data digest (CRC). Enabled or disabled.*
- **UniCHAPAuthen** – Uni-directional (peer) CHAP authentication, enabled or disabled.*
- **BiCHAPAuthen** – Bi-directional (local) CHAP authentication, enabled or disabled.*
- **FirstBurstLen** – First burst length in bytes.
- **AssignedPortals** – Portals assigned to this target.*

Items marked with an asterisk (*) are adjustable under “Making iSCSI Target Settings” on page 260.

Adding iSCSI Targets

If you plan to enable authentication on the new target, create a CHAP first, then add the target. See “Adding iSCSI CHAPs” on page 269.

Header and data digests work best with initiators equipped with a TCP Offload Engine (TOE). For more information, see your iSCSI HBA user documentation.

VTrak supports a maximum 2048 iSCSI targets. A maximum of 1024 logical drives can be mapped to a target.

Using the CLU, you must assign a portal to a target when you create the target.

To add an iSCSI target:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Targets** and press Enter.

   The list of iSCSI Targets displays.
3. Highlight **Create New Target** and press Enter.
4. Optional. Highlight **TargetAlias** and type an alias into the field provided.
5. Highlight each item and press the Spacebar to toggle between Enable and Disable.
   - **HeaderDigest** – Adds a header digest (CRC).
   - **DataDigest** – Adds a data digest (CRC).
   - **UniCHAPAuthen** – Enables uni-directional (peer) CHAP authentication.
   - **BiCHAPAuthen** – Enables bi-directional (local) CHAP authentication.

     Authentication requires a pre-existing CHAP.
6. Highlight **Save Settings and Continue** and press Enter.

   The Add Portals screen appears.
7. Highlight each portal that you want to assign to the new target and press the Spacebar to mark it.
8. When you have maked the portals you want, highlight **Save Settings** and press Enter.

   The new target appears in the list.

Note

Header digest and data digest work best with initiators equipped with a TCP Offload Engine (TOE). Refer to your iSCSI HBA user manual for more information.

Making iSCSI Target Settings

To make target settings:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Targets** and press Enter.

   The list of iSCSI Targets displays.
3. Highlight the target you want to change and press Enter.

   The target information screen displays.
4. Highlight **iSCSI Target Settings** and press Enter.
5. Make new settings as needed.

- Optional. Highlight **TargetAlias** and type an alias into the field provided.
- Highlight each item and press the Spacebar to toggle between Enable and Disable.
  - **HeaderDigest** – Adds a header digest (CRC).
  - **DataDigest** – Adds a data digest (CRC).
  - **UniCHAPAuthen** – Enables uni-directional CHAP authentication.
  - **BiCHAPAuthen** – Enables bi-directional CHAP authentication.

    Authentication requires a pre-existing CHAP.

6. Highlight **Save Settings** and press Enter.

   The Add Portals screen appears.
7. Highlight each portal that you want to assign to the new target and press the Spacebar to mark it.

   If a portal is marked, highlight and press the Spacebar to un-mark it.
8. When you have maked the portals you want, highlight **Save Settings** and press Enter.
9. Press Y to confirm.

   The revised target appears.
10. Press **Return to Previous Menu** to return to the iSCSI targets list.

Deleting iSCSI Targets

You cannot delete the default target. Using the CLU, to unassign a portal from a target, you must delete the target.

To delete an iSCSI target:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Targets** and press Enter.

   The list of iSCSI Targets displays.
3. Highlight the target you want to delete and press the Spacebar to mark it.
4. Highlight **Delete Marked Targets** and press Enter.
5. Press **Y** to confirm deletion.
6. Press **Y** again to acknowledge possible interruption of iSCSI services.

   The target is removed from the list.

Viewing a List of iSCSI Ports

An iSCSI port is the physical iSCSI connection on the VTrak. There are four iSCSI ports on each RAID controller for a total of eight per subsystem.

To view a list of iSCSI ports:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Ports** and press Enter.

   The list of ports appears with controller and port numbers.

Viewing iSCSI Port Information

To view information for an iSCSI target port:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Ports** and press Enter.

   The list of ports appears with controller and port numbers.
3. Highlight the port you want to see and press Enter.

   The target port information screen displays. Information includes:

   - **CtrlId** – Controller ID (1 or 2)
   - **PortStatus** – Port status, enabled or disabled*
   - **JumboFrame** – Jumbo frames, enabled or disabled*
   - **LinkStatus** – Link status, up or down, Active or Inactive
   - **MACAddress** – MAC address of the target port
   - **MaxSupportedSpeed** – Maximum speed supported (1 Gb/s)
   - **CurrentSpeed** – Current or actual speed of the target port
   - **RelativePortals** – The portals corresponding to this target port

   Items marked with an asterisk (*) are adjustable under “Making iSCSI Port Settings” below.

Making iSCSI Port Settings

To make port settings:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Ports** and press Enter.

   The list of ports appears with controller and port numbers.
3. Highlight the port you want to change and press Enter.

   The target port information screen displays.
4. Highlight **iSCSI Port Settings** and press Enter.
5. Highlight each item and press the Spacebar to toggle between Enable and Disable as needed.

   - **PortEnable** – Enables and disables the iSCSI port
   - **JumboFrame** – Enables and disables jumbo frame support
6. Highlight **Save Settings** and press Enter.
7. Press **Y** to acknowledge possible interruption of iSCSI services.

8. Press **Y** again to confirm the changes.
9. Highlight **Return to Previous Menu** and press Enter to return to the target port information screen.

Viewing a List of iSCSI Portals

A *portal* is the interface between an iSCSI port and the iSCSI network.

To view a list of iSCSI portals:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Portals** and press Enter.

   The list of iSCSI Portals displays.

   - **PortalId** – Portal number. Starts at 0.
   - **CtrlId** – RAID controller ID, 1 or 2.
   - **PortId** – Physical port on the RAID controller, 1 to 4.
   - **TrunkId** – Trunk ID, 1 to 8. Refers to portals associated with a trunk (link aggregation). N/A means this portal is not assciated with a trunk.
   - **VlanTag** – VLAN Tag, 0 to 4094. Refers to portals associated with a Virtual Local Area Network (VLAN). N/A means this portal is not assciated with a VLAN.
   - **IP** – IP address of the portal.

Viewing iSCSI Portal Information

To view information for an iSCSI target port:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Portals** and press Enter.

   The list of portals appears.
3. Highlight the port you want to see and press Enter.

   The portal information screen displays. Information includes:

   - **PortalID** – Portal number. Starts at 0.
   - **TcpPort** – TCP port number. 3260 is the default and recommended number.
   - **DHCP** – Enabled or disabled.*

     DHCP is currently supported only for IPv4.
   - **AssociatedType** – PHY, VLAN, or Trunk.
   - **ControllerID** – RAID controller ID, 1 or 2.
   - **PortID** – Physical port on the RAID controller, 1 to 4.
   - **InterfaceName** – eth2.

- **ProtocolFamily** – IPv4 or IPv6.*
- **PrimaryIP** – Primary IP address of this portal.*
- **PrimaryIPMask** – Subnet mask of this portal.*
- **AssignedTarget** – 0 is the default target. The number of targets available depends on how many targets you create. See “Adding iSCSI Targets” on page 259.

Items marked with an asterisk (*) are adjustable under “Making iSCSI Portal Settings” on page 265.

Adding iSCSI Portals

VTrak supports up to 32 iSCSI portals per iSCSI port. Each iSCSI portal can belong to a different VLAN for a maximum of 32 VLANs.

If you plan to associate the new portal with a trunk, create the trunk first. See “Adding iSCSI Trunks” on page 271.

For more information about iSCSI VLANs, see “iSCSI on a VLAN” on page 368.

To add an iSCSI portal:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Portals** and press Enter.

   The list of iSCSI Portals displays.
3. Highlight **Create New Portal** and press Enter.
4. Highlight AssociatedType and press the Spacebar to toggle through PHY, VLAN, and Trunk.
5. If you chose:
   - **PHY** – Choose a Controller ID (1 or 2) and a Port ID (1 to 4).
   - **VLAN** – Choose a Controller ID (1 or 2), a Port ID (1 to 4), and a VLANTag (0 to 4094).
   - **Trunk** – Choose a Trunk ID (1 to 8).

   To change an ID number, highlight the item, press Backspace to delete the current ID and type a new ID.
6. Highlight **DHCP** and press the Spacebar to toggle between Enable and Disable.

   Note that DHCP is currently supported only for IPv4.
7. If you chose **DHCP Disable**:
   - Choose a Protocol Family (IPv4 or IPv6).
   - Enter a Primary IP address.
   - Enter a Primary IP mask or subnet mask.

To change a value, highlight the item, press Backspace to delete the current value and type a new value.

8. Highlight **Save Settings** and press Enter.

   The new Portal is added to the list.

Making iSCSI Portal Settings

To make portal settings:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Portals** and press Enter.

   The list of portals displays.
3. Highlight the portal you want to change and press Enter.

   The portal information screen displays.
4. Highlight **iSCSI Portal Settings** and press Enter.
5. Make changes as needed.
   - **DHCP** – Enabled or disabled

     DHCP is currently supported only for IPv4.
   - **ProtocolFamily**– IPv4 or IPv6
   - **PrimaryIP** – Primary IP address of this portal
   - **PrimaryIPMask** – Subnet mask of this portal
   - **VlanTag** – VLAN tag number (0 to 4094) for portals associated with a VLAN
   - **TrunkId** – Trunk ID number (1 to 8) for portals associated with a trunk.
6. Highlight **Save Settings** and press Enter.
7. Press **Y** to acknowledge possible interruption of iSCSI services.
8. Press **Y** again to confirm the changes.
9. Highlight **Return to Previous Menu** and press Enter to return to the portal list.

Deleting iSCSI Portals

To delete an iSCSI portal:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Portals** and press Enter.

   The list of iSCSI portals displays.
3. Highlight the portal you want to delete and press the Spacebar to mark it.
4. Highlight **Delete Marked Targets** and press Enter.
5. Press **Y** to confirm deletion.

6. Press **Y** again to acknowledge possible interruption of iSCSI services.
   The portal is removed from the list.

Viewing a List of iSCSI Sessions

To view a list of iSCSI sessions:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Sessions** and press Enter.
   iSCSI session information includes:
   - **ID** – ID number of the session
   - **Target Name** – Alias of the target
   - **Initiator Name** – Part of the IQN
   - **Portal ID** – ID number of the portal
   - **Status** – Up or down, active or inactive.

Making iSCSI Session Settings

To change iSCSI session settings:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Sessions** and press Enter.
3. Highlight the session you want and press Enter.
4. Highlight **KeepAlive** and press the spacebar to toggle between Enable and Disable.
5. Press Control-A to save your setting.

You can also enable and disable the Keep Alive as a global setting. See page 258.

Deleting an iSCSI Session

To delete an iSCSI session:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Sessions** and press Enter.
3. Highlight the session you want delete and press the spacebar to select it.and press Enter.
4. Highlight **Delete iSCSI Session** and press Enter.
5. Press Y to confirm.

Viewing iSCSI Session Information

To view a list of iSCSI sessions:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI Sessions** and press Enter.
3. Highlight the session you want and press Enter.

   iSCSI session information includes:

   - **Session ID** – ID number of the session
   - **Status** – Active or inactive
   - **Initiator Name** – SCSI qualified name (iqn)
   - **Portal IP** – IP address of the portal
   - **Device Type** – Initiator or target
   - **Target Portal Group** – ID number
   - **TSIH** – Target session identifying handle
   - **Execution Throttle** – Max number of outstanding commands on any one port
   - **Max Rcv Data Seg Length** – Receive data segment length
   - **First Burst Length** – In bytes
   - **Default Time to Wait** – In seconds
   - **Immediate Data** – Enabled or disabled
   - **Header Digest** – Enabled or disabled
   - **CHAP Authentication Type** – None, Local, Peer
   - **Keep Alive** – Enabled or disabled
   - **Portal ID** – ID number of the portal
   - **Target Alias**
   - **Target Name** – iSCSI qualified name (iqn)
   - **Initiator IP** – IP address of the initiator
   - **Initiator Source Port** – ID number
   - **ISID** – Initiator session ID number
   - **Max Outstanding R2T** – Number of PDUs ready to transfer
   - **Max Burst Length** – In bytes
   - **Default Time to Retain** – In seconds
   - **Initial R2T** – Enabled or disabled
   - **Data Digest** – Enabled or disabled
   - **Data PDU in Order** – Enabled or disabled
   - **Data Seq in Order** – Enabled or disabled
   - **Device Access Control** – Enabled or disabled

Viewing iSCSI iSNS Information

Internet Storage Name Service (iSNS) is a protocol used to facilitate the automated discovery, management, and configuration of iSCSI and Fibre Channel devices on a TCP/IP network.

To view iSNS information:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI iSNS Options** and press Enter.

   The current iSNS options appear. Information includes:

   - **iSNS** – Enabled or disabled
   - **iSNSIPAddress** – IP address of the iSNS server
   - **iSNSPort** – iSNS port number (1 to 65535) 3205 is the default and recommended number

   Items marked with an asterisk (*) are adjustable under “Making iSCSI Portal Settings” on page 265.

Making iSCSI iSNS Settings

To make iSNS settings:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI iSNS Options** and press Enter.

   The current iSNS options appear.
3. Highlight **iSNS Settings** and press Enter.
4. Highlight **iSNS** and press the Spacebar to toggle between Enable and Disable.
5. If you chose **Enable**:
   - Enter an IP address.
   - Enter a Port number. 3205 is the default and recommended number.

   To change a value, highlight the item, press Backspace to delete the current value and type a new value.
6. Highlight **Save Settings** and press Enter.
7. Press **Y** to acknowledge possible interruption of iSCSI services.
8. Press **Y** again to confirm the changes.
9. Highlight **Return to Previous Menu** and press Enter to return to the portal list.

Viewing a List of iSCSI CHAPs

Challenge Handshake Authentication Protocol (CHAP) is an authentication mechanism used to authenticate iSCSI sessions between initiators and targets.

To view a list of iSCSI CHAPs:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI CHAPs** and press Enter.

   A list of the current CHAPs appears. Information includes:

   - **ID** – ID number. Numbering starts at 0.
   - **Type** – Peer is one-way. Local is bi-directional.
   - **Name** – Same as an alias.

Adding iSCSI CHAPs

Verify that CHAP authentication is enabled under “Making iSCSI Target Settings” on page 260.

To add an iSCSI CHAP:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI CHAPs** and press Enter.
3. Highlight **Create New CHAP Entry** and press Enter.
4. Highlight **Name** and type a name for the CHAP.
5. Highlight **Type** and press the spacebar to toggle between Peer and Local.

   Peer is one-way. Local is bi-directional.
6. Highlight **Secret** and type a secret of 12 to 99 characters.
7. Highlight **Retype Secret** and type the secret again to verify.
8. Highlight **Save CHAP Record** and press Enter.

   The new CHAP is added to the list.

Making iSCSI CHAP Settings

When you change CHAP settings, you must change the secret. You cannot change the type (peer or local).

To make iSCSI CHAP settings:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI CHAPs** and press Enter.
3. Highlight the CHAP you want to edit and press Enter.
4. Make changes as needed.
   - Highlight Name and press the backspace key to erase the current value, then type the new value.
   - Highlight **New Secret** and type a secret of 12 to 99 characters.
   - Highlight **Retype New Secret** and type the secret again to verify.
5. Highlight **Save CHAP Record** and press Enter.

The edited CHAP appears in the list.

Deleting iSCSI CHAPs

To delete an iSCSI CHAP:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **iSCSI CHAPs** and press Enter.
3. Highlight the CHAP you want to delete and press Enter to mark it.
4. Highlight **Delete Marked Entries** and press Enter.
5. Press **Y** to confirm the deletion.

Pinging a Host or Server on the iSCSI Network

This function enables you to ping other network nodes through any one of the VTrak's iSCSI ports.

To ping a host or server on the network:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **Ping** and press Enter.
3. Enter information as required:
   - Highlight **IP address** and type the IP address you want to ping.
   - Highlight **Packet Count** and enter the number of packets you want to send.
   - Highlight **Ping Through Controller ID** and choose a controller (1 or 2)
   - Highlight **Ping Through Port ID** and choose a port number (1 to 4)

   To change a value, highlight the item, press Backspace to delete the current value and type a new value.
4. Highlight **Ping** and press Enter.

   The results of the ping are displayed on the iSCSI Ping screen.

Viewing a List of iSCSI Trunks

A trunk is the aggregation of two or more iSCSI ports to increase bandwidth.

To view a list of iSCSI trunks:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **Trunk** and press Enter.

   The list of iSCSI Trunks displays.
   - **ID** – ID number of the trunk. Starts at 1.
   - **CtrlId** – RAID controller ID, 1 or 2
   - **Master Port** – One of the four physical ports on the RAID controller

- **Slave Ports** – Any or all of the remaining physical ports on the same RAID controller
- **Failed Ports** – A slave port that has no iSCSI data connection.
- **State** – Optimal, Sub-Optimal or Failed. Identify and correct the failed iSCSI ports.

Adding iSCSI Trunks

Ports must be *enabled* to add them to a trunk. See “Making iSCSI Port Settings” on page 262. VTrak supports a maximum of eight trunks.

You cannot use an iSCSI port that has portals configured to it. See “Viewing a List of iSCSI Portals” on page 263 and “Deleting iSCSI Portals” on page 265.

To add an iSCSI Trunk:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **Trunk** and press Enter.
3. Highlight **Create New Trunk** and press Enter.
4. Enter information as required:
   - Highlight **Controller** and type the controller you want (1 or 2).
   - Highlight **Master Port** and type the port number you want (1 to 4).
   - Highlight **Slave Ports** and type the port number you want.

     For multiple ports, separate the numbers with a comma.

     You can choose any or all port numbers except the Master Port number.
5. Highlight **Save Trunk** and press Enter.

   The new trunk appears in the list.

   You can add up to 8 trunks. After you add a trunk, you can assign it to a portal. See “Adding iSCSI Portals” on page 264.

Making iSCSI Trunk Settings

To make trunk settings:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **Trunk** and press Enter.
3. Highlight the trunk you want and press Enter.
4. Enter information as required:
   - Highlight **Controller** and type the controller you want (1 or 2).
   - Highlight **Master Port** and type the port number you want (1 to 4).
   - Highlight **Slave Ports** and type the port number you want.

     For multiple ports, separate the numbers with a comma.

You can choose any or all port numbers except the Master Port number.

5. Highlight **Save Settings** and press Enter.

Deleting iSCSI Trunks

Before you can delete a trunk, you must delete any portals configured on it. See“Deleting iSCSI Portals” on page 265.

To delete an iSCSI trunk:

1. From the Main Menu, highlight **iSCSI Management** and press Enter.
2. Highlight **Trunk** and press Enter.
3. Highlight the trunk you want to delete and press the Spacebar to mark it.
4. Highlight **Delete Marked Trunks** and press Enter.
5. Press Y to confirm.

Managing Background Activity

Background activity refers to any of several functions that take place in the background while normal operation of the VTrak continues.

Background activities work in conjunction with disk arrays and logical drives. See “Managing Disk Arrays” on page 229 and “Managing Logical Drives” on page 242 for more information about how and when to use background activities.

Background Activity Management includes the following functions:

- Viewing Current Background Activities (page 273)
- Making Background Activity Settings (page 273)

Viewing Current Background Activities

From the Main Menu, highlight **Background Activities** and press Enter. A count of current background activities appears, including:

- Rebuild
- PDM (Predictive Data Migration)
- Synchronization
- Redundancy Check
- Migration
- Transition
- Initialization
- Media Patrol

Making Background Activity Settings

1. From the Main Menu, highlight **Background Activities** and press Enter.
2. Highlight **Background Activity Settings** and press Enter.
3. Highlight following and press the spacebar to toggle between **Enabled** and **Disabled**.
    - **Media Patrol** – Checks the magnetic media on physical drives
    - **Auto Rebuild** – When enabled and no spare drive is available, the disk array begins to rebuild as soon as you replace the failed physical drive with an unconfigured physical drive of equal or greater size
4. Highlight following and press the spacebar to toggle through **Low**, **Medium**, and **High** rates:
    - **Rebuild** – Rebuilds data to a replacement physical drive in a disk array
    - **Migration** – Change RAID level or add physical drives to disk arrays

- **PDM** – Migrates data from a suspect physical drive to a replacement drive in a disk array
- **Transition** – Returns a revertible spare drive to spare status
- **Synchronization** – Checks the data integrity on disk arrays
- **Initialization** – Full initialization sets all data bits in the logical drive to a specified pattern, such as all zeros
- **Redundancy Check** – Checks, reports and can correct data inconsistencies in logical drives

The rates are defined as follows:

- **Low** – Fewer resources to activity, more to data read/write.
- **Medium** – Balance of resources to activity and data read/write.
- **High** – More resources to activity, fewer to data read/write.

5. Highlight the following PDM trigger settings and press the backspace key to erase the current value:
   - **BBM Threshold** – 1 to 2048 reassigned blocks
   - **Media Patrol Threshold** – 1 to 2048 error blocks
6. Press Control-A to save your settings.

Working with the Event Viewer

Working with the Event Viewer includes the following functions:

- Viewing Runtime Events (page 275)
- Clearing Runtime Events (page 276)
- Viewing NVRAM Events (page 276)
- Clearing NVRAM Events (page 276)

The Event Viewer displays log of subsystem events. Events are classified as:

- **Runtime Events** – A list of and information about the 1023 most recent runtime events recorded since the subsystem was started
- **NVRAM Events** – A list of and information about the most important events over multiple subsystem startups. NVRAM events are stored in non-volatile memory

Event Severity Levels	
Level	**Description**
Fatal	Non-recoverable error or failure has occurred.
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Minor	Action is needed but the condition is not a serious at this time.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Viewing Runtime Events

To display Runtime Events:

1. From the Main Menu, highlight **Event Viewer** and press Enter.

   The log of Runtime Events appears. Events are added to the top of the list. Each item includes:

   - **Sequence number** – Begins with 0 at system startup.
   - **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
   - **Severity** – See the table above.
   - **Timestamp** – Date and time the event happened.
   - **Description** – A description of the event in plain language.
2. Press the up and down arrow keys to scroll through the log.

Clearing Runtime Events

To clear the Runtime Event log:

1. From the Main Menu, highlight **Event Viewer** and press Enter.
2. Highlight **Clear Runtime Event Log** and press Enter.
3. Press Y to confirm.

Viewing NVRAM Events

This screen displays a list of and information about the most important events over multiple subsystem startups.

To display NVRAM events:

1. From the Main Menu, highlight **Event Viewer** and press Enter.
2. Highlight **NVRAM Events** and press Enter.

   The log of NVRAM Events appears. Events are added to the top of the list. Each item includes:

   - **Sequence number** – Begins with 0 at system startup.
   - **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
   - **Severity** – See the table on the previous page.
   - **Timestamp** – Date and time the event happened.
   - **Description** – A description of the event in plain language.
3. Press the up and down arrow keys to scroll through the log.

Clearing NVRAM Events

To clear the Runtime Event log:

1. From the Main Menu, highlight **Event Viewer** and press Enter.
2. Highlight **NVRAM Events** and press Enter.
3. Highlight **Clear NVRAM Event Log** and press Enter.
4. Press Y to confirm.

Working with LUN Mapping

LUN Mapping includes the following functions:

Enabling LUN Mapping

LUN Mapping must be enabled in order for VTrak to recognize an initiator.

To enable LUN mapping:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Highlight one of the following options and press Enter.
   - LUN Mapping: Intiators
   - LUN Mapping: Ports
   - LUN Mapping: Targets
4. Highlight **Enable LUN Mapping (Currently DISABLED)** and press Enter.

   A “Logical drives may become invisible” message appears.
5. Press any key to continue.
6. Press Y to confirm.

   LUN mapping is enabled.

Viewing a List Ports

To view a list of FC ports:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.

3. Highlight **LUN Mapping: Ports** and press Enter.

   A list of ports appears.

Viewing a List Targets

To view a list of iSCSI targets:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Highlight **LUN Mapping: Ports** and press Enter.

A list of ports appears.

Viewing a List of Initiators

LUN Mapping must be enabled in order for VTrak to recognize an initiator.

To view a list of FC or iSCSI initiators:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Highlight **LUN Mapping: Initiators** and press Enter.

   A list of the current initiators appears.

Adding an Initiator

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN.

To add an initiator to the VTrak's list:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Highlight **LUN Mapping: Initiators** and press Enter.
4. Highlight **Create New Initiator** and press Enter.
5. Type a name for the initiator in the field provided.
   - **Fibre Channel** – A Fibre Channel initiator name is the World Wide Port Name of the device and is composed of a series of eight, two-digit hexadecimal numbers.

     Example: *10-00-00-00-c9-73-2e-8b*
   - **iSCSI** – An iSCSI initiator name is the iSCSI name of the initiator device and is composed of a single text string.

     Example: *iqn.1991-05.com.microsoft:promise-29353b7*

Obtain the initiator name from the initiator utility on your host system.

Note that the initiator name you input must match exactly in order for the connection to work.

6. Highlight **Save Initiator** and press enter.

   The new initiator appears in the list.

Deleting an Initiator

Caution

If you delete an initiator, you delete the LUN map associated with that initiator. Verify that the LUN map is no longer needed before deleting the initiator

To delete an initiator:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Highlight the initiator you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
4. Highlight **Delete Marked Initiators** and press Enter.
5. Press Y to confirm the deletion.

Viewing a List of LUN Maps

To view a list of LUN maps:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Do one of the following actions:
   - Highlight **LUN Mapping: Initiators** and press Enter. Then highlight an initiator and press Enter.
   - Highlight **LUN Mapping: Ports** and press Enter. Then highlight a port and press Enter.
   - Highlight **LUN Mapping: Targets** and press Enter. Then highlight a target and press Enter.

   The list of logical drives with corresponding LUN maps appears.

Adding a LUN Map

For FC systems, you can set up an Initiator or Port type LUN map.

For iSCSI systems, you can set up an Initiator or Target type LUN map.

You can set up both LUN map types on the same subsystem but only one LUN map type can be active at a time.

A maximum of 1024 logical drives can be mapped to an FC initiator or port, or to an iSCSI initiator or target.

To assign a LUN to an FC or iSCSI initiator, add the initiator first. See “Adding an Initiator” on page 278.

LUN mapping must be enabled in order to map a LUN. See “Enabling LUN Mapping” on page 277.

Mapping a LUN to an FC Initiator or Port

To map a LUN to an FC initiator or port:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Do one of the following actions:
   - Highlight **LUN Mapping: Initiators** and press Enter. Then highlight an initiator and press Enter.
   - Highlight **LUN Mapping: Ports** and press Enter. Then highlight a port and press Enter.

   A list of logical drives displays.
4. In the LUN field, press the backspace key to erase the current value, then type the LUN you want to assign to this initiator, from 0 to 255.

   Each logical drive can have only one LUN and must have a unique LUN.

   If you make a error, press Control-AR to restore the current LUN.
5. Press Control-A to save the LUN map.

Mapping a LUN to an iSCSI Initiator or Target

To map a LUN to an iSCSI initiator or target:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Do one of the following actions:
   - Highlight **LUN Mapping: Initiators** and press Enter. Then highlight an initiator and press Enter.

- Highlight **LUN Mapping: Targets** and press Enter. Then highlight a target and press Enter.

A list of logical drives displays.

4. In the LUN field, press the backspace key to erase the current value, then type the LUN you want to assign to this target, from 0 to 255.

   Each logical drive can have only one LUN and must have a unique LUN.

   If you make a error, press Control-AR to restore the current LUN.

5. Press Control-A to save the LUN map.

Editing a LUN Map

Editing a LUN map is the action of assigning a logical drive or LUN to an initiator. By changing the assignment, you change the initiator's access.

To edit a LUN map:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Do one of the following actions:
   - Highlight **LUN Mapping: Initiators** and press Enter. Then highlight an initiator and press Enter.
   - Highlight **LUN Mapping: Ports** and press Enter. Then highlight a port and press Enter.
   - Highlight **LUN Mapping: Targets** and press Enter. Then highlight a target and press Enter.

   A list of logical drives displays.
4. In the LUN field, press the backspace key to erase the current value, then type the LUN you want to assign to this initiator, from 0 to 255.

   Each logical drive can have only one LUN and must have a unique LUN.

   If you make a error, press Control-AR to restore the current LUN.
5. Press Control-A to save the LUN map.

Deleting a LUN Map

Deleting a LUN map prevents the initiator from accessing the LUN while LUN masking is enabled.

To delete a LUN map:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.

3. Do one of the following actions:
   - Highlight **LUN Mapping: Initiators** and press Enter. Then highlight an initiator and press Enter.
   - Highlight **LUN Mapping: Ports** and press Enter. Then highlight a port and press Enter.
   - Highlight **LUN Mapping: Targets** and press Enter. Then highlight a target and press Enter.

   A list of logical drives displays.

   A list of logical drives displays.
4. In the LUN field, press the backspace key to erase the current value. Leave the field blank.
5. Press Control-A to save the initiator, port, or target without a LUN map.

Changing the Active LUN Mapping Type

For FC systems, you can set up an Initiator or Port type LUN map.

For iSCSI systems, you can set up an Initiator or Target type LUN map.

You can set up both LUN map types on the same subsystem but only one LUN map type can be active at a time.

To change the active LUN map type:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LUN Mapping** and press Enter.
3. Highlight Active LUN Mapping Type and press the Spacebar to toggle between choices:
   - FC subsystems, choose the Initiator or Port option.
   - iSCSI subsystems, choose the Initiator or Target option.
4. Press Control-A to save your setting.

Managing UPS Units

Uninterruptible Power Supply (UPS) Management includes the following functions:

- Viewing a List of UPS Units (below)
- Making UPS Settings (page 284)
- Viewing UPS Information (page 285)

Viewing a List of UPS Units

To view a list of UPS units supporting the VTrak:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **UPS Management** and press Enter.

   Information in the UPS List includes:

   - **Operational Status** – OK means Normal.

     On AC means the UPS is connected to a viable external AC power source.

     On Battery means the external AC power source is offline and the UPS is running on battery power.
   - **Capacity** – Backup capacity expressed as a percentage.
   - **Remaining Minutes** – Number of minutes the UPS is expected to power your system in the event of a power failure.
   - **Loading** – Actual output of UPS as a percentage of the rated output. See the Note below.

Note

The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%. If the reported Loading Ratio exceeds the recommended value for your UPS unit:

- Have fewer subsystems or peripherals connected to this UPS unit.
- Add more UPS units, or use a higher-capacity UPS unit, to protect your RAID systems.

Making UPS Settings

These settings control how the VTrak subsystem detects the UPS unit and responds to data reported by the UPS unit.

To make UPS settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **UPS Management** and press Enter.
3. Highlight **UPS Settings** and press Enter.
4. Perform the following actions as required:
   - Verify the Current UPS Communication method. See Note 1:
     - **SNMP** – Network connection.
     - **Serial** – Serial connection.
     - **Unknown** – No connection.
   - Choose a Detection Setting from the dropdown menu:
     - **Automatic** – Default. If a UPS is detected when the subsystem boots, the settings changes to Enable.
     - **Enable** – Monitors UPS. Settings changes, reports warnings, and logs events.
     - **Disable** – Monitors UPS only.
   - Type values into the Threshold fields. See Note 2:
     - **Running Time Remaining Threshold** – Actual time below this value resets adaptive writeback cache to writethrough.
     - **Warning Temperature Threshold** – Actual temperature above this value triggers a warning and logs an event.
     - **Loading Ratio Threshold** – Actual loading ratio (percentage) above this threshold triggers a warning and logs an event. See Note 3.
     - **Battery Charge Remaining Threshold** – Reserve capacity below this percentage triggers a warning and logs an event.
   - For UPS units with network cards, type the IP addresses or DNS names in fields UPS 1 and UPS 2. See Note 4.
5. Press Control-A to save your settings.

Note 1: VTrak supports multiple UPS units using network or serial connections, but not a combination of both methods.

Note 2: Detection Setting must be set to Auto. If a UPS is detected, the settings changes to Enable.

Note 3: The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%.

Note 4: To specify UPS units by DNS names, ask your IT administrator to add the DNS names to the DNS server, before you make UPS settings.

Viewing UPS Information

To view information about a specific UPS unit:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **UPS Management** and press Enter.
3. Highlight the UPS unit you want and press Enter.

   UPS information includes:

   - **UPS ID**
   - **Model Name**
   - **Serial Number**
   - **Firmware Version**
   - **Manufacture Date**
   - **Voltage Rating** – Output voltage of the UPS.
   - **Battery Capacity** – Backup capacity expressed as a percentage.
   - **Remaining Backup Time** – Number of minutes the UPS is expected to power your system in the event of a power failure.
   - **Loading Ratio** – Actual output of UPS as a percentage of the rated output. See the Note below.
   - **Temperature** – Reported temperature of the UPS unit.

Note

The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%. If the reported Loading Ratio exceeds the recommended value for your UPS unit:

- Have fewer subsystems or peripherals connected to this UPS unit.
- Add more UPS units, or use a higher-capacity UPS unit, to protect your RAID systems.

Managing Users

User Management includes the following functions:

Viewing User Information

Each user types their user name and password to log into the CLI.

To view a list of current user accounts:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **User Management** and press Enter.

   A list of the current users appears.

Creating a User

To create a new user account:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **User Management** and press Enter.
3. Highlight **Create New User** and press Enter.
4. Highlight each field and type in the appropriate information:
   - User name (Maximum 31 characters. Use letters, numbers, and underscore. No spaces.)
   - Password (Optional. Maximum 31 characters. Use letters, numbers, and underscore.)
   - Display name (Optional)
   - User's email address
5. Highlight **Privilege** and press the space bar to toggle though the options.

   See the Table on the next page.
6. Press Control-A to save the user.

User Privileges	
Level	**Meaning**
View	Allows the user to see all status and settings but not to make any changes
Maintenance	Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
Power	Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller
Super	Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default “administrator” account is a Super User

Changing Another User’s Settings

The Administrator or a Super User can change other users’ settings.

To change user settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **User Management** and press Enter.
3. Highlight the User whose settings you want to change and press Enter.
4. Highlight **Privilege** and press the space bar to toggle though the options.

   See the Table above.
5. Highlight **Status** and press the space bar to toggle between **Enabled** and **Disabled**.
6. Highlight the items you want and press the backspace key to erase the current value, then type the new value:
   - User name
   - Email address
7. Press Control-A to save the settings.

Important

If a user is logged-in when his account is disabled, the user is immediately logged-out.

Changing Your Own User Settings

Each user can change their display name and email address.

To change your user settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **User Management** and press Enter.
3. Highlight your name and press Enter.
4. Highlight the items you want and press the backspace key to erase the current value, then type the new value:
   - User name
   - Email address
5. Press Control-A to save the settings.

Changing Another User's Password

The Administrator or a Super User can change other users' passwords.

To change a password:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **User Management** and press Enter.
3. Highlight the User whose password you want to change and press Enter.
4. Highlight **Change Password...** and press Enter.
5. Highlight **New Password** and type a new password.

   Maximum 31 characters. Use letters, numbers, and underscore.
6. Highlight **Retype Password** and type the new password again to verify.
7. Press Control-A to save the new password.

Note

To reset the Administrator's password to the factory default, see "Resetting the Default Password" on page 330.

Changing Your Own Password

Each user can change their own password.

To change your password:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.

2. Highlight **User Management** and press Enter.
3. Highlight your name and press Enter.
4. Highlight **Change Password...** and press Enter.
5. Highlight **Old Password** and type your current password.
6. Highlight **New Password** and type a new password.

   Maximum 31 characters. Use letters, numbers, and underscore.
7. Highlight **Retype Password** and type the new password again to verify.
8. Press Control-A to save the new password.

Deleting a User

The Administrator or a Super User can delete other users. You cannot delete the account you used to log in. There must always be one Super User account.

Rather than deleting a user, consider disabling a user account. See “Changing Another User’s Settings” on page 287.

To delete a user:

1. Log in under a user name other than the one you want to delete.
2. From the Main Menu, highlight **Additional Info and Management** and press Enter.
3. Highlight **User Management** and press Enter.
4. Highlight the user you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
5. Highlight **Delete Marked Users** and press Enter.
6. Press Y to confirm the deletion.

Managing LDAP

LDAP Management includes the following functions:

- Viewing LDAP Information (page 290)
- Making LDAP Settings (page 291)
- Testing LDAP Settings (page 293)
- Viewing a List of Role Maps (page 293)
- Adding a Role Map (page 293)
- Making Role Map Settings (page 294)
- Deleting a Role Map (page 294)

Viewing LDAP Information

To view LDAP information:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LDAP Management** and press Enter.

   The LDAP Settings screen appears.
3. Highlight **LDAP Auth** and press Enter.

   The LDAP Authorization screen appears.

   LDAP must be enabled to see the settings. LDAP settings include:

   - LDAP – Enable and disables LDAP.
   - EmailNotificationForEvent – Enables email subscription for the LDAP authenticated user.
   - Timeout – Maximum time to allowed for communication with LDAP server.
   - BaseDN – Search domain limit of LDAP query.
   - Server – Hostname or IP address of LDAP server.
   - Port – Network port of LDAP server.
   - BindDN – Authenticates communication between subsystem and LDAP server.
   - Bindpw – Password for BindDN.

   When email notification is *enabled*, these items appear:

   - Object Class – person is the default value.
   - UIDAttribute – Setting depends on Server Type.
   - FullNameAttribute – Store user's full name in LDAP server.
   - EmailAddrAttribute – Store user's email address in LDAP server.

- Server Type – Windows Active Directory, Mac Open directory, or Unspecified.
- Role Policy – Default or Explicit.
- Default Privilege – Applies to Default Role Policy.

The following items apply to the *Default* Role Policy.

- BaseDNOfGroup – Authenticates communication between subsystem and LDAP server.
- ObjectClassOfGroup – group is the default value.
- GroupIDAttribute – cn is the default.

Making LDAP Settings

To make LDAP settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LDAP Management** and press Enter.

   The LDAP Settings screen appears.
3. Highlight **LDAP Auth** and press Enter.

   The LDAP Authorization screen appears.
4. Highlight each item and press the Spacebar to toggle between Enabled and Disabled, as needed:
   - LDAP
   - EmailNotificationForEvent
5. Highlight each item and press Backspace to erase the current value, then type a new value, as needed:
   - **Timeout** – Maximum time to allowed for communication with LDAP server. *10* seconds is the default.
   - **BaseDN** – Search domain limit of LDAP query. *dc=example,dc=com* is the default.
   - **Server** – Hostname or IP address of LDAP server. *127.0.0.1* is the default.
   - **Port** – Network port of LDAP server. *389* is the default.
   - **BindDN** – Authenticates communication between subsystem and LDAP server. *binddn* is the default value.
   - **Bindpw** – Password for BindDN. *binddn* is the default value.

   When email notification is *enabled*, these items appear:
   - **Object Class** – *person* is the default value.
   - **UIDAttribute** – Windows Active Directory *sets sAMAccountName*.

Mac Open Directory and Unspecified set *uid*.

- **FullNameAttribute** – Store user's full name in LDAP server. *displayName* is the default.
- **EmailAddrAttribute** – Store user's email address in LDAP server. *mail* is the default.

6. Highlight each item and press the Spacebar to toggle through the options, as needed.
   - **Server Type** – Windows Active Directory, Mac Open directory, or Unspecified.
   - **Role Policy** – Default or Explicit.
   - **Default Privilege** – Applies to *Default* Role Policy. View, Maintenance, Power, or Super. See Table 3, below.

   The following items apply to the *Default* Role Policy.
7. Highlight each item and press Backspace to erase the current value, then type a new value, as needed:
   - **BaseDNOfGroup** – Authenticates communication between subsystem and LDAP server. No default value.
   - **ObjectClassOfGroup** – *group* is the default value.
   - **GroupIDAttribute** – *cn* is the default.
8. To save your settings, press Control-A.

Table 3. User Privileges

Level	Meaning
View	Allows the user to see all status and settings but not to make any changes
Maintenance	Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
Power	Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller
Super	Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default "administrator" account is a Super User

Testing LDAP Settings

To test your LDAP settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LDAP Management** and press Enter.

   The LDAP Settings screen appears.
3. Highlight **LDAP Auth** and press Enter.

   The LDAP Authorization screen appears. LDAP must be enabled to test the settings.
4. Highlight **Test** and press Enter.

Viewing a List of Role Maps

A Role Map is a method of mapping a group of users to an LDAP server. You must enable LDAP to use Role Mapping. You do not have to enable LDAP to manage Role Mapping.

You must enable LDAP to use Role Mapping. See “Making LDAP Settings” on page 291.

You do not have to enable LDAP to manage Role Mapping.

To view a list of roles:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LDAP Management** and press Enter.

   The LDAP Settings screen appears.
3. Highlight **Role Mapping** and press Enter.

   The list of roles appears. Role information includes:

   - **External Group** – Enable and disables LDAP.
   - **Privilege** – Enables email subscription for the LDAP authenticated user.

Adding a Role Map

To add a role map:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LDAP Management** and press Enter.

   The LDAP Settings screen appears.
3. Highlight **Role Mapping** and press Enter.

   The list of roles appears.

4. Highlight **Create Role** and press Enter.
5. Highlight External Role and type a name in the field provided.
6. Highlight **Privilege** and press the Spacebar to toggle through the privilege levels: View, Maintenance, Power, and Super. See Table 3 on page 292.
7. Press **Control-A** to save your settings.

   The new role appears in the list.

Making Role Map Settings

To make role map settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LDAP Management** and press Enter.

   The LDAP Settings screen appears.
3. Highlight **Role Mapping** and press Enter.

   The list of roles appears.
4. Highlight the Role you want to change and press Enter.
5. Highlight **Privilege** and press the Spacebar to toggle through the privilege levels: View, Maintenance, Power, and Super. See Table 3 on page 292.
6. Press **Control-A** to save your settings.

   The role appears in the list with the new privilege setting.

Deleting a Role Map

To delete a role map:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **LDAP Management** and press Enter.

   The LDAP Settings screen appears.
3. Highlight **Role Mapping** and press Enter.

   The list of roles appears.
4. Highlight the role you want to delete and press the Spacebar to mark it.
5. Highlight **Delete Marked Roles** and press Enter.
6. Press **Y** to confirm.

Working with Software Management

Software Management includes the following functions:

Making Email Settings

By default, Email service is set to Automatic and its normal status is Started.

To make Email service settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **Email** and press Enter.
4. Highlight **Startup Type** and press the spacebar to toggle between **Automatic** and **Manual**.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - SMTP server IP address or server name
   - Server Port number (25 is the default)
6. Highlight **Authentication** and press the spacebar to toggle between **Yes** and **No**.

   If you selected Yes, type in a User name and Password in the fields provided.
7. The following items are optional but recommended. Highlight and press the backspace key to erase the current value, then type the new value:
   - Sender’s email address
   - Subject Line for the email message
8. Press Control-A to save your settings.

To start, stop or restart the Email service, highlight **Start**, **Stop** or **Restart** and press Enter.

Making SLP Settings

By default, SLP service is set to Automatic and its normal status is Started.

To make SLP service settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **SLP** and press Enter.
4. Highlight **Startup Type** and press the spacebar to toggle between **Automatic** and **Manual**.
5. Press Control-A to save your settings.

To start, stop or restart the SLP service, highlight **Start**, **Stop**, or **Restart** and press Enter.

Making Web Server Settings

By default, Web Server service is set to Automatic and its normal status is Started.

To make Web Server service settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight and press Enter.
4. Highlight **Startup Type** and press the spacebar to toggle between **Automatic** and **Manual**.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - HTTP Port (80 is the default)
   - Session Time Out (24 minutes is the default. 1440 minutes = 24 hours)
6. Highlight **SSL** and press the spacebar to toggle between **Enabled** and **Disabled**.
7. Highlight **HTTPS Port** and press the backspace key to erase the current value, then type the new value. 443 is the default.
8. Press Control-A to save your settings.

To start, stop or restart the service, highlight **Start**, **Stop**, or **Restart** and press Enter.

Making Telnet Settings

By default, Telnet service is set to Automatic and its normal status is Started.

To make Telnet service settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **Telnet** and press Enter.
4. Highlight **Startup Type** and press the spacebar to toggle between **Automatic** and **Manual**.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - Port number (2300 is the default)
   - Session Time Out (24 minutes is the default. 1440 minutes = 24 hours)
   - Maximum number of connections (4 is the default)
6. Press Control-A to save your settings.

To start, stop or restart the Telnet service, highlight **Start**, **Stop**, or **Restart** and press Enter.

Making SSH Settings

By default, Secure Shell (SSH) service is set to Automatic and its normal status is Started.

To make SSH settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **SSH** and press Enter.
4. Highlight **Startup Type** and press the spacebar to toggle between **Automatic** and **Manual**.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - Port number (22 is the default)
   - Session Time Out (24 minutes is the default. 1440 minutes = 24 hours)
   - Maximum number of connections (4 is the default)
6. Press Control-A to save your settings.

Making SNMP Settings

By default, Simple Network Management Protocol (SNMP) service is set to Automatic and its normal status is Started.

To make SNMP service settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **SNMP** and press Enter.
4. Highlight **Startup Type** and press the spacebar to toggle between **Automatic** and **Manual**.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - Port Number – 161 is the default
   - System Name – (optional) Type a system name in this field
   - System Location – Type a country name in this field
   - System Contact – Type the email address of your system administrator in this field
   - Read Community – Type a community name in this field
   - Write Community – private (no change possible)
6. Press Control-A to save your settings.

To start, stop or restart the SNMP service, highlight **Start**, **Stop**, or **Restart** and press Enter.

Managing SNMP Trap Sinks

Viewing a List of Trap Sinks

To create a trap sink:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **SNMP** and press Enter.
4. Highlight **Trap Sinks** and press Enter.

   A list of the current trap sinks appears.

Adding a Trap Sink

To add a trap sink:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.

2. Highlight **Software Management** and press Enter.
3. Highlight **SNMP** and press Enter.
4. Highlight **Trap Sinks** and press Enter.
5. Highlight **Create New Trap Sink** and press Enter
6. Highlight **Trap Sink IP address** and press the backspace key to erase the current value, then type the new IP address in this field.
7. Highlight **Trap Filter** and press the spacebar to toggle through the severity levels.

   See the Table below.
8. Press Control-A to save the Trap Sink.

Event Severity Levels	
Level	**Description**
Fatal	Non-recoverable error or failure has occurred.
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Minor	Action is needed but the condition is not a serious at this time.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Deleting a Trap Sink

To delete a trap sink:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **SNMP** and press Enter.
4. Highlight **Trap Sinks** and press Enter.
5. Highlight the trap sink you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
6. Highlight **Delete Marked Entries** and press Enter.

Making CIM Settings

By default, Common Information Model (CIM) service is set to Automatic and its normal status is Started.

To make CIM service settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **CIM** and press Enter.
4. Enter information or change settings as required.
   - Highlight **Startup Type** and press the spacebar to toggle between **Automatic** and **Manual**.
   - To use a HTTP connection, highlight **HTTP** and press the spacebar to toggle to **Enabled** and accept the 5988 is the default port number or highlight **HTTP Port**, press the backspace key to erase, type new value.
   - To use a HTTPS connection, highlight **HTTPS** and press the spacebar to toggle to **Enabled** accept the 5989 is the default port number or highlight **HTTPS Port**, press the backspace key to erase, type new value.
   - To use CIM authentication, highlight **Authentication** and press the spacebar to toggle to **Enabled**.

     Enter the old password and a new password into the fields provided. The default password is **password**.

   There is only one user. The default name is **cim**. No changes are possible.
5. Press Control-A to save your settings.
6. Press Y to confirm.

To start, stop or restart the CIM service, highlight **Start**, **Stop**, or **Restart** and press Enter.

Making Netsend Settings

By default, Netsend service is set to Manual and its normal status is Stopped.

To make Netsend service settings:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **Netsend** and press Enter.
4. Highlight **Startup Type** and press the spacebar to toggle between **Automatic** and **Manual**.
5. Press Control-A to save your settings.

To start, stop or restart the Netsend service, highlight **Start**, **Stop**, or **Restart** and press Enter.

Managing Netsend Recipients

VTrak's Netsend service sends VTrak subsystem events in the form of text messages to your Host PC and other networked PCs. See "Making Netsend Settings" on page 301.

Netsend Requirements

In order to use Netsend:

- NetSend must be running the VTrak
- You must provide the IP address for each recipient PC
- The Messenger service must be running on each recipient PC

If your Netsend and Messenger service settings are correct but the recipient PC does not receive event messages, check the recipient PC's Firewall settings. Refer to your OS documentation for more information.

Adding Netsend recipients

To add a Netsend recipient:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **Netsend** and press Enter.
4. Highlight **Message Recipients** and press Enter.
5. Highlight **Create New Message Recipient** and press Enter.
6. Type the recipient's IP address into the field provided.
7. Highlight **Message Event Severity Filter** and press the spacebar to change severity levels.

The selected level and all higher severity levels of severity are reported.

See the Table below.

8. Press Control-A to save your settings.

Event Severity Levels	
Level	**Description**
Fatal	Non-recoverable error or failure has occurred.
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Minor	Action is needed but the condition is not a serious at this time.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Deleting Netsend Recipients

To delete a Netsend recipient:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Software Management** and press Enter.
3. Highlight **Netsend** and press Enter.
4. Highlight **Message Recipients** and press Enter.
5. Highlight the recipient you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing
6. Highlight **Delete Marked Entries** and press Enter.

Flashing through TFTP

Use this function to flash (update) the firmware on the VTrak. See page 317 for the procedure.

Viewing Flash Image Information

Flash image information refers to the package of firmware components running on your VTrak controller or controllers.

To view flash image information:

1. From the Main Menu, highlight **Additional Info and Management**, and press Enter.
2. Highlight **Flash Image Version Info** and press Enter.

   The flash image information displays on the screen:

   - Enclosure Number – 1 (one) is the Head Unit. Other numbers are cascaded or expanded subsystems
   - Running Image Info – Firmware currently running on the controllers
   - Flashed Image Info – Firmware flashed to memory
   - Image Type – A specific component
   - Controller ID – 1 or 2
   - Version number
   - Build date
   - Flash (installation) date

   If the Running and Flashed Images do not match, the VTrak has not restarted since the firmware was last updated. Restart the VTrak to run the Flashed firmware package. See “Restarting the Subsystem” on page 311.

   Note that all of these components are upgraded together in a package. See “Updating the Subsystem Firmware” on page 315.

Clearing Statistics

This function clears the statistical counts for the RAID controller, Fibre Channel ports, iSCSI ports, physical drives, and logical drives. To clear statistics:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Clear Statistics** and press Enter.
3. Press Y to confirm the deletion.

Restoring Factory Defaults

This function restores the factory default settings to the firmware and software items you select.

Caution

Restoring default settings can disrupt your VTrak functions. Use this feature only when necessary.

If you restore Management Network settings, you lose your network connection to the VTrak.

Note

To reset the Administrator's password to the factory default, see "Resetting the Default Password" on page 330.

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Restore Factory Defaults** and press Enter.
3. Highlight the setting groups you want to restore and press the spacebar to toggle between **Yes** and **No**.

   Yes means this setting is restored to the default value.

   No means the current setting remains untouched.
4. Highlight **Restore Factory Defaults** and press Enter.
5. Press Y to confirm the reset.

Shutting Down the Subsystem

There are two methods for shutting down the subsystem. Choose one of the following procedures:

- Shutting down the VTrak – Telnet Connection (page 307)
- Shutting down the VTrak – SSH Connection (page 307)
- Shutting down the VTrak – Serial Connection (page 308)

Shutting down the VTrak – Telnet Connection

This function shuts down the VTrak subsystem on a Telnet connection. Additional action is required, as described below.

Important

If you have a JBOD Expansion, always power off the RAID subsystem first. Then power off the JBOD subsystems.

To shutdown the RAID subsystem:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Shutdown or Restart** and press Enter.
3. Highlight **Option** and press the spacebar to display **Shutdown**.
4. Highlight **Submit** and press Enter.

   A warning message appears.
5. Press Y to continue.

   The screen goes blank.
6. Wait for no less than two minutes.
7. Manually turn off the power supply switches on the back of the subsystem.

Shutting down the VTrak – SSH Connection

This function shuts down the VTrak subsystem on a SSH connection. Additional action is required, as described below.

Important

If you have a JBOD Expansion, always power off the RAID subsystem first. Then power off the JBOD subsystems.

To shutdown the RAID subsystem:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Shutdown or Restart** and press Enter.
3. Highlight **Option** and press the spacebar to display **Shutdown**.
4. Highlight **Submit** and press Enter.

   A warning message appears.
5. Press Y to continue.
6. Close your SSH session.
7. Wait for no less than two minutes.
8. Manually turn off the power supply switches on the back of the subsystem.

Shutting down the VTrak – Serial Connection

This function shuts down the VTrak subsystem on a serial connection. Additional action is required, as described below.

Important

If you have a JBOD Expansion, always power off the RAID subsystem first. Then power off the JBOD subsystems.

To shutdown the RAID subsystem:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Shutdown or Restart** and press Enter.
3. Highlight **Shutdown or Restart** and press Enter.
4. Highlight **Option** and press the spacebar to display **Shutdown**.
5. Highlight **Submit** and press Enter.

   A warning message appears.
6. Press Y to continue.
7. Turn off the power supply switches when you see the following message:

   Shutdown complete. It is now safe to power off the subsystem.

Starting Up After Shutdown

There are two methods for shutting down the subsystem. Choose one of the following procedures:

- Starting up the VTrak – Telnet Connection (page 309)
- Starting up the VTrak – SSH Connection (page 309)
- Starting up the VTrak – Serial Connection (page 310)

Starting up the VTrak – Telnet Connection

Important

If you have a JBOD Expansion, always power on the JBOD subsystems first. Then power on the RAID subsystem.

To start the RAID subsystem:

1. Manually turn on the power supply switches on the back of the subsystem.
2. Wait about two minutes.
3. Establish a Telnet connection to the VTrak.

   See “Making a Telnet Connection” on page 207.

   If you cannot log in, wait 30 seconds and try again.
4. Type **menu** and press Enter to open the CLU.

Starting up the VTrak – SSH Connection

Important

If you have a JBOD Expansion, always power on the JBOD subsystems first. Then power on the RAID subsystem.

To start the RAID subsystem:

1. Manually turn on the power supply switches on the back of the subsystem.
2. Wait about two minutes.
3. Establish a SSH connection to the VTrak.

   See “Making a SSH Connection” on page 207.

   If you cannot log in, wait 30 seconds and try again.
4. Type **menu** and press Enter to open the CLU.

Starting up the VTrak – Serial Connection

Important

If you have a JBOD Expansion, always power on the JBOD subsystems first. Then power on the RAID subsystem.

To start the RAID subsystem:

1. Manually turn on the power supply switches on the back of the subsystem.
2. Wait about two minutes.
3. Establish a serial connection to the VTrak.

   See “Making a Serial Connection” on page 206.

   When the **Login:** prompt appears, the start up is finished.
4. Type **menu** and press Enter to open the CLU.

Restarting the Subsystem

There are two methods for restarting the subsystem. Choose one of the following procedures:

- Restarting the Subsystem (page 311)
- Restarting VTrak – SSH Connection (page 311)
- Restarting VTrak – Serial Connection (page 312)

Note

If you have a JBOD Expansion, you are not required to restart the JBOD subsystems when you restart the RAID subsystem.

Restarting VTrak – Telnet Connection

To restart the RAID subsystem:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Shutdown or Restart** and press Enter.
3. Highlight **Option** and press the spacebar to display **Restart**.
4. Highlight **Submit** and press Enter.

   A warning message appears.
5. Press Y to continue.

   The screen goes blank.
6. Wait about two minutes.
7. Re-establish your Telnet connection to the VTrak CLU.

   See “Making a Telnet Connection” on page 207.

   If you cannot re-establish a connection, wait 30 seconds and try again.

Restarting VTrak – SSH Connection

To restart the RAID subsystem:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Shutdown or Restart** and press Enter.
3. Highlight **Option** and press the spacebar to display **Restart**.
4. Highlight **Submit** and press Enter.

   A warning message appears.
5. Press Y to continue.

6. Close your SSH session.
7. Wait about two minutes.
8. Re-establish your SSH connection to the VTrak CLU.

   See “Making a SSH Connection” on page 207.

   If you cannot re-establish a connection, wait 30 seconds and try again.

Restarting VTrak – Serial Connection

To restart the RAID subsystem:

1. From the Main Menu, highlight **Additional Info and Management** and press Enter.
2. Highlight **Shutdown or Restart** and press Enter.
3. Highlight **Option** and press the spacebar to display **Restart**.
4. Highlight **Submit** and press Enter.

   A warning message appears.
5. Press Y to continue.

   The screen displays shutdown and startup functions.
6. When the **Login:** prompt appears, log into the CLU again.

Buzzer

Making Buzzer Settings

The buzzer sounds to inform you that the VTrak needs attention. See “VTrak is Beeping” on page 375 for more information.

To make buzzer settings:

1. From the Main Menu, highlight **Buzzer** and press Enter.

   A list of Controllers appears with the current buzzer setting and status.
2. Highlight the Controller whose buzzer you want to set and press Enter.
3. Highlight **Enabled** and press the spacebar to toggle between **Yes** and **No**.
4. Press Control-A to save your settings.

Silencing the Buzzer

Caution

This action disables the buzzer for all events.

To silence the buzzer, follow the procedure above for disabling the buzzer.

Chapter 6: Maintenance

This chapter covers the following topics:

Updating the Subsystem Firmware

This procedure applies to VTrak RAID subsystems and VTrak JBOD expansion units managed by a VTrak RAID subsystem. There are three methods:

Updating with WebPAM PROe

Download the latest firmware image file from PROMISE support: http://www.promise.com/support/ and save it to your Host PC or TFTP server.

Important

Verify that no background activities are running on the RAID subsystem.

To update the firmware on the RAID subsystem and JBOD expansion units:

1. Click the **Administration** tab.
2. Click the **Firmware Update** icon.
3. Click the **Controller Firmware Update** tab.

   The Controller Firmware Update screen appears showing the current Image Version Number and Build Date.
4. Choose a download option:
   - **Local File through HTTP** – Click the **Browse** button, locate the firmware image file, click the file to choose it, then click the **Open** button.

- **TFTP Server** – Enter the TFTP Server host name or IP address, port number and file name.

5. Optional. Check the **Non-disruptive Image Update** (NDIU) box.

   NDIU updates the RAID controllers and I/O modules one at a time, enabling I/O operations continue during the firmware update. Updates with this option take a longer period of time to complete. Only VTrak x30 models support this feature.

6. Click the **Next** button.

   The next screen shows the Flash Image (firmware image file) Version Number and Build Date.

7. Click the **Submit** button.

   The progress of the update displays.

Warning

- Do NOT power off the RAID subsystem during the update!
- Do NOT move to any other screen until the firmware update operation is completed!

When the update is completed a message tells you to reboot the subsystem,

8. Click the **OK** button.

   - If you chose the Disruptive Flash Method, the RAID subsystem and JBOD expansion units automatically restart.
   - If you chose the Non-Disruptive Flash Method, the system automatically flashes and restarts the RAID controllers one at a time.

Automatic Restart

If you did NOT check the NDIU box, the RAID subsystem and JBOD expansion units automatically restart. That action temporarily disrupts I/O operations and drops your WebPAM PROe connection.

To reestablish your WebPAM PROe connection:

1. Wait no less than two minutes.
2. Click **Logout** in the WebPAM PROe Header, then log in again.

   If you cannot log in, wait 30 seconds and try again.

3. In your browser, click **Logout** in the WebPAM PROe Header, then log in again.

   If you cannot log in immediately, wait 30 seconds and try again.

Updating with the CLU

Download the latest firmware image file from PROMISE support: http://www.promise.com/support/ and save it to your Host PC or TFTP server.

Important

Verify that no background activities are running on the RAID subsystem.

To update the firmware on the RAID subsystem and JBOD expansion units:

1. From the Main Menu, highlight **Additional Info and Management**, and press Enter.
2. Highlight **Flash through TFTP** and press Enter.
3. Highlight **TFTP Server** and type the IP address of your TFTP server in the field provided.
4. Highlight **Port Number** and press the backspace key to erase the current value, then type the new value. 69 is the default.

   A list of the current users appears.
5. Highlight **File Name** and type the file name of the firmware image file in the field provided.
6. Highlight **Flash Method** and press the spacebar to toggle between:
   - **Disruptive** – Updates the RAID controllers and I/O modules simultaneously. I/O operations stop during the firmware update.
   - **Non Disruptive** – (NDIU) Updates the RAID controllers and I/O modules one at a time, enabling I/O operations continue during the firmware update. Updates with this option take a longer period of time to complete. Only VTrak x30 models support this feature.
7. Highlight **Start** and press Enter.

Warning

- Do NOT power off the RAID subsystem during the update!
- Do NOT move to any other screen until the firmware update operation is completed!

- If you chose the Disruptive Flash Method, the RAID subsystem and JBOD expansion units automatically restart.
- If you chose the Non-Disruptive Flash Method, the system automatically flashes and restarts the RAID controllers one at a time.

Automatic Restart

If you chose the Disruptive Flash Method, the RAID subsystem and JBOD expansion units automatically restart. That action temporarily disrupts I/O operations and drops your CLU connection.

After the screen goes blank, wait about two minutes, then re-establish your Telnet connection to the CLU. If you cannot re-establish a connection, wait 30 seconds and try again.

Updating with USB Support

USB support uses the disruptive flash method only. Both RAID controllers and all JBOD I/O modules are updated at the same time and momentarily go offline when the RAID subsystem and JBOD unit reboot.

This procedure requires a USB flash device:

- Formatted to FAT 32
- At least 50 MB of free space

Download the latest **OPAS_xxxxx.sbb** firmware image file from PROMISE support: http://www.promise.com/support/ and save it the root folder of the USB flash device.

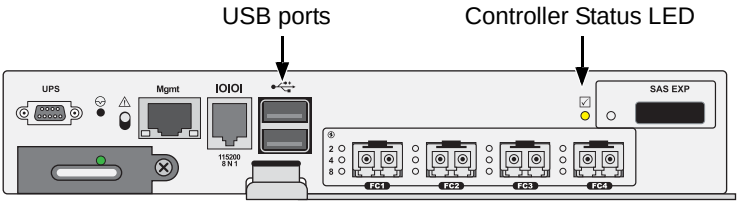
Important

Verify that no background activities are running on the RAID subsystem.

To update the subsystem firmware using VTrak's USB Support feature:

1. Insert the USB flash device into one of the USB ports on one of the RAID controllers.

Figure 1. FC RAID controller LEDs



   The controller status LED blinks green in half-second intervals.

2. Wait until the controller activity LED stops blinking green and starts blinking amber.

Warning

- Do NOT power off the RAID subsystem during the update!
- Do NOT remove your USB flash device until the LED changes color!

3. Within 30 seconds, remove the USB flash device, then insert the USB flash device back into the same RAID controller.

   The remove and insert action confirms that you want to update the firmware.

You can insert the USB flash device back into either USB port but it must be the same RAID controller as step 1.

4. Wait until the controller activity LED displays steady green.
5. Remove the USB flash device.

Automatic Restart

After you remove the USB flash device from the RAID controller, the RAID subsystem and any JBOD expansion units automatically restart. That action temporarily disrupts I/O operations and drops your WebPAM PROe or CLU connection.

To reestablish your WebPAM PROe connection:

1. Wait no less than two minutes.
2. Click **Logout** in the WebPAM PROe Header, then log in again.

   If you cannot log in, wait 30 seconds and try again.

To reestablish your CLU connection:

After the screen goes blank, wait about two minutes, then re-establish your Telnet connection to the CLU. If you cannot re-establish a connection, wait 30 seconds and try again.

If you have a serial connection to the RAID subsystem, the connection remains during the shut-down and restart. No reconnect is required.

Failed Update

If the firmware update fails, the controller status LED displays red. See page 319, Figure 1.

1. Remove the USB flash device.
2. Insert the USB flash device into a USB port on your PC.
3. Go to the **OPAX_xxxxxx** folder to obtain the report and log.

   Possible causes for an update failure include:

   - Less than 50 MB free space on the USB flash device.
   - The SBB firmware image is invalid.
   - A background activity is running.

   See “Contacting Technical Support” on page 435.

Updating Physical Drive Firmware

This feature applies only to PROMISE-supported physical drives. For a list of supported drives, go to PROMISE support: http://www.promise.com/support/.

If you have physical drives in your RAID system that are not PROMISE-supported, follow the firmware update procedure from the drive manufacturer.

WebPAM PROe

Download the latest firmware image file from PROMISE support: http://www.promise.com/support/ and save it to your Host PC or TFTP server.

To update the firmware on PROMISE-supported physical drives:

1. Click the **Administration** tab.
2. Click the **Firmware Update** icon.
3. Click the **PD Firmware Update** tab.
4. Choose a download option:
   - **Local File through HTTP** – Click the **Browse** button, locate the firmware image file, click the file to choose it, then click the **Open** button.
   - **TFTP Server** – Enter the TFTP Server host name or IP address, port number and file name.
5. Click the **Next** button.
6. Click the **Submit** button.

   The progress of the update displays.

Warning

- Do NOT power off the RAID subsystem during the update!
- Do NOT move to any other screen until the firmware update operation is completed!

When the update is completed a message tells you to reboot the subsystem.

7. Click the **OK** button.

   Restart the RAID subsystem. See “Restarting a Subsystem” on the next page.

Restarting a Subsystem

This function shuts down the subsystem and then restarts it.

Important

Do NOT turn off the power supply switches on the RAID subsystem or JBOD expansion units.

To restart the subsystem:

1. Click the **Administration** tab.
2. Click the **Subsystem Information** icon.
3. Click the **Shutdown/Restart** button.
4. Click the **Restart** button.
5. Type the word “confirm” in the field provided.
6. Click the **Confirm** button.

   When the controller shuts down, your WebPAM PROe connection is lost.
7. Wait no less than two minutes.
8. In your browser, click **Logout** in the WebPAM PROe Header, then log in again.

   If you cannot log in immediately, wait 30 seconds and try again.

Replacing a Power Supply

The power supply and its fans are replaced as one unit. There are no individually serviceable parts. No tools are required for this procedure.

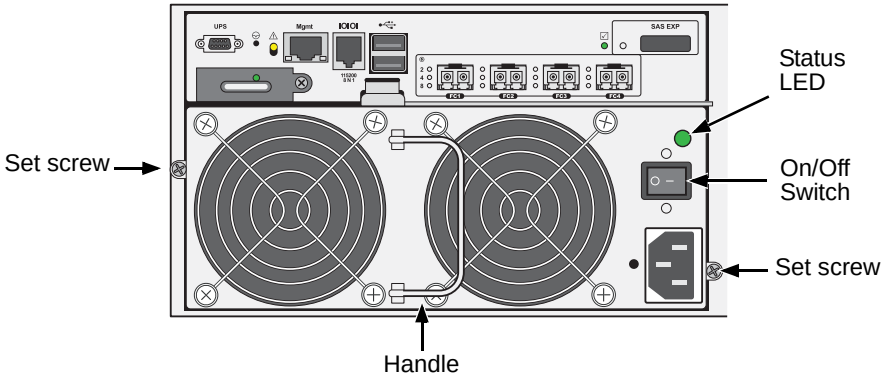
Removing the Old Power Supply

To remove the power supply:

1. Verify that the status LED is amber or red. See Figure 2.
2. Switch off the power.
3. Unplug the power cord.
4. Turn the two set screws counter-clockwise to loosen them.

   The screws are retained on the power supply housing.
5. Grasp the handle and pull the power supply out of the enclosure.

Figure 2. Power supply for VTrak E830f and E630f



Installing a New Power Supply

To install the power supply:

1. Carefully slide the power supply into the enclosure.
2. Turn the two set screws clockwise to tighten them.
3. Plug in the power cord.
4. Switch on the power supply.
5. Verify that the new power supply LED is green. See Figure 2.

Replacing a Cache Backup Battery

The cache backup battery, also called a Battery Backup Unit (BBU) powers the cache to preserve data that has not been written the physical drives. The battery is located inside the RAID controller. Each RAID controller has its own battery.

Cautions

- Try reconditioning the battery before you replace it. See “Reconditioning a Battery” on page 90 or page 223 for more information.
- The battery assembly is replaced as a unit. Do not attempt to disconnect the battery by itself.
- Installing the wrong replacement battery can result in an explosion.
- Dispose of used batteries according to the instructions that accompany the battery.
- While the battery is removed, your system is vulnerable to data loss if the power fails while data is being written to the logical drives.
- If power service has failed, do not remove the battery if the RAID controller’s dirty cache LED is flashing. See page 325, Figure 3.

The cache backup battery is replaced as an assembly. You do not have to power down the RAID subsystem nor disconnect any cables from the RAID controller. You need a No. 1 Phillips screwdriver for this procedure.

Removing the Old Battery

To remove a battery:

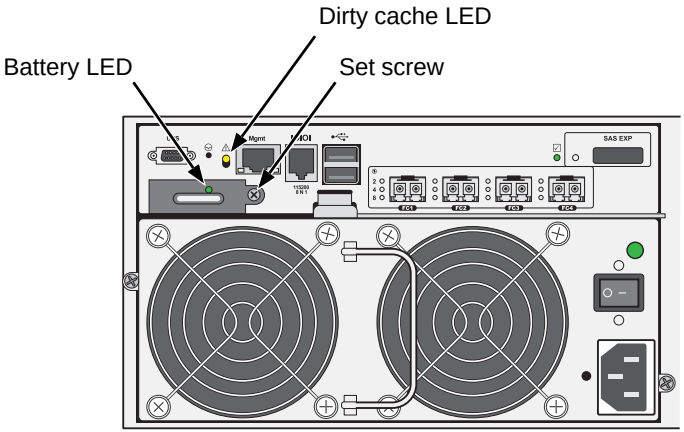
1. Verify that the battery LED is amber or red. See page 325, Figure 3.
2. Loosen and remove the set screw.
3. Grasp the handle and pull the battery out of the RAID controller.

Installing a New Battery

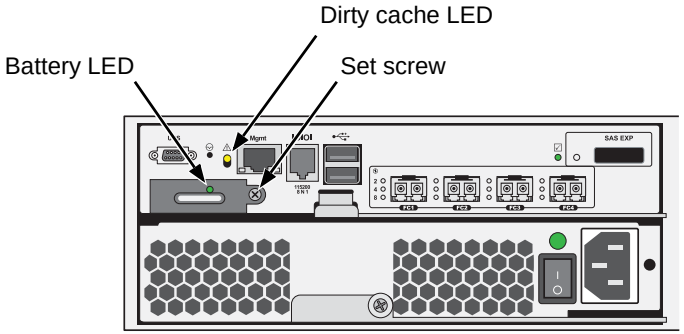
To install the battery:

1. Carefully slide the battery into the RAID controller.
2. Replace and tighten the set screw.
3. Verify that the battery LED is green.

Figure 3. Cache backup battery



VTrak E830f and E630f



VTrak E330f

Replacing a RAID Controller – Dual Controllers

The RAID controller monitors and manages the logical drives. When the RAID controller is replaced, all of your logical drive data and configurations remain intact because logical drive information is stored on the physical drives.

Important

- Do not replace the RAID controller based on LED colors alone. Only replace the RAID controller when directed to do so by PROMISE Technical Support. See page 435.
- The firmware version and amount of SDRAM must be the same on the replacement RAID controller and the other RAID controller in the subsystem.

  To obtain firmware and SDRAM information for an installed RAID controller, in WebPAM PROe, click the **Administration** button then click the **Image Version** icon.
- Replacement RAID controllers to not come with a BBU. Remove the BBU from the old controller and install it into the new one. See “Replacing a Cache Backup Battery” on page 324.

Note

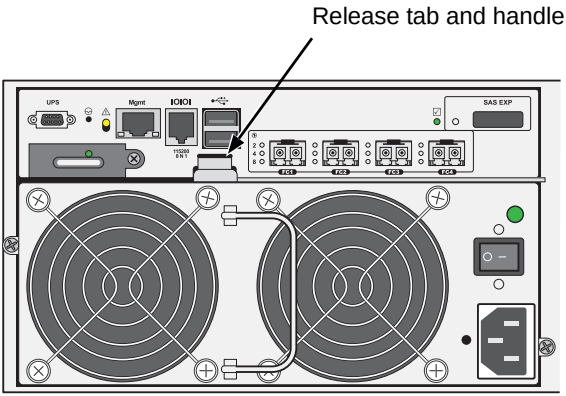
On subsystems with dual RAID controllers, you can hot-swap a controller while the subsystem is running.

Removing the Old Controller

To remove a RAID controller:

1. Disconnect all attached cables from the RAID controller,
   - Fibre Channel cables
   - iSCSI cables
   - SAS expansion cables
   - Management port cables
   - Serial cable
   - UPS control cable
2. On the controller handle, squeeze the release tab and pull the handle outward. See page 327, Figure 4.
3. Pull the RAID controller out of the subsystem enclosure.

Figure 4. RAID controller release



Installing the New Controller

To install the new RAID controller:

1. Carefully slide the RAID controller into the enclosure.
2. Gently swing the handle in and press the handle until it locks.
3. Reconnect all cables that were attached to the RAID controller.
   - Fibre Channel cables
   - iSCSI cables
   - SAS expansion cables
   - Management port cables
   - Serial cable
   - UPS control cable

   If one of the controllers goes into maintenance mode, see “Maintenance Mode” on page 395.

Replacing a RAID Controller – Single Controller

The RAID controller monitors and manages the logical drives. When the RAID controller is replaced, all of your logical drive data and configurations remain intact because logical drive information is stored on the physical drives.

Caution

The RAID controller is NOT hot-swappable if your VTrak has only one controller. Power-down the VTrak before removing it.

Important

Do not replace the RAID controller based on LED colors alone. Only replace the RAID controller when directed to do so by PROMISE Technical Support. See page 435.

Important

The firmware on the replacement RAID controller must be the same version as the original RAID controller or a later version.

The amount of SDRAM in the replacement RAID controller must be the same as the original RAID controller or greater.

To obtain firmware and SDRAM information for the currently installed RAID controller, click the **Administration** button then click the **Image Version** icon.

Removing the Old Controller

To remove the RAID controller:

1. Shutdown the VTrak. See “Shutting Down the Subsystem” on page 83 (WebPAM PROe) or page 307 (CLU).
2. Switch off the power.
3. Disconnect all attached cables from the RAID controller,
   - Fibre Channel cables
   - iSCSI cables
   - SAS expansion cables
   - Management port cables
   - Serial cable
   - UPS control cable
4. On the controller handle, squeeze the release tab and pull the handle outward. See page 327, Figure 4.
5. Pull the RAID controller out of the subsystem enclosure.

Installing the New Controller

To install the new RAID controller:

1. Carefully slide the RAID controller into the enclosure.
2. Gently swing the handle in and press the handle until it locks.
3. Reconnect all cables that were attached to the RAID controller.
   - Fibre Channel cables
   - iSCSI cables
   - SAS expansion cables
   - Management port cables
   - Serial cable
   - UPS control cable
4. Turn on the power supply switches.

The VTrak restarts. For more information about VTrak's start-up behavior, see "Connecting the Power" on page 41.

5. Log into the VTrak.

   For more information, see "Logging into WebPAM PROe" on page 69 or "Initial Connection" on page 206.

Resetting the Default Password

This feature resets the Administrator's password to the default factory setting, **password**. Use this feature when you have forgotten Administrator's password or a new Administrator has been appointed.

The reset applies to the Administrator's login for WebPAM PROe, the CLI, and the CLU. No other user passwords are affected.

To reset the Administrator's default password:

1. Verify that the VTrak has fully booted.

   See page 41 or page 377 for more information.

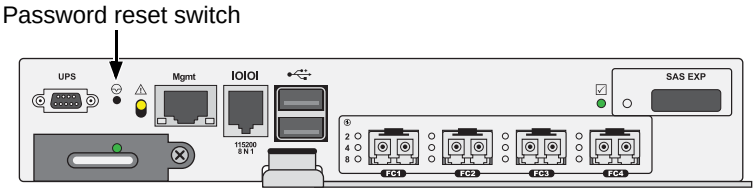
2. For one of the RAID controllers, locate the password reset switch.

   See Figure 5.

3. Insert a pin or a straightened paper clip into the opening and momentarily depress password reset switch.

   You only need to press the reset switch on one RAID controller.

Figure 5. FC RAID controller password reset



The next time the Administrator logs in, use the default password, **password**.

For more information, see "Logging into WebPAM PROe" on page 69 and "Logging Into the CLI" on page 208.

Important

PROMISE recommends that you change the Administrator's default password immediately after reset. See "Changing User Passwords" on page 105 or page 288.

Chapter 7: Technology Background

This chapter covers the following topics:

Disk Arrays

Disk array technology includes:

Media Patrol

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks all physical drives assigned to disk arrays and spare drives. Media Patrol does not check unconfigured drives.

Media Patrol checks are enabled by default on all disk arrays and spare drives. You can disable Media Patrol in the disk array and spare drive settings, however that action is not recommended.

Unlike Synchronization and Redundancy Check, Media Patrol is concerned with the condition of the media itself, not the data recorded on the media. If Media Patrol encounters a critical error, it triggers PDM, if PDM is enabled on the disk array.

Media Patrol has three status conditions:

- **Running** – Normal. You can access your logical drives at any time.
- **Yield** – Temporary pause while a read/write operation takes place.
- **Paused** – Temporary pause while another background runs. Or a pause initiated by the user.

  See “Running Media Patrol on a Disk Array” on page 158.

PDM

Predictive Data Migration (PDM) is the migration of data from the suspect phyical drive to a spare drive, similar to rebuilding a logical drive. But unlike Rebuilding,

PDM constantly monitors your physical drives and automatically copies your data to a spare drive *before* the physical drive fails and your logical drive goes Critical.

The following actions trigger PDM:

- A phyical drive with unhealthy status (see below)
- Media Patrol finds a critical error
- You initiate PDM manually

PDM also counts the number of media errors reported by Media Patrol. A disk drive becomes unhealthy when:

- A SMART error is reported
- The bad sector remapping table fills to the specified level.

Because data would be lost if written to a bad sector, when a bad sector is detected, the physical drive creates a map around it. These maps are saved in the *bad sector remapping table*, which has a capacity of 512 reassigned blocks and 2048 error blocks. See “Making PDM Settings” on page 121 or “Making Background Activity Settings” on page 273.

You can specify the maximum levels for the reassigned and error blocks in PDM settings. When the table fills to a specified value, PDM triggers a migration of data from the suspect drive (the disk drive with the bad sectors) to a replacement physical drive.

During data migration, you have access to your logical drives but they respond more slowly to read/write tasks because of the additional operation. The time required for data migration depends on the size of the physical drives.

PDM is enabled on all disk arrays by default. You can disable PDM in the disk array settings, however that action is not recommended.

See “Running PDM on a Disk Array” on page 159 or page 237.

Power Management

See “Power Saving” on page 364.

Logical Drives

Logical drive technology includes:

- RAID Levels (page 333)
- RAID Level Migration (page 347)
- Stripe Size (page 353)
- Sector Size (page 353)
- Preferred Controller ID (page 353)
- Initialization (page 354)
- Partition and Format (page 354)

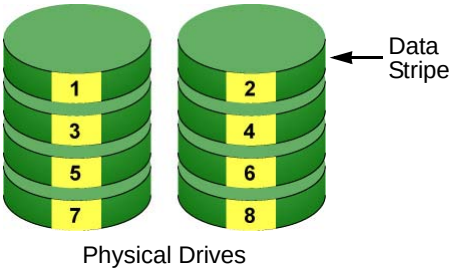
RAID Levels

RAID (Redundant Array of Independent Disks) allows multiple physical drives to be combined together in a disk array. Then all or a portion of the disk array is formed into a logical drive. The operating system sees the logical drive as a single storage device, and treats it as such.

RAID 0 – Stripe

When a logical drive is striped, the read and write blocks of data are interleaved between the sectors of multiple physical drives. Performance is increased, since the workload is balanced between drives or “members” that form the logical drive. Identical drives are recommended for performance as well as data storage efficiency.

Figure 1. RAID 0 Striping interleaves data across multiple drives



The disk array’s data capacity is equal to the number of disk drive members multiplied by the smallest drive’s capacity. For example, one 100 GB and three 120 GB drives form a 400 GB (4 x 100 GB) disk array instead of 460 GB.

If physical drives of different capacities are used, there is unused capacity on the larger drives.

RAID 0 logical drives on VTrak consist of one or more physical drives.

Advantages	Disadvantages
• Implements a striped disk array, the data is broken down into blocks and each block is written to a separate disk drive • I/O performance is greatly improved by spreading the I/O load across many channels and drives • No parity calculation overhead is involved	• Not a true RAID because it is not fault-tolerant • The failure of just one drive results in all data in an disk array being lost • Should not be used in mission critical environments

Recommended Applications for RAID 0:

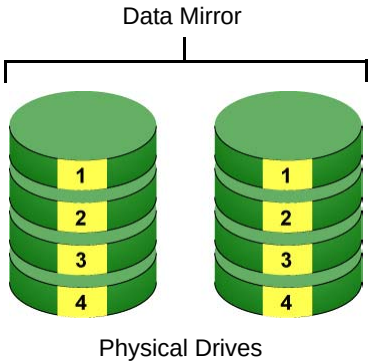
- Image Editing
- Pre-Press Applications
- Any application requiring high bandwidth

RAID 1 – Mirror

When a logical drive is mirrored, identical data is written to a pair of physical drives, while reads are performed in parallel. The reads are performed using elevator seek and load balancing techniques where the workload is distributed in the most efficient manner. Whichever drive is not busy and is positioned closer to the data is accessed first.

With RAID 1, if one physical drive fails or has errors, the other mirrored physical drive continues to function. Moreover, if a spare physical drive is present, the spare drive is used as the replacement drive and data begins to mirrored to it from the remaining good drive.

Figure 2. RAID 1 Mirrors identical data to two drives



The logical drive's data capacity equals the smaller physical drive. For example, a 100 GB physical drive and a 120 GB physical drive have a combined capacity of 100 GB in a mirrored logical drive.

If physical drives of different capacities are used, there is unused capacity on the larger drive.

RAID 1 logical drives on VTrak consist of two physical drives.

If you want a mirrored logical drive with more than two physical drives, see "RAID 1E – Enhanced Mirror" on page 337.

Advantages	Disadvantages
• Simplest RAID storage subsystem design • Can increase read performance by processing data requests in parallel since the same data resides on two different drives	• Very high disk overhead – uses only 50% of total capacity

Recommended Applications for RAID 1:

- Accounting
- Payroll
- Financial
- Any application requiring very high availability

RAID 1E – Enhanced Mirror

RAID 1E offers the security of mirrored data provided by RAID 1 plus the added capacity of more than two physical drives. It also offers overall increased read/write performance plus the flexibility of using an odd number of physical drives. With RAID 1E, each data stripe is mirrored onto two physical drives. If one drive fails or has errors, the other drives continue to function, providing fault tolerance.

Figure 3. RAID 1E can mirror data over an odd number of drives

The advantage of RAID 1E is the ability to use an odd number of physical drives, unlike RAID 1 and RAID 10. You can also create a RAID 1E Logical Drive with an even number of physical drives. However, with an even number of drives, you obtain somewhat greater security with comparable performance using RAID 10.

RAID 1E logical drives consist of three or more physical drives. You can create an array with just two physical drives and specify RAID 1E. But the resulting array is actually a RAID 1.

Advantages	Disadvantages
• Implemented as a mirrored disk array whose segments are RAID 0 disk arrays • High I/O rates are achieved thanks to multiple stripe segments • Can use an odd number of disks	• Very high disk overhead – uses only 50% of total capacity

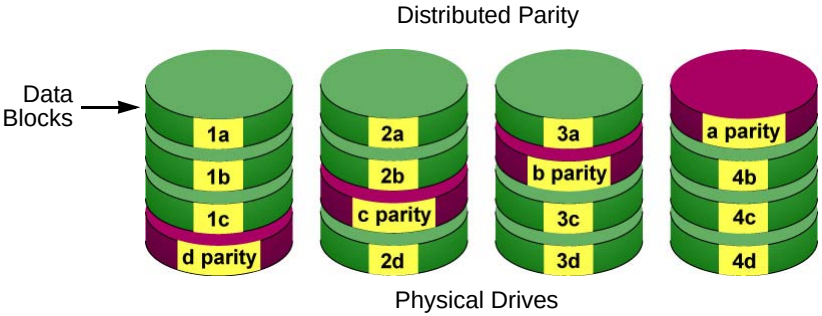
Recommended Applications for RAID 1E:

- Imaging applications
- Database servers
- General fileserver

RAID 5 – Block and Parity Stripe

RAID 5 organizes block data and parity data across the physical drives. Generally, RAID Level 5 tends to exhibit lower random write performance due to the heavy workload of parity recalculation for each I/O. RAID 5 is generally considered to be the most versatile RAID level. It works well for file, database, application and web servers.

Figure 4. RAID 5 stripes all drives with data and parity information



The capacity of a RAID 5 logical drive equals the smallest physical drive times the number of physical drives, minus one. Hence, a RAID 5 logical drive with four 100 GB physical drives has a capacity of 300 GB. A RAID 5 logical drive with two 120 GB physical drives and one 100 GB physical drive has a capacity of 200 GB.

RAID 5 is generally considered to be the most versatile RAID level.

A RAID 5 on VTrak consists of 3 to 32 physical drives.

Advantages	Disadvantages
• High Read data transaction rate • Medium Write data transaction rate • Good aggregate transfer rate • Most versatile RAID level	• Disk failure has a medium impact on throughput

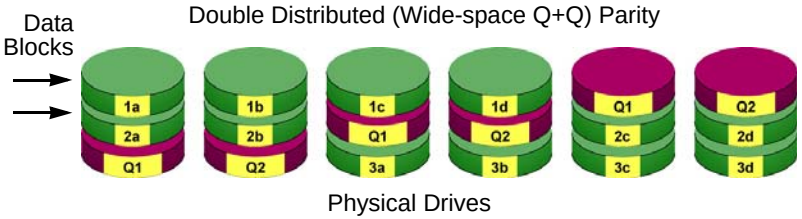
Recommended Applications for RAID 5:

- File and Application servers
- WWW, E-mail, and News servers
- Intranet servers

RAID 6 – Block and Double Parity Stripe

RAID level 6 stores dual parity data is rotated across the physical drives along with the block data. A RAID 6 logical drive can continue to accept I/O requests when any two physical drives fail.

Figure 5. RAID 6 stripes all drives with data and dual parity



Hence, a RAID 6 logical drive with (7) 100 GB physical drives has a capacity of 500 GB. A RAID 6 logical drive with (4) 100 GB physical drives has a capacity of 200 GB.

RAID 6 becomes more capacity efficient in terms of physical drives as the number of physical drives increases.

RAID 6 provides double fault tolerance. Your logical drive remains available when up to two physical drives fail.

RAID 6 is generally considered to be the safest RAID level.

A RAID 6 on VTrak consists of 4 to 32 physical drives.

Advantages	Disadvantages
• High Read data transaction rate • Medium Write data transaction rate • Good aggregate transfer rate • Safest RAID level, except for RAID 60	• High disk overhead – equivalent of two drives used for parity • Slightly lower performance than RAID 5

Recommended Applications for RAID 6:

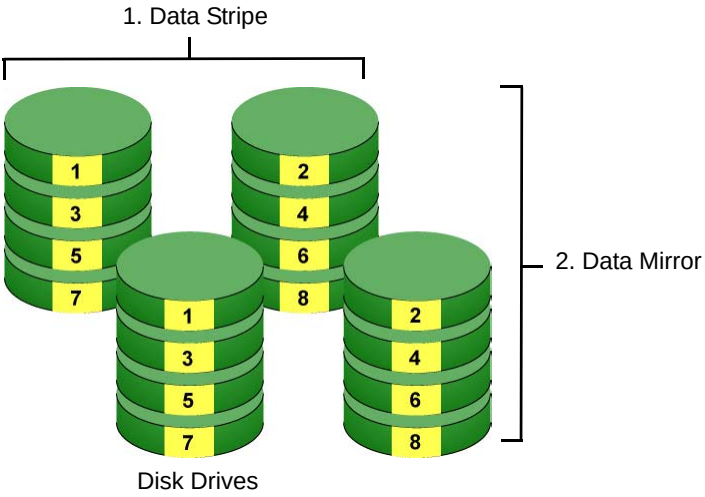
- Accounting and Financial
- Database servers
- Any application requiring very high availability

RAID 10 – Mirror + Stripe

Mirror + Stripe combines both of the RAID 1 and RAID 0 logical drive types. RAID 10 can increase performance by reading and writing data in parallel or striping, and duplicating the data, or mirroring.

PROMISE implements RAID 10 by creating a data stripe over one pair of disk drives, then mirroring the stripe over a second pair of disk drives. Some applications refer to this method as RAID 0+1.

Figure 6. PROMISE RAID 10 starts with a data stripe, then mirrors it



The data capacity RAID 10 logical drive equals the capacity of the smallest physical drive times the number of physical drives, divided by two.

In some cases, RAID 10 offers double fault tolerance, depending on which physical drives fail.

RAID 10 arrays require an even number of physical drives and a minimum of four.

For RAID 10 characteristics using an odd number of physical drives, choose RAID 1E.

Advantages	Disadvantages
• Implemented as a mirrored disk array whose segments are RAID 0 disk arrays • High I/O rates are achieved thanks to multiple stripe segments	• Very high disk overhead – uses only 50% of total capacity

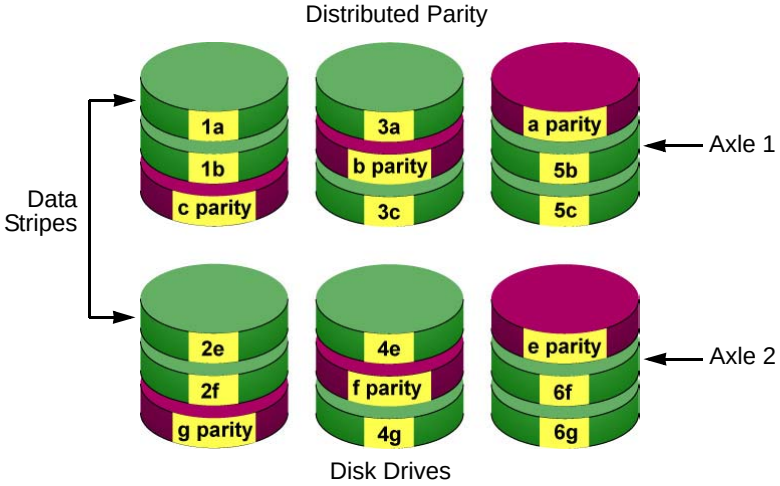
Recommended Applications for RAID 10:

- Imaging applications
- Database servers
- General fileserver

RAID 50 – Striping of Distributed Parity

RAID 50 combines both RAID 5 and RAID 0 features. Data is striped across physical drives as in RAID 0, and it uses distributed parity as in RAID 5. RAID 50 provides data reliability, good overall performance, and supports larger volume sizes.

Figure 7. RAID 50 is a combination of RAID 5 and RAID 0



The data capacity RAID 50 logical drive equals the capacity of the smallest physical drive times the number of physical drives, minus two.

RAID 50 also provides very high reliability because data is still available even if multiple physical drives fail (one in each axle). The greater the number of axles, the greater the number of physical drives that can fail without the RAID 50 logical drive going offline.

Component	Minimum	Maximum
Number of Axles	2	16
Physical Drives per Axle	3	32
Physical Drives per Logical Drive	6	256

RAID 50 Axles

When you create a RAID 50, you must specify the number of axles. An axle refers to a single RAID 5 logical drive that is striped with other RAID 5 logical drives to make RAID 50. An axle can have from 3 to 32 physical drives, depending on the number of physical drives in the logical drive.

The chart below shows RAID 50 logical drives with 6 to 32 physical drives, the available number of axles, and the resulting distribution of physical drives on each axle.

RAID 50 Logical Drive						
No. of Drives	**No. of Axles**	**Drives per Axle**		**No. of Drives**	**No. of Axles**	**Drives per Axle**
6	2	3,3		14	2	7,7
7	2	3,4			3	4,5,5
8	2	4,4			4	3,3,4,4
9	2	4,5		15	2	7,8
	3	3,3,3			3	5,5,5
10	2	5,5			4	3,4,4,4
	3	3,3,4			5	3,3,3,3,3
11	2	5,6		16	2	8,8
	3	3,4,4			3	5,5,6
12	2	6,6			4	4,4,4,4
	3	4,4,4			5	3,3,3,3,4
	4	3,3,3,3				
13	2	6,7				
	3	4,4,5				
	4	3,3,3,4				

Advantages	Disadvantages
• High Read data transaction rate • Medium Write data transaction rate • Good aggregate transfer rate • High reliability • Supports large volume sizes	• Higher disk overhead than RAID 5

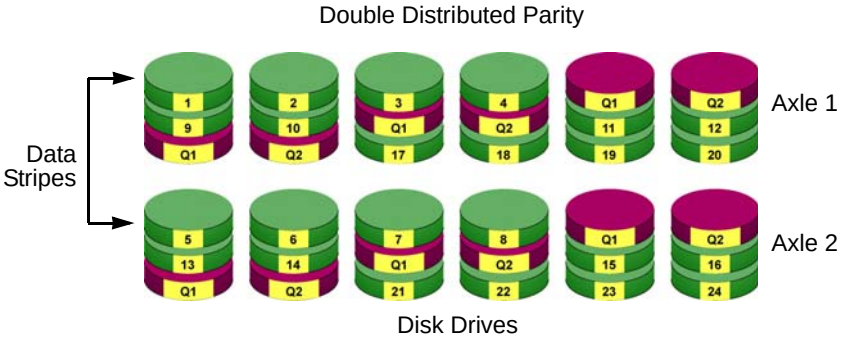
Recommended Applications for RAID 50:

- File and Application servers
- Transaction processing
- Office application with many users accessing small files

RAID 60 – Striping of Double Parity

RAID 60 combines both RAID 6 and RAID 0 features. Data is striped across disks as in RAID 0, and it uses double distributed parity as in RAID 6. RAID 60 provides data reliability, good overall performance and supports larger volume sizes.

Figure 8. RAID 60 is a combination of RAID 6 and RAID 0



The total capacity of a RAID 60 logical drive is the smallest physical drive times the number of physical drives, minus four.

RAID 60 also provides very high reliability because data is still available even if multiple physical drives fail (two in each axle). The greater the number of axles, the greater the number of physical drives that can fail without the RAID 60 logical drive going offline.

Component	Minimum	Maximum
Number of Axles	2	16
Physical Drives per Axle	4	32
Physical Drives per Logical Drive	8	256

RAID 60 Axles

When you create a RAID 60, you must specify the number of axles. An axle refers to a single RAID 6 logical drive that is striped with other RAID 6 logical drives to make RAID 60. An axle can have from 4 to 32 physical drives, depending on the number of physical drives in the logical drive.

RAID 60 Logical Drive					
No. of Drives	**No. of Axles**	**Drives per Axle**	**No. of Drives**	**No. of Axles**	**Drives per Axle**
8	2	4,4	17	2	8,9
9	2	4,5		3	5,6,6
10	2	5,5		4	4,4,4,5
11	2	5,6	18	2	9,9
12	2	6,6		3	6,6,6
	3	4,4,4		4	4,4,5,5
13	2	6,7	19	2	9,10
	3	4,4,5		3	6,6,7
14	2	7,7		4	4,5,5,5
	3	4,5,5	20	2	10,10
15	2	7,8		3	6,7,7
	3	5,5,5		4	5,5,5,5
16	2	8,8		5	4,4,4,4,4
	3	5,5,6			
	4	4,4,4,4			

Advantages	Disadvantages
• High Read data transaction rate • Medium Write data transaction rate • Good aggregate transfer rate • Safest RAID level	• High disk overhead – equivalent of two drives used for parity • Slightly lower performance than RAID 50

Recommended Applications for RAID 60:

- Accounting and Financial
- Database servers
- Any application requiring very high availability

RAID Level Migration

The term “Migration” means either or both of the following:

- Change the RAID level of a logical drive.
- Expand the storage capacity of a logical drive.

On VTrak, RAID level migration is performed on the disk array but it applies to the logical drives. Migration does not disturb your data. You can access the data while the migration is in progress. When migration is done, your disk array has a different RAID level and/or a larger capacity.

Migration Requirements

The following conditions affect RAID level migration:

- The disk array and logical drive must show a green check icon.
- The Target disk array may require more physical drives than the Source disk array.
- If the Target disk array requires an EVEN number of physical drives but the Source disk array has an ODD number, ADD a physical drive as part of the migration process.
- You cannot reduce the number of physical drives in your disk array, even if the Target disk array requires fewer physical drives than the Source disk array.
- RAID 1 (mirroring) works with two drives only. Only a single-drive RAID 0 disk array can migrate to RAID 1. Other RAID Levels use too many drives to migrate.
- You cannot migrate a disk array when it is Critical or performing activities such as Synchronizing, Rebuilding, and PDM.
- For RAID 6 or RAID 60, you can only migrate between these two RAID levels. Destination RAID 60 axles can have up to 16 physical drives. Other limitations might apply.

Source and Target RAID Levels

The tables on the following pages show the migration options for each source logical drive by its RAID level. The available target RAID levels are shown with their requirements.

RAID 0

A RAID 0 source logical drive can migrate to the following target logical drives:

Target	Requirements
RAID 0	Add physical drives.
RAID 1	2 physical drives only. Only a single-drive RAID 0 can migrate to RAID 1 by adding 1 physical drive.
RAID 1E	3 or more physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 5	3 physical drives minimum, 32 maximum. RAID 0 must have less than 16 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 6	4 physical drives minimum, 32 maximum. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

RAID 1

A RAID 1 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	3 or more physical drives. Add 1 or more physical drives.
RAID 5	3 physical drives minimum, 32 maximum. RAID 1 must have less than 32 physical drives. Add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. Add 2 or more physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum. Add 4 or more physical drives.

RAID 1E

A RAID 1E Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	Add physical drives.
RAID 5	3 physical drives minimum, 32 maximum. RAID 1E must have less than 32 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum.

RAID 5

A RAID 5 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	None.
RAID 5	Add physical drives. 32 maximum.
RAID 6	4 physical drives minimum, 32 maximum. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

RAID 6

A RAID 6 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 6	Add physical drives. 32 maximum.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

RAID 10

A RAID 10 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	None.
RAID 5	3 physical drives minimum, 32 maximum. RAID 10 must have less than 16 physical drives.
RAID 6	4 physical drives minimum, 32 maximum. RAID 10 must have less than 32 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	Add physical drives. Even number of physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

When you migrate RAID 10 logical drive, it becomes RAID 1E by default.

If you want a RAID 10 logical drive, there must be an even number of physical drives and you must specify RAID 10 for the target logical drive.

RAID 50

A RAID 50 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	None.
RAID 5	32 physical drives maximum. RAID 50 must have less than 32 physical drives.
RAID 6	32 physical drives maximum. RAID 50 must have less than 32 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	Even number of physical drives.
RAID 50	Add physical drives. 32 per axle maximum.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

You can add physical drives to a RAID 50 array but you cannot change the number of axles.

RAID 60

A RAID 60 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 6	32 physical drives maximum. RAID 60 must have less than 32 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 60	Add physical drives. 32 per axle maximum.

You can add physical drives to a RAID 60 array but you cannot change the number of axles.

Stripe Size

Stripe Size, also called “Stripe Block Size,” refers to the size of the data blocks written to, and read from, the physical drives. Stripe Size is specified when you create a logical drive. You can choose Stripe Size directly when you use the Wizard Advanced Configuration function to create a logical drive.

You cannot change the Stripe Size of an existing logical drive. You must delete the logical drive and create a new one.

The available Stripe Sizes are 64 KB, 128 KB, 256 KB, 512 KB, and 1 MB. 64 KB is the default. There are two issues to consider when choosing the Stripe Size:

- You should choose a Stripe Size equal to, or smaller than, the smallest cache buffer found on any physical drive in the disk array. Selecting a larger value slows read/write performance because physical drives with smaller cache buffers need more time for multiple accesses to fill their buffers.
- If your data retrieval consists of fixed data blocks, such as with some database or video applications, then you should choose that size as your Stripe Size.

If you do not know the cache buffer or fixed data block sizes, choose 64 KB as your Stripe Size. Generally speaking,

- Email, POS, and web servers prefer smaller stripe sizes.
- Video and database applications prefer larger stripe sizes.

Sector Size

A sector is the smallest addressable area on a physical drive. Sector size refers to the number of data bytes a sector can hold. A smaller sector size is a more efficient use of a physical drive’s capacity. 512 bytes (512 B) is the most common sector size, and the default in WebPAM PROe.

Preferred Controller ID

When you create a logical drive using the Advanced method of disk array creation, you can specify the Preferred Controller ID:

- **Controller 1** – Assign all logical drives to Controller 1
- **Controller 2** – Assign all logical drives to Controller 2.
- **Automatic** – Alternate logical drive assignments between Controllers 1 and 2.

Automatic is the default and preferred setting because it balances the logical drive assignments for you.

See “Creating a Disk Array Manually” on page 150, “Creating a Disk Array with the Wizard” on page 151, and “Creating a Disk Array – Advanced” on page 232.

Initialization

Initialization is done to logical drives after they are created from a disk array. Full initialization sets all data bits in the logical drive to a specified pattern, such as all zeros. The action is useful because there may be residual data on the logical drives left behind from earlier configurations. For this reason, Initialization is recommended for all new logical drives. See “Initializing a Logical Drive” on page 167 or page 245.

Caution

When you initialize a logical drive, all the data on the logical drive is lost. Backup any important data before you initialize a logical drive.

Partition and Format

Like any other type of fixed disk media in your system, a RAID logical drive must also be partitioned and formatted before use. Use the same method of partitioning and formatting on an logical drive as you would any other fixed disk.

Depending on the operating system you use, there may or may not be various capacity limitations applicable for the different types of partitions.

Spare Drives

Spare drive technology includes:

Definition

A spare drive is a physical drive that you designate to automatically replace the failed physical drive in a disk array. See “Creating a Spare Drive Manually” on page 173.

The general recommendation is to:

- Provide at least one spare drive for every 16 physical drives in the RAID system
- Configure the spares as **global revertible** spare drives

Options

There are several options you can specify for a spare drive:

- **System Options**
  - **Revertible** – Returns to its spare drive assignment after you replace the failed physical drive in the disk array and run the Transition function.
  - **Media Patrol** – By default, Media Patrol runs on spare drives unless you disable it.
- **Spare Type**
  - **Global** – Can be used by any disk array
  - **Dedicated** – Can be used only by the assigned disk array
- **Media Type (type of physical drive)**
  - Hard Disk Drive (HDD)
  - Solid State Drive (SSD)

Requirements

The spare drive must:

- Have adequate capacity to replace the largest physical drive in your disk arrays.
- Be the same media type as the physical drives in your disk arrays.

A revertible spare drive requires:

- You to replace the failed physical drive in the disk array
- You to run the Transition function

Transition

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. The revertible spare drive returns to its original status. In order to run the Transition function, the spare drive must be revertible.

In addition, you must specify an unconfigured physical drive of the same or larger capacity and same media type as the revertible spare drive.

Running a Transition

The Transition feature enables you to specify “permanent” spare drives for your VTrak subsystem. Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. The revertible spare drive returns to its original status.

Transition happens automatically when the following sequence of events takes place:

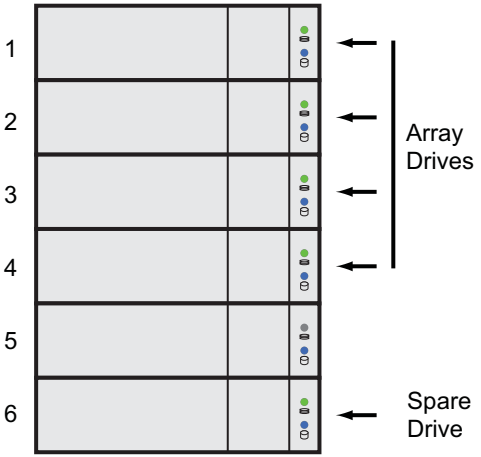
- You create a revertible spare drive. See “Creating a Spare Drive Manually” on page 173 or page 239.
- A physical drive assigned to your disk array fails and the array goes critical or degraded.
- VTrak automatically rebuilds your array to the revertible spare drive and the array becomes functional again.
- You replace the failed physical drive with a new physical drive of equal or greater capacity.
- VTrak automatically transitions (moves) the data from the revertible spare to the new physical drive.
- The new physical drive becomes part of the array and the revertible spare drive returns to its original spare status.

Transition happens manually when you specify a different unconfigured physical drive to transition (move) the data from the revertible spare drive.

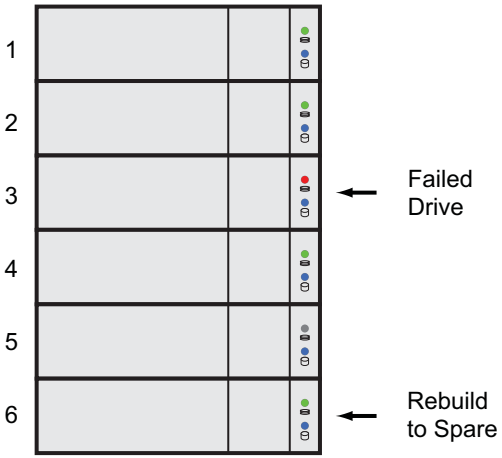
See the example on the following pages.

Example

Following is an example to explain the Transition function.

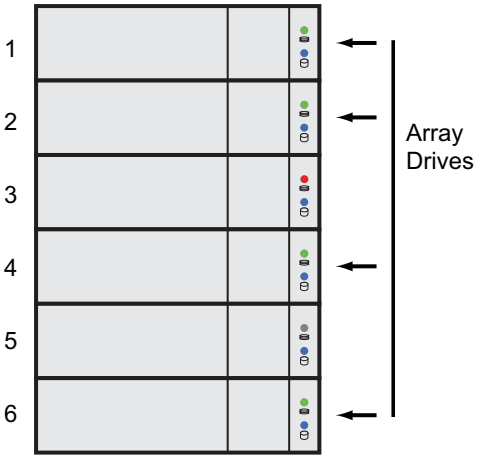


In the example above, there is a four-drive RAID 5 disk array and a global spare drive. Physical drives 1, 2, 3, and 4 belong to the disk array. Physical drive 5 remains unconfigured. Physical drive 6 is a revertible spare drive.



If a physical drive fails in a disk array and there is a spare drive of adequate capacity available, the controller automatically rebuilds the array using the spare

drive. In this example, physical drive 3 failed and the array is rebuilt using physical drive 6, the revertible spare drive.

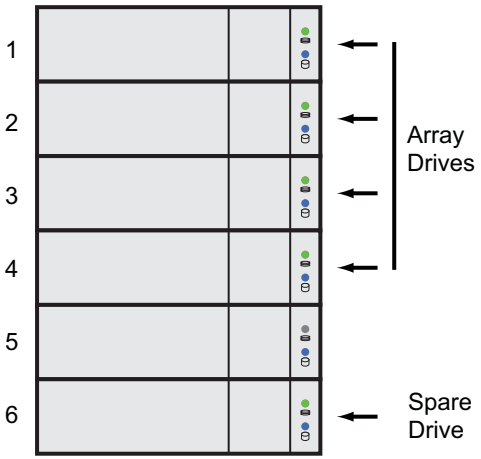


When the rebuild is complete, the spare drive has replaced the failed drive. In this example, failed drive 3 was replaced by spare drive 6. The disk array now consists of physical drives 1, 2, 4, and 6.

There is no spare drive at this moment. Even if physical drive 5 is of adequate capacity, it has not been designated as a spare, therefore the controller cannot use it as a spare.

Automatic Transition

At this juncture, you would replace the failed drive in slot 3 with a new one of the same or greater capacity.



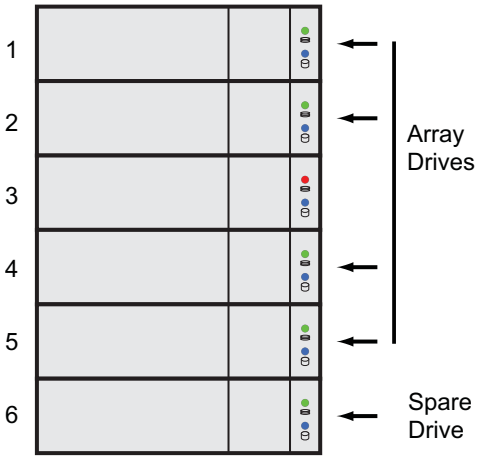
When the VTrak controller detects the new drive in slot 3, the controller:

- Automatically transitions the data on drive 6 to drive 3
- Returns drive 6 to spare status

When the Automatic Transition is finished, physical drives 1, 2, 3, and 4 belong to the disk array and physical drive 6 is a revertible spare drive. The original configuration is restored.

Manual Transition

If you wanted to use the drive in slot 5 as a member of the disk array, rather than the drive in slot 3, you would run the Transition function manually. See “Running a Transition on a Spare Drive” on page 175 or “Running Transition on a Disk Array” on page 237.



When the Manual Transition is finished, physical drives 1, 2, 4, and 5 belong to the disk array and physical drive 6 is a revertible spare drive.

At this point, you would replace the drive in slot 3. The new drive in slot 3 remains unconfigured until you assign it to a disk array or as a spare.

RAID Controllers

RAID controller technology includes;

- LUN Affinity (page 361)
- ALUA (page 361)
- Cache Policy (page 362)
- Preferred Controller ID (page 364)
- Power Saving (page 364)
- Capacity Coercion (page 364)

LUN Affinity

VTrak subsystems with dual RAID controllers include a LUN Affinity feature. Normally, either controller can access all logical drives. LUN Affinity enables you to specify which controller can access each logical drive. Use this feature to balance the load of your logical drives between the two controllers.

To use LUN Affinity you must:

- Have two RAID controllers in the subsystem.
- Set the redundancy type to **Active-Active**.

  See “Making Subsystem Settings” on page 77 or page 211.
- Enable LUN Affinity.

  See “Making Controller Settings” on page 86 or page 216.

On subsystems with two RAID controllers, when Cache Mirroring is disabled, LUN Affinity is enabled automatically.

ALUA

VTrak supports Asymmetric Logical Unit Access (ALUA) on Linux OSes. ALUA is a multhipathing tool. It enables an initiator (your host PC or server) to discover target port groups that provide a common failover/failback behavior for your LUNs. ALUA enables the host to see which paths are in an optimal state and which are not.

To use ALUA you must:

- Have two RAID controllers in the subsystem.
- Set the redundancy type to **Active-Active**.

  See “Making Subsystem Settings” on page 77 or page 211.
- Enable LUN Affinity and ALUA.

  See “Making Controller Settings” on page 86 or page 216.

For more information, see “Appendix C: Multipathing on Linux” on page 471.

Cache Policy

As it is used with VTrak, the term cache refers to any of several kinds of high-speed, volatile memory that hold data moving from your computer to the physical drives or vice-versa. Cache is important because it can read and write data much faster than a physical drive. There are read caches, which hold data as it is read from a physical drive; and write caches, which hold data as it is written to a physical drive.

In order to tune the cache for best performance in different applications, user-adjustable settings are provided. Cache settings are made on the RAID controller. See “Making Controller Settings” on page 86 (WebPAM PROe) or page 216 (CLU).

Read Cache Policy

- **Read Cache** – The read cache is enabled but no pre-fetch action.
- **Read Ahead** – The read cache and predictive pre-fetch feature are enabled. Read-ahead anticipates the next read and performs it before the request is made. Can increase read performance.
- **Forced Read Ahead** – The read cache and aggressive pre-fetch feature are enabled. See “Forced Read-Ahead Cache” below.
- **No Cache** – The read cache is disabled.

Write Cache Policy

- **Write Back** – Data is written first to the cache, then to the logical drive. Better performance. VTrak has a cache backup battery to protect data in the cache from a sudden power failure.
- **Adaptive Writeback** – See “Adaptive Writeback Cache” below.
- **Write Thru** – Also “Write Through.” Data is written to the cache and the logical drive at the same time. Safer.

If your write cache policy is set to Write Back, the write policy automatically changes to Write Thru when all of the following conditions occur:

- The logical drive write policy is set to Write Back
- The Adaptive Writeback Cache feature is enabled
- The cache backup battery goes offline

When the battery comes back online, the write policy automatically changes back to Write Back. Also see “Viewing Battery Information” on page 89 or page 222.

Forced Read-Ahead Cache

On the VTrak subsystem, you can set the logical drive read cache policy to Forced Read Ahead an enable the aggressive pre-fetch feature.

The Forced Read-Ahead cache policy setting provides predictive pre-fetching of data requests, allowing the controller to aggressively buffer large chunks of data in cache memory to prevent frame drops on high-bandwidth video playback. Not normally enabled for non-video applications.

Adaptive Writeback Cache

On the VTrak subsystem, you can set the logical drive write cache policy to Write Thru or Write Back.

If you set the write cache policy to Write Back, your data is first written to the controller cache, and later to the logical drive. This action improves performance. To preserve the data in the cache in the event of a power failure, the subsystem has a backup battery that powers the cache. To see an estimate of how long the battery can power the cache, see “Viewing Battery Information” on page 89 or “Viewing Battery Information” on page 222.

The Adaptive Writeback Cache feature protects your data by changing the write cache settings while the cache backup battery is offline. When all of the following conditions occur:

- The logical drive write policy is set to Write Back.
- The Adaptive Writeback Cache feature is enabled.
- The cache backup battery goes offline.

The write policy automatically changes to Write Thru. When the battery comes back online, the write policy automatically changes back to Write Back.

To enable the Adaptive Writeback Cache option, see “Making Controller Settings” on page 86 or page 216.

Host Cache Flushing

On the VTrak subsystem, you can enable or disable host cache flushing.

When enabled, host cache flushing guards against data loss in the event of a power failure. However RAID performance is slightly reduced.

When disabled, the VTrak subsystem has greater sustained bandwidth and lower latency, which are helpful for real-time video capture.

When you operate the VTrak with host cache flushing disabled, use a UPS to protect against data loss.

Preferred Controller ID

See “Preferred Controller ID” on page 353.

Power Saving

Power saving is a method of conserving energy by applying specific actions to hard disk drives (HDD). After an HDD has been idle for the set period of time, you can elect to:

- Park the read/write heads – Referred to as **Power Saving *Idle* Time** on VTrak.
- Reduce disk rotation speed – Referred to as **Power Saving *Standby* Time** on VTrak.
- Spin down the disk (stop rotation) – Referred to as **Power Saving *Stopped* Time** on VTrak.

Power management must be:

- Set on the RAID controller. See “Making Controller Settings” on page 86 or page 216.
- Enabled on each HDD. See “Making Disk Array Settings” on page 157 or page 233.

Capacity Coercion

This feature is designed for fault-tolerant logical drives (RAID 1, 1E, 5, 10, 50, and 60). It is generally recommended to use physical drives of the same size in your disk arrays. When this is not possible, the system adjusts for the size differences by reducing or coercing the capacity of the larger drives to match the smaller ones. With VTrak, you can choose to enable capacity coercion and any one of four methods.

Enable capacity coercion and choose a method, see “Making Controller Settings” on page 86 or page 216. The choices are:

- **GB Truncate** – (Default) Reduces the useful capacity to the nearest 1,000,000,000 byte boundary.
- **10GB Truncate** – Reduces the useful capacity to the nearest 10,000,000,000 byte boundary.
- **Group Rounding** – Uses an algorithm to determine how much to truncate. Results in the maximum amount of usable drive capacity.
- **Table Rounding** – Applies a predefined table to determine how much to truncate.

Capacity coercion also affects a replacement drive used in a disk array. Normally, when an physical drive fails, the replacement drive must be the same capacity or larger. However, the capacity coercion feature permits the installation of a

replacement drive that is slightly smaller (within 1 gigabyte) than the remaining working drive. For example, the remaining working drives can be 80.5 GB and the replacement drive can be 80.3, since all are rounded down to 80 GB. This permits the smaller drive to be used.

Without capacity coercion, the controller does not permit the use of a replacement physical drive that is slightly smaller than the remaining working drives.

iSCSI Management

iSCSI management uses the following terms:

- Basic iSCSI (page 366)
- iSCSI on a VLAN (page 368)
- Initiator (page 369)
- Target (page 370)
- Portal (page 371)
- Port (page 371)
- Trunk (page 372)
- Session (page 372)
- iSNS (page 372)
- CHAP (page 372)
- Ping (page 373)

Also see “Managing iSCSI Connections” on page 188 or page 257.

A detailed explanation of iSCSI functions and how to best use them is beyond the scope of this document. For more information, contact the Internet Engineering Task Force at http://www.ietf.org/.

Basic iSCSI

See the diagram on page 333, Figure 1.

To set up the data connections on a VTrak iSCSI subsystem:

1. Add a new portal.

   See “Adding iSCSI Portals” on page 194 or page 264.

   Note which iSCSI port you chose for the portal.
2. Add a new target.

   See “Adding iSCSI Targets” on page 190 or page 259.
3. Assign the new portal to the target.

   See “Assigning a Portal to an iSCSI Target” on page 192. The CLU assigns portals when you add the target. See page 259.
4. Map the target to a LUN.

   See “Adding a LUN Map” on page 180 or page 280.
5. Connect your iSCSI data cable to the iSCSI port you chose for the new portal.

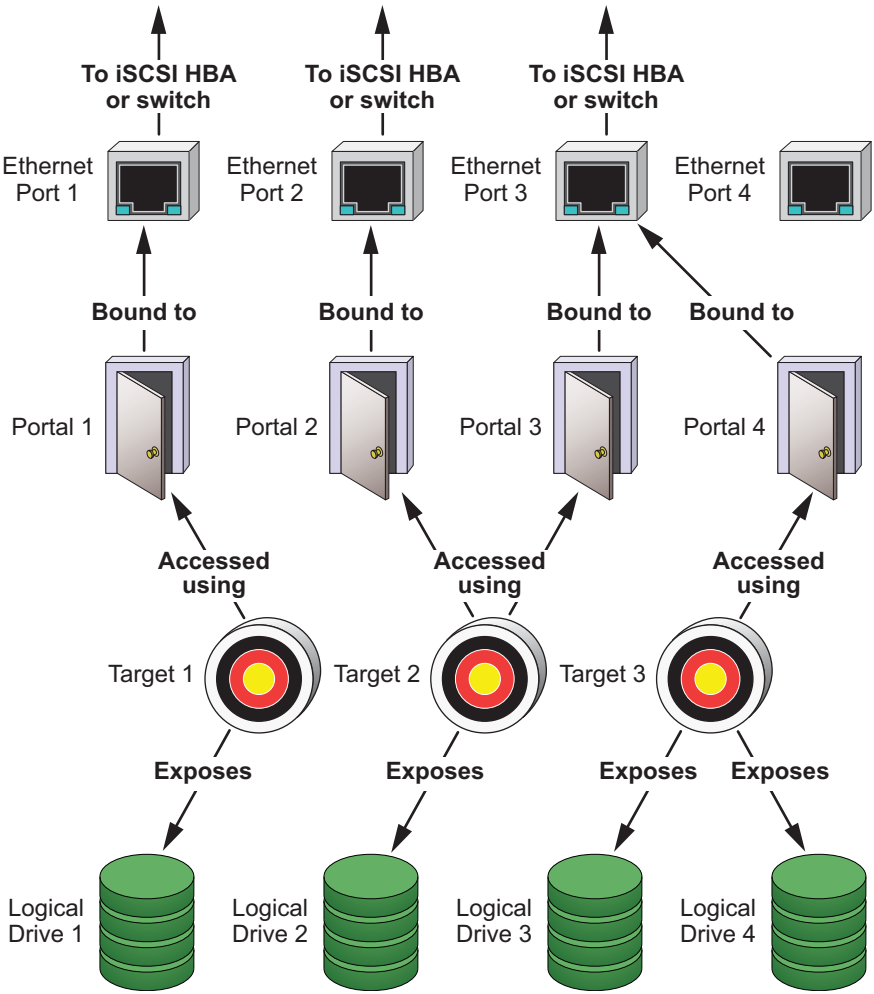
   See “iSCSI Storage Area Network (SAN)” on page 34.
6. Add your iSCSI intiators to the VTrak’s initiator list.

See “Adding an iSCSI Initiator” on page 178 or page 278.

For more information, see:

- “Managing iSCSI Connections” on page 188 or page 257
- “iSCSI Management” on page 366
- Visit the Promise Knowledgebase at http://kb.promise.com/ and access topic “10188 – Setting up Microsoft iSCSI Initiator With the VTrak”

Figure 9. iSCSI component map



iSCSI on a VLAN

VTrak supports up to 32 iSCSI portals per iSCSI port. Each iSCSI portal can belong to a different VLAN for a maximum of 32 VLANs.

See the diagram on page 335, Figure 2.

To set up the VTrak subsystem for a VLAN:

1. Add a new portal with a *VLAN association*.

   See “Adding iSCSI Portals” on page 194 or page 264.

   Note which iSCSI port you chose for the portal.
2. Add a new target.

   See “Adding iSCSI Targets” on page 190 or page 259.
3. Assign the new portal with VLAN assocation to the target.

   See “Assigning a Portal to an iSCSI Target” on page 192. The CLU assigns portals when you add the target. See page 259.
4. Map the target to a LUN.

   See “Adding a LUN Map” on page 180 or page 280.
5. Connect your iSCSI data cable to the iSCSI port you chose for the new portal.

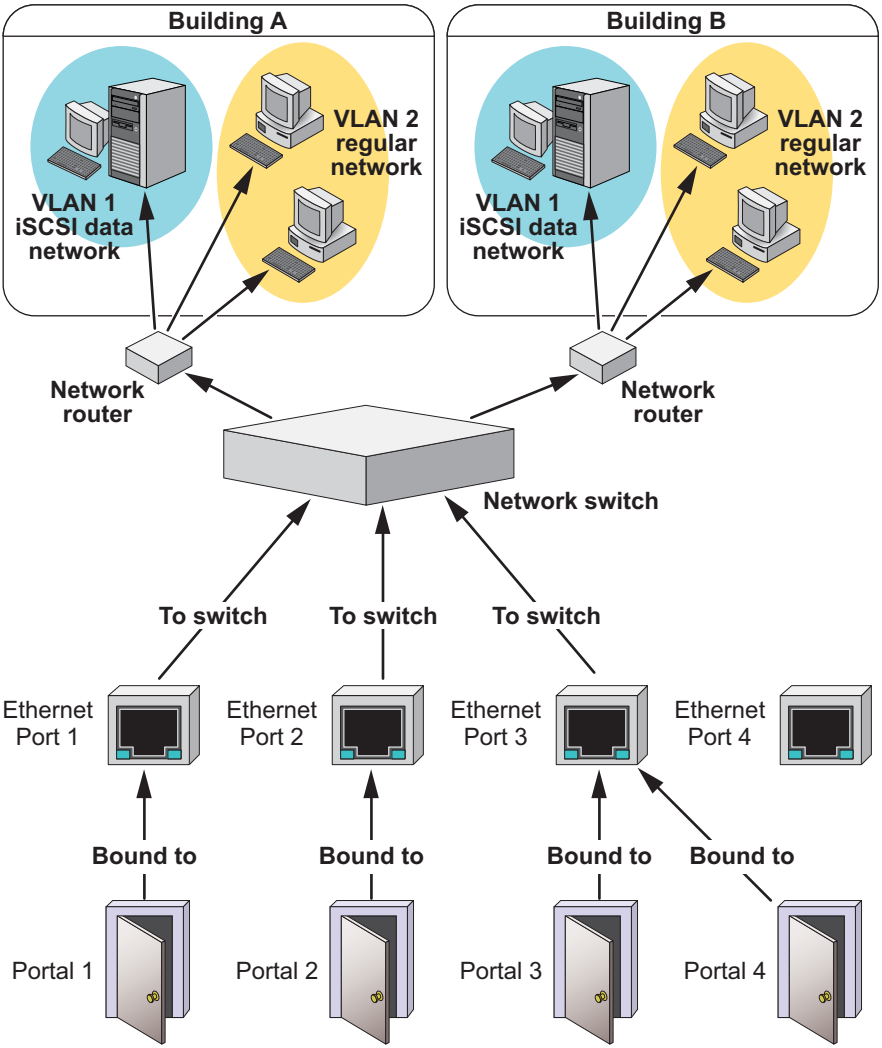
   See “iSCSI Storage Area Network (SAN)” on page 34.
6. Add your iSCSI intiators to the VTrak’s initiator list.

   See “Adding an iSCSI Initiator” on page 178 or page 278.

For information, see:

- “Managing iSCSI Connections” on page 188 or page 257.
- Visit the Promise Knowledgebase at http://kb.promise.com/ and access topic “10188 – Setting up Microsoft iSCSI Initiator With the VTrak.”

Figure 10. iSCSI VLAN map



Initiator

An initiator functions as the client, in this case, your host PC or server. The initiator makes requests to and receives responses from an iSCSI target on the VTrak RAID subsystem.

Each initiator has a unique iSCSI qualified name (IQN). You specify the initiator by that name when you map a LUN or logical drive to the initiator. Initiators come in two varieties, software and hardware.

Software

A software initiator uses code to implement iSCSI. The software emulates SCSI devices for a computer by speaking the iSCSI protocol. Software initiators are available for most mainstream operating systems, and this type is the most common mode of deploying iSCSI on computers.

For more information, see your iSCSI driver user documentation.

Hardware

A hardware initiator uses dedicated hardware in combination with software running on it, to implement iSCSI. A common example is an iSCSI host bus adapter (HBA) card.

The iSCSI HBA is a 1-gigabit or 10 gigabit Ethernet network Interface card (NIC) that plugs into a PCI-Express slot. It looks like a SCSI device to the host PC or server's operating system.

The iSCSI HBA uses a TCP/IP Offload Engine (TOE) to perform iSCSI and TCP processing and managing interrupts, leaving the host PC or server's microprocessor free to run other applications.

For more information, see your iSCSI HBA user documentation.

Target

The target represents a storage device, in this case the VTrak RAID subsystem. Each target has a unique iSCSI qualified name (IQN).

VTrak supports a maximum 2048 iSCSI targets. A maximum of 1024 logical drives can be mapped to a target.

Target options include Digests and CHAPs.

Digests

A *header* digest adds a 32-bit CRC digest to detect data corruption in the header portion of each iSCSI packet.

A *data* digest adds a 32-bit CRC digest to detect data corruption in the data portion of each iSCSI packet.

If a data packet arrives with an invalid CRC digest, the data packet is rejected.

Header and data digests work best with initiators equipped with a TOE. Refer to your iSCSI HBA. For more information, see your iSCSI HBA user documentation.

CHAPs

Challenge Handshake Authentication Protocol (CHAP) is an authentication mechanism used to authenticate iSCSI sessions between initiators and targets.

A uni-directional or peer CHAP authenticates from the target (VTrak) to the initiator (host PC or server).

A bi-directional or local CHAP authenticates target to initiator and initiator to target.

Portal

A portal is the logical point of connection between the VTrak and the iSCSI network. Portals use an IP address and a TCP port number to identify an IP storage resource. VTrak supports up to 32 iSCSI portals per iSCSI port. VTrak uses TCP port 3260.

VTrak supports both IPv4 and IPv6 addresses. See “Internet Protocols” on page 373.

Portals on VTrak support three types of port associations:

- **PHY** – A simple connection through one port.
- **VLAN** – Virtual Local Area Network. The portal is part of a virtual network. Used when a dedicated network is not available for iSCSI.
- **Trunk** – An aggregation of two or more iSCSI ports on the same RAID controller. Also known as a *link aggregation*. This feature combines ports to increase bandwidth.

Once you have made a port association, you cannot change it. If you have no portals with the port association you want, create a new portal.

Each iSCSI portal can belong to a different VLAN. VTrak supports 32 VLANs.

Port

A port is the physical point of connection between the VTrak and the iSCSI network. There are four ports on each RAID controller for a total of eight. When you create a portal, you specify one or more ports. Each port has a unique MAC address.

There are two options for each iSCSI port:

- **Enable Port** – Turns the port on or off.
- **Jumbo Frame** – Enables jumbo frame support on the port.

The standard Ethernet frame is 1518 bytes, with 1500 bytes for payload. A jumbo frame ranges from 1500 bytes to 9000 bytes of payload. Because jumbo frames carry more data, they are used to reduce network management overhead, thereby increasing network throughput.

Trunk

A trunk is an aggregation of two or more iSCSI ports on the same RAID controller. Also known as a *link aggregation*. This feature combines ports to increase bandwidth. Ports must be *enabled* to add them to a trunk. Trunks are identified by their Trunk IDs.

When you create a trunk, you specify:

- **Controller ID** – RAID controller whose iSCSI ports you are using.
- **Master port** – Any available iSCSI port.
- **Slave ports** – The remaining available iSCSI ports.

Session

A session is a group of TCP connections that link an iSCSI initiator with a target. Each RAID controller supports a maximum of 1024 sessions, or 2048 per subsystem.

Session has one option, Keep Alive, sometimes written, “Keepalive.”

Keep alive is an HTTP protocol for maintaining an active connection between teh iSCSI client and server. The client sends a *keepalive* signal is sent over the network at predefined intervals.

- When the server replies, the client knows that the link is up (the connection between client and server works).
- If there is no reply, the client assumes the link is down and routes future data over another path until the original link is up again.

The keep alive feature on VTrak tells the RAID controller to reply to keep alive signals, informing the client that its link to VTrak is up.

You can enable Keep Alive on individual sessions, or as a global setting for all sessions.

iSNS

Internet Storage Name Service (iSNS) is a protocol that facilitates automated discovery, management, and configuration of iSCSI devices on a TCP/IP network. iSNS service runs on an iSNS server on your network.

You can enable iSNS on the VTrak and specify the IP address and port number of the iSNS server.

CHAP

Challenge Handshake Authentication Protocol (CHAP) is an authentication mechanism used to authenticate iSCSI sessions between initiators and targets.

A *uni*-directional or *peer* CHAP authenticates from the target (VTrak) to the initiator (host PC or server).

A *bi*-directional or *local* CHAP authenticates target to initiator and initiator to target.

Ping

Ping is a computer network administration utility that tests whether a device is accessable over the IP network.

Ping sends echo request packets to the target node, such as your host PC or server, and waits for a response. It measures the time from transmission to reception and records any packet loss.

VTrak can ping through its virtual management port and each of its iSCSI data ports. You must input the IP address of the target client.

Internet Protocols

VTrak supports the IPv4 and IPv6 protocols.

Protocol	Addresses		Example
IPv4	32-bits	4.3×10^9	192.168.10.85
IPv6	128-bits	3.4×10^{38}	2001:0000:0000:0000:0000:0000:e2a8:4337 Abbreviated 2001:0:0:0:0:0:e2a8:4337

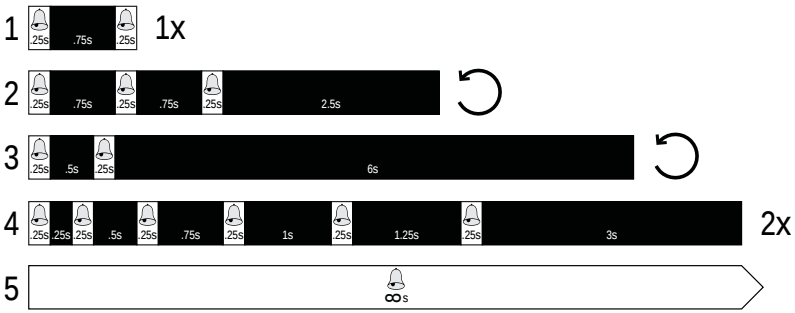
Chapter 8: Troubleshooting

This chapter contains the following topics:

VTrak is Beeping

VTrak's alarm has five different patterns, as shown below.

Figure 1. Audible alarm sound patterns



When you first power-up the VTrak, it beeps twice to show normal operation. See pattern 1, in Figure 1.

The audible alarm sounds at other times to inform you that the VTrak needs attention. But the alarm does not specify the condition.

When the alarm sounds:

- Check the front and back of VTrak enclosure for red or amber LEDs.
- If email notification is enabled, check for new messages.

- Check for yellow ! red X icons.
- Check the event log.

  See “Viewing Runtime Events” on page 382 and “Viewing NVRAM Events” on page 382.

When a continuous tone sounds, there are multiple alarm patterns sounding at the same time.

Silencing the Buzzer

Caution

This action disables the buzzer for all events.

To silence the buzzer:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Buzzer and click the **Settings** button.
4. Uncheck the **Enable Buzzer** box.
5. Click the **Save** button.

LEDs Display Amber or Red

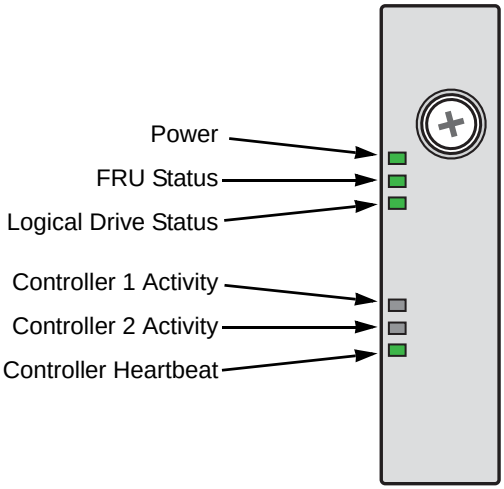
LEDs are used on VTrak's:

- Front Panel LEDs (page 377)
- Drive Carrier LEDs (page 378)
- Back Panel LEDs (page 379)

Front Panel LEDs

When the power is switched on, the LEDs on the front of the VTrak light up.

Figure 1. Front panel LED display



When boot-up is finished and the VTrak is functioning normally:

- Power, FRU, and Logical Drive LEDs display steady green.
- Each controller activity LED flashes green when there is activity on that controller.
- The controller heartbeat LED blinks green once per second for five seconds, goes dark for ten seconds, then blinks green once per second for five seconds again.

  Steady means the LED is on.

  Blinking means a regular on/off pattern.

  Flashing means an intermittent and irregular on/off pattern.

  Dark means the LED is off.

See the table below.

Enclosure Front LEDs					
State	**Power**	**FRU**	**Logical Drive**	**Controller Activity**	**Controller Heartbeat**
Dark	No power	No power	—	No Activity	—
Steady Green	Normal	Normal	Normal	—	—
Blinking Green	—	—	—	—	Normal**
Flashing Green	—	—	—	Activity	—
Amber	—	Problem*	Critical	—	—
Red	—	Failure*	Offline	—	—

* Check the LEDs on the back of the VTrak enclosure.

** Blinks blinks green once per second for five seconds, goes dark for ten seconds, then blinks green once per second for five seconds again.

See “Enclosure Problems” on page 391, “RAID Controller Problems” on page 395, and “Disk Array and Logical Drive Problems” on page 400 for more information.

The Locator feature is triggered from WebPAM PROe or the CLU. It causes the LEDs to blink on and off for one minute. That action helps you find the physical component.

Drive Carrier LEDs

The VTrak spins up the disk drives sequentially to equalize power draw during start-up. After a few moments:

- The Power/Activity LED displays blue when a physical drive is present.
- The Drive Status LED displays green when the physical drive is configured as a member of a disk array or as a spare. When the physical drive is unconfigured, the LED is dark.

  See the diagram and table on the next page.

Figure 2. Drive carrier LEDs

Drive Carrier LEDs		
State	**Power/Activity**	**Drive Status**
Dark	No drive in carrier	Drive is unconfigured
Steady Blue	Drive is present	—
Flashing Blue	Activity on drive	—
Steady green	—	Drive is configured
Blinking green	—	Locator feature
Amber	—	Drive is rebuilding
Red	—	Drive error or failure

See “Physical Drive Problems” on page 399 for a discussion of rebuilding and failed physical drives for more information.

The Locator feature is triggered from WebPAM PROe or the CLU. It causes the LEDs to blink on and off for one minute. That action helps you find the specific drive.

Back Panel LEDs

When the FRU Status LED on VTrak’s front panel shows amber or red, check the LEDs on the back of VTrak. These LEDs give the status of the field replaceable units:

- RAID controller
- Power supply

Under normal conditions, the controller status LED (marked with ☑ icon) and battery status LED display green. The dirty cache LED (marked with ⚠ icon) is dark.

Figure 3. FC RAID controller LEDs

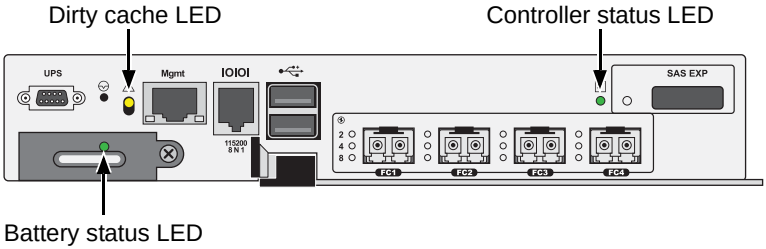
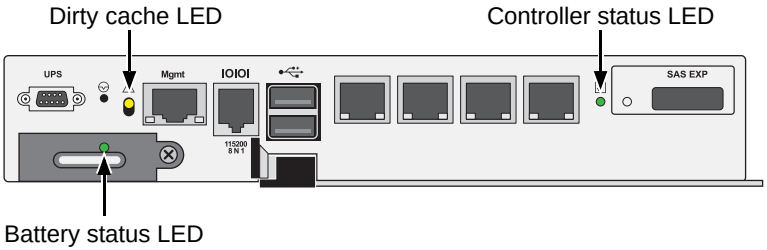
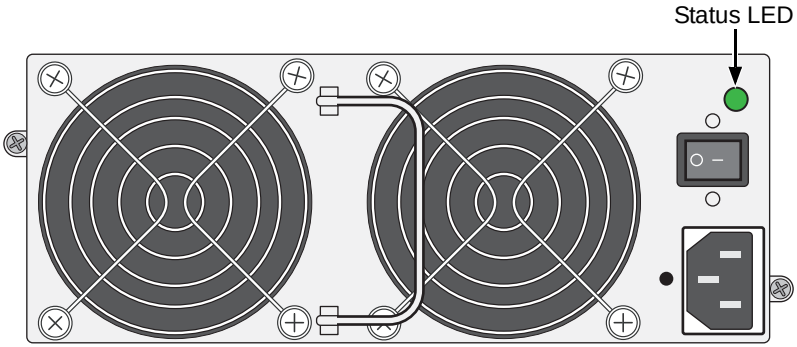


Figure 4. iSCSI RAID controller LEDs



Under normal conditions, the power supply status LEDs display green.

Figure 5. Power supply LED



Enclosure Back LEDs				
State	**Status**	**Dirty Cache**	**Battery**	**Power Supply**
Dark	No power	Normal	No power or Failed	No power
Steady Green	Normal	—	Normal	Normal
Blinking Green	Locator feature	Locator feature	—	Locator feature
Steady Amber	Surviving	Unsaved data in cache	Less than 72 hours reserve	—
Flashing Amber	—	Normal	—	—
Steady Red	Failed	—	Failed	Failed
Flashing Red	Maintenance Mode	—	—	—

See “Enclosure Problems” on page 391 and “RAID Controller Problems” on page 395 for more information.

The Locator feature is triggered from WebPAM PROe or the CLU. It causes the LEDs to blink on and off for one minute. That action helps you find the physical component.

Checking Component Installation

To check a component’s installation, remove the component, then reinstall the component in its original location. In most cases, this action fixes a bad connection and allows VTrak to detect the component. If this action does not correct the problem, replace the unit. See page 315 for instructions.

On VTraks with dual controllers, when one controller’s Status LED is amber and the other controller’s Status LED is flashing red, it means that the controller with the flashing red LED has entered *maintenance mode*. See “RAID Controller Problems” on page 395.

If the Controller Status LED continues to display amber after startup, contact PROMISE Technical Support. See “Contacting Technical Support” on page 435.

The Dirty Cache LED flashes during input/output operation. If the LED shines amber and the power is off, there is unsaved data in the cache. Do NOT power down the VTrak while this LED is on.

CLU Reports a Problem

The CLU reports information passively, that is you must determine which functions to check based on the sound of the VTrak's audible alarm and any amber or red LEDs. See "VTrak is Beeping" on page 375 and "LEDs Display Amber or Red" on page 377 for more information.

Check the event logs first. Then check the reported component.

Viewing Runtime Events

To display Runtime Events:

1. From the Main Menu, highlight **Event Viewer** and press Enter.

   The log of Runtime Events appears. Events are added to the top of the list. Each item includes:

   - **Sequence number** – Begins with 0 at system startup.
   - **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
   - **Severity** – See the Table below.
   - **Timestamp** – Date and time the event happened.
   - **Description** – A description of the event in plain language.

6. Press the up and down arrow keys to scroll through the log.

Event Severity Levels	
Level	**Description**
Fatal	Non-recoverable error or failure has occurred.
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Minor	Action is needed but the condition is not a serious at this time.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Viewing NVRAM Events

This screen displays a list of and information about 63 most important events over multiple subsystem startups.

To display NVRAM events:

1. From the Main Menu, highlight **Event Viewer** and press Enter.
2. Highlight **NVRAM Events** and press Enter.

The log of NVRAM Events appears. Events are added to the top of the list. Each item includes:

- **Sequence number** – Begins with 0 at system startup.
- **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
- **Severity** – See the Table on the previous page.
- **Timestamp** – Date and time the event happened.
- **Description** – A description of the event in plain language.

3. Press the up and down arrow keys to scroll through the log.

Checking a Reported Component

In this example, let us check disk array status.

1. Open the CLU.
2. Highlight **Disk Array Management** and press Enter.
3. Observe the status of your disk arrays.

```
DaId   Alias   OpStatus   CfgCapacity   FreeCapacity   MaxContiguousCap
-------------------------------------------------------------------------------
0      DA0     OK         75.44GB       66.06GB        66.06GB
1      DA1     Degraded   189.06GB      179.68GB       179.68GB
2      DA2     OK         73.57GB       64.20GB        64.20GB
```

At this point, you can highlight the Degraded array and press Enter to see more information. See below.

```
Disk Array ID          : 1          Physical Capacity        : 189.06GB
OperationalStatus      : Degraded   MaxContiguousCapacity    : 11.18GB
FreeCapacity           : 179.68 GB  ConfigurableCapacity     : 179.68GB
SupportedRAIDLevels    : 0 5 10 1E

Disk Array Alias       : DA1
MediaPatrol            : Enabled
PDM                    : Enabled

Transport
Rebuild
Predictive Data Migration
Transition
Dedicated Spare Drives in the Array
Physical Drives in the Array
Logical Drives in the Array
[Locate Disk Array]

Save Settings          [CTRL-A]
```

Restore Settings [CTRL-R]
Return to Previous Menu

From this screen:

- Highlight **Physical Drives in the Array** and press Enter to identify the failed disk drive
- Highlight **Rebuild** and press Enter to rebuild the array after you replace the failed disk drive

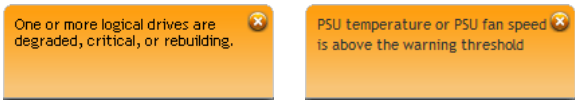
For more information, see “Enclosure Problems” on page 391.

WebPAM PROe Reports a Problem

WebPAM PROe reports these conditions in the header and all four tabs.

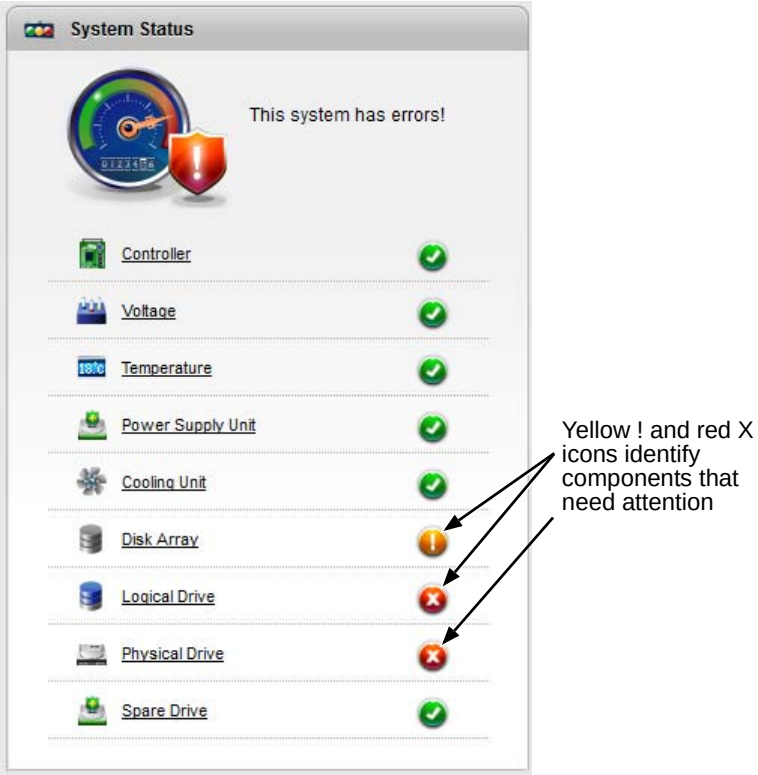
Header

The Header displays popup messages, per your configuration.

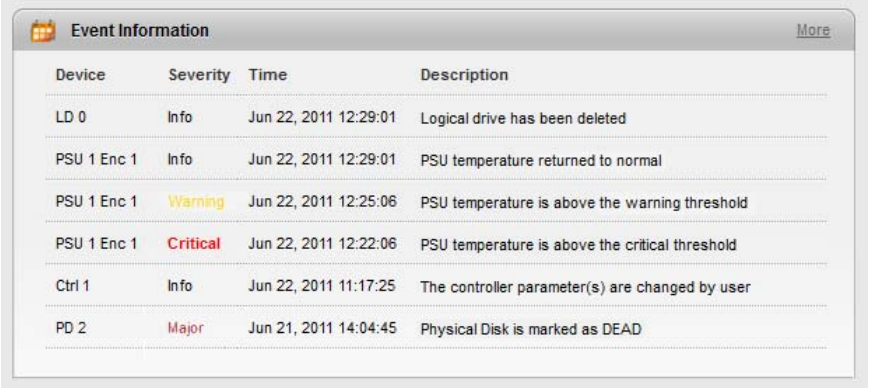


Dashboard Tab

- System Status



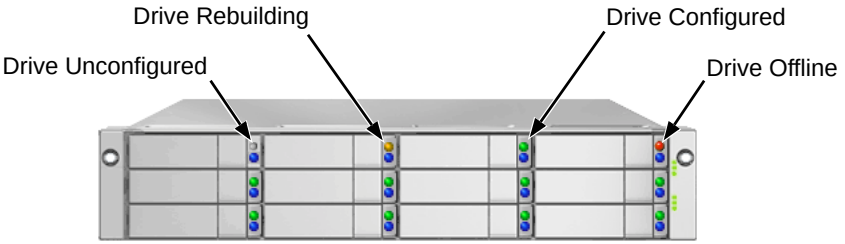
- Event Information



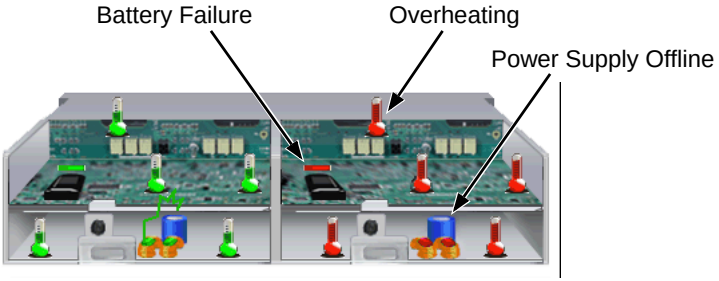
Event Severity Levels	
Level	**Description**
Fatal	Non-recoverable error or failure has occurred.
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Minor	Action is needed but the condition is not a serious at this time.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Device Tab

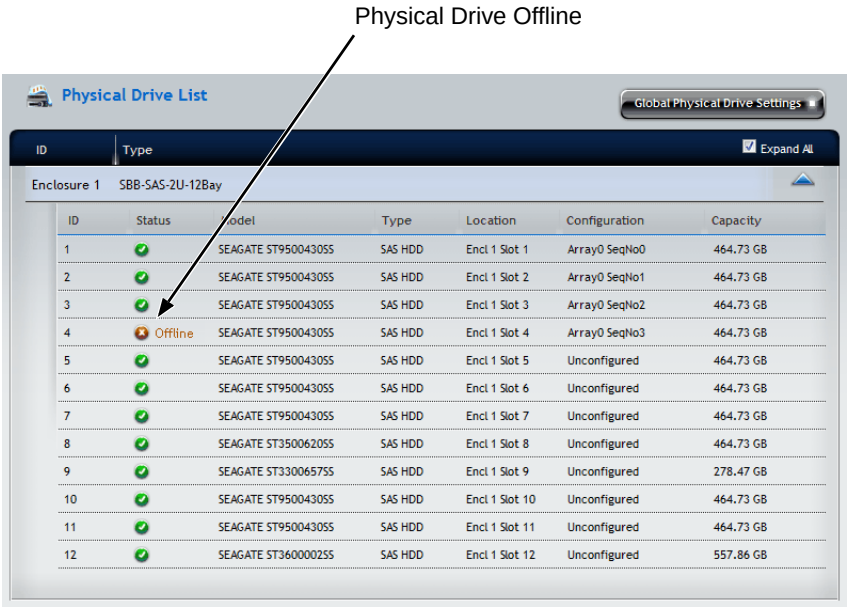
- Front View, showing the drive carrier icons.



- Rear View, with Show Internal Components option.

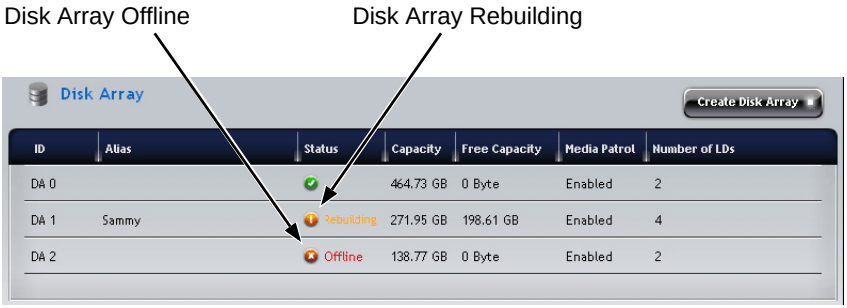


- Physical Drive View, physical drive shown dead or offline and marked with a red X icon.

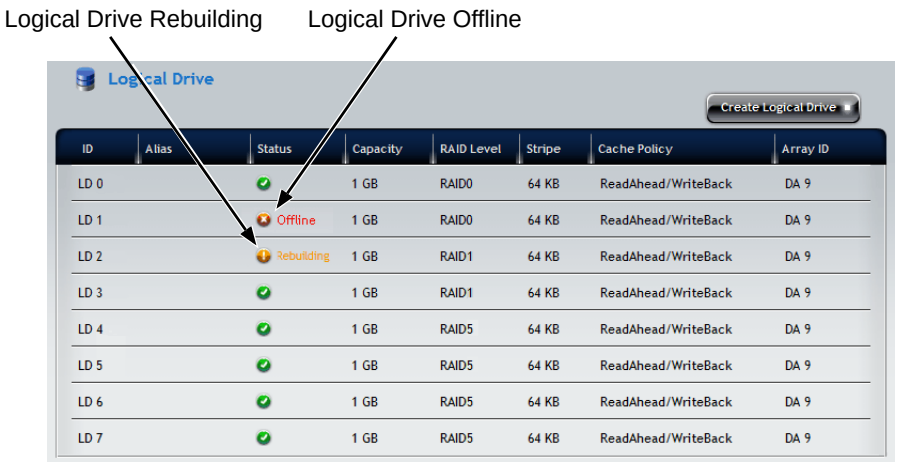


Storage Tab

- Disk Arrays

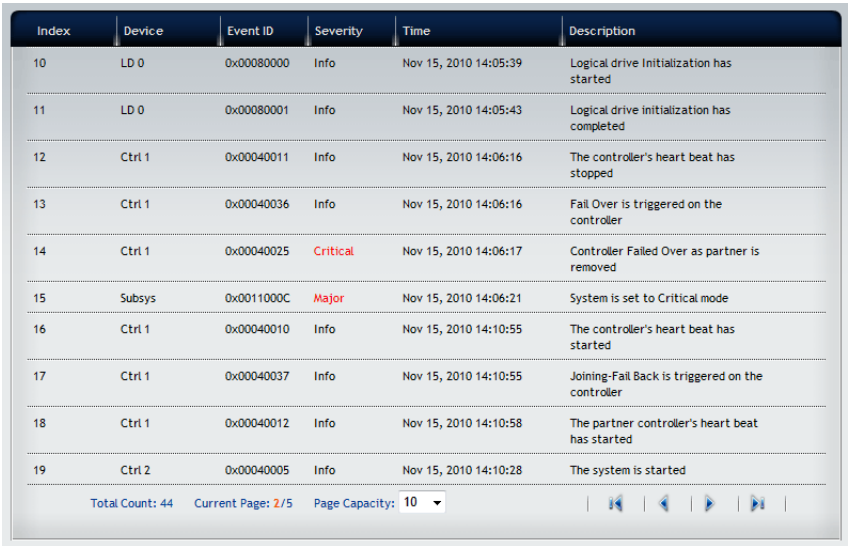


- Logical Drives



Administration Tab

Events icon.



Index	Device	Event ID	Severity	Time	Description
10	LD 0	0x00080000	Info	Nov 15, 2010 14:05:39	Logical drive Initialization has started
11	LD 0	0x00080001	Info	Nov 15, 2010 14:05:43	Logical drive initialization has completed
12	Ctrl 1	0x00040011	Info	Nov 15, 2010 14:06:16	The controller's heart beat has stopped
13	Ctrl 1	0x00040036	Info	Nov 15, 2010 14:06:16	Fail Over is triggered on the controller
14	Ctrl 1	0x00040025	Critical	Nov 15, 2010 14:06:17	Controller Failed Over as partner is removed
15	Subsys	0x0011000C	Major	Nov 15, 2010 14:06:21	System is set to Critical mode
16	Ctrl 1	0x00040010	Info	Nov 15, 2010 14:10:55	The controller's heart beat has started
17	Ctrl 1	0x00040037	Info	Nov 15, 2010 14:10:55	Joining-Fail Back is triggered on the controller
18	Ctrl 1	0x00040012	Info	Nov 15, 2010 14:10:58	The partner controller's heart beat has started
19	Ctrl 2	0x00040005	Info	Nov 15, 2010 14:10:28	The system is started

Total Count: 44 Current Page: 2/5 Page Capacity: 10

Event Severity Levels	
Level	**Description**
Fatal	Non-recoverable error or failure has occurred.
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Minor	Action is needed but the condition is not a serious at this time.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Also see these troubleshooting topics:

- “Event Notification Response” on page 410.
- “Enclosure Problems” on page 391.
- “Frequently Asked Questions” on page 429.

USB Support Reports a Problem

This procedure requires a USB flash device:

- Formatted to FAT 32
- At least 50 MB of free space

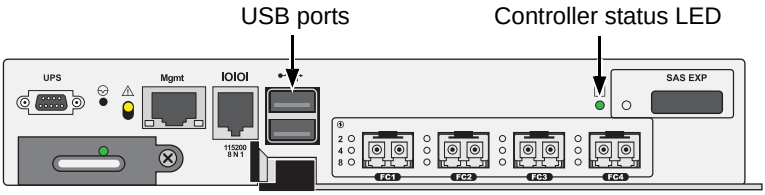
Caution

Verify that there is no firmware image file on the USB flash device. If a firmware image file is present, the RAID controller might attempt a firmware update. See page 319.

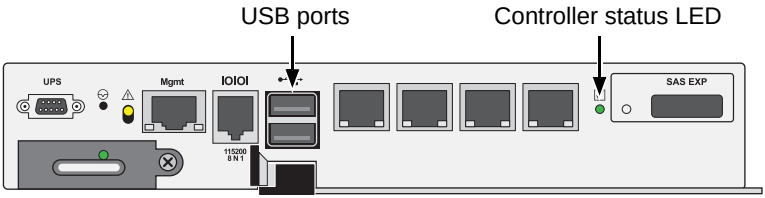
To collect a service report using the USB Support feature:

1. Insert the USB flash device into one of the USB ports on one of the RAID controllers.

   The controller status LED blinks green in half-second intervals.



FC RAID controller



iSCSI RAID controller

2. Wait until the controller activity LED stops blinking green and displays steady green.
3. Remove the USB flash device.
4. Insert the USB flash device into a USB port on your PC.
5. On the USB flash device, open the **OPAX_xxxxxx** folder to obtain the report and log.

Enclosure Problems

Enclosure Problems include:

- Diagnosing an Enclosure Problem (below)
- Overheating (page 393)
- Power Supplies (page 393)
- Batteries (page 394)

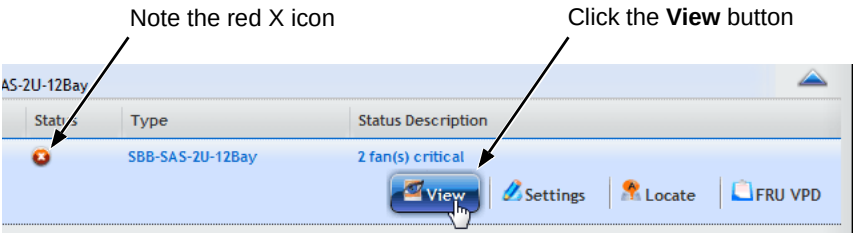
Diagnosing an Enclosure Problem

Check System Status on the Dashboard tab. If a yellow ! or red X appears in the System Status box:

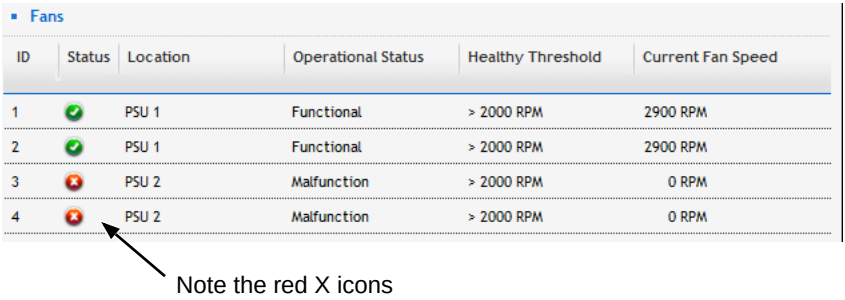
1. Click the name link of the component with the red X icon.

The Components List of the Device tab displays.

2. Mouse-over Enclosure with the red X icon and click the **View** button.



The components list expands and shows the power supply fans, which server as the Cooling Unit of the VTrak Ex30 enclosure.



Note that the fans for power supply 2 (PSU 2) have failed.

3. Click the **Back View** icon on the Device tab.
4. Click the picture of the enclosure.

   A popup messages displays the status of each component.

When a power supply fan fails, you must replace the power supply. See “Replacing a Power Supply” on page 323 for more information.

If the system reports a fan malfunction, contact Technical Support (see page 435) immediately to schedule replacement of the suspect power supply as soon as possible. Running the unit in this condition for more than three weeks may shorten subsystem life and void your warranty.

Overheating

Overheating is a potentially serious condition because the excessively high temperatures can lead to physical drive failure and controller malfunction.

Overheating usually results from:

- Fan failure
- Inadequate air circulation around the enclosure

Fan Failure

In the Ex30 series VTrak subsystems, the power supply fans are the Cooling Units for the enclosure.

When a power supply fan fails, you must replace the power supply. See “Replacing a Power Supply” on page 323 for more information.

Inadequate Air Circulation

Air circulation around the VTrak enclosure might be a more complex problem. Use the thermometer icons to help you locate the specific hot spot. Check for these conditions:

- Accumulated dust or objects blocking the fans
- Less than a minimum of 13 cm (5 inches) space between the back of the enclosure and the wall or other object
- Ambient temperature above 35°C (95°F) where the subsystem is operating

To cool down an enclosure:

- Correct any problems identified above.
- Power it down and let it sit for an hour or longer.

  See “Shutting Down the Subsystem” on page 83.

Power Supplies

VTrak subsystems are equipped with redundant power supplies. The advantage of dual power supplies is that, should one fail, the other continues to power the subsystem until the faulty one can be replaced. The subsystem is capable of operating on a single power supply.

The power supplies are hot-swappable, meaning you can leave the subsystem running when you replace the bad one. Be careful, however, to remove the faulty power supply and not the good one, or the subsystem comes to an immediate stop and your data is unavailable until the subsystem is powered and booted again.

See “Replacing a Power Supply” on page 323 for more information.

Batteries

The RAID controllers in the VTrak subsystem use a battery for backup power to protect data in the cache. Should a power failure occur, the battery enables the cache to hold data up to 72 hours. The battery recharges during normal subsystem operation.

In most cases, installing a replacement battery corrects a marginal or failed condition. The battery is located inside the RAID controller housing. You can remove and replace the battery without removing the RAID controller. The battery is hot-swappable.

No tools are required for the procedure. See “Replacing a Cache Backup Battery” on page 324.

Also see “Reconditioning a Battery” on page 90 or page 223.

RAID Controller Problems

RAID controller problems include:

- Maintenance Mode (page 395)
- Finding and Correcting the Cause of the Problem (page 395)
- Taking a RAID Controller out of Maintenance Mode (page 396)
- Unsaved Data in the Controller Cache (page 398)

Controller problems occur when one of the controllers goes into maintenance mode.

Maintenance Mode

For VTraks with two RAID controllers, one of them enters *maintenance mode* in the event of:

- A difference of some kind between the two controllers (described below)
- An internal controller failure

When a controller enters maintenance mode, it goes offline and it displays N/A (not accessible) under Readiness Status.

You must find and correct the cause of the problem and then take the controller out of maintenance mode (see page 396).

Finding and Correcting the Cause of the Problem

External Checks

Make the following external checks to your VTrak subsystem. Be sure that:

- Both RAID controllers are present, fully inserted into their slots, and locked into place.
- The RAID controllers match, meaning both are Fibre Channel or both are iSCSI.
- All SAS expansion cables from the RAID controllers to external JBOD units in good condition and are securely connected.

Important

A disconnected SAS expansion cable causes the two RAID controllers to see a different set of configured drives. This condition is the most common cause of a controller entering maintenance mode.

Internal Checks

If all external checks are OK, take the following actions:

1. Shut down the VTrak.

   See page 83 (WebPAM PROe) or page 248 (CLU).
2. Remove one of the RAID controllers.

   See “Replacing a RAID Controller – Dual Controllers” on page 326.
3. Restart the VTrak.
4. After the VTrak is fully booted, view the controller information.

   See page 85 (WebPAM PROe) or page 215 (CLU).
5. Observe and record the following information about the first controller:
   - SDRAM memory size
   - Hardware version
   - Firmware version
6. Shut down the VTrak.
7. Remove the first controller and install the second controller.
8. Repeat steps 3 through 6. Then compare your records.
9. Correct any differences between the two controllers.

   See “Updating the Subsystem Firmware” on page 315.

Taking a RAID Controller out of Maintenance Mode

If you shut down the VTrak subsystem in the process of correcting the maintenance mode problem, the affected RAID controller boots into *normal mode* when the VTrak restarts. No further action is required.

If you corrected the problem without shutting down the VTrak subsystem, choose one of the following methods to take the controller out of maintenance mode:

- Restart the VTrak subsystem

  See page 83 (WebPAM PROe) or page 311 (CLU).
- Establish a serial connection, then use the CLI (see below)
- Establish a Telnet connection, then use the CLI (see page 397)

Serial Connection

To clear maintenance mode using a serial connection:

1. Change your terminal emulation program settings to match the following specifications:
   - Bits per second: 115200
   - Data bits: 8
   - Parity: None

- Stop bits: 1
- Flow control: none

2. Start your PC's terminal VT100 or ANSI emulation program.
3. Press Enter once to launch the CLI.

   The login screen appears.

   The following steps show the default Administrator user name and password. Use your own user name and password if you have changed these.
4. At the Login prompt, type **administrator** and press Enter.
5. At the Password prompt, type **password** and press Enter.

   The CLI screen appears.

   The prompt should display MAINTENANCE MODE@cli>. If the prompt displays your login name, such as administrator@cli>, log into the other controller.
6. At the MAINTENANCE MODE@cli> prompt, type **maintenance -a exit** and press Enter.

   The controller reboots. The login screen again appears.
7. Close the Serial connection.

Telnet Connection

This procedure requires you to know the IP address of the controller.

To clear maintenance mode using a Telnet connection:

1. Go to the command line prompt (Windows) or click the terminal icon (Linux), then run:

   telnet 192.168.1.56 2300

   The IP address above is only an example. 2300 is the Telnet port for VTrak.

   The login screen appears.

   The following steps show the default Administrator user name and password. Use your own user name and password if you have changed these.
2. At the Login prompt, type **administrator** and press Enter.
3. At the Password prompt, type **password** and press Enter.

   The CLI screen appears.

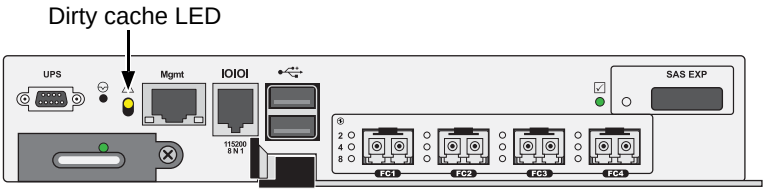
   The prompt should display MAINTENANCE MODE@cli>. If the prompt displays your login name, such as administrator@cli>, log into the other controller.
4. At the MAINTENANCE MODE@cli> prompt, type **maintenance -a exit** and press Enter.

The controller reboots. The Telnet session ends.

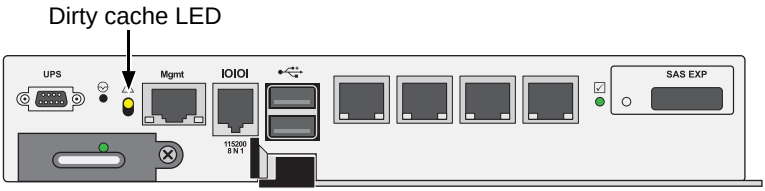
Unsaved Data in the Controller Cache

The dirty cache LED (marked with the ⚠ icon) informs you that there is data in the cache that has not been saved to non-volatile memory. Such data is sometimes called “dirty,” not to suggest it is corrupted in some way but because it has not been saved to a physical drive.

Figure 6. Dirty cache LEDs



FC RAID controller



iSCSI RAID controller

Caution

If there is unsaved data in the controller’s cache, the dirty cache LED shines amber. During this time, do NOT power down the VTrak. Wait until the LED goes dark.

Physical Drive Problems

Physical drives are the foundation of data storage. A physical drive problem can affect your entire RAID system.

When a yellow !  icon or a red X  icon appears beside a physical drive, check the drive's operational status:

1. Click the **Device** tab.
2. Click the **Physical Drive** icon.
3. Click the physical drive you want, then click the **View** button.

   Look under Operational Status for the condition of the physical drive.

   - **Offline** – Check the drive for:
     - **PFA Condition** – Caused by a bad block or sector. See Note 1 below.
     - **Stale Condition** – Caused by obsolete array information on the physical drive. See Note 2 below.
   - **Not Usable** – This condition occurs when you have:
     - Two controllers in your RAID subsystem and a SATA drive without a SAS-to-SATA adapter. See Note 3 below.
     - A missing or defective SAS cable between the RAID subsystem and a JBOD expansion unit.
   - **Drive Failed or Dead** – The physical drive cannot be repaired. You must replace the failed drive. See Note 4 below.

Note 1: Clear the error condition. Then the physical drive is available. See “Clearing a Stale or a PFA Condition” on page 147.

Note 2: Identify the disk array to which the physical drive belongs. Then delete the disk array. If the error condition remains on the physical drive, clear the error condition.

Note 3: Obtain SAS-to-SATA adapters though PROMISE Technology, at http://www.promise.com. See “Installing Physical Drives” on page 21 for installation instructions.

Note 4: You can set the number of bad blocks tolerated before the controller marks a physical drive as Dead. See “Making PDM Settings” on page 121 or “Making Background Activity Settings” on page 273.

See also: “Media Patrol” on page 331 and Disk Array Degraded. “Disk Array Degraded/Logical Drive Critical” on page 400.

Disk Array and Logical Drive Problems

Disk array and logical drive problems include:

- Disk Array Degraded/Logical Drive Critical (page 400)
- Disk Array Offline/Logical Drive Offline (page 401)
- Repairing an Offline Disk Array or Logical Drive (page 402)
- Rebuilding a Disk Array (page 402)
- Incomplete Array (page 403)

Disk array problems typically result from a physical drive failure. The most common problem is a degraded disk array. The RAID controller can rebuild a degraded disk array. See “Rebuilding a Disk Array” on page 402.

Disk Array Degraded/Logical Drive Critical

Disk arrays are made up of physical drives. Logical drives are created on the disk array.

When one of the physical drives in a disk array fails:

- The operational status of the *disk array* becomes **Critical**.
- The operational status of the *logical drives* becomes **Critical** or **Degraded**.
- The operational status of the *physical drive* becomes **Dead** or **Offline**.

WebPAM PROe reports these conditions in the following places:

- **Dashboard** tab

  A yellow ! icon beside the disk arrays, logical drives, and physical drives under System Status.

  Major event for the logical drive under Event Information.

  Warning event for the physical drive under Event Information.

- **Device** tab

  Front View – Physical drives are shown **Dead** or **Offline** and marked with a red X icon, or **Missing**.

  Physical Drive View – Physical drives are shown **Dead** or **Offline** and marked with a red X icon, or **Missing**.

- **Storage** tab

  Disk Array and Logical Drive are marked **Critical** with a yellow ! icon. RAID 6 and 60 logical drives are marked:

- **Degraded** with a yellow !  icon when ONE physical drive is offline.
- **Critical** with a yellow !  icon when TWO physical drives are offline.

RAID 0 logical drives show **Offline** status and a red X  icon.

If there is no spare drive or unconfigured drive in the RAID system, you must provide the replacement drive. See “Installing Physical Drives” on page 21.

- **Administration** tab

  Depending on your settings and availability of a replacement drive, your system automatically rebuilds the degraded disk array. See “Rebuilding a Disk Array” on page 402.

  The system sends an Email message about the incident to subscribing users, depending on user settings. See “Setting User Event Subscriptions” on page 103.

Disk Array Offline/Logical Drive Offline

Disk arrays are made up of physical drives. Logical drives are created on the disk array. When a disk array and its logical drives go **Offline**, the data stored in the logical drives is no longer accessible.

RAID 0 logical drives go **Offline** when ONE physical drive is removed or fails.

RAID 1, 1E, 5, 10, and 50 logical drives go **Offline** when TWO physical drives are removed or fail.

RAID 6 and 60 logical drives go **Offline** when THREE physical drives are removed or fail.

WebPAM PROe reports these conditions in the following places:

- **Dashboard** tab

  A red X  icon appears beside the disk arrays, logical drives, and physical drives under System Status.

  Major event for the *logical* drive under Event Information

  Warning event for the *physical* drive under Event Information.

- **Device** tab

  On Front View and Physical Drive View, physical drives are shown **Dead**, **Offline**, or **Missing**.

- **Storage** tab

  Disk array and logical drives are marked with a red X  icon.

- **Administration** tab

Under Background Activities, no Rebuild takes place. See Repairing, below.

The system sends an Email message about the incident to subscribing users, depending on user settings. See “Setting User Event Subscriptions” on page 103.

Repairing an Offline Disk Array or Logical Drive

RAID 1, 1E, 5, 6, 10, 50, and 60 Logical Drives

If a fault-tolerant logical drive, RAID 1, 1E, 5, 6, 10, 50, and 60, goes **Offline**, it may be possible to recover your data.

Warning

Take no further corrective action until you have consulted with Technical Support! See page 435.

RAID 0 Logical Drives

If a logical drive based on a non-fault-tolerant disk array, RAID 0, goes offline, all of the data on the logical drive is lost.

To recreate your logical drive:

1. Identify the failed physical drive.

   See “Locating a Physical Drive” on page 146.
2. Replace the failed drive.
3. See “Installing Physical Drives” on page 21.
4. If the disk array had more than one physical drive, delete the disk array and re-create it.

   See “Deleting a Disk Array” on page 156 and “Creating a Disk Array Manually” on page 150.
5. Restore the data from your backup source.

Rebuilding a Disk Array

When you rebuild a disk array, you are actually rebuilding the data on one physical drive.

- When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array begins to rebuild automatically using the spare drive.
- If there is no spare drive of adequate capacity, but the Auto Rebuild function is ENABLED, the disk array begins to rebuild automatically as soon as you remove the failed physical drive and install an unconfigured physical drive in the same slot. See “Making Rebuild Settings” on page 120.

- If there is no spare drive of adequate capacity and the Auto Rebuild function is DISABLED, you must replace the failed drive with an unconfigured physical drive, then perform a Manual Rebuild. See “Rebuilding a Disk Array” on page 160.

Important

If your replacement disk drive was formerly part of a different disk array or logical drive, you must clear the configuration data on the replacement drive before you use it. See “Clearing a Stale or a PFA Condition” on page 147.

Incomplete Array

A more serious, but far less common problem is an *Incomplete Array.* An incomplete array results from a physical drive that fails or becomes missing during:

- RAID level migration
- Disk array transport

Migration

Normally, if a physical drive or the controller fails during migration, the disk array goes critical, and you can rebuild it.

Transport

Transport is the action of moving the physical drives of a disk array:

- To different slots in the same enclosure
- From one enclosure to another

If a physical drive fails during a transport, or you do not move all of the physical drives to their new locations, WebPAM PROe displays an incomplete array. When WebPAM PROe discovers an incomplete array, it displays a dialog box asking you to:

- Click the **OK** button to accept the incomplete array.
- Click the **Cancel** button to reject the incomplete array.

Accepting an Incomplete Array

Before you accept the incomplete array, be sure all of the physical drives are present and that their drive carriers are properly installed into the enclosure. See “Installing Physical Drives” on page 21.

If you choose to accept the incomplete array:

1. Click **OK** in the incomplete array dialog box.

2. Check the operational status of the logical drives in the array.
   - If the logical drives are **Critical**, proceed with a rebuild.
   - If the logical drives are **Offline**, contact Technical Support. See page 435.
3. Restore your data from a backup source.

If you choose NOT to accept the incomplete array:

1. Click **Cancel** in the incomplete array dialog box.
2. Do one of the following:
   - Delete the array. This action deletes all logical drives on the array.
   - Replace the missing physical drive.

Connection Problems

Connection problems include:

- Serial Connections (page 405)
- Network Connections (page 406)
- Fibre Channel Connections (page 406)
- SAS Connections (page 407)
- Browser Does Not Connect to WebPAM PROe (page 408)

Connection problems cause a majority of failures in almost any electrical system. While the installation of the cables and components was correct, they don't function properly, or at all, because:

- A connector is dirty or corroded
- A connector is loose or damaged
- A cable looks OK outside but has an open circuit inside
- The wrong cable was used

VTraks ship with a full set of new cables, as required for each specific model. Be sure to use these components because: 1.) They are the proper ones for your RAID subsystem, 2.) They are in brand-new condition, and 3.) You paid for them with the purchase of your subsystem.

Serial Connections

VTrak uses a serial connection for the command line interface (CLI) and the command line utility (CLU). After you set the IP address, you can access the CLI and CLU through a network connection, also. Normally, users prefer WebPAM PROe because of its graphic user interface. But the CLI and CLU can do the same jobs. And they work when your network connection is down.

For VTrak, you must use the CLI or CLU to set the Management Port IP address in order for WebPAM PROe to connect with it. See “Setting-up the Serial Connection” on page 44. This issue is discussed further under Network Connections, below. See “Making Serial Cable Connections” on page 40 for more information on making the connection.

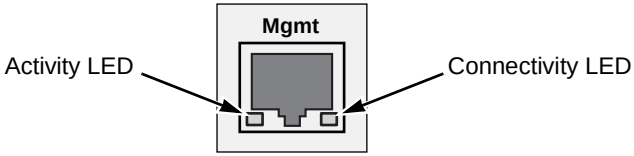
The CLI and CLU control and manage but they do not move data. They communicates through a RJ11-to-DB9 serial data cable, supplied with the VTrak. You may choose not use the CLI or CLU often and want to disconnect and store the cable. Consider leaving it connected, so you know where it is the next time you need it.

Network Connections

Each RAID controller has an Ethernet (RJ45) management port connector on the back of the enclosure. This is a Gigabit Ethernet connector designed to connect to your network. The VTrak becomes a node on your network like any other PC, server or other component with an IP address.

VTrak ships from the factory IP addresses of 10.0.0.1, 10.0.0.2, and 10.0.0.3. You must change these addresses to ones that work on your network. You make the initial IP address setting using the CLI or CLU. See “Setting-up the Serial Connection” on page 44.

Figure 3. Management port connection on the RAID controller



Management Port LEDs		
State	**Activity**	**Connectivity**
Dark	No activity	10BaseT
Steady green	—	100BaseT
Flashing green	Activity	—
Amber	—	1000BaseT

Note that VTrak’s virtual and maintenance ports can accept IP address assignments from a DHCP server. Use VTrak’s Command Line Utility (CLU) to enable this feature.

If you manually assigned an IP address to the VTrak but there is a DHCP server on your network, there is a chance that the server might assign the VTrak’s IP address to another node. You might see a warning to this effect on your PC’s monitor. If this happens, WebPAM PROe may not be able to connect. See your network administrator to work out a suitable arrangement.

Fibre Channel Connections

When there is a connection failure, use WebPAM PROe to verify that VTrak sees the initiators. See “Viewing a List of FC Initiators on the Fabric” on page 186 or page 255.

If VTrak sees some initiators but not the one you want, the problem is most likely elsewhere in the loop or fabric. If VTrak does not see any initiators:

- Check all of the Fibre Channel connections
- Verify that all nodes are properly connected and powered
- Verify that the fabric router or switch is properly connected powered

For more information, see “Managing Fibre Channel Connections” on page 184 or page 252.

SAS Connections

Faulty SAS expansion connections are suspected when the link port counter reports a large number of bad link errors. See the *VTrak Jx10s or Jx30s Product Manual* for more information.

Link errors can be caused by:

- Debris blocking the SAS cable connector
- A faulty SAS cable
- A faulty controller or I/O module SAS connector

Blocked Cable Connectors

To check for debris blocking the SAS cable connector:

1. Power down the RAID subsystem and JBOD units.
2. Remove the SAS cable and check all SAS connectors for debris.
3. Clean the connectors as required and reconnect the SAS cable.
4. Power up the subsystems and monitor the link port counter for changes in the rate of link error accumulation.

Faulty Cable

To check for a faulty SAS cable:

1. Power down the RAID subsystem and JBOD units.
2. Replace the SAS cable with a new one.
3. Power up the subsystems and monitor the link port counter for changes in the rate of link error accumulation.

Faulty Controller or I/O Module Connector

To check for a bad controller or I/O module SAS connector:

1. With the subsystems online and I/Os running, access the CLI via serial or Telnet.

   See “Initial Connection” on page 206.
2. At the command prompt, type the following command and press Enter.

```
administrator@cli> sasdiag -a errorlog -l expander -e 1 -i 1
```

3. At the command prompt, type the following command and press Enter.

   ```
   administrator@cli> sasdiag -a errorlog -l c2cport
   ```

   By interpreting the two error logs, you can verify which controller or I/O module SAS port is accumulating link errors.

Browser Does Not Connect to WebPAM PROe

If you successfully setup and connected to WebPAM PROe, then suddenly you can no longer connect, it might be the result of the following three conditions:

- DHCP is enabled on your VTrak's virtual management port
- The DHCP server does not have a dedicated IP address for the VTrak
- The VTrak restarted and your DHCP server assigned a new IP address

You must obtain the new IP Address for the virtual management port in order to direct your browser to the VTrak and start WebPAM PROe.

To access the new IP address:

1. Start your PC's terminal VT100 or ANSI emulation program.
2. Press Enter once to launch the CLI.
3. At the Login prompt, type **administrator** and press Enter.
4. At the Password prompt, type **password** and press Enter.
5. Type **net** and press Enter.

   ```
   administrator@cli> net

   ==========================================
   CId    Port  Type   IP             Mask           Gateway        Link
   ==========================================
   Virtual      Mgmt  192.168.10.85  255.255.255.0  192.168.10.1   Up
   ```

   The new virtual management port IP address and other network settings display.

6. Enter the new IP address into your browser to log into WebPAM PROe.

For more information, see "Making Serial Cable Connections" on page 40 and "Logging into WebPAM PROe" on page 60.

Power Cycling the Subsystem

To power cycle a RAID subsystem means to:

- Shut down
- Turn off the power
- Turn on the power
- Restart

Power cycling is sometimes required as a remedial action but only when prompted by a message from software or when directed by Technical Support.

To power cycle the RAID subsystem:

1. Shut down the subsystem.

   See “Shutting Down the Subsystem” on page 83 or page 307.

   When the controllers shut down, your network connection is lost.
2. Manually turn OFF the switches on both power supplies of the RAID subsystem and all attached JBOD expansion units.
3. Wait at least 10 seconds.
4. Manually turn ON the switches on both power supplies of the JBOD units.
5. Manually turn ON the switches on both power supplies of the RAID subsystem.
6. Wait no less than two minutes.
7. Do one of the following actions:
   - Open your browser and log into WebPAM PROe.
   - Re-establish your Telnet or SSH connection to the subsystem and open the CLU.

   If you cannot log in immediately, wait 30 seconds and try again.

Important

If your RAID subsystem manages JBOD expansion units, always power on the JBOD expansion units first. Then power on the RAID subsystem.

Event Notification Response

When you choose Event Notification, WebPAM PROe sends popup and/or email messages regarding its status. The messages you see depend on your notification selection and what is currently happening in the VTrak. See “Setting User Event Subscriptions” on page 103.

The table below cites:

- **Reported Events** – Events that require you to take action
- **Corrective Actions** – The action you should take in response to the event

A list of event categories is shown below.

Reported Event	Corrective Action
Battery	
Battery is inserted	No action is required.
Battery charging has failed	Replace the battery.
Battery reconditioning has started	No action is required.
Battery reconditioning has been terminated	Replace the battery.
The write policy of writeback logical drive switched from writeback to writethru	Check the event log to see whether battery is re-conditioning.
The write policy of writeback logical drive switched from writethru to writeback	No action is required.
Battery is charging in high temperature	Monitor the condition. Contact Tech Support if the problem persists.
Battery cannot function with the enclosure or with the attached battery board	Wrong battery installed. Contact Tech Support for assistance.
Logical drive writeback cache maybe enabled without battery support	No action required.
Battery is fully charged	
Battery is not present	Install a battery or verify that the battery is properly connected.
Battery is not accessible	Connect the battery properly or replace the battery.
BBU	
BBU flushing has started	No action is required.
BBU flushing has ended	
BBU flushing has failed	Contact Tech Support if the condition persists.
Blade Server	
Blade Server Inserted	No action is required.
Blade Server Removed	
Cache	
Not available	Contact Tech Support.

Reported Event	Corrective Action
Controller	
The controller parameter(s) are changed by user	No action is required.
The controller is reset by Watch Dog timer	Result of a firmware update. If the condition persists, replace the controller.
The controller has new crash information	Contact Tech Support.
The controller's heart beat has started	No action is required.
The controller's heart beat has stopped	
The partner controller's heart beat has started	
The partner controller's heart beat has stopped	
The partner controller's heart beat has skipped	
The controller's main scheduler has frozen	Contact Tech Support if the condition persists.
Controller has entered maintenance mode since configured physical disk seen by partner controller is not seen here	Verify that all SATA drives have an SAS-to-SATA adapter installed.
Controller has entered maintenance mode due to mismatch of physical disks types	Check and correct SAS cabling and connections as needed.
Controller has entered maintenance mode due to mismatch of physical disk WWN	Update to the latest firmware. If the condition persists, replace the controller.
Controller has entered maintenance mode due to mismatch of SATA Disks	Check and correct data cabling and connections as needed.
Controller has entered maintenance mode due to mismatch of Disk IDs	
Controller has entered maintenance mode since no physical disks are seen as seen by Partner controller	

Reported Event	Corrective Action
Controller is started	No action is required.
Controller is set to Active Mode	
Controller is set to Standby Mode	
Controller Failed Over as partner is removed	Verify that the partner controller is properly installed and all cables are connected.
Controller Failed Over as heart beat stopped	
Controller Firmware mismatch with that of the partner controller	Auto Firmware synchronization upgrades or downgrades the firmware.
Controller set to Maintenance Mode because of hardware mismatch with partner (controller)	Compare controller types and amount of memory installed. Correct or update as needed.
Controller set to Maintenance Mode because of firmware mismatch with partner controller	Update this controller to the same firmware version as the partner controller.
Controller set to Maintenance Mode because Firmware is flashing in the partner controller	Exit out of Maintenance mode after firmware flashing is complete.
Controller set to Maintenance Mode because of flash image version mismatch with partner (controller)	Update this controller to the same flash image version as the partner controller.
Controller has been set to Maintenance mode because there is a mismatch in the Controller Model or Hardware version with that of the partner controller	Replace this controller with the same Model and Hardware version as the partner controller.
Controller has been set to Maintenance mode because there is a mismatch in the memory size with that of the partner controller	Replace this controller's memory with the same memory size as the partner controller
Partner Controller has entered maintenance mode to protect user data since one of the configured physical drives was disconnected in the partner controller	Check and correct cable connections to external JBOD enclosures. Rebuild any critical logical drives. Back up array data. Replace the physical drive. Bring controller out of maintenance mode.

Reported Event	Corrective Action
Controller was placed on reset during Fail Over processing	No action is required.
Partner Controller was placed on reset during Fail Over processing	
Controller was reset as it was not able to join the running partner controller	Verify that the controller is running. If the condition persists, replace the controller.
The controller has reset because it encountered a firmware problem	If resets happen frequently, update to new firmware or replace the controller.
Controller temperature is above the warning threshold	Check airflow around the VTrak. Check blowers and fans.
The controller temperature is above controller critical threshold	
Controller temperature is within the normal range	No action is required.
CRC	
CRC error is detected while receiving CMD information unit	If this message appears repeatedly, contact Tech Support.
CRC error is detected during Data Out phase	
Disk Array	
New disk array has been created	No action is required.
Disk array has been deleted	
Disk array has been added	
Disk array has been removed	
Disk array settings have been changed	
Disk array is transport ready	Remove physical drives in disk array and insert them into a different subsystem. To cancel Transport Ready Status, remove and reinsert the drives in their original slots.
Drive Interface	
Drive-interface controller is found	No action is required.
Drive-interface controller is NOT found	Restart the VTrak. If this message appears repeatedly, contact Tech Support.

Reported Event	Corrective Action
Drive-interface diagnostics has passed	No action is required.
Drive-interface diagnostics has failed	Restart the VTrak. If this message appears repeatedly, contact Tech Support.
Drive-interface controller has generated a general parity error	If this message appears repeatedly, contact Tech Support.
Drive-interface controller has generated a data parity error	
Enclosure	
Enclosure temperature is above the threshold	Check blowers and fans.
Enclosure temperature is above the warning threshold	Check airflow around the VTrak. Check blowers and fans.
Enclosure temperature is above the critical threshold	
Enclosure temperature is within the normal range	No action is required.
Shut down PSUs due to enclosure or controller temperature over threshold	Shut down the VTrak and see “Enclosure Problems” on page 391.
Event Log	
Event logging is enabled	No action is required.
Event logging is disabled	
Event log buffer is cleared in RAM	
Event log buffer is cleared in NVRAM	
Event log buffer is cleared in MDD	
Fibre Channel	
Fibre Channel controller has detected bus reset	If this message appears repeatedly, contact Tech Support.
Fibre Channel controller has received a “LUN reset” command.	No action is required.
Fibre Channel controller has encountered a fatal error	Restart the VTrak. If this message appears repeatedly, contact Tech Support.

Reported Event	Corrective Action
Fibre Channel link is up	No action is required.
Fibre Channel link is down	
Fibre Channel controller settings have changed	
Firmware Update	
Firmware update is started	No action is required.
Firmware update is complete	
Firmware update is fail	Try the update again. If this message repeats, contact Tech Support.
Back-end expander firmware upgrade is started	No action is required.
Back-end expander firmware upgrade is completed	
Back-end expander firmware upgrade failed	Try the update again. If this message repeats, contact Tech Support.
Front-end expander firmware upgrade is started	No action is required.
Front-end expander firmware upgrade is completed	
Front-end expander firmware upgrade failed	Try the update again. If this message repeats, contact Tech Support.
Host Interface	
Host interface controller has detected bus reset	If this message appears repeatedly, contact Tech Support.
Host interface controller has encountered an unrecoverable error	Restart the VTrak. If this message appears repeatedly, contact Tech Support.
Host interface controller has received an “abort task” command.	No action is required.
Host interface controller has received an “abort task set” command.	
Host interface controller has received a “clear ACA” command.	If this message appears repeatedly, contact Tech Support.

Reported Event	Corrective Action
Host interface controller has received a “clear task set” command.	No action is required.
Host interface controller has received a “LUN reset” command.	
Host interface controller is informed that the initiator has detected an error	If this message appears repeatedly, contact Tech Support.
Host interface controller has received illegal secondary identification	
Host interface controller has received a message parity error	
Host interface controller has received a bus reboot	
Host interface link is up	No action is required.
Host interface link is down	Check connections.
Host interface controller has encountered an unknown error	If this message appears repeatedly, contact Tech Support.
Host interface controller has encountered a system error	
Host interface controller has encountered a fatal error	Restart the VTrak. If this message appears repeatedly, contact Tech Support.
Host interface controller settings have changed	No action is required.
Host interface controller has received a ‘WARM reset’ command	If this message appears repeatedly, contact Tech Support.
Host interface controller has received a “COLD reset” command	
Host Interface controller, MU handshake failed	
Host Interface controller, HMU has stopped	
Host Interface controller, FMU has unloaded	
Initiator	
Initiator sent message for detecting an error	If this message appears repeatedly, contact Tech Support.

Reported Event	Corrective Action
JBOD	
JBOD system connected	No action is required.
JBOD system either is removed or malfunctioned	Check Expander firmware and SAS connections.
Logical Drive	
Logical drive initialization has started	No action is required.
Logical drive Initialization is in progress	
Logical drive initialization has completed	
Logical drive initialization has paused	Resume the initialization when ready.
Logical drive initialization has resumed	No action is required.
Logical drive initialization has stopped	If this action was not intentional, check the logical drive's status.
Logical drive initialization marks the logical drive offline	Replace the failed physical drive. Delete and recreate the logical drive.
Logical drive initialization is aborted due to an internal error.	Reduce system load on the VTrak.
Logical drive initialization is queued	No action is required.
Quick logical drive initialization has started	
Quick logical drive initialization has completed	
Quick logical drive initialization has paused	Resume the initialization when ready.
Quick logical drive initialization has resumed	No action is required.
Quick logical drive initialization has stopped	If this action was not intentional, check the logical drive's status.
Quick logical drive initialization marks the logical drive offline	Replace the failed physical drive. Delete and recreate the logical drive.
Quick logical drive Initialization is aborted due to an internal error	Reduce system load on the VTrak.

Reported Event	Corrective Action
Quick logical drive initialization is queued	No action is required.
A new logical drive has been created	
Logical drive has been deleted	
Logical drive has been placed online	
Logical drive has been placed online. Possible data loss	Check the state of the physical drives, replace any bad drives. Rebuild logical drive.
Logical drive has been set to critical.	
Logical drive has been set to degrade	
Rebuild marks the logical drive synchronized upon rebuild completion	No action is required.
Logical drive settings has been changed through a user command	
One of the error tables of a logical drive has been cleared by the user	
Logical drive axle has been placed online	
Media Patrol	
Media patrol is started	No action is required.
Media patrol is in progress	
Media patrol is completed	
Media patrol is paused	Resume Media Patrol when ready.
Media patrol is resumed	No action is required.
Media patrol is stopped	If this action was not intentional, check the logical drive's status.
Media patrol is aborted due to an internal error.	Reduce system load on the VTrak.
Media patrol is queued	No action is required.
Media patrol is stopped internally	
Online Capacity Expansion	
Online capacity expansion has started	No action is required.
Online capacity expansion has completed	
Online capacity expansion has paused	Resume OCE when ready.

Reported Event	Corrective Action
Online capacity expansion has resumed	No action is required.
Online capacity expansion has stopped	If this action was not intentional, check the logical drive's status.
Online capacity expansion has encountered a physical disk error	Check the physical drive check table after OCE is finished.
Online capacity expansion is aborted due to an internal error.	Reduce system load on the VTrak.
Online capacity expansion is queued	No action is required.
Parity	
Parity error is detected during Data Out phase	If this message appears repeatedly, contact Tech Support.
PDM	
PDM is started	No action is required.
PDM is in progress	
PDM is completed	
PDM is paused	Resume PDM when ready.
PDM is resumed	No action is required.
PDM is stopped	If this action was not intentional, check the disk array's status.
PDM is switched to rebuild.	Replace the dead physical drive or reinstall the missing drive.
PDM is stopped internally	The destination drive was removed or used for a rebuild.
Physical Disk (Physical Drive)	
Physical disk is marked online	No action is required.
Physical disk is marked offline	Replace the physical drive.
Physical disk is marked as DEAD.	
Physical disk has been reset	

Reported Event	Corrective Action
Physical disk assigned as global spare	No action is required.
Global Spare has been deleted	
Physical Disk is no longer assigned as a global spare	
Physical disk assigned as dedicated spare	
Dedicated Spare has been deleted	
Physical Disk is no longer assigned as a dedicated spare	
Physical disk has been inserted	
Physical disk has been removed	Insert the physical drive back into the system.
Command on physical disk has been re-tried	If this message appears repeatedly, replace the physical drive
Physical disk ECC error is detected	Replace the physical drive.
Physical disk CRC error is detected	
Bad sector is found on physical disk	If this message appears repeatedly, replace the physical drive.
Error is detected in remap sectors	
Command times out on physical drive	
Physical disk negotiation speed is decreased.	
Previously configured disk is no longer found	Insert the physical drive back into the system.
A physical disk has encountered an unknown (non-ECC) media error.	If this message appears repeatedly, replace the physical drive.
A physical disk has encountered PFA condition	Clear the PFA condition. If this message appears repeatedly, replace the physical drive.
A configured dead physical drive has been inserted	Replace the physical drive.

Reported Event	Corrective Action
A physical drive page 0 settings have been changed	No action is required.
A physical drive page 1 settings have been changed (SATA drives)	
A physical drive page 3 settings have been changed (SAS drives)	
Physical disk is marked as DEAD due to removal	Replace the physical drive.
Physical disk is marked as DEAD due to failure of reassign sectors command	
Physical disk is marked as DEAD due to PFA condition	
Physical disk is marked as DEAD due to forced offline state	
Physical disk seen by partner controller not seen here	Check and correct SAS connections. Verify that SAS-to-SATA adapters are installed on all SATA drives.
Single ported physical disk seen by Partner controller not seen here	Install an SAS-to-SATA adapter on the SATA drive.
Physical disk reported not ready	Replace the physical drive.
PSU (Power Supply Units)	
PSU is not inserted	Reinstall the power supply unit.
PSU is off	Turn on the power supply or plug in the power cable.
PSU is on	No action is required.
PSU is installed and turned on	
PSU is functional and turned on	
PSU is installed and turned off	Turn on the power supply or plug in the power cable.
PSU is functional and turned off	
PSU is malfunctioning and turned on	Replace the power supply unit.
PSU is malfunctioning and turned off	
PSU has been removed	
PSU 12V/5V/3.3V power is out of the threshold range	

Reported Event	Corrective Action
PSU 12V/5V/3.3V power is within the normal range	No action is required.
PSU is critical. This may cause instability of the system	Check the power to the PSU. Verify that the correct PSU is installed.
PSU Fans	
PSU fan or blower has turned on	No action is required.
PSU fan or blower has turned off	
PSU fan or blower speed is increased	
PSU fan or blower speed is decreased	
PSU fan or blower is malfunctioning	Replace the power supply.
PSU fan or blower is inserted	No action is required.
PSU fan or blower is functioning normally	
PSU fan or blower is NOT installed	Check fans or blowers.
PSU fan status is unknown.	Check for proper installation and turn on the power supply. If the condition persists, replace the power supply.
RAID Level Migration	
RAID level migration is started	No action is required.
RAID migration is in progress	
RAID level migration is completed	
RAID level migration is paused	Resume migration when ready.
RAID level migration is resumed	No action is required.
RAID level migration is stopped	If this action was not intentional, check the logical drive's status.
RAID level migration has encountered a physical disk error	Check the disk drive check table after migration and replace disk drive as needed.
RAID level migration is aborted due to an internal error.	Reduce system load on the VTrak.
RAID level migration is queued	No action is required.
Migration has detected stale NV Watermark	Wait to see if the watermark clears.

Reported Event	Corrective Action
Migration has cleared stale NV Watermark	No action is required.
Array was made incomplete due to missing NV Watermark	If the array is online, try migration again. If the array is offline, delete and recreate the array.
User has accepted Incomplete Array. (Caused by a missing NV Watermark)	Rebuild the disk array.
Rebuild	
Rebuild is started	No action is required.
Rebuild is in progress	
Rebuild is completed	
Rebuild is paused	Resume rebuild when ready.
Rebuild is resumed	No action is required.
Rebuild is stopped	If this action was not intentional, check the logical drive's status.
Rebuild stopped internally	Contact Tech Support.
Rebuild is aborted	Reduce system load on the VTrak.
Rebuild is queued	No action is required.
Auto rebuild cannot start	Install a target physical drive of adequate capacity.
Redundancy Check	
Redundancy Check is started	No action is required.
Redundancy Check is completed	
Redundancy Check is paused	Resume Redundancy Check when ready.
Redundancy Check is resumed	No action is required.
Redundancy Check is stopped	
Redundancy Check is aborted due to internal error	Reduce system load on the VTrak.
Redundancy Check encountered inconsistent block(s)	Check the disk drive check table after RC and replace disk drive as needed.
Redundancy Check task is queued	No action is required.
Redundancy check is in progress	

Reported Event	Corrective Action
Redundancy Check task is stopped internally	Restore the disk array to functional status.
Redundancy check is started on unsynchronized logical drive	No action is required.
Resource	
Resource is NOT available	Reduce system load on the VTrak.
SCSI	
SCSI host interface controller settings have changed	No action is required.
SEP	
SEP is found	No action is required.
SEP is NOT found	Insert or replace SEP hardware.
SEP I2C device access failure	If this message appears repeatedly, contact Tech Support.
SEP I2C device access recovered from failure	
Spare Check	
Spare check started on the given spare drive	No action is required.
Spare check completed successfully on the given spare drive	
Spare Drives	
Physical disk assigned as global spare	No action is required.
Physical disk is no longer assigned as global spare	
Global Spare has been deleted	
Physical disk assigned as dedicated spare	
Physical disk is no longer assigned as dedicated spare	
Dedicated Spare has been deleted	
SMART	
SMART error is received	If this message appears repeatedly, replace the physical drive.

Reported Event	Corrective Action
Stripe Level Migration	
Stripe Level migration is started	No action is required.
Stripe Level migration is completed	
Stripe Level migration is paused	Resume SLM when ready.
Stripe Level migration is resumed	No action is required.
Stripe Level migration is stopped	If this action was not intentional, check the logical drive's status.
Stripe Level migration has encountered a physical disk error	Check the physical drive check table after OCE is finished.
Stripe Level migration is aborted due to an internal error.	Reduce system load on the VTrak.
Stripe Level migration is queued	No action is required.
Synchronization	
Synchronization is started	No action is required.
Synchronization is completed	No action is required.
Synchronization is paused	Resume synchronization when ready.
Synchronization is resumed	No action is required.
Synchronization is stopped	
Synchronization is aborted due to an internal error.	Reduce system load on the VTrak.
Synchronization is queued	No action is required.
Synchronization is stopped internally	
Subsystem (VTrak)	
The Subsystem is started	No action is required.
The Subsystem is stopped	
Subsystem parameter(s) are changed by user	
System is set to Redundant mode	
System is set to Critical mode	Check controller operation.
System is set to Non-Redundant mode	If your system has two controllers, check controller operation.

Reported Event	Corrective Action
Transition	
Transition is started	No action is required.
Transition is completed	
Transition is paused	Resume transition when ready.
Transition is resumed	No action is required.
Transition is stopped	If this action was not intentional, check the disk array's status.
Transition was switched to rebuild	Replace the dead physical drive or reinstall the missing drive.
Unknown	
Unknown priority reason is detected	If this message appears repeatedly, contact Tech Support.
Zoning	
Zoning permission settings with the expander has been reset to defaults	No action is required.
Zoning expander has been rebooted.	
Zoning permission settings with the expander different than expected	Settings have been updated correctly. No action is required.

Chapter 9: Support

This chapter contains the following topics:

Frequently Asked Questions

Physical Drives

What kind of disk drives can I use with VTrak?

VTrak E-Class supports:

- 3.5-inch and 2.5-inch form factor
- Hard disk drives (HDDs) and solid state drives (SSDs)
- SAS, 6 Gb/s and 3 Gb/s
- SATA, 6 Gb/s and 3 Gb/s
- Supports any mix of SAS and SATA drives simultaneously in the same enclosure

For a list of compatible drives, go to PROMISE support: http://www.promise.com/support/.

VTrak E-Class does not support Parallel ATA (PATA) disk drives.

Why are all the disk drives in my JBOD marked Dead?

This condition happens when the JBOD expansion subsystem is disconnected from the RAID subsystem, powered off while the RAID subsystem is running, or powered on after the RAID subsystem was powered on. Use the force online function to restore the disk drives. See “Clearing a Stale or a PFA Condition” on page 147 or page 227.

See “Making Settings” on “Making Webserver Settings” on page 127 or page 296.

With some RAID subsystems, I used a server’s IP address to log in. Why is VTrak E-Class different?

VTrak E-Class has the server software embedded. With the E-Class, you point your browser directly to the VTrak subsystem. WebPAM PROe is pre-installed on the VTrak and launches automatically.

I can access the VTrak over my company's intranet. But I can't access it from an outside Internet connection. How do I make the Internet connection work?

This condition is not related to VTrak, but is due to your firewall and network connection protocol. Contact your MIS Administrator.

Why can a RAID 1 logical drive on VTrak consist of only two disk drives?

RAID 1 logical drives work in mirrored physical drive pairs. You could create up to eight RAID 1 logical drives. Or you can create a single RAID 1E or RAID 10 logical drive with data mirroring and up to 16 physical drives.

See "Installing Disk Drives" on page 15 and "RAID Levels" on page 333 for more information on the number of physical drives you can use for each RAID level.

Are logical drives on VTrak limited to 2 TB?

No. But verify that your operating system supports logical drives over 2 TB.

Also, for the operating system to recognize the full capacity of logical drives over 2 TB, you must specify a sector size of 1 KB or larger when you create the logical drive. See "Sector Size" on page 353 for more information.

How can I be sure everything is working OK on the VTrak?

Locally: The VTrak enclosure has LEDs on the front to monitor the status of power, field replaceable units (FRUs) and logical drives. When these are green, VTrak is functioning normally. See "Front Panel LEDs" on page 377.

Remotely: Check the Dashboard tab in WebPAM PROe. See "WebPAM PROe Reports a Problem" on page 385.

If there are no yellow ! or red X warning icons displayed, VTrak is functioning normally.

Can VTrak run using just one power supply?

Yes, it is possible to run VTrak on a single power supply. There are redundant power supplies so that VTrak can continue running if one of them fails. But deliberately leaving one power supply off negates this advantage.

In addition, leaving one power supply off reduces air flow through the VTrak enclosure and can contribute to overheating. Always switch on both power supplies. Also see

What happens if a fan fails?

If the system reports a fan malfunction, contact Technical Support (see page 435) immediately to schedule replacement of the suspect power supply as soon as possible. Running the unit in this condition for more than three weeks may shorten subsystem life and void your warranty.

What happens if a logical drive goes critical?

On the front of VTrak, the logical drive LED turns amber and the buzzer sounds (if enabled). See “VTrak is Beeping” on page 375 and “LEDs Display Amber or Red” on page 377.

VTrak’s Netsend service does not report all events to Windows PCs.

This condition results from a shortcoming in Windows Messenger that causes miscommunication with Netsend. PROMISE is developing a workaround at the time of this writing. Note that all events are correctly reported in the Event Viewer.

Startup

How can I tell when the VTrak has fully booted?

When the VTrak is fully booted up, the Power and FRU LEDs light up green. If a disk array is present, the Logical Drive LED lights up green also. The Controller heartbeat LED blinks green once per second for five seconds, goes dark for ten seconds, then blinks green once per second for five seconds again. See “Front Panel LEDs” on page 377.

Logging In

Why am I not able to log in?

Check the spelling and case. User names and passwords are case sensitive.

I have entered correct user name and password, but still I am not able to log in.

The Administrator may have deleted or disabled your user name.

The login screen says “Login failed: the requested service is busy.”

The subsystem might still be booting or rebooting. Dual controller subsystems take longer because the controllers boot individually, then they synch to each other. Wait a few moments, then try again.

Connection

Why can’t I connect to my RAID System?

Be sure you are using the correct IP address and entry text for the VTrak RAID subsystem.

For more information, see “Logging into WebPAM PROe” on page 69.

I verified the IP address and entry text but I still cannot connect.

Check the physical network connections on the VTrak RAID subsystem. If these are OK, report the problem to your network administrator.

I can access the VTrak over my company's intranet. But I can’t access it from an outside Internet connection. How do I make the Internet connection work?

This condition is not related to the VTrak or WebPAM PROe. The problem is caused by your firewall or network connection protocol. Contact your network administrator for help.

I tried to log into WebPAM PROe but my browser showed the message “cannot be displayed.” What is the problem?

The browser decided prematurely that WebPAM PROe was not responding. Click the browser’s **Refresh** button. This action usually brings up the login screen.

Timeouts

WebPAM PROe was working OK. But then it timed out. What do I do now?

WebPAM PROe times out when 24 minutes have passed with no user activity. User activity means any action you do in WebPAM PROe to view or manage the subsystem. This feature is included for security purposes.

Have your administrator change the timeout interval. See page 126.

Or to prevent WebPAM PROe from timing out, periodically click the interface with your mouse.

Email Messages

Why don’t I receive email messages from WebPAM PROe?

Check your User Event Subscription and User Email settings. See pages 103 and 104. If these are correct, see your network administrator for assistance with the mail server setup, email accounts, and other issues.

User Management

Why can’t I create a new User?

Only the Administrator or a Super User can create a User.

If you are the Administrator or a Super User and cannot create a User, be sure the user name is not already in use.

If you still cannot create a User, contact Technical Support. See page 435.

Can I change my access rights?

Only the Administrator or a Super User can change user access rights. See page 104 or page 287.

Lock

Person “xyz” set the lock and is not available. How do I unlock it?

Ask your Administrator to release the lock.

Note: The lock automatically releases after the set amount of time has passed.

Creating a Disk Array or Logical Drive

Why can’t I see all RAID Levels in RAID Level dropdown menu?

The selection of RAID Levels shown depends on number of physical drives available to the controller. For example, if there are only two physical drives, then you cannot see RAID 10, which requires four physical drives or RAID 50 that requires at least six. See “RAID Levels” on page 333.

Why can’t I create more than one logical drive on my disk array?

If your logical drive takes up the entire capacity of the disk array, there is no room for another logical drive. Backup your important data, then delete the existing logical drive and create multiple smaller logical drives on the disk array. See “Deleting a Logical Drive” on page 166 or page 243 and “Creating a Logical Drive Manually” on page 165 or page 242.

Disk Array Degraded

According to WebPAM PROe, my disk array is degraded. What am I supposed to do?

If the Auto Rebuild option is enabled and a hot spare drive is available, your disk array begins rebuilding automatically. Also see “Disk Array Degraded/ Logical Drive Critical” on page 400.

When an disk array becomes degraded, can I still access the data on it?

Yes, but reads and writes take longer while rebuilding is in progress.

Deleting a Disk Array or Logical Drive

Why can't I select Delete Disk Array or Delete Logical Drive?

You must have Power or Super User Rights to delete a disk array or logical drive. See your Administrator about upgrading your access rights, if necessary. Also see "Making User Settings" on page 104 or page 287.

Can I delete a Logical Drive without deleting the Disk Array?

Yes. See "Deleting a Logical Drive" on page 166.

Rebuilding a Disk Array

I replaced a failed physical drive with a used but known-good drive. The system does not rebuild to it. Why not?

The replacement drive was previously used in a different disk array or logical drive. You must clear (erase) the Reserve Sector of the replacement disk drive before the system can rebuild to it. "Clearing a Stale or a PFA Condition" on page 147 or page 227.

Migrating a Disk Array

When I try to migrate a disk array from one RAID level to another, why doesn't the controller let me do it?

Most RAID levels have a minimum and maximum number of physical drives. Be sure you have the correct number of drives available for the target disk array. See "RAID Levels" on page 333 and "RAID Level Migration" on page 347.

I want to add two more drives to my RAID 1 disk array. Why won't the controller let me migrate it?

A RAID 1 disk array uses only two disk drives. In this case, you can add two physical drives, then convert to a RAID 10 disk array. Most RAID levels have a minimum and maximum number of disk drives. See "RAID Levels" on page 333.

Media Patrol and PDM

Media Patrol and PDM are enabled on my system. But they never report anything.

This is a good sign. Media Patrol and PDM operate transparently until they find a problem on a physical drive.

Contacting Technical Support

PROMISE Technical Support provides several support options for PROMISE users to access information and updates. We encourage you to use one of our electronic services, which provide product information updates for the most efficient service and support.

PROMISE E-Support: https://support.promise.com

PROMISE web site: http://www.promise.com/apple/

When you contact us, please have the following information available:

- Product model and serial number
- BIOS, firmware, and driver version numbers
- A description of the problem / situation
- System configuration information, including: motherboard and CPU type, hard drive models, SAS/SATA/ATA/ATAPI drives & devices, and other controllers.

United States

580 Cottonwood Drive

Milpitas, Ca 95035, USA

Apple Pre-Sales: 1 408 228-1400 Option 2

Apple Support Phone Toll Free: 1-800-888-0245 Option 8

Fax: 1 408 228-1097

Apple Sales Email: apple@promise.com

Technical Support (E-Support): https://support.promise.com

Web site: http://www.promise.com/apple/

Australia

Apple Pre-Sales Toll Free: 1800-149-746

Apple Support Phone Toll Free: 1800-149-746

Apple Sales Email: apple@promise.com

Technical Support (E-Support): https://support.promise.com

Web site: http://www.promise.com/apple/

EMEA

Netherlands

Science Park Eindhoven 5228
5692 EG Son, The Netherlands
Apple Pre-Sales Toll Free Phone (0830 to 1700): 0800-917-027
Apple Support Phone (0830 to 1700) Toll Free: 0800-917-027
Apple Support Phone (After Hours, English only) Toll Free: 0800-917-027
Fax: +31 (0) 40-256-9463
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Austria

Apple Pre-Sales Toll Free Phone (0830 to 1700): 0800-295-731
Apple Support Toll Free Phone (0830 to 1700): 0800-295-731
Apple Support Toll Free Phone (After Hours, English only): 0800-295-731
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

France

Apple Pre-Sales Toll Free Phone (0830 to 1700): 0800-917-027
Apple Support Toll Free Phone (0830 to 1700): 0800-917-027
Apple Support Toll Free Phone (After Hours, English only): 0800-917-027
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Germany

Europaplatz 9
44269 Dortmund, Germany
Apple Pre-Sales Toll Free Phone (0830 to 1700): 0800-187-3557
Apple Support Toll Free Phone (0830 to 1700): 0800-187-3557
Apple Support Toll Free Phone (After Hours, English only): 0800-187-3557
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Sweden

Apple Pre-Sales Toll Free Phone (0830 to 1700): 020-797-720
Apple Support Toll Free Phone (0830 to 1700): 020-797-720
Apple Support Toll Free Phone (After Hours, English only): 020-797-720
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Switzerland ITF

Apple Pre-Sales Toll Free Phone (0830 to 1700): 0800-562-898
Apple Support Toll Free Phone (0830 to 1700): 0800-562-898
Apple Support Toll Free Phone (After Hours, English only): 0800-562-898
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Norway ITF

Apple Pre-Sales Toll Free Phone (0830 to 1700): 0800-15406
Apple Support Toll Free Phone (0830 to 1700): 0800-15406
Apple Support Toll Free Phone (After Hours, English only): 0800-15406
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Belguim

Apple Pre-Sales Toll Free Phone (0830 to 1700): 0800-71915
Apple Support Toll Free Phone (0830 to 1700): 0800-71915
Apple Support Toll Free Phone (After Hours, English only): 0800-71915
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Luxembourg

Apple Pre-Sales Toll Free Phone (0830 to 1700): 0800-26425
Apple Support Toll Free Phone (0830 to 1700): 0800-26425
Apple Support Toll Free Phone (After Hours, English only): 0800-26425
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

United Kingdom

Apple Pre-Sales Toll Free Phone (0830 to 1700): 0800-587-1068
Apple Support Toll Free Phone (0830 to 1700): 0800-587-1068
Apple Support Toll Free Phone (After Hours, English only): 0800-587-1068
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Taiwan

Apple Pre-Sales Toll Free (24x7 English only): 008-0113-6030
Apple Support Phone Toll Free (24x7 English only): 008-0113-6030
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

China

Room 1108, West Wing, Shi Chuang Plaza, 22 Information Road
Shangdi IT Park, Haidian District, Beijing 100085
Apple Pre-Sales Toll Free: 86-10-8857-8085/8095
Apple Support Phone Toll Free: 86-10-8857-8085/8095
Fax: 86-10-8857-8015
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Korea

Apple Pre-Sales Toll Free (24x7 English only): 00798-14-800-7784
Apple Support Phone Toll Free (24x7 English only): 00798-14-800-7784
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Hong Kong

Apple Pre-Sales Toll Free Phone (24x7 English only): 800-933-480
Apple Support Toll Free Phone (24x7 English only): 800-933-480
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Singapore

Apple Pre-Sales Toll Free Phone (24x7 English only): 800-492-2153
Apple Support Toll Free Phone (24x7 English only): 800-492-2153
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Japan

3F, Mura Matsu Bldg, 3-8-5, Hongo Bunkyo-ku
Tokyo 113-0033, Japan
Apple Pre-Sales Toll Free Phone (24x7 English only): 0066-3384-9021
Apple Support Toll Free Phone (24x7 English only): 0066-3384-9021
Apple Sales Email: apple@promise.com
Technical Support (E-Support): https://support.promise.com
Web site: http://www.promise.com/apple/

Limited Warranty

PROMISE Technology, Inc. (“PROMISE”) warrants that this product, from the time of the delivery of the product to the original end user:

a) all components, except the cache backup battery, for a period of three (3) years;

b) the cache backup battery, for a period of one (1) year;

c) will conform to PROMISE’s specifications;

d) will be free from defects in material and workmanship under normal use and service.

This warranty:

a) applies only to products which are new and in cartons on the date of purchase;

b) is not transferable;

c) is valid only when accompanied by a copy of the original purchase invoice.

d) Is not valid on spare parts.

This warranty shall not apply to defects resulting from:

a) improper or inadequate maintenance, or unauthorized modification(s), performed by the end user;

b) operation outside the environmental specifications for the product;

c) accident, misuse, negligence, misapplication, abuse, natural or personal disaster, or maintenance by anyone other than a PROMISE or a PROMISE-authorized service center.

Disclaimer of other warranties

This warranty covers only parts and labor, and excludes coverage on software items as expressly set above.

Except as expressly set forth above, PROMISE DISCLAIMS any warranties, expressed or implied, by statute or otherwise, regarding the product, including, without limitation, any warranties for fitness for any purpose, quality, merchantability, non-infringement, or otherwise. PROMISE makes no warranty or representation concerning the suitability of any product for use with any other item. You assume full responsibility for selecting products and for ensuring that the products selected are compatible and appropriate for use with other goods with which they will be used.

PROMISE DOES NOT WARRANT that any product is free from errors or that it will interface without problems with your computer system. It is your responsibility to back up or otherwise save important data before installing any product and continue to back up your important data regularly.

No other document, statement or representation may be relied on to vary the terms of this limited warranty.

PROMISE's sole responsibility with respect to any product is to do one of the following:

a) replace the product with a conforming unit of the same or superior product;

b) repair the product.

PROMISE shall not be liable for the cost of procuring substitute goods, services, lost profits, unrealized savings, equipment damage, costs of recovering, reprogramming, or reproducing of programs or data stored in or used with the products, or for any other general, special, consequential, indirect, incidental, or punitive damages, whether in contract, tort, or otherwise, notwithstanding the failure of the essential purpose of the foregoing remedy and regardless of whether PROMISE has been advised of the possibility of such damages. PROMISE is not an insurer. If you desire insurance against such damage, you must obtain insurance from another party.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitation may not apply to you.

This warranty gives specific legal rights, and you may also have other rights that vary from state to state. This limited warranty is governed by the State of California.

Your Responsibilities

You are responsible for determining whether the product is appropriate for your use and will interface with your equipment without malfunction or damage. You are also responsible for backing up your data before installing any product and for regularly backing up your data after installing the product. PROMISE is not liable for any damage to equipment or data loss resulting from the use of any product.

Returning the Product For Repair

If you suspect a product is not working properly, or if you have any questions about your product, contact our Technical Support staff, and be ready to provide the following information:

- Product model and serial number (required)
- Return shipping address
- Daytime phone number
- Description of the problem
- Copy of the original purchase invoice

The technician helps you determine whether the product requires repair. If the product needs repair, the technician issues an RMA (Return Merchandise Authorization) number.

Important

Obtain an RMA number from Technical Support *before* you return the product and write the RMA number on the label. The RMA number is essential for tracking your product and providing the proper service.

Return ONLY the specific product covered by the warranty. Do not ship cables, manuals, CDs, etc.

USA and Canada:	PROMISE Technology, Inc. Customer Service Dept. Attn.: RMA # _____ 47654 Kato Road Fremont, CA 94538
Other Countries:	Return the product to your dealer or retailer. Contact them for instructions before shipping the product.

You must follow the packaging guidelines for returning products:

- Use the original shipping carton and packaging
- Include a summary of the product's problem(s)
- Write an attention line on the box with the RMA number
- Include a copy of your proof of purchase

You are responsible for the cost of insurance and shipment of the product to PROMISE. Note that damage incurred due to improper transport or packaging is not covered under the Limited Warranty.

When repairing returned product(s), PROMISE may replace defective parts with new or reconditioned parts, or replace the entire unit with a new or reconditioned unit. In the event of a replacement, the replacement unit is under warranty for the remainder of the original warranty term from purchase date, or 30 days, whichever is longer.

PROMISE pays for standard return shipping charges only. You must pay for any additional shipping options, such as express shipping.

Appendix A: Useful Information

The appendix covers the following topics:

- SNMP MIB Files (below)
- Adding a Second RAID Controller (page 445)
- Installing a Second RAID Controller (page 446)

SNMP MIB Files

PROMISE supplies two MIB files to integrate the VTrak E830f, E630f, or E330f subsystem into your SNMP system. These files are in the SNMP folder on the Software CD.

The MIB files are:

- FCMGMT-MIB.mib
- raidv4.mib

For help loading the MIB files, see the instructions that came with your MIB browser.

Adding a Second RAID Controller

If your VTrak E-Class subsystem shipped with one RAID controller, you can add a second RAID controller. The second controller must have:

- The same firmware version as the currently installed controller
- The same amount of SDRAM as the currently installed controller

To obtain information for the currently installed RAID controller:

1. Click the **Device** tab.
2. Click the **Component List** icon.
3. Click the Controller and click the **View** button.
4. On the **Information** tab, note the Firmware Version.
5. Click the **Advanced information** tab.
6. Note the Slot 1 and Slot 2 Memory Size.
7. Contact contact PROMISE Technical Support to order your second RAID controller.

PROMISE Technical Support prepares the new RAID controller with f‘irmware and SDRAM to match the existing RAID controller in your VTrak subsystem.

Installing a Second RAID Controller

To install a second RAID controller in your VTrak subsystem:

1. Shut down the subsystem.
2. Remove the blank cover from the right RAID controller slot.
3. Carefully slide the new RAID controller into the slot until the handle locks in place.
4. Attach your data and management cables to the new controller, as needed.

   See the “Making Management and Data Connections” on page 19 for cable connection information.
5. Power up the subsystem and launch WebPAM PROe.
6. In WebPAM PROe, click the **Dashboard** tab and look under **System Status**.

   - If the new controller has a green check  icon, the installation is completed. Go to “New Settings for Dual Controllers” on page 447.
   - If the new controller has a yellow !  icon, one of the RAID controllers went into **maintenance mode** because its firmware or memory do not match the other RAID controller. See “RAID Controller in Maintenance Mode,” below.

RAID Controller in Maintenance Mode

To manage a RAID controller in maintenance mode:

1. Click the **Administration** tab.
2. Click the **Firmware Update** icon.
3. Click the **Controller Firmware Update** option.
4. Compare the Firmware version on Controller 1 and Controller 2.
   - If the firmware versions are different, go to “Updating the Subsystem Firmware” on page 315.
   - If the firmware versions match, contact PROMISE Technical Support for help installing the correct memory into the RAID controller.

New Settings for Dual Controllers

With the second controller successfully installed, make the following settings:

- **Redundancy Type** – Set to Active-Active or Active-Standby.
  See “Making Subsystem Settings” on page 77 or page 211.
- **LUN Affinity** – If you choose Active-Active redundancy.
  See “Making Controller Settings” on page 86 or page 216.

Note

The VTrak subsystem boots its RAID controllers sequentially. With a second controller installed, your subsystem takes about a minute longer to boot. This condition is normal.

Dual Controllers and SATA Drives

If your VTrak subsystem has SATA disk drives installed, you must install a SAS-to-SATA adapter on each of the SATA drives.

Without the SAS-to-SATA adapter, SATA drives display a red X icon and **Not Usable** status.

Obtain SAS-to-SATA adapters from PROMISE Technology at http://www.promise.com.

SAS drives do not require adapters.

Also see “Installing Disk Drives” on page 15 and “Contacting Technical Support” on page 435.

Appendix B: Multipathing on Windows

The appendix covers the following topics:

PerfectPath is a multipathing software designed for use with PROMISE VTrak E-Class RAID subsystem products and includes:

- **GUI** – Graphic user interface, PerfectPath View, for easy monitoring and settings.
- **DSM** – Device-Specific Module driver.
- **Events Service** – Notification service posts events to the application log.

PerfectPath supports Fibre Channel and Serial Attached SCSI (SAS) technologies.

PerfectPath runs on Windows Server 2008 and 2008 R2 operating systems, on both x86 and x64 platforms.

For a list of supported OSes, download the latest compatibility list from PROMISE support: http://www.promise.com/support/.

Before You Begin

Before you install PerfectPath on your Windows Host PC, you must:

- Install your Fibre Channel or SAS HBA cards and their device drivers.
- Close all computer and storage management applications, including Computer Management, Device Manager, Disk Management, and the Registry Editor.

Note

If you have a complex configuration, such as multiple HBAs connected with multiple LUNs and paths to your PC, installation can take a long time. You can choose to temporarily disconnect your storage, install PerfectPath, then reconnect your storage to reduce installation time.

Installing PerfectPath

To install the PerfectPath software:

1. Download the PerfectPath installer file from PROMISE support: http://www.promise.com/support/ and save the installer file to your Windows desktop.
2. Double-click the **PerfectPath.exe** installer file to start the installer.
3. In the Welcome screen, click the **Next** button.
4. In the License Agreement screen, click the “I accept the terms of this license agreement” option, then click the **Next** button.
5. In the Close All Disk Management Applications screen, click the **Next** button.
6. In the Ready to Install the Program screen, click the **Install** button.
7. Optional. If the installer displays a Security Alert message about an unsigned driver, click the **Yes** button to continue installation.

   The software files install onto the system drive in the **Program Files\Promise\PerfectPath** folder. There is no optional install location.
8. In the Install Completed screen, click the **Finish** button.
9. In the Restart message box, click the **Yes** button to restart your PC.

Important

Save the PerfectPath installer file in case you need to repair your PerfectPath software in the future. See “Repairing PerfectPath” on page 469.

Verifying Installation

Before you can verify PerfectPath installation:

- Your Host PC must have multiple data-path connections to the VTrak subsystem.
- The VTrak must be fully booted.
- The VTrak must have at least one logical drive.

See “Making Management and Data Connections” on page 19 for information about making data connections. See “Creating a Disk Array Manually” on page 150 or “Creating a Disk Array” on page 229 for information about creating RAID arrays and logical drives.

You can verify Perfect Path installation on the Host PC in one of three ways:

- Start Menu
- Services List
- Device Manager

Start Menu

To verify PerfectPath installation in the Start menu:

From the Start menu, choose **All Programs** > **PerfectPath** > **PerfectPath View**.

The PerfectPath View software starts.

Services List

To verify PerfectPath installation in the Services list:

1. From the Start menu, right-click the **Computer** icon and choose **Manage** from the popup menu.
2. In the Server Management tree, click the **+** icon beside **Configuration**.
3. Click the **Services** icon.
4. In the Services window, look for the **PerfectPath Events Service**.

   If the PerfectPath Events Service is present, PerfectPath has been installed. The Service should be Started and set to Automatic on the Local System.

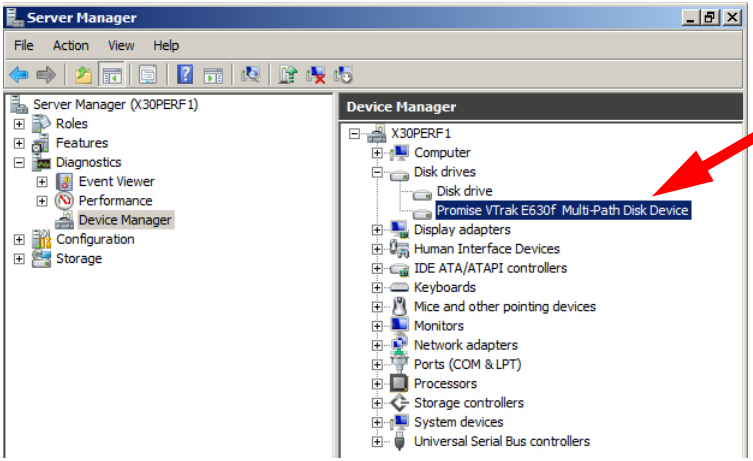
Device Manager

To verify PerfectPath installation in the Device Manager:

1. From the Windows desktop, right-click the **Computer** icon and choose **Manage** from the dropdown menu.
2. In the Server Management tree, click the **+** icon beside **Diagnostics**.
3. Under Diagnostics, click the **Device Manager.**

4. In the Device Manager window, click **Disk drives**.
5. Under Disk drives, look for “Promise VTrak Multi-Path Disk Device” in the Disk drives list. See Figure 1.

Figure 1. Device manager window



Running Perfect Path View

Running PerfectPath View includes these functions:

- Starting PerfectPath View (page 453)
- Quitting PerfectPath View (page 453)

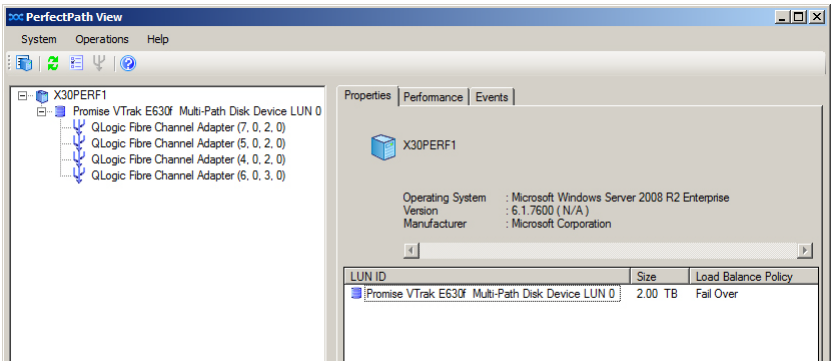
Starting PerfectPath View

To start PerfectPath View:

From the Start menu, choose **All Programs** > **PerfectPath** > **PerfectPath View**.

The PerfectPath View window opens. See Figure 2.

Figure 2. PerfectPath View window



Quitting PerfectPath View

To quit the PerfectPath View application, do one of the following actions:

- From the System menu, choose Exit.
- Click the Close icon on the PerfectPath View window.

Monitoring Your LUNs and Paths

Monitoring your LUNs and Paths includes these functions:

- Viewing LUN Properties (page 454)
- Viewing Path Properties (page 455)
- Viewing LUN Performance Statistics (page 456)
- Viewing Path Performance Statistics (page 457)
- Viewing Events (page 459)
- Clearing Path Statistics (page 459)

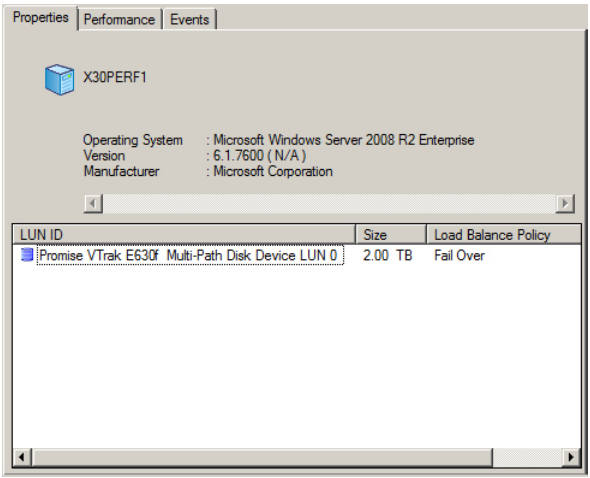
Viewing LUN Properties

To view a list of all LUNs:

1. Click a Server in Tree View.
2. Click the **Properties** tab.

   The Properties tab reports:

   - **System** – Name, OS type, and version
   - **LUNs** – Name, size, serial number, and load balance policy



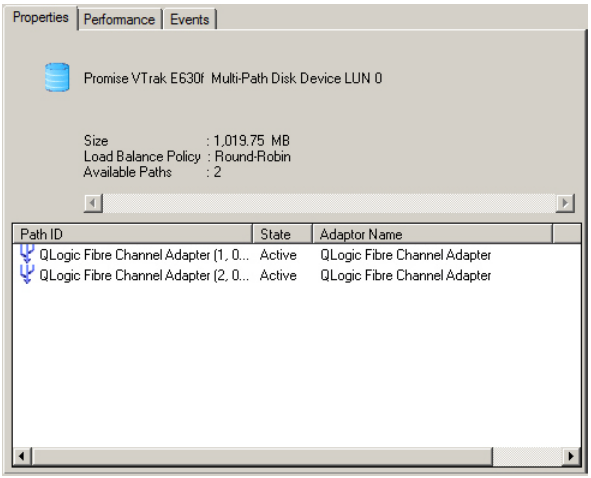
Move the scroll bar or expand the window to see all of the reported information.

To view a single LUN and all of its Paths:

1. Click the LUN in Tree View.
2. Click the **Properties** tab.

   The Properties tab reports:

   - **LUNs** – Name, size, and load balance policy
   - **Paths** – Path ID, state, and adapter name



Move the scroll bar or expand the window to see all of the reported information.

See also:

- “Load Balance Policy” on page 461
- “Refreshing the Objects” on page 465

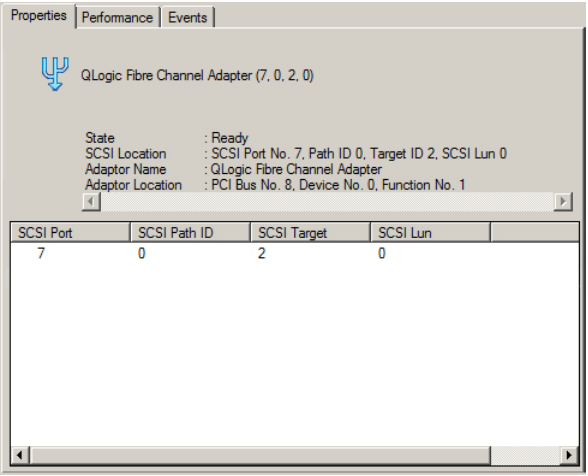
Viewing Path Properties

To view Path properties:

1. Click a Path in Tree View.
2. Click the **Properties** tab.

   The Properties tab reports:

   - SCSI Port number
   - SCSI Path ID
   - SCSI Target
   - SCSI LUN



See also:

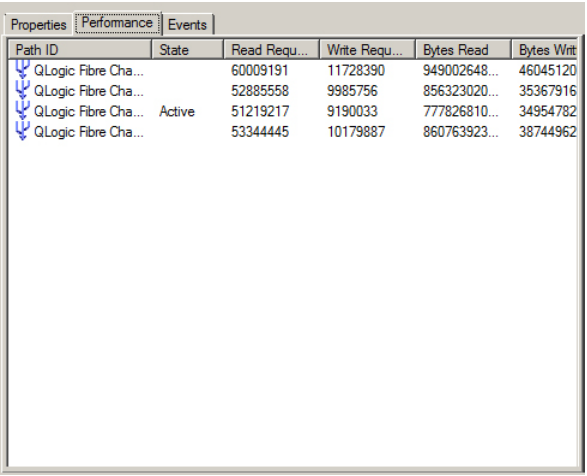
- “Load Balance Policy” on page 461
- “Refreshing the Objects” on page 465

Viewing LUN Performance Statistics

To view performance statistics for a LUN:

1. Click the LUN in Tree View.
2. Click the **Performance** tab.

   The Performance tab reports the state and cumulative counts for each path to that LUN.



Move the scroll bar or expand the window to see all of the reported statistics.

The Performance tab reports the following data for each path:

- Path ID
- State (Active or not)
- Read Requests
- Write Requests
- Bytes Read
- Bytes Written
- Non-IO Requests
- Queue Depth
- Retries Count
- Failure Count

An **Active** state indicates this path is available to handle I/O requests.

If **Active** does not appear, the path is designated as Standby.

Active and **Standby** states are determined by Load Balance Policy.

See also:

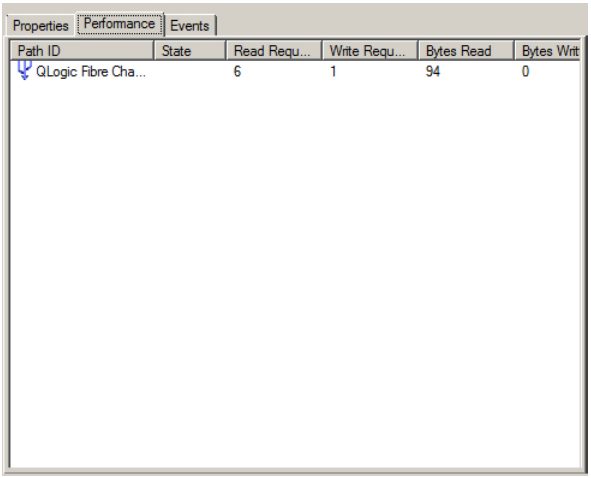
- “Viewing Path Performance Statistics” on page 457
- “Load Balance Policy” on page 461

Viewing Path Performance Statistics

To view performance statistics for a Path:

1. Click a Path in Tree View.
2. Click the **Performance** tab.

The Performance tab reports the state and cumulative counts for a specific path.



Move the scroll bar or expand the window to see all of the reported statistics.

The Performance tab reports the following data for each path:

- Path ID
- State (Active or not)
- Read Requests
- Write Requests
- Bytes Read
- Bytes Written
- Non-IO Requests
- Queue Depth
- Retries Count
- Failure Count

An **Active** state indicates this path is available to handle I/O requests.

If **Active** does not appear, the path is designated as Standby.

Active and **Standby** states are determined by Load Balance Policy.

See also:

- “Viewing Path Performance Statistics” on page 457
- “Load Balance Policy” on page 461

Viewing Events

Click the Events tab to view MPIO related events. The data includes:

- Type – Error, Warning, or Information
- Time
- Date
- Server
- Message

Move the scroll bar or expand the window to see all of the reported information.

Use this information to verify that settings changes took place and diagnose problems.

See also:

- “Automatic Load Balancing for Failover Policy” on page 460
- “Load Balance Policy” on page 461
- “Path Verification” on page 462
- “PDO Removal” on page 463
- “Refreshing the Objects” on page 465

Clearing Path Statistics

You can Clear Path Statistics for all paths as needed for monitoring and diagnostic purposes.

To clear the statistics for ALL paths, do one of the following actions:

- From the Operations menu, choose **Clear Path Statistics**.
- In the Tree, right-click the LUN  icon, and choose **Clear Path Statistics** from the popup menu.

Features and Settings

Features and Settings include the following functions:

Automatic Load Balancing for Failover Policy

The PROMISE MPIO solution can load balance the paths for your LUNs with load balance policy set to **Failover**.

With Automatic Load Balancing enabled, the LUNs set to Failover policy are automatically redistributed among all available paths when:

- A path fails
- A failed path comes back online
- A new path is added

Automatic Load Balancing, when enabled, provides optimal data throughput for LUNs set to Failover policy.

Note that Automatic Load Balancing has NO effect upon LUNs set to Round Robin, Round Robin with Subset, or Least Queue Depth.

Enabling Automatic Load Balancing

To enable automatic load balancing:

From the Operations menu, choose **Auto Load Balance**.

When you see a check mark beside Auto Load Balance in the Operations menu, this feature is enabled.

See also:

- “Viewing LUN Properties” on page 454
- “Viewing LUN Performance Statistics” on page 456
- “Load Balance Policy” on page 461

Load Balance Policy

Load Balance Policy is a method of equalizing the I/O traffic over each path by systematically dividing the load among multiple paths.

- **Failover Policy** – No load balancing. With Automatic Load Balancing disabled, the first path discovered is the primary path. I/Os follow the active path until it fails, then they change to next available path. Each LUN uses only one active path.

  See “Automatic Load Balancing for Failover Policy” on page 460.
- **Round Robin Policy** – I/Os follow all active paths, changing paths at the specified I/O count. You can set the I/O count in the General tab of the Advanced Settings dialog box.

  If LUN Affinity is enabled do NOT use Round Robin. See “Making Controller Settings” on page 86 or page 216.
- **Round Robin with Subset Policy** – One or more paths are designated as standby. I/Os follow all active paths, changing at the specified I/O count. You can set the I/O count in the General tab of the Advanced Settings dialog box.

  If LUN Affinity is enabled, you can use Round Robin with Subset. See “Making Controller Settings” on page 86 or page 216.
- **Least Queue Depth Policy** – I/Os follow the path with the least number of requests queued.

Note that you can enable Automatic Load Balancing for LUNs with policy set to Failover. See “Automatic Load Balancing for Failover Policy” on page 460.

Changing Load Balance Policy Settings

To change load balance policy settings:

1. Do one of the following actions:
   - From the Operations menu, choose **Change Load Balance Policy**.
   - In Tree View, highlight a LUN and click the Change Load Balance Policy icon.
   - In Tree View, right-click a a LUN and choose **Change Load Balance Policy** from the popup menu.

   The Change Load Policy dialog box appears with the Load Balance Policy tab displayed.
2. Click the option button for one of the Load Policies.
   - Failover Policy
   - Round Robin Policy
   - Round Robin with Subset Policy
   - Least Queue Depth Policy

3. Click the **Next** button.

   The Path Selection tab displays.

4. Take the action appropriate for your policy selection.
   - For Round Robin and Least Queue Depth, no action is required. Skip to step 5.
   - For Failover, move the path you want to be active to the **Primary Path Selected** pane.

     Move all other paths to the **Path Available** pane.
   - For Round Robin with Subset, move the paths you want to be active to the **Primary Path Selected** pane.

     Move the paths you want as standby to the **Path Available** pane.

     You can have all paths in the Subset.

5. Click the **Next** button.

   The Summary tab displays the current and selected (new) policy.

6. Click the **Finish** button to apply your settings.

   The new settings take effect immediately.

See also:

- “Round Robin Count” on page 464
- “Refreshing the Objects” on page 465

Path Verification

Path verification monitors any failed paths and automatically verifies them if they become available again.

There are two Path Verification Settings:

- Enable / disable
- Verification period in seconds

Changing Path Verification Settings

To make path verification settings:

1. Do one of the following actions:
   - Click the Advanced Settings  icon.
   - From the Operations menu, choose **Advanced Settings**.

   The Advanced Settings dialog box appears with the MPIO Parameters tab displayed.

2. Check the **Enable Path Verification** box to enable path verification.

   Uncheck to disable.

3. Click the arrows or type a new value in the **Path Verification Period** field to change the interval.

   30 seconds is the default value.
4. Click the **Apply** button.
5. Click the **OK** button in the confirmation box.

   The new setting takes effect immediately.

See also:

- “Load Balance Policy” on page 461
- “PDO Removal” on page 463
- “Refreshing the Objects” on page 465

PDO Removal

PDO removal refers to the action of deleting a multipath input/output (MPIO) disk from the Windows Device Manager after all paths to a physical device object (PDO) have failed.

PDO removal interval refers to the period of time in seconds between the moment all paths to a PDO are disconnected and the MPIO disk disappears from the Device Manager.

Changing PDO Removal Settings

To change PDO removal settings:

1. Do one of the following actions:

   - Click the Advanced Settings  icon.
   - From the Operations menu, choose **Advanced Settings**.

   The Advanced Settings dialog box appears with the MPIO Parameters tab displayed.
2. Click the arrows or type a new value in the PDO Remove Period field to change the interval.

   120 seconds is the PROMISE-recommended default value.
3. Click the **Apply** button.
4. Click the **OK** button in the confirmation box.

   The new setting takes effect immediately.

See also “Path Verification” on page 462.

Performance Tab Refresh Rate

Refresh Rate refers to the number of seconds between refreshes of the data reported on the Performance tab.

Changing Refresh Rate Settings

To change the refresh rate on the Performance tab:

1. Do one of the following actions:
   - Click the Advanced Settings  icon.
   - From the Operations menu, choose **Advanced Settings**.

   The Advanced Settings dialog box appears with the MPIO Parameters tab displayed.
2. Click the **General** tab.
3. Under Refresh Rate, click the arrows or type a new value in the **Seconds** field to change the interval.

   5 seconds is the default value.
4. Click the **Apply** button.

   The new setting takes effect immediately.

See also:

- “Viewing LUN Performance Statistics” on page 456
- “Viewing Path Performance Statistics” on page 457

Round Robin Count

When you set your path Load Balance Policy to Round Robin, the I/Os follow all active paths, changing paths at the specified I/O count. You can set the I/O count in the General tab of the Advanced Settings dialog box.

Changing the Round Robin Count

To change Round Robin Count settings:

1. Do one of the following actions:
   - Click the Advanced Settings  icon.
   - From the Operations menu, choose Settings  icon.

   The Advanced Settings dialog box appears with the MPIO Parameters tab displayed.
2. Click the **General** tab.
3. Under Round Robin Count, click the arrows or type a new value in the I/Os per Path field to change the count.

10 I/Os is the default value.

4. Click the **Apply** button.

   The new setting takes effect immediately.

See also:

- “Load Balance Policy” on page 461
- “Viewing LUN Performance Statistics” on page 456
- “Viewing Path Performance Statistics” on page 457

Refreshing the Objects

Use this function after making an addition or deletion to your LUNs or paths.

To refresh the objects, do one of the following actions:

- From the Operations menu, choose **Refresh**.
- Click the Refresh icon.

PerfectPath automatically displays all reported changes. However, some actions are not reported.

The Refresh action enables you to see the latest information.

See also:

- “Automatic Load Balancing for Failover Policy” on page 460
- “Load Balance Policy” on page 461
- “Path Verification” on page 462
- “PDO Removal” on page 463

Viewing System Information

To view System information and settings, do one of the following actions:

- From the System menu, choose System Information.
- Click the System Information icon.

The System Information dialog box displays.

System information supplies information about the Host PC or Server, including:

- Host Name
- Operating System
- OS Version
- OS Manufacturer
- IP Address
- Storport File
- Storport Version
- MPIO File
- MPIO Version
- MPDEV File
- MPDEV Version
- MPSPFLTR File
- MPSPFLTR Version
- DSM File
- DSM Version

Note

File information includes the file name and location of the installed file in the server's file system.

Saving System Information

To save the current System information and settings data to a text file:

1. Do one of the following actions:
   - From the System menu, choose System Information.
   - Click the System Information  icon.

   The System Information dialog box displays.
2. From the System Information dialog box, click the **Save** button.
3. In the Save As dialog box, navigate to the folder where you want to save the file.
4. Type a **file name** into the File name field.

   Append the file name with a **.txt** suffix.
5. Click the **Save** button.
6. Click the **OK** button in the confirmation box.

   Your information and settings data are saved to a text file in the folder you designated.

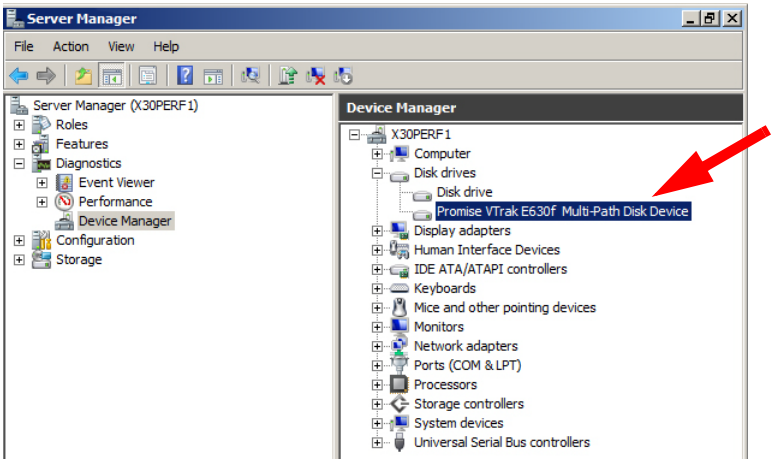
Troubleshooting

If you see no LUNs in the PerfectPath GUI, or no Multi-Path Disk Devices under Disk drives (see Figure 3), do the following actions:

- Verify that there is at least one logical drive on the VTrak
- Check your HBA cards and driver installation
- Check your data connections

Make any needed corrections and reboot your Host PC as needed.

Figure 3. Device manager window



Updating PerfectPath

To update your PerfectPath software to the latest version:

1. Download the new PerfectPath installation file from PROMISE support: http://www.promise.com/support/ and save the installation file to your Windows desktop.
2. Manually remove the current PerfectPath installation.

   See “Removing PerfectPath” on page 470.
3. Install the new PerfectPath software.

   See “Installing PerfectPath” on page 450.

Repairing PerfectPath

To implement this procedure, you must use the same PerfectPath.exe installer file that you used to install the PerfectPath software onto your PC.

The installer's version number is part of its file name. However, there is no corresponding number in the PerfectPath software.

To repair the PerfectPath software:

1. Double-click the **PerfectPath.exe** file to start the installer.
2. In the Welcome screen, click the **Next** button.
3. In the Program Maintenance screen, choose the **Repair** option, then click the **Next** button.
4. In the Ready to Repair the Program screen, click the **Install** button.
5. In the Install Completed screen, click the **Finish** button.
6. In the Restart message box, click the **Yes** button to restart your PC.

Removing PerfectPath

Preferred Method

This procedure uses the uninstaller included with PerfectPath.

To remove the PerfectPath software:

1. From the Start menu, choose **All Programs** > **PerfectPath > Uninstall PerfectPath**.
2. In the Welcome screen, click the **Next** button.
3. In the Program Maintenance screen, choose the **Remove** option, then click the **Next** button.
4. In the Remove the Program screen, click the **Remove** button.
5. In the Completed screen, click the **Finish** button.
6. In the Restart message box, click the **Yes** button to restart your PC.

Alternate Method 1

This procedure uses the Windows uninstaller.

To remove the PerfectPath software:

1. In the **Start** menu, choose **Control Panel**, then choose **Programs and Features.**
2. Right-click **Perfect Path**, and choose **Uninstall** from the popup menu.
3. In the Confirmation box, click the **Yes** button.
4. In the Restart message box, click the **Yes** button to restart your PC.

Alternate Method 2

To use this procedure, the **PerfectPath.exe** installer file must be the same version number as the PerfectPath software installed on your PC.

To remove the PerfectPath software:

1. Double-click the **PerfectPath.exe** file to start the installer.
2. In the Welcome screen, click the **Next** button.
3. In the Program Maintenance screen, choose the **Remove** option, then click the **Next** button.
4. In the Remove the Program screen, click the **Remove** button.
5. In the Completed screen, click the **Finish** button.
6. In the Restart message box, click the **Yes** button to restart your PC.

Appendix C: Multipathing on Linux

The appendix covers the following topics:

PROMISE has fully tested VTrak multipathing on RedHat RHEL 5.3, 5.4, and 5.5; and SuSE SLES 10 SP2, 10 SP3, 11, and 11 SP1. Coverage in this **Product Manual** is limited to those OSes.

Multipathing is possible on other Linux OSes. PROMISE has not tested every possible combination and therefore does not attempt to cover them here.

For a list of supported OSes, download the latest compatibility list from PROMISE support: http://www.promise.com/support/.

Before You Begin

Before you can set up multipathing on your Linux Host PC, you must:

- Install your Fibre Channel or SAS HBA card into the Host PC.
- Install the HBA card drivers onto the Host PC
- Setup your VTrak, install your physical drives and create your logical drives.
- Attach your Fibre Channel or SAS cables from the HBA card to the VTrak RAID subsystem.
- Install RHEL 5.x with the **linux mpath** option.
- For ALUA, refer to the PROMISE Linux support packages. See page 486.

Refer to the **Linux Administration Manual**, your HBA documentation, and this Appendix as needed for more information.

Check Initial Setup

To check your initial setup, verify that you can view the logical drives on your VTrak from your Linux desktop or terminal window. Refer to the **Linux Administration Manual** for the procedure on your system.

- If you can see your logical drives, the system is properly configured. Go to “Task 1: Meeting Package Requirements” on page 473.
- If you cannot see your logical drives, make the necessary adjustments and check again.

Task 1: Meeting Package Requirements

The latest device mapper and multipath packages must be loaded onto your Linux host before configuring Device Mapper Multipath (DM-MP). When this document was written, the current versions were:

- For RHEL 5.3
  - device-mapper-1.02.28-2.el5
  - device-mapper-multipath-0.4.7-23.el5
- For RHEL 5.4
  - device-mapper-1.02.32-1.el5
  - device-mapper-multipath-0.4.7-30.el5
- For RHEL 5.5
  - device-mapper-1.02.39-1.el5
  - device-mapper-multipath-0.4.7-34.el5
- For SLES 10 SP2
  - device-mapper-1.02.13-6.14
  - multipath-tools-0.4.7-34.38
- For SLES 10 SP3
  - device-mapper-1.02.13-6.14
  - multipath-tools-0.4.7-34.50.10
- For SLES 11
  - device-mapper-1.02.27-8.6
  - multipath-tools-0.4.8-40.1
- For SLES 11 SP1
  - device-mapper-1.02.27-8.20
  - multipath-tools-0.4.8-40.21.1

Installing Packages

The easiest and most effective way to install the device mapper and multipath tool is during OS installation. The **device mapper** installs by default, regardless of the configuration you select. However, you must manually specify the **multipath tool**, as it does not install as a part of any of the configurations of either OS. The multipath tool is listed as an option under **Base System**.

For hosts with the OS already installed, you can add the device mapper and multipath tool, if they are missing.

Example: To add the multipath tool for RHEL 5.x, do the following actions:

1. Open a terminal window.

2. Type the following command and press Enter:

```
# rpm -ivh device-mapper-multipath-0.4.7-8.el5.i386.rpm
```

The system returns the following lines:

```
Preparing...                ########################################### [100%]
1:device-mapper-multipath########################################### [100%]
#
```

(or a similar message)

Important

Where possible, obtain the device mapper and multipath tool from the original installation CDs to ensure full compatibility with your existing OS. Refer to your OS documentation for more information.

Verifying Packages – RedHat

To verify that the required packages are installed on the host, do the following actions:

1. Open a terminal window.
2. Type the following command and press Enter:

```
# rpm -qa | grep device-mapper
```

If the required packages are present, the system returns the following lines.

RHEL 5.3:

```
device-mapper-1.02.28-2.el5
device-mapper-multipath-0.4.7-23.el5
```

RHEL 5.4:

```
device-mapper-1.02.32-1.el5
device-mapper-multipath-0.4.7-30.el5
```

RHEL 5.5:

```
device-mapper-1.02.39-1.el5
device-mapper-multipath-0.4.7-34.el5
```

Note that the actual version number might be different, depending on your configuration.

Verifying Packages – SuSE

To verify that the required packages are installed on the host, do the following actions:

1. Open a terminal window.

2. Type the following command and press Enter:

   ```
   # rpm -qa | grep device-mapper
   ```

   If the required package is present, the system returns the following line.

   SLES 10 SP2:

   ```
   device-mapper-1.02.13-6.14
   ```

   SLES 10 SP3:

   ```
   device-mapper-1.02.13-6.14
   ```

   SLES 11:

   ```
   device-mapper-1.02.27-8.6
   ```

   SLES 11 SP1:

   ```
   device-mapper-1.02.27-8.17.20
   ```

   Note that the actual version number might be different, depending on your configuration.

3. Type the following command and press Enter:

   ```
   # rpm -qa | grep multipath-tools
   ```

   If the required package is present, the system returns the following line.

   SLES 10 SP2:

   ```
   multipath-tools-0.4.7-34.38
   ```

   SLES 10 SP3:

   ```
   multipath-tools-0.4.7-34.50.10
   ```

   SLES 11:

   ```
   multipath-tools-0.4.8-40.1
   ```

   SLES 11 SP1:

   ```
   multipath-tools-0.4.8-40.21.1
   ```

   Note that the actual version number might be different, depending on your configuration.

Task 2: Preparing the Configuration File

To setup multipathing with VTrak, or any other subsystem, you must provide the required device attributes in a configuration file. The multipath configuration file is named **multipath.conf**. The functional version of the file is saved in the **/etc** directory.

RedHat Systems

For RedHat systems, there is a default **/etc/multipath.conf** file. However, the default file does not have the required device attributes to work with VTrak.

There are also sample configuration files in the **/usr/share/doc/device-mapper-multipath-[version]** directory:

- **multipath.conf.annotated** – multipath device attributes listed and defined
- **multipath.conf.synthetic** – multipath device attributes listed only

SuSE Systems

For SuSE systems, there is no default **/etc/multipath.conf** file.

There are sample multipath configuration files in the **/usr/share/doc/packages/multipath-tools** directory:

- **multipath.conf.annotated** – multipath device attributes listed and defined
- **multipath.conf.synthetic** – multipath device attributes listed only

Editing a Configuration File

You must provide a configuration file with required device attributes to work with VTrak. See the sample configuration file on page 489.

Take the following actions to prepare a configuration file:

1. Choose an existing multipath.conf file and open the file in a text editor.
2. Save a working copy of the file under another name.
3. Edit the file to include the following line under defaults:

```
defaults {
user_friendly_names yes
}
```

4. Edit the file to include the following lines under devices:

```
devices {
device {
vendor                  "Promise"
product                 "VTrak"
path_grouping_policy    multibus
getuid_callout          "/sbin/scsi_id -g -u -s /block/%n"
path_checker            readsector0
path_selector           "round-robin 0"
hardware_handler        "0"
failback                immediate
rr_weight               uniform
rr_min_io               100
no_path_retry           20
features                "1 queue_if_no_path"
product_blacklist       "VTrak V-LUN"
}
}
```

5. Edit the file to include the following lines under devnode_blacklist:

```
devnode_blacklist {
devnode "^sda$"
devnode "^(ram|raw|loop|fd|md|dm-|sr|scd|st)[0-9]*"
devnode "^hd[a-z]"
devnode "^cciss!c[0-9]d[0-9]*"
}
```

6. Be sure all the relevant lines of your configuration file are uncommented. Remove the # character from the beginning of the line.
7. Save the file as **multipath.conf**.
8. Place a copy of the **multipath.conf** file into the Host's **/etc** directory.

Task 3: Making Initial Host Settings

After the packages and configuration file are installed, the Host is ready to accept multipath settings.

Setting the Daemon to Run

RHEL 5.3, 5.4, 5.5

This action requires RHEL installation with the “linux mpath” Option. See “Before You Begin” on page 471.

To set the MP daemon to run at boot time:

1. Open a terminal window.
2. Verify that **/etc/rc.d/rc[3~5].d/** has a symbolic link to **/etc/rc.d/init.d/multipathd**. Also see the Note below.

   Run the command:

   ```
   # ls -al /etc/rc.d/rc[3~5].d/ | grep multipathd
   ```
3. If there is no symbolic link, run the command:

   ```
   # cd /etc/rc.d/rc[3~5].d/
   ```

   Then run the command:

   ```
   # ln -s /etc/rc.d/init.d/multipathd S13multipathd
   ```

Note: **/etc/rc.d/rc[3~5].d** saves a link to start at each run level.

- Run level 3 is for a single user.
- Run level 4 is for multiple users.
- Run level 5 is for multiple users on X Windows.

SLES 10 SP2, 10 SP3, 11, 11 SP1

To set the MP daemon to run at boot time:

1. Open a terminal window.
2. Set the daemon to run at boot time.

   ```
   # chkconfig multipathd on
   ```

   The system does not return anything.

Verifying the Modules are Loaded

To verify that the DM-MP modules are loaded:

1. Open a terminal window.
2. Verify that the multipath module is loaded.

   ```
   # lsmod | grep dm_multipath
   ```

If the module is loaded, the system returns:

`dm_multipath 215770` (or a similar message)

3. Verify that the device mapper module is loaded.

```
# lsmod | grep dm_mod
```

If the module is loaded, the system returns:

`dm_mod 56537 8 dm_snapshot...` (or a similar message)

Verifying the Daemon is Running

To verify that the MP daemon is running:

1. Open a terminal window.
2. Check the daemon's status.

```
# /etc/init.d/multipathd status
```

3. Do one of the following actions:
   - If the system returns:

     `multipathd is running` (or a similar message)

     Go to "Task 4: Create and Configure Devices" on page 480.
   - If the system returns:

     `multipathd is stopped` (or a similar message)

     Start the MP daemon.

     ```
     # /etc/init.d/multipathd start
     ```

     Then go to "Task 4: Create and Configure Devices" on page 480.

Task 4: Create and Configure Devices

This step applies the settings from the multipath.config file to the Host.

1. Open a terminal window.
2. Type the following command and press Enter:

   ```
   #multipath -v3
   ```

   The system returns:

   ```
   ...
   ==== paths list ====
   uuid               hcil    dev dev_t pri dm_st chk_st   vend...
   222490001555459b3b 2:0:0:0 sdb 8:16  1   [undef][undef] Prom...
   222b40000155a75b49 2:0:0:2 sbc 8:32  1   [undef][undef] Prom...
   20efcff5501000121a 3:0:0:0 sbd 8:48  1   [undef][undef] Prom...
   222b44000155ebf0c  3:0:0:1 sde 8:64  1   [undef][undef] Prom...
   params = 1 que_if_no_path 0 1 1 round-robin 0 1 1 8:64 100
   status = 1 0 0 1 1 A 0 1 0 8:64 A 0
   sde: mask = 0x4
   sde: path checker = readsector0 (controller setting)
   sde: state = 2
   ...
   ```

   (or a similar message)

3. Restart the MP daemon.

   ```
   #/etc/init.d/multipathd restart
   ```

   The system returns:

   `Stopping multipathd daemon` (or a similar message)

   `Starting multipathd daemon` (or a similar message)

For more information about path monitoring functions, type **help** and press Enter.

Task 5: Setting-up ALUA

VTrak supports Asymmetric Logical Unit Access (ALUA) on the latest Linux distributions:

- RedHat Linux RHEL 5.4
- RedHat Linux RHEL 5.5
- SuSE Linux SLES 10 SP3
- SuSE Linux SLES 11
- SuSE Linux SLES 11 SP1

PROMISE provides RPM packages and **multipath.conf** files for ALUA. See “RPM Packages and Documents for Linux MPIO” on page 486.

RedHat Linux RHEL 5.4

Default Kernel

To support ALUA within RHEL 5.4 using the default kernel without XEN or PAE support:

1. Install RHEL 5.4. When the CD is chosen for installation, immediately type **linux mpath**.
2. Copy the PROMISE-supplied **multipath.conf** file to the **/etc** directory.

   ```
   cp multipath.conf-vtrak-alua-rhel5-4 /etc/multipath.conf
   ```

3. Install the appropriate **scsi_dh_alua** driver module.
   - i386

     ```
     cd /usr/src/redhat/RPM/i386
     rpm -ivh scsi_dh_alua_VTrak-1-1.i386.rpm
     ```

   - x86_64

     ```
     cd /usr/src/redhat/RPM/x86_64
     rpm -ivh scsi_dh_alua_VTrak-1-1.x86_64.rpm
     ```

4. Check the multipath configuration.

   ```
   Multipath -ll (multipath -v4)
   ```

Kernel with XEN or PAE support

To support ALUA within RHEL 5.4 using kernel with XEN or PAE support:

1. Install RHEL 5.4. When the CD is chosen for installation, immediately type **linux mpath**.
2. Copy the PROMISE-supplied **multipath.conf** file to the **/etc** directory.

   ```
   cp multipath.conf-vtrak-alua-rhel5-4 /etc/multipath.conf
   ```

3. Install this patched **alua_dh_scsi** source module.

   ```
   rpm -ivh scsi_dh_alua_VTrak-1-1.src.rpm
   ```

4. Make your own rpm.

   ```
   cd /usr/src/redhat/SPEC
   rpmbuild -ba scsi_dh_alau.spec
   ```

5. Determine your system architecture, x86_64 or i386.

   ```
   uname -a
   ```

6. Install the appropriate **scsi_dh_alua** driver module.
   - i386

     ```
     cd /usr/src/redhat/RPM/i386
     rpm -ivh scsi_dh_alua_VTrak-1-1.i386.rpm
     ```

   - x86_64

     ```
     cd /usr/src/redhat/RPM/x86_64
     rpm -ivh scsi_dh_alua_VTrak-1-1.x86_64.rpm
     ```

7. Check the multipath configuration.

   ```
   Multipath -ll (multipath -v4)
   ```

RedHat Linux RHEL 5.5

Default Kernel

To support ALUA within RHEL 5.5 using the default kernel without XEN or PAE support:

1. Install RHEL 5.5. When the CD is chosen for installation, immediately type **linux mpath**.
2. Copy the PROMISE-supplied **multipath.conf** file to the **/etc** directory.

   ```
   cp multipath.conf.alua-rhel5.5 /etc/multipath.conf
   ```

3. Install this patched **scsi_dh_alua** driver module.
   - i386

     ```
     cd /usr/src/redhat/RPM/i386
     rpm -ivh scsi_dh_alua_VTrak-2-1.i386.rpm
     ```

   - x86_64

     ```
     cd /usr/src/redhat/RPM/x86_64
     rpm -ivh scsi_dh_alua_VTrak-2-1.x86_64.rpm
     ```

4. Check the multipath configuration.

   ```
   Multipath -ll (multipath -v4)
   ```

Kernel with XEN or PAE support

To support ALUA within RHEL 5.5 using kernel with XEN or PAE support:

1. Install RHEL 5.5. When the CD is chosen for installation, immediately type **linux mpath**.
2. Copy the PROMISE-supplied **multipath.conf** file to the **/etc** directory.

   ```
   cp multipath.conf.alua-rhel5.5 /etc/multipath.conf
   ```
3. Install this patched **alua_dh_scsi** driver module.

   ```
   rpm -ivh scsi_dh_alua_VTrak-2-1.src.rpm
   ```
4. Make your own rpm.

   ```
   cd /usr/src/redhat/SPEC
   rpmbuild -ba scsi_dh_alau.spec
   ```
5. Determine your system architecture, x86_64 or i386.

   ```
   uname -a
   ```
6. Install the appropriate **scsi_dh_alua** driver module.
   - i386

     ```
     cd /usr/src/redhat/RPM/i386
     rpm -ivh scsi_dh_alua_VTrak-2-1.i386.rpm
     ```
   - x86_64

     ```
     cd /usr/src/redhat/RPM/x86_64
     rpm -ivh scsi_dh_alua_VTrak-2-1.x86_64.rpm
     ```
7. Check the multipath configuration.

   ```
   Multipath -ll (multipath -v4)
   ```

SuSE Linux SLES 10 SP3

To support ALUA within SLES10 SP3:

1. Determine your system architecture, i586 or x86_64.

   ```
   #> uname -a
   ```
2. Do one of the following actions:
   - Remove the currently installed multipath tool.

     ```
     rpm -ev multipath-tools
     ```

     Install the appropriate new multipath-tool RPM package.

     i586

     ```
     rpm -ivh multipath-tools-0.4.7-34.50.10.ass.fix.i586.rpm
     ```

     x86_64

     ```
     rpm -ivh multipath-tools-0.4.7-34.50.10.ass.fix.x86_64.rpm
     ```

- Force install the appropriate new multipath-tool RPM package.

  i586

  ```
  #> rpm -ivh -force multipath-tools-0.4.7-34.50.10.ass.fix.i586.rpm
  ```

  x86_64

  ```
  #> rpm -ivh -force multipath-tools-0.4.7-34.50.10.ass.fix.x86_64.rpm
  ```

3. Copy the PROMISE-supplied **multipath.conf** file to the **/etc** directory.

   ```
   #> cp multipath.conf-vtrak-alua-sles10-sp3 /etc multipath.conf
   ```

4. Check the multipath configuration.

   ```
   chkconfig multipathd on
   ```

   `chkconfig multipathd` (shows the status of multipathd)

   ```
   chkconfig boot.multipath on
   ```

   `chkconfig boot.multipath` (shows the status of boot.multipath)

5. Reboot the VTrak.
6. Check the multipath configuration.

   ```
   Multipath -ll (multipath -v4)
   ```

SuSE Linux SLES 11

To support ALUA within SLES 11:

1. Determine your system architecture, i586 or x86_64.

   ```
   #> uname -a
   ```

2. Install the appropriate path priority tool library.
   - i586

     ```
     #> rpm -ivh multipath-promise-suse11-0.4.8-1.i586.rpm
     ```

   - x86_64

     ```
     #> rpm -ivh multipath-promise-suse11-0.4.8-1.x86_64.rpm
     ```

3. Copy the PROMISE-supplied **multipath.conf** file to the **/etc** directory.

   ```
   #> cp multipath.conf-vtrak-alua-sles11 /etc multipath.conf
   ```

4. Check the multipath configuration.

   ```
   chkconfig multipathd on
   ```

   `chkconfig multipathd` (shows the status of multipathd)

5. Reboot the VTrak.
6. Check the multipath configuration.

   ```
   Multipath -ll (multipath -v4)
   ```

SuSE Linux SLES 11 SP1

Not updated with Novell SP1 patches

If you did NOT update with Novell SLES 11 SP1 patches:

1. Determine your system architecture, i586 or x86_64.

   ```
   #> uname -a
   ```

2. Install the appropriate patched **scsi_dh_alua.ko** device handler.
   - i586

     ```
     #> rpm -ivh --force scsi_dh_alua_sles11sp1-2-1.i586.rpm
     ```

   - x86_64

     ```
     #> rpm -ivh --force scsi_dh_alua_sles11sp1-2-1.x86_64.rpm
     ```

3. Copy the PROMISE-supplied **multipath.conf** file to the **/etc** directory.

   ```
   #> cp multipath.conf.alua-sles11sp1 /etc multipath.conf
   ```

4. Check the multipath configuration.

   ```
   chkconfig multipathd on
   ```

   `chkconfig multipathd` (shows the status of multipathd)

5. Reboot the VTrak.
6. Check the multipath configuration.

   ```
   Multipath -ll (multipath -v4)
   ```

Updated with Novell SP1 patches

If you updated with Novell SLES 11 SP1 patches:

1. Copy the PROMISE-supplied **multipath.conf** file to the **/etc** directory.

   ```
   #> cp multipath.conf.alua-sles11sp1 /etc multipath.conf
   ```

2. Check the multipath configuration.

   ```
   chkconfig multipathd on
   ```

   `chkconfig multipathd` (shows the status of multipathd)

3. Reboot the VTrak.
4. Check the multipath configuration.

   ```
   Multipath -ll (multipath -v4)
   ```

Fibre Channel HBA to VTrak

If you plan to use connect a Fibre Channel HBA card to VTrak RAID subsystem, you must change the remote port (rport) configuration.

1. Change the **dev_loss_tmo** value as large as possible.
   Example: 0x7fffffff.
2. Change the **fast_io_fail_tmo** value as 30.

RPM Packages and Documents for Linux MPIO

PROMISE provides RPM packages and **multipath.conf** files for Linux on the support: http://www.promise.com/support/.

A PROMISE Linux package contains:

- package folder – RPM packages for the Linux OS
- multipath-conf folder
  - ALUA folder – Configuration file and instructions for ALUA, if supported
  - normal folder – Configuration file for general multipathing

Important

Please read the **How to Configure** document in the ALUA folder for the latest information before beginning your setup.

The table below lists the content of each PROMISE Linux package:

Package	Folder	Contents
SLES10-SP2	normal	multipath.conf-vtrak-normal-sles10-sp2
SLES10-SP3	package	multipath-tools-0.4.7-34.50.10.ass.fix.i586.rpm multipath-tools-0.4.7-34.50.10.ass.fix.x86_64.rpm
	ALUA	multipath-conf-vtrak-alua-sles10-sp3 How to Configure MPIO SLES10 SP3.doc
	normal	multipath-conf-vtrak-normal-sles10-sp3
SLES11	packages	multipath-promise-suse11-0.4.8-i586.rpm multipath-promise-suse11-0.4.8-x86_64.rpm
	ALUA	multipath-conf-vtrak-alua-sles11 How to Configure MPIO SLES 11.doc
	normal	multipath-conf-vtrak-normal-sles11

Package	Folder	Contents
SLES11-SP1	packages	scsi_dh_alua_sles11sp1-2-1.i586.rpm scsi_dh_alua_sles11sp1-2-1.x86_64.rpm scsi_dh_alua_sles11sp1-2-1.src.rpm
	ALUA	multipath.conf.alua-sles11sp1 How to Configure MPIO SLES 11sp1.doc
	normal	multipath.conf-vtrak-normal-sles11sp1 How to Configure MPIO SLES 11sp1.doc
RHEL-5.3	normal	multipath.conf-vtrak-normal-rhel5-3
RHEL-5.4	package	scsi_dh_alua_Vtrak-1-1.i386.rpm scsi_dh_alua_Vtrak-1-1.x86_64.rpm scsi_dh_alua_Vtrak-1-1.src.rpm
	ALUA	multipath.conf-vtrak-alua-rhel5-4 How to Configure MPIO RHEL 5.4.doc
	normal	multipath.conf-vtrak-normal-rhel5-4
RHEL-5.5	packages	scsi_dh_alua_Vtrak-2-1.i386.rpm scsi_dh_alua_Vtrak-2-1.x86_64.rpm scsi_dh_alua_Vtrak-2-1.src.rpm
	ALUA	multipath.conf.alua-rhel5.5 How to Configure MPIO RHEL 5.5.doc
	normal	multipath.conf-normal-rhel5.5

Linux MPIO: Known Issues

Issue	OS	Description
1	SLES 11 GMC	OS multipath with SAS interface makes kernel panic.
2	SLES 11 GMC	OS sets default rports **dev_loss_tmo** value at 10 seconds resulting in loss of the path during failover/failback.
3	RHEL 5.4	With FC switch, HBA driver (such as Emulex 4g, QLogic 8g) sets rports **dev_loss_tmo** value too small, resulting in loss of the path during failover/failback. To fix this problem, increase the value to 60 seconds.
4	SLES 10 SP3	With FC switch, HBA driver (such as Emulex 4g, QLogic 8g) sets rports **dev_loss_tmo** value too small, resulting in loss of the path during failover/failback. To fix this problem, increase the value to 60 seconds.
5	SLES 11 SP1	• With a FC HBA, set rports **dev_loss_tmo** as large as possible, such as 0x7fffffff. Set **fast_io_failure_tmo** to 30 seconds. Without these settings, the system does not recognize device or the systems hang during boot and failover/failback. • Download and update the latest SLES11 SP1 patches from Novell. Without these patches, the system hangs during failover/failback.

With a Fibre Channel switch, a **dev_loss_tmo** value set too small can result in loss of the path during failover/failback.

Linux maintains the rports **dev_loss_tmo** value in the **/sys/class/fc_remote_port/rport-xxxx/dev_loss_tmo** file. The Fibre Channel HBA driver sets this value at loading time.

To change the **dev_loss_tmo** value to the recommended 60 seconds, during runtime type the **echo** command:

```
echo 60 > /sys/class/fc_remote_port/rpot-1:0:0/dev_loss_tmo
```

Sample multipath.conf File

Below is a complete **multipath.conf** file for VTrak.

- If you have no other multipath devices on your Host, you can use this **multipath.conf** file as shown.
- If you have other multipath devices, add these settings to your existing **multipath.conf** file.

```
##
## This is a template multipath-tools configuration file
## for the Promise VTrak subsystem
##
defaults {
        user_friendly_names   yes
}
blacklist {
        devnode "^sda$"
        devnode "^(ram|raw|loop|fd|md|dm-|sr|scd|st)[0-9]*"
        devnode "^hd[a-z][[0-9]*]"
        devnode "^cciss!c[0-9]d[0-9]*[p[0-9]*]"
}
devices {
        device {
        vendor                "Promise"
        product               "VTrak"
        path_grouping_policy  multibus
        getuid_callout        "/sbin/scsi_id -g -u -s /block/%n"
        path_checker          readsector0
        path_selector         "round-robin 0"
        hardware_handler      "0"
        failback              immediate
        rr_weight             uniform
        rr_min_io             100
        no_path_retry         20
        features              "1 queue_if_no_path"
        product_blacklist     "VTrak V-LUN"
        }
}
```

Appendix D: VTrak Monitor

The appendix covers the following topics:

Downloading and Installing VTrak Monitor

VTrak Monitor is a free application available from the App Store.

To download and install VTrak Monitor on your iPad or iPhone, follow the instructions in your iPad or iPhone *User Guide*.

Using VTrak Monitor

Launching VTrak Monitor

To launch VTrak Monitor, on the iPad or iPhone desktop, tap the **VTrak Monitor** icon (right).

Adding a VTrak Subsystem

To monitor a VTrak subsystem, you must add it to VTrak Monitor. When you add a subsystem, you log into it at the same time.

On any Network

To add a VTrak subsystem on any network:

1. Tap the **+** button at the top right corner of the screen (right).
2. Tap the **Add Device** icon in the dropdown menu.
3. In the Add Device dialog box, type:
   - IP address of the VTrak
   - Your username
   - Your password
4. Tap the **Login** button.

   The VTrak subsystem appears on the Home screen.
   See page 493, Figure 2.

With Bonjour Discovery

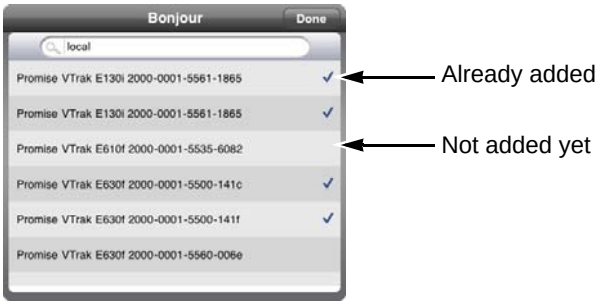
To use Bonjour discovery, the subsystem must be on the current Wi-Fi network. See “Choosing a Wi-Fi Network” on page 495.

To add a VTrak subsystem using Bonjour:

1. Tap the **+** button at the top right corner of the screen (right).
2. Tap the **Search Device** icon in the dropdown menu.

   The Bonjour dialog box displays a list of available subsystems, identified by model and IPv6 address. See Figure 1.

Figure 1. Bonjour dialog box



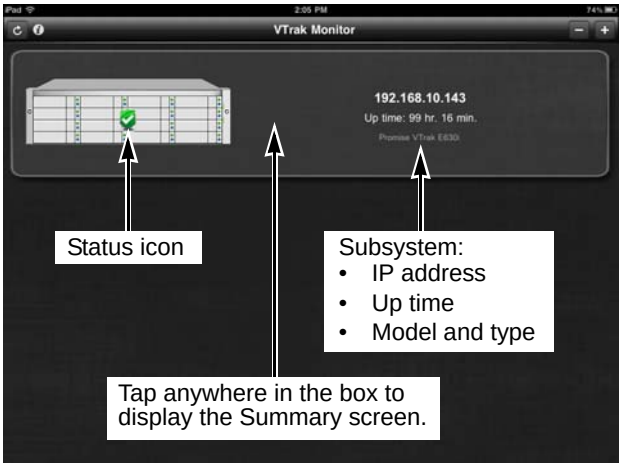
Subsytems with a check have been added to VTrak Monitor.

To add a subsystem, tap the subsystem.

When you are finished, tap the **Done** button.

The available subsystems appear on the Home screen. See page 493, Figure 2.

Figure 2. Home screen



The Status , , or icon indicates that the subsystem is connected. For more information on these icons, see “Top-Level Monitoring” on page 495 and “Troubleshooting” on page 499.

Viewing a VTrak Subsystem

To view a VTrak subsystem from the Home screen, tap the VTrak subsystem. See above, Figure 2.

The Summary screen appears. See Figure 3.

Figure 3. Summary screen

Deleting a VTrak Subsystem

One at a Time

To delete one subsystem from VTrak Monitor:

1. Click the Home icon to go to the Home screen.
2. To expose the Delete button, touch and drag the right edge of the VTrak box to the left.

Figure 4. Delete button

3. Tap the **Delete** button.

   The subsystem is deleted from VTrak Monitor.

All Subsystems at Once

To delete all subsystems from VTrak Monitor:

1. Click the Home icon to go to the Home screen.
2. Tap the **–** button at the top right of the screen.
3. In the confirmation dialog box, tap the **Yes** button to confirm.

Changing VTrak Monitor Settings

To change VTrak Monitor settings:

1. Press iPad or iPhone's **Home** button to go to desktop.
2. Tap the **Settings** icon.
3. In the Settings list, tap **VTrak Monitor**.
4. In the VTrak Monitor window, set:
   - **Event Severity** – Choose the lowest level you want to see in the Events screen, Critical, Major, Warning, or Info
   - **Page Capacity** – 10, 25, or 50
5. Press the **Home** button again to return to the desktop.

Choosing a Wi-Fi Network

Bonjour discovery only works on the currently chosen Wi-Fi network.
See “With Bonjour Discovery” on page 492.

To choose a Wi-Fi network:

1. Press iPad or iPhone’s **Home** ▢ button to go to desktop.
2. Tap the **Settings** icon.
3. In the Settings list, tap **Wi-Fi**.
4. Under *Choose a Network...*, tap the network you want use.
5. Press the **Home** button again to return to the desktop.

See your iPad or iPhone *User Guide* for more information.

Monitoring Subsystems

Top-Level Monitoring

The Home screen displays the top-level status of all VTrak subsystems.

One of these icons appears on each VTrak subsystem:

- Green check icon – All components are OK
- Yellow ! icon – One or more components in *Critical* status
- Red ! icon – One or more components in *Offline* status
- No icon – Subsystem is shut down or its network connection is lost

See page 493, Figure 2. Tap a subsystem to go to the Summary screen.

Component-Level Monitoring

The Summary screen displays the status of all components in a VTrak subsystem.

One of these icons appears beside each component:

- Green check icon – Component is OK
- Yellow ! icon – Component is critical
- Red X icon – Component is offline

Tap a component to go to the Configuration screen.

Additional Actions

- To view a list of a each type of component, tap the corresponding component icon at the top of the screen.
- To view more information about a single component, tap the component in the list.
- To locate the component in the VTrak subsystem, tap the **Locate** button beside that component. The LEDs for that component blink for one minute. See pages 377 through 379.

Diagnosing a Subsystem

To diagnose a problem on a VTrak subsystem:

1. Click the **Home**  icon to go to the Home screen.
2. At the Home screen, check the icon for each VTrak subsystem:
   - Green check  icon – All components are OK
   - Yellow !  icon – One or more components in *Critical* status
   - Red !  icon – One or more components in *Offline* status
   - No icon – Subsystem is shut down or its network connection is lost

   Tap the VTrak subsystem with the Yellow !  icon or Red !  icon to go to the Summary screen.
3. On the Summary screen, tap the **Configuration** icon to go to the Configuration screen.
4. On the Configuration screen, check the icon for each component:
   - Green check  icon – Component is OK
   - Yellow !  icon – Component is critical
   - Red X  icon – Component is offline
   - Gray ?  icon – Component is not present or no information is available

   Tap the component with the Yellow !  icon or Red X  icon to view more information its condition.

   Also see “Chapter 8: Troubleshooting” on page 375.

Viewing Information

Devices

To view device information:

1. From the Summary screen, tap the **Device** icon to view:
   - Enclosure front view
   - Disk arrays
   - Physical drives
2. Touch and slide the Enclosure to the left to view:
   - Enclosure external rear view
   - Controllers
   - Power supply units
   - Fans
3. Touch and slide the Enclosure to the left again to view:
   - Enclosure internal rear view
   - Temperature sensors
   - Batteries

To see more information about a particular device, tap the device itself.

Events

On the Summary screen, the Events icon displays a badge with the number of critical events recorded in the last 24 hours (right).

After you view the event information, the event badge disappears until the next critical event is recorded.

From the Summary screen, tap the **Events** icon to view runtime event information.

Runtime events are recorded from the moment that the VTrak subsystem is started.

The following icons report the severity of each event:

- Green check icon – Information
- Yellow ! icon – Warning
- Red X icon – Major or Critical

See the table on the next page.

Event Severity Levels	
Level	**Description**
Critical	Action is needed now and the implications of the condition are serious.
Major	Action is needed now.
Warning	User can decide whether or not action is required.
Information	Information only, no action is required.

Notes

- The default setting displays only Major or Critical events. To view Information and Warning events, see “Changing VTrak Monitor Settings” on page 494.
- VTrak Monitor has fewer event severity levels than WebPAM PROe. For more information on events, see page 382.

Support

To view support information:

1. Tap the **Support** icon.
2. Tap the location you want.

   Location information includes:

   - **Pre-sales toll free phone number** – Tap to call the number (iPhone only)
   - **Support toll free phone number** – Tap to call the number (iPhone only)
   - **Fax number** – For information only
   - **Sales email address** – Tap to send a message
   - **Tech Support email address** – Tap to send a message
   - **Website** – Tap to open the browser and visit the website

Managing the VTrak with WebPAM PROe

To launch WebPAM PROe through your iPad or iPhone, go to the Summary screen and tap the **Manage** icon.

For more information, see “Chapter 4: Management with WebPAM PROe” on page 69.

When you are done using the WebPAM PROe, tap the **Done** button in the top left corner of the screen.

You return to the Summary screen.

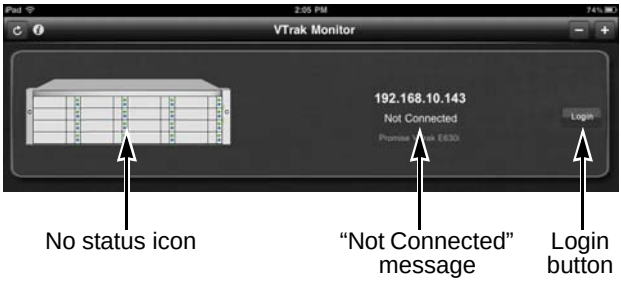
Troubleshooting

If a subsystem is shut down or its network connection is lost, the subsystem appears on the Home screen with:

- No status icon
- A “Not Connected” message
- A Login button

See Figure 5.

Figure 5. Subsystem not connected



Tap the **Login** button to reconnect.

If you cannot reconnect, verify that the subsystem is running and connected to your Wi-Fi network.

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