PROMISE®
TECHNOLOGY, INC.

VTRAK
E-Class
E610f, E610s, E310f, E310s
PRODUCT MANUAL

Version 3.2

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You should back up all data before installing any drive controller or storage peripheral. Promise Technology is not responsible for any loss of data resulting from the use, disuse or misuse of this or any other Promise Technology product.

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This version of the *Product Manual* supersedes all previous versions.

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.

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Chapter 1: Introduction to VTrak

This chapter covers the following topics:

Thank you for purchasing Promise Technology's VTrak E-Class external disk array subsystem.

About This Manual

This *Product Manual* describes how to setup, use and maintain the VTrak E610f, E610s, E310f, and E310s external disk array subsystems. It also describes how to use the built-in command-line interface (CLI), command-line utility (CLU) and 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:

Note

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

Important

An *Important* calls attention to an essential step or point required to complete a task. Important items include things often missed.

Caution

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

Warning

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

VTrak Overview

VTrak provides data storage solutions for applications where high performance and data protection are required. The failure of any single drive will not affect data integrity or accessibility of the data in a RAID protected logical drive.

Figure 1. VTrak E610f/s front view

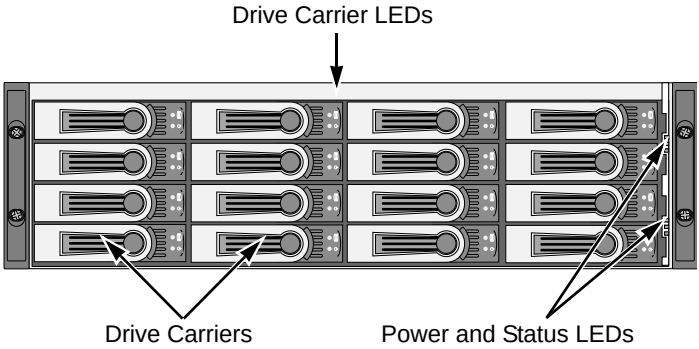
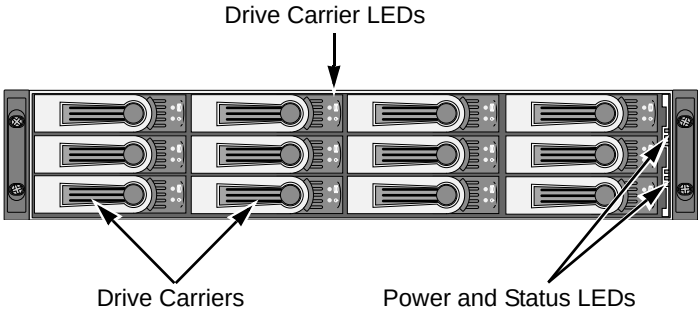


Figure 2. VTrak E310f/s front view with bezel removed



A defective drive may be replaced without interruption of data availability to the host computer. If so configured, a hot spare drive will automatically replace a failed drive, securing the fault-tolerant integrity of the logical drive. The self-contained hardware-based RAID logical drive provides maximum performance in a compact external chassis.

Figure 3. VTrak E610f rear view

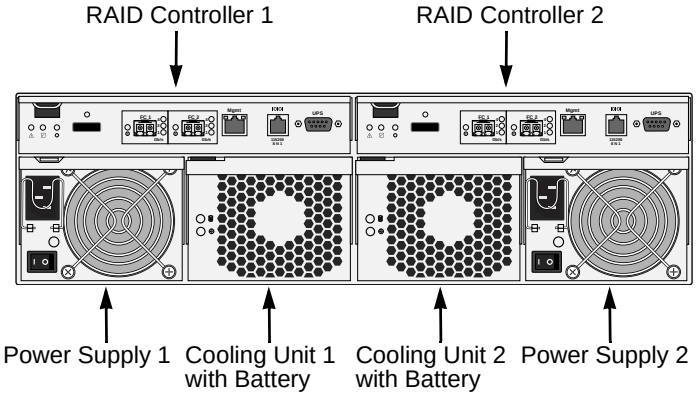


Figure 4. VTrak E610s rear view

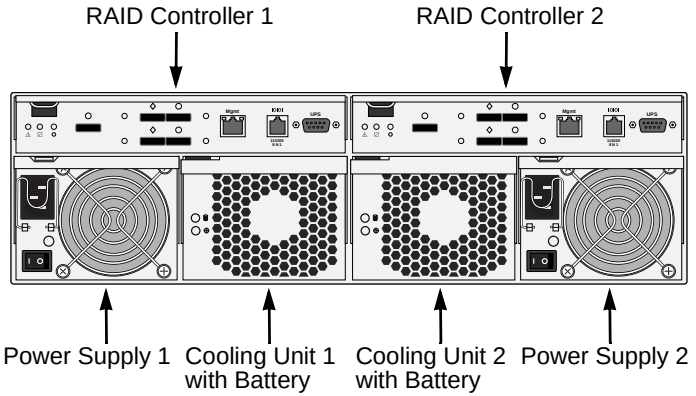


Figure 5. VTrak E310f rear view

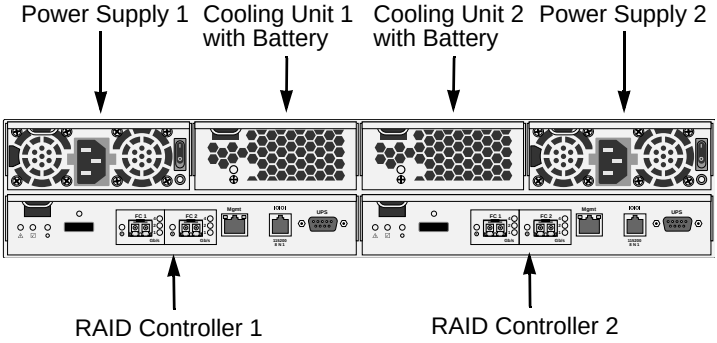
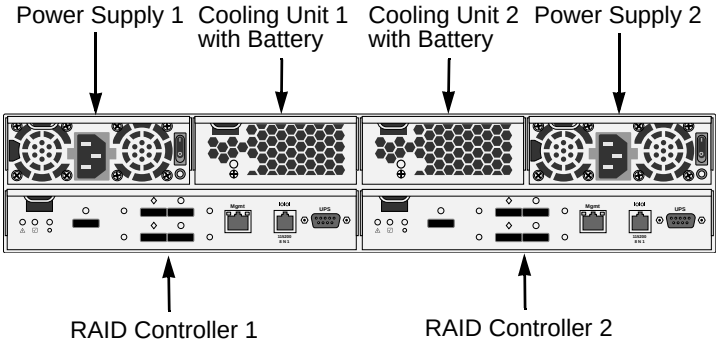


Figure 6. VTrak E310s rear view



Architectural Description

The VTrak E610f and E310f are Fibre Channel subsystems suitable for Direct Attached Storage (DAS), Storage Area Network (SAN), and Expanded Storage.

The VTrak E610s and E310s are Serial Attached SCSI (SAS) subsystems suitable for Direct Attached Storage (DAS), Cascaded Storage, and Expanded Storage.

The E-Class subsystems support:

- 1.5 Gb/s SATA disk drives
- 3.0 Gb/s SATA disk drives
- 3.0 Gb/s SAS disk drives

All E-Class enclosures include a mid-plane, RAID controller, power and cooling units, and enclosure processor all in one cable-less chassis design. Multiple fans and power supplies provide redundancy to ensure continued usage during component failure. The RAID controller is hardware based and controls all logical drive functions transparently to the host system. VTrak appears to the computer's operating system as a standard SCSI drive or drives.

Features and Benefits

Highlights

- Dual channel active/active, failover/failback RAID controllers
- E610f/s: 16 hot-swappable drive bays in a robust 3U rackmount chassis with redundant, hot-swappable power and cooling modules
- E310f/s: 12 hot-swappable drive bays in a robust 2U rackmount chassis with redundant, hot-swappable power and cooling modules
- Supports for Serial Attached SCSI (SAS) and Serial ATA (SATA) 3 Gb/s drives simultaneously in the same system—choose the drive that is best suited to your application
- Direct SATA LED support with AAMUX adapter
- Dual 4 Gb/s Fibre Channel or four 3 Gb/s SAS x4 host ports provide high-availability SAN and cluster-friendly platform
- JBOD expansion support through a 3 Gb/s SAS x4 port—up to four VTrak JBOD systems
- Simplified remote management with a comprehensive embedded web-based management via Ethernet—WebPAM PROe. Command Line Interface/Utility via RJ-11 Serial Port
- Three years complete system limited warranty includes 24 x 7 email and phone support with highly experienced technical support technicians and an advanced replacements program
- Support for the latest RAID technology—RAID 6 and 60—Protection from a catastrophic double drive failure
- Resilient data protection features such as Predictive Data Migration™ and PerfectRAID™ provide rock solid data protection
- LUN Mapping and Masking bring flexibility for multiple application and OS support on the same storage subsystem
- Open architecture, industry's most comprehensive support for SAS and SATA hard drives and standards-based management interfaces including SNMP, CIM, and WBEM

- Support for the industry standard Disk Data Format (DDF from SNIA) ensures interoperability and drive roaming even among different RAID vendors
- Compatible with leading SAS hard drives, host bus adapters and RAID controllers

Subsystem and Controller Features

Controllers: Dual-controller configuration or single-controller configuration, upgradeable to dual. Dual-controller subsystems feature Active/Active, Failover/Failback.

Drive Support: Up to 16 (E610f/s) or 12 (E310f/s) 3.5" x 1" hard disk drives: SAS 3Gb/s, SATA II 3Gb/s and 1.5Gb/s. SATA drives require an AAMUX Adapter in dual I/O module configuration (dual-controller) subsystems.

Supports any mix of SAS and SATA II 3Gb/s or 1.5Gb/s drives simultaneously in the same system. Staggered physical drive spin-up.

External I/O Ports (per controller): Dual 4-Gb Fibre Channel host port; One external 3 Gb/s SAS x4 ports for JBOD expansion (up to four VTrak JBOD Systems).

Data Cache: Shared 512 MB predictive data cache (expandable to 2 GB); Automatic write cache destaging; 72-hour battery backup (for 512 MB cache).

Command Queue Depth: 512 commands per VTrak system (up to 1024 commands with 512 MB memory).

Operational Features

RAID Levels: RAID 0, 1, 1E, 5, 6, 10, 50, and 60 – Any combination of these RAID levels can exist at the same time.

Configurable RAID stripe size: 64 KB, 128 KB, 256 KB, 512 KB, and 1 MB stripe size per logical drive.

Background task priority tuning: Adjustment of minimum I/O reserved for server use during all background tasks.

Hot spares: Multiple global or dedicated hot-spare drives with revert option.

Maximum LUNs per subsystem: 256 in any combination of RAID levels.

Maximum LUNs per array: 32 logical drives (LUNs). Supports LUN carving by allowing an array to be divided into multiple logical drives. Supports out-of-order logical drive deletion and re-creation.

Max LUNs per Target ID: Up to 256, depending on host side driver and operating system.

LUN Masking and Mapping: Supports multiple hosts.

Disk Data Formats: Supports Disk Data Format (DDF) for industry-wide standardization and drive roaming between VTrak systems.

Background Activities: Media Patrol, background synchronizing, disk array rebuild, Redundancy Check, SMART condition pooling, Online Capacity Expansion (OCE), RAID Level Migration (RLM). Includes priority control, rate control, and watermarking per BGA in disk and NVRAM.

Foreground Activities: Disk array initialization.

Physical Drive Error Recovery: Predictive Data Migration (PDM), replaces un-healthy disk member in array, while maintaining normal array status during the data transition. Bad Sector Mapping, Media Patrol, SMART, Hard/Soft Reset to recover HD from bad status, HD Power-control to recover HD from hung status.

Array Error Recovery: Data recovery from bad sector or failed HD for redundant RAID, RAID 5/6 inconsistent data Prevent (Write Hole Table), Data content Error Prevent (Read/Write Check Table) NVRAM event logging.

SCSI Commands: Supports extensive SCSI command set equivalent to SCSI/FC hard disk drives. Variable sector size (512 byte to 4 KB) to break OS 2TB limitation. 16 byte CDB support for 64-bit LBA addressing.

Management

Supported Host Operating Systems: Windows 2003 Server, Windows 2008 Server, Red Hat Linux RHEL 5.4, SuSE Linux SLES 11, VMware ESX Server 4.0.

For a detailed list of supported host OSes, download the latest compatibility list from the Promise support website.

Management Tools: WebPAM PROe via out-of-band Ethernet. OS independent, localized in multiple languages, SSL Security support. Command Line Interface (CLI) and Command Line Utility (CLU) via RJ-11 Serial Port or Telnet.

Standard Management Protocols: SNMP, WBEM/CIM

RAID Creation: Automatic, Express, and Advanced configuration support for novice to skilled users.

Management Interfaces: WebPAM PROe, CLU, CLI, audible (buzzer) and visible (LEDs) alarms.

Management Protocols: Embedded web server and management support—no host agent needed. Ethernet, RJ-11 serial port, SNMP, SSL, Telnet, Email.

Specifications

E610f and E610s

Voltage: 100–240 VAC Auto-ranging.

Current (maximum): 8 A @ 100 VAC or 4 A @ 240 VAC Current rating with two power cords.

Power Consumption (not including disk drives): E610f, 142.12 W. E610s, 151.42 W.

Power Consumption (including disk drives): E610f, 562.65 W. E610s, 566.95 W.

Power Supply: Dual 500 W, 100-240 VAC auto-ranging, 50-60 Hz, dual hot swap and redundant with PFC, N+1 design.

Operating Temperature: 5° to 40°C operational (-40° to 60°C non-operational)

Relative Humidity: Maximum 95 percent.

Vibration: Random, 0.21 grms, 5-500 Hz, 30 Mins, X, Y, Z axis.

Dimensions (H x W x D): 13.1 x 44.6 x 56.1 cm (5.2 x 17.6 x 22.1 in)

Net Weight: 30.5 kg (67.2 lb) without drives, 38.5 kg (84.9 lb) with 16 drives, assuming 0.5 kg (1.1 lb) per drive.

Gross Weight (including carton): 37.5 kg (82.7 lb) without drives.

Safety: CE, FCC Class A, VCCI, C-Tick, cUL, TUV, CB, BSMI, MIC.

E310f and E310s

Voltage: 100–240 VAC Auto-ranging.

Current (maximum): 8 A @ 100 VAC or 4 A @ 240 VAC Current rating with two power cords.

Power Consumption (not including disk drives): E310f, 141.68 W. E310s, 157.84 W.

Power Consumption (including disk drives): E310f, 453.32 W. E310s, 469.48 W.

Power Supply: Dual 400 W, 100-240 VAC auto-ranging, 50-60 Hz, dual hot swap and redundant with PFC, N+1 design.

Operating Temperature: 5° to 40°C operational (-40° to 60°C non-operational)

Relative Humidity: Maximum 95 percent.

Vibration: Random, 0.21 grms, 5-500 Hz, 30 Mins, X, Y, Z axis.

Dimensions (H x W x D): 8.8 x 44.4 x 56.1 cm (3.5 x 17.5 x 22.1 in)

Net Weight: 22 kg (49 lb) without drives, 28 kg (62 lb) with 12 drives, assuming 0.5 kg (1.1 lb) per drive.

Gross Weight (including carton): 30 kg (66 lb) without drives.

Safety: CE, FCC Class A, VCCI, C-Tick, cUL, TUV, CB, BSMI, MIC.

Warranty and Support

Warranty: Three years complete system limited warranty.

For more information, see “Limited Warranty” on page 362.

Support: 24x7 email and phone support (English only). 24x7 access to Promise support site for drivers, firmware, and compatibility.

For more information, see “Contacting Technical Support” on page 359.

BSMI Statement

Warning to User: This is Class A ITE product which might cause radio frequency interference if it is used in a residential environment. In such case, the user would be requested to adopt certain appropriate measures.

CE Statement

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 Statement

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 Statement

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

IRAM Statement

Advertencia: Este es un producto de clase A. En un ambiente doméstico, este producto puede causar interferencia de las ondas de radio, en cuyo caso se podría requerir que el usuario tome las medidas adecuadas.

KCC Statement

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.

Chapter 2: VTrak Installation

This chapter covers the following topics:

Unpacking the VTrak

The VTrak box contains the following items:

- VTrak Unit
- *Quick Start Guide*
- Front bezel and key (E310f and E310s only)
- Left and right center-mount brackets
- Left and right mounting rails
- RJ11-to-DB9 serial data cable
- Screws for disk drives (E610f/s: 70, including 6 spares) (E310f/s: 50, including 2 spares)
- 1.5m (4.9 ft) Power cords (2)
- CD with SNMP files, *Product Manual* and *Quick Start Guide*

Warning

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

Important

Use the following categories of network cables with VTrak:

- Cat 6, preferred
- Cat 5E, minimum

Mounting VTrak in a Rack

Cautions

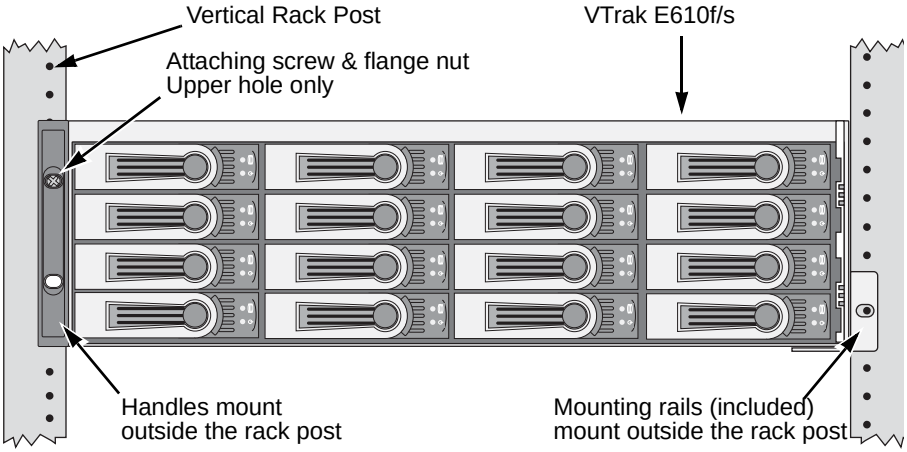
- At least two persons are required to safely lift, place, and attach the VTrak unit into a rack system.
- Do not lift or move the VTrak unit by the handles, power supplies or the controller units. Hold the subsystem itself.
- Do not install the VTrak unit into a rack without rails to support the subsystem.
- 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.

Note

To lighten the VTrak enclosure, remove the power supplies. Replace the power supplies after the VTrak unit is mounted in your rack.

The VTrak subsystem installs into your rack using the supplied mounting rails. You can also use your existing rails.

Figure 1. VTrak E610f/s mounted in a rack with the supplied rails



To install the VTrak subsystem into a rack with the supplied mounting rails:

1. Check the fit of the mounting rails in your rack system.

   See page 14, Figure 2.

2. Adjust the length of the mounting rails as needed.

   The rear rail slides inside the front rail. The rail halves are riveted together and use no adjustment screws.

3. Attach the mounting rail assemblies to the outside of the rack posts, using the attaching screws and flange nuts from your rack system.

   Be sure the front rail support is on the bottom facing inward.

   The alignment pins fit into the rack holes above and below the attaching screws.

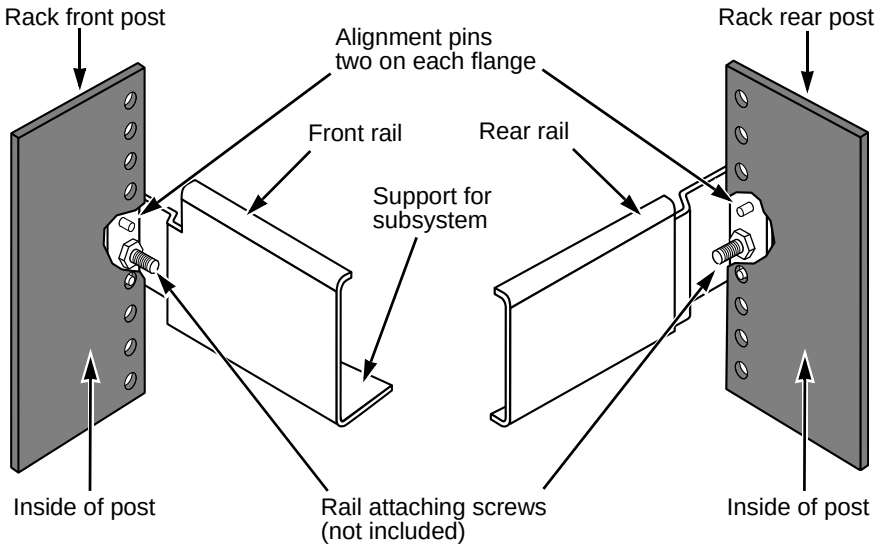
   Use the attaching screws and flange nuts from your rack system. Tighten the screws and flange nuts according to your rack system instructions.

4. Place the VTrak subsystem onto the rails.

5. Secure the VTrak subsystem to the rack.

   One screw each side, in the upper hole only. Use the attaching screws and flange nuts from your rack system. Tighten the screws and flange nuts according to your rack system instructions.

Figure 2. Rack mount assembly diagram



Note that only the front rail has a support for the subsystem.

Installing Disk Drives

You can populate the VTrak with SAS or SATA hard disk drives. For optimal performance, install physical drives of the same model and capacity. The drives' matched performance allows the logical drive to function better as a single drive. The table below shows the number of drives required for each RAID level.

Important

For a list of supported physical drives, download the latest compatibility list from the Promise support website.

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

* E310f/s: Drive counts above 12 require an expansion unit.
** 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 3. VTrak E610f/s drive slot numbering

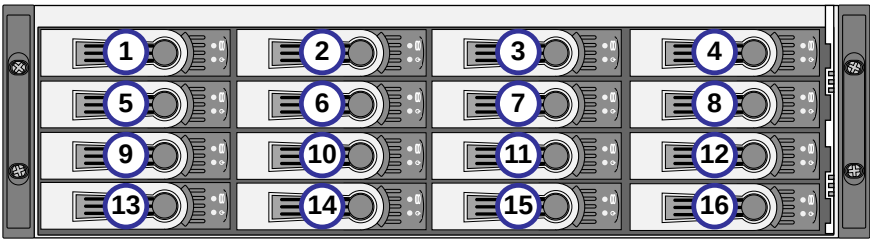
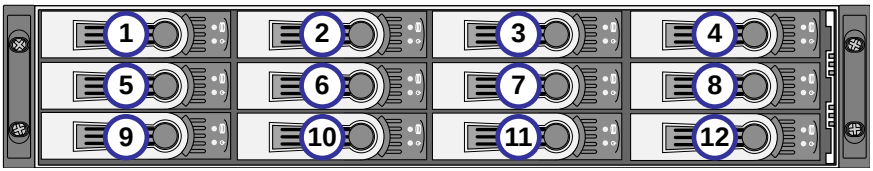


Figure 4. VTrak E310f/s drive slot numbering



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

AAMUX Adapter

If your VTrak has dual controllers—Fibre Channel or SAS—and you plan to install SATA drives, you **must** install an AAMUX adapter with each SATA drive. AAMUX adapters are available from Promise Technology.

Installing Disk Drives

Important

- If your VTrak has two RAID controllers and you are installing SATA disk drives, an AAMUX adapter is required so that both controllers can access the SATA disk drive. Obtain AAMUX adapters from Promise Technology, Inc.
- Proper installation ensures adequate grounding and minimizes vibration. Always install the disk drives using all four screws.

1. Remove a disk drive carrier.
2. Carefully lay the drive into the drive carrier at the front, so that the screw holes on the sides line up.

   If you are installing a AAMUX adapters and SATA disk drives:
   First attach the adapter to the drive. Then install the mounting screws.
   See page 17, Figure 6.
3. Insert the screws through the holes in the drive carrier and into the bottom of the disk drive. See page 17, Figure 5.
   - For the disk drive, install the counter-sink screws supplied with the VTrak.
   - For the adapter, install only the screws supplied with the adapter.
   - Install four screws per drive.

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

4. Reinstall the drive carrier into the VTrak chassis.
5. Repeat steps 2 through 4 until all of your disk drives are installed.

Figure 5. Disk drive mounting holes in the drive carrier

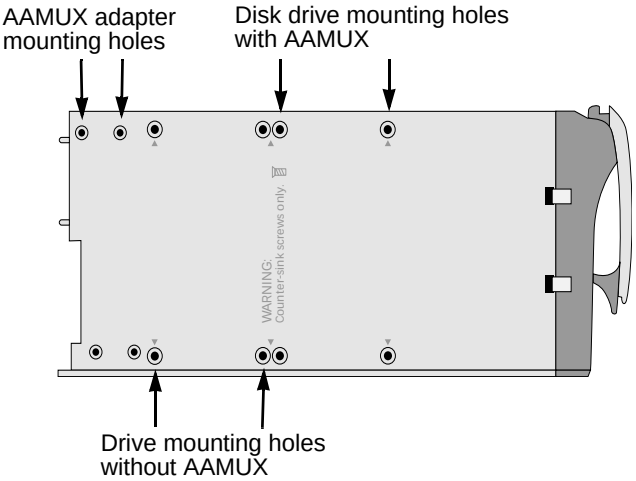


Figure 6. SATA drive mounted in a drive carrier with the AAMUX adapter

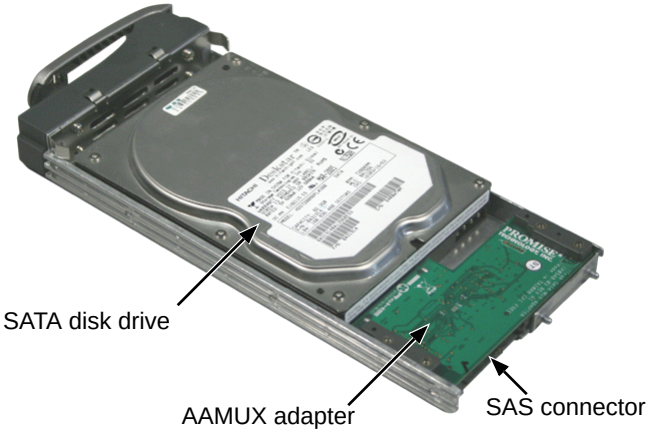


Figure 7. SAS drive mounted in a drive carrier

Caution

VTrak supports disk drive hot-swapping. To avoid hand contact with an electrical hazard, do not remove more than one drive carrier a time.

Making Management and Data Connections

Examples of VTrak configurations include:

- Fibre Channel SAN (below)
- Fibre Channel DAS (page 21)
- Fibre Channel with JBOD Expansion (page 23)
- Fibre Channel SAN – No Single Point of Failure – JBOD Expansion (page 24)
- SAS DAS. (page 27)
- SAS Cascaded Storage (page 29)
- SAS with JBOD Expansion (page 32)
- SAS DAS – No Single Point of Failure – JBOD Expansion (page 33)

Fibre Channel SAN

Important

For a list of supported FC HBAs, Switches and SFPs, download the latest compatibility list from the Promise support website.

A Fibre Channel storage area network (SAN) requires:

- A Fibre Channel switch
- A Fibre Channel HBA card in each Host PC or Server
- A network switch
- A network interface card (NIC) in each Host PC or Server

Data Path

To establish the data path:

1. Connect one of the Fibre Channel data ports on each VTrak controller to your Fibre Channel switch. See page 20, Figures 8 and 9.
2. Connect your Fibre Channel switch to the Fibre Channel HBA card in each Host PC or Server.

Management Path

To establish the management path:

1. Connect the Management port on each VTrak controller to your network switch. See page 20, Figures 8 and 9.
2. Connect each Host PC's or Server's standard NIC to your network switch.

Figure 8. VTrak E610f and E310f data and management ports

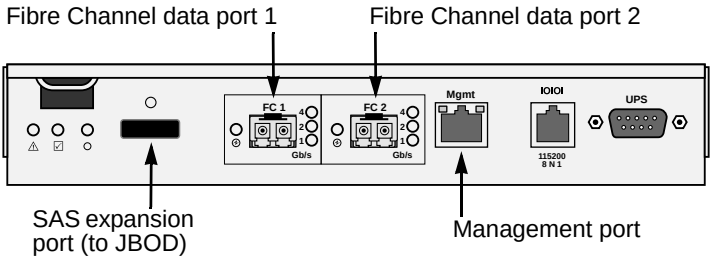
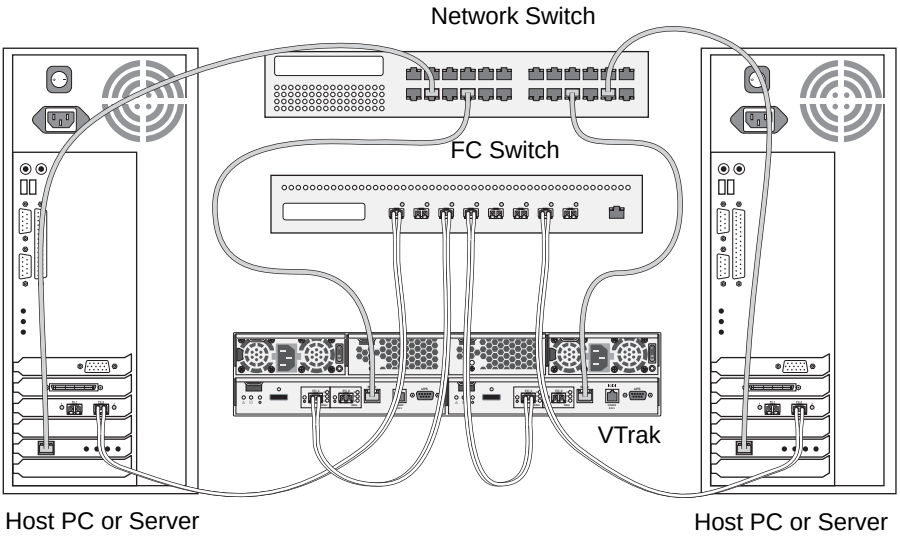


Figure 9. FC SAN data and management connections



Important

J830s and J630s IN and OUT ports are labeled differently from J610s and J310s models.

Important

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 371
- “Appendix C: Multipathing on Linux” on page 393

Fibre Channel DAS

Important

For a list of supported FC HBAs, Switches and SFPs, download the latest compatibility list from the Promise support website.

Fibre Channel direct attached storage (DAS) requires:

- Two Fibre Channel HBA cards in the Host PC or Server
- A network switch
- A network interface card (NIC) in the Host PC or Server

Data Path

To establish the data path:

Connect one of the Fibre Channel data ports on each VTrak controller to one of the Fibre Channel HBA cards in your Host PC or Server. See Figure 10 and page 22, Figure 11.

Management Path

To establish the management path:

1. Connect the Management port on each VTrak controller to your network switch. See Figure 10 and page 22, Figure 11.
2. Connect the Host PC's or Server's standard NIC to your network switch.

Figure 10. VTrak E610f and E310f data and management ports

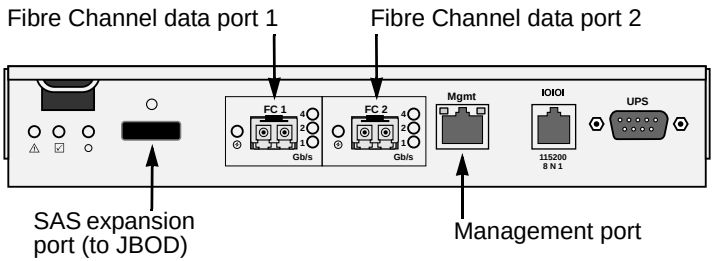
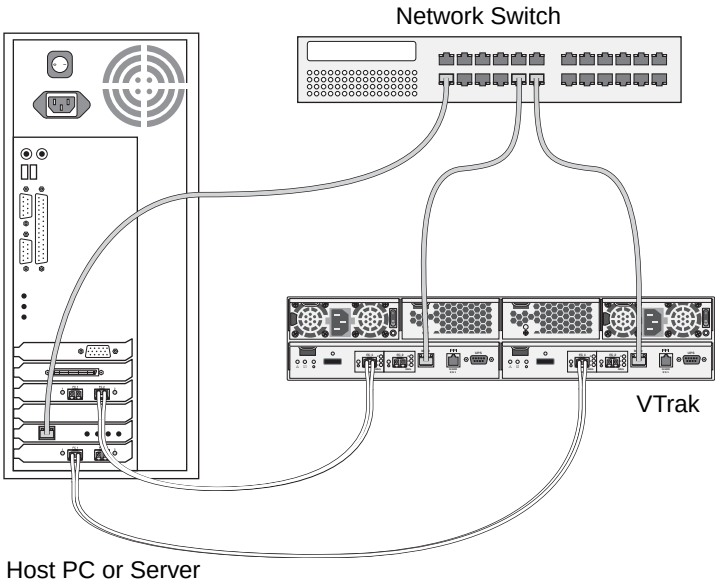


Figure 11. FC DAS data and management connections



Important

J830s and J630s IN and OUT ports are labeled differently from J610s and J310s models.

Important

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 371
- “Appendix C: Multipathing on Linux” on page 393

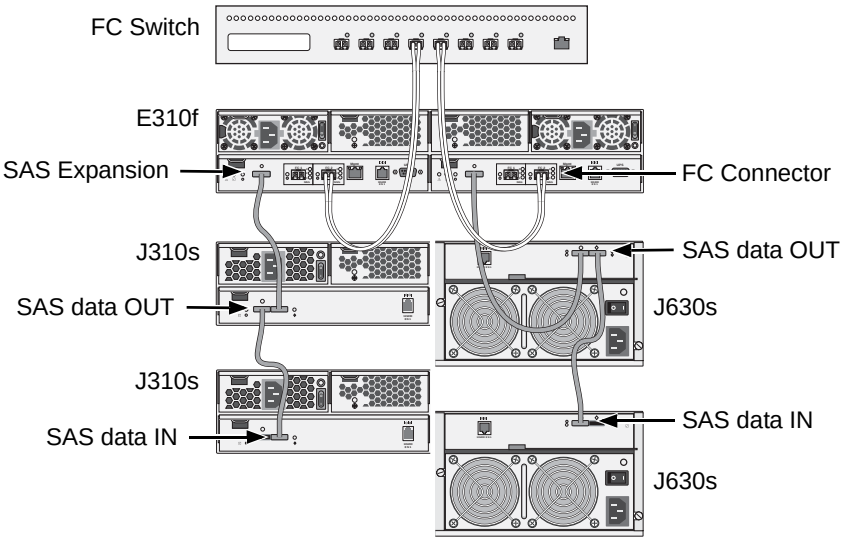
Fibre Channel with JBOD Expansion

To expand the number of disk drives:

1. Connect the SAS expansion port on the E610f or E310f controller to the SAS data IN port on the I/O module of the first JBOD unit. See Figure 12.
2. Connect the SAS data OUT port on the first JBOD unit to the SAS data IN port on the I/O module of the next JBOD unit.
3. Connect the remaining JBOD units in the same manner.

   You can combine different JBOD models in the expansion.

Figure 12. FC JBOD data connections



Important

J830s and J630s IN and OUT ports are labeled differently from J610s and J310s models. Follow the diagram above.

Important

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 371
- “Appendix C: Multipathing on Linux” on page 393

Fibre Channel SAN – No Single Point of Failure – JBOD Expansion

Important

For a list of supported FC HBAs, Switches and SFPs, download the latest compatibility list from the Promise support website.

A Fibre Channel SAN with no single point of failure requires:

- Two Fibre Channel switches
- A Fibre Channel HBA card in each Host PC or Server
- A network switch
- A network interface card (NIC) in each Host PC or Server

Data Path

To establish the data path:

1. Connect a Fibre Channel (FC) data port of the LEFT controller to the FC HBA card in one of the Host PCs or Servers.

   See page 25, Figure 13. And see page 26, Figure 14.
2. Connect the other FC data port of the LEFT controller to the FC HBA card in the other Host PC or Server.
3. Connect a FC data port of the RIGHT controller to the FC HBA card in one of the Host PCs or Servers.
4. Connect the other FC data port of the RIGHT controller to the FC HBA card in the other Host PC or Server.

Management Path

To establish the management path:

1. Connect the Management ports on both VTrak controllers to your network switch.
2. Connect the NICs in both Host PCs or Servers to your network switch.

Expansion

To expand the number of disk drives:

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

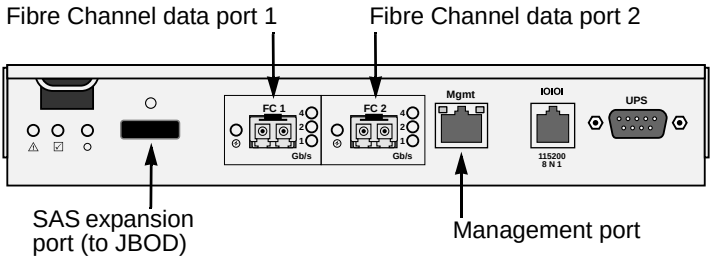
   See page 25, Figure 13. And see page 26, Figure 14.
2. Connect the SAS expansion port on the RIGHT controller to the SAS data IN port on RIGHT I/O module of the first JBOD unit.

3. Connect the SAS data OUT port on LEFT I/O module of the first JBOD unit to the SAS data IN port on LEFT I/O module of the next 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 RIGHT I/O module of the next JBOD unit.
5. Connect the remaining JBOD units in the same manner.

   Keep your data paths organized to ensure redundancy.

   You can combine different JBOD models in the expansion.

Figure 13. VTrak E610f and E310f data and management ports



Important

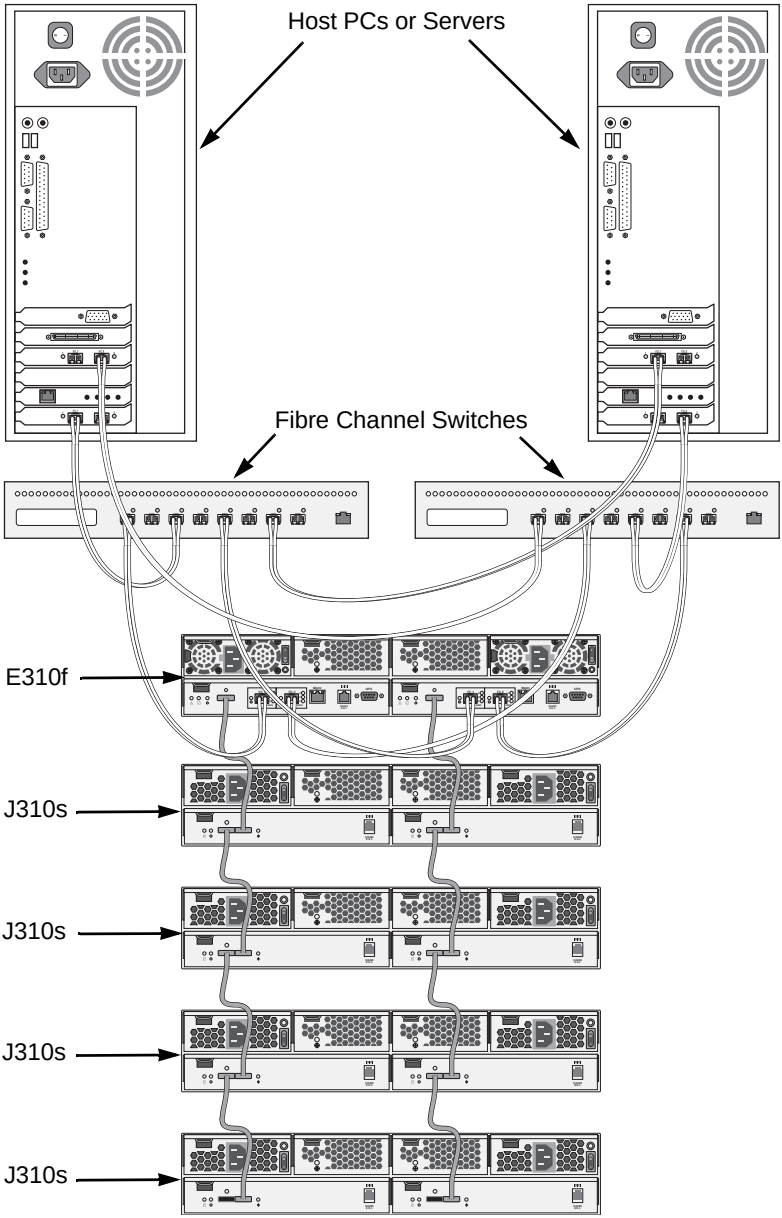
J830s and J630s IN and OUT ports are labeled differently from J610s and J310s models.

Important

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 371
- “Appendix C: Multipathing on Linux” on page 393

Figure 14.FC data connections for no single point of failure with JBOD expansion



SAS DAS.

Important

For a list of supported SAS HBAs, download the latest compatibility list from the Promise support website.

Serial Attached SCSI (SAS) Direct Attached Storage (DAS) requires:

- Two SAS HBA cards in the Host PC or Server
- A network switch
- A network interface card (NIC) in the Host PC or Server

Data Path

To establish the data path:

On the VTrak controller, connect a SAS data IN port to one of your SAS HBA cards. See Figure 15 and page 28, Figure 16.

Management Path

To establish the management path:

1. Connect the Management port on each Controller to your network switch. See Figure 15 and page 28, Figure 16.
2. Connect the Host PC's or Server's standard NIC to your network switch.

Figure 15. VTrak E610s and E310s data and management ports

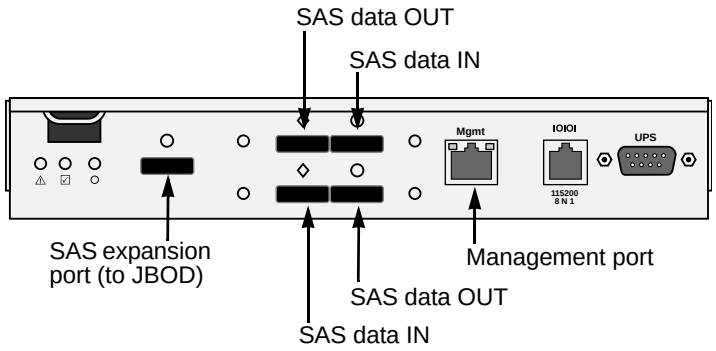
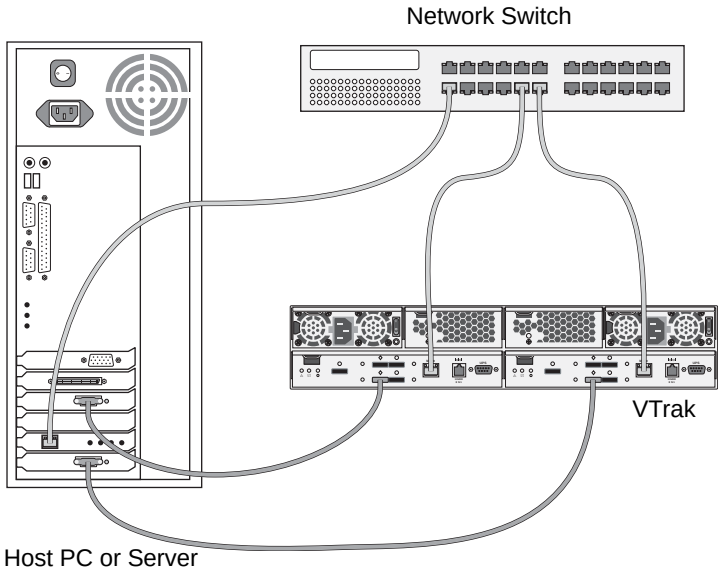


Figure 16. SAS DAS data and management connections



Important

J830s and J630s IN and OUT ports are labeled differently from J610s and J310s models.

Important

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 371
- “Appendix C: Multipathing on Linux” on page 393

SAS Cascaded Storage

Important

For a list of supported SAS HBAs, download the latest compatibility list from the Promise support website.

Serial Attached SCSI (SAS) Cascaded storage requires:

- One SAS HBA card in the Host PC or Server
- A network switch
- A network interface card (NIC) in the Host PC or Server

Data Path

To establish the data path:

1. Connect a SAS data IN port on the VTrak controller to your SAS HBA card. See Figures 17, 18, and 19 on the following pages.
2. Connect a SAS data OUT port of the first VTrak to a SAS data IN port on the next VTrak.
3. Connect the remaining VTrak controllers in the same manner.

   You can cascade up to eight VTrak subsystems.

Management Path

To establish the management path:

1. On the VTrak controller, connect the Management Port on each Controller to your network switch. See page 31, Figure 19.
2. Connect the Host PC's or Server's standard NIC to your network switch.

Figure 17. VTrak E610s and E310s data and management ports

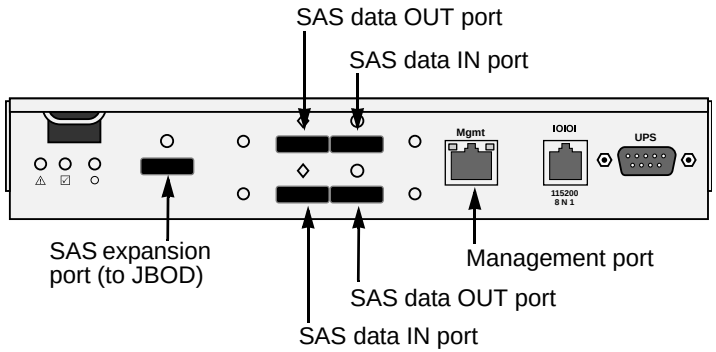
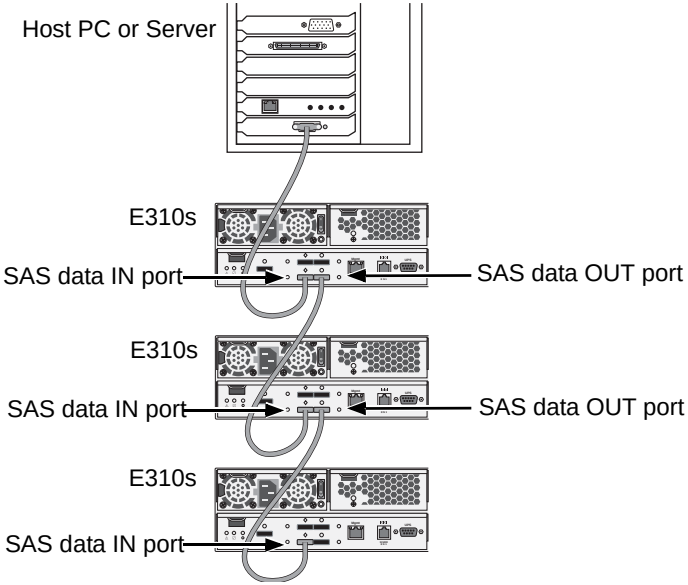


Figure 18. SAS Cascaded data connections



Important

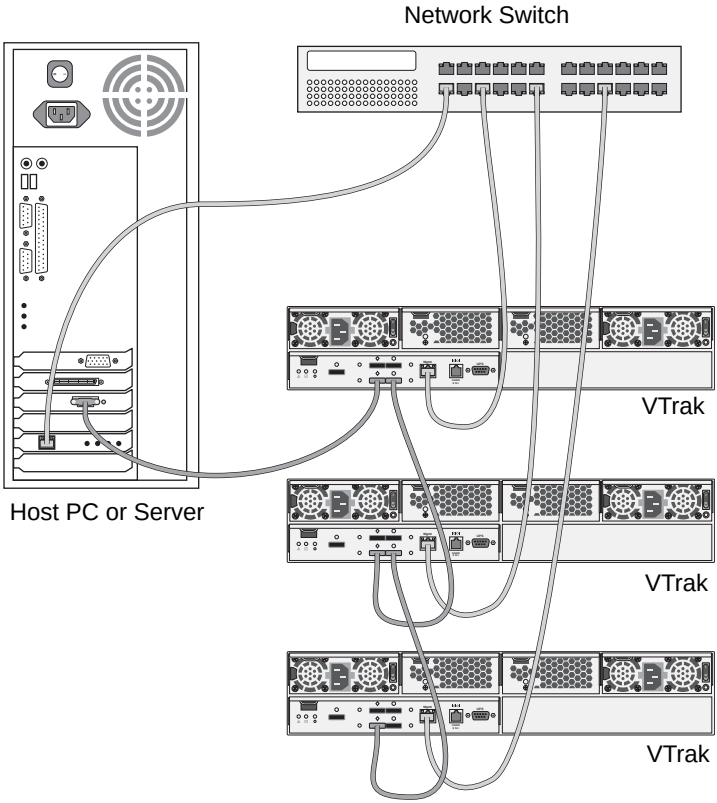
J830s and J630s IN and OUT ports are labeled differently from J610s and J310s models.

Important

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 371
- “Appendix C: Multipathing on Linux” on page 393

Figure 19. SAS Cascaded management and data connections



Important

J830s and J630s IN and OUT ports are labeled differently from J610s and J310s models.

Important

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 371
- “Appendix C: Multipathing on Linux” on page 393

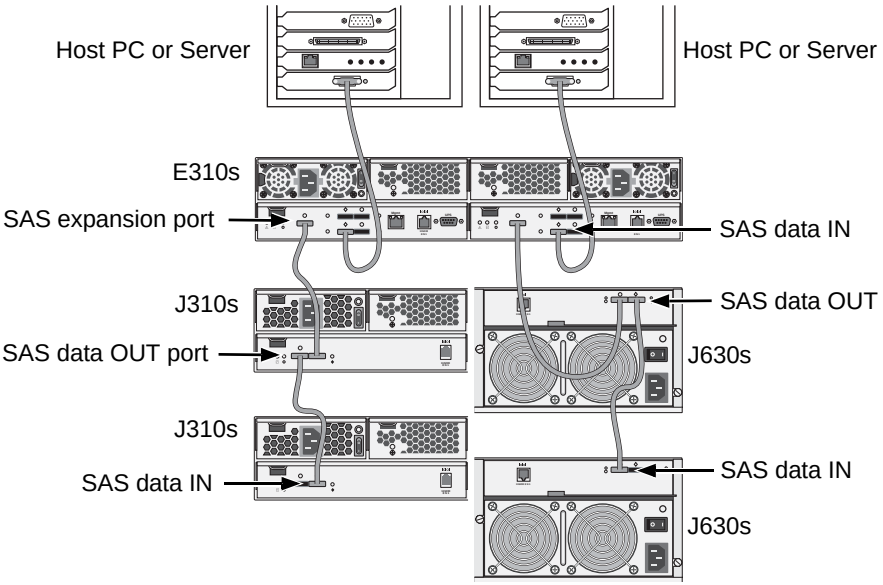
SAS with JBOD Expansion

To expand the number of disk drives:

1. Connect the SAS expansion port on the E610s or E310s controller to the SAS data IN port on the I/O module of the first JBOD unit. See Figure 20.
2. Connect the SAS data OUT port on the first JBOD unit to the SAS data IN port on the I/O module of the next JBOD unit.
3. Connect the remaining JBOD units in the same manner.

   You can combine different JBOD models in the expansion.

Figure 20. SAS JBOD data connections



Important

J830s and J630s IN and OUT ports are labeled differently from J610s and J310s models. Follow the diagram above.

Important

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 371
- “Appendix C: Multipathing on Linux” on page 393

SAS DAS – No Single Point of Failure – JBOD Expansion

Important

For a list of supported SAS HBAs, download the latest compatibility list from the Promise support website.

Serial Attached SCSI (SAS) Direct Attached Storage (DAS) with no single point of failure requires:

- Two SAS HBA cards in each Host PC or Server
- A network switch
- A network interface card (NIC) in each Host PC or Server

Data Path

To establish the data path:

1. Connect a SAS data IN port on the LEFT controller to the SAS HBA card in the first Host PC or Server.

   See page 34, Figure 21. And see page 35, Figure 22.
2. Connect the other SAS data IN port on the LEFT controller to the SAS HBA card in the second Host PC or Server.
3. Connect a SAS data IN port on the RIGHT controller to the SAS HBA card in the first Host PC or Server.
4. Connect the other SAS data IN port on the RIGHT controller to the SAS HBA card in the second Host PC or Server.

Management Path

To establish the management path:

1. Connect the Management ports on both VTrak controllers to your network switch.
2. Connect the NICs in both Host PCs or Servers to your network switch.

Expansion

To expand the number of disk drives:

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

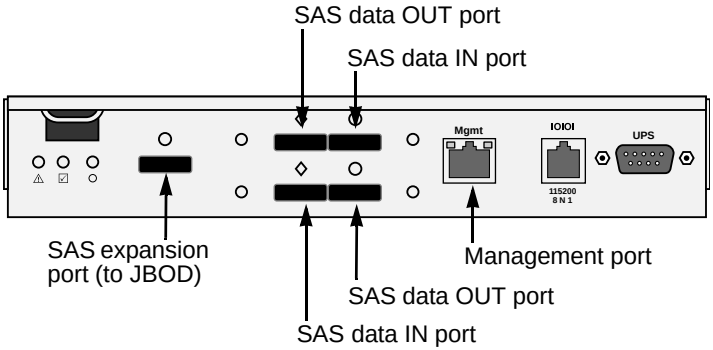
   See page 34, Figure 21. And see page 35, Figure 22.
2. Connect the SAS expansion port on the RIGHT controller to the SAS data IN port on RIGHT I/O module of the first JBOD unit.
3. Connect the SAS data OUT port on LEFT I/O module of the first JBOD unit to the SAS data IN port on LEFT I/O module of the next 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 RIGHT I/O module of the next JBOD unit.
5. Connect the remaining JBOD units in the same manner.

   Keep your data paths organized to ensure redundancy.

   You can combine different JBOD models in the expansion.

Figure 21. VTrak E610s and E310s data and management ports



Important

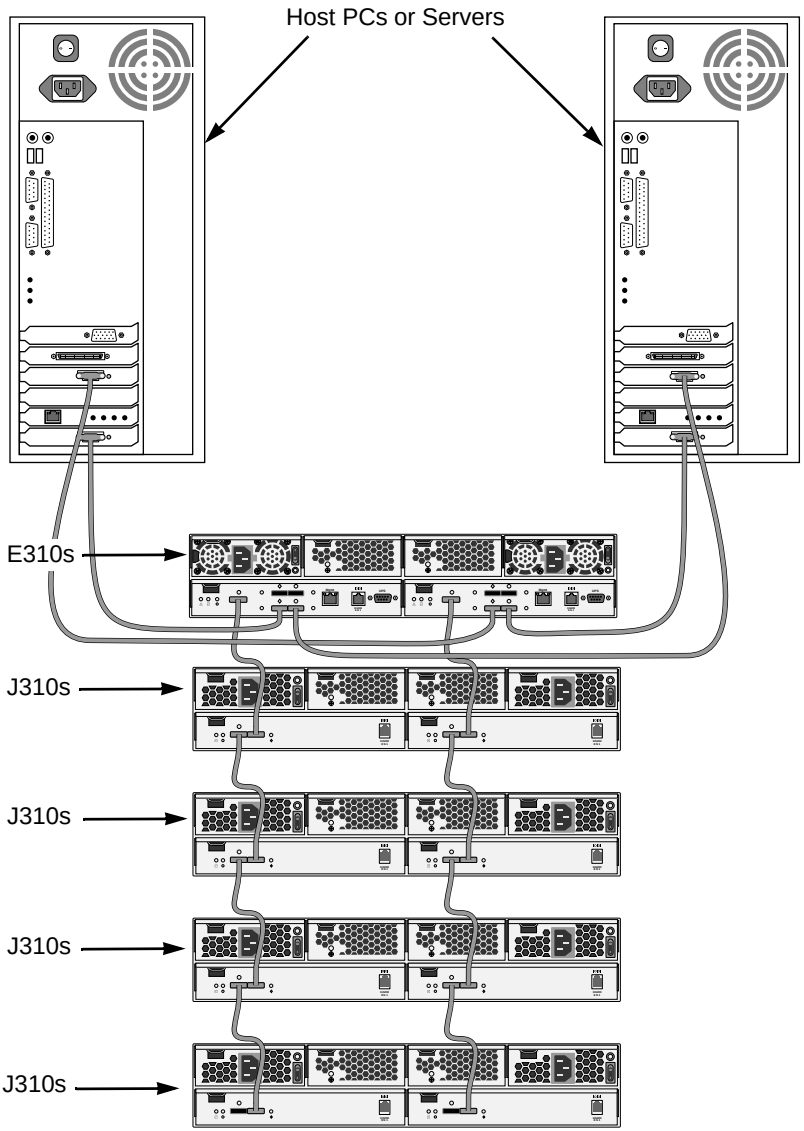
J830s and J630s IN and OUT ports are labeled differently from J610s and J310s models.

Important

For multipathing (MPIO) applications, see:

- “Appendix B: Multipathing on Windows” on page 371
- “Appendix C: Multipathing on Linux” on page 393

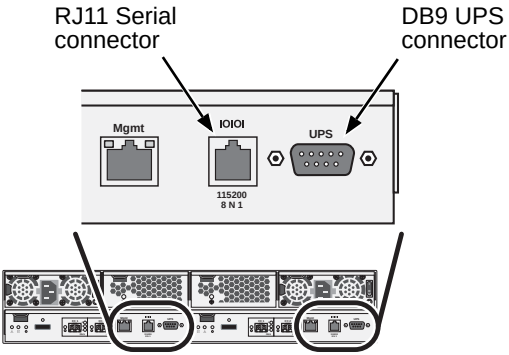
Figure 22. SAS data connections for no single point of failure with JBOD expansion



Setting Up Serial Cable Connections

Serial communication enables the Command Line Interface (CLI) and Command Line Utility (CLU) on your PC to monitor to control the VTrak. The VTrak package includes one RJ11-to-DB9 serial data cable for each controller. All VTrak models have the same serial connection.

Figure 23. Serial and UPS connectors are located on the controller



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 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 the UPS control cable to the DB9 connector on the VTrak controller. See Figure 23.

When your subsystem is running, see “Making UPS Settings” on page 138 or page 223 to complete the UPS management setup.

Connecting the Power

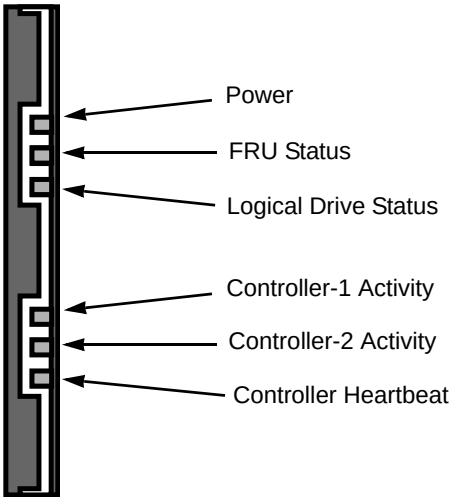
Plug the power cords and turn on the switches on both power supplies.

Important

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

When the power is switched on, the LEDs on the front of the VTrak will light up.

Figure 24. VTrak front panel LED display

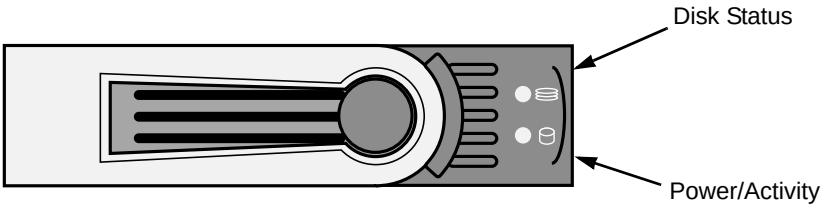


When boot-up is finished and the VTrak is functioning normally:

- Controller LED blinks green once per second for five seconds, goes dark for ten seconds, then blinks green once per second for five seconds again.
- Power, FRU and Logical Drive LEDs display green continuously.
- Controller LEDs flash green if there is activity on that controller.

There are two LEDs on each disk drive carrier. They report the presence of power and a disk drive, and the current condition of the drive.

Figure 25. VTrak disk drive carrier LEDs



After a few moments the Power/Activity LED should display Green. If there is no disk drive in the carrier, the Power/Activity LED will remain dark.

The Power/Activity LED flashes during drive activity.

The Disk Status LED displays Green when a drive is present and configured.

Go to “Chapter 3: VTrak Setup” on page 39.

Chapter 3: VTrak Setup

This chapter covers the following topics:

Setting up the Serial Connection

VTrak has a Command Line Interface (CLI) to manage all of its functions, including customization. A subset of the CLI is the Command Line Utility (CLU), a user-level interface that manages your VTrak via your PC's terminal emulation program, such as Microsoft HyperTerminal. This procedure uses the serial cable connection you made. "Setting Up Serial Cable Connections" on page 36.

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.
4. At the Login prompt, type **administrator** and press Enter.
5. At the Password prompt, type **password** and press Enter.

   At this point, you are in the CLI. You can continue using the CLI to make network settings or you can switch to the CLU. Go to:
   - Setting up VTrak with the CLI (page 41)
   - Setting up VTrak with the CLU (page 43)

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.

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 will prevent the DHCP server from assigning a new IP address when the VTrak restarts, with the result that users can no longer log in.

To access the MAC address for VTrak's virtual management port:

- In the CLI, type **net -v** and press Enter.
- In the CLU Main Menu, highlight *Network Management* and press Enter. Then highlight *Virtual* and press Enter.

VTrak Default IP Addresses

VTrak uses virtual and physical IP addresses. This arrangement enables you to access a VTrak with two RAID controllers over your network using a single IP address.

Virtual Management Port

The default virtual management port IP address is set to 10.0.0.1.

The virtual management port IP address belongs to the VTrak subsystem, not to the RAID controller. Use the virtual management port IP address to log into the VTrak over your network.

See "Logging into WebPAM PROe" on page 46.

Physical Management Ports

The default physical management port IP addresses are set to:

- Controller 1 – 10.0.0.2
- Controller 2 – 10.0.0.3

The physical management port IP address belongs to the RAID controller, not to the VTrak subsystem. Use the physical management port IP address only when a controller is in *maintenance mode*.

See "Controller Enters Maintenance Mode" on page 348.

Setting up VTrak with the CLI

1. Type the following string to set the system date and time, then press Enter.

   administrator@cli> **date -a mod -d 2009/06/25 -t 14:50:05**

   In the above example, the date and time are included as examples only. Your values will be different. Use yyyyy/mm/dd for the date and a 24-hour clock for the time.

2. Type the following string to set the Virtual Management Port IP address and other settings, then press Enter.

   administrator@cli> **net -a mod -t mgmt -s "primaryip=192.168.10.85, primaryipmask=255.255.255.0, gateway=192.168.10.1"**

   In the above example, the IP addresses and subnet mask are included as examples only. Your values will be different.

   If you prefer to let your DHCP server assign the Virtual Management Port IP address, type the following string, then press Enter.

   administrator@cli> **net -a mod -t mgmt -s "dhcp=enable"**

   Note that the IP address described above belongs to the VTrak subsystem, not to the RAID controller. Use this IP address to log into the VTrak over your network.

3. To verify the settings, 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
   ```

   Each RAID controller has an IP addresses for access when the controller goes into *maintenance mode*. Maintenance mode is only for remedial action in the event of a problem with the controller. See “Controller Enters Maintenance Mode” on page 348 for more information.

4. Type the following string to set the Maintenance Mode IP address and other settings, then press Enter. You must set each controller separately.

   administrator@cli> **net -a mod -t mgmt -m -c 1 -s "primaryip=192.168.10.101, primaryipmask=255.255.255.0, gateway=192.168.10.1"**

   administrator@cli> **net -a mod -t mgmt -m -c 2 -s "primaryip=192.168.10.102, primaryipmask=255.255.255.0, gateway=192.168.10.1"**

In the above example, the Maintenance Mode IP addresses and subnet mask are included as examples only. Your values will be different.

If you prefer to let your DHCP server assign the IP addresses, type the following strings, then press Enter.

administrator@cli> **net -a mod -t mgmt -m -c 1 -s "dhcp=enable"**

administrator@cli> **net -a mod -t mgmt -m -c 2 -s "dhcp=enable"**

Note that the IP address described above belongs to the RAID controller, not to the VTrak subsystem. Use this IP address to log into the controller over your network.

5. To verify the maintenance mode settings, type **net -m** and press Enter.

   administrator@cli> **net -m**

   ```
   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   CtrlId: 1                          Port: 1
   Type: Management Ethernet          IPType: IPv4
   IP: 192.168.10.101                 IPMask: 255.255.255.0
   MAC: 00:01:55:AE:02:AE             DNS: 0.0.0.0
   Gateway: 192.168.10.1              DHCP: Disabled
   ```

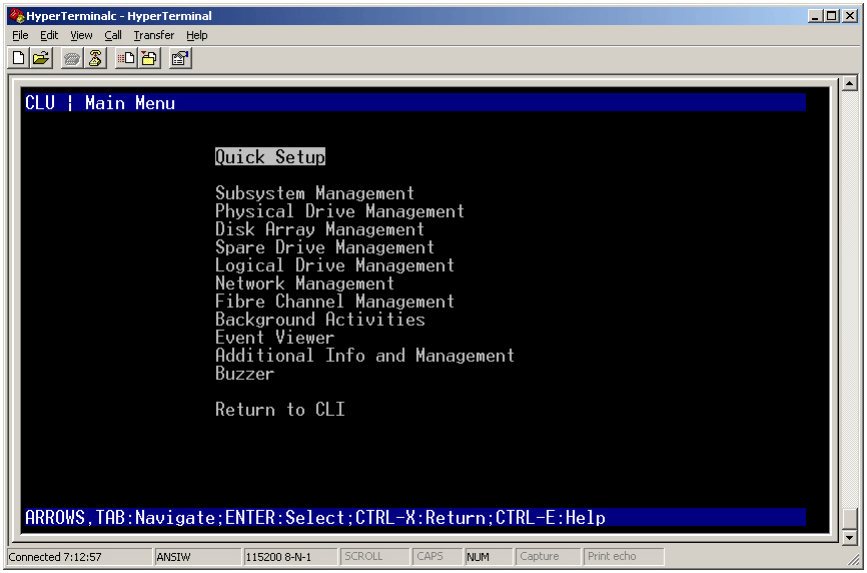
This completes the Management port setup. Go to “Setting Up WebPAM PROe” on page 46.

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

Setting up VTrak with the CLU

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

Figure 1. CLU main menu



2. With *Quick Setup* highlighted, press Enter.
   The first Quick Setup screen enables you to make Date and Time settings.

Setting system 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 Ctrl-A to save these settings and move to the Management Port configuration screen.

Making Management Port settings

Manual IP settings

To make Management Port settings manually:

1. Press the arrow keys to highlight *IP Address*.
2. Press the backspace key to erase the current IP Address.
3. Type the new 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 Ctrl-A to save your settings.

Automatic IP settings

To make Management Port settings automatically:

1. Press the arrow keys to highlight *DHCP*.
2. Press the spacebar to toggle to *Enable.*
3. Press Ctrl-A to save these settings.

Viewing IP address and 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 current Management Port settings are displayed.
3. Press the spacebar to toggle DHCP back to *Enable*.
4. Press Ctrl-A to save these settings and move to the RAID configuration screen.

Making Controller Maintenance Mode Settings

Each RAID controller has an IP addresses for access when the controller goes into *maintenance mode*. Maintenance mode is only for remedial action in the event of a problem with the controller. See “Controller Enters Maintenance Mode” on page 348 for more information.

Making Automatic 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 Ctrl-A to save your settings.

Making 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 Ctrl-A to save your settings.

Exiting the CLU

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

This completes the Management Port setup. Go to “Setting Up WebPAM PROe” on page 46.

Setting Up WebPAM PROe

Setting up WebPAM PROe consists of the following actions:

- Logging into WebPAM PROe (below)
- Choosing a Language (page 47)
- Creating a Disk Array (page 48)
- Logging out of WebPAM PROe (page 52)
- Using WebPAM PROe over the Internet (page 52)

Logging into WebPAM PROe

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

   Use the virtual IP address you set in the CLI (page 41) or CLU (page 43). Note that the IP address shown below is only an example. The IP address you type into your browser will be different.

Regular Connection

- WebPAM PROe uses an HTTP connection. . . . . .http://
- Enter the VTrak's IP address 192.168.10.85

Together, your entry looks like this:

http://192.168.10.85

Secure Connection

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

Together, your entry looks like this:

https://192.168.10.85

Note

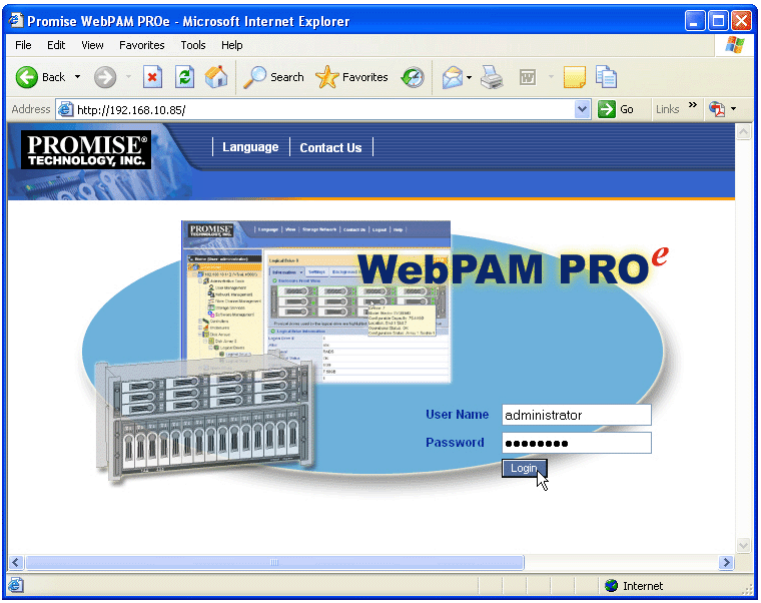
Whether you choose a regular or a secure connection, your login to WebPAM PROe and your user password are always secure.

3. When the log-in screen (Figure 2) 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. Click the **Login** button.

Figure 2. WebPAM PROe log-in screen



After sign-in, the WebPAM PROe opening screen appears. If there are any unconfigured physical drives in the enclosure, an Array Configuration menu also appears. See page 48, Figure 4.

Note

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

Choosing a Language

WebPAM PROe displays in English, German, French, Italian, Japanese, Korean, Traditional Chinese, and Simplified Chinese.

1. Click **Language** on the WebPAM PROe Header.

   The language list appears in the Header.

2. Click the language you prefer.

   The WebPAM PROe user interface displays in the chosen language.

Figure 3. Clicking "Language" on the WebPAM PROe Header

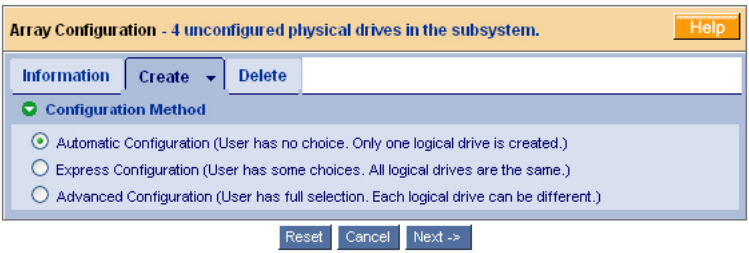
Creating a Disk Array

On a newly activated VTrak subsystem, there are no disk arrays or logical drives. To create a disk array:

1. Click the Disk Arrays icon, then click the **Create** tab.

   The Array Configuration menu appears.

Figure 4. The Array Configuration menu



2. Choose one of the options:
   - **Automatic** – Creates a new disk array following a default set of parameters. Makes one logical drive automatically. Also makes a hot spare drive for all RAID levels except RAID 0, if at least four unconfigured physical drives are available. See page 49.
   - **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 will all be identical. You can choose to make a hot spare drive for all RAID levels except RAID 0, if at least four unconfigured physical drives are available. See page 49.
   - **Advanced** – You directly specify all parameters for a new disk array. Makes one logical drive automatically. You can create additional logical drives at a later time, if additional configurable capacity is available. Does not make a hot spare drive. See page 50.
3. Click the **Next** button.

Automatic

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

- **Disk Arrays** – The number of physical drives in the disk array, their ID numbers, configurable capacity, and the number of logical drives to be created
- **Logical Drives** – The ID number of the logical drive(s), their RAID level, capacity, and stripe size
- **Spare Drives** – The physical drive slot number of the dedicated hot spare assigned to this disk array. A hot spare drive is created for all RAID levels except RAID 0, when five or more unconfigured physical drives are available

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

The new disk array appears in the Disk Array List on the Information tab.

If you do NOT accept these parameters, use the Express (below) or Advanced (page 50) option to create your disk array.

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 will remain 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 will be 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.

   The maximum possible number of logical drives appears to the right of this field.
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 **Update** button.

   Or check the Automatic Update box and updates will occur automatically.

   The following parameters display:

   - **Disk Arrays** – The number of physical drives in the disk array, their slot numbers, configurable capacity, and the number of logical drives to be created
   - **Logical Drives** – The slot number of the logical drive(s), their RAID level, capacity, and stripe size
   - **Spare Drives** – The physical drive slot number of the dedicated hot spare assigned to this disk array (all RAID levels except RAID 0)

   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.

5. When you are done, click the **Submit** button.

   The new disk array appears in the Disk Array List on the Information tab.

Advanced

Note

For an explanation of the parameters under the Advanced option, see “Chapter 7: Technology Background” on page 273.

When you choose the Advanced option, the *Step 1 – Disk Array Creation* screen displays.

Step 1 – Disk Array Creation

1. Optional. Enter a name for the disk array in the field provided.

   Maximum of 31 characters; letters, numbers, space between characters, and underline.

2. Uncheck the boxes if you want to disable Media Patrol or PDM.

   Promise recommends leaving these features enabled. See “Media Patrol” on page 301 and “Predictive Data Migration (PDM)” on page 302.

3. Highlight physical drives you want in the disk array from the Available list and press the **>>** button to move them to the Selected list.

   You can also double-click them to move them.

4. When you are done, click the **Next** button.

Step 2 – Logical Drive Creation

1. Optional. Enter an alias for the logical drive in the field provided.

   Maximum of 31 characters; letters, numbers, space between characters, and underline.

2. Choose a RAID level for the logical drive from the dropdown menu.

   The choice of RAID levels depends the number of physical drives you selected.

3. RAID 50 and 60 only – Specify the number of axles for your array.

   For more information on axles, see “RAID 50 Axles” on page 281 or “RAID 60 Axles” on page 283.

4. Specify a Capacity and the unit of measure (B, KB, MB, GB, TB).

   This value will be the data capacity of the first logical drive in your new disk array. If you specify less than disk array's maximum capacity, the remaining capacity is available for additional logical drives that you can create now or later.

5. For the following items, accept the default or choose a new value from the dropdown menu:

   - Stripe size. 64 KB is the default.

     64 KB, 128 KB, 256 KB, 512 KB, and 1 MB are available.

   - Sector size. 512 B is the default.

     512 B, 1 KB, 2 KB, and 4 KB are available.

   - Read (cache) Policy. Read Ahead is the default.

     Read Cache, Read Ahead Cache, and No Cache are available.

   - Write (cache) Policy. Write Back is the default.

     Write Back and Write Through (Thru) are available.

   - Preferred Controller ID.

     The choices are Controller 1 or 2, or Automatic. This feature is only available on subsystems with two controllers and LUN Affinity enabled.

6. Click the **Update** button.

   A new logical drive is displayed under New Logical Drives. If there is free capacity remaining, you can specify another logical drive now or wait until later.

7. When you are done specifying logical drives, click the **Next** button.

Step 3 – Summary

The Summary lists the disk array and logical drive information you specified.

To proceed with disk array and logical drive creation, click the **Submit** button.

Note

This function does not automatically create a hot spare drive. After the disk array is created, you can create a hot spare drive for it. See “Creating a Spare Drive” on page 161 or page 201.

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 5. Clicking “Logout” on the WebPAM PROe banner

Clicking **Logout** brings you back to the Login Screen. See page 47.

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.

Chapter 4: Management with WebPAM PROe

This chapter covers the following topics:

For information about VTrak's audible alarm and LEDs, see "Chapter 8: Troubleshooting" on page 307.

Logging into WebPAM PROe

In order to log into WebPAM PROe, you must first setup a network connection between your Host PC and the VTrak subsystem, as described in “Chapter 3: VTrak Setup” on page 39.

To log into WebPAM PROe:

1. Launch your Browser.
2. In the Browser address field, type in the IP address of the VTrak Management port.

   Note that the IP address shown below is only an example. The IP address you type into your browser will be different.

Regular Connection

- WebPAM PROe uses an HTTP connection. . . . . .http://
- Enter the VTrak’s Management Port IP address 192.168.10.85

Together, your entry looks like this:

http://192.168.10.85

Secure Connection

- WebPAM PROe uses a secure HTTP connection. . . . . .https://
- Enter the VTrak’s Management Port IP address 192.168.10.85

Together, your entry looks like this:

https://192.168.10.85

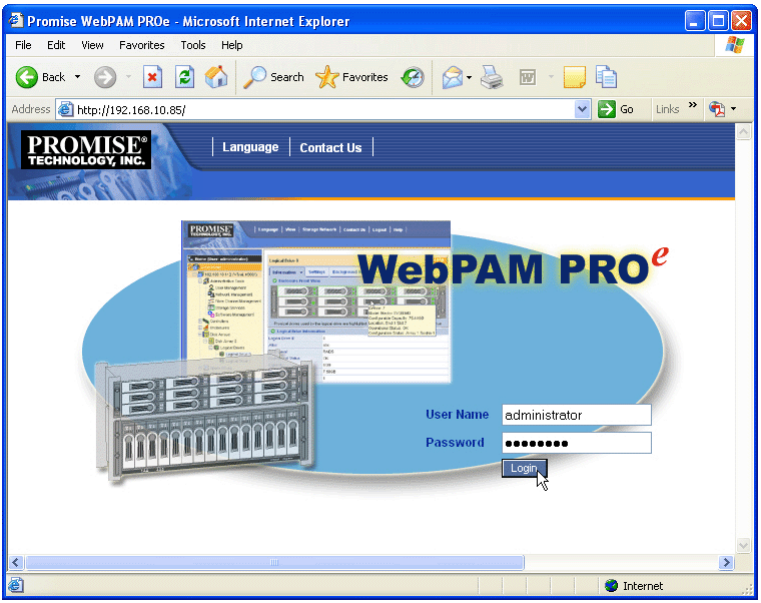
Note

Whether you choose a regular or a secure connection, your login to WebPAM PROe and your user password are always secure.

3. When the log-in 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. Click the **Login** button.

Figure 1. The WebPAM PROe log-in screen



Choosing a Language

WebPAM PROe displays in English, German, French, Italian, Japanese, Korean, Traditional Chinese, and Simplified Chinese.

1. Click **Language** the WebPAM PROe Header.

   The language list appears in the Header.

2. Click the language you prefer.

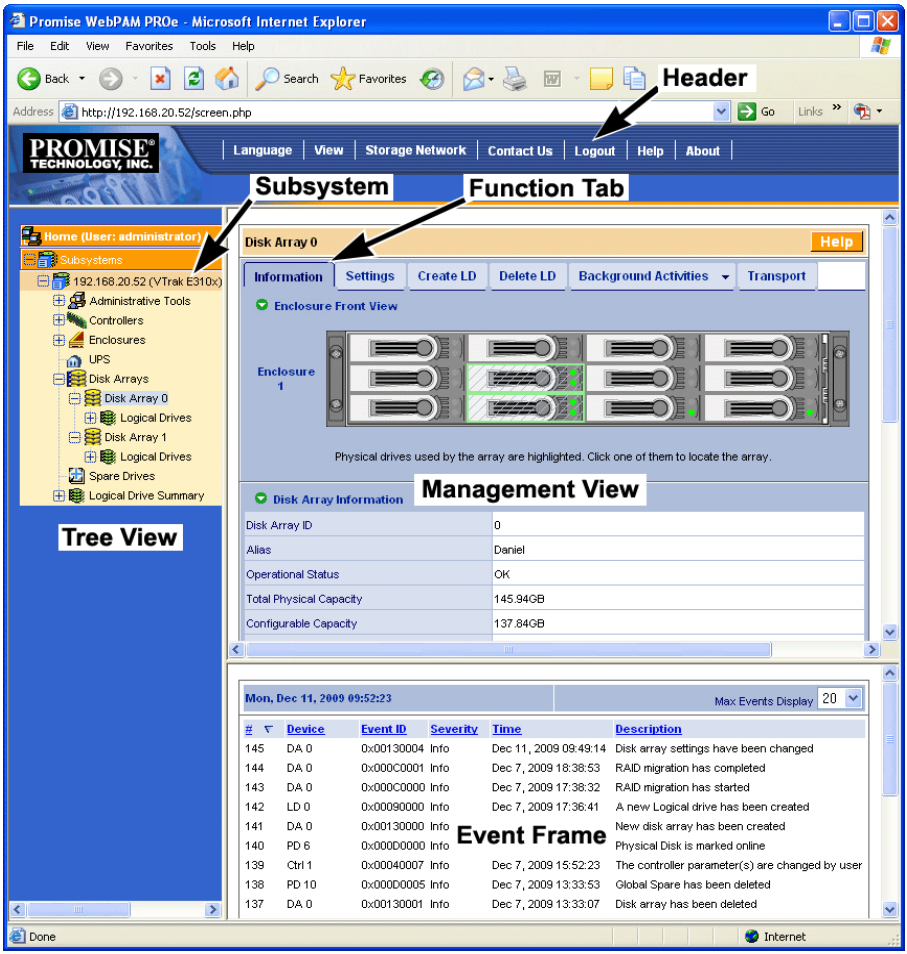
   The WebPAM PROe user interface displays in the chosen language.

Figure 2. Clicking "Language" in the Header

Perusing the Interface

WebPAM PROe is browser-based RAID management software with a graphic user interface.

Figure 3. WebPAM PROe interface



There are four major parts to the graphic user interface:

- Header (see page 58)
- Tree (see page 58)
- Management View (see page 59)
- Event Frame (see page 60)

Using the Header

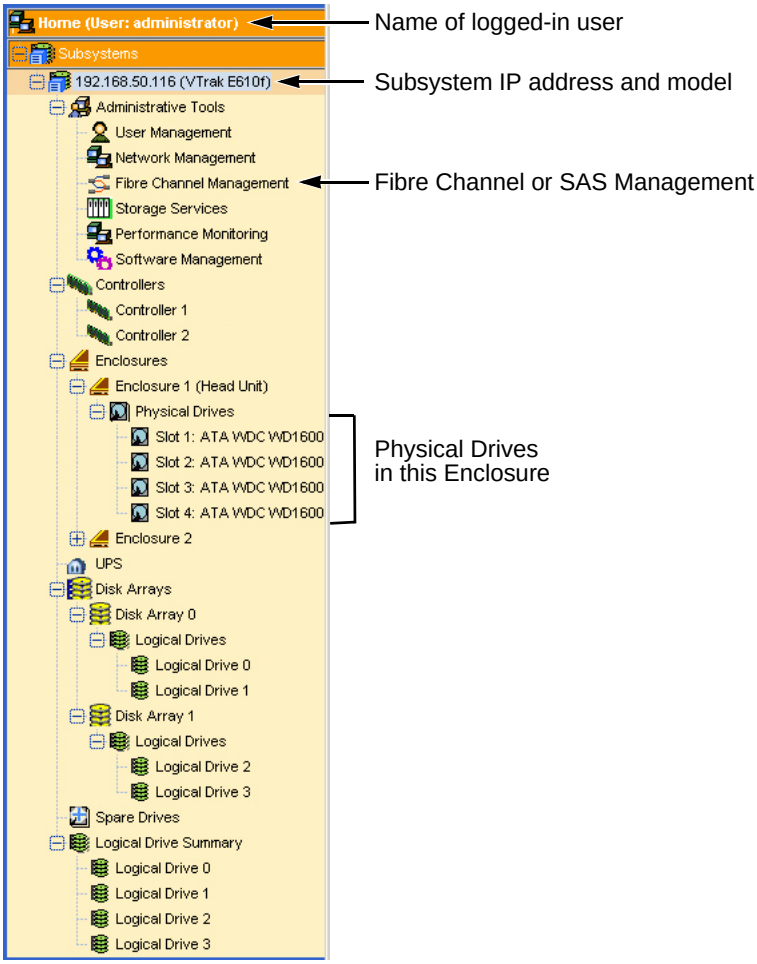
The Header contains the following items:

- **Language** – See “Choosing a Language” on page 56.
- **View** – See “Viewing the Event Frame” on page 60.
- **Storage Network** – See “Working with the Storage Network” on page 62.
- **Contact Us** – Click **Contact Us** for contact information and Technical Support. Also see “Contacting Technical Support” on page 359.
- **Logout** – See “Logging out of WebPAM PROe” on page 61
- **Help** – Click **Help** in the Header to access the main online help menu.
- **About** – Click **About** in the Header to display the WebPAM PROe software version and build date.

Using Tree View

Tree View enables you to navigate around all components of the Subsystem, including Fibre Channel or SAS management, network and service management, RAID controller, enclosure, physical drives, disk arrays, logical drives, and spare drives. The figure below shows the components of Tree View.

Figure 4. WebPAM PROe Tree View



The Administrative Tools section is different for the Administrator and Super User than for users with other privilege levels. The remainder of the Tree is the same for all users. Management View displays information according to the item you choose in Tree View.

Using Management View

Management View provides the actual user interface with the VTrak, including creation, maintenance, deletion, and monitoring of disk arrays and logical drives.

Function Tabs control specific actions and processes. This window changes depending on which item you choose in Tree View and which tab you choose in Management View itself.

Click the **Help** button in Management View to access online help for the function that is currently displayed.

Viewing the Event Frame

To view the Event Frame:

1. Click **View** in the Header.
2. Click the *Show Event Frame* popup option.
   WebPAM PROe displays the Event Frame below Management View.
3. Click **View** again to hide the Event Frame.

In the event frame, events are listed and sorted by:

- **Item Number** – A consecutive decimal number assigned to a specific event
- **Device** – Battery, controller, logical drive, physical drive, port, etc.
- **Event ID** – The hexadecimal number that identifies the specific type of event
- **Severity** – See Table 1
- **Time** – Time and date of the occurrence
- **Description** – A brief description of the event

Table 1 Event severity levels

Level	Meaning
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

Sorting Events

You can sort the events by Item Number, Device, Event ID, Severity, Time and Date, or Description.

Click the link at the top of the column by which you want to sort the events. After you click the item, a triangle icon appears.

- If the triangle points upward, the column is sorted low-to-high or old-to-new

- If the triangle points downward, the column is sorted high-to-low or new-to-old

Click the link a second time to change to flip the triangle and reverse the sort sequence.

Logging out of WebPAM PROe

There are two ways to log out of WebPAM PROe:

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

Figure 5. Clicking "Logout" in the Header)

Clicking **Logout** brings you back to the Login Screen. After logging out, you must enter your user name and password in order to log in again.

Working with the Storage Network

When you log into WebPAM PROe, you access a specific VTrak subsystem. See “Logging into WebPAM PROe” on page 54.

The Storage Network feature enables you to access all of the VTrak subsytems with a Management Port connection to your network.

Each VTrak subsystem is identified by its Management Port IP address.

Storage Network functions include:

- Viewing other subsystems
- Updating the list of subsystems
- Logging into a subsystem
- Hiding the other subsystems

Viewing Other Subsytems

To view the other VTrak subsytems the Storage Network:

1. Click **Storage Network** in the Header.
2. Click the *Show Network Subsystems* popup option.

   The list will show all subsystems the network at the time the GUI was launched.

Updating the List of Subsystems

To update the list of the VTrak subsytems the Storage Network:

Click the **Discover** button at the bottom of the subsystem list.

Logging into a Subsystem

To log into any of the displayed VTrak subsystems:

1. In Tree View, click the Subsystem  icon of the subsystem you want to see.

   If your user name and password do not match the subsystem you are logging into, the log in screen will appear.
2. Log into the new subsystem, as needed.

Hiding the Other Subsystems

To hide the other VTrak subsystems the Storage Network:

1. Click **Storage Network** in the Header.
2. Click the *Hide Network Subsystems* popup option.

Working with Subsystems

A VTrak subsystem is identified by its Management Port IP address. Subsystem functions include:

Viewing Subsystem Information

To view information about a subsystem, click the Subsystem icon in Tree View. The Information tab in Management View displays the subsystem information.

Saving a System Service Report

To save a System Service Report as a compressed HTML file:

1. In Tree View, click the Subsystem icon.
2. On the Information tab, click the **Save** button.
3. In the dialog box, click the **Save File** option, then click the **OK** button.

   The service report is saved to the Host PC from which you access WebPAM PROe. The file name includes **subsysteminfo**, the date, and **html**.

Setting an Alias for the Subsystem

An alias is optional. To set an alias for this subsystem:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Settings** tab.
3. Enter a name into the Alias field.

   Maximum of 48 characters. Use letters, numbers, space between words, and underscore.
4. Click the **Submit** button.

Setting Redundancy for the Subsystem

To set redundancy for this subsystem:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Settings** tab.
3. In the Redundancy Type dropdown menu, choose:
   - **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
4. Click the **Submit** button.

If you change Redundancy Type, be sure both controllers are properly installed in the subsystem before you restart.

If your subsystem has dual controllers and they are set to Active-Active, you can use the LUN Affinity feature. See “Making Controller Settings” on page 122.

Setting Cache Mirroring for the Subsystem

This option applies only to subsystems with two controllers. To use Cache Mirroring, the Redundancy Type must be set to Active-Active.

To change Cache Mirroring for this subsystem:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Settings** tab.
3. Do one of the following actions:
   - To enable Cache Mirroring, check the Cache Mirroring box.
   - To disable Cache Mirroring, uncheck the Cache Mirroring box.
4. Click the **Submit** button.
5. Restart the subsystem.

   See “Restarting the Subsystem” on page 119.

Notes

- If you disable Cache Mirroring, LUN Affinity will be enabled automatically.
- If you change Cache Mirroring, be sure both controllers are properly installed in the subsystem before you restart.

Setting Subsystem Date and Time

To set a Date and Time for this subsystem:

1. In Tree View, click the Subsystem icon.
2. From the dropdown menu on the **Settings** tab, choose *Date and Time Settings*.
3. Under Subsystem Date, choose the Month and Day from the dropdown menus.
4. Type the current year into the Year field.
5. Under Subsystem Time, choose the Hour, Minutes, and Seconds from the dropdown menus.
6. Click the **Submit** button.

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. In Tree View, click the Subsystem  icon.
2. From the dropdown menu on the **Settings** tab, choose *NTP Management*.
3. Check the **NTP Service** box to enable the NTP service.
4. Enter the URLs for NTP servers in the fields provided.

   One URL is required. Additional URLs are optional.
5. From the **Time Zone** dropdown menu, choose your time zone.
6. If your location observes Daylight Savings Time:
   - Check the **Daylight Savings Time** box.
   - Set the start date from the **DST Start Time** dropdown menus.
   - Set the end date from the **DST End Time** dropdown menus.
7. Click the **Submit** button.
8. Click the **OK** button in the notification dialog box.

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. In Tree View, click the Subsystem  icon.
2. From the dropdown menu on the **Settings** tab, choose *NTP Management*.
3. Click the **Start Time Sync** button.
4. Click the **OK** button in the notification dialog box.

Viewing the Runtime Event Log

Runtime Events lists information about the 1023 most recent runtime events recorded since the system was started. To view runtime events:

1. In Tree View, click the Subsystem  icon.
2. In Management View, click the **Events** tab dropdown menu and choose *Runtime Events*.

   Events are displayed by:
   - **Item Number** – A consecutive decimal number assigned to a specific event
   - **Device** – Battery, controller, logical drive, physical drive, port, etc.

- **Event ID** – The hexadecimal number that identifies the specific type of event
- **Severity** – See Table 2 on page 67
- **Time** – Time and date of the occurrence
- **Description** – A brief description of the event

3. Click the link at the top of the column by which you want to sort the events. After you click the item, a triangle icon appears.
   - If the triangle points upward, the column is sorted low-to-high or old-to-new
   - If the triangle points downward, the column is sorted high-to-low or new-to-old

   Click the link a second time to change to flip the triangle and reverse the sort sequence.

Table 2 Event severity levels

Level	Meaning
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

Saving the Runtime Event Log

To save the runtime event log as a text file:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *Runtime Events*.
3. Click the **Save Event Log** button.
4. In the File Download dialog box, click the **Save** button.
5. In the Save dialog box, name the file, navigate to the folder where you want to save the log file, and click the **Save** button.

Clearing the Runtime Event Log

To clear the runtime event log:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *Runtime Events*.
3. Click the **Clear Event Log** button.
4. In the Confirmation dialog box, type **confirm** and click the **OK** button.

Viewing NVRAM Events

NVRAM Events are the most recent important events stored in non-volatile memory. To view runtime events:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *System Events in NVRAM*.

   Events are displayed by:

   - **Item Number** – A consecutive decimal number assigned to a specific event
   - **Device** – Battery, controller, logical drive, physical drive, port, etc.
   - **Event ID** – The hexadecimal number that identifies the specific type of event
   - **Severity** – See Table 2 on page 67
   - **Time** – Time and date of the occurrence
   - **Description** – A brief description of the event

3. Click the link at the top of the column by which you want to sort the events. After you click the item, a triangle icon appears.
   - If the triangle points upward, the column is sorted low-to-high or old-to-new
   - If the triangle points downward, the column is sorted high-to-low or new-to-old

   Click the link a second time to change to flip the triangle and reverse the sort sequence.

Saving NVRAM Events

To save the NVRAM event log as a text file:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *System Events in NVRAM*.
3. Click the **Save Event Log** button.
4. In the File Download dialog box, click the **Save** button.
5. In the Save dialog box, name the file, navigate to the folder where you want to save the log file, and click the **Save** button.

Clearing NVRAM Events

To clear the NVRAM event log:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *System Events in NVRAM*.
3. Click the **Clear Event Log** button.
4. In the Confirmation dialog box, type **confirm** and click the **OK** button.

Viewing Current Background Activities

To view the current background activities:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Background Activities** tab.

   A list of current background activities appears, including:

   - Rebuild
   - PDM (Predictive Data Migration)
   - Synchronization
   - Redundancy Check
   - Migration
   - Transition
   - Initialization
   - Media Patrol

Making Background Activity Settings

To make settings for background activities:

1. In Tree View, click the Subsystem  icon.
2. From the dropdown menu on the **Background Activities** tab, choose *Settings*.
3. Click the dropdown menu to choose a priority of *Low*, *Medium*, and *High* for the following functions:
   - **Rebuild** – Rebuilds data to a replacement physical drive in a disk array
   - **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
   - **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

   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
4. Highlight the following PDM trigger settings and type a value into the corresponding field:
   - **BBM Threshold** – 1 to 2048 reassigned blocks
   - **Media Patrol Threshold** – 1 to 2048 error blocks
5. Check to enable or uncheck to disable the following functions:
   - **Media Patrol** – Checks the magnetic media on physical drives
   - **Auto Rebuild** – When enabled and no spare drive is available, the disk array will begin to rebuild as soon as you replace the failed physical drive with an unconfigured physical drive of equal or greater size
6. Click the **Submit** button to save your settings.

Running Background Activities

To run a background activity from the Background Activities tab:

1. In Tree View, click the Subsystem icon.
2. From the dropdown menu on the **Background Activities** tab, choose one of the following items:
   - **Media Patrol** – See “Running Media Patrol” below
   - **Rebuild** – See “Rebuilding a Disk Array” on page 149
   - **PDM** – See “Running PDM” on page 71
   - **Transition** – See “Transitioning a Disk Array” on page 151
   - **Initialization** – See “Initializing a Logical Drive” on page 156
   - **Redundancy Check** – See “Running Redundancy Check” on page 156
3. In the next screen, make the choices as requested.
4. Click the **Start** button.

Running Media Patrol

Media Patrol checks the magnetic media on physical drives. When it finds the specified number of bad blocks, it will trigger PDM. See “Making Background Activity Settings” on page 70. Also see “Media Patrol” on page 301.

You can also schedule a Media Patrol. See “Scheduling an Activity” on page 72.

To run Media Patrol:

1. In Tree View, click the Subsystem icon.
2. From the dropdown menu on the **Background Activities** tab, choose *Start Media Patrol*.
3. In the next screen, click the **Start** button.

Running PDM

Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare disk drive, similar to Rebuilding. But unlike Rebuilding, PDM acts *before* a disk drive fails and your Logical Drive goes Critical.

You an also run PDM on a specific disk array, see “Running PDM on a Disk Array” on page 151. Also see “Predictive Data Migration (PDM)” on page 302.

To run PDM:

1. In Tree View, click the Subsystem icon.
2. From the dropdown menu on the **Background Activities** tab choose *Start PDM*.

3. Choose the Array and Source physical drive.

   The source drive is the physical drive at risk of failure.

4. Choose the Target physical drive.

   The target drive is the replacement physical drive.

5. Click the **Submit** button.

Viewing Scheduled Activities

To view scheduled activities for this subsystem:

1. Click the Subsystem  icon Tree View.
2. Click the **Scheduler** tab in Management View.

Scheduling an Activity

To set a scheduled activity for this subsystem:

1. Click the Subsystem  icon Tree View.
2. From the dropdown menu on the **Scheduler** tab, choose an item:
   - Media Patrol. See “Running Media Patrol” on page 71
   - Redundancy Check. See “Running Redundancy Check” on page 156
   - Battery Reconditioning. See “Reconditioning a Battery” on page 128
   - Spare Drive Check. See “Running Spare Check” on page 163
3. In the Scheduler dialog box, check the Enable This Schedule box.
4. Select a start time (24-hour clock).
5. Select a Recurrence Pattern.
   - **Daily** – Enter the number of days between events.
   - **Weekly** – Enter the number of weeks between events and choose which days of the week.
   - **Monthly** – Choose a calendar day of the month (1 – 31).

   If you choose a higher number than there are days in the current month, the actual start date will occur at the beginning of the following month.

   Or, choose a day of the week and choose the first, second, third, fourth, or last occurrence of that day in the month.

   Then, choose the months in which you want the activity to occur.
6. Select a Range of Occurrence.
   - Start-from date. The default is today's date.
   - End-on date.

   Select No End Date (perpetual).

   Or, choose a number of occurrences for this activity.

Or, choose a specific end date. The default is today's date.

7. For Redundancy Check only:
   - Choose the Auto Fix option. This feature attempts to repair the problem when it finds an error.
   - Choose the Pause on Error option. This feature stops the process when it finds an error
   - Check the boxes beside the logical drives (all except RAID 0) to which this activity will apply.

     Each logical drive can have only one scheduled Redundancy Check.

Note

You can schedule only ONE Redundancy Check for each logical drive.

8. Click the **Submit** button.

Deleting a Scheduled Activity

To delete a scheduled activity for this subsystem:

1. Click the Subsystem icon Tree View.
2. From the dropdown menu on the **Scheduler** tab, choose *Delete Schedules*.
3. Check the box to the left of the schedule you want to delete.
4. Click the **Submit** button.

Viewing Lock Status

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

To view the lock status for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the **Lock** tab in Management View.

   The following information is displayed:
   - **Lock Status** – The User who set (owns) the current lock.
   - **Expiration Time** – Amount of time left until the lock automatically releases.
   - **Expire At Time** – The date and time when the lock will automatically release.

Setting the Lock

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

You can set the lock to last from one minute to one day. To set the lock for this subsystem:

1. Click the Subsystem  icon Tree View.
2. Click the **Lock** tab in Management View.
3. Click the **Lock** option.
4. Enter a time interval that you want the lock to stay active.

   The range is 1 to 1440 minutes. 1440 minutes equals one day.
5. Click the **Submit** button.

Renewing the Lock

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

Renewing the lock extends the period of time the controller remains locked. To renew an existing lock for this subsystem:

1. Click the Subsystem  icon Tree View.
2. Click the **Lock** tab in Management View.
3. Click the **Renew** option.
4. Enter a time interval that you want the lock to stay active.

   The range is 1 to 1440 minutes. 1440 minutes equals one day.

   The renew time replaces the previous Expiration Time.
5. Click the **Submit** button.

Releasing the Lock

The lock prevents other sessions (including by 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. You can also release the lock before the scheduled time.

To release the lock for this subsystem:

1. Click the Subsystem  icon Tree View.
2. Click the **Lock** tab in Management View.

   If you are the User who set the lock, click the **Unlock** option.

   If another User set the lock and you are a Super User, click the **Unlock** option and check the **Force Unlock** box.
3. Click the **Submit** button.

Managing Users

User Management includes all functions dealing with user accounts. Functions include:

Viewing User Information

The view a list of users, their status, access privileges, display name, and email address:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the User Management icon.

   The Information tab appears in Management View.

Creating a User

To create a user:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the **Create** tab in Management View.
6. Provide the following information as required:
   - Enter a user name into the User Name field.

     Maximum of 31 characters, no spaces.
   - Enter a password into the New Password and Retype Password fields.

Maximum of 31 characters, no spaces. A password is optional. If you do not specify a password, log into WebPAM PROe with the User Name and leave the password field blank.

- Enter a display name into the Display Name field.

  A display name is optional. Maximum of 31 characters, no spaces.
- Enter the user's email address into the Email Address field.

  An email address is required in order to receive email event notification.
- Choose a privilege level from the Privilege dropdown menu.

  See Table 3 below.

7. Optional. Uncheck the Enabled box to disable this user on this subsystem.
8. Click the **Submit** button.

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

Setting-up Event Notification

Event notification requires one or more user event subscriptions (below) and subsystem service settings. See “Making Event Notification Settings” on page 98.

To make or change a user event subscription:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the User Management icon.
4. Click the **Event Subscription** tab in Management View.
5. Check the box to enable event notification.

6. Under the subheadings, choose the lowest level of Severity to be reported for each event. See Table 4 on page 78.
7. Click the **Submit** button.

The user's account must have an email address. See "Changing Another User's Settings" on page 78.

To send a test message to the email address in the listed under General Info, click the **Test Email** button.

Table 4 Event severity levels

Level	Meaning
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

Changing Another User's Settings

To change settings of other users:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem  icon in Tree View.
3. Click the Administrative Tools  icon.
4. Click the User Management  icon.
5. On the Information tab, click the link of the user whose settings you want to change.
6. On the user settings screen,
   - Check the Enable box to enable this user
   - Uncheck the Enable box to disable this user
   - Enter or change the display name
   - Enter or change the email address
   - From the Privilege dropdown menu, choose a new level
     See Table 3 on page 77.
7. Click the **Submit** button.

Important

If you disable a user that is currently logged on, that user's session terminates immediately. A disabled user cannot log in until the account is enabled.

Changing Your Own User Settings

To change your own user settings:

1. Log into WebPAM PROe under your own user name.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the **Settings** tab in Management View.
6. Enter or change the display name or mail address.
7. Click the **Submit** button.

Changing Another User's Password

To change a user's password:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. In the list of users, click the link of the user whose password you want to change.
6. Click the **Password** tab in Management View.
7. Enter a new password into the New Password and Retype Password fields.

   Maximum of 31 characters, no spaces.
8. Click the **Submit** button.

Important

Be sure the user knows the new password. Otherwise the user cannot log into WebPAM PROe.

Changing Your Own Password

To set or change your own password:

1. Log into WebPAM PROe under your own user name.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the **Password** tab in Management View.
6. Enter the current password in the Old Password field.
   If you do not have a password, leave this field blank.
7. Enter a new password into the New Password and Retype Password fields.
   Maximum of 31 characters, no spaces.
8. Click the **Submit** button.

Deleting a User

WebPAM PROe requires at least one Super User account. A logged-in user cannot delete his own user account. Rather than delete a user, you can deny access by *disabling* a user. See “Changing Another User’s Settings” on page 78.

To delete a user:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the **Delete** tab in Management View.
6. Check the box to the left of the user you want to delete.
7. Click the **Submit** button.
8. Click **OK** in the confirmation box.

Viewing User Sessions

To view the current sessions:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the User Management icon.
4. Click the **Sessions** tab in Management View.

Logging out Other Users

To log out other users:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem  icon in Tree View.
3. Click the Administrative Tools  icon.
4. Click the User Management  icon.
5. Click the **Sessions** tab in Management View.
6. Check the box to the left of the user you want to log out.
7. Click the **Logout** button.
8. Click **OK** in the confirmation box.

Managing the Network Connection

The network connection deals with network connections to the VTrak's Management Ports. Functions include:

- Making Virtual Management Port Settings (page 82)
- Making Controller Management Port Settings (page 82)

Making Virtual Management Port Settings

The VTrak subsystem has a virtual management port. When you log into the VTrak over your network, you use the virtual management port, enabling you to log into a VTrak with two controllers using one IP address.

Before you change settings, please see "Choosing DHCP or a Static IP Address" on page 40.

To make changes to the Virtual Management Port settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Network Management icon.
4. Click the **Port Configuration** link on the Management Port tab.
5. To enable DHCP, check the DHCP box.

   When DHCP is NOT enabled, enter:

   - Primary IP address
   - Primary subnet mask
   - Default gateway IP address
   - Enter a primary DNS server IP address
6. Click the **Submit** button.

Making Controller Management Port Settings

The controller has an IP addresses for access when the controller goes into *maintenance mode*. Maintenance mode is only for remedial action in the event of a problem with the controller. See "Controller Enters Maintenance Mode" on page 348 for more information.

To make changes to the Controller Management Port settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Network Management icon.
4. Click the **Maintenance Mode** tab in Management View.

5. Click the **Port Configuration** link for Controller 1 or 2
6. To enable DHCP, check the DHCP box.

   When DHCP is NOT enabled, enter:

   - Primary IP address
   - Primary subnet mask
   - Default gateway IP address
   - Enter a primary DNS server IP address.
7. Click the **Submit** button.
8. Click the **Maintenance Mode** tab again.
9. Click the **Port Configuration** link for the other controller and repeat the steps 6 and 7 for the other controller.

Managing Fibre Channel Connections

This feature pertains to VTrak Fibre Channel models. Functions include:

- Viewing Fibre Channel Node Information (page 84)
- Viewing Fibre Channel Port Settings (page 84)
- Making Fibre Channel Port Settings (page 85)
- Viewing Fibre Channel Port Statistics (page 86)
- Viewing SFP Information (page 87)
- Viewing Fibre Channel Logged-in Devices (page 88)
- Viewing Fibre Channel Initiators (page 88)

Viewing Fibre Channel Node Information

To view Fibre Channel node information:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the **Node** tab in Management View.

   The current node (data port) settings the Controller are shown, including:

   - **WWNN** – World Wide Node Name
   - **Supported Features** – Class of service
   - **Maximum Frame Size** – 2048 bits
   - **Supported Speeds** – 4 Gb/s, 2Gb/s, or 1 Gb/s

Viewing Fibre Channel Port Settings

To view the current Fibre Channel port settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the **Port** tab in Management View

   The current data port settings the Controller are shown, including:

   - **State** – Online, Offline, Unknown
   - **Port Identifier** – A hexadecimal name for this port
   - **Topology Attached** – See the table on page 86
   - **WWNN** – World Wide Node Name
   - **WWPN** – World Wide Port Name

- **Fabric WWNN** – World Wide Node Name (appears when connected to a switch)
- **Fabric WWPN** – World Wide Port Name (appears when connected to a switch)
- **Current Speed** – 4 Gb/s, 2 Gb/s, or 1 Gb/s
- **Link Type** – Long-wave laser, short-wave laser or electrical
- **Link Speed*** – 4 Gb/s, 2 Gb/s, 1 Gb/s, or Auto
- **Topology*** – NL-Port, N-Port, or Auto
- **Hard ALPA*** – Address can be 0 to 254. 255 means this feature is disabled
- **Alias WWPN**

* Denotes items that you can change under Port Settings, below.

Making Fibre Channel Port Settings

To make Fibre Channel port settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the **Port** tab in Management View
5. Click the **Port1** or **Port2** link in Management View.
6. Make the settings appropriate to your system. See “Port Setting Information” on page 85.
   - **Configured Link Speed** – 4 Gb/s, 2 Gb/s, 1 Gb/s or Auto (self-setting)
   - **Configured Topology** – N-Port (Point-to-Point), NL Port (Arbitrated Loop) or Auto (self-setting)
   - **Hard ALPA** – Address can be 0 to 254. 255 means this feature is disabled. An ALPA identifies a port in an arbitrated loop.
7. Click the **Submit** button to save your settings.

Port Setting Information

The table below shows the type of attached topology you will 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 a Fibre Channel switch and choose NL-Port topology, you will 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 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 Fibre Channel Port Statistics

To view statistics for the Fibre Channel ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the **Statistic** tab in Management View.

   The statistics for all Fibre Channel ports are shown.

Property Definitions

Definitions of the properties for which statistical information is reported appears in the list below.

- **Time Since Last Reset** – Time in minutes since the system has been running.
- **Number of Frames Sent** – Number of frames sent since last reset.
- **Number of Frames Received** – Number of frames received since last reset.
- **Number of Words Sent** – Number of words sent since last reset.
- **Number of Words Received** – Number of words received since last reset.
- **LIP Count** – 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.

- **NOS Count** – 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.
- **Number of Error Frames** – 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.
- **Number of Dumped Frames** – This field specifies the number of frames dumped due to a lack of host buffers.
- **Link Failure Count** – Number of times the link has failed. Can be caused by a disconnected link or a bad fiber element.
- **Loss Sync Count** – Number of times a loss of sync has occurred since last reset.
- **Primitive Sequence Error Count** – 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.
- **Invalid Word Sent Count** – Number of invalid words sent since last reset.
- **Invalid CRC Count** – Invalid Cyclical Redundancy Count. Number of frames received with an invalid CRC since last reset.
- **Initiator IO Count** – I/O Count on the initiator on the host side.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 115.

Viewing SFP Information

SFPs (small form-factor pluggable) transceivers connect the ports the VTrak controllers to the Fibre Channel fabric.

To view SFP information:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the **SFP** tab in Management View.

The SFP information includes:

- **Connector** – Type of connector
- **Transceiver** – SFP
- **Transceiver Code** – Defines the method to interpret the transceiver type and compatibility options
- **Serial Encoding** – Serial encoding algorithm
- **Bit Rate** – In gigabits per second
- **Link Length** – The maximum link length depending the type of fiber
- **Vendor Name** – Vendor name of the SFP transceiver
- **Vendor OUI** – Organizational Unique Identifier, SFP vendor's IEEE company ID
- **Manufacturing Date** – Code with 2 digits each for year, month, day, and optional vendor-specific lot number

Viewing Fibre Channel Logged-in Devices

To view a list of the devices currently logged into the VTrak:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the **Logged In Device** tab in Management View.

   One of the devices in the list will be the port itself. If there is no other device, this notification will appear: "There is no logged in device." If a Fibre Channel switch is attached, it will also appear in this list.

Viewing Fibre Channel Initiators

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN for your logical drive.

To view a list of recognized initiators:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the **Initiators on Fabric** tab in Management View.

   A Fibre Channel switch will also display as an initiator in the list. If your Host PC's Fibre Channel HBA is connected to the VTrak directly (not though a Fibre Channel switch), the initiator will NOT display in the initiator list.

Adding an Initiator

To add an initiator to the VTrak's initiator list:

1. Check the box to the left of the initiator.
2. Click the **Add to Initiator List** button.

The initiator appears under Storage Services. See page 93. You can then use the initiator to create a LUN. See "Adding a LUN Map" on page 94.

Managing SAS Connections

This feature pertains to VTrak Serial Attached SCSI models. Functions include:

- Viewing SAS Port Information (page 90)
- Making SAS Port Settings (page 90)
- Viewing SAS Port Statistics (page 91)
- Viewing SAS Initiators (page 91)

Viewing SAS Port Information

A SAS Controller can have one or two SAS channels. Each SAS channel has two ports:

- Host In or Data Port (with a diamond icon)
- Host In/Out or Data Cascade Port (with a circle icon)

See pages 19 through 33 for information about how these ports are physically connected to the Host PC or other subsystems.

To view information about the SAS ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.

   The port information appears the screen.
   - Channel ID
   - Port Type
   - Link Status
   - Link Speed
   - SAS Address
   - Cable Signal Strength (adjustable under Port Settings)

See pages 19 through 33 for information about how these ports are physically connected to the Host PC or other subsystems.

Making SAS Port Settings

A SAS Controller can have one or two SAS channels. Each SAS channel has two ports:

- Host In or Data Port (with a diamond icon)
- Host In/Out or Data Cascade Port (with a circle icon)

To make settings to the SAS ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.
4. In Management View, click the **Port 1** or **Port 2** link.
5. From the Cable Signal Strength dropdown menu, choose a value.

   The range is 1 to 8. 1 is the default. Signal strength correlates to cable length in meters. Example: If you have a 2 m SAS cable, set signal strength to 2. If performance is unsatisfactory (see “Viewing SAS Port Statistics” on page 91), try settings of 1 and 3, then use the best setting for your system.
6. Click the **Submit** button.

Viewing SAS Port Statistics

The SAS Management Statistics tab displays statistical information about all of the SAS ports on the VTrak subsystem.

To view information about the SAS ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.
4. In Management View, click the **Statistic** tab.

   The statistics for the selected port appear the screen.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 115.

Viewing SAS Initiators

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN for your logical drive.

To view a list of recognized initiators:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.
4. In Management View, click the **Initiators** tab.

   A list of all currently logged-in initiators appears the screen.

Adding an Initiator

To add an initiator to the VTrak's initiator list:

1. Check the box to the left of the initiator.
2. Click the **Add to Initiator List** button.

The initiator appears under Storage Services. See page 93. You can then use the initiator to create a LUN. See "Adding a LUN Map" on page 94.

Managing Storage Services

Storage services deal with initiators and LUN mapping for Fibre Channel models and for Serial Attached SCSI models. LUN masking is the process of applying a LUN Map so that each initiator can only access the LUNs specified for it.

Features include:

Adding an Initiator

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN map.

To add an initiator:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **Initiators** tab in Management View.
5. From the Initiators tab dropdown menu, choose *Add Initiator*.
6. Enter the initiator's name in the Initiator Name field.
   - **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.
   - **SAS** – A SAS initiator name is the SAS address of the HBA card in the Host PC. Obtain the initiator name from the initiator utility on your host system.

   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.
7. Click the **Submit** button.

You can also add initiators from the Fibre Channel or SAS Initiators tab. See “Viewing Fibre Channel Initiators” on page 88 and “Viewing SAS Initiators” on page 91.

Deleting an Initiator

To delete an initiator:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **Initiators** tab in Management View.
5. From the Initiators tab dropdown menu, choose *Delete Initiators*.
6. Check the box to the left of the initiator you want to delete.
7. Click the **Submit** button.

Viewing the LUN Map

To view the current LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **LUN Map** tab in Management View.

Enabling LUN Masking

LUN masking must be enabled in order to assign LUNs to logical drives.

To enable the LUN Masking:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **LUN Map** tab in Management View.
5. Click the **Enable LUN Masking** box.
6. Click the **Submit** button.

Adding a LUN Map

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN map. LUN masking must be enabled in order to assign LUNs to logical drives.

To edit the LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **LUN Map** tab in Management View and from the dropdown menu, choose *Add LUN Map*.
5. Choose an initiator from the Initiator dropdown list.

   Or enter the initiator's name in the Initiator Name field.

   Note that the initiator name you input must match exactly in order for the connection to work.
6. In the LUN Mapping & Masking list, enter a LUN for each logical drive.

   You must enter different LUN numbers for each logical drive.
7. Click the **Submit** button.

Editing a LUN Map

To edit the LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **LUN Map** tab in Management View.
5. From the LUN Mapping & Masking Information list, choose an initiator and click its link.

   Or enter the initiator's name in the Initiator Name field.

   Note that the initiator name you input must match exactly in order for the connection to work.
6. In the LUN field, enter a LUN for each logical drive.

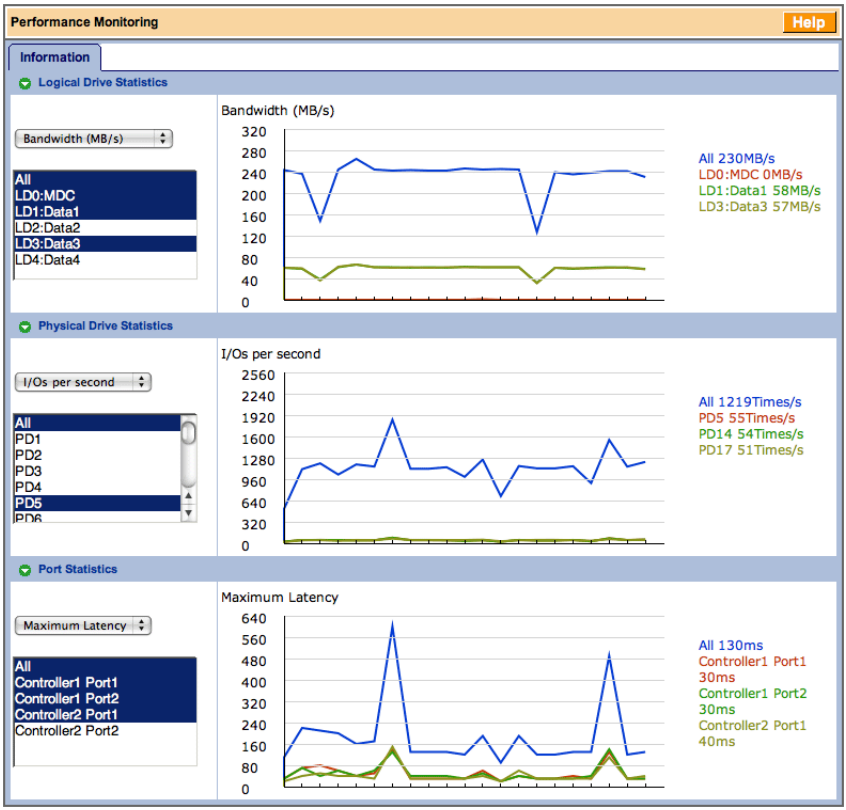
   You must enter different LUN numbers for each logical drive.
7. Click the **Submit** button.

Monitoring Performance

The Performance Monitoring displays real-time performance statistics for logical drives, physical drives, and 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.

Figure 6. Performance monitor



To view Performance Monitoring:

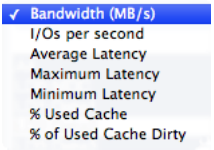
1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.

3. Click the Performance Monitoring icon.

   Under the Information tab, you can see:

   - Logical Drive Statistics
   - Physical Drive Statistics
   - Data Port Statistics

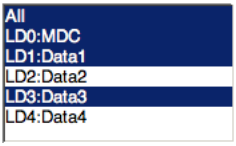
4. From the dropdown menus, choose the measurement you want to see:

   - Bandwidth in MB/s
   - I/Os per second
   - Average Latency
   - Maximum Latency
   - Minimum Latency
   - % Used Cache – Percentage of the controller cache used (logical drives only)
   - % of Used Cache Dirty – Percentage of controller cache used by data that is not saved to disk (logical drives only)

5. In the device lists, click the devices you want to see in the chart.

   You can choose up to 4 devices.
   Click a device to choose it.
   Click the device again to release it.

   For historical reports on the components listed above, see:

   - “Viewing Logical Drive Statistics” on page 155
   - “Viewing Physical Drive Statistics” on page 133
   - “Viewing Fibre Channel Port Statistics” on page 86
   - “Viewing SAS Port Statistics” on page 91

   See also “Chapter 8: Troubleshooting” on page 307.

Managing Software Services

Software Services include the following functions:

Making Event Notification Settings

Event notification requires subsystem service settings (below) and one or more user event subscriptions. See “Setting-up Event Notification” on page 77.

To make Email service settings for event notification:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Email Setting** link on the Service tab.
4. Enter information or change settings as required.
   - Enter the IP address or server name for your SMTP server.
   - Enter a new server port number for your SMTP server. 25 is the default.
   - Choose Yes to enable SMTP authentication or No to disable.

     If you chose Yes for SMTP authentication, enter a Username and Password into the fields provided.
   - Enter an Email sender address (example: RAIDmaster@mycompany.com).
   - Enter an Email subject (example: Event notification).
5. Click the **Submit** button.

Sending a Test Message

To send one test message to the User currently logged into WebPAM PROe:

1. Under Test Email, check the **Send A Test Email** box.
2. Click the **Submit** button.

If you do not receive the Test Email message, see your Network Administrator for assistance with the mail server setup, email accounts, and other issues.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping Email service

To stop the Email service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Email service

To start or restart the Email service, click the **Start** or **Restart** button.

Making SLP Settings

VTrak's SLP service discovers services available over the Internet. To make SLP service settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **SLP** link on the Service tab.
5. Choose the Startup Type.
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
6. Click the **Submit** button.

Stopping SLP service

To stop the SLP service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting SLP service

To start or restart the SLP service, click the **Start** or **Restart** button.

Making Web Server Settings

VTrak's Web Server service connects the VTrak GUI to the VTrak subsystem though your browser.

To make Web Server settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Webserver** link on the Service tab.
4. Enter information or change settings as required.
   - Enter a new HTTP Port number. 80 is the default.
   - Enter a new Session Time Out interval.

     This setting causes WebPAM PROe to time-out after a period of inactivity. 24 minutes is the default. The range is 1 to 1440 minutes (one day).
   - If you want to use a secure connection, check the Enable SSL box.

     If you checked the Enable SSL box, accept the default or enter a new HTTPS Port number. 443 is the default.
   - If you want to download a SSL Certificate, check the Download Certificate box.

     If you checked the Download Certificate box, enter the Certificate filename or click the **Browse...** button to locate it.
5. Click the **Submit** button.
6. Click **OK** in the confirmation box to restart the Web Server service with your changes.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping Web Server service

To stop the Web Server service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Web Server service

To start or restart the Web Server service, click the **Start** or **Restart** button.

Making Telnet Settings

VTrak's Telnet service enables you to access VTrak's Command Line Interface (CLI) through a network connection. To make Telnet settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Telnet** link on the Service tab.
4. Enter information or change settings as required.
   - Enter the Telnet Port number. 2300 is the default.
   - Enter the Maximum Number of Connections. 4 is the default.
   - Enter the Session Time Out interval. 24 minutes is the default.
5. Click the **Submit** button.
6. Click **OK** in the confirmation box to restart the Telnet service with your changes.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping Telnet service

To stop the Telnet service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Telnet service

To start or restart the Telnet service, click the **Start** or **Restart** button.

Making SSH Settings

VTrak's Secure Shell (SSH) service enables you to access VTrak's Command Line Interface (CLI) through a network connection. To make SSH settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **SSH** link on the Service tab.
4. Enter information or change settings as required.
   - Enter the SSH Port number. 22 is the default.
   - Enter the Maximum Number of Connections. 4 is the default.
   - Enter the Session Time Out interval. 24 minutes is the default.
5. Click the **Submit** button.
6. Click **OK** in the confirmation box to restart the SSH service with your changes.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping SSH service

To stop the SSH service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting SSH service

To start or restart the SSH service, click the **Start** or **Restart** button.

Making SNMP Settings

VTrak's SNMP service enables the SNMP browser to obtain information from the VTrak. The Trap Sink is where SNMP events are sent and can be viewed.

To change the SNMP settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **SNMP** link on the Service tab.

4. Enter information or change settings as required.
   - Enter the SNMP Port number. 161 is the default.
   - Enter a System Name. There is no default name.
   - Enter a System Location. USA is the default.
   - Enter a System Contact. The email address of the administrator or other individual.
   - Enter the Read Community. Public is the default.

   The Write Community is set to Private, no options.

   To add a Trap Sink, see “Adding Trap Sinks” below.
5. Click the **Submit** button.
6. Click **OK** in the confirmation box to restart the SNMP service with your changes.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping SNMP service

To stop the SNMP service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting SNMP service

To start or restart the SNMP service, click the **Start** or **Restart** button.

Managing SNMP Trap Sinks

Adding Trap Sinks

To add a SNMP trap sink:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **SNMP** link on the Service tab.
4. Enter a Trap Sink IP address.
5. Choose a Trap Filter.

The severity level you choose and all higher levels will pass the trap filter. See Table 5.

6. Click the **Update** button.

   The new trap sink appears in the Trap Sinks list.

7. Click the **Submit** button to add the new trap sink.
8. Click **OK** in the confirmation box.

Table 5 Event severity levels

Level	Meaning
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 Trap Sinks

To delete a SNMP trap sink:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **SNMP** link on the Service tab.
4. Highlight the trap sink you want to delete from the list.
5. Click the **Delete** button and then the **Submit** button.
6. Click **OK** in the confirmation box.

Making CIM Settings

VTrak's CIM (Common Information Model [a protocol]) service provides a database for information about computer systems and network devices.

To change the CIM settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **CIM Setting** link in Management View.
4. Enter information or change settings as required.

- To use a HTTP connection, beside CIM HTTP Enabled choose the Yes option and enter a port number in the field provided (5988 is the default)
- To use a HTTPS connection, beside CIM HTTPS Enabled choose the Yes option and enter a port number in the field provided (5989 is the default)
- To use CIM authentication, beside CIM authentication choose the Yes option
- To change your password, beside Change Password, choose the Yes option.

  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. Click the **Submit** button.
6. Click **OK** in the confirmation box.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping CIM service

To stop the CIM service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting CIM service

To start or restart the CIM service, click the **Start** or **Restart** button.

Making Netsend Settings

This service is normally Stopped and set to Manual start. See “Managing Netsend Recipients” on page 106.

To change the Netsend settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Netsend** link on the Service tab.
4. Click the **Start** button to start the Netsend service.

5. Click the **Submit** button.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended if you plan to use this feature.
   - Click the **Manual** option to start the service manually (the service does not start during system startup). The default setting.
2. Click the **Submit** button.

Stopping Netsend service

To stop the Netsend service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Netsend service

To start or restart the Netsend service, click the **Start** or **Restart** button.

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 105.

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. In the Recipient Address field, type the IP address of the recipient PC.
2. Choose a Recipient filter.

   The severity level you choose and all higher levels will pass the recipient filter. See Table 6.
3. Click the **Update** button to add the new recipient to the list.
4. Click the **Submit** button.

5. Click **OK** in the confirmation box.

Table 6 Event severity levels

Level	Meaning
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. Highlight the recipient you want to delete in the recipient list.
2. Click the **Delete** button to remove the recipient from the list.
3. Click the **Submit** button.
4. Click **OK** in the confirmation box.

Exporting the User Database

You can export the User Database file to share user information and settings among multiple VTrak subsystems.

The Export action saves a text file to a designated folder on the Host PC. From there, you can import the User Database file to other VTrak subsystems. See “Importing a User Database” on page 110.

To export the User Database file:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Export** link in Management View.
4. Click the **Export** button.
5. In the Opening export dialog box, click the **Save to Disk** option.
6. Click the **OK** button.

   The user database file is saved to the Host PC from which you access WebPAM PROe. The file name is **export**.

Exporting a Configuration Script

Caution

Do NOT attempt to write or modify a Configuration Script until you receive guidance from Promise Technical Support. See page 359.

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. See “Importing a Configuration Script” on page 111.

The Export action saves a text file to a designated folder on the Host PC. From there, you can import the Configuration Script to other VTrak subsystems.

To export the Configuration Script file:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Export** link in Management View.
4. Click the **Export** button.
5. In the Opening export dialog box, click the **Save to Disk** option.
6. Click the **OK** button.

   The Configuration Script is saved to the Host PC from which you access WebPAM PROe. The file name is **configscript**.

Importing a User Database

Cautions

- Importing a user database will overwrite the current settings on your VTrak subsystem.
- Do NOT use this function to update the VTrak firmware.

A User Database enables all VTraks so that all have the same User information and settings.

The Software Management–Import tab enables you to import the User Database file from the Host PC.

To import the User Database file to this subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Import** tab.
5. Under the Type dropdown list, choose *User Database*.
6. Enter the name of the file to be imported.

   Or, click the **Browse...** button to search for the file.

   Look for a file called *export*.
7. Click the **Submit** button.
8. Click the **Next** button.

   If the imported file is a valid user database, a warning will appear to inform you that it will overwrite the previous settings.
9. In the Warning box, click the **OK** button.

   This user settings are applied to this VTrak subsystem.

Importing a Configuration Script

Caution

- Importing a configuration script will overwrite the current settings on your VTrak subsystem.
- Do NOT use this function to update the VTrak firmware.
- Do NOT attempt to write or modify a Configuration Script until you receive guidance from Promise Technical Support. See page 359.

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.

The Software Management–Import tab enables you to import a Configuration Script to the VTrak subsystem. The Import function runs the script and performs the configuration automatically.

To import a Configuration Script to this subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Import** tab.
5. Under the Type dropdown list, choose *Configuration Script*.
6. Enter the name of the file to be imported.

   Or, click the **Browse...** button to search for the file.
7. Click the **Submit** button.
8. Click the **Next** button.

   If the imported file is a valid configuration script, a warning will appear to inform you that it will overwrite the previous settings.
9. In the Warning box, click the **OK** button.

   The new configuration is applied to this VTrak subsystem.

Updating the Firmware

This procedure is covered in Chapter 6: Maintenance. See “Updating the Firmware in WebPAM PROe” on page 249 for instructions.

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. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Image Version** tab.

   The flash image information displays on the screen.

   - Enclosure Number – 1 (one) is the Head Unit. Other numbers are cascaded or expanded subsystems
   - Image Condition – Running is the firmware currently running on the controllers. Flashed is the 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 119.

   Note that all of these components are upgraded together in a package. See “Updating the Firmware in WebPAM PROe” on page 249.

Restoring Factory Defaults

VTrak includes a function to restore the default settings to its Firmware and Software settings.

Caution

Restoring default settings can disrupt your VTrak functions. Use this feature only when necessary.

If you restore Management Network settings, you will lose your network connection to the VTrak.

To access the Restore Defaults feature:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.

   The Administrative Tools list appears.
3. Click the **Restore Factory Defaults** link at the bottom of the list in Management View.

   The Restore Factory Defaults screen appears.
4. Check the Firmware and Software functions you want to restore to default settings.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.

The functions you selected will be automatically restored to their default settings.

Clearing Statistics

The Clear Statistics function clears statistical data on controllers, Fibre Channel ports, SAS ports, physical drives, and logical drives.

To clear statistical data:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Clear Statistics** link.

   The Clear Statistics tab appears in Management View.
4. Click the **Submit** button.
5. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.

Saving a System Service Report

To save a System Service Report as a compressed HTML file:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Save System Service Report** link.
4. On the Information tab, click the **Save** button.
5. In the dialog box, click the **Save File** option, then click the **OK** button.

   The service report is saved to the Host PC from which you access WebPAM PROe. The file name includes **subsysteminfo**, the date, and **html**.

Shutting Down the Subsystem

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. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Shutdown** link in Management View.
4. On the Shutdown or Restart tab, choose *Shutdown* from the Option menu.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.

   When the controller shuts down, your WebPAM PROe connection is lost.
7. Wait no less than two minutes.
8. Manually turn off the power supply switches on the back of the subsystem.

Monitoring the Shutdown

To monitor a shutdown, you must use the Command Line Interface (CLI) though a serial connection to the VTrak.

Turn off both power supply switches when the following this message appears:

```
Shutdown complete. It is now safe to power off the subsystem.
```

Starting Up After Shutdown

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. Open your browser and log into WebPAM PROe.

   See “Logging into WebPAM PROe” on page 54.

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

Monitoring the Startup

To monitor a startup, you must use the Command Line Interface (CLI) though a serial connection to the VTrak.

When the **Login:** prompt appears, the start up is finished.

Restarting the Subsystem

Note

If you have a JBOD Expansion, you are not required to restart the JBOD subsystems when you restart the RAID subsystem.

To restart the RAID subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Shutdown** link in Management View.
4. On the Shutdown or Restart tab, choose *Restart* from the Option menu.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.

   When the controller shuts down, your WebPAM PROe connection is lost.
7. Wait about two minutes.
8. In your browser, click **Logout** in the Header, then log into WebPAM PROe once again.

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

Monitoring the Restart

To monitor a restart, you must use the Command Line Interface (CLI) though a serial connection to the VTrak.

When the **Login:** prompt appears, the restart is finished.

Managing Controllers

The RAID controllers are the heart of the VTrak subsystem. VTrak E-Class models have one or two controllers. Management of Controllers includes the following functions:

- Viewing the Controllers (page 120)
- Locating a Controller (page 120)
- Viewing Controller Information (page 121)
- Viewing Controller Statistics (page 122)
- Making Controller Settings (page 122)
- Clearing an Orphan Watermark (page 124)

Viewing the Controllers

To view information about the controllers:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.

   The controller information appears under the Information tab in Management View. Controller information includes:

   - **Controller ID** – 1 or 2
   - **Alias** – if assigned
   - **Model** – if applicable
   - **Status** – OK means normal. Also shows BGA running. Not present indicates a malfunction or no controller is installed
   - **Readiness Status** – Active or Standby is normal. N/A means not accessible
   - **Locate** – Click the button to locate the controller. See below

VTrak subsystems with only one controller will always show that the second controller is “Not present.”

If your VTrak subsystem has two controllers and one is “Not present,” see “Controller Enters Maintenance Mode” on page 348 for more information.

Locating a Controller

To identify a specific controller in the VTrak subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. In Management View, click the **Locate Controller** button.

4. The Controller Dirty Cache ⚠ LED and Status ☑ LED, on the back of the Controller, will flash for one minute. See the illustrations below.

Figure 7. The VTrak E610f and E310f controller LEDs

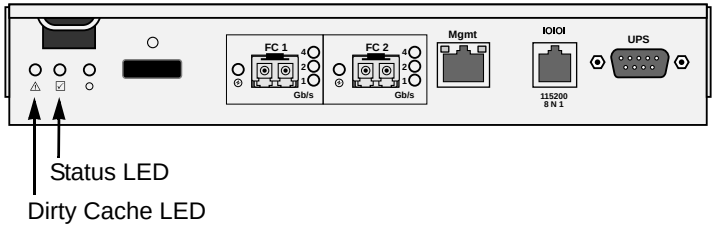
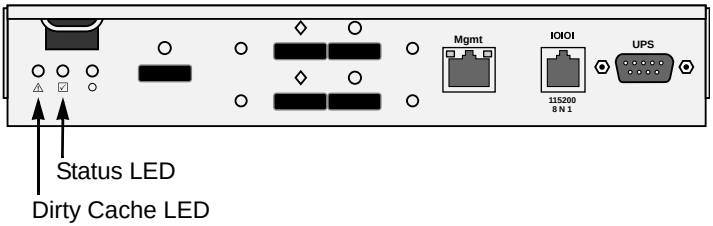


Figure 8. The VTrak E610s and E310s controller LEDs



Viewing Controller Information

To view Controller information:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.

   The controller information appears the Information tab in Management View.

Adjustable items

You can set or adjust the following items:

- Alias, if assigned
- LUN Affinity
- SMART (Self-Monitoring, Analysis, and Reporting System for physical drives)
- SMART Polling Interval
- Coercion, enable or disable
- Coercion Method
- Power Saving Idle Time

- Power Saving Standby Time
- Power Saving Stopped Time
- Write Back Cache Flush Interval
- Enclosure Polling Interval
- Adaptive Writeback Cache
- Host Cache Flushing
- Forced Read Ahead Cache

See “Making Controller Settings” on page 122.

Upgradable items

You can upgrade the following items:

- Boot loader Version
- Firmware Version number
- Software Version number
- Memory Size

See “Chapter 6: Maintenance” on page 249.

Viewing Controller Statistics

To view controller statistics:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.
4. Click the **Information** tab in Management View and choose *Statistics* from dropdown menu.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 115.

Making Controller Settings

If your subsystem has two controllers, any settings you make to one controller will automatically apply to the other controller.

To make Controller settings:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.
4. Click the **Settings** tab in Management View.

5. Make the following settings as needed:
   - Optional. Enter a name into the Alias field.

     Maximum of 48 characters. Use letters, numbers, space between words, and underscore.
   - Check the Enable LUN affinity box to enable the LUN affinity feature.

     If your subsystem has two controllers and Cache Mirroring is disabled, LUN Affinity is enabled automatically.
   - Check the SMART Log box to enable the Self-Monitoring, Analysis, and Reporting System (SMART).
   - Enter a polling interval in SMART Polling Interval field.

     The range is 1 to 1440 minutes. 1440 minutes equals one day.
   - Choose a Power Saving Idle Time from the dropdown menu.

     The physical drives go into Idle mode after the specified period of inactivity. *Never* disables this feature.
   - Choose a Power Saving Standby Time from the dropdown menu.

     The physical drives go into Standby mode after the specified period of inactivity. *Never* disables this feature.
   - Choose a Power Saving Stopped Time from the dropdown menu.

     The physical drives spin down after the specified period of inactivity. *Never* disables this feature.
   - Check the Coercion Enabled box to enable disk drive capacity coercion.

     When disk drives of different capacities are used in the same array, coercion reduces the usable capacity of the larger disk drive(s) in order to match the smallest capacity drive.

     For more information, see “Capacity Coercion” on page 293.
   - Select a coercion method from the Coercion Method dropdown menu. 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.
   - Enter a time interval in the Write Back Cache Flush Interval field.

     The range is 1 to 12 seconds. For more information, see “Cache Policy” on page 288.

- Enter a time interval in the Enclosure Polling Interval field.

  The range is 15 to 255 seconds.
- Check the Adaptive Writeback Cache box to enable the Adaptive Writeback Cache feature.

  For more information, see “Adaptive Writeback Cache” on page 289.
- Check the Host Cache Flushing box to enable the Host Cache Flushing feature.

  For more information, see “Host Cache Flushing” on page 290.
- Check the Forced Read Ahead Cache box to enable the Forced Read Ahead Cache feature.

  For more information, see “Forced Read Ahead Cache” on page 290.

6. Click the **Submit** button.

   The changes take effect immediately.

Clearing an Orphan Watermark

An Orphan Watermark 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. Click the Subsystem  icon in Tree View.
2. Click the Controllers  icon.
3. Click the Controller  icon.
4. Click the **Clear** tab in Management View.
5. Click the **Submit** button.

The changes take effect immediately. If your subsystem has two controllers, clearing a condition on one controller will automatically apply to the other controller.

Managing Enclosures

On VTrak E-Class, enclosures include the main VTrak subsystem or *Head Unit* as well as additional enclosures that are connected to it through cascading or expansion. Enclosure Management includes the following functions:

Viewing the Enclosures Summary

To view information about the enclosures:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.

   The following information is shown:

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

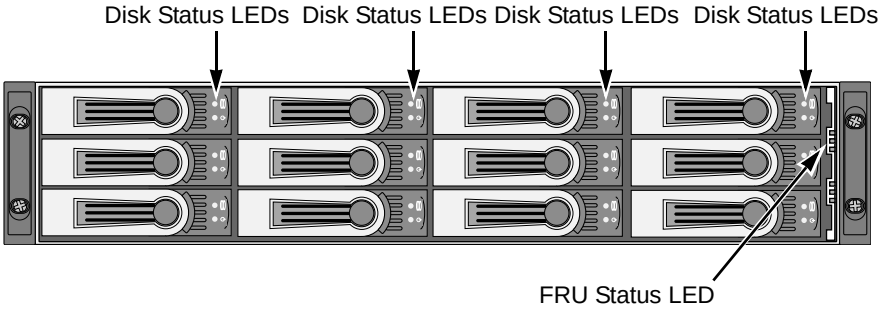
Locating an Enclosure

To locate an enclosure (subsystem):

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the **Locate Enclosure** button for the enclosure you want.

   The FRU Status and Disk Status LEDs on the front of the enclosure flash for one minute. See page 126, Figure 9.

Figure 9. VTrak E310f/s front view



Viewing Enclosure Topology

To view Enclosure Topology:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the **Topology** tab in Management View.

Enclosure topology refers to the manner in which the data paths among the enclosures are connected:

- **Individual Subsystem** – One VTrak E-Class subsystem
- **JBOD Expansion** – One VTrak E-Class subsystem plus one or more JBOD expansion subsystems, managed through one subsystem or head unit
- **RAID Subsystem Cascading** – Multiple VTrak E-Class subsystems, managed through one subsystem or head unit

The logical connections for these arrangements are shown the Enclosure Topology tab. The physical connections for these arrangements are discussed in “Chapter 2: VTrak Installation” on page 11.

Viewing Enclosure Information

To view enclosure information:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.

   Enclosure information appears the Information tab in Management View. 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” on page 127.

For information on Enclosure problems, see “Chapter 8: Troubleshooting” on page 307.

Making Enclosure Settings

To make Enclosure settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the **Settings** tab in Management View.
5. Enter a value in the following fields as necessary:
   - Enclosure Warning Temperature Threshold
   - Enclosure Critical Temperature Threshold
   - Controller Warning Temperature Threshold
   - Controller Critical Temperature Threshold
6. Click the **Submit** button.

   The changes take effect immediately.

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. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the **FRU VPD** tab in Management View.

Use this information when communicating with Technical Support and when ordering replacement units. For contact information, see “Contacting Technical Support” on page 359.

Checking the Batteries

The Enclosure–Battery tab displays information about the cache backup battery (or batteries) in the VTrak subsystem enclosure. To check the batteries:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the **Battery** tab in Management View.

Battery Notes

Each battery works with a controller. If the battery is present in the subsystem but the corresponding controller is not present, the battery will not appear in the interface.

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 128.

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 122.

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 Battery” on page 265.

VTrak automatically reconditions the battery every two months. To set the schedule, see “Scheduling an Activity” on page 72.

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 battery:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. From the **Battery** tab dropdown menu, choose *Recondition*.

5. Click the **Submit** button.

   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 122.

   VTrak automatically reconditions the battery every two months. To set the recondition schedule, see “Scheduling an Activity” on page 72.

Silencing the Buzzer

The buzzer sounds to inform you that the VTrak needs attention. See “VTrak is Beeping” on page 307 for more information.

Express Method

To silence the buzzer for the current trigger event:

1. Click the Buzzer  icon in the Header.

   The Buzzer tab appears in Management View.

2. Click the **Mute** button.

   The buzzer goes silent and the icon disappears. If another trigger event occurs, the buzzer will sound again. To silence the buzzer for all trigger events, disable it under “Making Buzzer Settings.”

Regular Method

To silence the buzzer for the current trigger event:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the **Buzzer** tab in Management View.
5. Click the **Mute** button.

   The buzzer goes silent. If another trigger event occurs, the buzzer will sound again. To silence the buzzer for all trigger events, disable it under “Making Buzzer Settings.”

Making Buzzer Settings

To make buzzer settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.

4. From the **Buzzer** tab dropdown menu, choose *Settings*.
5. Check the **Buzzer Enable** box to enable the buzzer.
   Uncheck the box to disable the buzzer.
6. Click the **Submit** button.

Testing the Buzzer

You must enable the buzzer before you can test it.

To test buzzer function:

1. Click the Subsystem  icon in Tree View.
2. Click the Enclosures  icon.
3. Click the Enclosure  icon.
4. Click the **Buzzer** tab in Management View.
5. Click the **Sound** button.
   The buzzer will sound for one minute.

Managing Physical Drives

Managing Physical Drives deals with the physical disk drives installed in the VTrak subsystem enclosure, including the following functions:

Viewing a List of Physical Drives

To view a list of physical drives in this enclosure:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.

   The list of physical drives appears in Management View.

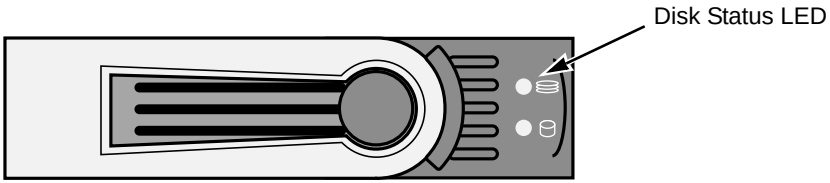
Identifying a Physical Drive

To identify physical drive in the VTrak subsystem enclosure:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. In Management View:
   - Click the physical drive in the Enclosure Front View Diagram.

     The physical drive's drive carrier Disk Status LED flashes for one minute. See page 132, Figure 10.
   - Click the **PD link** under Device to highlight the drive's location in the Enclosure Front View Diagram.

Figure 10. VTrak drive carrier LEDs



Making Global Physical Drive Settings

Global settings apply to all of the physical disk drives installed in the VTrak subsystem enclosure. To make global physical drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click the **Global Settings** tab in Management View.
6. Make the settings as needed.

   For SATA drives, check the boxes to enable:

   - Write Cache
   - Read Look Ahead Cache
   - Command Queuing (for disk drives that support Command Queuing)
   - From the DMA Mode dropdown menu, choose a DMA mode.

   For SAS drives, check the boxes to enable:

   - Write Cache
   - Read Look Ahead Cache
   - Command Queuing (for disk drives that support Command Queuing)
   - Read Cache

   For SATA and SAS drives, type a number into the:

   - Medium Error Threshold field (see the comments below)
7. Click the **Submit** button.

   See “Viewing Physical Drive Information” on page 133 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 physical drive information:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.

Useful information provided here includes:

- The location of the physical drive is highlighted in the Enclosure Front View diagram.
- **Operational Status** – OK is normal. Can also show Rebuilding, Forced Online, Forced Offline, Transition Running, PDM Running, Media Patrol Running, Stale, PFA, Offline, or Dead.
- **Configuration Status** – The array to which the drive is assigned or its spare designation. Visible to Fibre Channel subsystems with dual controllers and LUN Affinity enabled shows *Controller 1* or *Controller 2*. Other configurations and subsystem models show *All Controllers*.

Adjustable Items

- Write Cache
- Read Look Ahead Cache
- Read Cache (SAS drive only)
- Command Queuing
- DMA Mode (SATA drives only)
- Medium Error Threshold

See “Making Global Physical Drive Settings” on page 132.

Viewing Physical Drive Statistics

To view physical drive statistics:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.
6. From the dropdown menu on the Information tab, choose *Statistics*.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 115.

Viewing the Physical Drive SMART Log

To view the physical drive SMART log:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.
6. Click the **SMART Log** tab.

Note

If the SMART Log tab does not appear, the physical drive is in power saving mode. Temporarily disable Power Saving under Controller Settings. See page 122.

Saving the Physical Drive SMART Log

To save the physical drive SMART log:

1. Beside Save Advanced SMART Log, click the **Save** button.
2. Click the **OK** button.

   Your browser saves the Advanced SMART Log in a text file to the designated folder on your PC or server.

Enabling or Disabling the SMART Log

1. From the dropdown menu on the SMART Log tab, choose *Settings*.
2. Check the **Enable SMART Log** box to enable.

   Uncheck to disable.
3. Click the **Submit** button to save your settings.

Making Physical Drive Settings

An alias is the only setting you can make to an individual physical drive. All other settings are global. See “Making Global Physical Drive Settings” on page 132.

To make physical drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.

3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.
6. Click the **Settings** tab in Management View.
7. Type an alias into the Physical Drive Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
8. Click the **Submit** button.

Clearing Stale and PFA Conditions

The Clear tab only appears when those conditions are present.

- **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. See “Physical Drive Problems” on page 343 for more information.

To clear a Stale or PFA status from a physical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.
6. In Management View, click the **Clear** tab.

Note

If a physical drive has both a Stale and a PFA condition, click the **Clear** tab once to clear the Stale condition, then click again to clear the PFA condition.

Forcing a Physical Drive Offline or Online

The Physical Drive–Force Offline/Online tab enables you to force an:

- Online physical drive to go Offline
- Offline physical drive to go Online

The Force Offline/Online tab appears only for physical drives that are assigned to disk arrays.

Caution

Forcing a physical drive offline or online is likely to cause data loss. Back up your data before you proceed. Use these functions only when required.

Important

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

To force a physical drive offline or online:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.
6. Click the **Force Offline/Online** tab in Management View.
7. Click the **Submit** button.
8. In the confirmation box, type the word **confirm** in the field provided.
9. Click the **OK** button.

Managing UPS Units

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

- Viewing a List of UPS Units (below)
- Making UPS Settings (page 138)
- Viewing UPS Information (page 139)

Viewing a List of UPS Units

To view a list of UPS units supporting the VTrak:

1. Click the Subsystem icon in Tree View.
2. Click the UPS icon.
3. Click the **Information** tab in Management View.

   Information in the UPS List includes:

   - **UPS ID** – Click the ID number to view the UPS Tab.
   - **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.
   - **Model** Name or Number
   - **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 Backup Time** – 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:

- Reduce the number of subsystems or peripherals connected to this UPS unit.
- Add more UPS units or use a higher-capacity UPS unit.

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 Subsystem icon in Tree View.
2. Click the UPS icon.
3. Click the **Settings** tab in Management View.
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 setting 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:
     - **Runtime 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. Click the **Submit** button to apply 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 setting 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 Subsystem icon in Tree View.
2. Click the UPS icon.
3. Click the UPS1 or UPS2 icon.
4. Click the **UPS** tab in Management View.

   UPS information includes:

   - **Model**
   - **Serial Number**
   - **Manufacture Date**
   - **Firmware Version**
   - **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:

- Reduce the number of subsystems or peripherals connected to this UPS unit.
- Add more UPS units or use a higher-capacity UPS unit.

Managing Disk Arrays

Disk Array Management includes the following functions:

Viewing a List of Disk Arrays

To view a list of disk arrays in this enclosure plus any expanded or cascaded enclosures:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.

   A list of disk arrays appears in Management View.

   Click the **DA** link to view a specific disk array. See “Viewing Disk Array Information” on page 145.

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. Makes one logical drive automatically. Also makes a hot spare drive for all RAID levels except RAID 0, if at least four unconfigured physical drives are available. See “Creating a Disk Array – Automatic” on page 141.
- **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 will all be identical. You can choose to make a hot spare drive for all RAID levels except RAID 0, if at least four unconfigured physical drives are available. See “Creating a Disk Array – Express” on page 141.
- **Advanced** – You directly specify all parameters for a new disk array. Makes one logical drive automatically. You can create additional logical drives at a

later time, if additional configurable capacity is available. Does not make a hot spare drive. See “Creating a Disk Array – Advanced” on page 143.

Creating a Disk Array – Automatic

The Disk Array Automatic Creation option enables you to create a new disk array following a default set of parameters. The Automatic option proposes a disk array and logical drive arrangement. You can accept or reject the proposed arrangement but you cannot modify it.

To create a Disk Array using the Automatic function:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the **Create** tab in Management View.
4. From the Create tab dropdown menu, choose *Automatic*.

   The following parameters display:

   - **Disk Arrays** – The number of physical drives in the disk array, their slot numbers, configurable capacity, and the number of logical drives to be created
   - **Logical Drives** – The ID number of the logical drives, their RAID level, capacity, and stripe size
   - **Spare Drives** – The physical drive slot number of the dedicated hot spare assigned to this disk array. A hot spare drive is created for all RAID levels except RAID 0, when five or more unconfigured physical drives are available
5. If you accept these parameters, click the **Submit** button.

   The new disk array appears in the Disk Array List the Information tab.

   If you do NOT accept these parameters, use the Advanced option to create your disk array.

Creating a Disk Array – Express

The Disk Array Express Creation option enables you to choose the parameters for a new disk array by specifying the characteristics you want. With this method, you can create multiple logical drives at the same time you create your disk array. However, all of the logical drives will be the same.

If you prefer to specific the parameters directly, use the Advanced option to create your disk array.

If you are uncertain about choosing parameters for your disk array, use the Automatic option.

To create a new disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the **Create** tab in Management View.
4. From the Create tab dropdown menu, choose *Express*.
5. Check the boxes to choose any one or combination of:
   - **Redundancy** – The array will remain 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 select 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 will be created for each type of drive.
6. In the Number of Logical Drives field, enter the number of logical drives you want to make from this disk array.
7. 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
8. Click the **Update** button.

   Or check the Automatic Update box and updates will occur automatically.

   The following parameters display:
   - **Disk Arrays** – The number of physical drives in the disk array, their slot numbers, configurable capacity, and the number of logical drives to be created
   - **Logical Drives** – The slot number of the logical drive(s), their RAID level, capacity, and stripe size
   - **Spare Drives** – The physical drive slot number of the dedicated hot spare assigned to this disk array (all RAID levels except RAID 0)

   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.
9. When you are done, click the **Submit** button.

The new disk array appears in the Disk Array List the Information tab.

Creating a Disk Array – Advanced

The Disk Array Advanced Creation option enables you to directly specify all parameters for a new disk array. One logical drive will be made automatically when you create the disk array. If you choose less than the total available capacity, you can use the remaining space to create additional logical drives at a later time.

If you are uncertain about choosing parameters for your disk array, use the Express or Automatic option to create your disk array.

To create a new disk array:

1. Click the Subsystem  icon in Tree View.
2. Click the Disk Arrays  icon.
3. From the Create tab dropdown menu, choose *Advanced*.

Step 1 – Disk Array Creation

1. Optional. Enter a name for the disk array in the field provided.

   Maximum of 31 characters; letters, numbers, space between characters, and underline.
2. Uncheck the boxes if you want to disable Media Patrol, PDM, or Power Management.

   Promise recommends leaving these features enabled. See “Media Patrol” on page 301 and “Predictive Data Migration (PDM)” on page 302.
3. Highlight physical drives you want in the disk array from the Available list and press the **>>** button to move them to the Selected list.

   You can also double-click them to move them.
4. When you are done, click the **Next** button.

Step 2 – Logical Drive Creation

1. Optional. Enter an alias for the logical drive in the field provided.

   Maximum of 31 characters; letters, numbers, space between characters, and underline.
2. Choose a RAID level for the logical drive from the dropdown menu.

   The choice of RAID levels depends the number of physical drives you selected.
3. RAID 50 and 60 only. Specify the number of axles for your array.

   See “RAID 50 Axles” on page 281 or “RAID 60 Axles” on page 283.
4. Specify a Capacity and the unit of measure (B, KB, MB, GB, TB).

This value will be the data capacity of the first logical drive in your new disk array. If you specify less than disk array's maximum capacity, the remaining capacity is available for additional logical drives that you can create now or later.

5. For the following items, accept the default or choose a new value from the dropdown menu:
   - Stripe size. 64 KB is the default

     64 KB, 128 KB, 256 KB, 512 KB, and 1 MB are available.
   - Sector size. 512 B is the default.

     512 B, 1 KB, 2 KB, and 4 KB are available.
   - Read (cache) Policy. Read Ahead is the default.

     Read Cache, Read Ahead Cache, and No Cache are available.
   - Write (cache) Policy. Write Back is the default.

     Write Back and Write Through (Thru) are available.
   - Preferred Controller ID.

     The choices are Controller 1 or 2, or Automatic. This feature is only available on subsystems with two controllers with LUN Affinity enabled.
6. Click the **Update** button.

   A new logical drive is displayed under New Logical Drives. If there is free capacity remaining, you can specify another logical drive now or wait until later.
7. When you are done specifying logical drives, click the **Next** button.

Step 3 – Summary

The Summary lists the disk array and logical drive information you specified.

To proceed with disk array and logical drive creation, click the **Submit** button.

Note

This function does not automatically create a hot spare drive. After the disk array is created, you can create a hot spare drive for it. See “Creating a Spare Drive” on page 161.

Deleting a Disk Array

The Disk Arrays–Delete tab enables you to delete existing disk arrays.

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.

To delete a disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the **Delete** tab in Management View.
4. Check the box to the left of the disk array you want to delete.
5. Click the **Submit** button.
6. In the confirmation box, type the word confirm in the field provided and click the **OK** button.

The selected disk array disappears from the Disk Array List the Information tab.

Viewing Disk Array Information

To view Disk Array information:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.

   The disk array information is shown in Management View.

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 will function and your data is available. However, access will be slower due to the synchronizing operation.
- **Critical/Degraded** – This condition arises as the result of a physical drive failure. A degraded logical drive will still function 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 will function and your data is available. However, access will be 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 will show OK.

Adjustable Items

- **Alias** – Optional.
- **Media Patrol** – Enabled is the default and recommended setting
- **PDM** – Enabled is the default and recommended setting
- **Power Management** – Enabled is the default and recommended setting
- **Current Power Saving Level** – Disable, Idle, Standby, or Stop
- **User Set Power Saving Level** – Disable, Idle, Standby, or Stop

See “Making Controller Settings” on page 122 and “Making Disk Array Settings” on page 146.

Making Disk Array Settings

To make Disk Array settings:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the **Settings** tab in Management View.
5. Optional. Enter an alias in the Disk Array Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore.
6. Check the following boxes to enable, uncheck to disable:
   - Media Patrol
   - PDM
   - Power Management
7. Click the **Submit** button.

Creating a Logical Drive

When you create a disk array, you automatically create one logical drive also. If the initial logical drive used less than the full capacity of the disk array, you can create additional logical drives from the same disk array.

To create a logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the **Create LD** tab in Management View.
5. Optional. Enter an alias (name) in the Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore.
6. From the RAID Level dropdown list, choose a RAID level for this logical drive.

   All RAID levels supported by the disk array appear in the list. See “Choosing a RAID Level” on page 284.
7. RAID 50 and 60 only. Specify the number of axles for your logical drive.

   See “RAID 50 Axles” on page 281 or “RAID 60 Axles” on page 283.
8. Enter a capacity and choose unit of measure (B, KB, MB, GB, TB).

   The default value is the available capacity of the disk array. If you specify less than the maximum capacity, the remaining capacity is available for additional logical drives that you can create now or later.
9. For the following items, accept the default or choose a new value from the dropdown menu:
   - Stripe size. 64 KB is the default

     64 KB, 128 KB, 256 KB, 512 KB, and 1 MB are available.
   - Sector size. 512 B is the default.

     512 B, 1 KB, 2 KB, and 4 KB are available.
   - Read (cache) Policy. Read Ahead is the default.

     Read Cache, Read Ahead Cache, and No Cache are available.
   - Write (cache) Policy. Write Back is the default.

     Write Back and Write Through (Thru) are available.
   - Preferred Controller ID.

     The choices are Controller 1 or 2, or Automatic. This feature is only available on subsystems with two controllers with LUN Affinity enabled.
10. Click the **Update** button to enter the logical drive parameters.

11. Review the results. If there is remaining space the disk array, you can create another logical drive, following the steps above. Each logical drive can have a different set of parameters.
12. Click the **Next** button when you are done.

    A new window displays with the disk array information and the proposed logical drives with their parameters.
13. Click the **Submit** button create the logical drives.

The new logical drive appears in the Logical Drive List the Information tab.

If you created a fault-tolerant logical drive (any RAID level except RAID 0), the Operational Status of new logical drive will display *Synchronizing* for several minutes after creation. You can use the logical drive during this period but read/write performance could be slower than normal.

Deleting a Logical Drive

Caution

All data the logical drive will be lost. Back up any valuable data before deleting the logical drive.

To delete a logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon
3. Click the Disk Array icon.
4. Click the **Delete LD** tab in Management View.
5. Check the box to the left of the logical drive you want to delete.
6. Click the **Submit** button.
7. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.

   The logical drive disappears from the list on the Information tab.

Migrating a Disk Array

The action of migrating a disk array means either or both:

- Change the RAID Level
- Expand the storage capacity

For a list of Migration options and other important information, see “RAID Level Migration” on page 294.

To Migrate an existing disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. From the dropdown menu the **Background Activities** tab, choose *Start Migration*.
5. Highlight physical drives you want in the disk array from the Available list and press the >> button to move them to the Selected list.

   You can also double-click them to move them.
6. When you are done, click the **Next** button.
7. Select a new RAID Level, if desired.
8. To expand the disk array's capacity, check the Expand Capacity box.

   If you checked the Expand Capacity box, enter a number into the Capacity field and choose the appropriate unit of measure (B, KB, MB, GB, TB).
9. Under Capacity Usage, highlight the logical drive whose RAID level you want to change or whose capacity you want to expand.
10. Click the **Update** button.

    The logical drive changes to reflect your choices.

    Update other logical drives using the same method.
11. When you are done making the changes, click the **Next** button.
12. Click the **Submit** button to begin Migration.
13. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.

To set Migration priority, see “Making Background Activity Settings” on page 70.

Rebuilding a Disk Array

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

Rebuilding Automatically

Normally, a disk array would rebuild itself using a hot disk drive, after going Critical. However, if the Auto Rebuild function is disabled or no spare drives are available, you must initiate the procedure.

To enable Auto Rebuild, see “Making Background Activity Settings” on page 70.

To create a spare drive, see “Creating a Spare Drive” on page 161.

For more information, see “Hot Spare Drive(s)” on page 294.

Rebuilding Manually

If a physical drive has failed, identify and replace the drive, then rebuild the disk array as described below:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.

   If there are multiple disk arrays, choose the icon with the yellow !.
4. From the dropdown menu the **Background Activities** tab, choose *Start Rebuild*.
5. Choose the Source physical drive.

   The source drive is a remaining functional physical drive in the disk array.
6. Choose the Target physical drive.

   The target drive is the replacement physical drive.
7. Click the **Submit** button.

The Disk Array Background Activity tab shows the rebuild progress on the replacement (target) physical drive. Depending the size of the physical disk involved, this process will take some time.

To view more information, click the **Rebuild on PDx** link.

To set Rebuild priority, see “Making Background Activity Settings” on page 70.

Running Media Patrol on a Disk Array

Media Patrol checks the magnetic media on physical drives. When it finds the specified number of bad blocks, it will trigger PDM. See “Making Background Activity Settings” on page 70 and “Running PDM” on page 71.

You can schedule Media Patrol to run automatically, see “Scheduling an Activity” on page 72.

To start Media Patrol:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. From the dropdown menu the **Background Activities** tab, choose *Start Media Patrol*.
5. Click the **Start** button.

Running PDM on a Disk Array

Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare physical drive, similar to Rebuilding. Unlike Rebuilding, PDM acts *before* the disk drive fails and your Logical Drive goes Critical. See “Predictive Data Migration (PDM)” on page 302.

To start PDM:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. From the dropdown menu the **Background Activities** tab, choose *Start PDM*.
5. Choose the Source physical drive.

   The source drive is the physical drive at risk of failure.
6. Choose the Target physical drive.

   The target drive is the replacement physical drive.
7. Click the **Submit** button.

Transitioning 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. The revertible spare drive returns to its original status. For more information, see “Transition” on page 303.

In order to run the Transition function:

- The spare drive must be Revertible.
- You must specify an unconfigured physical drive of the same or larger capacity to replace the revertible spare drive.

To run Transition:

1. Click the Subsystem icon in Tree View.
2. From the dropdown menu on the Background Activities tab, choose *Start Transition*.
3. Choose an unconfigured physical drive from the list of available drives.
4. From the Target Physical Drive dropdown menu, choose an unconfigured physical drive.
5. Click the **Submit** button.

After the Transition is completed, refresh the screen. The revertible spare drive is listed under the Spare Drives icon and the disk array's operational status shows OK.

To set Transition priority, see "Making Background Activity Settings" on page 70.

Preparing a Disk Array for Transport

Transport is the action of moving the physical drives of a disk array:

- To different slots in the same VTrak enclosure
- From one VTrak enclosure to another

Important

Before you can use this feature, the disk array's Operational Status must be OK.

To prepare a disk array for transport:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the **Transport** tab in Management View.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.
7. After the Transition is complete, move the physical drives comprising the disk array to their new locations.
8. Click the **Refresh** button in your Browser.

   The drives appear in their new locations and disk array status displays OK.

Managing Logical Drives

Logical drives are made from disk arrays. In the Tree, you can see a graphic representation of the logical drives that belong to each array. You can see a summary of all logical drives in the subsystem under Logical Drive Summary.

Logical drive management includes the following functions:

Viewing Information for All Logical Drives

To view information about all logical drives in a disk array:

1. Click the Subsystem  icon in Tree View.
2. Click the Disk Arrays  icon.
3. Click the Disk Array  icon.
4. Click the Logical Drives  icon

Logical Drive 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 will function and your data is available. However, access will be slower due to the synchronizing operation.
- **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 will function and your data is available. However, access will be slower due to the rebuilding operation.
- **Critical** – This condition arises as the result of a physical drive failure. A degraded logical drive will still function 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.

- **Offline** – This condition arises as the result of a second physical drive failure. An Offline logical drive is not accessible but some or all of your data may remain intact. You must determine the cause of the problem and correct it.
- **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 will show OK.

To create a logical drive, see “Creating a Logical Drive” on page 147.

To delete a logical drive, see “Deleting a Logical Drive” on page 148.

For a Degraded or Offline logical drive, see “Critical & Offline Disk Arrays” on page 339.

Viewing Logical Drive Information

To view information for a single logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon.
5. Click the Logical Drive icon.

Logical drive information appears on the Information tab. For logical drive status definitions, see page 153.

Synchronization is an automatic procedure applied to logical drives when they are created. Yes means the logical drive was synchronized.

Adjustable Items

- Alias (optional)
- Read Policy
- Write Policy
- Preferred Controller ID

See “Making Logical Drive Settings” on page 155.

Viewing Logical Drive Statistics

To view information for a single logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon.
5. Click the Logical Drive icon.
6. From the dropdown menu on the **Information** tab, choose *Statistics*.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 115.

Making Logical Drive Settings

To make Logical Drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon.
5. Click the Logical Drive icon.
6. Click the **Settings** tab in Management View.
7. For the following items, accept the existing setting choose a new one:
   - Optional. Enter an alias in the Logical Drive Alias field.

     Maximum of 32 characters. Use letters, numbers, space between words, and underscore.
   - From the Read Policy dropdown menu, choose a Read Cache policy.

     The choices are *Read Cache*, *Read Ahead*, and *No Cache*.
   - From the Write Policy dropdown menu, choose a Write Cache policy.

     The choices are *Write Back* and *Write Through (Thru)*. If you choose No Read Cache, Write policy is automatically Write Through.
   - From the Preferred Controller ID dropdown menu, choose the preferred controller to access this logical drive.

     The choices are *1* and *2*. This feature is only available on subsystems with two controllers and LUN Affinity enabled. If N/A is shown, there is only one controller in the enclosure.
8. Click the **Submit** button.

Initializing a Logical Drive

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 the logical drives left behind from earlier configurations. For this reason, Initialization is recommended for all new logical drives.

Caution

When you initialize a logical drive, all the data the logical drive will be lost. Backup any important data before you initialize a logical drive.

Initialize a Logical Drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon.
5. Click the icon of the logical drive you want to initialize.
6. From the dropdown menu on the Background Activities tab, choose *Initialization*.
7. To choose Quick Initialization, check the box.

   If you checked the box, enter a value in the Quick Initialization Size field. This value is the size of the initialization blocks in MB.
8. If you did not choose Quick Initialization, enter a hexidecimal value in the Initialization Pattern in Hex field or use the default 00000000 value.
9. Click the **Submit** button.
10. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.

To view Initialization progress, click the **Background Activity** tab.

To set Initialization priority, see “Making Background Activity Settings” on page 70.

Running Redundancy Check

Redundancy Check is a routine maintenance procedure for fault-tolerant logical drives (those with redundancy) that ensures all the data matches exactly. Redundancy Check can also correct inconsistencies. You can also schedule a Redundancy Check. See “Scheduling an Activity” on page 72.

To Redundancy Check a Logical Drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon.
5. Click the icon of the logical drive you want to check.
6. From the dropdown menu on the **Background Activities** tab, choose *Redundancy Check*.
7. To choose *Auto Fix*, check the box.

   This feature attempts to repair the problem when it finds an error.
8. To choose *Pause On Error*, check the box.

   This feature stops the process when it finds an error.

   If **Auto Fix** is also checked, the process stops only when it finds a non-repairable error.
9. Click the **Submit** button.

To view Redundancy Check progress, click the **Background Activity** tab.

To set Redundancy Check priority, see “Making Background Activity Settings” on page 70.

Viewing the Logical Drive Check Table

The Logical Drive Check Table displays errors related to a logical drive. Use this information to evaluate the integrity of the logical drive and to determine whether corrective action is needed.

To view the Logical Drive Check Tables:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon.
5. Click the Logical Drive icon.
6. Click the **Check Table** tab in Management View.
7. Click the option for the table you want to see.

   The default is All tables.

   If there are entries, they are listed as follows:

   - **Entry Number** – A number assigned to each block of entry.

- **Table Type** – Read Check, Write Check or Inconsistent Block (see below).
- **Start Logical Block Address** – LBA of the first block for this entry.
- **Count** – Number of continuous blocks starting from this LBA.

Table Definitions

- **Read Check Table** – Contains a list of read errors for this logical drive.
- **Write Check Table** – Contains a list of write errors for this logical drive.
- **Inconsistent Block Table** – Contains a list of inconsistent blocks for this logical drive.

  Mirror data for RAID Levels 1, 1E, and 10; and Parity data for RAID Levels 5, 6, 50, and 60 are identified by the Redundancy Check.

Making Logical Drive LUN Settings

For Fibre Channel and SAS, LUN Masking is the process of applying a LUN Map so that each initiator can only access the LUNs specified for it.

Before you can specify an initiator for your LUN map, you must add the initiator to the VTrak 's initiator list. See “Adding an Initiator” on page 89 or page 92.

You must enable LUN Masking in order apply a LUN map. See “Enabling LUN Masking” on page 94.

To specify a LUN Map:

1. Click the Subsystem  icon in Tree View.
2. Click the Disk Arrays  icon.
3. Click the Disk Array  icon.
4. Click the Logical Drives  icon.
5. Click the Logical Drive  icon.
6. Click the **LUN Map** tab in Management View.
7. From the Unassigned Initiator List, click an initiator to choose it.

   Or type the initiator name into the Initiator Name field.
8. Type a LUN into the Map to LUN field.
9. Click the **Assign** button.

   The initiator appears in the Assigned Initiator List.
10. Click the **Submit** button.

Notes

- Obtain the initiator name from the initiator utility on your Host PC.
- The initiator name you input must match exactly in order for the connection to work.

LUN Mapping Parameters

- **Initiator Name**
  - **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.
  - **SAS** – A SAS initiator name is the SAS address of the HBA card in the Host PC.
- **Symbolic Name** – Optional. A common name for a Fibre Channel initiator
- **Port ID** – Port ID of the Fibre Channel port for this initiator
- **LUN** – Logical Unit Number on this logical drive for the selected initiator. You must enter a different LUN for each logical drive

Managing Spare Drives

When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array will begin to rebuild automatically using the spare drive. See “Critical & Offline Disk Arrays” on page 339.

Spare drive management includes the following functions:

- Viewing a List of Spare Drives (page 160)
- Locating a Spare Drive (page 160)
- Creating a Spare Drive (page 161)
- Deleting Spare Drive (page 162)
- Making Spare Drive Settings (page 162)
- Running Spare Check (page 163)

Viewing a List of Spare Drives

To view a list of spare drives:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.

The information includes:

- **ID** – The unique ID number assigned to the spare drive.
- **Operational Status** – OK is normal. Can also show Rebuilding, Transition Running, PDM Running, or Offline.
- **Physical Drive ID** – The ID number of the physical drive in the subsystem enclosure.
- **Capacity** – The data storage capacity of this spare drive.
- **Revertible** – Yes or No. A revertible spare drive automatically returns to its spare drive assignment after the failed physical drive in the disk array is replaced.
- **Type** – Global, can be used by any disk array. Dedicated, can only be used by the assigned disk array.
- **Dedicated to Array** – For dedicated spares, the disk array to which it is assigned. Global spares show N/A.

Locating a Spare Drive

To locate a physical drive assigned as a spare drive in the VTrak subsystem enclosure:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.

3. Click the Spare Drive icon.

   In Management View, the Enclosure Front View diagram appears with the location of the spare drive highlighted.

Creating a Spare Drive

Important

- There must be an unconfigured physical drive available for selection as a spare drive. See “Viewing a List of Physical Drives” on page 131.
- Be sure the unconfigured physical drive has adequate capacity to replace the largest drive in the disk array.

To create a spare drive:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the **Create** tab in Management View.
4. Select a spare type, Global or Dedicated.

   Global can be used by any disk array. Dedicated can only be used by the assigned disk arrays
5. To make a revertible spare drive, check the Revertible box.

   A revertible spare drive can be returned to spare drive status after it replaces a failed drive in a disk array. See “Transition” on page 303 for more information.
6. In the Physical drives field, highlight the physical drive you want to assign as a spare drive in the Available list and press the **>>** button to move the drive to the Selected list.

   You can also double-click drives to move them.
7. If you selected a Dedicated spare drive, in the Dedicated to Disk Arrays field, highlight disk arrays to which you want assign the spare drive from the Available list and press the **>>** button to move the array to the Selected list.

   You can also double-click arrays to move them.
8. Click the **Update** button.

   Your choices are displayed under New Hot Spare Drives.
9. If you agree with the proposed choices, click the **Submit** button.

Deleting Spare Drive

Note

If an existing spare drive has the wrong parameters for your needs, click the **Settings** tab to change the parameters rather than delete the spare drive and create a new one.

To delete a spare drive:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the **Delete** tab in Management View.
4. Check the box to the left of the spare drive you want to delete.
5. Click the **Submit** button.

   In the confirmation box, type the word **confirm** in the field provided.
6. Click the **OK** button.

Making Spare Drive Settings

The Spare Drive–Settings tab enables you to change the settings of an existing spare drive. To change spare drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the Spare Drive icon.
4. Click the **Settings** tab in Management View.
5. Select a spare type, Global or Dedicated.

   Global can be used by any disk array. Dedicated can only be used by the assigned disk arrays
6. To make a revertible spare drive, check the Revertible box.

   A revertible spare drive automatically returns to its spare drive assignment after the failed physical drive in the disk array is replaced.
7. If you selected a Dedicated spare drive, in the Dedicated to Disk Arrays field, highlight the disk arrays to which you want assign the spare drive from the Available list and press the **>>** button to move them to the Selected list.

   You can also double-click array to move it.
8. Click the **Submit** button.

Running Spare Check

Spare Check verifies the operational status of your spare drives. You can also schedule a Spare Check. See “Scheduling an Activity” on page 72.

To check a spare drive:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the **Spare Check** tab in Management View.
4. From the Physical Drive dropdown menu, choose the spare drive you want to check.

   Or choose *All* to check all the spare drives at the same time.
5. Click the **Submit** button.

The results of the Spare Check appear under Spare Check Status in the Information tab. “Healthy” means normal condition.

Working with the Logical Drive Summary

The Logical Drive Summary displays a list of all logical drives in the VTrak enclosure plus the expanded or cascaded enclosures. This list does not arrange the logical drives under the disk array to which they belong nor under the enclosure in which they are located.

Logical Drive Summary includes the following functions:

- Viewing a List of All Logical Drives (page 164)
- Viewing Individual Logical Drive Information (page 164)

Viewing a List of All Logical Drives

To view a list of all logical drives in all enclosures:

1. Click the Subsystem icon in Tree View.
2. Click the Drive Summary icon.

Viewing Individual Logical Drive Information

1. Click the Subsystem icon in Tree View.
2. Click the Drive Summary icon.
3. Click the Logical Drive icon.

   The information and location for the logical drive appear in Management View. See “Viewing Logical Drive Information” on page 154.

Chapter 5: Management with the CLU

This chapter covers the following topics:

For information about VTrak's audible alarm and LEDs, see "Chapter 8: Troubleshooting" on page 307.

Initial Connection

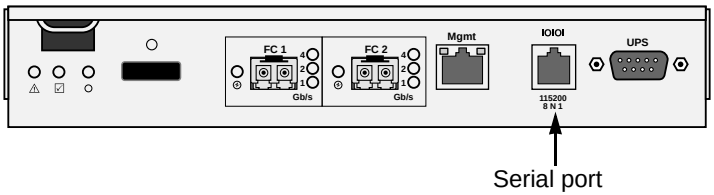
Making an initial connection includes the following functions:

- Making a Serial Connection (page 166)
- Making a Telnet Connection (page 167)
- Making a SSH Connection (page 167)
- Logging In (page 168)
- Accessing Online Help (page 169)
- Exiting the CLU (page 169)
- Logging Out of the CLI (page 170)
- Logging Back Into the CLI and CLU (page 170)

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



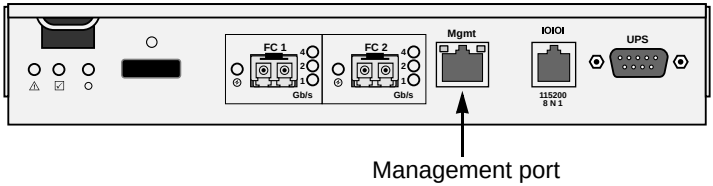
Then do the following actions:

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 VTrak controller's Management (Ethernet) port.

Figure 2. Management port on the 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.

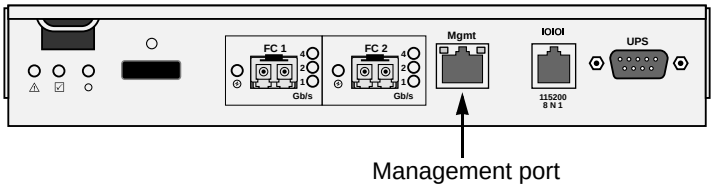
   The IP address above is only an example.
   Use your VTrak's Management port IP address.
   The VTrak's Telnet port number is 2300.
3. Press Enter once to launch the CLI.

Making a SSH Connection

A Secure Shell (SSH) connection requires a network connection between the Host PC and VTrak controller's Management (Ethernet) port.

Windows PCs require you to install a SSH application.

Figure 3. Management port on the controller



Windows

To start the Windows SSH program:

1. Open the SSH application from the Start menu.
2. Enter the VTrak's IP address and SSH port number in the fields provided.

   The VTrak's 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 your VTrak's Management port IP address.
   The VTrak's SSH default port number is 22.
3. Press Enter once to launch the CLI.

Logging In

1. At the Login prompt, type the user name and press Enter.

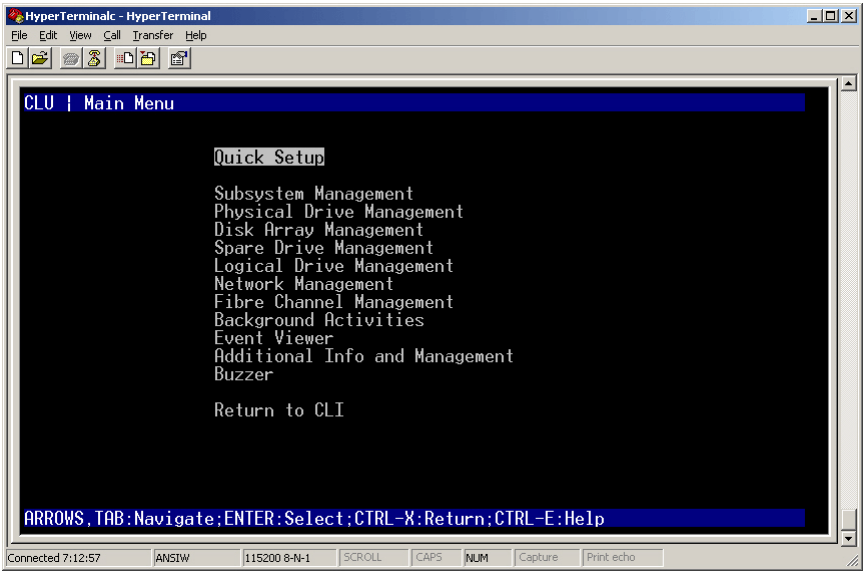
   The default user name is *administrator*.
2. At the Password prompt, type the password and press Enter.

   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 4. CLU main menu



Quick Setup – A sequence of four steps to setup System Date & Time, Management Port, and RAID Configuration.

Subsystem Management – Subsystem settings, Controller settings, statistics, lock/unlock the subsystem, set date and time, Enclosure settings, FRUs and Topology.

Physical Drive Management – View disk drive assignments and parameters, change global physical drive settings, and locate a physical drive.

Disk Array Management – View disk array information, create and delete disk arrays, transport, rebuild, PDM, and transition functions, and 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 – View logical drive information, name logical drives, initialization and redundancy check, 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 and statistics, list of logged-in devices, list of initiators.

SAS Management – Node information, Port information, settings, status, and statistics; SFP information, list initiators.

Background Activity – Summary of Activity, Settings for Media Patrol, Auto Rebuild, Rebuild, Migration, PDM, Transition, Synchronization, Initialization, Redundancy Check rate, and thresholds.

Event Viewer – View the event logs.

Additional Info and Management – LUN Mapping, User 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 Ctrl-E.

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 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.

Running Quick Setup

Quick Setup is discussed under “Setting up VTrak with the CLU” on page 43.

Managing the Subsystem

Subsystem Management includes the following functions:

Setting an Alias for the Subsystem

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. Type and alias into the Alias field.

   Maximum of 48 characters. Use letters, numbers, space between words and underscore.
4. Press Ctrl-A to save your settings.

Setting Redundancy for the Subsystem

This feature applies to models with dual controllers.

To set redundancy:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Subsystem Settings* and press Enter.
3. 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
4. Press Ctrl-A to save your settings.

Setting Cache Mirroring for the Subsystem

This option applies only to subsystems with two controllers. To use Cache Mirroring, the Redundancy Type must be set to Active-Active.

To change Cache Mirroring for this subsystem:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Subsystem Settings* and press Enter.
3. Highlight Cache Mirroring and press the spacebar to toggle between Enabled and Disabled.
4. Press Ctrl-A to save your settings.
5. Restart the subsystem.

   See “Restarting the Subsystem” on page 245.

Notes

- If you disable Cache Mirroring, LUN Affinity will be enabled automatically.
- If you change Cache Mirroring, be sure both controllers are properly installed in the subsystem before you restart.

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 Ctrl-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 Ctrl-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 Controllers

Controller Management includes the following functions:

- Viewing Controller Information (page 176)
- Clearing an Orphan Watermark (page 176)
- Making Controller Settings (page 177)
- Locating the Controller (page 178)

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 239.

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 Failed” on page 343 for more information.

Making Controller Settings

If your subsystem has two controllers, any settings you make to one controller will 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*.

     If your subsystem has two controllers and Cache Mirroring is disabled, LUN Affinity is enabled automatically.
   - Highlight *Coercion* and press the spacebar to toggle between *Enabled* and *Disabled*.

     For more information, see “Capacity Coercion” on page 293.
   - 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 290.
   - 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 288.
   - 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 289.
- 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 290.

6. Press Ctrl-A to save your settings.

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.

   Controller Dirty Cache ⚠ LED and Status ☑ LED, on the back of the Controller, will flash for one minute.

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.

   Enclosure information appears the Information tab in Management View. 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” on page 180.

For information on Enclosure problems, see “Chapter 8: Troubleshooting” on page 307.

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 Ctrl-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 359.

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 259.

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 blowers:

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. If fan or blower speed is below the Healthy Threshold, there is a malfunction. See "Replacing a Cooling Unit Fan or Blower" on page 260.

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 180 and "Chapter 8: Troubleshooting" on page 307.

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 “Chapter 8: Troubleshooting” on page 307.

Checking the Batteries

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

Each battery works with a controller. If the battery is present in the subsystem but the corresponding controller is not present, the battery will not appear in the interface.

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 183.

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 177.

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 Battery” on page 265.

VTrak automatically reconditions the battery 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 177.

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 will 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 19.

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 185)
- Making Global Physical Drive Settings (page 185)
- Viewing Physical Drive Information (page 186)
- Viewing Physical Drive Statistics (page 186)
- Setting an Alias (page 187)
- Clearing Stale and PFA Conditions (page 187)
- Forcing a Physical Drive Offline or Online (page 187)
- Locating a Physical Drive (page 188)

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 0–5 and MDMA 0–2.

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 Ctrl-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 239

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 Ctrl-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. Go to Disk Array Info and Settings.

   If a physical drive is offline and shows a PFA error, rebuild the disk array. Go to Disk Array Info and Settings. After rebuilding, the drive will show 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 will be 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 or Online

This function enables you to force an:

- Online physical drive to go Offline
- Offline physical drive to go Online

The Force Offline/Online function appears only for physical drives that are assigned to disk arrays.

Caution

Forcing a physical drive offline or online is likely to cause data loss. Back up your data before you proceed. Use these functions only when required.

To force a physical drive offline or online:

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* or *Force Online* 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 LEDs on the front of the VTrak will blink for one minute.

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 default disk array and logical drive based on unconfigured physical drives in the system. No user choices. See “Creating a Disk Array – Automatic” on page 190.
- **Express** – You choose the RAID characteristics and type of application. Creates a disk array and logical drive(s) based on your input. See “Creating a Disk Array – Express” on page 191.
- **Advanced** – You specify all parameters for a new disk array. One logical drive will be made automatically when you create the disk array. If you choose less than the total available capacity, you can use the remaining space to create additional logical drives at a later time. See “Creating a Disk Array – Advanced” on page 192.

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 Ctrl-A to save your settings and move to the next screen.
5. Review the proposed configuration of disk array and logical drive(s).
   - To accept the proposed configuration and create the disk array and logical drive(s), highlight *Save Configuration* and press Enter.
   - To reject the proposed configuration, highlight *Cancel Array Configuration* and press Enter. You will 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, different arrays will be 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 Ctrl-A to save your settings and move to the next screen.
8. Review the proposed configuration of disk array and logical drive(s).

   To accept the proposed configuration and create the disk array and logical drive(s), highlight *Save Configuration* and press Enter.

   To reject the proposed configuration, highlight *Cancel Array Configuration* and press Enter. You will 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 273.

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. Choose whether to enable Media Patrol and PDM.
2. 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.
3. Highlight *Save Settings* and Continue and press Enter.
4. 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.
5. 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 281 or “RAID 60 Axles” on page 283.
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 drive(s) you are about to create for your new array. Then do one of the following actions:

- If you agree with the logical drive(s) 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 drive(s), 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.

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 will function and your data is available. However, access will be slower due to the synchronizing operation.
- **Critical/Degraded** – This condition arises as the result of a physical drive failure. A degraded logical drive will still function 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 will function and your data is available. However, access will be 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 will show OK.

Setting an Alias for a Disk Array

This function sets an alias for the disk array. To set an alias:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. 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.

4. Press Ctrl-A to save your settings.

Accepting an Incomplete Array

This condition is the result of a missing physical drive. See “Incomplete Array” on page 342 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 and PDM 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 physical drive *before* the disk drive fails.

Media Patrol and PDM are enabled by default. Enabled is the recommended setting for both features.

To enable Media Patrol or 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 *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. Press Ctrl-A to save your settings.

See “Running PDM” on page 197.

For PDM rate, see “Making Background Activity 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 216.

Migrating a Disk Array

In order to migrate RAID level, you may have to add physical drives. For more information, see “RAID Level Migration” on page 294.

To migrate 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 *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 will become 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 216.

Running PDM

Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare physical drive *before* the disk 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 and PDM on a Disk Array” on page 195.

For PDM rate, see “Making Background Activity Settings” on page 216.

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 303.

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 216.

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 LEDs pertaining to this disk array will blink for one minute.

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 “Chapter 7: Technology Background” on page 273.

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.
7. Press Y again to re-confirm.

Managing Spare Drives

Spare Drive Management includes the following functions:

- Viewing a list of Spare Drives (page 201)
- Creating a Spare Drive (page 201)
- Making Spare Drive Settings (page 202)
- Running Spare Check (page 202)
- Deleting a Spare Drive (page 203)

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 303 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

See “Hot Spare Drive(s)” on page 294.

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 185.

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 303 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 Ctrl-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 303 for more information.
   - **Type** – Dedicated means this spare drive can only be used with the specified disk array(s). 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 Ctrl-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 will 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:

- Viewing Logical Drive Information (page 204)
- Viewing Logical Drive Statistics (page 204)
- Viewing the Logical Drive Check Table (page 205)
- Making Logical Drive Settings (page 205)
- Initializing a Logical Drive (page 205)
- Running Redundancy Check (page 206)
- Locating a Logical Drive (page 207)

To create or delete a logical drive, see “Managing Disk Arrays” on page 189.

For LUN mapping, see “Working with LUN Mapping” on page 220.

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 239.

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 Ctrl-A to save your settings.

Initializing a Logical Drive

This function sets all data bits in the logical drive to zero.

Caution

When you initialize a logical drive, you delete all the data it contains. Back up all important data before initializing 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 Activity* 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 216.

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 Activity* 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 216.

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 disk array you want and press Enter.
3. Highlight *Locate Logical Drive* and press Enter.

   The drive status LEDs for the physical drives in this logical drive will blink for one minute.

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 208)
- Making Controller Management Port Settings (page 208)

Making Virtual Management Port Settings

The VTrak subsystem has a virtual management port. When you log into the VTrak over your network, you use the virtual management port, enabling you to log into a VTrak with two controllers using one IP address.

Before you change settings, please see "Choosing DHCP or a Static IP Address" on page 40.

Making Automatic Settings

1. From the Main Menu, highlight *Network Management* and press Enter.
2. Highlight the Virtual management port and press Enter.
3. Highlight *NetMgmt Ethernet Port Settings* and press Enter
4. Highlight *DHCP* and press the spacebar to toggle to *Enabled*.
5. Press Ctrl-A to save your settings.

Making Manual Settings

1. From the Main Menu, highlight *Network Management* and press Enter.
2. Highlight the Virtual management port and press Enter.
3. Highlight *NetMgmt Ethernet Port Settings* 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 Ctrl-A to save your settings.

Making Controller Management Port Settings

Each RAID controller has an IP addresses for access when the controller goes into *maintenance mode*. Maintenance mode is only for remedial action in the event of a problem with the controller. See "Controller Enters Maintenance Mode" on page 348 for more information.

Before you change settings, please see “Choosing DHCP or a Static IP Address” on page 40.

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 you want and press Enter.
4. Highlight *DHCP* and press the spacebar to toggle to *Enabled*.
5. Press Ctrl-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 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 Ctrl-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 210)
- Viewing Fibre Channel Logged-in Devices (page 210)
- Making Fibre Channel Port Settings (page 210)
- Viewing SFP Information (page 211)
- Viewing Fibre Channel Port Statistics (page 212)
- Viewing Fibre Channel Initiators (page 213)
- Adding a Fibre Channel Initiator (page 213)

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 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 will also appear 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** – 1 Gb/s, 2 Gb/s, 4 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 Ctrl-A to save your settings.

The table below shows the type of attached topology you will 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 will 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 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 239.

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 239.

Viewing Fibre Channel Initiators

LUN Mapping must be enabled in order for VTrak to recognize a Fibre Channel. See “Enabling LUN Mapping” on page 220.

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.

Adding a Fibre Channel Initiator

LUN Mapping must be enabled in order for VTrak to add a Fibre Channel. See “Enabling LUN Mapping” on page 220.

You must add an initiator to the VTrak’s initiator list in order to use the initiator to create a LUN for your logical drive.

To add an initiator:

1. From the Main Menu, highlight *Fibre Channel Management* and press Enter.
2. Highlight *Fibre Channel Initiators* and press Enter.
3. Highlight the initiator you want to add and press the spacebar to choose it.
4. Highlight *Add Marked Initiators* and press Enter.

   The initiator is added to VTrak’s initiator list.

Managing SAS Connections

The SAS Management option appears only with VTrak Serial Attached SCSI models. SAS Management includes the following functions:

- Viewing SAS Port Information (page 214)
- Making SAS Port Settings (page 214)
- Viewing SAS Port Statistics (page 215)
- Viewing SAS Initiators (page 215)
- Adding a SAS Initiator (page 215)

Viewing SAS Port Information

There are two SAS ports on each controller.

To view information about the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Ports* and press Enter.
3. Highlight the port you want to see and press Enter.

   The port information appears on the screen.

Making SAS Port Settings

There are two SAS ports on each controller.

To make settings to the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Ports* and press Enter.
3. Highlight the port you want to see and press Enter.
4. Highlight *SAS Port Settings* and press Enter.
5. Highlight *Cable Signal Strength*, press the backspace key to erase the current value, then type in the new value.

   The range is 1 to 8. 1 is the default. Signal strength correlates to cable length in meters. Example: If you have a 2 m SAS cable, set signal strength to 2. If performance is unsatisfactory (see “Viewing SAS Port Statistics” on page 215), try settings of 1 and 3, then use the best setting for your system.
6. Press Ctrl-A to save your settings.

Viewing SAS Port Statistics

There are two SAS ports on each controller.

To view information about the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Ports* and press Enter.
3. Highlight the port you want to see and press Enter.
4. Highlight *SAS Port Statistics* and press Enter.

   The statistics for the selected port appear on the screen.

Clearing Statistics

To clear SAS port statics, see “Clearing Statistics” on page 239.

Viewing SAS Initiators

LUN Mapping must be enabled in order for VTrak to recognize a SAS initiator. See “Enabling LUN Mapping” on page 220.

There are two SAS ports on each controller, for a total of four SAS ports.

To a view a list of logged-in initiators:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Initiators* and press Enter.

   A list of all currently logged-in initiators appears on the screen.

Adding a SAS Initiator

LUN Mapping must be enabled in order for VTrak to add a SAS initiator. See “Enabling LUN Mapping” on page 220.

You must add an initiator to the VTrak’s initiator list in order to use the initiator to create a LUN for your logical drive.

To add an initiator:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Initiators* and press Enter.
3. Highlight the initiator you want to add and press the spacebar to choose it.
4. Highlight *Add Marked Initiators* and press Enter.

   The initiator is added to VTrak’s initiator list.

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 189 and “Managing Logical Drives” on page 204 for more information about how and when to use background activities.

Background Activity Management includes the following functions:

- Viewing Current Background Activities (page 216)
- Making Background Activity Settings (page 216)

Viewing Current Background Activities

From the Main Menu, highlight *Background Activity* 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 Activity* 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 will begin 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 Ctrl-A to save your settings.

Working with the Event Viewer

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

Working with the Event Viewer includes the following functions:

- Viewing Runtime Events (page 218)
- Clearing Runtime Events (page 218)
- Viewing NVRAM Events (page 218)
- Clearing NVRAM Events (page 219)

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 Table 1 on page 219
   - **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 Table 1
   - **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.

Table 1 Event severity levels

Level	Meaning
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

Working with LUN Mapping

LUN Mapping includes the following functions:

- Viewing a List of Initiators (page 220)
- Enabling LUN Mapping (page 220)
- Adding an Initiator (page 220)
- Mapping a LUN to an Initiator (page 221)
- Deleting an Initiator (page 221)

Viewing a List of Initiators

LUN Mapping must be enabled in order for VTrak to recognize an initiator.

To view a list of initiators:

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

   A list of the current initiators appears.

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. Press Y to confirm.

   A list of the current Fibre Channel or SAS 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. You can also add initiators from a list under Fibre Channel Management, see page 213, or SAS Management, see page 215.

To add a new initiator:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.
3. Highlight *Create New Initiator* and press Enter.
4. Type the name of the initiator.

- **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.
- **SAS** – A SAS initiator name is the SAS address of the HBA card in the Host PC. Obtain the initiator name from the initiator utility on your host system.

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. Press Ctrl-A to save the initiator.

Mapping a LUN to an Initiator

You must add an initiator to the VTrak's initiator list in order to map the initiator to a LUN. See "Enabling LUN Mapping" and "Adding an Initiator" on page 220.

To map a LUN to an initiator:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.
3. Highlight an existing Initiator 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.

   If you make a error, press Ctrl-R to restore the current LUN.
5. Press Ctrl-A to save the LUN map.

Deleting an 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.

Managing UPS Units

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

- Viewing a List of UPS Units (below)
- Making UPS Settings (page 223)
- Viewing UPS Information (page 224)

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 setting 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 Ctrl-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 setting 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 (page 225)
- Creating a User (page 225)
- Changing Another User's Settings (page 226)
- Changing Your Own User Settings (page 227)
- Changing Another User's Password (page 227)
- Changing Your Own Password (page 227)
- Deleting a User (page 228)

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 Table 2 on page 226.
6. Press Ctrl-A to save the user.

Table 2 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 Table 2.
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 Ctrl-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 Ctrl-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 Ctrl-A to save the new password.

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 Ctrl-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 226.

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.

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 Ctrl-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 Ctrl-A to save your settings.

To start, stop or restart the SLP service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Making Webserver Settings

By default, Webserver service is set to Automatic and its normal status is Started.

To make Webserver service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Webserver* 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 Ctrl-A to save your settings.

To start, stop or restart the Webserver 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 Ctrl-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 Ctrl-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 Ctrl-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 Table 3 on page 233.
8. Press Ctrl-A to save the Trap Sink.

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.

Table 3 Event severity levels

Level	Meaning
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

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 Ctrl-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 Ctrl-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 235.

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 will be reported. See Table 4 on page 236.

8. Press Ctrl-A to save your settings.

Table 4 Event severity levels

Level	Meaning
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 the VTrak's firmware. See "Updating the Firmware in the CLU" on page 254 for this 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 245.

   Note that all of these components are upgraded together in a package. See “Updating the Firmware in the CLU” on page 254.

Clearing Statistics

This function clears the statistical counts for the RAID controller, Fibre Channel ports, SAS 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 will lose your network connection to the VTrak.

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 241)
- Shutting down the VTrak – SSH Connection (page 241)
- Shutting down the VTrak – Serial Connection (page 242)

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 243)
- Starting up the VTrak – SSH Connection (page 243)
- Starting up the VTrak – Serial Connection (page 244)

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 167.

   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 167.

   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 166.

   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 245)
- Restarting VTrak – SSH Connection (page 245)
- Restarting VTrak – Serial Connection (page 246)

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 167.

   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 167.

   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.

Making Buzzer Settings

The buzzer sounds to inform you that the VTrak needs attention. See “VTrak is Beeping” on page 307 for more information.

To change 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 Ctrl-A to save your settings.

Chapter 6: Maintenance

This chapter covers the following topics:

Updating the Firmware in WebPAM PROe

A firmware update consists of the following actions:

Downloading the Firmware Image File

Go to the Promise website at http://www.promise.com/support and download the latest firmware image (.img) file to your TFTP server or your PC. The firmware update image file includes all of the files for the VTrak, including:

- Redboot ROM
- Kernel
- Firmware
- Software
- Ramdisk
- SEP Firmware
- OEM Customization
- Other files

The firmware update image file is designed to update the firmware on:

- A single RAID subsystem
- A single RAID subsystem with connected JBOD subsystems

The firmware update image file cannot update multiple RAID subsystems. You must update RAID subsystems one at a time.

Updating Firmware from TFTP Server

Important

If you have a JBOD expansion systems, the firmware is updated on the **Head Unit** or the RAID subsystem.

Be sure all subsystems are connected and running before beginning the update.

To update the firmware from a TFTP server:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Firmware Update** tab.
5. Do one of the following actions:
   - Click the **Download from TFTP Server** option, then click the **Next** button.
   - From the Firmware Update tab dropdown menu, choose *Download from TFTP Server*.
6. Enter the hostname or IP address of your TFTP server in the field provided.
7. Enter the port number of your TFTP server in the field provided (69 is the default).
8. Enter the filename of the Firmware Update file in the field provided.
9. Click the **Submit** button.
10. When the download is completed, click the **Next** button.

    A popup message appears warning you not to reboot the VTrak during the firmware update procedure.
11. In the popup message, click the **OK** button.

    The update progress displays. Then a popup message appears to tell you to reboot the VTrak.
12. In the popup message, click the **OK** button.
13. Restart the VTrak. See page 252.

Note

After you click the **Submit** button, if WebPAM PROe displays this message: **error transferring image**, you entered an incorrect file name or an incorrect location. Check the information and try again.

Updating Firmware from your PC

Important

If you have a JBOD expansion systems, the firmware is updated on the **Head Unit** or the RAID subsystem.

Be sure all subsystems are connected and running before beginning the update.

To update the firmware from your PC:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Firmware Update** tab.
5. Do one of the following actions:
   - Click the **Download Flash File from Local File through HTTP** option, then click the **Next** button.
   - From the Firmware Update tab dropdown menu, choose *Download from Local File*.
6. Enter the filename of the Firmware Update file in the field provided.

   Or, click the **Browse...** button and choose the Firmware Update file in the Open dialog box.
7. Click the **Submit** button.
8. When the download is completed, click the **Next** button.

   A popup message appears to warn you not to reboot the VTrak during the firmware update procedure.
9. In the popup message, click the **OK** button.

   The update progress displays. A popup message appears to tell you to reboot the VTrak.
10. In the popup message, click the **OK** button.
11. Restart the VTrak. See page 252.

Note

After you click the **Submit** button, if WebPAM PROe displays this message: **error transferring image**, you entered an incorrect file name or an incorrect location. Check the information and try again.

Restarting – Single RAID Subsystem

Warning

Do not restart the VTrak during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart a single subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Shutdown** link in Management View.

   A Shutdown or Restart tab will appear.
4. On the Shutdown or Restart tab, choose *Restart* from the dropdown menu.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.

   When the controller shuts down, your WebPAM PROe connection is lost.
7. Wait about two minutes.
8. In your browser, click **Logout** in the Header, then log into WebPAM PROe once again.

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

Restarting – RAID with JBOD Expansion

Warning

Do not restart the VTraks during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart the multiple subsystems:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Shutdown** link in Management View.

   A Shutdown or Restart tab will appear.
4. On the Shutdown or Restart tab, choose *Shutdown* from the dropdown menu.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided and click the **OK** button.

7. If you have other VTrak RAID Subsystems, repeat the same procedure for each of them.

   As each controller shuts down, your WebPAM PROe connection is lost.
8. Wait for two to three minutes.
9. Turn off the power switches for **all subsystems**.
10. Wait 30 seconds, then turn on the power switches on **all JBOD subsystems**.
11. Wait 30 more seconds, then turn on the power switches on **the RAID subsystem**.
12. Wait 2 to 3 minutes for the Head Unit to boot, then log into WebPAM PROe.

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

Updating the Firmware in the CLU

A firmware update consists of the following actions:

- Downloading the Firmware Image File (page 254)
- Updating the Firmware (page 254)
- Restarting – Single RAID Subsystem, Telnet (page 255)
- Restarting – RAID with JBOD Expansion, Telnet (page 255)
- Restarting – Single RAID Subsystem, SSH (page 256)
- Restarting – RAID with JBOD Expansion, SSH (page 257)
- Restarting – Single RAID Subsystem, Serial (page 257)
- Restarting – RAID with JBOD Expansion, Serial (page 258)

Downloading the Firmware Image File

Go to the Promise website at http://www.promise.com/support and download the latest firmware image file to your TFTP server. The firmware update image file includes all of the files for the VTrak, including:

- Redboot ROM
- Kernel
- Firmware
- Software
- Ramdisk
- SEP Firmware
- OEM Customization
- Other files

The firmware update image file is designed to update the firmware on:

- A single RAID subsystem
- A single RAID subsystem with connected JBOD subsystems

The firmware update image file cannot update multiple RAID subsystems. You must update RAID subsystems one at a time.

Updating the Firmware

Important

If you have a JBOD expansion systems, the firmware is updated on the **Head Unit** or the RAID subsystem.

Be sure all subsystems are connected and running before beginning the update.

To update the firmware file in the CLU:

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 *Start* and press Enter.

   A message appears to tell you to reboot the VTrak.
7. Restart the VTrak. See the restarting instructions below.

Restarting – Single RAID Subsystem, Telnet

Warning

Do not restart the VTraks during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart a single subsystem:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Restart* then press Enter.

   A warning message appears.
4. Press Y to continue.

   The screen goes blank.
5. Wait about two minutes, then re-establish your Telnet connection to the VTrak CLU.

   If you cannot re-establish a connection, wait 30 seconds and try again.

Restarting – RAID with JBOD Expansion, Telnet

Warning

Do not restart the VTraks during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart the multiple subsystems:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Shutdown* then press Enter.

   A warning message appears.
4. Press Y to continue.

   The screen goes blank.
5. If you have other VTrak RAID Subsystems, repeat the same procedure for each of them.

   As each controller shuts down, your connection is lost.
6. Wait for two to three minutes, then turn off the power switches for **all subsystems**.
7. Wait 30 seconds, then turn on the power switches on **all JBOD subsystems**.
8. Wait 30 more seconds, then turn on the power switches on **the RAID subsystem**.
9. Wait 2 to 3 minutes for the RAID Head to boot, then reestablish a Telnet connection to the CLU.

   If you cannot re-establish a connection, wait 30 seconds and try again.

Restarting – Single RAID Subsystem, SSH

Warning

Do not restart the VTraks during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart a single subsystem:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Restart* then press Enter.

   A warning message appears.
4. Press Y to continue.
5. Close your SSH session.
6. Wait about two minutes, then re-establish your SSH connection to the VTrak CLU.

   If you cannot re-establish a connection, wait 30 seconds and try again.

Restarting – RAID with JBOD Expansion, SSH

Warning

Do not restart the VTraks during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart the multiple subsystems:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Shutdown* then press Enter.

   A warning message appears.
4. Press Y to continue.
5. Close your SSH session.

   If you have other VTrak RAID Subsystems, repeat the same procedure for each of them. As each controller shuts down, your connection is lost.
6. Wait for two to three minutes, then turn off the power switches for **all subsystems**.
7. Wait 30 seconds, then turn on the power switches on **all JBOD subsystems**.
8. Wait 30 more seconds, then turn on the power switches on **the RAID subsystem**.
9. Wait 2 to 3 minutes for the RAID Head to boot, then reestablish your SSH connection to the VTrak CLU.

   If you cannot re-establish a connection, wait 30 seconds and try again.

Restarting – Single RAID Subsystem, Serial

Warning

Do not restart the VTraks during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart a single subsystem:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Restart* then press Enter.

   A warning message appears.

4. Press Y to continue.

   The screen will display shutdown and startup functions.

5. When the `Login:` prompt appears, log into the CLU again.

Restarting – RAID with JBOD Expansion, Serial

Warning

Do not restart the VTraks during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart multiple subsystems:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Shutdown* then press Enter.

   A warning message appears.

4. Press Y to continue.

   The screen displays shutdown functions.

5. If you have other VTrak RAID Subsystems, repeat the same procedure for each of them.
6. Wait for two to three minutes, then turn off the power switches for **all subsystems**.
7. Wait 30 seconds, then turn on the power switches on **all JBOD subsystems**.
8. Wait 30 more seconds, then turn on the power switches on **the RAID subsystem**.
9. When the `Login:` prompt for the Head Unit appears, log into the CLU 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.

Remove the Old Power Supply

To remove the power supply:

1. Verify that the power supply LED is amber or red.
2. Switch off the power.
3. Unplug the power cord.
4. Press the release button and pull the handle downward as shown. See Figure 1 (E610f/s) or 2 (E310f/s).
5. Pull the power supply out of the VTrak enclosure.

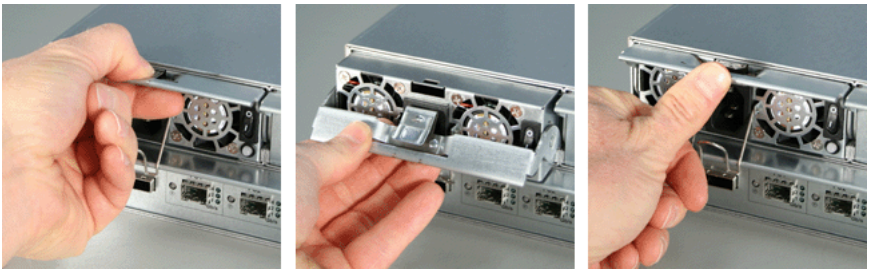
Install a New Power Supply

To install the power supply:

1. Carefully slide the power supply into the enclosure.
2. Gently press the handle in and upward until it locks. See Figure 1 (E610f/s) or 2 (E310f/s).
3. Plug in the power cord.
4. Switch on the power supply.
5. Verify that the new power supply LED is green.

Figure 1. Replacing an E610f/s power supply

Figure 2. Replacing an E310f/s power supply



This completes the power supply replacement procedure.

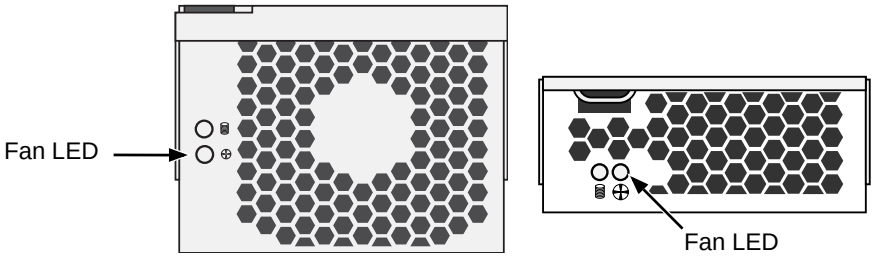
Replacing a Cooling Unit Fan or Blower

The fan or blower in each cooling unit is replaced as an individual part. No tools are required for this procedure.

To replace a fan or blower:

1. Verify that the Fan LED on the cooling unit is amber or red. See Figure 3.

Figure 3. Fan LED (left: E610f/s, right: E310f/s)



2. On the cooling unit, press the release button and pull the handle downward. See Figure 4 (E610f/s) or 5 (E310f/s).
3. Pull the cooling unit out of the VTrak enclosure.

Figure 4. Removing a cooling unit from the E610f/s

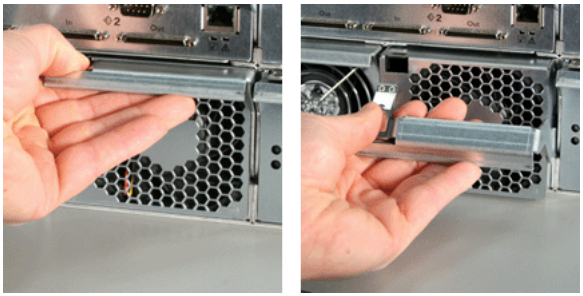
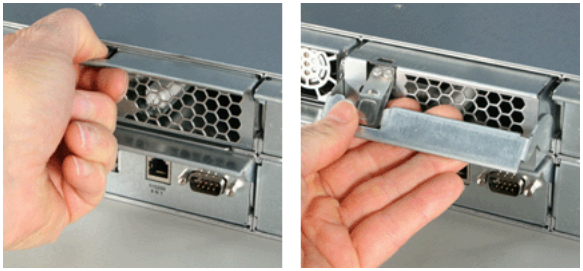


Figure 5. Removing a cooling unit from the E310f/s



4. Loosen the thumbscrews. A retainer keeps the thumbscrews in place.
5. Grasp the top section near the thumbscrews and lift it off the bottom section. Separate the cooling unit sections to access the blower. See Figure 6 (E610f/s) or 7 (E310f/s).

Figure 6. Loosen the thumbscrews and remove the cover (E610f/s)

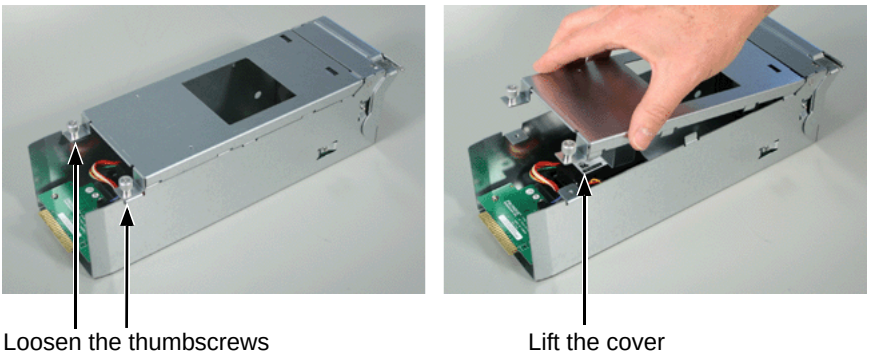
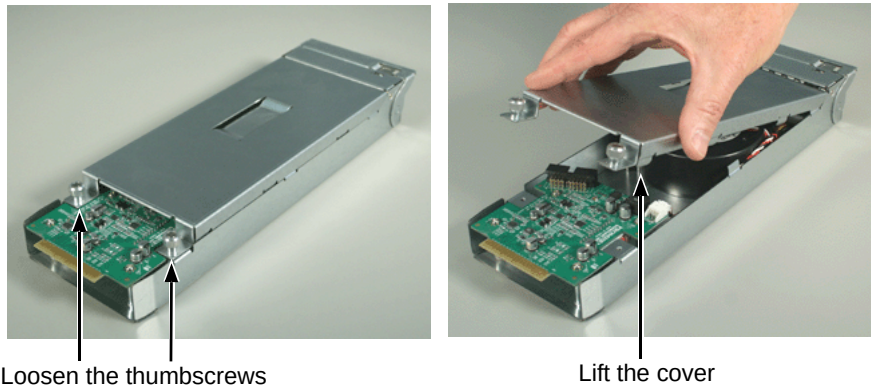


Figure 7. Loosen the thumbscrews and remove the cover (E310f/s)



6. Lift the fan or blower off the mounting pins and detach the electrical connector. See Figure 8 (E610f/s) or 9 (E310f/s).

Figure 8. The E610f/s fan and its electrical connector

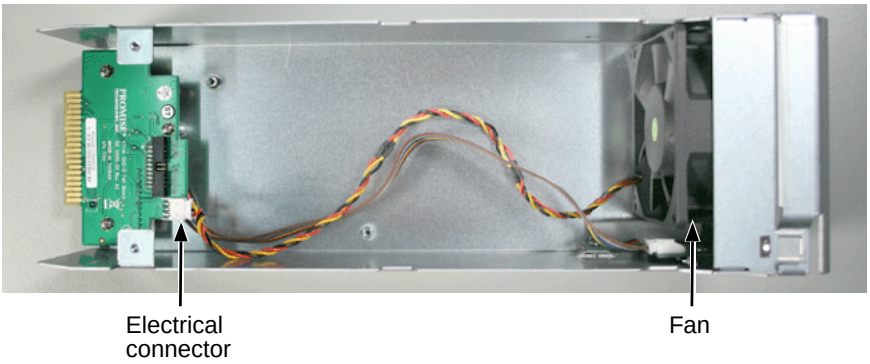
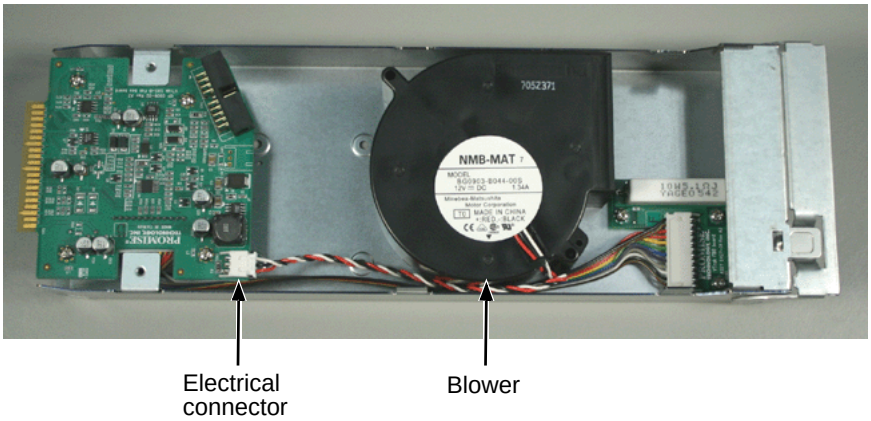


Figure 9. The E310f/s blower and its electrical connector



7. Attach the electrical connector of the new fan blower and set the fan or blower in place.

   Be sure you position the fan or blower onto the mounting pins. See Figure 10 (E610f/s) or 11 (E310f/s).

Figure 10. Position the fan onto the mounting pins, pointed outward

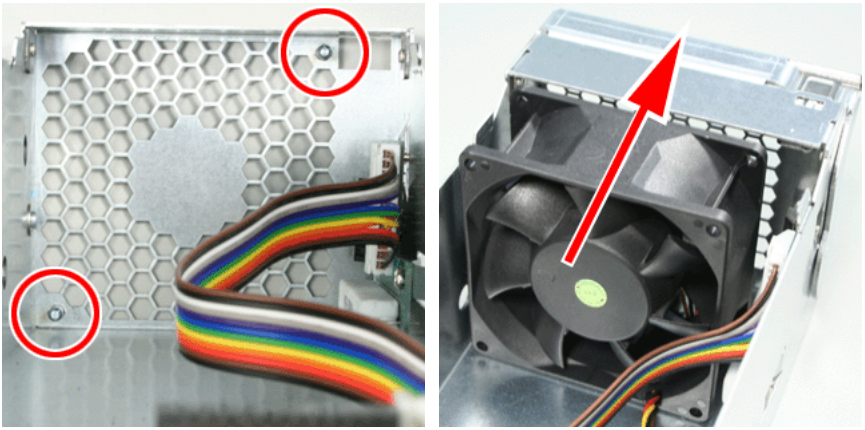
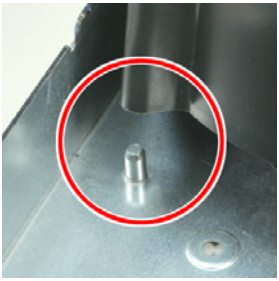
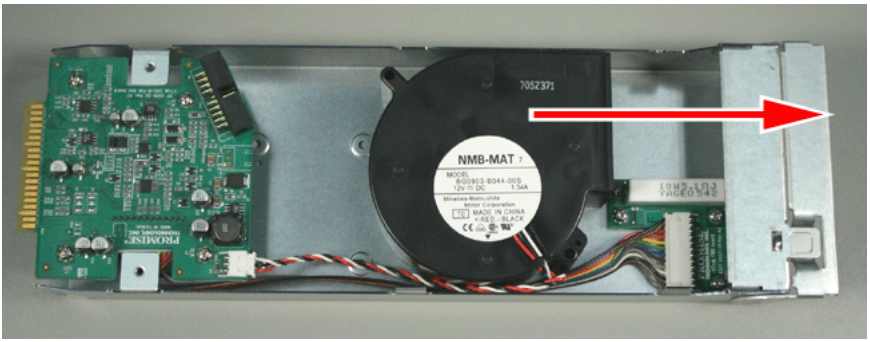


Figure 11. Positioning the blower onto the mounting pins, pointed outward





Be sure the blower points outward, towards the handle.

8. Place the top section of the cooling unit onto the bottom section and tighten the thumbscrews.
9. Carefully slide the cooling unit into the enclosure.
10. Gently press the handle in and upward until it locks. See Figure 12.

Figure 12. Locking the cooling unit handle (left: E610f/s, right: E310f/s)

11. Verify that the Fan LEDs are green.

This completes the fan replacement procedure.

Replacing a Cache Battery

The cache battery is located inside the cooling unit. The battery assembly is replaced as an individual part.

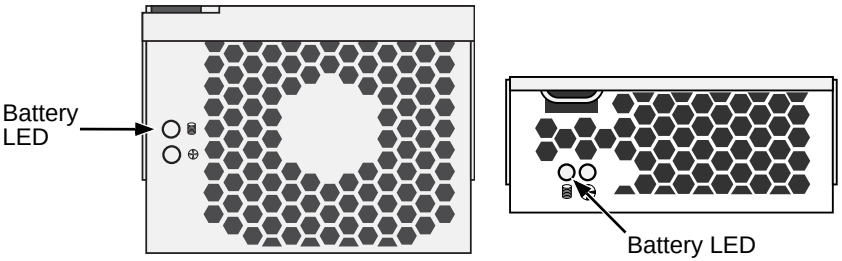
Cautions

- Try reconditioning the battery before you replace it. See page 128 or page 183 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 will be 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 cooling unit if the Controller's Dirty Cache LED is flashing. See "Browser Does Not Connect to WebPAM PROe" on page 354.

To replace a cache battery:

1. Verify that the Battery LED is amber or red. See Figure 13.

Figure 13. Fan LED (left: E610f/s, right: E310f/s)



2. Press the release button and pull the handle downward as shown above.
3. Pull the cooling unit out of the VTrak enclosure. See Figure 14 (E610f/s) or 15 (E310f/s).

Figure 14. Removing the cooling unit from the enclosure from the E610f/s

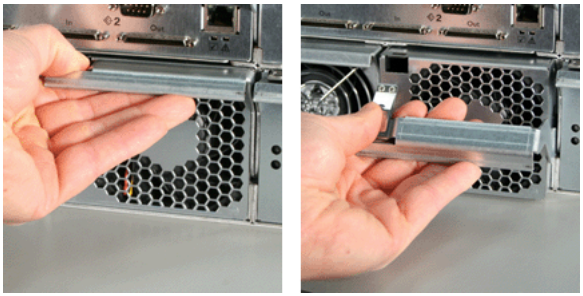
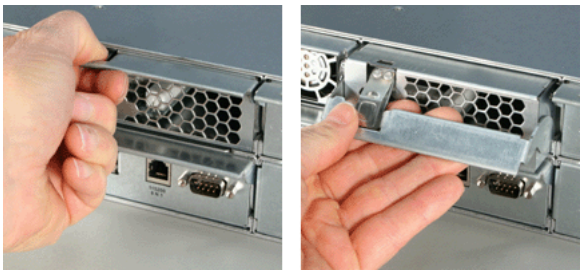


Figure 15. Removing the cooling unit from the enclosure from the E310f/s



3. Loosen the thumbscrews. A retainer keeps the thumbscrews in place.
4. Grasp the top section near the thumbscrews and lift it off the bottom section. Separate the cooling unit sections to access the battery assemble. See Figure 16 (E610f/s) or 17 (E310f/s).

Figure 16. Loosen the thumbscrews and remove the cover (E610f/s)

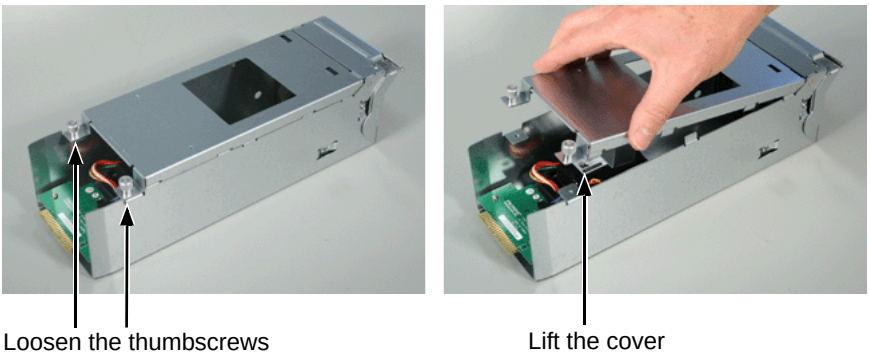
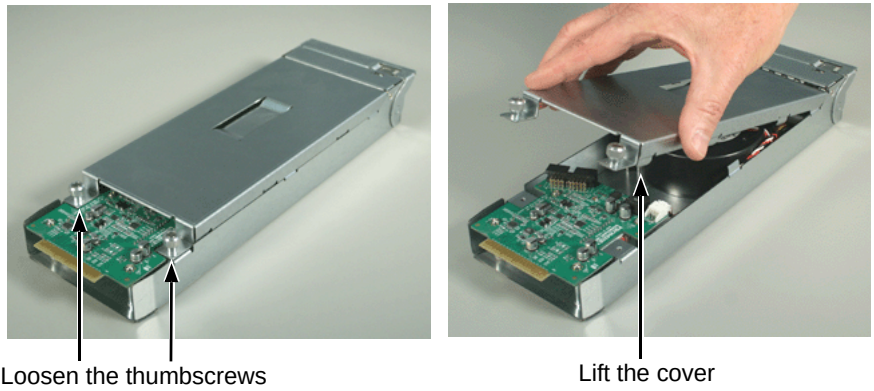


Figure 17. Loosen the thumbscrews and remove the cover (E310f/s)



5. Remove the two screws holding the battery assembly in place.
6. Detach the connector on the circuit board.

   Do not detach any other connectors. See Figure 18 (E610f/s) or 19 (E310f/s).

Figure 18. Removing the battery assembly (E610f/s)

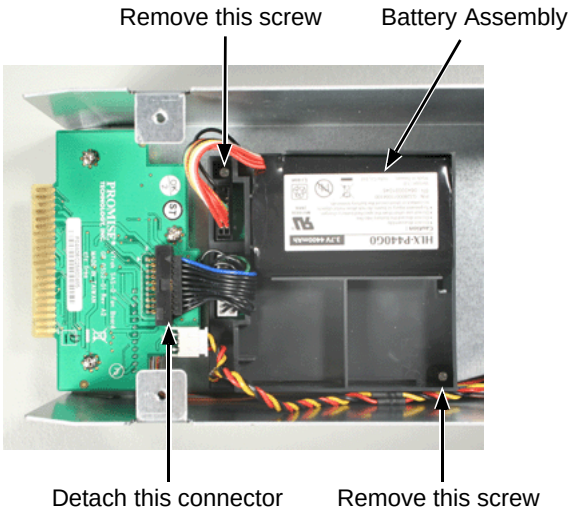
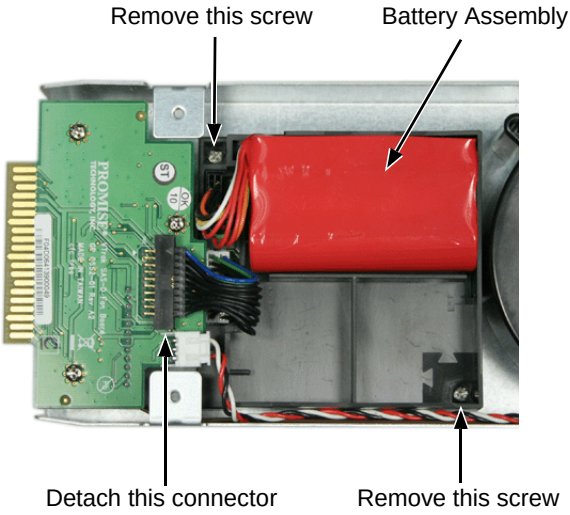


Figure 19. Removing the battery assembly (E310f/s)



7. Lift the battery assembly out of the cooling unit.
8. Place a new battery assembly into the cooling unit.
9. Attach the connector on the circuit board.
10. Install the two screws holding the battery assembly in place to the cooling unit.
11. Place the top section of the cooling unit onto the bottom section and tighten the thumbscrews.
12. Carefully slide the cooling unit into the enclosure.
13. Gently press the handle in and upward until it locks. See Figure 20.

Figure 20.Locking the cooling unit handle (left: E610f/s, right: E310f/s)

This completes the battery replacement procedure.

Replacing a RAID Controller – Dual Controllers

The RAID Controller monitors and manages the logical drives. When this controller is replaced, all of your logical drive data and configurations remain intact because this logical drive information is stored on the disk 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 359.

Important

Before you install the replacement controller, be sure the replacement controller has:

- The same Firmware version as the original controller
- The same amount of SDRAM as the original controller

To obtain this information, click the Controller icon, Information tab, and look for Firmware Version and Memory Size.

Note

On VTraks with dual RAID controllers, you can hot-swap one controller at a time.

Removing the old controller

To remove a RAID Controller:

1. Disconnect the Fibre Channel or SAS cables, management, serial, and power cables.
2. On the controller handle, press the release button and pull the handle downward. See Figure 21.
3. Pull the controller out of the VTrak enclosure.

Installing the new controller

To install the new controller:

1. Carefully slide the controller into the enclosure.
2. Gently press the handle in and upward until it locks. See Figure 21.
3. Connect the Fibre Channel or SAS cables, management, serial, and power cables.

Replacing a RAID Controller – Single Controller

The RAID Controller monitors and manages the logical drives. When this controller is replaced, all of your logical drive data and configurations remain intact because this logical drive information is stored on the disk 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 359.

Important

Before you install the replacement controller, be sure the replacement controller has:

- The same Firmware version as the original controller
- The same amount of SDRAM as the original controller

To obtain this information, click the Controller icon, Information tab, and look for Firmware Version and Memory Size.

Removing the old controller

To remove the RAID Controller:

1. Shutdown the VTrak. See “Shutting Down the Subsystem” on page 117 (WebPAM PROe) or page 241 (CLU).
2. Switch off the power.
3. Disconnect the Fibre Channel or SAS cables, management, serial and power cables.
4. On the controller handle, press the release button and pull the handle downward. See Figure 21.
5. Pull the controller out of the VTrak enclosure.

Installing the new controller

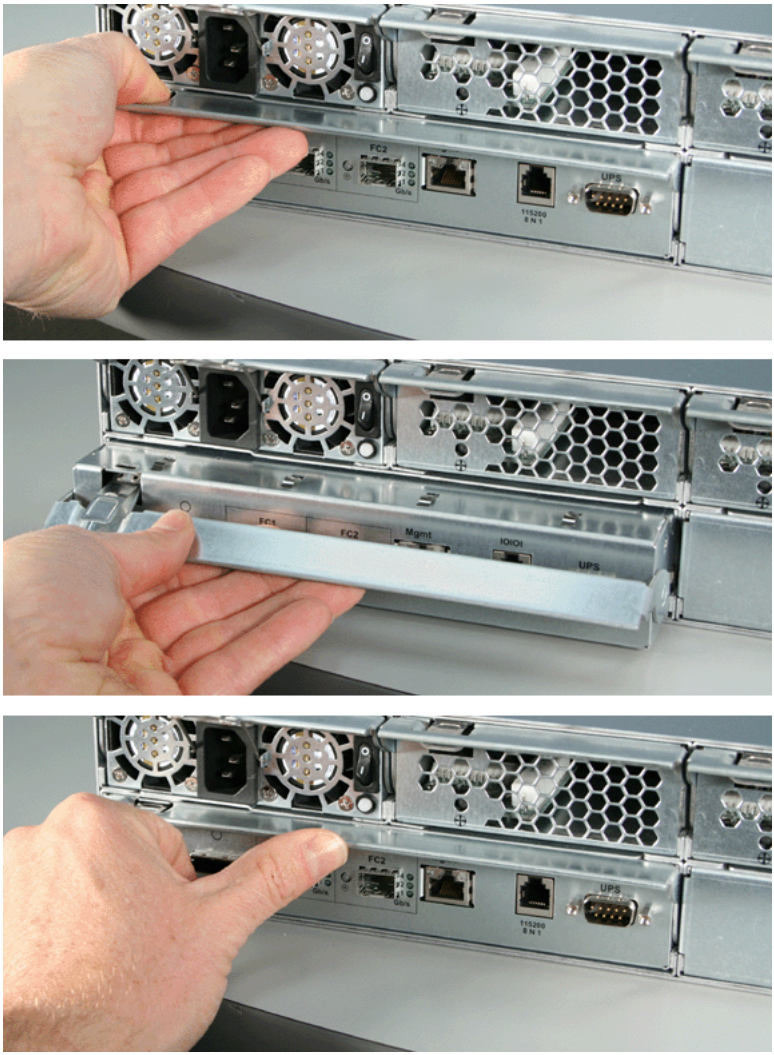
To install the new controller:

1. Carefully slide the controller into the enclosure.
2. Gently press the handle in and upward until it locks. See Figure 21.

3. Connect the Fibre Channel or SAS cables, management, serial and power cables.
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 37.

Figure 21. Replacing the controller. The E310f/s is shown. The E610f/s is similar



Chapter 7: Technology Background

This chapter covers the following topics:

Introduction to RAID

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.

The RAID software and controller manage all of the individual drives. The benefits of a RAID can include:

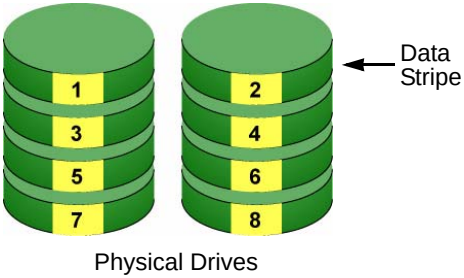
- Higher data transfer rates for increased server performance
- Increased overall storage capacity for a single drive designation (such as, C, D, E, etc.)
- Data redundancy/fault tolerance for ensuring continuous system operation in the event of a hard drive failure

Different types of logical drives use different organizational models and have varying benefits. Also see “Choosing a RAID Level” on page 284. The following outline breaks down the properties for each type of RAID logical drive:

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 will form a 400 GB (4 x 100 GB) disk array instead of 460 GB.

If physical drives of different capacities are used, there will also be unused capacity on the larger drives.

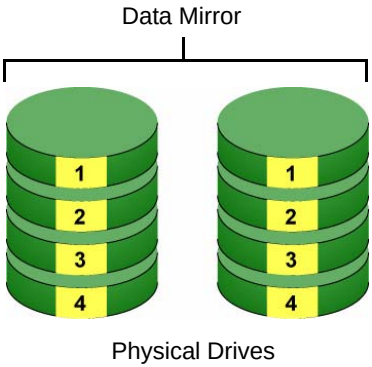
RAID 0 logical drives on VTrak consist of one or more physical drives.

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 will be 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 will be used as the replacement drive and data will begin to be 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 will be unused capacity on the larger drive.

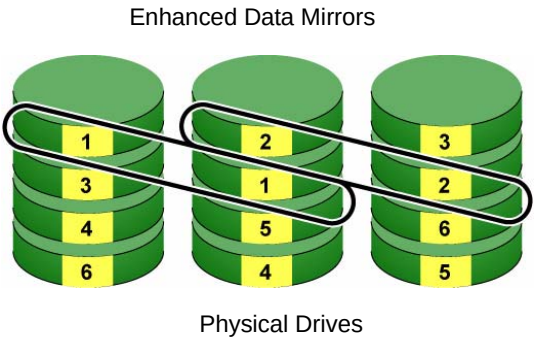
RAID 1 logical drives on VTrak consist of two physical drives.

If you want a mirrored logical drive with more than two physical drives, see "RAID 1E – Enhanced Mirror" on page 276 and "RAID 10 – Mirror + Stripe" on page 279.

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



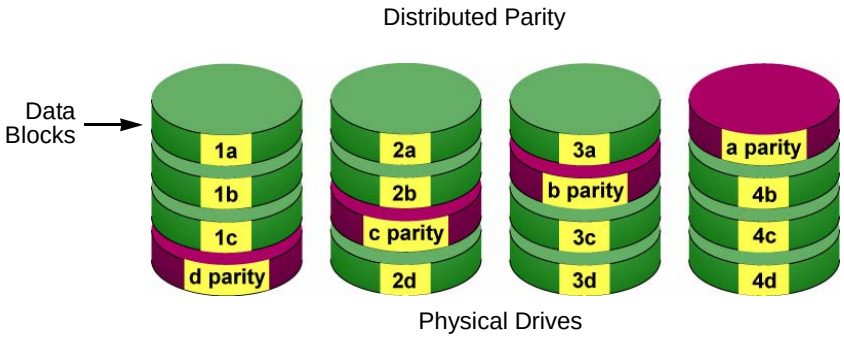
The advantage of RAID 1E is the ability to use an odd number of physical drives, unlike RAID 1 and RAID 10. You can also create a RAID 1E Logical Drive with an even number of physical drives. However, with an even number of drives, you will obtain somewhat greater security with comparable performance 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 will actually be a RAID 1.

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 will have a capacity of 300 GB. A RAID 5 logical drive with two 120 GB physical drives and one 100 GB physical drive will have a capacity of 200 GB.

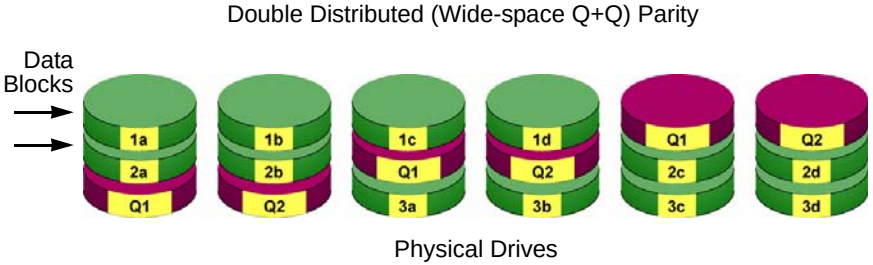
RAID 5 is generally considered to be the most versatile RAID level.

A RAID 5 on VTrak consists of 3 to 32 physical drives.

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 will have a capacity of 500 GB. A RAID 6 logical drive with (4) 100 GB physical drives will have 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.

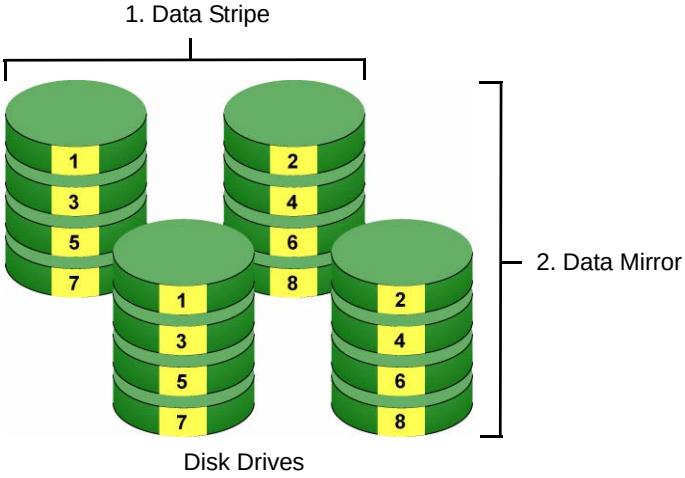
A RAID 6 on VTrak consists of 4 to 32 physical drives.

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—striping—while protecting data by duplicating it—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.

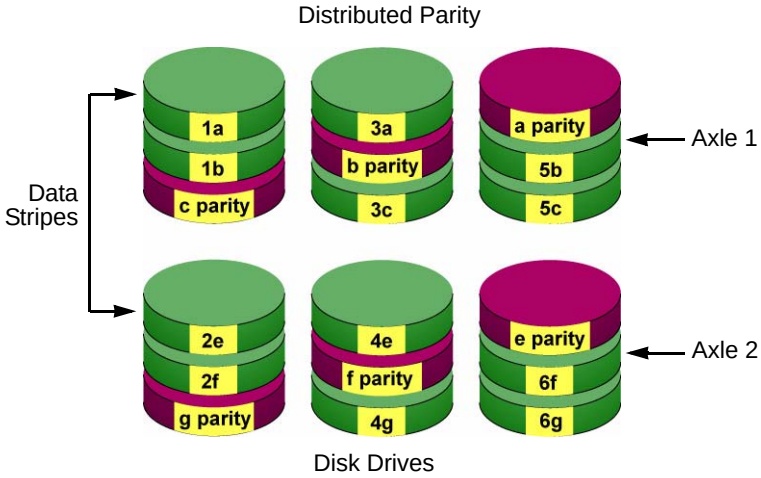
RAID 10 arrays require an even number of physical drives and a minimum of four.

For RAID 10 characteristics using an odd number of physical drives, choose RAID 1E.

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 16 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				

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

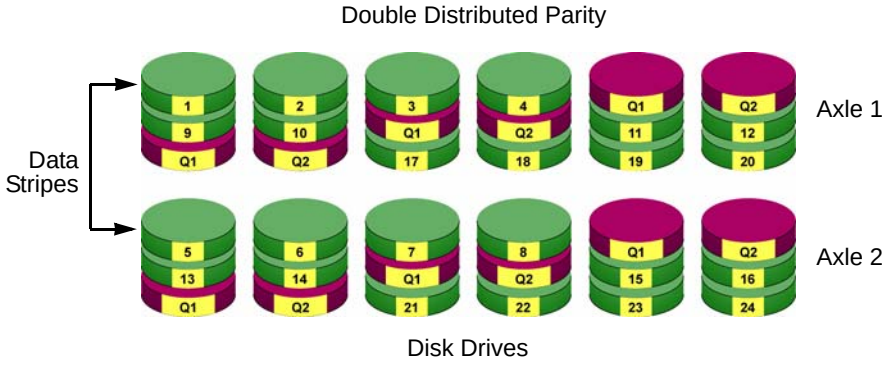


Figure 9. RAID 60 Striping of Double Distributed Parity disk arrays

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.

The chart below shows RAID 60 logical drives with 8 to 20 physical drives, the available number of axles, and the resulting distribution of physical drives on each axle.

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				

Choosing a RAID Level

There are several issues to consider when choosing the RAID Level for your VTrak disk array. The following discussion summarizes some advantages, disadvantages, and applications for each choice.

RAID 0

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 will result 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

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

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

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate	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
- Most versatile RAID level

RAID 6

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

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

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

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

Choosing 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 disk array. In order to change the Stripe Size of an existing disk array, you must delete the disk array and create a new one. You can choose Stripe Size directly when you use the Advanced function to create a disk array. If you use the Express function to create a disk array, WebPAM PRO selects the Stripe Size when you choose an Application Type.

The available Stripe Sizes are 64, 128, 256 KB, 512 KB, and 1 MB. 64 KB is the default. There are two issues to consider when selecting the Stripe Size.

First, 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.

Second, 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, Promise suggests you choose 64 KB as your Stripe Size. Generally speaking, email, POS, and webservers prefer smaller stripe sizes. Video and database applications prefer larger stripe sizes.

Choosing Sector Size

A sector is the smallest addressable area on a physical disk drive. Sector Size refers to the size of sector measured by the number of bytes of data it can hold. The most common sector size is 512 bytes (512 B). A smaller sector size results in a more efficient use of a disk drive’s capacity. 512 B is the default sector size for logical drives on VTrak.

The number of usable sectors is limited by the addressing method of the computer's operating system:

- Windows 2000 and Windows XP (32-bit) support 10-bit logical bit addressing (LBA), so with 512 B sectors, they can only support up to 2 terabytes (TB) of data storage capacity. To increase the capacity, you must use larger sectors. See “2 TB Limitation” on page 288.
- Windows XP (64-bit), Windows 2003 Server, Windows 2008 Server, Windows Vista, and Windows 7 support 64-bit LBA, so they are not affected by this limitation. For these OSes, always choose the default 512 B sector size.

- Linux operating systems with the 2.4 kernel do not support variable sector sizes. For these OSes, always choose the default 512 B sector size.
- Linux operating systems with the 2.6 kernel support 64-bit LBA. For these OSes, always choose the default 512 B sector size.

2 TB Limitation

If your Host PC runs Windows 2000 or Windows XP (32-bit), and you want to create logical drives larger than 2TB, you must choose a sector size larger than 512 B when you create the logical drive. The table below correlates sector size with logical drive capacity.

Logical Drive Size	Sector Size
8 to 16 TB	4096 bytes (4 KB)
4 to 8 TB	2048 bytes (2 KB)
2 to 4 TB	1024 bytes (1 KB)
0 to 2 TB	512 bytes (512 B)

Because logical drives can be expanded, you may encounter a situation where the usable capacity of your expanded logical drive is reduced by the addressing issue described above. There are two alternatives:

- Limit your logical drive expansion to within the limits described in the chart.
- Back up your data, then delete your existing logical drive and create a new one with a larger sector size.

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 in conjunction with logical drives:

- When you create a logical drive. See “Creating a Logical Drive” on page 147 or page 198
- On an existing logical drive. See “Making Logical Drive Settings” on page 155 or page 205.

Read Cache Policy

- **Read Cache** – The read cache is enabled.
- **Read Ahead** – The read cache and the read-ahead feature are enabled. Read-ahead anticipates the next read and performs it before the request is made. Can increase read performance.
- **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.
- **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 “Cache Mirroring” on page 290.

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 will power the cache, see “Checking the Batteries” on page 128 or page 182.

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 122 or page 177.

Also see “Replacing a Cache Battery” on page 265.

Host Cache Flushing

When host cache flushing is enabled, the VTrak immediately flushes the data in its controller cache to the drives when the Host sends a Flush Cache command.

Forced Read Ahead Cache

When forced read ahead cache is **enabled**, the controller cache is forced to read ahead of the designated data. This action increases performance in video applications, where large block sequential reads are common.

However, forced read ahead cache might reduce performance when large block sequential reads do not occur. Promise recommends leaving this feature **disabled** for applications other than video.

Cache Mirroring

VTrak subsystems with two controllers include a Cache Mirroring feature. Cache Mirroring causes the local controller to mirror write data to the remote controller. That means, when there is write data in the cache of the controller managing the target logical drive, the same write data is copied to the cache of the other controller as well. This arrangement protects the data from loss, in the event that the local controller fails before the data is written to the logical drive.

Cache Mirroring works whether the write cache policy of your logical drives is set to *Write Back* or *Write Through*. However, you only realize the advantage of Cache Mirroring when the write cache policy is set to *Write Back*.

With Cache Mirroring **enabled**, any write data in the controller cache that has not been written to the logical drive, will be written to the logical drive, even if the controller fails. Enable Cache Mirroring when you require failover/failback protection.

With Cache Mirroring **disabled**, any write data in the controller cache that has not been written to the logical drive, will be lost if the controller fails. On the other hand, write performance increases because of greater bandwidth. Disable Cache Mirroring when you require maximum performance.

To use Cache Mirroring you must:

- Have two controllers in the subsystem

- Set Redundancy Type to Active-Active.
  See “Setting Redundancy for the Subsystem” on page 64 or page 172
- Enable Cache Mirroring under subsystem settings.
  See “Setting Redundancy for the Subsystem” on page 64 or page 172
- On subsystems with two controllers, when Cache Mirroring is disabled, LUN Affinity is enabled automatically. See “LUN Affinity” on page 291

Failover and Failback

When one controller fails, the surviving controller takes over logical drive access until the failed controller is brought back online or is replaced. For example, Cache Mirroring is enabled and your logical drives are assigned to Controller 1.

The following actions will happen:

- If Controller 1 goes offline, Controller 2 takes over access to the logical drives assigned to Controller 1.
- All write data that is still in the controller cache will be written to the logical drives, even though the controller managing them has failed.
- If Controller 1 comes back online, Controller 1 takes back access to the logical drives assigned to it.
- If Controller 1 is replaced, the new controller takes over access to the logical drives assigned to Controller 1.

LUN Affinity

VTrak subsystems with two 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 controllers in the subsystem
- Enable LUN Affinity under controller settings. See page 122 or page 177

On subsystems with two controllers, when Cache Mirroring is disabled, LUN Affinity is enabled automatically. See “Cache Mirroring” on page 290.

Disk Array Creation

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 will balance the logical drive assignments for you.

When you create a logical drive using the Automatic or Express disk array creation, the logical drives are assigned alternatively between Controllers 1 and 2 automatically.

See “Creating a Disk Array – Automatic” on page 141 or page 190
“Creating a Disk Array – Express” on page 141 or page 191
“Creating a Disk Array – Advanced” on page 143 or page 192

Logical Drive Settings

After you have created a logical drive, you can click the Settings tab and manually change the Preferred Controller ID between Controller 1 and Controller 2. See “Making Logical Drive Settings” on page 155 or page 205.

If you create logical drives with LUN Affinity disabled, the Preferred Controller ID will show N/A, and your logical drives will be visible to both controllers.

If you create logical drives with LUN Affinity disabled, and later you enable LUN Affinity, all of your logical drives will be assigned to Controller 1. To balance the load, you can reassign some of your logical drives to Controller 2 under the Preferred Controller ID in the Settings tab. See “Making Logical Drive Settings” on page 155 or page 205.

When you a delete a logical drive, the remaining logical drives keep the same Controller assignments. If you want to rebalance controller assignments of the remaining logical drives, change their Preferred Controller IDs in the Settings tab.

Failover and Failback

When one controller fails, the surviving controller takes over logical drive access until the failed controller is brought back online or is replaced. For example, LUN Affinity is enabled and your logical drives are assigned to Controller 1. The following actions will happen:

- If Controller 1 goes offline, Controller 2 takes over access to the logical drives assigned to Controller 1.
- If Controller 1 comes back online, Controller 1 takes back access to the logical drives assigned to it.
- If Controller 1 is replaced, the new controller takes over access to the logical drives assigned to Controller 1.
- All logical drives assigned to Controller 2 remain accessible by Controller 2. Controller 1 cannot access them at any time.

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, physical drives of different sizes will work but the system must adjust 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 the Method in the Controller Settings menu. See page 122 or page 177. 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 will not permit the use of a replacement physical drive that is slightly smaller than the remaining working drive(s).

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 156 or page 205.

Caution

When you initialize a logical drive, all the data on the logical drive will be lost. Backup any important data before you initialize a logical drive.

Hot Spare Drive(s)

A hot spare is a disk drive that is connected to the disk array system but is not assigned as a member of the disk array. In the event of the failure of a drive within a functioning fault tolerant disk array, the hot spare is activated as a member of the disk array to replace a drive that has failed.

VTrak will replace a failing disk drive in a disk array with an unassigned drive, if one is available. The unassigned drive is not part of any disk array. Such a drive is called a *hot spare* drive. There are two types:

- **Global** – An unassigned disk drive available to any disk array on the VTrak.
- **Dedicated** – An unassigned disk drive that can only be used by a specified disk array.

The hot spare policy function lets you choose whether a disk array will access any unassigned disk drive or a designated drive in the event of disk drive failure. See “Managing Spare Drives” on page 160 (WebPAM PROe) or page 201 (CLU) for information on how to make this setting.

The spare drive effectively takes the place of the failed drive and the RAID system immediately begins to rebuild data onto the drive. When the rebuild is complete, the disk array is returned to fault tolerant status.

VTrak includes a function that enables you to return a hot spare drive from a disk array back to spare status. When you create the hot spare drive, check the Revertible box to enable this feature. See “Transition” on page 303.

See also “Critical & Offline Disk Arrays” on page 339.

Partition and Format the Logical Drive

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.

RAID Level Migration

To *migrate* a disk array is to do one or both:

- Change its RAID level
- Increase the number of disk drives (sometimes called Expansion)

On VTrak, RAID level migration is performed on the disk array but it applies to the logical drives. The disk array must be *Functional*. Migration does not disturb your data. You can access the data while the migration is in progress. When migration

is done, your disk array will have a different RAID level and/or a larger capacity. See “Migrating a Disk Array” on page 148 or page 196.

In most cases, you must add one or more physical drives during the migration process. You can *never* reduce the number of physical drives.

The tables below show the migration options for a source logical drive according to 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.

Important

- 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

Ranges of Disk Array Expansion

The Windows 2000 and Windows XP (32-bit) operating systems support a 10-byte LBA format. As a result, these OSes can only recognize 4 billion addresses. If you create a logical drive using the default 512 B sector size, the logical drive will be limited to 2 TB of data, even if there is more space available on your disk drives.

This limitation does not apply to Windows XP (64-bit), Windows 2003 Server, Windows 2008 Server, Windows Vista, Windows 7, and Linux OSes with the 2.6 kernel. Linux OSes with the 2.4 kernel do not support variable sector sizes, therefore you cannot apply the solution described here to those OSes.

Note that once you create your logical drive, you cannot change the size of the sectors. Nor can you increase the number of address blocks that the OS recognizes.

You can direct WebPAM PROe to expand a logical drive beyond the maximum expansion size. When the expansion is finished:

- WebPAM PROe will show the logical drive in the desired size.
- Your operating system might show the logical drive at the maximum size listed in the table below.
- Additional capacity might appear as unpartitioned and unformatted.

Current LD Size	Maximum LD Expansion Size	Sector Size
8 to 16 TB	16 TB	4096 bytes
4 to 8 TB	8 TB	2048 bytes
2 to 4 TB	4 TB	1024 bytes
up to 2 TB	2 TB	512 bytes

At this point, you have the choice of:

- Format the unpartitioned/unformatted capacity as a *second* logical drive
- Delete the existing disk array and create a new one in the desired size

Delete and Recreate

If you require a logical drive larger than the maximum expansion size:

1. Backup the data from the current logical drive.
2. Delete the current logical drive.
   See page 148 (WebPAM PROe) or page 200 (CLU).
3. Create a new logical drive with the desired capacity.
   See page 147 (WebPAM PROe) or page 198 (CLU).
4. Restore the data to the new logical drive.

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. Media Patrol does not check unconfigured drives.

Media Patrol also checks spare drives, if those drives have Media Patrol enabled. Media Patrol for spare drives is enabled by default. You can disable it in VTrak's Command Line Interface (CLI).

Unlike Synchronization and Redundancy Check, Media Patrol is concerned with the condition of the media itself, not the data recorded on the media. Media Patrol triggers PDM when the number of error blocks exceeds the threshold value.

You can run Media Patrol from the subsystem. See "Running Media Patrol" on page 71 (WebPAM PROe) or page 173 (CLU).

You can also run Media Patrol on a disk array. See "Running Media Patrol on a Disk Array" on page 150 (WebPAM PROe) or page 195 (CLU).

Predictive Data Migration (PDM)

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

PDM is triggered automatically, based on Background Activity Settings. See page 70 for WebPAM PROe or page 216 for the CLU.

You can run PDM manually, See “Running PDM” on page 71 for WebPAM PROe or page 197 for the CLU.

After the data is copied from the suspect disk drive, the controller marks it with a Stale configuration and a PFA error.

You can clear the Stale configuration and PFA error and put the disk drive back into service. See “Clearing Stale and PFA Conditions” on page 135 for WebPAM PROe or page 187 for the CLU. In some cases, however, you might remove the disk drive for repair or replacement.

PDM Triggers

The following actions trigger PDM:

- A SMART error
- The reassigned block count exceeds the threshold value
- The error block count exceeds the threshold value
- You initiate PDM manually

The Bad Block Manager counts the reassigned blocks as reported by the disk drives. Media Patrol finds and counts for media error blocks. You can specify the number of:

- Reassigned blocks for the BBM Threshold
- Error blocks for the Media Patrol Threshold

See “Making Background Activity Settings” on page 70 (WebPAM PROe) or page 216 (CLU).

During data migration, you have access to the Logical Drive but it responds more slowly to read/write tasks because of the additional operation. The time required for data migration depends on the size of the disk drives.

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.

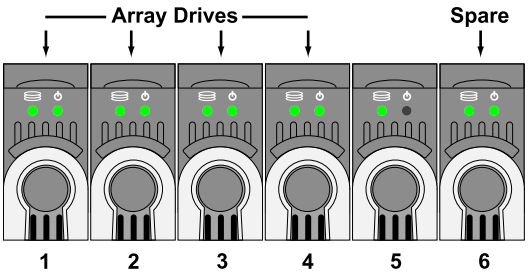
  See page 161 (WebPAM PROe) or page 201 (CLU).
- A physical drive assigned to your disk array fails and the array goes critical or degraded.
- VTrak automatically rebuilds your array to the revertible spare drive and the array becomes functional again.
- You replace the failed physical drive with a new 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.

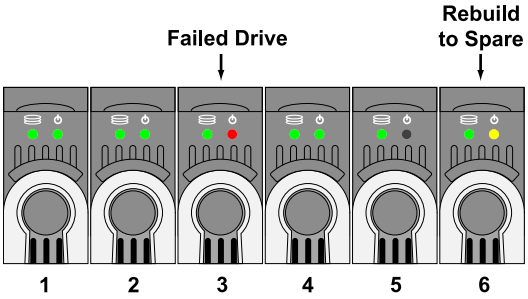
See the example below.

Example

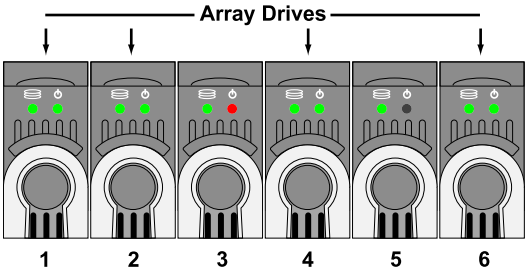
Following is an example to explain the Transition function.



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.

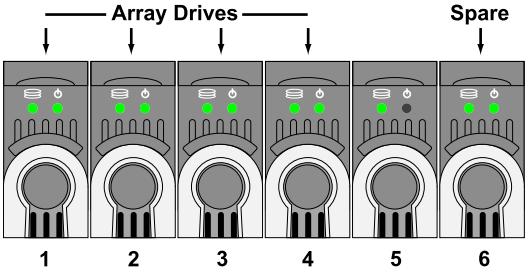


When the rebuild is complete, the spare drive has replaced the failed drive. In this example, failed drive 3 was replaced by spare drive 6. The disk array now consists of physical drives 1, 2, 4, and 6.

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.



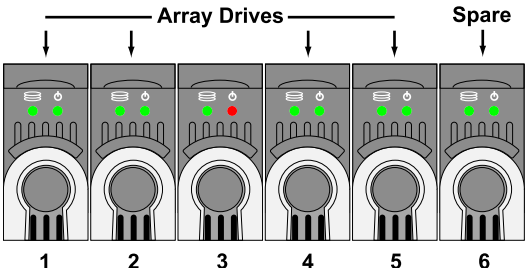
When the VTrak controller detects the new drive in slot 3, it will:

- Automatically transition the data on drive 6 to drive 3
- Return 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 page 151 (WebPAM PROe) or page 198 (CLU).



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 will be unconfigured until you assign it to a disk array or as a spare.

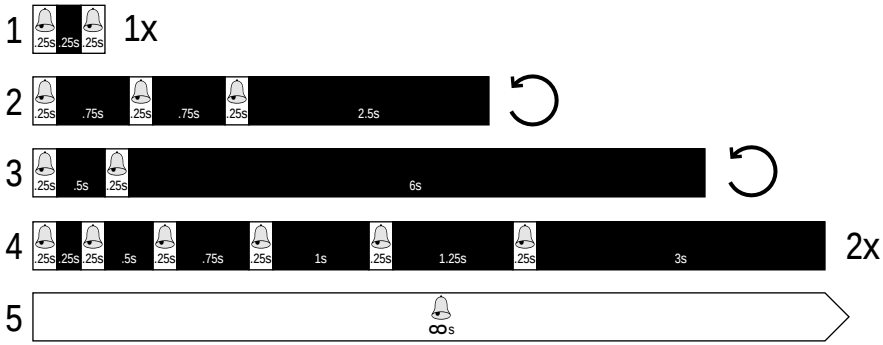
Chapter 8: Troubleshooting

This chapter covers the following topics:

VTrak is Beeping

VTrak's alarm has five different patterns, as shown below.

Figure 1. Audible alarm sound patters



When you first power-up the VTrak, it beeps twice to show normal operation.

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 for red or amber LEDs, as described above.
- If email notification is enabled, check for new messages.
- Check for yellow !s red Xs in Tree View (see page 318).
- Check the event log. See page 66 (WebPAM PROe) or page 218 (CLU).

When a continuous tone sounds, there are multiple alarm patterns sounding at the same time.

Silencing the Buzzer

To silence the buzzer for the current trigger event:

1. Click the Buzzer  icon in the WebPAM PROe Header.

   The Buzzer tab appears in Management View.
2. Click the **Mute** button.

The buzzer goes silent and the icon disappears. If another trigger event occurs, the buzzer will sound again.

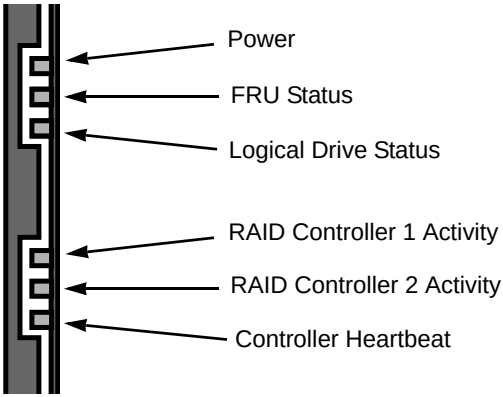
To make alarm settings or cancel an alarm, see page 129 (WebPAM PROe) or page 247 (CLU).

LEDs Display Amber or Red

Front Panel

When the power is switched on, the LEDs on the front of the VTrak will light up.

Figure 2. VTrak front panel LED display. The E310f/s is shown. the E610f/s is similar



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

- Controller Heartbeat LED blinks once every two seconds.
- Power, FRU and Logical Drive LEDs display green continuously.
- The RAID Controller LEDs flash green if there is activity on that controller.

See the table below.

LEDs	State				
	Dark	**Steady Green**	**Flashing Green**	**Amber**	**Red**
Power	System Off	Normal	—	—	—
FRU*	System Off	Normal	—	Fan, battery or PSU Problem	Fan, battery or PSU Failed
Logical Drive	System Off	Normal	—	Logical Drive Critical	Logical Drive Offline
Controller Activity	No Activity	—	Activity	—	—
Controller Heartbeat	System Off	—	Normal**	—	—

* Field Replacement Unit: includes fan, battery, and power supply unit (PSU).

** Blinks once every two seconds.

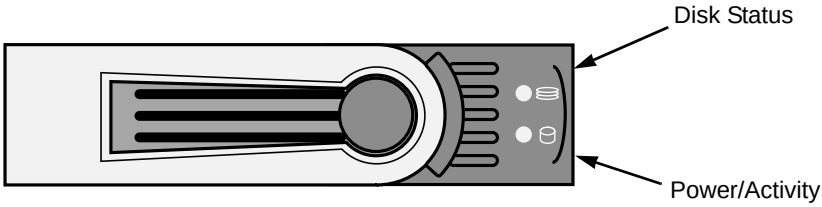
See page 249 for more information about field-replaceable components.
See page 339 for a discussion of critical and offline logical drives.

Drive Status Indicators

There are two LEDs on each Drive Carrier. They report the presence of power and a disk drive, and the current condition of the drive.

The VTrak spins up the disk drives sequentially in order to equalize power draw during start-up. After a few moments the Power/Activity and Disk Status LEDs should display green.

Figure 3. VTrak drive carrier LEDs



LEDs	State				
	Dark	**Steady Green**	**Flashing Green**	**Amber**	**Red**
Power/ Activity	No Drive	Drive Present	Activity	—	—
Status	No Power/ No Drive	Drive OK	—	Drive Rebuilding	Drive Error

See “Critical & Offline Disk Arrays” on page 339 for a discussion of rebuilding and failed disk drives.

Back of Enclosure

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.

Figure 4. VTrak E610f rear view

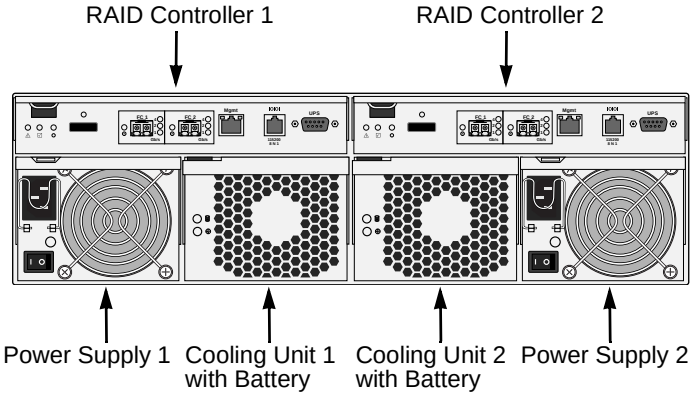


Figure 5. VTrak E610s rear view

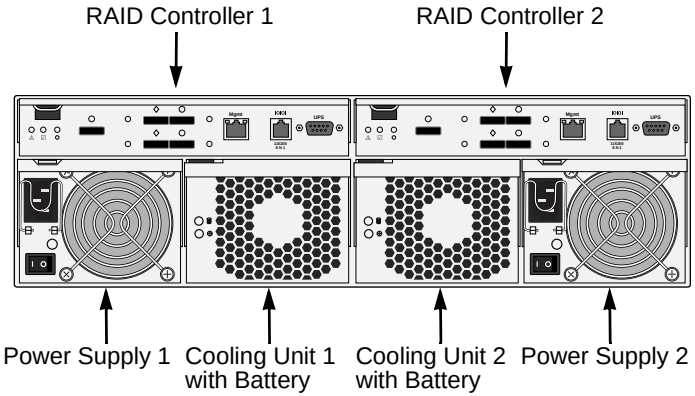


Figure 6. VTrak E310f rear view

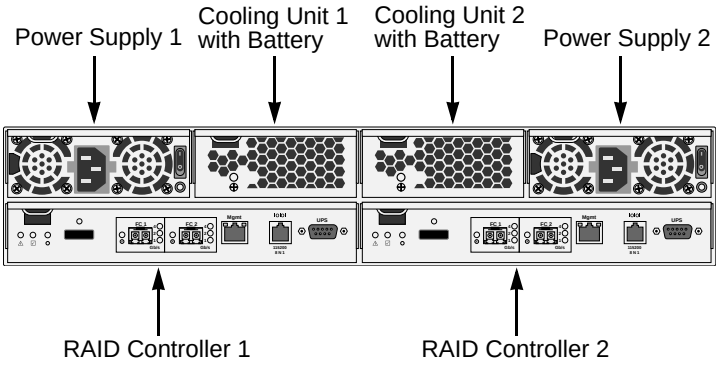


Figure 7. VTrak E310s rear view

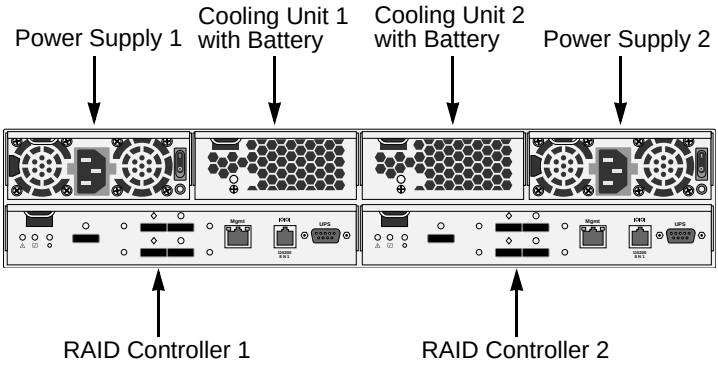
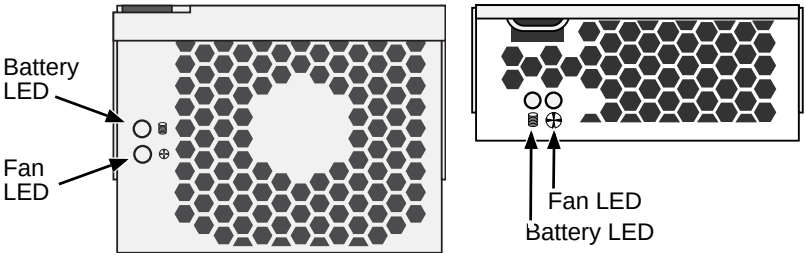


Figure 8. Battery and Fan LEDs (left: E610f/s, right: E310f/s)



Under normal conditions, the power supply and fan LEDs should display green.

LEDs	State		
	Green	Amber	Red
Power supply	OK	—	No power, Failed
Battery	OK	Less than 72 hours reserve	Not detected, Not present, Failed
Fan	OK	—	Not detected, Failed

To check a component's installation, follow the same procedure as replacing the component, except that you reinstall the original component rather than a new one. 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 249 for instructions.

The Controller Location LEDs, on the back of the VTrak subsystem, will flash for one minute.

Figure 9. The VTrak E610f/E310f controller LEDs

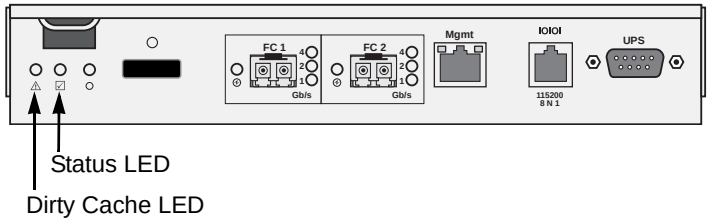
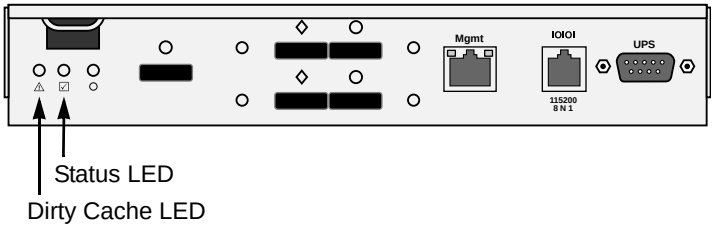


Figure 10. The VTrak E610f/E310s controller LEDs



Under normal conditions, the Controller Status LED (marked with ☑ icon) is green and the Dirty Cache LED (marked with ⚠) icon is dark. See the table below.

LEDs	State				
	Dark	**Green**	**Amber**	**Flashing Amber**	**Flashing Red**
Status	no power	OK	Surviving	—	Maintenance Mode
Dirty Cache	OK	—	Unsaved data in cache	OK	—

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 "Controller Enters Maintenance Mode" on page 348.

If the Controller Status LED continues to display amber after startup, contact Promise Technical Support. See "Contacting Technical Support" on page 359.

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. See "Browser Does Not Connect to WebPAM PROe" on page 354 for more information.

CLU Reports a Problem

The CLU reports information passively—you must determine which functions to check based on the sound of the VTrak's audible alarm (see page 307) and any amber or red LEDs (see page 309).

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 – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
   - 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.

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 Table 1 on page 316
   - 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.

Table 1 Event severity levels

Level	Meaning
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

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

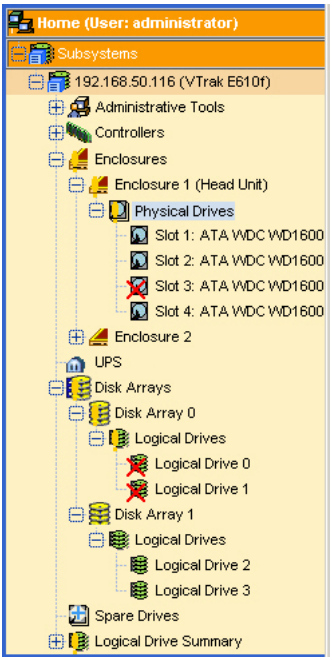
For more information, see “Critical & Offline Disk Arrays” on page 339.

WebPAM PROe Reports a Problem

WebPAM PROe aids in troubleshooting your logical drives and enclosure by continuous monitoring and reporting to the User in the following ways:

- Displays yellow !s red Xs in Tree View.

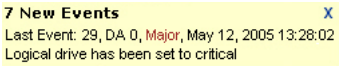
Figure 11. Yellow !s and red Xs in Tree View



- Sends email messages, per your configuration.
- Displays popup messages, per your configuration.

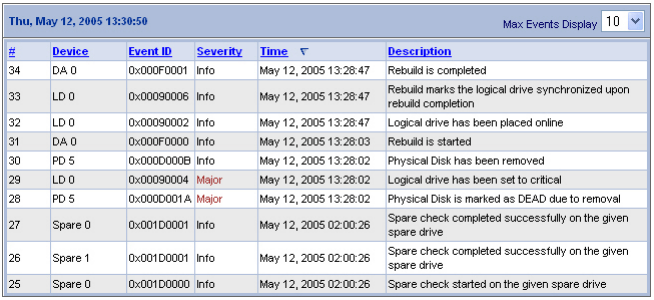
To set up email and popup message notification, see “Setting-up Event Notification” on page 77.

Figure 12. An example of a popup message



- Keeps a record in the Event Log.

Figure 13. The Event Log

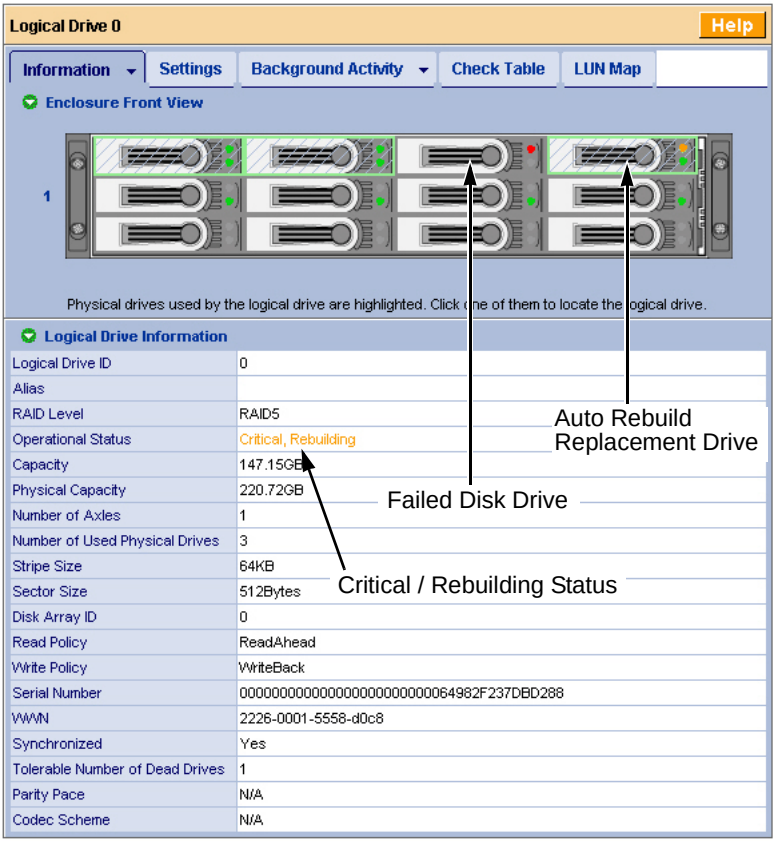


Thu, May 12, 2005 13:30:50 — Max Events Display: 10

#	Device	Event ID	Severity	Time	Description
34	DA 0	0x000F0001	Info	May 12, 2005 13:28:47	Rebuild is completed
33	LD 0	0x00090006	Info	May 12, 2005 13:28:47	Rebuild marks the logical drive synchronized upon rebuild completion
32	LD 0	0x00090002	Info	May 12, 2005 13:28:47	Logical drive has been placed online
31	DA 0	0x000F0000	Info	May 12, 2005 13:28:03	Rebuild is started
30	PD 5	0x000D000B	Info	May 12, 2005 13:28:02	Physical Disk has been removed
29	LD 0	0x00090004	Major	May 12, 2005 13:28:02	Logical drive has been set to critical
28	PD 5	0x000D001A	Major	May 12, 2005 13:28:02	Physical Disk is marked as DEAD due to removal
27	Spare 0	0x001D0001	Info	May 12, 2005 02:00:26	Spare check completed successfully on the given spare drive
26	Spare 1	0x001D0001	Info	May 12, 2005 02:00:26	Spare check completed successfully on the given spare drive
25	Spare 0	0x001D0000	Info	May 12, 2005 02:00:26	Spare check started on the given spare drive

- Keeps a record in the Event Log.
- Displays full information in Management View.

Figure 14. A failed disk drive shown in Management View



Also see these troubleshooting topics:

- “Event Notification Response” on page 321
- “Critical & Offline Disk Arrays” on page 339
- “Frequently Asked Questions” on page 357

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-up Event Notification” on page 77.

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 w/o 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 AAMUX 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 345.
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.
Backend expander firmware upgrade is started	No action is required.
Backend expander firmware upgrade is completed	
Backend expander firmware upgrade failed	Try the update again. If this message repeats, contact Tech Support.
Frontend expander firmware upgrade is started	No action is required.
Frontend expander firmware upgrade is completed	
Frontend 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.
ogical 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 phyiscal 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 AAMUX adapters are installed on all SATA drives.
Single Ported Physical disk seen by Partner controller not seen here	Install an AAMUX 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 aynchronization 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.

Critical & Offline Disk Arrays

A fault-tolerant disk array—RAID 1, 1E, 5, 10, and 50—goes *critical* when a disk drive is removed or fails. A RAID 6 or 60 disk array—goes *degraded* when a disk drive is removed or fails and *critical* when two disk drives are removed of fail.

Due to the fault tolerance of the disk array, the data is still available and online. However, once the disk array goes critical, the disk array has lost its fault tolerance, and performance may be adversely affected.

If the fault was caused by a failed drive that was removed, the drive must be replaced by another drive, either identical or larger, in order for the RAID system to rebuild and restore optimal configuration.

If your fault-tolerant disk array—RAID 1, 1E, 5, 6, 10, 50, and 60— goes *offline*, contact Promise Technical Support. See “Contacting Technical Support” on page 359.

Warning

Take no further corrective action until you have consulted with Promise Technical Support.

A non-fault tolerant disk array—RAID 0—goes *offline* when a disk drive is removed or fails. Since the disk array is not fault tolerant, the data stored in the disk array is no longer accessible.

If one disk drive fails, all of the data on the disk array is lost. You must replace the failed drive. Then, if the disk array had more than one disk drive, delete the disk array and re-create it. Restore the data from a backup source.

When a Physical Drive Fails

VTrak provides both audible and visual indicators to alert you of a disk drive failure. The following events occur when a disk drive fails or goes offline:

- The Logical Drive LED changes from green to amber. See page 309.
- The Disk Carrier Status LED changes from green to red. See page 310.
- The audible alarm repeatedly sounds two short beeps. See page 307.
- WebPAM PROe reports the condition. See page 318.

Also see “Physical Drive Problems” on page 343.

With a Hot Spare Drive

When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array will begin to rebuild automatically using the spare drive.

After the disk array rebuilds itself using the spare drive, you must replace the failed drive.

To set up a spare drive, see “Creating a Spare Drive” on page 161 (WebPAM PROe) or page 201 (CLU).

Without a Hot Spare Drive

If there is no hot spare drive of adequate capacity, you must remove the failed drive and install an unconfigured replacement drive of the same or greater capacity in the same slot as the failed drive. Until you install the replacement drive, the logical drive will remain Degraded.

- If the Auto Rebuild function is ENABLED, the disk array will begin to rebuild automatically as soon as you replace the failed drive.
- If the Auto Rebuild function is DISABLED, you must manually rebuild the disk array after you replace the failed drive.

To enable Automatic Rebuild, see “Making Background Activity Settings” on page 70 (WebPAM PROe) or page 216 (CLU).

To set Hot Spare Policy, see “Making Spare Drive Settings” on page 162 (WebPAM PROe) or page 202 (CLU).

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 Stale and PFA Conditions” on page 135 (WebPAM PROe) or page 187 (CLU).

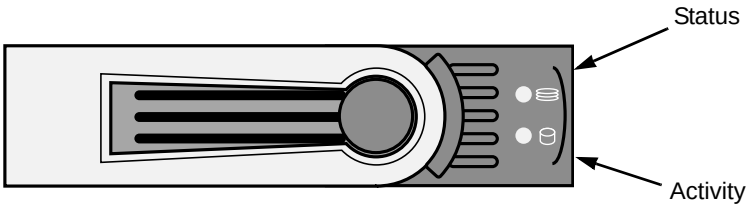
Rebuild Operation

During rebuild:

- The alarm sounds a single short beep, repeated
- No warning icon displays over the Disk Array or Logical Drive in the Tree.

  Management View reports the Disk Array’s Operational Status as OK, Rebuilding.
- The drive carrier holding the rebuilding physical drive displays a green Activity (lower) LED while the Status (upper) LED flashes green once per second.

Figure 15. Drive carrier LEDs



During rebuilding, you can still read and write data to the logical drive. However, fault tolerance is lost until the Disk Array returns to OK (not-rebuilding) status.

After a successful rebuild:

- The alarm is silent
- The Disk Array's Operational Status as OK
- The rebuilt disk drive Status LED displays steady green

Incomplete Array

An incomplete array can result from any of the following conditions:

- The NVRAM watermark for the RAID level migration currently in progress is missing or cannot be found
- A physical drive goes missing during transport

See “Physical Drive Failed” on page 343 for more information.

When VTrak discovers an incomplete array, WebPAM PROe 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

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 Disk Drives” on page 15.

Accepting an Incomplete Array

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* or *degraded*, proceed with a rebuild. See “Rebuilding a Disk Array” on page 149 or page 196.
    - If the logical drives are *offline*, contact Technical Support. See “Contacting Technical Support” on page 359.
3. Restore your data from a backup source, if required.

The CLU displays the option *Accept Incomplete Array* on the Disk Array Info and Settings screen. Highlight the option and press Enter to accept the incomplete array.

Rejecting an Incomplete Array

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. See “Deleting a Disk Array” on page 145 or page 193.
    - Replace the missing physical drive.

Physical Drive Problems

Physical Drive Offline

Check the drive for:

- **PFA Condition** – Caused by a bad block or sector.
  See “Clearing Stale and PFA Conditions” on page 135 or page 187.
- **Stale Configuration** – Caused by obsolete array information on the physical drive. Identify the disk array to which the physical drive belongs. Then delete the disk array. See “Deleting a Disk Array” on page 145 or page 193.

  If the error condition remains on the physical drive, clear the error condition. See “Clearing Stale and PFA Conditions” on page 135 or page 187.

Physical Drive Not Usable

This condition occurs when you have:

- Two controllers in your VTrak subsystem and a SATA drive without an AAMUX adapter. See “AAMUX Adapter” on page 16.
- A missing or defective SAS cable between the VTrak subsystem and a JBOD enclosure.

Physical Drive Failed

When physical drive status shows *failed*, the physical drive cannot be repaired. You must replace the failed drive.

Physical Drive Fails during Migration

VTrak has two methods for migrating a disk array:

- **DDF** – The default setting. Slower but reliable
- **NVRAM** – An optional setting that requires special access. Faster but risks data loss

Normally, RAID level migration is done under the default Disk Data Format (DDF) setting. If a physical drive or the controller fails during migration, the disk array goes critical, and you can rebuild it. Migration under DDF can take up to several hours depending on the number and size of the physical drives and data input/output activity.

You can set the VTrak to migrate disk arrays under Non-Volatile Random Access Memory (NVRAM), a much faster process because it writes data to the memory in the controller. However, if a physical drive or the controller fails during migration, the logical drives will go offline and you will lose data. See “Incomplete Array” on page 342.

Because the setting for migration under NVRAM requires special access, most users will not encounter this condition.

Physical Drive Fails during Transport

Transport is the action of moving the physical drives of a disk array:

- To different slots in the same VTrak enclosure
- From one VTrak enclosure to another

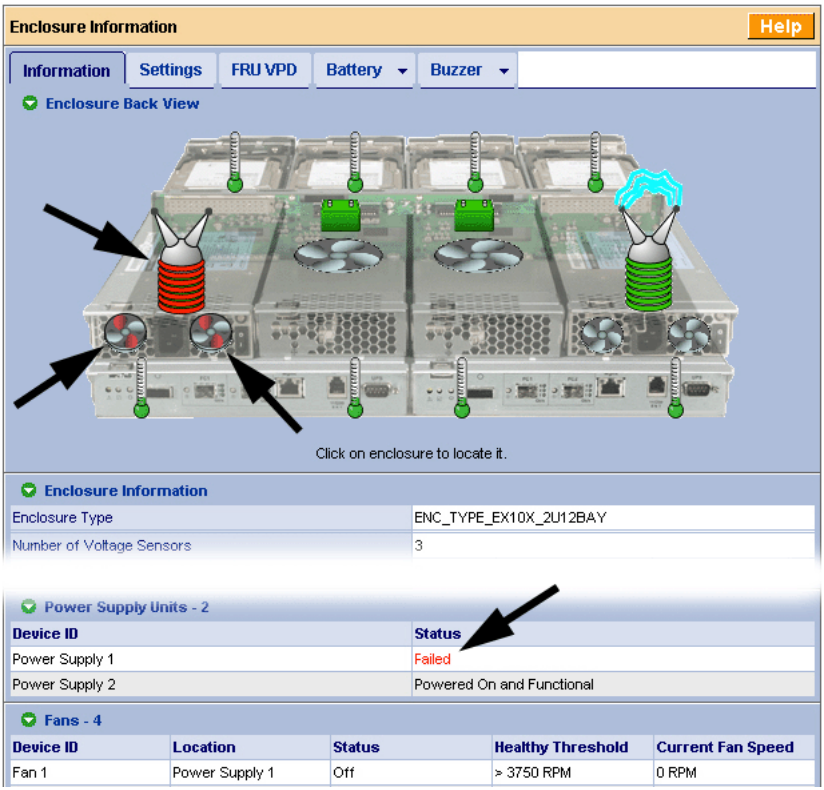
If a physical drive fails during a transport, or you do not move all of the physical drives to their new locations, WebPAM PROe will display an incomplete array. See “Incomplete Array” on page 342.

Enclosure Problems

WebPAM PROe displays yellow !s red Xs in Tree View to identify components that need attention.

When a yellow ! appears over a Subsystem in Tree View, click the Enclosure icon. The Enclosure screen displays. See Figure 16.

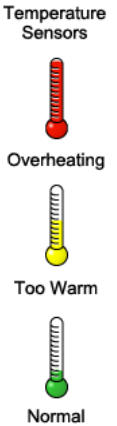
Figure 16. Enclosure information in Management View



In this example, a power supply has failed. The Enclosure Diagram displays color and motion changes to identify the failed power supply. In this case, you must replace the power supply. See “Replacing a Power Supply” on page 259.

Note that the image above was shortened to fit on the page.

Overheating



Overheating is a potentially serious condition because the excessively high temperatures can lead to disk drive failure and controller malfunction.

Overheating usually results from:

- Fan failure
- Poor air circulation around the enclosure

WebPAM PROe reports failed fans along with elevated temperature. On VTrak, there are two kinds of fans:

- Power supply
- Cooling unit

If a power supply fan fails, you must replace the power supply. If a cooling unit fan fails, you can remove the cooling unit and replace only the fan itself.

No tools are required for either procedure. See “Replacing a Power Supply” on page 259 and “Replacing a Cooling Unit Fan or Blower” on page 260.

Air circulation around the VTrak enclosure may 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 5 inches (13 cm) space between the back of the VTrak and the wall or other object
- Ambient temperature above 95°F (35°C) where the VTrak is operating

To cool down a VTrak:

- Correct any problems identified above
- Power it down and let it sit for an hour or longer

Power Supplies

OK

Replace Soon

Replace Now

VTrak subsystems are equipped with redundant power supplies. The advantage of dual power supplies is that, should one fail, the other will continue powering the subsystem until the faulty one can be replaced. The subsystem is capable of operating on a single power supply. As a result, if one power supply fails you must watch the front panel LEDs or WebPAM PROe in order to become aware of the condition.

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.

As noted above, if a power supply fan fails, you must replace the power supply. Without the fan to cool it, the power supply overheats and eventually fails anyway.

No tools are required for the procedure. See “Replacing a Power Supply” on page 259.

Battery

VTrak subsystems use a battery as backup power for 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 will correct a marginal or failed condition. The battery is located in the cooling unit above the controller. Remove the cooling unit for access. The battery is hot-swappable.

No tools are required for the procedure. See “Replacing a Cache Battery” on page 265.

Also see “Reconditioning a Battery” on page 128 or page 183.

Controller Enters Maintenance Mode

For VTraks with two controllers, one of the controllers will enter *maintenance mode* in the event of a problem with the controller. When a controller enters maintenance mode, it goes offline and it displays N/A (not accessible) under Readiness Status.

You must take the following actions:

- Find and correct the cause of the problem (see below)
- Take the controller out of maintenance mode (see page 349)

Finding and Correcting the Cause of the Problem

Make the following external checks to your VTrak system. Be sure that:

- Both controllers are present, fully inserted into their slots, and locked into place.
- The controllers match, meaning both are Fibre Channel or both are SAS.
- All data cables to external JBOD enclosures in good condition and are securely attached.

  A disconnected data cable to an external JBOD enclosure causes the two controllers to see a different set of configured drives. This condition is the most common cause of a controller entering maintenance mode.

If all external checks are OK, take the following actions:

1. Shut down the VTrak.
2. Remove one of the controllers.
3. Restart the VTrak.
4. After the VTrak is fully booted, access the CLI, the CLU, or WebPAM PROe.
5. Observe and record the following information about the first controller:
   - Memory size
   - Hardware version
   - Firmware version

   To view this information in WebPAM PROe, click the Controller  icon, **Information** tab.
6. Shut down the VTrak.
7. Remove the first controller and install the second controller.
8. Repeat steps 3 through 6.
9. Compare your records.
10. Correct any differences between the two controllers.

Taking a Controller out of Maintenance Mode

If you shut down the VTrak in the process of correcting the problem, the controller boots into normal mode when the VTrak restarts. No further action is required.

If you corrected the problem without shutting down the VTrak, choose one of the following methods to take the controller out of maintenance mode:

- Reboot the VTrak
- Establish a serial connection, then use the CLI (see below)
- Establish a Telnet connection, then use the CLI (see page 350)

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.

Connection Problems

When you install your Promise product following the instructions in the *Quick Start Guide* and this *Product Manual*, you should have little trouble getting your equipment to work the first time. But connection problems can arise that are not the User's or Installer's fault. Every conceivable problem cannot be covered in this documentation but some guidelines could be helpful.

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 will 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 39. This issue is discussed further under Network Connections, below. See “Setting Up Serial Cable Connections” on page 36 for more information on making the connection.

The CLI and CLU control and manage but they do not move data. They communicates through a null-modem cable, supplied with the VTrak. A straight-through serial cable will not work for this purpose. You may choose not use the CLI or CLU often and want to disconnect and store the cable. Consider leaving it connected, to be sure it will be there when you need it.

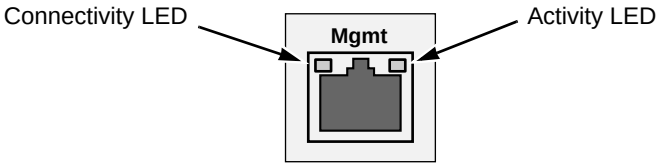
Network Connections

Each 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 39.

Figure 17. Management port connection on the RAID controller



LEDs	State			
	Dark	Amber	Green	Flashing Green
Connectivity	10BaseT	1000BaseT	100BaseT	
Activity	No activity			Activity

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 initiator(s). See “Viewing Fibre Channel Initiators” on page 88 or page 213.

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 84 or page 210.

SAS Connections

Faulty SAS connections are suspected when the link port counter reports a large number of bad link errors. See “Viewing SAS Port Statistics” on page 91 or page 215.

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 head and JBOD subsystems.
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 head and JBOD subsystems.
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 166.

2. At the administrator@cli> prompt, type the following command and press Enter.

   ```
   sasdiag -a errorlog -l expander -e 1 -i 1
   ```

3. At the administrator@cli> prompt, type the following command and press Enter.

   ```
   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 "Setting up the Serial Connection" on page 39 and "Logging into WebPAM PROe" on page 46.

Unsaved Data in the Controller Cache

An LED (marked with the ⚠ icon) is provided to inform 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 disk drive.

Figure 18. The VTrak E610f/E310f dirty cache LED

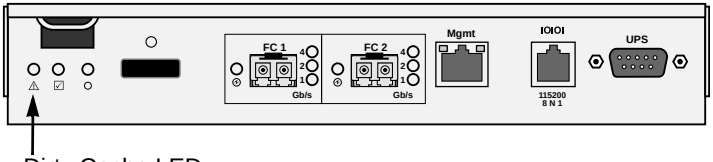
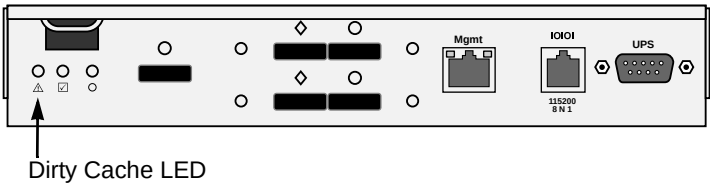


Figure 19. The VTrak E610s/E310s dirty cache LED



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 will goes dark.

Chapter 9: Support

This chapter covers the following topics:

- Frequently Asked Questions (below)
- Contacting Technical Support (page 359)
- Limited Warranty (page 362)
- Returning the Product For Repair (page 364)

Frequently Asked Questions

What kind of disk drives can I use with VTrak?

VTrak supports 1.5 and 3.0 GB/s Serial ATA disk drives and 3.0 Gb/s SAS drives. VTrak E-Class does not support Parallel ATA (PATA) disk drives.

How can I tell when the VTrak has fully booted?

When the VTrak is fully booted up, the Power and FRU LEDs will light up green. If a disk array is present, the Logical Drive LED will light up green also. The Controller heartbeat LED blinks once every two seconds.

Why does VTrak come with a Command Line Utility?

First, to assign your VTrak an IP address in order for the WebPAM PROe management software to connect to it. Second, in the event of a network failure, you can still access the VTrak. Third, some users prefer the Command Line Utility.

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 page 135 or page 187.

WebPAM PROe was working OK. But then it timed out. What do I do now?

The network connection can time-out for several reasons. When an open connection has no action for a specific amount of time, the connection times-out automatically for security reasons. When you attempt to use WebPAM PROe, it returns to the login screen.

At the login screen, all you need to do is click the **Login** button.

Have your administrator change the Web Server session timeout interval. See “Making Web Server Settings” on page 100 or page 230.

With other Promise VTraks, I used a server's IP address in WebPAM PRO to connect with the RAID subsystem. Why is this 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?

On VTrak, 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 "Introduction to RAID" on page 273 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 "Choosing Sector Size" on page 287 or 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.

Remotely: Check the Tree Icons in WebPAM. If there are no yellow or red 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.

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 “Critical & Offline Disk Arrays” on page 339.

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.

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.

If you decide to 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 model(s), SAS/SATA/ATA/ATAPI drives & devices, and other controllers.

Technical Support Services

Promise Online™ Web Site	http://www.promise.com/support/support_eng.asp. (technical documents, drivers, utilities, etc.)

United States

E-mail Support	e-Support On-Line
Fax Support	+1 408 228 1100 Attn: Technical Support
Phone Support	+1 408 228 1400 option 4
If you wish to write us for support:	Promise Technology, Inc. 580 Cottonwood Drive Milpitas, CA 95035, USA

The Netherlands

E-mail Support	e-Support On-Line
Fax Support	+31 0 40 256 9463 Attn: Technical Support
Phone Support	+31 0 40 235 2600
If you wish to write us for support:	Promise Technology Europe B.V. Science Park Eindhoven 5542 5692 EL Son, The Netherlands

Germany

E-mail Support	e-Support On-Line
Fax Technical Support	+49 0 2 31 56 76 48 29 Attn: Technical Support
Phone Technical Support	+49 0 2 31 56 76 48 10
If you wish to write us for support:	Promise Technology Germany Europaplatz 9 44269 Dortmund, Germany

Italy

E-mail Support	e-Support On-Line
Fax Support	+39 0 6 367 124 00 Attn: Technical Support
Phone Support	+39 0 6 367 126 26
If you wish to write us for support:	Promise Technology Italy Piazza del Popolo 18 00187 Roma, Italia

Taiwan

E-mail Support	e-Support On-Line
Fax Support	+886 3 578 2390 Attn: Technical Support
Phone Support	+886 3 578 2395 ext. 8822 or 8823
If you wish to write us for support:	Promise Technology, Inc. 2F, No. 30, Industry E. Rd. IX Science-based Industrial Park Hsin-Chu 30075, Taiwan (R.O.C.)

China

E-mail Support	e-Support On-Line
Fax Support	+86 10 8857 8015 Attn: Technical Support
Phone Support	+86 10 8857 8085 or 8095
If you wish to write us for support:	Promise Technology China – Beijing Room 1205, Tower C Webok Time Center, No.17 South Zhong Guan Cun Street Hai Dian District, Beijing 100081, China

E-mail Support	e-Support On-Line
Fax Support	+86 21 6249 4627 Attn: Technical Support
Phone Support	+86 21 6249 4192, 4193, or 4199
If you wish to write us for support:	Promise Technology China – Shanghai Room 508, Leader Tower 1189 West Wu Ding Road Jing An District, Shanghai 200042, China

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 through one of our Technical Services, making sure 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 will assist you in determining whether the product requires repair. If the product needs repair, the Technical Support Department will issue 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, diskettes, 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 will be under warranty for the remainder of the original warranty term from purchase date, or 30 days, whichever is longer.

Promise will pay for standard return shipping charges only. You will be required to 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 Controller (page 367)

SNMP MIB Files

Promise supplies two MIB files to integrate the VTrak E610f/s or E310f/s subsystem into your SNMP system. These files are in the SNMP folder on the VTrak Product 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 Controller

If your VTrak E-Class subsystem shipped with one controller, you can add a second 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 this information for the currently installed controller, click the Controller  icon, **Information** tab, and look for Firmware Version and Memory Size.

Obtain your second controller though Promise Technology. Promise Support will prepare the new controller with Firmware and SDRAM to match your current VTrak subsystem.

When you order the second controller, you should also order a second cache battery to power the new controller's cache in the event of a power failure.

The VTrak subsystem boots its controllers sequentially. With a second controller installed, your subsystem will take about a minute longer to boot. This condition is normal.

Installing a Second Controller

To install a second controller in your VTrak subsystem:

1. Shut down the subsystem.
2. Remove the blank cover from the right controller slot.

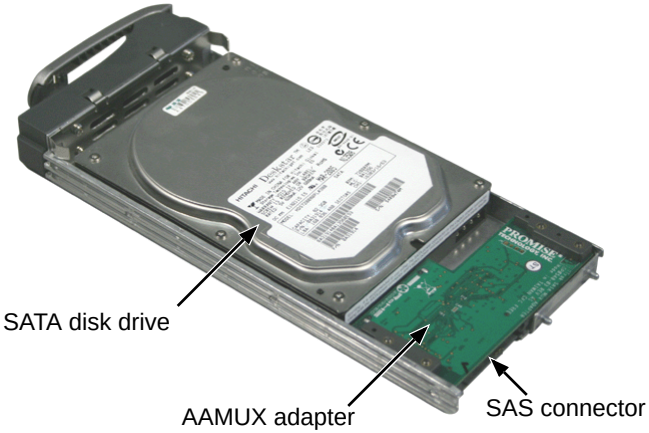
3. Carefully slide the new controller into the slot until the handle locks in place.
4. Attach your data and management cables to the new controller, as needed.

   See the “Making Management and Data Connections” on page 19 for cable connection information.
5. Power up the subsystem and launch WebPAM PROe.
6. Click the Controllers icon in the Tree, then look at the Information tab in Management view.
   - If both controllers’ Operational Status is OK, the installation was successful.
   - If one of the controller’s Operational Status is N/A, that controller went into maintenance mode. See page 348.
7. With the second controller successfully installed, make the following settings:
   - Redundancy Type to Active-Active or Active-Standby. See page 64 or page 172.
   - LUN Affinity if you choose Active-Active redundancy. See page 122 or page 177.

Dual Controllers and SATA Drives

If your VTrak subsystem has SATA disk drives installed, you must install an AAMUX adapter on each of the SATA drives. Without the AAMUX adapter, SATA drives display *Not Usable* under Operational Status.

Figure 1. SATA drive mounted in a drive carrier with the AAMUX adapter



Obtain AAMUX adapters though Promise Technology. Also see “Installing Disk Drives” on page 15.

Installing a Second Cache Battery

The cache battery comes as an assembly, with attaching screws and a wiring harness. Install the new cache battery into the cooling unit above the new controller.

To install a new cache battery:

1. On the cooling unit above the new controller, press the release button and pull the handle downward.
2. Pull the cooling unit out of the VTrak enclosure.
3. Loosen the thumbscrews. A retainer keeps the thumbscrews in place.
4. Grasp the top section near the thumbscrews and lift it off the bottom section.
5. Place the battery assembly into the bottom section of the cooling unit as shown in Figure 2 (E610f/s) and Figure 3 (E310f/s).
6. Install the two screws that came with the battery assembly as shown.
7. Attach the wiring harness from the battery assembly to the circuit board in the cooling unit as shown.

Figure 2. IE610f/s cache battery installation

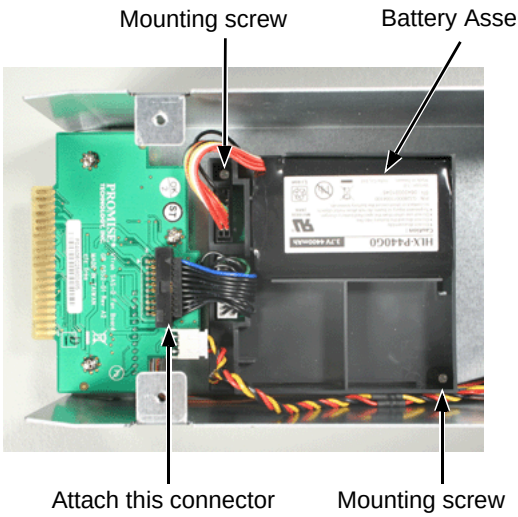
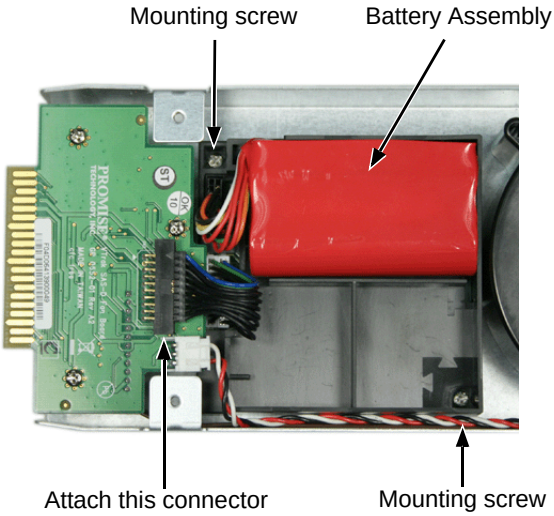


Figure 3. E310f/s cache battery installation



8. Place the top section of the cooling unit onto the bottom section and tighten the thumbscrews.
9. Carefully slide the cooling unit into the enclosure.
10. Gently press the handle in and upward until it locks.

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 2003 Server and 2008 Server operating systems, on both x86 and x64 platforms.

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.
- Have Microsoft .NET Framework v2.0 or later installed on your system.

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 the Promise website at http://www.promise.com/support/support_eng.asp 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 391.

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” on page 140 or page 189 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 *Programs* > *PerfectPath* > *PerfectPath View*.

The PerfectPath View software starts.

Services List

To verify PerfectPath installation in the Services list:

1. From the Windows desktop, right click the **My Computer** icon and choose *Manage* from the dropdown menu.
2. In the Computer Management tree, click the **+** icon beside Services and Applications.
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.

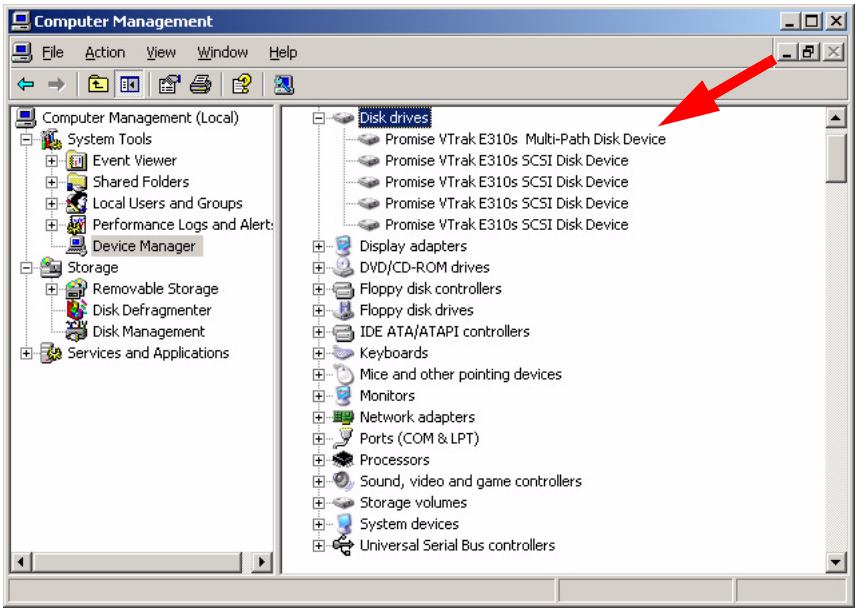
Device Manager

To verify PerfectPath installation in the Device Manager:

1. From the Windows desktop, right click the **My Computer** icon and choose *Manage* from the dropdown menu.
2. In the Computer Management tree, click the **Device Manager** icon.
3. In the Computer Management window, click **Disk drives**.

4. Under Disk drives, look for “Promise VTrak Multi-Path Disk Device” at the top of the Disk drives list. See Figure 1.

Figure 1. Look for “Promise VTrak Multi-Path Disk Device”



When properly installed, the PerfectPath DSM driver displays one “Multi-Path Disk Device” for each LUN on the VTrak. In the example above, there is one LUN and four data paths.

Note that the individual paths for each LUN are also displayed on the screen, below the Multi-Path Disk Device. If there are multiple LUNs, all of the Multi-Path Disk Devices are displayed at the top of the list.

Note also that Individual LUNs are shown as SCSI Disk Devices, even though the actual data connection is over Fibre Channel or SAS.

Running Perfect Path View

Running PerfectPath View includes these functions:

- Starting PerfectPath View (page 375)
- Quitting PerfectPath View (page 375)

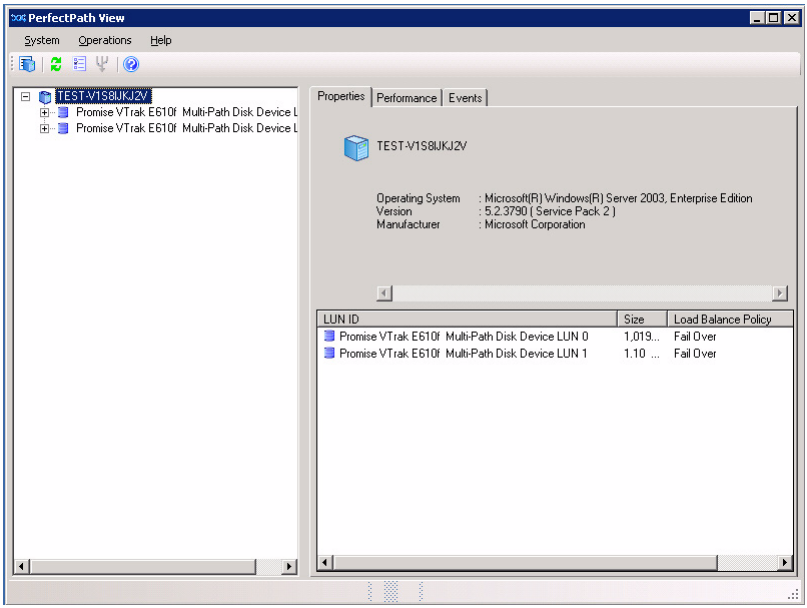
Starting PerfectPath View

To start PerfectPath View:

From the Start menu, choose *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 376)
- Viewing Path Properties (page 378)
- Viewing LUN Performance Statistics (page 379)
- Viewing Path Performance Statistics (page 379)
- Viewing Path Performance Statistics (page 379)
- Viewing Events (page 381)

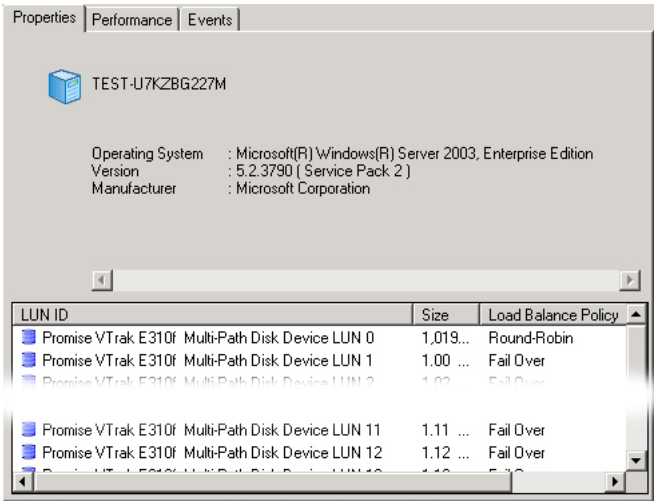
Viewing LUN Properties

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



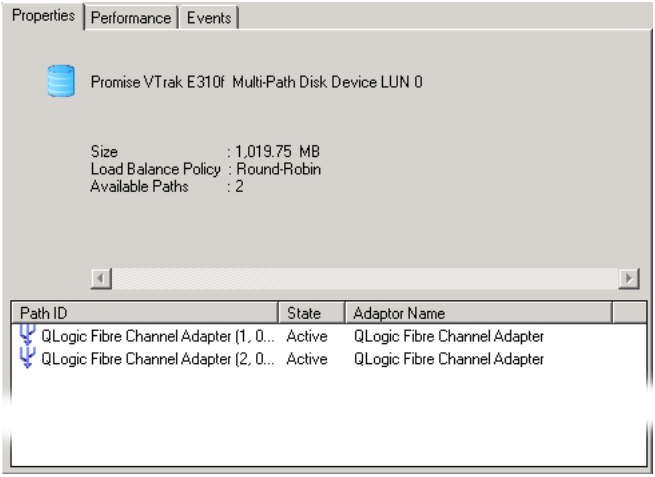
Move the scroll bar or expand the window to see all of the reported information.

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 383
- “Refreshing the Objects” on page 387

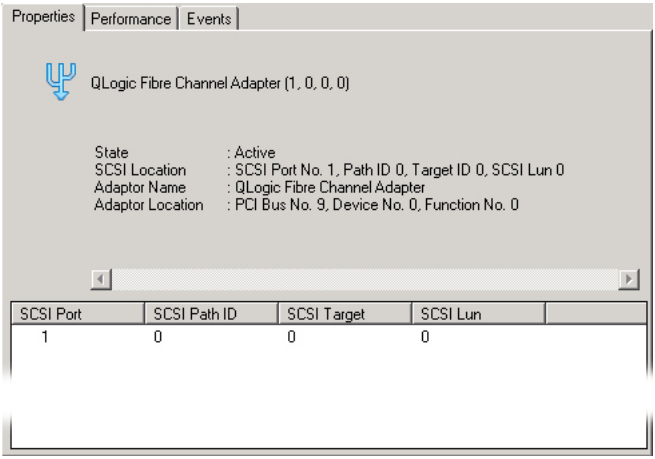
Viewing Path Properties

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:

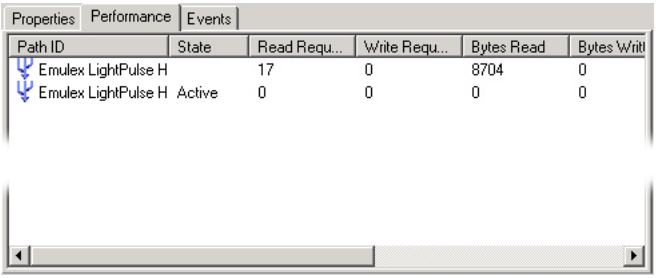
- “Load Balance Policy” on page 383
- “Refreshing the Objects” on page 387

Viewing LUN Performance Statistics

To view performance statistics for a LUN:

1. Click a 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:

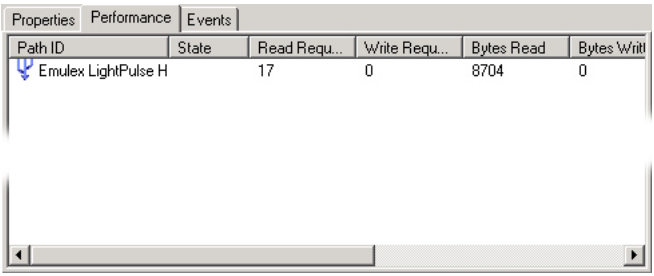
- “Viewing Path Performance Statistics” on page 379
- “Load Balance Policy” on page 383

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.

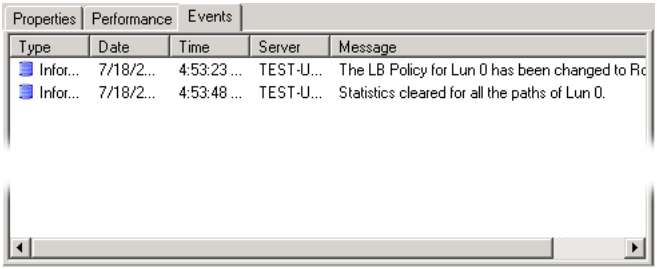
See also:

- “Viewing Path Performance Statistics” on page 379
- “Load Balance Policy” on page 383

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 382
- “Load Balance Policy” on page 383
- “Path Verification” on page 384
- “PDO Removal” on page 385
- “Refreshing the Objects” on page 387

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 on 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 376.
- “Viewing LUN Performance Statistics” on page 379.
- “Load Balance Policy” on page 383.

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 382.
- **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.
- **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.
- **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 382.

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 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 386.
- “Refreshing the Objects” on page 387.

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 383.
- “PDO Removal” on page 385.
- “Refreshing the Objects” on page 387.

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 384.

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 379.
- “Viewing Path Performance Statistics” on page 379.

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 *Advanced Settings*.

   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 383.
- “Viewing LUN Performance Statistics” on page 379.
- “Viewing Path Performance Statistics” on page 379.

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 382.
- “Load Balance Policy” on page 383.
- “Path Verification” on page 384.
- “PDO Removal” on page 385.

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.

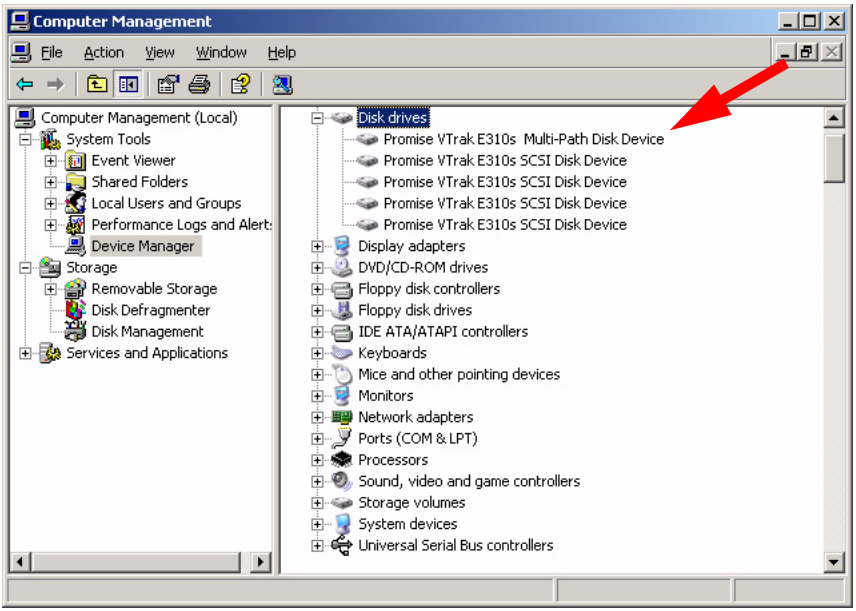
Troubleshooting

If you see no LUNs in the PerfectPath GUI, or no Multi-Path Disk Devices under Disk drives (see Figure 1), 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. Look for "Promise VTrak Multi-Path Disk Device"



Updating PerfectPath

To update your PerfectPath software to the latest version:

1. Download the new PerfectPath installation file from the Promise website at http://www.promise.com/support/support_eng.asp and save the installation file to your Windows desktop.
2. Manually remove the current PerfectPath installation.

   See “Removing PerfectPath” on page 392.
3. Install the new PerfectPath software.

   See “Installing PerfectPath” on page 372.

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

To remove the PerfectPath software:

1. From the Start menu, choose *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

To remove the PerfectPath software:

1. In the **Start** menu, choose **Settings**, then choose **Control Panel**.
2. In the Control Panel window, double-click the **Add or Remove Programs** icon.
3. In the Add or Remove Programs window, click **Perfect Path**, then click the **Remove** button.
4. In the Confirmation box, click the **Yes** button.
5. 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, 5.1, 5.2, 5.3, and 5.4; and SuSE SLES 10, 10 SP1, 10 SP2, 10 SP3, and 11. Coverage in this *Guide* is limited to those OSes.

Multipathing is possible on other Linux OSes, in some cases with certain limitations, kernel updates, or different versions of the device mapper or multipath tool. Promise has not tested all of the possible combinations and therefore does not attempt to cover them here.

Before You Begin

Before you can set up multipathing on your Linux Host PC, you must:

- Install your Fibre Channel or SAS HBA card and drivers into the Host PC.
- Set up your VTrak, install your disk drives, and create your logical drives.
- Attach your Fibre Channel or SAS cables from the HBA card to the VTrak.
- Install RHEL 5.x with the “linux mpath” Option.

Refer to the Linux Administration Manual, your HBA documentation, and the *VTrak Quick Start Guide* or *Product Manual* 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 the logical drives, your system is properly configured. Go to “Task 1: Meeting Package Requirements” on page 394.
- If you cannot see the 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
  - device-mapper-1.02.13-1.el5
  - device-mapper-multipath-0.4.7-8.el5
- For RHEL 5.1
  - device-mapper-1.02.20-1.el5
  - device-mapper-multipath-0.4.7-12.el5
- For RHEL 5.2
  - device-mapper-1.02.24-1.el5
  - device-mapper-multipath-0.4.7-17.el5
- 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 SLES 10
  - device-mapper-1.02.03-8.2.rpm
  - multipath-tools-0.4.6-25.8.rpm
- For SLES 10 SP1
  - device-mapper-1.02.13-6.9
  - multipath-tools-0.4.7-34.18
- 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

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:

   ```
   device-mapper-1.02.13-1.el5
   device-mapper-multipath-0.4.7-8.el5
   ```

   RHEL 5.1:

   ```
   device-mapper-1.02.20-1.el5
   ```

device-mapper-multipath-0.4.7-12.el5

RHEL 5.2:

device-mapper-1.02.24-1.el5

device-mapper-multipath-0.4.7-17.el5

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

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:

   device-mapper-1.02.03-8.2.rpm

   SLES 10 SP1:

   device-mapper-1.02.13-6.9

   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

   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:

multipath-tools-0.4.6-25.8.rpm

SLES 10 SP1:

multipath-tools-0.4.7-34.18

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

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 407.

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 – RedHat

This action requires RHEL installation with the “linux mpath” Option. See “Before You Begin” on page 393.

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.

Setting the Daemon to Run – SuSE

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 402.
   - 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 402.

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

Asymmetric Logical Unit Access (ALUA) is a new feature on VTrak. VTrak supports ALUA on the latest Linux distributions:

- RedHat Linux RHEL 5.4
- SuSE Linux SLES 10 SP3
- SuSE Linux SLES 11

Promise provides RPM packages and multipath.conf files for ALUA. See “RPM Packages and Documents for Linux MPIO” on page 405.

RedHat Linux RHEL 5.4

To support ALUA within RHEL 5.4 using the default kernel (without XEN or PAE support):

1. install the new **scsi_dh_alua** RPM package.

   ```
   #> rpm -ivh scsi_dh_alua_VTrak-1-1.i386(x86_64).rpm
   ```

2. Copy the Promise-supplied **multipath.conf** file to the /etc directory.

   ```
   #> cp multipath.conf-vtrak-alua-rhel5-4 /etc/multipath.conf
   ```

To support ALUA within RHEL 5.4 using XEN or PAE:

1. Rebuild the **scsi_dh_alua** file with the source RPM package.

   ```
   #> rpm -ivh scsi_dh_alua_VTrak-1-1.src.rpm
   #> cd /usr/src/redhat/SPEC
   #> rpmbuild -ba scsi_dh_alau.spec
   ```

2. Copy the Promise-supplied **multipath.conf** file to the /etc directory.

   ```
   #> cp multipath.conf-vtrak-alua-rhel5-4 /etc/multipath.conf
   ```

3. Check your file system architecture (x86_64/i386).

   ```
   #> uname -a
   ```

4. Move the rebuilt RPM package to the RPM directory.

   ```
   #> cd /usr/src/redhat/RPM/i386 (x86_64)
   ```

5. Install the rebuilt RPM package.

   ```
   #> rpm -ivh  scsi_dh_alua_VTrak-1-1.i386(x86_64).rpm
   ```

SuSE Linux SLES 10 SP3

To support ALUA within SLES10 SP3:

1. Do one of the following actions.
   - Remove the current multipath-tools package and install the new RPM package.

```
#> rpm -ev multipath-tools-xxx
#> rpm -ivh multipath-tools-0.4.7-
34.50.10.ass.fix.i586(x86_64).rpm
```

- Force install the new multipath-tool RPM package.

```
#> rpm -ivh -force multipath-tools-0.4.7-
34.50.10.ass.fix.i586(x86_64).rpm
```

2. Copy the Promise-supplied **multipath.conf** file to the /etc directory.

```
#> cp multipath.conf-vtrak-alua-sles10-sp3 /etc
multipath.conf
```

3. Set to run at boot time.

```
#> chkconfig multipathd on
#> chkconfig boot.multipath on
```

4. Check multipath status.

```
#> chkconfig multipathd
#> chkconfig boot.multipath
```

5. Reboot the VTrak.

SuSE Linux SLES 11

To support ALUA within SLES11:

1. Check your system architecture (x86_64/i386).

```
#> uname -a
```

2. Install the multipath-tool library RPM package.

```
#> rpm -ivh multipath-promise-suse11-0.4.8-
1.i586(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. Set to run at boot time.

```
#> chkconfig multipathd on
```

5. Check multipath status.

```
#> chkconfig multipathd
```

6. Reboot the VTrak.

RPM Packages and Documents for Linux MPIO

Promise provides RPM packages and multipath.conf files for Linux support on the support website: http://www.promise.com/support/support_eng.asp.

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 and instructions 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 package:

Linux Package	multipath-conf folder		Folder Contents
	ALUA folder	normal folder	
SLES10-SP2-prev	No	Yes	multipath.conf-vtrak-normal-sles10-sp2
SLES10-SP3	Yes	Yes	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 multipath-tools-alua-patch multipath-conf-vtrak-normal-sles10-sp3 multipath-conf-vtrak-alua-sles10-sp3 How to Configure MPIO SLES10-SP3.txt
SLES11	Yes	Yes	multipath-promise-suse11-0.4.8-i586.rpm multipath-promise-suse11-0.4.8-x86_64.rpm multipath-conf-vtrak-normal-sles11 multipath-conf-vtrak-alua-sles11 How to Configure MPIO SLES11.txt
RHEL-5.1-prev	No	Yes	multipath-conf-vtrak-normal-rhel5-1

RHEL-5.2	No	Yes	multipath-conf-vtrak-normal-rhel5-2
RHEL-5.3	No	Yes	multipath-conf-vtrak-normal-rhel5-3
RHEL-5.4	Yes	Yes	scsi_dh_alua_Vtrak-1-1.i386.rpm scsi_dh_alua_Vtrak-1-1.src.rpm scsi_dh_alua_Vtrak-1-1.x86_64.rpm multipath-conf-vtrak-normal-rhel5-4 multipath-conf-vtrak-alua-rhel5-4 How to Configure MPIO RHEL 5.4.txt

Linux MPIO: Known Issues

Item	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. To fix this problem, increase the value to 60 seconds.
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.

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 second value, 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 exsiting **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"
      }
}
```

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