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Preface

What is in this Manual

This manual provides information on preparing, installing, configuring, and using the Altos RAIDWatch management program to manage disk array systems incorporating Fibre-to-SATA controllers.

Altos RAIDWatch allows you to control and monitor disk array systems, either from a local host, or from a remote station connected through a local area network (LAN) or the Internet.

An independent monitoring program, Event Monitor, is bundled with newer release of this manager. The configuration and use of the program is discussed in Chapter 12 on page 157.

In addition to Altos RAIDWatch, you can also use the on-board RS-232 menu interface available for various operating systems to manage disk array systems incorporating disk array controllers. For information about these programs, see the documentation that comes with your hardware.

Who should use this Manual

This manual is intended for system administrators. Use this manual to:

- Gain a basic understanding of the Altos RAIDWatch software.
- Learn how to install, configure, and run the Altos RAIDWatch software in Linux, IRIX and Windows environments.
- Learn about hardware and software requirements.
- Learn how to use the GUI to operate the Altos RAIDWatch software.

Structure of this Manual

This user guide contains the following chapters and appendices:

- Chapter 1 , "Introduction", on page 1 Provides information about Altos RAIDWatch, including a product description, a features summary and highlights, and section on basic concepts.
- Chapter 2 , "Installation", on page 7 Discusses how to install Altos RAIDWatch in your systems. Discussions include the system requirements, setting up hardware, software installation, and how to update your software by downloading updates from the FTP site.
- Chapter 3 , "Configuration Options", on page 31 describes the Altos RAIDWatch configuration options. There are a number of different items that users can configure. These include primary and secondary agents and the Notification Processing Center.
- Chapter 4 , "Operation", on page 47 Discusses basic operations at system startup. These include starting Altos RAIDWatch, connecting and disconnecting from a disk array system,

setting up system security, display controls, working with various disk array windows, and exiting from the program.

- Chapter 5 , "Array Management", on page 71 Provides information on disk array management, including defining enclosures, setting the controller and channel configurations, scanning in drives, creating, expanding and deleting logical drives, assigning spare drives, rebuilding logical drives, creating and deleting logical volumes, defining volume partitions, mapping logical volumes to host LUNs, deleting LUN mappings, displaying the contents of the log file, and monitoring the disk array statistics.

- Chapter 6, "Controller Configuration", on page 75 describes those disk array controller configuration features and information displays which can be set or modified with Altos RAIDWatch Manager

- Chapter 7, "Channel Configuration", on page 85 describes those channel configuration features which can be set or modified with Altos RAIDWatch Manager

- Chapter 8, "Drive Management", on page 89 describes those drive management features which can be set or modified with Altos RAIDWatch Manager

- Chapter 9, "LUN Mapping", on page 121 explains LUN Mapping features, including accessing the LUN map table, mapping a complete Logical Drive or Logical Volume, deleting a host LUN mapping, Extended LUN mapping, adding a WWN name and deleting an Extended LUN Mapping or WWN Name.

- Chapter 10, "System Monitoring and Management", on page 135 describes system monitoring and management features, including SAF-TE, SES monitoring, defining enclosures, displaying the Event Log and monitoring statistics.

- Chapter 11, "The Notification Processing Center", on page 145 describes The "Notification Processing Center" (NPC), a notification application that enables users to configure notifications that are transmitted when various disk array events occur.

- Chapter 12 , "Event Monitor", on page 157 Describes how to use this monitoring utility as an all-time window onto system status.

- Appendix A , "Command Summary", on page 173 Summarizes the available commands and command buttons in Altos RAIDWatch.

- Appendix B, "Troubleshooting", on page 177 Provides troubleshooting tips for some problems you may encounter while using Altos RAIDWatch.

- Appendix C , "RAID Levels", on page 183 Provides information about the various RAID levels.

- , "Glossary", on page 189. Provides information and definitions of key technology terms used in this guide.

Conventions

This Getting Started guide uses several conventions to help explain how to use the Altos RAIDWatch management program.

Convention	Definition
Controller	RAID array controllers;
Altos RAIDWatch	The entire program and all of its modules.
Altos RAIDWatch Manager	Refers only to the management interface, not to any of the other parts of the software.
Primary Agent	The element of the software which permits one station to manage multiple RAID systems. The Primary Agent gets information from and sends commands to one or multiple Secondary Agents.
Secondary Agent	The part of the software which allows the local RAID controller to talk to the Primary Agent (and thus to Altos RAIDWatch Manager). A Secondary Agent communicates with the RAID controller via SCSI bus or Fibre channel (using "In-band" technology), or even via an RS-232 serial port. Secondary Agents are the intermediaries between the Primary Agent and the RAID controllers.
Event Monitor	A software utility that runs separately from Altos RAIDWatch Manager. It requires agents to communicate between controller and management station. It also shares with Altos RAIDWatch Manager a part of Java class. Therefore, Altos RAIDWatch Manager should be installed even if the user prefers Event Monitor. Hardware and software requirements for installing the program is the same as those for Altos RAIDWatch.

Reference Information

The following information may be useful in creating and operating a RAID controller and in using Altos RAIDWatch and Altos RAIDWatch Manager.

- *Java Runtime Environment*

  JRE (Java Runtime Environment) is a shareware product from Sun/Solaris. Two websites that may be of use relative to JRE are:

  The main Java website URL
  The JRE download website URL 1

- *Altos RAIDWatch Updates & Upgrading*

  Please contact your supplier for Altos RAIDWatch agent and Altos RAIDWatch Manager updates.

- *Uninstalling Altos RAIDWatch*

Altos RAIDWatch agents and Altos RAIDWatch Manager can be uninstalled. Choose the **Uninstall** icon in the Altos RAIDWatch group or type ***"uninstall"*** in the *usr/hybrid/bin* subdirectory under Unix-based systems

Revision History

1.0	May, 2004	Initial Release

Chapter 1
Introduction

This chapter provides information about the Altos RAIDWatch management program, including the following topics:

A.1 Product Description

The GUI RAID Manager, ***"Altos RAIDWatch,"*** is a Java-based program specifically designed for use in managing disk array systems implemented using standalone RAID controllers (GUI is an acronym of "Graphic User Interface.")

Altos RAIDWatch provides a user-friendly interface that facilitates understanding of the relationship between disk array elements and simplifies the normally complicated process of array configuration. Altos RAIDWatch also provides real-time reporting on the status of the entire array, thus making the task of monitoring disk arrays virtually effortless. Since the release of software revision 1.31, Event Monitor is supplemented for use with a constant monitoring of multiple disk arrays.

A.2 Feature Summary

The list below summarizes Altos RAIDWatch features.

- User-friendly graphical interface running under operating systems compatible with the Java Run-time Environment (JRE).

- Internet browser access to full program functionality provides worldwide management capability
- Supports Fibre-to-SATA RAID controllers (Altos S205F)
- Communicates with the controllers over a LAN, the Internet, over the SCSI bus or Fibre channel
- Supports multiple instances of RAID managers over the network, allowing multiple management sessions with a disk array system
- Illustrates graphically and clearly the relationship between various disk array elements
- At a glance monitoring of the entire disk array status by Altos RAIDWatch and constant monitoring of multiple systems by Event Monitor
- Supports remote management over the network of an agent running Windows, Solaris, or Linux via the TCP/IP protocol (future versions will support additional protocols)
- Provides standard disk array functions, including examining and modifying controller configuration; viewing and monitoring configuration and status of physical drives; scanning in new physical drives; creating, deleting, and monitoring configuration and status of logical drives rebuilding logical drives; defining spare drives; creating, deleting, and partitioning logical volumes; and mapping logical drive and volume partitions to specific host channels/LUNs
- Enclosure management functions, including defining multiple customized enclosures, dimensions, and number of drives; monitoring physical drive, power supply, fan, and temperature status; displaying the relative location of failed physical drives for reduced risk of replacing the wrong drives
- Supports redundant configuration of important Altos S205F modules to avoid single-point-of-failure
- RAID controller real-time event notices provide information about various event occurrences, including the time when an event occurs, event severity, and event description.
- Selectable event notification via SNMP traps by severity levels
- Supports statistics monitoring for displaying I/O throughput and cache hit rate
- Provides innovative, user-configurable event notification functions
    - Pager notification via a local modem
    - E-Mail notification via the MAPI service of Windows; or built-in SMTP for Unix systems
    - Broadcast notification over the LAN:
    – Broadcasts user-configurable message along with the event description (Broadcast notification currently not supported on cross-OS, e.g., Unix to Windows, platforms.)
    - Facsimile (Fax) notification via a local Fax/modem:

  - User-configurable fax messages sent along with the event description
  - Automatic message retransmission in the event previous transmission attempts fail
- Provides password protection for guarding against unauthorized modification of disk array configuration.

A.3 Featured Highlights

This section explains in greater detail the important features of Altos RAIDWatch.

A.3.1 Graphical User Interface

Altos RAIDWatch's graphical interface is designed for ease-of-use. It uses symbolic icons to represent physical and logical drives, and logical volumes on the screen; and to identify the current configuration of a disk array system. Pull-down and pop-up menus are used with all command options listed.

Users need only point and click a mouse button to select an icon or command. The program also identifies the current status of various drives by changing the colors of their respective icons.

With an easy-to-use interface, complicated disk array operations such as logical drive and logical volume creation, drive partitioning, and drive partition mapping to host channels/LUNs can be completed with only a few mouse clicks.

A.3.2 Enclosure Management

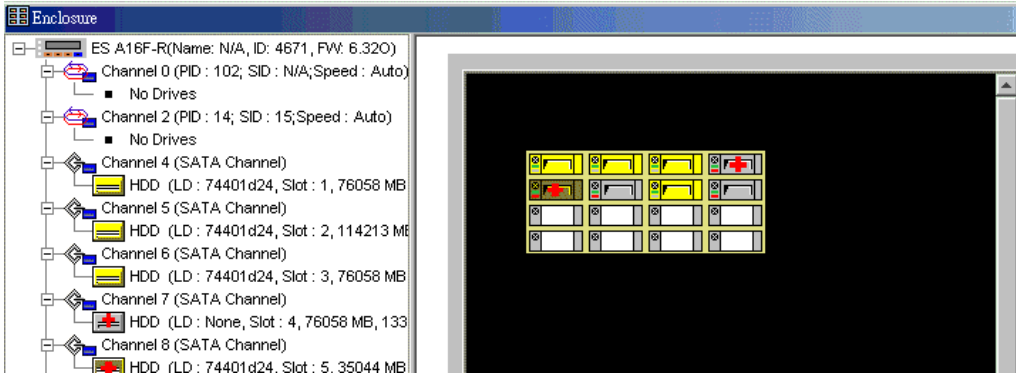


Figure A–1 Enclosure Window

The enclosure window provides real-time reporting of the status of the connected physical drives. When a drive fails, the system highlights the corresponding icon of the failed drive by placing a red X mark on it; when you remove a drive, its icon is removed from the enclosure window. This feature is particularly useful in cases where a drive fails, and you need to identify its exact location for subsequent replacement.

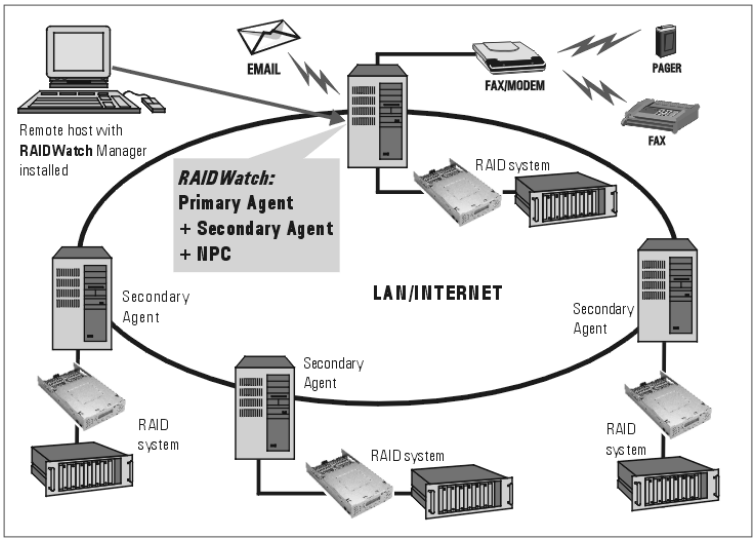
The enclosure window also includes Logical view as a sub-function. The Logical view displays the logical relationship among member drives of a logical configuration. Drives belonging to the same logical unit will be displayed in the same color for ease of identification.

A.3.3 Powerful Event Notification Function

Altos RAIDWatch can notify system administrators of event occurrences and status changes in the disk array system. Notifications can be sent via a modem to a pager, via the Internet as E-mail messages, via a LAN as a broadcast message, SNMP traps, or via fax/modem as fax messages.

A.3.4 Java-based Remote Management

Altos RAIDWatch supports remote management of disk array controllers over a LAN/WAN or the Internet using the TCP/IP protocol. Management over the LAN is achieved through data exchanges between a remote Altos RAIDWatch Manager station and Altos RAIDWatch agents on the host server(s). Figure A–2 shows a typical connection:



Typical Altos Altos RAIDWatch Connection

A.3.5 Password Protection

Altos RAIDWatch Manager comes with password protection to prevent unauthorized users from modifying the configuration of the disk array system. With the password security feature, you have the luxury of leaving your Altos RAIDWatch station unattended knowing that the currently managed disk array system is safe from any unauthorized modifications because the correct password must be entered for each modification.

A.4 Conceptual Foundation

In order for Altos RAIDWatch to function properly, different software modules must be correctly installed on different servers and stations in a given LAN or WAN. Assuming that a given network has multiple RAID systems, one RAID connected server will need to be chosen as the main server. This point is particularly important if Altos RAIDWatch will be operated via web browsers as the main server will need to be a web server.

The main server will need to have the Primary agent and Secondary agent (if the main server is also a RAID host), and Notification Processing Center (NPC) if it will be used. The main server will also need Java Run-time Environment (JRE) installed if it is a Altos RAIDWatch Manager or Event Monitor site. Subsequent installations at other RAID servers will only need the Secondary agent installed.

Table A–1 on page 5 provides a guide to what modules need to be installed on which server.

Note items in the bottom five rows of the table are not included with Altos RAIDWatch and must be installed or modified by system users:

For more information about specific platform requirements, see 2.3, "Platform Requirements", on page 9.

Altos RAIDWatch Module Requirements

Primary Agent				
Secondary Agent				
Altos RAIDWatch Manager				
NPC				
JRE				
OS drivers				
OS patches				
Web browser				
Edit browser preferences				
Web server				

***** If Altos RAIDWatch is to be operated or installed through web browsers, the web server must be the main RAID server.

Notes

1. OS drivers are required for Solaris servers.
2. OS patches are required to run JRE on Solaris, AIX and Linux servers.
3. Browser preferences must be edited for browsers running under Windows systems.

The requirements for installing Event Monitor are exactly the same as those for Altos RAIDWatch Manager.

Chapter 2
Installation

This chapter contains information about installing the Altos RAIDWatch software (including its sub-module Event Monitor) for local and remote management. The chapter includes the following topics:

2.1 System Requirements

The minimum hardware and software requirements for Altos RAIDWatch are listed below.

2.1.1 Server Running Altos RAIDWatch

- Pentium or above compatible (or equivalent PC) running Windows NT 4/Windows 2000/XP; Solaris 7 & 8(SPARC, x86); AIX 4.3; or Red Hat Linux 6.1 (kernel v2.2.xx); Red Hat 7, SUSE 7
- At least one available RS-232 port.
- Hayes-compatible modem (if pager/telephone/mobile phone event notification is desired) or fax/modem (if fax event notification is desired). [Note: fax command class 2.0 support only.]

- SNMP service for Windows (if SNMP remote management is desired)
- Windows Messaging (MAPI) for Windows (if support for pager or fax notification is needed)
- Windows NetBEUI support for Windows (if network broadcast support notification is needed)

2.1.2 Local Client Running Altos RAIDWatch Manager

- Pentium or above compatible (or equivalent PC) running Windows NT 4/Windows 2000/ Windows XP; Solaris 7 & 8 (SPARC, x86); AIX 4.3; or Red Hat Linux 6.1 (kernel v2.2.xx); Red Hat 7/8/9 Advanced server, SUSE 7, Windows 95/98, Windows Me.
- SNMP service for Windows NT (if SNMP agent is under the Windows NT environment)
- Windows Messaging (MAPI) for Windows NT/95/98/2000/XP (if support for pager or fax notification is needed)
- Windows NetBEUI support for Windows NT/95/98/2000/XP (if network broadcast support notification is needed)

2.2 RAID Chart

Before installing Altos RAIDWatch and its various agents and modules, it is helpful for users to chart their RAID systems. Users who operate a single RAID from a local or remote workstation may skip this section. For users with multiple RAID systems, the following information provides guidelines for charting existing RAID systems.

Table 2–1 RAID Systems Chart

Example	HQ	Win NT	205.163. 164.111	Main RAID server	Yes

- **ID/Name**: User designated; an ID or name should be a unique identifying label.
- **Where**: a specific geographic reference (e.g., Headquarters, building 3, equipment room 100).
- **OS**: the operating system running on the particular system.
- **IP Address**: if available
- **Role**: the purpose, relative to RAID operations, fulfilled by the particular system.

- **Internet Capable**: if a server is an internet server, the answer to this is, "Yes." If a workstation will manage RAID systems through a browser, note the particular browser software and its version number.

2.3 Platform Requirements

Altos RAIDWatch supports various operating systems both for servers (RAID management hosts or web servers) and for client management stations (Altos RAIDWatch Manager workstations). Support for Java, however, varies from OS to OS. This section explains what steps need to be taken depending upon which OS will be used.

2.3.1 Platform Limitations

Important **The Java installation program, INSTALL.JAR, *ONLY* supports Netscape 4.5 (or above), Microsoft Internet Explorer 4.0 (or above) under Windows NT Server 4.0 (Windows 95/98/2000/XP) and Netscape 4.5 (or above) under Solaris (x86, SPARC).**

The Altos RAIDWatch Manager program, GRM.JAR, *ONLY* supports Netscape 4.5 (or above), Microsoft Internet Explorer 5.1 (or above) under Windows NT Server 4.0 (Windows 95/98/Me/2000/XP), or Netscape 4.5 (or above) under Solaris (x86, SPARC).

2.3.2 Solaris Platforms

Altos RAIDWatch supports both Solaris 7 and 8 x86 and SPARC servers and workstations. Prior to running the installation procedure for Altos RAIDWatch on a Solaris machine, complete the following steps:

1. Mount installation CD

2. Add agents: Please add necessary agents to the system shell script. These agents will be loaded when the system initiates. The following is an example of how to add agents to the system shell script:

   Append the following strings to /etc/profile:

   /usr/hybrid/bin/secondary > /dev/null 2>&1

   /usr/hybrid/bin/primary > /dev/null 2>&1

3. If the Solaris machine is a web server, (Apache server software default subdirectories are used to illustrate), copy the "common" file folder from your Altos RAIDWatch installation CD to the Apache html directory and type the following:

   #cp –r /cdrom/common /usr/local/apache/htdocs/

4. Modifying browsers for remote installation:

   No configuration change is needed for systems using Internet Explorer. If the browser used on a particular machine is Netscape Navigator or Hot Java and Altos RAIDWatch will be installed remotely via the internet, you will have to modify your browser configuration as follows:

a For Netscape on a Solaris system, append the string:

user_pref("signed.applets.codebase_principal_support", true);

to

~/. netscape/preferences.js

b For HotJava on a Solaris system, append the string:

hotjava.default.security=low

to

~/.hotjava/properties

Note HotJava will create a.hotjava directory under the user's home directory when it is run for the first time. Netscape will create a.netscape directory under the user's home directory when it is run for the first time.

5 Required Java Patch Files:

In order to use Java scripts under the Java Runtime Environment (JRE) on your Solaris machine, you will need to download certain Java patch files.

To download JRE patches for Solaris 7, and make the files accessible, complete the following steps:

1 Use a web browser to open

http://www.sun.com/software/solaris/jre/download.html

2 Click on the HTTP hotpoint that corresponds with your Solaris version. For example, if your platform is a SPARC workstation, and the Solaris is an English edition, click **Solaris SPARC Platform Edition: English** to open the next HTML page.

3 The web server will then ask you to sign in. Please sign in.

4 When you see the license agreement, please click **OK**.

5 Click the appropriate message to download your patches. For example, if your system is a SPARC platform, please select the file below to download:

Download Patches for Solaris 7 REQUIRED for 1.2.2_05a, Solaris/Intel 8.93 MB)

The file name is 1[1].2.2_05a_patches_i386_5.7.tar

If your system is an x86 platform, please select the file below to download:

Download Patches for Solaris 7 REQUIRED for 1.2.2_05a, Solaris/SPARC 1.04 MB)

The file name is 1[1].2.2_05a_patches_sparc_5.7.tar

6 Put the patch files in the right directory. The install shell script (intall.sh) needs for you to put the patch files in your system. For example in a Solaris SPARC workstation, if the patch file name is **2.2_05a_patches_sparc_5.7.tar**

Enter the following:

```
#mkdir /usr/patches
#cp 2.2_05a_patches_sparc_5.7.tar /usr/patches
#cd /usr/patches
#tar xvf 2.2_05a_patches_sparc_5.7.tar
```

You have now tarred the patch files in the /usr/patches directory.

Note Patches displayed here are only examples. Patches are continuously updated on Sun's web site.

Altos RAIDWatch also supports Red Hat Linux 6.1 servers and workstations.

1 Mount installation CD

2 Add agents: Please add necessary agents to the system shell script. These agents will be loaded when the system initiates. The following is an example of how to add agents to the system shell script:

Append the following strings to /etc/profile:

/usr/hybrid/bin/secondary > /dev/null 2>&1

/usr/hybrid/bin/primary > /dev/null 2>&1

3 If your Red Hat Linux 6.1 host is a web server:

Make sure that web server software is already installed on your Linux server. The default web directory will be /usr/home/httpd. Allow the Altos RAIDWatch installation package to be accessed from /usr/home/httpd/html.

a Mount the Altos RAIDWatch installation CD to /cdrom:, type the following and press Enter to proceed (assuming that the CD-ROM drive is /dev/hdc):

#mount /dev/hdc /cdrom

b Copy the "common" file folder from the installation package CD to the Apache html directory, type the following and press Enter to proceed:

#cp –r /cdrom/common /home/httpd/html/

4 Modifying browsers for remote installation:

No configuration change is needed for systems using Internet Explorer. If the browser used on a particular machine is Netscape Navigator or Hot Java and Altos RAIDWatch will be installed remotely via the internet, you will have to modify your browser configuration as follows:

a) For Netscape on a Linux system, append the string:

user_pref("signed.applets.codebase_principal_support", true);

to

~/. netscape/preferences.js

b) For HotJava on a Linux system, append the string:

hotjava.default.security=low

to

~/.hotjava/properties

Note HotJava will create a.hotjava directory under the user's home directory when it is run for the first time. Netscape will create a.netscape directory under the user's home directory when it is run for the first time.

2.3.3 Windows Platforms

Altos RAIDWatch supports Windows NT 4.0, 2000 and 2003 for servers and Windows 95/98/Me/NT/ 2000/XP for workstations.

1. In order to use Netscape in Windows, append the string:

   user_pref("signed.applets.codebase_principal_support", true);

   to

   c:\winnt\profiles\<username>
   (for Windows NT or Windows 2000)

   -or-

   c:\Program_Files\Netscape\Users\<username>
   (for Windows 95/98/Me/XP)

2. SNMP Service

   SNMP service for Windows NT (if the SNMP agent is under a Windows NT environment) must be enabled.

   Locate "**Services**" under the Windows Control Panel. Enable or install SNMP services. Refer to your Windows documentation for more information.

3. MAPI for Windows

   Windows Messaging (MAPI) for Windows NT/95/98/Me/2000/XP (if support for pager, fax, or e-mail notification is needed) must be enabled. Refer to your Windows documentation for more information.

4. NetBEUI support

Windows NetBEUI support for Windows NT/95/98/Me/2000/XP (if network broadcast support notification is needed) must be enabled. Refer to your Windows documentation for more information.

2.4 Software Setup

This section discusses how to install Altos RAIDWatch in your system. Before proceeding with the setup procedure, read through section 2.4.1, "Before You Start" below.

2.4.1 Before You Start

Before starting the installation, read through the notes listed below.

- TCP/IP must be installed and running with a valid IP address assigned to each primary and secondary agent station, even if Altos RAIDWatch Manager is being used on the local host.
- Your system display must be running in 256 color mode or some configuration items will not be visible.
- Your RAID controller must either be defined as a peripheral device or logical drives mapped to host LUNs, otherwise Altos RAIDWatch will be unable to locate the controller.
- Be certain that your system meets the minimum hardware and software requirements listed in the System Requirements section.
- Check to be certain that the RAID disk arrays and controllers are installed properly. For the installation procedure, see the documentation that came with the controller.
- Follow the directions provided in the Platform Requirements section to prepare for installation and operation under different OS environments.

2.4.2 Installing Altos RAIDWatch

Follow these steps to install Altos RAIDWatch on your server(s) and RAID systems (the installation procedure for Altos RAIDWatch Manager and Event Monitor is explained in section 2.4.3):

1 Insert the Altos RAIDWatch installation CD into your CD-ROM drive.

2 If installing on a Unix system, mount the Altos RAIDWatch CD to /mnt.

3 If you are currently running other applications, close them before proceeding with the setup process. This will minimize the possibility of encountering system errors during setup.

4 **To install Altos RAIDWatch,** run the install script file related to the OS you are using to start the installation process. (Each OS has its own subdirectory.) This method will open a command line window and ask first if you want to install Java Runtime Environment (JRE). Enter "**N**" for No unless you are also installing Altos RAIDWatch Manager. The installation script will then ask if you want to install Altos RAIDWatch. Type **"Y"** for a first install, reinstall, or reconfigure of the program.

5 After opening the install shield, the following welcome screen, shown in Figure 2–1, will appear. To continue installing Altos RAIDWatch, click the **"Next"** button at the bottom of the window. If you do not wish to continue with the installation process, select the **"Stop"** button.

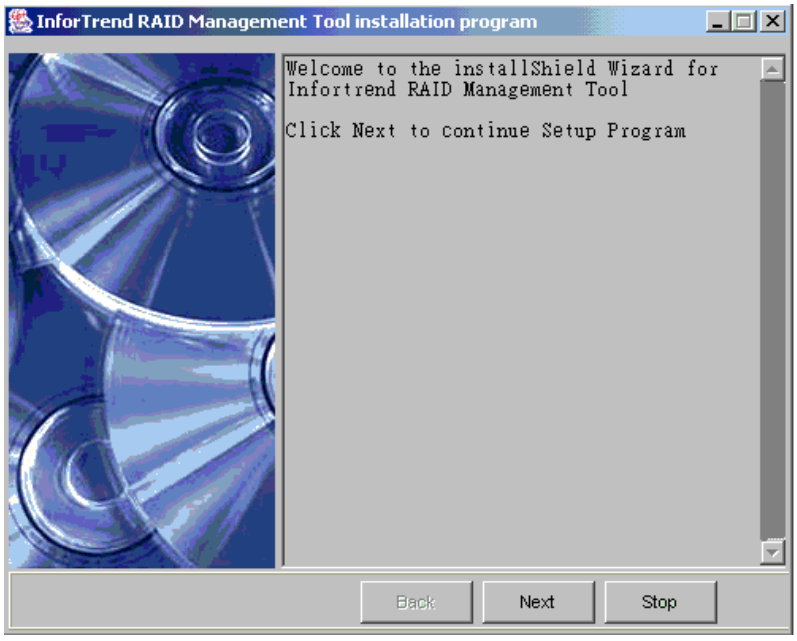


Figure 2–1 Welcome to the Install Shield Window

6 If you selected the **"Next"** button on Figure 2–1, the License Agreement window seen in Figure 2–2. First read through the License Agreement. If you are in agreement with the specified terms and wish to continue installing the Altos RAIDWatch program, select the "Accept." If you do not wish to continue with the installation process then select the **"Stop"** button.

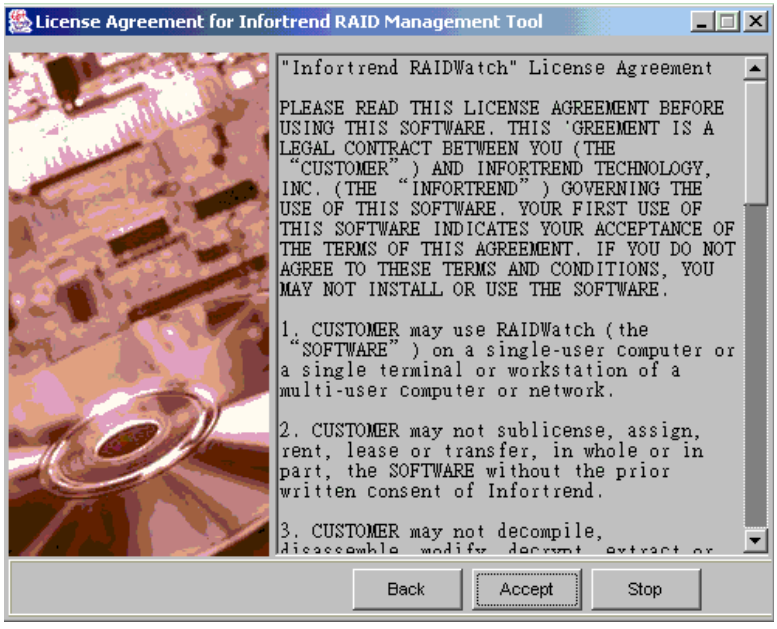


Figure 2–2 Licence Agreement

7 If you accepted the License Agreement in Figure 2–2, a new window with three installation options will appear. These options, shown in Figure 2–3, are **Out-Band, In-Band,** and **Applet Only**.

- **Out of Band**: Selecting this option allows you to install the Altos RAIDWatch GUI and the Event Monitor on the local computer. If this option is selected then none of the primary or secondary agents will be installed and it will be necessary to access the controller through a LAN.

- **In-Band**: Selecting this option will result in the installation of the In-Band SCSI driver and associated agents and configuration tools as well as the Altos RAIDWatch GUI on the local computer. This option should only be selected when the controller is connected directly to the local computer via the serial port.

- **Applet Only**: This will install the GUI onto the controller itself. Prior to selecting this option, a user must reserve space on the controller. After the space has been reserved, and if this installation option is selected, then the associated Altos RAIDWatch files will automatically be installed on the controller.

  If the **Applet Only** installation was selected, a user will have to use a web browser to connect to the Altos RAIDWatch program. To do this, a web browser is opened and the controller IP address entered. The Altos RAIDWatch program can then be accessed and use to manage the storage array.

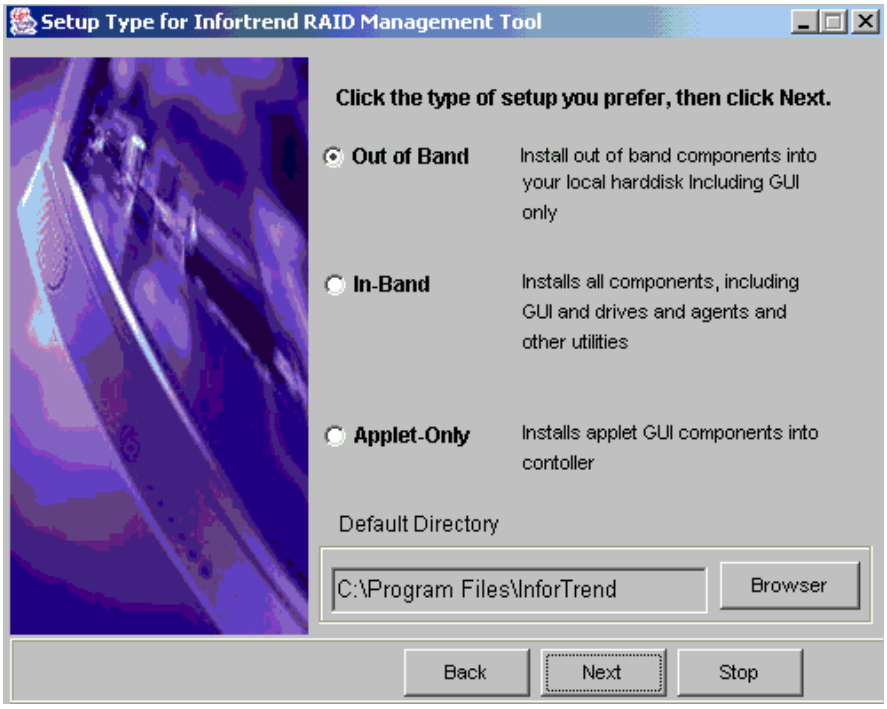


Figure 2–3 Installation Options

2.4.3 Installing Out of Band Components

If you wish to install the Out of Band components only please follow these steps.

1 Use the cursor to select the **"Out of Band"** option in Figure 2–3. The application and the files associated with the GUI will be stored in the

C:/Program Files/Acer/raid

directory. If you wish to change the directory, select the "Browser Button" and choose the directory you wish to use.

2 Once you have selected the directory in which you wish to install the ***Out of Band*** components and if you wish to continue installing the ***Out of Band*** components, select the **"Next"** button and the screen shown in Figure 2–4 will appear.

If you wish to discontinue the installation process, select the **"Stop"** button. If you wish to re-read the License Agreement, select the **"Back"** button.

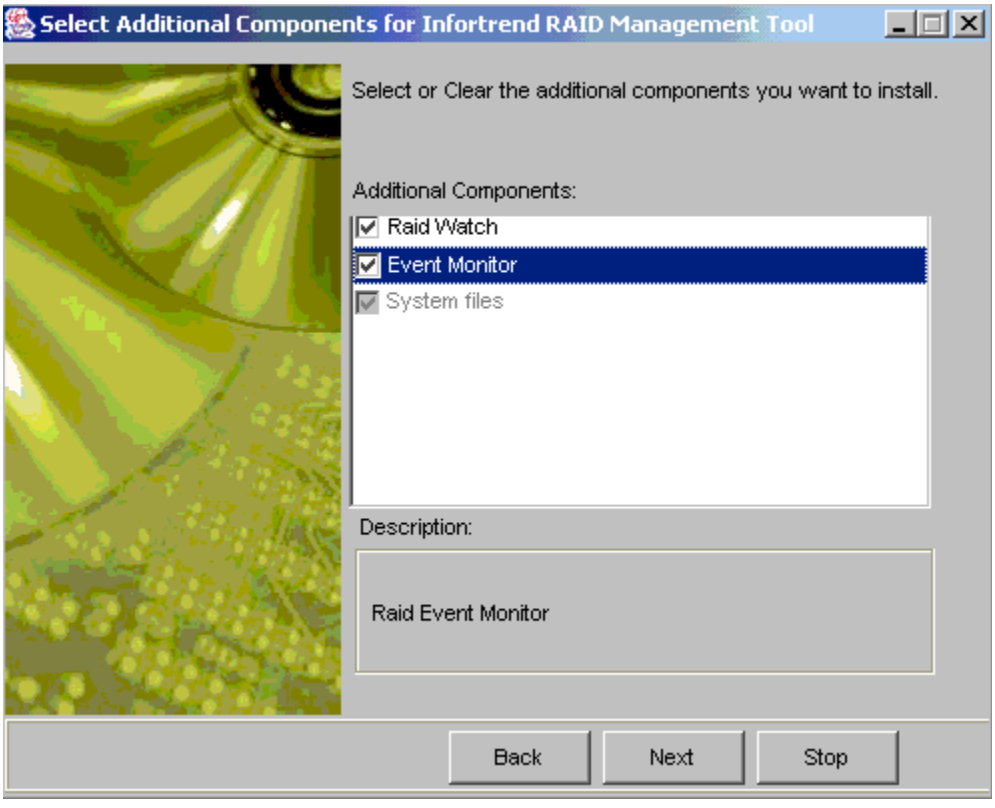


Figure 2–4 Additional Components

3 From Figure 2–4 above, additional components can be selected. The default option selects all the additional components, if you wish to de-select the additional components, then use your mouse to de-select those components you do not wish to install.

Once the additional components have been selected, and if you wish to proceed with the installation process, select the **"Next"** button. If you do not wish to proceed with the installation process, select the **"Stop"** button and if you wish to re-select the installation options, then select the **"Back"** button.

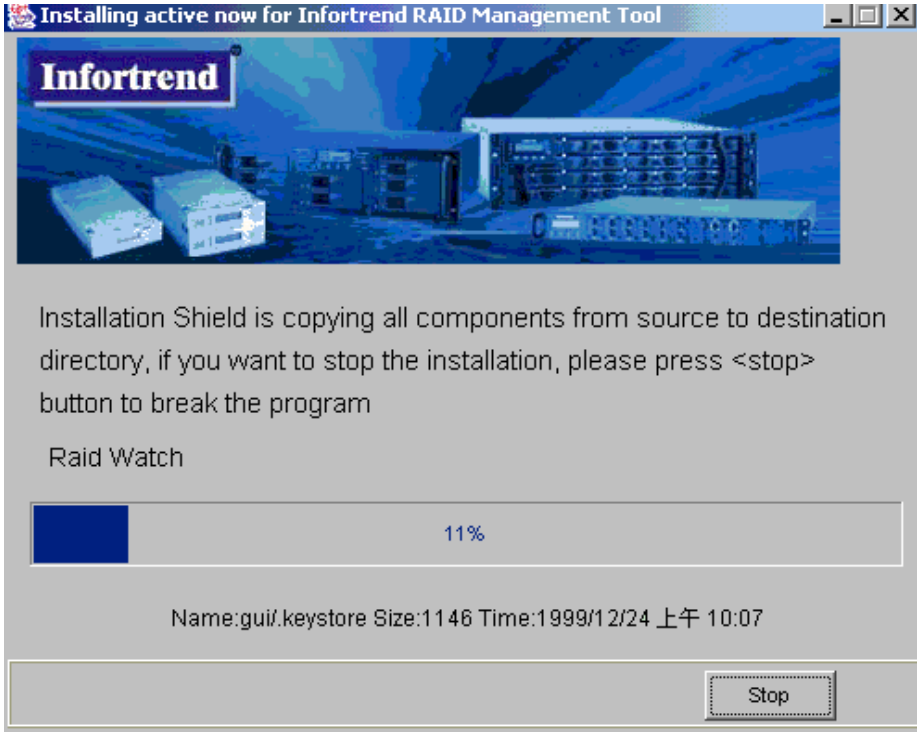


Figure 2–5 Installing Active

4 If the **"Next"** button from Figure 2–4 was selected, the Install Active window shown in Figure 2–5 will appear. If you wish to stop the installation procedure, then click the **"Stop"** button. If you wish to continue installing the ***Out of Band*** components, allow the installation shield to continue the installation process uninterrupted.

5 Once the ***Out of Band*** components have been successfully installed, a window indicating the successful installation, shown in Figure 2–6, will appear. To complete the process and to make the window disappear, click on the **"OK"** button.

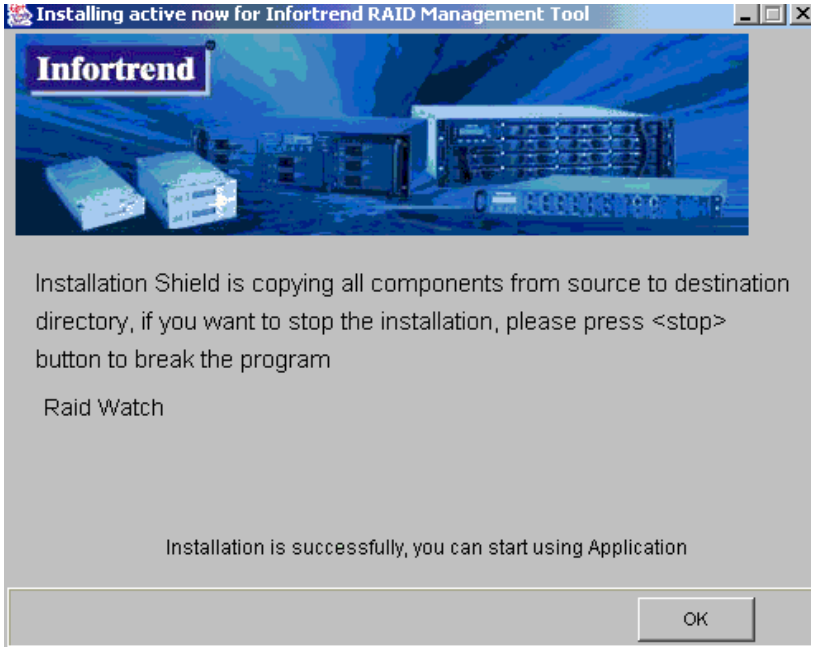


Figure 2–6 Successful Installation

2.4.4 Installing In-Band Components

If you wish to install the In-Band components only please follow these steps.

1 Use the cursor to select the **"In-Band"** option in Figure 2–3. The application and the files associated with the GUI will be stored in the

C:/Program Files/Acer/raid

directory. If you wish to change the directory, select the **"Browser"** button and choose the directory you wish to use.

2 Once you have selected the directory in which you wish to install the In-Band components and if you wish to continue installing the In-Band components, select the **"Next"** button and the screen shown in Figure 2–7 will appear.

If you wish to discontinue the installation process, select the **"Stop"** button. If you wish to re-read the License Agreement, select the **"Back"** button.

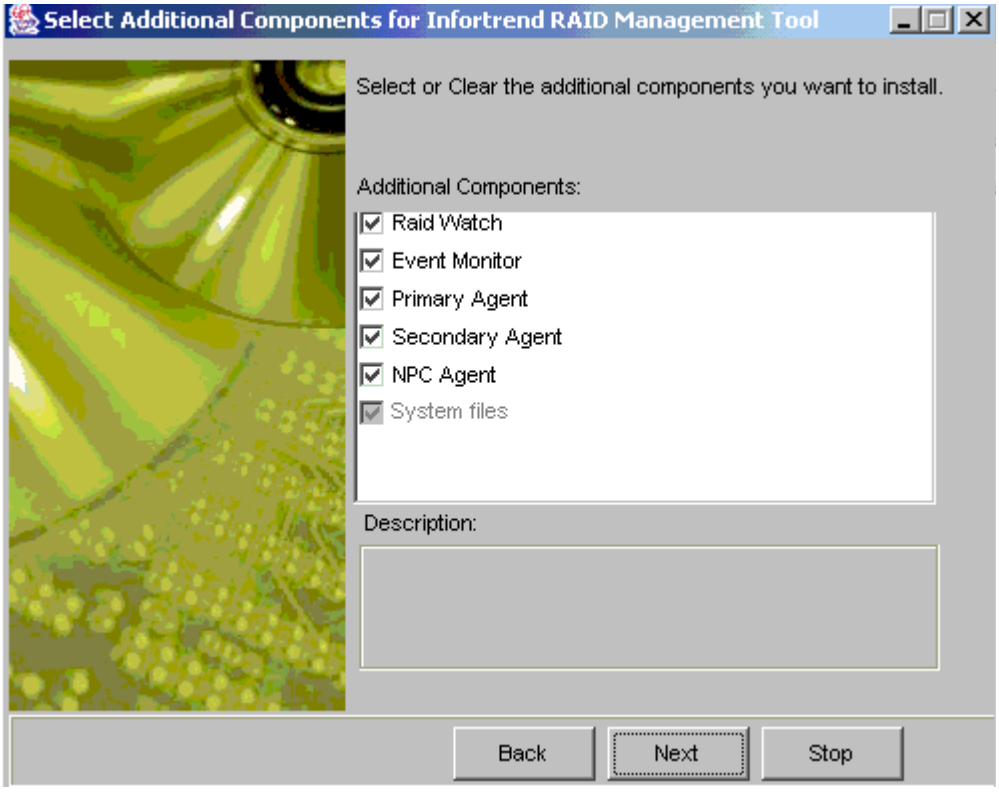


Figure 2–7 Additional Components

3 From Figure 2–7 above, additional components can be selected. The default option selects all the additional components, if you wish to de-select the additional components, then use your mouse to de-select those components you do not wish to install.

Once the additional components have been selected, and if you wish to proceed with the installation process, select the **"Next"** button. If you do not wish to proceed with the installation process, select the **"Stop"** button and if you wish to re-select the installation options, then select the **"Back"** button.

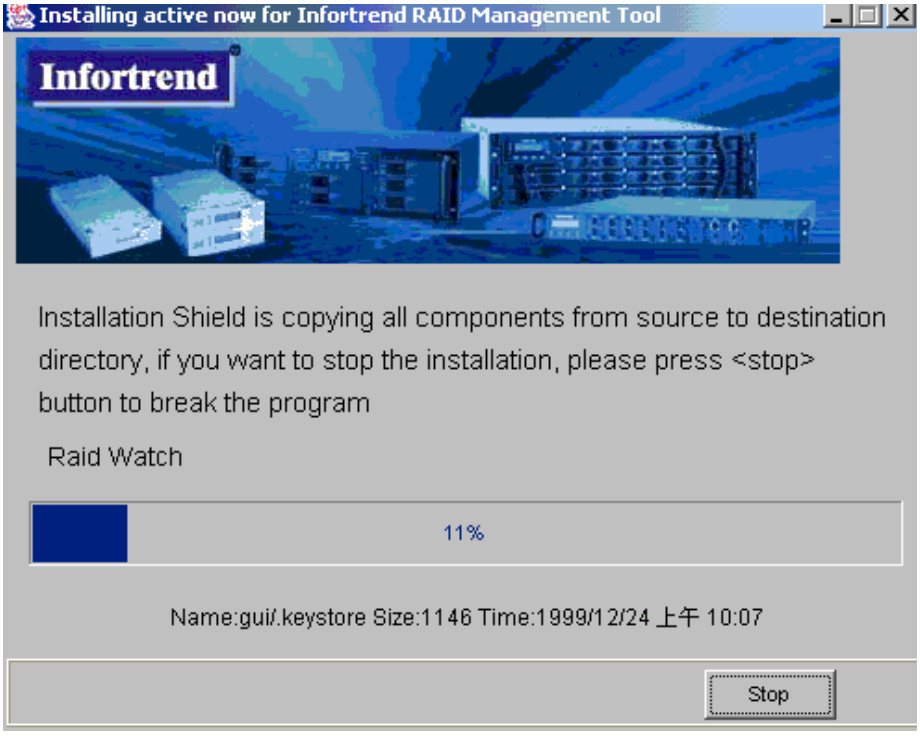


Figure 2–8 Installing Active

4 If the **"Next"** button from Figure 2–7 was selected, the ***Install Active*** window shown in Figure 2–8 will appear. If you wish to stop the installation procedure, then click the **"Stop"** button. If you wish to continue installing the ***In-Band*** components, allow the installation shield to continue the installation process uninterrupted.

5 Once the ***In-Band*** components have been successfully installed, a window indicating the successful installation, shown in Figure 2–9, will appear. To complete the process and to make the window disappear, click on the **"OK"** button.

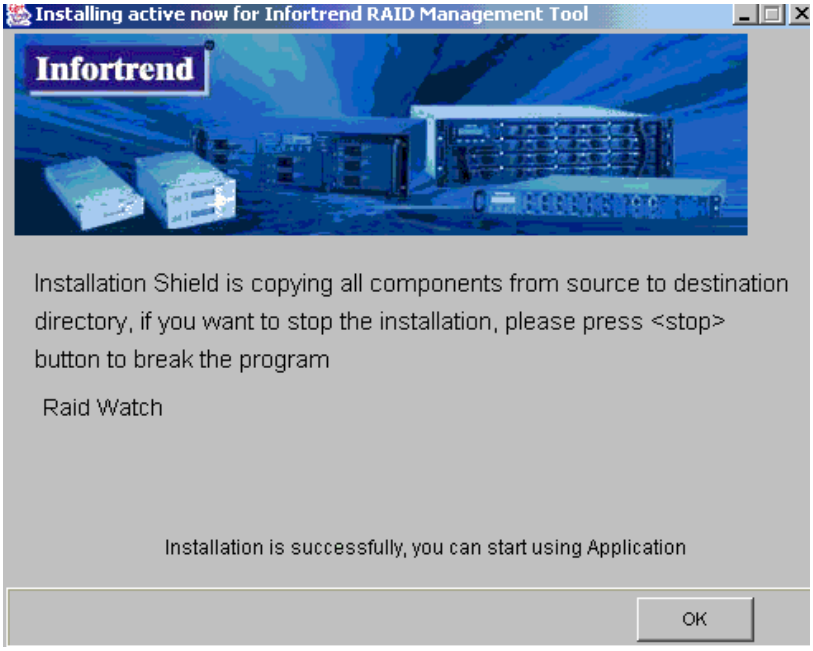


Figure 2–9 Successful Installation

2.4.5 Applet-Only Installation

2.4.5.1 Reserved Space

If the ***Applet Only*** option is selected, Altos RAIDWatch files will be installed directly onto the controller and therefore space for these files must be reserved. If you have not already reserved the space on the controller then do so now. Follow these steps:

1. Stop the Altos RAIDWatch Installation Program. To do this, use the cursor to click the "**Stop**" button in Figure 2–3.
2. Use either the MUI or the terminal emulation program, to access the pre-installed firmware on the controller.
3. Use the FW to create a logical array (please refer to your RAID Controller Operating Manual). Make sure that you reserve a space of at least 256MB. This reserved space is required for the Altos RAIDWatch Files that will be transferred to the RAID Controller.

Caution *If you do not reserve a space of at least 256MB, you will not be able to transfer the necessary Altos RAIDWatch files to the controller and will therefore be unable to use the Altos RAIDWatch Program.*

2.4.5.2 Applet Only Installation

1. Once space has been reserved on the controller, follow the instructions outlined in Section 2.4.2 until the ***Installation Options*** screen shown in Figure 2–3 appears.

2 Use the cursor to select the **"Applet"** option in Figure 2–3. The application and the files associated with the GUI will be stored in the

C:/Program Files/Infortrend

directory. If you wish to change the directory, select the **"Browser"** button and choose the directory you wish to use.

3 Once you have selected the directory in which you wish to install the ***Applet*** components and if you wish to continue installing the ***Applet*** components, select the **"Next"** button and the screen shown in Figure 2–8 will appear.

If you wish to discontinue the installation process, select the **"Stop"** button. If you wish to re-read the License Agreement, select the **"Back"** button.

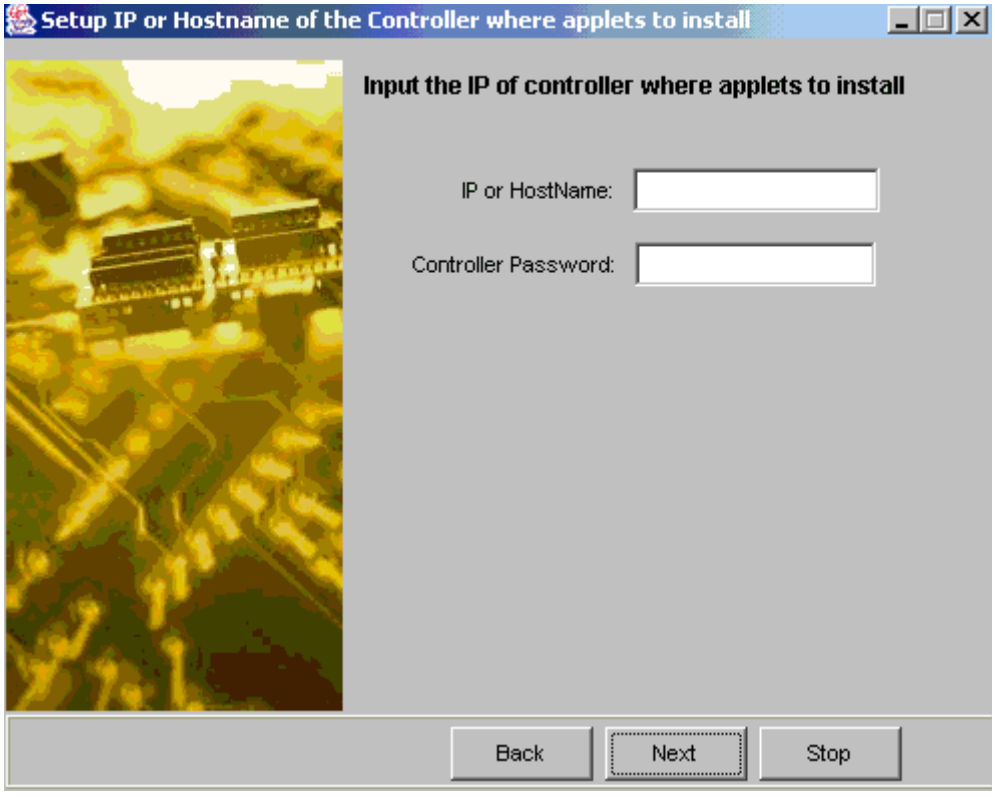


Figure 2–10 Input IP and Controller Password

4 As shown in Figure 2–10 above, enter the IP address or the host name of the controller and the controller password in the respective fields. The default controller is blank and it needs to be configured in Altos RAIDWatch.

Once IP (or host name) and the controller password have entered, and if you wish to proceed with the installation process, select the **"Next"** button. If you do not wish to proceed with the installation process, select the **"Stop"** button and if you wish to re-select the installation options, then select the **"Back"** button.

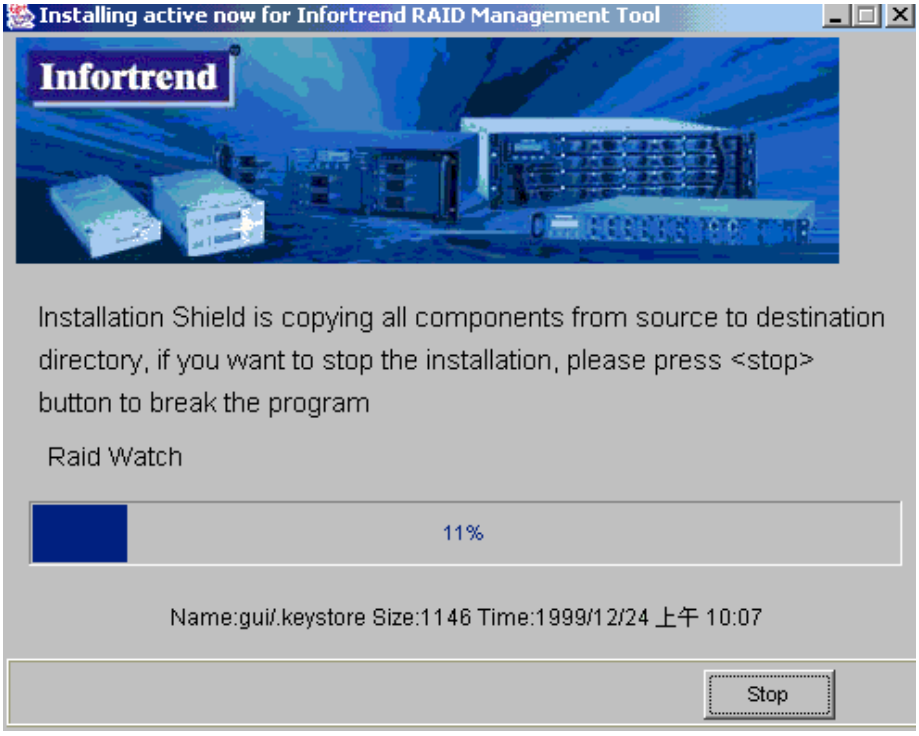


Figure 2–11 Installing Active

5 If the **"Next"** button from Figure 2–11 was selected, the ***Install Active*** window shown in Figure 2–12 will appear. If you wish to stop the installation procedure, then click the "Stop" button. If you wish to continue installing the Applet components, allow the installation shield to continue the installation process uninterrupted.

6 Once the ***Applet*** components have been successfully installed, a window indicating the successful installation, shown in Figure 2–12, will appear. To complete the process and to make the window disappear, click on the **"OK"** button.

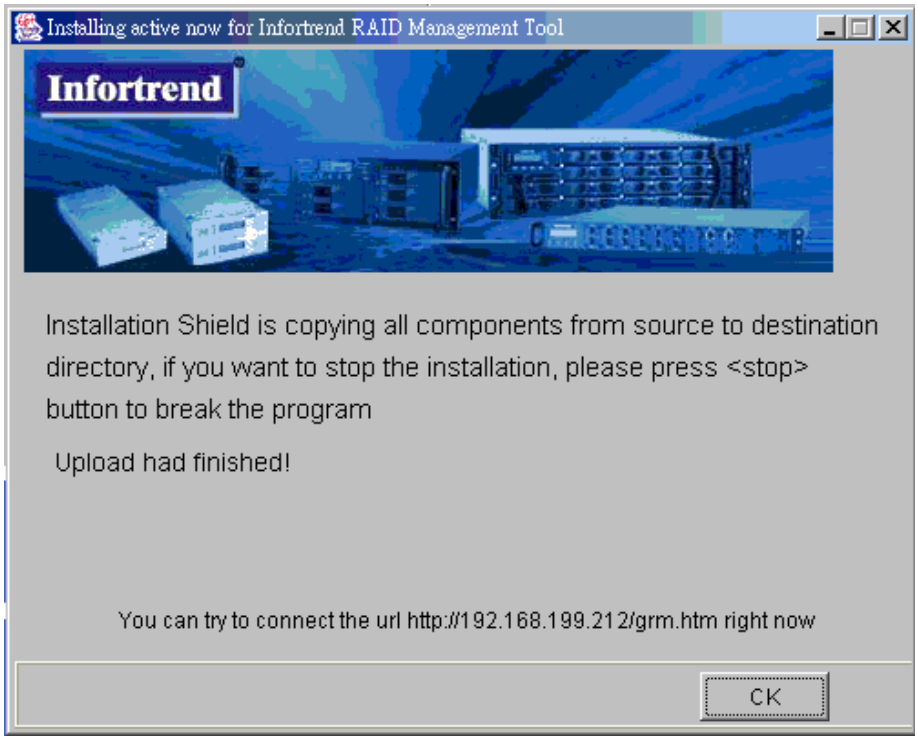


Figure 2–12 Successful Installation

7 If you wish to immediately access the Altos RAIDWatch manager then open a web browser and type in the IP address that you used in Figure 2–10 with the associated filename.

i.e. To run the ***Altos RAIDWatch Manager*** from the controller, enter the following into the address bar of the web browser:

http://www.xxx.yyy.zzz/grm.htm

or, to run the Event Monitor, enter the following into the address bar of the web browser.

http://www.xxx.yyy.zzz/grem.htm

where www.xxx.yyy.zzz is the IP address entered in Figure 2–10.

2.5 List of Filenames

Below is a list of key Altos RAIDWatch files installed during the installation process. All files should be found in the ***/usr/hybrid/bin/*** (default) directory or the directory you chose during the installation.

Altos RAIDWatch Manager access:

1 GRM.JAR --> executable.jar Java file

2 GRM.HTM --> browser accessible HTML file

Event Monitor access:

1 GREM.JAR -- executable.jar Java file

2 GREM.HTM -- browser accessible HTML file

Executable Agent files:

1 PRIMARY.EXE -- to start the Primary Agent

2 SECONDARY.EXE -- to start the Secondary Agent

3 NCP EXE - to start the Notification Processing Center

Configuration and Install files:

1 CONFIGURE.JAR --> executable.jar Java file

2.6 Program Updates

As a valued customer, you are entitled to free program updates. You can download the latest version of Altos RAIDWatch from FTP sites. For more information about this service, call your supplier.

2.7 In-band SCSI

What is it and what is it used for?

These days more and more external devices require communication with the host computer for device monitoring and administration. This is usually done through RS-232C ports.

An alternative means of communication is now available for FC-to-SATA RAID controllers – in-band SCSI. The traditional way for SCSI controllers to communicate with the host computer has been via software (such as Altos RAIDWatch) using an RS-232C connection. With in-band SCSI, integrators have more flexibility. They may use RS-232C or the existing FC cable instead.

In-band SCSI is particularly useful when creating a new RAID. In order for a host to “see” the controller, and thus for Primary and Secondary agents, and Altos RAIDWatch Manager to manage the controller, it must first be configured as a peripheral device. In-band SCSI allows you to do this using a terminal emulation program.

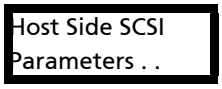
2.7.1 Configuring a RAID Controller to Use In-band SCSI

2.7.1.1 RAID Controller Adjustments

Some adjustments must be made to the RAID controller settings before the two can communicate using SCSI commands. The RAID controller settings can be changed using the RS232.

From the Main Menu, press ***up** or ***down** arrows to select **"View and Edit Configuration Parameters."**

Press **<Enter>**; and then use the ***up** or ***down** arrows to select **"Host-side SCSI Parameters."** Then press **<Enter>.**



You will need to make adjustments in the following four submenus: **Peripheral Device Type, Peripheral Device Qualifier, Device Support for Removable Media,** and **LUN Application.** Different host operating systems require different adjustments. Look at the table below to find the proper settings for your host operating system.

Table 2–2 Peripheral Device Type Parameters

Windows NT® 4.0	0x1f	connected	disabled	All Undefined LUNs
NetWare® 4.x/ Windows 2000/XP	0x03	connected	disabled	All Undefined LUNs
SCO OpenServer 5.0x	0x7f	connected	either is okay	All Undefined LUNs
SCO UnixWare 2.1x, UnixWare 7	0x03	connected	either is okay	All Undefined LUNs
Solaris™ 2.5.x/2.6 (x86 and SPARC)	0x7f	connected	either is okay	All Undefined LUNs
Linux	0x03	connected	enabled	All Undefined LUNs

***Up** and **Down** Arrows*

Table 2–3 Peripheral Device Type Settings:

No Device Present	0x7f
Direct-access Device	0
Sequential-access Device	1
Processor Type	3
CD-ROM Device	5
Scanner Device	6
MO Device	7
Storage Array Controller Device	0xC
Unknown Device	0x1f

Example: Settings for Windows NT 4.0

The settings for Windows NT 4.0 are provided here as an example. For the settings under other operating systems, please refer toTable 2–2, "Peripheral Device Type Parameters" above.

On the front panel, use **up* or *down* arrows to select **"Peripheral Device Type Parameters"**; and then press **<Enter>**.

Periph Dev
Type Parameters

(For this example, we assume that there are currently no peripheral devices.

Device Type -
No Device (0x7f)

)

Press *up* or *down* arrows to choose **"Set Device Type? Unknown (0x1f)"**.

Set Device Type
Unknown (0x1f)

Press **<Enter>** to confirm the selection. Now that we have changed the Peripheral Device Type, let us set the Peripheral Device Qualifier. Press **<Esc>** to return to the sub-menus mentioned above. Use the arrow keys to scroll down to **Device Qualifier,** press **up* or *down* arrows to select **"Device Qualifier Connected."**

The default setting is **"Connected."** If your Front Panel reads **"Disconnected,"** press **<ENT>** and you will be prompted to change to **"Connected."**

Device Qualifier
Connected

If your Device Qualifier setting reads **"Connected,"** press **<Esc>** to return to the host-side SCSI submenus

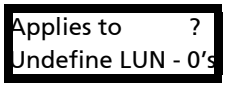
Use *up* or *down* arrows to select Support for Removable Media. The default setting is **"Disabled."** If the LCD reads **"Enabled,"** press **<Enter>** and you will be prompted

Support Removable
Media Disabled

to accept a change. If the screen reads **"Disabled,"** press **<Esc>** to return to the host-side SCSI submenus.

Press ******up* or *down* arrows to select **"LUN Application";** and then press **<Enter>**. The default setting is **"All Undefine LUN."**.

Press **<Enter>** and use ******up* or *down* arrows to select **"Undefine LUN-0's."**



Press **<Enter>** to accept. The screen should display the following message.

The RAID controller adjustments necessary to use in-band SCSI have been completed.

If an Out-of-Band connection is being used, then it is recommended Peripheral Device Type is set to No Device (0x7F)

Chapter 3
Configuration Options

3.1 Introduction

This chapter describes the Altos RAIDWatch configuration options. There are a number of different items that users can configure. These include primary and secondary agents and the Notification Processing Center.

Note If during installation (see section 2.4, "Software Setup", on page 14), you selected the Out of Band option, since neither the primary nor secondary agents were installed and only the GUI was installed, these configuration options will not be available to you.

- Accessing the Configuration Panel, 3.2 on page 31,
- Primary Agent Configuration, 3.3 on page 33
- Secondary Agent Settings, 3.4 on page 36,
- NPC Settings, 3.5 on page 37
- Rebooting the Controller, 3.6 on page 45

3.2 Accessing the Configuration Panel

3.2.1 Using Windows – Altos RAIDWatch Installed as In-Band

If, during the installation process outlined in Chapter 2, the In-Band option was selected, the In-Band SCSI driver, associated agents and configuration tools were installed on the local computer. To access the configuration tools using Windows, please do the following:

1 Open the directory in which the Altos RAIDWatch GUI was installed. This default directory was selected during the installation process.

2 If you are using Windows, first selecting **"Start"** then opening the **"Programs"** menu and finally opening the default menu can easily access the configuration panel. Once the default directory has been successfully opened select the configure option.

3 Once **"Configure**" has been selected, the **"Configuration Panel",** shown in Figure 3–1 will appear. Users can configure the following Items:

- Primary Agent
- Secondary Agent
- Notification Processing Center (NPC)

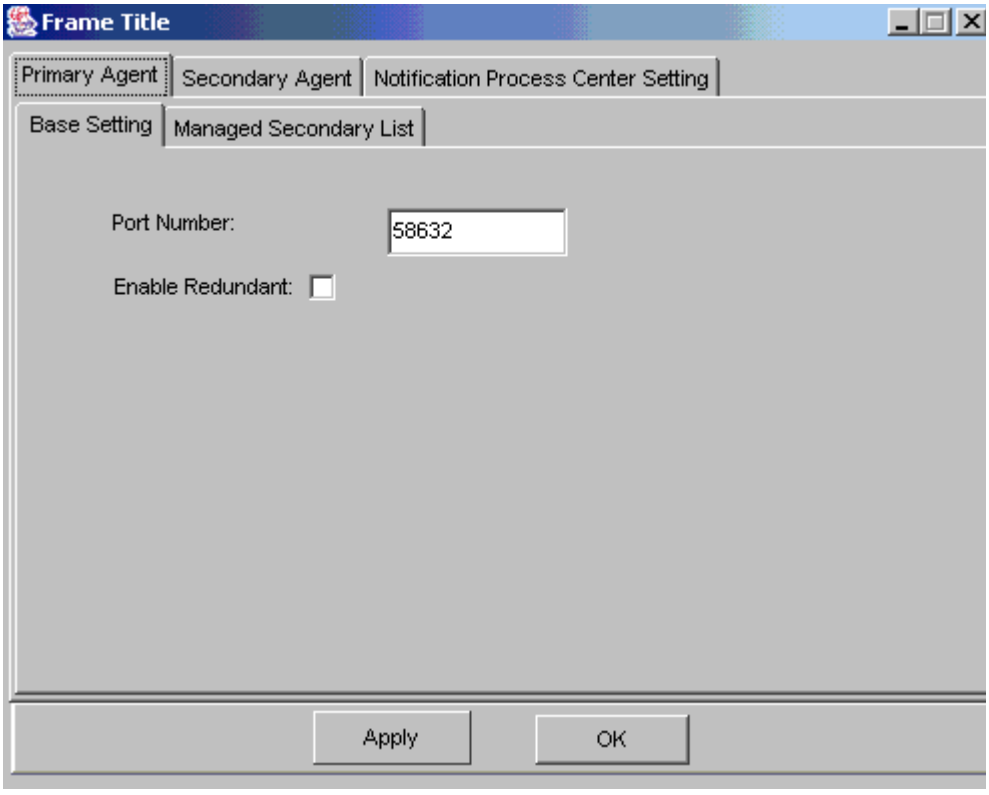


Figure 3–1 In-Band Configuration Panel

3.2.2 Using Web Browser – Altos RAIDWatch Installed as Applet

If, during the installation process outlined in Chapter 3 on page 31, the ***"Applet Only"*** option was selected, the Altos RAIDWatch GUI must be accessed through a web browser. To access the configuration panel shown in Figure 3–2, type in the controller IP address (see Section 2.4.5 on page 22) followed by **"configure.htm."** i.e. if the controller IP Address is **ww.xx.yy.zz**, in the address line of the web browser type:

http://ww.xx.yy.zz/configure.htm

The screen shown in Figure 3–2 will appear.

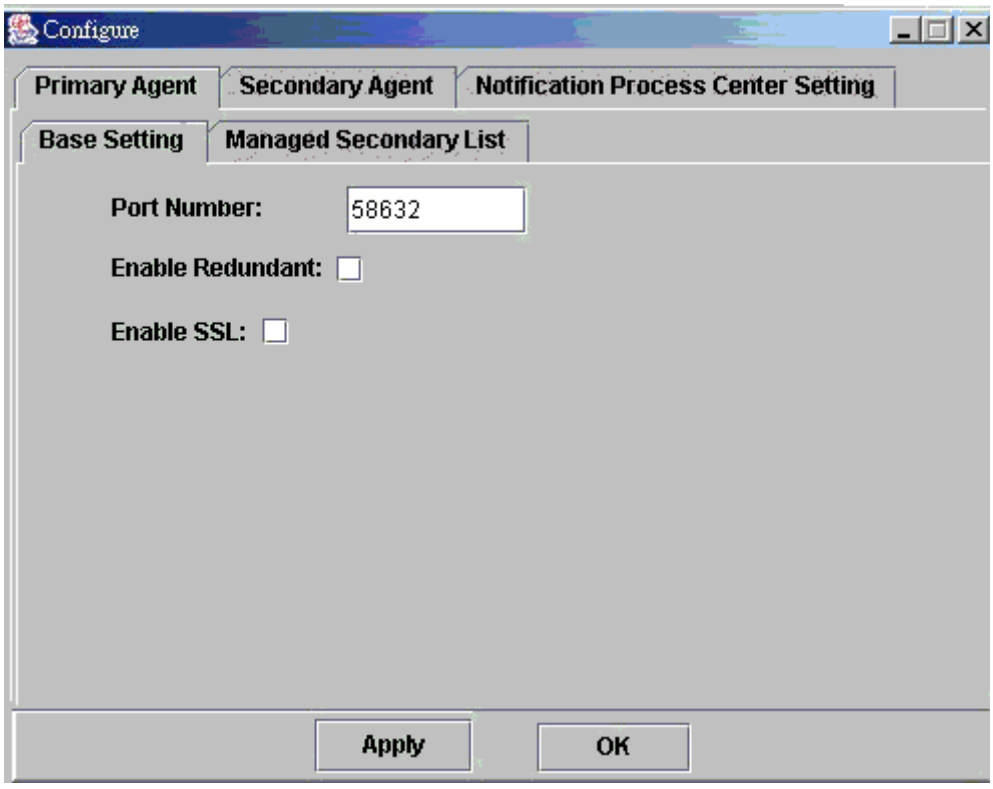


Figure 3–2 Applet Only Configuration Panel

It can be seen that the difference between Figure 3–1 and Figure 3–2 is the **"Enable SSL."**

Note Enabling the SSL can only be done when the GUI is installed on the controller as an Applet Only.

3.3 Primary Agent Configuration

To configure the Primary agent settings, select ***"Primary Agent"*** tab from the tab menu at the top of Figure 3–3. Two sub-tabs, **"Base Settings"** and **"Managed Secondary List"**.

3.3.1 Base Settings

The **"Base Settings"** are shown in Figure 3–3.

- **Port Number:** This is the port number the Altos RAIDWatch Manager stations will use to communicate with the Primary Agent.
- **Enable Redundant:** This is selected to enable primary agent/NPC on another server for the precaution that a Primary Agent/NPC might fail and, as the consequence, fatal system events might then occur unnoticed.
- **SSL Enable:** This option, only available if the controller is installed as an applet on the controller, enables the Secure Sockets Layer (SSL). To enable it just point the mouse to the square and double click. To disable it, do the same.

3.3.1.1 Redundant Modules

It is recommended to install Primary and NPC Agents redundantly on different servers to avoid the blind time when the Primary Agent or NPC module is down. Once the Primary Agent or NPC is down, the Primary Agent installed on another server will take over instantly allowing NPC to work.

Primary Agent and NPC should be installed manually on different servers. The configuration utility does not automatically add these modules to the selected RAID server.

If Enable Redundant is selected, the following options shown in Figure 3–3 will appear.

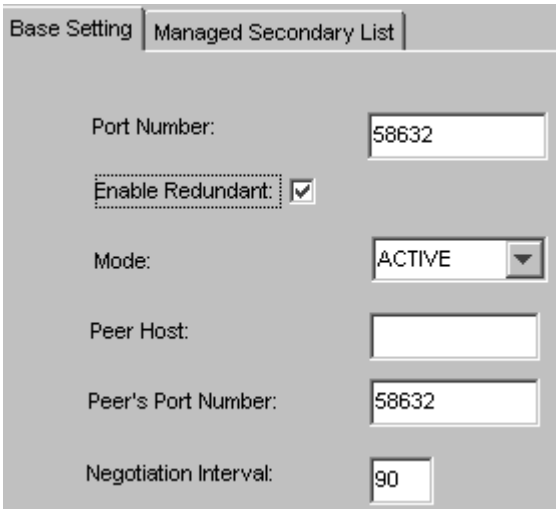


Figure 3–3 Enable Redundant Options

- **Mode**: assign the preferred mode for the Primary Agent installed on current server as active or standby. There exists an active-standby relationship between Primary Agents and the relationship can be automatically resolved between agents.
- **Peer Host**: enter the IP address.
- **Peer's Port Number**: A use should enter the same port number as that on the current Primary Agent host.
- **Negotiation Interval**: This is the duration of time (in seconds) for Primary Agents to negotiate for the active-standby status. A Primary Agent might wait for seconds for its peer agent to start up.

Important **At least one Primary Agent and one Secondary Agent must be installed in a network managed by Altos RAIDWatch. RAID controllers are managed by Secondary Agents which are in-turn managed by the Primary Agent. Without Secondary Agents associated with each RAID, it will be impossible to manage RAID systems.**

The *Event Monitor* also requires Primary and Secondary Agents to be running on RAID servers to record system events and report system status.

Even if the system only has one RAID and all Altos RAIDWatch components are installed on a single server, both a Primary Agent and a Secondary Agent must be installed.

3.3.2 Managed Secondary Agent Settings

To configure the **"Managed Secondary List"** settings, select the **"Managed Secondary List"** sub-tab shown in Figure 3–3. The **"Managed Secondary List"** shown in Figure 3–4 will appear.

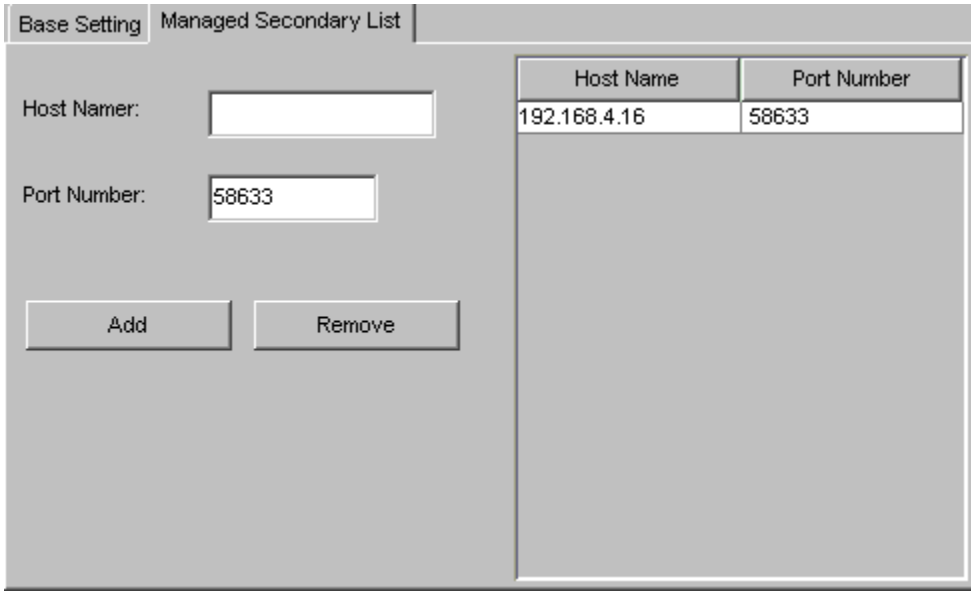


Figure 3–4 Managed Secondary List

This part of the Primary Agent configuration, lists each Secondary Agent RAID server that will be managed through the Primary Agent where you are installing Altos RAIDWatch.

- **Host names**: These are IP addresses for each RAID server.
- **Port Number:** The settings that should be the same for all Secondary Agents but should they should be from the Primary Agent port setting and otherwise unique to the Secondary Agents.

Important **The Primary Agent default port setting should be changed to a network-unique assignment. The default TCP port setting is 58632. Any port number between 49152 and 65535 can be used.**

Also, Managed Secondary Agents should all use a different, common-to-all Secondary Agents, TCP port setting from that of the Primary Agent.

3.4 Secondary Agent Settings

To configure the Primary agent settings, select the **"Secondary Agent"** tab from the tab menu at the top of Figure 3–3. The **"Secondary Agent"** screen shown in Figure 3–5 will appear.

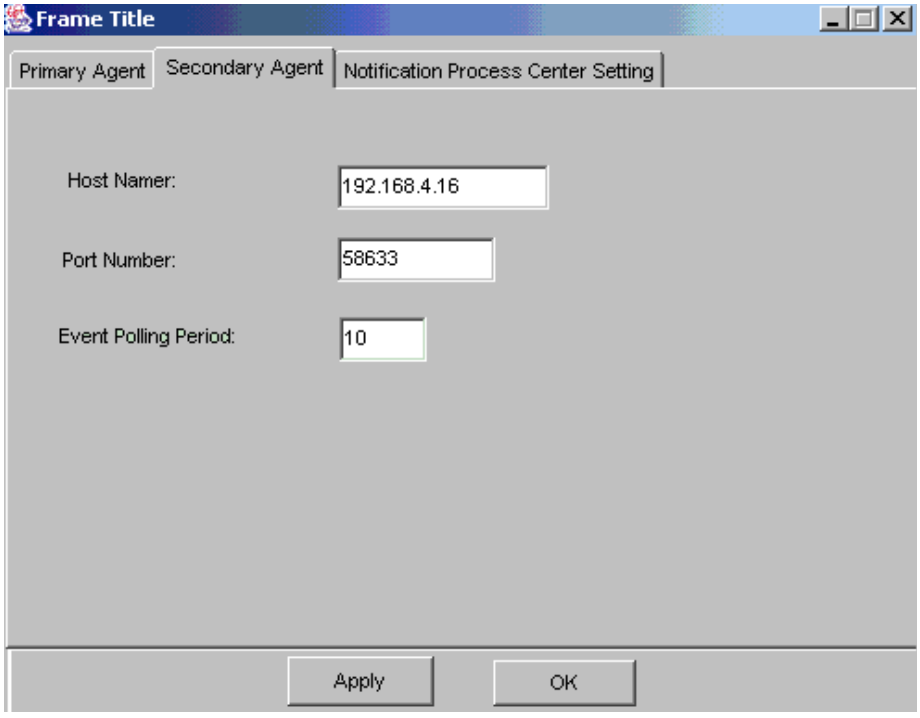


Figure 3–5 Secondary Agent Settings

Important **Local Secondary Agents must be installed at all RAID hosts managed by Altos RAIDWatch.**

- **Host Name/IP Address**: The IP address for the current RAID server.
- **Port Number**: The TCP port to be used by all secondary agents.
- **Event Polling Period**: The time interval (in seconds) for event queries from the Secondary Agent to the RAID controller.

3.5 NPC Settings

To configure the ***Notification Process Center (NPC)*** settings, select **"Notification Process Center Setting"** tab from the tab menu at the top of Figure 3–3. the **"Notification Process Center"** screen shown in Figure 3–6 will appear.

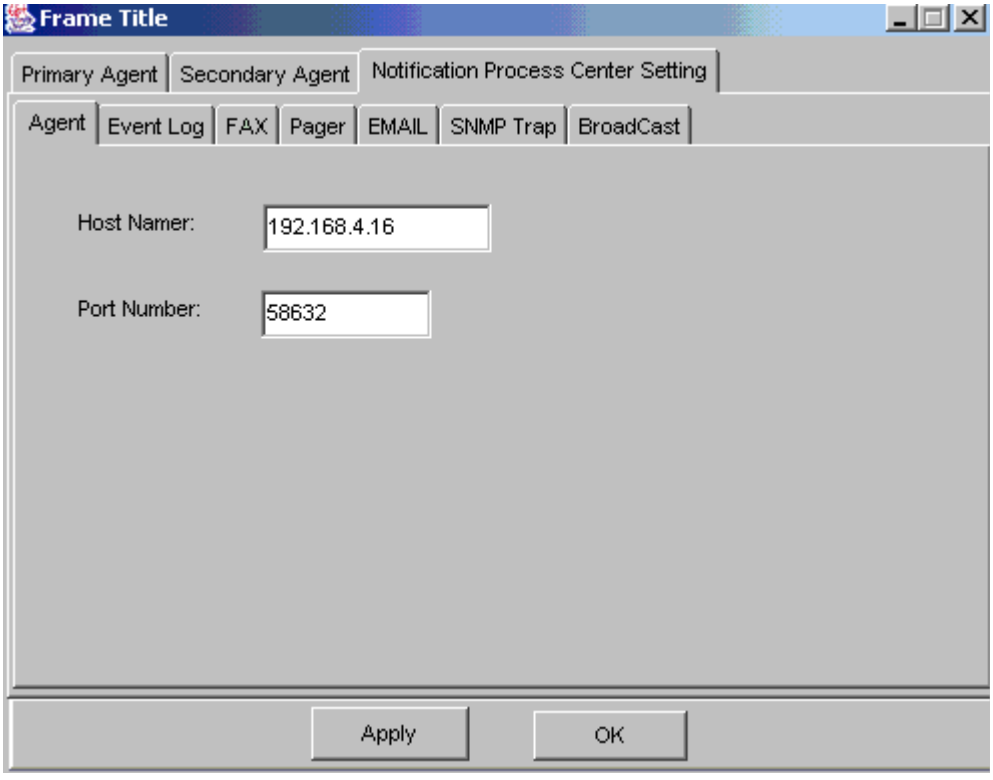


Figure 3–6 NPC Settings

There are seven sub-tabs at the top of the ***NPC Settings*** window shown in Figure 3–6. Along with five different (Fax, Pager, Broadcast, Email, and SNMP Traps) means of informing RAID managers that an event has occurred, the Agent and the Event Log can also be configured by the user.

In order to use fax or pager notification, Modem parameters must also be set. For NT servers, Widows Messaging and Personal Fax must be installed and running for NPC to work. If NPC will not be used, skip these steps.

3.5.1 Agent

After opening the NPC Settings window shown in Figure 3–6, the Agent window will immediately appear. The ***Host Name*** and the ***Port Number*** must be configured.

- **Host Name**: This is the controller's IP address.
- **Port Number:** This is the port number the Altos RAIDWatch Manager stations will use to communicate with the Primary Agent.

3.5.2 Event Log

To open the **"Event Log Configuration"** window, first open the ***NPC Settings*** window shown in Figure 3–6, and then select the Event Log sub-tab. The ***Event Log Configuration*** window shown in Figure 3–7 will appear.

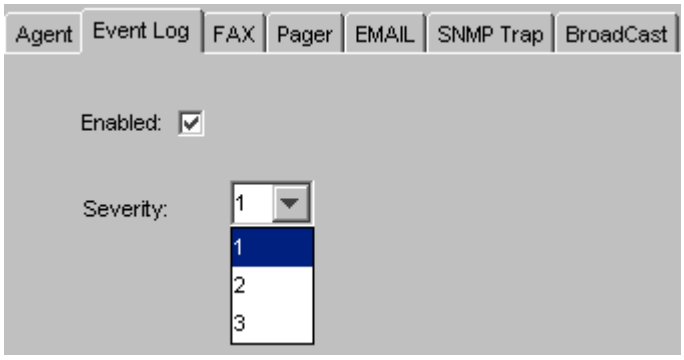


Figure 3–7 Select NPC

To open the **"FAX"** window, first open the ***NPC Settings*** window shown in Figure 3–6, and then select the FAX sub-tab. The FAX configuration window shown in Figure 3–8 will appear. There are two sub-tabs in the FAX configuration window, **"Base Settings"** and **"Phone Number List"**

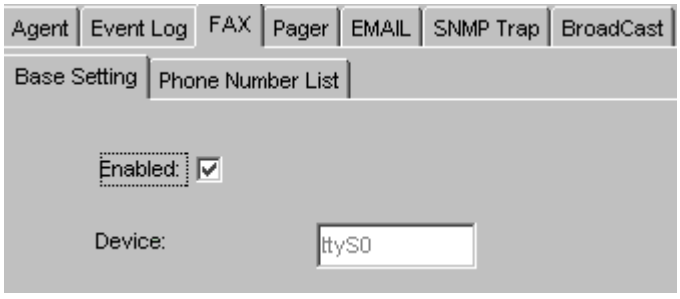


Figure 3–8 : Enable device

3.5.2.1 Base Settings

To open the **"Base Settings"** configuration window, select the ***Base Setting*** sub-tab shown in Figure 3–8.

- **Enable**: In the center of the ***FAX*** settings window there is an enable option. To configure the notification device click on the square next to **"Enable."** See Figure 3–8.

3.5.2.2 Phone Number List

To open the **"Phone Number List"** configuration window, select the ***Phone Number*** list sub-tab shown in Figure 3–8. The window shown in Figure 3–9 will appear:

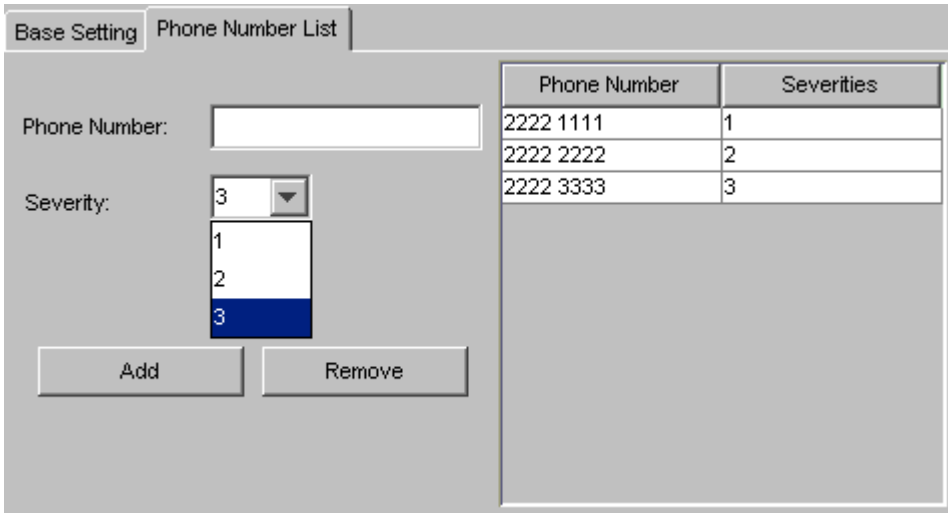


Figure 3–9 FAX Phone Number List

- **Phone Number**: The phone number for an event message receiving fax machine. (Note that any access dialing requirements, such as accessing an outside line, must be included in the phone number. For example: 9,,,2241603 wherein "9" is access for an outside line and ",,," indicates a pause.)

- **Severity** is the parameter used to determine what levels of events to be sent via FAX (1, all levels; 2, Warning and Alert; 3, only Alert).

- **Available phone numbers**: A list of all phone numbers that the NPC will use to send a message to. The numbers and the severity of the messages that will be sent to the number shown are listed.

3.5.3 Pager Settings

To open the **"Pager"** window, first open the ***NPC Settings*** window shown in Figure 3–6, and then select the ***Pager*** sub-tab. The ***Pager*** configuration window shown in Figure 3–10 will appear. There are two sub-tabs in the Pager configuration window, **"Base Settings"** and **"Phone Number List"**

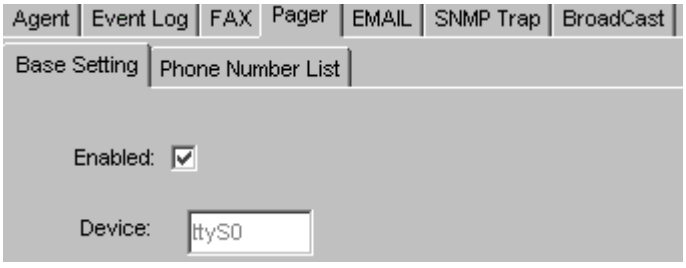


Figure 3–10 Enable device

3.5.3.1 Base Settings

To open the **"Base Settings"** configuration window, select the ***Base Setting*** sub-tab shown in Figure 3–10.

- Enable - In the center of the ***FAX*** settings window there is an enable option. To configure the notification device click on the square next to **"Enable."** See Figure 3–10.

3.5.3.2 Phone Number List

To open the **"Phone Number List"** configuration window, select the **"Phone Number"** list sub-tab shown in Figure 3–10. The window shown in Figure 3–11 will appear:

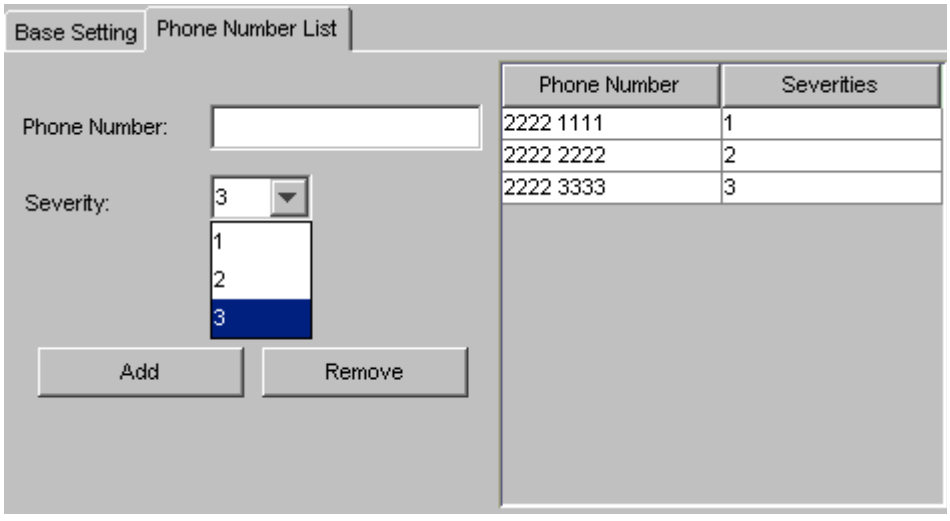


Figure 3–11 Pager Phone Number List

- **Phone Number**: The phone number for an event message receiving pager. (Note that any access dialing requirements, such as accessing an outside line, must be included in the phone number. For example: 9,,,2241603 wherein "9" is access for an outside line and ",,," indicates a pause.)

- **Severity** is the parameter used to determine what levels of events to be sent via Pager (1, all levels; 2, Warning and Alert; 3, only Alert).

- **Available phone numbers**: A list of all phone numbers that the NPC will use to send a message to. The numbers and the severity of the messages that will be sent to the number shown are listed.

3.5.4 Email Settings

To open the **"Email"** window, first open the ***NPC Settings*** window shown in Figure 3–6, and then select the ***Email*** sub-tab. The ***Email*** configuration window shown in Figure 3–12 will appear. There are two sub-tabs in the ***Email*** configuration window, **"Base Settings"** and **"Mail Address List"**

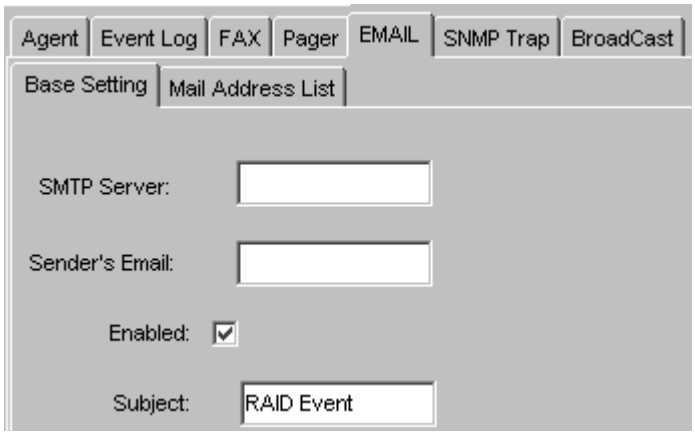


Figure 3–12 Email Settings

3.5.4.1 Base Settings

To configure the "**Base Settings**" select the ***Base Settings*** sub-tab from Figure 3–12 and the configuration options shown in Figure 3–12 will appear.

- **SMTP Server**: The mail server used to send event notifications via e-mail.
- **Sender's Email:** The **"From"** part of e-mail notification messages. It must be a valid internet e-mail address.
- **Enable:** Enables the email settings, select the click on the **"Enable"** box in the middle of the ***Broadcast Settings*** window.
- **Subject**: Allows users to add a subject to event notification emails.

3.5.4.2 Mail Address List

To configure the **"Email Address List"** select the ***Email Address List*** sub-tab from Figure 3–12. The configuration options shown in Figure 3–13 will appear.

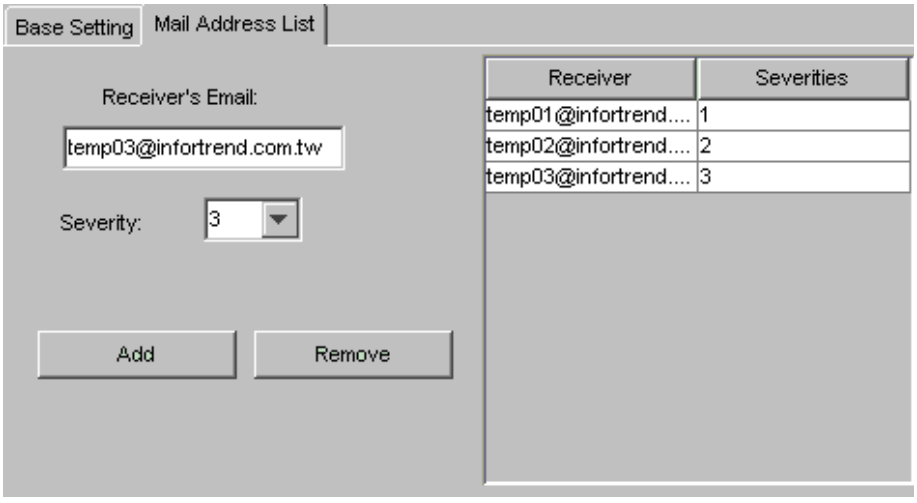


Figure 3–13 Email Settings

- **Receiver's Email:** Allows users to enter multiple event notification e-mail recipients with messages for each. Each entry must be a valid internet e-mail address.
- **Severity**: The parameter used to determine what levels of events to be sent via Email (1, all levels; 2, Warning and Alert; 3, only Alert).
- **Available Addresses**: Shows a list of all the email addresses that the NPC will use to send a message to. Both the email addresses and the severity of the messages that will be sent to the addresses shown are listed.

3.5.5 SNMP Settings

To open the **"SNMP"** window, first open the ***NPC Settings*** window shown in Figure 3–6, and then select the ***SNMP*** sub-tab. The SNMP configuration window shown in Figure 3–14 will appear. There are two sub-tabs in the ***SNMP*** configuration window, **"Base Settings"** and **"SNMP Traps List".**

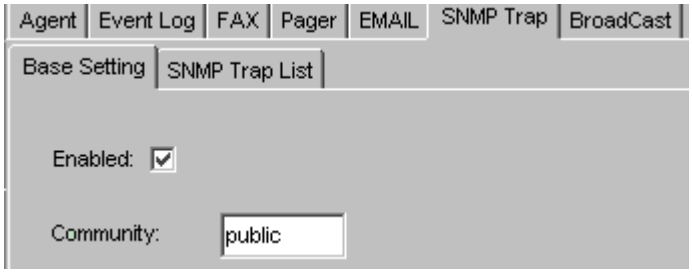


Figure 3–14 SNMP Base Settings

3.5.5.1 Base Settings

To configure the **"Base Settings"** select the **"Base Settings"** sub-tab from Figure 3–14 and the configuration options shown in Figure 3–14 will appear.

- **Enable**: To enable the SNMPTrap settings, click on the **"Enable"** box in the middle of the ***SNMP Settings*** window.

- **Community**: This is just a string authentication and can be seen as a plain text password.

3.5.5.2 SNMP Trap List

To configure the **"SNMP Trap List"** select the ***SNMP Trap List*** sub-tab from Figure 3–14. The configuration options shown in Figure 3–15 will appear.

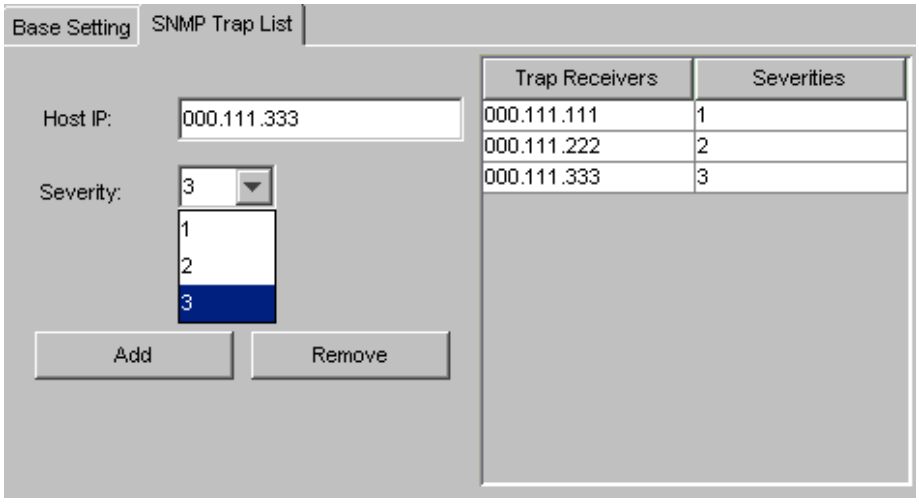


Figure 3–15 SNMP Trap List Settings

- **Host IP**: The port number of the agents listening for traps. Click **Add** to avail agents to the ***Trap Receiver List***.

- **Severity** is the parameter used to determine what levels of events to be sent via SNMP (1, all levels; 2, Warning and Alert; 3, only Alert).

- **Host Name**: A list of listening SNMP agents.

Important **Agent and NPC configuration parameters can be reconfigured later using the installation program. Run the installation program and select Configure Only from the Start menu to reconfigure Agent and NPC settings.**

3.5.6 Broadcast Settings

To open the **"Broadcast Settings"** window, first open the ***NPC Settings*** window shown in Figure 3–6, and then select the ***Broadcast Settings*** sub-tab. The ***Broadcast Settings*** configuration window shown in Figure 3–16 will appear. There are two sub-tabs in the ***Broadcast Settings*** configuration window, **"Base Settings"** and **"Broadcasting List".**

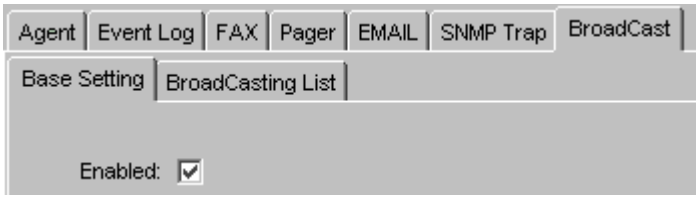


Figure 3–16 Enable Broadcast settings

3.5.6.1 Base Settings

To configure the **"Base Settings"** select the ***Base Settings*** sub-tab from Figure 3–16 and the configuration options shown in Figure 3–16 will appear.

- **Enable**: To enable the broadcast settings, select the **"Enable"** box in the middle of the ***Broadcast Settings*** window.

3.5.6.2 Broadcasting List

To configure the **"Broadcasting List"** select the ***Broadcasting List*** sub-tab from.Figure 3–16. The configuration options shown in Figure 3–17 will appear.

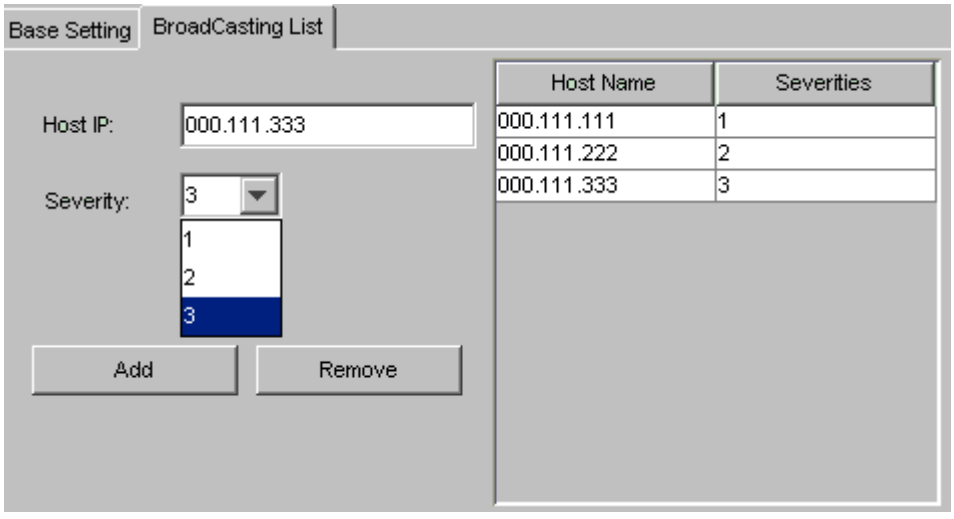


Figure 3–17 Broadcasting List Settings

- **Host IP/Name**: The IP address a broadcast message will be sent to.
- **Severity**: The parameter used to determine what levels of events to be sent via Broadcast (1, all levels; 2, Warning and Alert; 3, only Alert).
- **Host Name**: Shows a list of all the IP addresses that the NPC will use to send a message to. Both the IP addresses and the severity of the messages that will be sent to the address shown are listed.

3.6 Rebooting the Controller

After the configurations settings have been made, for them to take affect the controller must be rebooted. If the controller is not rebooted after the configuration settings have been made then the settings may not take effect.

Chapter 4
Operation

This chapter discusses basic Altos RAIDWatch Manager operations. We recommend that you review it to learn the basic organization and functions of the program. This chapter includes the following topics:

4.1 Starting Altos RAIDWatch

4.1.1 Starting Altos RAIDWatch Agents

4.1.1.1 Under Windows (NT 4, or 2000/XP) Operating Systems

The Primary Agent and Secondary Agents start automatically under Windows Operating Systems each time the host computer is reset.

4.1.1.2 Under Unix or AIX Operating Systems (Solaris 7 SPARC or x86, HP UX 11, or Red Hat Linux 6.1)

Under **Unix systems** the Primary Agent, Secondary Agent and NPC (which are all installed on the host computer) must be started manually each time the host computer is reset. These items must be started in the following order:

- First start the secondary agent,
- Second start the primary agent,
- Third start the NPC

To start the Primary Agent, Secondary Agent(s) under a Unix system:

1 At the host computer, change directories to:

/usr/hybrid/bin/ (or whatever directory you chose during the installation if not the default)

2 Then at the command line, type:

primary <Enter> -- to start the Primary Agent

secondary <Enter> -- to start the Secondary Agent

npc <Enter> -- to start the Secondary Agent

Altos RAIDWatch is now running. The next step is to start the GUI part of the software, Altos RAIDWatch Manager.

4.2 Starting Altos RAIDWatch Manager

The GUI management interface, Altos RAIDWatch Manager, needs to be started by a network or RAID systems manager regardless of which OS is being used.

Depending on your setup, you can start Altos RAIDWatch Manager in various ways.

For both local and distant management, and under various Operating systems, starting the program is fairly simple. Please refer to the appropriate sub-section below for information.

4.2.1 Starting Altos RAIDWatch Manager Locally or via LAN under the Windows (95/98/Me/NT/2000/XP) Environment

1 From the **Start** menu, select *Programs --> Altos RAIDWatch Manager*.

or,

Double-click the Altos RAIDWatch Manager icon either in the group folder or from the desktop if a shortcut was added during the installation process. The Altos RAIDWatch Manager *Connect to RAID Agen*t prompt window should appear on the screen.

2 Enter the IP address and TCP port assignment of the disk array system where the Primary Agent was installed. If you are running Altos RAIDWatch Manager at the Primary Agent host machine (i.e., "locally") and want to manage a RAID hosted by the Primary machine, click the **Default** button.

3 Double click on a RAID host IP you would like to manage, then double click on the controller icon, then double click on the connection method (e.g., In-Band SCSI), to connect to the disk array system. For more information on how to connect, see section 4.3, "Connecting and Disconnecting from a Disk Array", on page 50.

4.2.2 Starting Altos RAIDWatch Manager for Remote Management via Web Browser (any supported OS)

1 Start your web browser and enter the IP address of the Primary Agent host followed by GRM.HTML as your URL (e.g., 222.212.121.123\GRM.HTML). After a brief delay while the Java Applet starts, the Altos RAIDWatch Manager main connection window appears on the screen.

2 Double click on a RAID host IP you would like to manage, then double click on the controller icon, then double click on the connection method (e.g., In-Band SCSI), to connect to the disk array system. For more information on how to connect, see section 4.3, "Connecting and Disconnecting from a Disk Array", on page 50.

4.2.3 Starting Altos RAIDWatch Manager Locally or via a LAN under a Unix or AIX Workstation (Solaris 7 (SPARC, x86); Red Hat Linux 6.1) Environment

1 Open a terminal application or command line window.

2 Change directory to **/usr/hybrid/bin/** (or whatever directory you chose during the installation if not the default).

3 At the command prompt, type:

java -jar grm.jar

The Altos RAIDWatch Manager main connection window should appear on the screen.

4 Enter the IP address and TCP port assignment of the disk array system where the Primary Agent was installed. If you are running Altos RAIDWatch Manager at the Primary Agent host machine (i.e., "locally") and want to manage a RAID hosted by the Primary machine, click the **Default** button.

5 Double click on a RAID host IP you would like to manage, then double click on the controller icon, then double click on the connection method (e.g., In-Band SCSI), to connect to the disk array system.

For more information on how to connect, see section 4.3, "Connecting and Disconnecting from a Disk Array".

4.3 Connecting and Disconnecting from a Disk Array

Before management can be performed on a particular disk array system, you need to first establish a connection between your Altos RAIDWatch Manager station and the Primary Agent host. Once a connection is established successfully, management can be started.

Disconnection is used for breaking the link between the Altos RAIDWatch Manager station and the array. This option is particularly useful in cases where multiple disk arrays are being managed at the same time instead of restarting the Altos RAIDWatch Manager every time you need to switch to another system, you just need to disconnect from the current array and then connect to another.

The following discusses how to connect to a disk array. Information on disconnection is provided at the end of this section.

4.3.1 Connecting to a RAID System while Working from the Local Primary Agent Host

1 From the **File** menu, select **Connect**. *or*

Click on the **Connect** command button. The following prompt will appear on the screen:

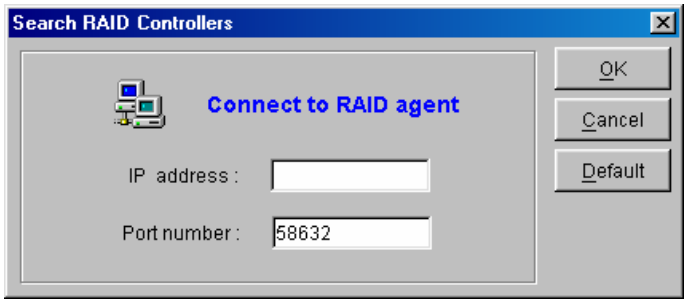


Figure 4–1 Connect to RAID Agent

Click the **Default** button.

2 The connection screen shown in Figure 4–2 will appear. Select the IP address of the RAID you would like to monitor or manage from the **Connection View** list. Double click the IP address. Double click the controller icon. Double click the connection method (e.g., In-Band SCSI).

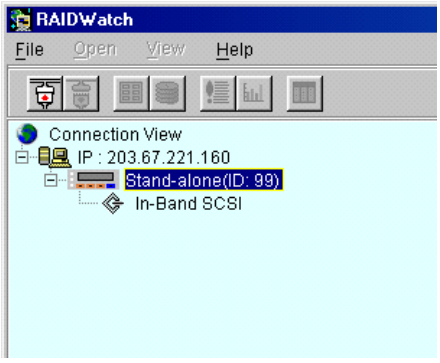


Figure 4–2 Click the connection Method, e.g. In-Band SCSI

3 You will be prompted for a password to access the controller. Enter the password (there is no default password) and click **OK**. The connection is successful when the RAID View Introduction window appears and the tool bar buttons are activated.

Figure 4–3 Enter Password

4.3.2 Connecting to a RAID System from a Distant Host

1 In the screen shown in Figure 4–4, select the IP address of the RAID you would like to monitor or manage from the **Connection View** list. Choose and double click on an IP address. Double click the controller icon for that IP address. Choose and double click the connection method (e.g., In-Band SCSI).

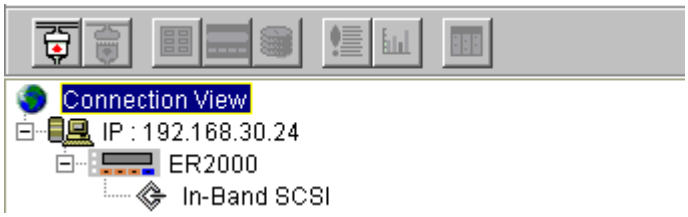


Figure 4–4 Click the connection Method, e.g. In-Band SCSI

2 You will be prompted for a password to access the controller. Enter the password (there is no default password) and click **OK**. The connection is successful when the **Introduction** window appears and the tool bar buttons are activated.

Figure 4–5 Enter Password

4.3.3 Disconnecting from a Disk Array System

- From the **File** menu, select "**Disconnect**". Or, click the **Disconnect** button on the toolbar.

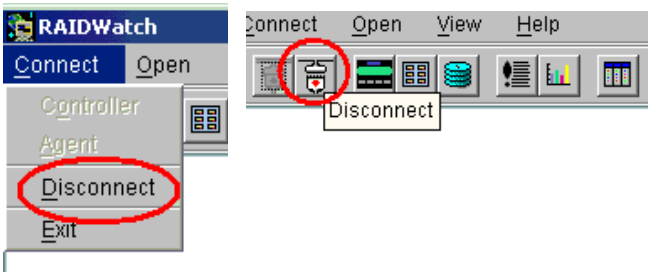


Figure 4–6 Disconnect from Altos RAIDWatch

All toolbar buttons, except the **Connect** command button, turn gray signifying disconnection from the disk array system. Altos RAIDWatch Manager should return to the **Connection View** window.

4.4 Setting Up Security

Altos RAIDWatch provides password protection to prevent unauthorized access to RAID controllers or controller setting modifications. This protection, which is implemented by the Altos RAIDWatch Primary Agent, prompts a user for the station password the first time he or she attempts to connect to a controller through a Secondary Agent.

By default, Altos RAIDWatch comes without passwords, so when prompted for a password the first time, just press Enter. After gaining control, set a password to provide security to the managed disk arrays.

4.4.1 Setting a Password for Altos RAIDWatch Controller Access

1 Display the Configuration window by clicking on the **Configuration** button under the introduction in the RAIDView, see section 4.5.4 on page 56.

2 From the **Configuration** window, click on the controller tab, under **Controller**, click on the operation tab, under **Operation**, choose the **Password** tab. The **Change Password** dialog box appears as shown in Figure 4–7.

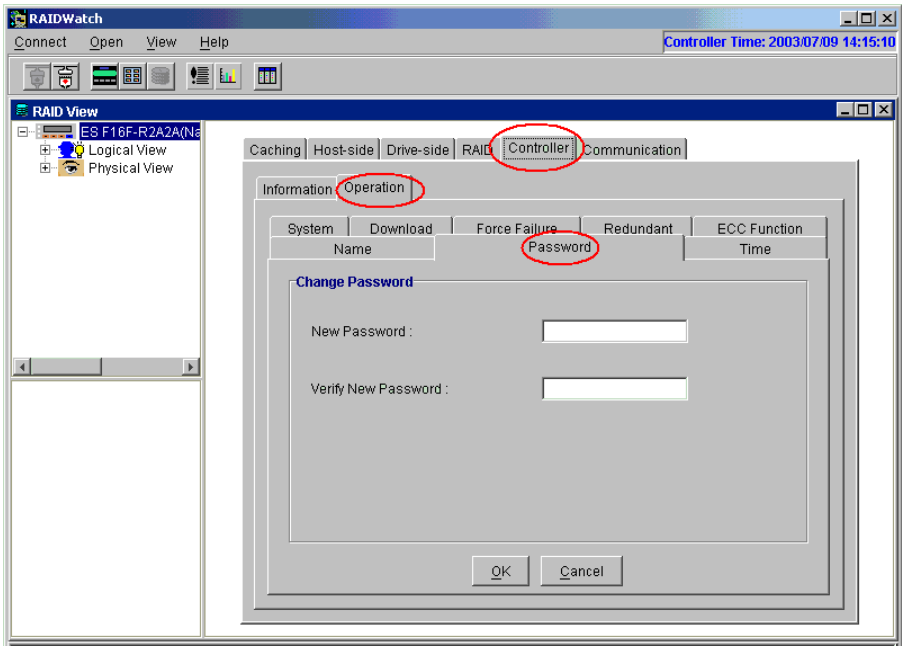


Figure 4–7 Enter a New Password

3 Type in a **New Password**.

4 Re-type the password in the **Verify Password** field to confirm.

5 Click **OK**.

4.4.2 Setting TCP Port Numbers

A security related setting that should be considered is the TCP port setting of Primary Agent hosts. TCP port assignments must be made in order for Altos RAIDWatch to work. Modifying TCP port settings to something other than the default will increase system security.

Altos RAIDWatch is shipped with a default TCP port setting for the Primary Agent: 58632. It is recommended that users change the default TCP port setting to a less commonly used TCP port assignment.

TCP ports can be assigned any number between 1 and 65535, but as some of the smaller possible assignments are commonly used for other purposes, we recommend using a port number between 49152 and 65535. Refer to section 2.4.2, ”Installing Altos RAIDWatch”, on page 14 for information on configuring Primary Agent TCP port numbers.

4.5 Look and Feel

4.5.1 Look and Feel Overview

Because Altos RAIDWatch Manager is a Java-based GUI program, it can accommodate the "Look and Feel" standards of various Operating Systems (OS) At present, three different interface appearances are supported: Windows, Unix, and Java.

Altos RAIDWatch Manager will auto-detect and configure to match the Operating System where it is currently running.

In the event of a compatibility problem or under unknown Operating Systems or OS versions, the program will default to Java look and feel.

Just like other GUI-based applications, Altos RAIDWatch Manager works entirely with windows, buttons, and menus to facilitate various disk array operations. These windows follow the standard Windows and Unix OS "Look and Feel" specifications, thus steps for manipulating elements and windows within any Altos RAIDWatch Manager window generally conform to standard procedures. The management sessions are best displayed in the 800x600 screen resolution.

Note Screen captures throughout this document show the Windows look and feel.

4.5.2 Navigation Menus

The menu bar shown in Figure 4–8 displays the available menus.

Figure 4–8 : Menu Bar

All menus provide a list of commands (shown in Figure 4–10) for invoking various disk array and display-related operations. Most commonly used commands such as ***Statistics and Event Log*** also have command buttons to facilitate their execution. You can either select the command from the menu, or click on its toolbar command button. For a summary of commands, see Appendix A , "Command Summary", on page 173.

4.5.3 Tool Bar

Altos RAIDWatch Manager provides a toolbar located just beneath the menu bar for displaying key command buttons. These buttons serve various purposes, which are described in detail in this section.

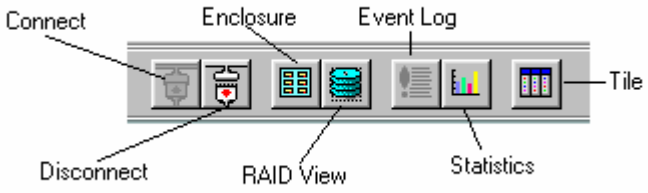


Figure 4–9 Tool Bar

4.5.4 Common Commands

The following commands appear both in the Navigation Menus described in Section4.5.2 and the Tool Bar described in section 4.5.3.

- The Connect command button is used for connecting to a disk array system. This button has the same function as the Connect command under the File menu.

Note Multiple simultaneous Altos RAIDWatch Manager connects to one Secondary agent is not a supported function.

- The **Disconnect** command button is used for disconnecting from a disk array system. This button has the same function as the **Disconnect** command under the **File** menu. (Note that Disconnect does not close Altos RAIDWatch Manager.)

- The **Enclosure** command button displays the Enclosure window for displaying and configuring custom enclosures. This button provides the same function as the **Enclosure** command under the **Open** menu.

- The **RAID View** command button displays the configuration and control window for the controller and drives. This button provides the same function as the **RAID View** command under the **Open** menu.

- The **Event Log** command button opens the **Event Log** window for displaying the array event log. This button provides the same function as the **Event Log** command under the Open menu.

- The **Statistics** command button displays the Statistics window for viewing activity (Cache hits or Read/Write) on the disk array system. This button provides the same function as the **Statistics** command under the **Open** menu.

- The **Tile** command button arranges the displayed windows by giving each an equal share of the available application window space. This button has the same function as the **Tile In-Window** command under the **View** menu. (Note: The **Tile In-Sequence** function listed under **View** is not currently available.)

4.5.5 Menu Commands

The following commands only appear in the ***Navigation Menus*** described in section 4.5.2 and shown in Figure 4–10.

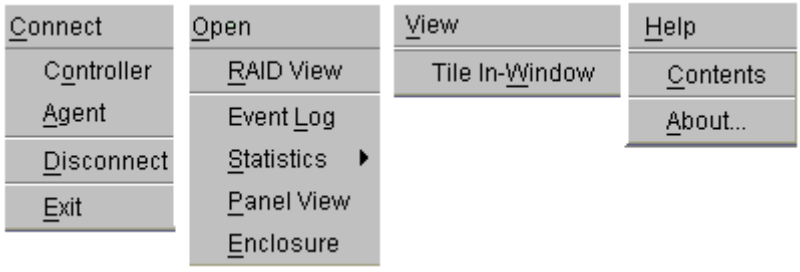


Figure 4–10 Menu Commands

- The **Agent** command under the **Connect** menu brings up the "**Connect to RAID agent**" prompt. This command is only available when Altos RAIDWatch Manager is not currently connected to any agents.
- The **Exit** command under the **Connect** menu is always available and is used to end the current Altos RAIDWatch Manager session.
- The **Contents** command under the **Help** menu brings up the main navigation window for the Altos RAIDWatch Manager help file.
- The **About** command under the **Help** menu brings up a window that provides Altos RAIDWatch version information.

4.5.6 Windows Display Area

The windows display area is where the system displays Altos RAIDWatch Manager windows. You have the option to arrange the displayed windows on this area in various ways depending on your specific needs.

- The **View** menu provides you with commands to arrange windows. For information on how to do this see section 4.9.3, "Arranging Windows", on page 68**.**
- **Controller Time**, shown at the top right hand corner of the screen, shows the current controller date and time settings (see Figure 4–11).

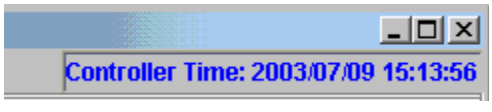


Figure 4–11 Controller Time

- The **status bar** at the bottom of the Window (see Figure 4–12) displays the results of various disk array operations.

Figure 4–12 Status Bar

- The **scroll bars** let you move parts of a window into view when the entire window does not fit into the windows display area.

4.6 Using the RAID View Window

The **RAID View** window provides the configuration, installation, management, and monitoring functions available in Altos RAIDWatch. The RAID View window includes a Navigation Panel and a Content Panel.

4.6.1 Accessing the RAID View Display

To open the RAID View display either select the RAID View icon from the navigation toolbar shown in Figure 4–9 or select the RAID View command from the Open Menu Shown in Figure 4–10.

When the RAID View display is opened, the screen shown in Figure 4–13 should appear.

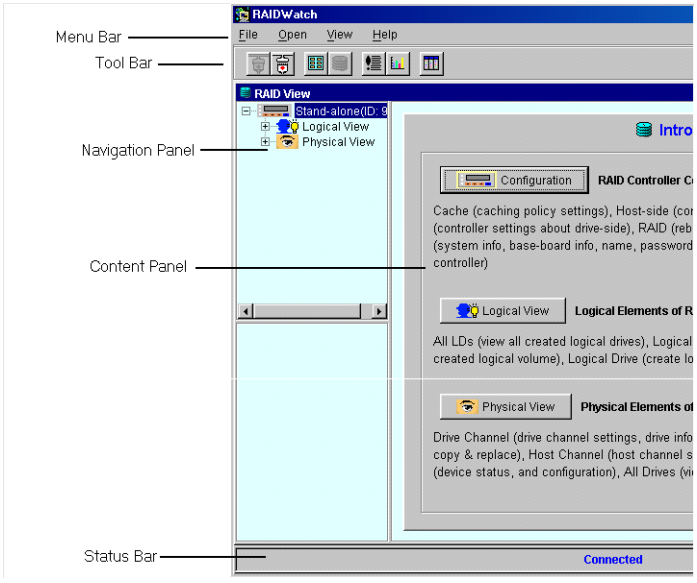


Figure 4–13 RAID View Display

- The **Navigation Panel** provides a tree organization display of logical and physical drives managed by the current controller. The **Navigation Panel** also has a sub panel for displaying longer information trees.

- When **RAID View** first opens, the Navigation panel in the upper left quadrant of the window will display icons for the controller, **Logical View** and **Physical View**.

- The **Content Panel** displays information about controller settings, logical drive settings, and physical drives as selected in the Navigation Panel.

The large Contents panel to the right will display an Introduction with access buttons for **Configuration**, **Logical View** and **Physical View**. Each of these primary function windows will be described below and in detail in Chapter 4.The following describes the various control and display components found in the RAID View window:

4.6.2 Using the Configuration View

Configuration functions can only be accessed by clicking the **Configuration** button under the Introduction in the RAID View window.

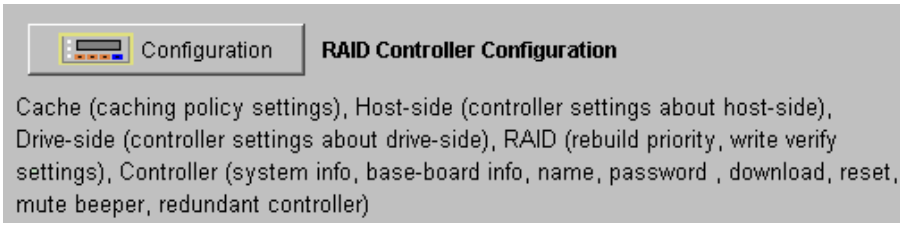


Figure 4–14 select Configuration

Once in the **Configuration** view, all windows are accessed via window tabs.

Each tab corresponds with a controller configuration setting, option, or readout; and most tabs include various sub-functions.

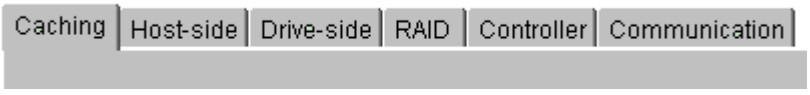


Figure 4–15 Configuration View Window Tabs

See section 6.1, "Configuring the Controller", on page 75 and the controller's user documentation for more information about controller settings.

4.6.3 Using the Logical View

Logical View is where you perform management on the logical drives and logical volumes of the disk array system. Logical drives (LDs) are combinations of physical drives, which are used to create logical volumes (LVs). These volumes (or their partitions) can then be mapped to various host LUNs.

A sub-function of the RAID View window, **Logical View** allows you to create, expand, and delete existing LDs and LVs. It uses unique colors to distinguish between logical drives. When a physical drive within a logical drive fails, the system notifies you by darkening the color of the affected logical drive. The logical drive will remain in this state until either a spare is detected and an automatic rebuild is started, or the drive is replaced and a rebuild is manually initiated.

After a rebuild is complete, the logical drive will display its normal color, signifying an on-line condition.

To display the **Logical View**, you can either click on the **Logical View** button in the RAID View Introduction or select the **Logical View** icon in the navigation panel of the RAID View window.

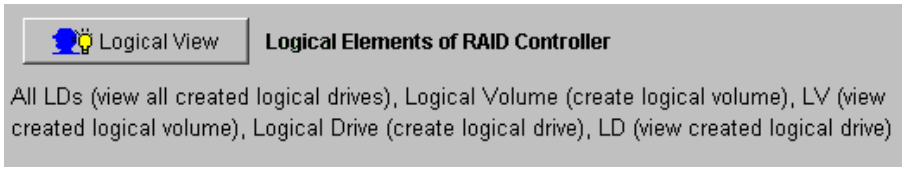


Figure 4–16 Select View Button

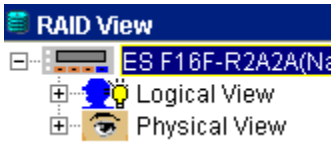


Figure 4–17 Select Logical View Icon

A window similar to the one shown in Figure 4–18 will appear in the Content Panel and the icons shown in Figure 4–19 will appear in the navigation panel.

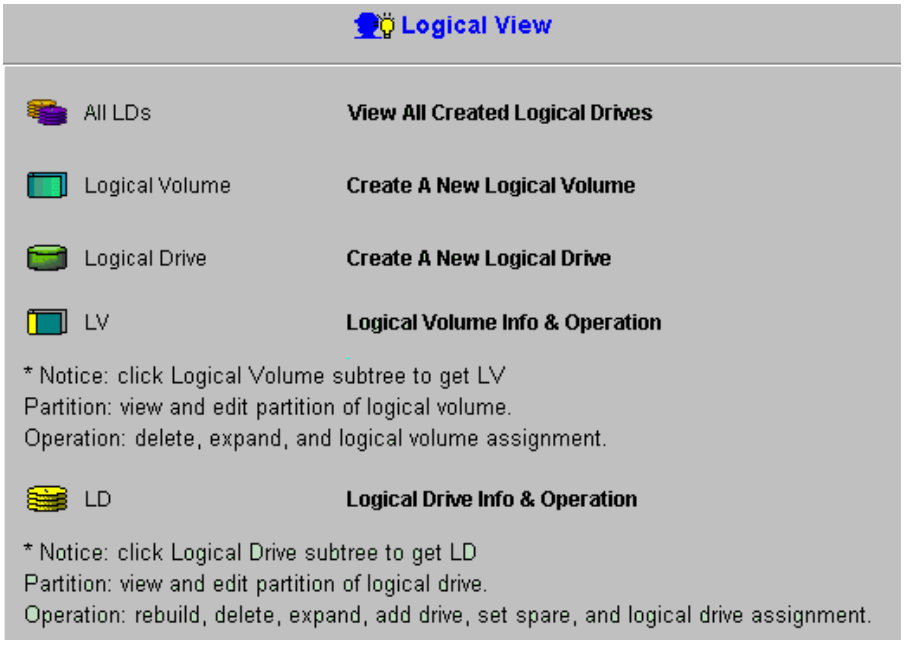


Figure 4–18 Logical View Content Panel information

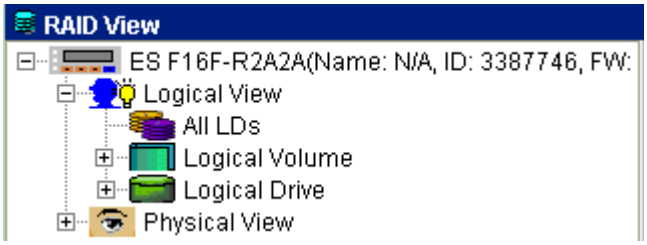


Figure 4–19 Logical View Navigation Panel icons

Note that the symbols in the initial Logical View content panel are not interactive. To select a Logical Drive or Logical Volume, click on the appropriate icon in the navigation panel.

If you need information about a particular logical drive, just let the mouse pointer hover over its corresponding icon. A message similar to the one in Figure 4–20 will appear:

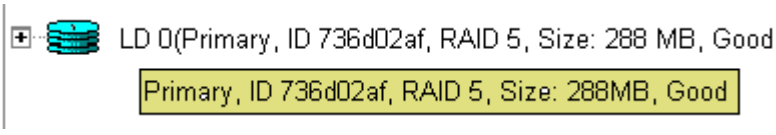


Figure 4–20 Logical Drive message tag

This message displays the controller assignment, ID number, RAID level, total capacity, and current status of the logical drive.

For more information on how to create, delete, and rebuild logical drives and logical volumes, see Chapter 5 , "Array Management", on page 71

4.6.4 Using the Physical View

Physical View under the RAID View window is where you can view and modify the configuration of drive and host channels and physical drives.

To display the Physical View, you can either click on the **Physical View** button (see Figure 4–21) in the RAID View Introduction or select the **Physical View** icon (see Figure 4–22) in the navigation panel of the RAID View window. A window similar to the one below will appear.

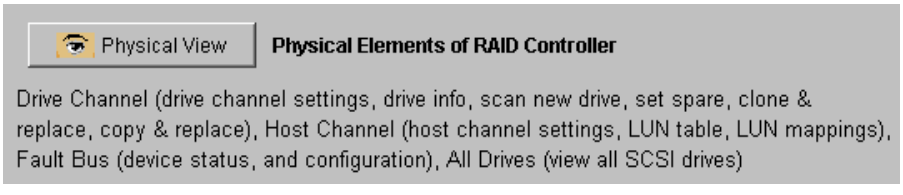


Figure 4–21 Select the Physical View Button

Figure 4–22 Select the Physical View Icon

A window similar to the one shown in Figure 4–23 will appear in the Content Panel and the icons shown in Figure 4–24 will appear in the navigation panel.

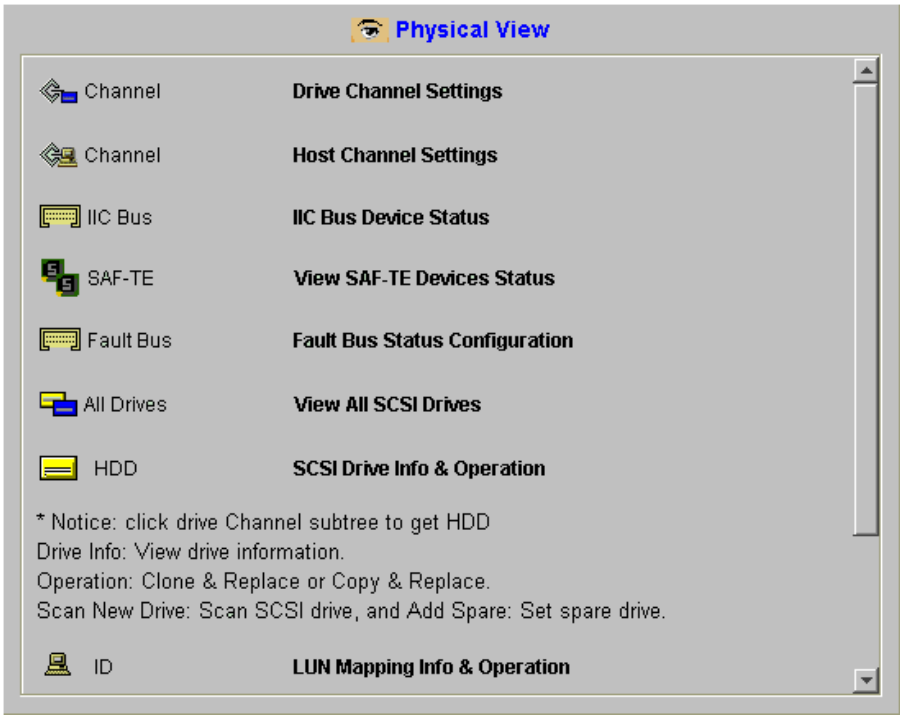


Figure 4–23 Physical View Content Panel information

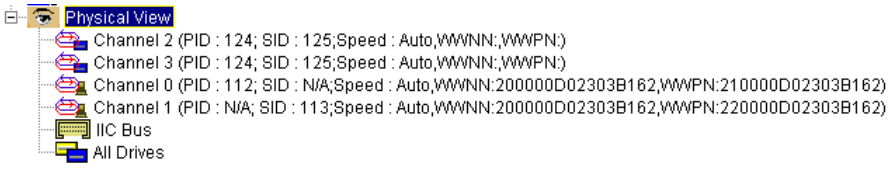


Figure 4–24 Physical View Navigation Panel icons

Note The symbols in the **Physical View** initial content panel are not interactive. To select a channel, status display, or physical drive, click on the appropriate icon in the navigation panel.

Letting the mouse pointer hover over a channel displays a message tag similar to the one shown in Figure 4–25

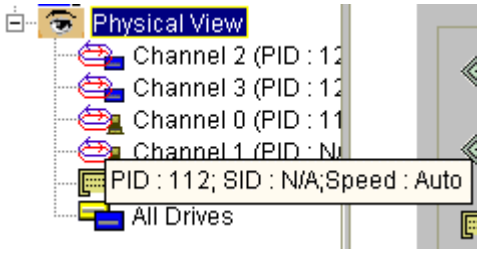


Figure 4–25 Physical view navigation Panel Icons Message Tag

The message tag shown in Figure 4–25 provides information such as primary and secondary IDs, and the current transfer clock rate.

The **Physical View** also allows you to modify the configuration of the drive and host channels, and scan in newly added or replaced physical drives. It also provides host channel LUN configuration; and remote enclosure monitoring SES.

To display host channel LUN configuration information, click on a host channel icon in the navigation panel, then click on the channel ID in the sub-navigation panel (lower-left quadrant of the window). For more information about modifying these configurations, see Chapter 5 , "Array Management", on page 71

4.6.4.1 SES

In addition to displaying drive and host channels, the Physical View can also display ***SES Management devices***. To open view the ***SES Management devices*** click on the **"SES Management devices"** icon in the ***Physical View*** navigation panel.

SES is an interface by which signals from enclosure sensors are passed to the RAID controller. It provides a basic status report on enclosure devices and system parameters like power supplies, fans, and voltage.

Altos RAIDWatch Manager will display the SES Management devices under Physical View. Click on the icon to show status. SES is not user configurable via Altos RAIDWatch Manager.

4.7 Using the Enclosure Window

The **Enclosure** window allows you to define enclosures for creating an exact replica of the disk array's drive bay arrangement, displaying the exact location of the physical drives and controllers.

4.7.1 Accessing the Enclosure Display

To open the Enclosure window display either select the **Enclosure** icon from the navigation button shown in Figure 4–9 or select the **Enclosure** command from the **Open** menu shown in Figure 4–10. The command allows you to access the pre-configured enclosure(s). If multiple enclosures have been defined by system vendor, you may select your enclosure from the selection box shown in Figure 4–26

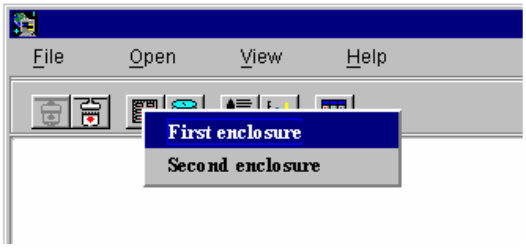


Figure 4–26 Enclosure Selection Box

Select your enclosure and start adding devices into the empty spaces in the enclosure window.

4.7.2 Using the Enclosure Window

Both enclosure windows allow you to assign locations for different components. The Enclosure window is particularly useful in monitoring the status of the physical drives. It provides you with a real-time report on the drive status, using symbols and colors to represent various conditions. The following figures exemplify how Altos RAIDWatch Manager represents various drive conditions:

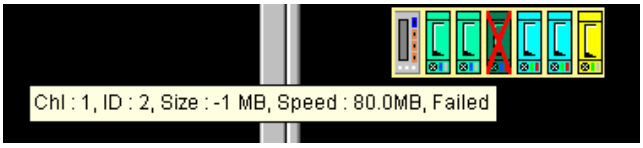


Figure 4–27 Identifying Spare Drives

Spare drives appear with their colors darker (shaded) than normal drives and have a red cross superimposed on them (see Figure 4–27).

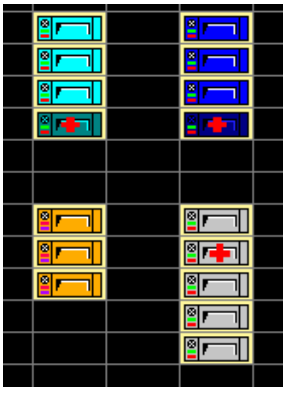


Figure 4–28 Identifying Failed Drives

The red cross is larger on Global spares and smaller on Local spares. When you remove a drive from the drive bay, its corresponding icon on the Enclosure window disappears. The system places a large red **"X"** mark on the icon of a failed drive.

Note **Physical View** under the RAID View window also provides a real-time report on drive status, using the same symbols and colors to represent various conditions. What you see in the Enclosure window

is also reflected in the **Physical View.** These windows, however, differ in the way physical drives are presented; in the Enclosure window, the drives should be arranged according to their actual locations in the drive bays, while in the **Physical View,** the drives are arranged according to channel connections.

You can also display some information about a particular drive by simply placing the mouse pointer on its respective icon. A readout similar to the one shown in Figure 4–29 appears.

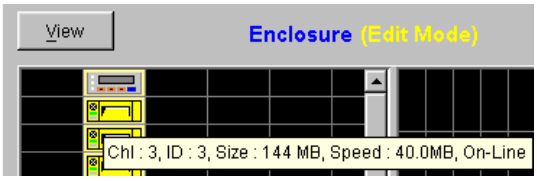


Figure 4–29 Drive Information Message Tag

This readout displays the current configuration of the drive, including the channel number of the connector on the controller to which the drive's cable is connected, the ID number where the drive is installed, the drive's capacity, transfer rate, and current status.

4.8 Event Window

The **Event Log** window displays controller and array events since the last time Altos RAIDWatch Manager was started. The **Event Log** can be accessed through either the **Event Log** command button on the tool bar or under the **Open** menu. If you need to read event logs recorded before Altos RAIDWatch is started, consult your Event Monitor.

Event Log items include critical alerts, warnings, and notifications regarding the RAID controller; drives status; logical device status; and enclosure elements like power supplies, fan, and temperature. Events are not always failures. Some events, such as controller setting changes, are displayed for information purposes.

4.8.1 Accessing the Event Log Display

To open the **Event Log** window display either select the **Event Log** icon from the navigation toolbar shown in Figure 4–9 or select the **Event Log** command from the Open Menu shown in Figure 4–10.

If you need to read event logs recorded before Altos RAIDWatch is started, consult your Event Monitor.

4.8.2 Using the Event Log to Monitor the System

When events occur, Altos RAIDWatch will display a waving Event Flag command button on the tool bar.

Clicking on the Event Flag button will open the **Event Log** window**. Event Log** entries include the time of occurrence and a description of what event took place.

4.9 The Statistics Window

The **Statistics** window includes separate displays for cache hits and for sustained read/write performance.

4.9.1 Accessing the Statistics Window

To open the **Statistics** window display either select the **Statistics** icon from the navigation toolbar shown in Figure 4–9 or select the **Statistics** command from the Open Menu shown in Figure 4–10.

4.9.2 Using the Statistics Window

When selecting the **Statistics** window command in the Menu or the toolbar, a user can select either **"Cache Hits"** or **"Disk R/W."**

4.9.2.1 Cache Hits

If you select Cache Hits, a window similar to the one shown in Figure 4–30 will appear.

- **Cache hits Average** and history provides information about the current operating performance of the RAID controller and disk array.

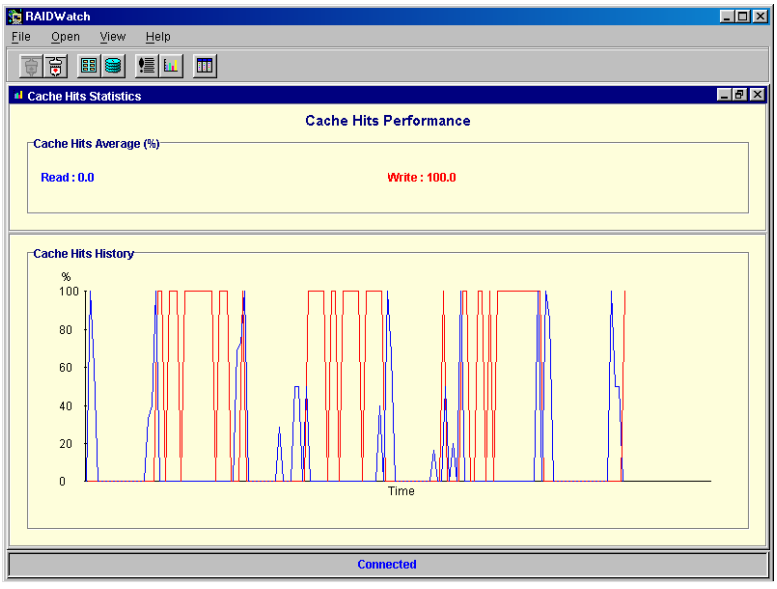


Figure 4–30 Cache Hits Performance Statistics window

- **Cache Hits Average** is a measure of data read or write cache accesses at the most recent moment of sampling. It indicates what percentage of data I/O is cache accessed.

- **Cache Hits History** shows cache read and write hit data over the last few minutes and indicates data caching consistency and frequency.

4.9.2.2 Disk R/W

If you select Disk R/W, a window similar to the one shown in Figure 4–31 will appear.

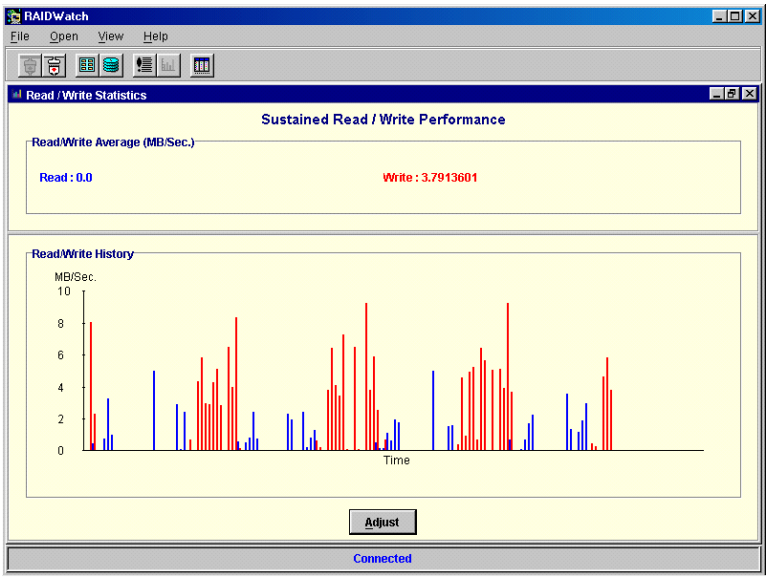


Figure 4–31 Cache Hits Performance Statistics window

- **Sustained Read/Write Performance** is also displayed as both an average and historically. Read/write performance is another way to evaluate the current RAID controller and disk array I/O throughput.

- **Read/Write Average** is a measure of the average data throughput, in MB/second, at the most recent data sample.

- **Read/Write History** shows read/write performance over the last few minutes and indicates data throughput consistency.

The read/write data display scale can be modified using the **Adjust** button at the bottom-center of the Read/Write Statistics window. Scales from 10MB/second to 200MB/second are available.

4.9.3 Arranging Windows

The **View** menu provides you with a command for rearranging the currently open Altos RAIDWatch Manager windows. You can manually manipulate the window frames to display them as you like, or use the **Tile In-Window** command under the **View** menu to arrange open windows to fit next to each other on the screen. **Tile In-Window** is also available via a command button on the tool bar.

Note Currently, the **Tile In-Sequence** function under the **View** menu is not supported.

4.10 Exiting Altos RAIDWatch Manager

Exiting from Altos RAIDWatch Manager terminates the current management session with the disk array system.

4.10.1 Exiting from Altos RAIDWatch Manager

- From the **File** menu, select **Exit**.

or,

- Click the **Close** button on the program window.

4.10.2 Exiting from Altos RAIDWatch Manager Connected via Web Browser

- From the **File** menu, select **Exit**. (Recommended method.)

or,

- Exit the browser application.

or,

- Change the browser HTTP address to a URL or IP other than that of a Altos RAIDWatch Primary Agent.

Chapter 5

Array Management

This chapter describes how to manage a disk array system. Topics covered include the following:

- Background information about disk array management, 5.1 on page 71.
- Operating with Spare Drives, 5.2 on page 72
- Operating without spare drives, 5.3 on page 73.
- Before you start, 5.4 on page 73.

If this is your first time to manage a disk array system, we recommend that you read through section 5.1, "Background Information", to get basic information about disk array management. You will need this basic knowledge to be able to effectively use Altos RAIDWatch Manager.

5.1 Background Information

Redundant Arrays of Independent Disks (RAID) is a storage technology used to improve the processing capability of storage systems. This technology is designed to provide reliability (i.e., "fault tolerance") in disk array systems and to take advantage of the performance gains multiple disks can offer.

RAID comes with a redundancy feature that ensures fault-tolerant, uninterrupted disk storage operations. In the event of a disk failure, disk access will still continue normally with the failure transparent to the host system.

RAID has six levels: RAID 0 ~ 5. RAID levels 1, 3 and 5 are the most commonly used levels, while RAID levels 2 and 4 are less popular. Appendix C , "RAID Levels", on page 183 gives information about these levels, including the benefits of each.

Disk array controllers support hot-swapping where a failed drive can be replaced while the disk array system continues to function. Spares can also be assigned so that, as soon as a drive fails, the spare will be automatically configured into the array and reconstruction will commence.

5.1.1 Definition of Terms

This section describes some of the disk array terms used in this documentation.

- **Physical drives**. These are the actual drives installed in the enclosures.These drives are displayed in Physical View under the RAID View window.

- **Spare drive**s. These are physical drives that serve as backups. When a drive fails, the spare is automatically configured into the array, and data reconstruction will commence immediately. Spare drives appear in darker (shaded) colors than normal drives and have a red cross superimposed on them. Large red crosses indicate Global spares, smaller ones represent Local spares.

- **Replacement drives**. These are physical drives that are manually configured into the array to replace failed drives. In the absence of spare drives, you will need to use replacement drives to replace defective drives before rebuilding. If a spare drive has been used to rebuild the array, you will also need to replace the failed drive manually to create another spare with the precaution that another drive might fail.

- **Failed drives**. These are physical drives that fail due to some type of error. Failed drives appear with large red X marks on their respective icons.

- **Logical drives.** These drives are created using physical drives. Combining physical drives into logical drives gives you a disk array with a certain RAID level. To view logical drives, use Logical View under the RAID View window.

- **Logical volumes.** These volumes are created using logical drives. Combining logical drives into logical volumes gives you a single logical unit with even larger capacity. Logical volumes or their partitions are mapped to various host LUNs. To view logical volumes, use Logical View under the RAID View window.

5.2 Operating With Spare Drives

You can assign spare drives to a particular logical drive to serve as backup drives. When a drive fails within the logical drive, one of the spares will be automatically configured into the logical drive, and data reconstruction onto it will immediately commence.

The following are guidelines for disk failure recovery when a spare drive is available:

- If a spare drive exists in the same logical drive, the controller will automatically mount the spare drive and start data rebuilding in the background.

- Depending on the design of the system external to the controller, it may be possible to remove a defective drive and replace it with a new drive without shutting down the system (hot-swapping). Alternatively, the system can be shut down at a convenient time and the failed drive replaced.

- The replacement drive must then be assigned as a new spare drive.

5.3 Operating Without Spare Drives

The following are guidelines for disk failure recovery when a spare drive is not available:

- Depending on the design of the system, it may be possible to remove a defective drive and replace it with a new drive without shutting down the system (hot-swapping). Alternatively, the system can be shut down at a convenient time and the system administrator can replace the failed drive.
- If the replacement drive is installed on the same channel and ID, you can then proceed with data rebuilding.
- If the replacement drive is installed on a different channel or ID, you need to scan in the new drive first then assign it as a spare drive of the logical drive which has had a drive failure. Data rebuilding will have to be manually initiated.

Important **Although the RAID system provides uninterrupted disk access even after a disk failure, do not leave a failed drive unattended to. Without replacement, the system will not survive a second physical drive failure on the same logical drive. A defective drive must be promptly replaced and data rebuilt.**

Caution *When performing hot-swapping, be sure to remove only the defective drive. Removing the wrong drive will result in complete, unrecoverable data loss. Use the Enclosure window or Physical View to locate exactly which physical drive has failed.*

5.4 Before You Start

Altos RAIDWatch Manager comes with password protection that prevents unauthorized modification of the disk array configuration. During each attempt at modifying the system configuration, the configuration will be password protected.

By default, Altos RAIDWatch Manager station comes without any password. For information on how to set a password and other security features, see section 3.4, "Secondary Agent Settings", on page 36.

Chapter 6
Controller Configuration

This chapter describes how to modify the configuration of a disk array controller. Topics covered include the following:

6.1 Configuring the Controller

Altos RAIDWatch Manager enables you to modify the configuration of the disk array controller from your manager console. You can set caching optimization parameters of the system, set I/O queue limitations, set drive optimization parameters, set RAID verification options, get information about current system and board status, download firmware or NVRAM data to the controller, set redundant controller options, and modify the RAID system password among other variables.

6.2 Accessing Controller Configuration Options

To be able to access controller configuration options either use the **RAID View** toolbar icon or select the *RAID View* command from the Open menu to open the RAID View. Once the **RAID View** has been opened select the **Configuration** button from the content window. For more information on accessing the controller configuration options, please refer to section 4.6, "Using the RAID View Window", on page 58.

The following is a complete list of configuration controls and information displays that users will have available once the Controller Configuration option has been selected.

More information about many of these variables is available in the controller hardware and firmware documentation.

6.3 Caching

To be able to configure the data cache, select the "Caching" tab, as shown in Figure 6–1, from the Configuration View Window Tabs.

Figure 6–1 Select the Caching Tab

The data cache can be configured for optimal I/O performance using the following variables:

- **Caching Policy** (choose one from Figure 6–2):

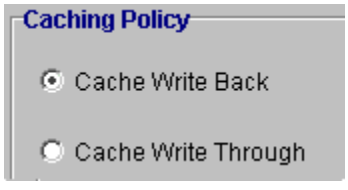


Figure 6–2 Caching Policy

  - **Cache Write Back**. (Default controller setting.) Recommended operating mode, provides better performance.

  - **Cache Write Through**. Used primarily if no cache battery backup is installed and there is increased likelihood of a power failure.

- **Optimization Policy** (choose one):

Important **Optimization settings should not be changed after logical drives are created. Under some circumstances, changing the optimization setting after logical drives have been created will destroy existing data on those drives.**

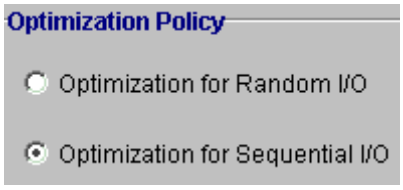


Figure 6–3 Optimization Policy

- **Optimization for Random I/O**. More common setting. Use this option for environments (e.g., database maintenance) with smaller I/O transactions.

- **Optimization for Sequential I/O**. Used for large I/O environments such as video recording and editing. Particularly useful where I/O read/write must be in sequential order.

6.4 Host-Side

To be able to configure the Host-Side, select the **"Host-Side"** tab, as shown in Figure 6–4, from the Configuration View Window Tabs.

Figure 6–4 elect the Host-Side Tab

- **Host-side SCSI Parameters** (choose from each range as shown in Figure 6–5):

Figure 6–5 Host-side SCSI Parameters

- **LUNS per Host ID**. Allows you to control the LUNS assigned to each ID. The number of LUNS that can be assigned to an ID are: 1, 2, 4, 8 (default), 16 and 32.

- **Maximum Queued I/O Count**. Allows you to control the maximum size of the I/O queue. Available size selections: Auto, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024.

6.5 Drive-Side

To be able to configure the Drive-Side, select the **"Drive-Side"** tab, as shown in Figure 6–6, from the ***Configuration View Window*** Tabs.

Figure 6–6 Select the Drive-Side Tab

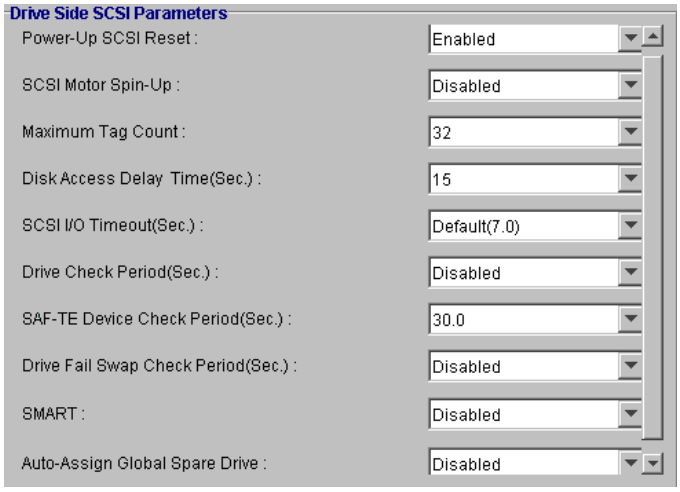


Figure 6–7 Drive -side SCSI Parameters

- **Drive Side Parameters** (choose from each range as shown in Figure 6–7):
  - **SCSI Motor Spin up**. Available selections: Disabled or Enabled.
  - **Maximum Tag Count**. Available selections: Disabled, 1, 2, 4, 8, 16, 32, 64, 128.
  - **Disk Access Delay Time (Sec.)**. Available selections: No Delay, 5, 10, 15, 20. . .75.
  - **I/O Drive Timeout (Sec.).** Available selections: Default(7.0), 0.5, 1, 2, 4, 6, 8, 10.
  - **Drive Check Period (Sec.)**. Available selections: Disabled, 0.5, 1, 2, 5, 10, 30.
  - **SAF-TE Device Check Period (Sec.)**. Available selections: Disabled, 0.05, 0.1, 0.2, 0.5, 1, 2, 5.
  - **Drive Fail Swap Check Period (Sec.).** Available selections: Disabled, 5, 10, 15, 30, 60.
  - **SMART.** Available selections: Disabled, Detect Only, Clone only, Clone & Replace.
  - **Auto Assign Global Spare Drive**. Available selections: Disabled and Enabled.

6.6 RAID

To be able to configure the **Disk Array** parameters, select the **"RAID"** tab, as shown in Figure 6–8, from the Configuration View Window Tabs.

Figure 6–8 Select the RAID Tab

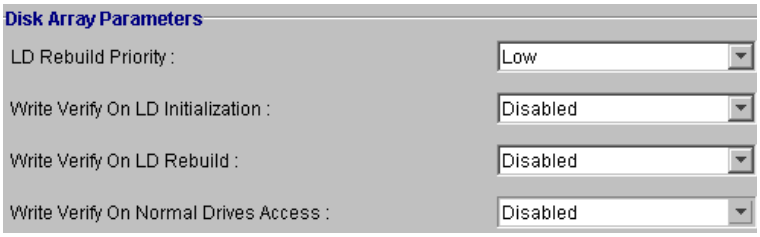


Figure 6–9 Disk Array Parameters

- **Disk Array Parameters** (choose from each range as shown in Figure 6–9):
  - **LD Rebuild Priority**. Available selections: Low, Normal, Improved, High.
  - **Write Verify On LD Initialization**. Choose Enabled or Disabled.
  - **Write Verify On LD Rebuild**. Choose Enabled or Disabled.
  - **Write Verify On Normal Drives Access**. Choose Enabled or Disabled.

6.7 Controller

To be able to view and configure the **Controller** parameters, select the "**Controller"** tab, as shown in Figure 6–10 from the ***Configuration View Window*** Tabs.

Figure 6–10 Select the Controller Tab

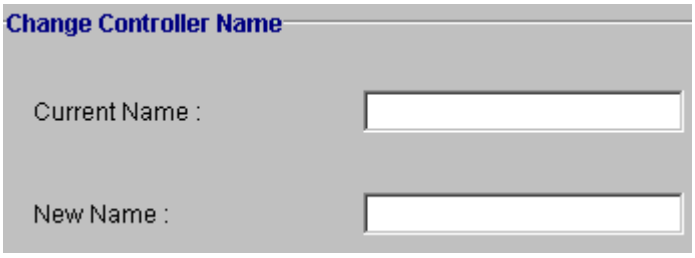


Figure 6–11 Change Name

- **Password**: A user-configurable security setting. Note, the password and name fields combined have a maximum size of 16 characters.(For more information see section 3.3 on page 33).

- **Time**: Allows you to select the Time Zone and to input the current time in your area. See Figure 6–12.

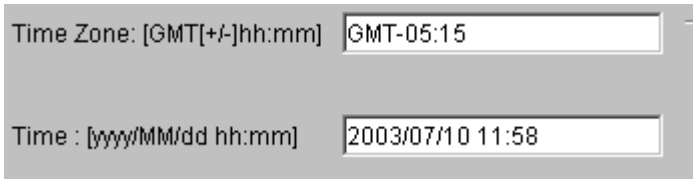


Figure 6–12 Change Time

- **Download**: An user can select ***Download Firmware, Download Firmware/Bootrecord, Download NVRAM, Upload NVRAM, Download BIOS***. All of the Download functions will prompt for a file source from the current workstation. Upload NVRAM will prompt for a file destination at the current workstation.

- **System**: system functions are shown in Figure 6–13 and described below:

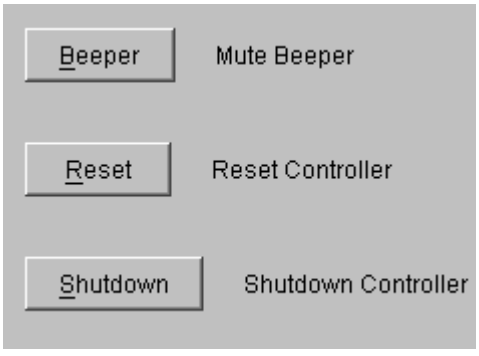


Figure 6–13 Available System Functions

- **Name**: A user-configurable identifier for the controller.

  Note: The name and password fields combined have a maximum size of 16 characters, see Figure 6–11.

- **Mute Beeper**: temporarily mutes the controller beeper if it is currently sounding;
- **Reset Controller**: resets the controller (similar to a PC reset), allowing configuration changes to take effect.
- **Shutdown Controller:** Shutdown the controller

- **Force Failure**: Allows a controller to be forced to fail.
- **Redundant**:
  - **Controller Unique Identifier**: This unique ID is used by controller to generate a controller-unique WWPN. WWPN is a Fibre channel port name. If redundant controller configuration is preferred and host interface is Fibre channel. Each controller in redundant controller configuration MUST be assigned with a unique ID from 1 to FFFFF.
  - **Redundant Controller Configuration**: Enabled or Disabled depending on whether or not the current RAID has controller redundancy;
  - **Redundant Controller Channel:** sets the communication channel for redundant controllers.
  - **ECC Function: S**elect either "**Disable"** or "**Enable"** as shown in Figure 6–14.

Figure 6–14 ECC function

6.8 Communication

To be able to configure the Communication settings, select the ***Communication*** tab, as shown in Figure 6–15, from the Configuration View Window Tabs.

Figure 6–15 Select the Communication Tab

- **TCP/IP**: To set the TCP/IP settings, select the ***TCP/IP*** tab.
- **Network Hardware MAC**: A DHCP client identifies itself to the server using its network hardware (MAC) address. See Figure 6–16.

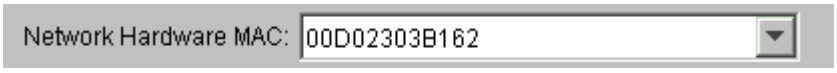


Figure 6–16 Setting the Network Hardware MAC

- **Set IP Address**: IP settings are shown in Figure 6–17.

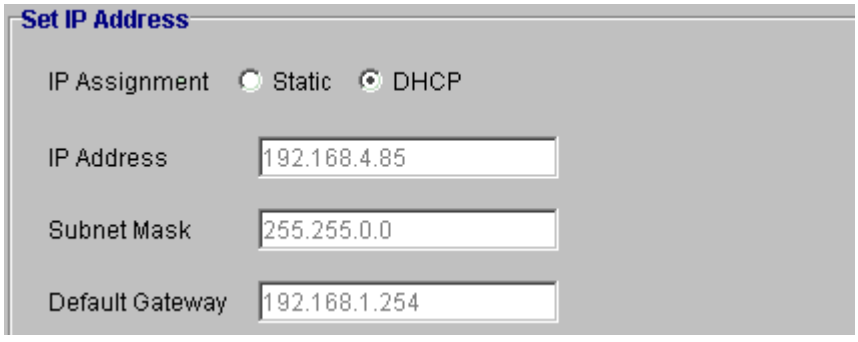


Figure 6–17 Set IP Address

  - **IP Assignment**: Select any of the following options: **Static**, **DHCP**, **BOOTP**, **RARP**, or **NONE**.
  - **IP Address**: Input the IP Address assigned to the subsystem.
  - **Subnet Mask**: Enter a Subnet Mask that will be used by the subsystem e.g. 255.255.0.0.
  - **Default Gateway**: Enter the default value into this field e.g. 192.168.1.254.

- **RS232 Port:** To set the RS-232 serial port settings, select the RS-232 tab.
- **COM Port Select:** Select the serial port that will be used for serial port connection. please refer to Figure 6–18.

Figure 6–18 COM Port Select

- **RS232 Configuration**: To set the appropriate RS-232 serial port settings below, please refer to Figure 6–19.

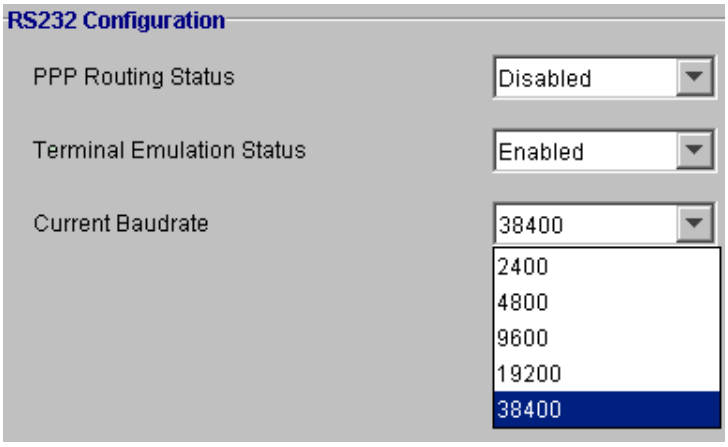


Figure 6–19 RS-232 Configuration Options

- **PPP Routing Status**: Select "**Disable**" or "**Enable**".
- **Terminal Emulation Status**: Select "**Disable**" or "**Enable**".
- **Current Baudr**ate: Select the Baudrate from the following range: 2400, 4800, 9600, 19200, and 38400.

Chapter 7
Channel Configuration

Using Altos RAIDWatch Manager, you can modify the configuration of any channel on the controller. There are 20 channels available. Channels 4 through 19 are SATA drive channels. Channel 0 is used for inter controller communciation and Channel 3 is used for expansion. Channels 1 and 2 are host ports which are configurable as explained below.

Channel configuration settings are available under **Physical View** in the RAID View window. This chapter describes the following Channel Configuration features:

The following describes user-configurable channel parameters:

7.1 Accessing Channel Configuration Options

Channel configuration options are available in the **Physical View** window, which is found in the **RAID View** environment.

To be able to access the **Physical View** either use the **RAID View** toolbar icon or select the RAID View command from the **Open** menu to open the **RAID View**. Once the **RAID View** has been opened select either the **Physical View** button from the content window or the **Physical View** icon in the Navigation Panel.

For more information on accessing the controller configuration options, please refer to 4.6, "Using the RAID View Window", on page 58

Once the Physical View has been opened and channel icons, have appeared under the Physical View icon in the Navigation Panel, select the channel that needs to be configured.

7.2 User-Configurable Channel Parameters

Once the channel has been selected, the content window will appear. The different options are discussed below.

7.2.1 ID pool / PID / SID

This parameter sets the ID of the channel. Each channel must have a unique ID in order to work properly. ID ranges from 0 up to 15, with 0 assigned as the default value for host channels, and 7 for drive channels.

It is necessary to create a SID on every I/O channels in redundant controller configuration. The default are 6 for SID and 7 for PID on drive channels. The default values for Infortrend's dual-redundant configuration are 8 for SID and 9 for PID. For more information, please refer to the hardware documentation that came with your controller.

7.3 Setting the Configuration of a Channel

1. Display **Physical View** by clicking on the **Physical View** command button under the **RAID View** introduction or by selecting **Physical View** from the **RAID View** Navigation Panel. (See Section 3.3 on page 33

2. From **Physical View** double-click on the corresponding **Channel** icon of the target channel. Channel icons are displayed in the navigation panels on the left side of the RAID View window. The Channel Settings configuration will appear in the **RAID View** content panel.

3. If you want to assign a different ID to the selected channel, choose the new ID from the I**D pool** scroll menu shown in Figure 7–1.

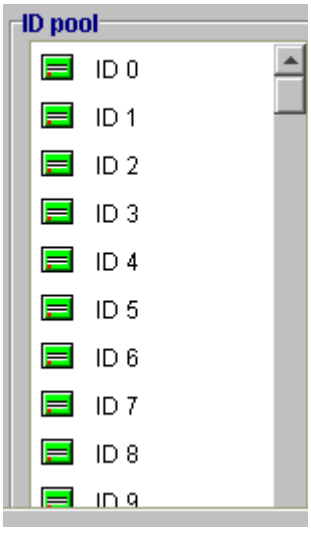


Figure 7–1 ID Pool Menu

When selecting an ID, be sure that it does not conflict with the other devices on the channel. The ID pool lists all of the channels. Highlight the ID you want to use and click **Add** next to either the **PID** (Primary ID) or **SID** (Secondary ID) window (see below).

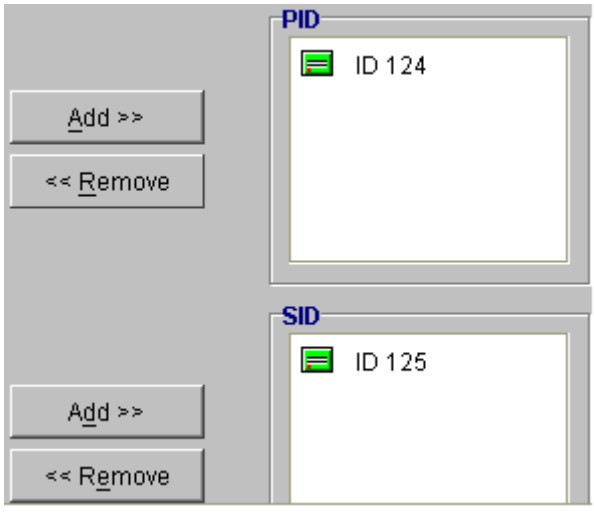


Figure 7–2 Specifying Channel PID or SID

4 To change the speed of the bus synchronous transfer clock, choose the new value from the options listed in the **Def Xfer Clock** drop-down list box.

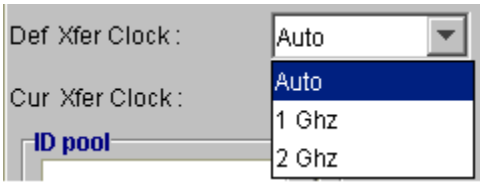


Figure 7–3 Def Xfer Clock options

5 Click **OK** to save the new channel configuration into the non-volatile memory (NVRAM) of the controller. You will be prompted for a password in order to complete the changes.

Chapter 8

Drive Management

Using Altos RAIDWatch Manager, you can make and delete Logical Drives (LDs) and Logical Volumes (LVs). Both LDs and LVs can be partitioned. This chapter describes the following drive management features:

8.1 Scanning in Drives

Disk scanning is a process in which a newly installed drive is introduced to the disk array system. You need to scan in a drive when:

- The drive is a new one. A drive is considered a new drive if it is not yet displayed in the Physical View display of the RAID View window.
- The drive is a replacement for a failed drive which is installed on a different channel or has a different SCSI ID.

If you do not scan in the drive on such occasions, the system will not be able to see the drive, rendering it useless.

8.1.1 Scanning in a Drive

1 Display **Physical View** under the RAID View window by clicking on the **Physical View** command button under the introduction or selecting **Physical View** from the Navigation Panel.

2 In **Physical View**, double-click on the channel corresponding to the SCSI ID of the drive to be scanned.

3 Alternatively the drive should be automatically detected on insertion.

4 Altos RAIDWatch Manager will add a drive icon to the relevant channel if the scanning process is successful. The new drive can now be added to an existing logical drive or used to create a new logical drive.

8.2 Logical Drive Management

This section describes how to:

- Access the Logical Drive (LD) Management Window
- Create LDs
- Expand LDs
- Delete LDs

Note When you delete a logical drive, all physical drives assigned to the logical drive will be released, making them available for creation or expansion of logical drives.

8.2.1 Accessing the "Create Logical Drive" Window

LDs are managed in the **Logical View** contents panel. The **Logical View** is accessed from the **RAID View** Navigation Panel.

1 To manage LDs; i.e. to create, expand and delete LDs; display the LDs window by clicking on the **Logical View** command button in the **RAID View** introduction or the **Logical View** icon in the **RAID View** navigation panel.

2 The items shown in Figure 8–1 should appear in the **RAID View** navigation panel.

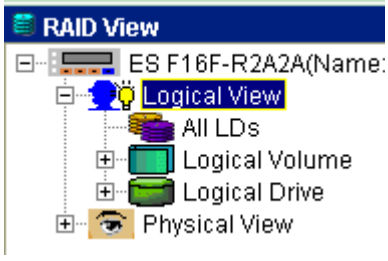


Figure 8–1 Logical View Navigation Panel

3 For LD management, select the **"Logical Drive"** icon shown in Figure 8–1. The screen shown in Figure 8–2 should appear in the contents panel.

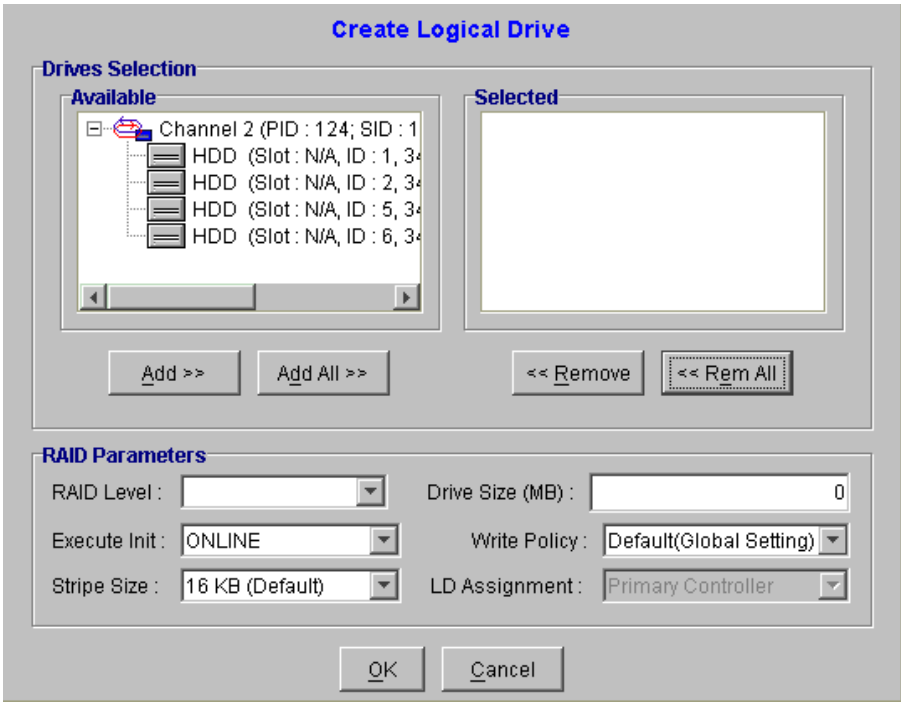


Figure 8–2 Create Logical Drive Management Window

8.2.2 Creating Logical Drives

8.2.2.1 LD Creation

To create a logical drive:

1. Select the physical drives that will be used in the LD. (See section 8.2.2.2.)
2. Select the following RAID parameters (See section 8.2.2.3):
   - RAID Level
   - Online or Offline
   - Initialization
   - Stripe Size
   - Drive Size
   - Write Policy
   - LD Assignment
3. Click the **"OK"** button (See section 8.2.2.4).

8.2.2.2 Selecting Drives

1 The **"Available"** menu in Figure 8–2 shows the drives that are can be used to create LDs and the channels to which they have been assigned.

To select the physical drives that will be used in the LD either:

a Select the physical drives you wish to incorporate into a LD and click the "**Add**" button beneath the **"Available"** menu. See Figure 8–3.

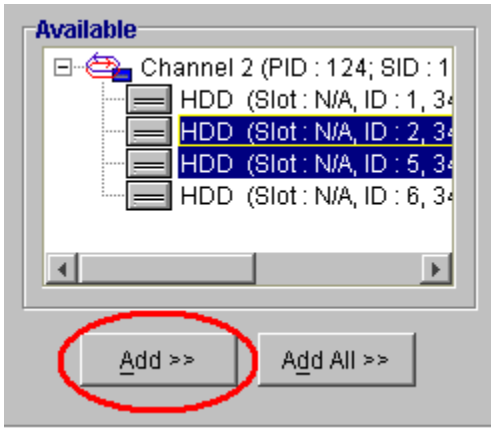


Figure 8–3 Selecting Logical Drives

or,

b If you wish to use all the available drives to create a logical drive, click the **"Add All"** button that appears beneath the **"Available"** menu (SeeFigure 8–3).

2 After clicking the **"Add"** (or **"Add All"**) button, the drives that were selected will be removed from the "Available" menu and appear in the **"Selected"** window on the right hand side. See Figure 8–4.

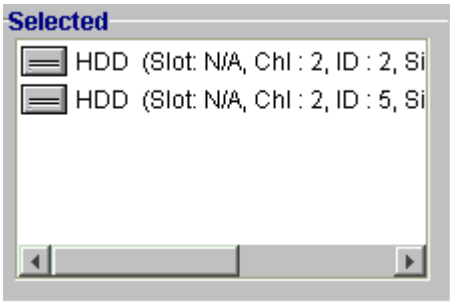


Figure 8–4 Selected Logical Drives

Note If the **"Add All"** button was selected, all the drives that previously appeared in the "Available" menu should now appear in the **"Selected"** menu.

8.2.2.3 Setting RAID Parameters

After the physical drives that will be used in the LD have been selected, the RAID parameters for the LD must be selected. RAID parameter options that are available are shown in Figure 8–5 and can be accessed at the bottom of the LD Management Window shown in Figure 8–2.

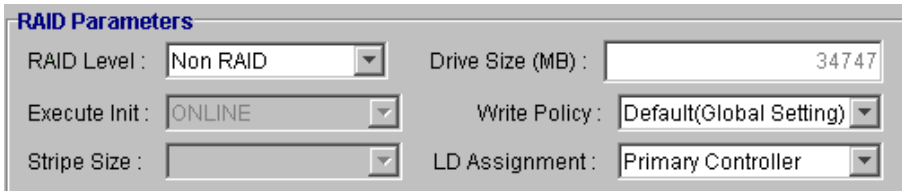


Figure 8–5 RAID Parameter Options

Select RAID Level

From the **"RAID Level"** pull down shown in select the RAID level you wish to use when creating the LD.

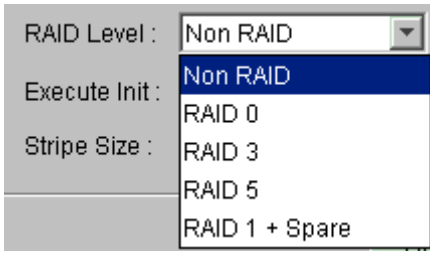


Figure 8–6 Select RAID Level

Initialization Options

Using the **"Execute Init"** pull down menu shown in Figure 8–7, the user can select whether the LD is initialized online or offline.

Figure 8–7 Initialization Options

Selecting Stripe Size

The stripe size that is used when the LD is created can be selected from the **"Stripe Size"** pull down menu shown in Figure 8–8. As can be seen, the following stripe sizes are available: 16KB, 32KB, 64KB, 128KB (Default), or 256KB.

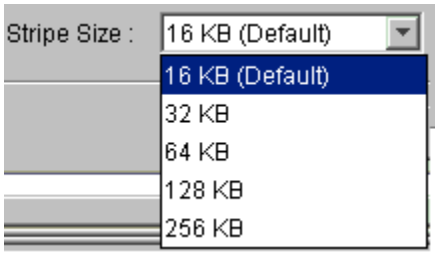


Figure 8–8 Stripe Size Options

Drive Size

The value entered in the **"Drive Size"** field shown in Figure 8–9determines how much capacity from each drive will be used in the logical drive. Unused drive capacity can then later be used to expand the logical drive.

Figure 8–9 Enter a Drive Size

Select Write Policy

Use the **"Write Policy"** menu shown in Figure 8–10 to select either Default , Write Through or Write Back.

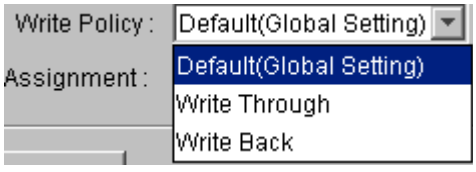


Figure 8–10 Select the Write Policy

LD Assignment

Choose **"Primary Controller"** or **"Secondary Controller"** from the **"LD Assignment"** menu shown in Figure 8–11.

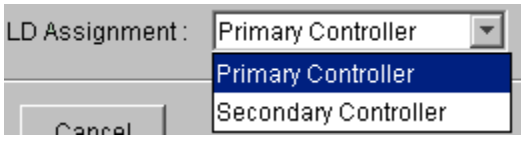


Figure 8–11 LD Assignment Selection

Note If the redundant controller function has not been enabled or the SID's are not assigned on drive channels, the "**LD Assignment**" pull down menu will not be available.

8.2.2.4 Click "OK" to Create LD

Once the physical drives that will be used in the LD have been selected and all the desired LD parameters have been selected:

1 Click the **"OK"** button at the bottom of the LD management window shown in Figure 8–2.

2 A confirmation window shown in Figure 8–12 will appear. If you are certain that you want to create the LD with the settings you have selected, click the **"OK"** button.

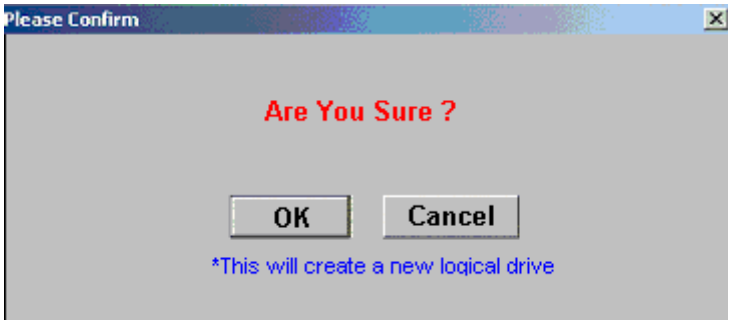


Figure 8–12 : Confirm LD Creation

3 If you selected the **"OK"** button in the **"Please Confirm"** window the **"Create In Progress"** content window shown in Figure 8–13 will display logical drive creation progress.

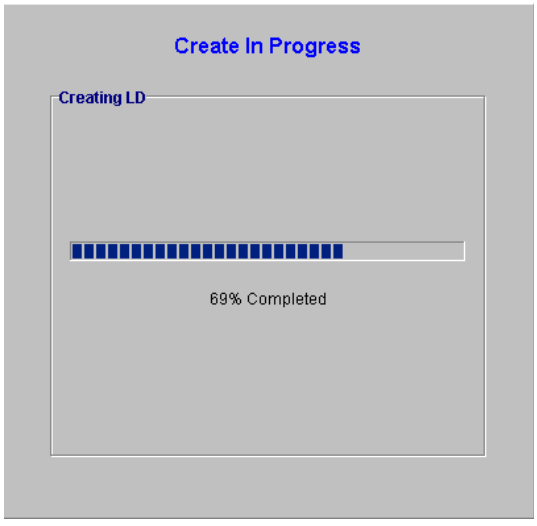


Figure 8–13 Create in Progress

8.2.3 Expanding a Logical Volume

When physical drives are added to the array, the additional capacity can be added to existing logical drives.

8.2.3.1 Opening the "Expand Logical Drive" Window

1 Select the **"Logical Drive"** icon from the **Logical View** Navigation Panel shown in Figure 8–1. As shown in Figure 8–14, all the LDs that have been created will appear below the **"Logical Drive"** icon.

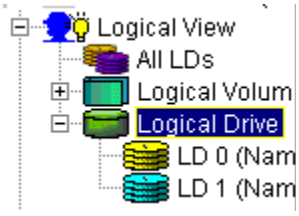


Figure 8–14 List of LDs

2 From the list shown in FFigure 8–14, select the LD that you wish to expand. Once this LD has been selected a **"View and Edit LD Partition"** table will appear in the content panel. At the top of this window the two tabs ("**Partition**" and "**Operation**") shown in Figure 8–15, will appear. Select the **"Operation"** tab.

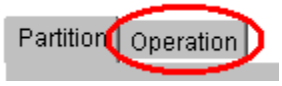


Figure 8–15 Select Operation

3 After selecting the **"Operation"** tab, an **"Expand Logical Drive"** window will appear in the content panel. The tabs shown in Figure 8–16 can be seen at the top of the **"Expand Logical Drive"** window.

Figure 8–16 Select Expand

4 Once the **"Expand"** tab has been selected the **"Expand Logical Drive"** window shown in Figure 8–17 will appear in the content panel.

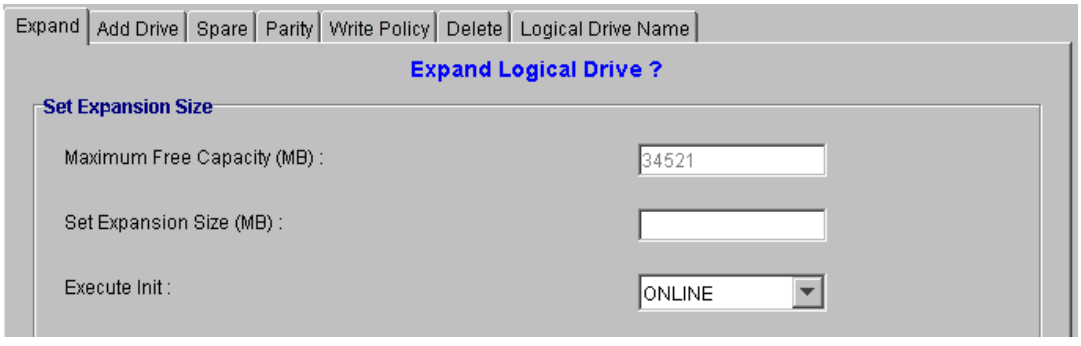


Figure 8–17 Expand Logical Drive Window

8.2.3.2 Setting LD Expansion Parameters

Maximum Free Capacity (MB)
If there is an amount present in the **Maximum Free Capacity** text box, the LD may be expanded. If there is no amount present in **Maximum Free Capacity** text box then the LD cannot be expanded.

Set Expansion Size
A value can be entered in this text box if and only if an amount is shown in the **Maximum Free Capacity** text box. The value entered into the **Set Expansion Size** text box cannot exceed the amount shown in the **Maximum Free Capacity** text box. The value entered into the **Set Expansion Size** text box specifies the size of the LD expansion.

Execute Init
The **"Execute Init"** allows the user to determine whether or not the expansion will be done online or offline. If the user wishes to do an online expansion then the ONLINE menu option should be selected. If the user wishes to do an offline expansion then the OFFLINE menu item should be selected from the **"Execute Init"** menu.

8.2.3.3 Click "OK" to Initiate LD expansion

To initiate the LD expansion, follow these steps:

1. Once the LD expansion parameters have been selected, click the **"OK"** button at the bottom of the **Expand Logical Drive** window shown in Figure 8–17 (note that the **"OK"** button is not shown in this image and can be found at the bottom of the screen).

2. A confirmation window shown in Figure 8–18 will appear. If you are certain that you want to create the LD with the settings you have selected, click the **"OK"** button.

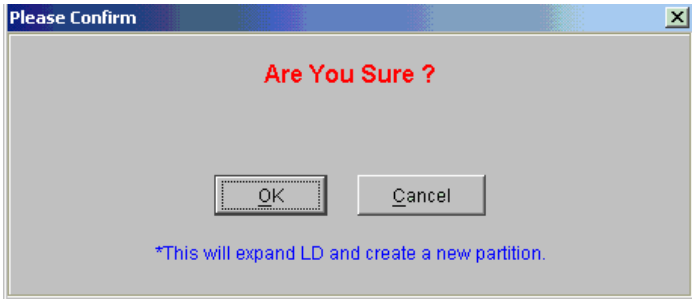


Figure 8–18 Confirm LD Expansion

3. If you selected the **"OK"** button in the **"Please Confirm"** window the **"Create In Progress"** content window shown in Figure 8–19 will display logical drive creation progress.

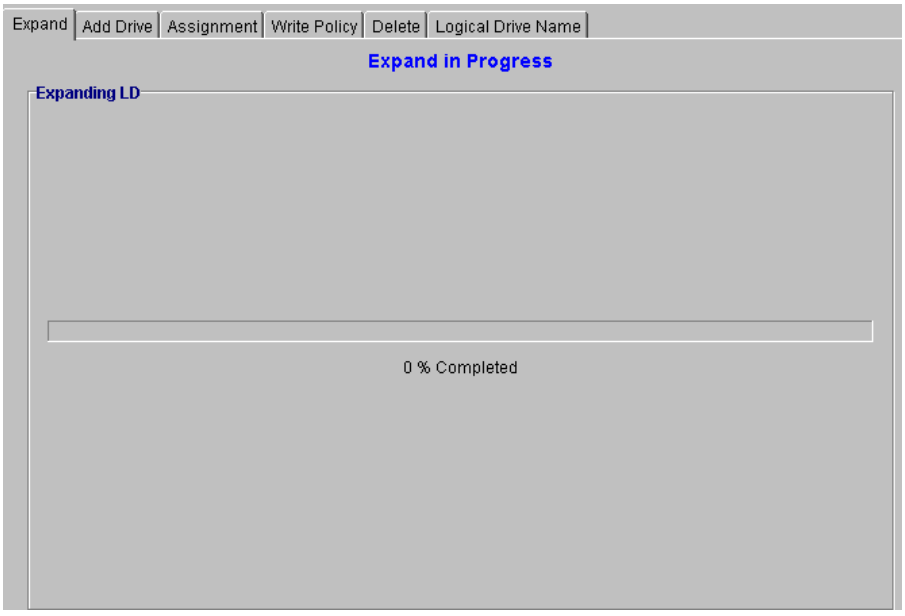


Figure 8–19 Expand in Progress

4 The logical drive will now have a new last partition the same size as the expansion. Look at the **View and Edit LD Partition Table** to verify this.

8.2.4 Dynamic Logical Drive Expansion

8.2.4.1 What Is It and How Does It Work?

Before Dynamic Logical Drive Expansion, increasing the capacity of a RAID system using traditional methods meant backing up, re-creating and then restoring. Dynamic Logical Drive Expansion allows users to add new hard disk drives and expand a RAID 0, 3 or 5 Logical Drive without powering down the system.

8.2.4.2 Two Modes of Dynamic LD Expansion

There are two modes of Dynamic Logical Drive Expansion.

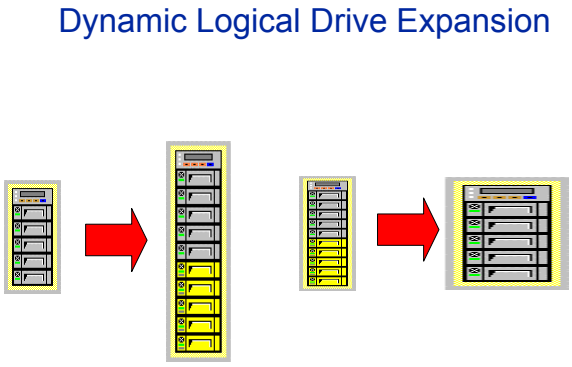


Figure 8–20 Dynamic Logical Drive Expansion

- **Mode 1 Expansion (**Figure 8–21**)** involves adding more SCSI hard disk drives to a logical drive, which may require that the user obtain an enclosure with more drive bays. The data will be re-striped onto the original and newly added disks.

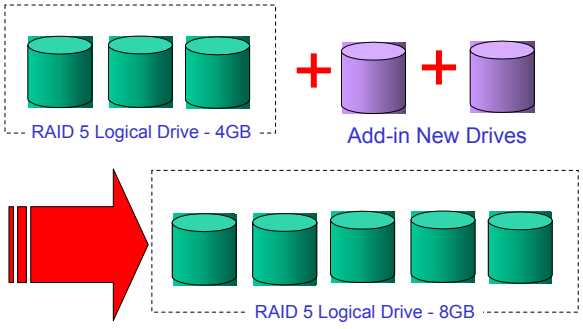


Figure 8–21 RAID Expansion Mode 1

In Figure 8–21, new drives are added to increase the capacity of a 4-Gigabyte RAID 5 logical drive. The two new drives increase the capacity to 8 Gigabytes.

- **Mode 2 Expansion**, on the other hand, requires the same number of higher-capacity SCSI hard disk drives for a given logical drive.

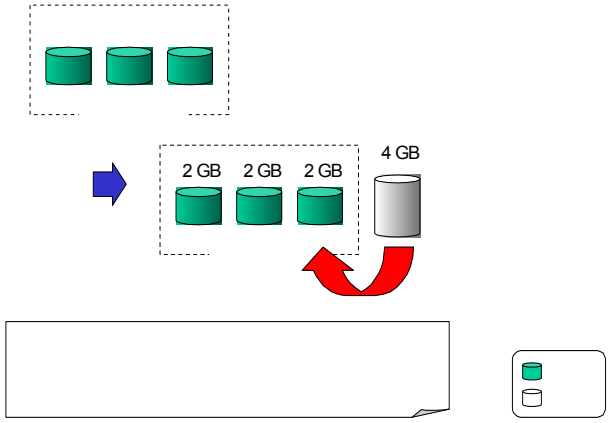


Figure 8–22 RAID Expansion Mode 2(1/3)

Figure 8–22 illustrates expansion of the same 4-Gigabyte RAID 5 logical drive using Mode 2 Expansion. Drives are copied and replaced, one by one, onto three higher-capacity drives.

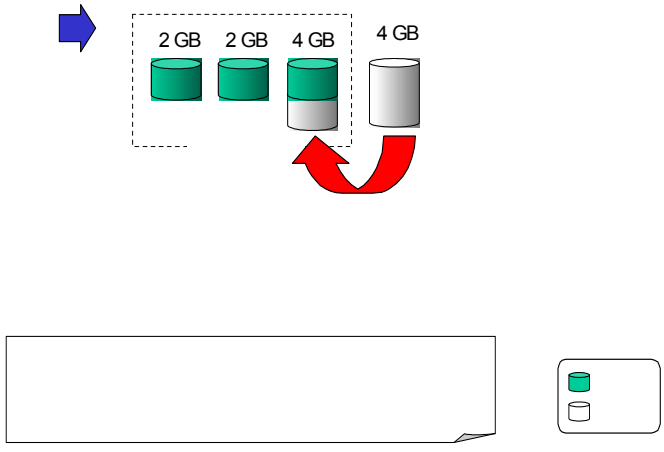


Figure 8–23 RAID Expansion Mode 2(2/3)

This results in a new 4-Gigabyte, RAID 5 logical drive composed of three physical drives. The 4 Gigabytes of increased capacity is in a new partition.

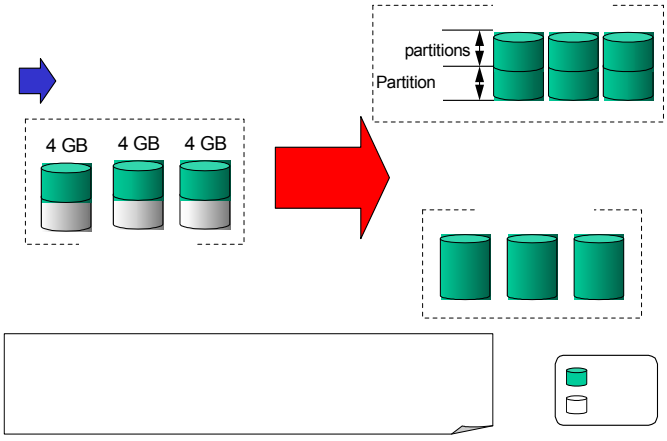


Figure 8–24 RAID Expansion Mode 2(3/3)

Important **The increased capacity from either expansion type will be a new partition.**

Three new drives are scanned in (see section 8.1 on page 89 for details on scanning in new drives). To add the drives to the logical drive, select the logical drive where they will be added, then choose the **Operation** tab and **Add Drive** sub-tab. Select a drive to add and click the **Add** button. When you have selected all of the new drives you want to add, click **OK**.

The progress of the add process will be displayed as it is carried out.

The logical drive icon will appear to be degraded while the new drives are being added to the logical drive. The color will return to normal once the drive add is complete.

When you return to the partition table, you will notice that either partition 0 or the last partition will now be larger than before.

Follow the directions in section 4.12 to map the new partition to a host LUN. The new partition must be The logical drive icon will appear to be degraded while the new drives are being added to the logical drive. The color will return to normal once the drive add is complete.

8.2.5 Adding and Deleting Spare Drive Assignments

You can assign spare drives to a logical drive to serve as backups for failed drives. In the event of a drive failure, the spare drive will be automatically configured into the array and reconstruction (or rebuilding) will immediately commence.

Logical drives can support multiple spare drives; this configuration however is rarely used due to its high cost and uncommon occurrences of drive failures. A practical configuration calls for one spare drive per logical drive after rebuilding on this drive, just replace the failed drive and then configure the replacement as the new spare drive of the logical drive.

Note Adding a spare drive can be done automatically by selecting the RAID 1+Spare, RAID 3+Spare or RAID 5+Spare option from the logical drive RAID Level selection dialog box when creating a logical drive. These options apply to RAID 1, RAID 3, and RAID 5 levels respectively.

8.2.5.1 Accessing The Spare Drive Management Screen

To open the spare drive management screen please follow these steps:-

1 Select the **"Logical Drive"** icon from the Logical View Navigation Panel shown in Figure 8–1, "Logical View Navigation Panel", on page 90. As shown in Figure 8–25, all the LDs that have been created will appear below the **"Logical Drive"** icon.

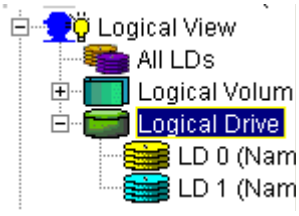


Figure 8–25 : List of LDs

2 From the list shown in Figure 8–25, select the LD that you wish to expand. Once this LD has been selected a **"View and Edit LD Partition"** table will appear in the content panel. At the top of this window the two tabs **("Partition"** and **"Operation"**) shown in Figure 8–26, will appear. Select the **"Operation"** tab.

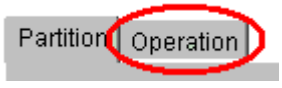


Figure 8–26 Select Operation

3 After selecting the **"Operation"** tab, an **"Expand Logical Drive"** window will appear in the content panel. The tabs shown in Figure 8–16 on page 96 can be seen at the top of the **"Expand Logical Drive"** window.

Figure 8–27 Select Spare

8.2.5.2 Adding a Spare Drive

1 After the **"Spare"** tab has been selected the "**Spare Drive Management"** window shown in Figure 8–28 will appear in the content panel. Under the **Add** tab, if there are drives available to assign as spares, their channels will be listed under **Available**. Choose the drive icon for the drive that will become the new spare.

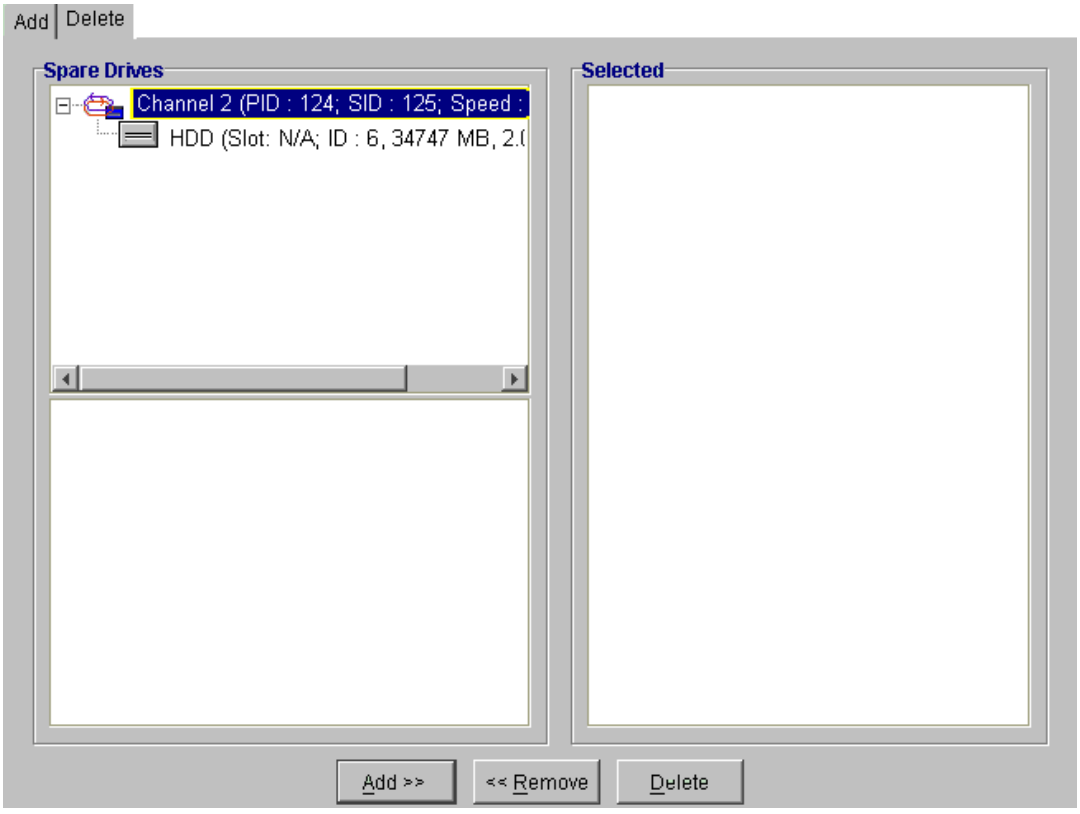


Figure 8–28 Spare Drive Management Window

2 Click the Add button in Figure 8–28, then click either Local or Global. Local spares will only replace failed drives in the same logical drive. Global spares will replace any drive that fails in any logical drive on the RAID controller.

3 A confirmation screen will appear. If you are certain you wish to add the spare then click the **"OK"** button.

Note Spare drive assignments can also be made when scanning in new drives under **Physical View**.

8.2.5.3 Deleting a Spare Drive Assignment

1 Access the **'Spare Drive Management"** window shown in Figure 8–288.

2 To delete a spare drive, select the **Delete** tab shown in the **Spare Drive Management** window. A new screen, shown in, will appear.

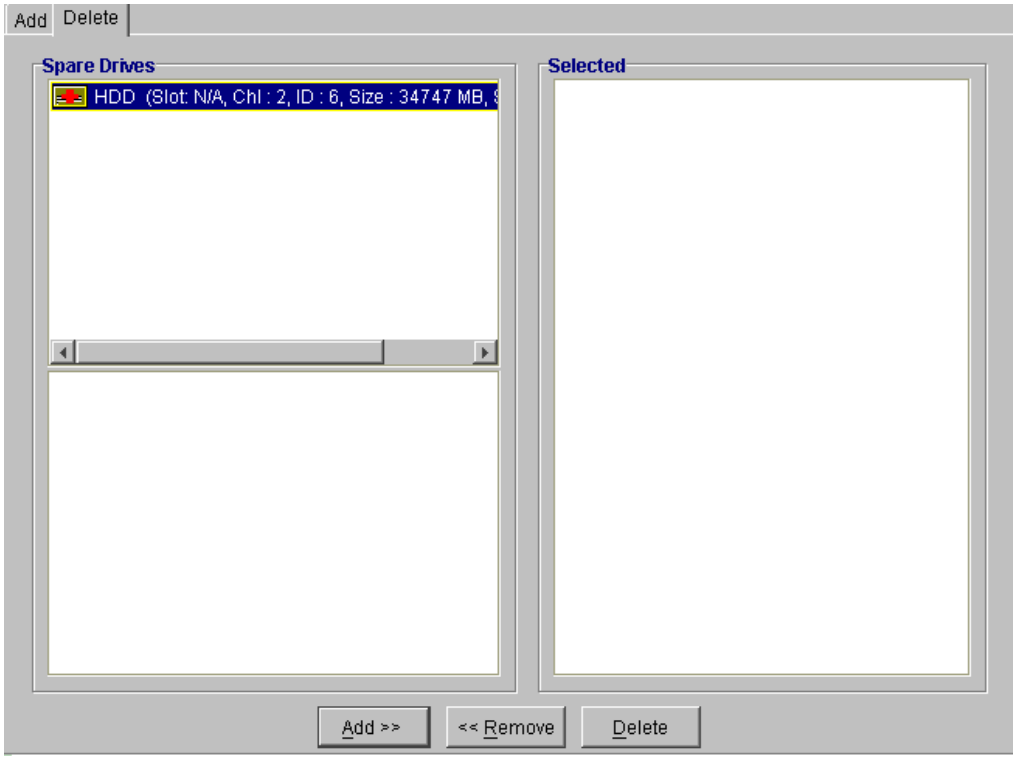


Figure 8–29 Select Operation

3 Under the **Delete** tab, if there are drives assigned as spares, their icons will be displayed under **Spare Drives**. The upper window under **Spare Drives** lists **Local Spares**. The lower window lists **Global Spares**. Choose the drive icon for the drive that you want to delete and click the Add button at the bottom of the screen.

4 Spare drives to delete will be added to the Selected window. Once all of the spare drives you want to delete are listed, click **Delete**. You will be prompted for a password. Enter it and click **OK**. All selected spare drives will return to normal status.

8.2.6 Rebuilding Logical Drives

Depending on whether or not there is a spare drive, rebuilding is initiated automatically or must be started manually. In the presence of a spare drive, the system automatically rebuilds onto the spare drive. This process is done in the background, thus it is transparent to users.

In the absence of a spare drive, rebuilding must be initiated manually. Before initiating a manual rebuild, you must first replace the failed drive. If you install the replacement drive on the same connector (that is, the same channel and ID), then you can proceed with the rebuilding process; otherwise, you need to scan in the drive first.

8.2.6.1 To rebuild a logical drive

1 Select the "**Logical Drive**" icon from the Logical View Navigation Panel shown in Figure 8–1. As shown in Figure 8–30, all the LDs that have been created will appear below the **"Logical Drive"** icon.

Important **Deleting a logical drive irretrievably wipes all data currently stored on the logical drive.**

Figure 8–30 List of LDs

2 From the list shown in Figure 8–30, select the degraded LD that you wish to rebuild. Once this LD has been selected a **"View and Edit LD Partition"** table will appear in the content panel. At the top of this window the two tabs (**"Partition"** and **"Operation"**) shown in Figure 8–31, will appear. Select the **"Operation"** tab.

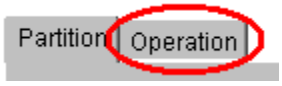


Figure 8–31 : Select Operation

3 After selecting the ***"Operation"*** tab, an **"Expand Logical Drive"** window will appear in the content panel. If the drive you selected was a degraded drive then a "Rebuild" tab would appear at the top of the **"Expand Logical Drive"** window. To rebuild the LD the **Rebuild** sub-tab must be selected.

4 The **Rebuild in Progress** window will appear and show the percentage of rebuild progress until complete.

5 Once the logical drive has been rebuilt, the logical drive icon will return to its normal color and the **Rebuild** tab will no longer be available under **Operation.**

8.2.7 Deleting a LD

If you want to delete an LD from you RAID subsystem, follow the steps outlined below. Remember that deleting a LD results in all the data on the LD being deleted and any data that was previously stored on the LD will be irretrievable.

Important **Deleting a logical drive irretrievably wipes all data currently stored on the logical drive.**

8.2.7.1 To Delete a LD

1 Select the **"Logical Drive"** icon from the **Logical View** Navigation Panel shown in Figure 8–1. As shown in Figure 8–32, all the LDs that have been created will appear below the **"Logical Drive"** icon.

Important **Deleting a logical drive irretrievably wipes all data currently stored on the logical drive.**

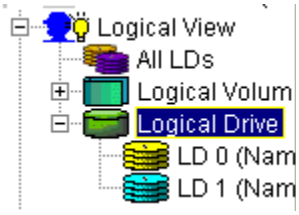


Figure 8–32 List of LDs

2 From the list shown in Figure 8–32, select the LD that you wish to delete. Once this LD has been selected a **"View and Edit LD Partition"** table will appear in the content panel. At the top of this window the two tabs (**"Partition"** and **"Operation"**) shown in Figure 8–33, will appear. Select the **"Operation"** tab.

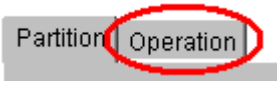


Figure 8–33 Select Operation

3 After selecting the **"Operation"** tab, an **"Expand Logical Drive"** window will appear in the content panel. The tabs shown in Figure 8–34 can be seen at the top of the **"Expand Logical Drive"** window. From these tabs select delete.

Figure 8–34 Select Delete

4 Once the **"Delete"** tab has been selected the **"Delete Logical Drive"** window shown in will appear in the content panel.

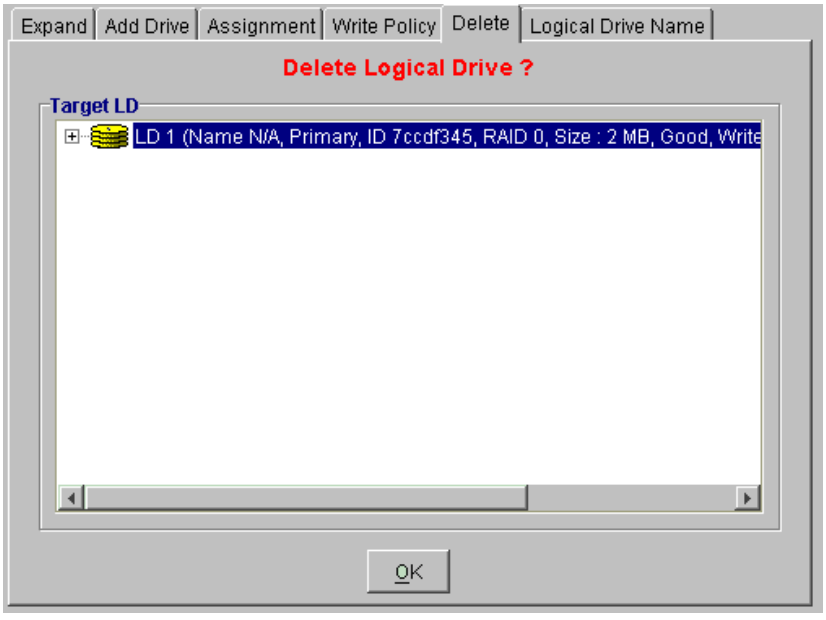


Figure 8–35 Delete Logical Drive

5 Once the LD has been selected, and if you are certain that you wish to delete the LD, press the **"OK"** button. A confirmation screen similar to the one in Figure 8–36 will appear. If you are still certain that you wish to delete the LD press the **"OK"** button. If you are not sure, click the **"Cancel"** button.

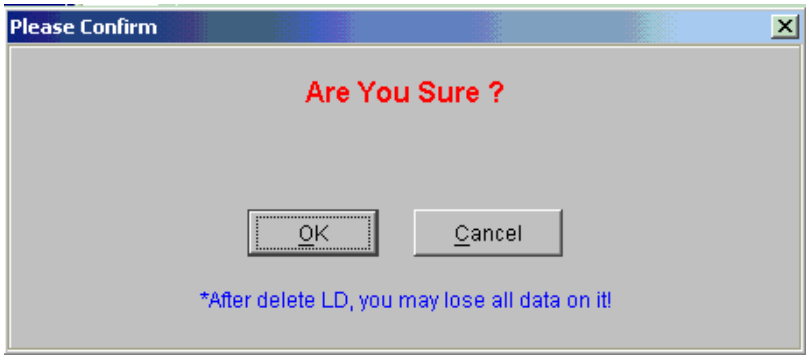


Figure 8–36 Confirm LD Delete

6 If you select the **"OK"** button, the LD will be deleted and you will be returned to the LD Management window shown in Figure 8–2. If you clicked on the **"Cancel"** button, you will be returned to the **"Delete Logical Drive"** screen shown in Figure 8–35.

Important **IMPORTANT: Deleting a logical drive irretrievably wipes all data currently stored on the logical drive.**

8.3 Creating and Deleting Logical Volumes

You can create and delete logical volumes using Altos RAIDWatch Manager. Logical volumes are created by combining logical drives together. You can combine logical drives with different capacities and RAID levels into a single logical volume. You can also delete existing logical volumes. Before deleting, make certain that the data stored in the logical volume is no longer needed. Deleting a logical volume erases all information stored on that logical volume.

Note When you delete a logical volume, all logical drives assigned to it will be released, making them available for new logical volume creation.

8.3.1 Accessing the "Create Logical Volume" Window

LVs are managed in the Logical View contents panel. The **Logical View** is accessed from the **RAID View** Navigation Panel.

1. To manage LVs; i.e. to create, expand and delete LVs; display the LVs window by clicking on the **Logical View** command button in the RAID View introduction or the **Logical View** icon in the RAID View navigation panel.

2. The items shown in Figure 8–1 should appear in the **RAID View** navigation panel.

Figure 8–37 Logical View Navigation Panel

3. For LV management, select the **"Logical Volume"** icon shown inFigure 8–37. The screen shown in Figure 8–38 should appear in the contents panel.

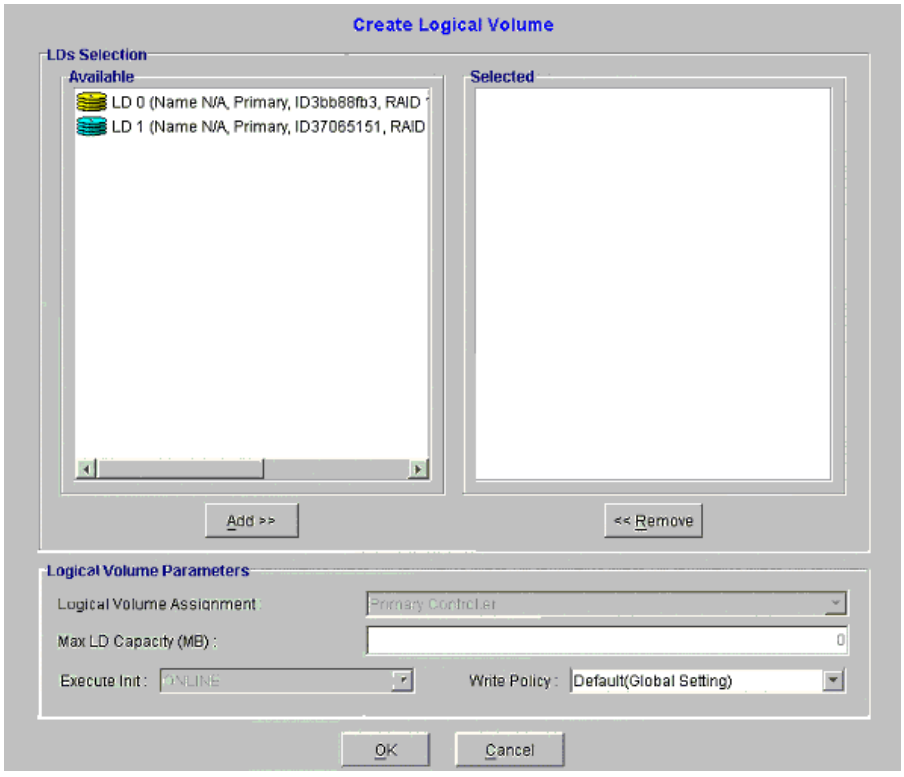


Figure 8–38 Create Logical Volume Management Window

8.3.2 Creating Logical Volumes

8.3.2.1 LV Creation

To create a logical volume:

1. Select the LDs that will be used in the LV.
2. Select the following RAID parameters:
   - Logical Volume Assignment
   - Max LD Capacity
   - Execute Init
   - Write Policy
3. Click the **"OK"** button

8.3.2.2 Selecting LDs

1. The **"Available"** menu in Figure 8–38shows the LDs that can be used to create LVs.

2 Select the LDs you wish to incorporate into a LV and click the **"Add"** button beneath the **"Available"** menu. See Figure 8–39.

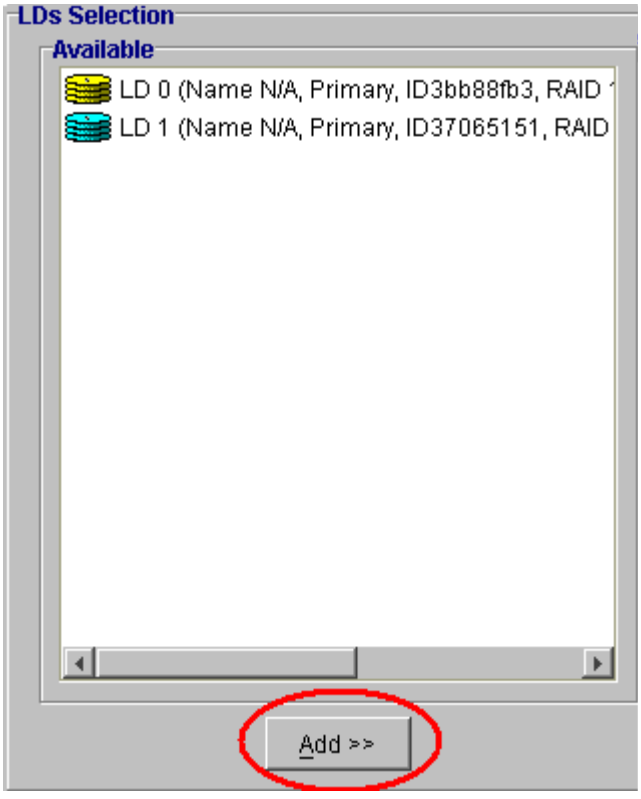


Figure 8–39 Selecting Logical Drives

3 After clicking the **"Add"** button, the drives that were selected will be removed from the **"Available"** menu and appear in the **"Selected"** window on the right hand side. SeeFigure 8–40.

Figure 8–40 Selected Logical Drives

8.3.2.3 Setting Logical Volume Parameters

After the LDs that will be used in the LV have been selected, the LV parameters for the LV must be selected. LV parameter options that are available are shown in Figure 8–41 and can be accessed at the bottom of the **LV Management Window** shown in Figure 8–38.

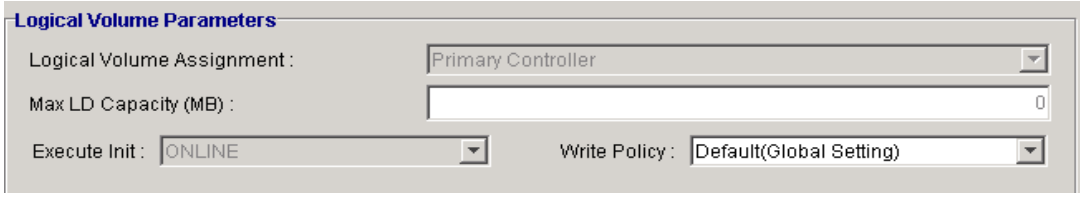


Figure 8–41 LV Parameter Options

LV Assignment

Choose **"Primary Controller"** or **"Secondary Controller"** from the **"LV Assignment"** menu shown in Figure 8–42.

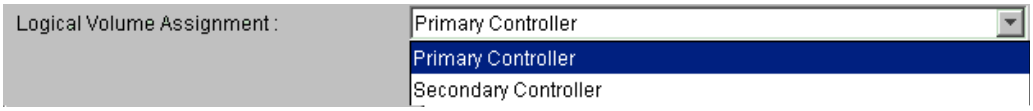


Figure 8–42 LV Assignment Selection

Note If the redundant controller function has not been enabled or the SID's are not assigned on drive channels, the **"LD Assignment"** pull down menu will not be available.

Max LD Capacity
This field, shown in Figure 8–43 specifies the maximum amount of memory that will be used from each LD to create the LV. Note that this field is not user configurable and the maximum amount of that will be used is determined automatically.

Figure 8–43 Max LD Capacity

Execute Init

Using the **"Execute Init"** pull down menu shown in Figure 8–41 the user can select whether the LV is initialized online or offline.

Select Write Policy
Use the **"Write Policy"** menu to select either "**Default"** (Global Setting)," **Write Through"** or "**Write Back"**.

8.3.2.4 Click "OK" to Create LV

Once the logical drives that will be used in the LV have been selected and all the desired LV parameters have been selected:

1 Click the **"OK"** button at the bottom of the LV management window shown in Figure 8–38

2 A confirmation window shown inFigure 8–44 will appear. If you are certain that you want to create the LD with the settings you have selected, click the **"OK"** button.

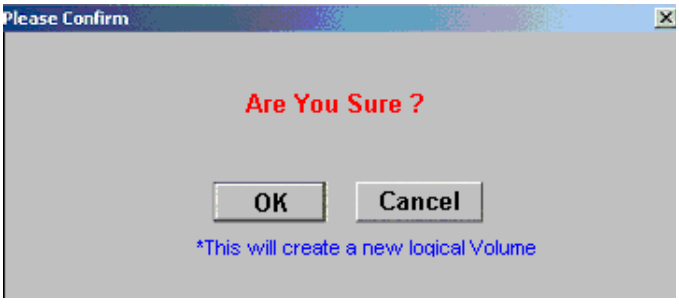


Figure 8–44 Confirm LV Creation

3 If you selected the "**OK**" button in the **"Please Confirm"** window the **"Create In Progress"** content window shown in Figure 8–13 on page 95 will display logical drive creation progress.

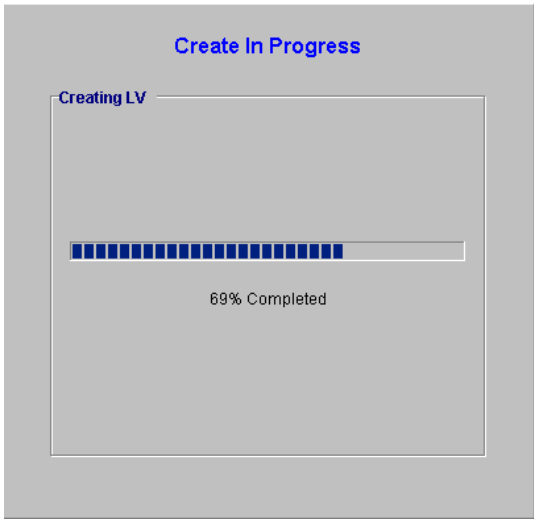


Figure 8–45 Create in Progress

8.3.3 To Expand a Logical Volume

When logical volumes are expanded by adding new logical drives, additional capacity can be added to existing logical volumes.

8.3.3.1 Opening the "Expand Logical Volume" Window

1 Select the **"Logical Volume"** icon from the **Logical View** Navigation Panel shown in Figure 8–1 on page 90. As shown in Figure 8–46, all the LVs that have been created will appear below the "Logical Volume" icon.

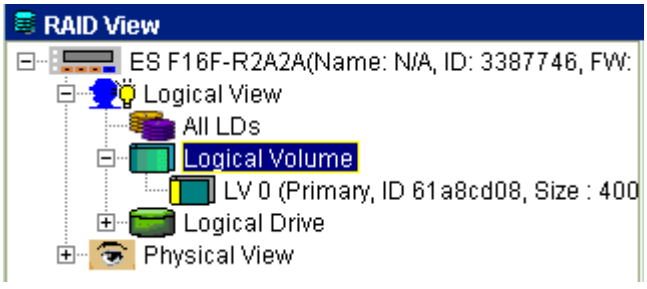


Figure 8–46 List of LVs

2 From the list shown in Figure 8–46, select the LV that you wish to expand. Once this LV has been selected a **"View and Edit LV Partition"** table will appear in the content panel. At the top of this window the two tabs **("Partition"** and **"Operation")** shown in Figure 8–47, will appear. Select the **"Operation"** tab.

Figure 8–47 Select Operation

3 After selecting the **"Operation"** tab, a new window will appear in the contents panel. Select the **"Expand"** tab shown in Figure 8–48.

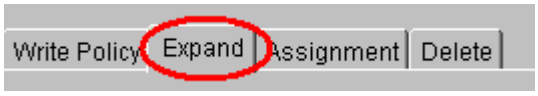


Figure 8–48 Select Expand

4 Once the **"Expand"** tab has been selected the **"Expand Logical Volume"** window shown in Figure 8–49 will appear in the content panel.

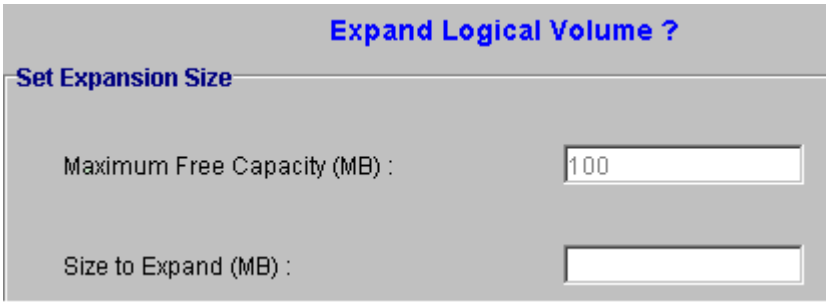


Figure 8–49 Expand Logical Drive Window

8.3.3.2 Setting LV Expansion Parameters

Maximum Free Capacity
This is a read only field and cannot be configured by the end user. This field informs the user as to the maximum available memory that can be used.

Size to Expand
Enter a value that is not larger that the value shown in the Maximum Free Capacity field. The LV will be expanded by the amount entered in this field.

Note You may combine partitions under View and Edit LV Partition Table by expanding the size of earlier partitions (as in, increase the size of partition 0 so that it is as large as all partitions combined to make one partition). Combining partitions destroys existing data on all drive partitions.

8.3.3.3 Click "OK" to Initiate LV expansion

To initiate the LD expansion, follow these steps:

1 Once the LV expansion parameters have been selected, click the **"OK"** button at the bottom of the **Expand Logical Volume** window.

2 A confirmation window shown in Figure 8–50will appear. If you are certain that you want to create the LV with the settings you have selected, click the **"OK"** button.

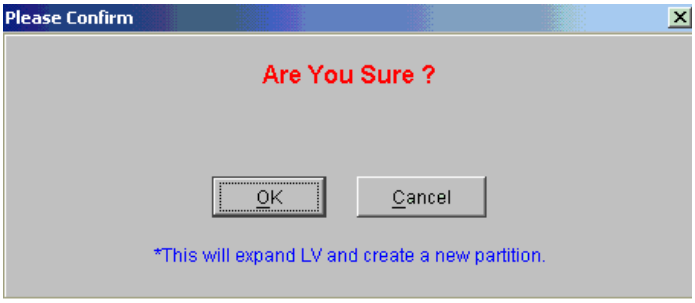


Figure 8–50 Confirm LV Expansion

3 If you selected the **"OK"** button in the **"Please Confirm"** window the **"Create In Progress"** content window will display logical volume expansion progress.

4 The logical drive will now have a new last partition the same size as the expansion. Look at the **View and Edit LD Partition Table** to verify this.

8.3.4 Delete a Logical Volume

1 Select the **"Logical Volume"** icon from the Logical View Navigation Panel shown in Figure 8–1. As shown in Figure 8–51, all the LVs that have been created will appear below the **"Logical Volume"** icon.

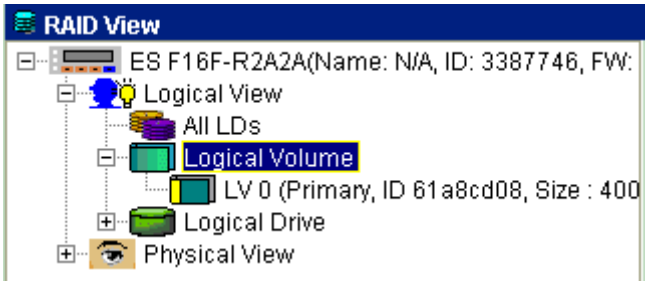


Figure 8–51 List of LVs

2 From the list shown in Figure 8–46, select the LV that you wish to delete. Once this LV has been selected a **"View and Edit LV Partition"** table will appear in the content panel. At the top of this window the two tabs (**"Partition"** and **"Operation"**) shown in Figure 8–47 will appear. Select the **"Operation"** tab.

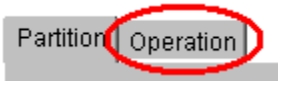


Figure 8–52 Select Operation

3 After selecting the **"Operation"** tab, a new window will appear in the contents panel. Select the **"Delete"** tab shown in Figure 8–53.

Figure 8–53 Select Delete

4 Once the **"Delete"** tab has been selected the **"Delete Logical Volume"** window shown in Figure 8–54 will appear in the content panel.

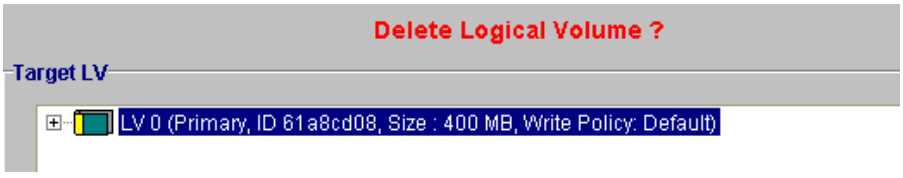


Figure 8–54 Delete LV

5 Select the LV you wish to delete and click the **"OK"** button that can be found at the bottom of the screen.

6 You will be asked to confirm that you wish to delete the LV in question. If you are certain that you want to delete the LV then select **OK**. The logical volume will be deleted and removed from the logical volumes list.

Important **Deleting a logical drive irretrievably wipes all data currently stored on the logical drive.**

8.4 Partitions

8.4.1 Overview

Partitions can be created in both logical drives (LD) and logical volumes (LV). Depending on your specific needs, you can partition an LD or LV into smaller sizes or just leave it at its default size (that is, one large partition covering the entire LD or LV).

If you intend to map an entire LD or LV to a single host LUN, then partitioning becomes irrelevant. If, however, the LD or LV is to be mapped to multiple host LUNs, then you need to define partitions for later LUN mapping.

Note You can create a maximum of eight partitions per logical drive or logical volume. Also, partitioned logical drives can not be part of a logical volume.

8.4.2 Partitioning a Logical Drive (LD)

1 Select the **"Logical Drive"** icon from the Logical View Navigation Panel shown in Figure 8–55. As shown in Figure 8–55, all the LDs that have been created will appear below the **"Logical Drive"** icon.

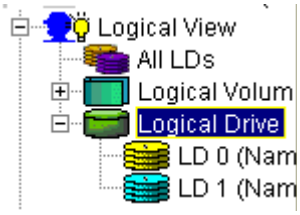


Figure 8–55 List of LDs

2 From the list shown in Figure 8–55, select the LD that you wish to partition. Once this LD has been selected a **"View and Edit LD Partition"** table will appear in the content panel. See Figure 8–56.

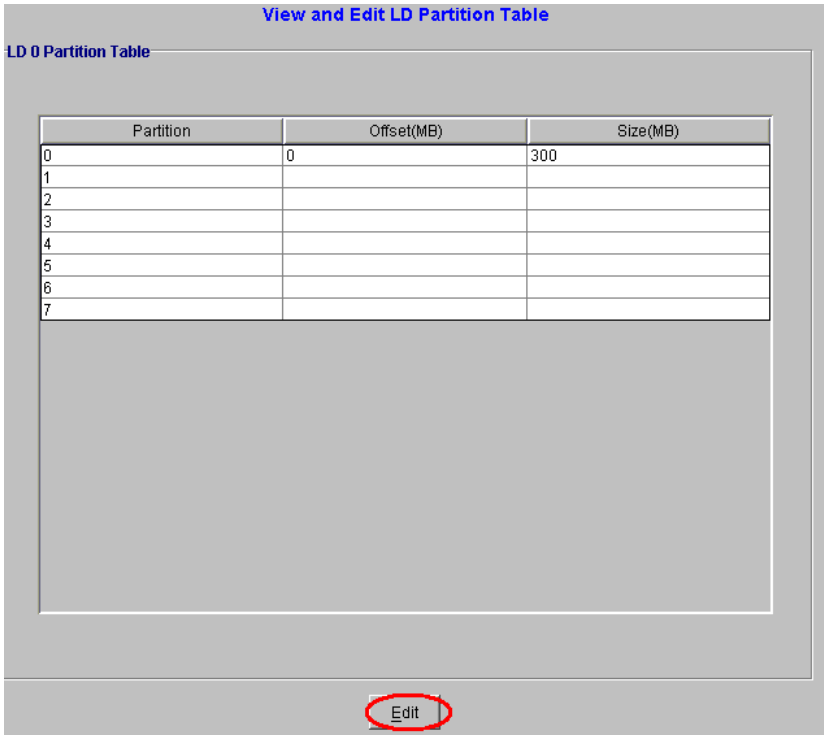


Figure 8–56 Partition Table

3 To create a new partition, edit an existing one, or remove an existing partition, click the Edit button at the bottom of Figure 8–56. You will be prompted for a password, enter it and click **OK**.

4 Select partition 0 or the last partition in the list to create a new partition. Only the Size(MB) field is editable and partitions must be contiguous. Modify the value of partition 0 or the last partition so that it will be the size you intend. All unallocated space will automatically be assigned to the new partition.

Note Any partition can be modified using the method described here. Changes will be reflected in other partitions as disk space is occupied or freed.

5 If you want to make multiple partitions, repeat the process. If you exit the **View and Edit LD Partition Table**, you will need to click Edit and enter a password again before you can make changes. A list of partitions is shown in Figure 8–57.

Partition	Offset(MB)	Size(MB)
0	0	30
1	30	70
2	100	10
3	110	40
4	150	20
5	170	50
6	220	10
7	230	70

Figure 8–57 List of Partitions

6 To remove partitions, make the size of the partition you wish to delete 0. The excess size will then be given to the partition higher in the list and the partition will be deleted. All the partitions that were below it will also be move one place higher in the table.

For example, if Partition 5 in Figure 8–57 needs to be deleted, reduce the size of Partition 5 to 0MB. As can be seen in Figure 858, the overall size of Partition 4 would increase by 50MB, from 20MB to 70MB. The size of Partition 5 would then change from 50MB to 10MB (previous size of Partition 6) and the size of Partition 6 would increase from 10MB to 70MB (the previous size of Partition 7). Partition 7 would no longer exist.

Partition	Offset(MB)	Size(MB)
0	0	30
1	30	70
2	100	10
3	110	40
4	150	70
5	220	10
6	230	70
7		

Figure 8–58 List of Modified Partitions

7 The logical drive is now ready for mapping to host LUNs. See: Mapping Logical Drives/Volumes/ Partitions to Host LUNs.

8.4.3 Partitioning a Logical Volume (LV)

1 Select the **"Logical Volume"** icon from the Logical View Navigation Panel shown in Figure 8–59. As shown in Figure 8–59 all the LVs that have been created will appear below the **"Logical Volume"** icon.

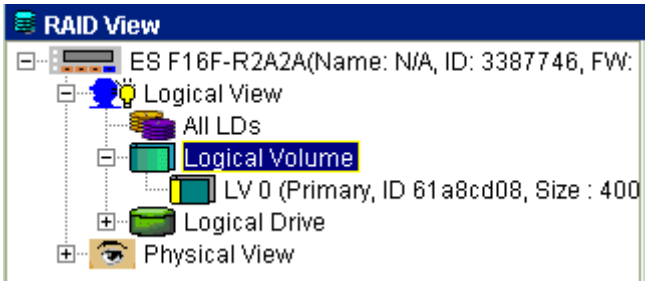


Figure 8–59 : List of LVs

2 From the list shown in Figure 8–59, select the LV that you wish to partition. Once this LV has been selected a **"View and Edit LV Partition"** table will appear in the content panel. See Figure 8–59.

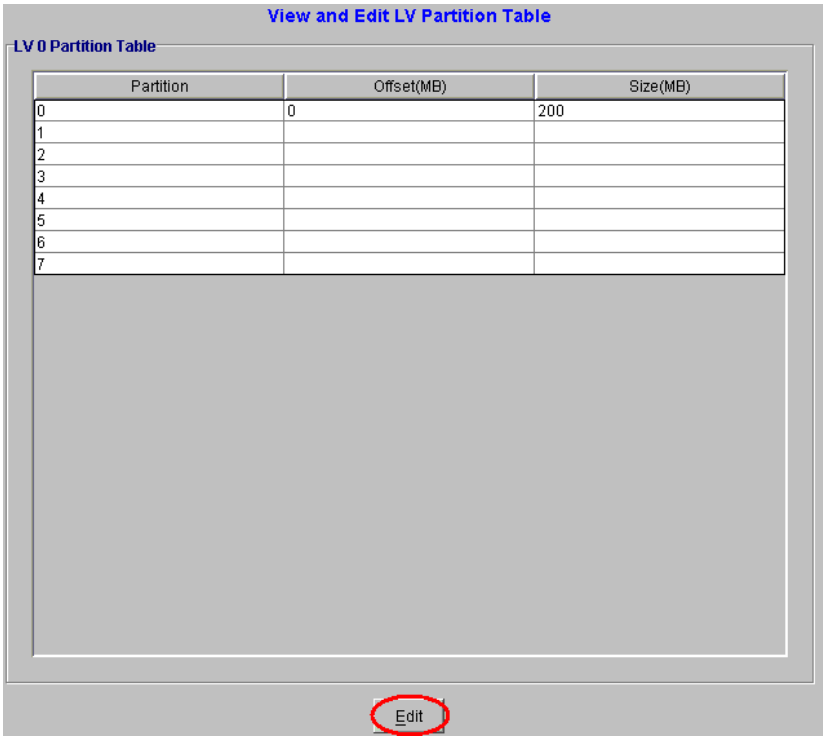


Figure 8–60 LV Partition Table

3 To create a new partition, edit an existing one, or remove an existing partition, click the **Edit** button at the bottom of Figure 8–60. You will be prompted for a password, enter it and click **OK**.

4 Select partition 0 or the last partition in the list to create a new partition. Only the Size(MB) field is editable and partitions must be contiguous. Modify the value of partition 0 or the last partition so that it will be the size you intend. All unallocated space will automatically be assigned to the new partition.

Note Any partition can be modified using the method described here. Changes will be reflected in other partitions as disk space is occupied or freed.

5 If you want to make multiple partitions, repeat the process. If you exit the **View and Edit LV Partition Table**, you will need to click **Edit** and enter a password again before you can make changes. A list of partitions is shown inFigure 8–61.

Partition	Offset(MB)	Size(MB)
0	0	20
1	20	60
2	80	20
3	100	10
4	110	30
5	140	20
6	160	10
7	170	30

Figure 8–61 List of Partitions

6 To remove partitions, make the size of the partition you wish to delete 0. The excess size will then be given to the partition higher in the list and the partition will be deleted. All the partitions that were below it will also be move one place higher in the table.

For example, if Partition 5 in Figure 8–611 needs to be deleted, reduce the size of Partition 5 to 0MB. As can be seen in Figure 8–62, the overall size of Partition 4 would increase by 20MB, from 30MB to 50MB. The size of Partition 5 would then change from 20MB to 10MB (previous size of Partition 6) and the size of Partition 6 would increase from 10MB to 30MB (the previous size of Partition 7). Partition 7 would no longer exist.

Partition	Offset(MB)	Size(MB)
0	0	20
1	20	60
2	80	20
3	100	10
4	110	50
5	160	10
6	170	30
7		

Figure 8–62 List of Modified Partitions

7 The logical volume is now ready for mapping to host LUNs. Please refer to Chapter 9 , ”LUN Mapping”, on page 121.

Chapter 9
LUN Mapping

After creating a logical drive (LD) or logical volume (LV), you can map it as is to a host LUN; or, if partitions are set, you can map each partition to a specific host LUN. Altos RAIDWatch supports 32 LUNs per host channel (numbered 0 - 31), each of which appears as a single drive letter to the host if mapped to a LD, LV, or a partition of either. Existing host LUN mappings can also be deleted. In cases where certain mappings are found to be useless, or disk array reconfiguration is needed, you can delete unwanted mappings in your system. This chapter explains the following LUN Mapping features.

9.1 Accessing the LUN Map Table

When you want to either create or delete a LUN Mapping or an extended LUN mapping, it is necessary to access the **LUN Map Table**. The L**UN Map Table** lists the LDs, LVs and partitions that have previously been mapped. To access the **LUN Map Table** please follow these steps:

1 In the Navigation Panel under **Physical View**, click on the **Host Channel** where you would like to map a drive or volume (see Figure 9–1).

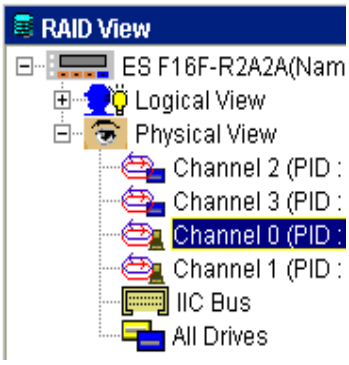


Figure 9–1 Select the Host Channel

2 In the sub-navigation window, beneath the Navigation Panel, select a host channel ID number as shown in Figure 9–2.

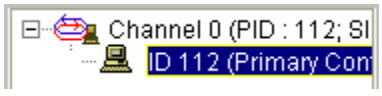


Figure 9–2 Selecting the Host Channel ID Number

3 After selecting the ID, the LUN Table for the host channel shown in Figure 9–3 will be displayed in the content panel.

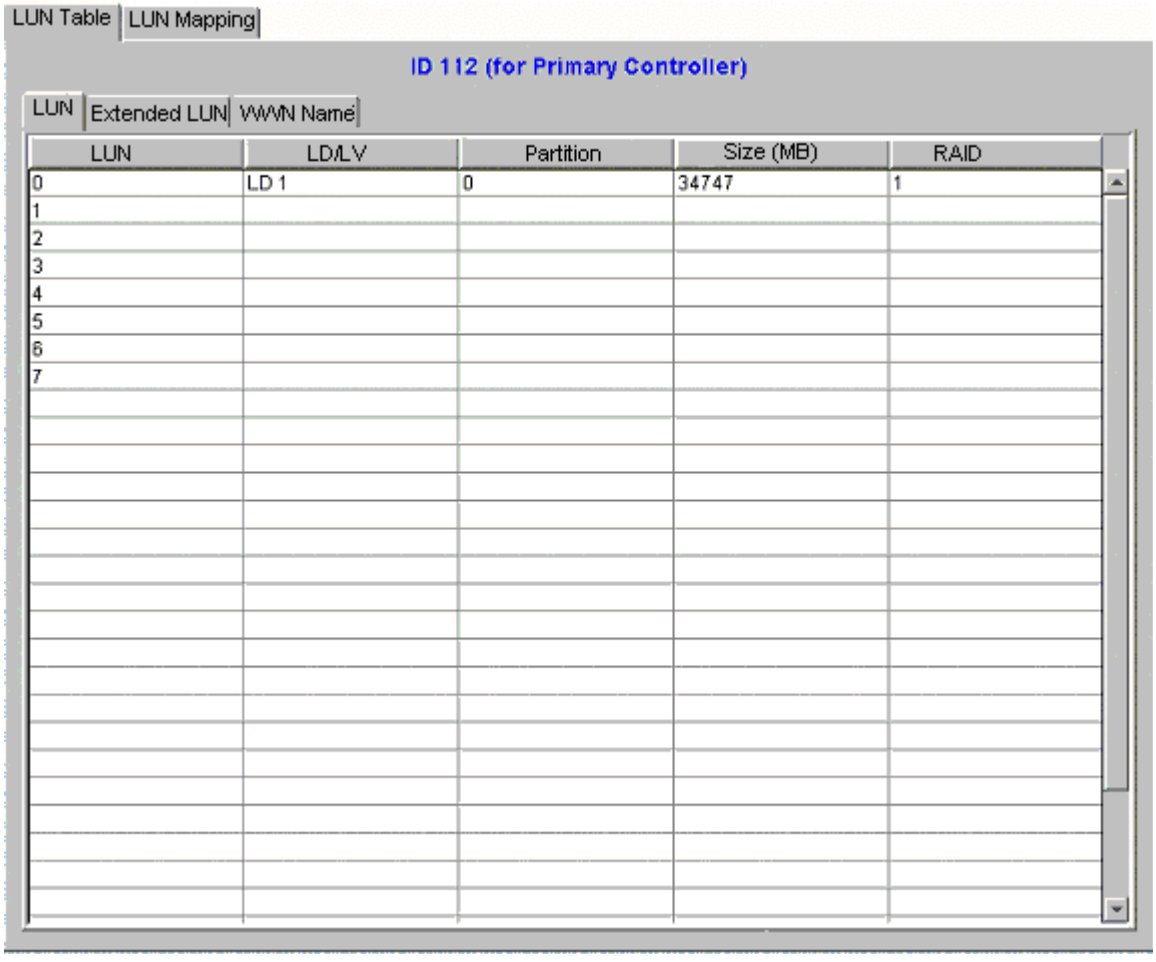


Figure 9–3 LUN Map Table

9.2 LUN Mapping

9.2.1 Mapping a Complete LD or LV

1. If you want to map a complete LD or LV make sure that the LD or LV has not been partitioned.

2. Follow the steps listed in Section 1 above to access the **LUN Map Table** shown in Figure 9–3.

3. Select the **LUN Mapping** tab shown at the top of the **LUN Map Table**. A new screen will appear in the content window. From this screen first select the **Add** sub-tab, and then click on the **LUN** sub-tab. (See Figure 9–4).

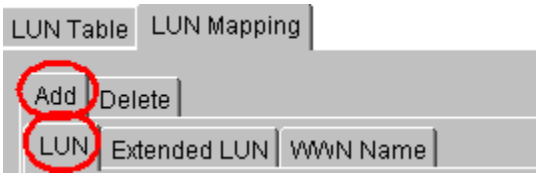


Figure 9–4 Select ADD then LUN

4 The **Create LUN Mapping** window should appear in the content panel (see Figure 9–5). If you want to map a logical drive then select the **LD** tab shown in Figure 9–5. If you want to map a logical volume, select the **LV** tab shown in Figure 9–5.

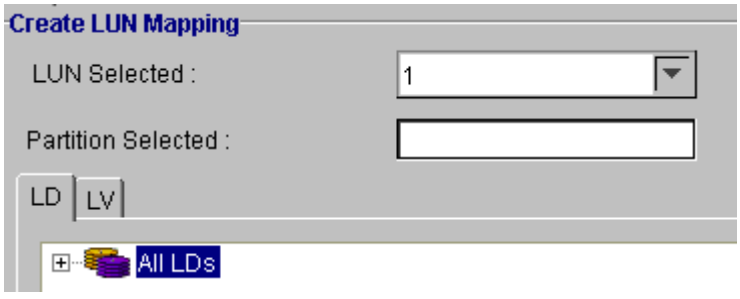


Figure 9–5 Create LUN Mapping

5 List the available logical volumes or logical drives by clicking on the **"All"** icon in the respective window. For example, in Figure 9–55 if the **"All LD"** icon is clicked, all available LDs will be shown (see Figure 9–6).

Figure 9–6 LD List

6 Click on the LD (or LV) you would like to map. All the LD (LV) partitions should appear. If you wish to map the entire *LD* (or *LV*), the LD (or *LV*) should not have been partitioned and the only partition that will appear is Partition 0 (see Figure 9–7).

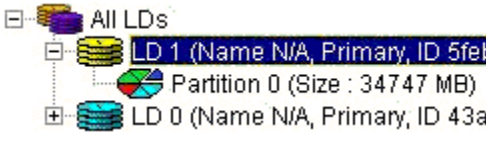


Figure 9–7 LD Partition 0

7 From the **LUN Selected** drop-box in Figure 9–8, choose the LUN ID that will be assigned to the LD (or LV). Only unused IDs will be listed.

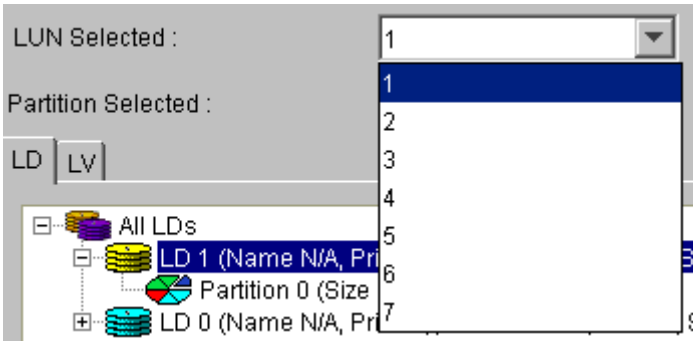
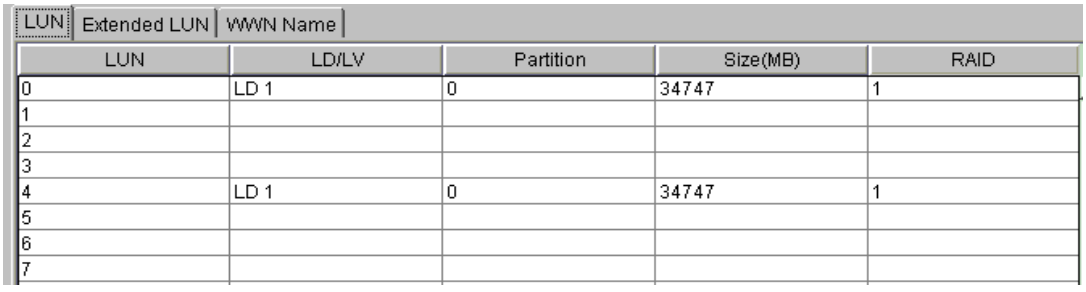


Figure 9–8 Available LUNs

8 Next, click on the partition 0 icon. **"Partition 0"** should appear, as shown in Figure 9–9, in the **Partition Selected** box. Click **OK** and enter the password when prompted.

Figure 9–9 Partitioned Selected

9 If you choose the **LUN Table**, the newly mapped LUN should now be listed, as seen in Figure 9–10.



LUN	LD/LV	Partition	Size(MB)	RAID
0	LD 1	0	34747	1
1				
2				
3				
4	LD 1	0	34747	1
5				
6				
7				

Figure 9–10 Listed LUN Mapping

9.2.2 Map a logical drive or volume partition to a host LUN

1 First, partition the logical drive or logical volume.

2 Follow the steps listed in section 9.2.1 above to access the LUN Map Table shown in Figure 9–3.

3 Select the **LUN Mapping** tab shown at the top of the **LUN Map Table**. A new screen will appear in the content window. From this screen first select the **Add** sub-tab, and then click on the **LUN** sub-tab. (See Figure 9–11).

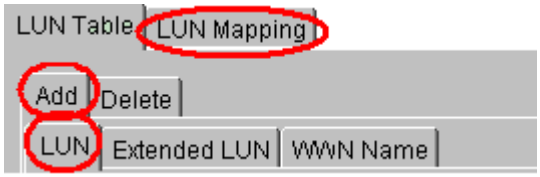


Figure 9–11 Select ADD then LUN

4 The **Create LUN Mapping** window should appear in the content panel (see Figure 9–12). If you want to map a logical drive then select the **LD** tab shown in Figure 9–12. If you want to map a logical volume, select the **LV** tab shown in Figure 9–12.

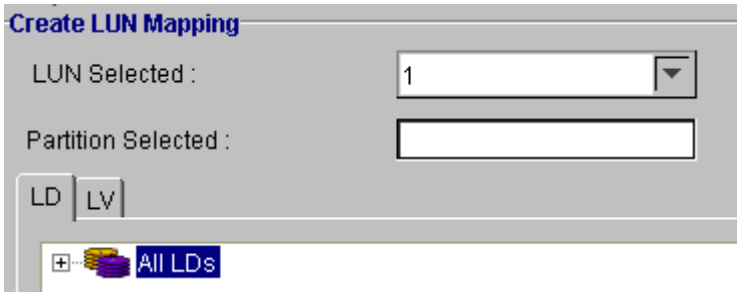


Figure 9–12 Create LUN Mapping

5 List the available logical volumes or logical drives by clicking on the **"All"** icon in the respective window. For example, in Figure 9–12 if the **"All LD"** icon is clicked, all available LDs will be shown (see Figure 9–13).

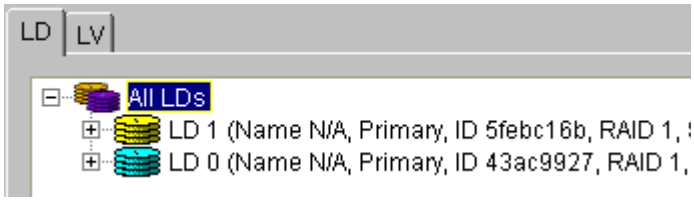


Figure 9–13 : LD List

6 To display the partitions of the drive you wish to map, click on the corresponding icon in the create LUN mapping window. (SeeFigure 9–14). Each drive and volume can have up to 8 partitions, each of which can be mapped to a host LUN.

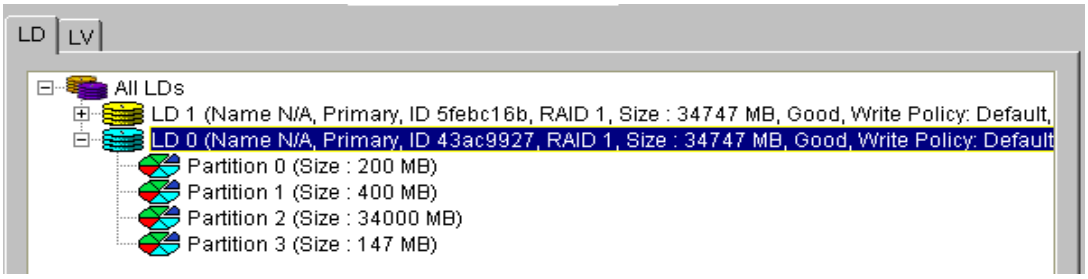


Figure 9–14 LD partitions

7 From the **LUN Selected** drop-box shown in Figure 9–15, choose the LUN ID to assign. Only unused IDs will be listed.

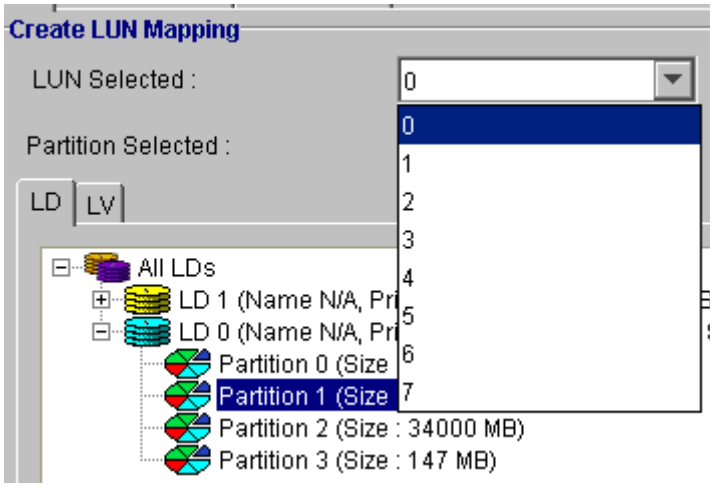


Figure 9–15 Selecting LUN ID

8 Next, double-click on the icon of the partition you would like to map. The partition should appear, as shown in Figure 9–16, in the **Partition Selected** box. Click **OK** and enter the password when prompted.

Figure 9–16 Selected Partition

9 To map additional partitions, repeat step 7and 8 listed above.

10 Once all partitions have been mapped, if you choose the **LUN Table** tab as shown in Figure 9–17, the newly mapped LUNs should appear in the LUN table.

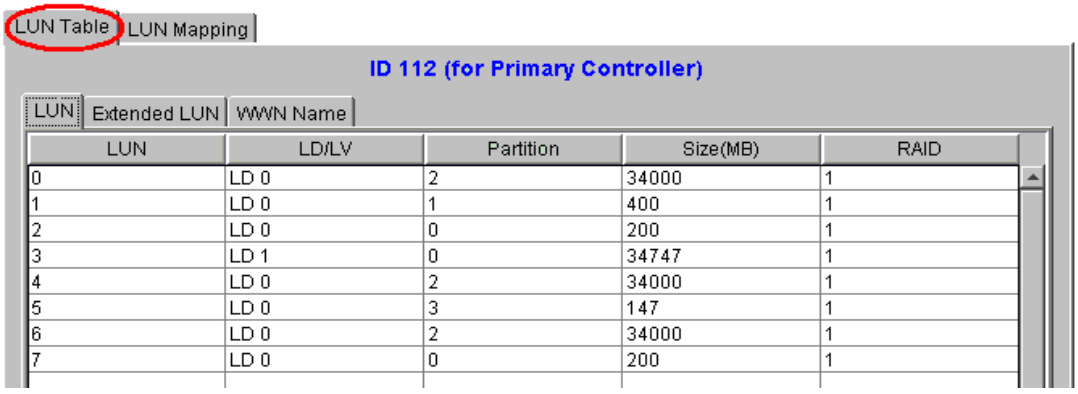


Figure 9–17 LUN Table with LUN Mappings

9.2.3 Deleting a host LUN mapping

1 Follow the steps listed in Section 9.2.1 above to access the LUN Map Table shown in Figure 9–3.

2 Select the **"LUN Mapping"** tab at the top of the LUN Table. Next, as shown in Figure 9–18, select the **Delete** and the **LUN** sub-tabs.

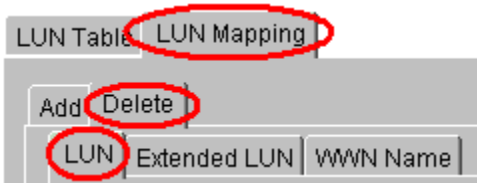


Figure 9–18 Delete LUN Tabs

3 To delete a LUN mapping, double-click on **LUN Mapping** in the LUN Map table until the ID is displayed in the **LUN Selected** box, which can be seen at the top of the LUN Map table shown in Figure 9–19.

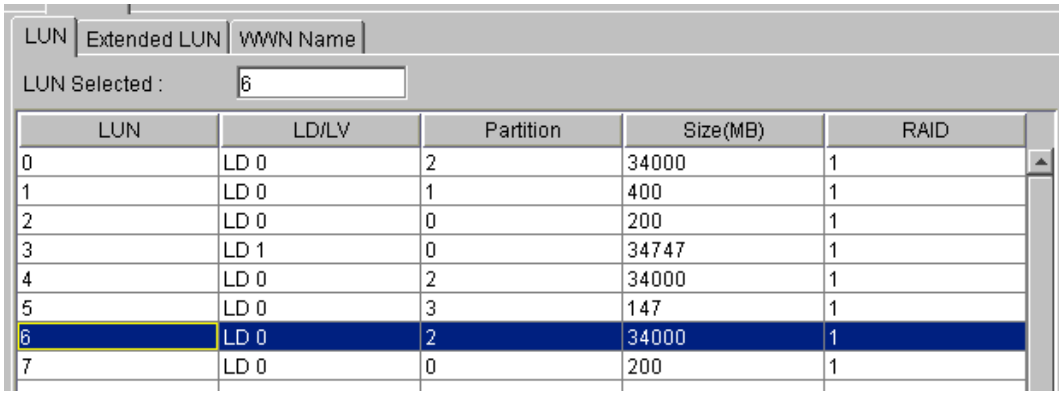


Figure 9–19 Select the LUN that is to be deleted

4 Click **OK**. When prompted for a password, enter it and click **OK**. The LUN mapping should no longer be listed in the LUN Map table. In the example shown in Figure 9–19. LUN 6 was selected. After deleting the LUN mapping it no longer appears in the **LUN Mapping** table. See Figure 9–10 on page 125.

LUN	LD/LV	Partition	Size(MB)	RAID
0	LD 0	2	34000	1
1	LD 0	1	400	1
2	LD 0	0	200	1
3	LD 1	0	34747	1
4	LD 0	2	34000	1
5	LD 0	3	147	1
6				
7	LD 0	0	200	1

Figure 9–20 Deleted LUN

5 To remove additional LUN mappings, repeat step 2.

9.3 Extended LUN Mapping

Extended LUN Mapping adds extra functionality to the normal LUN Mapping, which only allows you to assign LUNs. Extended LUN mapping provides users with added masking and filtering features. This enables users to restrict access to specified LUNs. It also enables users to assign different access modes (Read and Write or Read only) to pre-specified LUNs.

9.3.1 Preliminaries

- Before you can use the **Extended LUN Mapping** feature you must first create the logical drives and logical volumes.
- If you want to use **Extended LUN Mapping** to map an entire logical drive or logical volume, make sure that the logical drive or volume is ***NOT*** partitioned.
- If you want to use the **Extended LUN Mapping** to map a logical drive partition or logical volume partition, make sure that the logical drive and volumes are partitioned ***before*** accessing the Extended LUN Mapping Feature.

9.3.2 Extended LUN Mapping

1 Follow the steps listed in section 9.2.1 to access the **LUN Map Table** shown in Figure 9–3

2 Select the **LUN Mapping** tab shown at the top of the **LUN Map Table**. A new screen will appear in the content window. From this screen first select the **Add** sub-tab, and then click on the **Extended LUN** sub-tab. (See Figure 9–21).

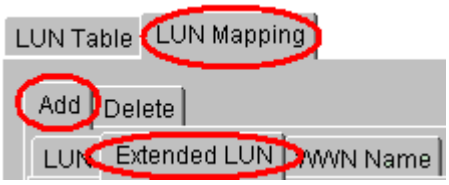


Figure 9–21 Extended LUN Mapping Tabs

3 A ***Create Extended LUN Mapping*** window, as shown in Figure 9–22, should appear in the content panel.

If you want to map a logical drive select the **LD** tab at the bottom of the screen. If you want to map a logical volume, select the **LV** tab at the bottom of the screen.

If you want to map a partition, select **LD** (for logical drive partition) or LV (for logical volume partition). Then click on the **"ALL"** icon in the respective window. Click on the drive or volume you would like to display to map its partitions. Each drive and volume can have up to eight partitions. Each one can be mapped to a host LUN.

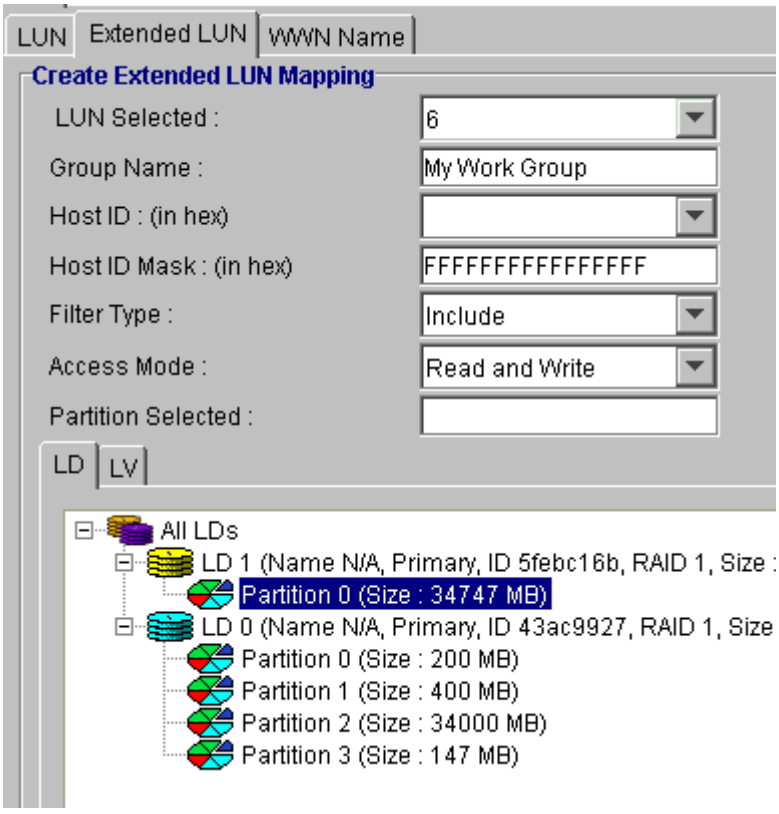


Figure 9–22 Create Extended LUN Mapping

4 Once the LD, LV or partition that is going to be mapped is selected, the following extended LUN mapping parameters need to be set.

- **LUN Selected:** Click on the pull down next to the **LUN Selected** field. Unused IDs will be listed. Select the LUN that is to be assigned.
- **Group Name:** This field permits a user to enter an appropriate group name.
- **Host ID:** This field should contain the WWN number of the HBA that will have access to the LD, LV or partition that is being mapped. The WWN can be selected from the drop down box next to the **Host ID** field. The WWN number can be added manually, to see how this is done please see the next section.
- **ID Mask:** The default host **ID Mask** is shown. The ID Mask is a 16 bit hexadecimal number and can be changed by the user.
- **Filter Type:** This field has two options, **"Include"** or **"Exclude."** Selecting **"Include"** will enable the HBA to access the LD, LV or partition that is being accessed. Selecting **"Exclude"** will prevent the HBA from accessing the storage space that is currently being mapped.
- **Access Mode:** This field enables the user to select what access rights the HBA will have. If you select **"Read and Write"** then the HBA will be able to both read and write information to the selected LD, LV or partition. If you select **"Read Only"** the HBA will only be able to read the contents stored on the selected LD, LV or partition. It will not be able to store any information.

5 Once all the extended LUN mapping parameters have been selected, click **"OK."**

6 To continue to mapping other LDs, LVs or partitions, repeat Steps 3, Step 4 and Step 5 above.

7 Once all the extended LUN mappings have been made, the extended LUN mappings can be viewed in the **Extended LUN Mapping Table** shown in Figure 9–23. To view this table, select the **LUN Table** tab at the top of the screen and the **Extended LUN** sub-tab.

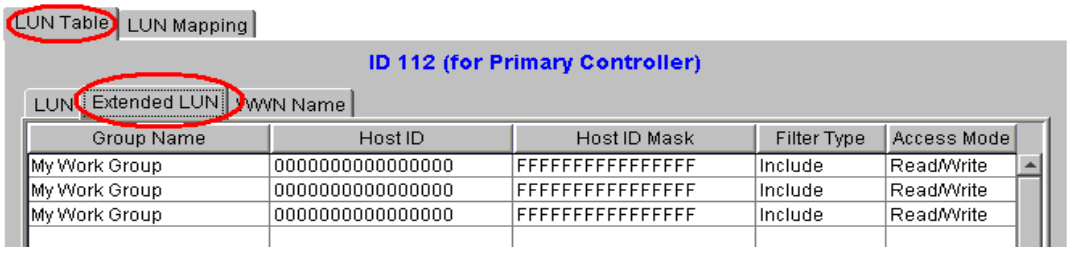


Figure 9–23 Extended LUN Mapping Table

9.3.3 Adding a WWN Name

1 To manually add a **WWN Name**, click on the WWN Name sub tab. Follow the steps listed in Section 1 above to access the LUN Map Table shown in Figure 9–3.

2 Select the **LUN Mapping** tab shown at the top of the **LUN Map Table**. A new screen will appear in the content window. From this screen first select the **Add** sub-tab, and then click on the **WWN Name** sub-tab. (See Figure 9–24).

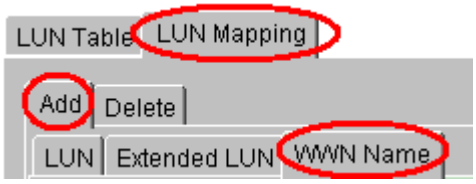


Figure 9–24 WWN Tabs

3 A Create **WWN Name Mapping** window, as shown in Figure 9–25, should appear in the content panel.

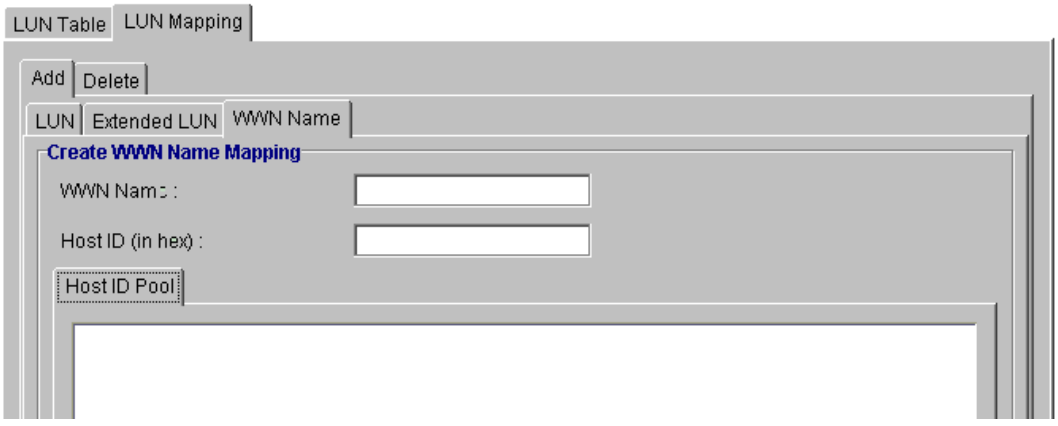


Figure 9–25 Create WWN Name Mapping

4 The following WWN parameters need to be entered.

- **WWN Name:** The WWN name is selected by the user. Enter the name you wish to assign to the HBA.
- **Host ID:** There are two ways in which a user can select the **Host ID**, manually or automatically.
  - **Manually**: Refer to the documentation that came with the HBA and enter the Host ID that is given in this document.
  - **Automatically**: Select the Host ID from the Host ID Pool by clicking on the ID you wish to select. The ID's shown in the pool are automatically detected by the controller's embedded firmware.

5 Once the new WWNs have been added, if you select the **LUN Table** tab all the newly entered WWNs should be listed.

9.3.4 Deleting an Extended LUN Mapping or WWN Name

1 Deleting an Extended LUN Mapping or WWN is similar to deleting a normal LUN Mapping. Follow the steps listed in Section 1 above to access the LUN Map Table shown in Figure 9–3.

2 Select the **"LUN Mapping"** tab at the top of the LUN Table. Next, as shown in Figure 9–26, select the **Delete** and either the **Extended LUN** tab or the **WWN Name** tab.

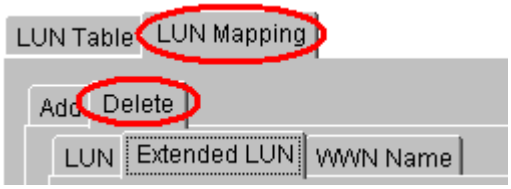


Figure 9–26 Delete Extended LUN Mapping or WWN Name

– If you selected the **Extended LUN** tab then a window listing all the Extended LUN Group Names will appear. Select the group name you wish to delete and click on the **OK** button at the bottom of the box.

– If you selected the **WWN Name** tab, a window with a list of all WWN Names and corresponding Host IDs will appear. Select the WWN Name you wish to delete and click on the **OK** button at the bottom of the box.

3 Click **OK**. When prompted for a password, enter it and click **OK**. The mapping should no longer be listed in the **Extended LUN Mapping** table or the **WWN Name Table**.

Chapter 10

System Monitoring and Management

10.1 S.E.S. Monitoring

SCSI Enclosure Services (SES) is a protocol that is used to manage and sense the state of the power supplies, cooling devices, temperature sensors, individual drives, and other non-SCSI elements installed in a fibre channel JBOD enclosure. If you have a SES-compliant enclosure the firmware on the controller boards will be able to decode and report this information. This information can also be accessed using Altos RAIDWatch.

10.1.1 Accessing SES Monitoring

1 To access the SES first, open the **RAIDView** navigation panel by selecting either the **RAIDView** icon in the toolbar or the **RAIDView** command in the **"View"** menu. After opening the **RAIDView** select the **Physical View** icon in the **RAIDView** navigation panel, items shown in Figure 10–1 should appear.

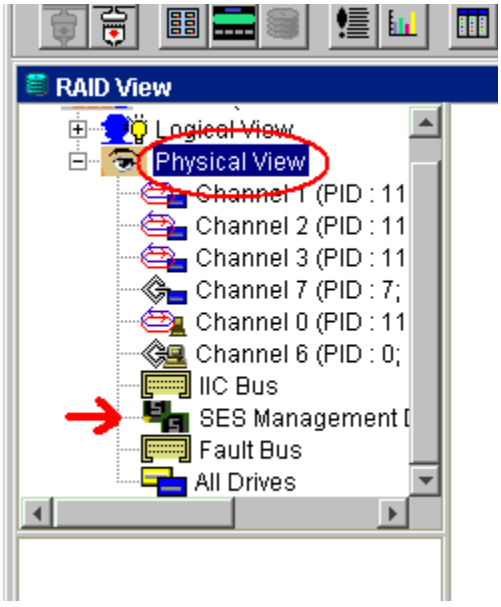


Figure 10–1 Opening SES Fault Management

2 Once **Physical Vie**w has been selected, scroll down and select **SES Management Device** icon. Once this is selected, a framed menu **(Managed Unit Status)** of hardware items will appear in the screen frame on the right hand side.

10.1.2 SES Management Device

Once the SES Management Device is selected, the **Managed Unit Status** screen, shown in Figure 10–2 below, will appear in the content panel. You will notice at the top of the menu there are two options, **Monitor** and **Information**. Selecting **Monitor** accesses the **Managed Unit Status** screen, which provides information on the JBOD enclosure hardware components. Selecting **Information** accesses the **Management Device Information** screen, which provides information on the JBOD enclosure itself

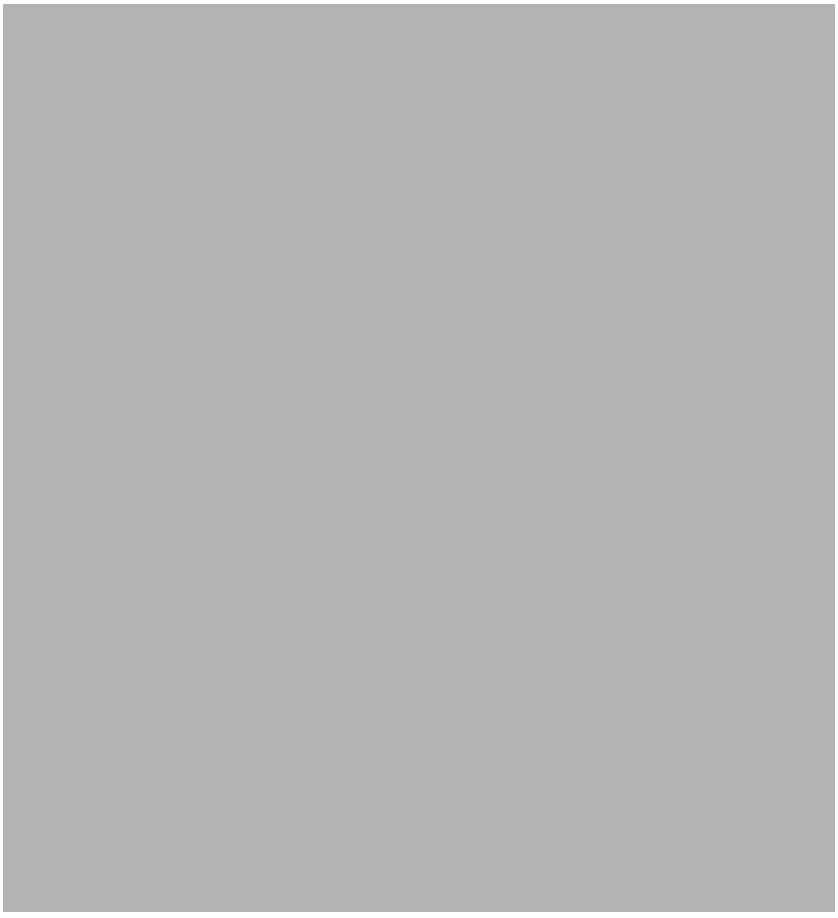


Figure 10–2 Managed Unit status

10.1.2.1 Managed Unit Status

The **Managed Unit Status** screen is shown in Figure 10–2. The status of the JBOD enclosure hardware components is shown in the parentheses next to the listed item. Please note that, depending on the enclosure you are using, the list of managed components may be different. Below is just a sampling of the JBOD enclosure elements that are managed.

- ***SES (CH 2, ID 105)***: The parentheses next to SES show a Channel (CH) and ID number. The CH and ID are not unique to the SES, rather the SES is connected through one of the hard drives in the JBOD enclosure.
- ***Power Supply 0/1***: If the PSUs are functioning normally a message indicating this will be shown. If a PSU has failed or been removed, error messages will be shown.
- ***Fan 0/1***: The status message shows the operating speed of the fans. If a cooling fan has failed or been removed, error messages will be shown.
- ***Temperature Sensor***: If the temperature sensor is operating normally the status message will show the temperature and whether or not the temperature of the JBOD enclosure is in the safety range. If the temperature has failed or been removed, error messages will be shown.

- ***UPS 0***: If the backup battery is functioning normally, the status message will show whether or not it is fully charged. If the backup battery has failed or been removed, error messages will be displayed.

- ***Speaker***: If the speaker is functioning normally a message indicating this will be shown. If the speaker has failed or been removed, error messages will be displayed.

- ***Device Slot:*** The device slot is where the physical HDD is inserted in the JBOD enclosure. The message in the parentheses shows the channel, the device slot ID, whether the slot is activated and ready for insertion or removal and whether the slot is empty or occupied.

10.1.2.2 Management Device Information

The **Management Device Information** screen, shown in Figure 10–3, has four fields: the ***Vender ID***, the ***Product ID, Hardware Revision*** and ***software revision***. This information is valuable when you need to report a failed or faulty enclosure to the vendor concerned.

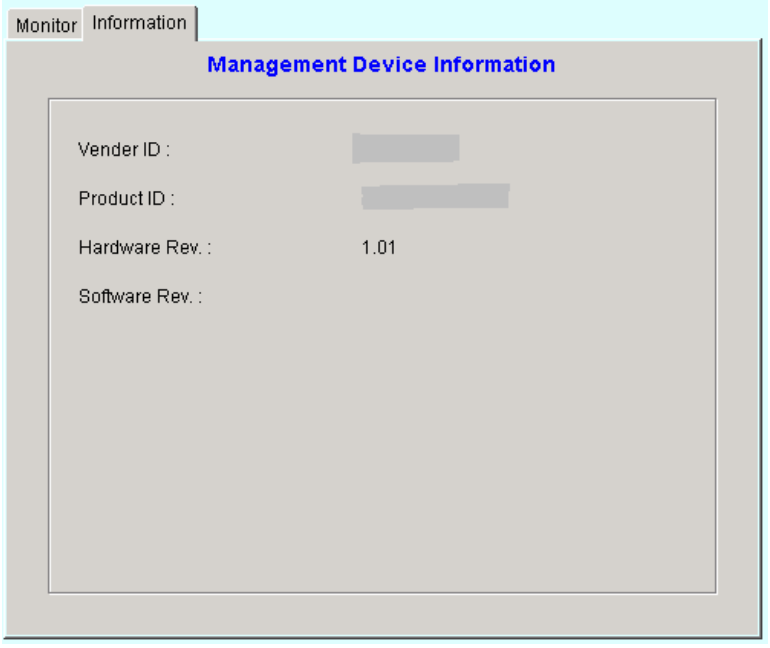


Figure 10–3 Management Device Information

10.2 Defining Enclosures

This allows the user to replicate real enclosures with real drive bays, depicting the exact locations and positions of the physical drives and RAID controller(s). In both cases, you create custom enclosures to facilitate management of the physical drives in the disk array system. When a drive fails, determining which drive to replace will be simply a matter of checking the Enclosure window for the exact location of the failed drive (a failed drive appears with a red **"X"** mark on its icon).

10.2.1 Creating an Enclosure

1 Display the *Enclosure* window. To display it, either click on the **Enclosure** command button (Case 1) or select the **Enclosure** command from the **Open** menu (Case 2). Similar items as shown in Figure 10–4

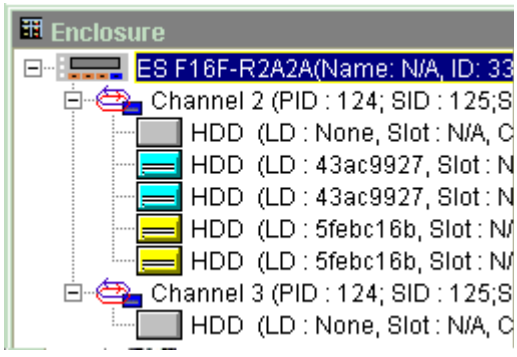


Figure 10–4 Enclosure View Navigation Panel

2 After selecting the **"Enclosure View",** the screen shown in Figure 10–5 will appear in the content panel.

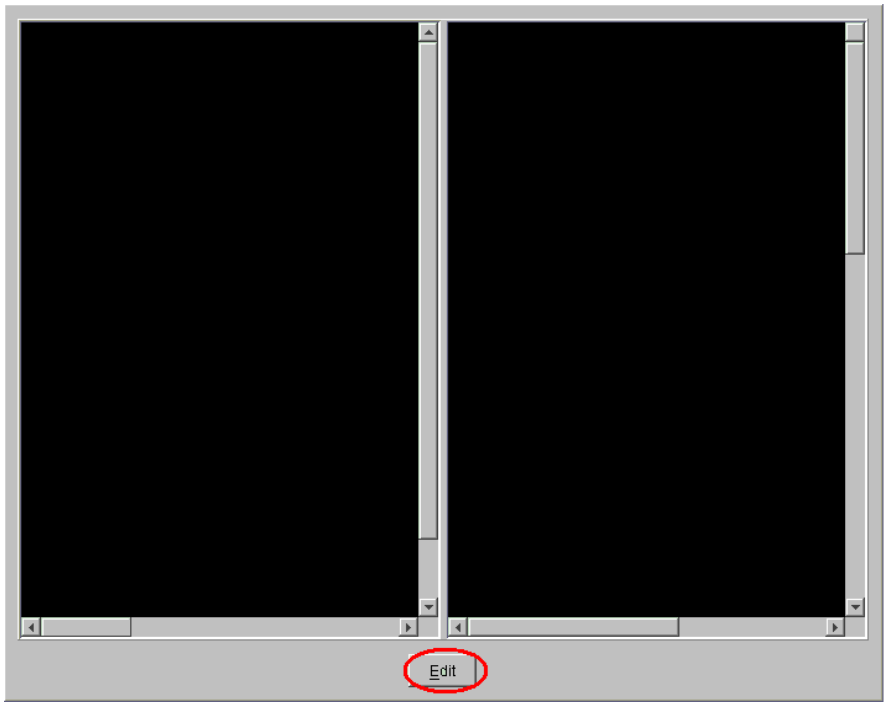


Figure 10–5 Enclosure View Content Panel

3 Click on the **"Edit"** button at the bottom of the content panel screen. The Enclosure window has, as shown in Figure 10–6, pre-configured spaces that resemble controller and drive canisters of your enclosure. The enclosure window might have been defined by your system vendor.

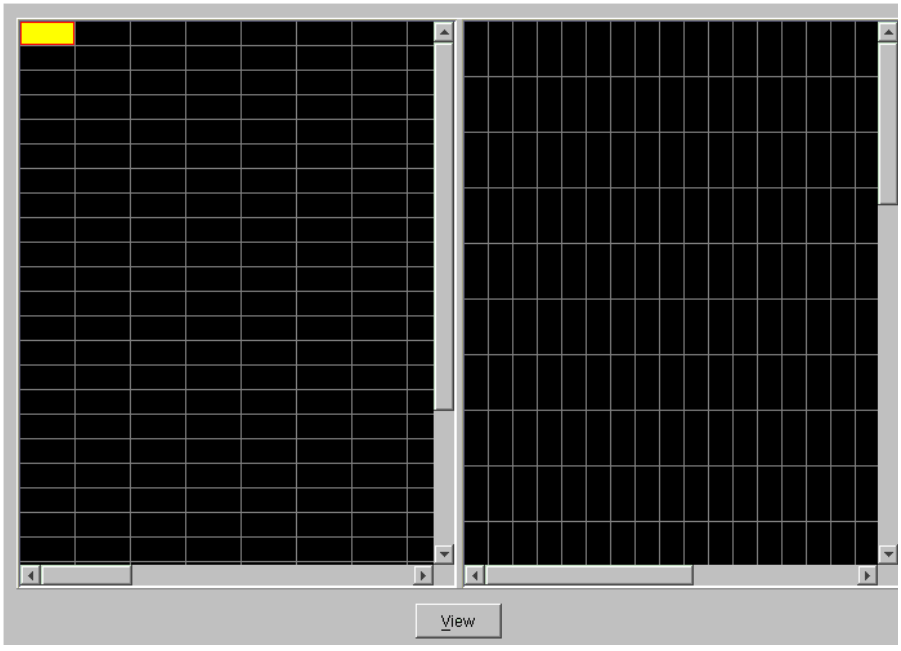


Figure 10–6 Enclosure View Pre-Configuration

4 Click on an empty space that represents an empty canister or drive bay within the Enclosure window (horizontal or vertical). The space you selected will be highlighted by different color as shown in Figure 10–7.

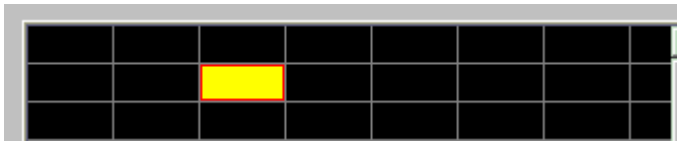


Figure 10–7 Enclosure View Configuration

5 Next click on a drive icon from the navigation panel, see Figure 10–8, then click the **Add** button. The drive icon should appear in the previously selected space on the right hand side.

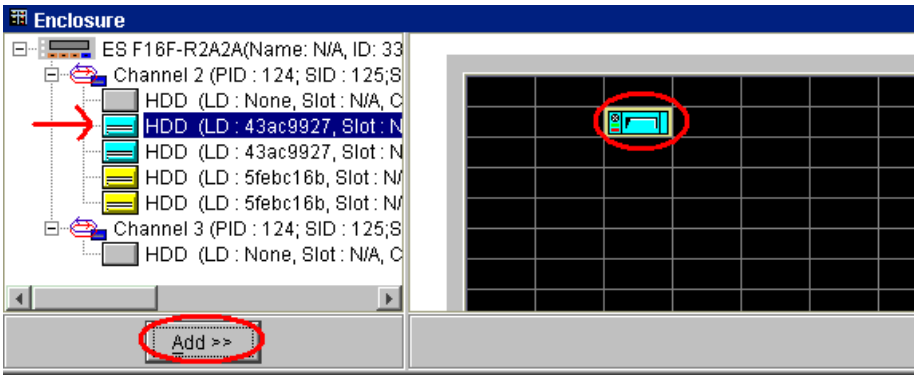


Figure 10–8 Select a drive

Note If an empty space does not match the drive icon or controller icon you selected, the **Add** button will be inactivated. This happens when you try to place a drive in an inadequate canister (e.g. you can not place a drive in a controller canister; and you should arrange your drives according to actual locations and SCSI ID sequence).

6 Repeat the above procedure to add more drives. Using this same method, monitoring device icons can also be added to defined enclosures.

Note Drives may only be added to one enclosure and the enclosure window provides no "auto-update" function. If drives are added or removed from your array, you will need to update the enclosure settings in the ***Enclosure*** window.

7 The ***Enclosure*** window also supports a logical view of connected drives. Click on the **Logical** button to display the logical relationship among physical drives. Physical drives configured in a logical drive group will be displayed in the same color. If there are more than one logical drives, different colors will be displayed to distinguish members of different logical drives.See Figure 10–9.

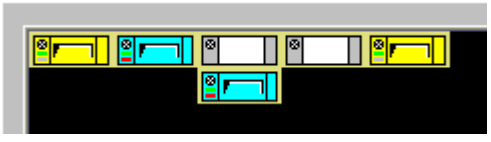


Figure 10–9 Logical View of Drives in the Enclosure View

Note Physical View under the RAID View window also provides a real-time report on drive status, using the same symbols and colors to represent various conditions. What you see in the Enclosure window is also reflected in the Physical View. These windows, however, differ in the way physical drives are presented; in the Enclosure window, the drives should be arranged according to their actual locations in the drive bays, while in the Physical View, the drives are arranged according to channel connections.

10.2.2 Removing a Drive from an Enclosure

1 Click on the target drive.

2 Click the **Remove** button.

10.3 Displaying the Event Log

Altos RAIDWatch Manager can display a running log of all events that occur in the disk array system ranging from simple notifications, to warnings, to alerts.

Note The Event Log only displays events that occur while Altos RAIDWatch Manager is running.

1 Click on the **Event Log** command button or select the **Event Log** command from the **Open** menu. The Event Log window will appear

The events in the window are listed according to the date and time they occurred with the most recent event at the bottom. A description of each event is provided.

2 To scroll through the list, use the vertical scroll bars.

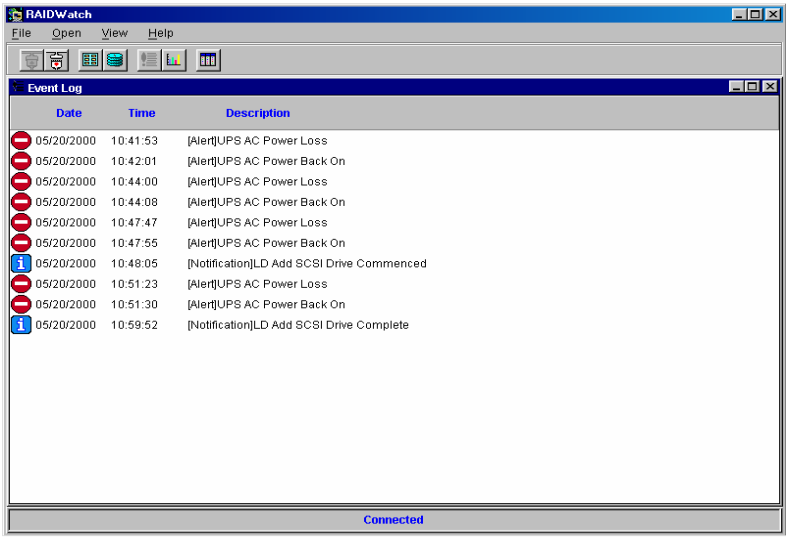


Figure 10–10 event log Window

Note If events occur and the **Event Log** window is not open, a red **Event Flag** button will appear on the button bar. The **Event Log** can be accessed by clicking on this button.

10.4 Monitoring Statistics

Altos RAIDWatch Manager includes a statistics monitoring feature to report on the overall performance of the disk array system. This feature provides a continually updated real-time report on the current throughput of the system, displaying the number of bytes being read and written per second, and the percentage of data access being handled by cache memory. These values are displayed in a graphical format.

- **To access the Statistics window:** Click on the **Statistics** command button or select the **Statistics** command from the **Open** menu. Then choose either **Cache Hits** or **Disk R/W** (disk read/write).

  - The **Cache Hits Statistics** window displays what percentage of data is being accessed via cache memory. Read values appear in blue and Write values in red.

- The **Read/Write Statistics** window displays the amount of data being read from and written to the disk array system, in MB per second. Read values appear in blue and Write values in red.

Chapter 11

The Notification Processing Center

The **Notification Processing Center** (**NPC**) is a notification application that enables users to configure notifications that are transmitted when various disk array events occur. The NPC makes it possible to manage (or monitor) the disk array system even when the administrator is away from the manager station. When properly configured, this function can notify the administrator of event occurrences in a RAID array instantly.

This Chapter introduces the following NPC topics:

11.1 Before You Begin

11.1.1 About NPC

Altos RAIDWatch NPC provides five methods of sending notifications:

- Fax
- Pager
- E-mail
- Broadcast
- SNMP Traps

You can use any or all of the notification methods mentioned above. In order to use a particular method, you must have the proper hardware (like a modem for pager notification) and software (like Windows NT with the window messaging subsystem for e-mail message notification) installed in your system.

11.1.2 Platform Requirements

Before Altos RAIDWatch's event notification can be used, some adjustments may need to be made to your operating system's configuration. See section 2.3, "Platform Requirements", on page 9 about pre-installation configuration needs. Many of the steps described in Chapter 2 and Chapter 3 directly relate to event notification, particularly for Windows operating systems.

Important **All configuration entries in all notification types will send event notifications at every event. Multiple receiver destinations are available in all types, but every event notification will be sent to all configured receivers in all types. That is, over-configuring may result in an unintentional "storm" of event notifications.**

11.2 Basic Running Requirements

NPC is a separate software application from Altos RAIDWatch's primary and secondary agents, and from the Altos RAIDWatch Manager. In order for notifications to be sent out, the **NPC** must be manually configured and run (and re-run after a host computer is reset).

Installation and configuration of the NPC is accomplished using the same program and interface as that for the installation and configuration of the Primary and Secondary agents.
In order for NPC to work, it must be:

- Installed and run on the same host computer as a Primary Agent.
- Once NPC is installed, it must be configured to send the types of notifications you want to receive.

Important **For NPC to function on NT servers, the "Windows Messaging Service," "Personal Fax," "Internet Mail," and "Telephony service" must be installed and running. Windows Messaging can be used to receive and store faxes, and for other kinds of messages.**

11.3 Redundant NPC Modules

Figure 11–1 Redundant NPC Modules

The NPC and Primary Agent should be, as shown in Figure 11–1, installed redundantly on two different servers in case the Primary Agent or *NPC* module should fail. If the Primary Agent or NPC should fail, the Primary Agent and NPC installed on another server will continue event notification. This method is applied for the consideration that fatal system failure might occur unnoticed at the time when the only NPC or Primary Agent is unable to function.

Redundant NPC modules should not be installed without Primary Agents. Run the Altos RAIDWatch configuration procedure and enable this function by designating another server as where the standby modules will be installed. Primary Agent and NPC module must then be installed manually on that particular server (either a RAID server or not). The installation utility does not automatically add these modules to the selected server.

11.4 Severity Levels

Altos RAIDWatch classifies disk array events into three severity levels. The first level includes non-critical information events such as initialization of the controller and initiation of the rebuilding process. Level 2 severity includes events which require the issuance of a warning message. Level 3 severity is the most serious level, and includes events that need immediate attention. The following sections provide example events for each level:

11.4.1 Level 1 Severity Events (examples)

- Controller Initialization Complete
- Rebuild Initiated
- Rebuild Complete
- Rebuild Failed
- Logical Drive Initialization Started
- Logical Drive Initialization Complete
- Logical Drive Initialization Failed

11.4.2 Level 2 Severity Events (examples)

- SCSI Target Select Timeout
- SCSI Target Unexpected Disconnect
- SCSI Target Timed Out
- SCSI Target Parity Error
- SCSI Target Not Ready Error
- SCSI Target Media Error
- SCSI Target Hardware Error
- SCSI Target Unit Attention
- SCSI Target Unexpected Sense Date
- SCSI Target Block Reassignment Failure
- SCSI Target Unexpected Data Over/Underrun
- Drive SCSI Unrecognized Event

11.4.3 Level 3 Severity Events (example)

- Drive Failure

  Note: The current version of NPC does not include event notification configuration based on event severity.

11.5 Configuring Notification Options

The configuration of NPC notification modes has been fully described in Chapter 3 , "Configuration Options", on page 31. Please refer to this chapter to see how to configure the following NPC configuration options.

- Modem
- Fax
- Pager
- Broadcast
- E-Mail
- SNMP

11.5.1 Configuring Modem Settings

NPC needs to be configured with the proper settings for the host's fax/modem if fax or pager notification is going to be used.

NPC modem settings include Serial Port and Baud Rate. If multiple modems are available on different COM ports, each one can be entered. The NPC settings of each of these variables must identically match the host's fax/modem configuration settings.

- **Serial Port:** choose from COM1 to COM16 in the drop box.
- **Baud Rate**: choose 4800, 9600, 19200, 38400, or 57600 in the drop box.

When you have finished, click **Add** to allow NPC to use this modem. Next, choose another NPC item to configure or click **Close** to save changes and exit the installation procedure.

Important **A pre-configured modem can only be removed from the list of Available Modems after all references to the modem have been removed.**

11.5.2 Configuring Fax Notification

NPC sends fax messages to specific destinations using the fax service and window messaging subsystem. If these services are not available on your host computer, install them first before using the fax notification function of the system. You will also need to connect a fax/modem to your computer. Installing a fax/modem can be a tricky process, so consult your operating system manuals for instructions on how to install your fax/modem software.

As a rule, the following services should be available on the host computer running NPC:

- Personal Fax
- Windows Messaging
- Internet Mail and Telephony Services

For fax notification to function on a Unix-based system, connect a modem and NPC will be able to send fax.

To enable fax service on NT, the following steps can be taken as examples:

1 You need to install Personal Fax and Windows Messaging. Personal Fax is usually bundled with Microsoft's Small Business Server. You may download its package from Microsoft's web site.

2 Here are some of the known issues with installing Personal Fax.
- Telephony service must be enabled and running.
- Listed below are examples for configuring fax service under Windows NT. Some of them must be configured during the installation process of Personal Fax.

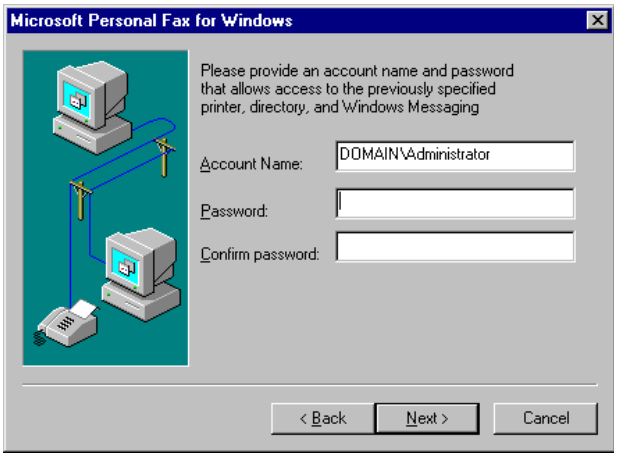


Figure 11–2 Fax Configuration

3 When Personal Fax is installed, only administrators can send faxes. NPC has altered the associated configurations to eliminate this limitation. However, it is recommended to log in as an **Administrator.** For normal users to send faxes, you may check your write access in the registry key:

HKEY_LOCAL_MACHINE/SYSTEM/CurrentControlSet/Control/Print/Printers/Fax/….

- The profile name necessary for logging on to personal fax/messaging service is usually the same as the account name that you use for system logon.

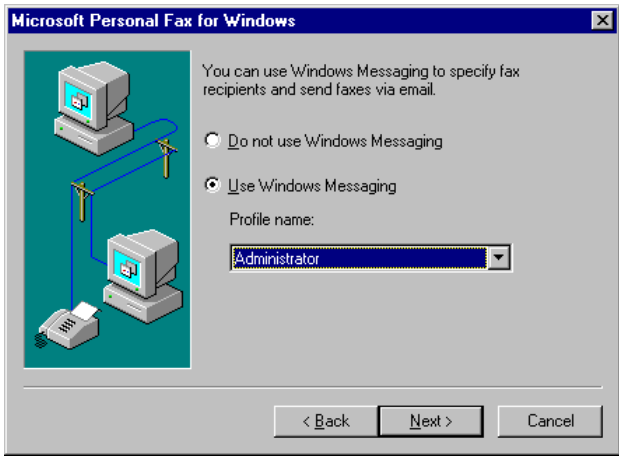


Figure 11–3 Fax Configuration – Profile Name

- Fax service requires Windows Messaging to send fax via email.

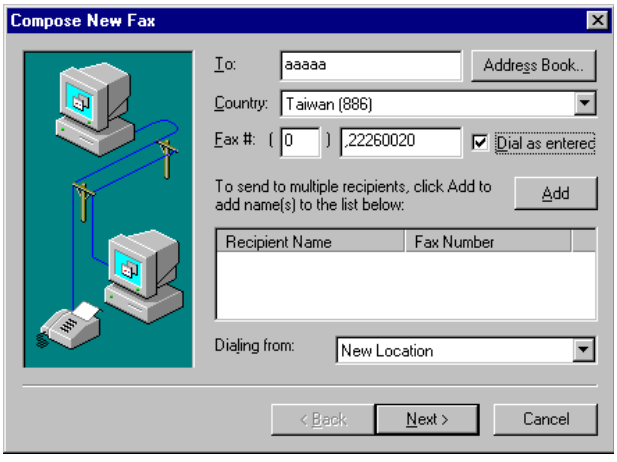


Figure 11–4 Fax Configuration – Compose New FAX

- You may add more recipient machines later using the Altos RAIDWatch configuration utility (as will be discussed in the proceeding discussions).
- Proceed to complete the installation process.
- Diagrammed below is the topological view of the relationship between fax receiving machines and the fax sending computer.

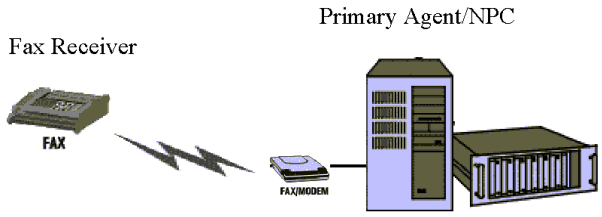


Figure 11–5 : FAX Topology

4 Add Fax Mail Transport and Internet Mail as the active services to Windows Messaging profile.

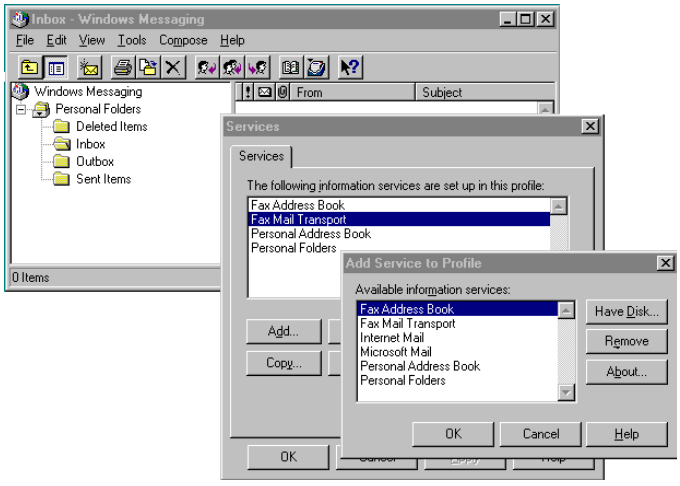


Figure 11–6 Add Fax Mail Transport and Internet Mail

Since NPC depends largely on the fax service installed to the MAPI of Windows NT for the delivery of fax messages, most fax notification parameters are configured through this software package. NPC allows you to set a telephone number for the receiving fax machine, the message that will be sent in the fax, the modem that will be used from a list of available modems, and the initialization string the NPC will use when starting to send a fax.

- **Profile Name**: is a collection name required for logon to a Windows Messaging profile (FAX, E-mail, Exchange Mail). It is usually the same with the account name. A profile name validates the available messaging services and service providers during a particular MAPI session.

- **Telephone**: enter the phone number of the event notification receiving fax machine. Note that you must enter the entire dialing sequence (no hyphens) including line access, country and area codes.

- **Message**: the message that will be printed on the fax message. You may add, for instance, the contact information of technical personnel, etc.

- **Available Modems**: choose a modem from those listed in the drop box.

- **Initializing String**: is a standard AT command set initialization command string. The default is &F1X0M0 and should be appropriate for most modems. If you need to change it, consult your modem manual for the correct AT command string.

  The Initializing String is applied for fax and pager service on Unix-based systems.

When you have finished, click **Add** to have NPC send event notifications to this fax machine. Next, either enter another fax machine to receive notices, choose another NPC item to configure, or click **Close** to save changes and exit the installation procedure.

11.6 Configuring Pager Notification

Pager notifications, like faxes, are sent using the fax/modem, so an NPC modem configuration is required.

NPC allows you to set a telephone number for the receiving pager, the message that will be sent to the pager, the modem that will be used from a list of available modems, and the initialization string the NPC will use when starting to send a pager message.

- **Telephone**: enter the phone number of the event notification receiving pager. Note that you must enter the entire dialing sequence (no hyphens) including line access, country and area codes.
- **Message**: the message that will be delivered to the pager.
- **Available Modems**: choose a modem from those listed in the drop box.
- **Initializing String**: is a standard AT command set initialization command string for Unix-based systems. The default is:

  V1B1E0F0L1M1Q0TV1X1Y0&C1&D2&G0S7=20

  and should be appropriate for most modems sending to a pager. If you need to change it, consult your modem manual for the correct AT command string.

When you have finished, click **Add** to have NPC send event notifications to this pager. Next, either enter another pager to receive notices, choose another NPC item to configure, or click **Close** to save changes and exit the installation procedure.

11.7 Configuring Broadcast Message Notification

Broadcast messages are sent to every station on the subnetwork configured. A broadcast message should cause a window to appear that will stay visible until manually closed by a user.

To enable Message Broadcast in Solaris, open a console terminal and then execute "./rpc.rwalld" under *"/usr/lib/netsvc/rwall".*

Note Under some circumstances, software component necessary for running NPC under RedHat - *"rpc.rwalld"* - may be absent from system.

If the package *"rpc.rwalld"* is not installed, users can find the associated rpms, *"rwall-server-<version>-.i386.rpm*" and *"rwall-<version>.i386.rpm*" under the directory *"RedHat/RPMS"* on the RedHat installation CD.

To install the rpm packages, use the command: ***rpm -i <your rpm package>+.***

Make sure NETBIOS and TCP/IP are active services on your NT for message broadcasting.

Broadcast settings include:

- **Host Name**: which should be computer name for Windows NT/98/95 but should be a host name or IP address for Unix systems such as Solaris, Linux, HP-UX, and AIX.
- **Message**: which is the message that network stations will see when events occur. Message added here can serve as a reminder and may as well be the technical contact information.

Note Cross-platform broadcasts (i.e., Unix-based servers broadcasting to Windows-based network stations and vice versa) are not currently supported.

When you have finished, click **Add** to have NPC send event notification broadcasts to stations served by this server. Next, either enter another server to receive notices, choose another NPC item to configure, or click **Close** to save changes and exit the installation procedure.

11.8 Configuring E-Mail Notification

NPC sends e-mail messages to specific people on the network or Internet using the Microsoft Internet Mail service or a third-party, MAPI-compliant e-mail service. You will need these services to enable the e-mail notification function of NPC.

Since NPC depends largely on services mentioned above for the delivery of e-mail messages, most e-mail notification parameters are configured through these packages. NPC only allows you to select the users who will receive the notification messages, and specify the notification message for each recipient.

For information on how to configure users for e-mail reception and other pertinent information about the Microsoft Internet Mail service in Windows NT, refer to the Windows NT manual. Be sure that these services are configured properly, and functioning before using the e-mail notification function of NPC.

NPC e-mail settings include:

- **Profile Name**: is a collection name required for logon to a Windows Messaging profile (FAX, E-mail, Exchange Mail). It is usually the same with the account name. A profile name validates the available messaging services and service providers during a particular MAPI session.
- **SMTP Server**: enter the IP address of the mail server to use to send e-mail event notifications.

- **Sender's E-mail**: enter the valid e-mail address that will be used as the "From" part of event e-mail notices.
- **Receiver's E-mail**: enter the full internet e-mail address for the receiver.
- **Subject**: enter a subject for notification e-mails. Currently, Subject is not available for Unix-based platforms.
- **Message**: enter the message to be included as the e-mail event notices. Messages can be added such as the contact information of technical personnel.

When you have finished, click **Add** to have NPC send event notification e-mail messages to this e-mail address. Next, either enter another e-mail address to receive notices, choose another NPC item to configure, or click **Close** to save changes and exit the installation procedure.

11.9 Configuring SNMP Trap Notification

Starting SNMP trap receiving capability can be as simple as keying *"net start snmp"* and *"snmputil trap"* at the DOS prompt under Windows-based systems.

To enable SNMP receiving capability under Linux, you can use the *"snmptrapd -P"* command. SNMP trap notification is a supported NPC function. Simply enter the IP addresses of SNMP agents for trap notification to work.

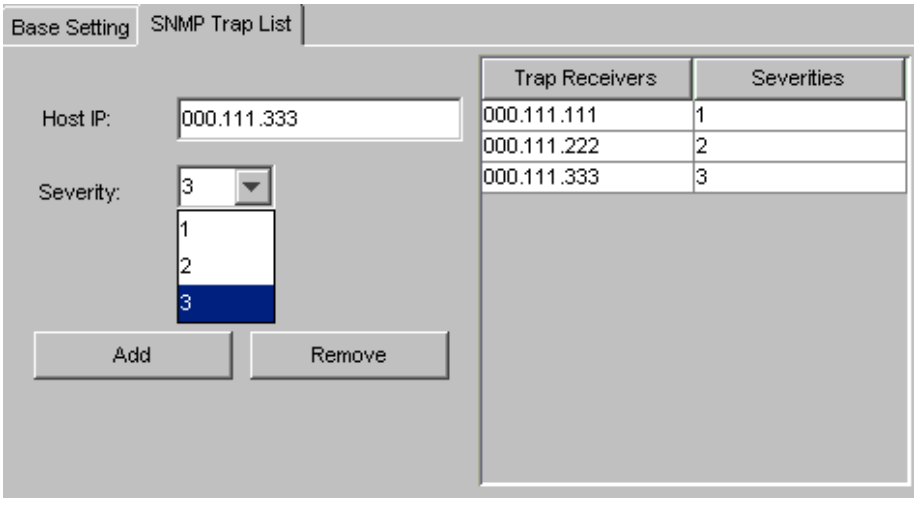


Figure 11–7 : SNMP Trap List

Avail hosts to be listening to SNMP traps by entering its IP addresses and adding the addresses to the list of trap receivers.

Users may select a severity parameter (1,2, or 3). The parameter determines events of what severity level(s) are to be sent via SNMP.

1	All severity levels

2	Two levels: Warning and Alert
3	Only the most serious events: Alert messages

Chapter 12
Event Monitor

This chapter discusses how to configure and use the **Event Monitor**. Topics include the following:

- Summary of the Event Monitor features, 12.1.
- Before you begin, 12.2.
- Sharing the Event Monitor, 12.3.
- Exiting the Event Monitor, 12.4.
- Connecting and disconnecting from a disk array, 12.5.
- Using the Event Monitor, 12.6.
- Severity levels, .

The **Event Monitor** is designed to run as an all-time monitor of the events reported from multiple RAID systems.

The program can help, along with NPC (Notification Processing Center described in Chapter 10) a system administrator to quickly respond to system alerts. It compensates for Altos RAIDWatch's drawback that previous records of events are lost once the manager is restarted. System problems can be easily identified and located with the help of the graphical display of system components. If system adjustment is required, you can switch to Altos RAIDWatch Manager online using the current connection with disk array.

12.1 Event Monitor Features

12.1.1 Feature Summary

The list below summarizes **Event Monitor**:

- Concurrent monitoring of multiple arrays
- RAID controller real-time event notices provide information about various event occurrences, including the time when an event occurs, event severity, and event description
- Displaying record of up to1024 events per connection to a controller.
- Graphical representation of disk array components for ease of locating problems
- User-configurable display of events by severity and time of occurrence

12.1.2 Other Features

- User-friendly graphical interface running under operating systems compatible with the Java Run-time Environment
- Internet browser access to full program functionality provides worldwide management capability
- Supports FC-to-SATA RAID controllers.
- Communicates with the controllers over a LAN, the Internet or over Fibre channel
- Illustrates graphically and clearly the relationship between various disk array elements
- Supports remote management over the network of an agent running Windows, Solaris, or Linux via the TCP/IP protocol
- Real-time monitoring of physical drive, power supply, fan, and other component status

12.1.3 Event Monitor Considerations

Event Monitor is an event monitoring utility bundled with Altos RAIDWatch Manager. **Event Monitor** can be selected for installation from the Altos RAIDWatch installer. Follow the procedure as discussed in Chapter 2 for installing the program.

12.2 Before You Begin

- Event Monitor must be installed with Altos RAIDWatch Manager. Executing the program does not require running Altos RAIDWatch Manager program. However, RAID agents are necessary to be running as the communication bridges between controller and RAID servers.
- Event Monitor can be running locally or remotely via browser.
- When running remotely via browser, Java Applet will be started. Connection to an http server providing "*GREM.htm*" is necessary.
- Files listed below are necessary on an http server for accessing **Event Monitor** remotely over network:

File type	File name
HTML	grem.htm grm.htm
Jar	grem.jar grm.jar
Multi-language support	IFTBundle_0 IFTBundle_1 …
OEM definitions	em_oemname oemname oemlogo default.enc
Help files if online help is preferred	/help /em_help

- When Java Applet is started, a prompt will require IP address of a Primary Agent server. Connection to other Primary agents can be established through the program's menu commands.

12.2.1 Basic Running Requirements

This program shares Java class with Altos RAIDWatch Manager. Both software must be installed for running Event Monitor. It must be started manually (and re-run after a host computer reset).

- Please be sure that your system meets the system requirements listed in Chapter 2.
- The RAID disk arrays are properly installed.
- There is no need for configuration. Remote management is possible by connecting to an http server providing access to *"GREM.htm"* and other necessary files in its web page root directory.

- **Event Monitor** requires at least one disk array to be operating normally and Altos RAIDWatch Primary and Secondary agents installed on a main management server. Other requirements for running **Event Monitor** are identical to those required for Altos RAIDWatch Manager.

12.3 Starting Event Monitor

12.3.1 Starting Agents and NPC

Agents must be started before running the program. The **Event Monitor** is unable to display system events when agents are not running.

12.3.1.1 Under Windows (95,98, NT 4, or 2000/XP) Operating Systems:

The Primary and Secondary Agents start automatically under **Windows** Operating Systems whenever the host machine they have been installed on is powered up. However, the NPC (NPC.exe) must be started manually.

12.3.1.2 Under Unix Operating Systems (Solaris 7 SPARC or x86, HP UX 11, or Red Hat Linux 6.1):

Under **Unix systems** the Primary Agent and Secondary Agent and NPC (which are located on the host) must be started manually each time the host computer is reset. These components must be started in the following order:

- First the secondary agent must be started,
- Second, the primary agent must be started.
- Third, the NPC module must be started.

To start the Primary Agent, Secondary Agent(s), and NPC under a Unix system:

To Start the Primary Agent and Secondary Agent(s) under a Unix system:

1 At the host computer, change directories to:

/usr/hybrid/bin/ (or whatever directory you chose during the installation if not the default)

2 Then at the command line, type:

primary <Enter>: to start the Primary Agent

secondary <Enter>: to start the Secondary Agent

Agents are now running. The next step is to start the Event Monitor.

12.3.2 Running the Program:

The program can be started in two different ways:

1 executing browser accessible HTML file *(GREM.HTM)*;

or,

2 running locally as an executable Java program *(GREM.jar).* Any computer with a Java Virtual Machine can run this program.

12.3.2.1 Remote: as Java Applet

An applet is a program written in the Java programming language that can be included in an HTML file. Start your browser to view the GREM.HTM that should be available on the Primary Agent host. If your browser is a Java-enabled web browser, while viewing a page containing applet, the Java Virtual Machine will load and execute codes transferred from the remote server and behaves as running a local application.

Starting Event Monitor for Remote Management via Web Browser (any supported OS):

1 Connect to the Primary Agent host:

2 Start your web browser and enter the IP address of the Primary Agent host followed by GREM.HTM as your URL (e.g., 222.212.121.123\GRM.HTML). After a brief delay while the Java Applet starts, the Event Monitor language support and main connection window appear on the screen.

3 When the HTML page is open, you will be prompted to enter the IP address of your Primary Agent host.

4 Double click on a RAID host IP you would like to manage, then double click on the controller icon, then double click on the connection method (e.g., In-Band SCSI), to connect to the disk array system. For more information on how to connect, please refer to section 12.5, "Connecting and Disconnecting from a Disk Array", on page 164..

Starting Event Monitor for Remote Management via web browser (any supported OS) using the same http server

If you prefer running the program via browser and the connection is always made to the same http server providing *"GREM.HTM,"* you may find re-entering the same IP address very annoying. To avoid the IP address prompt, try editing the *"GREM.HTM"* file with an HTML editor. Change the variable in the following line:

<PARAM NAME = "PrimaryInServer" VALUE = "No" >

to

<PARAM NAME = "PrimaryInServer" VALUE = "Yes" >

If you use Netscape browser, you need to add an attribute, (PrimaryInServer="No") to the embedded tag. Append the attribute at the end of the following:

<EMBED type="application/x-java-applet;version=1.2.2"

java_CODE = "grem.EvtWatch.class"

java_ARCHIVE = "grem.jar, grm.jar"

WIDTH = 260

HEIGHT = 90

pluginspage="http://java.sun.com/products/plugin/1.2/plugin-install.html"

PrimaryInServer="Yes">

Chances are you might use different browsers at different time. Change the attributes for both Netscape and Explorer.

The precondition is that the http server must also be a primary agent host. Whenever the program is started and run as a Java Applet via a web browser, you are connected to the same http/Primary agent server.

Once the value is set to yes, you can not access other Primary agent hosts except the http/Primary agent server.

12.3.2.2 Local

Starting Event Monitor locally or via LAN under the Windows (95, 98, 2000, XP or NT4) Environment:

1 From the **Start** menu, select **Programs --> Acer Event Monitor**.

or,

Double-click the **Acer Event Monitor** icon either in the group folder or from the desktop if a shortcut was added during the installation process. The **Event Monitor** ***"Welcome"*** prompt window should appear on the screen. If there are multiple options for different languages, select the language display type.

2 Enter the IP address and TCP port assignment of the disk array system. If you are running **Event Monitor** at the Primary Agent host machine (i.e., "locally") and want to manage a RAID hosted by the Primary machine, click the **Default** button.

3 Double click on a RAID host IP you would like to manage, then double click on the controller icon, then double click on the connection method (e.g., In-Band SCSI), to connect to the disk array system.

Starting Event Monitor locally or via a LAN under a Unix workstation (Solaris 7 and 8 (SPARC, x86); Red Hat Linux 6.1) environment:

1 Open a terminal application or command line window.

2 Change directory to **/usr/hybrid/bin/** (or whatever directory you chose during the installation if not the default).

3 At the command prompt, type:

java -cp grem.jar:grm.jar grem.EvtWatch

The **Event Monitor** main connection and language support windows should appear on the screen.

4 Enter the IP address and TCP port assignment of the disk array system where the Primary Agent was installed. If you are running Event Monitor at the Primary Agent host machine (i.e., "locally") and want to manage a RAID hosted by the Primary machine, click the **Default** button.

5 Double click on a RAID host IP you would like to manage, then double click on the controller icon, then double click on the connection method (e.g., In-Band SCSI), to connect to the disk array system.

12.4 Exiting Event Monitor

Exiting from **Event Monitor** terminates the current management session with the disk array system.

12.4.1 Exiting from Event Monitor

- From the **Connect** menu, select **Exit**.

or,

- Click the **Close** button on the program window.

12.4.2 Exiting from Event Monitor Connected via Web Browser

- From the **Connect** menu, select **Exit**. *(Recommended method.)*

or,

- Exit the browser application.

or,

- Change the browser HTTP address to a URL or IP other than that of a Primary Agent.

12.5 Connecting and Disconnecting from a Disk Array

One benefit of **Event Monitor**r is that the program can be installed as a permanent window on array status. Before system monitoring can be performed on a particular disk array system, you need to first establish the connection between your management station and the Primary Agent host. Once the connection is established successfully, system events can be displayed.

All the arrays controlled by a Primary Agent server, as each is a controller communicating through a Secondary agent, appear on the **Connection View** window.

There is only one controller icon for disk arrays using redundant controller configuration. Controller configuration is synchronized between two controllers and these two controllers appear to the host as one controller.

Disconnection is used for breaking the link between the **Event Monitor** station and the array. Normally, all the arrays should be selected and all it takes to switch around multiple disk arrays is but a single mouse click? instead of restarting the **Event Monitor** every time you need to switch to another system.

The following discusses how to connect to a disk array.

12.5.1 Connecting to a RAID System while working from the Local Primary Agent Host

1 From the **Connect** menu, select **Open**. Repeat this process to select all the Primary Agent hosts.

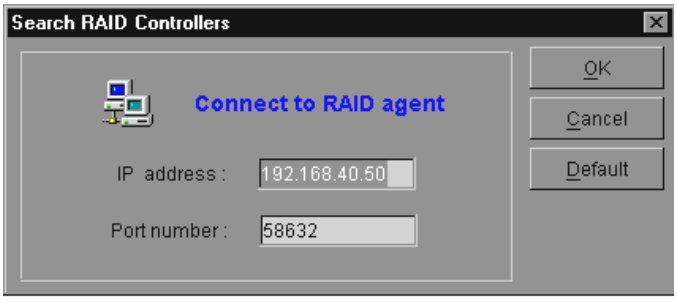


Figure 12–1 Connecting to the RAID Agent

Click the **Default** button. (Figure 12–1)

2 As shown in Figure 12–2, Select the IP address of the RAID you would like to monitor or manage from the **Connection View** list. Double click the IP address. Double click the controller icon. Double click the connection method (e.g., In-Band SCSI).

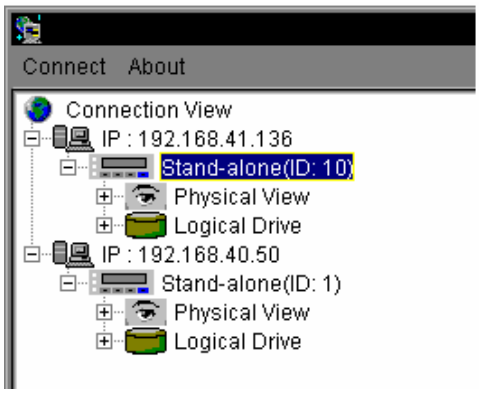


Figure 12–2 Select the IP Address

3 The connection is successful when the list of events shown in Figure 12–3, appears and the Physical view and logical unit subtrees appear in the Navigation Panel.

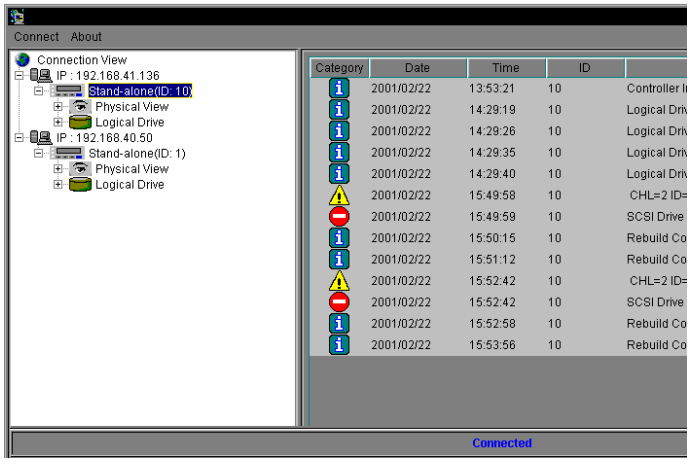


Figure 12–3 Event Monitor Window

12.5.2 Connecting to a RAID System from a Distant Host

1 From the **Connect** menu, select **Open**. Repeat this process to select all the Primary Agent hosts.

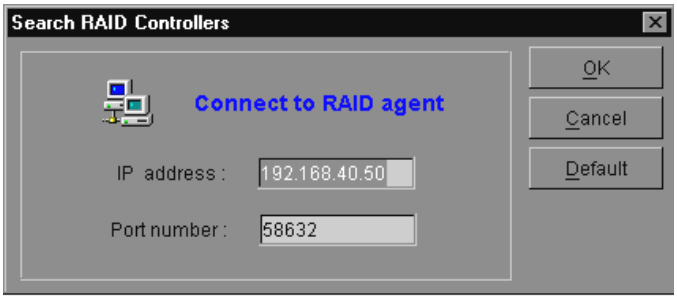


Figure 12–4 Connecting to a RAID Agent

2 As shown in Figure 12–5, Select the IP address of the RAID you would like to monitor from the **Connection View** list. Choose and double click on an IP address. Double click the controller icon for that IP address. Choose and double click the connection method (e.g., In-Band SCSI).

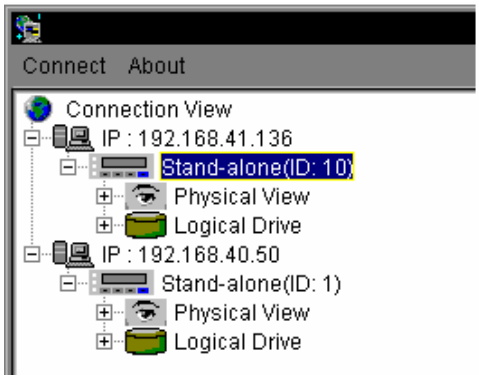


Figure 12–5 Select the IP

3 The connection is successful when the list of events shown in Figure 12–6 appears and the Physical view and Logical unit subtrees appear in the Navigation Panel.

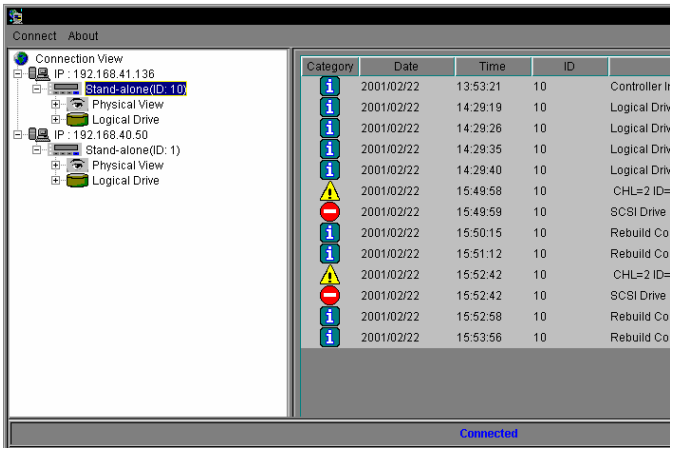


Figure 12–6 Event Monitor View

12.5.3 Disconnecting from a Disk Array System

- Select an IP address by single mouse click. From the ***Connect*** menu, select **Close**. This method will disconnect with the host computer represented by its IP address. If the host is a Primary Agent server, this will discontinue the connection to all the RAID systems managed by it.

The subtree representing the RAID system immediately disappears from the navigation panel once disconnected.

12.6 Using the Event Monitor

After starting **Event Monitor** and establishing the connection to RAID systems, the **Event** window appears on the screen. All the events recorded since the Primary agent is installed will be displayed within. The Primary agent will maintain an event log file saving up to 1024 records of event.

12.6.1 Display Controls

Just like Altos RAIDWatch Manager, **Event Monitor** works entirely with windows, buttons, and icons to facilitate the display of various disk array conditions. These windows follow the standard Windows and Unix OS "Look and Feel" specifications, thus steps for manipulating elements and windows within any Event Monitor window generally conform to standard procedures.

12.6.2 Basics

Figure 12–7 shows a general layout of the Event Monitor. When a RAID system is connected, the Navigation Panel in the upper left quadrant of the window will display icons for the controller, **Physical View**, and **Logical Unit View** of system components. The large Contents panel to the right will display a list of all the recorded events.

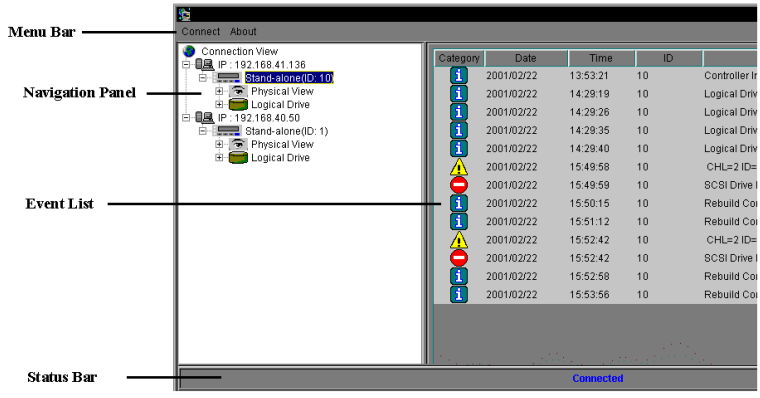


Figure 12–7 Event Monitor Layout

- The ***Connect View*** window includes a Navigation Panel.
  - **The Navigation Panel** provides a tree organization display of logical and physical elements managed by different controllers. Unlike Altos RAIDWatch, the panel can simultaneously display status of multiple controllers.
- The **Event List** displays all the event messages preserved in a Primary agent log file. Restarting Event Monitor or resetting controller will not affect the event list.
- The status bar displays the connection status.
- The functional menu bar includes **Connect** and **About**.

– The menu bar displays the available menus. All menus provide a list of commands for invoking various operations. The **Connect** menu, shown in Figure 12–8, allows you to **Open, Close**, switch to **Altos RAIDWatch Manager**, and **Exit** the program.

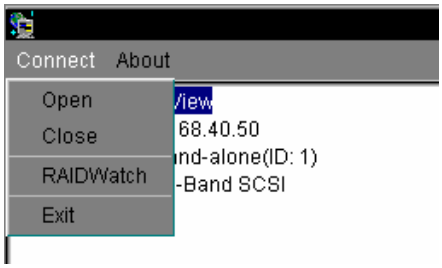


Figure 12–8 The Connect Menu

– The **About** menu displays software version and copyright information. It also provides access to Help files. Each of these commands will be discussed below.

- The **Open** command allows you to connect to a Primary Agent server.
- The **Close** command allows you to terminate the connection to a Primary Agent server. Before executing this command, select the Primary agent IP address you want to disconnect on the Navigation Panel. The selected item will be highlighted.
- The **Altos RAIDWatch** command allows you to start Altos RAIDWatch Manager and configure the selected RAID system.
- The **Exit** command is used to end the current Event Monitor session.

12.6.3 Using the Connection View

The **Connection View** window does not allow you to configure and manage your system. This window is intended to provide a real-time monitoring of system status. The **Connection View** displays logical and physical elements managed by controllers. It uses unique colors and icons to reveal various component statuses.

The navigation panel reports failures to the user by displaying a red **"X"** on the icon of whichever device has failed. As long as a RAID system is connected, events appear instantly on the **Event List** window.

The component status is simultaneously reflected on the associated icons in the navigation panel of the **Connection View** window. For instance, if a cooling fan failure is reported through an event message, a system administrator can locate the failed device on the navigation panel to get a clearer view of what is happening.

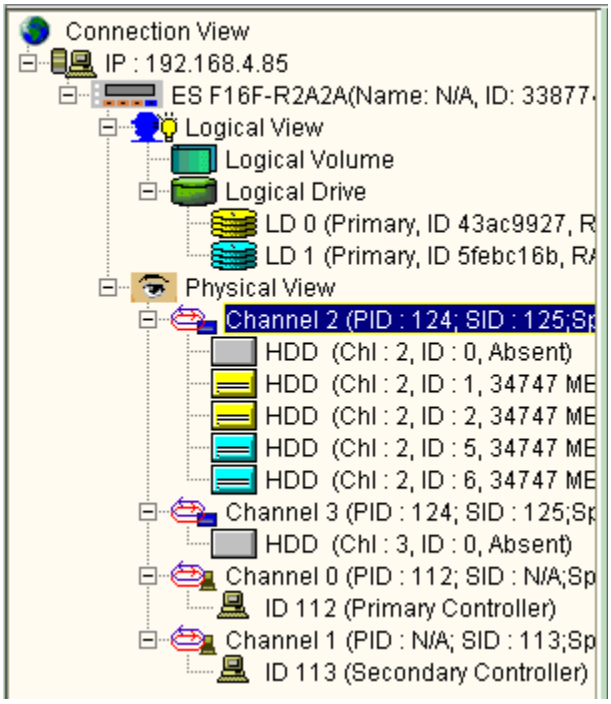
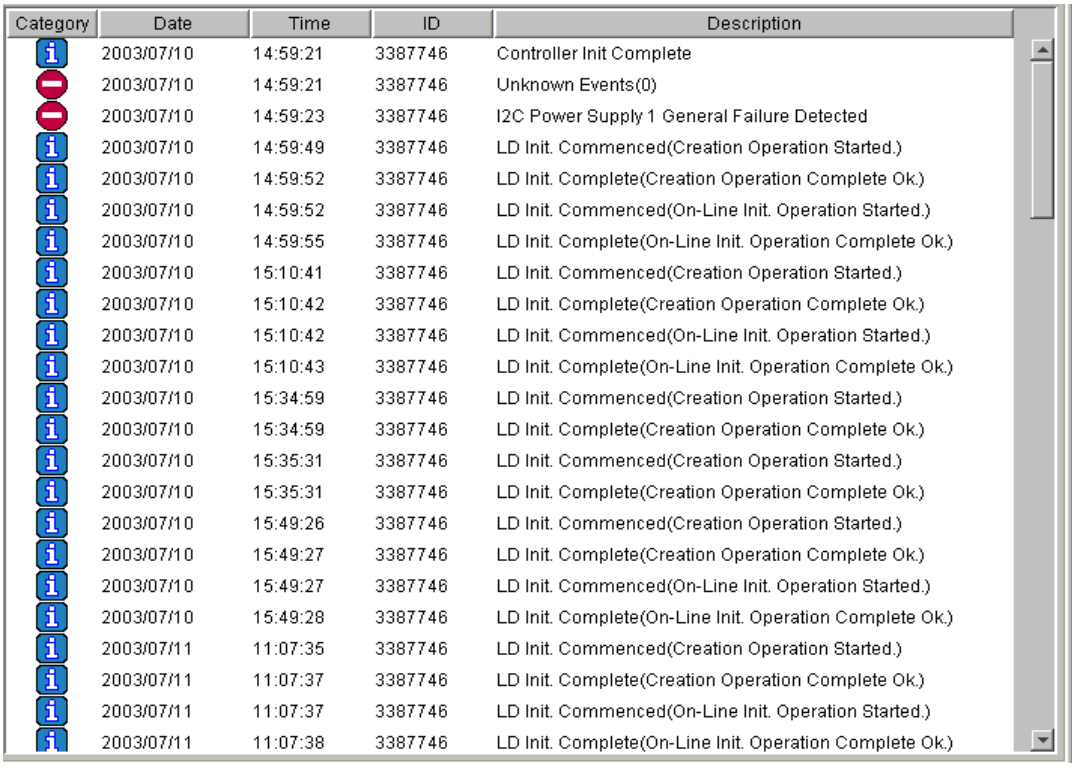


Figure 12–9 Connection View: Navigation Panel

12.6.4 Using the Event List

Event List, shown in Figure 12–10, displays all the event messages recorded ever since the installation of Primary agent.



Category	Date	Time	ID	Description
	2003/07/10	14:59:21	3387746	Controller Init Complete
	2003/07/10	14:59:21	3387746	Unknown Events(0)
	2003/07/10	14:59:23	3387746	I2C Power Supply 1 General Failure Detected
	2003/07/10	14:59:49	3387746	LD Init. Commenced(Creation Operation Started.)
	2003/07/10	14:59:52	3387746	LD Init. Complete(Creation Operation Complete Ok.)
	2003/07/10	14:59:52	3387746	LD Init. Commenced(On-Line Init. Operation Started.)
	2003/07/10	14:59:55	3387746	LD Init. Complete(On-Line Init. Operation Complete Ok.)
	2003/07/10	15:10:41	3387746	LD Init. Commenced(Creation Operation Started.)
	2003/07/10	15:10:42	3387746	LD Init. Complete(Creation Operation Complete Ok.)
	2003/07/10	15:10:42	3387746	LD Init. Commenced(On-Line Init. Operation Started.)
	2003/07/10	15:10:43	3387746	LD Init. Complete(On-Line Init. Operation Complete Ok.)
	2003/07/10	15:34:59	3387746	LD Init. Commenced(Creation Operation Started.)
	2003/07/10	15:34:59	3387746	LD Init. Complete(Creation Operation Complete Ok.)
	2003/07/10	15:35:31	3387746	LD Init. Commenced(Creation Operation Started.)
	2003/07/10	15:35:31	3387746	LD Init. Complete(Creation Operation Complete Ok.)
	2003/07/10	15:49:26	3387746	LD Init. Commenced(Creation Operation Started.)
	2003/07/10	15:49:27	3387746	LD Init. Complete(Creation Operation Complete Ok.)
	2003/07/10	15:49:27	3387746	LD Init. Commenced(On-Line Init. Operation Started.)
	2003/07/10	15:49:28	3387746	LD Init. Complete(On-Line Init. Operation Complete Ok.)
	2003/07/11	11:07:35	3387746	LD Init. Commenced(Creation Operation Started.)
	2003/07/11	11:07:37	3387746	LD Init. Complete(Creation Operation Complete Ok.)
	2003/07/11	11:07:37	3387746	LD Init. Commenced(On-Line Init. Operation Started.)
	2003/07/11	11:07:38	3387746	LD Init. Complete(On-Line Init. Operation Complete Ok.)

Figure 12–10 Event List

There are two sorting methods that can be used to arrange the data in a preferred order. The first is by selecting the relevant button at the top of the event list. If you wish to sort your events into their categories, or according to their dates, select the appropriate button and the event list will automatically be rearranged.

A second option for sorting the data is to use the pull-down menus shown in Figure 12–11 that can be found beneath the **Event List.**

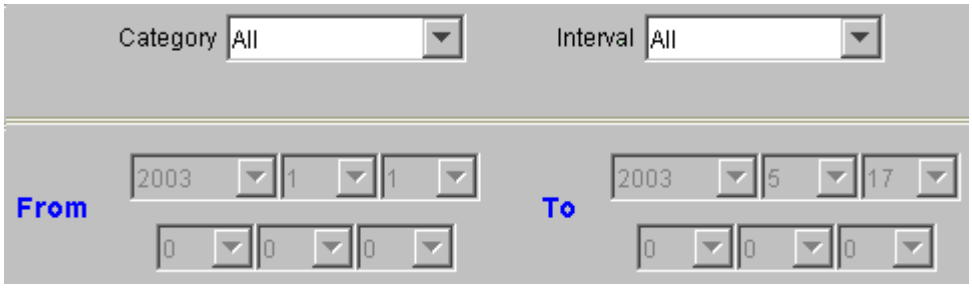


Figure 12–11 Event List Pull Down Sorting Menu

The ***Event List*** window has sub-functions for sorting and filtering event messages.

- Select from the **Category** drop-down list to display different event types. Selections include **All**, **Information**, **Warning**, or **Critical. Events** are listed in an ascending order.

- The Interval drop-down list allows you to confine event display by the date and time of occurrence. **Select All, From**, **Until**, or **Interval**. The time frame of event occurrence can be defined in the scroll lists **From** and **To** below.

- You may want to compare system events between two controllers. Press and hold down the **Ctlr** key and select both controllers by mouse clicks. Events of the two disk arrays will be listed in an ascending order.

12.6.5 Event Severity Levels

Like Altos RAIDWatch, **Event Monitor** classifies disk array events into three severity levels. The first level includes non-critical information events such as initialization of the controller. Level 2 severity includes events which require the issuance of a warning message such as drive bad block reassignment. Level 3 severity is the most serious level, including component failures that require immediate attention. Please refer to section 11.4 on page 147 for more details on event severity.

Appendix A
Command Summary

This appendix describes the commands available in Altos RAIDWatch Manager. These commands are presented either in menus or as command buttons on the toolbar.

A.1 Menu Commands

This section lists and explains the commands available from the menus in the menu bar. Keyboard strokes for commands that can also be executed from the keyboard are indicated by angle brackets. For example:

Connect **<C>**

means that you can connect to a disk array system by selecting **Connect** from the **File** menu or by pressing the ***"C"*** key on your keyboard.

Table A–1 Altos RAIDWatch File Menu Commands

Command	**Description**	
Connect <C>	Connects Altos RAIDWatch Manager to a particular disk array system for management. This command has the same function as the Connect command button on the toolbar.	
Disconnect <D>	Disconnects from the current disk array system, terminating the current management session with the device but not exiting Altos RAIDWatch Manager.	
Agent <A>	Activates the Connect to RAID Agent dialog box.	
Exit <X>	Closes the Altos RAIDWatch Manager application.	
Enclosure <E>	Displays the Enclosure window. This command has the same function as the Enclosure command button on the toolbar.	

Table A–1 Altos RAIDWatch File Menu Commands

Command	Description	
RAID View <R>	Displays the main RAID View window. This command has the same function as the RAID View command button on the toolbar.	
Event Log <L>	Displays the Event Log window. This command has the same function as the Event Log and Event Flag command buttons on the toolbar.	
Statistics <S>	Accesses the two statistics display commands (Cache Hits and Disk R/W). This command has the same function as the Statistics command button on the toolbar.	
	Cache Hits <C>	Displays the Cache Hits statistics window. This command has the same function as the Cache Hits button on the toolbar.
	Disk R/W <D>	Displays the Disk Read/Write statistics window. This command has the same function as the Disk R/W button on the toolbar.

Table A–2 Altos RAIDWatch View Menu Commands

Command	Description
Tile In-Window <W>	This command arranges currently open windows so that they are all visible and occupy an equal part of the Altos RAIDWatch application window. It has the same function as the Tile In-Window command button on the toolbar.
Tile In-Sequence <S>	(This command is disabled in the current version of the software.)

Table A–3 Altos RAIDWatch Help Menu Commands

Command	Description
Contents <C>	Displays Altos RAIDWatch Manager on-line help.
About <A>	Displays information about the Altos RAIDWatch Manager program.

A.2 Before You Begin

Before Altos RAIDWatch's event notification can be used, some adjustments may need to be made to your operating system's configuration. See section 2.3, "Platform Requirements", on page 9 for information about pre-installation configuration needs. Many of the steps described in section 2.3 directly relate to event notification, particularly for Windows operating systems.

Table A–4 Event Monitor Connect Menu Commands

Command	Description
Open <O>	Connects Event Monitor to a particular disk array system.
Close <C>	Disconnects Event Monitor from a particular disk array system.
Altos RAIDWatch <R>	When a disk array IP address is selected, this command opens the Altos RAIDWatch Manager application.
Exit <E>	Closes the Event Monitor application.

Event Monitor About Menu Commands

Table A–5

Command	Description
Help <H>	Displays on-line help.
About <A>	Displays information about the Event Monitor program.

A.3 Command Buttons

This section describes the various command buttons provided to facilitate execution of commonly used commands. These buttons are on the toolbar.

Table A–6 Command Buttons

Command Button	Description
Connect	Connects Altos RAIDWatch Manager to a particular disk array system for management. This command has the same function as the Connect command in the File menu.
Disconnect	Disconnects from the current disk array system, terminating the current management session with the device but not exiting Altos RAIDWatch Manager. This command has the same function as the Disconnect command in the File menu.
Enclosure	Displays the Enclosure window. This button has the same function as the Enclosure command in the Open menu.
RAID View	Displays the main RAID View window. This button has the same function as the RAID View command in the Open menu.
Event Log	Displays the Event Log window. This button has the same function as the Event Log command found in the Open menu.

Table A–6 Command Buttons

Command Button	Description
Statistics	Displays the Statistics window options. Select either Cache Hits or Disk R/W. Has the same function as the Statistics command in the Open menu.
Tile	This command arranges currently open windows so that they are all visible and occupy an equal part of the Altos RAIDWatch application window. It has the same function as the Tile In-Window command in the View menu.

Appendix B
Troubleshooting

This appendix provides troubleshooting tips for common problems you may encounter while using Altos RAIDWatch Manager. It includes the following topics:

B.1 Common Oversights

Check the following first before you run Altos RAIDWatch or if you are having trouble.

1 Check Platform Requirements

Review section 2.3, "Platform Requirements", on page 9 to make sure that all OS-specific installation configuration steps have been completed.

2 Check Altos RAIDWatch Connections

In-Band SCSI (Solaris only): All Solaris operating systems must have an in-band SCSI driver installed.

Agents: All RAID host servers must have a Secondary Agent installed and running. Check that all RAID hosts have a Secondary Agent.

Windows NT Systems: Open the **Control Panel,** then open the **Service** icon in the Control Panel and check the status of **Primary Agent** and **Secondary Agent** to see if the status reads **"Start."**

Unix Systems (including Linux): Make sure the in-band SCSI driver is installed (Solaris only). (You can run Text RAID Manager to determine this).

3 Check the Primary and Secondary agents

#ps -eaf|grep primary

#ps -eaf |grep secondary

If either program is not running, please open a terminal session and run it manually.

IP Settings: Each RAID host server must have a unique IP address assigned. Check the IP address of each RAID host. Also, each Secondary agent IP and TCP port setting must be listed under the Primary agent's configuration. To check this, run the Altos RAIDWatch install program at the Primary Agent host and choose **Configuration Only**.

TCP Port Settings: The Primary agent must have a TCP port setting different from the Secondary agents. The Secondary agents should have a common TCP port setting, and that setting should be listed with each Secondary agent's IP under the Primary agent configuration.

4 NPC Troubleshooting

Windows NT servers only

- **Fax**: If NPC has trouble sending fax messages, please check to be sure that Microsoft Personal Fax is installed.
- **Broadcast**: If NPC does not broadcast normally, please check to be sure that Windows Messaging is installed on BOTH server and client(s).

RedHat

- **rwalld**: Under some circumstances, software component necessary for running NPC under RedHat - *"rpc.rwalld"* - may be absent from system.

If the package *"rpc.rwalld"* is not installed, users can find the associated rpms, *"rwall-server-<version>-.i386.rpm"* and *"rwall-<version>.i386.rpm"* under the directory *"RedHat/RPMS"* on the RedHat installation CD.

To install the rpm packages, use the command:

rpm -i <your rpm package>+.

B.2 Error Codes

Under some circumstances, you may see the following error codes. (Some additional error codes are not listed because they indicate failures which are not user resolvable.)

Code: RC=1

- **Meaning**: The Primary agent did not respond to a Altos RAIDWatch Manager command before timeout.

What You Can Do: Check your network environment to determine whether or not the Primary agent is available. Use a "ping" utility to see if the server exists on the network.

Code: RC=2

- **Meaning**: The Primary agent did not understand the last Altos RAIDWatch Manager command.

  What You Can Do: Please check the firmware version of controller to see if it is compatible with your version of Altos RAIDWatch. Altos RAIDWatch currently only works with firmware versions 2.23 or 3.11 and higher. You should also contact your technical support engineer.

Code: RC=3

- **Meaning**: Exception error detected

  What You Can Do: Check that the versions of Altos RAIDWatch Manager, Primary agent, and Secondary agent are compatible. You should also contact your technical support engineer.

Code: RC=7

- **Meaning**: Altos RAIDWatch didn't find the RAID controller.

  What You Can Do: Check if the Secondary and Primary are running on their respective servers; also check if the RAID controller that Altos RAIDWatch wants to control has failed. (The Secondary agent on the host might be functioning, but the RAID controller it relates to has failed.)

Code: RC=9

- **Meaning: The Primary or Secondary agent is not running, or one or more servers is down.**

  What You Can Do: Restart the suspect servers and all related Altos RAIDWatch agents.

B.3 Error Messages

You may encounter some of the following Altos RAIDWatch Manager error messages. This section provides some guidance for those messages that may be unclear. Note that this is not an exhaustive list of Altos RAIDWatch Manager error messages.

B.3.1 Under Channel Settings

- **Message**: Undefined Channel Mode

  Explanation: Channels must be defined as either a drive or host channel.

- **Message**: Drive channel should have at least one PID!

Explanation: Please assign one PID to each drive channel.

- **Message**: Channel settings failed!

  Explanation: Please check the channel settings.

- **Message**: Drive channel can only have one ID! Please remove ID from PID list first, and then add.

  Explanation: Please remove the current ID from the PID list first, then add the new one.

B.3.2 Under Logical Drive Creation

- **Message**: Maximum RAID 3 or RAID 5 drive count is 31!

  Explanation: You cannot create a RAID3 or RAID5 logical drive with more than 31 SCSI drives. Reduce the number of drives you are using.

B.3.3 Under Logical Drive Settings

- **Message**: Delete Logical Drive failed!

  What can be done: The logical drive maybe a member of a LV, so it can not be deleted.

- **Message**: Rebuild failed!

  What can be done: Use another new drive and try to perform the rebuild again.

- **Message**: Expand logical drive failed!

  What can be done: Replace the hard drive and rebuild the logical drive.

- **Message**: Add drives failed!

  Adding drive is a re-initialization process. A failure during the process will be fatal.

  What can be done: Delete the logical drive then recreate the logical drive.

- **Message**: Change LD assignment failed!

  What can be done: Check if drive channel is assigned both PID and SID that own the member SCSI drive of this LD.

B.3.4 Under RAIDView

- **Message**: Currently, controller supports 8 LDs.

  Explanation: Currently, the controller can only support 8 logical drives.

- **Message**: Setup redundant controller failed!

  Explanation: Check the redundant controller configuration. See if the PID and SID of drive and host channels are all correct and if the logical drives (volumes) are correctly assigned.

All other Altos RAIDWatch Manager error messages should be fairly self-explanatory.

Appendix C
RAID Levels

This appendix provides a functional description of **Redundant Array of Independent Disks (RAID)**. This includes information about RAID and available RAID levels.

C.1 RAID Description

Redundant Array of Independent Disks (RAID) is a storage technology used to improve the processing capability of storage systems. This technology is designed to provide reliability in disk array systems and to take advantage of the performance gains multiple disks can offer.

RAID comes with a redundancy feature that ensures fault-tolerant, uninterrupted disk storage operations. In the event of a disk failure, disk access will still continue normally with the failure transparent to the host system.

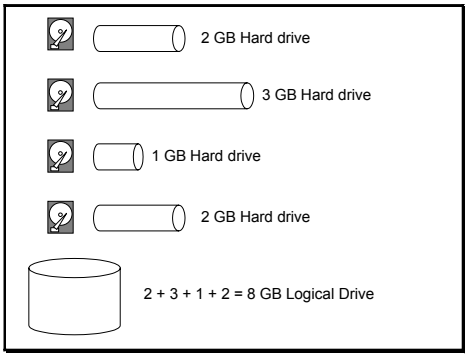
RAID has six levels: RAID 0 ~ 5. RAID levels 1, 3 and 5 are the most commonly used levels, while RAID levels 2 and 4 are rarely implemented. The following sections describe in detail each of the commonly used RAID levels.

C.2 Non-RAID Storage

One common option for expanding disk storage capacity is simply to install multiple disk drives into the system and then combine them end to end. This method is called disk spanning.

In disk spanning, the total disk capacity is equivalent to the sum of the capacities of all SCSI drives in the combination. This combination appears to the system as a single logical drive. Thus, combining four 1GB SCSI drives in this way, for example, would create a single logical drive with a total disk capacity of 4GB.

Disk spanning is considered non-RAID due to the fact that it provides neither redundancy nor improved performance. Disk spanning is inexpensive, flexible, and easy to implement; however, it does not improve the performance of the drives and any single disk failure will result in total data loss.

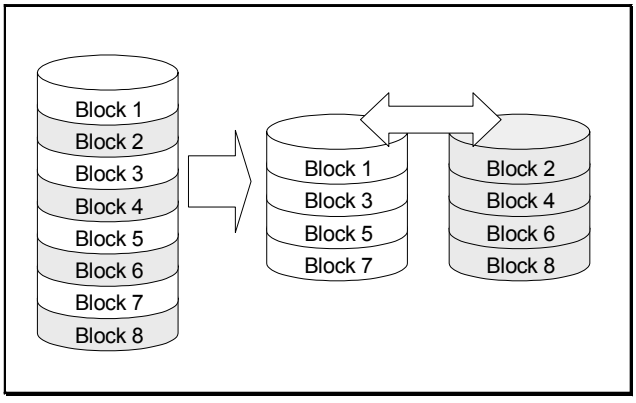


C.3 RAID 0

RAID 0 implements block striping where data is broken into logical blocks and striped across several drives. Although called RAID 0, this is not a true implementation of RAID because there is no facility for redundancy. In the event of a disk failure, data is lost.

In block striping, the total disk capacity is equivalent to the sum of the capacities of all SCSI drives in the array. This combination of drives appears to the system as a single logical drive.

RAID 0 provides the highest performance without redundancy. It is fast because data can be simultaneously transferred to/from multiple disks. Furthermore, read/writes to different drives can be processed concurrently.

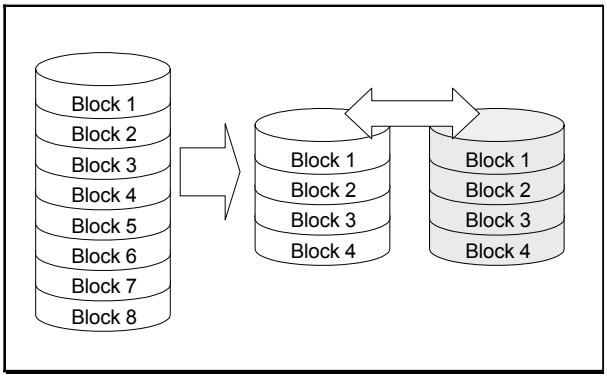


C.4 RAID 1

RAID 1 implements disk mirroring where a copy of the same data is recorded onto two sets of striped drives. By keeping two copies of data on separate disks or arrays, data is protected against a disk failure. If, at any time, a disk on either side fails, the good disks can provide all of the data needed, thus preventing downtime.

In disk mirroring, the total disk capacity is equivalent to half the sum of the capacities of all SCSI drives in the combination. Thus, combining four 250GB SATA drives, for example, would create a single logical drive with a total disk capacity of 1TB. This combination of drives appears to the system as a single logical drive.

RAID 1 is simple and easy to implement; however, it is more expensive as it doubles the investment required for a non-redundant disk array implementation.

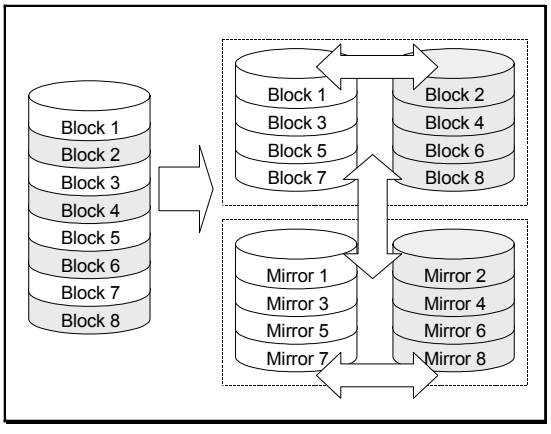


In addition to the data protection RAID 1 provides, this RAID level also improves performance. In cases where multiple concurrent I/Os are occurring, these I/Os can be distributed between two disk copies, thus reducing total effective data access time.

C.5 RAID 1(0+1)

RAID 1(0+1) combines RAID 0 and RAID 1 – Mirroring and Disk Striping. RAID (0+1) allows multiple drive failure because of the full redundancy of the hard disk drives. If more than two hard disk drives are chosen for RAID 1, RAID (0+1) will be performed automatically.

Important **RAID (0+1) will not appear in the list of RAID levels supported by the controller. If you wish to perform RAID 1, the controller will determine whether to perform RAID 1 or RAID (0+1). This will depend on the drive number that has been selected for the logical drive.**



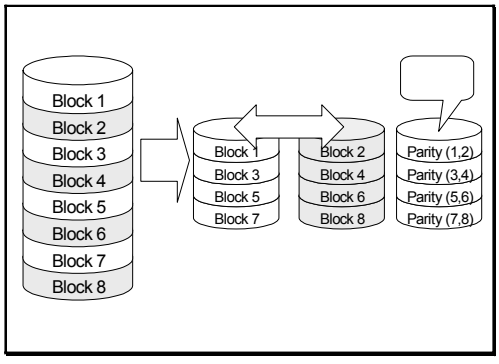
C.6 RAID 3

RAID 3 implements block striping with dedicated parity. This RAID level breaks data into logical blocks, the size of a SCSI disk block, and then stripes these blocks across several drives. One drive is dedicated to parity. In the event a disk fails, the original data can be reconstructed from the parity information.

In RAID 3, the total disk capacity is equivalent to the sum of the capacities of all SCSI drives in the combination, excluding the parity drive. Thus, combining four 250GB SATA drives, for example, would create a single logical drive with a total disk capacity of 750GB. This combination appears to the system as a single logical drive.

RAID 3 provides increased data transfer rates when data is being accessed in large chunks or sequentially.

However, in write operations that do not span multiple drives, performance is reduced since the information stored in the parity drive needs to be re-calculated and re-written every time new data is written to any of the data disks.

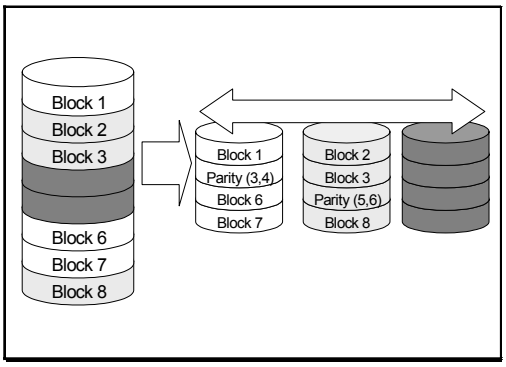


C.7 RAID 5

RAID 5 implements multiple-block striping with distributed parity. This RAID level offers the same redundancy available in RAID 3; though the parity information this time is distributed across all disks in the array. Data and relative parity are never stored on the same disk. In the event a disk fails, original data can be reconstructed using the available parity information.

For small I/Os, as few as one disk may be activated for improved access speed.

RAID 5 offers both increased data transfer rates when data is being accessed in large chunks or sequentially and reduced total effective data access time for multiple concurrent I/Os that do not span multiple drives.


Block 1
Block 2
Block 3
Block 6
Block 7
Block 8
Block 1
Parity (3,4)
Block 6
Block 7
Block 2
Block 3
Parity (5,6)
Block 8

Glossary

Fibre (Also known as "fibre channel.") . A device (in the case of RAID, a data storage device) protocol capable of high data transfer rates. Fibre channel simplifies data bus sharing and supports not only greater speed, but also more devices on the same bus. Fibre channel can be used over both copper wire and optical cable.

Fiber . An optical network data transmission cable type which is unrelated to fibre channel (above).

HBA Host-Bus Adapter . an HBA is a device that permits a PC bus to pass data to and receive data from a storage bus (such as SCSI or fibre channel).

Host . A computer, typically a server, which uses a RAID system (internal or external) for data storage.

Host LUN (See Host and LUN). "Host LUN" is another term for a LUN.

In-Band SCSI (sometimes "in-band" or "In-band") . A means whereby RAID management software can use SCSI protocols to manage a controller. (Note: in-band SCSI is typically used in place of RS-232 for controller management.)

JBOD . Just a Bunch of Drives – non-RAID use of multiple hard disks for data storage.

JRE Java Runtime Environment – . the Solaris Java program used to run.JAR applications locally or over a network or the internet.

Logical Drive . Typically, a group of hard disks logically combined to form a single large storage unit. More broadly, the assignment of a SCSI or Fibre channel ID to a drive or drives for use in storage management. Often abbreviated, "LD."

Logical Volume . A group of logical drives logically combined to form a single large storage unit. Often abbreviated, "LV."

LUN (Logical Unit Number) . A 3-bit identifier used on a SCSI bus to distinguish between up to eight devices (logical units) with the same SCSI ID.

Mapping . The assignment of a protocol or logical ID to a device for purposes of data storage, data transfer, or device management.

Mirroring . A form of RAID where two or more identical copies of data are kept on separate disks. Used in RAID 1.

NAS Network Attached Storage . a RAID enclosure that includes a network interface so that the disk array can be directly connected to a LAN.

NPC. Notification Processing Center. a software application included with Altos RAIDWatch which permits event notification via various methods including e-mail and fax.

NRAID . Non RAID

Parity . Parity checking is used to detect errors in binary-coded data. The fact that all numbers have parity is commonly used in data communications to ensure the validity of data. This is called parity checking.

Primary Agent . The Altos RAIDWatch module which manages secondary agents and supports both NPC and Altos RAIDWatch Manager.

RAID Redundant Arrays of Independent Disks (Originally "Redundant Arrays of Inexpensive Disks"). The use of two or more disk drives instead of one disk, which provides better disk performance, error recovery, and fault tolerance, and includes interleaved storage techniques and mirroring of important data. See Appendix D.

Altos RAIDWatch Manager . The GUI RAID interface part of Altos RAIDWatch.

SAN (Storage Area Network) . is a high-speed subnetwork of shared storage devices. A storage device is a machine that contains nothing but a disk or disks for storing data. A SAN's architecture works in a way that makes all storage devices available to all servers on a LAN or WAN. Because stored data does not reside directly on the network's servers, server power is utilized for applications rather than for data passing.

Secondary Agent . The Altos RAIDWatch module which manages and monitors a RAID controller and receives Altos RAIDWatch Manager commands via the primary agent.

S.E.S. SCSI Enclosure Services is a protocol that is used to manage and sense the state of the power supplies, cooling devices, temperature sensors, individual drives, and other non-SCSI elements installed in a fibre channel JBOD enclosure.

S.M.A.R.T.(Self-Monitoring, Analysis and Reporting Technology). an open standard for developing disk drives and software systems that automatically monitor a disk drive's health and report potential problems. Ideally, this should allow users to take proactive actions to prevent impending disk crashes.

Spare (Local / Global) . A drive designation used in RAID systems for drives that are not used but are instead "hot-ready" and used to automatically replace a failed drive. RAIDs generally support two types of spare, Local and Global. Local spares only replace drives that fail in the same logical drive. Global spares replace any drive in the RAID that fails.

Stripe . A contiguous region of disk space. Stripes may be as small as one sector or may be composed of many contiguous sectors.

Striping Also called RAID-0. A method of distributing data evenly across all drives in an array by concatenating interleaved stripes from each drive.

Stripe Size (A.k.a., "chunk size.") . The smallest block of data read from or written to a physical drive. Modern hardware implementations let users to tune this block to the typical access patterns of the most common system applications.

Stripe Width . The number of physical drives used for a stripe. As a rule, the wider the stripe, the better the performance.

Write-back Cache . Many modern disk controllers have several megabytes of cache on board. Inboard cache gives the controller greater freedom in scheduling reads and writes to disks attached to the controller. In write-back mode, the controller reports a write operation as complete as soon as the data is in the cache. This sequence improves write performance at the expense of reliability. Power failures or system crashes can result in lost data in the cache, possibly corrupting the file system.

Write-through Cache . The opposite of write-back. When running in a write-through mode, the controller will not report a write as complete until it is written to the disk drives. This sequence reduces read/write performance by forcing the controller to suspend an operation while it satisfies the write request.

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