RAIDWatch

Java GUI Manager for Infortrend Disk Array Controllers

User's Manual

Revision 1.2

Software Revision: 1.31

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User's Guide Overview

Congratulations on your decision to use Infortrend's RAIDWatch disk array management program. This management program 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.

This guide discusses how to install and use RAIDWatch to manage disk array systems incorporating Infortrend's SCSI-to-SCSI, Fibre-to-SCSI, or Fibre-to-Fibre controllers.

An independent monitoring program, Event Monitor, is bundled with newer release of this manager (ver. 1.31 and above). The configuration and use of the program is discussed in Chapter 6.

In addition to RAIDWatch, you can also use the on-board RS-232 menu interface (non-PCI controllers only) or the text-based RAID Managers available for various operating systems to manage disk array systems incorporating Infortrend's disk array controllers. For information about these programs, see the documentation that comes with your hardware.

Chapter Summary

- Chapter 1, *Introduction*. Provides information about RAIDWatch, including a product description, a features summary and highlights, and section on basic concepts.
- Chapter 2, *Installation*. Discusses how to install RAIDWatch in your systems. Discussions include the system requirements, setting up hardware, software installation, and how to update your software by downloading updates from Infortrend's FTP site.
- Chapter 3, *Basic Operations*. Discusses basic operations at system startup. These include starting 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 4, *Array Management.* 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 5, *Notification Configuration.* Describes how to configure the RAIDWatch notification

function for pagers, faxes, e-mail, and broadcast. Information about the supported notification levels are also provided to aid in the explanation of these functions.

- Chapter 6, Event Monitor. Describes how to use this monitoring utility as a all-time window onto system status.
- Appendix A, *Command Summary*. Summarizes the available commands and command buttons in RAIDWatch.
- Appendix B, *Troubleshooting.* Provides troubleshooting tips for some problems you may encounter while using RAIDWatch.
- Appendix C, *Glossary.* Provides information and definitions of key technology terms used in this guide.
- Appendix D, *RAID Levels*. Provides information about the various RAID levels.

Usage Conventions

Throughout this document, the following terminology usage rules apply:

- **"Controller"** always refers to Infotrend RAID array controllers;
- **"RAIDWatch"** refers to the entire program and all of its modules.

- **"RAIDWatch Manager"** refers only to the management interface, not to any of the other parts of the software.

- **"Primary Agent"** is 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"** is the part of the software which allows the local RAID controller to talk to the Primary Agent (and thus to RAIDWatch Manager). A Secondary Agent communicates with the RAID controller via SCSI bus or Fibre channel (using Infortrend "In-band" technology), or even via an RS-232 serial port. Secondary Agents are the intermediaries between the Primary Agent and the RAID controllers.

- **"NPC"** and "**Notification Processing Center"** refer to the software subsystem that allows RAIDWatch to notify system managers of events at any of the RAID systems being managed.

- **"Event Monitor"** is a software utility that runs separately from RAIDWatch Manager. It requires agents to communicate between controller and management station. It also shares with RAIDWatch Manager a part of Java class. Therefore, RAIDWatch Manager should be installed even if the user prefers Event Monitor. Hardware and software requirments for installing the program is the same as those for RAIDWatch.

1 Introduction

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

- Product description
- Feature summary
- Feature highlights
- Conceptual foundation

1.1 Product Description

Infortrend's GUI RAID Manager, "RAIDWatch," is a Java-based program specifically designed for use in managing disk array systems implemented using any of Infortrend's line of standalone RAID controllers (GUI stands for "**g**raphic **u**ser **i**nterface.") 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. 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.

RAIDWatch complements the on-board console interface found on Infortrend's non-PCI RAID controllers and a line of host-based, text-based RAID Managers providing the same functionality, but with greater ease of use. The following sections describe the outstanding features of RAIDWatch and introduce its conceptual framework.

1.2 Feature Summary

The list below summarizes RAIDWatch 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 Infortrend's entire line of Fibre-to-Fibre, Fibre-to-SCSI, and SCSI-to-SCSI RAID controllers
- 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 RAIDWatch and constant monitoring of multiple systems by Event Monitor
- Supports remote management over the network of an agent running Windows NT, 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 customizable 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 RAIDWatch modules to avoid single-point-of-failure
- RAID controller realtime 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 NT or Windows 95; 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.

1.3 Feature Highlights

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

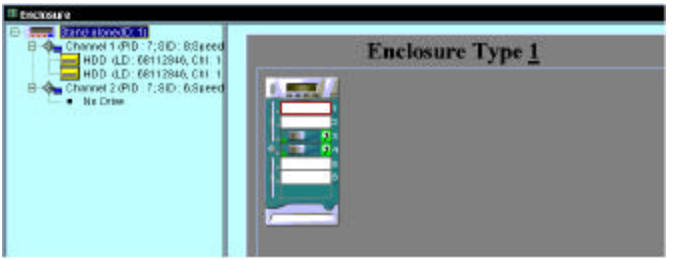
1.3.1 Graphical User Interface

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.

1.3.2 Enclosure Management



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.

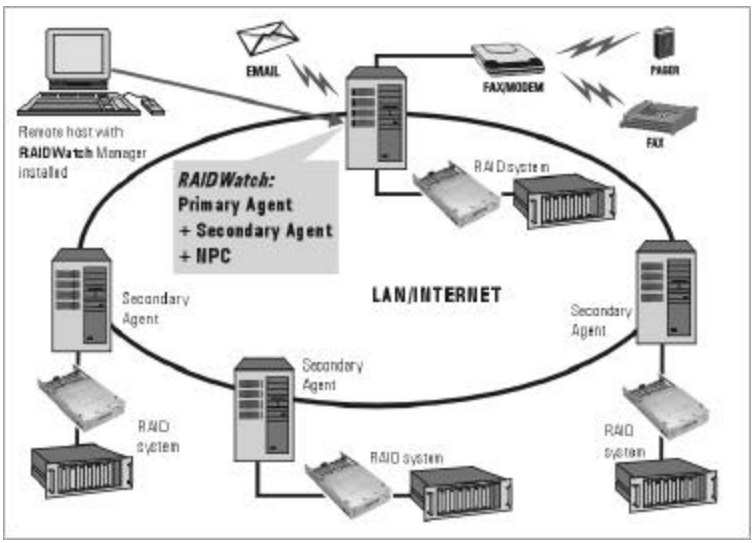
1.3.3 Powerful Event Notification Function

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.

1.3.4 Java-based Remote Management

RAIDWatch supports remote management of Infortrend's 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 RAIDWatch Manager station and RAIDWatch agents on the host server(s). The following figure shows a typical connection:



1.3.5 Password Protection

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 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.

1.4 Conceptual Foundation

In order for 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 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, 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 RAIDWatch Manager or Event Monitor site. Subsequent installations at other RAID servers will only need the Secondary agent installed.

The table below provides a guide to what modules need to be installed where (items in the bottom five rows of the table are not included with RAIDWatch and must be installed or modified by system users):

For more information about specific platform requirements, see *Section 2.3 Platform Requirements.*

Table 1-1 : RAIDWatch Module Requirements

Install Elements	Main RAID Server*	Web Server*	Secondary Server	RAIDWatch Station
Primary Agent	✓	✓		
Secondary Agent	✓		✓	
RAIDWatch Manager				✓
NPC	✓	✓		
JRE				✓
OS drivers[1]	✓			
OS patches[2]	✓			
Web browser				✓
Edit browser preferences[3]				✓
Web server		✓		

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

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

2 Installation

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

- System requirements
- Platform-specific requirements
- RAID network charting
- Software setup
- In-band SCSI

2.1 System Requirements

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

Server Running RAIDWatch

- Pentium or above compatible (or equivalent PC) running Windows NT 4/Windows 2000; 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 (if remote event notification over the telephone line is desired)
- Hayes-compatible modem (if pager/telephone 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 NT (if SNMP remote management is desired)
- Windows Messaging (MAPI) for Windows NT (if support for pager or fax notification is needed)
- Windows NetBEUI support for Windows NT (if network broadcast support notification is needed)

Local client running RAIDWatch Manager

- Pentium or above compatible (or equivalent PC) running Windows NT 4/Windows 2000; Solaris 7 & 8 (SPARC, x86); AIX 4.3; or Red Hat Linux 6.1 (kernel v2.2.xx); Red Hat 7, SUSE 7, WIN95/98, 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 (if support for pager or fax notification is needed)
- Windows NetBEUI support for Windows NT/95/98/2000 (if network broadcast support notification is needed)

2.2 RAID Chart

Before installing 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

ID/Name	Where ?	OS?	IP Address ?	Role	Internet Capable ?
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

RAIDWatch supports various operating systems both for servers (RAID management hosts or web servers) and for client management stations (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.

LIMITATION:

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) and Netscape 4.5 (or above) under Solaris (x86, SPARC).

The RAIDWatch Manager program, GRM.JAR, ONLY supports Netscape 4.5 (or above) under Windows NT Server 4.0

(Windows 95/98/Me/2000), or Netscape 4.5 (or above) under Solaris (x86, SPARC).

2.3.1 Solaris Platforms

RAIDWatch supports both Solaris 7 and 8 x86 and SPARC servers and workstations. Prior to running the installation procedure for 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 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 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.

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 RAIDWatch installation package to be accessed from /usr/home/httpd/html.

A. Mount the 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 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

RAIDWatch supports Windows NT 4.0 for servers and Windows 95/98/Me/NT/2000 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)

(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 (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 (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 RAIDWatch in your system. Before proceeding with the setup procedure, read through the *Before You Start* section 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 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 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 RAIDWatch

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

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

2. If installing on a Unix system, mount the 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.

If you are installing remotely, skip step 4.

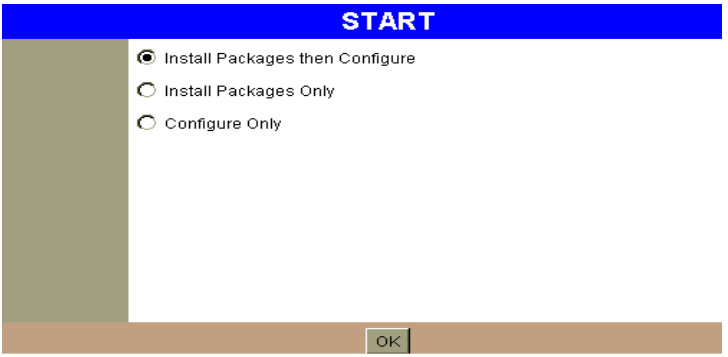
4. For local installs, run the install script file related to the OS you are using to start the installation process. (Each OS has its own subdirectory.) This method will open a command line window and ask first if you want to install Java Runtime Environment (JRE). Enter "N" for no unless you are also installing RAIDWatch Manager (see *2.4.3 Installing RAIDWatch Manager)*. The installation script will then ask if you want to install RAIDWatch. Type "Y" for a first install, reinstall, or reconfigure of the program.

If you have just completed step 4, skip step 5.

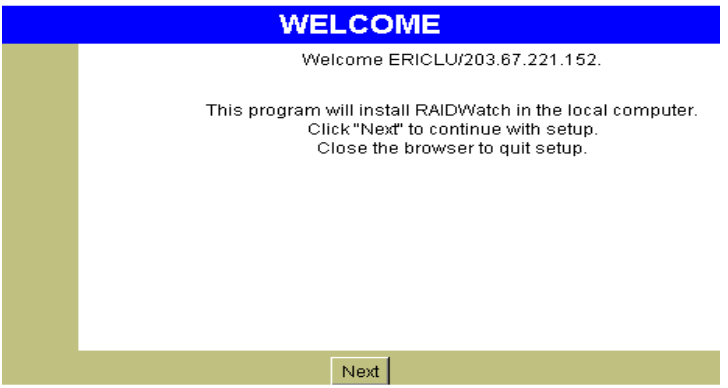
5. For remote installation, open …\common\install.htm through a web browser. (For example, use your web browser to open "/mnt/common/install.htm" from a Unix system or the directory "d:\common\install.htm" under Windows NT.) The installation procedure will auto-select the software modules that match your OS.

(The browser installation start explained in step 5 can also be used locally if you prefer.)

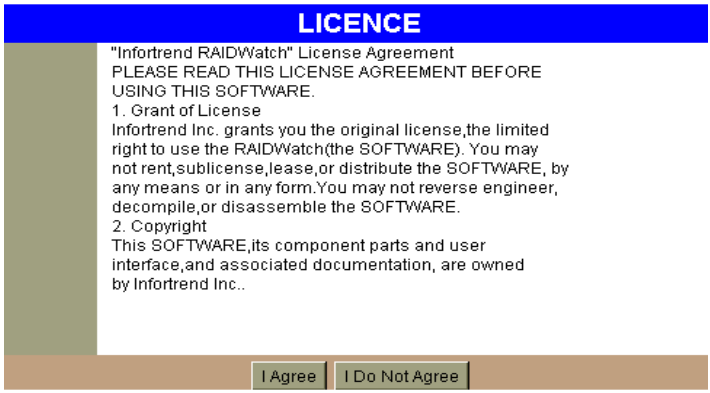
6. For both local and browser starts, accessing the install file should open the first stage of the installation process. There are three options here for installing or configuring your package. Please select ***Install Packages then Configure***, and click the **OK** button to continue.



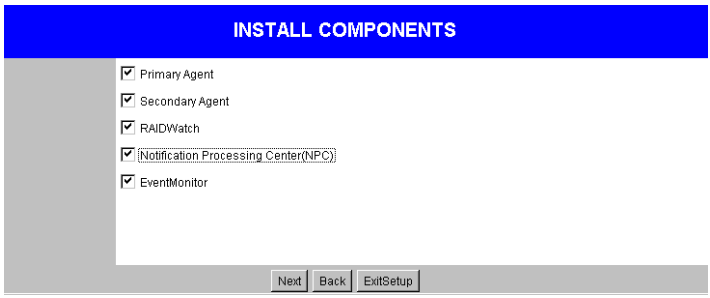
7. Click the **Next** button on the ***Welcome*** screen to continue.



8. Read the contents of the ***License*** and click the ***I Agree*** button to continue.

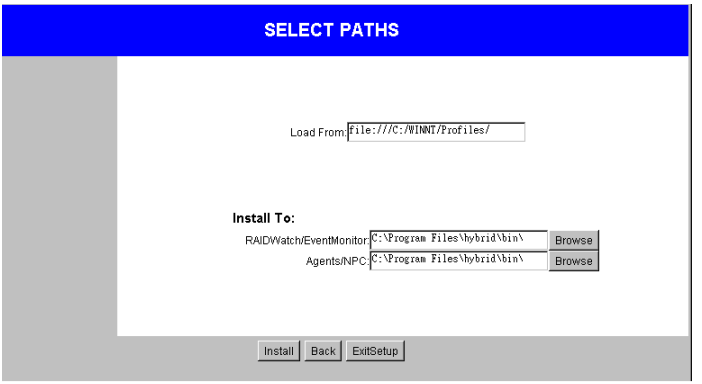


9. If you are installing to a primary host, please select **Primary Agent, NPC (Notification Processing Center)**, **Event Monitor**, and, if the primary host server is also connected to a RAID, please select **Secondary Agent.** Then click on the **Next** button to continue. Please note that although **Event Monitor** can run without starting RAIDWatch Manager, yet it can not be installed without RAIDWatch Manager.



10. Click on the **Install** button under the ***SELECT PATHS Window*** to start installing the selected components to your system. The installer program will automatically create a new directory for these components. The default is "/usr/hybrid/bin." For Windows NT, the directory will be "c:\Program

Files\hybrid\bin." RAIDWatch Manager and Event Monitor must be installed to the same directory.



11. Primary Agent Settings Assign the "TCP Port Number" that RAIDWatch Manager stations will use to communicate with the Primary Agent. The "Max Client Number" and "Max Controller Number" are also configurable. Users are recommended to keep the defaults for these two parameters.

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.

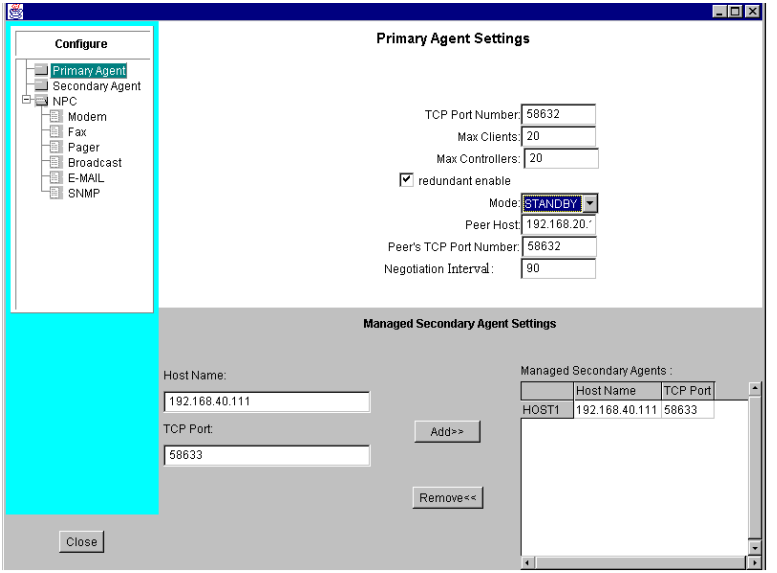
- **Redundant enable:** select to enable primary agent/NPC on another server for the precaution that a Primary Agent/NPC might fail and, as the consequence, fatal system events might then occur unnoticed.

- **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 TCP Port Number:** enter the same TCP port number as that on the current Primary Agent host.

- **Negotiation Interval** 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 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 RAIDWatch components are installed on a single server, both a Primary Agent and a Secondary Agent must be installed.

12. Managed Secondary Agent Settings (subsection of Primary Agent Settings): under this part of the Primary Agent configuration, list each Secondary Agent RAID

server that will be managed through the Primary Agent where you are installing RAIDWatch.

- **Host names** are IP addresses for each RAID server.

- **TCP Port** settings should be the same for all Secondary Agents but should be a different Port setting from the Primary Agent setting and otherwise unique to the Secondary Agents.

Important: the Primary Agent default TCP port setting should be changed to a network-unique assignment. The default TCP port setting is 58632. Any TCP 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.

---

13. Secondary Agent Settings: each Secondary Agent RAID server needs to be configured under this window.

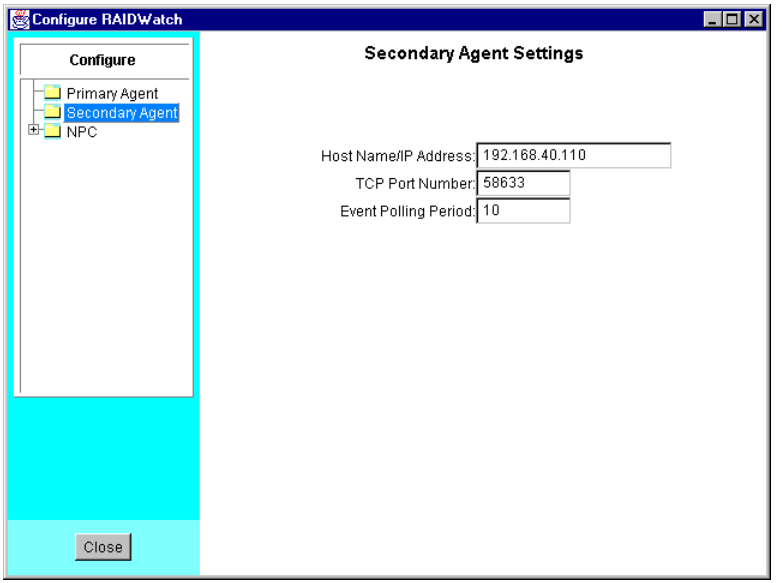
Important: local Secondary Agents must be installed at all RAID hosts managed by RAIDWatch.

- **Host Name/IP Address** is the IP address for the current RAID server.

- **TCP Port Number** is the TCP port to be used by all secondary agents.

- **Event Polling Period** is the time interval (in seconds) for event queries from the Secondary Agent to the RAID controller.

- **Port Name** is the COM port which has a modem connected.



- **Baud Rate** is the maximum data transfer rate of the attached modem.

14. NPC Settings: Notifier has four possible means of informing RAID managers that an event has occurred. They are: Fax, Pager, Broadcast, Email, and SNMP Traps. 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.

- **Modem Settings** include **Serial Port,** which is a COM port setting and **Baud Rate** which is the maximum transfer speed of the modem. A

modem must be installed and setup in order to use NPC fax or pager notification.

Important Note:

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

- **Fax Settings:**

  - **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** is 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.)

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

- **Available Modems** provides a list of installed and configured modems that may be used for sending event notices via fax.

- **Initializing String** – standard AT command set. The default is "&F1X0M0" (for Unix-based systems) and should be left as is for most fax modems.

- **Pager Settings:**

  - **Telephone** is the phone number for an event message receiving pager. ***(Note*** that any access dialing requirements, such as accessing an outside line or entering commands upon connecting with a pager service, must be included in the phone number. For example: 9,,,2241603,,,1 wherein "9" is access for an outside line, ",,," indicates a pause, and "1" is to leave a message to be forwarded to the pager.)

  - **Message** is the text that will be sent to the pager. ***(Note:*** any pager specific limitations regarding length or content must be considered.)

  - **Available Modems** provides a list of installed and configured modems that may be used for sending event notices via this pager number.

- **Initializing String** – standard AT command set. The default is "V1B1E0F0L1M1Q0TV1X1Y0&C1&D2&G0S7=20" and should be left as is for most pagers.

- **Broadcast Settings** include a **Host Name** (IP address) and the **Message** to be broadcast. The host name should be the server for the LAN where the notification messages will be broadcast.

- **Email Settings:**

  - **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** is the mail server used to send event notifications via e-mail.

  - **Sender's Email** is the "From" part of e-mail notification messages. It must be a valid internet e-mail address.

  - **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.

- **Subject** allows users to add a subject to event notification emails.

- **Message** is the message sent to the particular e-mail address being added. You may list, for example, the contact information of technical personnel.

- **SNMP Settings:**

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

  - **Trap Receiver List** is a list of listening SNMP agents.

Important Note:
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.

If the Primary Agent, Secondary Agent, and NPC (if needed) have all been installed and configured, including Secondary Agents for each RAID host, then installation is complete.

After all elements have been installed in a particular machine, click the **ExitSetup** button to exit.

You may now install RAIDWatch Manager or Event Monitor at stations from which your RAIDs will be monitored and managed.

2.4.3 Installing RAIDWatch Manager & Event Monitor

If a web server is not available to run RAIDWatch, or for some other reason browser access to the program is not preferred, RAIDWatch Manager or Event Monitor can be installed on workstations on the LAN where the RAID server with the Primary Agent installed resides.

Follow these steps to install RAIDWatch Manager and Event Monitor on a workstation:

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

2. If installing on a Unix system, mount the 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.

If you are installing remotely, skip step 4.

4. For local installs, 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) and second if you want to install RAIDWatch (including Event Monitor). In both cases, type "Y" for a first install, reinstall, or reconfigure of the program.

If you have just completed step 4, skip step 5.

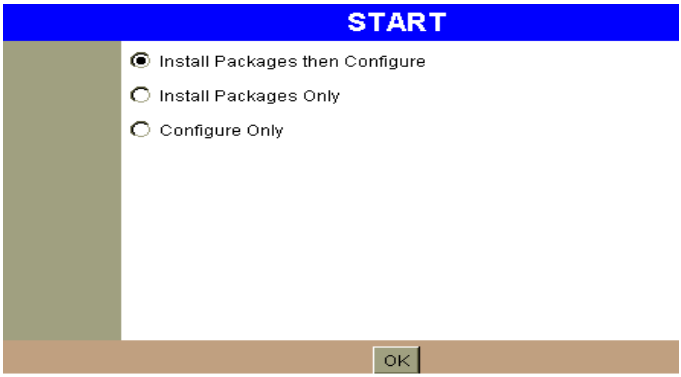
5. For remote installation, open …\common\install.htm through a web browser. (For example, use your web browser to open "/mnt/common/install.htm" from a Unix system or the directory "d:\common\install.htm" under Windows NT.) The installation procedure will auto-select the software modules that match your OS.

(The browser method for starting the installation process explained in step 5 can also be used locally if you prefer.)

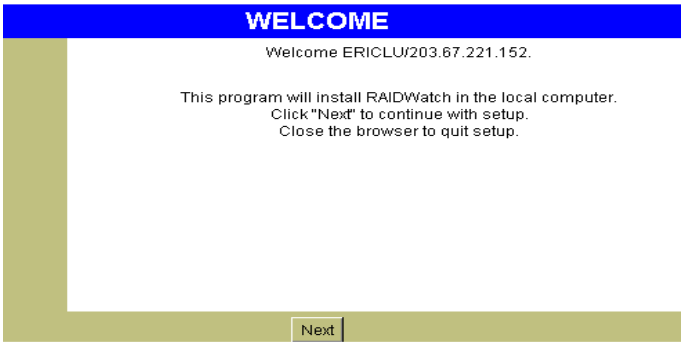
6. For both local and browser starts, accessing the install file should open the first stage of the installation process. There are three options here for installing or configuring your package. Please select ***Install Packages Only***, and click the **OK** button to continue.

Important Note:

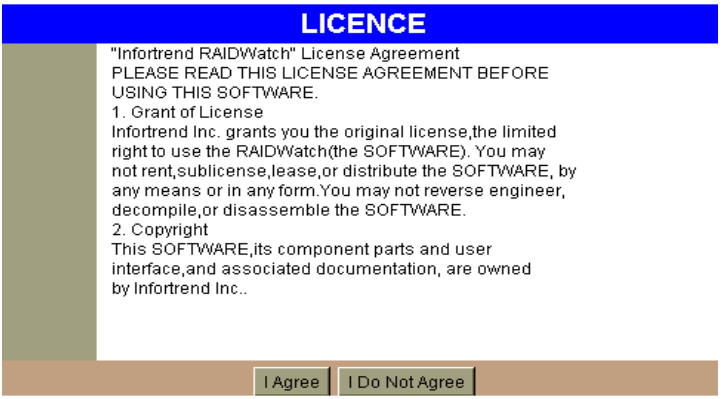
Agent and NPC configuration parameters can be reconfigured later using the installation program. Run the installation program and select **Configure Only** from the **Start** menu to reconfigure Agent and NPC settings.



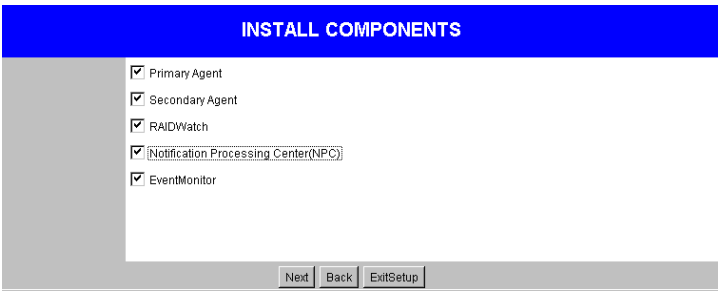
7. Click the **Next** button on the ***Welcome*** screen to continue.



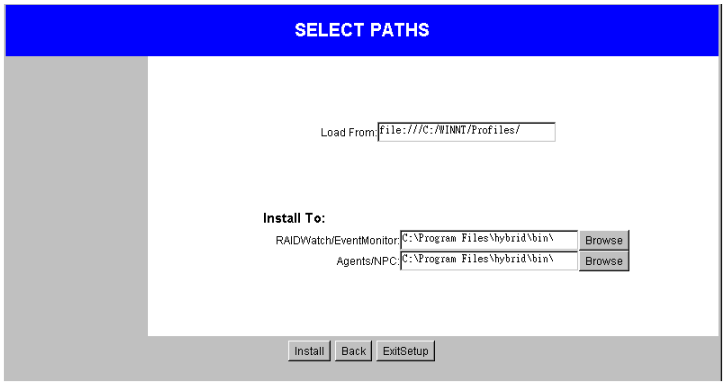
8. Read the contents of the ***License*** and click the ***I Agree*** button to continue.



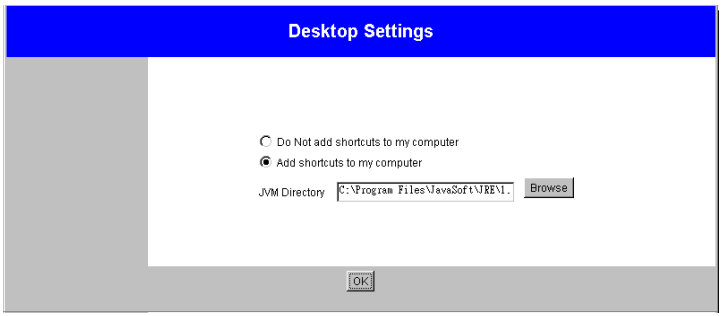
9. Please select **RAIDWatch** and **Event Monitor.** Click on the **Next** button to continue. RAIDWatch Manager can be installed and run without Event Monitor. However, Event Monitor can not be installed without RAIDWatch Manager.



10. Click on the **Install** button under the ***SELECT PATHS Window*** to start installing the selected components to your system.



The installer program will automatically create a new directory for RAIDWatch components. The default is "\usr\hybrid\bin." For Windows NT, the default directory will be "c:\Program Files\hybrid\bin."



11. Before the installation procedure finishes, it will ask if you want to add shortcuts to your computer. Choosing to add them will put a shortcut icons on your desktop for starting RAIDWatch Manager and Event Monitor. (For Windows users only.) Click the ExitSetup button on the final screen to finish.

The installation procedure is now complete. You may start managing your RAID disk array systems. For

information on first time operating instructions, see *Chapter 3, Basic Operations.*

2.4.4 List of Filenames

Below is a list of key 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.

- **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. NPC.EXE → to start the Notification Processing Center

- **Configuration and Install files:**

1. INSTALL.JAR → executable .jar Java file
2. INSTALL.HTM → browser accessible HTML file
3. UNINSTALL.HTM → browser accessible HTML file

- **Others (including OEM definitions):**

IFTBundle_0 IFTBundle_1	Multi-language support

…	
em_oemname oemname oemlogo default.enc	OEM definitions .. .. OEM enclosure view definitions
/help /em_help	Java-help files

2.4.5 Program Updates

As Infortrend's valued customer, you are entitled to free program updates. You can download the latest version of RAIDWatch from Infortrend's FTP sites at ftp.infortrend.com in the U.S.A., or ftp.infortrend.com.tw in Taiwan. For more information about this service, call Infortrend or an Infortrend distributor in your area.

2.5 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 SCSI-to-SCSI RAID controllers – in-band SCSI. The traditional way for SCSI controllers to communicate with the host computer has been via software (such as RAIDWatch) using an RS-232C connection. With in-band SCSI, integrators have more flexibility. They may use RS-232C or the existing SCSI 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 RAIDWatch Manager to manage the controller, it must first be configured as a peripheral device. In-band SCSI allows you to do this using Text RAID Manager.

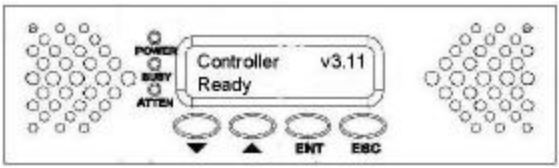
How is it able to use the SCSI cable?

In-band SCSI technology translates the original commands into standard SCSI commands. These SCSI commands are then sent to and received from the SCSI RAID controller. RAIDWatch can manage the RAID controller just as it could before via RS-232C. ***(Note:*** it is assumed that users of in-band SCSI possess the following – a third-party SCSI adapter and a channel on their Infortrend RAID controller that can be designated as a host channel. Both of these are required for in-band SCSI communication between the host and the RAID controller.)

Configuring a RAID Controller to Use In-band SCSI

RAID Controller Adjustments

Some adjustments must be made to the RAID controller and to the host computer's SNMP settings before the two can communicate using SCSI commands. The RAID controller settings can be changed using the Front Panel. (Your front panel may be different in appearance from the one shown in this example.)



From the Main Menu, press ▼ or ▲ to select "View and Edit Configuration Parameters."

```
View and Edit
Config Parms
```

Press <Enter>; and then use the ▼ or ▲ to select "Host-side SCSI Parameters." Then press <Enter>.

```
Host-side SCSI
Parameters  ..
```

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 Reference for Various Operating Systems:

Operating System	Peripheral Device Type	Peripheral Device Qualifier	Device Support for Removable Media	LUN Applic-ability
NT 4.0	1f	connected	disabled	All Undefined LUNs
NT 5.0	3	connected	enabled	All Undefined LUNs
NetWare 4.x	1f	connected	disabled	All Undefined LUNs
SCO Unix 5.0x	7f	connected	either is okay	All Undefined LUNs
UnixWare 2.1x	3	connected	either is okay	All Undefined LUNs
Solaris 2.5.x/2.6	7f	connected	either is okay	All Undefined LUNs

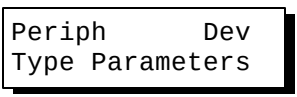
Table 2-3 : Peripheral Device Type Settings:

Device Type	Setting
No Device Present	7f
Direct-access Device	0
Sequential-access Device	1
CD-ROM Device	5
Scanner Device	6
MO Device	7
Unknown Device	1f
Processor Type	3

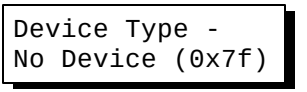
Example: Settings for Windows NT 4.0

The settings for Windows NT 4.0 are provided here as an example. For the settings under other operating systems, please refer to table 2-2 above, *Peripheral Device Type Parameters Reference for Various Operating Systems.*

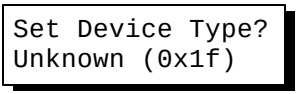
On the front panel, use ▼ or ▲ to select “Peripheral Device Type Parameters”; and then press <Enter>.



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

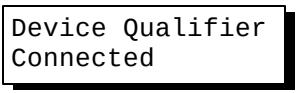


Press ▼ or ▲ to choose "Unknown Device - 1f".



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



Use the ▼ or ▲ to select Support for Removable Media. The default setting is "Disabled." If the LCD reads "Enabled," press <Enter> and you will be prompted to accept a change. If the screen reads "Disabled," press <Esc> to return to the host-side SCSI submenus.

```
SupportRemovable
Media - Disabled
```

Press ▼ or ▲ to select "LUN Application"; and then press <Enter>. The default setting is "All Undefine LUN."

```
LUN Application-
All Undefine LUN
```

Press <Enter> and use ▼ or ▲ to select "Undefine LUN-0's."

```
Applies to     ?
Undefine LUN-0's
```

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

```
LUN Application-
Undefine LUN-0's
```

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

2.6 Out-of-band via Ethernet

Newer line of Infortrend controllers running firmware version 3.21 are equipped with an Ethernet port for connection with a management station. RAIDWatch programs can now run on a RAID controller, allowing users to manage the system from any management station in any place via TCP/IP protocol.

Listed below are steps necessary for preparing RAIDWatch programs on a RAID controller.

1. Follow the instructions in documentation that came with your controller for details on how to connect Ethernet port. Requirements for a management station are the same as those for the clients running RAIDWatch manager. Support for Java should be enabled on a management station accessing the manager program through web browser.

2. Create a logical drive by the use of LCD front panel or firmware-embedded manager. Make sure there is no pre-configured storage sector on the selected member drives.

3. Assign an IP address to the controller and provide Net Mask and gateway values. Reset the controller for the configuration to take effect.

4. The controller will take a while formatting a small storage sector for the manager programs. When the controller is finished with formatting

drives, ftp RAIDWatch programs to the designated controller IP address. Program files transferred to a controller for out-of-band management should include: grm.htm, grm.jar, and IFT-Bundle_0. Files named as IFT-Bundle are definitions of multi-language support. For an English interface, ftp IFT-Bundle_0 to the controller.

5. Primary and Secondary Agents are not necessary here.

6. Other modules, NPC and Event Monitor, should be installed on host computer. The requirements and installation procedures are the same as described in the previous sections.

7. Start your web browser and enter the IP address assigned to the controller followed by grm.htm as your URL (e.g., http://222.212.121.123/grm.htm).

8. A RAID system thus connected can also be accessed by a Primary Agent host in a greater topological scheme involving multiple RAID systems. The RAID system will then be considered as one of the Secondary Agent hosts and managed from where another RAIDWatch manager resides through the Primary Agent. The RAID system can also be defined as one of the monitoring targets where multiple systems are managed by an NPC or Event Monitor.

3 Basic Operations

This chapter discusses basic 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:

- Starting RAIDWatch Manager
- Connecting and disconnecting from a disk array
- Setting up security
- Display controls
- Exiting RAIDWatch Manager

3.1 Starting RAIDWatch

3.1.1 Starting RAIDWatch Agents and NPC

- **Under Windows (NT 4, or 2000) OSes:**

The Primary Agent and Secondary Agents start automatically under Windows OSes each time the host computer is reset. However, the NPC must be started manually by executing the NPC.exe each time the host is reset.

- **Under Unix or AIX OSes (Solaris 7 SPARC or x86, HP UX 11, or Red Hat Linux 6.1):**

Under **Unix systems** the Primary Agent, Secondary Agent, and NPC must be started manually each time the host computer is reset.

To start the Primary Agent, Secondary Agent(s), and NPC 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 NPC

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

3.1.2 Starting RAIDWatch Manager

The GUI management interface, 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 RAIDWatch Manager in various ways.

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

- **Starting RAIDWatch Manager locally or via LAN under the Windows (95/98/Me/NT/2000) environment:**

  1. From the **Start** menu, select **Programs → RAIDWatch Manager**.

     -or-

     Double-click the RAIDWatch Manager icon either in the group folder or from the desktop if a shortcut was added during the installation process. The RAIDWatch Manager "Connect to RAID Agent" 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 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 the *Connecting and Disconnecting from a Disk Array* section of this chapter.

- **Starting 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 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 the *Connecting and Disconnecting from a Disk Array* section of this chapter.

- **Starting 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 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 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 the *Connecting and Disconnecting from a Disk Array* section of this chapter.

3.2 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 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 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 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.

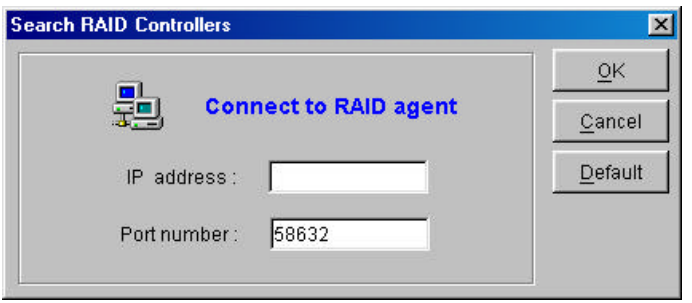
The following discusses how to connect to a disk array. Information on disconnection is provided at the end of this section.

- **Connecting to a RAID system while working from the local Primary Agent host:**

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

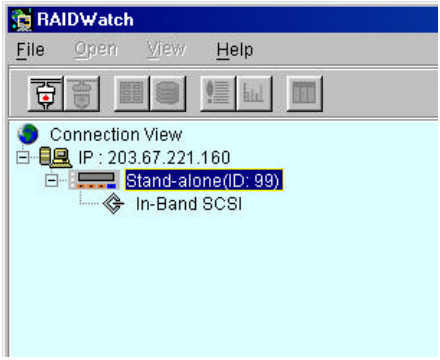
   -or-

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



   Click the **Default** button.

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).



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.

▸ Connecting to a RAID system from a distant host:

1. 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).

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.

▸ **Disconnecting from a disk array system:**

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

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

3.3 Setting Up Security

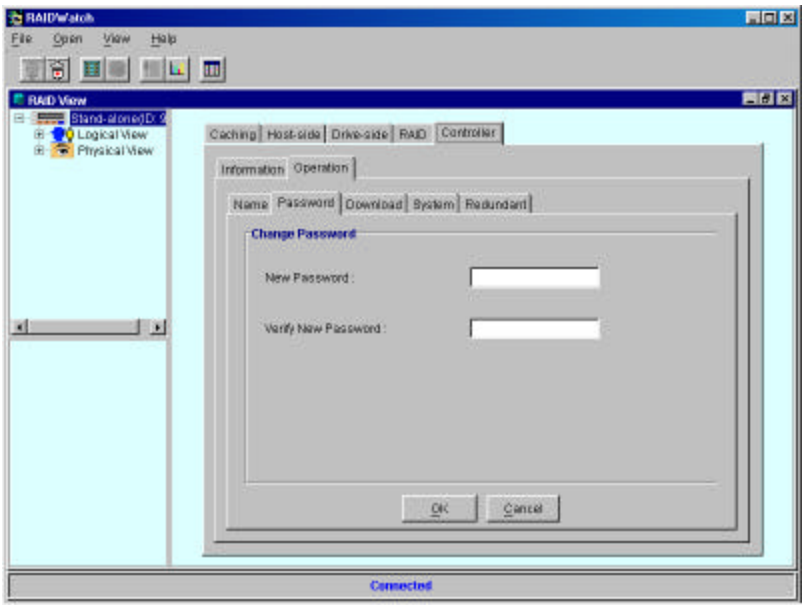
RAIDWatch provides password protection to prevent unauthorized access to RAID controllers or controller setting modifications. This protection, which is implemented by the RAIDWatch Primary Agent, prompts a user for the station password the first time he or she attempts to connect to a controller through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

By default, 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.

Setting a password for RAIDWatch controller access:

1. Display the Configuration window by clicking on the **Configuration** button under the introduction.

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:



3. Type in a **New Password**.

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

5. Click **OK**.

- **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 RAIDWatch to work. Modifying TCP port settings to something other than the default will increase system security.

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 RAIDWatch* for information on configuring Primary Agent TCP port numbers.

3.4 Look and Feel

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

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

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

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

3.5 Display Controls

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.

Just like other GUI-based applications, 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 RAIDWatch Manager window generally conform to standard procedures. The management sessions are best displayed in the 800x600 screen resolution.

3.5.1 Using the RAID View Window

After starting RAIDWatch Manager, choosing a RAID to manage, and entering the right password to get access, the RAIDWatch Manager main **RAID View** window appears on the screen. All configuration operations pertaining to the disk array system will be performed within RAID View.

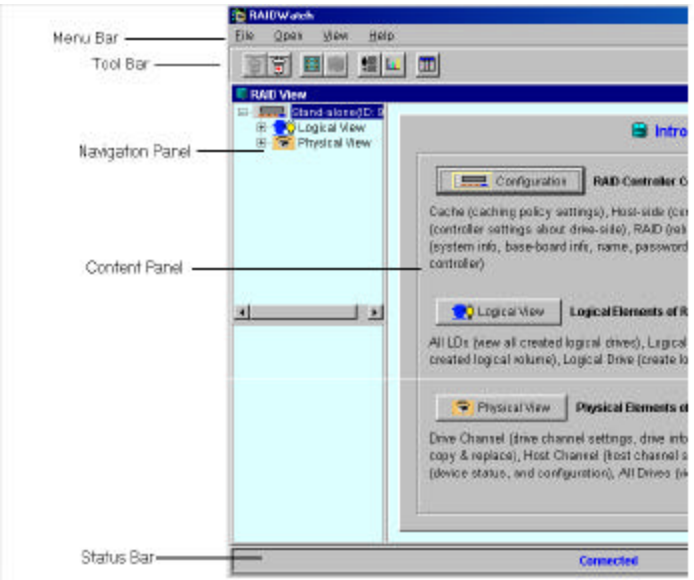
Basics

When **RAID View** first opens, the Navigation panel in the upper left quadrant of the window will display icons

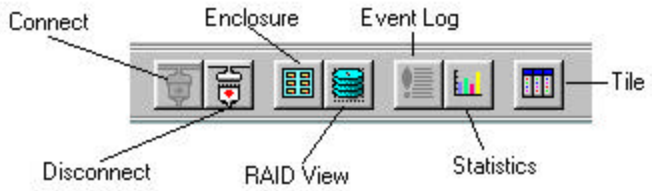
for the controller, **Logical View**, and **Physical View.** The large Contents panel to the right will display an Introduction with access buttons for **Configuration**, **Logical View**, and **Physical View.** Each of these primary function windows will be described below and in detail in Chapter 4.

The following describes the various control and display components found in the RAID View window:

- The *menu bar* displays the available menus. All menus provide a list of commands 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*.



- RAIDWatch Manager provides *command buttons* to execute most commonly used commands. These buttons are displayed on the *toolbar*. The following figure displays the command buttons on the toolbar:



  - 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 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 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.)

♦ The following additional commands are only accessible via the *menu bar:*

- The **Agent** command under the **File** menu brings up the "Connect to RAID agent" prompt. This command is only available

when RAIDWatch Manager is not currently connected to any agents.

- The **Exit** command under the **File** menu is always available and is used to end the current RAIDWatch Manager session.
- The **Contents** command under the **Help** menu brings up the main navigation window for the RAIDWatch Manager help file.
- The **About** command under the **Help** menu brings up a window that provides RAIDWatch version information.

- The *windows display area* is where the system displays 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 the *Arranging Windows* section of this chapter.

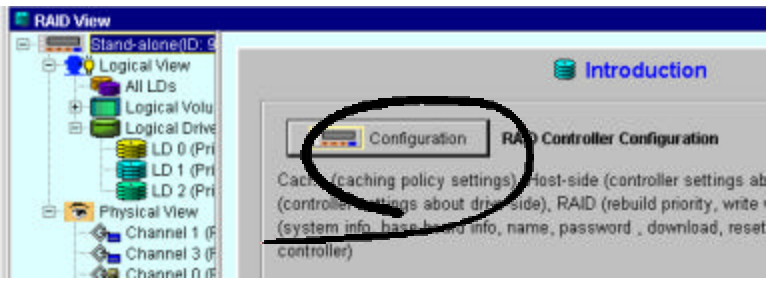
- The **RAID View** window provides the configuration, installation, management, and monitoring functions available in RAIDWatch. The RAID View window includes a Navigation Panel and a Content Panel.
  - The **Navigation Panel** provides a tree organization display of logical and physical drives managed by the current controller. The Navigation Panel also has a sub panel for displaying longer information trees.
  - The **Content Panel** displays information about controller settings, logical drive settings,

and physical drives as selected in the Navigation Panel.

- The *status bar* displays the results of various disk array operations.
- The *scroll bars* let you move parts of a window into view when the entire window does not fit into the windows display area.

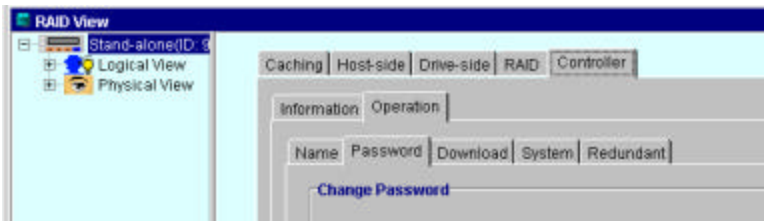
3.5.2 Using the Configuration View

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



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.

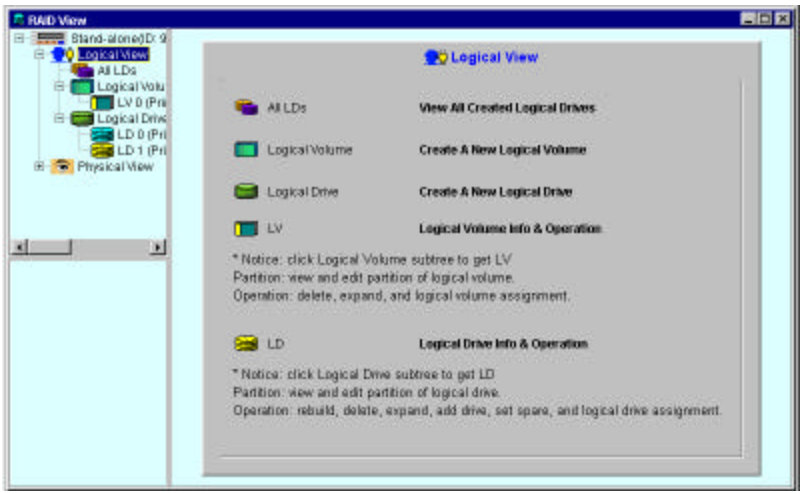


See section *4.4 Configuring the Controller* of this user's manual and the controller's user documentation for more information about controller settings.

3.5.3 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. A window similar to the one above will appear.

Note that the symbols in the Logical View initial 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 readout similar to the following will appear:

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

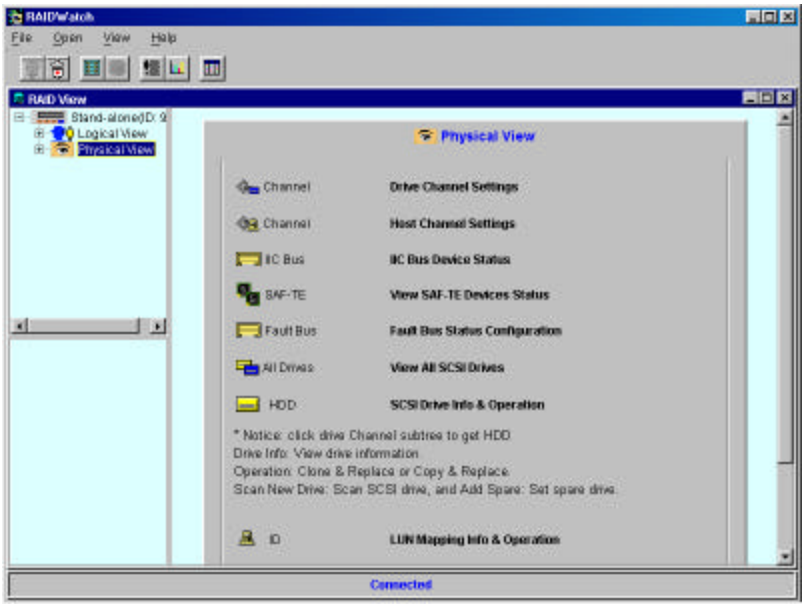
For more information on how to create, delete, and rebuild logical drives and logical volumes, see Chapter 4, *Array Management.*

3.5.4 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, the fault bus, and physical drives.

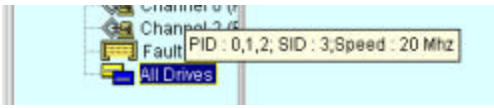
To display the Physical View, you can either click on the **Physical View** button in the RAID View Introduction or

select the **Physical View** icon in the navigation panel of the RAID View window. A window similar to the one below will appear.



Note that 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 table similar to the following:



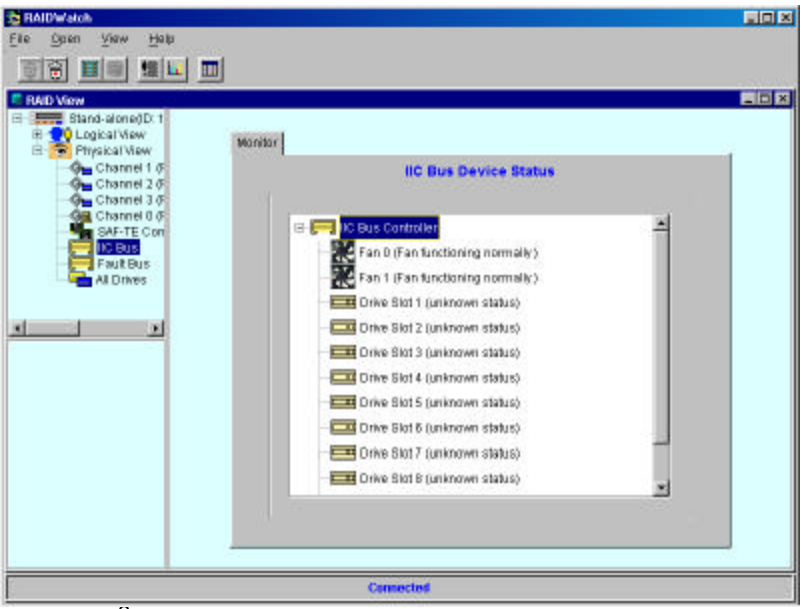
This table provides information such as primary and secondary IDs, and the current transfer clock rate.

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 via I^2C Bus, SAF-TE Bus, and Fault Bus.

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 4, *Array Management.*

I^2C

In addition to displaying drive and host channels, the Physical View can also display **I^2C Bus Device Status**.



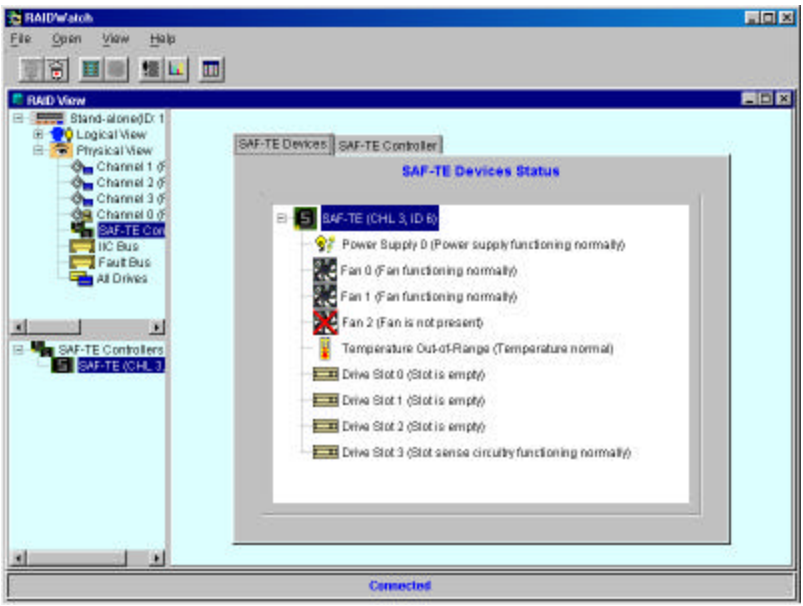
I^2C is an interface by which signals from enclosure

sensors are passed to the RAID controller. It provides a basic status report on enclosure devices like power supplies, fans, and drive slots.

If your enclosure has I^2C monitoring circuitry and cabling installed, RAIDWatch Manager will display an I^2C icon under Physical View. Click on the icon to show I^2C devices and status. I^2C is not user configurable via RAIDWatch Manager.

SAF-TE

SAF-TE stands for **S**CSI **A**ccessed **F**ault-**T**olerant **E**nclosures. It is an enclosure management technology. A SAF-TE-compliant enclosure monitors the fan temperature, power supply, UPS, and also provides drive status LED's.

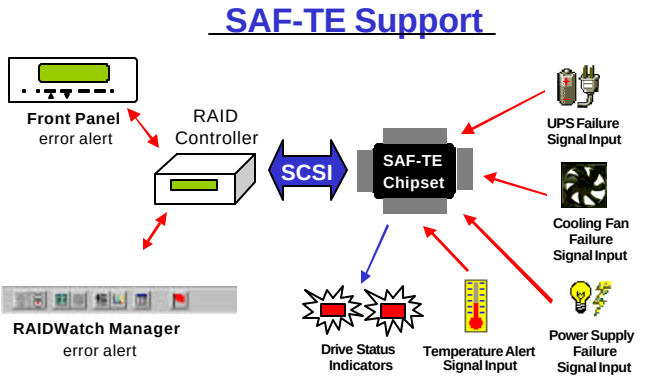


The SAF-TE enclosure connects to the RAID Controller via a SCSI connector. The RAID controller communicates with the SAF-TE enclosure using standard SCSI commands.

How does SAF-TE work?

The SAF-TE device (often a back plane within a drive-bay enclosure) must occupy a connector on one of the drive channels' SCSI cables. The presence of a SAF-TE device will be detected and its presence will be displayed in the RAIDWatch Manager program under Physical view.

SAF-TE controllers and SAF-TE devices are not user-configurable via RAIDWatch Manager.

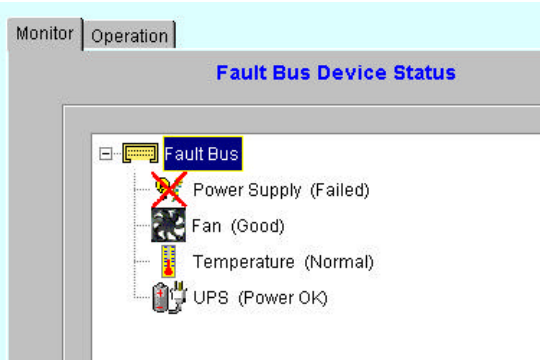


- SAF-TE chipset connects to the drive channel of the controller together with the SCSI drives.

Fault Bus

In addition to displaying drive and host channels, the Physical View can also display the status of the Fault Bus.

Fault Bus is a proprietary enclosure management interface. It will warn the user if a dangerous failure occurs within the RAID system. Fault Bus monitors the fault signals of the ventilation fans, power supply, enclosure temperature sensor, and UPS. In RAIDWatch Manager, it will report failures to the user by displaying a red "X" on the icon of whichever device has failed.



Fault Bus only detects failure signals; it does not detect the current temperature, fan rotation, power supply output, or UPS status. Either a user-designed circuit or a third-party circuit is necessary for Fault Bus.

NOTE: Only the IFT-3101, IFT-3102, SentinelRAID 100, and SentinelRAID 150 Infortrend controllers support fault-bus.

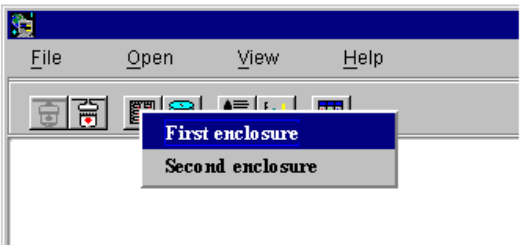
The user is given the choice of enabling or disabling failure signals. In addition, each signal must be configured as either **High** or **Low** (refer to your third-

party manufacturer's documentation for the proper settings.)

3.5.5 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.

The Enclosure window appears when you click on the **Enclosure** command button or select the **Enclosure** command from the **Open** menu. 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 on the selection box.



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

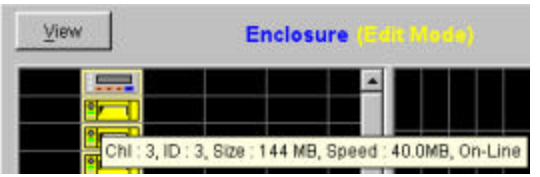
Both enclosure windows allow you to assign locations for different components. The Enclosure window is particularly useful in monitoring the status of the physical drives. It provides you with a real-time report on the drive status, using symbols and colors to represent various conditions. The following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

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

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 below appears.



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.

3.5.6 Using the Event Log Window

The **Event Log** window displays controller and array events since the last time 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 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.

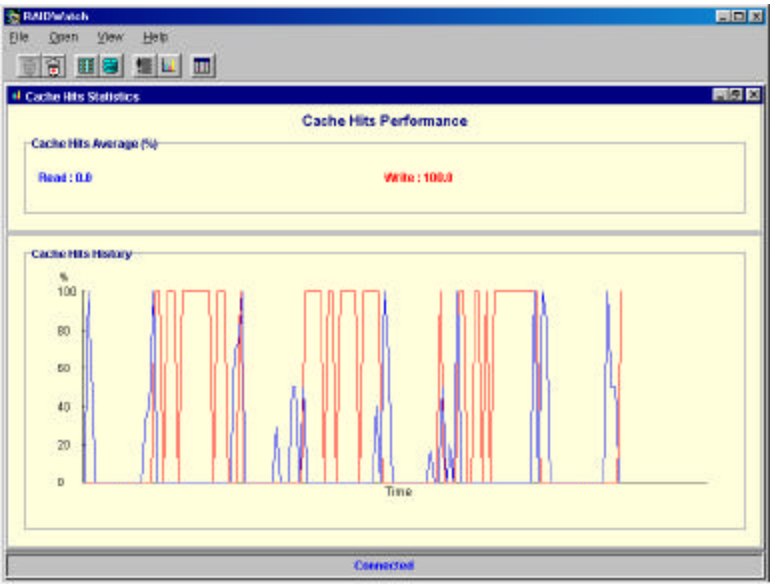
When events occur, RAIDWatch will display a waving Event Flag command button on the tool bar:

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.

3.5.7 Using the Statistics Window

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

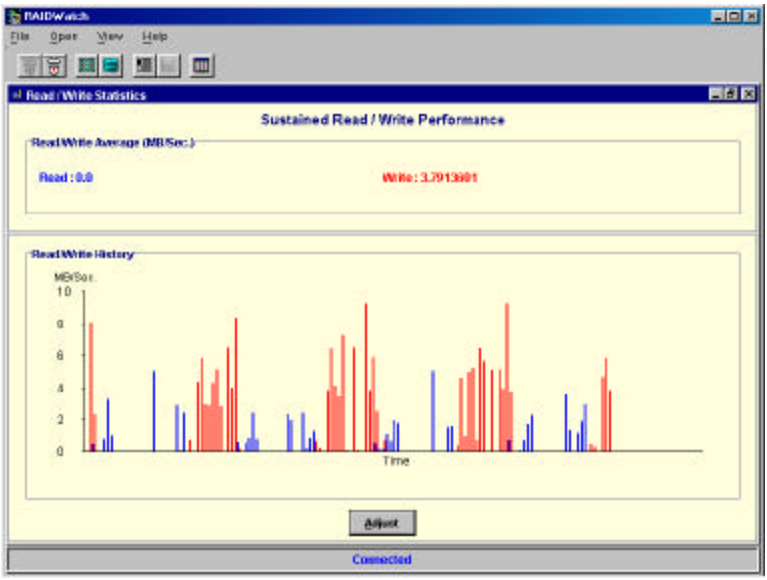
Cache hits average and history provides information about the current operating performance of the RAID controller and disk array.



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.

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.

3.5.8 Arranging Windows

The **View** menu provides you with a command for rearranging the currently open 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.)

3.6 Exiting RAIDWatch Manager

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

Exiting from RAIDWatch Manager:

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

-or-

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

Exiting from 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 RAIDWatch Primary Agent.

4 Array Management

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

- Background information about disk array management
- Setting controller configuration
- Setting channel configuration
- Scanning in drives
- Creating and deleting logical drives
- Adding and deleting spare drive assignments
- Rebuilding logical drives
- Creating and deleting logical volumes
- Creating and deleting volume partitions
- Mapping logical volumes or partitions to host LUNs
- SAF-TE / I^2C / Fault Bus
- Defining enclosures
- Displaying the contents of the event log
- Monitoring performance statistics
- Dynamic logical drive expansion
- Redundant controller use

If this is your first time to manage a disk array system, we recommend that you read through section *4.1 Background Information*, to get basic information about disk array management. You will need this basic knowledge to be able to effectively use RAIDWatch Manager.

4.1 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 D, *RAID Levels*, gives information about these levels, including the benefits of each.

Infortrend 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.

4.1.1 Definition of Terms

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

- **Physical drives**. These are the actual SCSI drives installed on the connectors of the SCSI cables. These drives are displayed in **Physical View** under the RAID View window.

- **Spare drives**. 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.

4.1.2 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.

4.2 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 SCSI ID, you can then proceed with data rebuilding.
- If the replacement drive is installed on a different channel or SCSI 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.

4.3 Before You Start

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, RAIDWatch Manager station comes without any password. For information on how to set a password and other security features, see the *Setting Up Security* section of Chapter 3, *Basic Operations.*

4.4 Configuring the Controller

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.

The following is a complete list of configuration controls and information displays (more information about many of these variables is available in the controller hardware and firmware documentation).

4.4.1 Caching

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

- **Caching Policy** (choose one):
  - **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.

- **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.

4.4.2 Host-Side

♦ **Host-side SCSI Parameters** (choose from the range):

- **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.

4.4.3 Drive-Side

♦ **Drive Side SCSI Parameters** (choose from each range):

- **Power-Up SCSI Reset.** Choose Enabled or Disabled.

- **SCSI Motor Spin-Up.** Choose Enabled or Disabled. Enabled causes the controller to spin-up the SCSI drives at a spaced time interval rather than all at once.

- **Maximum Tag Count.** Available selections: Disable, 1, 2, 4, 8, 16, 32, 64, 128.

- **Disk Access Delay Time (Sec.).** Available selections: No Delay, 5, 10, 15, 20. . .75.

- **SCSI I/O 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.
  - **Detect:** detect and report SMART errors
  - **Clone Only:** clone drive data to spare automatically when an error is detected
  - **Clone&Replace:** clone drive data to spare and replace drive with spare when cloning is finished

4.4.4 RAID

♦ **Disk Array Parameters** (choose from each range):

- **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.

4.4.5 Controller

♦ **Information** (no configurable parameters, readouts only)

- **System:** Total Cache Size, Firmware Version, Bootrecord Version, Serial Number, CPU Type.
- **Board:** CPU Temp Sensor, Board Temp Sensor, +3.45V Value, +5V Value, +12V Value

♦ **Operation** (choose from each range or enter a value):

- **Name:** A user-configurable identifier for the controller. Note, the name and password fields combined have a maximum size of 16 characters.
- **Password:** A user-configurable security setting. Note, the password and name fields combined have a maximum size of 16 characters.
- **Download:** Choose **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:**
  - **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.
- **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 65535.

- **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.

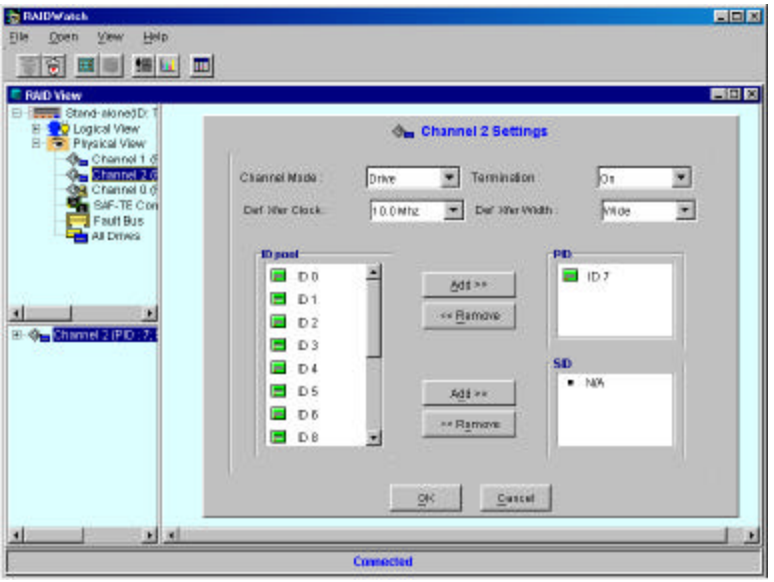
4.5 Configuring Channels

Using RAIDWatch Manager, you can modify the configuration of any channel on the controller. You can set the channel operation mode to host or drive, enable or disable channel termination, set SCSI IDs, set the transfer clock rate for synchronous communication, and select the transfer width.

Channel configuration settings are available under **Physical View** in the RAID View window.

The following describes user-configurable channel parameters:

- **Channel Mode**. This parameter sets the operation mode of a particular channel on the controller. It configures the operation mode to either host or drive, where a host channel is used when



connecting to a host and a drive channel is for connecting to SCSI drives. Any SCSI channel on the controller can serve as either a host or drive channel. Channel 0 is the default host channel with SCSI ID number 0. In redundant mode, channel 0 is also the default channel for synchronized cache communiations.

- **Termination**. This parameter enables or disables SCSI channel termination. SCSI cables must be properly terminated at both ends; that is, when connecting one end of a SCSI cable to a channel, the termination of the channel must be enabled. Note that the other end of the cable must also be properly terminated.

You can terminate the other end of the cable by installing or enabling termination on the SCSI drive farthest from the controller or by installing an external terminator on the end connector. The latter method is recommended so that removal of the drives will not affect cable termination. All other terminators must be removed or disabled making sure that only one terminator is installed on each end. (SentinelRAID series users, check your hardware documentation for additional termination information.)

- **Default Xfer Clock (in MHz), Default Xfer Width**. These parameters set the data transfer clock rate for synchronous communication over the SCSI bus, and enable or disable wide transfer, respectively.

  Data that is transferred across the SCSI bus in synchronous transfer mode is clocked using a synchronous transfer clock signal. The frequency of this signal determines the rate at which data is transferred. If, for example, the synchronous transfer clock is 10 MHz, data transfer rate will be 10 million bytes per second (assuming narrow transfer).

  Data transfer across the SCSI bus can be either 8 bits or 16 bits at a time. The former is referred to as *narrow* transfer, while the latter is referred to as *wide* transfer. At the same synchronous transfer clock rate, data transfer using *wide* transfer will be double that of *narrow*. With a transfer clock of 10MHz, the data transfer rate will be 10 Mbytes/second under *narrow* transfer, and 20Mbytes/second using *wide*.

Occasionally, under conditions in which SCSI signal quality is poor, such as with extremely long cables, poor connections, or bad termination, it may be necessary to reduce the synchronous transfer clock to allow the SCSI channel to function normally. Worst case, it may be necessary to switch to asynchronous communication mode.

Furthermore, certain older SCSI devices may only support *narrow* transfer and behave abnormally when attempting to negotiate *wide* transfer. Under such conditions, *wide* transfer may need to be disabled, forcing the controller to use *narrow* transfer mode with that device.

- **ID pool / PID / SID**. This parameter sets the SCSI ID of the channel. Each channel must have a unique SCSI ID in order to work properly. SCSI 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.

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.

2. From Physical View, double-click on the corresponding SCSI Channel icon of the target channel. SCSI 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 are using a SCSI-to-SCSI controller, select the channel mode from the **Channel Mode** drop-down list box. To select, click on the down-arrow button at the right of the box, then select the option you want. If you want to configure the selected channel as a host channel, select **Host**; to configure as a drive channel, select **Drive**.

4. From the **Termination** drop-down list box, specify whether to enable the channel termination or not. To enable, select **On**; to disable, select **Off**. (IFT-3200 series users, check your hardware documentation for additional termination information.)

5. If you want to assign a different SCSI ID to the selected channel, choose the new ID from the **ID pool** scroll list box. When selecting an ID, be sure that it does not conflict with the other SCSI 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.

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

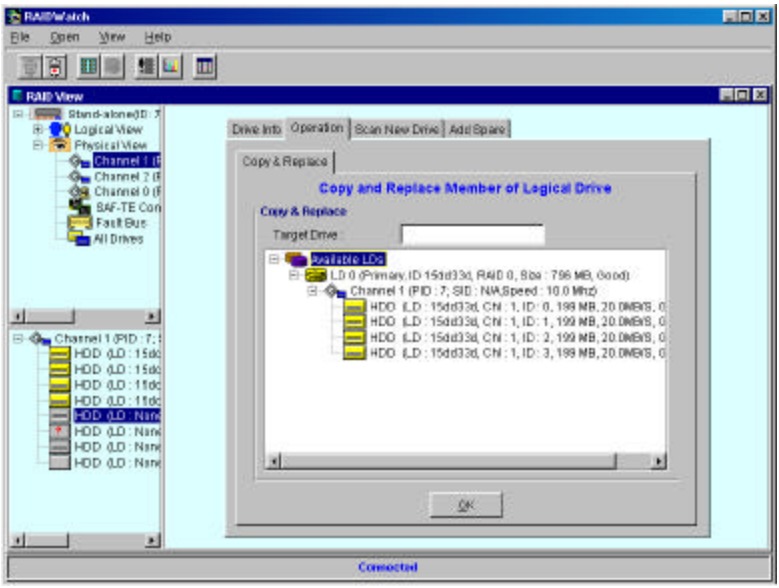
7. From the **Default Xfer Width** drop-down list box, select whether to use *narrow* or *wide* transfer. To use *narrow* transfer, select **Narrow**; to use *wide* transfer, select **Wide**.

8. 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.

4.5.1 Configuring New or Unassigned Drives

New and unassigned drives have some additional configuration options listed by channel under Physical View.

- **Drive Info** (no configurable parameters, readouts only)
  - **Drive Information:** Slot Number, Channel Number, ID Number, Capacity, Status, Transfer Rate, Logical Drive ID, Vender/Product ID.



- **Operation**

  - **Copy&Replace:** used to copy and replace a current member drive of a logical drive. Choose the target drive by clicking on its icon in the Copy& Replace window pane. Click **OK** to replace the target with the selected new drive.

NOTE: This operation is intended for use in expanding a logical drive by replacing all member drives one at a time. Also, as the available size will be limited to the maximum size of the smallest hard drive, it is recommended that all drives in a logical drive be the same size.

- **Scan New Drive**

  - Choose the channel number and ID where the new drive is located.

- Click **OK**. The system will ask for a password and then scan for a drive with the specified ID. It will then either display a successful confirmation message or an error message.

- Repeat these steps to scan additional drives.

♦ **Add Spare**

- Choose a logical drive to which to add a spare. Once it is displayed in the **Target LD** text box, click the **Local** button (to make a local spare) or the **Global** button (to make a global spare).

4.6 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.

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. Click on a drive icon and choose **Scan New Drive.**

4. Choose the channel number and ID where the new drive is located.

5. Click **OK**. The system will ask for a password and then scan for a drive with the specified ID. It will then either display a successful confirmation message or an error message.

6. Repeat steps 2 through 5 to scan additional drives.

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.

4.7 Creating and Deleting Logical Drives

Logical drives can be created by combining physical drives together. Under **Logical View** in the RAID View window, click Logical Drives.

RAIDWatch Manager also allows you to delete logical drives. Before deleting, however, be sure that the data stored on the target logical drive is no longer needed. Deleting a logical drive erases all information stored on that logical drive.

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.

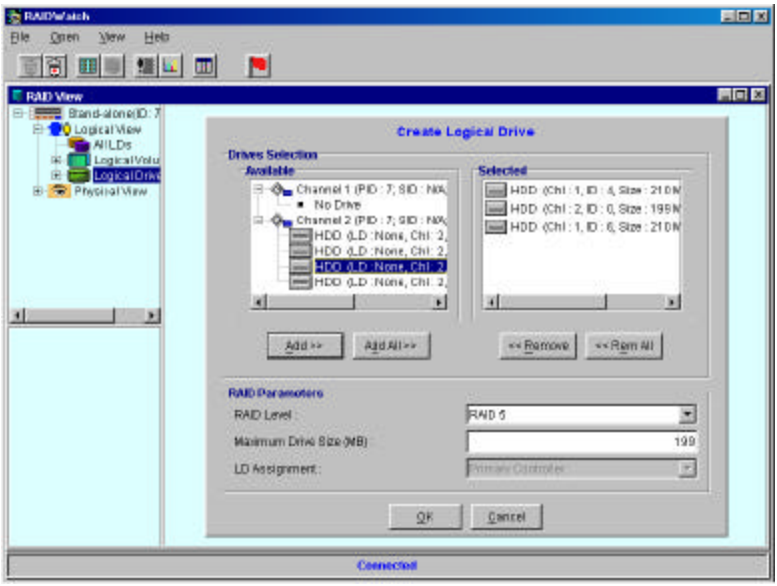
To create a logical drive

The contents panel will display **Create Logical Drive** and show any available (i.e., unassigned) physical drives organized by channel. Select the drives you want to include in the logical drive and click **Add** or click **Add All**. Once drives have been added to the "Selected" window, available RAID levels will be listed under RAID parameters.

1. Display the Logical Drives window by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. From Logical View, click on **Logical Drives** in the navigation panel, then click on a channel listed under " Create Logical Drive / Drives Selection / Available." Select the drives you want to include in the logical drive and click **Add** or click **Add All** to select all currently unassigned drives.

   Once drives have been added to the "Selected" window, available RAID levels will be listed under RAID parameters.



3. Select a **RAID Level** from the RAID Level menu.

4. Enter a **Maximum Drive Size** in that text box. The value entered determines 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.

5. Choose Primary Controller or Secondary Controller from the **LD Assignment** menu. If redundant controller function has not enabled or that SID's are not assigned on drive channels, LD Assignment menu will not be available.

6. Click OK. You will be prompted for the controller password. Enter the password and click OK.

7. The **Create In Progress** content window will display logical drive creation progress.

To expand a logical drive

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

1. Display the Logical Drive window by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. From Logical View, click on Logical Drives and choose the logical drive where you would like to expand capacity.

3. Choose the **Operation** tab and the **Expand** sub-tab, then note whether or not there is a number in the **Maximum Free Capacity (MB):** text box.

4. If there is an amount in the Maximum Free Capacity text box, you may enter an amount in the **Set Expansion Size (MB):** text box up to the total of free capacity.

5. Click **OK**. You will be prompted for the controller password. Enter the password and click **OK**.

6. 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.

NOTE: See section 4.17 for a detailed explanation of dynamic logical drive expansion principles.

To delete a logical drive

1. Display the Logical Drives window by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. From the Logical Drives window, click the left mouse button on the target logical drive.

3. Select the **Operation** tab.

4. Select the **Delete** sub-tab, click on the logical drive to delete, and click **OK**. You will be prompted for a password. Enter it and click **OK**. The logical drive will be deleted and removed from the logical drives list.

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

4.8 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.

- **Assigning a spare drive**

1. Display the Logical Drives window by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. Choose the logical drive where you would like to assign a spare drive. Choose the **Operation** tab and the **Spare** sub-tab. If the Spare sub-tab does not appear, there are no drives available to serve as spares.

3. 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.

4. Click the **Add** button, 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.

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

- **Deleting a spare drive assignment**

1. Display the Logical Drives window by clicking on the **Logical View** command button in the

introduction or selecting **Logical View** from the RAID View navigation panel.

2. Choose the logical drive where you would like to delete an existing spare drive assignment. Choose the **Operation** tab and the **Spare** sub-tab.

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 **Add**.

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.

4.9 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 SCSI ID), then you can proceed with the rebuilding process; otherwise, you need to scan in the drive first.

▸ To rebuild a logical drive

1. Display the Logical Drives window by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. In the Logical Drives window, click on the degraded logical drive.

3. Choose the **Operation** tab and then the **Rebuild** sub-tab.

4. Choose a logical drive to rebuild. Logical drives in need of rebuilding will be marked "degraded" and will have darkened icons. Click OK. You will be prompted for a password. Enter it and click OK.

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

6. 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**.

4.10 Creating and Deleting Logical Volumes

You can create and delete logical volumes using 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.

▸ To create a logical volume

The contents panel will display Create Logical Volume and show any available (i.e., unassigned) logical drives organized by ID.

1. Display the Logical Volume window by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. From Logical View, click on a channel listed under "LDs Selection / Available." Select the drives you want to include in the logical volume and click **Add** or click **Add All** to select all currently unassigned drives.

3. The **Maximum LD Capacity (MB)** is an information only text box. It is not a user-configurable value. The figure listed indicates the maximum capacity of each LD that will be used in the new LV.

4. Choose Primary Controller or Secondary Controller from the **Logical Volume Assignment** menu.

5. Click OK. You will be prompted for the controller password. Enter the password and click OK.

6. The new logical volume will be displayed in the navigation panel. You may now define its partitions. See the *Creating and Deleting Partitions* section of this chapter.

To expand a logical volume

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

1. Display the Logical Volume window by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. From Logical View, click on **Logical Volumes** and choose the logical volume which has an expanded capacity logical drive.

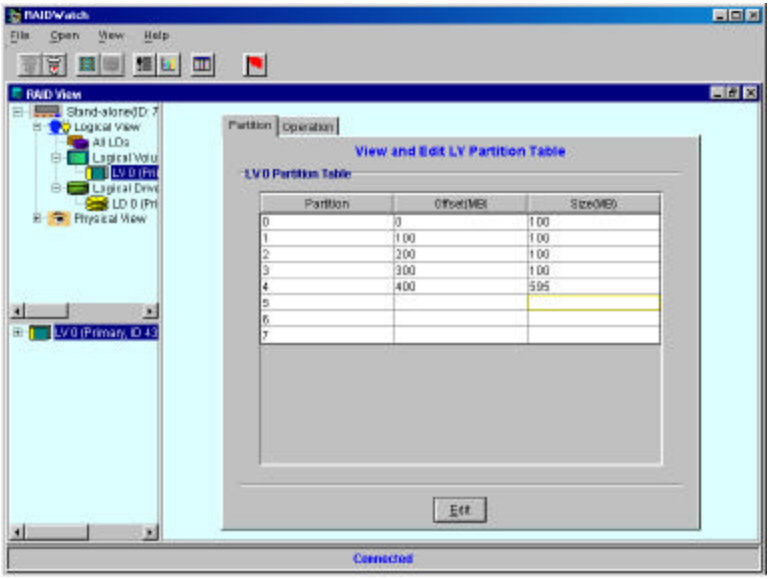
3. Choose the **Operation** tab and the **Expand** sub-tab, then note whether or not there is a number in the **Maximum Free Capacity (MB):** text box.

4. If there is an amount in the Maximum Free Capacity text box, you may enter an amount in the **Size to Expand (MB):** text box up to the total of free capacity.

5. Click **OK**. You will be prompted for the controller password. Enter the password and click **OK**.

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

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.



To delete a logical volume

1. Display the Logical Volumes window by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. From the Logical Volumes window, click the left mouse button on the target logical volume.

3. Select the **Operation** tab.

4. Select the **Delete** sub-tab, click on the logical drive to delete, and click OK. You will be prompted for a password. Enter it and click OK. The logical drive will be deleted and removed from the logical drives list.

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

4.11 Creating and Deleting Partitions

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.

- **Partitioning a logical drive (LD)**

1. Display Logical Drives by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. From Logical View, choose **Logical Drives** and then the LD that will be partitioned. After you select an LD, the contents panel will display the current **View and Edit LD Partition Table.**

3. To create a new partition, edit an existing one, or remove an existing partition, click the **Edit** button.

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.

6. To remove partitions, increase the size of partitions higher in the list. Last partitions will always be absorbed first.

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

- **Partitioning a logical volume (LV)**

1. Display Logical Volumes by clicking on the **Logical View** command button in the introduction or selecting **Logical View** from the RAID View navigation panel.

2. From Logical View, choose **Logical Volumes** and then the LV that will be partitioned. After you select

an LV, the contents panel will display the current **View and Edit LV Partition Table.**

3. To create a new partition, edit an existing one, or remove an existing partition, click the **Edit** button. 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.

6. To remove partitions, increase the size of partitions higher in the list. Last partitions will always be absorbed first.

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

4.12 Mapping Logical Drives/Volumes/Partitions to Host LUNs

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. RAIDWatch supports 8 LUNs per host channel (numbered 0 - 7), each of which appears as a single drive letter to the host if mapped to an LD, LV, or a partition of either.

Existing host LUN mappings also can 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.

▸ Map an entire logical drive or volume to a host LUN

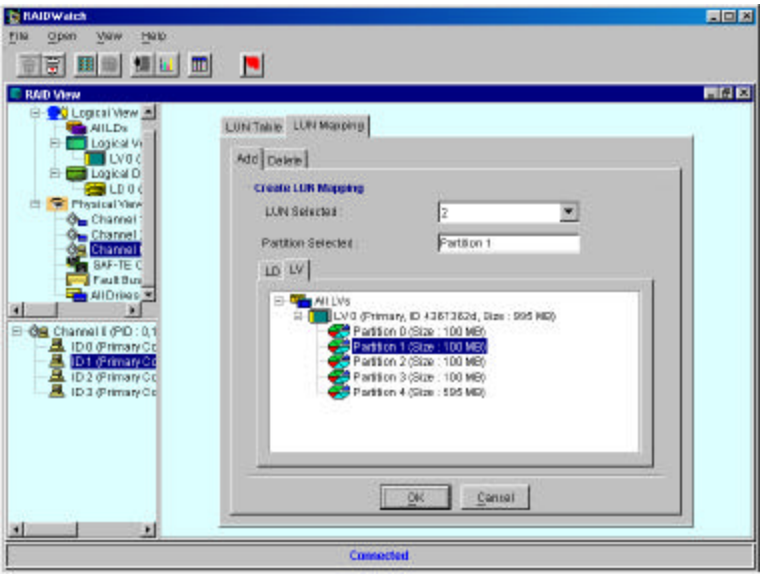
1. First, be certain that the logical drive or logical volume to map is not partitioned.

2. In the navigation panel under **Physical View**, click on the host channel where you would like to map a drive or volume.

3. In the sub-navigation window, click on a host channel ID number. The **LUN Table** for the host channel will be displayed.

4. Choose the **LUN Mapping** tab, and under the **Add** sub-tab, choose either **LD** (for logical drives) or **LV** (for logical volumes).

5. List the available logical volumes or logical drives by clicking on the "All" icon in the respective window. Click on the drive or volume you would like to map to display its partition 0. Partition 0 should be the only partition listed if you want to map an entire drive or volume to a single LUN.



6. From the **LUN Selected** drop-box, choose the LUN ID to assign. Only unused IDs will be listed.

7. Next, click on the partition 0 icon. "Partition 0," should appear in the **Partition Selected** box. Click **OK** and enter the password when prompted.

8. If you choose the LUN Table, the newly mapped LUN should now be listed.

- **Map a logical drive or volume partition to a host LUN**

1. First, partition the logical drive or logical volume (see section 4.11 above).

2. Once the drive or volume has been partitioned, in the navigation panel under **Physical View**, click on the host channel where you would like to map partitions.

3. In the sub-navigation window, click on a host channel ID number. The **LUN Table** for the host channel will be displayed.

4. Choose the **LUN Mapping** tab, and under the **Add** sub-tab, choose either **LD** (for logical drive partitions) or **LV** (for logical volume partitions).

5. List the available logical volumes or logical drives by clicking on the "All" icon in the respective window. Click on the drive or volume you would like to map to display its partitions. Each drive and volume can have up to 8 partitions, each of which can be mapped to a host LUN.

6. From the **LUN Selected** drop-box, choose the LUN ID to assign. Only unused IDs will be listed.

7. Next, double-click on the icon of the partition you would like to map. The partition should appear in the **Partition Selected** box. Click **OK** and enter the password when prompted.

8. Repeat steps 6 and 7 to map additional partitions.

9. Once all partitions have been mapped, if you choose the LUN Table tab, the newly mapped LUNs should be listed.

- **Deleting a host LUN mapping**

1. In the navigation panel under **Physical View**, click on the host channel where you would like to delete a host LUN mapping.

2. In the sub-navigation window, click on a host channel ID number. The **LUN Table** for the host channel will be displayed.

3. Choose the **LUN Mapping** tab, and then the **Delete** sub-tab.

4. To delete a LUN mapping, double-click on it in the **LUN Map** table until the ID is displayed in the **LUN Selected** box, then click **OK**. When prompted for a password, enter it and click **OK**.

5. The LUN mapping should no longer be listed in the **LUN Map** table. Repeat step 4 to remove additional LUN mappings.

4.13 SAF-TE / I²C / Fault Bus

Support for SAF-TE, I²C, and Fault Bus devices and monitoring allows RAIDWatch to display current status for SAF-TE and I²C, and provides status displays and some minimal configuration of Fault Bus.

To display SAF-TE, I²C, or Fault Bus, under **Physical View** in the navigation panel, choose the icon for the one you want. For SAF-TE and I²C, you must then double-click on the specific device in the sub-navigation panel.

4.13.1 SAF-TE and I²C

Both SAF-TE and I²C are enclosure-proprietary monitoring technologies which must be configured by the enclosure manufacturer.

RAIDWatch is capable of displaying any information provided by a SAF-TE or I²C device. Included among the kinds of information typically provided is status for:

- Power Supplies
- Fans
- Ambient Temperature
- UPS

Click on the appropriate icon to display the status readout.

4.13.2 Fault Bus

Access the Fault Bus by clicking on the Fault Bus icon in the navigation panel of **Physical View**.

To monitor the current status, click on the Fault Bus icon in the **Monitor** window. The current status of the Power Supply, Fan, Temperature, and UPS should be displayed.

To modify the current Fault Bus settings, choose the **Operation** tab. Under Operation, choose the **Device** tab to enable or disable each device monitor.

To change the active signal settings, choose the **Signal** tab under **Operation**, then select either High or Low for each device monitor.

To save any setting changes, click **OK** before configuring some other part of the RAID or the controller.

4.14 Defining Enclosures

There are two different cases with customized enclosures: **Case 1** is an enclosure window pre-defined by system vendors. The enclosure may be presented in a front view drawing or photograph. The user may have to add devices into the pre-defined spaces. **Case 2** is an enclosure window showing only spaces representing device canisters. In case 2, you have to start from the beginning to arrange devices in an enclosure.

Both cases allow you 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).

Creating an enclosure

1. Display the Enclosure window. To display it, click on the **Enclosure** command button (Case 1) or select the **Enclosure** command from the **Open** menu (Case 2).

2. The Enclosure window has pre-configured spaces that resemble controller and drive canisters of your enclosure. The enclosure window might have been defined by your system vendor.

3. 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. Next click on a drive icon from the navigation panel, then click the **Add** button. 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). Repeat to add more drives. Using this same method, monitoring device icons can also be added to defined enclosures.

4. 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.

5. 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.

6. 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.

- **Removing a drive from an enclosure**

1. Click on the target drive.

2. Click the **Remove** button.

4.15 Displaying the Event Log

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.

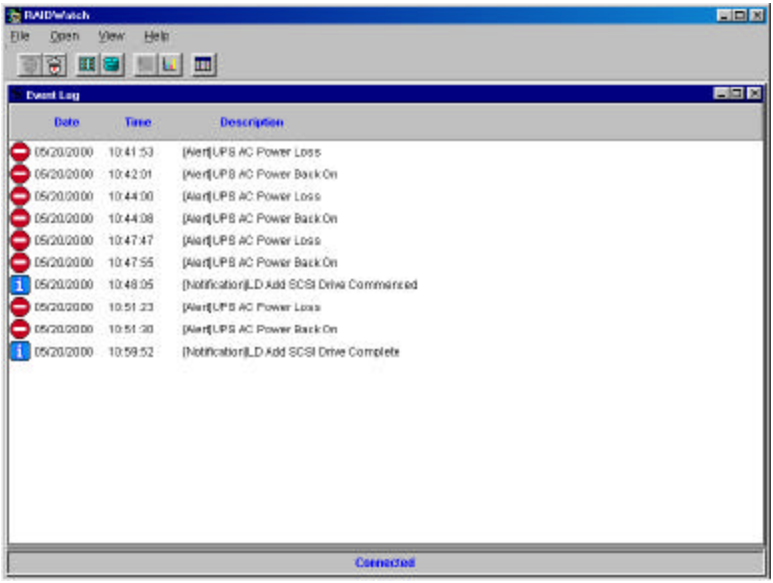
Note that the Event Log only displays events that occur while RAIDWatch Manager is running.

- **To display the event log**

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.



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.

4.16 Monitoring Statistics

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 monitor current data traffic on the disk array

- 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.

4.17 Dynamic Logical Drive Expansion

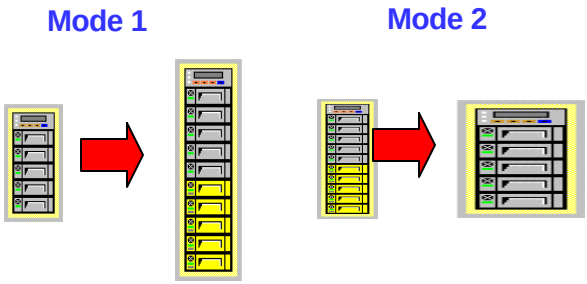
What Is It and How Does It Work?

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 (a new feature in controller firmware versions 2.11 and later) allows users to add new SCSI hard disk drives and expand a RAID 0, 3 or 5 Logical Drive without powering down the system.

4.17.1 Two Modes of Dynamic LD Expansion

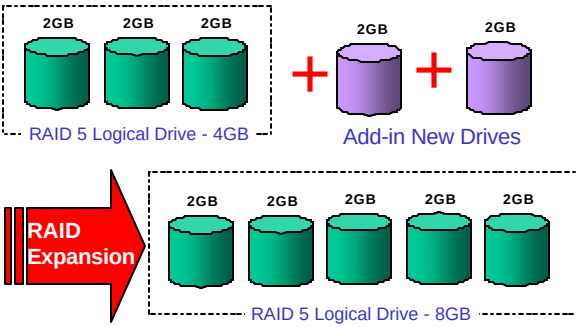
There are two modes of Dynamic Logical Drive Expansion.

Dynamic Logical Drive Expansion



Mode 1 Expansion 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.

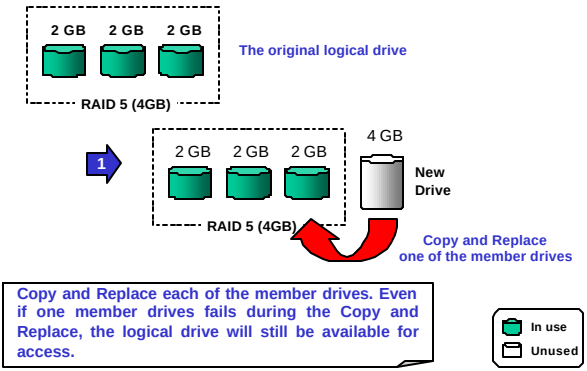
RAID Expansion - Mode 1



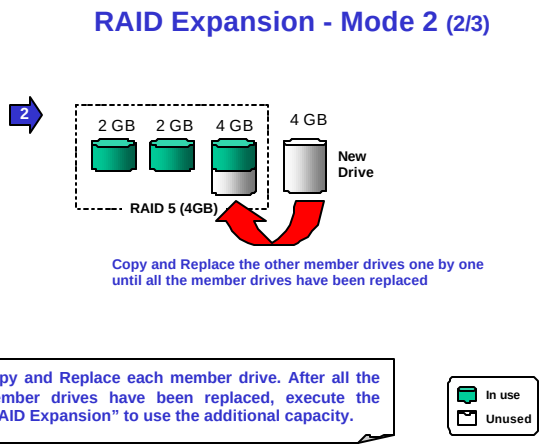
In the figure above, new drives are added to increase the capacity of a 4-Gigabyte RAID 5 logical drive. The two new drives increase the capacity to 8 Gigabytes.

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

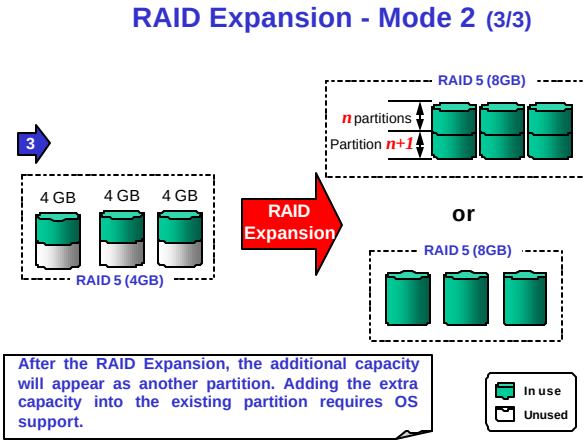
RAID Expansion - Mode 2 (1/3)



The figure above 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.



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.



IMPORTANT: The increased capacity from either expansion type will be a new partition.

Three new drives are scanned in (see section 4.6 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 mapped to a host LUN in order for the HBA (host-bus adapter) to see it.

4.18 Redundant Controller

For SCSI-to-SCSI controllers, RAIDWatch Manager is capable of configuring some aspects of redundant controller implementation.

Under the **Configuration** window, choose the **Controller** tab, the **Operation** sub-tab, and the **Redundant** sub-sub-tab. From this window pane, you can set the following redundant controller parameters:

- **Controller Unique Identifier:** enter a number between 1 and 65535.

- **Redundant Controller Configuration:** from the drop-box, choose Disabled, Primary, Secondary, or AutoConfigure.

- **Redundant Controller Channel:** The is a hardware-dependent function. Once the controller-controller negotiation is completed, this drop-box will display the interface used for communications. Newer line of RAID

controllers does not allow a switch between SCSI and RS-232.

All other Primary and Secondary redundant controller features must be configured using the controller's front panel. Please refer to your RAID controller instruction manual for details.

5 Notification Configuration

This chapter discusses how to configure event notifications. Topics include the following:

- Description of the notification function
- Configuring notification options
- Configuring a modem
- Configuring fax notification
- Configuring pager notification
- Configuring broadcast notification
- Configuring e-mail notification
- SNMP Trap notification

5.1. Notification Processing Center

A management program is much more useful when it includes a reporting or notification function. For this reason, RAIDWatch allows you to configure notifications which occur in response to various disk array events. The notification application is called, "Notification Processing Center" or NPC.

The notification function 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 even when he or she is at home, or in other places around the globe.

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.

5.2 Before You Begin

Before RAIDWatch's event notification can be used, some adjustments may need to be made to your OS's configuration. See *2.3 Platform Requirements* for information about pre-installation configuration needs. Many of the steps described in section 2.3 directly relate to event notification, particularly for Windows OSes.

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.

5.3 Basic Running Requirements

Notification Processing Center (NPC) is a separate software application from RAIDWatch primary and secondary agents, and from RAIDWatch Manager, and it must be manually configured and run (and re-run after a host computer reset) in order for notifications to be sent out.

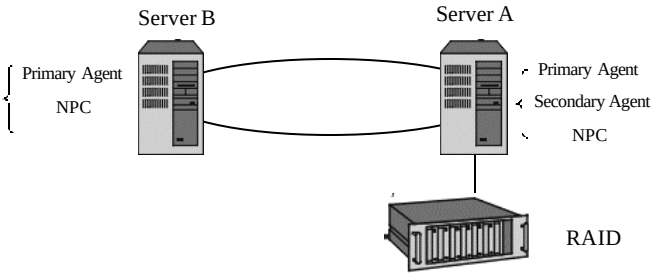
Installation and configuration of the NPC is accomplished using the same program and interface as that for the installation and configuration of the Primary and Secondary agents.

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 NOTE:

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.

5. 4 Redundant NPC Modules



NPC and Primary Agent should be 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 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.

5.5 Severity Levels

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 provides example events for each level:

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

Level 2 Severity Events (examples)

- SCSI Target Select Timeout
- SCSI Target Phase/Signal Error
- SCSI Target Unexpected Disconnect
- SCSI Target Negotiation Error
- SCSI Target Timed Out
- SCSI Target Parity Error

- SCSI Bus Reset Issued
- 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

Level 3 Severity Events (example)

- SCSI Drive Failure

NOTE: The current version of NPC does not include event notification configuration based on event severity. Future versions of NPC may support event severity based notifications.

5.6 Configuring Notification Options

In order to configure NPC notification modes, you must run the RAIDWatch installation procedure for your particular OS and arrangement (e.g., local or remote). Once you start the installation procedure (see chapter 2 for information on how to do this), choose "Configure Only" and then double-click "Notification" in the upper left part of the screen. NPC configuration options should be listed and include:

- Modem

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

From the list of notification method options, choose the one you would like to configure and click on it.

5.7 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 Note:

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

5.8 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:

1. Personal Fax
2. Windows Messaging
3. 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.

    1. Telephony service must be enabled and running.

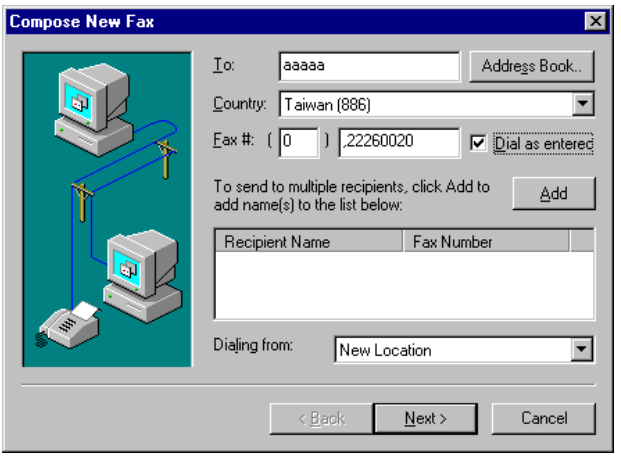
2. Listed below are examples for configuring fax service under Windows NT. Some of them must be configured during the installation process of Personal Fax.

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.

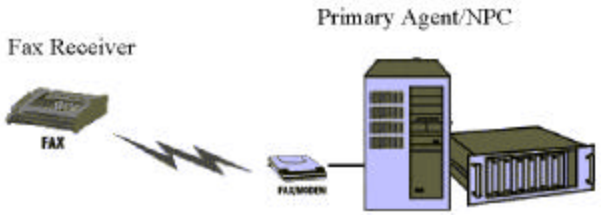
Fax service requires Windows Messaging to send fax via email.



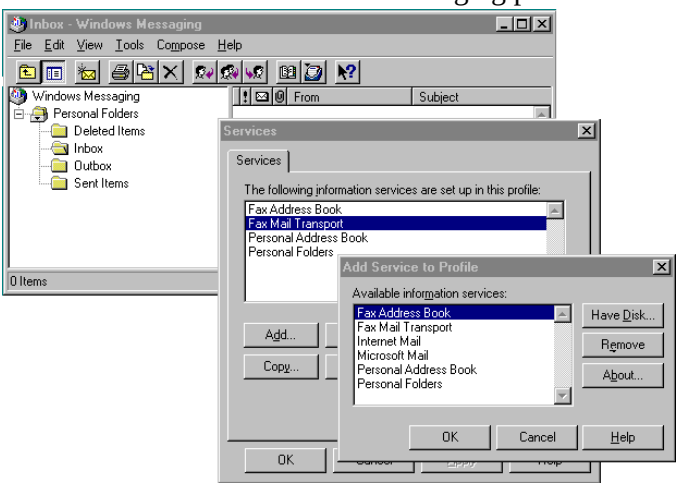
- You may add more recipient machines later using the RAIDWatch configuration utility (as will be discussed in the proceeding discussions).

- Proceed to complete the installation process.

- Diagrammed below is the topological view of the relationship between fax receiving machines and the fax sending computer.



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



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.

5.9 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.

5.10 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".

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.

5.11 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.

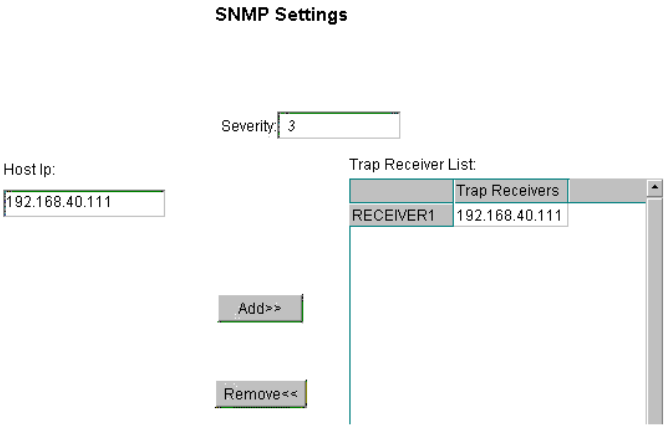
When you have finished, click **Add** to have NPC send event notification e-mail messages to this e-mail address. Next, either enter another e-mail address to receive notices, choose another NPC item to configure, or click **Close** to save changes and exit the installation procedure.

5.12 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.



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

6 Event Monitor

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

- Connection
- Description of the functions
- Configuring display options
- Real-time monitoring of disk arrays

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) a system administrator to quickly respond to system alerts. It compensates for 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 RAIDWatch Manager online using the current connection with disk array.

6.1 Feature Summary:

The list below summarizes **Event Monitor**:

1. Concurrent monitoring of multiple arrays
2. RAID controller real-time event notices provide information about various event occurrences,

including the time when an event occurs, event severity, and event description

3. Displaying record of up to 1024 events per connection to a controller.

4. Graphical representation of disk array components for ease of locating problems

5. User-configurable display of events by severity and time of occurrence

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 Infortrend's entire line of Fibre-to-Fibre, Fibre-to-SCSI, and SCSI-to-SCSI RAID controllers
- Communicates with the controllers over a LAN, the Internet, over the SCSI bus or Fibre channel
- Illustrates graphically and clearly the relationship between various disk array elements
- Supports remote management over the network of an agent running Windows NT, Solaris, or Linux via the TCP/IP protocol
- Real-time monitoring of physical drive, power supply, fan, and other component status

Note on Installation:

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

6.2 Before You Begin

1. Event Monitor must be installed with RAIDWatch Manager. Executing the program does not require running RAIDWatch Manager program. However, RAID agents are necessary to be running as the communication bridges between controller and RAID servers.

2. Event Monitor can be running locally or remotely via browser

3. 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

4. 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.

Basic Running Requirements

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

1. Please be sure that your system meets the system requirements listed in Chapter 2.

2. The RAID disk arrays are properly installed.

3. 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.

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

6.3 Starting Event Monitor

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.

- **Under Windows (NT 4, or 2000) OSes:**

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

- **Under Unix OSes (Solaris 7 SPARC or x86, HP UX 11, or Red Hat Linux 6.1):**

Under **Unix systems** the Primary Agent, Secondary Agent, and NPC must be started manually each time the host computer is reset.

To start the Primary Agent, Secondary Agent(s), and NPC 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 NPC

Agents are now running. The next step is to start the Event Monitor.

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.

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:

   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.

2. When the HTML page is open, you will be prompted to enter the IP address of your Primary Agent host.

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 the *Connecting and Disconnecting from a Disk Array* section of this chapter.

NOTE: 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.

Local

- **Starting Event Monitor locally or via LAN under the Windows (95, 98, 2000 or NT4) environment:**

  1. From the **Start** menu, select **Programs → Event Monitor**.

     -or-

     Double-click the 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).

4. 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.

6.4 Exiting Event Monitor

Exiting from Event Monitor terminates the current management session with the disk array system.

Exiting from Event Monitor:

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

-or-

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

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.

6.5 Connecting and Disconnecting from a Disk Array

One benefit of Event Monitor 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.

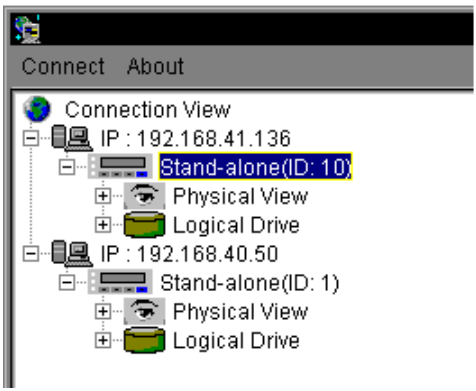
The following discusses how to connect to a disk array.

- **Connecting to a RAID system while working from the local Primary Agent host:**

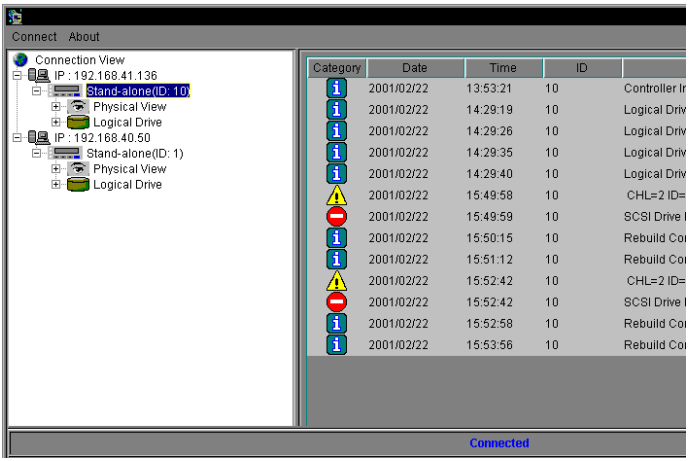
1. From the **Connect** menu, select **Open**. Repeat this process to select all the Primary Agent hosts.

Click the **Default** button.

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).



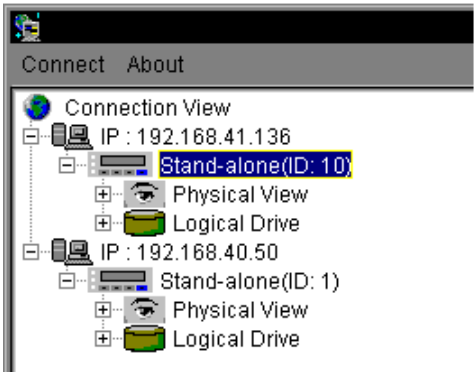
3. The connection is successful when the list of events appears and the Physical view and logical unit subtrees appear in the navigation panel.



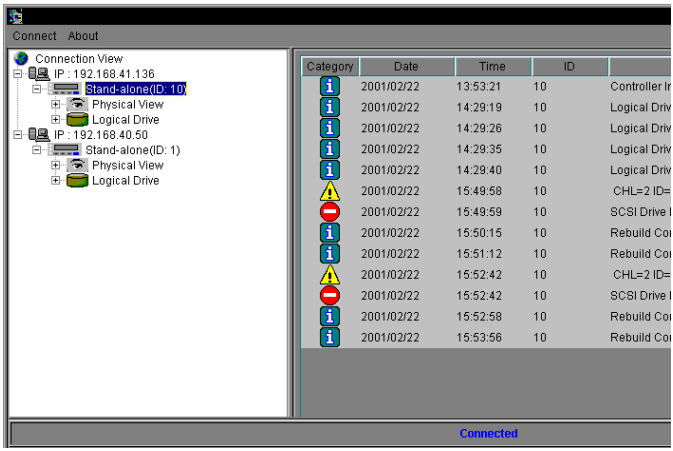
Connecting to a RAID system from a distant host:

1. From the **Connect** menu, select **Open**. Repeat this process to select all the Primary Agent hosts.

2. 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).



3. The connection is successful when the list of events appears and the Physical view and Logical unit subtrees appear in the navigation panel.



- **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.

Display Controls

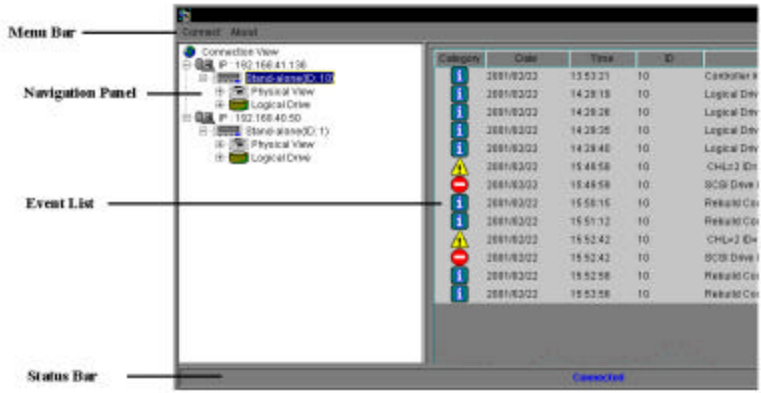
Just like RAIDWatch Manager, Event Monitor works entirely with windows, buttons, and icons to facilitate the display of various disk array conditions. These windows follow the standard Windows and Unix OS "Look and Feel" specifications, thus steps for manipulating elements and windows within any Event Monitor window generally conform to standard procedures.

6.6 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.

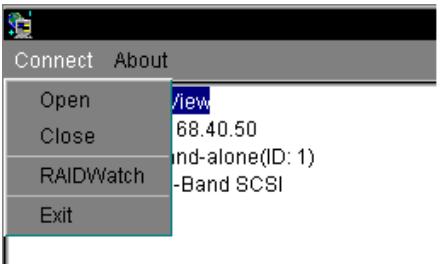
Basics

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.



- 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 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 allows you to **Open**, **Close**, switch to **RAIDWatch** Manager, and **Exit** the program.
  - The **About** menu displays software version and copyright information. It also provides access to Help files. Each of these commands will be discussed below.



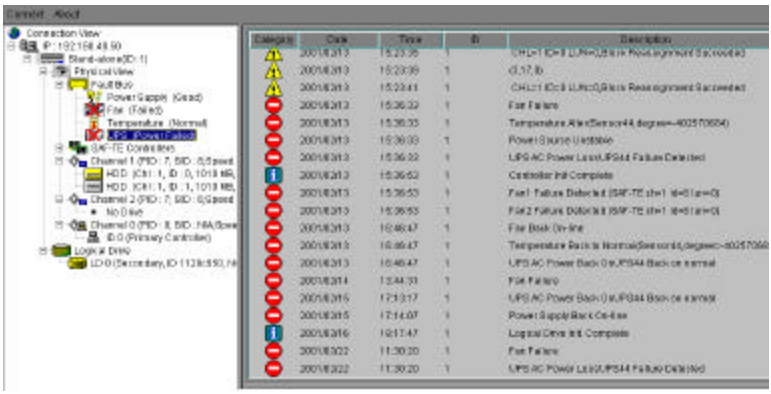
- The **Open** command allows you to connect to a Primary Agent server.
- The **Close** command allows you to terminate the connection to a Primary Agent server. Before executing this command, select the Primary agent IP address you want to disconnect on the navigation panel. The selected item will be highlighted.
- The **RAIDWatch** command allows you to start RAIDWatch Manager and configure the selected RAID system.

- The **Exit** command is used to end the current Event Monitor session.

6.6.1 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.



6.6.2 Using the Event List

Event List displays all the event messages recorded ever since the installation of Primary agent.

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, Notification, 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.

6.6.3 Event Severity Levels

Like 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 5.4 for more details on event severity.

A Command Summary

This appendix describes the commands available in RAIDWatch Manager. These commands are presented either in menus or as command buttons on the toolbar.

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.

RAIDWatch File Menu Commands

Command	Description
Connect <C>	Connects 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 RAIDWatch Manager.
Agent <A>	Activates the **Connect to RAID Agent** dialog box.
Exit <X>	Closes the RAIDWatch Manager

	application.

RAIDWatch Open Menu Commands

Command	Description	
Enclosure <E>	Displays the Enclosure window. This command has the same function as the Enclosure command button on the toolbar.	
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.

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 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.)*

RAIDWatch Help Menu Commands

Command	Description
Contents <C>	Displays RAIDWatch Manager on-line help.
About <A>	Displays information about the RAIDWatch Manager program.

.

5.2 Before You Begin

Before RAIDWatch's event notification can be used, some adjustments may need to be made to your OS's configuration. See *2.3 Platform Requirements* for information about pre-installation configuration needs. Many of the steps described in section 2.3 directly relate to event notification, particularly for Windows OSes.

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.
RAIDWatch <R>	When a disk array IP address is selected, this command opens the RAIDWatch Manager application.
Exit <E>	Closes the Event Monitor application.

Event Monitor About Menu Commands

Command	Description
Help <H>	Displays on-line help.
About <A>	Displays information about the Event Monitor program.

Command Buttons

This section describes the various command buttons provided to facilitate execution of commonly used commands. These buttons are on the toolbar.

Command Button	Description
Connect	Connects 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 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.
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 RAIDWatch application window. It has the same function as the Tile In-Window command in the View menu.

B Troubleshooting

This appendix provides troubleshooting tips for common problems you may encounter while using RAIDWatch Manager. It includes the following topics:

- Common oversights
- Error codes
- Error messages

B.1 Common Oversights

Check the following first before you run RAIDWatch or if you are having trouble.

Check Platform Requirements

Review section *2.3 Platform Requirements* to make sure that all OS-specific installation configuration steps have been completed.

Check 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.)

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 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.

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).

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 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 RAIDWatch Manager command.

What You Can Do : Please check the firmware version of controller to see if it is compatible with your version of RAIDWatch. 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 RAIDWatch Manager, Primary agent, and Secondary agent are compatible. You should also contact your technical support engineer.

Code: RC=7

Meaning : 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 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 RAIDWatch agents.

B.3 Error Messages

You may encounter some of the following 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 RAIDWatch Manager error messages.

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.

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.

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.

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 RAIDWatch Manager error messages should be fairly self-explanatory.

C Glossary

Fault Bus A proprietary enclosure management interface. It is intended to be used to warn RAID managers of enclosure environment component failures.

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 **H**ost-**B**us **A**dapter – 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.

I^2C **I**nter-**IC** – a type of bus designed by Philips Semiconductors which is used to connect integrated circuits. I^2C is a *multi-master bus*, which means that multiple chips can be connected to the same bus and each one can act as a master by initiating a data transfer.

In-Band SCSI (sometimes "in-band" or "In-band") A means whereby RAID management software can use SCSI cabling and protocols to manage a controller. (Note: in-band SCSI is typically used in place of RS-232 for controller management.)

ISEMS **I**nfortrend **S**imple **E**nclosure **M**anagement **S**ystem – an I^2C-based enclosure monitoring standard developed by Infortrend Technologies, Inc.

JBOD **J**ust a **B**unch **o**f **D**rives – non-RAID use of multiple hard disks for data storage.

JRE **J**ava **R**untime **E**nvironment – 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 **L**ogical **U**nit **N**umber **–** 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 **N**etwork **A**ttached **S**torage – a RAID enclosure that includes a network interface so that the disk array can be directly connected to a LAN.

NPC **N**otification **P**rocessing **C**enter – a software application included with 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 RAIDWatch module which manages secondary agents and supports both NPC and 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.

RAIDWatch Manager The GUI RAID interface part of RAIDWatch.

SAF-TE **S**CSI **A**ccessed **F**ault-**T**olerant **E**nclosures – an evolving enclosure monitoring device type used as a simple real-time check on the go/no-go status of enclosure UPS, fans, and other items.

SAN **S**torage **A**rea **N**etwork – 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.

SCSI **S**mall **C**omputer **S**ystems **I**nterface (pronounced "scuzzy") – a high-speed interface for mass storage that can connect computer devices such as hard drives, CD-ROM drives, floppy drives, and tape drives. SCSI can connect up to sixteen devices.

Secondary Agent The RAIDWatch module which manages and monitors a RAID controller and receives RAIDWatch Manager commands via the primary agent.

S.M.A.R.T. **S**elf-**M**onitoring, **A**nalysis and **R**eporting **T**echnology – 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. Onboard 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.

D RAID Levels

This appendix provides a functional description of Redundant Array of Independent Disks (RAID). This includes information about RAID and available RAID levels.

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 described in detail each of the commonly used RAID levels.

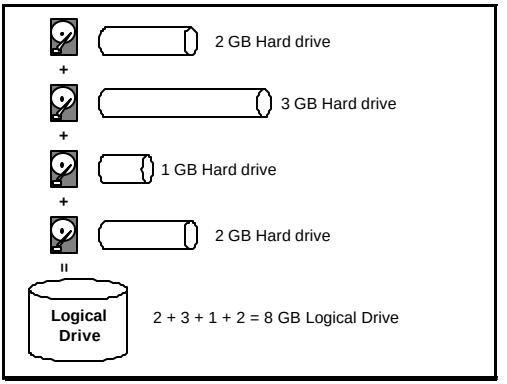
Non-RAID Storage

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.

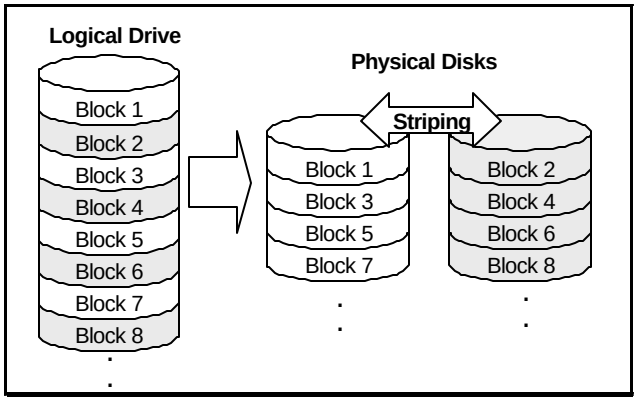


RAID 0

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.

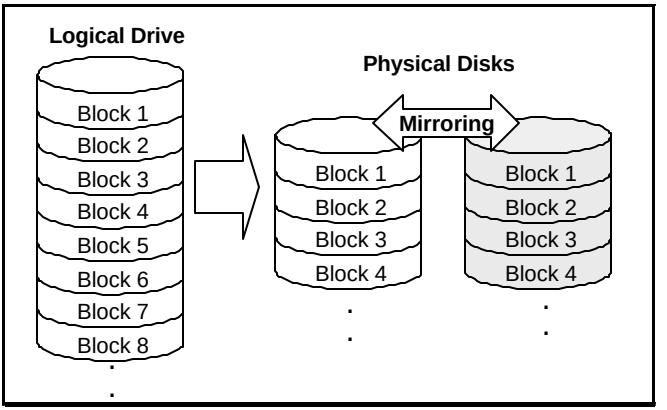


RAID 1

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 1GB SCSI drives, for example, would create a single logical drive with a total disk capacity of 2GB. 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.



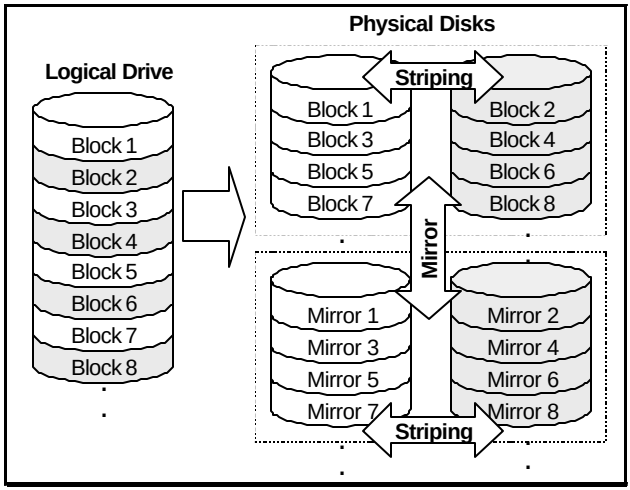
In addition to the data protection RAID 1 provides, this RAID level also improves performance. In cases where multiple concurrent I/Os are occurring, these I/Os can be distributed between two disk copies, thus reducing total effective data access time.

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.



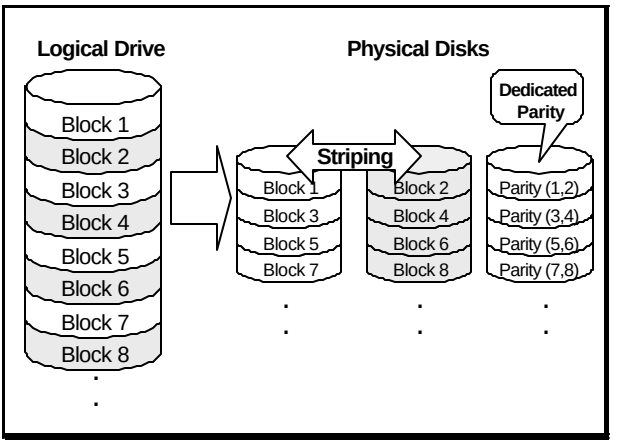
RAID 3

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 1GB SCSI drives, for example, would create a single logical drive with a total disk capacity of 3GB. 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.

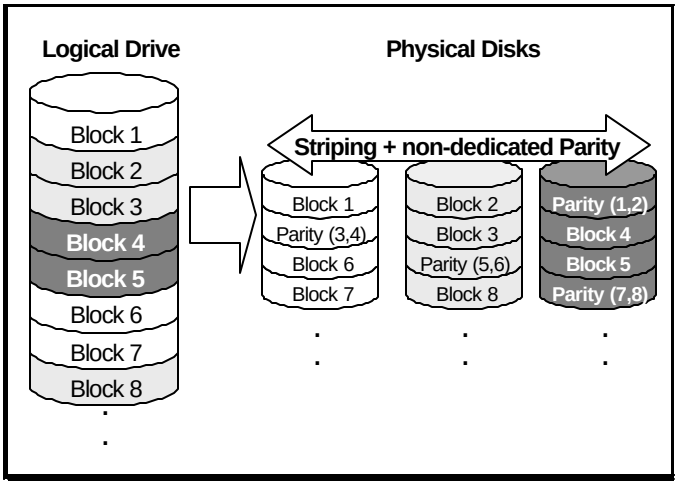


RAID 5

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/O's that do not span multiple drives.


Logical Drive
Physical Disks
Block 1
Block 2
Block 3
Block 4
Block 5
Block 6
Block 7
Block 8
Striping + non-dedicated Parity
Block 1
Parity (3,4)
Block 6
Block 7
Block 2
Block 3
Parity (5,6)
Block 8
Parity (1,2)
Block 4
Block 5
Parity (7,8)

E Additional References

This appendix provides direction to additional references that may be useful in creating and operating a RAID, and in using RAIDWatch and 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:

java.sun.com

The JRE download website URL:

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

RAIDWatch Update Downloads & Upgrading

Infortrend will provide RAIDWatch agent and RAIDWatch Manager updates periodically both via our ftp server and as new CD releases. Our FTP site can be accessed via our websites at:

www.infortrend.com

www.infortrend.com.tw

Uninstalling RAIDWatch

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

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