Bosch RAIDWatch

BOSCH

en User Manual

Table of Contents

1 Introduction

1.1 Bosch RAIDWatch Overview

1.1.1 Product Description

Bosch RAIDWatch is a Java-based program specifically designed for use in managing Bosch's RAID subsystems.

Bosch RAIDWatch provides a user-friendly interface that graphically represents disk array elements and simplifies the normally complicated process of array configuration. Bosch RAIDWatch also provides real-time reporting on the status of the entire array, thus making the task of monitoring disk arrays virtually effortless. The functionality provided in the Event Monitor sub-module in the previous Bosch RAIDWatch versions is now integrated into the main management screen and the Bosch RAIDWatch Server.

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

1.1.2 Feature Summary

The list below summarizes Bosch RAIDWatch features:

- Several RAID level support
- RAID level migration on a per logical drive basis
- Each logical drive can be accessed by both controllers
- 512K/1024K stripe size supported
- User-friendly graphical interface displays multiple information windows for simultaneous managing and monitoring of multiple RAID subsystems
- Standard TCP/IP connections to an Internet agent for full-featured worldwide remote management over the network
- Communicates with the subsystems over a LAN (out-of-band) and the Internet, and over the SCSI bus or iSCSI using in-band command protocols
- Auto Discovery function searches available subsystems on the network for user-convenient RAID connections
- Severity levels and display sequences are configurable for event notification via Email, Fax, ICQ, MSN Messenger, SMS Short Message, LAN Broadcast, and SNMP Traps
- Provides password protection to guard against unauthorized modification of disk array configuration; passwords are set for Maintenance (user) and Configuration (administrator) login access
- A Centralized Management utility that provides Online monitoring of Bosch RAID subsystems in the network
- Compatible with most popular computer working: Windows operating systems compatible with the Java Run-time Environment

1.2 Featured Highlights

1.2.1 Graphical User Interface (GUI)

Bosch RAIDWatch manager is designed for ease-of-use. It uses symbolic icons to represent configuration levels, physical and logical drives, and logical volumes on the screen, and to identify the current configuration of a disk array system. Pull-down, right-click, and pop-up menus are used with all command options.

You need only point-and-click a mouse button to select an icon or command. The program also displays the current status of various disk drives or enclosure components by changing the color of their respective LED 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 just a few mouse clicks.

The Central Management utility, an entrance portal to Bosch RAIDWatch, provides convenient monitoring of Bosch RAID subsystems in the network. The utility also provides and instant event log, which can be exported to a text file.

1.2.2 Enclosure View

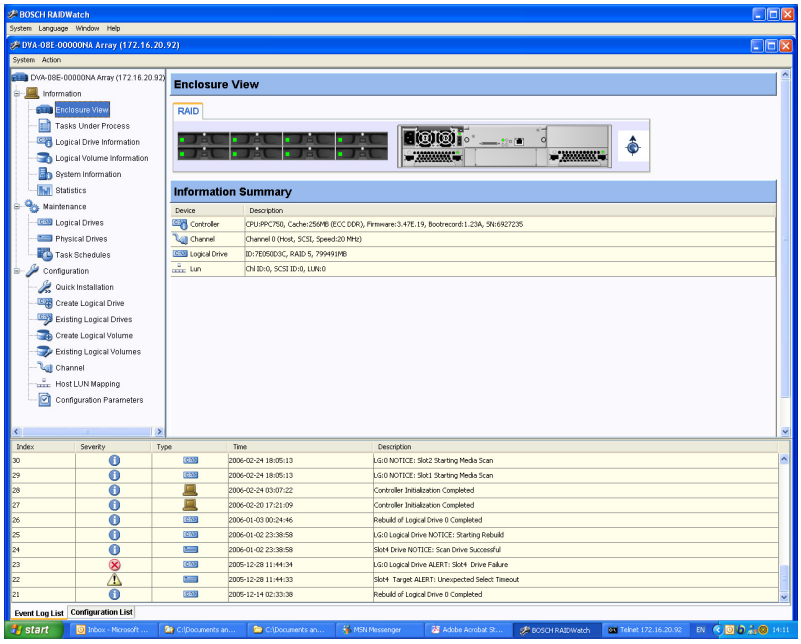


Fig. 1.1 Enclosure View Window

The enclosure window shown in *Figure 1.1* provides real-time reporting of the status of enclosure components, including components that can be accessed through the front or the rear side of an enclosure. When a drive fails, the system highlights the corresponding LED icon of the failed drive by changing its display color. When you remove a drive, its icon is removed from the enclosure window. This feature is particularly useful in cases when a drive fails, and you need to identify its exact location for subsequent replacement.

The enclosure window also appears in other configuration windows showing the logical relationship between the member drives of a logical configuration. Drives belonging to the same logical drive will be displayed in the same color. This allows you to easily identify members of different configurations.

1.2.3 Powerful Event Notification Function

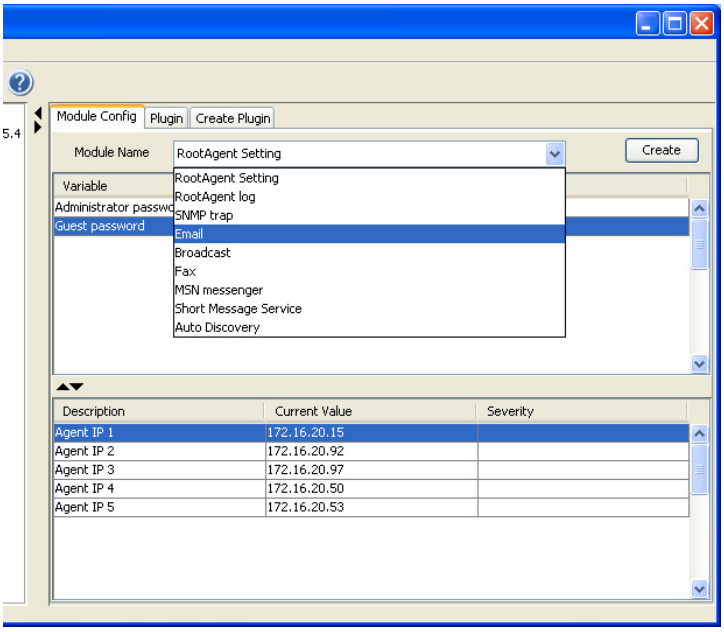


Fig. 1.2 Event Notification Function

Bosch RAIDWatch can notify system administrators of event occurrences and status changes in the RAID system. Event Notification is managed by a Bosch RAIDWatch's sub-module, Bosch RAIDWatch Server that is installed onto a management station and runs independently from the main manager program. Notifications can be sent via the Internet as email messages, via a local network as a broadcast message, SNMP traps, ICQ or MSN messenger, SMS short message, or via fax/modem as fax messages without location constrain. To setup the event notification options, please refer to *Section 4 Bosch RAIDWatch Server Options* in this manual.

1.2.4 Java-based Remote Management

Bosch RAIDWatch supports local or remote management of Bosch RAID subsystems over a LAN/WAN or the Internet using the TCP/IP protocol. Bosch RAIDWatch can be highly flexible to access to a RAID subsystem. When "Custom" installation is chosen during the installation process, three (3) installation schemes are available for you to select using the install shield program. (See *Figure 1.3*) Below sections are the explanations of the three options.

NOTICE!

The default setting of Bosch RAIDWatch installation is using basic installation. Basic installation is the same as Mode 1, Centralized Management, in Custom installation.

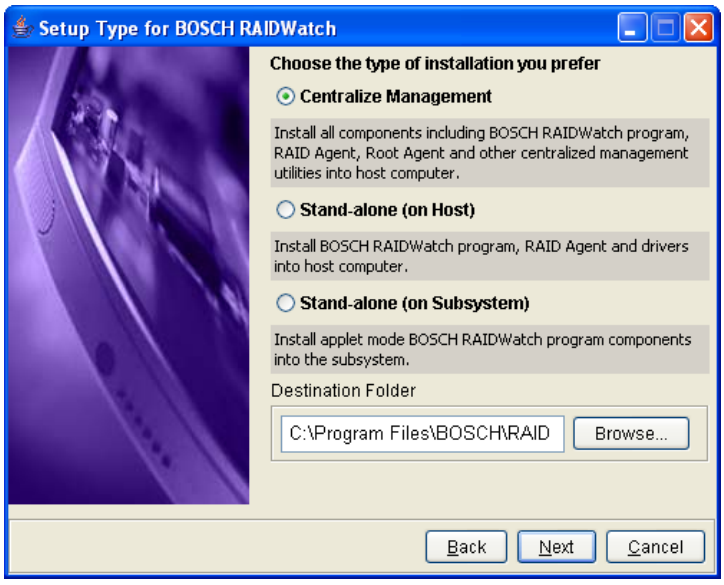


Fig. 1.3 Installation Options

Mode One: Centralized Management

For centralized or one-to-many configurations using either the Ethernet or in-band host connection to the RAID subsystems. The root agent and sub-modules, including the Bosch RAIDWatch Server and Bosch RAIDWatch Gate, are included. Necessary RAID agents are installed onto the management computer.

Mode Two: Stand-alone (on Host)

For configurations depending on the existing SCSI or iSCSI host connection for Bosch RAIDWatch-to-RAID communications. Servers in DAS (Direct Attached Storage) environments, SCSI host models for example, require RAID agents for Bosch RAIDWatch commands to pass through and communicate with RAID arrays. RAID agents are installed onto the servers that are directly attached with a RAID subsystem.

Mode Three: Stand-alone (on Subsystems)

For remote and server-transparent management using an Ethernet connection to RAID subsystems or RAID controllers. The manager program is installed on the RAID subsystem itself. The RAID subsystem then uses a segregated disk space, called the “reserved space,” to store the program files. The array is accessed by invoking a Java Applet on a web browser that runs anywhere in the network.

NOTICE!

RAID agents are embedded in the RAID subsystem firmware. When subsystems are installed in Mode 2 or Mode 3, the management station running in Mode 1 can manage the Bosch RAIDWatch components. This way, multiple and/or distant arrays can be managed by a single management station.

Access Requirements

Three (3) installation schemes for different access requirements are discussed below.

NOTICE!

The discussions below do not include all possibilities. Bosch RAIDWatch supports various configurations and the combinations of machines running components installed in any of the three different modes.

1. A RAID Server Chosen as the Centralized Management Station: Applied in heterogeneous environments where multiple arrays are serving different hosts/applications and scattered in distant locations. Access management over the network is achieved through data exchanges between a local or remote Bosch RAIDWatch Manager station (can be a RAID server or not) and RAID agents that are installed on the RAID servers or RAID subsystems themselves. The management center and the Bosch RAIDWatch station can be two different machines.
   A Root agent is installed on a computer chosen to be the management center. *Figure 1.4* shows a typical connection and *Table 1.1* shows the modules installed and the installation mode required:

Installation	Software Modules
Mode One	Management Center: Root Agent + Bosch RAIDWatch Server utility
Mode Two	RAID Servers (servers A, B, and C) via in-band
Mode Three	Independent Array
Java Runtime	Management Station

Table 1.1 Software Modules: Heterogeneous Bosch RAIDWatch Connection

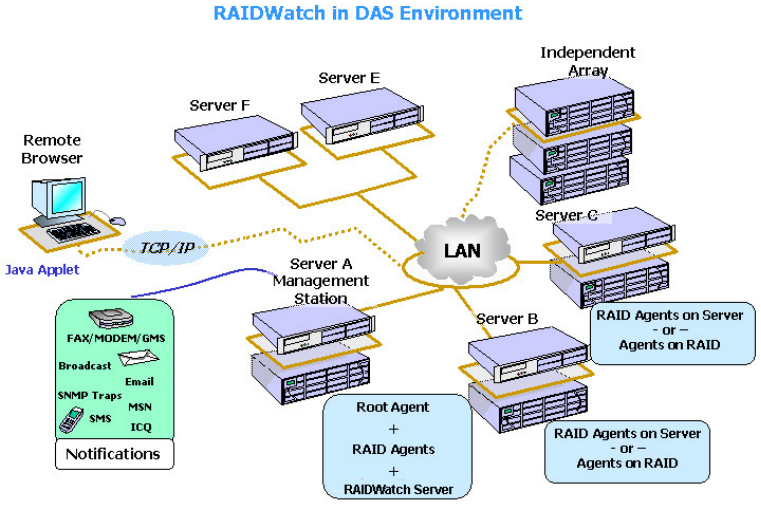


Fig. 1.4 Typical Bosch RAIDWatch Connection – Heterogeneous

2. Using a Workstation as the Management Center: Applied in SAN (Storage Area Network) environments. Access management over the network is directed through exchanges between a remote manager station and Bosch RAIDWatch programs that exist on array hard drives.
   Installing the Bosch RAIDWatch Server and Root Agent onto a management station enables Event Notification. Installing these modules onto two or more management computers also supports redundancy for agents.

Installation	Software Modules
Mode One	Management Center: Root Agent + Bosch RAIDWatch Server utility
Mode Three	RAID Arrays
Java Runtime	Management Station

Table 1.2 Software Modules: Bosch RAIDWatch Connection over Java Applet

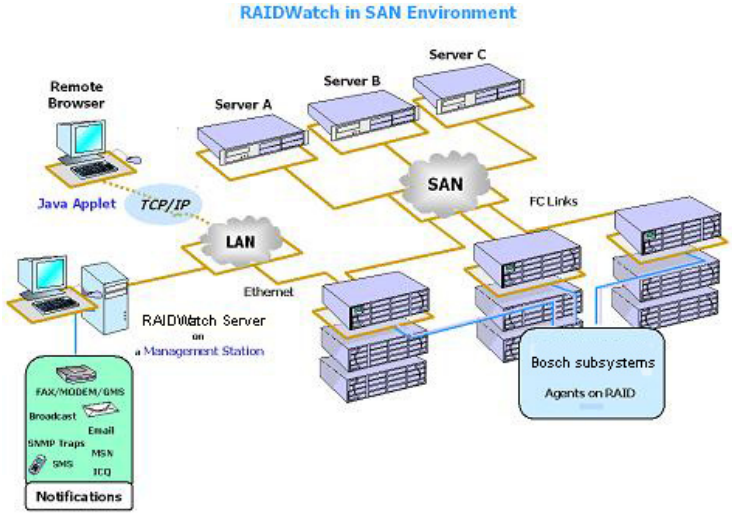


Fig. 1.5 Typical Bosch RAIDWatch Connection – Applet Mode

3. Stand-alone/Out-of-Band (on Host) Installation: This installation provides management access with no centralized management utility. Event notification is provided through an independent NPC utility. Bosch RAIDWatch accesses RAID subsystems over the network through the command exchanges between a manager station and Bosch RAIDWatch programs that exist in array hard drives. The management session and the NPC configuration screen are invoked as a Java Applet.

Installation	Software Modules
Mode Three	RAID Arrays
Java Runtime	Management Station

Table 1.3 Software Modules: Management Only

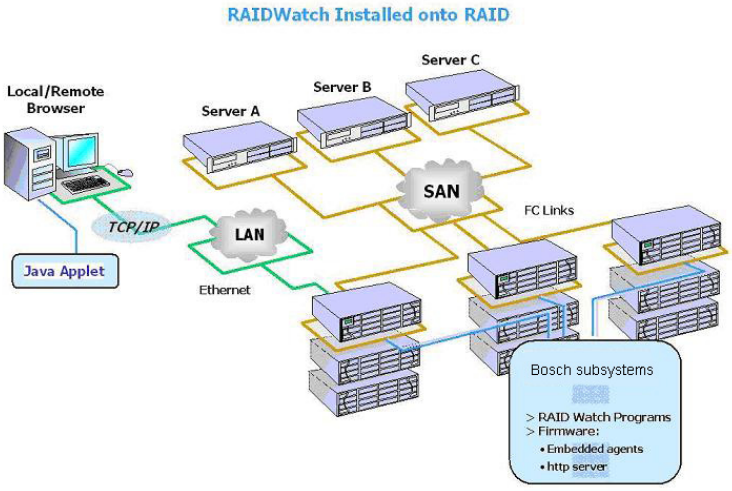


Fig. 1.6 Typical Bosch RAIDWatch Connection – Applet Mode

1.2.5 Multi-Language Support

Bosch RAIDWatch is a useful RAID management tool that is being used worldwide. The software is currently available in three languages: English, German and Japanese. Support for other languages is under development. The language display is easily changed using the language selection on the program menu bar. As soon as a language is selected, the user interface, wizards, and online help display the chosen language.

1.2.6 Password Protection

Bosch RAIDWatch Manager comes with password protection to prevent unauthorized users from modifying the configuration of the RAID system. With the password security feature, you have control over array settings knowing that the currently managed disk array is safe from unauthorized modifications because the correct password must be entered for each access level.

The Bosch RAIDWatch management screen has a navigation tree panel that provides access to functional windows under three major categories:

- Information: An Information login can only access the first level, Information.
- Maintenance: A Maintenance (user) login can access the second level, the Maintenance tasks.
- Configuration: The Configuration (administrator) login has access rights to all three levels, Configuration, Maintenance, and Information.

NOTICE!

The default password for Information categories is 1234.

Passwords for access levels can be set in the Configuration category under the “Configuration Parameters” “Password” settings. Please refer to *Section 7.5 Password*.

1.3 Conceptual Foundation

In order for Bosch RAIDWatch to function properly, different software modules must be correctly installed on different servers and stations in a given LAN or WAN. If you follow the default installation during the installation process, Bosch RAIDWatch will be installed as a centralized management tool into your system.

1.3.1 Centralized Management (Agent-based) Installation

- Bosch RAIDWatch communicates with a RAID subsystem either using the firmware-embedded RAID agents or agents manually installed onto a RAID-attached server. Assuming that a given network has multiple RAID systems, Bosch RAIDWatch can communicate with RAID arrays through the RAID agents installed on the servers or on the RAID subsystems.
- A server is chosen as the main management server. When Bosch RAIDWatch is installed onto this server using the first installation scheme, two important modules are included, Bosch RAIDWatch Server and Root Agent. The Bosch RAIDWatch Server enables automatic notifications of system events, and the Root Agent communicates with multiple RAID subsystems that are not directly attached to this server.
- The main management server will also need Java Run-time Environment (JRE) installed if a system administrator needs to configure the arrays from it.
- *Table 1.4* provides a guide to what modules need to be installed on which servers.

NOTICE!
The items in the lower section of *Table 1.4*, JRE, web browser and/or web server are not included with Bosch RAIDWatch management program; therefore, they must be installed or modified by system users.

- For more information about specific requirements, see *Section 3.1 Requirements*.

	Mode 1 Centralized Management	All Modes	Mode 2 Stand-alone on Host	Mode 3 Stand-alone on Subsystem
Installed Elements	Centralized Management Server	Remote Browser Station	Server w/ RAID Directly Attached (in-band)	RAID Subsystem (Applet Mode)
Root Agent	Yes	-	-	-
RAID Agents	Yes	-	Yes	-
Bosch RAIDWatch Manager	Yes	-	Yes, if it is used to run Bosch RAIDWatch	Yes
Bosch RAIDWatch Server	Yes	-	-	-
JRE	Yes, if it is used to run Bosch RAIDWatch	Yes	Yes	-
Web Browser	Yes	Yes	Yes	-
Web Server	Yes	-	-	Embedded

Table 1.4 Bosch RAIDWatch Module Requirements

1.3.2 Stand-alone (on Host) Installation

Main features of the RAID-based installation method are listed below:

- Bosch RAIDWatch main programs and the RAID agents used to communicate with a RAID subsystem over in-band connection are installed.
- Bosch RAIDWatch runs on the RAID-attached server as a Java program.

1.3.3 Stand-alone (on Subsystem) Installation

Main features of the RAID-based installation method are listed below:

- Bosch RAIDWatch revisions 2.0 and above support installation to array hard drives. A portion of the drive capacity (256MB of disk space) is segregated and formatted on each hard drive. This segregated portion is called a “reserved space.” Once installation begins, Bosch RAIDWatch’s main programs are automatically distributed to the reserved space.

NOTICE!

The Bosch RAIDWatch 2.0 or above installation only executed when hard drive is formatted or at least one logical drive exists. Use LCD panel or RS-232 terminal program to create a logical drive when you are using new hard drive before installing Bosch RAIDWatch 2.0 or above version.

- There is no need to install the Bosch RAIDWatch program to your management computer.
- The RAID subsystem can be accessed from a remote station running a web browser. Bosch RAIDWatch now runs in Java Applet mode. Applet is executed when the connection is established between a remote browser and the RAID subsystem. Web browsers, which are often equipped with Java virtual machines, can interpret applets from web servers.
- The controller firmware has an embedded HTTP server. Once properly configured, the controller/subsystem’s Ethernet port behaves like an HTTP server.

2 Bosch RAIDWatch Considerations

Before you begin installing Bosch RAIDWatch, the following items should be considered:

- Background Information – See *Section 2.1 Background Information*
- Definition of Terms – See *Section 2.2 Definition of Terms*
- Operating with Spare Drives – See *Section 2.3 Operating with Spare Drives*
- Operating without Spare Drives – See *Section 2.4 Operating without Spare Drives*
- Before You Start – See *Section 2.5 Before You Start*

2.1 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 several levels and multi-level configurations including RAID 10, 30 and 50. RAID levels 1, 3 and 5 are the most commonly used levels.

Bosch disk array controllers support hot-swapping so that 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 is automatically configured into the array and reconstruction will commence.

2.2 Definition of Terms

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

- Physical drives. These are the actual drives installed into the enclosure drive slots. These drives are displayed in Enclosure View and the Front View of different configuration windows.
- Spare drives. These are physical drives that serve as backups. When a drive fails, the spare automatically joins the array and data reconstruction commences immediately. Dedicated and Global Spares are shown in different colors. A Dedicated Spare appears in the same color as other members of the logical drive it belongs to. A Global Spare uses the default color (black). Both Dedicated and Global Spares have an orange cross superimposed on them.
- 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 in case another drive fails.
- Failed drives. These are physical drives that fail due to some type of error. Failed drives appear with red LED marks on their respective icons.
- Logical drives. Logical drives are the combinations of multiple physical drives. Combining physical drives into logical drives gives you a disk array with a certain RAID level. To view logical drives, select “Existing Logical Drives” under the navigation menu tree.
- Logical volumes. Volumes are the combinations of several 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, select “Existing Logical Volumes” under the navigation menu tree.

2.3 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 rebuilding data in the background.
- Depending on system design, it may be possible to remove a defective drive and replace it with a new drive without shutting down the system (hot-swapping). All Bosch subsystems support drive hot-swapping.
- The replacement drive must then be assigned as a new spare drive.

2.4 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). All Bosch subsystems support drive hot-swapping.
- If the replacement drive is installed on the same channel and ID (the original drive slot where the faulty drive was), you can then proceed with data rebuilding.
- If the replacement drive is installed on a different channel or ID (different drive slot) or the periodic drive scan function has been disabled, you need to scan in the new drive first, and then assign it as a spare drive of the logical drive which had a drive failure. Data rebuilding will have to be manually initiated.

CAUTION!

- Although the RAID system provides uninterrupted disk access even after a disk failure, do not leave a failed drive unattended. 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.
- 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 View window or Logical Drive Information window to locate exactly which physical drive has failed.

2.5 Before You Start

Bosch 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 require the correct password before proceeding.
By default, the Bosch RAIDWatch Manager station comes with a password for login as an Information viewer. For information on how to set a password and other security features, see *Section 7.5 Password*.

3 Installation

This chapter describes Bosch RAIDWatch requirements and the installation procedure.

3.1 Requirements

This chapter describes the minimum hardware and software requirements for Bosch RAID-Watch.

3.1.1 System Requirements

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

- TCP/IP must be installed and running with a valid IP address assigned to a server. The server can either be used as a centralized management station, a remote client using a browser to access the array, or directly attached with a RAID subsystem using the in-band protocols.
- Your system display must be running in 256 colors or a higher mode otherwise some configuration items may not be visible. Screen size of 1024 x 768 is recommended to avoid any graphic transformation
- Check to confirm that the RAID disk arrays and controllers are installed properly. For the installation procedure, see the documentation included with the controller/subsystems.

3.1.2 Server Running Bosch RAIDWatch

- Computer must be a Pentium or above PC-compatible running Windows 2000/XP and Windows 2003 that supports Java Runtime 1.4.2 or higher.
- 256-color or higher mode management station monitor.
- At least one available RS-232C port is required (if connection to the controller is through the RS-232C).

3.1.3 Local Client Running Bosch RAIDWatch Manager

- Computer must be Pentium or above PC-compatible running Windows 2000/XP and Windows 2003 (32-bit or 64-bit) that supports Java Runtime 1.4.2 or higher.
- Remote station must be running Netscape 4.7X, Internet Explorer 6.0 or Mozilla 5.0 and Java Runtime 1.4.2 (for a particular platform).
- 256-color or higher mode management station monitor.
- At least one available RS-232C port is required (if connection to the controller is through the RS-232C).
- Windows Messaging (MAPI) for Windows 2000/XP/2003 if fax notification support is needed.
- Windows NetBEUI support for Windows 2000/XP/2003 must be enabled if network broadcast support notification is needed. Please refer to your Windows documentation for more information.
- SNMP traps service for Windows if SNMP traps notification is desired.
- TCP/IP with a valid IP assigned to each controller/subsystem.
- A fax modem that supports Hayes AT command protocol is required if using the fax event notification function. (Fax command class 2.0 and above.)
- A GSM modem is required if using the SMS short message event notification function. Bosch RAIDWatch currently supports two GSM modem models (not in the Bosch product portfolio and not distributed by Bosch):
  - Siemens TC35
  - WAVECOM Fast Rack M1206
- Under Windows 2000/XP/2003, the Java installation program, installshield.jar, only supports:

  - Netscape 4.5 (or above)
  - Microsoft Internet Explorer 4.0 (or above)
- Windows Messaging (MAPI) for Windows must be enabled if support for fax or email notification under NT is needed. Refer to your Windows documentation for more information.
- Windows NetBEUI support for Windows must be enabled if network broadcast support notification is needed. Refer to your Windows documentation for more information.

NOTICE!
Bosch RAIDWatch allows you to select several options during the installation process. However, it is recommended that all default combinations be retained. This installation guide only describes the installation process using the default settings.

3.2 RAID Chart

Before installing Bosch RAIDWatch and its various agents and modules, it is helpful to chart your RAID subsystems. If you operate a single RAID subsystem from a local or remote workstation, you may skip this section. If you have multiple RAID subsystems, the information shown in *Table 3.1* provides guidelines for charting existing RAID subsystems. Each field is explained follows the table.

RAID System	RAID System 1	RAID System 2	RAID System 3
ID/Name	Example	Example	....
Location	HQ	Storage	....
OS	Windows 2000	N/A	....
IP Address	205.163.164.111	xxx.xxx.xxx.xxx	....
Role	Centralized Management Center	Storage pool	....
Internet Capable	Yes	N/A	....

Table 3.1 RAID Charting Table

- ID/Name – User designated; an ID or name should be a unique identifying label.
- Location – 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 fulfilled by the particular system, relative to RAID operations.
- 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, its version number, and its support for Java.

3.3 Software Setup

This section discusses how to install Bosch RAIDWatch in your system. Before proceeding with the setup procedure, read through the *Before You Start* section below. The sections follow will explain how to install Bosch RAIDWatch in different operation systems.

Installing Bosch RAIDWatch on a Windows Platform

To install Bosch RAIDWatch on your hose computer:

1. Before you initiate the installation process, close any other applications that are currently running. This will minimize the possibility of encountering system errors during setup.
2. Insert the Bosch product CD or Bosch RAIDWatch installation CD into the system's CD/DVD drive.
3. The Bosch RAIDWatch installer program is included on the CD-ROM that came with your subsystem. An auto-run screen provides a hot link to the installer program. (See *Figure 3.1*)

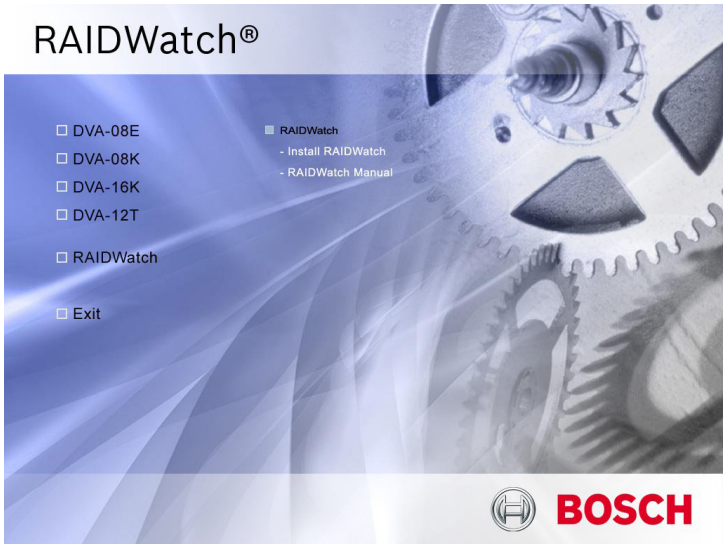


Fig. 3.1 Product Utility CD Initial Screen

4. Select the **RAIDWatch** check box, and then click **Install RAIDWatch**.
   An install shield will be launched and a welcome screen will appear.
5. To install Bosch RAIDWatch, click **Next**. The **License Agreement** dialog box appears.
6. Click **Accept** If you agree with the specified terms. A new dialog box with two installation options appears.
7. Click **Typical**. Selecting this option (default) allows you to install the Bosch RAIDWatch software, RAID agent, and necessary drivers on the host computer. The installation procedures described in this Quick Installation Guide are based on this selection.
   Click **Browse** and select a different directory or create a new directory. Then click **Next**.
   The installer program will start copying the application files to your system. Once the software has been successfully installed, a successful installation dialog box appears.

NOTICE!

If you click **Custom,** three (3) installation modes will appear.

- **Centralized Management** – Selecting this option allows you to install the Bosch RAIDWatch software, a Root Agent, RAID Agents, Bosch RAIDWatch Server utility, and necessary drivers on the computer chosen as a management center.
  The new Central Management utility is also installed in this process. The utility provides Online monitoring of Bosch RAID subsystems in the network.
- **Stand-alone (on Host)** – Selecting this option will install the In-band driver (RAID agents) for servers that are directly attached to a RAID subsystem, and the Bosch RAIDWatch software on the local computer.
- **Stand-alone (on Subsystem**) – This will install the software onto the controller/subsystem itself. The RAID subsystems come with necessary RAID agents embedded in the firmware. A RAID subsystem will use a small section of formatted disk space (called the reserved space) to store software related files. Installed in this mode, Bosch RAIDWatch can be started by a remote browser accessing the IP address assigned to the subsystem's Ethernet port. If the Stand-alone (on Subsystem) installation was selected, you will have to use a web browser to connect to the Bosch RAIDWatch program. To do this, open a web browser and enter the controller/subsystem IP address.

Please follow the installation instructions!

8. Click **Finish**, to complete the process and exit the installation menu.
   After installing the Bosch RAIDWatch you can change the subsystem settings.

NOTICE!

There is no need to configure the Peripheral Device setting if you are trying to manage a RAID subsystem from a Bosch RAIDWatch station through an Ethernet connection (to the RAID subsystem's Ethernet port). An Ethernet connection to RAID uses TCP/IP as the communication protocol.

3.4 Program Updates

As Bosch's valued customer, you are entitled to free program updates. You can download the latest version of Bosch RAIDWatch from Bosch's web site.

3.5 In-band SCSI

3.5.1 Overview

To meet the needs of device monitoring and administration, more and more external devices require communication with the host computers. Out-of-band connections such as RS-232C ports or an Ethernet port can be used to achieve this goal.

An alternative way of communication is in-band SCSI, which transfers configuration commands into supported SCSI commands and uses them to communicate with RAID arrays over the existing SCSI host connections. The traditional way for controllers to communicate with the host computer has been via software (such as Bosch RAIDWatch) using an Ethernet connection. With in-band, integrators have more flexibility and may use the existing host connection instead.

There are limitations on the use of in-band protocols however. In order for a host to "see" the RAID controller/subsystem, at least one (1) logical drive must exist and be mapped to a host ID/LUN. Otherwise, the RAID controller/subsystem itself must be configured to appear as a peripheral device to the host computers.

See the following examples for the procedures on configuring RAID controller/subsystems into a peripheral device.

3.5.2 Related Configuration on Controller/Subsystem

The RAID controller or subsystem must make some adjustments as well as the host computer's SNMP settings before the two can communicate using SCSI commands. You can use the RS-232 terminal to change the RAID controller settings.

1. From the Main Menu, press the *Up* or *Down* buttons to select "View and Edit Configuration Parameters."
2. Press *Enter*; and then use the *Up* or *Down* keys to select "Host-side SCSI Parameters." Then press *Enter*.

The Peripheral Device Type Parameters submenu also needs to be adjusted. Refer to the instructions below to set the proper settings for the in-band protocol to work.

1. First select the "Peripheral Device Type" submenu and then select "Enclosure Services Devices <Type=0xd>."

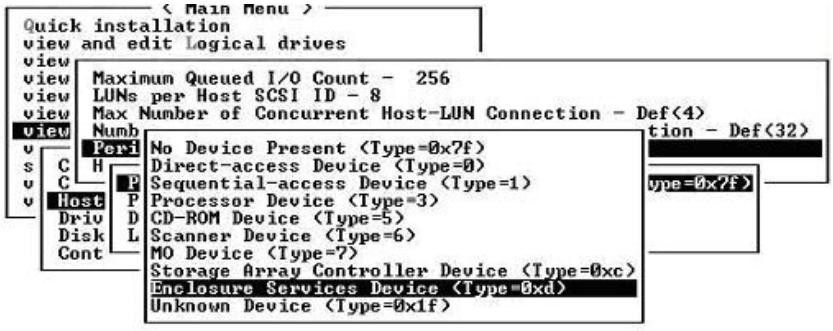


Fig. 3.2 RS-232 Terminal Screen (I)

2. Select "LUN Applicability - Undefined LUN-0's Only" option.

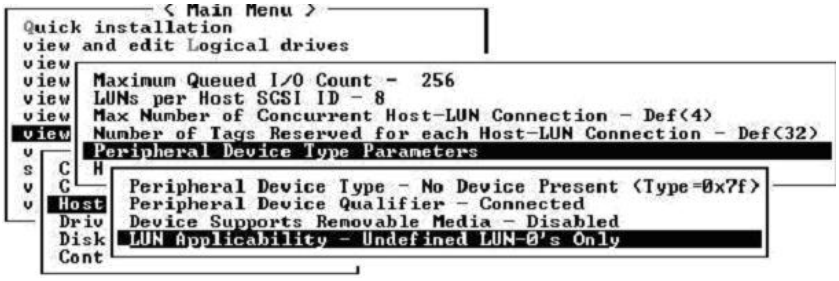


Fig. 3.3 RS-232 Terminal Screen (II)

3. Leave other options as defaulted. In-band should work fine by setting these two options. The adjustments necessary to use in-band protocols have been completed.

NOTICE!
Be sure to change the Peripheral Device Type to your preference after in-band SCSI connection has been setup.

4 Bosch RAIDWatch Server Options

This chapter describes the Bosch RAIDWatch Server options. There are a number of different items that users can configure. These include the Root Agent and RAID Agents relationship and the configuration options concerning event notification.

4.1 The Bosch RAIDWatch Server Utility

4.1.1 Start the Bosch RAIDWatch Server Program

If the Centralized Management option was selected during the installation process outlined in *Section 2 Bosch RAIDWatch Considerations*, the Root Agent driver, associated agents, and Bosch RAIDWatch Server utilities will be installed onto your computer. Centralized management in a multi-RAID environment is achieved through the Bosch RAIDWatch Server utility.

To access the Bosch RAIDWatch Server interface, please do the following:

1. Open the directory in which the Bosch RAIDWatch management software was installed. The directory was selected during the installation process and the default setting was named “*Bosch*”
2. If you are using a Windows operating environment, you may start the Bosch RAIDWatch Server by double-clicking on the *Bosch RAIDWatch Server* shortcut on your Windows Desktop. Otherwise, click the windows **Start** button, point to **All Programs** and **Bosch**, and then click **Bosch RAIDWatch Server** (see *Figure 4.1*).

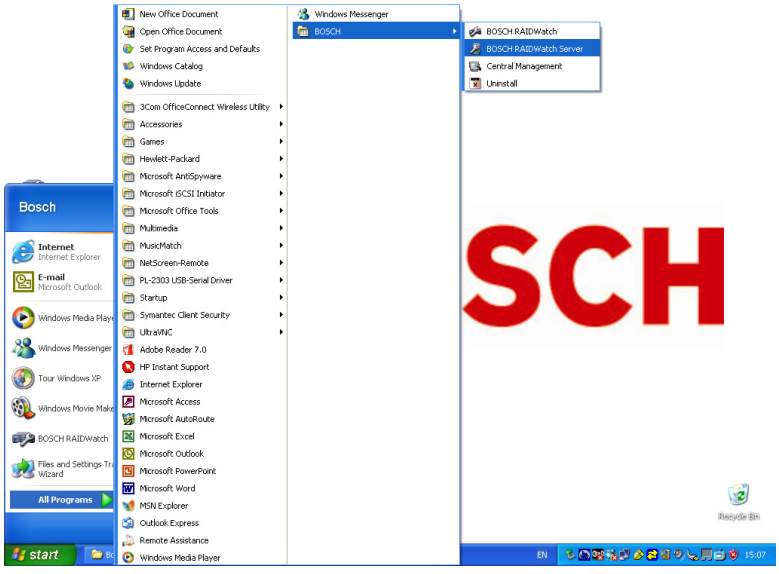


Fig. 4.1 Bosch RAIDWatch Server Shortcut on Windows Startup Menu

3. Click on *Bosch RAIDWatch Server* to activate the Bosch RAIDWatch Server window as shown in *Figure 4.2*. The Bosch RAIDWatch Server program allows you to configure the following items:
   - Root Agent (administrative settings)
   - Auto Discovery
   - Notification configuration options

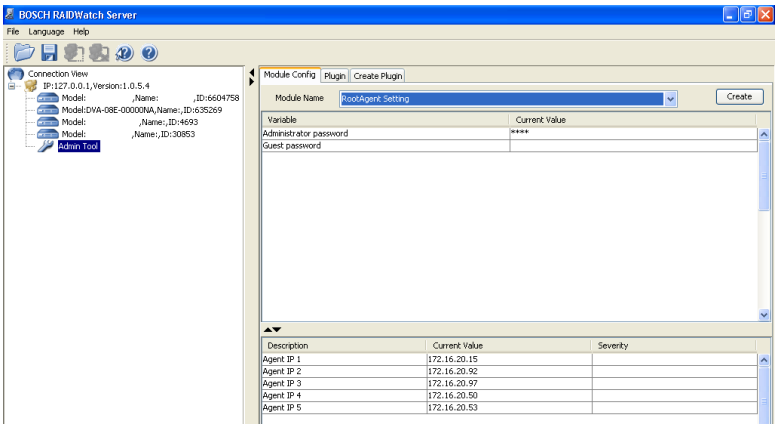


Fig. 4.2 Bosch RAIDWatch Server Window

4.1.2 Setting Up a Root Agent

1. Launch the Bosch RAIDWatch Server program. See *Section 4.1.1 Start the Bosch RAIDWatch Server Program*.
2. From the Command menu, select File -> Add Host (see *Figure 4.3*), or right-click on *Connection View* to bring up the Input Root Agent Dialog Box, and enter a Root Agent IP here. (See *Figure 4.4*)

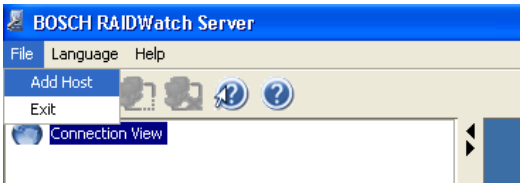


Fig. 4.3 Add Host Command

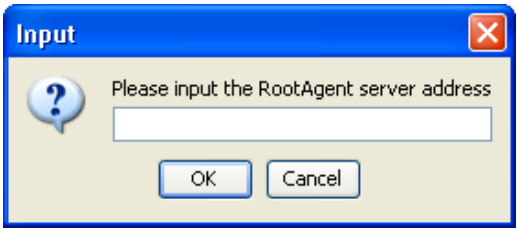


Fig. 4.4 Input Root Agent Dialog Box

NOTICE!
The Root Agent IP is usually the computer IP where the Bosch RAIDWatch Server is installed.

3. The connected IP displays on the left of the Connection View window. Select the IP and click the *Connect Root Agent Server* icon (see *Figure 4.5*) or right-click on the displayed IP to display the *Connect* commands. (See *Figure 4.6*)

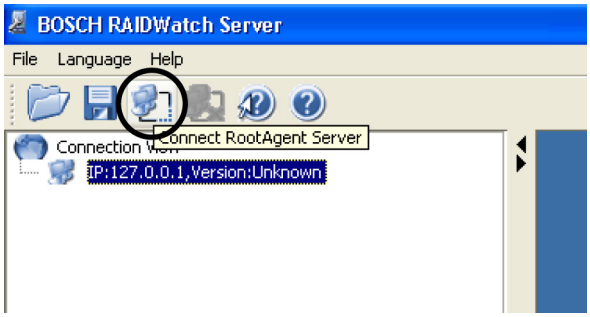


Fig. 4.5 Connect Commands

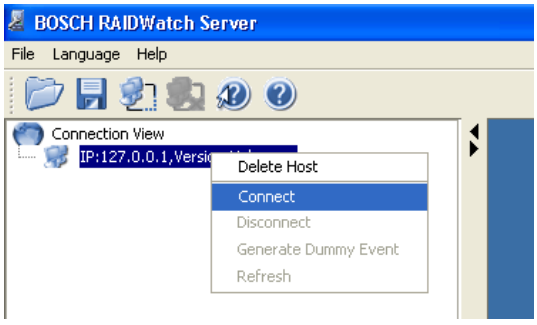


Fig. 4.6 Connect Commands

4. The Bosch RAIDWatch Server dialog box appears. Select to log in either as an Administrator or Guest. An administrator has the authority to change any Bosch RAIDWatch Server settings, unlike a guest is allowed to view the settings only. (See *Figure 4.7*)

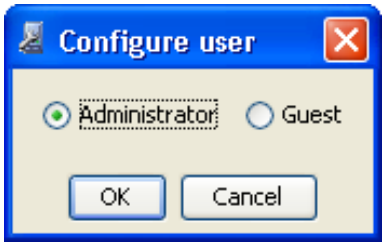


Fig. 4.7 Access Rights Selection Box

5. When login as an administrator, enter "*root*" as the authentication code in the Password dialog box at the first time login, and then click **OK**. (See *Figure 4.8*) The authentication code can be changed later in the utility. Only an administrator who has the password can access the notification settings.
6. Password is not required when login as a guest. Click **OK** to login without entering any password.

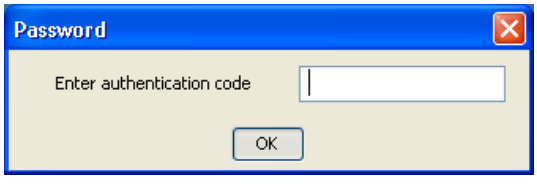


Fig. 4.8 Password Dialog Box

7. Double-click the Admin Tool item on the Connection View window in the Bosch RAIDWatch Server User Interface. (See *Figure 4.9*)

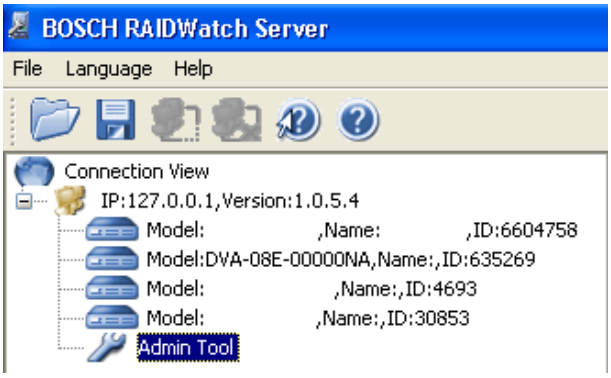


Fig. 4.9 Left Column of Bosch RAIDWatch Server User Interface

8. The Module Configuration window will display on the right of the Bosch RAIDWatch Server User Interface. You may now start configuring event receivers under each notification method window. Click on the Module Name pull-down list to display all the configuration options.

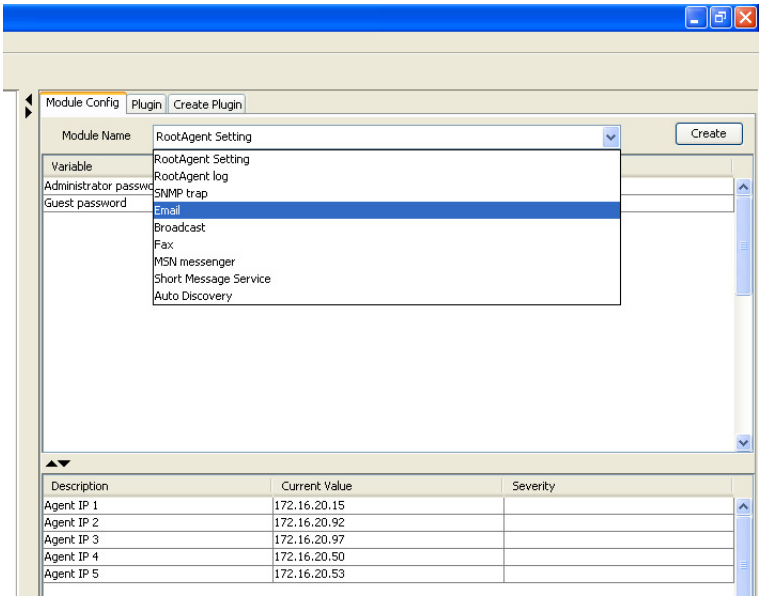


Fig. 4.10 Module Name Pull-down List

4.2 Bosch RAIDWatch Server User Interface

The Bosch RAIDWatch Server user interface contains four (4) major elements: Tool Bar Buttons, Connection View Window, and Module Configuration Window.

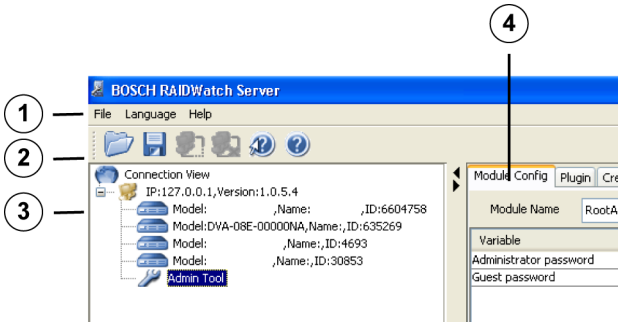


Fig. 4.11 Major Elements in Bosch RAIDWatch Server User Interface

1 Command Menu

2 Tool Bar Buttons

3 Connection View Window

4 Module Configuration Window

4.2.1 Command Menu

- File commands include Add Host and Exit. The Add Host command connects you to a Root Agent host. A Root Agent host is one that is chosen as a management center to manage multiple RAID agents, which are, in turn, used to access different arrays. By connecting to a Root Agent IP, all its subsidiary RAIDs are then managed by the management center. The Exit command will let you exit the Bosch RAIDWatch Server User Interface and close the program.
- The Language command allows you to select the language display on the Bosch RAIDWatch Server User Interface. The current selections include English, German and Japanese.
- The Help command provides information about the current software version. The Help explains how to use the Bosch RAIDWatch Server.

4.2.2 Tool Bar Buttons

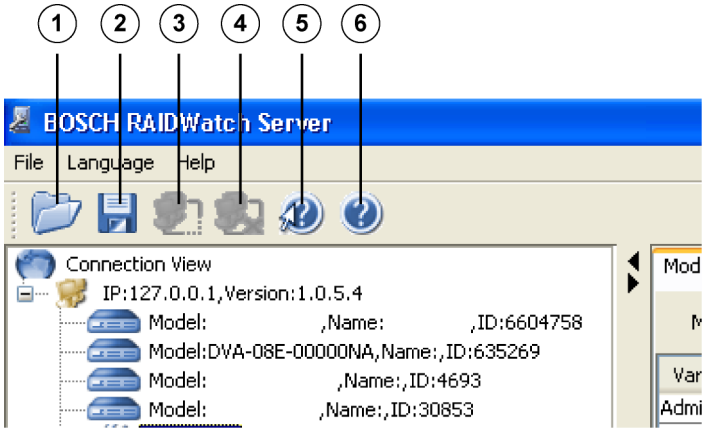


Fig. 4.12 Tool Bar Buttons

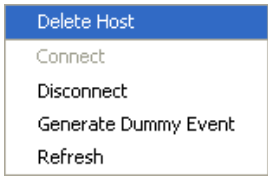
The tool bar has six (6) buttons, described from left to right as follows:

1	Open Bookmark File	In the environment where multiple arrays need to be monitored at the same time, this button brings out the previously saved profile of the access to multiple arrays (via Root Agent and RAID Agent IPs).
2	Save Bookmark File	This button allows you to save the current connection profile (as shown in the Navigation panel) as a file to your system drive. A file path dialog box displays when selected.
3	Connect Root Agent Server	This button allows you to connect to a Root Agent server to begin monitoring, for example, in situations when it has been manually disconnected. The Root Agent IP is the IP of the computer where you installed your Bosch RAIDWatch Server utility.
4	Disconnect Root Agent	This button allows you to disconnect from a Root Agent server.
5	Help Cursor	Click the *Help Cursor* button and then click on the area where you have question. A Help window will appear to explain the functionality.
6	Help	Click on the *Help* button to browse the Online Help in Bosch RAIDWatch management software's main Help program.

4.2.3 Connection View Window

The Connection View window displays the current connections with different RAID Agent servers. Each Root Agent server IP has an Administration Tool. This window has a command menu that can be triggered by *right-clicking* a Root Agent icon. Right-click on the Root Agent server to show a selection menu. (See *Figure 4.13*)
These commands on the selection menu allow you to remove a Root Agent entry, to connect, disconnect, or refresh the current connectivity status. The Connection View window automatically updates when an array is turned on or off, and automatically prompts you for a status change, e.g., a managed array once disconnected is now connected.

When Root Agent Server is Disconnected



When Root Agent Server is Connected

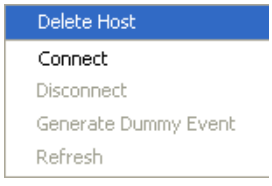


Fig. 4.13 Connection: The Right-click Menus

Delete Host: Delete the Root Agent Server by selecting this command.
Connect: Select this command to connect your computer to the Root Agent Server.
Disconnect: To disconnect the Root Agent Server from your computer, select this command.
Generate Dummy Event: You can also generate simulated events to test the notification functions once you have configured any or all of the notification methods.
Refresh: Refresh the connection between your computer and the Root Agent Server.

4.2.4 Module Configuration Window

The *Module Config* panel contains pull-down menus that allow access to create or modify various notification methods. The panel also allows you to setup an administrator's identity and lets an administrator be constantly aware of all arrays' status through notification emails.

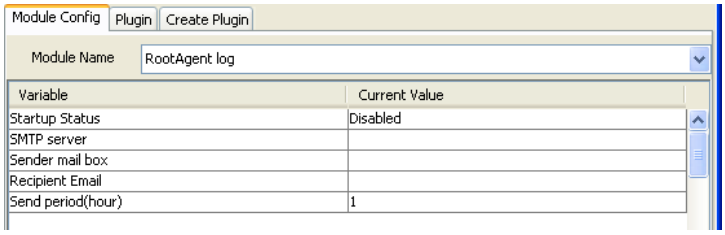


Fig. 4.14 Enable an Administrator's Options

The Module Config panel provides access to ten (10) configurable items, and each item contains two or more setup options. Seven (7) of them belong to the notification methods (ways to notify a user if event faults occur) settings.
Double-clicking the Current Value field can modify all configuration options.

4.3 Root Agent Configuration

To configure the Root agent settings, select the *Module Config* menu on the right of the Bosch RAIDWatch Server User Interface as shown in *Figure 4.15*. Select the pull-down menu named *Root Agent Setting* from the *Module Name* section.

4.3.1 Root Agent Settings

The Root Agent Setting option is shown in *Figure 4.15*.

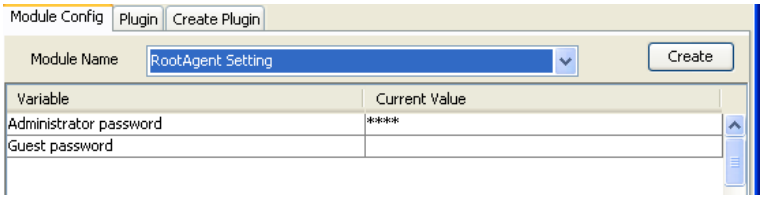


Fig. 4.15 Root Agent Setting

- *Administrator Password*: This allows you to set an administrator's password. This is the port number the Bosch RAIDWatch centralized manager station will use to communicate with the Root Agent. The default for Administrator is "root." There is no default password for login as Guest.

NOTICE!
This password is independent from the password set for the "Configuration" login to start the Bosch RAIDWatch management program.

- *Guest Password:* This is selected to enable a user logging in as "Guest" to view the status of RAID arrays currently being managed by the Bosch RAIDWatch Server utility.

4.3.2 Adding RAID Agents IPs (Associating Root Agent with Multiple RAID Arrays)

RAID Agents are the sub-modules of Bosch RAIDWatch or the Bosch RAIDWatch Server utility used to communicate with a RAID subsystem. Multiple RAID Agents can be associated with a Root Agent. A Root Agent then summarizes and presents these RAID Agents to the Bosch RAIDWatch Server so that system administrators can be notified of system alerts if any faulty conditions are detected within these RAID arrays.

1. RAID Agents currently being managed by a Root Agent are listed in the lower right corner of the Bosch RAIDWatch screen.
2. To add or delete RAID Agents, click the *Create* button next to the Root Agent pull-down list to open an *Add Monitor Controller* window. (See *Figure 4.16*) The same command can also be activated by right-clicking on the agent list under *Current Value* section. (See *Figure 4.17*)

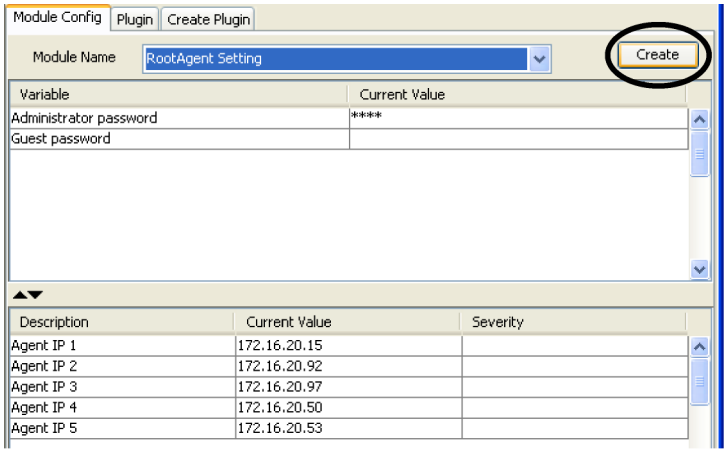


Fig. 4.16 Agent List under Root Agent Setting

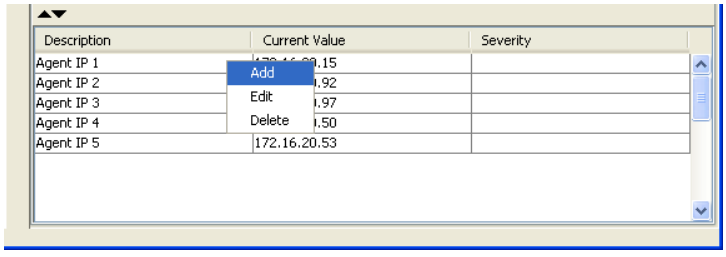


Fig. 4.17 Agent List Right-click Menu

3. Enter the IP address of the array you wish the Root Agent to manage. Click *OK* to complete the process. An example is shown in *Figure 4.18*.

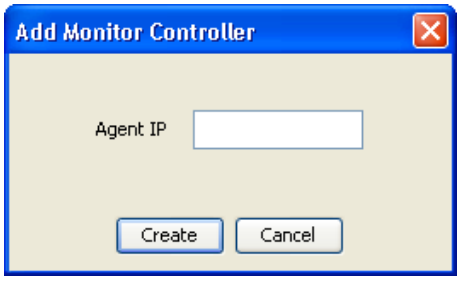


Fig. 4.18 Adding RAID Agent IP

4.3.3 Root Agent Log Settings

Following are the methods used to keep an administrator constantly notified of the status of managed arrays. As shown in *Figure 4.19,* when properly configured, the Root Agent Log allows an administrator to receive event logs for all managed arrays for every preset time period.

To configure the *Root Agent Log* settings:

1. Enable the function by double-clicking the Current Value field in the Status field.
2. Set an SMTP server address in the SMTP server field so that event log emails can be sent to the administrator.
3. Set a valid mail address in the Sender mailbox field and an administrator's email address in the Recipient Email field.
4. The Send period (hour) determines how often an administrator receives event log notifications.

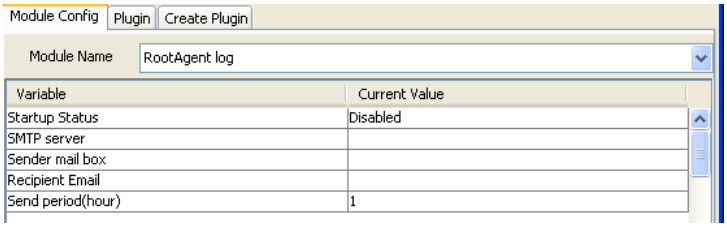


Fig. 4.19 Root Agent Log Settings

4.3.4 Create Plug-ins with Event Notification

Before you begin

- The Plug-in sub-function allows you to add a specific feature or service to Bosch RAID-Watch's notification methods.
- The add-ins can be used to process the events received from Bosch RAIDWatch Server utility and extend its functionality.
  Prepare your execution file, and place it under the plug-in sub-folder under the directory where you installed the Bosch RAIDWatch program. If the default installation path has not been altered, the plug-in folder should be similar to the following:
  Program Files -> Bosch -> RAID GUI Tools -> bin -> plug-in.

  Place the execution file that will be implemented as a plug-in in this folder.

  The plug-in capability provides advanced users the flexibility to customize and present the event messages received from the Bosch RAIDWatch Server utility.

The Configuration Process

1. Click the Create Plug-in tab.
2. Make sure you have placed the execution file in the plug-in folder as described earlier.
3. Enter the appropriate data in the Plug-in Description and Plug-in Label fields, and then select an execution file from the *Application Program* field (if there is more than one).
4. Click *Create* to complete the process. (See *Figure 4.20*)

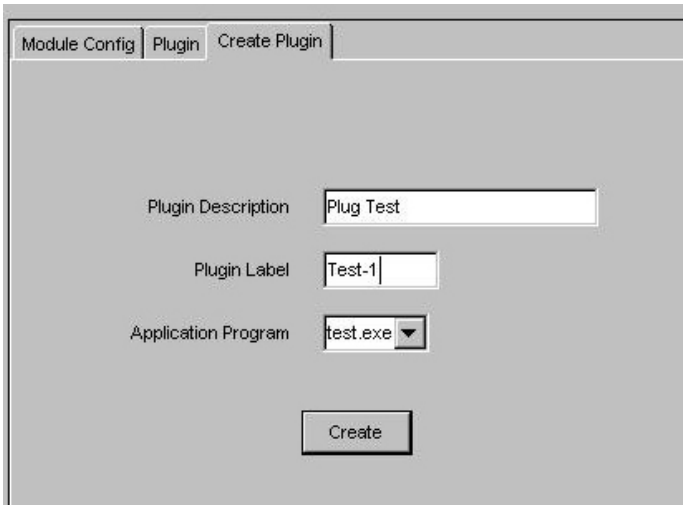


Fig. 4.20 Naming and Associating a Plug-in file

5. Select the *Plug-in* tab from the panel. Click *Create Receiver* to display an input field dialog box.
6. Enter the configuration string to be read when the application program starts. (See *Figure 4.21*) A configuration argument may look like this:

"\plugin\userprogram.exe uid=xx model=xxx-xxx ip=xxx.xxx.xxx.xxx ctrlrName=N/A severity=1 evtStr="Evt String" recv="customized string"

An added profile is listed in the Receiver Data field.

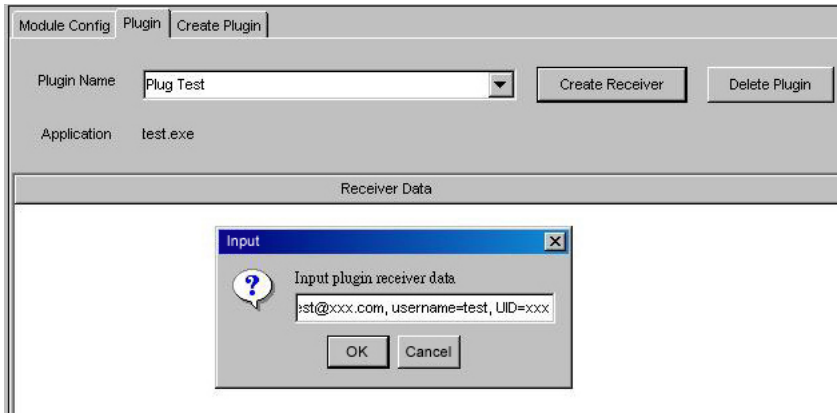


Fig. 4.21 Create Plug-in Receiver Profile

4.4 Event Notification Settings

4.4.1 Bosch RAIDWatch Server Notification Methods

Bosch RAIDWatch Server provides the following methods for sending notifications: SNMP traps, email, LAN broadcast, fax, ICQ, SMS, and MSN Messenger. Some notification methods, such as the connection to a fax machine, require Windows MAPI support on the servers used as the Bosch RAIDWatch Server platform.

To configure the Event Notification (previous *NPC*) settings, select *Module Config* from the right-hand side of GUI screen. Scroll down the pull-down menus to create or modify various notification methods.

There are seven notification methods listed in the pull-down menus. Along with seven different means of informing RAID managers that an event has occurred (fax, broadcast, email, SNMP traps, ICQ, SMS, and MSN messenger), the severity level of events to be sent via these notification methods can also be configured.

4.4.2 Event Severity Levels

You may select a severity level for every notification method using the Event Severity Level setting. Each level determines events of what severity level(s) are to be sent to a receiver. See *Table 4.1* for severity level descriptions.

Level	Description
1	All severity levels
2	Two levels: Warning and Alert
3	Only the most serious events: Alert messages

Table 4.1 Levels of Notification Severity

The event security level can be set during notification function setting. If you wish to modify the security levels for any notification setting, right-click on the *Severity* section in the lower level of Configuration screen. Select Edit common to view the Edit dialog box. (See *Figure 4.22*) Select the desired severity level in the Severity pull-down menu. (See *Figure 4.23*) Once the severity level is selected, click **OK** to exit the dialog box.

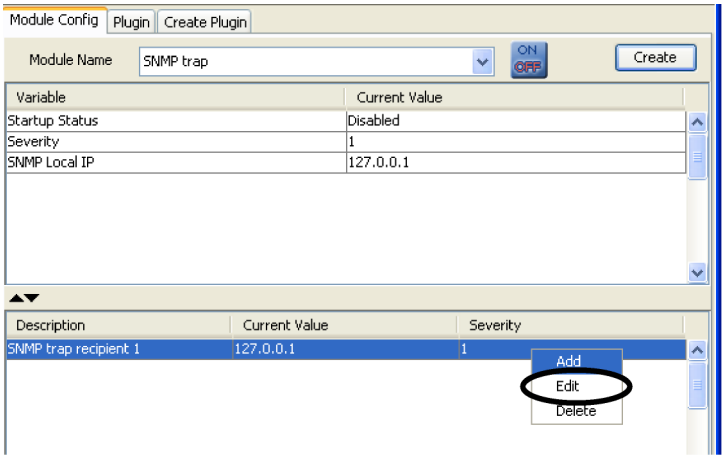


Fig. 4.22 Editing the Severity Level

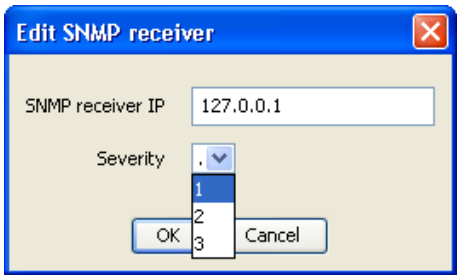


Fig. 4.23 Selecting the Severity Level

4.4.3 Enabling Notification Functions

When all notification settings have been properly configured, remember to enable each notification method by double-clicking the *Current Value* field in Status row. Set Status to *Enable* if you want the module to be activated every time the Root Agent is loaded. Please see an example shown in *Figure 4.24*.

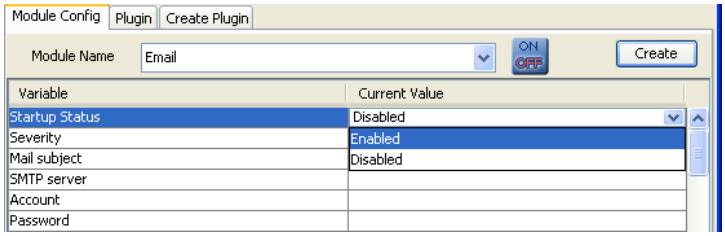


Fig. 4.24 Enabling a Notification Method under Status Row

You can also turn on and off each notification method by double-clicking on the switch button located on the upper left of the user interface. (See *Figure 4.25*)
The Root Agent runs as an application and is automatically loaded when the server is powered on. Restart the Bosch RAIDWatch Server for the changes to take effect.

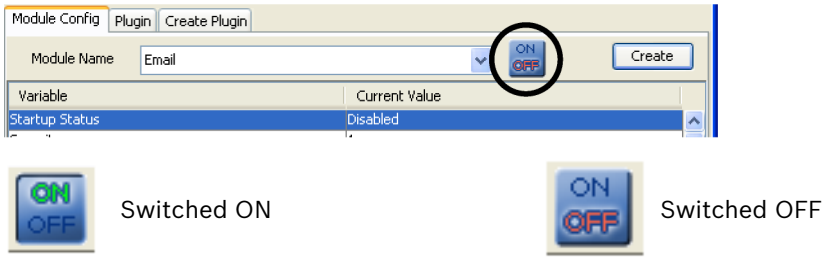


Fig. 4.25 Enabling a Notification Method by the Switch Button

4.4.4 SNMP Traps Settings

Receiver Side

To set a client listening to SNMP traps:

1. Open the *Module Config* page. Use the *Module Name* pull-down menu to select *SNMP trap*.

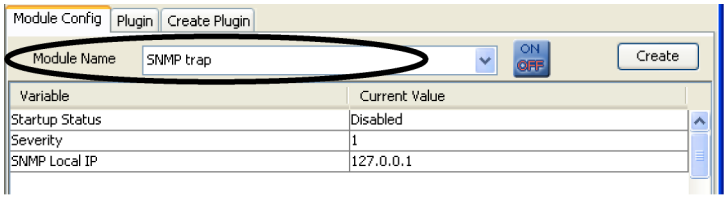


Fig. 4.26 Selecting SNMP Trap Notification

2. To create a new SNMP trap, click the *Create* button on the top right screen or right-click on the lower half of the configuration screen; the Add SNMP Receiver dialog box will appear.

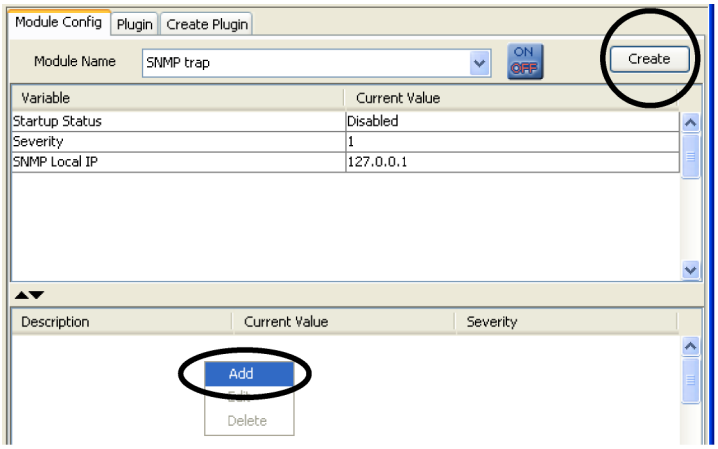


Fig. 4.27 Adding SNMP trap

3. Enter the IP addresses of the SNMP agents that will be listening for trap notification in the Add SNMP Receiver dialog box.

Fig. 4.28 Add SNMP Receiver Dialog Box

4. Select the severity level of events that will be sent to the SNMP agent. Refer to *Section 4.4.2 Event Severity Levels*.
5. Repeat this process to add more SNMP agents.

Sender Side

From the Module Config window:

1. Find the SNMP settings from the pull-down list.
2. Click on the *On/Off* switch beside the pull-down button to enable SNMP traps notification.

Switched ON

Switched OFF

3. Double-click on the Current Value field of the Status row to enable SNMP traps notification.
4. Select the severity level of events to be sent to the receiver station.
5. Provide a valid out port IP that will be used for delivering SNMP traps. Usually the default IP detected by the Root Agent will be sufficient. If you have more than one Ethernet port, double-click to configure it.

4.4.5 Email Settings

Receiver Side

NOTICE!
SASL authentication is supported with this revision.

To set an email address to receive notification emails:

1. Open the Module Configuration page. Use the Module Name pull-down menu to select Email.

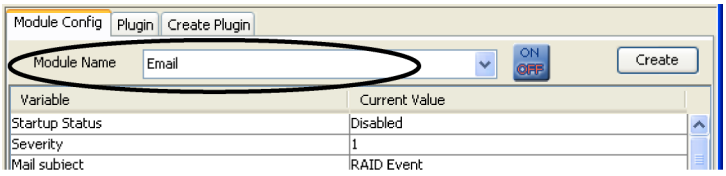


Fig. 4.29 Selecting Email Notification

2. To create a new email notification, click *Create* on the top right of the screen or right-click on the lower half of the configuration screen to display the Add Email Recipient dialog box.

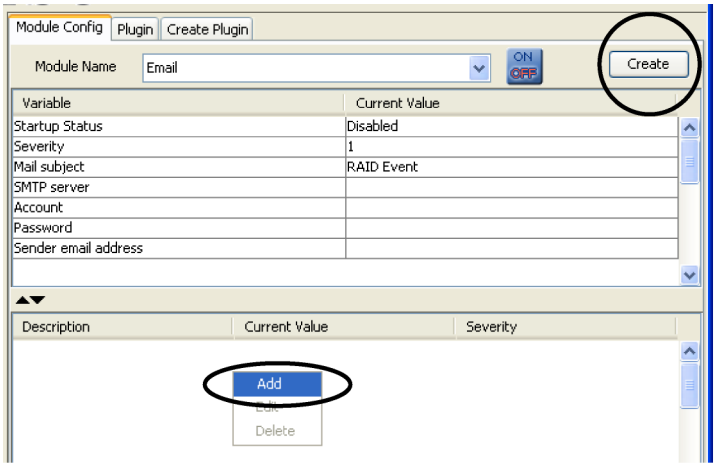


Fig. 4.30 Adding Email Notification

3. An Add Email Recipient dialog box appears. Enter an email address that is able to receive email notification.

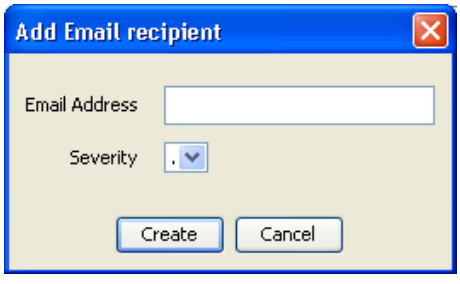


Fig. 4.31 Add Email Recipient Dialog Box

4. Select the severity level of events to be sent to the receiver's email.
5. Repeat this process to add more email addresses.

Sender Side

From the Module Config window:

1. Find the email settings from the *Module Name* pull-down list.
2. Click the On/Off switch beside the pull-down list button to enable Email notification.

Switched ON

Switched OFF

3. Double-click on the Current Value field of the Status row to enable email notification.
4. Select the severity level of events to be sent to the receiver station.
5. Enter the mail subject by double-clicking the Current Value field.
6. Set your SMTP mail server through which emails will be sent.
7. Enter the Account name and Password if your mail server requires these values. SASL is the currently supported mechanism.
8. Provide a valid email address as your sender's address.

4.4.6 LAN Broadcast Settings

Receiver Side

To set a computer to receive broadcast messages:

1. Open the Module Configuration page. Use the Module Name pull-down menu to select Broadcast.

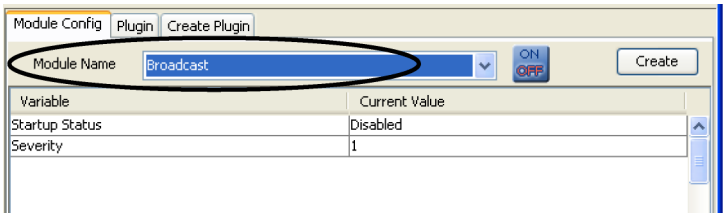


Fig. 4.32 Selecting LAN Broadcast Notification

2. To create a new LAN broadcast notification, click the *Create* button on the top right of the screen or right-click on the lower half of the configuration screen to display the Add Broadcast Recipient dialog box.

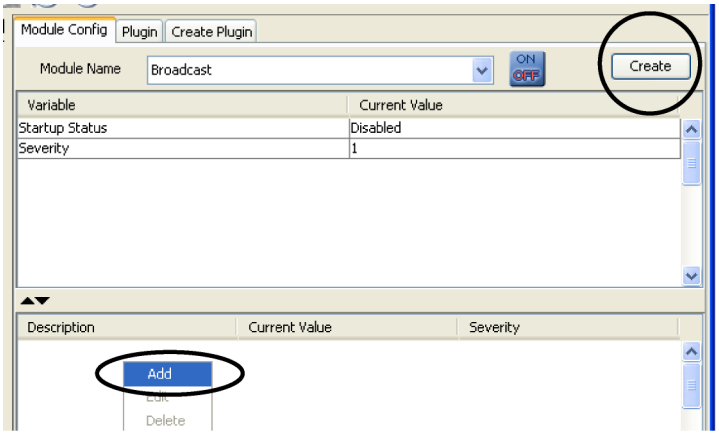


Fig. 4.33 Adding LAN Broadcast Notification

3. An Add Broadcast Receiver dialog box appears. Simply enter the IP addresses of a station configured on a network.

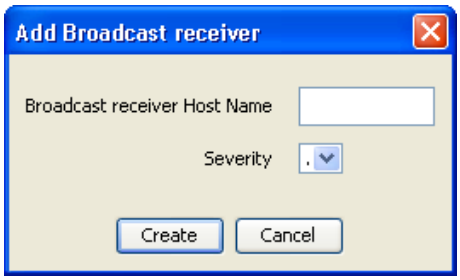


Fig. 4.34 Add Broadcast Receiver Dialog Box

4. Select the severity level of events to be sent to the receiver station.
5. Repeat this process to add more receivers.

NOTICE!
NETBUES and TCP/IP should be active services on your Centralized Management station for message broadcasting.

Sender Side

From the Module Config window:

1. Find the Broadcast settings from the pull-down list.
2. Click on the On/Off switch beside the pull-down button to enable LAN broadcast notification.

Switched ON

Switched OFF

3. Double-click on the Current Value field of the Status row to enable LAN broadcast. Set Status to Enable if you want the module to be activated every time the Root Agent is started. Note that the On/Off switch should also be in the On position before you turn off the server or close the utility. Otherwise, you will have to manually enable the function whenever you reboot the server.
4. Select the severity level of events to be sent to the receiver station.

4.4.7 Fax Settings

In order to use fax notification, a fax modem is required and its parameters must be properly set on the main management station. For NT servers, Widows MAPI services, modem, and fax must be ready and running for the notification methods to work.

Receiver Side

To set a fax machine to receive event messages:

1. Open the Module Configuration page. Use the Module Name pull-down menu to select Fax.

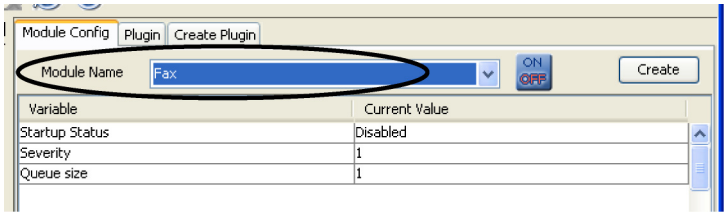


Fig. 4.35 Selecting Fax Notification

2. To create a new Fax notification, click *Create* on the top right of the screen or right-click on the lower half of the configuration screen to display the Add Fax Recipient dialog box.

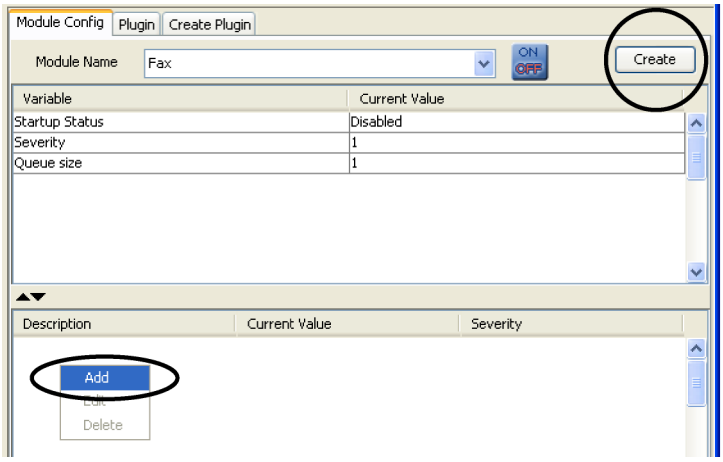


Fig. 4.36 Adding Fax Notification

3. An Add Fax Receiver dialog box prompts. Enter the phone number of the fax machine that will receive event notifications.

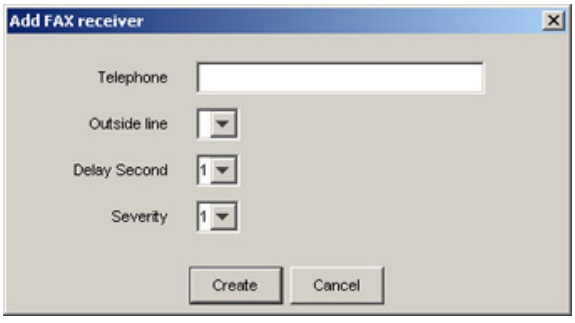


Fig. 4.37 Add FAX Receiver Dialog Box

4. Enter the Outside line dial-out number if there is any.
5. Enter the Delay Second number.
6. Enter the level of Severity of events to be sent via fax.
7. Repeat this process to add more receivers.

NOTICE!
The physical connection and fax service with Windows MAPI should be ready before configuring this function.

Sender Side

From the Module Config window:

1. Find the Fax settings from the pull-down list
2. Click on the On/Off switch beside the pull-down button to enable Fax notification.

Switched ON

Switched OFF

3. Double-click on the Current Value field of the Status row to enable fax notification. Set Status to Enable if you want the module to be activated every time the Root Agent is started. Note that the On/Off switch should also be in the On position before you turn off

the server or close the utility. Otherwise, you will have to manually enable the function whenever you reboot the server.

4. Select the severity level of events to be sent to the receiver station.
5. The Fax device row shows the fax machine(s) currently available. Check for appropriate setup in the Windows control panel.
6. Queue size determines how many events will be accumulated and then sent via a single fax transmission.

4.4.8 MSN Settings

Receiver Side

To set an MSN messenger address to receive notification messages:

1. Open the Module Configuration page. Use the Module Name pull-down menu to select MSN.

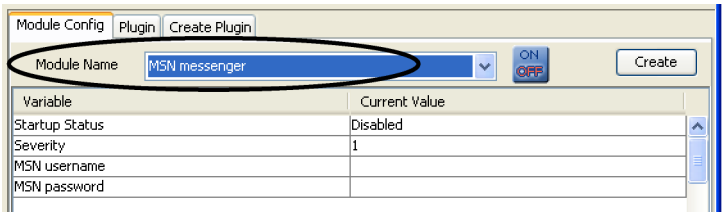


Fig. 4.38 Selecting MSN Notification

2. To create an MSN notification, click *Create* on the top right of the screen or right-click on the lower half of the configuration screen to display the Add MSN Recipient dialog box.

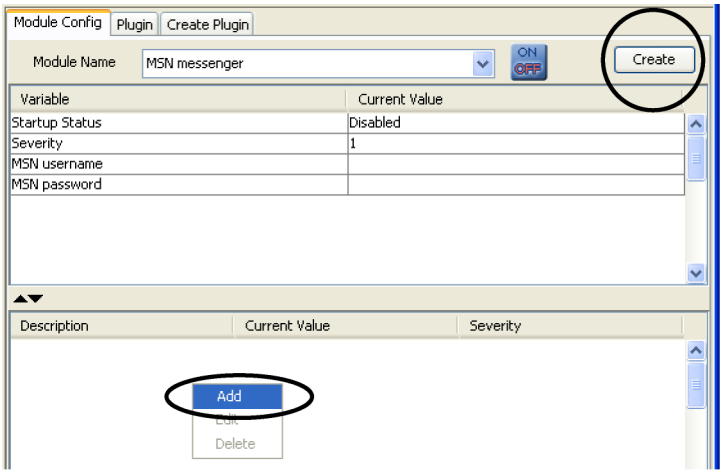


Fig. 4.39 Adding MSN Notification

3. Enter the MSN account of the contact receiving event messages.

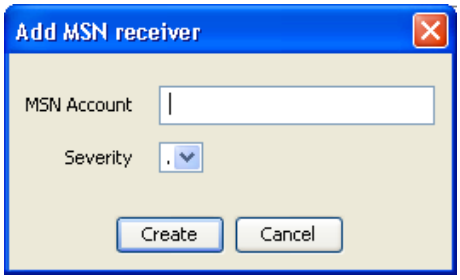


Fig. 4.40 Add MSN Receive Dialog Box

4. Select the severity level of events to be sent to the receiver.
5. Repeat this process to add more receivers.

Sender Side

From the Module Config window:

1. Find the MSN settings from the pull-down list.
2. Click on the On/Off switch beside the pull-down button to enable MSN notification.

Switched ON

Switched OFF

3. Double-click on the Current Value field of the Status row to enable MSN notification. Set Status to Enable if you want the module to be activated every time the Root Agent is started. Note that the On/Off switch should also be in the On position before you turn off the server or close the utility. Otherwise, you will have to manually enable the function whenever you reboot your server.
4. Select the severity level of events to be sent to the receiver station.
5. Provide a valid MSN contact by entering the user name.
6. Provide the associated password.

4.4.9 SMS Settings

SMS is a short for “Short Message Service.” Using this notification method requires a GSM modem. Bosch RAIDWatch currently supports two GSM modem models (not in the Bosch product portfolio and not distributed by Bosch):

- Siemens TC35
- WAVECOM Fast Rack M1206

Receiver Side

To set a cell phone to receive notification messages:

1. Open the Module Configuration page. Use the Module Name pull-down menu to select SMS Message Service.

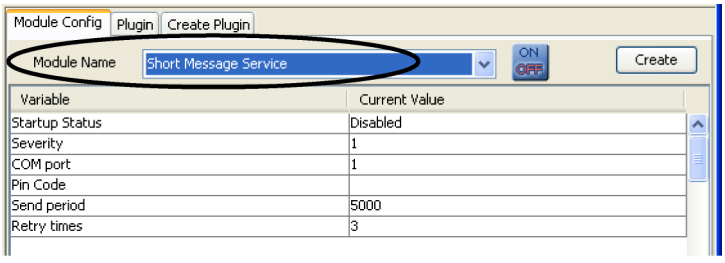


Fig. 4.41 Selecting SMS Notification

2. To create a new SMS notification, click the *Create* button on the top right of the screen or right-click on the lower half of the configuration screen to display the Add SMS Recipient dialog box.

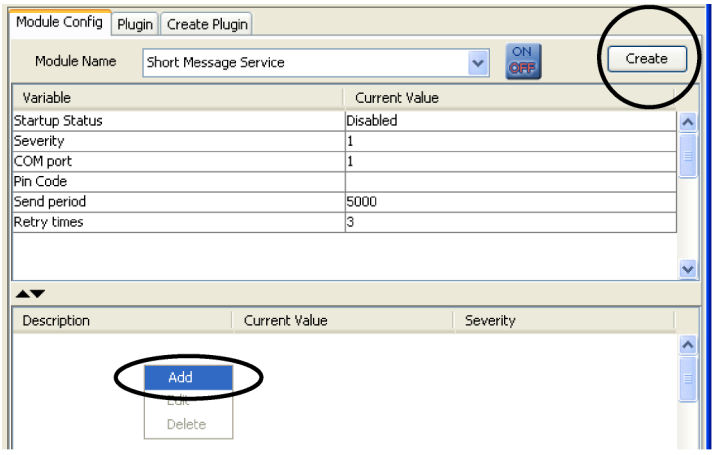


Fig. 4.42 Adding SMS Notification

3. Enter the Cell Phone Number of the contact who will receive event messages.

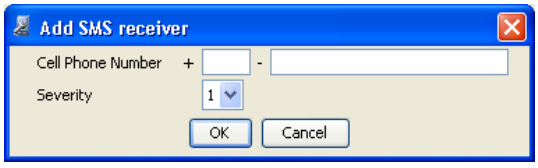


Fig. 4.43 Add SMS Receiver Dialog Box

4. Select the severity level of events to be sent to the receiver.
5. Repeat this process to add more receivers.

Sender Side

From the Module Config window:

1. Find the SMS settings from the pull-down list.
2. Click on the On/Off switch beside the pull-down button to enable SMS notification.

Switched ON

Switched OFF

3. Set Status to Enable if you want the module to be activated every time the Bosch RAID-Watch Server is started. Note that the On/Off switch should also be in the On position before you turn off the server or close the utility. Otherwise, you will have to manually enable the function whenever you reboot the server.
4. Select the severity level of events to be sent to the receiver station.
5. Select the COM port where you connect your GSM modem.
6. Enter the four-digit identification Pin Code required by the modem.
7. Provide a Send Period in milliseconds for time intervals between messages sent.
8. Provide a retry time value.

4.5 Auto Discovery

The innovative Auto Discovery feature provides quick, instant agent search function. If this option is enabled, the system will automatically search for the available agents and add it into agent list without manually key-in each agent IP address.

To setup the Auto Discovery option, please follow the steps below:

1. Open the Module Configuration page. Use the Module Name pull-down menu to select Auto Discovery option. (See *Figure 4.44*)

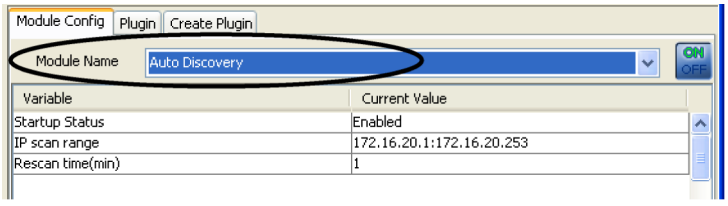


Fig. 4.44 Auto Discovery Option

2. Double-click on the current value under IP scan range row to open the Auto Discovery dialog box. (See *Figure 4.45*)

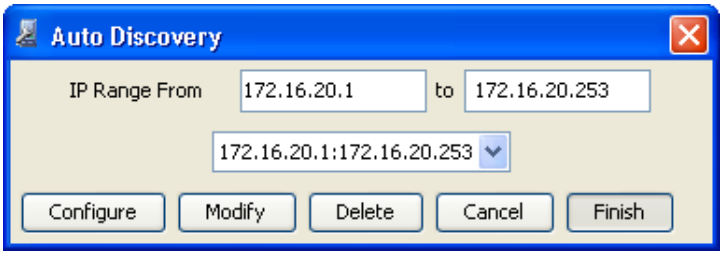


Fig. 4.45 Auto Discovery Dialog Box

3. Enter a set of IP range that you want the system to detect in the IP range dialog box.

NOTICE!
You may modify an existing IP range by clicking the Modify button or delete an existing IP range by clicking the Delete button. Click on the Cancel button to cancel any action you made in the Auto Discovery dialog box and return to the Auto Discovery main screen.

4. Click the Expand button to add the new IP range into a preset list.
5. Click Finish button to close this dialog box and return to the Auto Discovery option main screen.
6. Double-click on the current value under Rescan time row to modify a time frame in minute that you like the system to scan the network.

NOTICE!
The default rescan time is set to 0 minute that indicates the system will scan the network only when Bosch RAIDWatch Server is starting up. The Auto Discovery option will be turned off after the first scan.

7. You may turn on and off this option by double click on current value under Status row (see *Figure 4.46*) or click on the On/Off switch beside the pull-down button to enable the option.

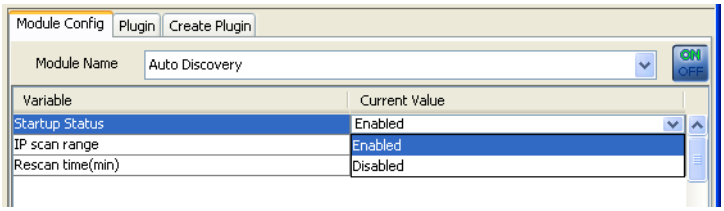


Fig. 4.46 Enable/Disable the Auto Discovery

NOTICE!
If you already have the Auto Discovery option turned on, be sure to turn off and then turn on the option for any adjustments that you newly made to take effect.

Once the Auto Discovery option is successfully configured, the system will detect the IP range that you designated, and automatically add the search results into the agent list. An Auto Discovery Notice window will prompt, you may click *OK* to close the window and start using Bosch RAIDWatch Server and Bosch RAIDWatch Manager.

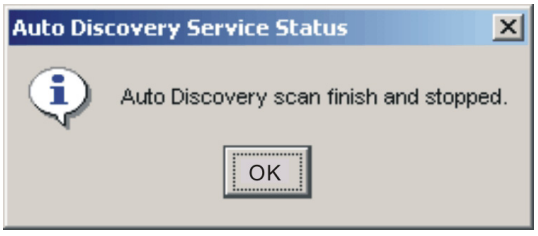


Fig. 4.47 Auto Discovery Notice

If you open the Root Agent setting option under module configuration window, an available agent list will be shown in the lower section of the Bosch RAIDWatch Server user interface. (See *Figure 4.48*)

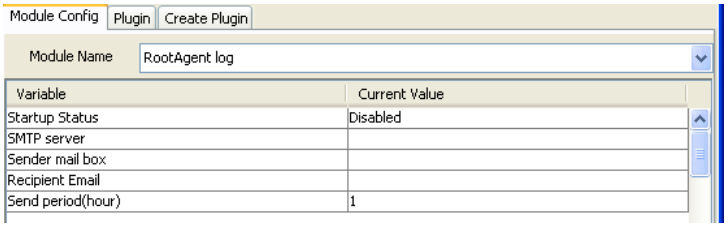


Fig. 4.48 The Root Agent List

If you like to start using the Bosch RAIDWatch manager, please refer to *Section 5.2 Array Information Icons*. A *Agent List window* will automatically show the controllers that were detected by the Auto Discovery option.

4.6 Event Severity Levels

Bosch RAIDWatch classifies disk array events into three severity levels. Level 1 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:

NOTICE!
The severity levels here are different from the levels used for configuring the notification methods.

4.6.1 Level 1 Severity Events (Examples)

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

4.6.2 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

4.6.3 Level 3 Severity Events (example)

- Drive Failure
- Enclosure Power Supply Failure
- Cooling Fan Module Failure
- RAID Controller Unit Failure

4.7 Event Log Display

Once RAID Agent IPs are associated with a Root Agent, their icons and names display on the Connection View panel.
To check the events that have happened since the Bosch RAIDWatch Server started, single-click on a connected RAID.

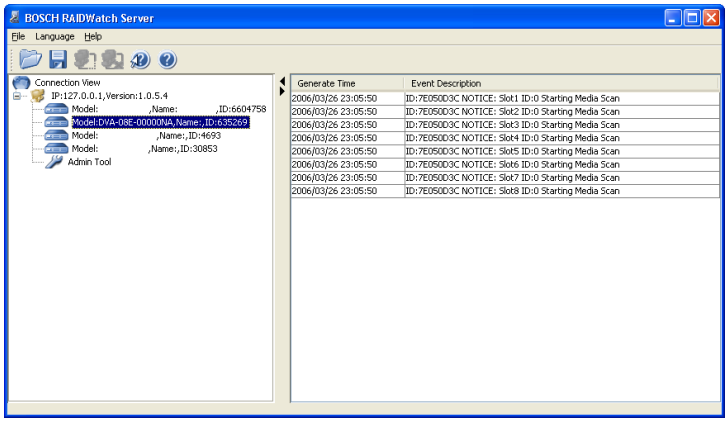


Fig. 4.49 Event Log Display Window

The event log window displays on the right-hand side of the Bosch RAIDWatch screen.

NOTICE!
The utility does not display events that happened before the utility started.

5 Bosch RAIDWatch Icons

This chapter introduces icons used in the main configuration access categories:

- Navigation Tree Icons – *Section 5.1 Navigation Tree Icons*
- Information Icons – *Section 5.2 Array Information Icons*
- Maintenance Icons – *Section 5.3 Maintenance Icons*
- Configuration Icons – *Section 5.4 Configuration Icons*
- Event Log Icons – *Section 5.5 Event Log Icons*

5.1 Navigation Tree Icons

Connected RAID Array

Information

Enclosure View

Tasks Under Process

Logical Drive Information

Logical Volume Information

System Information

Statistics

Maintenance

Logical Drive

Physical Drive

Task Scheduler

Configuration

Quick Installation

Create Logical Drive

Existing Logical Drives

Create Logical Volume

Existing Logical Volumes

Host Channel

Host LUN Mapping

Configuration Parameters

5.2 Array Information Icons

Enclosure View

Drive in good condition

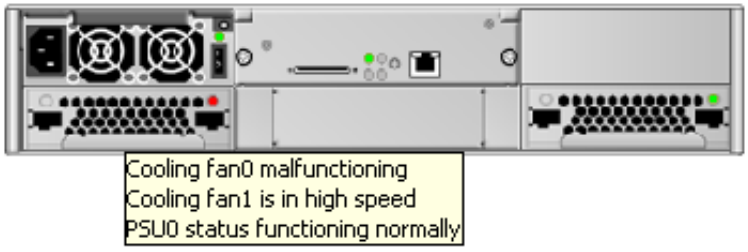
Drive missing or bad

Global Spare

Any drive icon showing a color other than black represents a member of a logical drive or a dedicated spare. Black is the default color of a new or used drive. A used drive is a drive that had been used as a member of a logical drive.

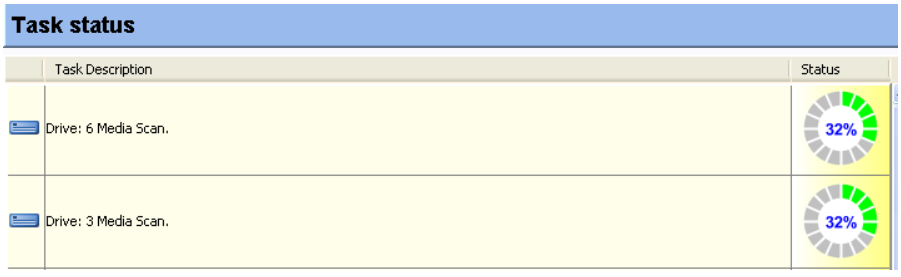
An empty tray; disk drive not installed

This graphic represents a rotation button. Each mouse-click on it turns the enclosure graphic 90 degrees clockwise.



Bosch RAIDWatch recognizes each subsystem by its board serial number, and displays an exact replica of it in the panel view.
LEDs shown on the enclosure view correspond to the real LEDs on the subsystem's rear panel.
If an LED corresponding to a failed component is lit red as shown in the diagram, move your mouse cursor to point to the red LED on the enclosure panel. Hold the cursor on the LED for a few seconds and an enclosure status summary will be displayed.

Tasks Under Process



Type of tasks being processed by the subsystem. The Task status window displays icons representing specific configurations.

Progress indicator

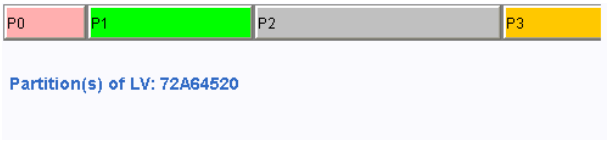
Logical Drive Information

A logical drive

A partitioned logical drive volume is represented as a color bar that can be split into many segments. Each color segment indicates a partition of a configured array.

Logical Volume Information

A logical volume



A partitioned logical volume is represented as a color bar that can be split into many segments. Each color segment indicates a partition of a configured volume.
A member of a logical volume, representing a logical drive. Different logical drives are presented using icons of different colors.

System Information

A battery module

A RAID controller unit

A current sensor

A cooling module

An enclosure device connected through an I2C bus

A power supply

An enclosure device connected through SAF-TE (SCSI bus)

An enclosure device connected through SES

A drive tray slot

A temperature sensor


An UPS device


A voltage sensor

5.3 Maintenance Icons


Logical Drives


Physical Drives


Task Schedules

5.4 Configuration Icons


Quick Installation


Create Logical Drive


Existing Logical Drive


Create Logical Volume


Existing Logical Volume


Channel


Host LUN Mapping


Configuration Parameters
No icons are used in the window.

5.5 Event Log Icons

Severity Levels

An informational message: Command-processed message sent from the firmware

A warning message: System faults

An alert message: Errors that need immediate attention

Event Messages - Event Type

Type of messages detected by the subsystem. The event view panel displays icons representing specific categories using the same icons as those used in the System Information window.

6 Basic Operations

This chapter describes the Bosch RAIDWatch screen elements and basic operations.

6.1 Starting Bosch RAIDWatch Agents

Once the Bosch RAIDWatch software is properly installed, the necessary software agents start automatically each time the host computer is started or reset, e.g., RAID Agents and Root Agents. However, the GUI part of Bosch RAIDWatch and the Bosch RAIDWatch Server utility need to be manually started.

Since the majority of RAID storage applications require non-stop operation, the Bosch RAIDWatch Server utility, which is used to monitor and report array conditions, should be installed on a management server that runs 24-7 operation. For a higher level of fault tolerance in case of server failure, the Bosch RAIDWatch Server can be installed onto more than one server. As shown below, when installing Bosch RAIDWatch using the Centralized Management scheme, a pair of redundant servers can be specified in the installation wizard prompt. The configuration is done by specifying IP addresses for a Master Host and a Slave Host.

NOTICE!

Bosch RAIDWatch must be manually installed (Custom Installation, and then choose Mode 1 installation: Centralized Management) onto both the Master and Slave hosts. The Bosch RAIDWatch Server functionality on the Slave host becomes active only when the Master host fails.

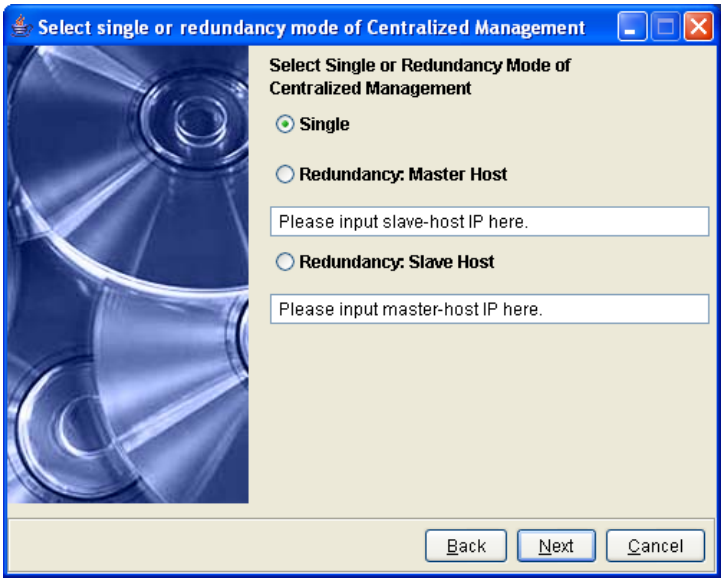


Fig. 6.1 Installation Wizard Prompt: Redundancy Server

Before management can be performed on a particular disk array system, you need to first establish a connection from your array to the network or a connection between your array and the directly attached server. Once a connection is established successfully, management can be started.

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

6.2 Starting Bosch RAIDWatch Manager

The management software interface, Bosch RAIDWatch Manager, needs to be started by a network or RAID subsystem manager.
Depending on your setup, you can start Bosch RAIDWatch Manager locally or via LAN.

6.2.1 Locally or via LAN under Windows 2000/ 2003 Environments

▶ Click the Windows **Start** button, point to **All Programs** and **Bosch**, and then click **Bosch RAIDWatch**.

- OR -

Double-click the Bosch RAIDWatch Manager icon from the desktop (see *Figure 6.2*) if a shortcut was added during the installation process.

Fig. 6.2 Bosch RAIDWatch Shortcut on Windows Desktop

6.2.2 For Remote Management via Web Browser

1. Start your web browser and enter the IP address assigned to the RAID subsystem Ethernet port or that of a RAID-attached server as your URL (e.g., 210.212.121.123). The IP of a RAID-attached server is used when the server uses in-band protocols to communicate with the attached RAID array. After a brief delay while the Java Applet starts, the Bosch RAIDWatch Manager main connection wizard appears on the screen.
2. The Bosch RAIDWatch management window should start after a brief moment.

NOTICE!
In Applet mode, connecting to the second array requires opening another browser window and entering its IP.

6.3 Start Using Bosch RAIDWatch Manager

When the Bosch RAIDWatch Manager is launched, a Connection window will first prompt and appear on the screen. (See *Figure 6.3*)

Fig. 6.3 Bosch RAIDWatch Connection Window

On the computer screen, if you don't see the Bosch RAIDWatch Connection window, it can be opened from the Bosch RAIDWatch program menu. Click on the System and then select Open Device command, and the Connection window will prompt up. (See *Figure 6.4*)

Fig. 6.4 Opening the Bosch RAIDWatch Connection Window

6.3.1 Connecting to a RAID Subsystem

The following steps will explain how to connect to a RAID Subsystem that is available on your network by Bosch RAIDWatch Manager.

1. If you have a specific RAID array's IP address in mind and wish only to manage one array, simply enter the IP address to proceed.
   As soon as you input the first number of an IP address, the screen will show the previous entries that start with the same number by auto complete feature. You are able to choose one you are looking for from the list or type in a new IP address.

NOTICE!
If you are not certain of a RAID array's IP address, you may rely on the Auto Discovery option in the Bosch RAIDWatch Server to automatically detect the available RAID arrays that are controlled by root agents. If the Auto Discovery option is enabled, the available RAID array will be shown automatically in the Agent List window that is described in later this section. To use the Auto Discovery option, please refer to *Section 4.5 Auto Discovery*.

2. You may select to enable the Secure Sockets Layer (SSL) security option by a single mouse-click on its check box. SSL works by using a private key to encrypt data when transmitting private documents and obtain confidential information. SSL creates a secure connection between a client and a server, over which any amount of data can be sent securely.
3. Enter a user name by selecting from the pull-down menu. Each user name represents an authorized access level. Enter a password to proceed. Leave it blank if there is no preset password. Click *OK* button to start the management session.

NOTICE!
Refer to *Section 6.4 Security: Authorized Access Levels* for the details of the three authorized access levels.

6.3.2 Using the Agent List Window

A unique Agent List window is built-in the Bosch RAIDWatch Manager to help you search available RAID subsystems that are connected to the network or a specific root agent. To use the Agent List window, please follow the steps below:

1. If you would like to see the available RAID subsystems that are connected to the network or a specific root agent, you may click the *Show Root Agent List* button on the bottom of the Bosch RAIDWatch Connection window. The window displays the tree tables of the available RAID systems that are detected by Auto Discovery function. An example of an Agent List window is shown in *Figure 6.5*.

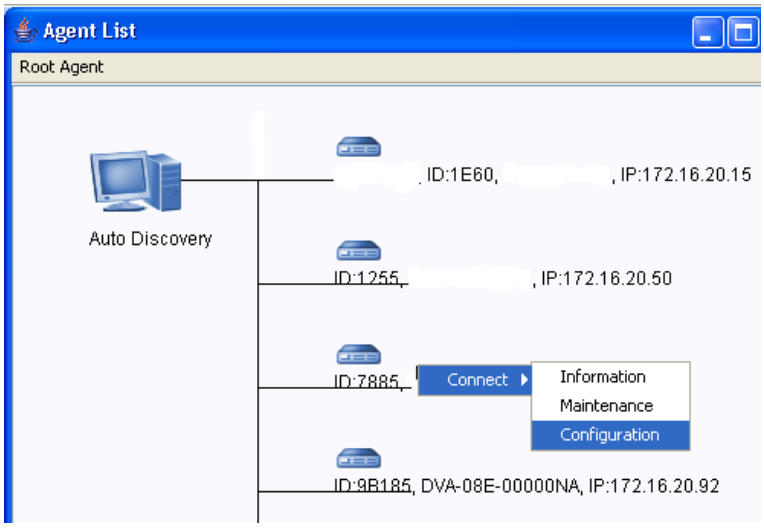


Fig. 6.5 Retrieve IP List: IPs Managed by Root Agents

2. If you like to add a new root agent, pull-down the Root Agent command menu in the Agent List window and select Add Root Agent. Enter a root agent IP address in the prompt up window. Any RAID systems that are connected to the root agent will be shown in a tree table in the Agent List window.

Fig. 6.6 Add an Root Agent

3. You may refresh the Agent List window by select Refresh under Root Agent command menu.
4. Click on the controller that you want to manage and select an authorized access level. Enter any necessary password and the program will lead you to its management session.
5. If you like the system to search the available RAID systems again, pull down the System command menu and select Auto Discovery. (See *Figure 6.7*) The new search result will be showing in the Agent List Window.

Fig. 6.7 Start Auto Discovery Function

When the system is executing auto discovery function, the Auto Discovery option in the System pull-down menu will be temporarily disabled. (See *Figure 6.8*)

Fig. 6.8 The system is processing Auto Discovery Function

NOTICE!
Setting up Auto Discovery is shown in *Section 4.5 Auto Discovery*.

6.3.3 Disconnecting and Refreshing a Connection

From the System menu, select Logout.

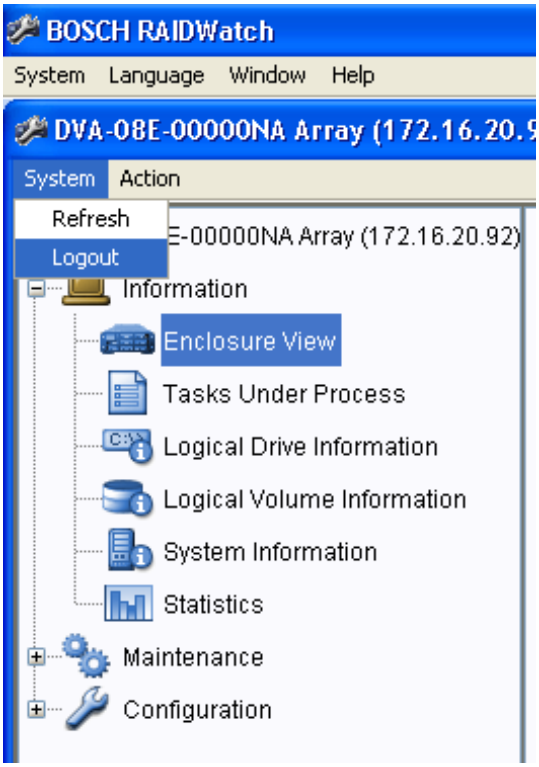


Fig. 6.9 Disconnect from a Connected Array

Select Logout will close the current management session and return to the Outer Shell window. If you wish to connect to another RAID array, enter its IP address and then click *OK* to proceed. Click *Cancel* to close the connection prompt and return to the Outer Shell window. Selecting the Refresh button allows you to re-connect with an array if a RAID system has been temporarily disconnected; e.g., the RAID system is being reset or the host links were disconnected for maintenance reasons.

6.4 Security: Authorized Access Levels

Password protection is implemented with the Connection wizard to prevent unauthorized access to configured arrays. This protection, which is implemented along with the security access levels, prompts a user for the station password the first time he or she attempts to connect to a RAID system.
By default, no password is required to access a RAID system using the first two protection levels, “Configuration” (Administrator) and “Maintenance” (User). A default password is required for the Information login.

Default Passwords	
Configuration	Password previously set for the controller/ subsystem; press Enter for none. The password can be changed in “Configuration Parameters” window in Bosch RAIDWatch’s main program.
Maintenance	You can set a password for this level login in “Configuration Parameters” window in Bosch RAIDWatch’s main program.
Information	Default password is “1234.”

It is recommended to configure passwords for the first two access levels at the first time you successfully connect to an array. Information users can monitor array status and see event messages. A user logging for Maintenance access can perform maintenance jobs onto configured arrays, and a user logging in using the Configuration login has full access to create, modify, or delete all related array configurations.
Note that some RAID subsystem/controllers may have been configured with a password using terminal or LCD keypad utilities. This preset password can be used for a “Configuration” login. However, the password can be changed using “Configuration Parameters” window in Bosch RAIDWatch’s main program. See *Section 7 Configuration Parameters* for the description of password setup.

6.5 Look and Feel

6.5.1 Look and Feel Overview

Because Bosch RAIDWatch Manager is a Java-based GUI program, it accommodates the “look-and-feel” standards of various Operating Systems. At present, the Windows interface appearance is supported.
Bosch 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 an unknown OS or OS versions, the program will default to the Java look and feel.
Just like other GUI-based applications, the Bosch RAIDWatch Manager works entirely with windows, buttons, and menus to facilitate various disk array operations. These windows follow the standard Windows look-and-feel specifications, so that manipulating elements and windows within any Bosch RAIDWatch Manager window generally conforms to standard procedures. The management sessions are best displayed with 1024x768 screen resolution.

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

6.5.2 Screen Elements

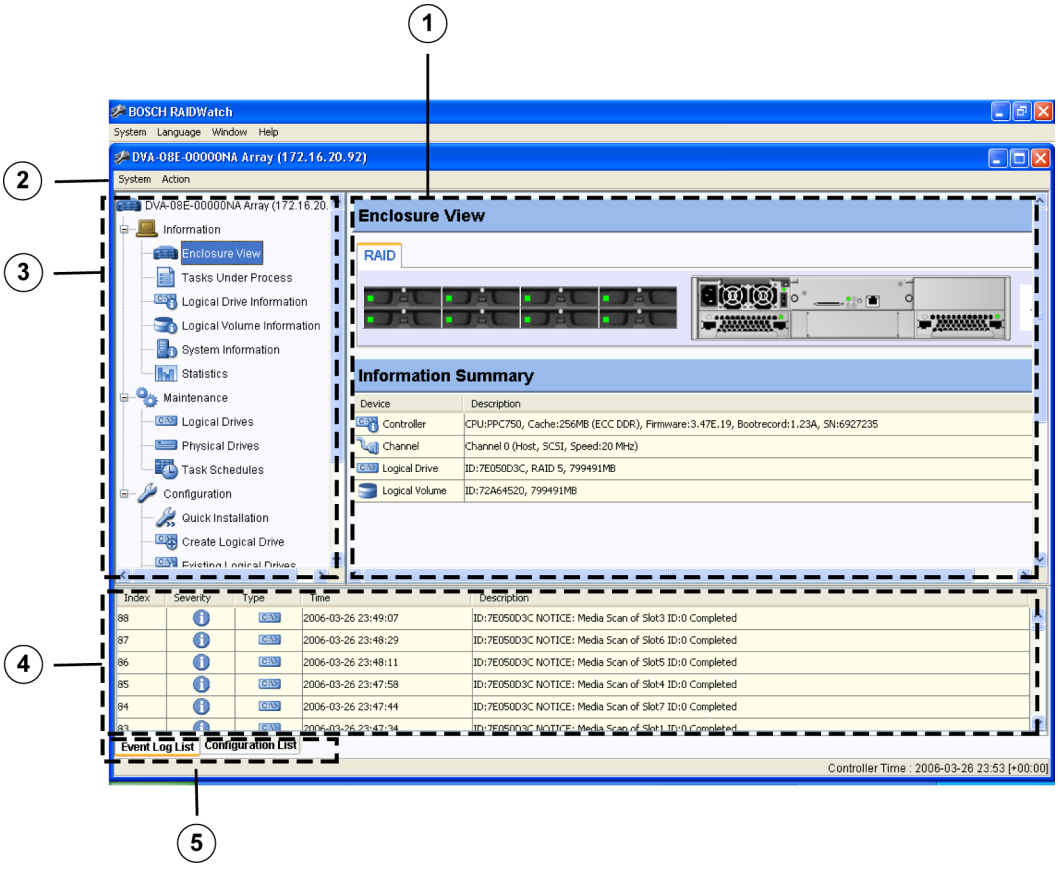


Fig. 6.10 GUI Screen Elements

1 Command Menu

2 Information/Configuration Window

3 Navigation Panel

4 Event Log Window

5 Event Log List/Configuration List/Switch Buttons

The GUI screen can be divided mainly into three (3) separate windows: a tree-structure Navigation Panel, the Information/Configuration window, and the Event Log/Configuration View window at the bottom.
Each information or configuration window can also be accessed through the command menus on the upper left corner of the management interface. At the bottom of the Event Log window, tab buttons allow you to switch the view to the Configuration View display.

6.5.3 Command Menus

The menu bar (shown in *Figure 6.11)* displays the available menus on the Outer Shell window. The Outer Shell window contains multiple management windows each providing access to a connected array.

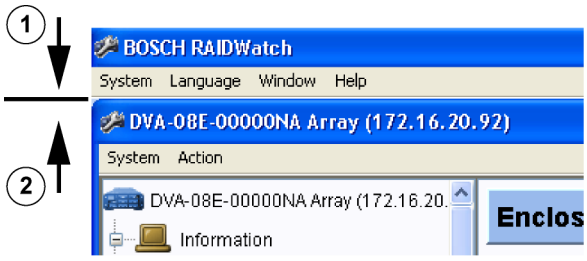


Fig. 6.11 Command Menu Bar

1 Outer Shell Window

2 Management Window

All menus provide a list of commands (shown in *Figure 6.12*) for invoking various disk array and display-related operations.

NOTICE!
Multiple simultaneous Bosch RAIDWatch Managers can connect to one RAID system.

6.5.4 Outer Shell Commands

The following commands are described in *Section 6.5.2 Screen Elements* and shown in *Figure 6.12*.

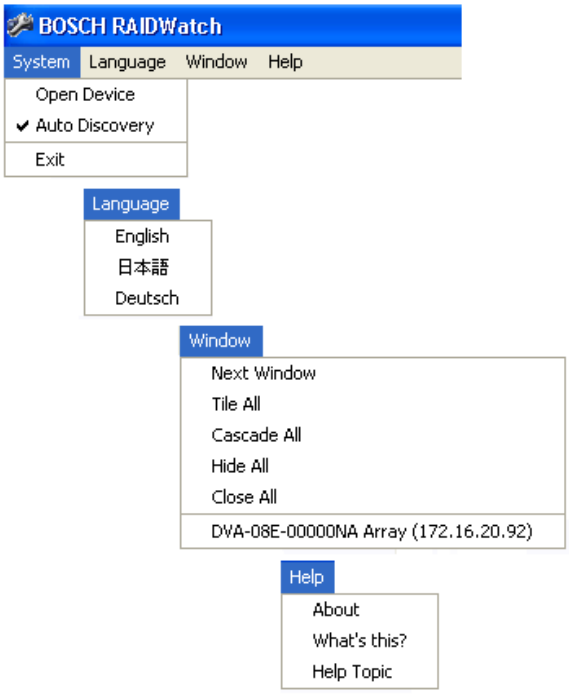


Fig. 6.12 Outer Shell Commands

- Under System menu, the Open Device command lets you connect to a RAID array. This command triggers the connection prompt. Multiple arrays can be managed each in a separate management window.
  Click the Auto Discovery command will start a new search of any available RAID systems in the specific IP ranges on the network. The function can be setup using Bosch RAIDWatch Server utility.

The Exit command under the System menu is always available and is used to end all Bosch RAIDWatch Manager sessions at once.

- The Language items allow you to display the on-screen GUI, instructions, commands, messages, and explanatory legends in a different languages. The current supporting languages are English, German and Japanese.
- The Window command allows you to enlarge, shrink or rearrange the system view window(s). Please refer to *Section 6.9 Arranging Windows* for details on the use of the Window commands.
- Under the Help menu, the About command displays a window that provides Bosch RAIDWatch version and copyright information.
  The Help Topic commands displays the online help contents, which are implemented in Java Help format.
  You may click the What's this? command, move it around the screen, and display related information by a second mouse-click on the screen element you are interested in.

6.5.5 Management Window Commands

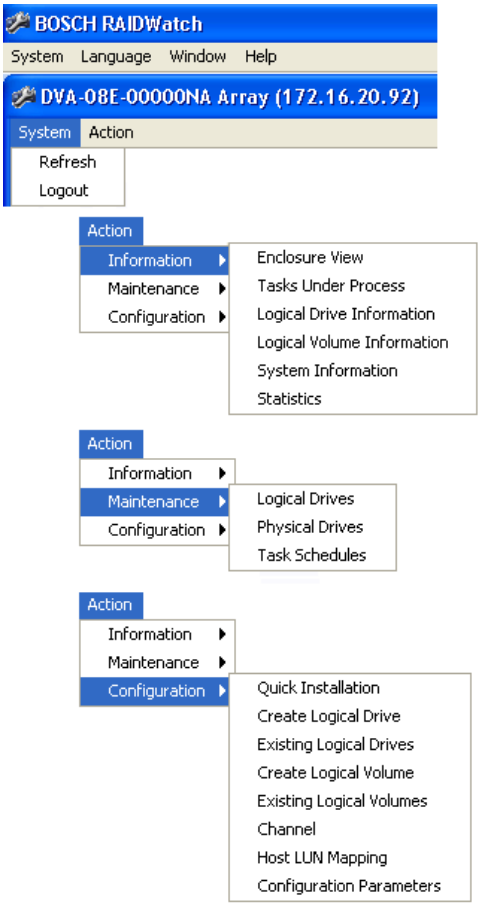


Fig. 6.13 Management Window Commands

- The Refresh command sends instructions to the GUI asking to review the connection status. The Logout command under the System menu allows you to disconnect from a controller/subsystem and to end the software session. This command is only available when Bosch RAIDWatch Manager is currently connected to a RAID array.
- The Action menu brings up sub-menus that allow you to access various options under the three (3) configuration categories: Information, Maintenance and Configuration. Each of these options will be discussed in later this chapter.

- The Command menu provides different configuration options only when specific configuration items are selected in a functional display window. On the other hand, when a configurable item is selected, the corresponding command menu and the related commands automatically appear on the menu bar.

6.6 The Information Category

The Information category allows you to access to information about every aspect of system operation.
To access the information category, either select the icon from the navigation tree or go to the Action Command menus and then select Information on the top of the screen. (See *Figure 6.14*)

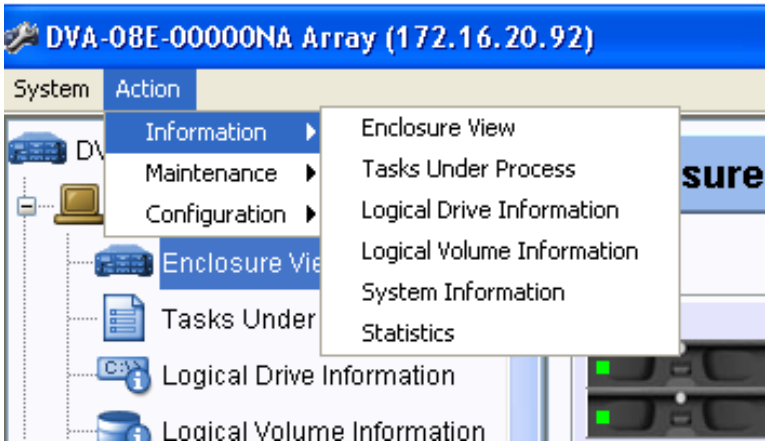


Fig. 6.14 Accessing Information Commands

6.6.1 Enclosure View Window

The Enclosure View window displays the physical view of all major components, including drive slots and enclosure components. When the Enclosure View window is opened, the screen shown in *Figure 6.15* should appear. Use the Enclosure View window to monitor multiple enclosures from the computer screen. For detail of using the Enclosure View window, please refer to *Section 12 Enclosure Display*.

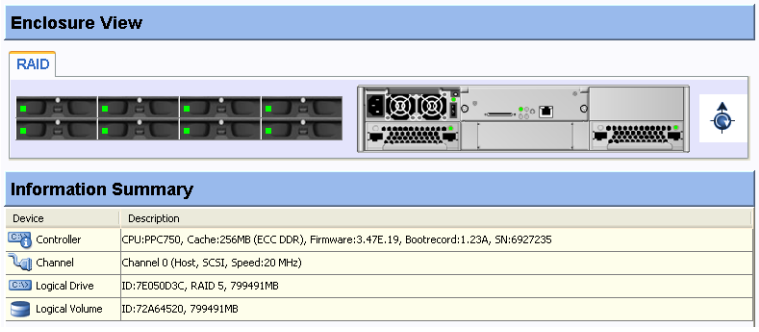


Fig. 6.15 Enclosure View Window

6.6.2 Tasks Under Process Window

The Tasks Under Process window (shown in *Figure 6.16)* reminds you of unfinished tasks being processed by a subsystem. The start time and percentage of progress are also displayed on-screen.

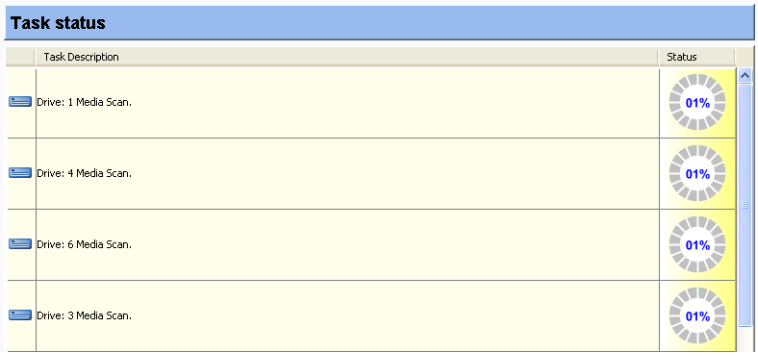


Fig. 6.16 Task Status Window

6.6.3 Logical Drive Information Window

The Logical Drive Information window (shown in *Figure 6.17)* provides the configuration, management, and monitoring functions available in Bosch RAIDWatch. The Logical Drive View window includes three (3) sub-windows: Logical Drive Status, Front View, and Logical Drive Message.

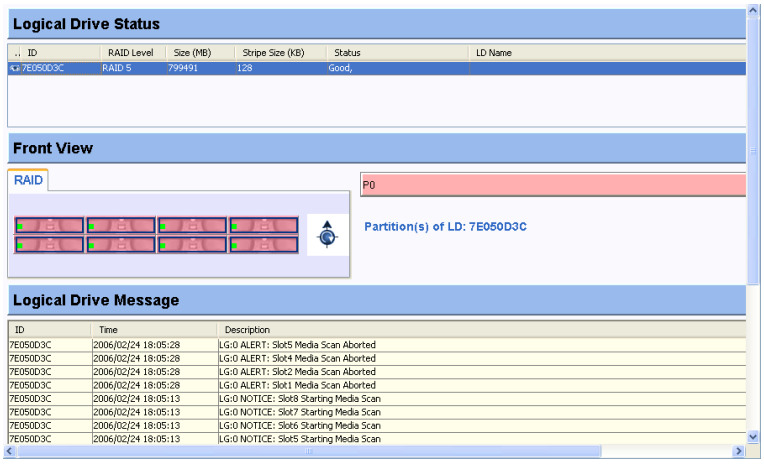


Fig. 6.17 Logical Drive information

Logical Drive Status: This sub-window displays information on configured arrays (logical drives) showing a unique array ID, RAID level, capacity, array status and a name that can be manually assigned.
Front View: This sub-window helps you to quickly identify configured arrays by the physical locations of their members. Different arrays are distinguished by different colors. When any member drive is selected by a mouse click the rest of the array's members will be highlighted by bright blue lines, indicating they are members of the selected array.
Formation of logical partitions is displayed next to the Front View window.
Logical Drive Message: Messages related to a selected array are automatically listed at the bottom of the screen.

6.6.4 Logical Volume Information Window

The Logical Volume Information window (shown in *Figure 6.18)* provides the configuration of a configured volume. The Logical Volume Information window includes three sub-windows: Logical Volume Status, Member Logical Drive(s), and Related Information.

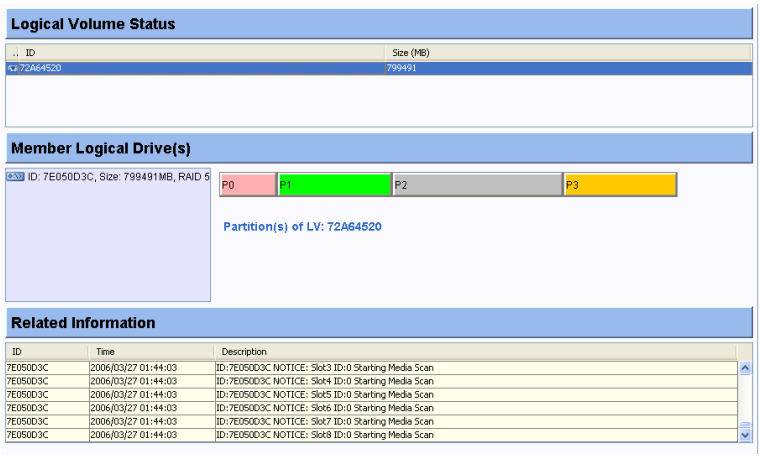


Fig. 6.18 Logical Volume Information

6.6.5 System Information Window

The System Information window (shown in *Figure 6.19)* provides key information about the RAID subsystem and the RAID controller unit that powers the subsystem. Enclosure information includes the operating status of power supply, temperature sensors, and cooling fan units. Controller information includes CPU, firmware/boot record version, serial number, CPU and board temperature, voltage, and status of the battery. This window has no configuration options.

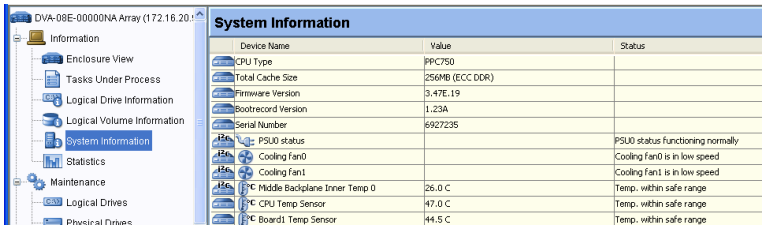


Fig. 6.19 System Information Window

6.6.6 Statistics Window

Select the Statistics window in the configuration tree, and start calculating “Cache Dirty” rate or “Disk Read/Write Performance” by clicking either or both of the check boxes.

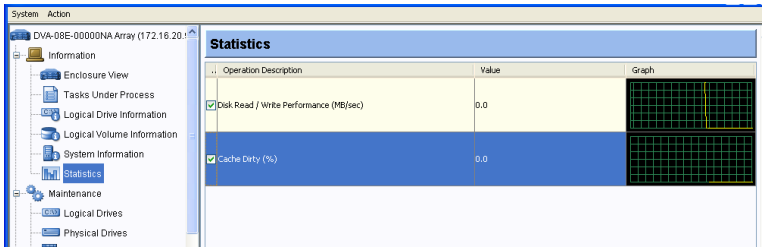


Fig. 6.20 Performance Statistics Window

Cache Dirty (%)

If you select Cache Dirty (%), a window similar to the one shown in *Figure 6.20* will appear. The percentage of the cache block in use is displayed in numbers and the cache hits average is displayed as a graph. The Cache Dirty rate provides cached writes data over the last few minutes and indicates data caching consistency and frequency.

Disk Read/Write Performance (MB/s)

If you select Disk R/W, a window similar to the one shown in *Figure 6.20* will appear showing the read/write performance. A real-time view of current activity is provided as a graph and the performance data is constantly updated and displayed as MB/s.

6.7 The Maintenance Category

The Maintenance category provides access to logical and physical drives and performs maintenance functions that help ensure the integrity of the configured arrays. The operation of the Maintenance window also includes access through the Navigation Panel and a functional window.

To access the maintenance category, either select the icon from the navigation tree or go to the Action Command menus and then select Maintenance on the top of the screen. (See *Figure 6.21*)

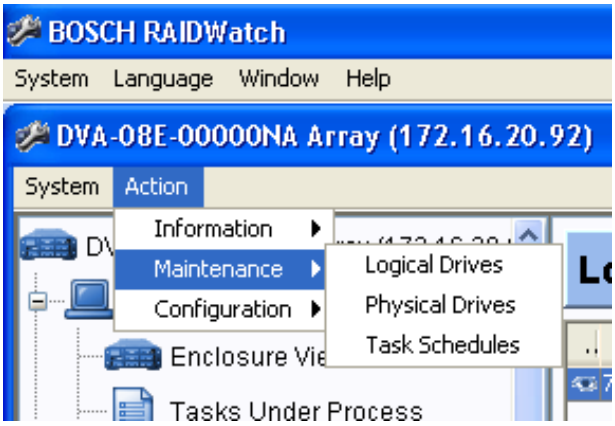


Fig. 6.21 Accessing Maintenance Commands

6.7.1 Logical Drives Maintenance Window

When the Logical Drives maintenance window is opened, the screen shown in *Figure 6.22* should appear.

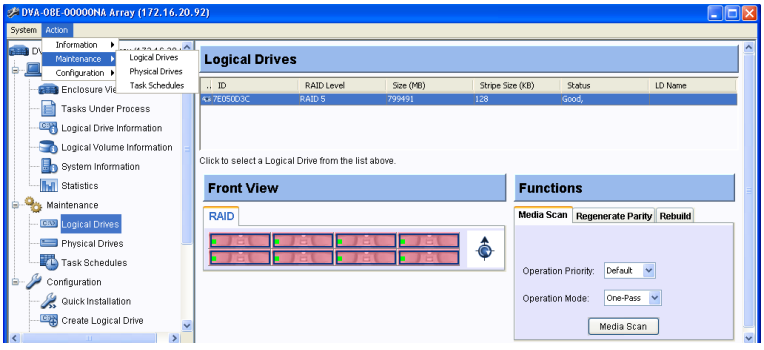


Fig. 6.22 Maintenance - Logical Drives

There are three (3) sub-windows in the Logical Drives maintenance mode window:

- The Logical Drives window provides a list of all configured arrays. Use a single mouse-click to select the logical drive you wish to perform maintenance tasks on.
- The Front View window allows you to see the locations of logical drives. Note that a logical drive is selected by a single mouse-click from the list of configured arrays on the upper screen.
- The Functions window provides configuration options for maintenance tasks and the buttons, which start a maintenance task.
  - Media Scan - Media Scan examines drives and detects the presence of bad blocks. If any data blocks have not been properly committed and are found during the scanning process, data from those blocks are automatically recalculated, retrieved and stored onto undamaged sectors. If bad blocks are encountered on yet another drive during the rebuild process, the block LBA (Logical Block Address) of those bad blocks will be shown. If rebuild is carried out under this situation, rebuild will con-

tinue with the unaffected sectors, salvaging the majority of the stored data.
There are two options with performing the Media Scan:
Operation Priority: determines how much of the system resources will be used for the drive scanning and recalculating process.
Operation Mode: determines how many times the scan is performed. If set to “continuous,” the scan will run in the background continuously until it is stopped by a user.
The system can automatically perform a Media Scan according to a preset task schedule. For more details, please refer to *Section 6.7.3 Task Schedules Maintenance Window*.

– Regenerate Parity - If no verifying method is applied to data writes, this function can often be performed to verify parity blocks of a selected array. This function compares and recalculates parity data to correct parity errors.

NOTICE!
The function is available for logical drive that is configured to RAID level 1, 3 and 5.

– Rebuild – To manually rebuild a logical drive. When this feature is applied, the controller will first examine whether there is any Local Spare assigned to the logical drive. If yes, it will automatically start to rebuild.
If there is no Local Spare available, the controller will search for a Global Spare. If there is a Global Spare, logical drive rebuild will be automatically conducted.

6.7.2 Physical Drives Maintenance Window

When the Physical Drives maintenance window is opened, the screen shown in *Figure 6.23* should appear.

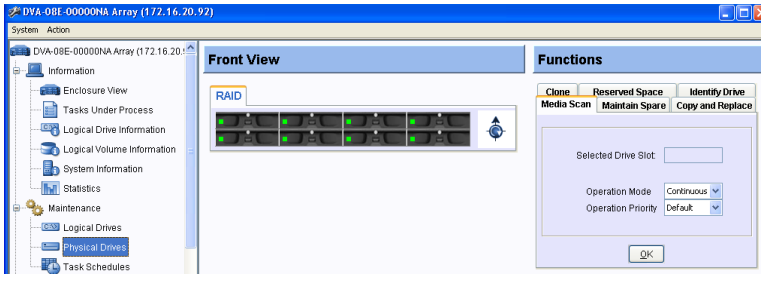


Fig. 6.23 Maintenance - Physical Drives

There are two (2) sub-windows in the Physical Drives maintenance mode window:

- The Front View window allows you to select a hard drive to perform maintenance tasks on. A selected drive is highlighted by bright blue lines, and its slot number is shown in the Functions window in the Selected Drive Slot field.
- The Functions window provides configuration options with maintenance tasks and an OK button to apply the configuration.
- Media Scan – You can set up media scan action to a specific physical drive. To start a media scan, select a drive from the Front View window then set all options in the Functions window and click Apply button.
- Maintain Spare - You can add a spare drive from the list of the unused drives. The spare chosen here can be selected as global or local spare drive. If you choose to create a local spare drive, enter a logical drive ID in the next page. Click Finish, the controller will then rebuild data onto the replacement drive.

NOTICE!
A logical drive composed in a non-redundancy RAID level (NRAID or RAID 0) does not support spare drive rebuild.

- Copy and Replace – Logical drives can be expanded by copying and replacing the member drives with drives of higher capacity. The existing data in the array is copied onto the new drives, and then the original members can be removed.
- Clone – a system administrator can also choose to manually perform “Clone Failing Drive” on a drive, which is about to fail.
- Reserved Space – The 256MB of reserved space can be removed from a drive once the drive is excluded from a logical drive. The reserved space, a space formatted with a micro-file system, can also be manually created from a new disk drive.
- Identify Drive – Use this function to identify a drive on the subsystem. Administrations can identify a drive easily in the server room when he applies this feature using Bosch RAIDWatch program. Select a drive from the Front View window then click Apply button in the Functions window. The drive LED will start flashing.
- Scan/Add/Clear Drive – The Scan drive function allows user to scan a new drive. The ADD and Clear function only appear when you click on an empty drive slot on a SCSI drive channel RAID subsystem. The feature enable user to add a drive entry when the drive slot is empty. The created entry can be deleted by applying Clear Drive Status option.
- Low Level Format – This function only appear when you have inserted a new disk drive without disk format. This function allows you to format a new disk drive.
- Read/Write Test – You can setup a read/write test to a single disk drive. Click on the disk drive that you wish to test in the Front View window and then set the conditions in the Functions window. Click Apply to start the action.

6.7.3 Task Schedules Maintenance Window

When the Physical Drives maintenance window is opened, the screen shown in *Figure 6.24* should appear.

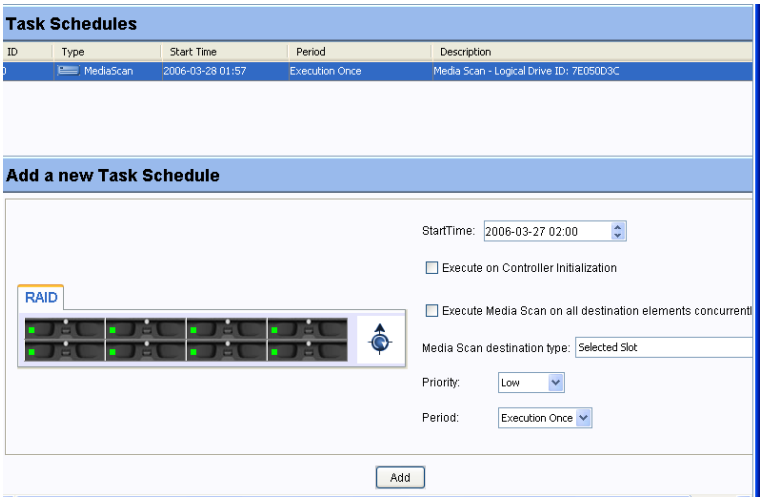


Fig. 6.24 Task Schedules Window

To begin using the Task Schedule functionality, right-click to display the Add New Schedule Task command.

There are two (2) sub-windows in the Task Schedules maintenance mode window:

- The Task Schedules window displays previously configured schedules that are now being held in NVRAM.

- The Configure Task Schedule window allows you to select a hard drive or logical drive to perform a scheduled task on. A selected drive or logical drive is highlighted by bright blue lines and its related configuration options are displayed on the selection boxes on the right of the screen.

The Apply button allows you to complete the process and add the schedule.

6.8 The Configuration Category

The Configuration category contains functional windows that allow you to create logical configurations and set appropriate configuration settings for system operations. This category is available only when logging in using the Configuration access with the correct password.
To access the Configuration category, either select the icon from the navigation tree or go to the Action Command menus and then select Configuration on the top of the screen. (See *Figure 6.21*)

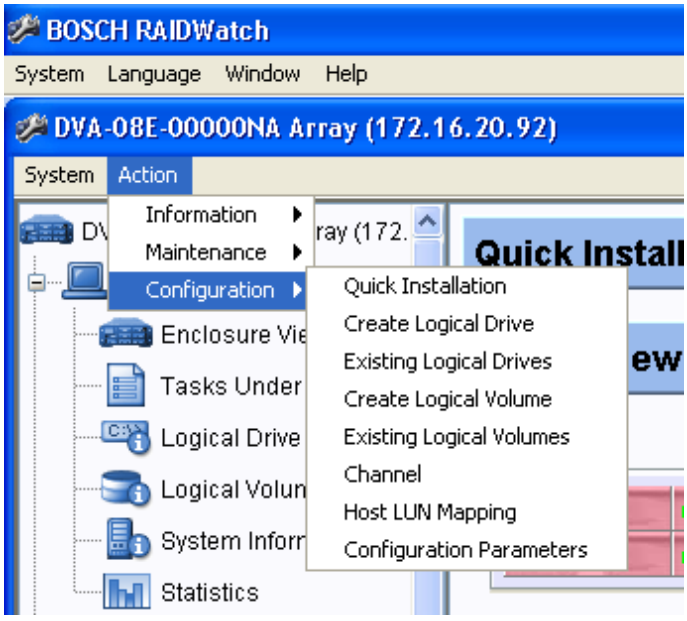


Fig. 6.25 Accessing Configuration Commands

6.8.1 Quick Installation

This is a new function in Bosch RAIDWatch 2.2 or above version. When you first connect Bosch RAIDWatch to a new RAID system without any previous configurations, select Quick Installation and let Bosch RAIDWatch guide you thought a simple logical drive creation process. Later, the Bosch RAIDWatch program will lead you to a LUN mapping process.
If you already have at least one logical drive existed in the RAID system, this function will be disabled. You will be prompt a message window that indicates logical drive already exists.

6.8.2 Create Logical Drive Window

When the Create Logical Drive window is opened, the screen shown in *Figure 6.26* should appear.
The basic rules for using the functional elements in the Create Logical Drive window are:

- This window uses a parallel display principle. To create a logical drive, select its members from the Front View window each by a single mouse-click. The Selected Members window then displays the disk drives' slot IDs and sizes.
- The Configuration view also employs an up-then-down pattern with the configuration process. Important logical drive characteristics are set using the pull-down menus at the

lower part of the Configuration screen. The creation procedure is completed by clicking the OK button at the bottom of the screen.

- A selected physical drive is highlighted by bright blue lines; a second mouse-click on it deselects the drive.

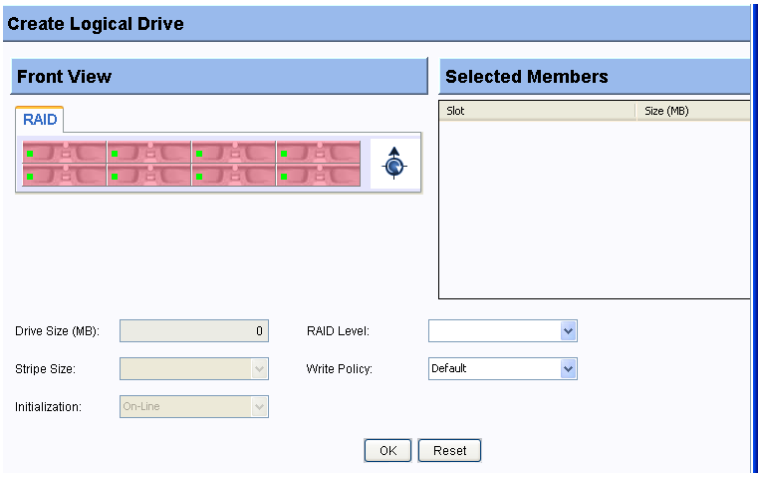


Fig. 6.26 Selecting Members for a New Logical Drive

For detail of creating a logical drive, please refer to *Section 9 Drive Management* of this document.

6.8.3 Existing Logical Drives Window

When the Existing Logical Drives window is opened, the screen shown in *Figure 6.27* should appear.

The basic rules for using the functional elements in the Existing Logical Drives window are:

- This window also uses a parallel display and the up-then-down principle. To start configuring an existing array, select a configured array from the LD list above. Locations of its members are automatically displayed, and then the available functions are displayed in the Functions window.
- This window contains three edit commands that can be triggered by right-clicking your mouse button.

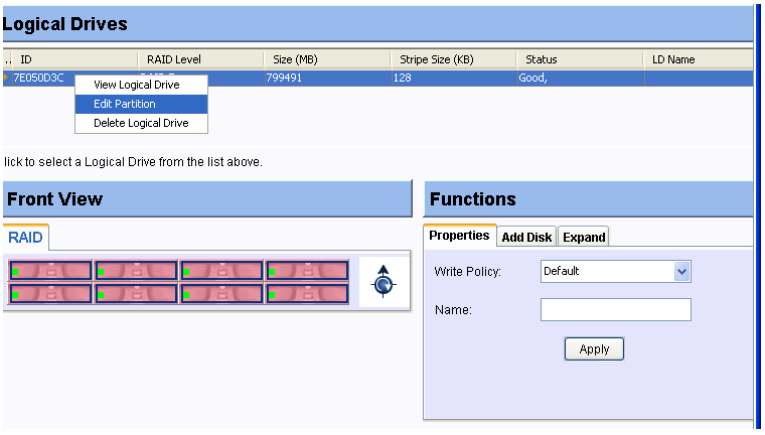


Fig. 6.27 Existing Logical Drives Window

6.8.4 Create Logical Volume Window

This window uses the same operation flow as that applied in the Create Logical Drive window.

6.8.5 Existing Logical Volumes Window

This window uses the same operation flow as that applied in the Existing Logical Volumes window.

NOTICE!
This window also contains Edit mode commands that are only accessible by a mouse right-click.

6.8.6 Channel Window

The Channel window allows you to change host or drive port data rate and to add or remove channel IDs.
When the Channel window is opened, the screen shown in *Figure 6.28* should appear.
Two pages, Parameters and ID, display on the right of the Channel screen.

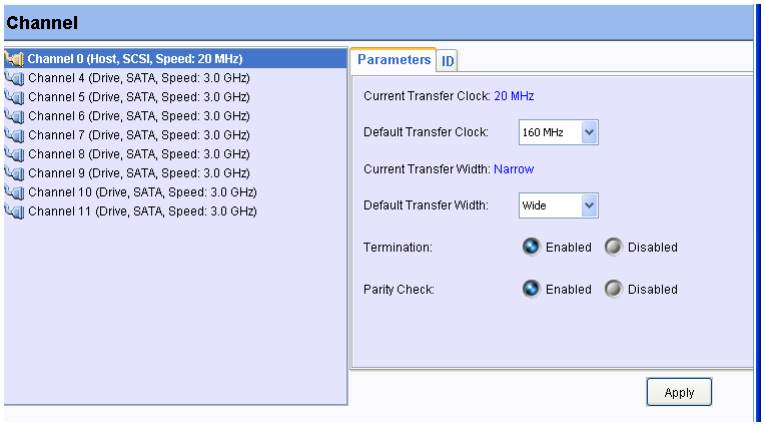


Fig. 6.28 Channel Window

On the Parameters page, current data rate, default data rate and current transfer width are displayed.
Default Data Rate: Should only be applied with limitations on current configuration, e.g., when optical cables and adapters are running on different wavelengths.
The ID page allows you to add or remove IDs by selecting or deselecting ID boxes.

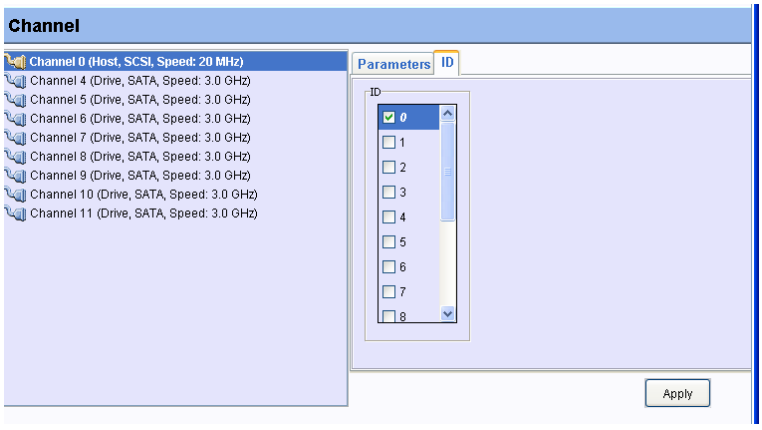


Fig. 6.29 Host Channel ID Settings

Be sure to click *Apply* for the configuration to take effect. For detail of how to configure channels, please refer to *Section 8 Channel Configuration* of this document.

NOTICE!
Adding/removing IDs requires resetting the controller/subsystem.

6.8.7 Host LUN Mapping Window

The Host LUN Mapping window allows you to associate configured arrays with host channel IDs or LUN numbers.

- The Host LUN Mapping window contains four sub-windows: Host LUN(s), WWN Names(s), and Logical Drive(s) or Volume(s).
- This window also contains a right-click menu that creates association with either a Primary Controller ID or a Secondary Controller ID.

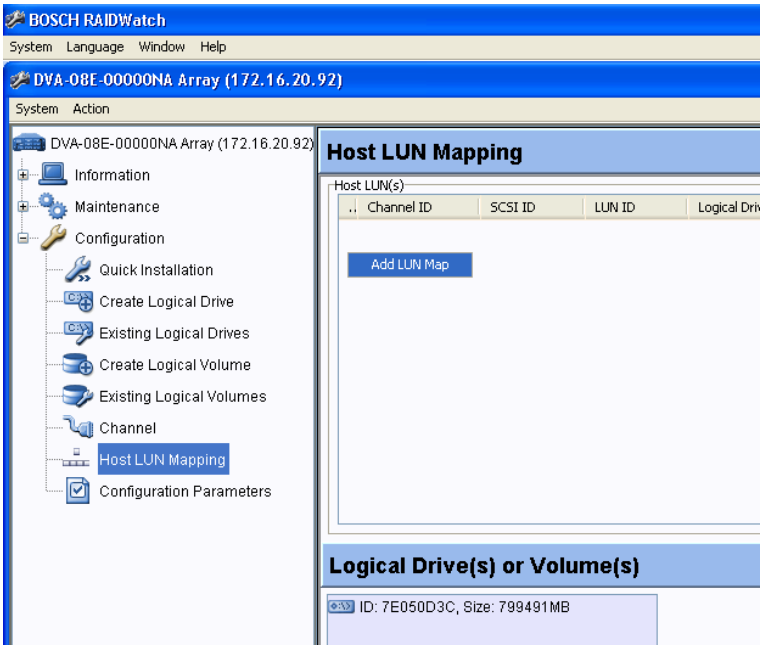


Fig. 6.30 Host LUN Mapping Right-click Menu

6.8.8 Configuration Parameters Window

The Configuration Parameters window allows you to change various system preferences options.

This window uses tabbed panels to provide access to the functional sub-windows. Each sub-window provides configurable options using check boxes, check circles, or pull-down menus. Clicking Apply button will complete the configuration process. A mixture of message prompts, file path windows, text fields, and confirm boxes ensure ease of use. Refer to *Section 7 Configuration Parameters* for details of each configuration options.

6.9 Arranging Windows

Each array configuration window is enveloped in a system view window. The system view window is the area where you interact with Bosch RAIDWatch program. You can use the mouse to choose commands from outer shell Window menu to enlarge, shrink or rearrange currently opened system view window(s) on your screen. You may also select each connected system by clicking the listed systems at the bottom of the Window menu.

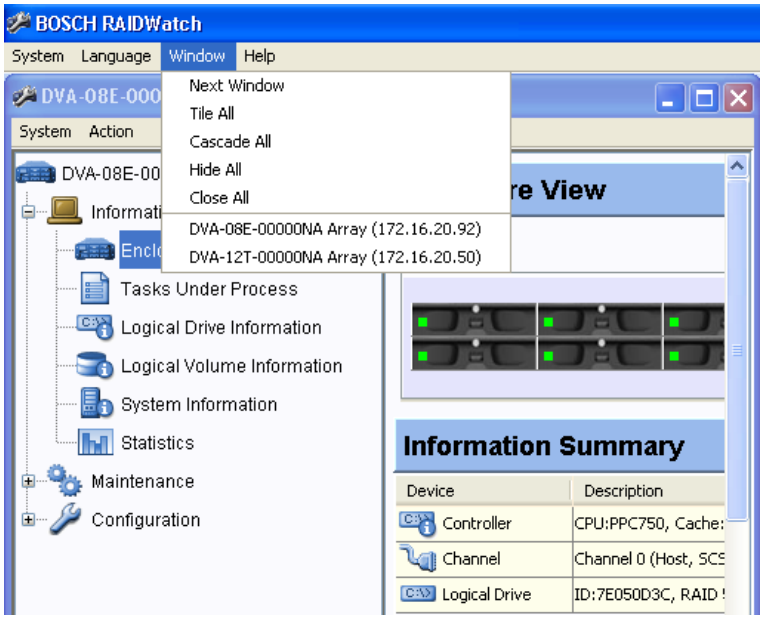


Fig. 6.31 The “Outer Shell” System View Window

The window menu includes the following commands:

- Next Window: The Next Window command change which window is active. The active window is raised to the top of the screen. If you connect more than one RAID system, this command allows you to switch between different system view windows. The Next Window command is useful if you want to circulate through all the windows on the screen.
- Tile All: Use the Tile All command to arrange and display all system view windows. This allows you to view multiple systems simultaneously.
- Cascade All: Use the Cascade All command to diagonally arrange and display all system view windows on the screen. This allows you to view multiple systems at a glance.
- Hide All: When you select this command, all active system view windows will be minimized to small icons on the bottom left of the Bosch RAIDWatch screen. To enlarge the system view window, click on the icon(s).
- Close All: If you select this command, all the RAID systems will be discounted and every system view windows will be closed.
- System List: A list of connected RAID systems is shown in the Window menu. To view a specific system, mouse click on the system name and its system view window will show up.

6.10 Multi-array Management

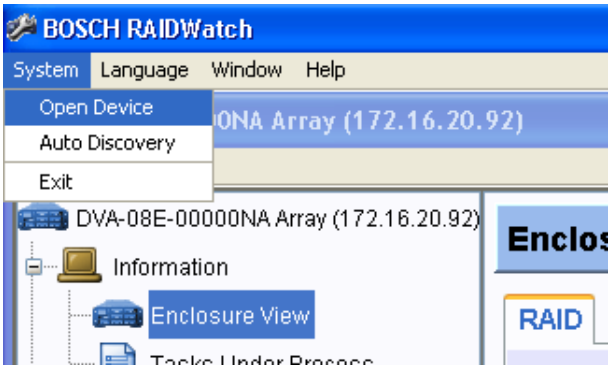


Fig. 6.32 Opening Device for Multi-Array Management

Management of multiple arrays is allowed by clicking the Open Device command under the System menu. The Exit command ends the Bosch RAIDWatch manager session with all configured arrays. Clicking the Open Device command and the connection wizard is followed. Multiple management windows can be opened.

7 Configuration Parameters

7.1 Accessing Configuration Parameters Options

To access controller configuration options, either use the Configuration category icons on the Navigation Tree or select the Configuration Parameters command from the command menu to open the Configuration Parameters. The configuration window contains many options that are directly related to array performance, and should be configured *before* creating logical arrays. (See *Figure 7.1*)

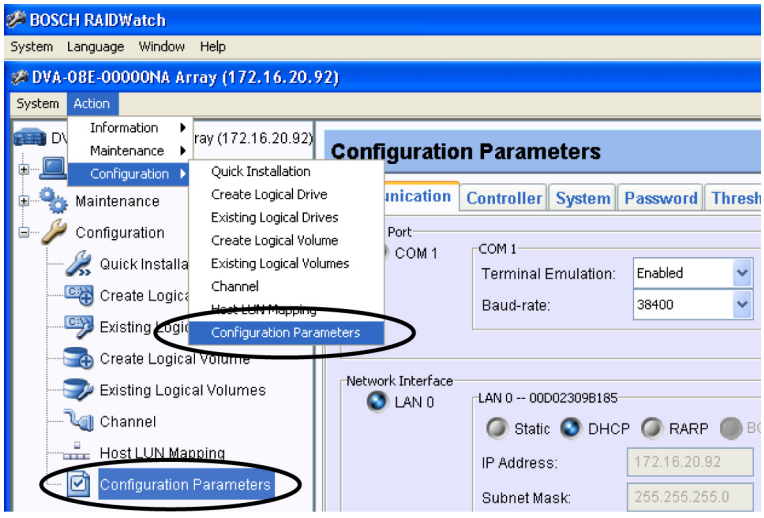


Fig. 7.1 Opening the Configuration Parameters Window

The following is a complete list of configuration controls and optional menus that you will have available once the Configuration Parameters option has been selected.
More information about many of these variables is available in the controller hardware and firmware documentation.

7.2 Communications

To configure the Communication options, select the Communication page, as shown in *Figure 7.2*, from the Configuration Parameters window.

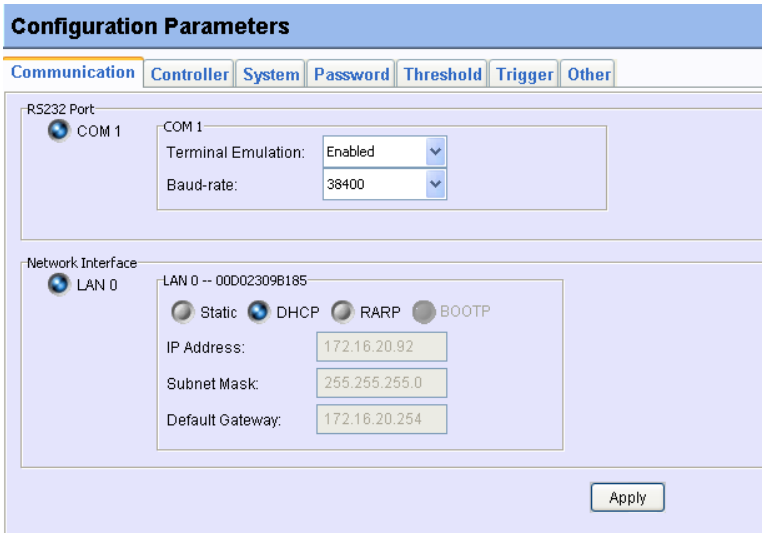


Fig. 7.2 The Communication Page

7.2.1 RS-232C Port

Bosch RAID subsystems/controllers come with one or two serial ports. Before proceeding with configuration, first select COM1 or COM2 by a single mouse click.

- Terminal emulation allows you to enable or disable the terminal emulation option. If you want to connect the COM port to a computer running terminal emulation, enable the option and set the identical baud rate to the computer COM port.
- Baud rate allows you to control the serial port baud rate. Select an appropriate value from the pull-down menu.

7.2.2 Network Interface

Depending on your network setting, select a protocol selection circle to obtain adequate TCP/IP support. This column is used to configure the subsystem's Ethernet port. If the Static box is selected, consult your network administrator for appropriate IP address, subnet mask and gateway values.

Click Apply for the configurations to take effect.

7.3 Controller

"Controller" here refers to the RAID controller unit, which is the main processing unit of a RAID subsystem. The configuration window contains two sub-windows: "Caching" and "Controller Parameters." To configure the controller's caching behaviors, select an appropriate value from each of the pull-down menus.

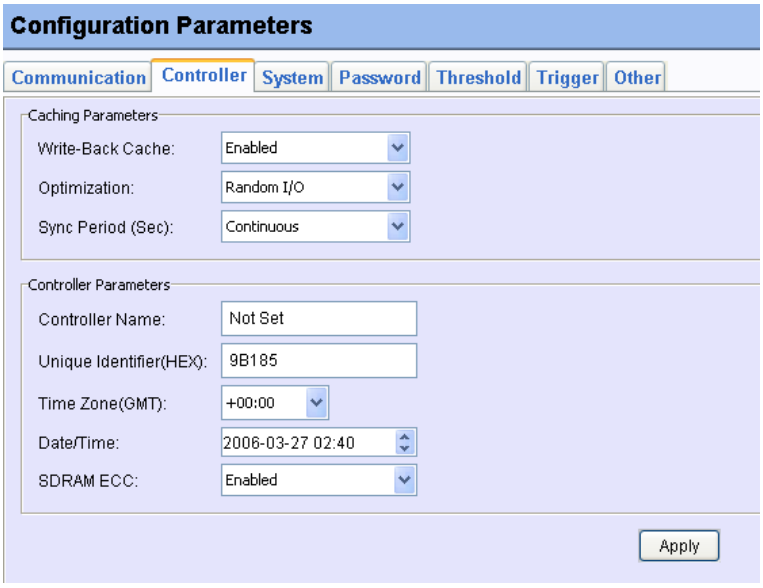


Fig. 7.3 The Controller Page

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

7.3.1 Caching Parameters

- Write-Back Cache
  - Enabled, Host Writes are cached before being distributed to hard drives. This improves write performance but requires battery backup support to protect data integrity in case of a power outage.
  - Disabled, Cache Write-Through. Used primarily if no cache battery backup is installed and if there is increased likelihood of a power failure.
- Optimization Policy

  - Optimization for Random I/O. More common setting. Use this option for environments (e.g., database maintenance) with smaller I/O transactions.
  - Optimization for Sequential I/O. Used for large I/O environments such as video recording and editing. Particularly useful where I/O read/write must be in sequential order.
- Sync. Period
  Enter the period, the cache is being written to the hard disks.

7.3.2 Controller Parameters

- Controller Name
  A manually entered nickname for the RAID controller. This name can also be used to recognize a RAID subsystem in an environment where multiple RAID subsystems reside.
- Unique Identifier (HEX)
  This is a MUST for subsystem configuration. This identifier must be unique in a network environment. The MAC address is derived from this.
- Time Zone(GMT)
  GMT (Greenwich Mean Time) is used with a 24-hour clock. To change the clock to your local time zone, select a time from the drop-down menu. Choose the hour later than the Greenwich Mean Time following a plus (+) sign. For example, enter "+9" for Japan's time zone.
- Date/Time
  Enter time and date in their numeric representatives in the following order: month, day, hour, minute, and the year.
- SDRAM ECC
  If the DIMM module installed for data caching supports ECC, you may select to enable or disable the error check function here.

When preferences have been set with the configurations above, click Apply to make the changes.

7.4 System

To access the System-specific functions, select the *System* page, as shown in *Figure 7.4*, from the Configuration Parameters window.

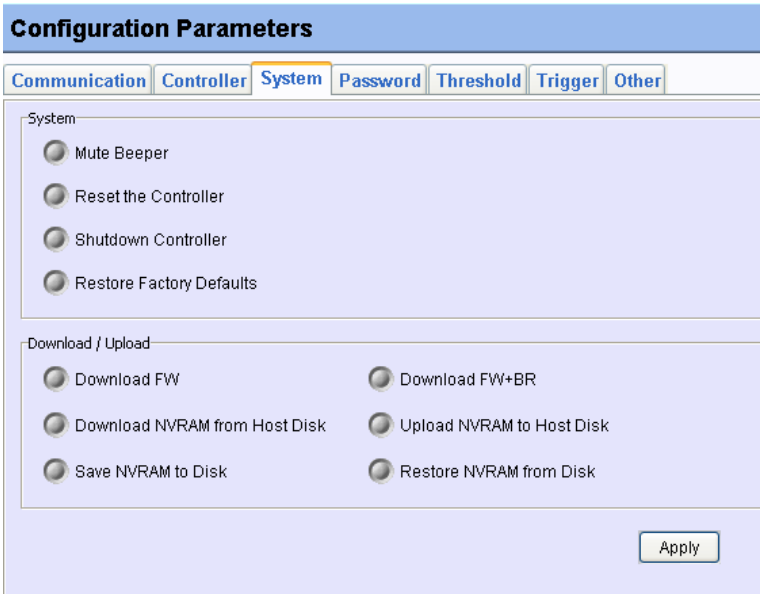


Fig. 7.4 The System Page

Each function is executed by a two-step procedure. Click the select button of the function you wish to perform and click the "*Apply*" button for the configuration to take effect.
Select only one option each time from the *System* page. You may repeat the steps if you like to change more than one option.

7.4.1 System Functions

- *Mute Beeper*. Turns the beeper off temporarily for the current event. The beeper will still be activated by the next event. Be sure that you have checked carefully to determine the cause of the event.
- *Reset Controller*. Resets the subsystem without powering off.
- *Shutdown Controller*. This prepares the subsystem to be powered off. This function flushes the unfinished writes still cached in controller memory making it safe to turn off the subsystem.
- *Restore Factory Default*. When you apply this function, any settings that you have made in Bosch RAIDWatch program will be formatted and the original factory default configuration will be restored.

7.4.2 Download/Upload

- *Download FW*. Subsystem firmware can be upgraded using the existing management connection (whether Ethernet or in-band). Provide the firmware filename using the file location prompt. Bosch RAIDWatch will start to download the firmware. Find an appropriate time to temporarily stop the access from host systems, then reset the controller in order to use the new downloaded firmware.
- *Download FW+BR:* This allows you to download the firmware and boot record together. It may not be necessary to upgrade the boot record each time you update your firmware binaries. Please refer to the readme text file that came with each firmware version.
- *Download NVRAM from Host Disk:* The subsystem configuration is saved in NVRAM and can be saved to a system drive. This function allows you to retrieve a previously saved configuration profile from a system disk.

NOTICE!
All of the download functions will prompt for a file source from the current workstation.

- *Upload NVRAM to Host Disk:* This allows you to backup your controller-dependent configuration information to a system drive. We strongly recommend using this function to save the configuration profile whenever a configuration change is made.
- *Save NVRAM to Disk:* The configuration profile can also be saved to array hard drives. Each array hard drive will have a replica of the NVRAM backup in its reserved space so that when a drive fails or is being regrouped, the backup remains intact.
- *Restore NVRAM from Disk:* While user likes to retrieve the previously saved NVRAM backup from subsystem hard drives, all the settings including system password will also be restored. It causes inconvenience if user doesn't get the stored password before and hence user can't access subsystem. With this option, user can decide whether to restore with or without password through user interface (terminal) according to individual requirement.
  When this option is applied, a question window will prompt up. (See *Figure 7.5*)

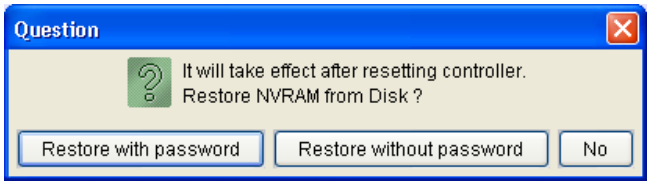


Fig. 7.5 The Question Window

NOTICE!
Upload NVRAM will prompt for a file destination at the current workstation.
This option is only available in Firmware 3.47 or above version.

7.5 Password

To configure different levels of the Access authorization Password, select the *Password* page, as shown in *Figure 7.6*, from the Configuration Parameter window.

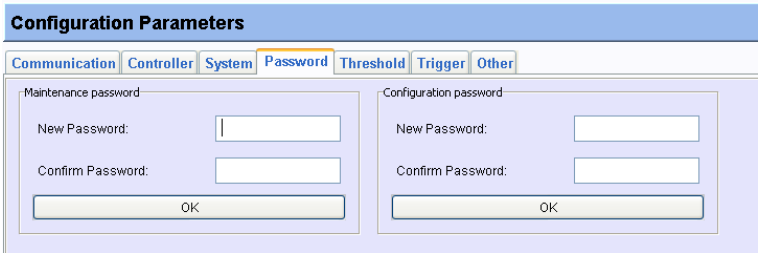


Fig. 7.6 The Password Page

7.5.1 Maintenance Password

Users logging in using the Maintainance Password will be able to access the first two configuration categories, Information and Maintenance. You may set the Maintenance Password here and click **OK** for the change to take effect.

7.5.2 Configuration Password

Users logging in using the Configuration Password have full access to all configuration options. A super-user has the right to access all three configuration categories on the naviga-

tion tree. You may set the Configuration Password here and click *OK* for the change to take effect.

7.6 Threshold

To access the event threshold options, click the Threshold page in the Configuration Parameters window.
This window allows you to change the preset values on thresholds used to monitor the condition of the RAID controller unit(s) in your subsystem. For example, these threshold values can be changed if the controller operates in a system enclosure where the upper or lower limit on ambient temperature is much higher or lower than that on the RAID controller. Adjusting the default thresholds can coordinate the controller status monitoring with that of the system enclosure.
It is not recommended to change the threshold values unless out-of-normal conditions are expected on the installation site.

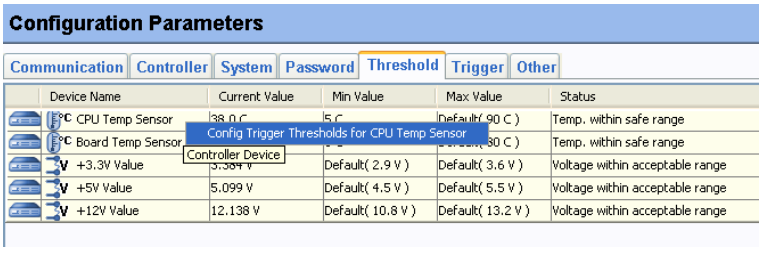


Fig. 7.7 The Threshold Page

To change the threshold values on a specific monitored item, for example, the CPU Temp Sensor, right-click on the item. The *Configuration* button will prompt. (See *Figure 7.7*) Left-click on the *Configuration* button to bring up the Configuration prompt window. (See *Figure 7.8*)

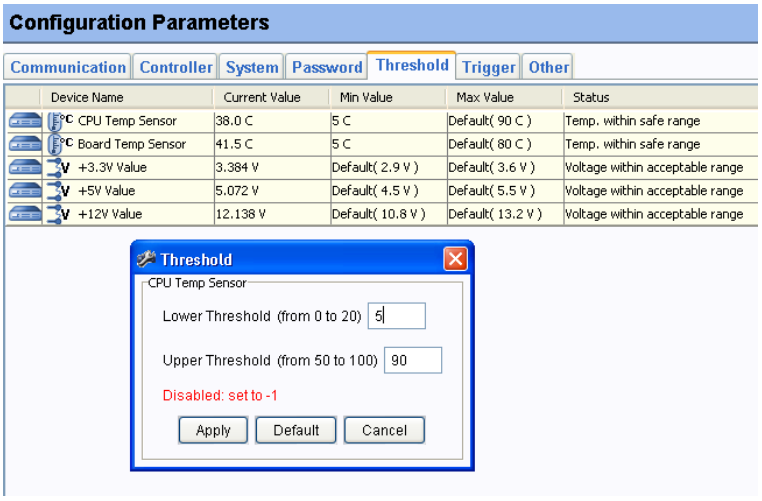


Fig. 7.8 The Threshold Configuration Prompt Window

CAUTION!
The upper or lower thresholds can also be disabled by entering “-1” in the threshold field. However, users who disable the thresholds do this at their own risk. The controller(s) will not report condition warning when the original thresholds are exceeded.

You may then enter a value in either the lower or upper threshold field.

NOTICE!
If a value exceeding the safety range is entered, an error message will prompt and the new parameter will be ignored.

Click Apply for the configuration change to take effect.
Click Default to restore the default values for both thresholds.
Click Cancel to cancel this action and go back to the Threshold page in Configuration Parameter window.

7.7 Event Triggered Operations

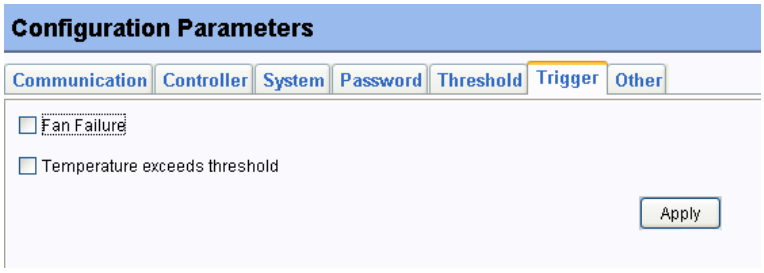


Fig. 7.9 The Trigger Page

To reduce the chance of data loss caused by hardware failure, the controller/subsystem can automatically commence an auto cache flush upon the detection of the following conditions. When cache contents are forced to be distributed to hard drives the Write-Back caching mode is also switched to the Write-Through mode.

- Controller Failure
- BBU Lower or Failure
- UPS Auxiliary Power Loss
- Power Supply Failed (single PSU failure)
- Fan Failure
- Temperature Exceeds Threshold

Each option is executed by a two-step procedure. Select the check box of the events for which you wish the controller/subsystem to commence the cache flush, and then click *Apply* for the configuration to take effect.

NOTICE!
The thresholds on temperature refer to the defaults set for “RAID controller board temperature.”

7.8 Other

I/O channel host-side, drive-side, and rebuild priority options are included in the Other sub-window. To configure these configuration options, select the *Other* page, as shown in *Figure 7.10*, from the Configuration Parameters window.

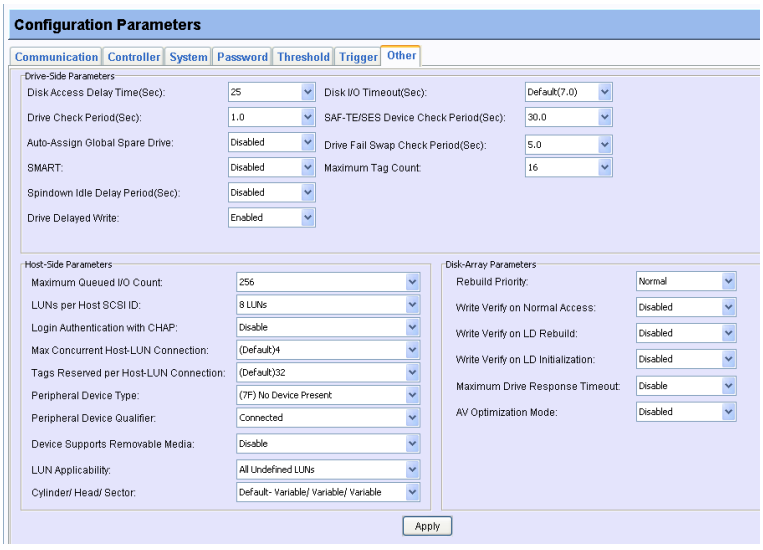


Fig. 7.10 The Other Page

Each option is executed by a two-step procedure. Click to select a desired value from the pull-down menu, and then click **Apply** for the configuration to take effect. Some configuration changes may only take effect after resetting the subsystem.

7.8.1 Drive-side Parameters

- *Disk Access Delay Time (Sec)*: Sets the delay time before the subsystem tries to access the hard drives after power-on. Default is 15 seconds.
- *Drive Check Period (Sec):* This is the time interval for the controller to check all disk drives that were on the drive buses at controller startup. The default value is “Disabled.” Disabled means that if a drive is removed from the bus, the controller will not know it is missing as long as no host accesses that drive. Changing the check time to any other value allows the controller to check all array hard drives at the selected time interval. If any drive is then removed, the controller will be able to know – even if no host accesses that drive.
- *Auto-assign Global Spare Drive:* Enable this function to allow the system to auto-assign the Global Spare drive.
- *SMART*: This allows you to configure SMART-related functionality. SMART is short for “Self-Monitoring, Analysis and Reporting Technology.” Options provided in the pull-down menu are the actions to be taken if the SMART function detects an unstable drive.
- *Drive Motor Spin Up:* Selected when hard drives need to Spin-up by SCSI command. By default, all hard drives will start spinning up when powered-on. Also refer to the documentation that came with your hard drives.
- *Drive Delayed Write:* User is able to enable/disable the drive write cache. With enabled drive write cache, the non-mission critical application can achieve better performance. Whereas, the disabled drive write cache is recommended to be used for mission-critical applications. Bosch’s RAID system will maintain the system reliability. The default setting is “Disabled.”

NOTICE!
This function is only applicable on RAID subsystems running Firmware 3.47 or above version with SATA HDD configured.

- *Disk I/O Timeout (Sec):* This is the time interval for the subsystem to wait for a drive to respond to I/O requests. Selectable intervals range from 1 to 10 seconds.
- *SAF-TE/SES Device Check Period (Sec):* If enclosure devices in your RAID enclosure are being monitored via SAF-TE/SES, use this function to decide at what interval the subsystem will check the status of these devices.
- *Drive Fail Swap Check Period (Sec):* The subsystem scans drive buses at this interval to check if a failed drive has been replaced.
- *Maximum Tag Count*: The subsystem supports tag command queuing with an adjustable maximum tag count from 1 to 128. The default setting is “Enabled” with a maximum tag count of 32.
- *Spindown Idle Delay Period (Sec):* User can setup an idle period for the drives. Drives will automatically spin down while there is no read/write command to drives within the idle period. Then if any I/O command is issued, such as disk backup, the drives will wake up and serve the I/O requirement. This feature rises up drives’ usage life.

NOTICE!
This function is only applicable on RAID subsystems running Firmware 3.47 or above version with SATA HDD configured.

7.8.2 Host-side Parameters

- *Maximum Queued I/O Count:* This is the arrangement of the controller internal resources for use with a number of the current host nexus. It is a "concurrent" nexus, so when the cache is cleared up, it will accept a different nexus again. Many I/Os can be accessed via the same nexus.
  This function allows you to configure the maximum number of I/O queues the controller can accept from the host computer.
- *LUNs per Host ID:* Each SCSI ID can have up to 32 LUNs (Logical Unit Numbers). A logical configuration of array capacity can be presented through one of the LUNs under each host channel ID. Most SCSI host adapters treat a LUN like another SCSI device.
- *Max. Concurrent Host-LUN:* The configuration option adjusts the internal resources for use with a number of current host nexus. If there are four host computers (A, B, C, and D) accessing the array through four host IDs/LUNs (ID 0, 1, 2 and 3), host A through ID 0 (one nexus), host B through ID 1 (one nexus), host C through ID 2 (one nexus) and host D through ID 3 (one nexus) - all queued in the cache - that is called 4 nexus. If there are I/Os in the cache through four different nexus, and another host I/O comes down with a nexus different than the four in the cache (for example, host A access ID 3), the controller will return "busy". Note that it is "concurrent" nexus; if the cache is cleared up, it will accept four different nexus again. Many I/Os can be accessed via the same nexus.
- *Tag Reserved Per Host-LUN Connection:* Each nexus has 32 (the default setting) tags reserved. When the host computer sends 8 I/O tags to the controller, and the controller is too busy to process them all, the host might start to send less than 8 tags during every certain period of time since then. This setting ensures that the controller will accept at least 32 tags per nexus. The controller will be able to accept more than that as long as the controller internal resources allow - if the controller does not have enough resources, at least 32 tags can be accepted per nexus.

- *Peripheral Device Type / Peripheral Device Qualifier / Device Supports Removable Media / LUN applicability:* If no logical drive has been created and mapped to a host LUN, and the RAID controller is the only device connected to the host SCSI card, usually the operating system will not load the driver for the host adapter. If the driver is not loaded, the host computer will not be able to use the in-band utility to communicate with the RAID controller. This is often the case when users want to start configuring a RAID using management software from the host. It will be necessary to configure the "*Peripheral Device Type*" setting for the host to communicate with the controller. If the "LUN-0's only" is selected; only LUN-0 of the host ID will appear as a device with the user-defined peripheral device type. If "all undefined LUNs" is selected, each LUN in that host ID will appear as a device with the user-defined peripheral device type.
  For connection without a pre-configured logical unit and Ethernet link to a host, the in-band SCSI protocol can be used in order for the host to “see” the RAID subsystem. Please refer to the reference table below. You will need to make adjustments in those pull-down menu: Peripheral Device Type, Peripheral Device Qualifier, Device Support for Removable Media, and LUN Application.

Operation System	Peripheral Device Type	Peripheral Device Qualifier	Device Support for Removable Media	LUN Applicability
Windows 2000/ 2003	0xd	Connected	Either is okay	LUN-0’s

Table 7.1 Peripheral Device Type Parameters

Device Type	Settings
Enclosure Service Device	0xd
No Device Present	0x7f
Direct Access Device	0
Sequential-access Device	1
Processor Device	3
CD-ROM Device	5
Scanner Device	6
MO Device	7
Storage Array Controller Device	0xC
Enclosure Services Device	0xD
Unknown Device	0x1f

Table 7.2 Peripheral Device Type Settings

NOTICE!
This function is only applicable on Bosch iSCSI series RAID subsystems.

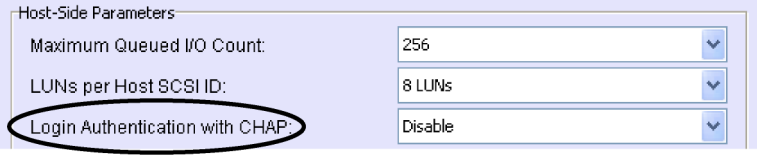


Fig. 7.11 The Other Page for iSCSI Models

7.8.3 Disk-Array Parameters

- *Rebuild Priority:* The rebuild priority determines how much of the system resources are applied when rebuilding a logical drive. Available options are Low, Normal, Improved, and High. The higher priority takes up more system resources and the rebuild process completes more rapidly. However, I/O performance in the meantime is inevitably lower due to the resources consumed.
- *Write-Verify Options:* Errors may occur when a hard drive writes data. In order to avoid write errors, the controller can force the hard drives to verify the written data. There are three selectable methods:
  - Verification on LD Normal Access:
    Performs Verify-after-Write during normal I/O requests.
  - Verification on LD Rebuild Writes:
    Performs Verify-after-Write during the rebuilding process.
  - Verification on LD Initialization Writes:
    Performs Verify-after-Write while initializing the logical drive.
- *Maximum Drive Response Timeout (ms):* The main purpose for having a maximum response time on hard drives is to ensure delays caused by media errors or drive erratic behaviors do not result in host I/O timeouts. Doing so can avoid the unnecessary efforts dealing with delays especially when drives showing problems are often the failing drives. Below are some operation limitations:
  - Battery shall be present and not failed.
  - Write-Back policy is enabled.
  - Only available for RAID level 1, 3 and 5.

  If this option is applied, when write cmd Timeout regarding to different RAID levels with its corresponding disk status will:
  - RAID1: Paired disk conditions are good and the corresponding write cmd is complete.
  - RAID3 or 5: All member disk conditions are good and others write are completed on the same stripe disk.

NOTICE!
This function is only applicable on RAID subsystems running Firmware 3.42 or above version.

- *AV Optimization Mode:* The AV optimization is applied for the emerging Audio/Video or non-drop frame applications.
  Choose Fewer Steaming will:
  - Maximum Drive Response Timeout will be automatically set as 160ms.
  - The drive cache-flushing threshold is set as 16% to enhance performance by using LMDD test in the sequential read.
  - Low Priority Rebuild will be much slow down when host I/O loading.
  - A minimum read-ahead size is determined.

  Choose Multiple Steaming will:
  - Maximum Drive Response Timeout will be automatically set as 960ms.
  - The drive cache-flushing threshold is set as 16% to enhance performance by using LMDD test in the sequential read.
  - Low Priority Rebuild will be much slow down when host I/O loading.
  - A minimum read-ahead size is determined.

NOTICE!

- No matter what user configures for the Maximum Drive Response Timeout, once the AV optimization is set to Fewer Streaming option, the Maximum Drive Response Timeout is fixed at 160ms. If the AV optimization is set to Multiple Streaming option, the Maximum Drive Response Timeout is fixed at 960ms.
- The above parameter (2) & (3) will leave modification capability in append file for specific ODM/OEM requirement.

8 Channel Configuration

Using Bosch RAIDWatch Manager, you can modify the configuration of any channel on the controller. Enable or disable channel termination, set 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.

8.1 Channel Configuration Window

I/O Channel configuration options are available under the Configuration category, which is found in the lower section of the navigation panel.
To access the Channel window, use either the command from the Action menu or select the Channel icon from the navigation panel. (See *Figure 8.1*).

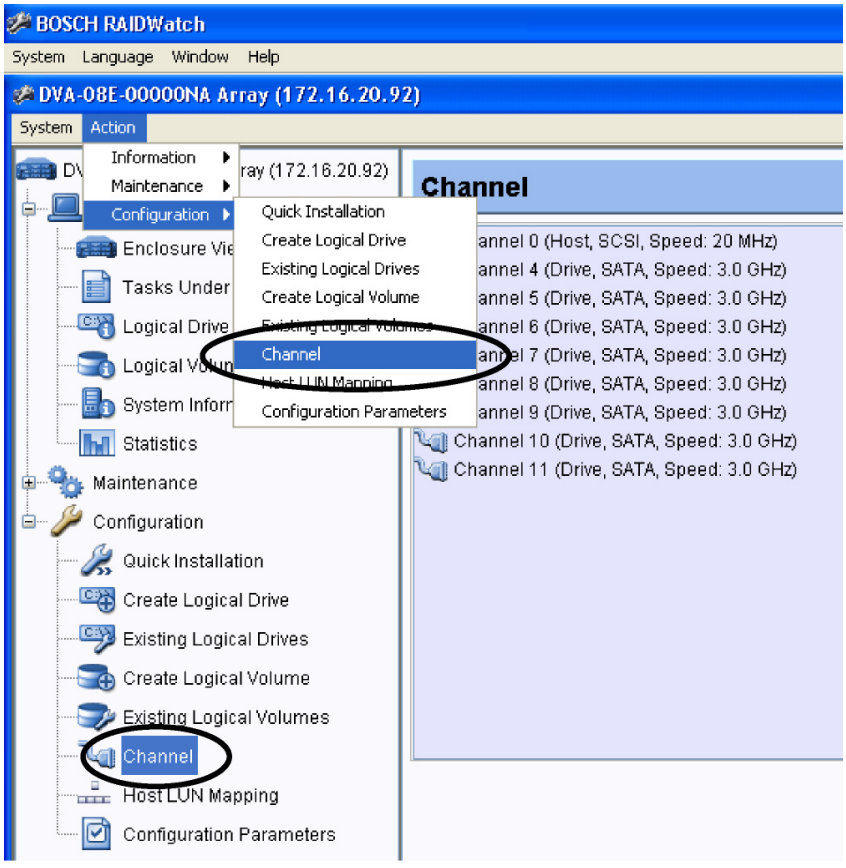


Fig. 8.1 Accessing Channel Configuration Window

Once the Channel window has been opened and channel items have appeared, click on the channel that needs to be configured and its configuration window will appear on the right. (See *Figure 8.2*)

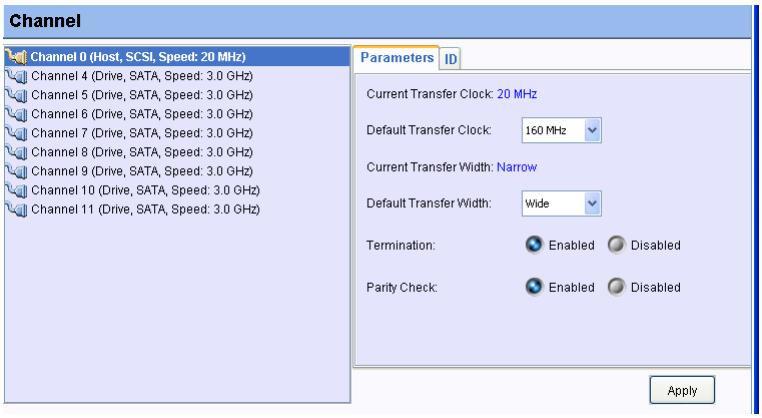


Fig. 8.2 Selecting a Channel

The following sections describe user-configurable channel parameters.

8.2 User-Configurable Channel Parameters

Once the channel has been selected, the screen shown in *Figure 8.3* will appear in the content window. The different options are discussed below.

NOTICE!
A SCSI host channel is shown in *Figure 8.3*.

Channel Parameters:

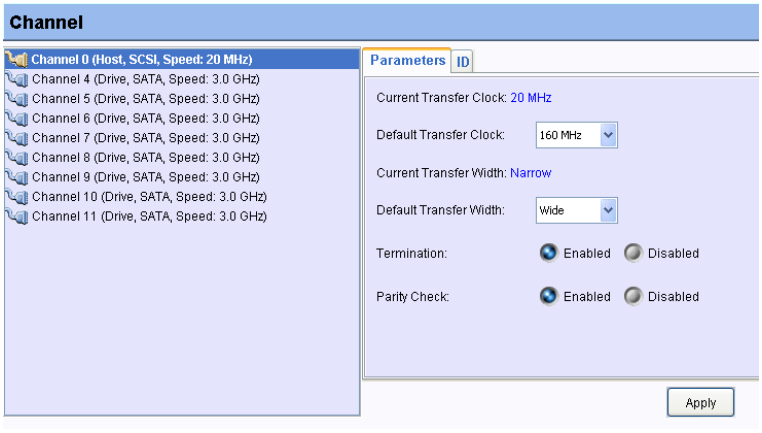


Fig. 8.3 Selecting a Host Channel

8.2.1 Termination

This parameter enables or disables channel SCSI termination on subsystems featuring SCSI host channels. SCSI buses must be properly terminated at both ends; that is, when connecting one end of a SCSI cable to a host HBA, the termination of the channel must be enabled on the subsystem side. An alternate configuration should be applied when multiple enclosures are being cascaded on the host buses. An enclosure situated in the middle of a SCSI bus should have its termination set to disabled.

8.2.2 Default Transfer Clock (in MHz)

These parameters set the data transfer clock rate for synchronous communication over the SCSI bus, and enable or disable wide transfer, respectively.

Data transferred across the 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. For example, if the synchronous transfer clock is 10 MHz, data transfer rate will be 10 million bytes per second (using 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. According to SCSI channel specifications, transfer speed shown in MHz is the SCSI bus synchronous frequency. At the same synchronous transfer clock rate, 16-bit wide transfer rate is double of 8-bit narrow transfer rate. Please refer to the transfer speed in the table below.

Transfer Rate	Clock Speed in MHz
SCSI-320	160MHz
SCSI-160	80MHz

Table 8.1 SCSI Channels Clock Speeds

NOTICE!
Bosch's SCSI products are backward compatible with older version of SCSI type. However, using older versions of SCSI type may slow down the data transferring speed and do not enjoy some of the new SCSI features.

Under conditions in which SCSI signal quality is poor, such as with extremely long cables, poor connections, or bad termination, it may occasionally 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.

NOTICE!
Every time you change the transfer speed, you must reset the controller for the changes to take effect.

8.3 Setting the Configurations for a Channel

1. Single-click under the Channel window to select a corresponding channel. Channel icons are displayed in the left-side panel of the configuration window. The Channel Settings configuration will appear as two separate pages on the right side: Parameters and ID. (See *Figure 8.1*).
2. From the Parameters panel, specify a preferred value with configurable items either by checking the pull-down menus or radio buttons of the transfer clock, transfer width, termination, and/or parity check. Be sure to click *Apply* for the changes to take effect.
3. If you want to assign a different ID to the selected channel, choose the ID panel. An ID pool scroll menu will appear as shown in ID Pool Menu.

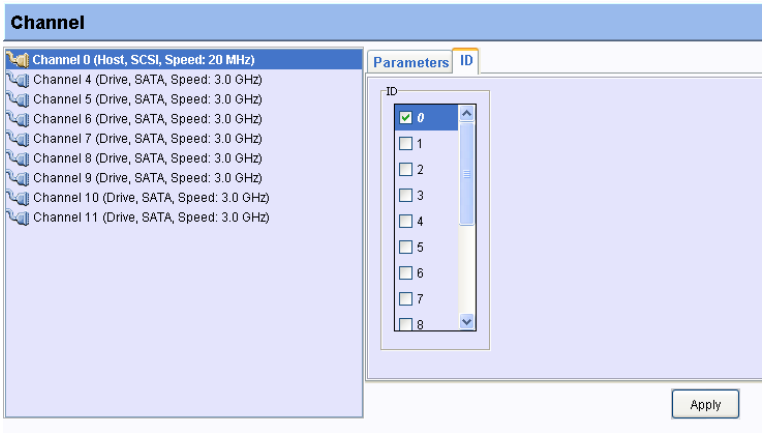


Fig. 8.4 ID Pool Menu

When selecting an ID, be sure that it does not conflict with the other devices on the channel. Preset IDs should have been grayed out and excluded from selection. The ID pool lists all available IDs for the current selection. Highlight the IDs you want to use by selecting their check boxes and click *Apply*.

9 Drive Management

Using Bosch RAIDWatch Manager, you can make and delete Logical Drives (LDs) and Logical Volumes (LVs). Both LDs and LVs can be partitioned.

9.1 Locating Drives

Bosch RAIDWatch uses icons to represent subsystem drive trays. In many configuration windows, a single click on a drive tray icon selects a hard drive. Drive status is indicated and automatically refreshed by displaying different icons. The drive tray icons used in the Front View window to instantly display drive status are shown below. By referring to the drive status in the Front View window, you can start to create or configure a logical array.

Drive Conditions	Graphical Identification
New or Healthy Used Drive	
Bad or Missing Drive	
Spare Drive	

Table 9.1 Drive conditions

Before you start configuring a logical array, please read the following:

- All members in a logical configuration are displayed in the same unique color.
- Whenever a disk drive is selected by a single mouse click on its icon, the drive's status is displayed on the associated configuration window. For example, when a drive is selected by clicking its icon, it automatically appears in the Selected Members column. In this way, mistakes can be avoided by double-checking the information related to a specific disk drive.

9.2 Logical Drive Management

9.2.1 Accessing the Create Logical Drive Window

LDs are created in the Create Logical Drive window and managed in the Existing Logical Drives window. These functional windows are accessed from the command from the Action menu or Bosch RAIDWatch's navigation panel on the left of the GUI screen.

1. To manage LDs, such as to create and set related parameters, display the Create Logical Drive window by clicking on the Create Logical Drive icon in the functional navigation panel or clicking on the Action menu items located on top of the screen.

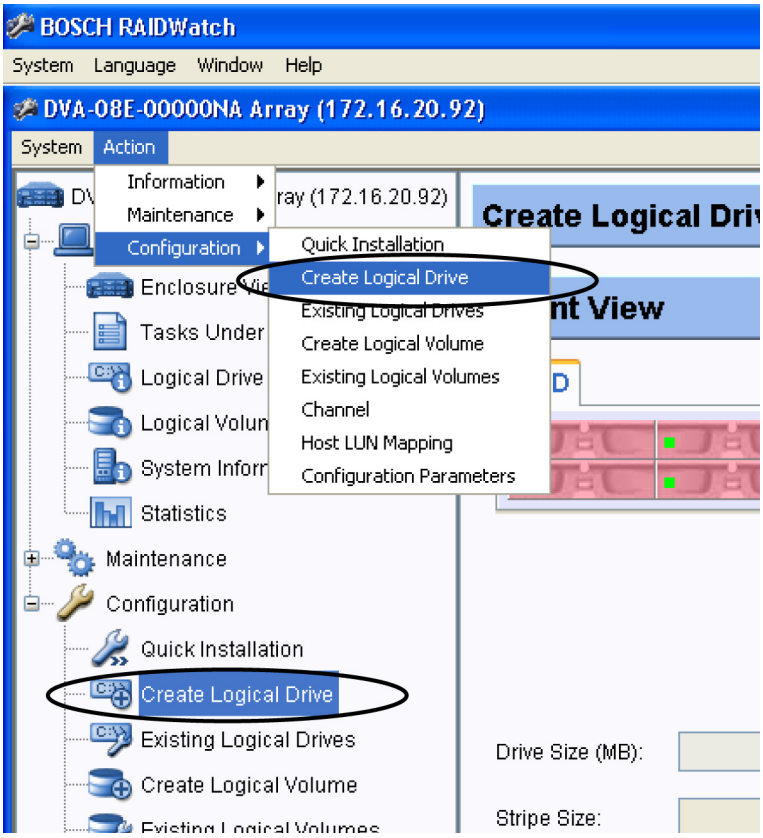


Fig. 9.1 Accessing the Create Logical Drive Window

2. The configuration screen shown in *Figure 9.2* should appear.

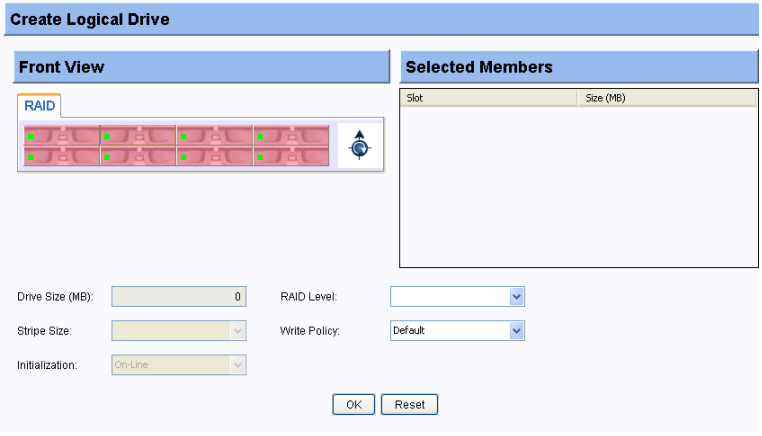


Fig. 9.2 The Create Logical Drive Window

9.2.2 Creating Logical Drives

Logical Drive Creation

1. Select the physical drives that will be used in the LD.
2. Select the following RAID parameters (see *Section Setting RAID Parameters*, page 94).
   - Drive Size
   - Stripe Size
   - Initialization Mode
   - RAID Level
   - Write Policy
3. Click the OK button (see *Section Click OK to Create LD*, page 94).

Selecting Drives

1. Select members for the new logical drive by clicking drive icons in the Front View window. Bad drives or drives being used by another logical drive are unavailable for the creation process.
2. Drives selected for a new logical drive will be listed in the Selected Members sub-window on the right-hand side of the screen.
3. Continue to set appropriate RAID parameters in the Select menu at the lower part of the configuration screen.

Setting RAID Parameters

After the physical drives that will be used in the LD have been selected, the RAID parameters for the LD must be selected. Available RAID parameter options can be accessed at the bottom of the configuration screen.

- Drive Size*:* The value entered in the *Drive Size* field determines how much capacity from each drive will be used in the logical drive.

NOTICE!
Enter a smaller number if you do not want to use up all of the capacity at this time. The unused capacity can be utilized later using the Expand Logical Drive function.

- Selecting Stripe Size: The stripe size used when the LD is created can be selected from the Stripe Size pull down menu. The following stripe sizes are available: 16KB, 32KB, 64KB, 128KB, 256KB, 512KB, or 1024KB. A default stripe size is pre-selected.
  Select a stripe size, but note that stripe size arrangement has a tremendous effect on RAID subsystem performance. Changing strip size is only recommended for experienced users. Stripe size defaulted to this menu is determined by the subsystem Optimization mode and the RAID level selected.
- Initialization Options: This allows you immediate availability of the array. "Online" means the logical drive is immediately available for I/Os and the initialization process can be automatically completed some time later.
- Select RAID Level: From the RAID Level pull-down menu shown, select the RAID level you wish to use when creating the LD.
- Write Policy: Define the write policy that will be applied to this array. "Default" means identical to the subsystem's overall setting. The overall setting can be accessed in the Caching Parameters section of the Configuration Parameters sub-window.

Click *OK* to Create LD

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

1. Click **OK** at the bottom of the LD management window.
2. A confirmation window will appear. If you are certain that you want to create the LD with the settings you have selected, click *OK*.
3. If you selected *OK* in the Please Confirm window, the Create In Progress content window will display the logical drive creation progress.
4. Click the Reset button to redo or abort the process. When the initialization process begins, you can check the Tasks Under Process window to view its progress.

9.2.3 Accessing the Existing Logical Drive Window

Various functions can be performed on configured arrays in the Existing Logical Drives window. The window is accessible from the command in the Action menu or Bosch RAIDWatch's navigation panel on the left of the GUI screen.

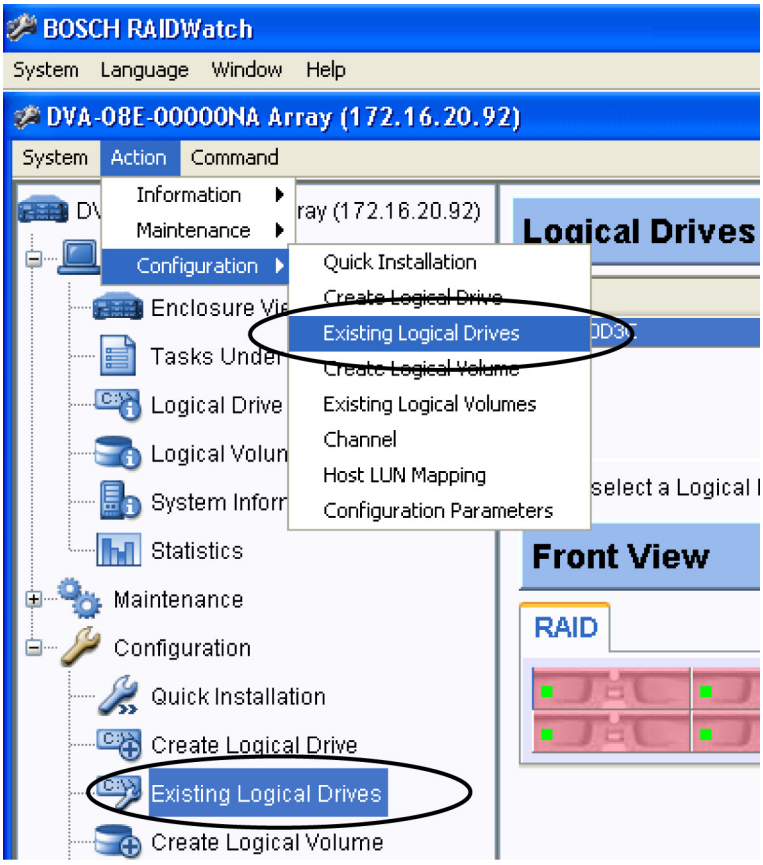


Fig. 9.3 Accessing the Existing Logical Drives Window

After the Existing Logical Drives window is opened, the LDs that have been created will appear in the Logical Drives panel.

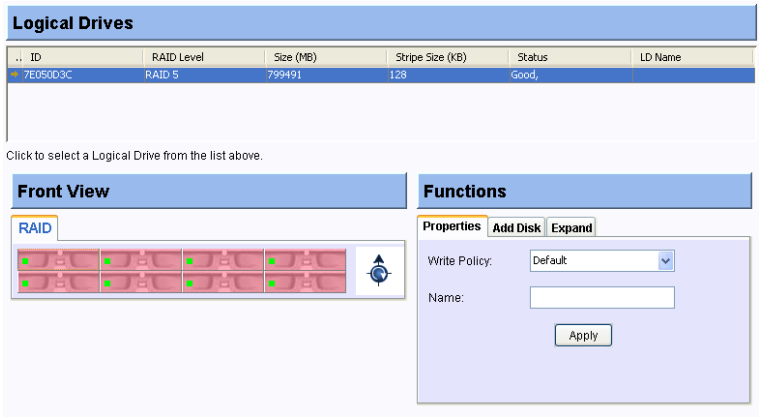


Fig. 9.4 List of LDs

From the list shown in *Figure 9.4,* select the LD for which you wish to change its characteristics or configure. Once this LD has been selected, its members will appear in the Front View sub-window. At the top of the Functions window, three tabs (Properties, Add Disk and Expand) will appear.

Modifying LD Configurations

After the LD is created, some configurations can be modified in the Properties command page. To access the page, select a logical drive and click on the *Properties* tab under Functions window.

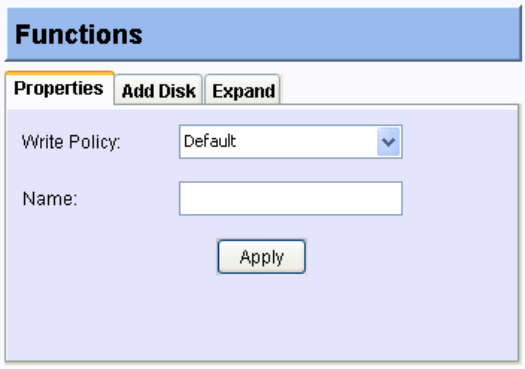


Fig. 9.5 The Add Drive Command Sub-window

Each option is executed by a two-step procedure. Click to select a desired value from the pull-down menu or input a name, and then click *Apply* for the configuration to take effect.

- Write Policy
  Write policy can be adjusted on a per logical drive basis. This option allows you to set a write policy for the specific logical drive you selected. “Default” is a neutral value that is coordinated with the controller’s caching mode setting. Other choices are “Write-back” and “Write-through.”
- Name
  You can name a logical drive per logical drive basis.

Expanding LD by Adding Disks

To access the Add Disk command page, select a logical drive and click on the *Add Disk* tab under Functions window.

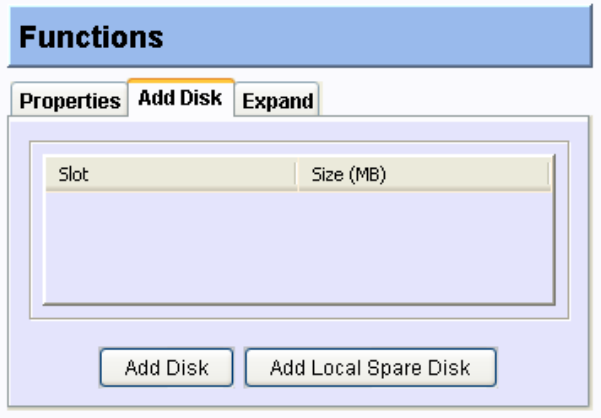


Fig. 9.6 The Add Drive Command Sub-window

1. Select the logical drive you wish to expand from the LD list on top of the GUI screen.
2. Select the *Add Disk* tab to display the content panel.
3. Select one or more drives you wish to add to the logical drive by single mouse-click from the Front View window. When the drive(s) are selected, its status is displayed in the Add Disk content panel.
4. The Add Disk panel has two functional buttons: Add Disk and Add Local Spare Disk. Click on the *Add Disk* button to include new members into the array.
5. The Add Disk process should immediately begin. You may check the add drive progress in the Tasks Under Process window.

Accessing the Expand Command page

To access the Expand command page, select a logical drive and click on the *Expand* tab under Functions window.

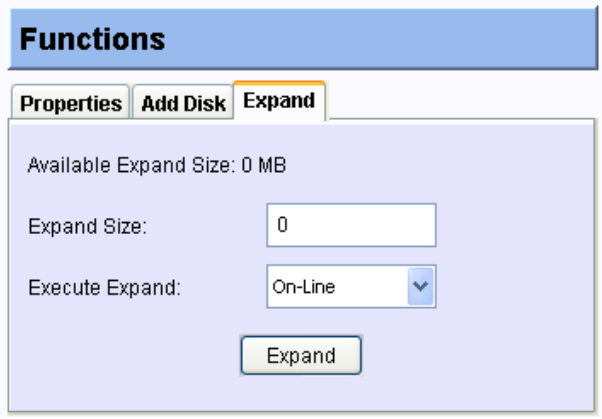


Fig. 9.7 The Expand Command Sub-window

- Available Expand Size (MB)
  If there is an amount of unused capacity in a logical drive, the LD may be expanded. If there is no amount present in the text box, then the LD cannot be expanded.
- Set Expansion Size
  A value can be entered in this text box if and only if an amount is shown in the *Available Expand Size* text box. The value entered into the *Expansion Size* text box cannot exceed the amount shown above. The value entered here specifies the size of the LD expansion.
- Execute Expand
  Execute Expand allows you to determine whether or not the expansion will be done online or offline. If you wish to do an online expansion, then the expand process will be completed once the subsystem finds I/O requests from the host are comparatively low and allows the expand operation. If you wish to do an offline expansion, then the OFFLINE menu item will begin immediately.

Click Expand to Initiate LD Expansion

To initiate the LD expansion, follow these steps:

1. Once the LD expansion parameters have been selected, click the *Expand* button at the bottom of the Expand page.
2. The expand process begins and you may check the progress in the Tasks Under Process window.
3. The logical drive will now have a new last partition the same size as the expansion. You may right-click the logical drive field listed above to display the Edit Partition command to verify this.

Click Migrate Logical Drives to Initiate LD Migration

To initiate the LD expansion, follow these steps:

1. Once the LD migration parameters have been set to the value desired, click the *Migrate LD* button at the bottom of the Migrate Logical Drives page.
2. The migration process begins and you may check the progress in the Tasks Under Process window.
3. The logical drive will now have a new RAID level, strip size and drive size. All data will be moved from the old logical drive to the new logical drive.

9.2.4 Dynamic Logical Drive Expansion

Before Dynamic Logical Drive Expansion, increasing the capacity of a RAID system using traditional methods meant backing up, re-creating, and then restoring data. Dynamic Logical Drive Expansion allows you to add new hard disk drives and expand a RAID level 0, 3 or 5.
There are two modes of Dynamic Logical Drive Expansion.

Mode 1

Mode 1 Expansion involves adding more hard disk drives to a logical drive, which may require that the purchase of an enclosure with more drive bays. The data will be re-striped onto the original and newly added disks.

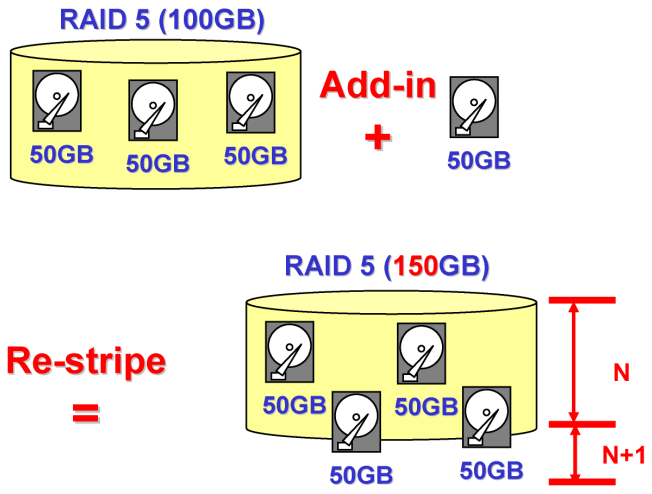


Fig. 9.8 RAID Expansion Mode 1

NOTICE!

- Multiple drives can be added at the same time.
- If the new drive is bigger in size than the original member drives, the surplus capacity will not be used.
- Use the extra RAID capacity as another logical drive partition.

Mode 2

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

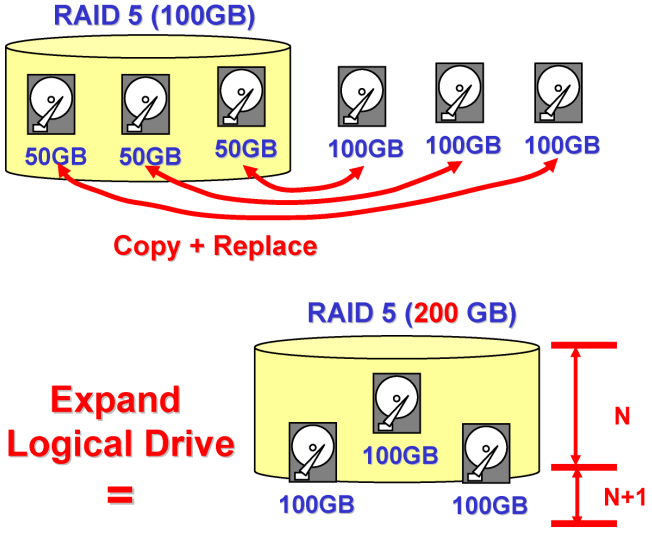


Fig. 9.9 RAID Expansion Mode 2 (1/3)

NOTICE!

- Copy and Replace each member drive with a new bigger drive, the surplus capacity can be used.
- Use the extra RAID capacity as another logical drive partition.

9.2.5 Adding 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; however, this configuration is rarely used due to its high cost and the 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.

NOTICE!

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.

Accessing the Spare Drive Management Screen

To open the Spare Drive Management screen, please follow these steps:

1. Select the logical drive to which you wish to add a dedicated spare from the list of the logical drives above. In the Functions window, click the *Add Disk* tab. The functional window is accessed from the Existing Logical Drives window as shown in *Figure 9.10*, the Add Spare button appears next to the Add Disk button.

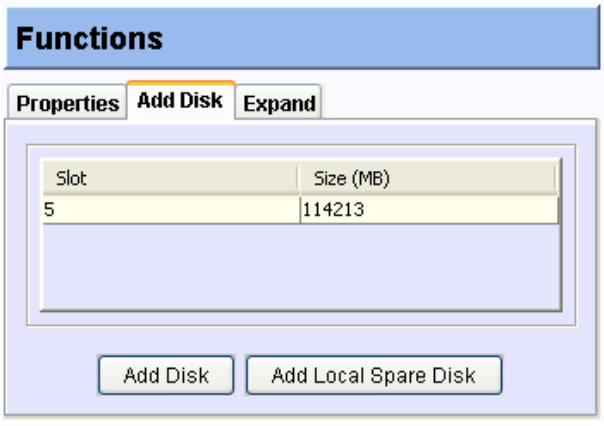


Fig. 9.10 The “Add Spare Drive” Button

2. From the Front View window, select the disk drive you want to use as a dedicated spare with a single mouse-click.
3. After selecting the drive that will be used as a spare, the selected drive’s status will be displayed and you may click the Add Spare button to complete the process.

CAUTION!

Spare drive assignments can also be made in the Maintenance mode window. Note that a Global Spare cannot be added in the Existing Logical Drives window.

9.2.6 Rebuilding Logical Drives

Depending on whether or not there is a spare drive, rebuilding is initiated automatically or must be started manually. In the presence of a spare drive, the system automatically rebuilds onto the spare drive. This process is done in the background, thus it is transparent to users. However, you should replace the failed drive as soon as possible and insert a new drive and set it as a spare just in case another drive fails and you will need a backup drive.
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 in the same drive slot (that is, the same channel and ID), then you can proceed with the rebuilding process by clicking on the *Rebuild* button; otherwise, you need to scan in the drive first.
A failed drive should be replaced as soon as possible. For a RAID 3 or RAID 5 array, two failed members will cause an irrecoverable loss of data.
The controller/subsystem can be set to rescan the drive bus for a replacement drive at preset intervals. The related setting can be found in Configuration Parameters -> Other -> Drive Side Parameters -> Drive Fail Swap Check Period in second.

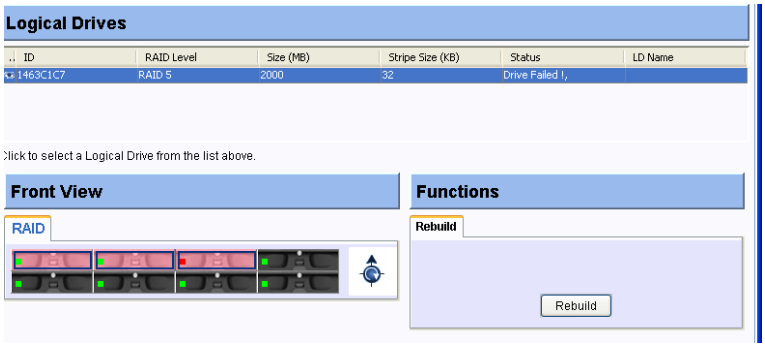


Fig. 9.11 Displaying the Rebuild Command Menu

9.2.7 Deleting an LD

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

NOTICE!

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

1. Select the logical drive you wish to remove with a single mouse-click. Right-click on the adjacent screen area. A command menu will prompt as shown in *Figure 9.12*.

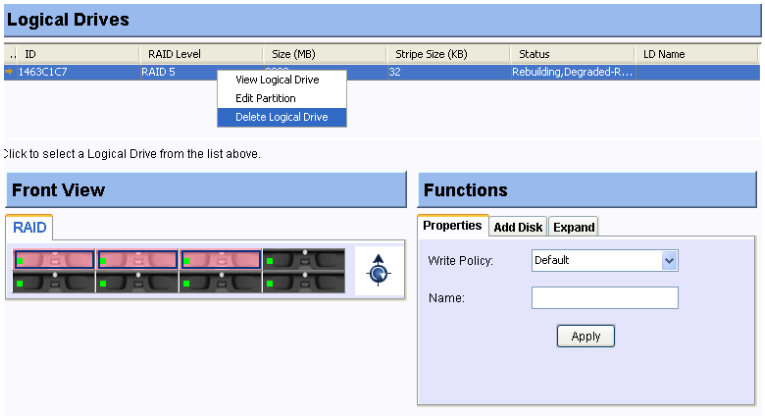


Fig. 9.12 Displaying the Logical Drive Command Menu

2. Select the Delete Logical Drive command. The delete process is completed almost immediately.
3. Once the *Delete* command has been selected, a confirm box will prompt asking you whether to proceed or not.
4. If you are certain that you wish to delete the LD, press the *OK* button. If you are not sure, click the *Cancel* button.

9.3 Logical Volume Management

You can create and delete logical volumes using Bosch RAIDWatch Manager. Combining logical drives together creates logical volumes. 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.

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

9.3.1 Accessing the Create Logical Volume Window

LVs are created in the Create Logical View window, which can be accessed either from the navigation panel icon or the command menu on top of the screen.

1. To create LVs; display the Create Logical Volume window by clicking on the associated icon in the GUI's navigation panel or the command in the Action menu bar.

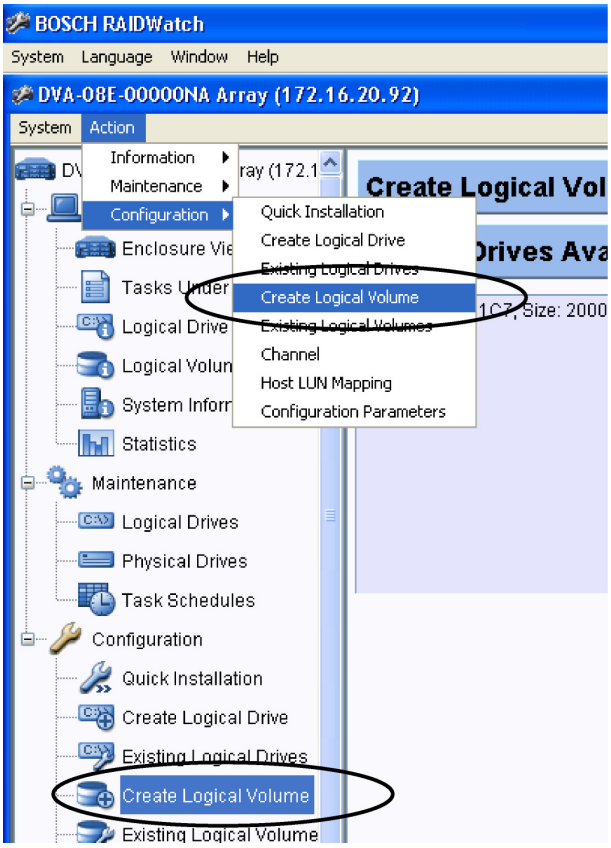


Fig. 9.13 Accessing the Create Logical Volume Window

2. The Create Logical Volume window will appear.

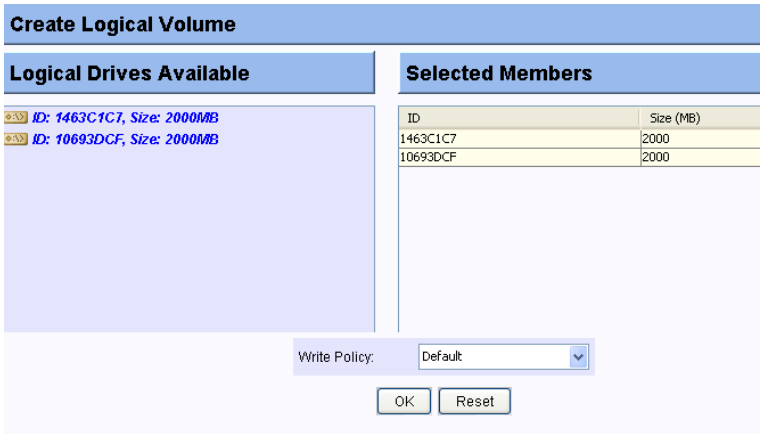


Fig. 9.14 The Create Logical Volume Window

9.3.2 Creating Logical Volumes

LV Creation

1. Select the LDs that will be used in the LV from the Logical Drives Available panel.
2. Select the following RAID parameters:
   – Write Policy
   – Assignment parameters:
3. Information about the selected LDs will appear on the Selected Members panel. Click the OK button.

Selecting LDs

1. Select each logical drive you wish to include in the new logical volume with a single mouse-click. Select the LDs you wish to incorporate into a LV and click the *Add* button beneath the *Available* menu.
2. All available logical drives are listed on the left. There are no limitations as to the number of logical drives that can be included in a logical volume. Double-check to ensure that you have selected the appropriate members.

Setting LV Parameters

After the LDs that will be used in the LV have been selected, the LV parameters for the LV must be selected. LV parameter options can be accessed at the bottom of the Create Logical Volume window as shown in *Figure 9.14*.

- LV Assignment
  Choose *Controller* from the Logical Volume Assignment menu.
- Select Write Policy
  Use the Write Policy menu to select either Default (Global Setting), Write Through, or Write Back. The same policy will automatically apply to all logical drives (members) included in the logical volume.

Click OK to Create LV

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

1. Click the **OK** button at the bottom of the Create Logical Volume window.
2. The creation is completed almost immediately.

9.3.3 Accessing the Existing Logical Volumes Window

The Existing Logical Volumes window allows you to perform LV expansion and change related configuration options. As shown below, the configuration window can be accessed either from the functional navigation panel or the command menu on the top of the GUI screen.

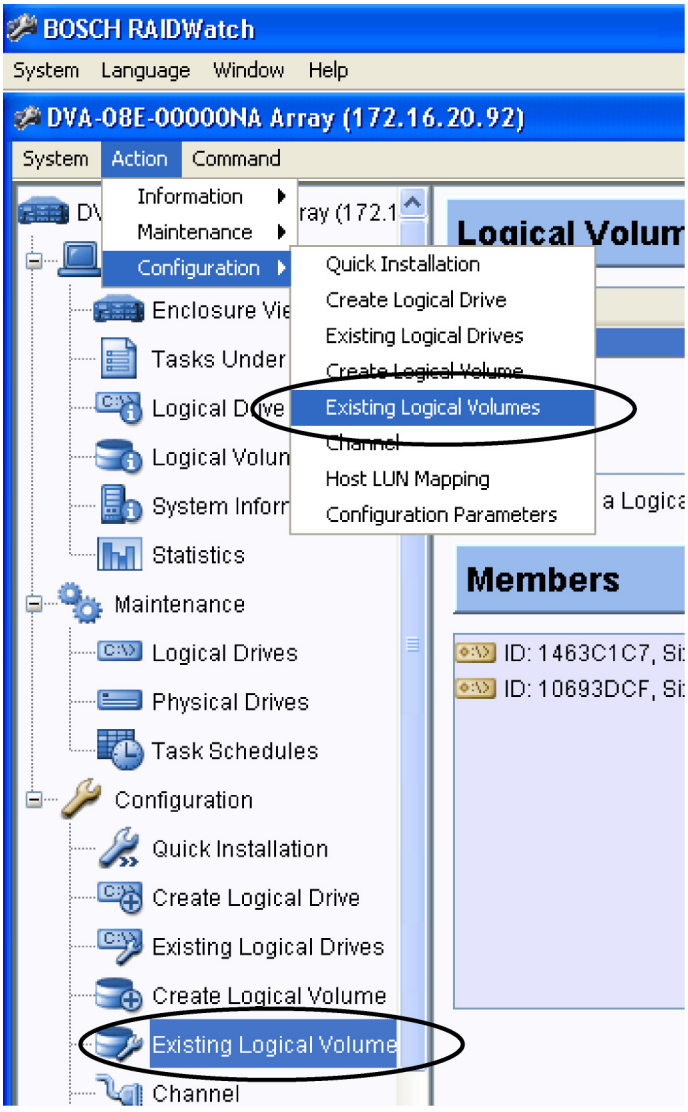


Fig. 9.15 Accessing Existing Logical Volume Window

Modifying LV Configurations

After the LV is created, some configurations can be modified in the Properties command page. To access the page, select a LV and click on the *Properties* tab under Functions window.

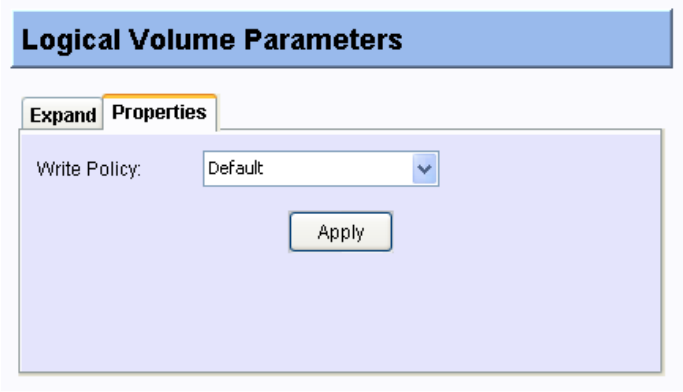


Fig. 9.16 Properties command page under Functions window

Each option is executed by a two-step procedure. Click to select a desired value from the pull-down menu, and then click *Apply* for the configuration to take effect.

- LV Assignment
  Both controllers can access a logical volume. In tradition to LV management, one LV can only be accessed by primary or secondary controller.
- Write Policy
  Write policy can be adjusted on a per logical volume basis. This option allows you to set a write policy for the specific logical volume you selected. “Default” is a neutral value that is coordinated with the controller’s caching mode setting. Other choices are “Write-back” and “Write-through.”

Expanding a LV

When members of a logical volume have free and unused capacity, the additional capacity can be added to existing logical volumes. The unused capacity can result from the following situations:

- Certain amount of capacity was intentionally left unused when the logical drives were created (configurable with maximum array capacity).
- Some or all of the members of a logical volume have been expanded, either by adding new drives or copying and replacing original drives with drives of larger capacity.

Accessing the Expand LV Command Page

1. Select a configured LV from the Existing Logical Volumes window shown in *Figure 9.17*. As shown below, all the LVs that have been created will appear below the Logical Volume Status panel.

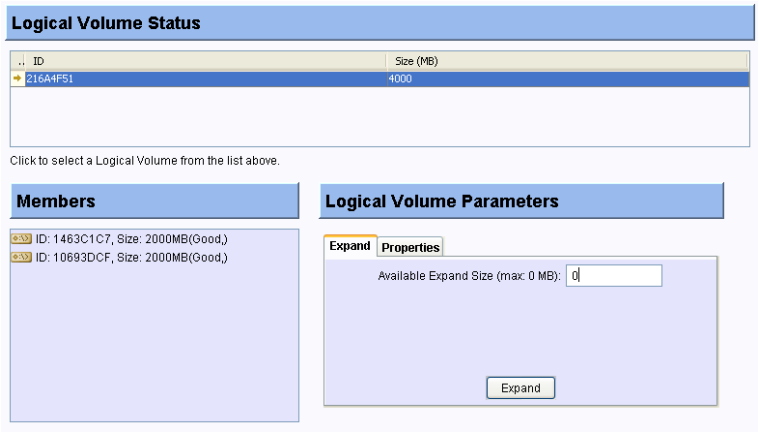


Fig. 9.17 Existing Logical Volumes Window

2. The expand command can be found by clicking the *Expand* tab under the LV Parameters panel.

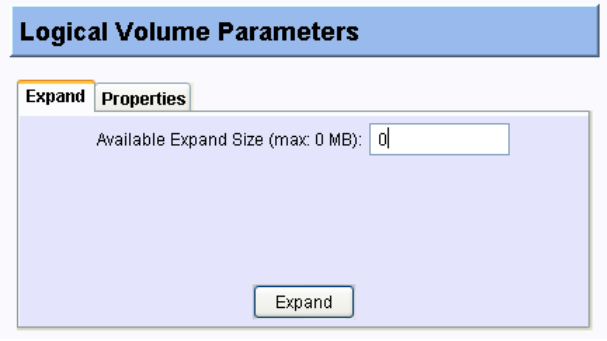


Fig. 9.18 Logical Volume Parameters

3. Available expansion size displays in a text box if there is any amount of unused capacity.
4. Click the Expand button at the bottom of the configuration panel. The expand process should be completed in a short while because all unused capacity in the members of a logical volume must be made useful by the same expansion process. The expansion process on a logical volume simply lets subsystem firmware recognize the change in the arrangement of free capacity.

NOTICE!
You may combine partitions under View and Edit LV Partition Table by expanding the size of earlier partitions (such as increasing the size of partition 0 so that it is as large as all partitions combined to make one partition).

CAUTION!
Combining partitions destroys existing data on all drive partitions.

5. The logical volume will now have a new last partition the same size as the expansion. *Right-click* the expanded volume and select the *Edit Partition* command to look at the partition verify this.

9.3.4 Deleting an LV

1. Select the configured volume you wish to remove with a single mouse-click. Right-click the adjacent area to display a command menu. As shown in *Figure 9.19*, all the LVs that have been created will appear below the Logical Volume Status panel.

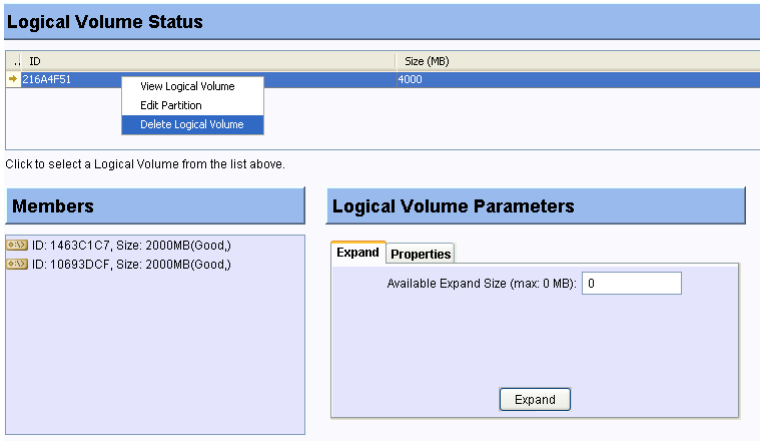


Fig. 9.19 Displaying Logical Volume Edit Mode Menu

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

9.4 Partitioning a Logical Configuration

9.4.1 Overview

Partitions can be created in both logical drives (LD) and logical volumes (LV). Depending on your specific needs, you can partition an LD or LV into smaller sizes or just leave it at its default size (that is, one large partition covering the entire LD or LV).
If you intend to map an entire LD or LV to a single host LUN, then partitioning becomes irrelevant. Partitioning can be helpful when dealing with arrays of massive capacities and when rearranging capacities for applications that need to be accessed by many hosts running heterogeneous OSs.

NOTICE!
You can create a maximum of eight partitions per logical drive or logical volume. Also, partitioned logical drives cannot be included in a logical volume.

9.4.2 Partitioning a Logical Drive

CAUTION!
Partitioning a configured array destroys the data already stored on it.

1. Select the logical drive you want to partition. Move your cursor to the Logical Drives window. Right-click to display the Edit Partition command menu.

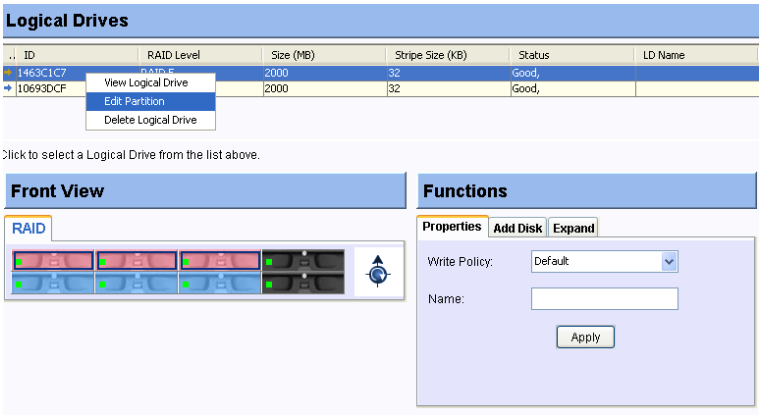


Fig. 9.20 The Edit Partition Command

2. Select Edit Partition from the menu.
3. The Edit Partition window displays. Use the arrow keys on the button on the lower right to switch between partitions.

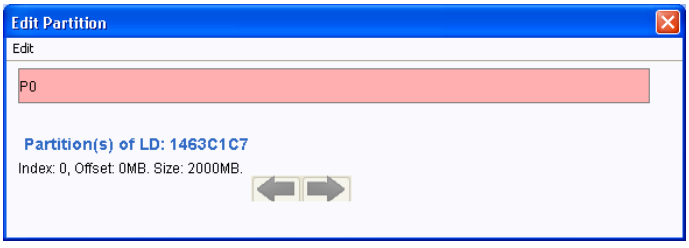


Fig. 9.21 The Edit Partition Command Window

4. If the array has not been partitioned, all of its capacity appears as one single partition. Single-click to select the partition (the color bar).

5. Right-click or select the Edit command to display the Add Partition command. Click to proceed.
6. The Partition Size window displays. Enter the desired capacity and press OK to proceed.

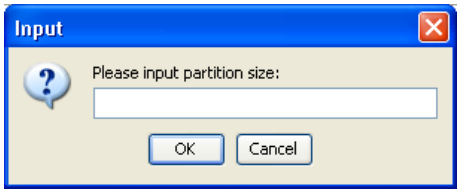


Fig. 9.22 The Partition Size Window

7. Shown below is a capacity partitioned into two. Each partition is displayed in a different color. Repeat the above process to create more partitions or click to view its information. A new partition is created from the existing partition.

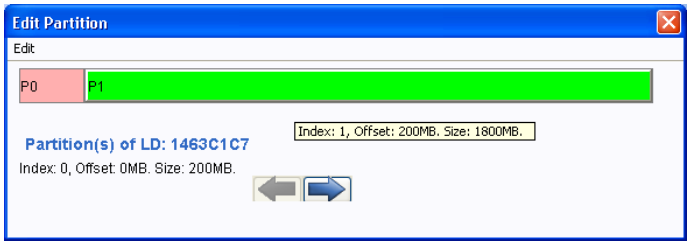


Fig. 9.23 The Edit Partition Command Window

The arrow buttons help you travel from one partition to another.

9.4.3 Partitioning a Logical Volume

1. Select the logical volume you wish to partition. Move your cursor onto the Logical Volume Status window. Right-click to display the Edit Partition command menu.

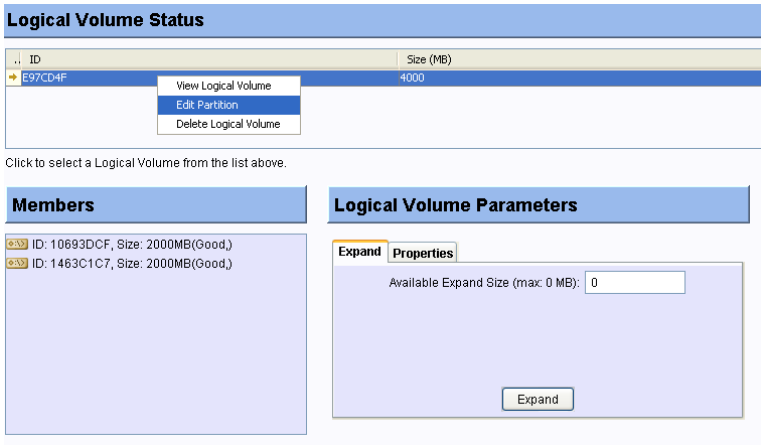


Fig. 9.24 The Edit Partition Command

2. Select Edit Partition from the menu.
3. The Edit Partition mode window displays as shown below.

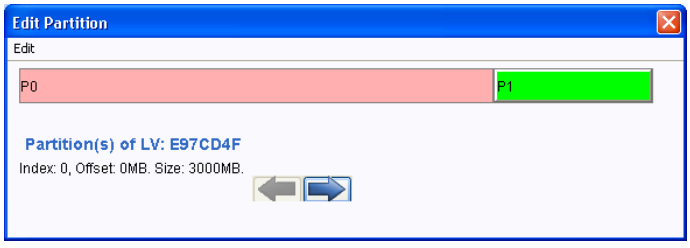


Fig. 9.25 The Edit Partition Window

4. If the volume has not been partitioned, all of its capacity appears as one single partition. Single-click to select the partition (the color bar).
5. Right-click or select the Edit command to display the Add Partition command. Click to proceed.
6. The Partition Size window displays. Enter the desired capacity and press OK to proceed.

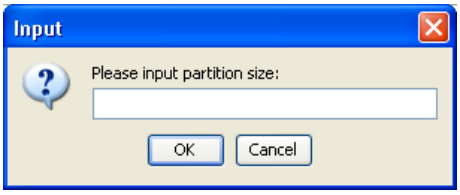


Fig. 9.26 The Partition Size Window

7. Shown below is a capacity partitioned into three. Each partition is displayed in a different color. Repeat the above process to create more partitions or click to view its information.

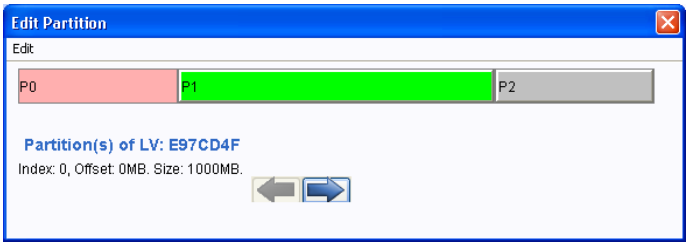


Fig. 9.27 The Edit Partition Window

The arrow buttons help you travel from one partition to another.

10 LUN Mapping

After creating a logical drive (LD) or logical volume (LV), you can map it as is to a host LUN; or, if partitions are set, you can map each partition to a specific host LUN. Bosch RAIDWatch supports eight 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 can also be deleted. In cases where certain mappings are found to be useless, or the disk array needs to be reconfigured, you can delete unwanted mappings in your system.

10.1 Accessing the LUN Map Table

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

1. In the navigation panel under the Configuration category, click on the Host LUN Mapping where you can find the configuration options with the mapping operation. (See *Figure 10.1*).

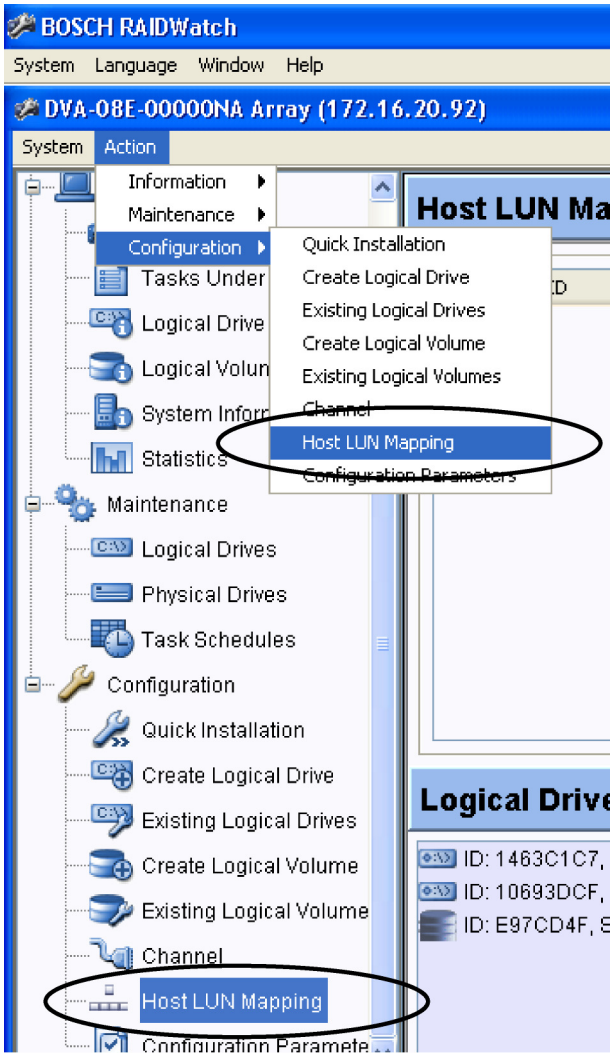


Fig. 10.1 Select the Host LUN Mapping Window

2. The Host LUN Mapping window should appear on the right. Right-click on the Host LUN(s) sub-window to display command menu as shown in *Figure 10.2*. Bosch's control-

lers or subsystems always come with pre-configured IDs. If it is necessary to add alternative IDs, please select the Channel window from the navigation panel.

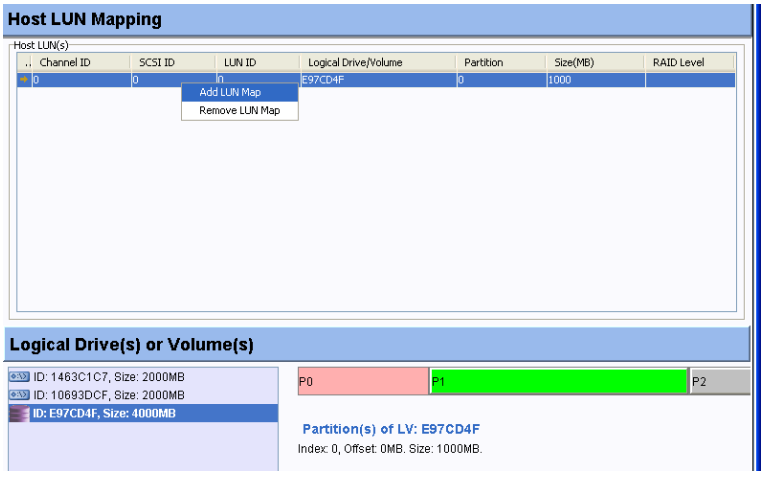


Fig. 10.2 Selecting the Host Channel ID Number

3. After selecting the ID, the LUN Map Setting window appears as shown in *Figure 10.3*.

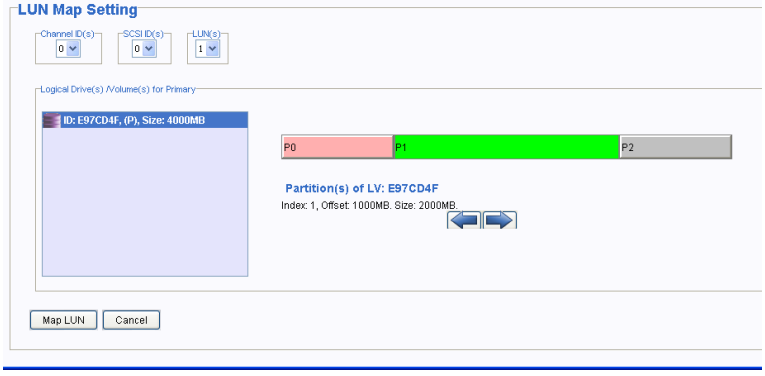


Fig. 10.3 LUN Map Setting Window

10.2 LUN Mapping

10.2.1 Mapping a Complete LD or LV

1. If you want to map a complete LD or LV, make sure that the LD or LV has not been partitioned.
2. Follow the steps listed in *Section 10.1 Accessing the LUN Map Table* above to access the Host LUN Mapping window shown in *Figure 10.3*.
3. Select the appropriate Channel, SCSI ID, and LUN numbers from the separate pull-down lists above.
4. Select a Logical Drive or Logical Volume and then select the Partition color bar with a single mouse-click. The partition bar appears on the right-hand side of the screen. An LD or LV that has not been partitioned should have only one partition.
5. Click on the Map LUN button to complete the process. (See *Figure 10.4*)

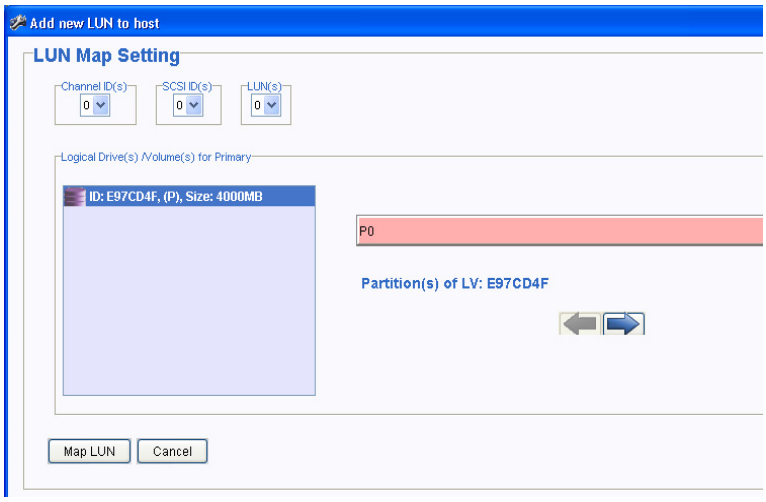


Fig. 10.4 LUN Map Setting Window: Single Partition

10.2.2 Map a Logical Drive or Volume Partition to a Host LUN

1. First, partition the logical drive or logical volume.
2. Follow the steps listed in *Section 10.1 Accessing the LUN Map Table* above to access the LUN Map Setting window shown in *Figure 10.3*.
3. When the LUN Map window appears, select the appropriate Channel, SCSI ID, and LUN numbers from the separate pull-down lists above.
4. Select a Logical Drive or Logical Volume with a single mouse-click. With a single mouse-click on the Partition color bar, select one of the partitions that you wish to associate with the selected channel ID/LUN number. See *Figure 10.5* for the configuration screen.

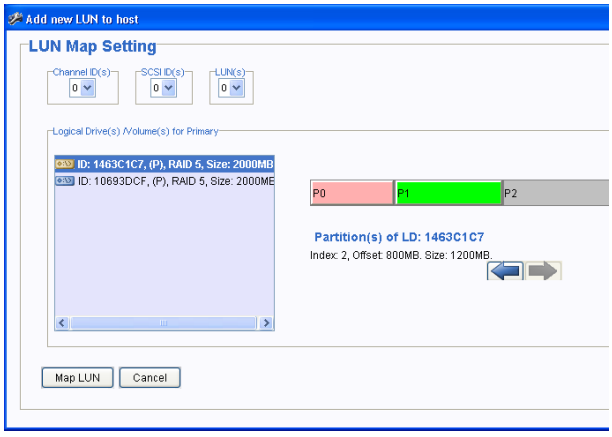


Fig. 10.5 Select Add New LUN to Host

5. Click on the Map LUN button to complete the process.

10.2.3 Deleting a Host LUN Mapping

1. Follow the steps listed in *Section 10.1 Accessing the LUN Map Table* above to access the LUN Map Setting window shown in *Figure 10.2*.
2. Left-click on a configured LUN and then right-click on the adjacent area. A command menu displays as shown in *Figure 10.6*. Select *Remove LUN Map* to complete the process.

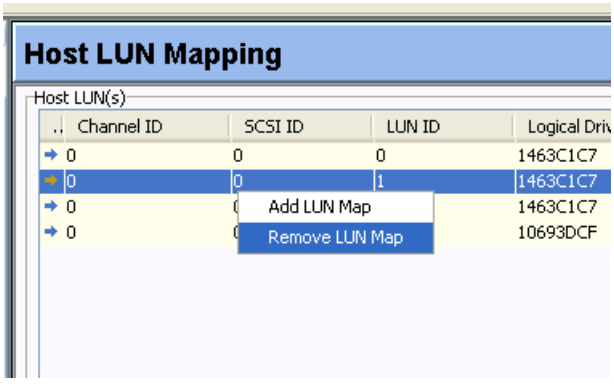


Fig. 10.6 Delete LUN Command

3. When prompted for a password or an answer, enter it and click OK. The LUN mapping should no longer be listed in the LUN Map table. After deleting the LUN mapping it no longer appears in the host LUN(s).
4. To remove additional LUN mappings, repeat *Step 2*.

11 System Monitoring and Management

11.1 RAID Information

Unlike its predecessor, Bosch RAIDWatch presents access to all information services under one Array Status category. Users logged in using the Information authorization will be allowed to access the information windows while being excluded from other configuration options. Support for device monitoring via SAF-TE, SES, and I2C data buses is the same. However, Bosch RAIDWatch now uses a more object-oriented approach by showing the enclosure graphics, which are identical to your Bosch RAID subsystems. Bosch RAIDWatch reads identification data from connected arrays and presents a correct display as an enclosure graphic. This process is automatically completed without user's setup.

NOTICE!
Bosch RAIDWatch does not support the display of drive enclosures provided by other vendors.

11.1.1 The Information Category

Once properly set up and connected with a RAID array, a navigation panel displays on the upper left of the screen. Bosch RAIDWatch defaults to the Enclosure View window at startup. To access each informational window, single-click a display icon on the navigation panel. You may also access each window by selecting from the Action menu on the menu bar at the top of the screen. See *Figure 11.1* for access routes.

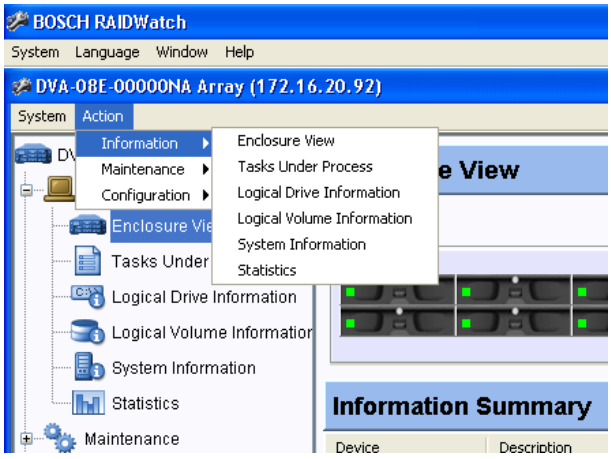


Fig. 11.1 Selecting Information Windows

11.1.2 Date and Time

Once date and time has been configured on your subsystem, they are displayed on the bottom right corner of the manager's screen.

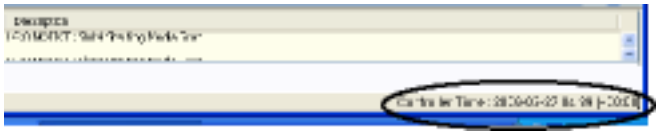


Fig. 11.2 Selecting Information Windows

Maintaining the system date and time is important, because it is used for tracking a pending task, past events, configuring a maintenance task schedule, etc. Date and time are generated by the real-time clock on the RAID controller/subsystems.

11.1.3 Enclosure View

The Enclosure View window displays both the front and the rear views of connected enclosures. For the RAID subsystems, Bosch RAIDWatch displays drive trays in the front view, and system modules (power supplies, cooling modules, etc.) In the rear view. For the RAID controllers, Bosch RAIDWatch displays FC port modules and LEDs in the front view; powers supplies, cooling modules, and controller modules display in the rear view.
If multiple enclosures are cascaded and managed by a RAID subsystem, Bosch RAIDWatch defaults to the display of RAID enclosures and the graphics of the cascaded JBODs, which can be accessed by clicking the tab buttons.

Bosch RAIDWatch is capable of displaying any information provided by an SES, SAF-TE or I^2C data bus. Various kinds of information is typically provided including the status of:

- Power supplies
- Fans
- Ambient temperature
- Voltage
- UPS
- Disk drives
- System module LEDs

To read more information about enclosure devices, place your cursor either over the front view or rear view graphic. An information text field displays as shown below.

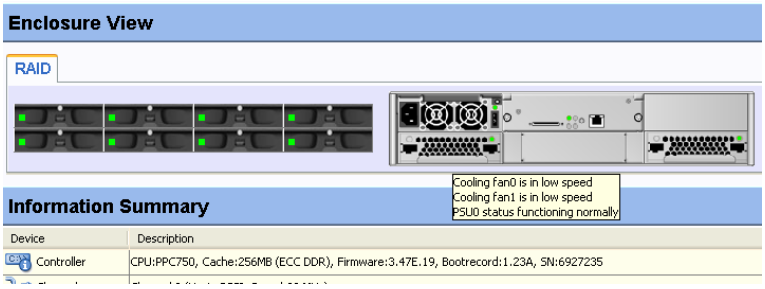


Fig. 11.3 Displaying Enclosure Device Information

More information about each enclosure device can also be found in the System Information window.

11.1.4 Task Under Process

Access the Task Under Process window by clicking on the display icon in the Bosch RAIDWatch navigation panel.

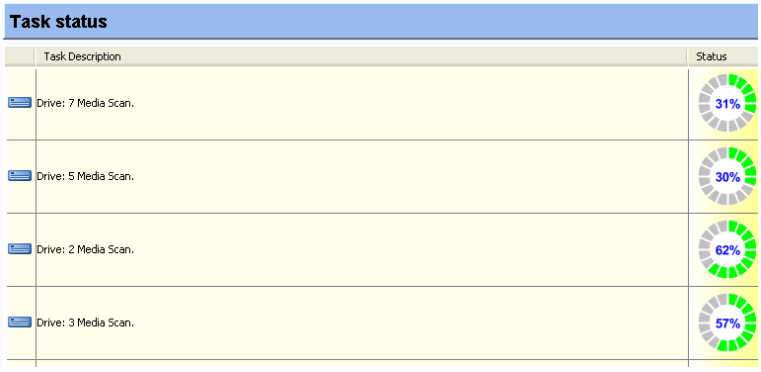


Fig. 11.4 Tasks Currently Being Processed

- This window shows the unfinished tasks currently being processed by the subsystem. The Task Status display includes disk drive maintenance tasks such as Media Scan or

Regenerate Parity, and array configuration processes such as logical drive initialization and capacity expansion.

- If you find that you have made the wrong configuration choice, you may also left-click and then right-click on the task information to display the Abort command.
- A brief task description, start time, and a percentage indicator are available with each processing task.

11.1.5 Event Log List/Configuration List Window

In the bottom of Bosch RAIDWatch program shows Event Log List and Configuration List windows. You can switch between the two windows by clicking on the tabbed panel on the bottom left of Bosch RAIDWatch screen.

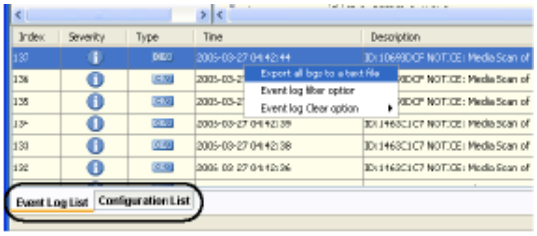


Fig. 11.5 Event Log List and Configuration List Window Tabbed Panel

Event Lot List Window

The Event Lot List window generates the system's event log list in the bottom of the Bosch RAIDWatch screen. The Event Log window give user the real-time monitoring, alerting as well as status reporting of the RAID systems.

When a new event is generated, the icon under Severity column will flash to draw user's attention. The severity icons also indicate the severity level of an event. (See *Table 11.1*) You can easily read the time of an event occurred by viewing the Time column.

Icon	Definition	Explanation
	Information	A notice of an action begin/complete or status change of the RAID system.
	Warning	This is a warning message that an event happened that may cause damage to the system.
	Critical	A critical condition happened. Bosch RAIDWatch program strongly suggest you to check your system immediately.

Table 11.1 Severity Level Icons

The Event log list function allow you to export the logs to a text file, and the event log filter option enable user to easily filter through stores of log files for specific event logs and then view, filter, export, and report on those events of interest.

To export or filter the event logs, mouse right-click on the event log list window. A list of three selections will appear on the screen. You may select Export all logs to a text file, Event log filter option or Event log clear option.

- Export All Logs to a Text File: This option will export all logs start from the time you accessed the RAID system to a text file. You may select a location where you like to save the file in a prompt up Save window. If you like to export any specific events, set the Event log Filter option before export the logs to a text file.
- Event Log Filter Option: When you click this option, an Event View Option window will prompt up.

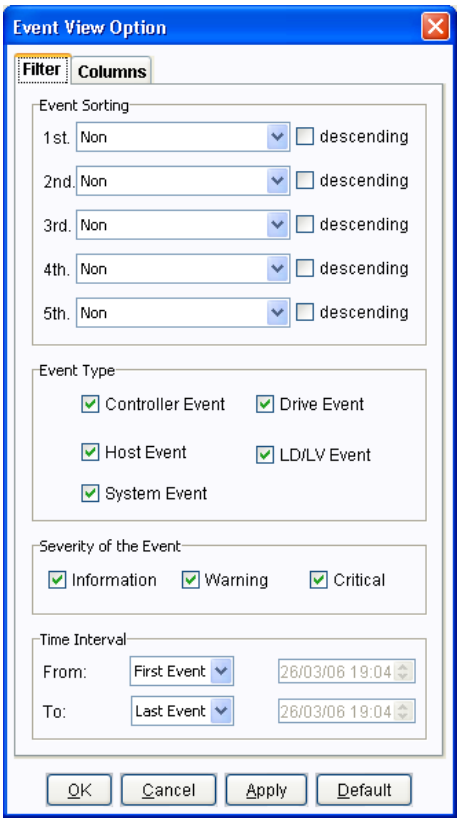


Fig. 11.6 Event View Option Window

In the Event View Option window, the tabbed panel on the top of the window allow you to switch between Filter and column pages.

You may set the event sorting criteria, the type of event you like to export, the severity of the event and the time occurrence range in the Filter page of the Event View Option window. Switch to Column page allows you to set the column you like to view. Click Apply for the changes to take effect. The Event Log List window will immediately shows the event list follows the new criteria. Click OK to exist the window, or click Default to return to the system default settings.

- Event Log Clear Option: This option allow you to clear the event logs in the Event Log List window. All event logs will be erased when you select Clear All Logs option. Select the Clear Log Precede Index: X option will erase the beginning of the events to the one before you selected.

Configuration List Window

Every detail of the RAID system is presented in the Configuration List window. The information will include system information, controller settings, logical drive setting(s), logical volume setting(s), channel setting(s), host LUN list, drive-side parameters, caching parameters, and communication information.

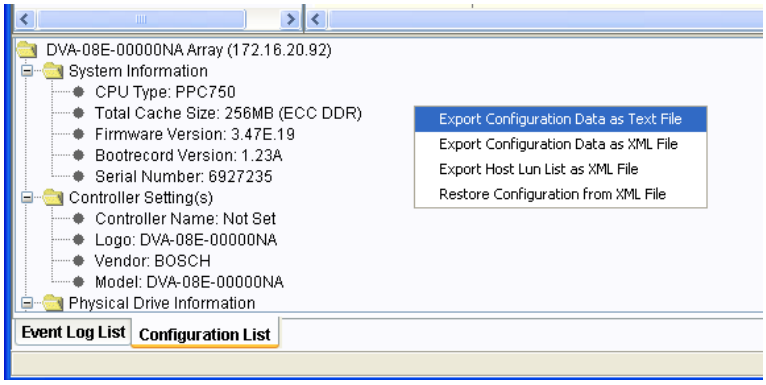


Fig. 11.7 Configuration List Window

Right-click on the Configuration List window will allow you to select four (4) options and they are explained as below:

- Export Configuration Data as Text File: When you select this option, the program will save the system's configuration data to a text file. You may select a file destination in a prompt up Save window.
- Export Configuration Data as XML File: Select a file location where you like to save the system's configuration data as an XML file in a prompt up Save window when you select this option.
- Export Host LUN List as XML File: This option will only export Host LUN list to a XML file. You may select a file destination in a prompt up Save window.
- Restore Configuration from XML File: You may retrieve the configuration data that you export earlier to the system. Browse the file in the prompt up Open window.

11.2 Logical Drive Information

Logical Drive Information helps you to identify the physical locations and logical relationship among disk drive members. In a massive storage application, a logical array may consist of disk drives installed in different drive enclosures.

The Logical Drive information is designed for today's complicated configurations of RAID arrays. The information window helps to achieve the following:

- Having a clear idea of the logical relationship can help avoid removing the wrong drive in the event of drive failure. A logical drive (RAID) configuration of disk drives cannot afford two failed disk drives.
- A logical drive may include members that reside on different enclosures or different drive channels. Doing so can help reduce the chance of downtime if a hardware failure should occur.
- With operations such as manual rebuild or capacity expansion using the "Copy and Replace" methodology, it is crucial to correctly identify an original member and a replacement drive.

Accessing Logical Drive Information

1. To access the *Logical Drive Information*, single-click its display icon on the GUI navigation panel or select the command from the *Action* command menu. After opening the information window, select the logical drive with a single mouse-click. A display window as shown in *Figure 11.8* should appear.

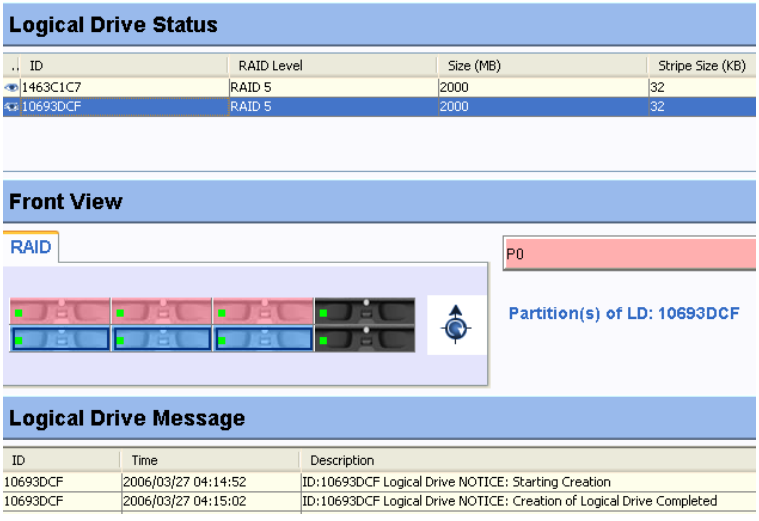


Fig. 11.8 Opening Logical Drive Information Display

2. As shown above, once a configured array is selected, its members will be displayed as highlighted drive trays in the Front View window. The array's logical partition is displayed on the right. Each logical configuration of drives is displayed in a different color. If a selected array includes members on different enclosures, click the JBOD tab button on top of the enclosure graphic to locate its positions.

NOTICE!

The Logical Drive Messages column only displays messages that are related to a selected array.

11.3 Logical Volume Information

A logical volume consists of one or many logical drives. Data written onto the logical volume is striped across the members.

Accessing Logical Volume Information

1. To access the *Logical Volume Information*, single-click its display icon on the navigation panel or select the command from the *Action* command menu. After opening the information window, select a logical volume by single mouse-click. The window defaults to the first volume on the list. A display window as shown in *Figure 11.9* should appear.

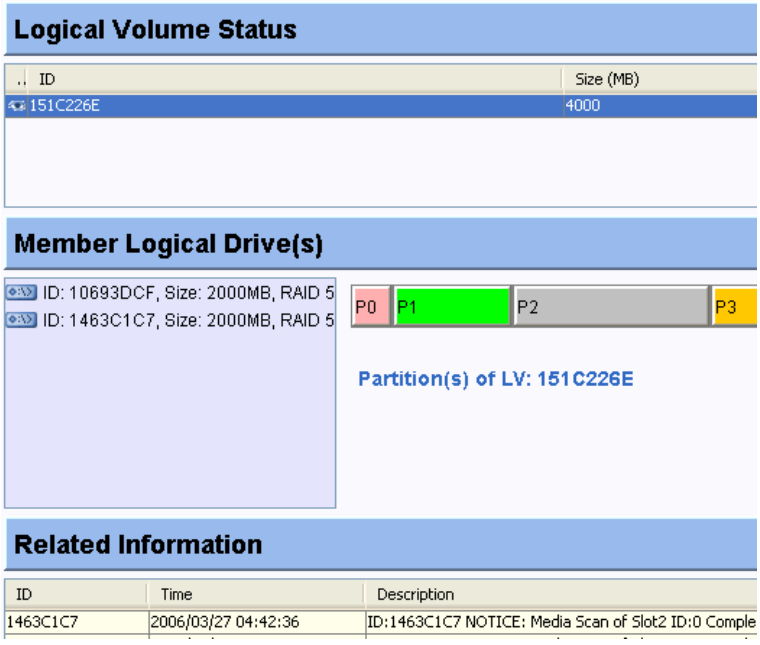


Fig. 11.9 Opening Logical Volume Information Display

2. As shown above, once a configured volume is selected, its members will be displayed in the Members column. The volume's logical partition(s) are displayed on the right as a segmented color bar. Each segment represents a partition of the volume capacity.

NOTICE!

The Related Information column only displays messages that are related to the selected volume.

11.4 System Information

This is a view-only window. This window contains information about the operating status of major components including CPU, board temperature, and enclosure modules like cooling fan and power supply units.
If the application includes multiple cascaded enclosures, you may also refer to the Enclosure View window where a faulty unit is indicated by the lit red LED. The color display of the LEDs shown on enclosure graphics corresponds to the real situation on the enclosure modules.

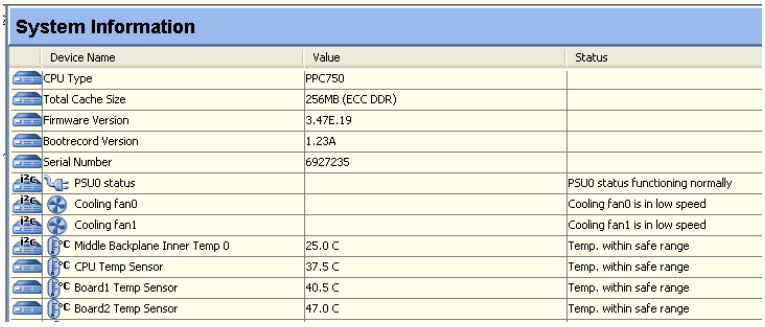


Fig. 11.10 System Information Window

1. To access the window, click on the System Information icon on the GUI navigation panel or select the command from the *Action* command menu.
2. Carefully check the display icons in front of the Device Name. Devices are categorized by the data bus by which they are connected. See the icon list below for more information:

Icon	Description
	RAID controller status
	Status of I2C bus devices
	Status of SAF-TE devices
	Status of SES devices
	Temperature sensors

Table 11.2 Device Icon

A Refresh button allows you to renew the information in cases when loop IDs are changed or when an LIP has been issued.

NOTICE!
Place your cursor on a specific item to display its device category.

Component status is constantly refreshed, yet the refresh time depends on the value set for device bus polling intervals, e.g., polling period set for SAF-TE or SES devices.
The RAID subsystem series supports auto-polling of cascaded enclosures, meaning the status of a connected enclosure is automatically added to the System Information window without the user's intervention.

11.5 Statistics

Bosch RAIDWatch Manager includes a statistics-monitoring feature to report 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 cached in memory. These values are displayed by numeric value and as a graph.

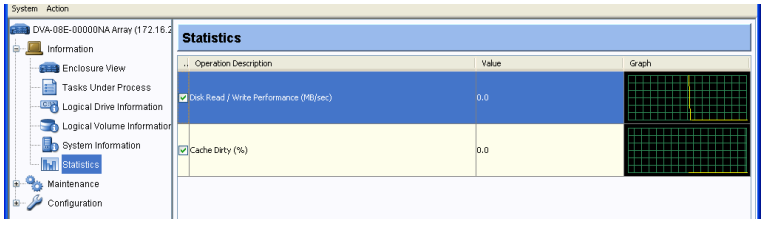


Fig. 11.11 Statistics Display Window

To access the Statistics window, click on the Statistics icon on the GUI navigation panel or select the Statistics command from the Action menu. Then choose either Cache Dirty (%) or Disk Read/Write Performance (MB/s) by checking the respective select box.

- The Cache Dirty statistics window displays what percentage of data is being accessed via cache memory.
- The Read/Write Performance window displays the amount of data being read from or written to the disk array system, in MB per second.

12 Enclosure Display

This chapter introduces the enclosure display using the Enclosure View window in the Bosch RAIDWatch's main program.

12.1 About The Enclosure View Window

The Bosch RAIDWatch Enclosure View is a customized display that shows a visual representation of the physical RAID controller/subsystem components. The Enclosure View allows you to quickly determine the operational status of critical RAID device components.
The Enclosure View window shows both the front and rear panel (see *Figure 12.1*). The Enclosure View of each Bosch RAIDWatch session defaults to the display of the connected RAID controller or RAID subsystem. The tabbed panel provides access to other cascaded enclosures so you can monitor multiple enclosures by your computer screen.

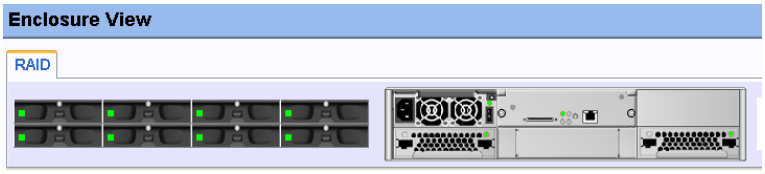


Fig. 12.1 Enclosure View

12.2 Accessing the Enclosure View

12.2.1 Connecting to the RAID Agent

To open the Enclosure View window, it is necessary to access the Bosch RAIDWatch program. Connecting to the RAID Agent is fully described in *Section 3 Installation* of this manual. Please refer to that chapter for further instructions on how to open the Bosch RAIDWatch program.

12.2.2 Opening the Enclosure View Window

Once Bosch RAIDWatch is successfully connected to a RAID device, the Enclosure View of the device you are using will appear immediately. If it doesn't appear or if you have closed the Enclosure View window but wish to access it again, you can either select the Enclosure View icon from the navigation tree or go to the Action Command menus and then select Information/Enclosure View on the top of the screen. (See *Figure 12.2*)

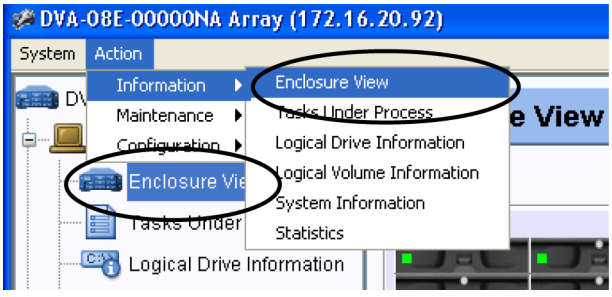


Fig. 12.2 Accessing the Enclosure View

12.2.3 Component Information

The front and rear view of a RAID system in the Enclosure View window presents a graphical display of different components. This window is particularly useful in monitoring the status of the physical drives. It provides a real-time report on the drive status, using LED colors to represent various operating conditions.

Using the Bosch RAIDWatch Enclosure View, it is possible to obtain information about the following RAID device components:

- *RAID Controller* – The RAID controller is the heart of any RAID device and controls the flow of data to and from the storage devices.
- *I/O Channels* – An I/O channel is the channel through which data flows to and from the RAID controller.
- *Battery Backup Unit (BBU)* – The BBU provides power to the memory cache when power outage occurs or the power supply units fail.

NOTICE!
The BBU is an optional item for some subsystem models.

- *Power Supply Unit (PSU)* – All RAID devices should come with at least one PSU that provides power to the RAID device from the main power source.
- *Cooling Module* – All RAID devices should come with at least one cooling module. The cooling modules keep the RAID device temperature down to prevent the RAID device from overheating.

12.3 LED Representations

As described earlier (see *Section 12.1 About The Enclosure View Window*), the Enclosure View is a direct representation of the physical device. Almost every major component has its status-indicating LEDs. When a component fails (or some other event occurs), the related LEDs will flash or change the display color. The physical status of the LEDs will be reflected by the LEDs shown in the Enclosure View window. That is, if an LED on the physical device changes its display color, then the display color of the corresponding LED in the Enclosure View window will also change.

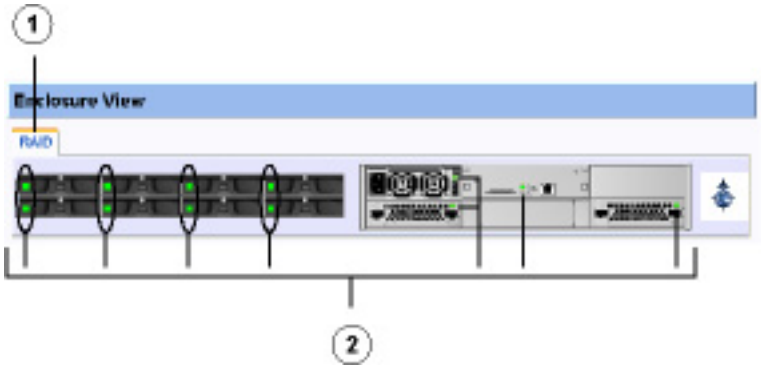


Fig. 12.3 Enclosure Tabbed Panel and Component LED Display

1 Enclosure Page
2 Status LEDs

12.4 Enclosure View Messages

The messages shown in the Enclosure View window provide easy access to information about components on the RAID device that is being monitored. The message tag reports the status of major devices.

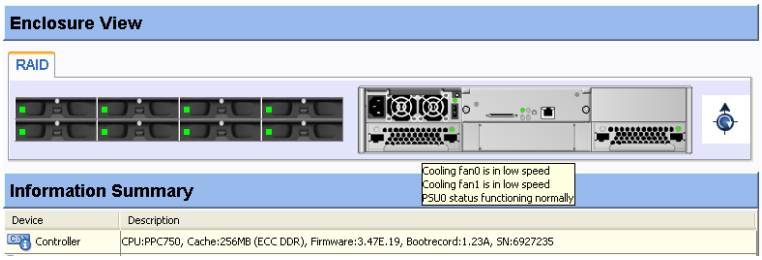


Fig. 12.4 Component Information Message Tags

To generate the message tags, move the mouse cursor onto the relevant RAID device component. For example, if you wish to determine the operational status of a RAID subsystem, move the cursor onto the enclosure graphic and the corresponding message tag will appear.
The enclosure front view message tag displays the current configuration of the drive, including the channel number of the drive slot on the subsystem to which the drives are connected, the drive's capacity, transfer rate, and current status.
The enclosure components displays as a summary of module operating status. The operating status of each module is shown either as operating normally or failed.

NOTICE!

- Messages do not always appear instantaneously. After the cursor has been moved onto the component, there is usually a delay of a second before the message tag appears.
- More device-dependent information is provided in the System Information window. To access the System Information window, please refer to *Section 6 Basic Operations*.

12.5 Information Summary

The Information Summary window displays key information on the subsystem currently selected, including the RAID controller(s), I/O channels, connecting speeds, logical drive status, LUN mapping status...etc.

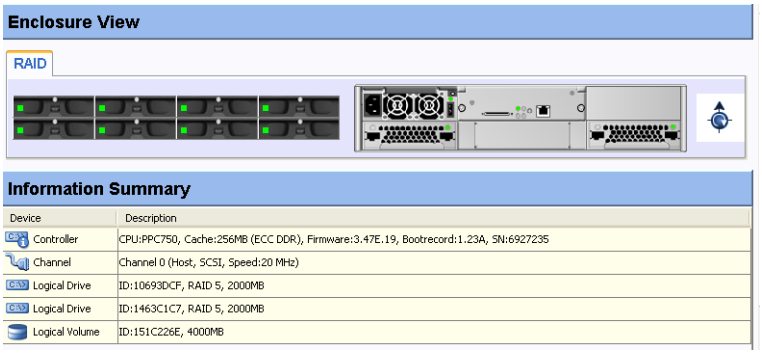


Fig. 12.5 Information Summary

13 NPC Utility Coupled with Mode Three Installation

This chapter introduces the NPC utility.

13.1 NPC Utility

NPC is stands for “Notification Processing Center.” This utility is used to send event messages when the main Bosch RAIDWatch modules are installed to a RAID subsystem’s segregated disk capacity, the reserved space. NPC is implemented to manage event notification functions since the Bosch RAIDWatch Server utility is not available with the Mode 3 installation scheme. With Mode 3 installation, arrays are accessed directly through network connections without installing the manager software and utilities onto a server. The NPC utility is automatically distributed to a disk array's reserved space when installing Bosch RAIDWatch using the Mode 3 scheme.

To Access the Utility

The NPC utility is easily accessed using a web browser over the network.

1. Open a web browser program.
2. Enter "http://<controller IP>/configure.htm" in the web browser's URL field.
3. A safe content warning message might prompt. Click Yes to proceed. (See *Figure 13.1*)

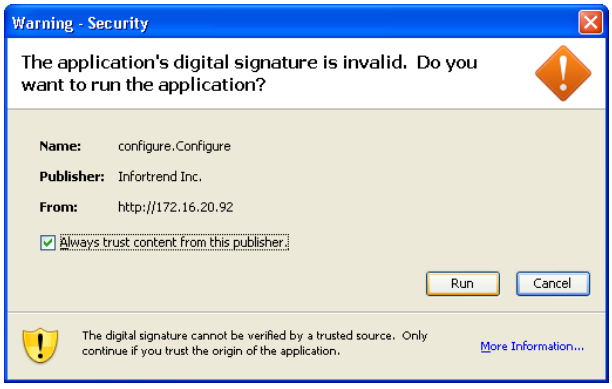


Fig. 13.1 Security Warning

4. The configuration utility starts as a Java Applet. (See *Figure 13.2*)

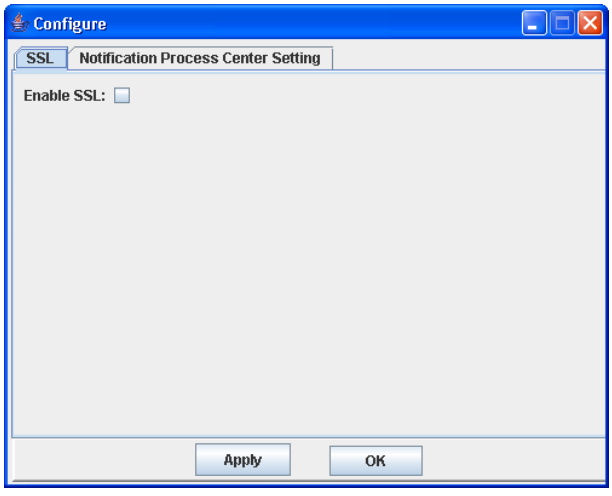


Fig. 13.2 The NPC Initial Screen

13.2 Configuring the Utility Options

13.2.1 SSL

SSL stands for “Secure Sockets Layer Handshake Protocol.” As shown in *Figure 13.2* above, the initial screen defaults to the SSL option. Select the check box if you want to enable SSL connection for the management session with the array.

NOTICE!
The configuration will take effect after you restart the network connection or reset the management station.

13.2.2 Email Notification

Follow the steps below to configure email notification:

1. Click on the *Notification Process Center Setting* tab. Open the *Base Setting* page.

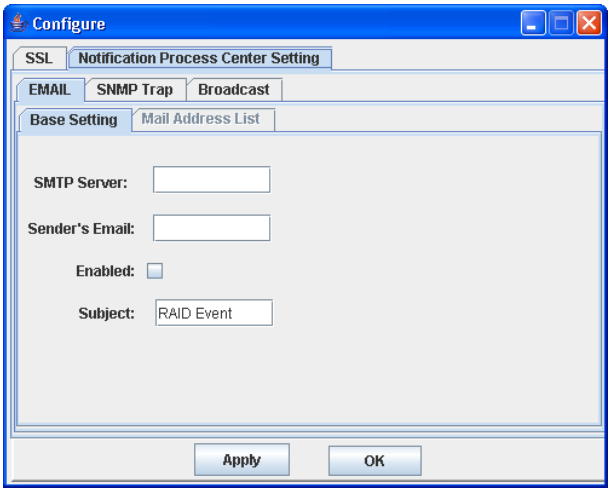


Fig. 13.3 Email Notification – Sender Side Settings

2. Fill in or select the following configuration fields:
   - SMTP Server: The Internet mail server used to send event notification.
   - Sender's email: Enter a valid mail address, the "From" part of email notification functionality.
   - Enabled: Select this check box to enable email notification.
   - Subject: Allows you to append a subject matter to event notification emails; e.g., “Events from RAID 3 array.”
3. Click Apply or OK to proceed with configuration. Note that the configuration will be saved to the reserved space on the array and may cause a short delay.
4. Click Mail Address List from the tabbed panel above.
   Fill in or select the following configuration fields:

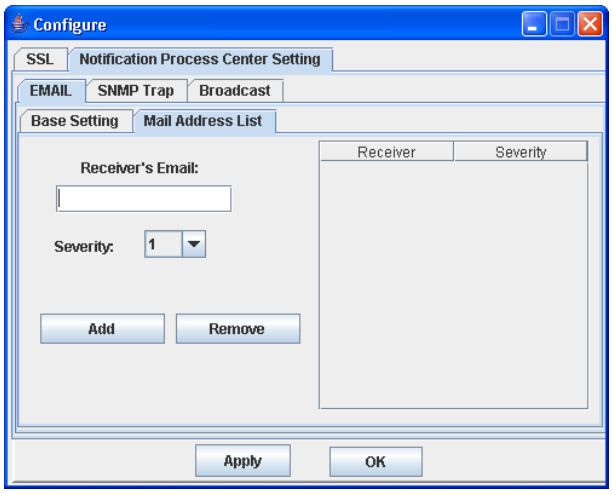


Fig. 13.4 Email Notification – Receiver Side Settings

- Receiver's email: Shows a list of all the email addresses that the NPC will send a message to. Addresses added will be listed on the right.
- Severity: Select the severity level of events to be sent to the receiver station.

5. Click Apply or OK to complete the configuration.

13.2.3 SNMP Traps

1. Click on the *Notification Process Center Setting* tab and SNMP Trap to display SNMP settings.

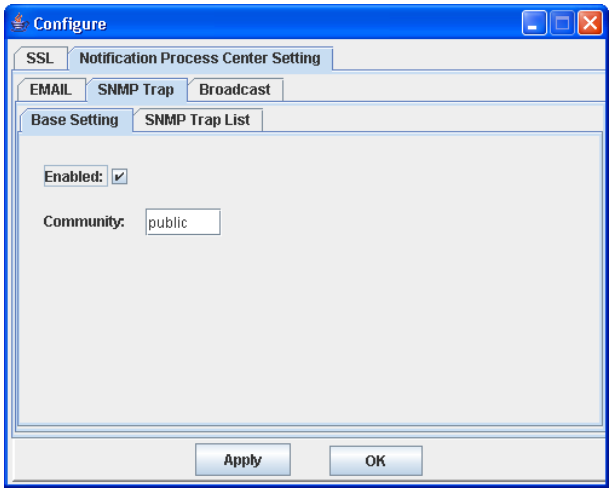


Fig. 13.5 SNMP Traps – Sender-side Settings

2. Fill in or select the following configuration fields:
   - Enabled: Select this check box to enable the notification.
   - Community: This is just a string authentication and can be seen as a plain text password.
3. Click Apply or OK to proceed with configuration. Note that the configuration will be saved to the reserved space on the array and may cause a short delay.
4. Click SNMP Trap List from the tabbed panel above.

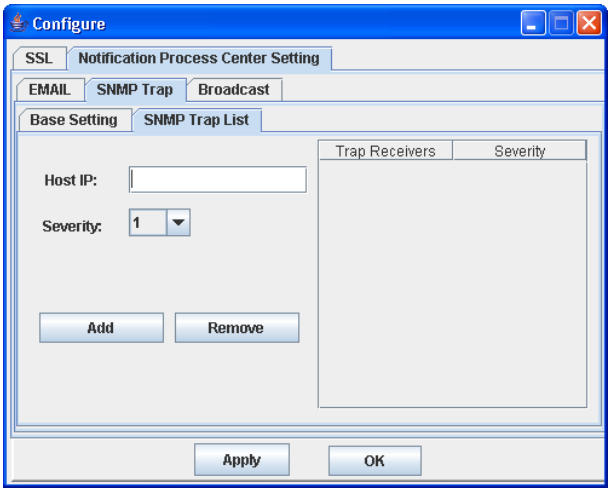


Fig. 13.6 SNMP Traps – Receiver Side Settings

- Host IP: The port number of the agents listening for traps.
- Severity: Select the severity level of events to be sent to the receiver station.
- Trap receivers will be added to the Trap Receivers list on the right.

5. Click Apply or OK to complete the configuration.

13.2.4 Broadcast Notification

1. Click on the *Notification Process Center Setting* tab and Broadcast to display Broadcast settings.

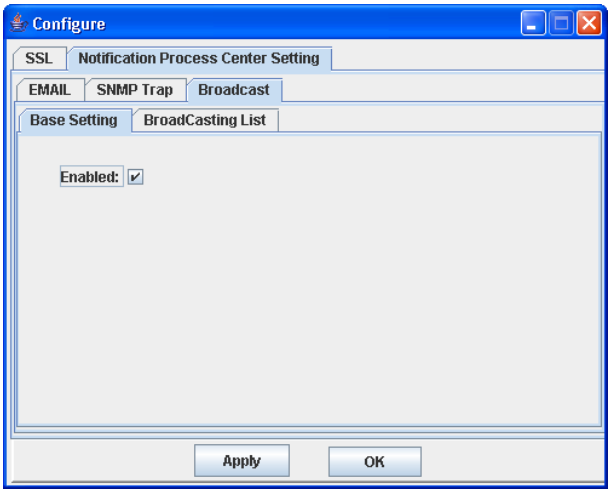


Fig. 13.7 Broadcast – Sender-side Settings

2. Fill in or select the following configuration fields:
   - Enabled: Select this check box to enable the notification.
3. Click Apply or OK to proceed with configuration. Note that the configuration will be saved to the reserved space on the array and may cause a short delay.
4. Click Broadcasting List from the tabbed panel above.
   - Host IP: The IP address a broadcast message will be sent to.
   - Severity: Select the severity level of events to be sent to the receiver station.

   Computers receiving broadcast messages will be added to the Host Name list on the right.

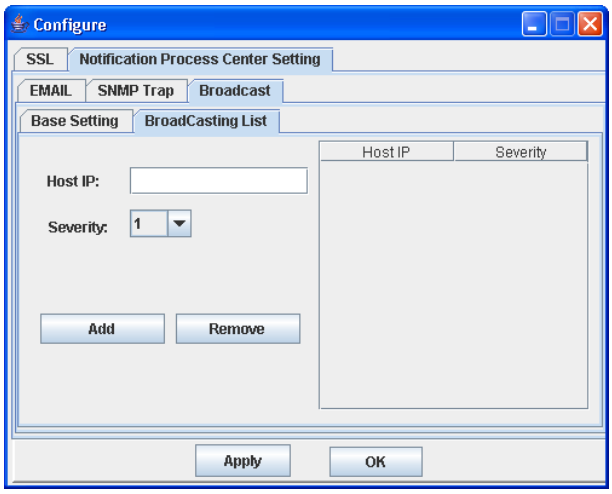


Fig. 13.8 Broadcast – Receiver-side Settings

5. Click Apply or OK to complete the configuration.

NOTICE!
In a massive capacity configuration, it takes a while for the RAID subsystem to write the NPC configuration profile to every disk member. DO NOT reset or power down the subsystem before the configuration can be safely distributed to the array.
Also make sure the subsystem's Ethernet port and related TCP/IP settings have been properly configured for the NPC functionality to take effect.

14 Central Management Utility

This chapter introduces the Central Management Utility.

14.1 Central Management Introduction

The Central Management utility provides:

- Online monitoring of Bosch RAID subsystems in the network
- Creation of instant event logs
- Filtering and exporting event logs via text files

The Central Management utility is an entrance portal to Bosch RAIDWatch whereby you can configure and maintain subsystems. Simply click the icon to connect to the subsystem.

14.2 Setting Up the Utility

The Central Management utility, along with the Bosch RAIDWatch Server and Bosch RAIDWatch, can be accessed from the icons on your desktop or traditionally, through the Start menu.

1. Open the Bosch RAIDWatch Server and select Add Host. (See *Figure 14.1*)

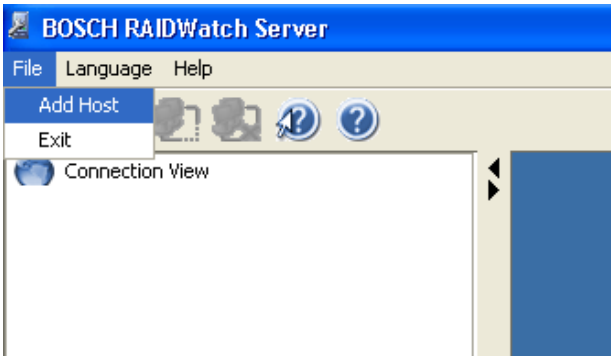


Fig. 14.1 Add Host

2. Add one (1) Root Agent by entering the IP address for the Root Agent. (See *Figure 14.2*)

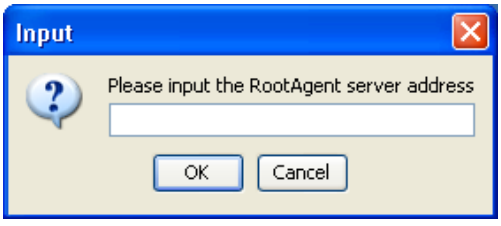


Fig. 14.2 Input Root Agent IP

3. Select the Auto Discovery option from the Module Name drop-down box. (See *Figure 14.3*)

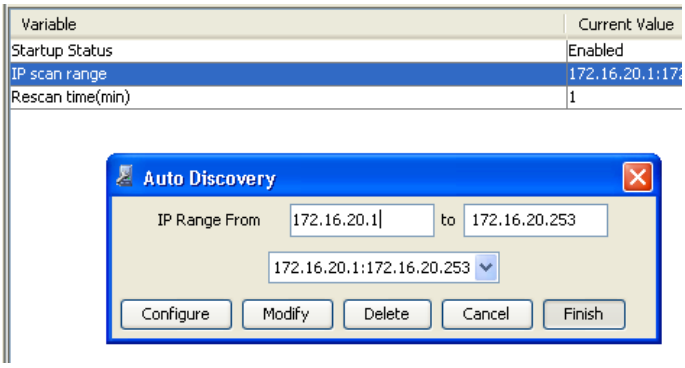


Fig. 14.3 Auto Discovery

4. Input the IP scan range to search the network. Click *Finish*.
5. Double-click the ON/OFF switch.
   The Root Agent will automatically scan the IP range for available subsystems on the network.
6. Check the results of the scan in RootAgent Setting.

14.3 Central Management Connectivity

Central Management will display subsystems based on the Agent IP list. The information is queried from the RootAgent and available subsystems are displayed via icons.

Fig. 14.4 Not Connected

Figure 14.4 shows that Central Management is not connected with the RootAgent and there will be no systems listed in Central Management.

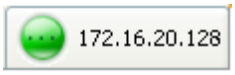


Fig. 14.5 Data Query

Figure 14.5 shows that Central Management is querying data from the RootAgent.

Fig. 14.6 Connected

Figure 14.6 shows that Central Management is connected with the RootAgent.

14.4 Maintenance & Configuration

14.4.1 Icon Labels

Icon labels will display the model name and the IP address of the connected subsystems. Move the cursor over the icon and an information box will pop up with more detailed system information such as, the System Name, ID, IP and event log. (See *Figure 14.7*)

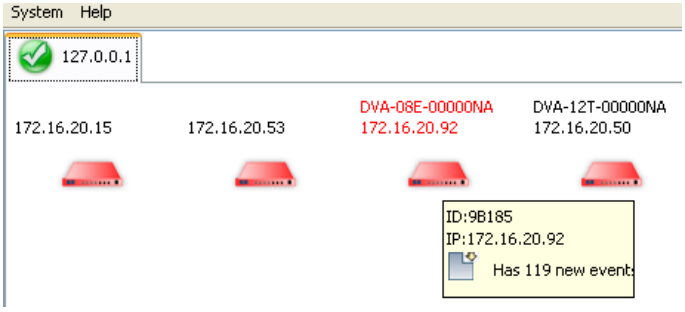


Fig. 14.7 System Information Box

NOTICE!

Icons that are blinking red have warning messages or events that should be checked. The event log is the same as used in Bosch RAIDWatch.

14.4.2 System Events

There are two (2) options when clicking on a system icon.

Connect to the subsystem

1. Double-click the system icon will invoke Bosch RAIDWatch to connect to the subsystem. The main Bosch RAIDWatch program will open and more detailed information regarding the subsystem will be displayed.

Filter and export log

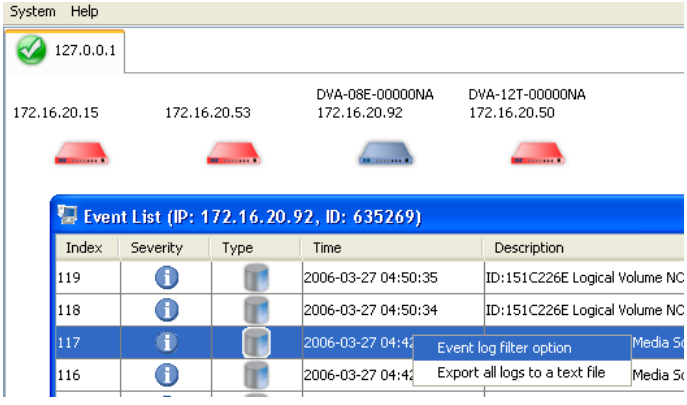


Fig. 14.8 Event List Options

2. Right-clicking the system icon will also provide you with two (2) options - filtering the event log and exporting the event log to a text file. (See *Figure 14.8*)

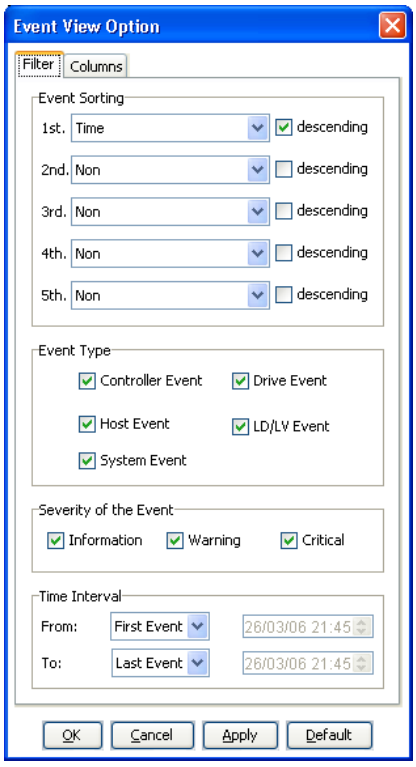


Fig. 14.9 Event View Option

The Event log filter option allows you to filter events based on various criteria. (See *Figure 14.9*)

NOTICE!
Using multi-RootAgents for load balance/redundant purpose: You can add more RootAgents to query information from the system. Add procedure is the same as described in Setting Up the Utility.

15 Command Summary

This chapter describes the commands available in Bosch RAIDWatch Manager. These commands are presented either in each configuration window, as command buttons on pull-down menus, or on pop-up menus triggered by a mouse right-click.

15.1 Bosch RAIDWatch Menu Commands

The following sections list and explain the commands available from the menus in the menu bar.

15.1.1 Bosch RAIDWatch System Menu Commands (Base-level Window)

Command	Description
Open Device	Connects Bosch RAIDWatch Manager to a particular disk array system for management.
Auto Discovery	Search the available RAID systems in the specific range on the network.
Exit <X>	Closes the Bosch RAIDWatch Manager application.

15.1.2 Bosch RAIDWatch Language menu Commands (Base-level Window)

Command	Description
English	The Bosch RAIDWatch GUI, online help will show in English.
German	The Bosch RAIDWatch GUI, online help will show in German.
Japanese	The Bosch RAIDWatch GUI, online help will show in Japanese.

15.1.3 Bosch RAIDWatch Window Menu Commands (Base-level Window)

Command	Description
Next Window	This command allows you to switch to the display of the next array being connected.
Tile All	This command arranges currently open windows so that they are all visible and occupy an equal part of the Bosch RAIDWatch application window.
Cascade All	This command arranges currently open windows so that one is placed over the other but every window is still visible.
Hide All	This command functions like the minimize caption button.
Close All	This command closes all currently open windows and ends all software connections.

15.1.4 Bosch RAIDWatch Help Menu Commands (Base-level Window)

Command	Description
About <A>	Displays information about the Bosch RAIDWatch Manager program.
What's this?	Produces an interactive arrow mark. By placing the arrow mark over and clicking on a functional menu or push button, the related help content page displays.
Help Topic	Displays Bosch RAIDWatch Manager online help.

15.1.5 Bosch RAIDWatch System Menu Commands (Each Connection Window)

Command	Description
Refresh	Refreshes the status display of the current connection in cases when configuration changes are made through a terminal connection to the same array.
Logout	Closes the currently open window and ends the software's connection with the array

15.1.6 Bosch RAIDWatch Action Menu Commands (Each Connection Window)

Command	Description
Array Information	Displays the second-level menu, which provides access to all information windows. Access to the information windows can also be found on the navigation panel.
Maintenance	Displays the second-level menu, which provides access to all maintenance tasks windows. Access to the maintenance task windows can also be found on the navigation panel.
Configuration	Displays the second-level menu, which provides access to all configuration windows. Access to the configuration windows can also be found on the navigation panel.

15.2 Bosch RAIDWatch Server Utility Commands

15.2.1 File Menu Commands

Command	Description
Add Host	Creates a new entry by entering Root Agent server IP.
Exit	Closes the Bosch RAIDWatch Server application.

15.2.2 Language Commands

Command	Description
English	The Bosch RAIDWatch Server, online help will show in English.
German	The Bosch RAIDWatch Server, online help will show in German.
Japanese	The Bosch RAIDWatch Server, online help will show in Japanese.

15.2.3 Help Menu Commands

Command	Description
About	Displays information about the Bosch RAIDWatch Server program.

15.2.4 Tool Bar Commands

Command	Description
Open Bookmark File	Opens a previously saved connection view profile. This profile contains information about the Root Agent server and the RAID arrays being managed by a Root Agent.
Save Bookmark File	Saves the current connection view profile onto your system drive. The default file name is “default.npc.”
Connect RootAgent Server	Connects to a Root Agent server, usually the one that you choose as a management and install the Bosch RAIDWatch Server utility. However, you may connect to multiple Root Agent servers from a single workstation.
Disconnect RootAgent	Disconnects from a currently connected Root Agent server.
Help Cursor	Helps linking and displaying the associative help topics with a screen element.
Help	Displays Bosch RAIDWatch Manager online help. Details about the Bosch RAIDWatch Server utility are also included.

15.2.5 Root Agent Right-click Menu Commands

Command	Description
Add Host	Connects to a Root Agent server, usually the one that you choose as a management and install the Bosch RAIDWatch Server utility. However, you may connect to multiple Root Agent servers from a single workstation.
Delete Host	Deletes a Root Agent entry from the connection view
Disconnect	Disconnects from a currently connected Root Agent server.
Generate Dummy Events	Creates dummy events for testing the notification functions.
Refresh	Refreshes the connection view status. Updates the connection information about Root Agent(s) and the RAID arrays being managed.

16 RAID Levels

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

16.1 RAID Description

Redundant Array of Independent Disks (RAID) is a storage technology used to improve the processing capability of storage systems. This technology is designed to provide reliability in disk array systems and to take advantage of the performance gains multiple disks can offer. RAID comes with a redundancy feature that ensures fault-tolerant, uninterrupted disk storage operations. In the event of a disk failure, disk access will still continue normally with the failure transparent to the host system.

RAID has several different levels and can be configured into multi-levels, such as RAID 10, 30, and 50. 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.

RAID offers the advantages of Availability, Capacity, and Performance. Choosing the right RAID level and drive failure management can increase data availability, subsequently increasing system performance and storage capacity.

16.2 Non-RAID Storage

One common option for expanding disk storage capacity is simply to install multiple disk drives into the system and then combine them end-to-end. This method is called *disk spanning*.

In disk spanning, the total disk capacity is equivalent to the sum of the capacities of all SCSI drives in the combination. This combination appears to the system as a single logical drive. For example, combining four 1GB drives in this way 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.

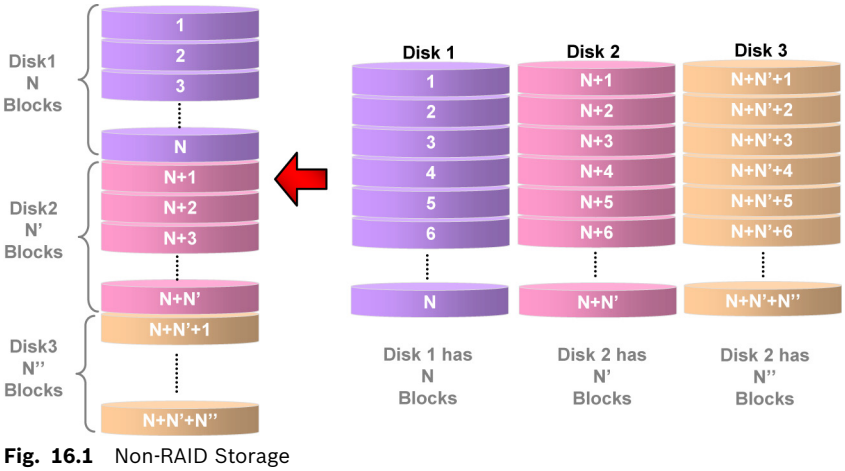


Fig. 16.1 Non-RAID Storage

16.3 RAID 0

RAID 0 implements *block striping* where data is broken into logical blocks and striped across several drives. Although called RAID 0, this is not a true implementation of RAID because there is no facility for redundancy. In the event of a disk failure, data is lost.
In block striping, the total disk capacity is equivalent to the sum of the capacities of all 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.

Fig. 16.2 RAID0 Storage

16.4 RAID 1

RAID 1 implements *disk mirroring* where a copy of the same data is recorded onto two sets of striped drives. By keeping two copies of data on separate disks or arrays, data is protected against a disk failure. If a disk on either side fails at any time, 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 drives in the combination. For example, combining four 1GB drives 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.

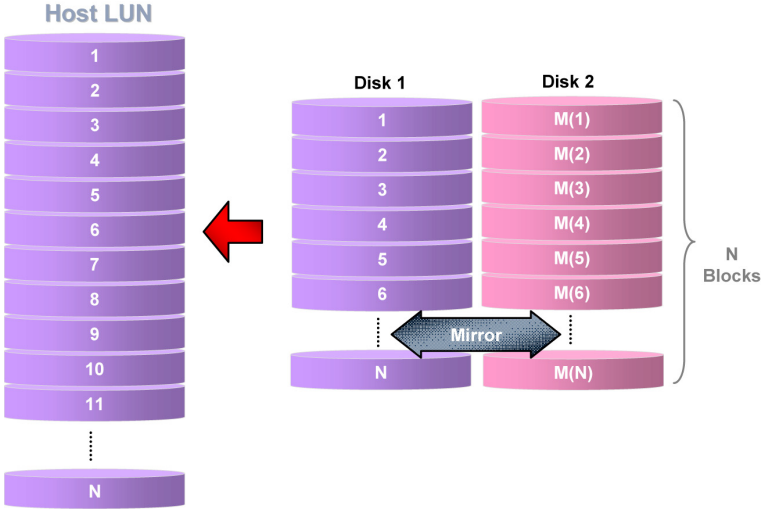


Fig. 16.3 RAID1 Storage

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.

16.5 RAID 1(0+1)

RAID 1(0+1) combines RAID 0 and RAID 1 – *mirroring and disk striping*. RAID (0+1) allows multiple drive failure because of the full redundancy of the hard disk drives. If more than two hard disk drives are chosen for RAID 1, RAID (0+1) will be performed automatically.

CAUTION!
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.

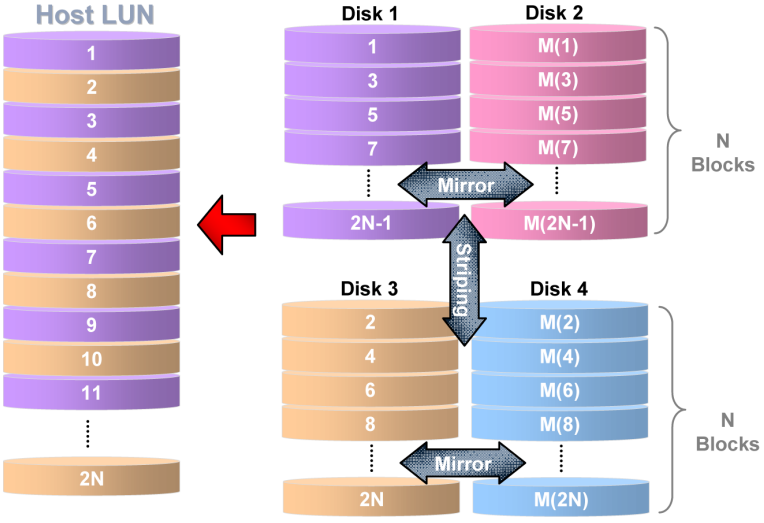


Fig. 16.4 RAID 1(0+1) Storage

16.6 RAID 3

RAID 3 implements *block striping with dedicated parity*. This RAID level breaks data into logical blocks, the size of a 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 drives in the combination, excluding the parity drive. For example, combining four 1GB drives 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 recalculated and rewritten every time new data is written to any of the data disks.

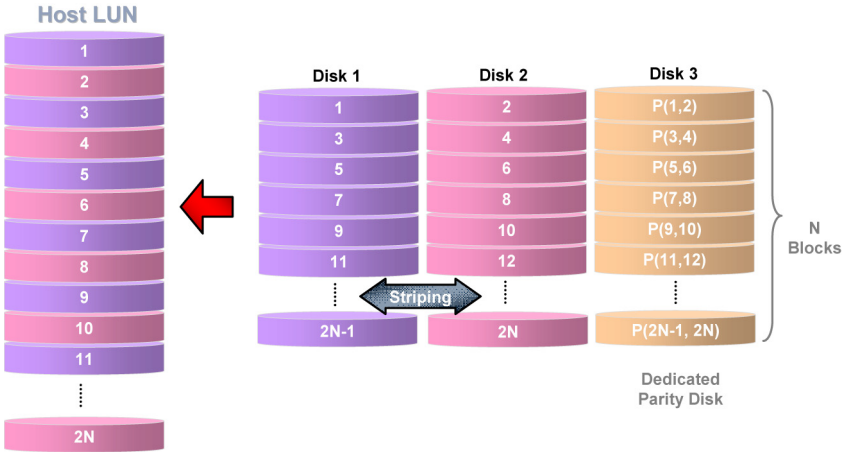


Fig. 16.5 RAID 3 Storage

16.7 RAID 5

RAID 5 implements *multiple-block striping with distributed parity*. This RAID level offers the same redundancy available in RAID 3, though the parity information is distributed across all disks in the array. Data and relative parity are never stored on the same disk. In the event a disk fails, original data can be reconstructed using the available parity information.
For small I/Os, as few as one disk may be activated for improved access speed.
RAID 5 offers both increased data transfer rates when data is being accessed in large chunks or sequentially and reduced total effective data access time for multiple concurrent I/Os that do not span multiple drives.

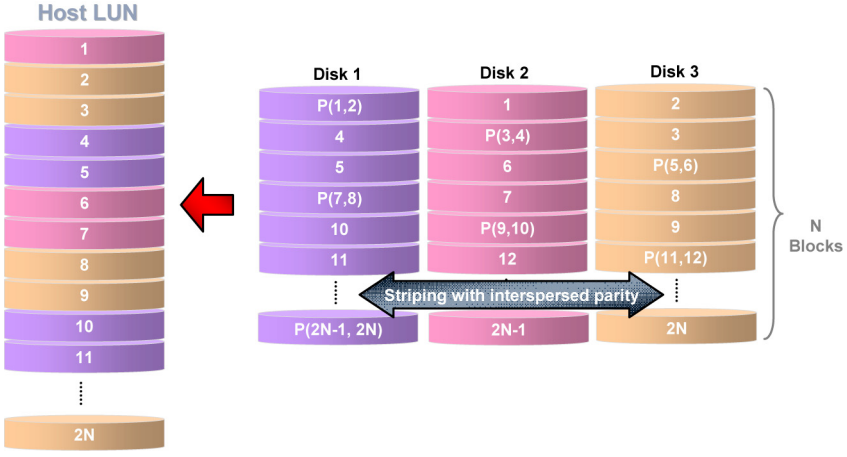


Fig. 16.6 RAID 5 Storage

16.8 RAID 10, 30 and 50

Bosch implements RAID 10, 30 and 50 in the form of logical volumes. Each logical volume consists of one or more logical drives. Each member logical drive can be composed of a different RAID level. Members of a logical volume are striped together (RAID 0); therefore, if all members are RAID 3 logical drives, the logical volume can be called a RAID 30 storage configuration.
Using logical volumes to contain multiple logical drives can help manage arrays of large capacity. It is, however, difficult to define the RAID level of a logical volume when it includes members composed of different RAID levels.

17 Additional References

This chapter provides direction to additional references that may be useful in creating and operating a RAID, and in using Bosch RAIDWatch.

17.1 Java Runtime Environment

JRE (Java Runtime Environment) is a shareware product from Sun/Solaris.

17.2 Bosch RAIDWatch Update Downloads & Upgrading

Bosch will provide Bosch RAIDWatch Agent and Bosch RAIDWatch Manager updates periodically via Bosch Extranet and as new CD releases.

17.3 Uninstalling Bosch RAIDWatch

Bosch RAIDWatch agents, Bosch RAIDWatch Server and Bosch RAIDWatch Manager can be uninstalled.

To uninstall the Bosch RAIDWatch

1. Click the Windows **Start** button, point to **All Programs**. Point to **Bosch**, and then click **Uninstall**. The following dialog box appears.

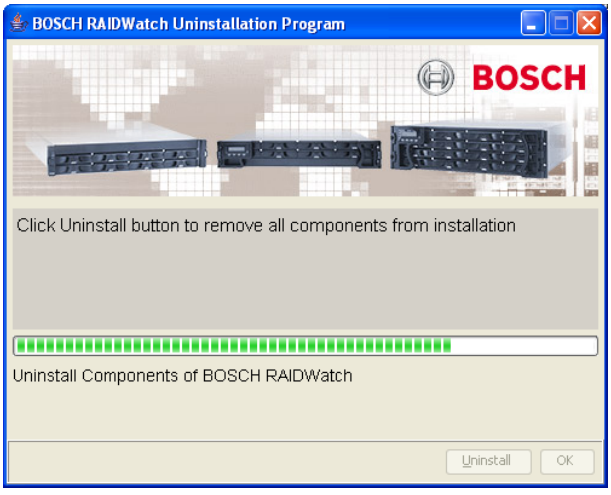


Fig. 17.1 Bosch RAIDWatch Uninstallation Program

2. Click **Uninstall** to start the uninstall process. The Bosch RAIDWatch program will be uninstalled and files will be removed from your computer.

18 Event Messages

The controller events can be categorized as follows according to the severity levels:

Critical	Errors that need to attend to immediately
Warning	Errors
Notification	Command processed message sent from Firmware

The RAID subsystem records all system events from power on, it can record up to 1,000 events. To power off or to reset the controller will cause an automatic deletion of all the recorded event logs.
The RAIDWatch manager can be used to record events on multiple subsystems especially when controller reset or power-off is an expected action. The events can also be seen from RAIDWatch's Configuration Client utility. Associated details can be found in the RAIDWatch user's manual and online help.
Descriptions below may contain abbreviations. Abbreviations and Capitalized letters are preserved for the coherency with the event messages shown on LCD screen or terminal.

18.1 Event Index

18.1.1 Logical Drive Events

Critical

LG:0 Logical Drive ALERT: CHL:0 ID:132 Drive Missing
LG:0 Logical Drive ALERT: CHL:0 ID:132 Drive Failure
LG:0 Logical Drive ALERT: Rebuild Aborted
LG:0 Logical Drive ALERT: Rebuild Failed
LG:0 Logical Drive ALERT: Parity Regeneration Aborted
LG:0 Logical Drive ALERT: Parity Regeneration Failed
LG:0 Logical Drive ALERT: Creation Aborted
LG:0 Logical Drive ALERT: Creation Failed
LG:0 Logical Drive ALERT: Initialization Failed
LG:0 Logical Drive ALERT: Expansion Aborted
LG:0 Logical Drive ALERT: Expansion Failed
ALERT: CHL:0 ID:132 Media Scan Failed
LG:0 ALERT: CHL:0 ID:132 Media Scan Failed
LG:0 Logical Drive ALERT:CHL:0 ID:132 Clone Failed
LG:0 Logical Drive ALERT:CHL:0 ID:132 Clone Aborted
LG:0 Logical Drive ALERT:CHL:0 ID:132 Clone Failed
LG:0 Logical Drive ALERT:CHL:0 ID:132 Clone Aborted
LG:0 Logical Drive ALERT: Logical Drive Bad Block Table FULL
LG:0 Logical Drive ALERT: Logical Drive Bad Block Table BAD
LG:0 Logical Drive ALERT: Logical Drive On-Line Init Table BAD
LG:0 Logical Drive ALERT: Bad Data Block Marked 000000084
LG:0 Logical Drive ALERT: UNPROTECTED Block Marked 000000084
LG:0 Logical Drive NOTIFY: Bad Data Block Encountered 000000084
LG:0 ALERT: Inconsistent Parity Encountered Block 20000000B

Notification

LG:0 Logical Drive NOTICE: Continue Rebuild Operation
LG:0 Logical Drive NOTICE: Starting Rebuild
LG:0 Logical Drive NOTICE: Rebuild of Logical Drive Completed

LG:0 Logical Drive NOTICE: Continue Parity Regeneration Operation
LG:0 Logical Drive NOTICE: Starting Parity Regeneration
LG:0 Logical Drive NOTICE: Parity Regeneration of Logical Drive Completed
LG:0 Logical Drive NOTICE: Starting Creation
LG:0 Logical Drive NOTICE: Creation of Logical Drive Completed
LG:0 Logical Drive NOTICE: Starting On-Line Initialization
LG:0 Logical Drive NOTICE: On-Line Initialization of Logical Drive Completed
LG:0 Logical Drive NOTICE: Starting Off-Line Initialization
LG:0 Logical Drive NOTICE: Off-Line Initialization of Logical Drive Completed
LG:0 Logical Drive NOTICE: Starting On-Line Expansion
LG:0 Logical Drive NOTICE: On-Line Expansion of Logical Drive Completed
LG:0 Logical Drive NOTICE: Starting Off-Line Expansion
LG:0 Logical Drive NOTICE: Off-Line Expansion of Logical Drive Completed
LG:0 Logical Drive NOTICE: Continue Add Drive Operation
LG:0 Logical Drive NOTICE: Starting Add Drive Operation
LG:0 Logical Drive NOTICE: Add Drive Operation Paused
LG:0 Logical Drive NOTICE: Add Drive to Logical Drive Completed
LG:0 Logical Drive NOTICE: Add Drive Operation Paused
NOTICE: CHL:0 ID:132 Starting Media Scan
LG:0 NOTICE: CHL:0 ID:132 Starting Media Scan
NOTICE: Media Scan of CHL:0 ID:132 Completed
LG:0 NOTICE: Media Scan of CHL:0 ID:132 Completed
LG:0 ALERT: CHL:0 ID:132 Media Scan Aborted
LG:0 Logical Drive NOTICE:CHL:0 ID:132 Continue Clone Operation
LG:0 Logical Drive NOTICE:CHL:0 ID:132 Starting Clone
LG:0 Logical Drive NOTICE:CHL:0 ID:132 Copy and Replace Completed
LG:0 Logical Drive NOTICE:CHL:0 ID:132 Clone Completed
LG:0 Logical Drive NOTIFY: Bad Data Block Recovered 000000084
LG:0 Logical Drive NOTIFY: Bad Data Block Recovered 000000084

18.1.2 Channel and Individual Drive Events

Critical

CHL:0 ID:132 ALERT: Media Error Unrecoverable-0xD8001C7C
CHL:0 FATAL ERROR(0)

Warning

CHL:1 ID:0 Target ALERT: Unexpected Select Timeout
CHL:1 ID:0 Target ALERT: Unexpected Select Timeout
CHL:1 Drive Channel ALERT: Unexpected Select Timeout
CHL:1 RCC Channel ALERT: Gross Phase/Signal Error Detected
CHL:1 ID:0 Target ALERT: Gross Phase/Signal Error Detected
CHL:1 ID:0 Target ALERT: Gross Phase/Signal Error Detected
CHL:1 Drive Channel ALERT: Gross Phase/Signal Error Detected
CHL:1 RCC Channel ALERT: Unexpected Disconnect Encountered
CHL:1 ID:0 Target ALERT: Unexpected Disconnect Encountered
CHL:1 ID:0 Target ALERT: Unexpected Disconnect Encountered
CHL:1 Drive Channel ALERT: Unexpected Disconnect Encountered
CHL:1 RCC Channel ALERT: Timeout Waiting for I/O to Complete
CHL:1 ID:0 Target ALERT: Timeout Waiting for I/O to Complete
CHL:1 ID:0 Target ALERT: Timeout Waiting for I/O to Complete

CHL:1 Drive Channel ALERT: Timeout Waiting for I/O to Complete
CHL:1 RCC Channel ALERT: Parity/CRC Error Detected
CHL:1 ID:1 Host Channel ALERT: Parity/CRC Error Detected
CHL:1 Host Channel ALERT: Parity/CRC Error Detected
CHL:0 ID:0 Drive ALERT: Unexpected Drive Not Ready (00B)
CHL:0 ID:0 Drive ALERT: Drive HW Error (00B)
CHL:0 RCC Channel ALERT: Unit Attention Received
CHL:0 ID:0 Target ALERT: Unit Attention Received (10B)
CHL:0 ID:0 Target ALERT: Unit Attention Received
CHL:0 Drive Channel ALERT: Unit Attention Received
CHL:0 ID:0 Drive ALERT: Aborted Command (00B)
CHL:0 ID:0 Drive ALERT: Unexpected Sense Received (00B)
CHL:0 ID:0 Drive NOTIFY: Block Reassignment Failed - 0 (10B)
CHL:0 ID:0 Drive NOTIFY: Block Reassignment Failed - 0x0
CHL:0 RCC Channel ALERT: Data Overrun/Underrun Detected
CHL:0 ID:0 Target ALERT: Data Overrun/Underrun Detected
CHL:0 ID:0 Target ALERT: Data Overrun/Underrun Detected
CHL:0 Drive Channel ALERT: Data Overrun/Underrun Detected
CHL:0 RCC Channel ALERT: Negotiation Error Detected
CHL:0 ID:0 Target ALERT: Negotiation Error Detected
CHL:0 ID:0 Target ALERT: Negotiation Error Detected
CHL:0 Drive Channel ALERT: Negotiation Error Detected
CHL:0 RCC Channel ALERT: Invalid Status/Sense Data Received
CHL:0 ID:0 Target ALERT: Invalid Status/Sense Data Received (10B)
CHL:0 ID:0 Target ALERT: Invalid Status/Sense Data Received
CHL:0 Drive Channel ALERT: Invalid Status/Sense Data Received
CHL:0 ALERT: Redundant Loop Connection Error Detected on ID:11
CHL:0 Host Channel ALERT: Channel Failure
SMART-Slot:-1 Predictable Failure Detected-Clone Failed
SMART-Slot:-1 Predictable Failure Detected
SMART-Slot:-1 Predictable Failure Detected-Starting Clone
SMART-Slot:-1 Predictable Failure Detected (TEST)
SMART-Slot:-1 Predictable Failure Detected (TEST)
SMART-Slot:-1 Predictable Failure Detected (TEST)
SMART-Slot:-1 Predictable Failure Detected (TEST)
CHL:0 ALERT: Redundant Loop for Chl:0 Failure Detected
CHL:0 ALERT: Redundant Path for Chl:0 ID:0 Expected but Not Found
CHL:0 ID:0 ALERT: Redundant Path for Chl:0 ID:0 Failure Detected

Notification

CHL:0 ID:132 NOTICE: Media Error Recovered-0xD8001C7C
CHL:0 ID:132 NOTICE: Media Error Recovered-0xD8001C7C
CHL:0 ID:255 NOTICE: Redundant Path for Chl:0 Restored
CHL:0 NOTICE: Redundant Path for Chl:0 ID:0 Restored
CHL:0 ID:0 NOTICE: Redundant Path for Chl:0 ID:0 Restored
CHL:0 ID:0 Drive NOTICE: Drive Recovered Error Reported
CHL:0 LIP(FF B) Detected
CHL:0 Host Channel Notification: Bus Reset Issued
CHL:0 Host Channel ALERT: Bus Reset Issued
CHL:0 ID:0 Drive NOTICE: Scan Drive Successful

CHL:0 ID:0 Drive NOTIFY: Block Successfully Reassigned - 0 (10B)
CHL:0 ID:0 Drive NOTIFY: Block Successfully Reassigned - 0x0

18.1.3 General Target Events

Critical

SAF-TE Device(0)ALERT: Power Supply Failure Detected(Idx:132)
Peripheral Set 0 Device ALERT: Power Supply 0 Failure Detected
Peripheral Set 0 Device ALERT: Power Supply 0 Not Present
Peripheral Set 0 Device ALERT: Low Voltage Detected(-1073939240.5V)
SES(C0 I0) Power Supply 0: Device Not Supported!
SAF-TE Device (0)ALERT: Cooling Fan Not Installed(Idx:2)
SAF-TE Device (0)ALERT: Cooling Fan Failure Detected(Idx:2)
Peripheral Set 0 Device ALERT: Cooling fan2 Failure Detected
Peripheral Set 0 Device ALERT: Cooling fan2 Not Present
Peripheral Set 0 Device ALERT: Low Speed Detected(-1073870808 RPM)
SES(C0 I0)Cooling Fan 0:Device Not Supported!
SAF-TE Device(0)ALERT: Elevated Temperature Alert
Peripheral Device ALERT: CPU Cold Temperature Detected(0.0(C))
Peripheral Device ALERT: Elevated Temperature Alert
Peripheral Device ALERT: Elevated Temperature Alert
Peripheral Set 0 Device ALERT: Temperature Sensor 0 Failure Detected
Peripheral Set 0 Device ALERT: Temperature Sensor 0 Not Present
Peripheral Set 0 Device ALERT: Cold Detected(0(C))
SES(C0 I0)Temp Sensor 0:Device Not Supported!
UPS Connection Is Absent
SAF-TE Device(2)ALERT: UPS Power Failure Detected
Peripheral Set 2 Device ALERT: UPS 2 AC Power Failure Detected
Peripheral Set 2 Device ALERT: UPS 2 Battery Failure Detected
Warning: UPS AC Power-Loss Detected
Warning: UPS Battery Low - 0%.
SES(C0 I0)UPS 2:Device Not Supported!

Notification

SAF-TE Device(2) NOTICE: Fan Back On-Line(Idx:11)
NOTICE: FAN Module A Back On-Line(FAN0 0RPM)
NOTICE: Controller FAN 1 Back On-Line(0 RPM)
Peripheral Device NOTICE: Fan Back On-Line
Peripheral Set 1 Device NOTICE: FAN 1 Back On-Line
Peripheral Set 1 Device NOTICE: FAN 1 is Present
Peripheral Set 1 Device NOTICE: FAN 1 Back On-Line(0 RPM)
SES(C0 I0)Cooling Fan 1:Fan Back On-Line
SAF-TE Device(1) NOTICE: Temperature Back To Non-Critical LVs
Peripheral Set 1 Device NOTICE: Temperature 1 Back To Non-Critical LVs
Peripheral Set 1 Device NOTICE: Temperature 1 is Present
Peripheral Set 1 Device NOTICE: Temperature 1 Back To Non-Critical LVs(0(C))
SES(C0 I0)Temp Sensor 1:Temperature Back To Non-Critical LVs
SAF-TE Device(1) NOTICE: Power Supply Back On-Line(Idx:4)
Power Supply 0 Back-Online
Peripheral Set 2 Device NOTICE: PSU0 +12V Back On-Line
Peripheral Set 2 Device NOTICE: PSU0 +12V is Present

Peripheral Set 2 Device NOTICE: PSU0 +12V Back On-Line(5.0V)
SES(C0 I0)Power Supply 2:Power Supply Back On-Line
UPS Connection Detected
UPS AC Power Restored
UPS Battery Restored To Safe Level 0
SAF-TE Device(2) NOTICE: UPS Power Back On-Line
Peripheral Set 2 Device NOTICE: UPS 2 AC Power Back On-Line
Peripheral Set 2 Device NOTICE: UPS 2 Battery Back On-Line
SES(C0 I0)UPS 2:UPS Power Back On-Line

18.1.4 Controller Events

Critical

ALERT: +3.3V Low Voltage Detected(205.9V)
ALERT: Controller FAN 0 Low Speed Detected(0 RPM)
Controller NOTICE: Redundant Controller Firmware Updated
Controller ALERT: Redundant Controller Failure Detected
Controller SDRAM ECC Multi-bits Error Detected
Controller SDRAM ECC Single-bit Error Detected
Controller SDRAM Parity Error Detected
Controller PCI Bus Parity Error Detected
Controller ALERT: Power Supply Unstable or NVRAM Failed
BBU Absent or Failed! Correct It and Reset Ctlr to Take Effect
Controller BBU Absent or Failed!
Controller BBU Failure Detected!
Controller BBU Thermal Shutdown/Enter Sleep-Mode!

Warning

Memory Not Sufficient to Fully Support Current Config.

Notification

Board1 Cold Temperature Back To Non-Critical LVs(0(C))
+12V Upper Voltage Back within Acceptable Limits(0.0V)
+12V Lower Voltage Back within Acceptable Limits(0.0V)
Memory is Now Sufficient to Fully Support Current Config.
Controller NOTICE: NVRAM Factory Defaults Restored
Controller NOTICE: NVRAM Factory Defaults Restored
Controller NOTICE: NVRAM Factory Defaults Restored
Controller BBU is Charging!
NOTICE: Controller BBU Present!
NOTICE: Controller BBU Back On-Line!
NOTICE: Controller BBU Fully Charged!
Force Controller Write-Through on Trigger Cause

18.2 Event Description

18.2.1 Logical Drive Events

Critical

Message	LG:0 Logical Drive ALERT: CHL:0 ID:132 Drive Missing
What Happens?	The specified hard drive in the specified logical drive has is missing.
What to Do?	The drive could have been accidentally removed or drive connection problems occurred. Check drive connection and related enclosure status.

Message	LG: Logical Drive ALERT: CHL:0 ID:132 Drive Failure
What Happens?	The specified hard drive in the specified logical drive has failed
What to Do?	IF a spare is available, the subsystem will automatically start rebuild. If there is no spare, replace the faulty drive and rebuild will be automatically initiated provided that a replacement drive can be recognized by the subsystem. For example, in a SCSI-based subsystem, a manual “Scan Drive” command should be executed. In subsystems using other types of disk drives, drive swap auto-detection should be enabled on the drive channels.

Message	LG:0 Logical Drive ALERT: Rebuild Aborted
What Happens?	Logical drive rebuild aborted. It could result from the one of the following reasons: 1. The rebuild has been manually canceled by a user. 2. The replacement drive used for a rebuild may have failed during the rebuild or the drive contains immanent defects. 3. Bad blocks are encountered on another member drive during the rebuild. (RAID 1, 3, and 5 arrays) 4. System faults occurred.
What to Do?	Carefully identify and replace the faulty drive and perform logical drive rebuild again. It is best to stop host I/Os temporarily to this logical drive.

Message	LG:0 Logical Drive ALERT: Rebuild Failed
What Happens?	Logical drive rebuild failed. It could result from the one of the following reasons: 1. The rebuild has been manually canceled by a user. 2. The replacement drive used for a rebuild may have failed during the rebuild or the drive contains immanent defects. 3. Bad blocks are encountered on another member drive during the rebuild. (RAID 1, 3, and 5 arrays) 4. System faults occurred.
What to Do?	Carefully identify and replace the faulty drive and perform logical drive rebuild again. It is best to stop host I/Os temporarily to this logical drive.

Message	LG:0 Logical Drive ALERT: Parity Regeneration Aborted
What Happens?	System faults or integrity problems forced system to abandon the operation. Irrecoverable parity inconsistency may also cause a halt to the operation.
What to Do?	Check proper system working conditions. Contact system vendor for help.

Message	LG:0 Logical Drive ALERT: Parity Regeneration Failed
What Happens?	System faults or integrity problems forced system to abandon the operation. Irrecoverable parity inconsistency may also cause a halt to the operation.
What to Do?	Check proper system working conditions. Contact system vendor for help.

Message	LG:0 Logical Drive ALERT: Creation Aborted
What Happens?	Logical drive creation process manually aborted or that some system integrity problems forced the subsystem to abort logical drive creation process.
What to Do?	Check proper system working conditions.

Message	LG:0 Logical Drive ALERT: Creation Failed
What Happens?	Logical drive creation process failed when one or more drive members failed or have been accidentally removed. Drive abnormality may also be the cause of the problems.
What to Do?	Check proper system working conditions and drive connection. Replace the faulty drives and repeat the creation process.

Message	LG:0 Logical Drive ALERT: Initialization Failed
What Happens?	Logical drive initialization failed.It could result from one of the following reasons: 1. 1. One of the disk drives used for a logical drive might have failed during rebuild. 2. 2. Media errors are encountered on another member drive during the initialization process. 3. 3. Drive hardware faults occurred.
What to Do?	Carefully identify and replace the faulty drive and perform logical drive initialization again.

Message	LG:0 Logical Drive ALERT: Expansion Aborted
What Happens?	Logical drive expansion failed. It could result from one of the following reasons: 1. The expansion has been canceled by a user. 2. The drive used for expansion might have failed during expansion. 3. Media errors are encountered on another member drive during the expansion process. 4. One member drive has failed. 5. Drive hardware faults occurred.
What to Do?	Carefully identify and replace the faulty drive and perform logical drive expansion again.

Message	LG:0 Logical Drive ALERT: Expansion Failed
What Happens?	Logical drive initialization failed. It could result from one of the following reasons: 1. The drive(s) used for expansion might have failed during expansion. 2. Media errors are encountered on another member drive during the expansion process. 3. One member drive has failed. 4. Drive hardware faults occurred.
What to Do?	Carefully identify and replace the faulty drive and perform logical drive expansion again.

Message	LG:0 ALERT: CHL:0 ID:132 Media Scan Failed
What Happens?	Media Scan failed to carry on with scanning drive(s) for certain reasons, e.g., a logical drive or a disk drive has fatally or physically failed.
What to Do?	Carefully identify and replace the faulty drive if rebuild is possible.

Message	LG:0 ALERT: CHL:0 ID:132 Media Scan Aborted
What Happens?	Media Scan operation is aborted for certain reasons, e.g., it has been manually canceled.
What to Do?	Check disk drive and system operation status.

Message	LG:0 Logical Drive ALERT: CHL:0 ID:132 Clone Failed
What Happens?	Drive cloning failed. It could result from one of the following reasons: 1. Cloning has been manually canceled by a user. 2. The drive used for cloning might have failed during the cloning process. 3. Bad blocks are encountered on another member drive during the cloning process. 4. The source drive has failed. 5. System faults occurred.
What to Do?	Carefully identify and replace the faulty drive.

Message	LG:0 Logical Drive ALERT: CHL:0 ID:132 Clone Aborted
What Happens?	Logical drive cloning aborted. It could result from one of the following reasons: 1. The cloning process has been manually canceled by a user. 2. The drive used for cloning might have failed during cloning. 3. Media errors are encountered on another member drive during the cloning process. 4. The source drive has failed. 5. System has been reset or drive hardware faults occurred.
What to Do?	Carefully identify and replace the faulty drive.

Message	LG:0 Logical Drive ALERT: Logical Drive Bad Block Table FULL
What Happens?	Available bad block table entries full. Media Scan or host access has discovered and marked too many damaged sectors.
What to Do?	The target disk drive may have become physically unreliable. Contact system vendor for help.

Message	LG:0 Logical Drive ALERT: Logical Drive Bad Block Table BAD
What Happens?	System failed to generate a bad block table. Logical drive may have generated serious integrity problems.
What to Do?	The members of a logical drive may have become physically unreliable. Locate, replace, and replace the logical drive if possible. Contact system vendor for help.

Message	LG:0 Logical Drive ALERT: Logical Drive On-Line Init Table Bad
What Happens?	Serious system faults might have occurred, unstable voltage or damaged components, and forced the initialization to halt.
What to Do?	Check proper system working conditions. Contact system vendor for help.

Message	LG:0 Logical Drive ALERT: Bad Data Block Marked 000000084
What Happens?	Media errors caused data inconsistency; e.g., concurrent occurrences of media errors on more than one RAID5 member drive. The affected data blocks # are marked bad. The situation may result from the following: 1. One member drive failed, and media errors are found on another member drive. 2. Media errors occurred consequentially on two member drives.
What to Do?	The data affected by data blocks failure will be lost. The host computer will return media error messages if host accesses fall within the affected blocks.

Message	LG:0 Logical Drive ALERT: UNPROTECTED Block Marked 000000084
What Happens?	Media errors are found in an unprotected array, e.g., RAID0. The affected data blocks will be marked bad.
What to Do?	The data affected by data blocks failure will be lost. The host computer will return media error messages if host access falls within the affected blocks. Restoring data from a backup source is recommended.

Message	LG:0 Logical Drive NOTIFY: Bad Data Block encountered 000000084
What Happens?	Data blocks previously marked bad are re-encountered during host I/O access or certain operations such as Media Scan.
What to Do?	The data affected by data blocks failure is lost. Restoring data from a backup source is recommended. The host computer will return media error messages if host access falls within the affected blocks.

Message	LG:0 ALERT: Inconsistent Parity Encountered Block 000000084
What Happens?	Parity inconsistency encountered on block address ____
What to Do?	It is recommended to perform the “Regenerate Parity” function to correct the parity faults.

Notification:

Message	LG:0 Logical Drive NOTICE: Continue Rebuild Operation
What Happens?	The target logical drive has been stored to its previous one-drive-failed status, and the rebuild operation is automatically resumed by firmware. This may occur when the system is powered off or reset during the rebuild process or that media errors have been discovered and corrected during the rebuild.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Starting Rebuild
What Happens?	The rebuild process has begun.
What to Do?	This is the message displayed when a stand-by spare is available when a member drive fails or when a faulty drive is physically replaced. The subsystem should automatically detect a drive for rebuild if the hot-swap detection mechanism has been enabled.

Message	LG:0 Logical Drive NOTICE: Rebuild of Logical Drive Completed
What Happens?	The subsystem has successfully rebuilt a logical drive.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Continue Parity Regeneration Operation
What Happens?	Start
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Starting Parity Regeneration
What Happens?	Start regenerating parity of a logical drive.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Parity Regeneration of Logical Drive Completed
What Happens?	The parity regeneration process on logical drive _ is completed.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Starting Creation
What Happens?	Logical drive creation process started. Note that the creation and initialization processes are separated. Creation of a logical drive only takes a second while the initialization may take hours with the arrays containing large capacity drives.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Starting On-Line Initialization
What Happens?	Creation process is completed, initialization process has begun to generate parity sectors and readying member drives. The On-line initialization mode takes a longer time to complete and allows the logical drive to receive host I/Os immediately if appropriate host ID/LUN mapping has been applied.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: On-Line Initialization of Logical Drive Completed
What Happens?	Logical drive on-line initialization completed
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Starting Off-Line Initialization
What Happens?	Creation process is completed, initialization process has begun to generate parity sectors and readying member drives. The Off-line initialization mode takes place immediately after the creation of a logical drive, and does not allow host I/Os to be distributed to the logical drive at the same time.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Off-Line Initialization of Logical Drive Completed
What Happens?	Logical drive off-line initialization completed. The logical drive is now ready for host ID/LUN mapping, and then receiving host I/Os.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Starting On-Line Expansion
What Happens?	Start expanding the logical drive's added or free capacity (previously not included) when system find appropriate time after selecting to expand its capacity. The On-Line mode allows the added capacity of a logical drive to appear immediately as a usable partition and ready for host I/Os. This partition may require being associated with a separate ID/LUN on the host bus. Response to host I/Os will be slower because the expansion process requires distributing data blocks and parity data across new drive sectors.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: On-Line Expansion of Logical Drive Completed
What Happens?	Logical drive on-line expansion completed The added capacity will appear as a new partition, and this partition may require being associated with a separate ID/LUN on the host bus. Adjustments should also be made through the host OS volume management utility.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Starting Off-Line Expansion
What Happens?	Start expanding the logical drive's added or free capacity (previously not included) when system find appropriate time after selecting to expand its capacity. The Off-Line mode does not allow the added capacity of a logical drive to be immediately available for host I/Os. This partition can only be associated with a separate ID/LUN on the host bus after the expansion process is completed. Access to the data already stored on the logical drive is not affected.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Continue Add Drive Operation
What Happens?	The target logical drive has been restored to its previous status, e.g., power-off or media errors, and the add drive operation can continue.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Starting Add Drive Operation
What Happens?	Add drive expansion process started
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: Add Drive Operation Paused
What Happens?	The add drive expansion process is halted by: 1. Logical drive expansion is canceled by a user. 2. One of the member drives failed during logical drive expansion. 3. Media errors are found on one or more of the logical drive members. 4. System faults have occurred.
What to Do?	Carefully identify and replace the faulty drive and correct system faults. The add drive expansion should continue once the faults are corrected.

Message	LG:0 Logical Drive NOTICE: Add Drive to Logical Drive Completed
What Happens?	The add drive expansion process is completed.
What to Do?	Press ESC to clear the message. Please remember to rearrange the added capacity which will appear as a new partition volume.

Message	NOTICE: CHL:0 ID:132 Starting Media Scan
What Happens?	Media Scan is manually or automatically started by the preset Task Schedules on a specific disk drive.
What to Do?	Press ESC to clear the message.

Message	LG:0 NOTICE: CHL:0 ID:132 Starting Media Scan
What Happens?	Media Scan is manually or automatically started by the preset Task Schedules on a specific member of Logical Drive 0.
What to Do?	Press ESC to clear the message.

Message	NOTICE: Media Scan of CHL:0 ID:132 Completed
What Happens?	Media Scan on a specific disk drive is completed.
What to Do?	Press ESC to clear the message.

Message	LG:0 NOTICE: Media Scan of CHL:0 ID:132 Completed
What Happens?	Media Scan on a specific member of Logical Drive 0 is completed.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: CHL:0 ID:132 Continue Clone Operation
What Happens?	The target logical drive has been restored to its previous status, e.g., a failed drive is restored, and the cloning process can continue.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: CHL:0 ID:132 Starting Clone
What Happens?	Cloning process started on one of the members of Logical Drive 0
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: CHL:0 ID:132 Copy and Replace Completed
What Happens?	Copy and replace is completed with a specific member of Logical Drive 0. The original member drive is replaced by another disk drive.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTICE: CHL:0 ID:132 Clone Completed
What Happens?	Cloning is completed with a specific member of Logical Drive 0, whether it is replaced (Copy and Replace) or cloned (Perpetual Clone) to a spare drive.
What to Do?	Press ESC to clear the message.

Message	LG:0 Logical Drive NOTIFY: Bad Data Block Recovered 000000084
What Happens?	Host writes fall onto the data blocks previously marked bad and over-write the drive sectors.
What to Do?	Press ESC to clear the message.

18.2.2 Channel and Individual Drive Events

Critical:

Message	CHL:0 ID:132 Target ALERT: Media Error Unrecoverable-0xD8001C7C
What Happens?	Drive surface media errors found and after rewrite the drive sectors are determined as physically damaged and unusable.
What to Do?	Data will be reassigned to other drive sectors. Host writes should continue without problems.

Message	CHL:0 Fatal Error (0)
What Happens?	Channel 0 has fatally failed.
What to Do?	Contact your system vendor for help.

Warning

Message	CHL:1 ID:0 Target ALERT: Unexpected Select Timeout
What Happens?	Drive target select timeout. The specified hard drive cannot be selected by the RAID controller/subsystem. Whether the drive has been removed, or the cabling/termination/canister is out of order.
What to Do?	This could occur if a disk drive is not properly installed or accidentally removed, or when cable links become unreliable.Check cabling and drive installation, and contact your RAID system supplier.

Message	CHL:1 Drive Channel ALERT: Unexpected Select Timeout
What Happens?	Drive Channel target select timeout. The specified drive channel cannot be selected by the RAID controller/subsystem. Faults might have occurred with the cabling/termination/internal data paths.
What to Do?	Check cabling and drive installation, and contact your RAID system supplier.

Message	CHL:_ RCC Channel ALERT: Gross Phase/Signal Error Detected
What Happens?	Phase/signal abnormality detected on the specific RCC channel.
What to Do?	Rare occurrence of phase/signal error could be recovered by firmware retry. Contact your RAID system supplier.

Message	CHL:_ ID:_ Target ALERT: Gross Phase/Signal Error Detected
What Happens?	Phase/signal abnormality detected with a specific target disk drive.
What to Do?	Check proper installation of disk drives and contact your RAID system supplier.

Message	CHL:_ Drive Channel ALERT: Gross Phase/Signal Error Detected
What Happens?	Phase/signal abnormality detected on the specific drive channel.
What to Do?	Contact your RAID system supplier.

Message	CHL:_ RCC Channel ALERT: Unexpected Disconnect Encountered
What Happens?	Unexpected disconnect detected on the specific RCC channel.
What to Do?	Check cabling/termination and canister connections, and contact your RAID system supplier.

Message	CHL:_ ID:_ Target ALERT: Unexpected Disconnect Encountered
What Happens?	Unexpected disconnect detected on the specific target disk drive.
What to Do?	Check cabling/termination and canister installation, and contact your RAID system supplier.

Message	CHL:_ Drive Channel ALERT: Unexpected Disconnect Encountered
What Happens?	Unexpected disconnect detected on the specific drive channel.
What to Do?	Check cabling/termination and canister connections, and contact your RAID system supplier.

Message	CHL:_ RCC Channel ALERT: Timeout Waiting for I/O to Complete
What Happens?	I/O timeout on specific RCC channel.
What to Do?	Contact your RAID system supplier.

Message	CHL:_ ID:_ Target ALERT: Timeout Waiting for I/O to Complete
What Happens?	Drive-side target I/O timeout. Possible drive-side cabling/termination and canister connection abnormal or drive malfunctioning.
What to Do?	Check drive-side cabling/termination/canister/disk drive connections and contact your RAID system supplier.

Message	CHL:_ Drive Channel ALERT: Timeout Waiting for I/O to Complete
What Happens?	I/O timeout on specific drive channel.
What to Do?	Contact your RAID system supplier.

Message	CHL:_ RCC Channel ALERT: Parity/CRC Error Detected
What Happens?	RCC channel parity or CRC errors detected.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ ID:_ Host Channel ALERT: Parity/CRC Error Detected
What Happens?	Parity or CRC errors detected through host ID, CHL_ ID_.
What to Do?	Occurrences of these faults usually can be negotiated between RAID subsystems and application servers. If occurrences become frequent, contact your RAID system supplier.

Message	CHL:_ Host Channel ALERT: Parity/CRC Error Detected
What Happens?	Host channel parity or CRC errors detected.
What to Do?	Parity and CRC faults can often be negotiated between application servers and RAID subsystems. Contact your RAID system supplier if this occurs too frequently.

Message	CHL:_ ID:_ Drive ALERT: Unexpected Drive Not Ready (00B)
What Happens?	Unexpected Drive Not Ready returned from a disk drive on CHL:_ ID:_.
What to Do?	Check proper installation of disk drives or cabling connection. This event often occurs when hot-swapping disk drives and may be caused by signal glitches. If the disk drive fails to respond, the subsystem should consider the disk drive as a failed drive when the timeout threshold is reached. Contact your RAID system supplier.

Message	CHL:_ ID:_ Drive ALERT: Drive HW Error (00B)
What Happens?	Drive hardware error returned from a disk drive on CHL:_ ID:_.
What to Do?	The target disk drive may have failed. Contact your RAID system supplier for a replacement.

Message	CHL:_ RCC Channel ALERT: Unit Attention Received
What Happens?	Unit attention received from RCC channel CHL:_.
What to Do?	Rare occurrences of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ ID:_ Target ALERT: Unit Attention Received (10B)
What Happens?	Drive-side target unit attention receive on a disk drive CHL:_ ID:_.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ ID:_ Target ALERT: Unit Attention Received (10B)
What Happens?	Drive-side target unit attention receive on a disk drive CHL:_ ID:_.
What to Do?	Rare occurrence of these errors can be managed by firmware. Check disk drive connection and contact your RAID system supplier.

Message	CHL:_ Drive Channel ALERT: Unit Attention Received (10B)
What Happens?	Drive-side target unit attention receive on a drive channel CHL:_ ID:_.
What to Do?	Rare occurrence of these errors can be managed by firmware. Check proper installation and contact your RAID system supplier.

Message	CHL:_ ID:_ Drive ALERT: Aborted Command (00B)
What Happens?	Aborted command reported from a disk drive CHL:_ ID:_
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ ID:_ Drive ALERT: Unexpected Sense Received (00B)
What Happens?	Drive-side target unexpected sense received on a disk drive CHL:_ ID:_.
What to Do?	Check drive-side cabling/installation/working conditions. This may result from bad signal quality or poor connection. Contact your RAID system supplier.

Message	CHL:_ ID:_ Drive NOTIFY: Block Reassignment Failed – 0(10B)
What Happens?	Data regeneration and reassignment failed. The Bad Block Table is full. Too many bad blocks have been found on the disk drive. The adjacent data blocks on other member drives might have also been damaged.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ RCC Channel ALERT: Data Overrun/Underrun Detected
What Happens?	Data overrun/underrun errors detected on the RCC channel CHL:_.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ ID:_ Target ALERT: Data Overrun/Underrun Detected
What Happens?	Data overrun/underrun errors detected on a disk drive CHL:_ ID:_.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ Drive Channel ALERT: Data Overrun/Underrun Detected
What Happens?	Data overrun/underrun errors detected on the drive channel CHL:_.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ RCC Channel ALERT: Negotiation Error Detected
What Happens?	Negotiation errors occurred on the RCC channel CHL:_.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ ID:_ Target ALERT: Negotiation Error Detected
What Happens?	Negotiation errors occurred with the communications with a disk drive CHL:_ ID:_. The event could also occur with drive target data bus sync/ wide negotiation abnormality.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ Drive Channel ALERT: Negotiation Error Detected
What Happens?	Negotiation errors occurred with the communications with a drive channel CHL:_. The event could also occur with drive target data bus sync/wide negotiation abnormality.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ RCC Channel ALERT: Invalid Status/Sense Data Received
What Happens?	Invalid status/sense data received on the RCC channel CHL:_
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ ID:_ Target ALERT: Invalid Status/Sense Data Received (10B)
What Happens?	Invalid status/sense data received by a disk drive CHL:_ ID:_.
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ Drive Channel ALERT: Invalid Status/Sense Data Received
What Happens?	Invalid status/sense data received on the drive channel CHL:_
What to Do?	Rare occurrence of these errors can be managed by firmware. Contact your RAID system supplier.

Message	CHL:_ ALERT: Redundant Loop Connection Error Detected on ID:_
What Happens?	One of the dual loop members might have failed or been disconnected. Make sure all cabling are properly connected and topological configurations properly set.
What to Do?	Check cabling and channel bus working conditions. If the problem does not result from cabling problems, contact your RAID system supplier.

Message	CHL:_ Host Channel ALERT: Channel Failure
What Happens?	Host channel CHL:_ link failure or disconnection occurred.
What to Do?	Check proper cabling connection and host HBA, link connection devices, etc. Contact your RAID system supplier.

Message	SMART-Slot:_ Predictable Failure Detected-Clone Failed
What Happens?	Hard Drive(s) report SMART-detected defects. A spare drive is commenced to clone or replace the member drive showing defects. The cloning operation failed. The member drive suspected of errors might have failed, or the clone process has been interrupted, e.g., yet another member has failed or the spare drive used for cloning has shown immanent faults.
What to Do?	Carefully check drive status and replace the unstable/failed drive. Contact your RAID system supplier.

Message	SMART-Slot:_ Predictable Failure Detected
What Happens?	Hard drive slot:_ reported SMART-detected errors, e.g., abnormal rotation speed, seek time delay, etc.
What to Do?	Carefully check drive status and replace the unstable/failed drive. Contact your RAID system supplier.

Message	SMART-Slot:_ Predictable Failure Detected-Starting Clone
What Happens?	One or more hard Drive(s) reports SMART-detected defects. Starts using a pre-defined spare drive to clone the member drive suspected of inherent errors. This happens when SMART detection is enabled with the “Copy & Replace” or “Perpetual Clone” reaction schemes.
What to Do?	Press ESC to clear the message. After the cloning process, you may consider replacing the defective drive with a good one and configure it as a spare drive in case drive failure might happen in the future.

Message	SMART-Slot:_ Predictable Failure Detected (TEST)
What Happens?	This results from a manually executed test command. This ensures your disk drive supports SMART detection and report functionality.
What to Do?	Press ESC to clear the message.

Message	CHL:_ ALERT: Redundant Loop for CHL:_ Failure Detected
What Happens?	One of the dual loop members may have failed or been disconnected. Make sure all channels are properly connected and topological configurations properly set.
What to Do?	Check cabling and system installation. Contact your supplier if no connection errors could be found.

Message	CHL:_ ALERT: Redundant Path for CHL:_ ID:_ Expected but Not Found
What Happens?	One of the dual loop members may have failed or been disconnected. This event is regenerated in the event when the one of dual loop connections to an expansion enclosure can not be found after power-up. Make sure all channels are properly connected and topological configurations properly set.
What to Do?	Check cabling and system installation. A manual “Issue LIP” command may restore the connection. Contact your supplier if no connection errors could be found.

Message	CHL:_ ID:_ ALERT: Redundant Loop for CHL:_ ID:_ Failure Detected
What Happens?	One of the dual loop members connecting device CHL:_ ID:_ may have failed or been disconnected. Make sure all channels are properly connected and topological configurations properly set.
What to Do?	Check cabling and system installation. Contact your supplier if no connection errors could be found.

Notification

Message	CHL:_ ID:_ NOTICE: Media Error Recovered-0xD8001C7C
What Happens?	Data once stored on bad drive sectors has been successfully re-conducted from adjacent data blocks/stripes onto the original drive blocks or distributed onto other healthy sectors. ** Bosch firmware translates SATA error codes into SCSI standard sense keys and sense codes. That's the error codes at the end of message.
What to Do?	Press ESC to clear the message.

Message	CHL:_ ID:_ NOTICE: Redundant Path for CHL:_ Restored
What Happens?	Redundant path, one of the drive-side loop members, for CHL:_ ID:_ is restored.
What to Do?	Check proper host- or drive-side activities. Press ESC to clear the message.

Message	CHL:_ NOTICE: Redundant Path for CHL:_ ID:_ Restored
What Happens?	The redundant path (CHL:_) connecting drive (CHL:_ ID:_) is restored.
What to Do?	Check proper host- or drive-side activities. Press ESC to clear the message.

Message	CHL:_ ID:_ Drive NOTICE: Drive Recovered Error Reported
What Happens?	Hard drive unrecoverable media error reported. A bad block is encountered in the specified hard drive. The RAID controller will ask the hard drive to retry.
What to Do?	Press [ESC] to clear the message.

Message	CHL:_ LIP(FF B) Detected
What Happens?	A LIP is issued on CHL:_.
What to Do?	Check proper host- or drive-side activities. Press ESC to clear the message.

Message	CHL:_ Host Channel Notification: Bus Reset Issued.
What Happens?	Bus reset on the CHL:_ host channel.
What to Do?	Check proper host- or drive-side activities. Press ESC to clear the message.

Message	CHL:_ ID:_ Drive NOTICE: Scan Drive Successful
What Happens?	A new drive or a replacement drive has been successfully scanned/recognized by the subsystem.
What to Do?	Press ESC to clear the message.

Message	CHL:_ ID:_ Drive NOTIFY: Block Successfully Reassigned – 0 (10B)
What Happens?	Writes conducted, retried, and media errors were discovered. Writes will then be re-directed to other drive sectors.
What to Do?	Press ESC to clear the message. If this message becomes frequent, the target disk drive might have developed serious media errors.

Message	CHL:_ ID_ Drive #SEV#: Media Error Encountered
What Happens?	Media errors are encountered in a hard drive.
What to Do?	Press ESC to clear the message. If this message becomes frequent, the target disk drive might have developed serious media errors.

18.2.3 General Target Events

Critical

Message	SAF-TE Device(0) ALERT: Power Supply Failure Detected(Idx:132)
What Happens?	Power supply failure detected through SAF-TE monitoring device.
What to Do?	Contact your RAID supplier for a replacement module.

Message	Peripheral Set 0 Device ALERT: Power Supply 0 Failure Detected
What Happens?	Power supply failure detected through an I2C serial bus.
What to Do?	Contact your RAID supplier for a replacement module.

Message	Peripheral Set 0 Device ALERT: Power Supply 0 Not Present
What Happens?	No power supply module is installed in the expected module slot.
What to Do?	Check proper module installation. If an installed module can not be detected, contact your RAID supplier.

Message	Peripheral Set 0 Device ALERT: Low Voltage Detected (-1073939240.5V)
What Happens?	Low voltage detected from the power supply. Power supply may have become unstable.
What to Do?	Check proper module installation and contact your RAID supplier for a replacement module.

Message	SES(C0 I0)Power Supply 0:Device Not Supported!
What Happens?	Unrecognizable device type. This event may result from an incorrect configuration with the SES remote device monitoring.
What to Do?	Check proper module installation and contact your RAID system supplier.

Message	SAF-TE Device(0) ALERT: Cooling Fan Not Installed(Idx:2)
What Happens?	No cooling fan module is installed in the expected module slot.
What to Do?	Check proper module installation. If an installed module can not be detected, contact your RAID supplier.

Message	SAF-TE Device(0) ALERT: Cooling Fan Failure Detected(Idx:2)
What Happens?	Cooling fan failure detected through SAF-TE monitoring device.
What to Do?	Contact your RAID supplier for a replacement module.

Message	Peripheral Set 0 Device ALERT: Cooling Fan 2 Failure Detected
What Happens?	Cooling fan failure detected through an I2C serial bus.
What to Do?	Contact your RAID supplier for a replacement module.

Message	Peripheral Set 0 Device ALERT: Cooling Fan 2 Note Present
What Happens?	No cooling fan module is installed in the expected module slot.
What to Do?	Check proper module installation or contact your RAID supplier for a replacement module.

Message	Peripheral Set 0 Device ALERT: Low Speed Detected(-1073870808 RPM)
What Happens?	Low rotation speed detected on cooling fan. This is a fault detected through an I2C serial bus.
What to Do?	Check proper module installation or contact your RAID supplier for a replacement module.

Message	SES(C0 I0)Cooling Fan 0:Device Not Supported!
What Happens?	Unrecognizable device type. This event may result from an incorrect configuration with the SES remote device monitoring.
What to Do?	Check proper module installation and contact your RAID system supplier.

Message	SAF-TE Device(0) ALERT: Elevated Temperature Alert
What Happens?	Elevated temperature detected through SAF-TE monitoring device. Improper installation site condition or cooling fan failure might have caused the system temperature to rise.
What to Do?	Check proper cooling and cooling fan working condition. Contact your RAID system supplier.

Message	Peripheral Device ALERT: CPU Cold Temperature Detected(_._C))
What Happens?	Temperature below the lower CPU threshold detected. Improper installation site condition might have caused the situation.
What to Do?	Correct your installation site condition. Contact your RAID system supplier.

Message	Peripheral Device ALERT: Elevated Temperature Alert
What Happens?	High temperature threshold violated and detected through an I2C serial bus. Improper installation site condition or cooling fan failure might have caused the situation.
What to Do?	Correct your installation site condition and cooling fan failure. Contact your RAID system supplier if a replacement is necessary.

Message	Peripheral Set 0 Device ALERT: Temperature Sensor 0 Failure Detected
What Happens?	Temperature sensor failure reported through an I2C serial bus.
What to Do?	Contact your RAID system supplier.

Message	Peripheral Set 0 Device ALERT: Temperature Sensor 0 Not Present
What Happens?	Temperature sensor failed or serial bus configuration/connection faults occurred.
What to Do?	Contact your RAID system supplier.

Message	Peripheral Set 0 Device ALERT: Cold Detected
What Happens?	Temperature dropped below the lower system threshold detected. Improper installation site condition might have caused the situation.
What to Do?	Correct your installation site condition. Contact your RAID system supplier.

Message	SES(C0 I0)Temp Sensor 0: Device Note Supported!
What Happens?	Unrecognizable device type. This event may result from an incorrect configuration with the SES remote device monitoring.
What to Do?	Check proper module installation and contact your RAID system supplier.

Message	UPS Connection Is Absent
What Happens?	The COM2 link to a UPS device is absent.
What to Do?	Check cabling to the UPS device. If hardware faults occurred, contact your RAID system supplier.

Message	SAF-TE Device(2) ALERT: UPS Power Failure Detected
What Happens?	UPS power failure detected through SAF-TE monitoring device.
What to Do?	Contact your UPS supplier.

Message	Peripheral Set 0 Device ALERT: UPS Power Failure Detected
What Happens?	UPS power failure is detected through an I2C serial bus.
What to Do?	Contact your RAID system supplier.

Message	Peripheral Set 0 Device ALERT: UPS 2 AC Power Failure Detected
What Happens?	AC power source failure reported by UPS and to the subsystem firmware through an I2C serial bus.
What to Do?	Check your power source connection or contact your RAID system supplier.

Message	Peripheral Set 0 Device ALERT: UPS 2 Battery Failure Detected
What Happens?	UPS battery failure reported by UPS and to the subsystem firmware through an I2C serial bus.
What to Do?	Contact your UPS supplier.

Message	Warning: UPS AC Power-Loss Detected
What Happens?	UPS AC power loss reported through the COM2 serial port connection.
What to Do?	Contact your UPS supplier.

Message	Warning: UPS Battery Low - __%
What Happens?	UPS battery charge low, may not be able to support subsystem during a power outage.
What to Do?	Wait for the UPS to recharge or you may use the Event Triggered mechanisms implemented with firmware. These mechanisms use conservative operation modes to reduce the chance of data loss in the event of power outage. Contact your UPS supplier.

Message	SES(C0 I0)UPS 2: Device Not Supported!
What Happens?	Unrecognizable device type. This event may result from an incorrect configuration with the SES remote device monitoring.
What to Do?	Check proper module installation and contact your RAID system supplier.

Notification:

Message	SAF-TE Device(2) NOTICE: Fan Back On-Line(Idx:11)
What Happens?	A once missing or failed cooling fan is restored. This message is reported through the SAF_TE monitoring device.
What to Do?	Press ESC to clear this message.

Message	NOTICE: Fan Module A Back On-Line(FAN0 _RPM)
What Happens?	A once missing or failed cooling fan is restored. This message is reported through an I2C serial bus with RPM reading.
What to Do?	Press ESC to clear this message.

Message	Peripheral Device NOTICE: Fan Back On-Line
What Happens?	An I2C serial bus message indicating a once missing or failed cooling fan is restored.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: FAN 1 Back On-Line
What Happens?	An individual cooling fan once missing or failed is restored.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: FAN 1 is Present
What Happens?	An individual cooling fan once missing or failed is restored.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: FAN 1 Back On-Line(_RPM)
What Happens?	An individual cooling fan once missing or failed is restored, and the PRM reading displays. This applies to enclosure implementations using cooling fans capable of reporting rotation speed.
What to Do?	Press ESC to clear this message.

Message	SES(C0 I0) Cooling Fan 1:Fan Back On-Line
What Happens?	A cooling fan once missing or failed is restored. This message is reported through an SES monitoring device.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: FAN 1 Back On-Line
What Happens?	An individual cooling fan once missing or failed is restored.
What to Do?	Press ESC to clear this message.

Message	SAF-TE Device(1) NOTICE: Temperature Back To Non-Critical LVs
What Happens?	Operating temperature back within normal temperature range.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: Temperature 1 Back To Non-Critical LVs
What Happens?	Temperature sensor 1 reports operating temperature is now within normal temperature range.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: Temperature 1 is Present
What Happens?	Temperature sensor 1 once missing and is now present on the serial bus.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: Temperature 1 Back To Non-Critical LVs (_(C)
What Happens?	Temperature sensor 1 reports operating temperature is now within normal temperature range and the Celsius reading displays.
What to Do?	Press ESC to clear this message.

Message	SES(C0 I0) Temp Sensor 1: Temperature Back to Non Critical LVs
What Happens?	Temperature sensor 1 reports operating temperature is now within normal temperature range.
What to Do?	Press ESC to clear this message.

Message	SAF-TE Device(1) NOTICE: Power Supply Back On-Line (Idx:4)
What Happens?	A power supply once missing or failed is now restored. This event is reported through the SAF-TE monitoring interface.
What to Do?	Press ESC to clear this message.

Message	Power Supply 0 Back-Online
What Happens?	Power supply module 0 is back online
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: PSU0 +12V Back On-Line
What Happens?	Power supply module 0 restored normal +12V voltage range
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: PSU0 +12V is Present
What Happens?	Power supply module 0 restored normal +12V voltage range
What to Do?	Press ESC to clear this message.

Message	SES(C0 I0)Power Supply 2: Power Supply Back On-Line
What Happens?	Power supply module 2 once missing or failed is now restored.
What to Do?	Press ESC to clear this message.

Message	UPS Connection Detected
What Happens?	The COM2 serial link to UPS device is now valid.
What to Do?	Press ESC to clear this message.

Message	UPS AC Power Restored
What Happens?	UPS reports AC power source is now restored.
What to Do?	Press ESC to clear this message.

Message	UPS Battery Restored to Safe Level 0
What Happens?	UPS battery is charged to a safe level, able to protect system operation.
What to Do?	Press ESC to clear this message.

Message	SAF-TE Device(2) NOTICE: UPS Power Back On-Line
What Happens?	Power supplied by UPS is now restored.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: UPS 2 AC Power Back On-Line
What Happens?	UPS 2 AC power source restored.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: UPS 2 Battery Back On-Line
What Happens?	UPS 2 Battery charge or battery failure restored.
What to Do?	Press ESC to clear this message.

Message	Peripheral Set 0 Device NOTICE: UPS 2 AC Power Back On-Line
What Happens?	UPS 2 AC power source restored.
What to Do?	Press ESC to clear this message.

Message	SES(C0 I0)UPS 2: UPS Power Back On-Line
What Happens?	UPS 2 connected through SES interface reports power back online.
What to Do?	Press ESC to clear this message.

18.2.4 Controller Events

Critical

Message	ALERT: +3.3V Low Voltage Detected(_._V)
What Happens?	The detected +3.3V voltage source is lower than the preset voltage threshold.
What to Do?	Check power supply working condition, voltage threshold settings, and contact your RAID system supplier if necessary.

Message	ALERT: Controller FAN 0 Low Speed Detected (_RPM)
What Happens?	This only applies to controller fans in the SentinelRAID series. Low rotation speed detected.
What to Do?	Contact your RAID system supplier for a replacement.

Message	Controller NOTICE: Redundant Controller Firmware Updated
What Happens?	Firmware updated on a redundant controller RAID subsystem. Resetting the subsystem may be required for the new firmware to take effect.
What to Do?	Updating firmware on a complex system configuration is recommended for experienced engineers only. Unless for bug fixing, updating firmware is not always necessary.

Message	Controller ALERT: Redundant Controller Failure Detected
What Happens?	One RAID controller in a controller pair failed. This message indicates that its partner has taken the workload and managed the failover operation.
What to Do?	Contact your RAID system supplier for a replacement controller and restore the dual-active configuration.

Message	Controller SDRAM ECC Multi-bits Errors Detected
What Happens?	Memory multi-bits errors.
What to Do?	Contact your RAID system supplier to return the subsystem/RAID controller for repair.

Message	Controller SDRAM ECC Single-bit Errors Detected
What Happens?	Memory single-bit errors.
What to Do?	Subsystem firmware should be able to manage the single-bit errors. Contact your RAID system supplier if this message becomes frequent.

Message	Controller SDRAM Parity Errors Detected
What Happens?	Memory parity errors.
What to Do?	Subsystem firmware should be able to manage the parity errors in memory. Contact your RAID system supplier if this message becomes frequent.

Message	Controller PCI Bus Parity Errors Detected
What Happens?	Serious system faults have occurred.
What to Do?	Stop host I/Os immediately to prevent further data dis-integrity and contact your RAID system supplier.

Message	Controller ALERT: Power Supply Unstable or NVRAM Failed
What Happens?	Power supply voltage fluctuating or internal system faults have occurred. Different system faults may trigger this event, e.g., memory pins contact problems or incongruent firmware versions, etc.
What to Do?	Check proper system operation conditions and contact your RAID system supplier.

Message	BBU Absent or Failed! Correct It and Reset Ctlr to Take Effect
What Happens?	BBU (battery cell pack) has failed or is accidentally removed. When a new module is installed, reset the subsystem for the configuration to take effect.
What to Do?	Check proper installation of the module or contact your RAID system supplier for a replacement module.

Message	Controller BBU Absent or Failed!
What Happens?	BBU (battery cell pack) has failed or is accidentally removed. When a new module is installed, reset the subsystem for the configuration to take effect.
What to Do?	Check proper installation of the module or contact your RAID system supplier for a replacement module.

Message	Controller BBU Failure Detected!
What Happens?	BBU (battery cell pack) has failed or is accidentally removed. When a new module is installed, reset the subsystem for the configuration to take effect.
What to Do?	Check proper installation of the module or contact your RAID system supplier for a replacement module.

Message	Controller BBU Thermal Shutdown/Enter Sleep-Mode!
What Happens?	The following conditions will cause the charger circuits to enter a low-power and self-protection state: 1. The temperature sensor on the charger circuit reports elevated temperature reading (>= 45 degree Celsius). 2. The BBU (battery cell pack) has been charged for over 7 hours. The BBU charger will enter a timer fault state.
What to Do?	1. Check proper ventilation within the subsystem. You may also check the readings from other sensors within the enclosure. Air-flow might have been disrupted by the absence of one or several major modules or the failure of a cooling fan. Once the thermal condition is improved, charging will resume automatically. 2. If a new battery module has been charged for over seven (7) hours and this event is issued, you may remove and re-install the battery module. An empty battery module may take more than 7 hours to be fully charge. There is a timer embedded with the charger, doing so can reset the timer. Charging will resume automatically.

Warning

Message	Memory Not Sufficient to Fully Support Current Config.
What Happens?	The installed memory size does not support current configuration. Try using a DIMM module of a larger size.
What to Do?	Check proper installation of the module or contact your RAID system supplier for a certified module.

Notification

Message	Board1 Cold Temperature Back to Non-Critical LVs(_(C))
What Happens?	Board1 (usually the RAID controller main board) ventilation condition is restored to normal.
What to Do?	Check proper working condition and press ESC to clear the message.

Message	+12V Upper Voltage Back within Acceptable Limits (_._V)
What Happens?	+12V voltage dropped back within preset thresholds.
What to Do?	Check proper working condition and press ESC to clear the message.

Message	+12V Lower Voltage Back within Acceptable Limits (_._V)
What Happens?	+12V voltage dropped back within preset thresholds.
What to Do?	Check proper working condition and press ESC to clear the message.

Message	Memory is Now Sufficient to Fully Support Current Config.
What Happens?	Memory of a sufficient capacity is installed and the subsystem should work properly.
What to Do?	Check proper working condition and press ESC to clear the message.

Message	Controller NOTICE: NVRAM Factory Defaults Restored
What Happens?	The factory defaults for configuration profile is restored.
What to Do?	Press ESC to clear the message.

Message	Controller BBU is Charging!
What Happens?	Once a new BBU is installed or BBU charge drops below a preconfigured level, the subsystem will start charging its batteries.
What to Do?	Press ESC to clear the message. All batteries have a limited life expectancy. If this message appears too frequently, the BBU may have gradually lost its ability to hold charge.

Message	+12V Upper Voltage Back within Acceptable Limits (_._V)
What Happens?	+12V voltage dropped back within preset thresholds.
What to Do?	Check proper working condition and press ESC to clear the message.

Message	NOTICE: Controller BBU Present!
What Happens?	A BBU once missing or removed is now electrically connected to the subsystem.
What to Do?	Check proper working condition and press ESC to clear the message.

Message	NOTICE: Controller BBU Back On-Line!
What Happens?	A BBU once missing or removed is now restored to its normal working condition.
What to Do?	Check proper working condition and press ESC to clear the message.

Message	NOTICE: Controller BBU Fully Charged!
What Happens?	A BBU is fully charged.
What to Do?	Check proper working condition and press ESC to clear the message.

Message	Force Controller Write-Through on Trigger Cause
What Happens?	Preset conditions, e.g., elevated temperature or component failure, has forced the subsystem to adopt a more conservative operating mode by disabling the Write-Back caching.
What to Do?	Check proper working condition and correct system faults. Press ESC to clear the message.

19 Glossary

B

Bosch RAIDWatch Manager	The Bosch RAIDWatch management software interface. It's part of the Bosch RAIDWatch software.
Bosch RAIDWatch Server	An independently run software application included with Bosch RAIDWatch, which permits centralized management using the Root Agent as the bridging element and event notification via various methods including e-mail and fax.

F

Fiber	An optical network data transmission type of cable, which is unrelated to the Fibre Channel described above.

H

HBA	Host-Bus Adapter – an HBA is a device that permits a PC bus to pass data to and receive data from a storage bus (such as SCSI).
Host	A computer, typically a server, which uses a RAID system (internal or external) for data storage.
Host LUN	"Host LUN" is another term for a LUN.

I

I2C	Inter-Integrated Circuit – a type of bus designed by Philips Semiconductors, which is used to connect integrated circuits. I2C 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	(Also known as "in-band" or "In-band".) A means whereby RAID management software can use SCSI cabling and protocols to manage a controller.
iSCSI	iSCSI is Internet SCSI (Small Computer System Interface), an Internet Protocol (IP)-based storage networking standard for linking data storage facilities, developed by the Internet Engineering Task Force (IETF).

J

JBOD	Just a Bunch of Disk – non-RAID use of multiple hard disks for data storage.
JRE	Java Runtime Environment – the Solaris Java program used to run .JAR applications locally, over a network, or the Internet.

L

Logical Drive	Typically, a group of hard disks logically combined to form a single large storage unit. More broadly, the assignment of an ID to a drive or drives used in storage management. Often abbreviated "LD."

Logical Volume	A group of logical drives logically combined to form a single large storage unit. Often abbreviated “LV.”
LUN	Logical Unit Number – A 3-bit identifier used on a bus to distinguish between up to eight devices (logical units) with the same ID.

M

Mapping	The assignment of a protocol or logical ID to a device for the 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.

N

NRAID	Non-RAID. The capacities of all the drives are combined to become one logical drive (no block striping). In other words, the capacity of the logical drive is the total capacity of the physical drives. NRAID does not provide data redundancy.

P

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.

R

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.
RAID Agent	The Bosch RAIDWatch module that manages and monitors a RAID controller and receives Bosch RAIDWatch Manager commands via the RAID Agent. RAID Agent comes embedded with RAID array firmware. RAID Agent can also be manually installed onto a server that is directly-attached with a RAID array and communicates with it using the in-band protocols. See description of in-band.

S

SAF-TE	SCSI Accessed Fault-Tolerant Enclosures – 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	Storage Area Network – is a high-speed subnetwork of shared storage devices. A storage device is a machine that contains nothing but a disk or disks for storing data. A SAN's architecture works in a way that makes all storage devices available to all servers on a LAN or WAN. Because stored data does not reside directly on the network’s servers, server power is utilized for applications rather than for data passing.
SASL	SASL is the Simple Authentication and Security Layer, a mechanism for identifying and authenticating a user login to a server and for providing negotiating protection with protocol interactions.

SCSI	Small Computer Systems Interface (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.
SES.	SCSI Enclosure Services is a protocol used to manage and sense the state of the power supplies, cooling devices, temperature sensors, individual drives, and other non-SCSI elements installed in a Fibre Channel JBOD enclosure.
S.M.A.R.T.	Self-Monitoring, Analysis and Reporting Technology – an open standard for developing disk drives and software systems that automatically monitor a disk drive’s health and report potential problems. Ideally, this should allow users to take proactive actions to prevent impending disk crashes.
SMS	The Short Message Service (SMS) is the ability to send and receive text messages to and from mobile telephones. SMS was created and incorporated into the Global System for Mobiles (GSM) digital standard.
Spare	Spares are defined as dedicated (Local) or 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 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.

W

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.

20 Index

F

G

H

I

J

L

M

N

O

P

Q

R

S

T

U

W

Bosch Security Systems
Robert-Koch-Straße 100
D-85521 Ottobrunn
Germany
Telefon +49 (89) 6290-0
Fax +49 (89) 6290-1020
www.bosch-securitysystems.com