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Adaptec Storage Manager
User's Guide

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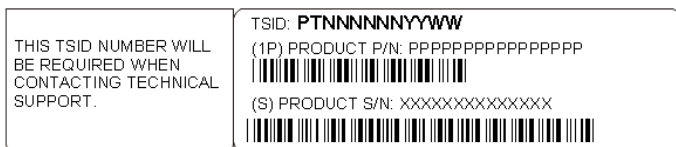
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```
THIS TSID NUMBER WILL      TSID: PTNNNNNNYYWW
BE REQUIRED WHEN           (1P) PRODUCT P/N: PPPPPPPPPPPPPPPPP
CONTACTING TECHNICAL       ||||||||||||||||||||||||||||||||
SUPPORT.                   (S) PRODUCT S/N: XXXXXXXXXXXXXX
                           ||||||||||||||||||||||||||||||||
```

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North America

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Contents

Exploring Adaptec Storage Manager

Building Your Storage Space

Customizing Adaptec Storage Manager

Part II: Using Adaptec Storage Manager

Managing Logical Drives and Hot Spares

Protecting Your Data

Monitoring Your Storage Space

Managing Tasks

Part III: Quick Reference

Quick Answers to Common Questions...

Buttons and Icons At-a-Glance

Selecting the Best RAID Level

Glossary

Index

About This Guide

This *User's Guide* explains how to install and use Adaptec® Storage Manager™ to build a storage space and manage your stored data, whether you have a single RAID controller installed in a server or a complex Storage Area Network (SAN) with multiple RAID controllers and servers.

How This Guide is Organized

This *Guide* is divided into three sections:

- **Part I:** *Getting Started*—Follow the five steps in this section to install Adaptec Storage Manager and build and customize your storage space. (For a definition of 'storage space' and other terms used in this *Guide*, see page 13.)

- **Part II:** *Using Adaptec Storage Manager*—Once your storage space is built, refer to this section for help growing, managing, monitoring and troubleshooting your storage space and its components.

- **Part III:** *Quick Reference*—Refer to this section for quick answers to common questions about Adaptec Storage Manager. A comparison of RAID levels is also included.

What You Need to Know Before You Begin

This *Guide* is written for advanced computer users who want to create a storage space for their data. Advanced knowledge of storage networks is not required, but you should be familiar with computer hardware, data storage, and Redundant Array of Independent Disks (RAID) technology.

If you are using Adaptec Storage Manager as part of a complex storage system, such as a SAN, you should be familiar with network administration terminology and tasks, have knowledge of Local Area Network (LAN) and SAN technology, and be familiar with the input/output (I/O) technology—such as Fibre Channel (FC) or Serial Attached SCSI (SAS)—that you are using on your network.

> **Note:** Because this *Guide* covers multiple Adaptec RAID products, some of the features and functions described may not be available for your controller.

Terminology Used in this Guide

Because this *Guide* provides information that can be used to manage multiple Adaptec RAID products in a variety of configurations from DAS to SAN, the generic term "storage space" is used to refer to the controller(s) and disk drives being managed with Adaptec Storage Manager.

For efficiency, the term "components" or "component" is used when referring generically to the physical and virtual parts of your storage space, such as systems, disk drives, controllers, and logical drives.

Many of the terms and concepts referred to in this *Guide* are known to computer users by multiple names. In this *Guide*, this terminology is used:

● Controller (also known as adapter, HBA, board, or card)

● Disk drive (also known as hard disk, hard drive, or hard disk drive)

● Logical drive (also known as logical device)

Note: For more information, see *Selecting the Best RAID Level* on page 136 and the *Glossary* on page 145.

adaptec

Part I: Getting Started

Step 1: Introduction to Adaptec Storage Manager

Step 2: Installing and Starting Adaptec Storage Manager

Step 3: Exploring Adaptec Storage Manager

Step 4: Building Your Storage Space

Step 5: Customizing Adaptec Storage Manager

Getting Started

5
4
3
2
1

STEP

Introduction to Adaptec Storage Manager

1

In this chapter...

This chapter describes Adaptec Storage Manager and the Adaptec Storage Manager agent, explains the concept of a "storage space" and provides a checklist of getting-started tasks.

Getting Started Checklist

Part I of this *Guide* includes five special Getting Started chapters to help you install, start, and begin to use Adaptec Storage Manager.

✔ **Step 1:**Familiarize yourself with Adaptec Storage Manager and the Adaptec Storage Manager agent (see the remainder of this chapter).

✔ **Step 2:** Install Adaptec Storage Manager on every computer that will be part of your storage space, then start Adaptec Storage Manager—or the Adaptec Storage Manager agent only—on those computers (see page 22).

✔ **Step 3:** Explore the features of Adaptec Storage Manager (see page 33).

✔ **Step 4:** Build your storage space (see page 39).

✔ **Step 5:** *Optional*—Customize Adaptec Storage Manager and the Adaptec Storage Manager agent (see page 50).

About Adaptec Storage Manager

Adaptec Storage Manager is a software application that helps you build a storage space for your online data, using Adaptec RAID controllers and disk drives. With Adaptec Storage Manager, you can group disk drives into logical drives and build in redundancy to protect your data and improve system performance. You can also use Adaptec Storage Manager to monitor and manage all the controllers and disk drives in your storage space from a single location.

About the Adaptec Storage Manager Agent

When Adaptec Storage Manager is installed on a computer, the *Adaptec Storage Manager agent* is also installed automatically. The agent is like a service that keeps your storage space running. It's designed to run in the background, without user intervention, and its job is to monitor and manage system health, event notifications, tasks schedules, and other on-going processes on that system. It sends notices when tasks are completed successfully, and sounds an alarm when errors or failures occur on that system.

The agent uses less memory than the full application. If your storage space includes systems that won't be connected to monitors (and therefore won't require the user interface described in this *Guide*), you can choose to run the *agent only* on those systems instead of the full application (see page 16). You may want to do this if system resources are limited, or if you want more system resources available for other tasks.

You can manage and monitor systems running the agent only by logging into them as remote systems (see page 51).

You can also customize the agent settings to suit your storage space requirements (see page 56).

Growing Your Storage Space with Adaptec Storage Manager

As your requirements change, Adaptec Storage Manager grows with your storage space as you add more controllers, more disk drives, more logical drives, and more data protection.

A Simple Storage Space

This example shows the sort of simple storage space that might be appropriate in a home office or for a small business. This storage space includes one RAID controller and two disk drives installed in a server. For data protection, the disk drives have been used to build a RAID 1 logical drive.
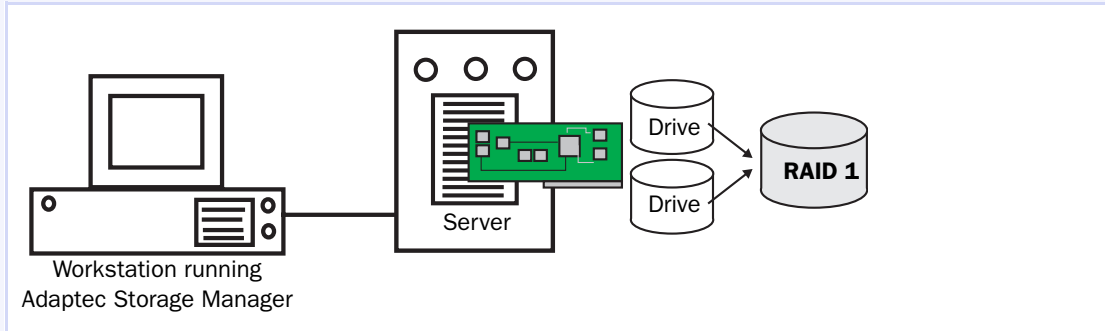
An Advanced Storage Space

This example shows how you can grow your storage space to meet the expanding requirements of your business. For data protection, segments of space from each disk drive have been used to build two RAID 5 logical drives. One logical drive stores all the customer information and the other logical drive stores the business's accounting, payroll, and personnel information.
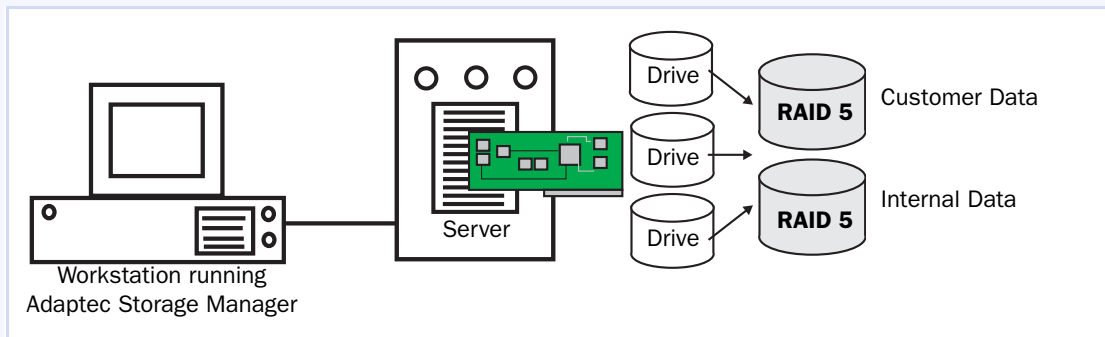
Continuing to Grow Your Storage Space

As your needs change, Adaptec Storage Manager will help you grow your storage space to include multiple controllers, storage enclosures, and disk drives in multiple locations.

The Administrator of the storage space shown in this example can create and modify logical drives and monitor all the controllers, enclosures, and disk drives in the storage space from a single workstation.
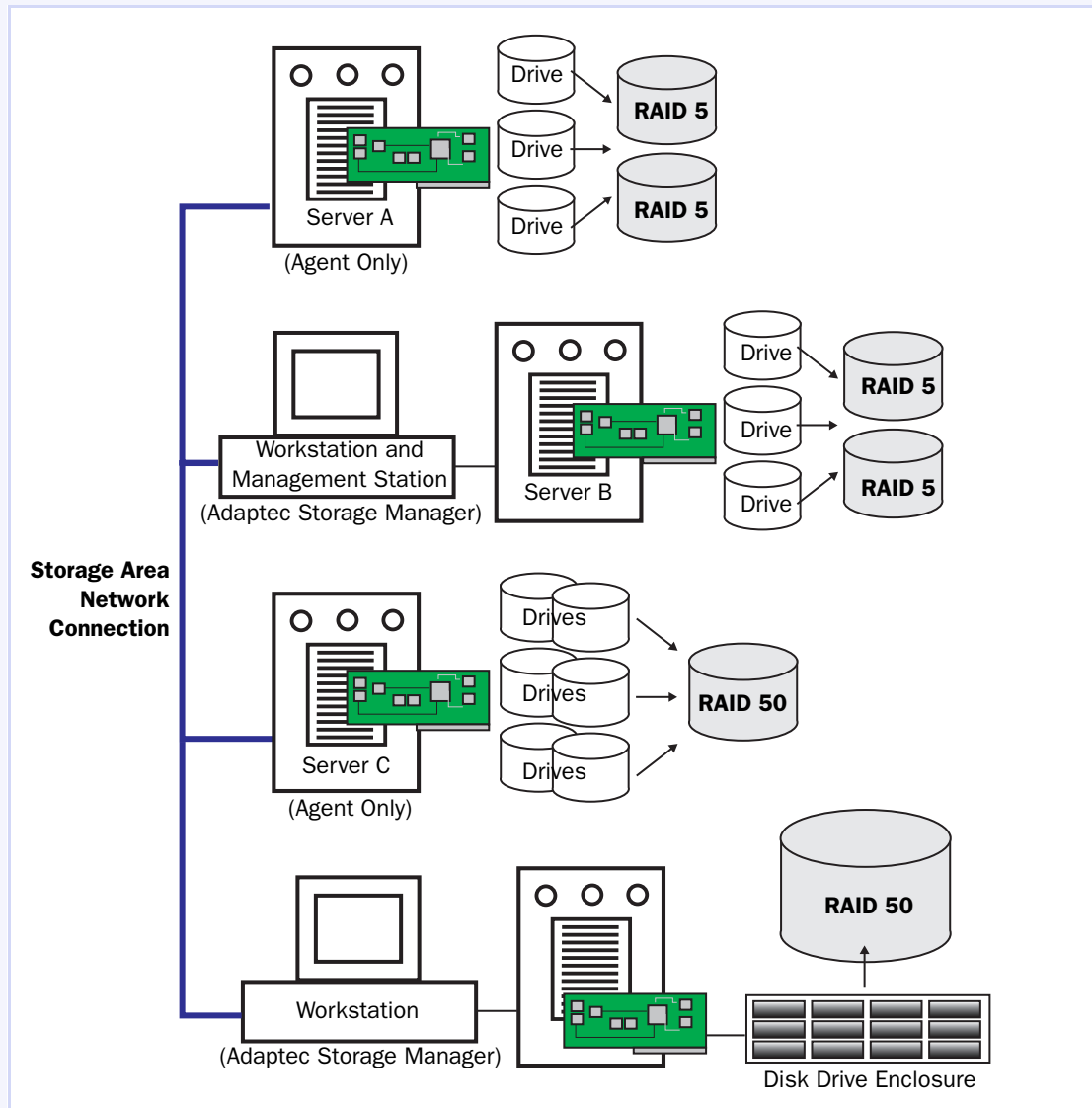
Adding Enhanced Features

As you grow your storage space, you can enhance data protection and improve performance by upgrading your Adaptec controller with extra features, then manage these enhanced features with Adaptec Storage Manager.

Currently, Adaptec offers the snapshot function as an upgrade feature which can be activated with a feature key (sold separately). A *snapshot* is a frozen image of a logical drive at a particular point in time. You can copy the data on one logical device to another logical device by creating a snapshot. For more information, see page 78.

For the most up-to-date information about available upgrade features, refer to the Adaptec Web site at www.adaptec.com.

Locked features—features which are unavailable without a key— have a padlock icon beside them, as shown in the example at right. If you select a locked feature, you are reminded that a key is required to unlock it.

To purchase a feature key, contact your Adaptec Reseller or refer to the Adaptec Web site at www.adaptec.com.

To unlock enhanced features with a feature key, see page 19.
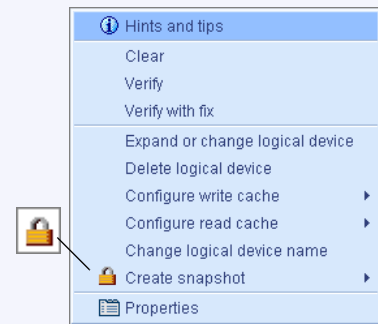
Unlocking the Enhanced Features

To unlock enhanced features with a feature key:

1 In the Enterprise View, right-click the controller you want, then click **Add feature key**.
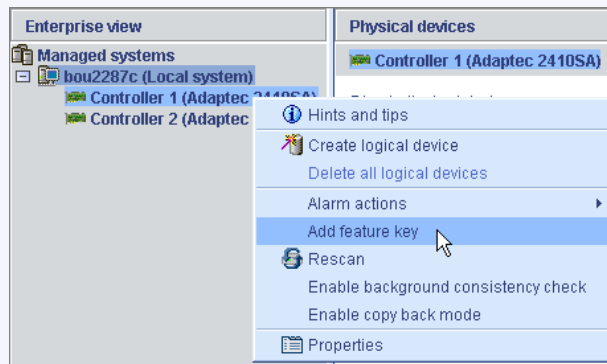
The Add Feature Key window opens.

2 Enter the feature key, then click **OK**.
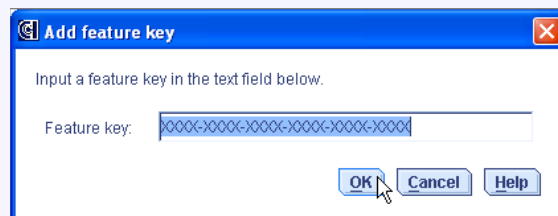
3 Click **OK** to confirm.

The enhanced features are unlocked and are now ready for use.

System Requirements

- PC-compatible computer with Intel Pentium, or equivalent, processor

- At least 128 MB of RAM

- 20 MB of free drive space

- 16-bit SVGA color monitor with a resolution of at least 800 x 600

- CD drive

- One of these operating systems:

  - Microsoft® Windows® 2000—Server, Advanced Server, Professional

  - Windows 2003 Server—Standard, Advanced

  - Windows XP—Home Edition, Professional

  - Red Hat® Linux—Professional, Enterprise, Advanced Server

  - SuSE Linux—Personal, Professional, Enterprise

    Note: For the latest on Adaptec's support of Linux, or to download driver sources, visit www.adaptec.com.

  - Novell®—NetWare® 6.5

Note: Adaptec Storage Manager can also be used before an operating system is installed. See *Running Adaptec Storage Manager from the CD* on page 31 for more information.

STEP

2

Installing and Starting Adaptec Storage Manager

In this chapter...

Adaptec Storage Manager must be installed on every computer that will be part of your storage space.

Installing Adaptec Storage Manager

Note: You need administrator or root privileges to install Adaptec Storage Manager. For details on verifying privileges, refer to your operating system documentation.

To install and start Adaptec Storage Manager, follow the instructions for your operating system:

● To install on Windows, see the following section.

● To perform a silent Windows installation (*advanced users only*), see page 23.

● To install on Linux, see page 24.

● To install on NetWare, see page 25.

Installing on Windows

This section describes how to install Adaptec Storage Manager on computers running Windows. See *System Requirements* on page 20 for a list of supported operating systems.

If a previous version of Adaptec Storage Manager is installed on your computer, you must remove it before beginning this installation. To uninstall Adaptec Storage Manager, use the Add/Remove Programs option in your Windows Control Panel.

Note: *Advanced users*—To perform a silent installation, follow the instructions on page 23.

To install Adaptec Storage Manager:

1 Insert the Adaptec Storage Manager CD.

The Installation wizard opens automatically. (If it doesn't open, browse to the CD in Windows Explorer, then click **Autorun**.)

2 Follow the on-screen instructions to complete the installation.

Do not install SNMP (Simple Network Management Protocol) unless you have a specific requirement for Adaptec Storage Manager to work with SNMP gets and traps. (See page 126 for more information.)

3 Repeat these steps to install Adaptec Storage Manager on every Windows computer that will be part of your storage space.

4 Continue with *Completing a Silent Windows Installation (Advanced)* on page 23.

Completing a Silent Windows Installation (Advanced)

A *silent installation* uses command line parameters to complete an installation without messages or user interaction.

To complete a silent installation:

1 Insert the Adaptec Storage Manager CD into your CD drive.

2 Open a command prompt window and change to the CD directory.

3 Install Adaptec Storage Manager using this command line string:

```
setup.exe /s /v" /qn properties"
```

where *properties* is one or more of the options listed in the next table. Separate multiple features with commas.

Option	Values
INSTALLDIR (Not required)	\"path to installation directory\" The installation path *must* be enclosed in escaped quotation marks. For example: INSTALLDIR=\"C:\Program Files\Adaptec\Adaptec Storage Manager\"
ADDLOCAL (Required)	● **All**—(Default) Installs all features. ● **Manager**—Installs Adaptec Storage Manager. ● **SNMPSupport**—Installs SNMP support; requires **Manager** feature. (See page 126 for more information.) ● **ASMReadme**—Installs the Readme file and Start menu shortcut. ● **CLITools**—Installs Command Line Interface tools. **Note**: Use commas to separate multiple features.
REBOOT (Not Required)	● **Force**—(Default) Forces a reboot at the end of the installation. ● **Suppress**—Suppresses a reboot unless files were in use and could not be overwritten during installation. ● **ReallySuppress**—Suppresses all reboots at the end of the installation.

Example command strings:

● Install all default features and default to reboot:

```
setup.exe /s /v" /qn INSTALLDIR=\"C:\Program Files\Adaptec\Adaptec Storage
Manager\""
```

● Install Adaptec Storage Manager, Readme, and SNMP support, and default to reboot:

```
setup.exe /s /v" /qn INSTALLDIR=\"C:\Program Files\Adaptec\Adaptec Storage
Manager\"ADDLOCAL=Manager,SNMPSupport,ASMReadme"
```

4 After a minute or two, the silent installation should be complete and the Adaptec Storage Manager icon should be accessible.

Installing on Linux

This section describes how to install Adaptec Storage Manager on computers running Linux. See *System Requirements* on page 20 for a list of supported operating systems.

Adaptec Storage Manager includes the Java Runtime Environment (JRE).

Note: If a previous version of Adaptec Storage Manager is installed on your computer, you must remove it before beginning this installation. Any customization files you created with the previous version are saved and used in the upgrade. To remove Adaptec Storage Manager, type the `rpm --erase StorMan` command.

To install Adaptec Storage Manager:

1   Insert the Adaptec Storage Manager CD.

2   Mount the Adaptec Storage Manager CD:

For Red Hat   `mount /dev/cdrom /mnt/cdrom`

For SuSE   `mount /dev/cdrom /media/cdrom`

3   Change to the cdrom directory:

For Red Hat   `cd /mnt/cdrom/linux/manager`

For SuSE   `cd /media/cdrom/linux/manager`

4   Extract the RPM package and install it:

`rpm --install ./StorMan*.rpm`

5   Unmount the Adaptec Storage Manager CD:

For Red Hat   `umount /mnt/cdrom`

For SuSE   `umount /media/cdrom`

6   Repeat these steps to install Adaptec Storage Manager on every Linux computer that will be part of your storage space.

7   Continue with *Starting Adaptec Storage Manager on Linux* on page 27.

Installing on NetWare

This section describes how to install Adaptec Storage Manager on computers running NetWare. See *System Requirements* on page 20 for a list of supported operating systems.

You need the latest Support Pack for your operating system so you can run the supported Java Virtual Machine (JVM). You need JVM version 1.3 or later. To check your JVM version, load JVM, type `JAVA -VERSION`.

Note: For the latest updates from Novell, visit www.novell.com.

To install Adaptec Storage Manager:

1 Insert the Adaptec Storage Manager CD.

2 From the command prompt, type `load cdrom` and press **Enter**.

3 From the command prompt, type:

`xx_yy_zz:\netware\manager\install`

where *xx* is the product CD, *yy* is the version number, and *zz* is the release number. For example:

`adptcd_v2_01`

The installation program starts.

4 Follow the on-screen instructions to complete the installation.

5 Repeat these steps to install Adaptec Storage Manager on every NetWare computer that will be part of your storage space.

6 Continue with *Starting Adaptec Storage Manager on NetWare* on page 27.

Starting Adaptec Storage Manager

Note: You need root privileges to run Adaptec Storage Manager.

To start Adaptec Storage Manager, follow the instructions for your operating system. To start the Adaptec Storage Manager agent only, see .

● To start on Windows, see the following section.

● To start on Linux, see .

● To start on NetWare, see .

Starting Adaptec Storage Manager on Windows

On systems running Windows, you can run Adaptec Storage Manager as a *stand-alone application* (like a regular software application), or in a browser window (such as Microsoft Internet Explorer).

Note: Normally, you only need to run Adaptec Storage Manager in a browser window if you're working on a computer that *isn't* part of your storage space (does not have a controller installed). If the computer you're working on is part of your storage space, run Adaptec Storage Manager as a standalone application.

1   Click **Start** > **Programs** > **Adaptec Storage Manager**.

The Log In dialog box appears.
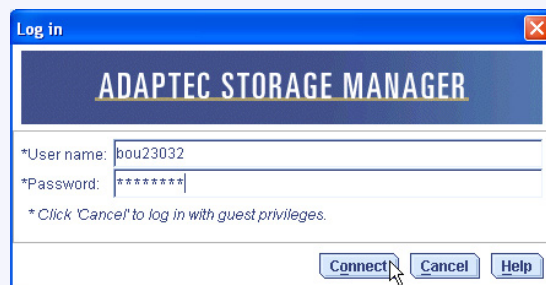
2   Enter the user name and password that you use to log on to your system, then click **Connect**.

Note: Each user name has a permission level associated with it. See *Understanding Permission Levels* on page 28 for more information.

Starting Adaptec Storage Manager on Linux

1 Type the following command to change to the Adaptec Storage Manager installation directory:

```
cd /usr/StorMan
```

2 Type the following command and press **Enter**:

```
sh StorMan.sh
```

3 When the Log In dialog box appears (see page 26), enter the user name and password that you use to log on to your system, then click **Connect**.

Note: Each user name has a permission level associated with it. See *Understanding Permission Levels* on page 28 for more information.

Starting Adaptec Storage Manager on NetWare

To start Adaptec Storage Manager on the NetWare operating system, type the `LOAD RAIDMAN` command.

Starting the Adaptec Storage Manager Agent Only

Note: For more information, see *About the Adaptec Storage Manager Agent* on page 16.

To start the Adaptec Storage Manager agent only, follow the instructions for your operating system:

● To start on Windows, see the following section.

● To start on Linux, see page 28.

● To start on NetWare, see page 28.

Starting the Agent on Windows

On systems running Windows, the Adaptec Storage Manager agent starts automatically when the system is powered on.

To verify that the agent is running:

1 Open the Windows **Control Panel**.

2 Double-click **Administrative Tools**, then double-click **Services**.

3 In the list of services, check that the Adaptec Storage Manager agent is installed and running. If it's not, you can choose to restart it.

4 Manage and monitor the system by logging into it as a remote system (see page 51).

The Adaptec Storage Manager agent's default settings are suitable for most storage spaces. To customize the settings for your specific requirements, see page 56.

Starting the Agent on Linux

On systems running Linux, the Adaptec Storage Manager agent starts automatically when the system is powered on.

To verify that the agent is running:

1 Open a shell window.

2 Enter this command: `ps -ef | grep StorAgnt.sh`

   If the agent is running, it's listed as sh StorAgnt.sh.

3 Manage and monitor the system by logging into it as a remote system (see page 51).

The Adaptec Storage Manager agent's default settings are suitable for most storage spaces. To customize the settings for your specific requirements, see page 56.

Starting the Agent on NetWare

To start the agent:

1 From the NetWare console, type: `LOAD RaidAgnt`

2 Press **Enter**.

3 Manage and monitor the system by logging into it as a remote system (see page 51).

The Adaptec Storage Manager agent's default settings are suitable for most storage spaces. To customize the settings for your specific requirements, see page 56.

Understanding Permission Levels

When you log in to Adaptec Storage Manager, your permission level is identical to your operating system permission level. For example, if you have Administrator permissions on your operating system, you also have Administrator permissions in Adaptec Storage Manager.

Note: *NetWare users only*—See *Configuring NetWare User Authentication* on page 29.

This section describes the three different permission levels.

Administrator Level

Logging in as an Administrator allows you full access to manage and modify the controllers, disk drives, and logical drives that are part of your storage space.

To log in as an Administrator:

● **Windows**—Enter a valid user name and password for the Administrator or Administrative User on the system. (The Administrative User is any member of the local Administrators group, which can, in a Domain configuration, include Domain Administrators.)

● **Linux**—Enter `root` for the user name and enter the root password.

● **Netware**—See page 29.

User Level

Logging in as a User partially restricts your access to the storage space, as described in this table.

Users can...	User's can't...
Rescan controllers	Create logical drives
Save activity logs	Modify logical drives
Verify disk drives (with and without fix)	Delete logical drives
Verify logical drives (with and without fix)	Delete hot spares
Identify disk drives and enclosures	Perform data migrations
Rebuild disk drives	
Create hot spares	
Access the same information as Guests (see the following section)	

To log in as a User, use your normal network user name and password.

Guest Level

Logging in as a Guest restricts your access to the storage space to "view-only".

You can see all local and remote systems and view their properties windows, view event logs, save configuration files and support archives, and browse the online Help.

You cannot make any changes to the storage space.

To log in as Guest, click **Cancel** on the Login window.

Configuring NetWare User Authentication

This section describes two ways to configure NetWare user authentication.

Out-of-box Authentication

● **Administrative Access**—Granted exclusively to the Admin user account, which must be defined within the NetWare Bindery context of the server running the Adaptec Storage Manager agent.

● **User Access**—Granted to all Bindery and NetWare Directory Services (NDS) user accounts. For NDS users, the user account must reside within the same tree as the server running the Adaptec Storage Manager agent.

When logging into Adaptec Storage Manager, NDS users must provide the fully distinguished account name.

NDS Authentication

NDS authentication is based on NDS group membership.

To set up NDS group membership:

1   Create and populate an NDS group for storage administration.

    Note: The group must reside within the same NDS tree as the server running the Adaptec Storage Manager agent.

2   Install Adaptec Storage Manager (see page 25).

3   Restrict authentication to the new group by adding this entry to the SYS:\RAIDMAN\RaidAgent.pps file:

    `agent.group.NetWareStorageAdmin=<fully distinguished group name>`

    For example:

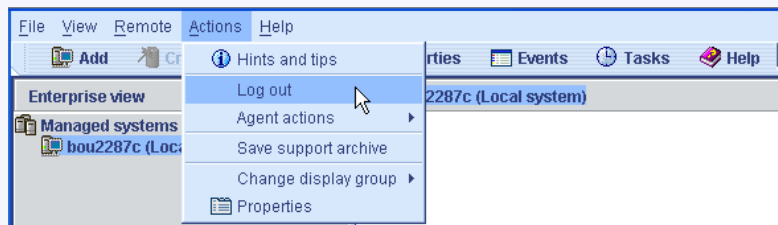   `agent.group.NetWareStorageAdmin=.CN=StorageAdmins.O=Acme`

4   Restart the server.

    Limited user access is granted to all NDS user accounts.

Logging Out of Adaptec Storage Manager

To log out of Adaptec Storage Manager:

1   In the Enterprise View, click on the local system.

2   In the menu bar, select **Actions**, then click **Log out**.

You are logged out of Adaptec Storage Manager.

Logging Back In

To log in to Adaptec Storage Manager:

1   In the Enterprise View, click on the local system.

2   In the menu bar, select **Actions**, then click **Log in**.

3   Enter your user name and password, then click **Connect**. (See *Understanding Permission Levels* on page 28 for more information.)

Running Adaptec Storage Manager from the CD

This section describes how to run Adaptec Storage Manager from the Adaptec RAID installation CD included in the kit, instead of as an installed application. When you run Adaptec Storage Manager from the CD, you are using *bootable-CD mode*.

When to Choose Bootable-CD Mode

Use Adaptec Storage Manager in bootable-CD mode if you want to install your operating system on a disk drive or logical drive associated with your controller. Bootable-CD mode lets you configure the controller before you install your operating system.

After you have configured the controller and installed the operating system, install and run Adaptec Storage Manager as an installed software application, as described earlier in this chapter.

Bootable-CD Mode Limitations

Running Adaptec Storage Manager from the CD is not an alternative to running it as an installed software application. Most of the features and functions described in this *User's Guide* are not available when you are running Adaptec Storage Manager from the CD. Bootable-CD mode is only for configuring your controller before you install an operating system.

Getting Started in Bootable-CD Mode

This is a checklist of tasks to complete when you're building your storage space with Adaptec Storage Manager in bootable-CD mode.

✔ Install your Adaptec RAID controller.

✔ Run Adaptec Storage Manager (see page 32).

✔ Build your storage space (see page 39).

  For an introduction to the Adaptec Storage Manager window and its features, see page 33.

✔ Install your operating system (and controller device drivers, if appropriate).

✔ Install Adaptec Storage Manager as a software application (see page 22).

✔ Continue to build, customize, and manage your storage space as described in the rest of this *Guide*.

Running Adaptec Storage Manager from the CD

Note: Before you begin, ensure that your system is set up to boot from a CD. Check the system BIOS to see if the CD drive is listed first in the boot order. For more information, refer to your computer's documentation.

To run Adaptec Storage Manager in bootable-CD mode:

1 Insert the RAID installation CD into your CD drive, then restart your computer.

2 When prompted, select the language you want, then press **Enter**.

3 Review the license information, then press **Enter**.

The main Adaptec Storage Manager CD menu opens.

4 Click **Launch Configuration Utility**.

Adaptec Storage Manager opens.

5 Click **Create**.
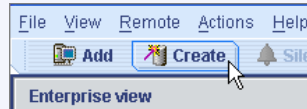
The Configuration wizard opens.
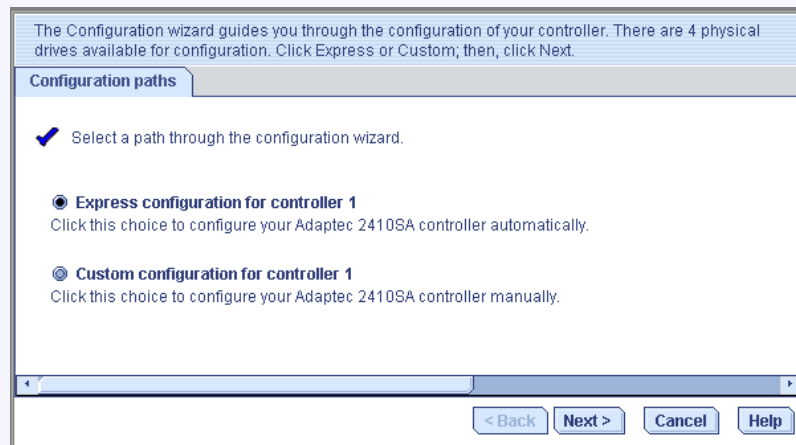
6 Continue with *Building Your Storage Space* on page 39.

Getting
Started

5
4
3
2
1

STEP
**3**

Exploring Adaptec Storage Manager

In this chapter...

Before you build your storage space, familiarize yourself with the main features of Adaptec Storage Manager and learn to navigate to the information you need.

Navigating the Main Window

The main window of Adaptec Storage Manager has three main panels, or *views*, in addition to the other features shown in this figure.
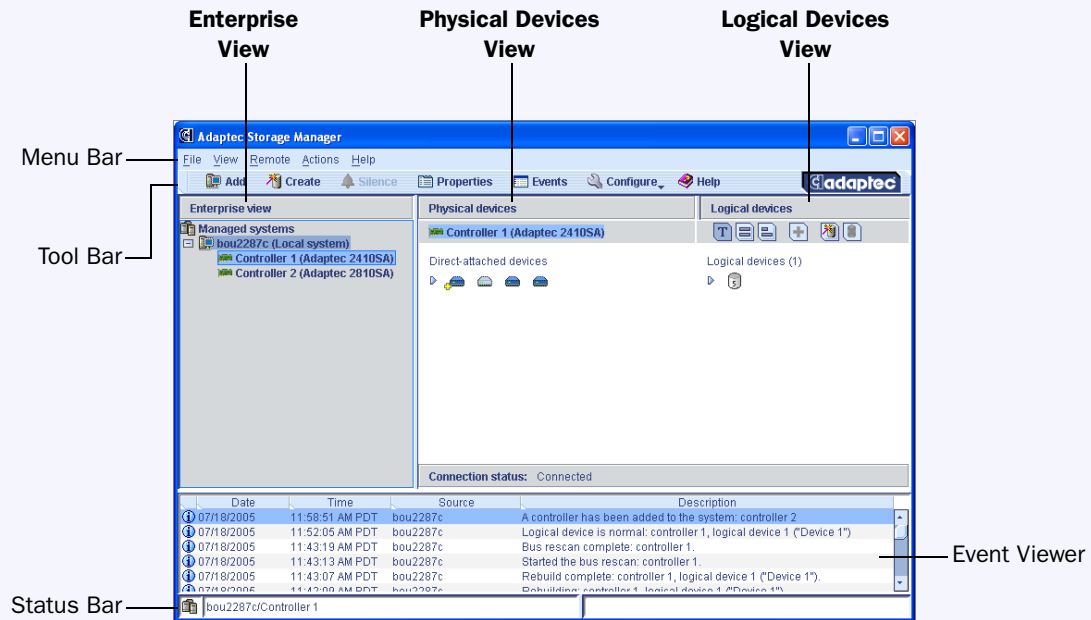
Resize the panels and scroll horizontally or vertically as required, to view more or less information.

Using Enterprise View

The Enterprise View is an expandable tree that lists the local system (the computer you're working on) and any remote systems that you're logged in to. All the controllers on those systems are also listed in the Enterprise View. (See *Logging In to Remote Systems* on page 51 for more information about local and remote systems.)

Note: See *Creating Display Groups* on page 53 to learn how to group related local and remote systems together in the Enterprise View.

When you select a component in the Enterprise View, the disk drives and logical drives ("devices") associated with it appear in the Physical and Logical Devices Views, as shown in this figure.

By selecting Controller 1 in the Enterprise View...   ...the disk drives connected to Controller 1 and the logical drives created with those disk drives appear in the Physical and Logical Devices Views.

You can perform most tasks by selecting a controller in the Enterprise View and working with its associated devices in the Physical and Logical Devices Views.

Using Physical Devices View

When you select a controller in the Enterprise View, information about the physical disk drives connected to that controller appear in the Physical Devices View.

Controller 2 is connected to...   ...eight disk drives.

Disk drives designated as hot spares have plus signs (+) beside them:

- A blue plus sign (shown at right) means that the spare is protecting at least one logical drive.

- A hot spare with a yellow plus sign (shown at right) may not be large enough to protect the logical drive it's assigned to, or may not be assigned to a logical drive.

See *Working with Hot Spares* on page 74 for more information.

Hold your cursor over any disk drive to see its status, port number, and maximum speed. You can also click the arrow, shown at right, to see this same information for all the disk drives at the same time. To reveal further information, use the View buttons to change how the disk drives are displayed, as described in *Revealing More Disk Drive Information* on page 36.

A disk drive shaded in light blue is not part of any logical drive. A disk drive shaded half light/half dark blue (as shown at right) has some space allocated to a logical drive, and some space available.

To view the logical drives associated with a particular disk drive, see *Using Logical Devices View* on page 35.

Using Logical Devices View

When you select a controller in the Enterprise View, information about the logical drives and arrays associated with that controller appear in the Logical Devices View. (A *logical drive* is a group of physical disk drives that your operating system recognizes as a single drive. For more information, see *Understanding Logical Drives* on page 61.)


Controller 2 is connected to...   ...eight disk drives...   ...from which two logical drives have been created.

The RAID level of a logical drive is indicated by the number inside the logical drive's icon. For instance, the logical drive shown at right has RAID 1. Logical drives protected by hot spares have plus signs (+) beside them, as shown at right.

Hold your cursor over any logical drive to see its name, status, and size. You can also click the arrow, shown at right, to view this same information for all the logical drives at once.

Click on a logical drive to highlight the disk drives that comprise it in the Physical Devices View.
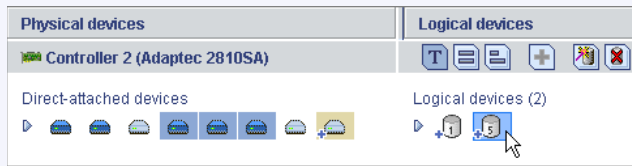

Three disk drives (plus one hot spare) comprise the selected RAID 5 logical drive.

You can also click on any disk drive to see which (if any) logical drive it belongs to. A disk drive shaded in light blue is not part of any logical drive.
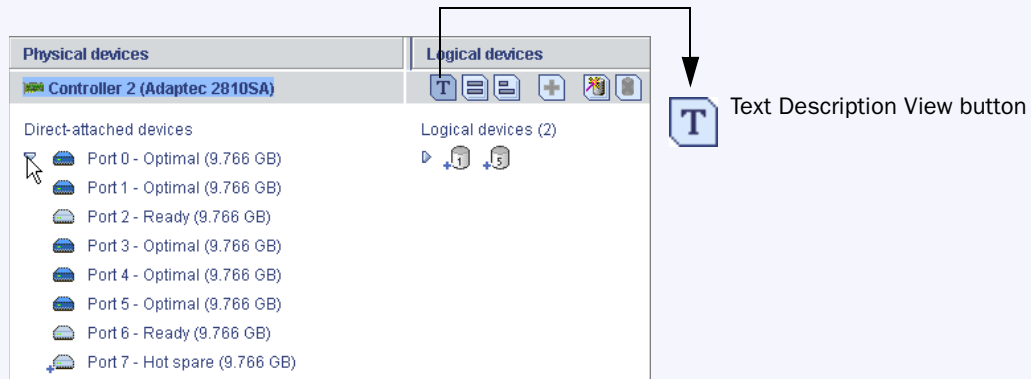
Revealing More Disk Drive Information

You can reveal more information about your disk drives by using the View buttons to change how they are displayed.
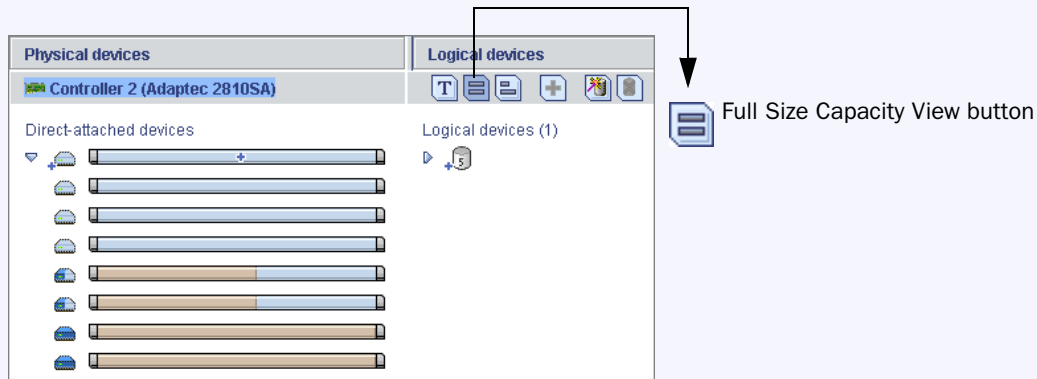
By default, disk drives are displayed in unexpanded Text Description View.
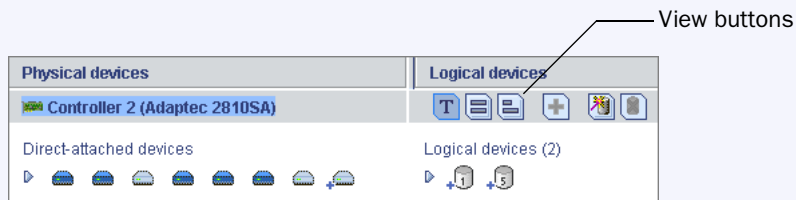
Click the expand arrow to see basic disk drive information.

Click the **Full Size Capacity View** button to see the size capacities of your disk drives.

Full Size Capacity View button

Disk drives or segments of disk drives that are included in logical drives are shaded brown.

Click the **Relative Size Capacity View** button to see the size capacities of your disk drives relative to each other.

Relative Size Capacity View button
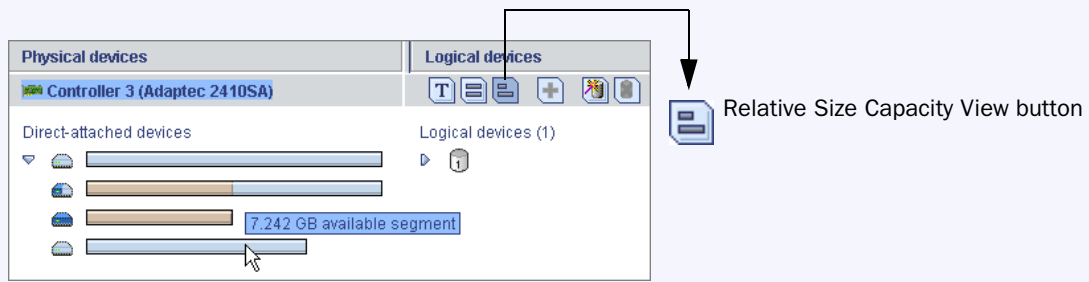
A full length bar is displayed for the largest disk drive. Proportionally shorter bars are displayed for other disk drives.

Checking System Status

Adaptec Storage Manager includes an Event Viewer and a status bar for at-a-glance system and event status information.

The status bar provides at-a-glance information about a selected controller.

The status icon indicates if a controller is in a normal state or if a problem has been detected

The tree path displays the location of the selected object within Adaptec Storage Manager

The Event Viewer provides status information and messages about activity (or *events*) occurring in your storage space. Double-click any event to see more information in an easier-to-read format. See Chapter 8, *Monitoring Your Storage Space* for more information.

Note: By default, all Warning- and Error-level events activate an audible alarm. See *Silencing and Testing the Audible Alarm* on page 96 for more information.

Working in Adaptec Storage Manager

Adaptec Storage Manager provides multiple ways to work with its menus and windows.

Most menu options are available by:

- Selecting items from the menu bar.

- Clicking buttons on the tool bar.

- Right-clicking on components in the main window. (Only tasks and windows associated with a specific component are available on right-click menus.)

For simplicity, the tasks in this *Guide* are explained mainly using menu bar options.

About the Actions Menu

Most of the main tasks in Adaptec Storage Manager are part of the Actions menu on the menu bar. Options on the Actions menu vary, depending on which type of component is selected in the main window. For instance, managed systems, disk drives, and hot spares each have specialized Actions menus.

Getting Help

Adaptec Storage Manager online Help includes conceptual information, glossary definitions, and descriptions of on-screen menus and items, in addition to step-by-step instructions for completing tasks.

To open the online Help, click the **Help** button (shown at right). Alternatively, press the **F1** key, or in the menu bar select **Help**, then click **Search** or **Contents**.

Press the **Help** button in a dialog box or wizard for help with that specific dialog box, window, or procedure.

STEP
4

Building Your Storage Space

In this chapter...

Once you have logged in to Adaptec Storage Manager, you can begin to build your storage space by creating logical drives. (For more information, see *Understanding Logical Drives* on page 61.)

Note: You must be logged in as an Administrator to complete the tasks described in this chapter.

Selecting a Configuration Method

Adaptec Storage Manager has a wizard to help you build (or *configure*) logical drives, and offers two configuration methods to choose from, depending on your needs:

- **Express configuration (basic)**—Automatically creates logical drives by grouping together same-sized physical drives, and assigns RAID levels based on the number of physical disk drives in the logical drive.

  Use the express method when you want to use all available disk drives in the most efficient manner. For instructions, see the next section.

- **Custom configuration (advanced)**—Helps you group disk drives, set RAID levels, determine logical drive size, and configure advanced settings manually.

  Use the custom method when you want to create specific logical drives with any or all available disk drives. For instructions, see page 42.

Express Configuration: Building the Easy Way

When you use express configuration, Adaptec Storage Manager automatically creates logical drives by grouping together same-sized physical disk drives, and assigns RAID levels based on the number of physical disk drives in a logical drive:
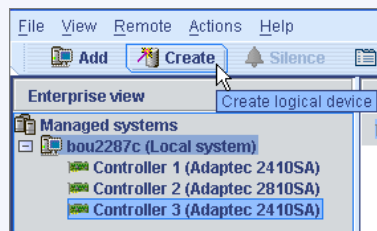
- A logical drive with three or more physical disk drives is assigned RAID 5.

- A logical drive with two physical disk drives is assigned RAID 1.

- A logical drive with only a single physical disk drive becomes a simple volume, which does not offer redundancy.

Note: To create a logical drive with any other RAID level, you must use the custom method, as described on page 42. See *Selecting the Best RAID Level* on page 136 for more information about RAID levels.
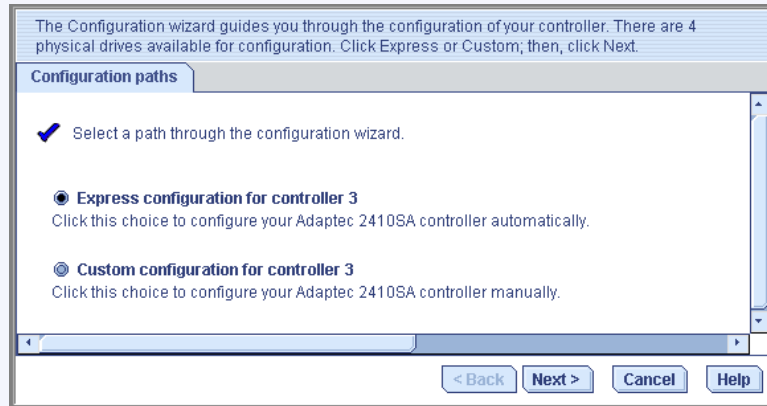
By default, logical drive size is set by Adaptec Storage Manager and automatically maximizes the capacity of the disk drives. However, you can choose to specify a size for a logical drive, if required.

To build your storage space with the express method:

1   In the Enterprise View, select the controller you want.
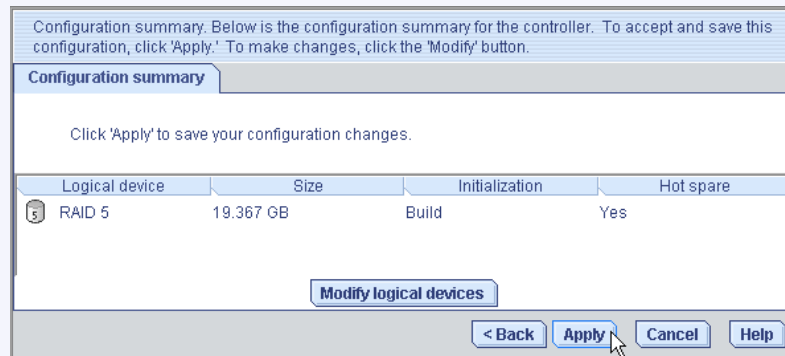
2   On the toolbar, click **Create**.

3 When the wizard opens, select **Express configuration...**, then click **Next**.

> The Configuration wizard guides you through the configuration of your controller. There are 4
> physical drives available for configuration. Click Express or Custom; then, click Next.
>
> **Configuration paths**
>
> ✔ Select a path through the configuration wizard.
>
> ⦿ **Express configuration for controller 3**
> Click this choice to configure your Adaptec 2410SA controller automatically.
>
> ◎ **Custom configuration for controller 3**
> Click this choice to configure your Adaptec 2410SA controller manually.
>
> [< Back] [Next >] [Cancel] [Help]
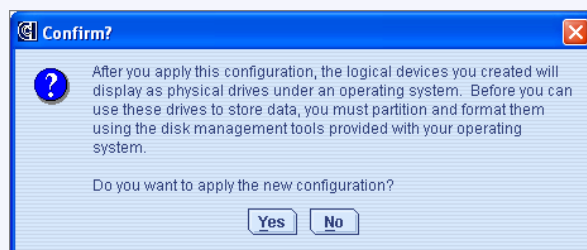
4 Review the information that is displayed.

In this example, Adaptec Storage Manager has used three equal-sized disk drives to automatically create one logical drive with RAID 5 and a hot spare.

> Configuration summary. Below is the configuration summary for the controller. To accept and save this
> configuration, click 'Apply.' To make changes, click the 'Modify' button.
>
> **Configuration summary**
>
> Click 'Apply' to save your configuration changes.
>
> | Logical device | Size | Initialization | Hot spare |
> | --- | --- | --- | --- |
> | RAID 5 | 19.367 GB | Build | Yes |
>
> [Modify logical devices]
>
> [< Back] [Apply] [Cancel] [Help]

To specify a size for the logical drives, or to make other changes to the configuration, click **Modify logical devices**. See for more information.

Note: Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system.

5 Click **Apply**, then click **Yes**.

> **Confirm?**
>
> ❓ After you apply this configuration, the logical devices you created will
> display as physical drives under an operating system. Before you can
> use these drives to store data, you must partition and format them
> using the disk management tools provided with your operating
> system.
>
> Do you want to apply the new configuration?
>
> [Yes] [No]

Adaptec Storage Manager builds the logical drive(s). The configuration is saved on the Adaptec controller and on the physical drives.

6 Repeat Steps 1 to 5 for each controller on your system.

7 Continue with .

Partitioning and Formatting Your Logical Drives

The logical drives you create appear as physical disk drives on your operating system. You *must* partition and format these logical drives before you can use them to store data.

Note: Logical drives that have not been partitioned and formatted cannot be used to store data.

Refer to your operating system documentation for more information.

Next Steps

If you have installed Adaptec RAID controllers on more than one computer, to continue building your storage space:

● From each computer, log in to Adaptec Storage Manager and repeat Steps 1 to 7 to create logical drives.

● From your *local system* (the computer you're working on), log in to all other computers in your storage space as *remote systems* (see page 51), then repeat Steps 1 to 7 to create logical drives.

The maximum number of supported RAID controllers varies depending on your operating system. See *RAID Controller Support* on page 48 for more information.

To continue, see *Managing Your Storage Space* on page 49.

Custom Configuration (Advanced)

Custom configuration helps you build your storage space manually by stepping you through the process of creating logical drives, setting RAID levels, and configuring other settings.

To build your storage space with custom configuration:

1 In the Enterprise View, click the controller you want.

Note how many available disk drives are connected to the controller; this information will be helpful as you create logical drives.
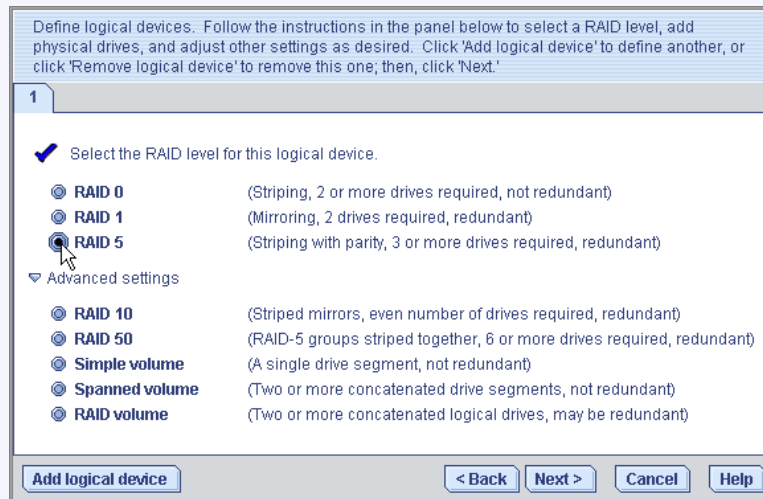
2 On the toolbar, click **Create**.
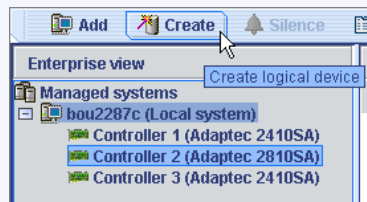
3 When the wizard opens, select **Custom configuration...**, then click **Next**.
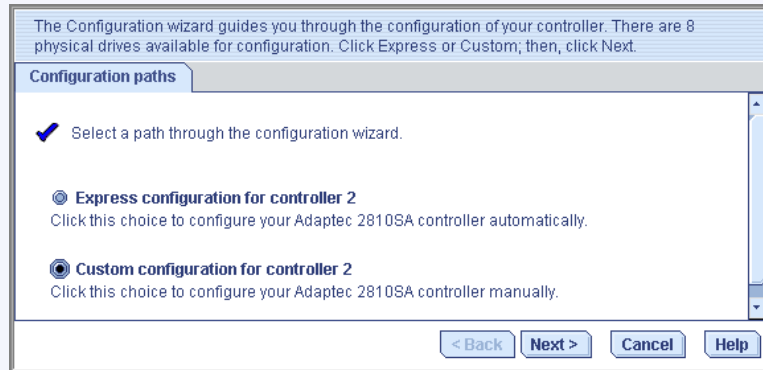
4 Select a RAID level.

The most common RAID levels are listed first; advanced RAID levels are available by clicking **Advanced settings**.


Note: To build a RAID Volume, see page 46. See *Selecting the Best RAID Level* on page 136 for more information about RAID levels.

5 Click **Next**.

6 In the Physical Devices panel, select the disk drives you want to use in the logical drive.

Adaptec Storage Manager prompts you to select the correct number of disk drives, as shown in the next figure. By default, Adaptec Storage Manager automatically sets the size of the logical drive and maximizes the capacity of the disk drives you select. (To set a custom size for the logical drive, see the second bullet below).

Number of disk drives required
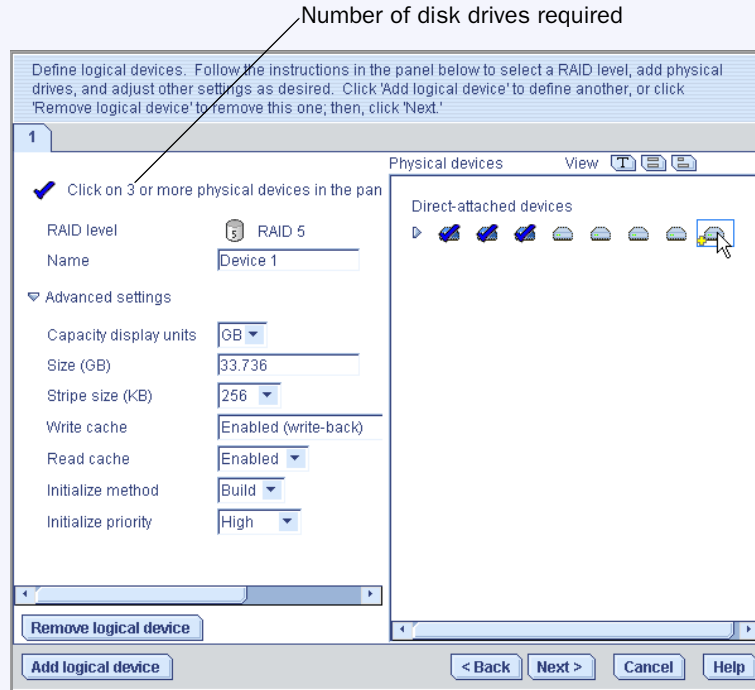
- **To create a hot spare**—Control-click on an available disk drive. A plus sign (+) appears to indicate that the selected drive will be designated as a hot spare. (See page 74 for more information.)

- **To set a smaller logical drive size**—Click **Advanced Settings**, then enter a size for the logical drive in the **Size GB** box. Available space will remain on the selected disk drives. (See page 61 for more information.)

- **To modify other settings**—Click **Advanced Settings** and customize the settings as required. (See *Fine-tuning Logical Drives* on page 65 for more information.)

7 If you have no other available disk drives, skip to Step 9.

If you have available disk drives and want to create additional logical drives, click **Add logical device** to open a new tab in the wizard.

Tab for second logical drive

Define logical devices. Follow the instructions in the panel below to select a RAID level, add physical drives, and adjust other settings as desired. Click 'Add logical device' to define another, or click 'Remove logical device' to remove this one; then, click 'Next.'

| 1 | 2 |

✔ Select the RAID level for this logical device.

◎ RAID 0   (Striping, 2 or more drives required, not redundant)
◉ RAID 1   (Mirroring, 2 drives required, redundant)
◎ RAID 5   (Striping with parity, 3 or more drives required, redundant)

▷ Advanced settings

[Add logical device]   [< Back] [Next >] [Cancel] [Help]

8 Repeat Steps 4 to 7 for each logical drive that you want to create on the controller.

9 Click **Next**, then review the logical drive settings.

This example shows two logical drives with RAID 5 are ready to be created.
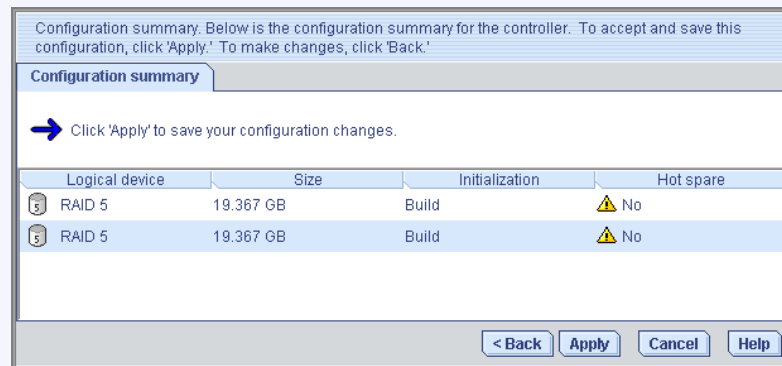
Configuration summary. Below is the configuration summary for the controller. To accept and save this configuration, click 'Apply.' To make changes, click 'Back.'

Configuration summary

➡ Click 'Apply' to save your configuration changes.

Logical device	Size	Initialization	Hot spare
⑤ RAID 5	19.367 GB	Build	⚠ No
⑤ RAID 5	19.367 GB	Build	⚠ No

[< Back] [Apply] [Cancel] [Help]

To make changes, click **Back**.

Note: Some operating systems have size limitations for logical drives. Before continuing, verify that the size of the logical drive is appropriate for your operating system. For more information, refer to your operating system documentation.

10 Click **Apply**, then click **Yes**.
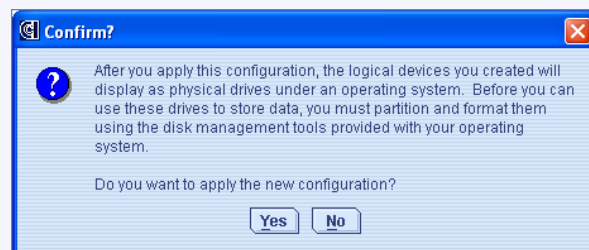
Confirm? ✕

❓ After you apply this configuration, the logical devices you created will display as physical drives under an operating system. Before you can use these drives to store data, you must partition and format them using the disk management tools provided with your operating system.

Do you want to apply the new configuration?

[Yes] [No]

Adaptec Storage Manager builds the logical drive(s). The configuration is saved on the Adaptec controller and on the physical drives.

11 Repeat Steps 1 to 10 for each controller on your system.

12 Partition and format your logical drives. See page 42 for more information.

If your storage space comprises one or more Adaptec RAID controllers on a single computer, building is complete. Continue with *Managing Your Storage Space* on page 49.

If you have installed Adaptec RAID controllers on more than one computer and wish to add them to your storage space, continue with the next section, *Including More Systems in Your Storage Space*.

Including More Systems in Your Storage Space

If you have installed Adaptec RAID controllers on more than one computer, to continue building your storage space:

● From each individual computer, log in to Adaptec Storage Manager and repeat Steps 1 to 12 to continue building your storage space, *or*

● From your local system, log in to all the other computers as *remote systems* (see page 51), then repeat Steps 1 to 12 to continue building your storage space.

Note: The maximum number of supported RAID controllers varies depending on your operating system. See *RAID Controller Support* on page 48 for more information.

When your storage space is complete, continue with *Managing Your Storage Space* on page 49.

Building a RAID Volume

A RAID Volume comprises two or more logical drives connected end-to-end. The logical drives in a RAID Volume:

● Must be built using disk drives connected to the same controller.

● Must have the same RAID level assigned.

● Must not be striped together.

● May have equal or different capacities.

To build a RAID Volume:

1 Create two or more logical drives that meet the requirements listed at the beginning of this section, and wait for them to build and initialize. For instructions, see *Express Configuration: Building the Easy Way* on page 40 or *Custom Configuration (Advanced)* on page 42.

This example shows two RAID 5 logical drives.

2 On the toolbar, click **Create**.

3 When the configuration wizard opens, select **Custom configuration...**, then click **Next**.

4 Click **Advanced settings**, select **RAID Volume**, then click **Next**.
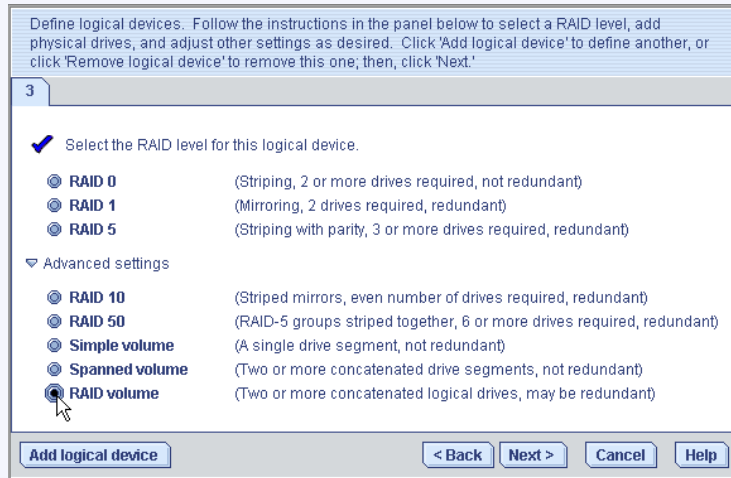
5 In the Logical Devices panel, select the logical drives you want to use in the RAID Volume.

Adaptec Storage Manager prompts you to select the correct number of logical drives.
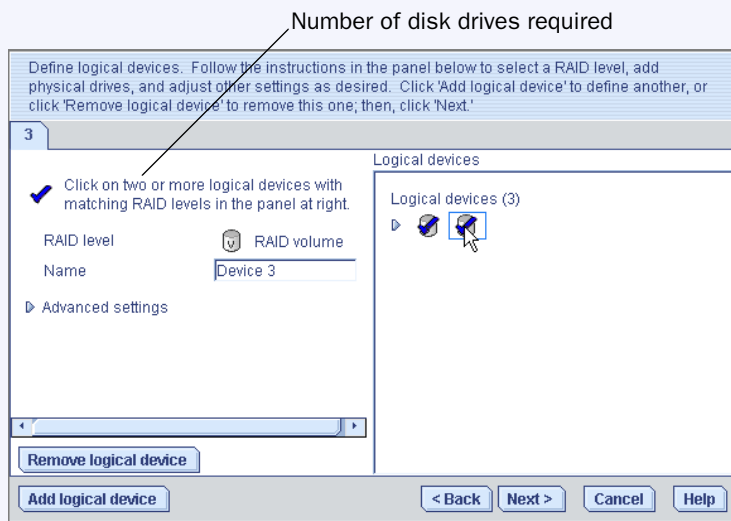
6 Modify the Advanced Settings, if required. (See *Fine-tuning Logical Drives* on page 65 for more information.)

7 Click **Next**.

8 Review the RAID Volume settings.

This example shows one RAID Volume ready to be created.
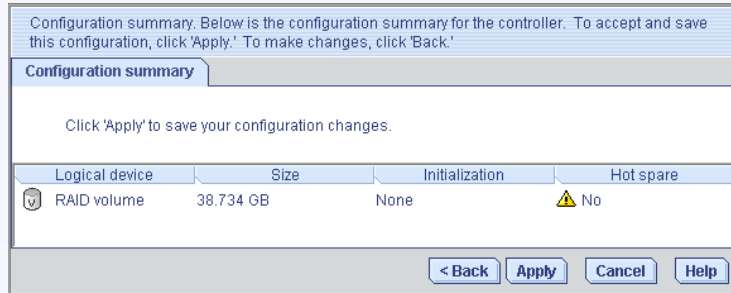
To make changes, click **Back**.

9 Click **Apply**, then click **Yes**.

Adaptec Storage Manager builds the RAID Volume. The configuration is saved on the Adaptec controller and on the physical drives.

Adaptec Storage Manager replaces the individual logical drives with a single RAID Volume in the Logical Devices View. The Event Viewer shows that the logical drives have been deleted.
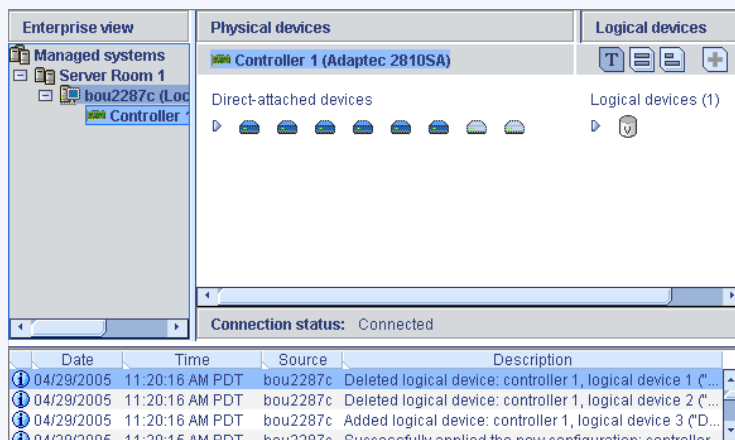
10 Partition and format your RAID Volume. See for more information.

RAID Controller Support

The maximum number of RAID controllers supported by Adaptec Storage Manager varies, depending on your computer's operating system:

- **Windows**—up to 16 Adaptec RAID controllers
- **Linux**—up to 12 Adaptec RAID controllers
- **NetWare**—up to 16 Adaptec RAID controllers

Note: For the most recent operating system support information, visit www.adaptec.com.

Managing Your Storage Space

Once your storage space is built, you can add systems, controllers, and disk drives to meet your changing needs, then create logical drives by repeating the steps in this chapter.

To customize Adaptec Storage Manager and make managing your storage space easier and more effective, continue with *Customizing Adaptec Storage Manager* on page 50.

To learn how to monitor, manage, and modify your storage space, see these chapters in the rest of this *Guide*:

- Chapter 6, *Managing Logical Drives and Hot Spares*

- Chapter 7, *Protecting Your Data*

- Chapter 8, *Monitoring Your Storage Space*

- Chapter 9, *Managing Tasks*

- Chapter 10, *Working with Display Groups*

- Chapter 11, *Managing Controllers and Disk Drives*

- Chapter 12, *Solving Problems*

To find the most commonly asked-about information, see *Quick Answers to Common Questions...* on page 130.

Customizing Adaptec Storage Manager

In this chapter...

You can customize Adaptec Storage Manager to make managing your storage space easier and more effective:

- Log in to other systems on your network to view and manage all your controllers, disk drives, and logical drives from your local system (see page 51).

- Create display groups to organize related local and remote systems (see page 53).

- Change display settings, and add or remove features from the main window (see page 54).

- Change alarm settings, or set the agent to broadcast event notices from selected systems (see page 56).

Note: The tasks described in this chapter are optional.

Logging In to Remote Systems

If multiple computers (or *systems*) on your network are in your storage space, you can use Adaptec Storage Manager to monitor and manage all of them from one computer.

The computer that you're working on is called the *local system*. All other computers in your storage space are *remote systems*. 'Local' and 'remote' are relative terms, as shown in the following figure—when you are working on workstation A (local system), server B is a remote system; when you are working on server B (local system), workstation A is a remote system.
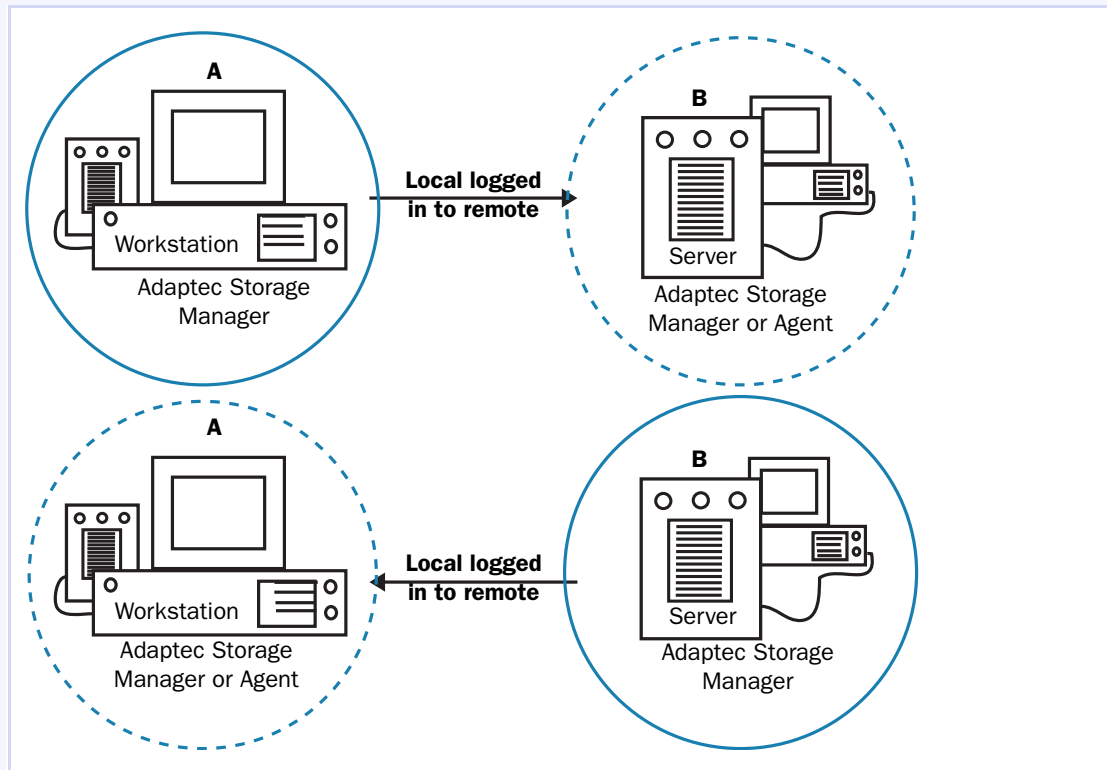
To manage remote systems, you log in to them from the local system. Adaptec Storage Manager or the Adaptec Storage Manager agent (see page 27) must be running on the remote system and before you can log in to it.

When you log in to a remote system, you add that system to the Enterprise View of Adaptec Storage Manager, as shown in this example.
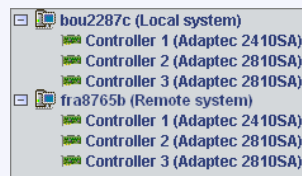
Once you have logged in to a remote system, it is automatically included in the Enterprise View each time you start Adaptec Storage Manager from the local system. You can work with its controllers, disk drives, and logical drives as if they were part of your local system. You must log in with the proper permission level to complete the tasks you wish to perform. (See *Understanding Permission Levels* on page 28 for more information.)

To log in to a remote system:

1   From the menu bar, click **Remote**, then select **Add Remote System**.

The Add Remote System window opens.

2   Enter the host name or TCP/IP address of the remote system.

3   Enter the startup port number of the remote system. The default port number is 34571.

4   If prompted, enter your user name and password. (User names and passwords are case sensitive.)

To save this user name and password, click inside the **Save user name/password** box.

5   Click **Connect**.

Adaptec Storage Manager connects to the remote system and adds it to the list of managed systems in the Enterprise View.

6   To manage the remote system, select it in the Enterprise View and enter your user name and password if prompted.

To create logical drives on your remote systems, see *Building Your Storage Space* on page 39.

Removing a Remote System

If you no longer want to monitor a remote system, you can remove it from the Enterprise View of Adaptec Storage Manager.

Removing a remote system does not cause it to fail.

To remove a remote system:

1   In the menu bar of the main window, select **Remote**, select **Remove managed system**, then click the system you want to remove.

The Remove Managed System window opens.

2   If you want to continue receiving events from the remote system after it's been removed from the local system, select **Continue to receive events from the remote system** from the drop-down menu.

3   Click **OK**.

The remote system is removed from the Enterprise View of Adaptec Storage Manager.

Creating Display Groups

You can organize related local and remote systems into display groups to make managing your storage space easier and more effective.

Systems in a display group appear together in the Enterprise View under the group name.

To create a display group:

1 In the Enterprise View, right-click on a system that you want to add to a display group.
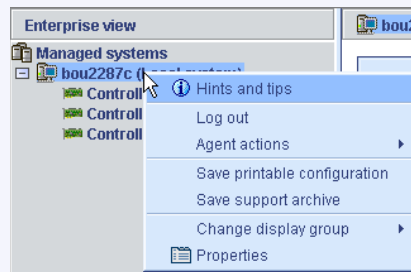
2 Select **Change display group,** then click **New group**.
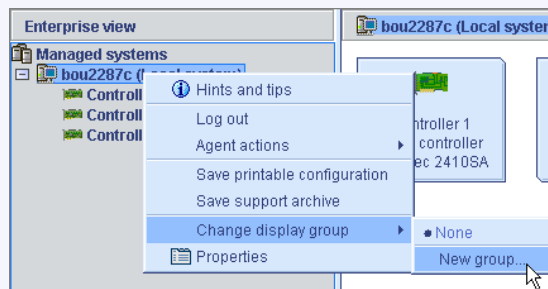
3 Enter a name for the new display group, then click **OK**.
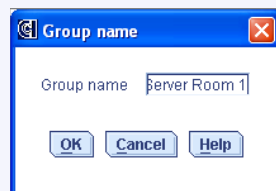
The display group is created and the system you selected in Step 1 is added to it.
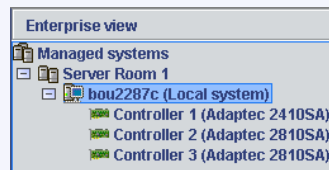
4 To add another system to the display group, right-click on that system in the Enterprise View, select **Change display group**, then click the display group name.
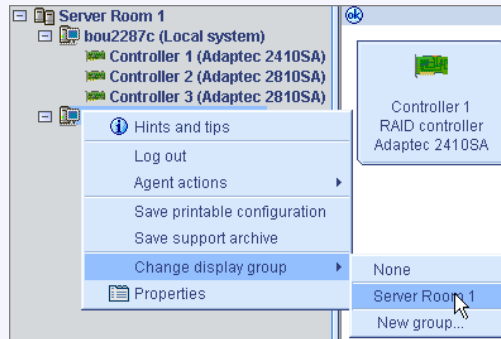
The system is added to the display group.
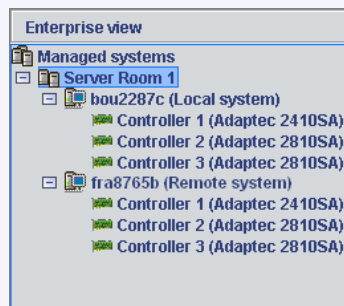
Display groups are sorted alphabetically and appear in the Enterprise View below any systems that are not part of a display group.

A system can belong to only one display group at a time; you can't include the same system in multiple display groups.

For more information, see Chapter 10, *Working with Display Groups*.

Setting Preferences and Changing Views

You can customize Adaptec Storage Manager by:

● Sorting the systems in the Enterprise View (see the following section).

● Selecting the standard unit of measure shown for disk drives (see page 55).

● Excluding the tool bar or status bar from the main window, or turning off the Tool Tips (see page 55).

Sorting Systems in the Enterprise View

You can set Adaptec Storage Manager to sort systems in the Enterprise View alphabetically or chronologically. By default, systems are listed in alphabetical order. The local system always appears first when you sort objects alphabetically.

To re-sort the Enterprise View:

1 In the menu bar of the main window, select **File**, then click **Preferences**.

2 Click the **Display options** tab.

3 In the **System tree sorting** drop-down menu, select the option you want.
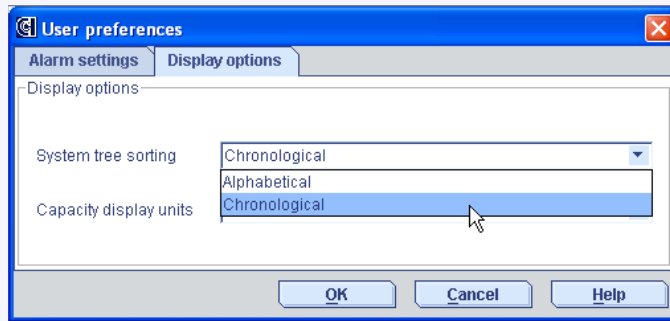
4 Click **OK**.

Setting the Standard Unit of Measure

You can set Adaptec Storage Manager to show disk drive capacity in measures of megabytes (MB), gigabytes (GB), or terabytes (TB).

You can choose the Auto-select setting to allow Adaptec Storage Manager to show the most appropriate unit of measure based on disk drive size. This option allows different disk drives to be shown in different units of measure.

By default, disk drives are shown in GB.

To change the standard unit of measure:

1 In the menu bar of the main window, select **File**, then click **Preferences**.

2 Click the **Display options** tab.

3 In the **Capacity display units** drop-down menu, select the option you want.
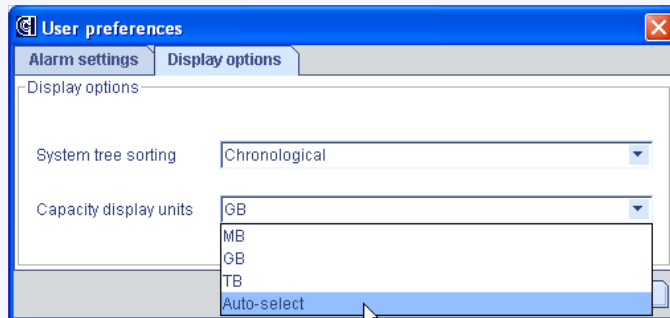
4 Click **OK**.

Changing the Main Window Appearance

You can choose to remove the tool bar and status bar from the main Adaptec Storage Manager window to save space on-screen. You can also choose to turn off the Tool Tips that automatically appear when you place your cursor over on-screen items.

To change the appearance of the main window, in the menu bar select **View.** The options in the View menu are toggle switches, which means that they can be selected and deselected by clicking on them.

Customizing the Adaptec Storage Manager Agent

The Adaptec Storage Manager agent's default settings are suitable for most storage spaces. (See page 16 for more information about the agent.) However, you can customize the agent on any system by:

- Setting the agent to broadcast events on that system to all logged-in users. See the following section.

- Changing the operating system event log setting for that system. See page 56.

- Changing the frequency and duration of the alarm, or choose to disable the alarm for that system. See page 57.

- Changing to agent base port number on that system. See page 58.

Any changes you make to the agent settings affect the selected system only and are not applied to all systems in your storage space.

Broadcasting Event Alerts from a System

You can set the Adaptec Storage Manager agent to send event alerts about a specific system to all users who are logged into your storage space network. You might want to do this if your storage space isn't managed by a dedicated person, or if that particular system is off-site or isn't connected to a monitor.

Event alerts signal to everyone working on the storage space that technical assistance is required for that system.

For more information, see *Broadcasting Event Alerts to Users* on page 95.

Changing a System's Event Log Setting

By default, all Warning- and Error-level events on a system are recorded in the operating system event log.

To disable operating system event logging on a system:

1 Click the **Configure** button, select the system you want, then click **General Settings**.

   The Adaptec Storage Manager Agent General Settings window opens for that system. (See Step 1 on page 57.)

2 Deselect **Save events in OS event log**.

3 Click **Save changes**.

4 Restart Adaptec Storage Manager to apply the new setting.

Changing a System's Audible Alarm Settings

Warning- and Error-level events on a system (see page 82) trigger an audible alarm, a series of beeps which sound every five minutes until the event is resolved.

You can change the frequency and duration of the alarm, or choose to disable the alarm on any system. For information about using the audible alarm, see page 96.

To change alarm settings on a system:

1   Click the **Configure** button, select the system you want, then click **General Settings**.
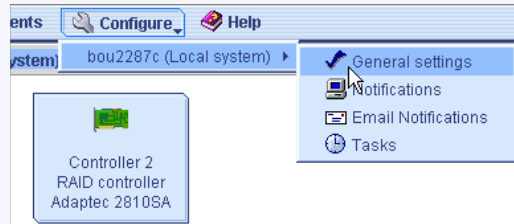
The Adaptec Storage Manager Agent General Settings window opens for that system.
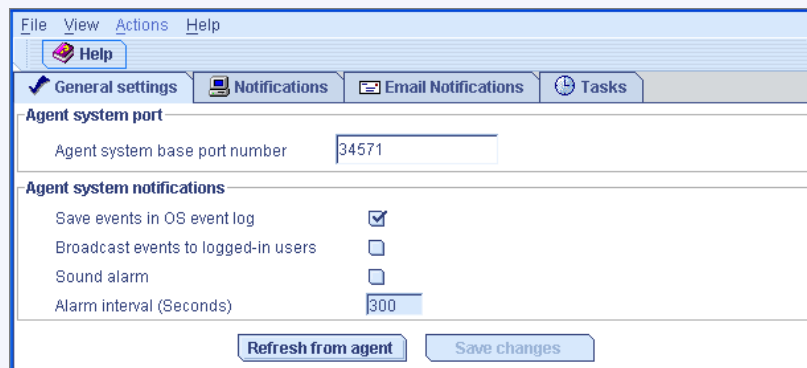
2   Edit the alarm settings as required. (Select or deselect **Sound alarm**; change the alarm interval time.)

⚠ **Caution:** If you disable the alarm, no audible signal will sound on that system when a Warning- or Error-level event occurs.

3   Click **Save changes**.

4   Restart Adaptec Storage Manager to apply the new settings.

Changing a System's Agent Base Port Number

Adaptec Storage Manager uses four consecutive ports to access remote systems: 34571, 34572, 34573, and 34574. The default port number for the agent is 34571. If your system has a conflict with these ports, change the base port to a different port number.

To change the agent base port number:

1   Click the **Configure** button, select the system you want, then click **General Settings**.

The Adaptec Storage Manager Agent General Settings window opens for that system. (See Step 1 on page 57.)

2   Enter a new agent system base port number.

3   Click **Save changes**.

4   Restart Adaptec Storage Manager *and* the Adaptec Storage Manager agent to apply the new setting.

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Part II: Using Adaptec Storage Manager

Managing Logical Drives and Hot Spares

Protecting Your Data

Monitoring Your Storage Space

Managing Tasks

Working with Display Groups

Managing Controllers and Disk Drives

Solving Problems

Configuring SNMP Support

Managing Logical Drives and Hot Spares

6

In this chapter...

This chapter explains how to manage logical drives and hot spares associated with Adaptec RAID controllers.

To create a logical drive, see *Building Your Storage Space* on page 39.

Understanding Logical Drives

A logical drive is a group of physical disk drives that appears to your operating system as a single drive that can be used for storing data.

A logical drive can comprise one or more disk drives and can use part or all of each disk drive's capacity.

It is possible to include the same disk drive in two different logical drives by using just a portion of the space on the disk drive in each, as shown in the following figure.
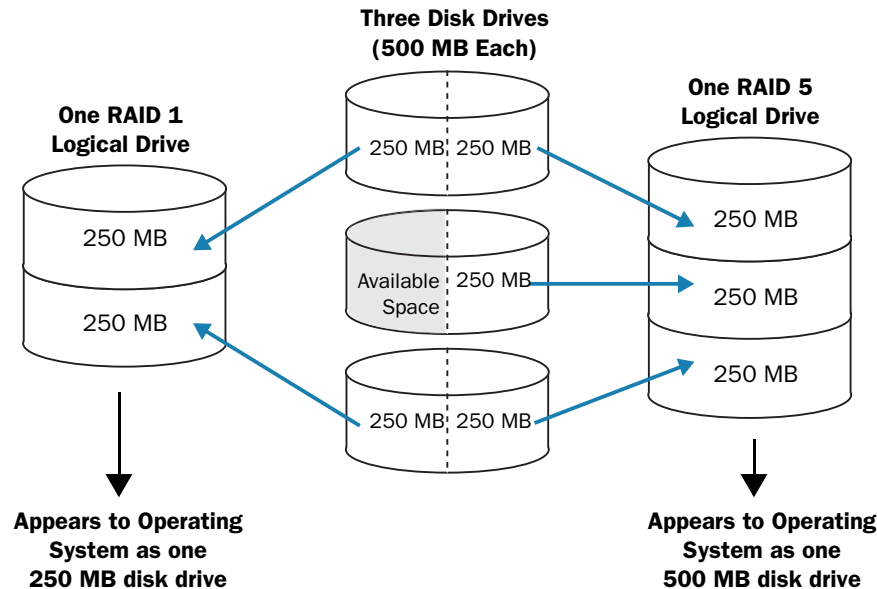
Disk drive space that has been assigned to a logical drive is called a *segment*. A segment can include all or just a portion of a disk drive's space. A disk drive with one segment is part of one logical drive, a disk drive with two segments is part of two logical drives, and so on. A segment can be part of only one logical drive. When a logical drive is deleted, the segments that comprised it revert to available space (or *free segments*).

A logical drive can include redundancy, depending on the RAID level assigned to it. (See *Selecting the Best RAID Level* on page 136 for more information.)

Once a logical drive has been created, you can change its RAID level or increase its capacity to meet changing requirements. You can also protect your logical drives by assigning one or more hot spares to them. (See page 74 for more information.)

Creating Logical Drives

For basic instructions for creating logical drives, see *Building Your Storage Space* on page 39.

This section describes three additional scenarios for creating logical drives:

● Setting the size of a new logical drive (see the following section)

● Including different-sized disk drives in a logical drive (see page 63)

● Creating a logical drive using available *segments* of disk drives (see page 64)

Setting the Size of a Logical Drive

As described in Step 6 on page 44, Adaptec Storage Manager automatically sets the size of a new logical drive to maximize the capacity of the disk drives that it comprises. However, you can choose to set the size for a new logical drive. You may want to do this to maximize your available disk drive space, or allocate available space to more than one logical drive.

To set the size of a logical drive:

1 Complete Steps 1 through 6 in *Custom Configuration (Advanced)* on page 42.

2 Click **Advanced Settings**.

The maximum size of the logical drive appears in the Size (GB) box.

3 Enter the new size for the logical drive. The size you enter must be less than or equal to the maximum size.

4 Click **Next**.

5 Review the logical drive settings, click **Apply**, then click **Yes**.

Adaptec Storage Manager builds the logical drive. The configuration is saved in the Adaptec controller and in the physical drives.

If the disk drives you used to create this logical drive have available space left over, you can use them to create a new logical drive (see page 64), or to expand an existing logical drive (see page 70).

Including Different-sized Disk Drives in a Logical Drive

You can combine disk drives of different sizes in the same logical drive. If the logical drive includes redundancy, however, the size of each segment can be no larger than the size of the smallest disk drive. (See *Selecting the Best RAID Level* on page 136 for more information about redundancy.)

To create a logical drive with disk drives of different sizes, follow the instructions in *Building Your Storage Space* on page 39. When the logical drive is created, it appears similar to the example in the next figure, where a RAID 5 logical drive includes two 16.95 GB disk drives and two 9.766 GB disk drives.
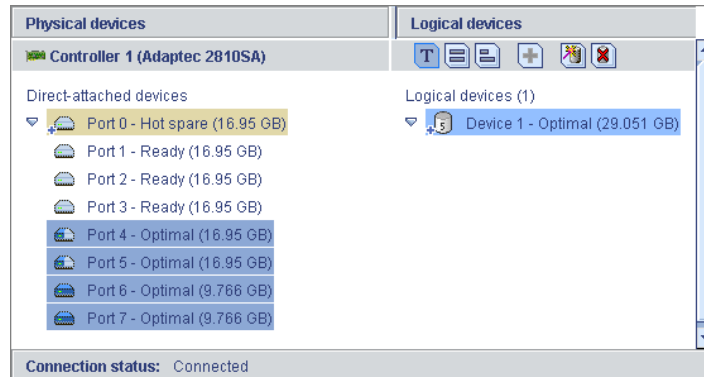
The Full Size Capacity View of the same RAID 5 logical drive shows that the two larger disk drives still have available space (free segments, indicated in light-blue) that is not part of a logical drive.
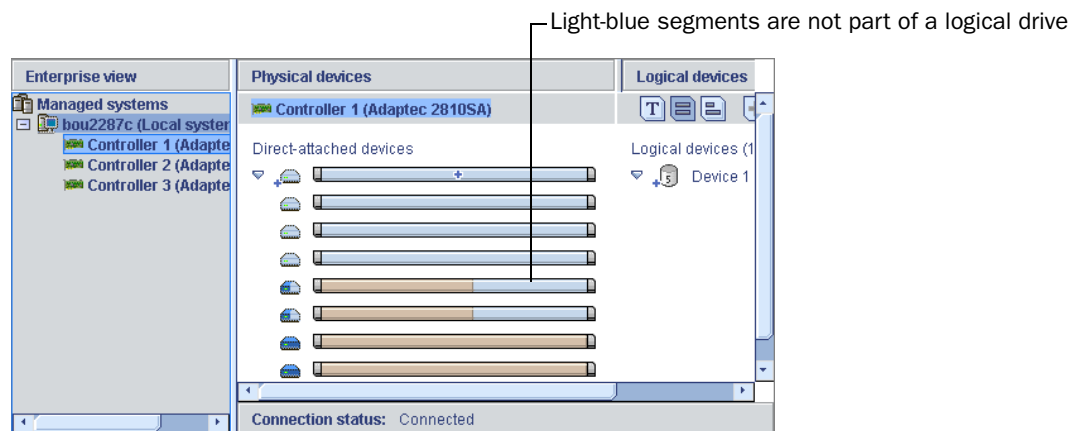
You can include a disk drive's available space in a new logical drive (see page 64), or add it to an existing logical drive (see page 70).

Creating a Logical Drive Using Available Space

Free segments on a disk drive can be used to create a new logical drive. (A segment can only be used in one logical drive at a time.)

To create a logical drive using free segments on disk drives:

1 Complete Steps 1 through 5 in *Custom Configuration (Advanced) on page 42*.

2 In the Physical Devices panel, select the disk drives and/or free disk drive segments you want to use in the logical drive.

In this example, two free disk drive segments (indicated in blue) are used to create a RAID 1 logical drive.
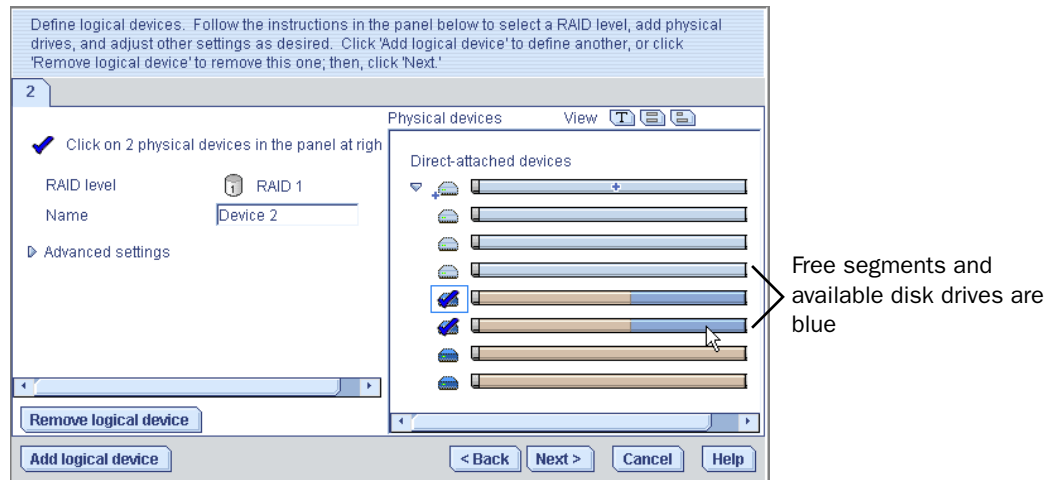
3 Click **Next**.

4 Review the logical drive settings.

5 Click **Apply**, then click **Yes**.

Adaptec Storage Manager builds the logical drive. The configuration is saved in the Adaptec controller and in the physical drives.

Fine-tuning Logical Drives

You can fine-tune a new or existing logical drive to meet your needs by adjusting the Advanced settings described in this section. (Not all options are available for all controllers or all RAID levels.)

Note: The default settings in Adaptec Storage Manager are optimal for most users and storage spaces. Only advanced users should change the settings described in this section.

To fine-tune a logical drive:

1 Open the list of Advanced settings.

If you are creating a *new* logical drive, follow the instructions in Step 6 on page 44.

If you are modifying an *existing* logical drive:

a In the Enterprise View, click the controller associated with the logical drive.

b In the Logical Devices View, click the logical drive.

c In the menu bar, select **Actions**, then click **Expand or change logical device**.

d Click **Next**, then click **Advanced settings**.

Modify the available settings as required for your logical drive (not all options are available for all controllers or all RAID levels):

- Logical drive size (see page 62)
- Stripe size (see the following section)
- Write cache (see page 66)
- Read cache (see page 66)
- Initialize priority (see page 66)
- Initialize method (see page 67)

2 Click **Next**.

3 To apply the changes immediately, click **Apply**.

To schedule the changes for later, click **Schedule**, then set the date and time. (For more information, see *Scheduling a Task* on page 99.)

Changing the Stripe Size

The *stripe size* is the amount of data (in KB) written to one partition before the controller moves to the next partition in a logical drive.

Stripe size options vary, depending on your controller. Normally, the default stripe size provides the best performance.

For RAID 6 and RAID 60 logical drives, the more disk drives there are in the logical drive, the fewer the stripe size options.

Changing the Write Cache Setting

The *write cache* setting determines when data is stored on a disk drive and when the controller communicates with the operating system.

- **Disabled (write-through)**—The controller sends (or *writes*) the data to a disk drive, then sends confirmation to the operating system that the data was received. Use this setting when performance is less important than data protection.

- **Enabled (write-back)**—The controller sends confirmation to the operating system that the data was received, then writes the data to a disk drive. Use this setting when performance is more important than data protection and you aren't using a battery-backup cache. *Enabled* is the default setting.

- **Enabled (write-back) when protected by battery**—The controller sends confirmation to the operating system that the data was received, then writes the data to a disk drive. Use this setting if you are using a battery-backup cache and performance is more important than data protection.

Note: (*RAID 10, 50, and 60 only*) All logical drives within a RAID 10/50/60 logical drive must have the same write cache setting—either all write-through or all write-back.

To quickly change the write cache setting, click the logical drive you want; then, in the menu bar, select **Actions**, click **Configure write cache**, then select **Enabled** or **Disabled** as required.

Changing the Read Cache Setting

When *read caching* is enabled, the controller monitors the read access to a logical drive and, if it sees a pattern, pre-loads the cache with data that seems most likely to be read next, increasing performance.

- **Enabled**—The controller transfers data from the logical drive to its local cache in portions equal to the stripe size. Use this setting for the best performance when workloads are steady and sequential. *Enabled* is the default setting.

- **Disabled**—The controller transfers data from the logical drive to its local cache in portions equal to the system I/O request size. Use this setting for the best performance when workloads are random or the system I/O requests are smaller than the stripe size. (For more information about system I/O requests, refer to your operating system documentation.)

To quickly change the read cache setting, click the logical drive you want; then, in the menu bar, select **Actions**, click **Configure read cache**, then select **Enabled** or **Disabled** as required.

Changing the Initialize Priority

The Initialize Priority setting determines the priority for the initialization of the logical drive. The default setting is *High*, which means that the logical drive is initialized as quickly as possible.

Changing the Initialize Method

The Initialize Method setting determines how a logical drive is *initialized* (prepared for reading and writing), and how long initialization will take. The settings are presented in order of slowest to fastest method.

● **Build**—(slowest) For RAID 1 logical drives, data is copied from the primary drive to the mirror drive; for RAID 5 logical drives, parity is computed and written. *Build* is the default setting.

  Adaptec Storage Manager performs build initializations in the background; you can use the logical drive immediately.

● **Clear**—Every block in the logical drive is overwritten, removing all existing data. You can't use the logical drive until the initialization is complete.

● **Quick**—(fastest) The logical drive is made available immediately. Quick initialization should be used for new physical disks *only*.

Verifying Logical Drives

To ensure that there are no data problems on your logical drives, it is important to *verify* them. When you verify a logical drive, Adaptec Storage Manager checks it for inconsistent or bad data and then fixes any problems. (You can also choose to verify a logical drive without fixing it.)

Logical drives with no redundancy (for instance, RAID 0 logical drives) do not need to be verified.

In Adaptec Storage Manager, logical drive verification can occur in different ways, depending on your controller:

● **Automatic verification**—If your controller supports build initialization, Adaptec Storage Manager automatically verifies all new redundant logical drives. No manual verification is required.

  To see if your controller supports build initialization, right-click the controller in the Enterprise View and click **Properties**.

● **Manual verification**—If your controller doesn't support build initialization, a Warning-level event notice appears in the Event Viewer prompting you to verify a logical drive before you begin to use it. To verify a logical drive manually, see *Verifying and Fixing a Logical Drive* on page 68.

● **Background verification**—If your controller supports background consistency check, Adaptec Storage Manager continually and automatically checks your logical drives once they're in use.

  To see if your controller supports background consistency check, right-click the controller in the Enterprise View, then click **Properties**. To enable or disable background consistency check, see page 69.

  Note: If your controller doesn't support background consistency check, Adaptec highly recommends that you verify your logical drives weekly, following the instructions in *Verifying and Fixing a Logical Drive* on page 68.

Verifying and Fixing a Logical Drive

Note: To verify a logical drive without fixing it, see page 69.

While Adaptec Storage Manager verifies and fixes a logical drive, you can't complete any other tasks on the controller. Because the verification can take a long time to complete, you may want to schedule it as a task to be completed overnight or on a weekend.

To verify and fix a logical drive:

1   In the Enterprise View, click the controller associated with the logical drive.

2   In the Logical Devices View, click the logical drive.

3   In the menu bar, select **Actions**, then click **Verify with fix**.
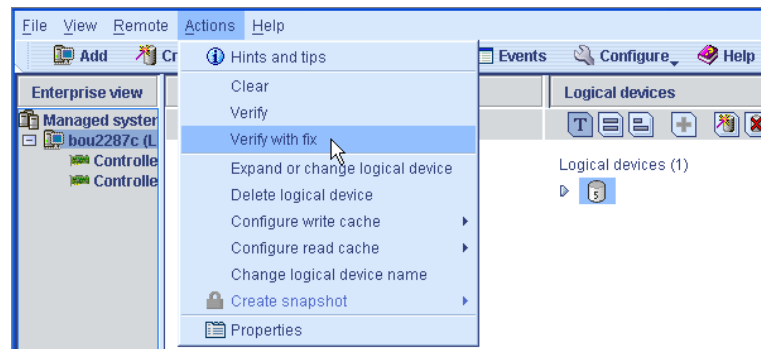
4   To begin the verification immediately, click **Yes**.

To schedule the verification, click **Schedule**, then set the date and time. You can also choose to set the verification as a recurring task. (For more information, see page 99.)

Note: Don't power off the system while the verification is in progress. If you do, the verification will stop.

While the verification is in progress, the logical device is shown as an animated icon (as shown at right) to indicate that the task is in progress.

When the verification is complete, an event notice is generated in the local system's event log (and broadcast to other systems, if you have event notification set up—see *Using Event Notifications to Monitor Status* on page 83).

You can now continue working on the controller.

Verifying a Logical Drive (Without Fix)

Note: To verify *and fix* a logical drive, see page 68.

While Adaptec Storage Manager verifies a logical drive, you can't complete any other tasks on the controller associated with that logical drive. Because verification takes a long time to complete, you may want to schedule it as a task to be completed overnight or on a weekend.

To verify a logical drive:

1 In the Enterprise View, click the controller associated with the logical drive.

2 In the Logical Devices View, click the logical drive.

3 In the menu bar, select **Actions**, then click **Verify**.
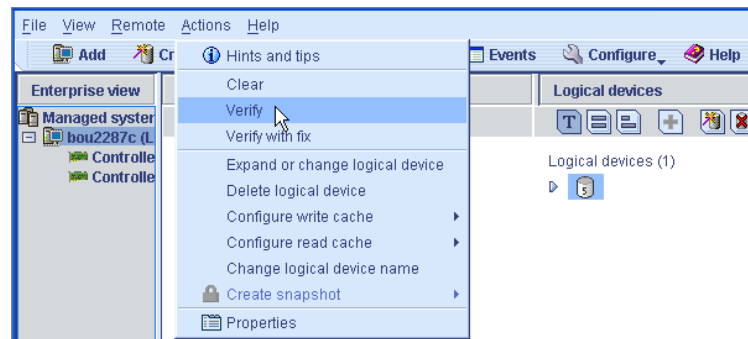
4 To begin the verification immediately, click **Yes**.

To schedule the verification for later, click **Schedule**, set the date and time, then click **Apply**. You can also set the verification to recur. (For more information, see page 99.)

Note: Don't power off the system while the verification is in progress. If you do, the verification will stop.

While the verification is in progress, the logical device is shown as an animated icon (as shown at right) to indicate that the task is in progress.

When the verification is complete, an event notice is generated in the local system's event log (and broadcast to other systems, if you have event notification set up—see *Using Event Notifications to Monitor Status* on page 83).

You can now continue working on the controller.

Enabling/Disabling Background Consistency Check

If your controller supports background consistency check, Adaptec Storage Manager continually and automatically checks your logical drives once they're in use. (To see if your controller supports background consistency check, right-click the controller in the Enterprise View, then click **Properties**.)

To enable or disable background consistency check:

1 In the Enterprise View, click the controller.

2 In the menu bar, select **Actions**, then click **Enable (Disable) background consistency check**.

The controller is updated with the new setting.

Increasing the Capacity of a Logical Drive

You can add more disk drive space to a logical drive to increase its capacity (or *expand* it).

Note: The maximum size of a logical drive varies by controller. Refer to your controller's documentation for more information.

The expanded logical drive must have a capacity that's greater than or equal to the original logical drive.

To increase the capacity of a logical drive:

1   In the Enterprise View, click the controller associated with the logical drive.

2   In the Logical Devices View, click the logical drive.

3   In the menu bar, select **Actions**, then click **Expand or change logical device**.
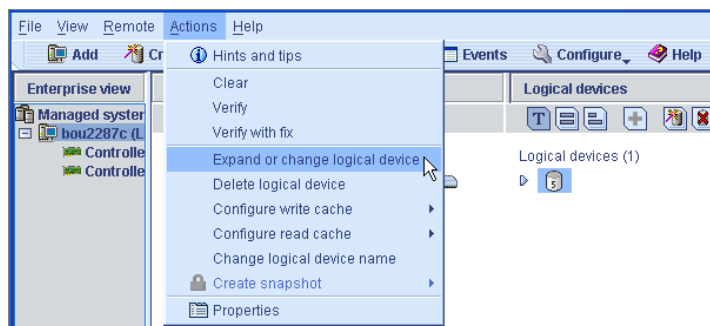
A wizard opens to help you modify the logical drive.

4   Click **Next**.

5   Click on the disk drive(s) or disk drive segments you want to add to the logical drive.
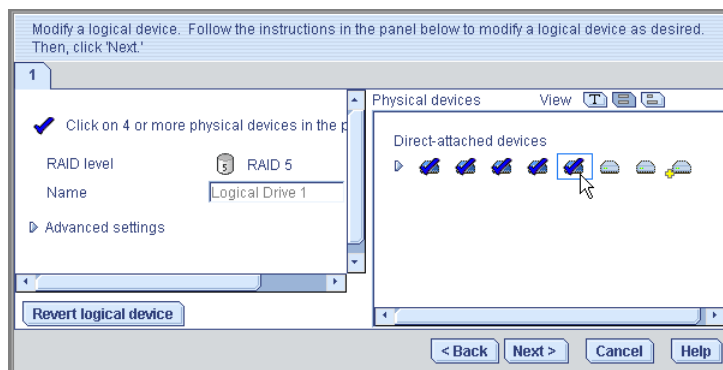
If you want to remove a specific disk drive or segment and replace it with another one (for instance, replace a smaller disk drive with a larger one), click on the disk drive you want to remove.

An X indicates that the selected disk drive will be removed from the logical drive, and you are prompted to select another disk drive (of greater or equal size) to replace it.
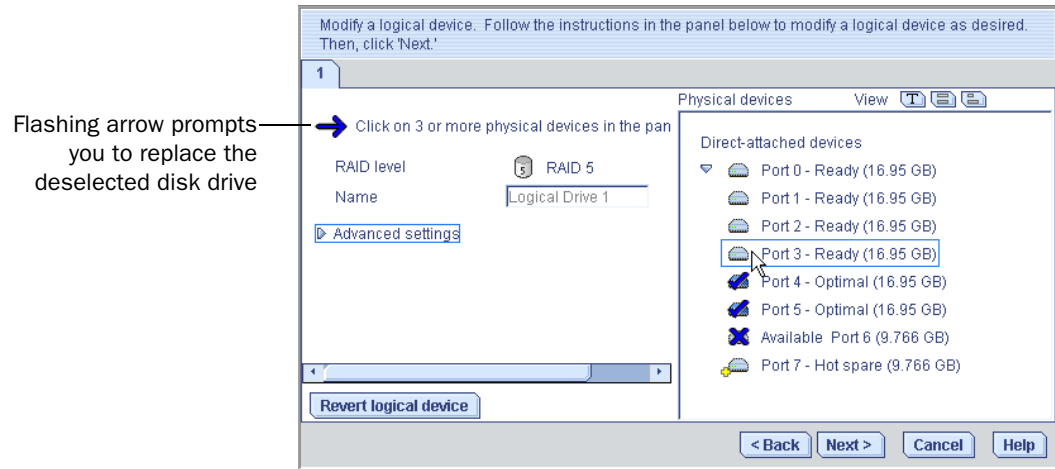
Flashing arrow prompts you to replace the deselected disk drive

6   Modify the Advanced Settings, if required. (See *Fine-tuning Logical Drives* on page 65.)

7   Click **Next**.

8   Review the new logical drive settings. To make changes, click **Back**.
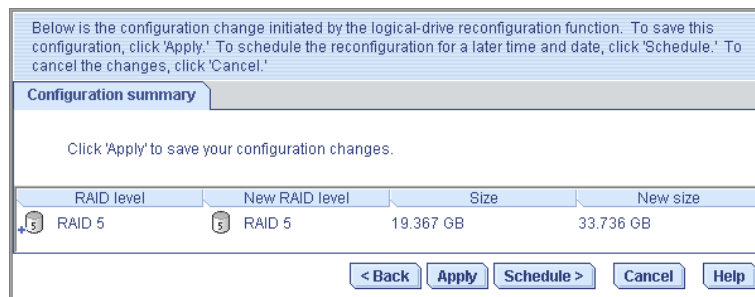
Note: Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system.

9   To update your logical drive immediately, click **Apply**, then click **Yes**.

    To schedule the changes for later, click **Schedule**, set the date and time, then click **Apply**. (For more information, see page 99.)

Extending a Partition on a Logical Drive

(Windows 2003, Windows XP, and Windows 2000 only) If you have expanded a logical drive, you can extend the partition on that logical drive to use the newly added space. Refer to your operating system instructions for more information.

Changing the RAID Level of a Logical Drive

As your requirements change, you can change the RAID level of your logical devices to suit your needs. You may want to do this to add redundancy to protect your data, or improve data availability for speedier access to your data. See *Selecting the Best RAID Level* on page 136 for more information.

Changing the RAID level normally requires one or more disk drives to be added to or removed from the logical drive. Adaptec Storage Manager won't allow you to continue unless you have the right number of disk drives available.

To change the RAID level of a logical drive:

1   In the Enterprise View, click the controller associated with the logical drive.

2   In the Logical Devices View, click the logical drive.

3   In the menu bar, select **Actions**, then click **Expand or change logical device** (see page 70).

A wizard opens to help you change the RAID level.

4   Select a new RAID level, then click **Next**. Only valid options are offered.

In the example shown in this section, a RAID 1 logical device is being changed to a RAID 5 logical device.
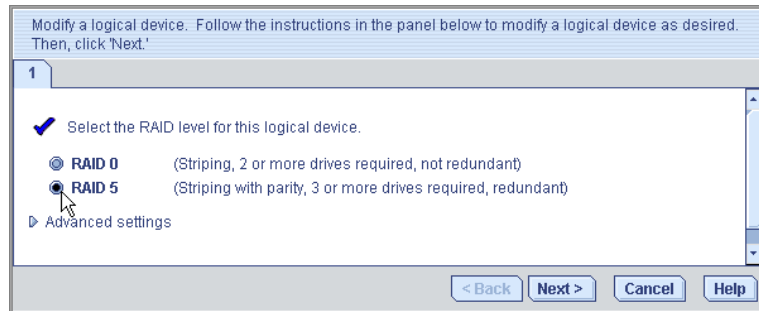
5   In the Logical Devices panel, select the disk drives you want to use in the modified logical drive.

Adaptec Storage Manager prompts you to select the correct number of disk drives.
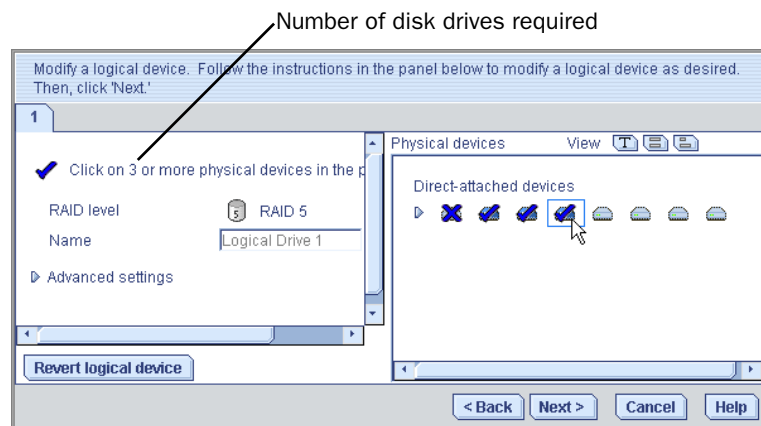
If you want to remove a specific disk drive and replace it with another one (for instance, replace a smaller disk drive with a larger one), click on the disk drive you want to remove. An X indicates that the selected disk drive will be removed from the logical drive.

6 Modify the Advanced Settings, if required. (See *Fine-tuning Logical Drives* on page 65.)

7 Click **Next**.

8 Review the new logical drive settings. To make changes, click **Back**.

Note: Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system.

9 To update your logical drive immediately, click **Apply**, then click **Yes**.

To schedule the changes for later, click **Schedule**, set the date and time, then click **Apply**. (For more information, see page 99.)

Deleting a Logical Drive

⚠ **Caution:** When you delete a logical drive, you lose all data stored on that logical drive.

To delete a logical drive:

Ensure that you no longer need the data stored on the logical drive.

1 In the Enterprise View, click on the controller associated with the logical drive.

2 In the Logical Devices View, click the logical drive.

3 In the menu bar, select **Actions**, then click **Delete logical device**.
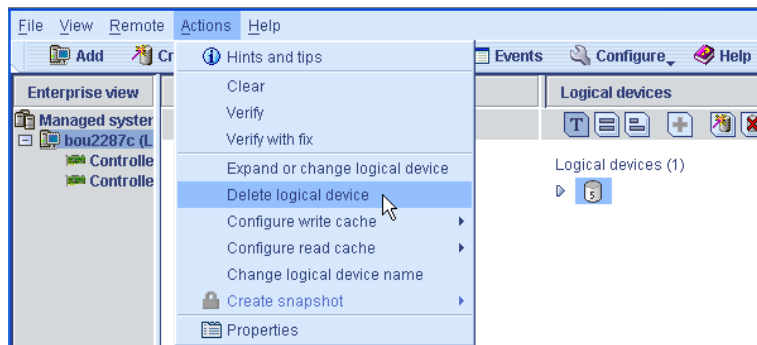
4 When prompted, click **Yes** to delete the device, or **No** to cancel the deletion.

If you click **Yes**, the logical device is deleted. The disk drives or drive segments included in the logical device become available, and can be used to create a new logical drive (see page 64), or to expand an existing logical drive (see page 70).

Working with Hot Spares

A *hot spare* is a disk drive that automatically replaces any failed drive in a logical drive, and can subsequently be used to rebuild that logical drive. (For more information on recovering from a disk drive failure, see page 116.)

Hot Spare Limitations

● You can't create a hot spare for RAID 0 logical drives, simple volumes, or spanned volumes.

● You can't create a hot spare from a disk drive that is already part of a logical drive.

● You should select a disk drive that is at least as big as the largest disk drive it might replace.

Dedicated Spare or Global Spare?

A *global* hot spare is not assigned to a specific logical drive and will protect any logical drive on the controller (except RAID 0 logical drives). You can designate a global hot spare before or after you build logical drives on a controller; you can also designate a global hot spare while you're creating a logical drive. To designate a global hot spare, see the following section.

A *dedicated* hot spare is assigned to one or more specific logical drives and will only protect those logical drives. You must create the logical drive before you can assign a dedicated hot spare. To assign a dedicated hot spare, see page 75.

Designating a Global Hot Spare

This section describes how to designate a global hot spare before or after you build a logical drive.

Note: To designate a global hot spare while you're creating a logical drive, see Step 6 on page 44.

To designate a global hot spare:

1 In the Enterprise View, click the controller on which you want a global hot spare.

2 In the Physical Devices View, click the disk drive you want to designate as a hot spare. (See *Hot Spare Limitations* for help selecting a disk drive.)

3 Click the **Create global hot-spare drive** button (shown at right).
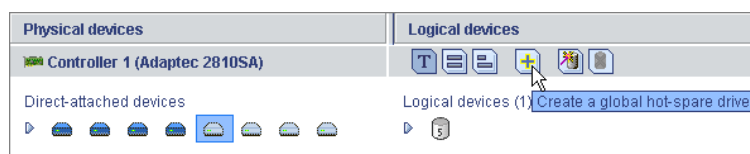
A plus sign appears beside the selected disk drive, indicating that it's designated as a hot spare. (A yellow plus sign indicates an error. See *What Do the Hot Spare Icons Mean?* on page 76 for help solving the problem.)
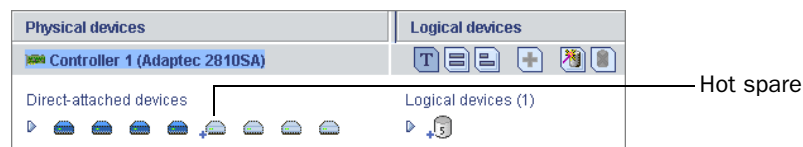
Any other logical drives created on the controller will automatically be protected by that global hot spare.

Assigning a Dedicated Hot Spare

A dedicated hot spare is assigned to one or more specific logical drives.

To assign a dedicated hot spare:

1   In the Enterprise View, click the controller on which you want a dedicated hot spare.

2   In the Physical Devices View, click the disk drive you want to designate as a hot spare. (See *Hot Spare Limitations* on page 74 for help selecting a disk drive.)

3   In the menu bar, select **Actions**, then click **Create dedicated hot-spare drive for**, then click the name of the logical drive. (In this example, the logical drive name is "Clients".)
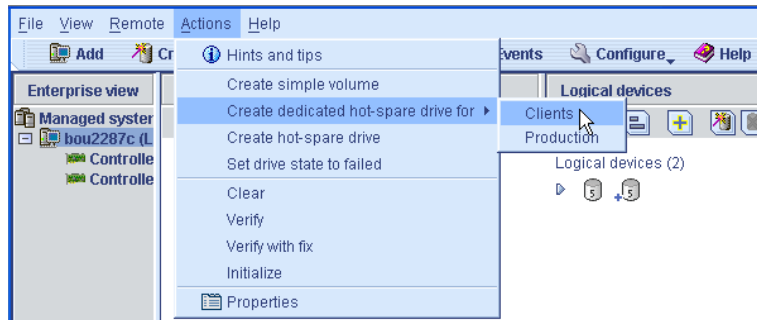
A plus sign appears beside the selected disk drive, indicating that it's designated as a dedicated hot spare. (A yellow plus sign indicates an error. See *What Do the Hot Spare Icons Mean?* on page 76 for help solving the problem.)

4   To use the same dedicated hot spare to protect another logical drive, repeat Step 2 and Step 3.

What Do the Hot Spare Icons Mean?

Icon	Explanation	Action
	Healthy global or dedicated hot spare	No action required.
	Error on hot spare: ● Hot spare is not assigned to any logical drives	● Create at least one logical drive on the same controller
	● Hot spare is too small to protect the logical drive(s) it's assigned to	● Designate larger disk drive as hot spare
	● Global hot spare was designated before any logical drives were built	● Create at least one logical drive on the same controller
	Hot spare has been built into a logical drive after disk drive failure	Designate replacement or other available disk drive as new hot spare; remove 'hot spare' designation from disk drive (see *Removing a Hot Spare*)

Removing a Hot Spare

You can remove a global hot spare or dedicated hot spare. You may want to do this to:

● Make disk drive space available for a logical drive.

● Make a dedicated hot spare into a global hot spare or a global hot spare into a dedicated hot spare.

● Remove the 'hot spare' designation from a disk drive that is no longer being used as a hot spare. (When a hot spare is built into a logical drive after a disk drive failure, it retains its 'hot spare' designation even though it can no longer protect the logical drives it's assigned to. See *Recovering from a Disk Drive Failure* on page 116 for more information.)

To remove a hot spare:

1 In the Enterprise View, click the controller associated with the hot spare.

2 In the Physical Devices View, click the hot spare.

3 In the menu bar, select **Actions**, then click **Delete hot-spare drive** or **Delete dedicated hot-spare drive**.

The hot spare is deleted, and the disk drive becomes available for other uses in your storage space.

Protecting Your Data

7

In this chapter...

This chapter describes two additional methods of protecting the data on your storage space, snapshot and copyback.

Creating a Snapshot

Note: Snapshot is an upgrade feature; if the snapshot feature is locked, see *Adding Enhanced Features* on page 19 for information on purchasing a feature key.

A *snapshot* is a frozen image of a logical drive at a particular point in time. You can copy the data on one logical device to another logical device by creating a snapshot. You may want to do this if you want to back up your data to tape, clone a drive, or copy the data to multiple servers.

There are two snapshot options:

● **Snapshot Backup**—Copies all data on a logical drive so that it can be moved from one server to another. See the following sections.

● **Snapshot Nobackup**—Creates a temporary copy of a logical drive for tape backup and reference (uses less system resources than Snapshot Backup).

Snapshot Limitations

● You can create a snapshot of only one controller at a time; you can't create a snapshot that includes multiple controllers.

● The *source* logical drive (the logical drive that you're copying) and the *target* logical drive (the logical drive that you're copying to) must be on the same controller.

● The source and target logical drives may have the same or different RAID levels.

● You can create up to four snapshots on each controller.

● The size of the target logical drive must be greater than or equal to the size of the source logical drive.

● You can't modify any information on a snapshot.

Creating a Snapshot with Backup

To create a snapshot with backup:

1 In the Logical Devices View, right-click the logical drive you want to copy.

2 Select **Create snapshot**, click **with backup to**, then click the name of the target logical drive.

The snapshot is created on the target logical drive. The snapshot appears in Adaptec Storage Manager with a camera icon beside it, as shown at right.

Creating a Snapshot Without Backup

To create a snapshot without backup:

1 In the Logical Devices View, right-click the logical drive you want to copy.

2 Select **Create snapshot**, click **without backup to**, then click the name of the target logical drive.

The snapshot is created on the target logical drive. The snapshot appears in Adaptec Storage Manager with a camera icon beside it, as shown at right.

3 Use an operating system-level or third-party data backup tool to move the snapshot onto a tape drive or other server.

Deleting a Snapshot

When a snapshot is no longer needed, you can delete it from Adaptec Storage Manager.

To delete a snapshot:

1 In the Logical Devices View, right-click the snapshot you want to delete.

2 Click **Remove snapshot**.

The snapshot is deleted.

Enabling Copyback

When a logical drive is rebuilt using a hot spare (see page 117), data from the failed drive is transferred to the hot spare. When *copyback* is enabled, data is moved back to its original location once the controller detects that the failed drive has been replaced. Once the data is copied back, the hot spare becomes available again.

Copyback is disabled by default.

To enable copyback, right-click the controller, then click **Enable or Disable copy back mode**. (The copyback setting is a toggle switch.)

Monitoring Your Storage Space 8

In this chapter...

This chapter describes how Adaptec Storage Manager helps you monitor your storage space.

Monitoring Options

Adaptec Storage Manager provides many ways to monitor the status of your storage space:

- **Event Viewer**—The main window of Adaptec Storage Manager includes an Event Viewer that provides at-a-glance status information about activity occurring in your storage space. (See the following section.)

- **Status Icons**—Three basic icons (information, warning, and error) appear in the Event Viewer and in the main Adaptec Storage Manager window to help you quickly identify problems. (See page 82.)

- **Notification Manager** and **Email Notification Manager**—Notification utilities help you monitor these activities on local and remote systems (see page 83 and page 89):

  - Progress of scheduled tasks, such as logical drive verifications.

  - Changes in the status of the physical components of your storage space, such as disk drives.

  - Changes to the local system, such as the expansion of a logical drive expansion or the creation of a hot spare.

- **Audible Alarm**—A series of beeps sounds whenever a serious event occurs on your storage space. (See page 96.)

- **Properties Button**—You can check the status of any component in your storage space by using the Properties button. (See page 97.)

Checking Activity in Your Storage Space

From your local system, you can see status information and messages about the activity (or *events*) occurring in your storage space by looking at the Event Viewer, which displays a log of events. Status is indicated by an icon in the left-hand column, as shown in the following figure. (The icons are described in *What Do the Status Icons Mean?* on page 82.)

Date	Time	Source	Description
05/05/2005	04:21:50 PM PDT	bou2287c	Bus rescan complete: controller 1.
05/05/2005	04:21:44 PM PDT	bou2287c	Started the bus rescan: controller 1.
05/05/2005	04:20:36 PM PDT	bou2287c	Failed drive: controller 1, port 0 (Vendor: Adapt...
05/05/2005	04:20:31 PM PDT	bou2287c	Set drive to failed: controller 1, port 0.
05/05/2005	09:36:18 AM PDT	bou2287c	Deleted logical device: controller 1, logical dev...
05/05/2005	09:16:13 AM PDT	bou2287c	Verify complete: controller 1, logical device 1 ("...
05/05/2005	09:15:16 AM PDT	bou2287c	Verifying: controller 1, logical device 1 ("Device...
05/05/2005	09:15:16 AM PDT	bou2287c	Added logical device: controller 1, logical devic...
05/05/2005	09:15:10 AM PDT	bou2287c	Successfully applied the new configuration: co...

Double-click any event to see more details in an easier-to-read format. Click **Next** to see the next event in the list.
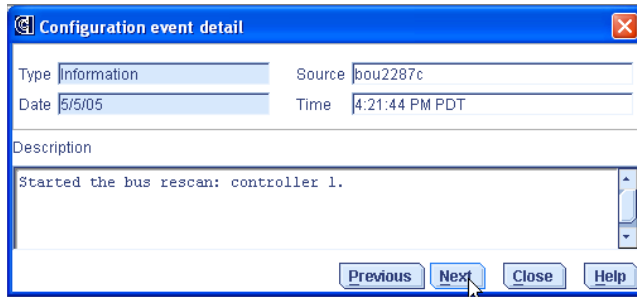
You can monitor activity on, and the status of, remote systems from the local system by using Adaptec Storage Manager's two notification utilities to broadcast messages—the Notification Manager (see page 83) and the Email Notification Manager (see page 89).

Viewing the Full List of Events

To open a full-screen version of the event log, click the **Events** button (shown at right).

To make it easier to find a specific event, click on the column heads to sort the events. (Sort events by status icons to help you find specific Error- or Warning-level events.

Clearing the Event Log

To clear the event log of all recorded activity:

1 In the menu bar of the main Adaptec Storage Manager window, click **Actions**, select **Agent actions**, then click **Clear the configuration event log**.

2 Click **Yes** to clear the log.

The log is cleared, except for one event reporting that the log was cleared.

What Do the Status Icons Mean?

Adaptec Storage Manager indicates event status with icons. This table lists the three categories, or types, of events based on severity.

Icon	Status	Examples
	Information	The local system successfully connected to a remote system; a logical drive was created; a hot spare was created; a logical drive was deleted.
	Warning	A logical drive is in a degraded state; a disk drive is being rebuilt.
	Error	A controller has failed; a logical drive has failed; a hot spare has failed; a disk drive within a logical drive has failed.

Warning- and Error-level icons appear next to components (such as systems and logical drives) affected by a failure or error, creating a trail, or *rapid fault isolation*, that helps you identify the source of a problem when it occurs. See *Identifying a Failed or Failing Component* on page 116 for more information.

Note: All Warning- and Error-level events also cause the audible alarm to sound. See page 96 for more information.

Using Event Notifications to Monitor Status

You can set up Adaptec Storage Manager to broadcast messages (or *notifications*) to selected remote systems and users when an event, such as the creation of a logical drive or the failure of a disk drive, occurs on the local system. (For more information about event types, see page 82.)

You can set up one or both of these types of notifications for any system in your storage space:

● **Event notifications**—Messages about a system are sent to the Event Viewer of other systems in your storage space. See the following section.

● **Email notifications**—Messages about a system are sent by email to specified users. See page 89.

Setting up Event Notifications

Event notifications are messages about events on one system that are sent to the Event Viewer of another system in your storage space. These messages, called *logged notifications*, can help you monitor activity on your entire storage space from a single local station, and are especially useful in storage spaces that include multiple systems running the Adaptec Storage Manager agent only.

Logged notifications include status information and identify which system (or *source*) an event occurred on. For instance, in this example, the Event Viewer indicates that a logical drive was added to a system named 'bra2380a' and then verified.

Logged notifications are *not* sent to all systems in your storage space. In the Notification Manager, you can specify which systems will send and receive logged notifications; then, you can add or delete systems as your storage space grows and changes.

Opening the Notification Manager and Adding Systems

This section describes how to set up event notifications for one system in your storage space. You must complete the tasks in this section for *each* individual system that you'll be monitoring with logged notifications.

To set up event notifications for a system:

1 Note this information for each system that will *receive* event notifications about the selected system:

● Host name or TCP/IP address

● TCP/IP port number (or the default, 34571)

2 In the Adaptec Storage Manager tool bar, click **Configure**, select the system you want, then click **Notifications**.
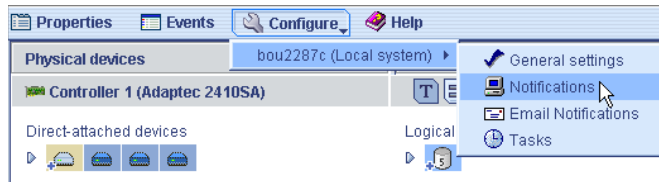
The Notification Manager opens on the Notifications tab of a new window. The local system is automatically included on the Notification List—by default, all local events are listed in the local Event Viewer.
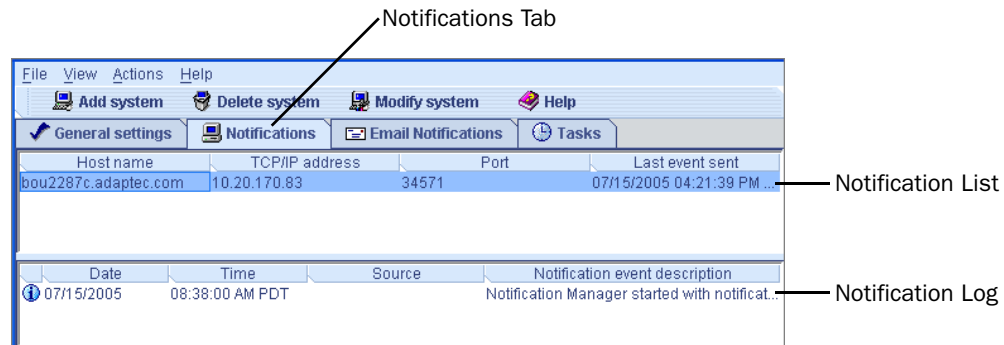
3 Add the names of the other systems in your storage space that will receive event notifications generated by this system to the Notification List:

a In the tool bar, click **Add system**.

b In the Add System window, enter the host name or TCP/IP address of the first system. If you are not using the default port number, 34571, enter the TCP/IP port. Then, click **Add**.
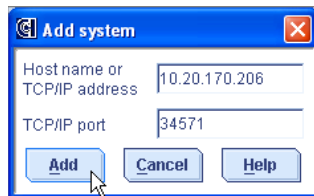
c If you want more than one system to receive the event notifications, repeat Step b as required.

d When done, click **Cancel** to close the Add System window.

The systems you added appear in the Notification List. Although you can't sort the list, you can reorganize the columns by clicking and dragging the column heads.

4 Close the Notifications window when you're done.

Note: You can access other utilities in this window, such as the Task Manager (see Chapter 9, *Managing Tasks*), by clicking their tabs.

5 Repeat Steps 1 to 4 for each system you want to monitor with event notifications.

Sending a Test Event

To ensure that a system is receiving logged notifications, you can send a test event.

To send a test event:

1 Open the Notification Manager. (See page 83.)

Note: You can also access the Notification Manager by selecting the system you want in the Enterprise View, then (on the menu bar) clicking **Actions > Agent actions > Configure > Notifications** tab.

2 In the Notification List, click on the system you want to send a test event to.

Note: You can only send a test event to one system at a time.

3 On the menu bar, select **Actions**, then click **Send test event**.
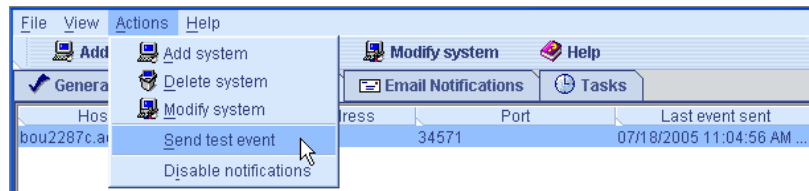
The test event is sent. A message appears indicating either that the test event was sent successfully or that the test failed. (Click **OK** to clear the message.)

If the test is successful, the receiving system beeps once, and its Event Viewer shows that a test event was received.

If the test fails:

a Ensure that the receiving system is powered on and running Adaptec Storage Manager.

b Open the receiving system's System Properties window (see Step 3 on page 86) and double-check the TCP/IP address and port number.

c Try sending the test event again.

Managing the Event Notification List

This section describes how to manage systems in the Notification List:

● To add a system to the Notification List, see page 83.

● To modify a system's connection information, see the following section.

● To remove a system from the Notification List, see page 86.

Modifying a System's Address or Host Name

If the TCP/IP information or host name of a system changes, update its properties in the Notification Manager.

Note: Does this system receive event notifications from more than one other system? Ensure you enter the updated information in the Notification Manager of all affected systems.

To modify system information:

1 Open the Notification Manager. (See page 83.)

2 In the Notification List, click on the system you want to modify.

3 In the System Properties window, enter the new information, then click **OK**.
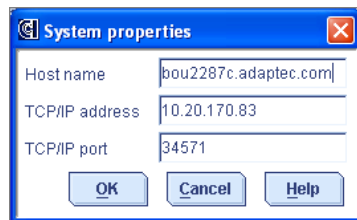
The Notification List shows the modified information.

Removing a System from the Notification List

You can remove any system (including the local system) from the Notification List. Once a system has been removed, logged notifications from the local system are no longer sent to it.

To remove a system from the Notification List:

1 Open the Notification Manager. (See page 83.)

2 In the Notification List, click on the system you want to remove.

3 In the tool bar, click **Delete system**.

4 Click **Yes** to confirm the deletion.

The system is removed from the Notification List.

Monitoring and Managing the Notification Log

The Notification Log displays status information and messages about the Notification Manager itself, such as whether notifications were sent successfully or not.

This section describes how to manage the Notification Log and use it to monitor the logged notifications being sent:

● Using the Notification Log (see the following section).

● Find the Notification Log files (see page 87).

● Clear the Notification Log (see page 88).

Using the Notification Log

By default, notification events are listed in the order they occurred, with the most recent event first. To make it easier to find a specific event, click on the column heads to sort the events. You can also reorganize the columns by clicking and dragging the column heads (see the figure on page 84).

The Notification Log uses icons to show the status of events. These icons also appear in the Event Viewer of the remote systems.

Icon	Status	Explanation and Solution
	Information	The Notification Manager successfully connected and sent the event. No action required.
	Error	The Notification Manager did not successfully connect to a system or send an event. Ensure that the correct host name and TCP/IP address of the receiving system is correct (see page 86).

Double-click on an event to see basic information about it. Click **Next** to see the next event in the list.
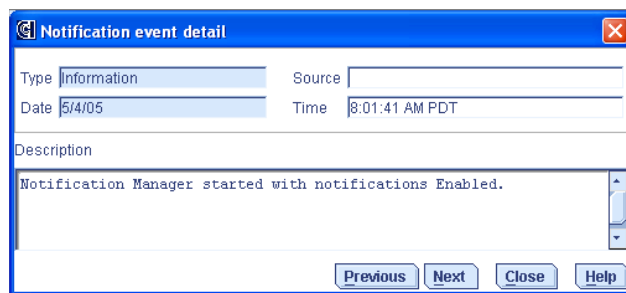
Finding the Notification Log Files

In addition to appearing in the Notification Log, notifications are saved in a log file named raidnot.log, which can be found in the top-level Adaptec Storage Manager folder.

The raidnot.log file has a maximum capacity of 200 kilobytes (KBs). When the capacity is exceeded, old events are copied into a file named raidnot.old, and a new raidnot.log file is created. If a raidnot.old file already exists, it is overwritten.
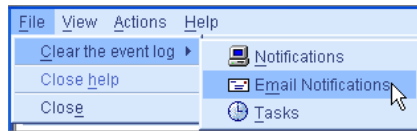
Clearing the Notification Log

To make it easier to monitor recent events, you can clear the Notification Log.

Note: Clearing the Notification Log doesn't erase the existing raidnot.log file (see page 87).

To clear the Notification Log:

1 Open the Notification Manager. (See page 83.)

2 In the menu bar, click **File**, select **Clear the event log**, then click **Notifications**.
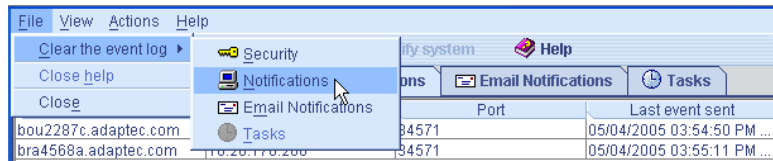
3 Click **Yes** to clear the log.

The log is cleared, except for one event reporting that the log was cleared.

Disabling Event Notifications

Event notifications are enabled by default. You can choose disable them, if required.

Note: If you disable event notifications, events will be generated but not broadcast—not even to the local system.

To disable event notifications:

1 Open the Notification Manager. (See page 83.)

2 In the menu bar, click **Actions**, then click **Disable notifications**.
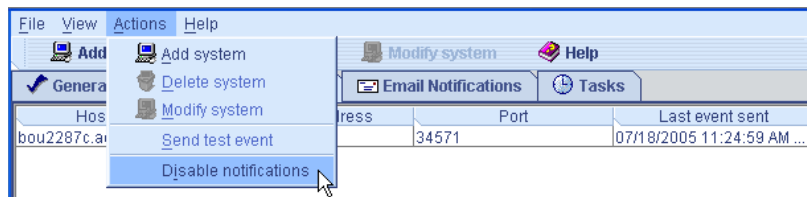
Event notifications are disabled. The Notifications tab (shown at right) shows the red 'disabled' icon.

Re-enabling Event Notifications

To re-enable event notifications, repeat steps 1 and 2 in *Disabling Event Notifications*, selecting Enable Notifications during Step 2.

Setting Up Email Notifications

Email notifications are email messages about events on a system in your storage space that are sent to specified users. Email notifications can help you monitor activity on your entire storage space from any location, and are especially useful in storage spaces that include multiple systems running the Adaptec Storage Manager agent only.

Only the users you specify receive email notifications. (See page 92.) You can specify which types of events generate email messages to which recipients to ensure that errors receive immediate attention from the right people.

In the Email Notification Manager, you can add and delete email recipients, and modify the types of email notices they receive, as your requirements change.

Opening the Email Notification Manager

This section describes how to set up email notifications for one system in your storage space. You must complete the tasks in this section for *each* individual system that you'll be monitoring with email notifications.

To set up email notifications:

1 Note this information:

- The address of your Simple Mail Transfer Protocol (SMTP) server (host name and domain, or TCP/IP address)

- The name and email address of each person who will receive email notifications

2 In the tool bar, click **Configure**, select the system you want, then click **Email Notifications**.
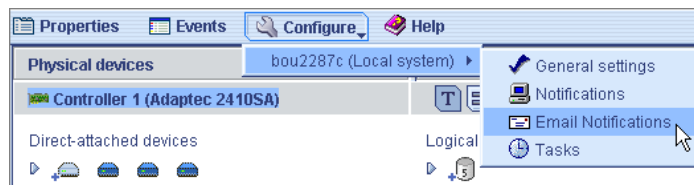
The Email Notification Manager opens on the Email Notifications tab of a new window.
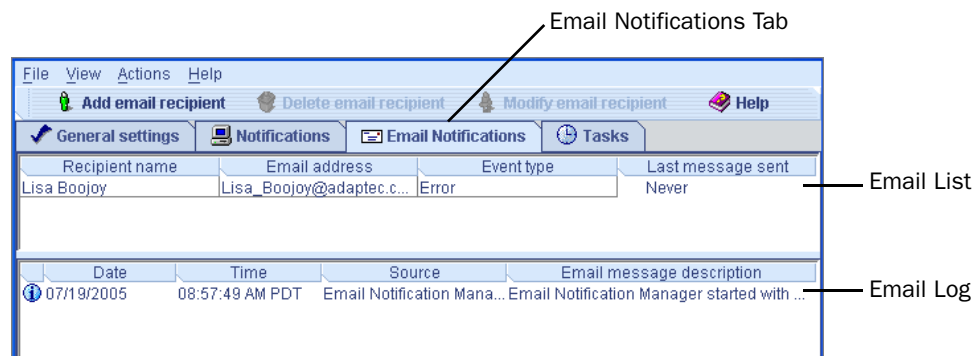
3 If this is the first time you are opening the Email Notification Manager, continue with *Entering the SMTP Server Settings* on page 90.

To set up email notifications, continue with *Adding an Email Recipient* on page 90.

Entering the SMTP Server Settings

The first time you are opening the Email Notification Manager, the SMTP Server Settings window opens automatically.
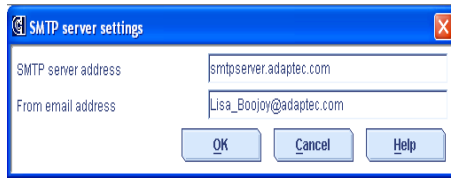
In the SMTP Server Settings window:

1 Enter the address of your SMTP server.

2 Enter the "From" address to appear in email notifications.

> If email recipients will be replying to email notifications, be sure that the "From" address belongs to a computer that is actively monitored.

3 Click **OK** to save the settings.

4 To set up email notifications, continue with *Adding an Email Recipient*.

Adding an Email Recipient

To add an email recipient to the Email List:
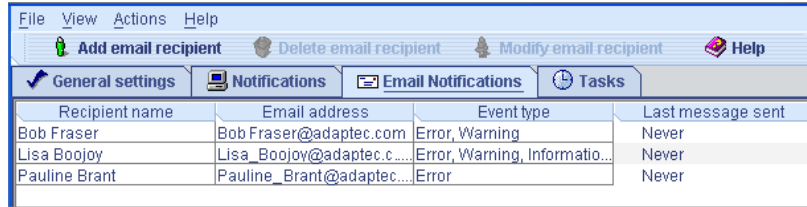
1 Open the Email Notification Manager. (See page 89.)

2 In the tool bar, click **Add email recipient**.

3 In the Add Email Recipient window (shown in the next Step), enter the recipient's name and email address.

4 In the **Event Type** drop-down menu, select an event level. (For more information on event levels, see page 82.)
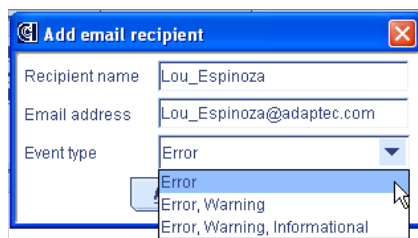
5 Click **Add**.

6 Repeat Steps 3 to 5 to add more email recipients.

7   Click **Cancel** to close the Add Email Recipient window.

The email recipients you added appear in the Email List.

Although you can't sort the list, you can reorganize the columns by clicking and dragging the column heads (see the figure on page 84).

8   Close the Email Notifications window when you're done.

Note: You can access other utilities in this window, such as the Task Manager (see Chapter 9, *Managing Task*s), by clicking their tabs.

9   Repeat Steps 1 to 8 for each system you want to monitor with email notifications.

Sending a Test Message

To ensure that an email recipient is receiving event notifications, you can send them a test message.

To send a test message:

1   Open the Email Notification Manager. (See page 89.)

Note: You can also access the Notification Manager from the menu bar by clicking **Actions > Agent actions > Configure > Email Notifications** tab.

2   Click on the email address you want to send the test message to.

Note: You can only send a test message to one email address at a time.

3   On the menu bar, select **Actions**, then click **Send test message**.
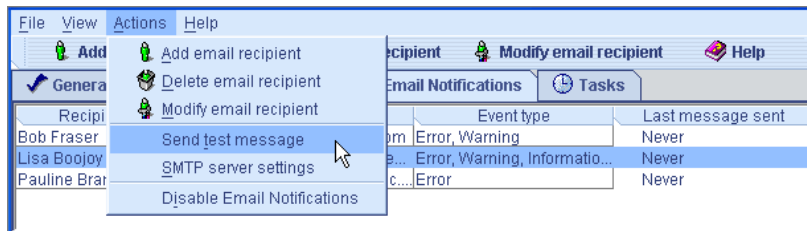
The test message is sent.

If the test is successful, the email recipient receives the test message. If the test fails:

a   Ensure that the recipient's email address is correct. (See *Modifying a Recipient's Information* on page 92 to modify the address.)

b   Ensure that your SMTP server address is correct. (See *Changing the Email Notification Manager Settings* on page 94 to modify the address.)

c   Try sending the test message again.

Managing the Email List

This section describes how to:

- Add an email recipient, see page 90.

- Modify an email recipient's information, see the following section.

- Remove an email recipient, see page 92.

Modifying a Recipient's Information

If a recipient's email address changes, or if you need to change the types of event notifications the recipient receives, you can update the recipient's information in the Email List.

To modify a recipient's information:

1 Open the Email Notification Manager. (See page 89.)

2 Click on the recipient's name.

3 Modify the recipient's information as required, then click **OK**.
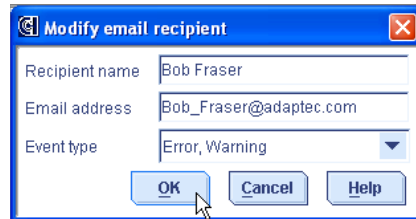
Removing a Recipient from the Email List

You can remove any recipient from the Email List. Once a recipient has been removed, event notifications from the local system are no longer sent to that email address.

To remove a recipient from the Email List:

1 Open the Email Notification Manager. (See page 89.)

2 Click on the recipient you want to remove.

3 In the tool bar, click **Delete email recipient**.

4 Click **Yes** to confirm the deletion.

The recipient is removed from the Email List.

Monitoring and Managing the Email Log

The Email Log displays status information and messages about the Email Notification Manager itself, such as whether email notifications were sent successfully or not.

This section explains how to:

- Use the Email Log (see the following section).

- Find the Email Log files (see page 93).

- Clear the Email Log (see page 94).

Using the Email Log

By default, email events are listed in the order they occurred, with the most recent event first. To make it easier to find a specific event, click on the column heads to sort events. You can also reorganize the column by clicking and dragging the column heads (see the figure on page 84).

Double-click on an event to see basic information about the event, including the event type. (See page 82 for a list of event types.) Click **Next** to see the next event in the list.
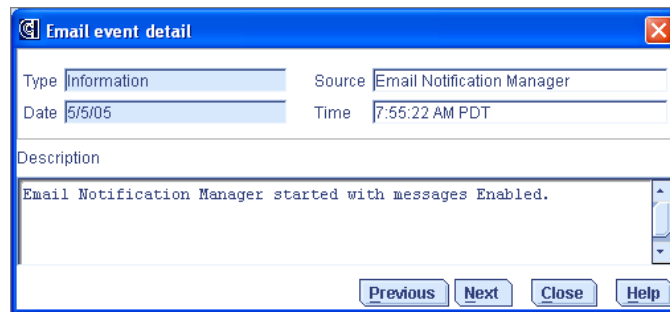
Finding the Email Log Files

In addition to appearing in the Email Log, event notifications are saved in a log file named raidsmtp.log, which can be found in the top-level Adaptec Storage Manager folder.

The raidsmtp.log file has a maximum capacity of 200 KB. When the capacity is exceeded, old events are copied into a file named raidsmtp.old, and a new raidsmtp.log file is created. If a raidsmtp.old file already exists, it is overwritten.

Clearing the Email Log

To make it easier to monitor recent events, you can clear the Email Log.

Note: Clearing the Email Log doesn't erase the existing raidsmtp.log file (see page 93).

To clear the Email Log:

1 Open the Email Notification Manager. (See page 89.)

2 In the menu bar, select **Clear the event log**, then click **Email Notifications**.

3 Click **Yes** to clear the log.

The log is cleared, except for one event reporting that the log was cleared.

Changing the Email Notification Manager Settings

You can modify these Email Notification Manager settings as your needs change:

● Address of your SMTP server

● 'From' address that will appear in email notifications

To modify the Email Notification Manager settings:

1 Open the Email Notification Manager. (See page 89.)

2 In the menu bar, select **Actions**, then click **SMTP server settings**.
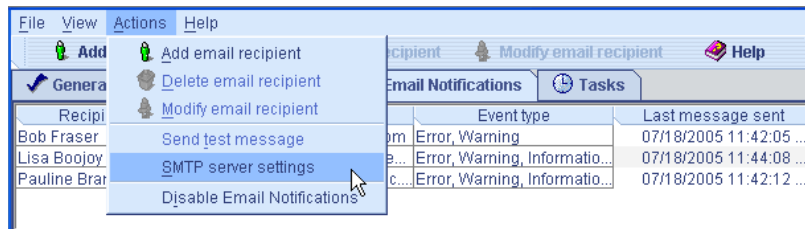
The SMTP Server Settings window opens.
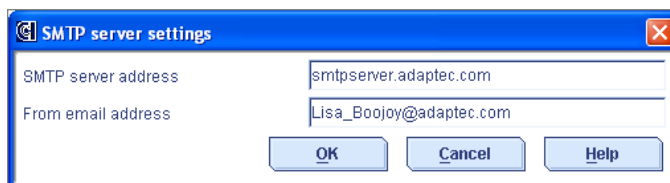
3 Enter the address of your SMTP server.

4 Enter the "From" address to appear in email notifications.

If email recipients will be replying to email notifications, be sure that the "From" address belongs to a computer that is actively monitored.

5 Click **OK** to save the settings.

Disabling Email Notifications

Email notifications are enabled by default, but can be disabled, if required.

Note: If you disable email notifications, events will be generated but email notices won't be broadcast.

To disable email notifications:

1 Open the Email Notification Manager. (See page 89.)

2 In the menu bar, click **Actions**, then click **Disable Email Notifications**.
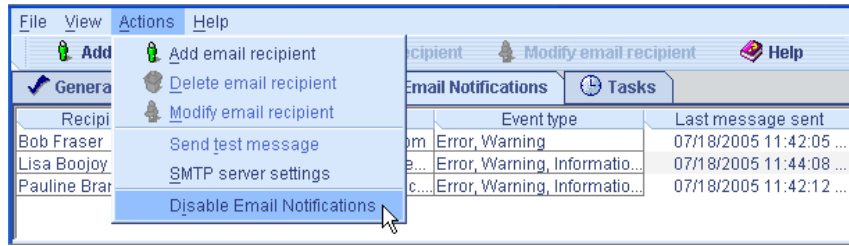
Email notifications are disabled. The Email Notifications tab (shown at right) shows the red 'disabled' icon.

Re-enabling Email Notifications

To re-enable email notifications, repeat steps 1 and 2 in *Disabling Email Notifications*, selecting Enable Notifications during Step 2.

Broadcasting Event Alerts to Users

You can set the Adaptec Storage Manager agent to send event alerts about a *specific* system to all users who are logged into your storage space. You might want to do this if your storage space isn't managed by a dedicated person, or if that particular system is off-site or not connected to a monitor. Event alerts signal everyone working on the storage space that a system requires technical assistance.

When you set Adaptec Storage Manager to broadcast event alerts, *all* logged-in users receive messages about *all* types of events. In Windows, these alerts appear as pop-up messages; in all other operating systems, these alerts appear as console messages.

When enabled, event alerts occur independent of event notifications (see page 83) and email notifications (see page 89).

To enable event alerts:

1 On the tool bar, click the **Configure** button, select the system you want, then click **General Settings**.
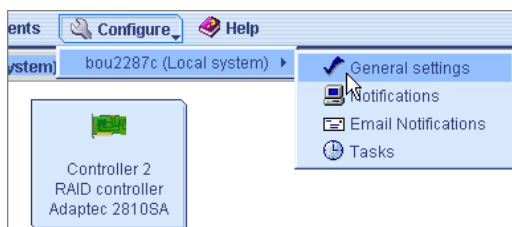
The Adaptec Storage Manager Agent General Settings window opens for that system.
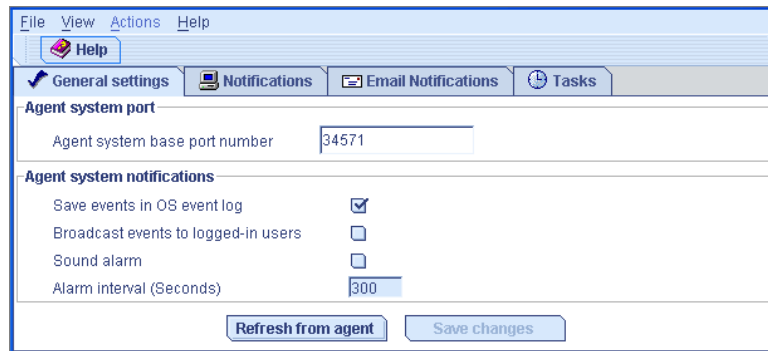
2   Select **Broadcast events to logged-in users**, then click **Save changes**.

3   Restart Adaptec Storage Manager to apply the change.

Silencing and Testing the Audible Alarm

By default, when a Warning- or Error-level event (see page 82) occurs on any system in the Enterprise View, an audible alarm is triggered on the local system. The alarm is a series of beeps, which sound every five minutes until the event is resolved.

You can change the frequency and duration of the alarm, or choose to disable the alarm on any system. See *Changing a System's Audible Alarm Settings* on page 57 for more information.

This section describes how to:

● Ensure the alarm is working on your local system (see the following section).

● Silence a sounding alarm (see page 97).

● Disable the alarm for a selected controller (see page 97).

Testing the Alarm

To test the audible alarm to ensure that it's working on your local system:

1   Ensure that the speakers on your local system aren't muted.

2   In the Enterprise View, click on any controller.

3   In the menu bar, click **Actions**, select **Alarm Actions**, then click **Test alarm**.
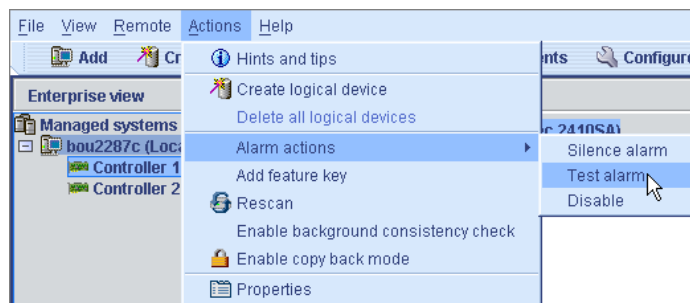
The alarm sounds.

4   To stop the test, click **OK**.

Silencing the Alarm

When a Warning- or Error-level event occurs, you can silence the alarm on your local system while you fix the problem.

To silence the alarm, click the **Silence** button (shown at right) in the main Adaptec Storage Manager window.

Disabling a Controller's Alarm

You can disable the alarm for a selected controller, if required.

⚠ **Caution:** If you disable the alarm, no audible signal will sound when a Warning- or Error-level event occurs on the controller.

1 In the Enterprise View, click on the controller you want.

2 In the menu bar, click **Actions**, select **Alarm Actions**, then click **Silence alarm**.
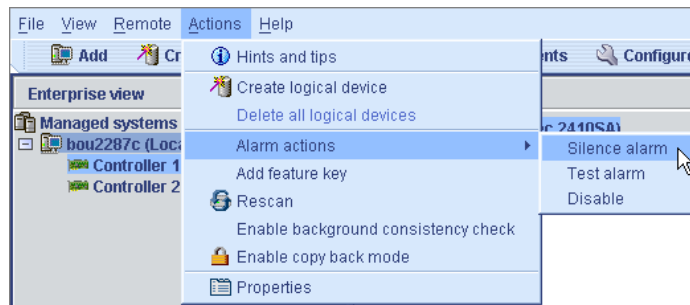
The alarm is disabled for that controller.

Viewing Component Properties

Click on any component in the main window of Adaptec Storage Manager, then click the **Properties** button (shown at right) to view version numbers, status, model numbers, and other information about that component.

The properties listed vary, depending on which type of component you selected.

Managing Tasks

9

In this chapter...

Adaptec Storage Manager allows you to schedule some types of jobs (or *tasks*) to complete at convenient times. Additionally, you can schedule some tasks to recur at preset times.

A Task Manager utility helps you manage the tasks you schedule.

This chapter describes how to schedule, monitor, and manage tasks.

Scheduling a Task

If a task is lengthy and limits access to components on your storage space, you may want to set a date and time for the task to complete, instead of running the task while there is activity on your storage space.

If a task must be performed regularly, you can schedule it to recur at preset times.

You can schedule these Adaptec Storage Manager tasks:

● Expanding a logical drive

● Changing a logical drive's RAID level

● Modifying the stripe size of a logical drive

● Verifying a logical drive

● Verifying and fixing a logical drive

To schedule one of these tasks:

1 Complete each step of the task until you are prompted to click **Apply**. (*Don't* click **Apply**.)
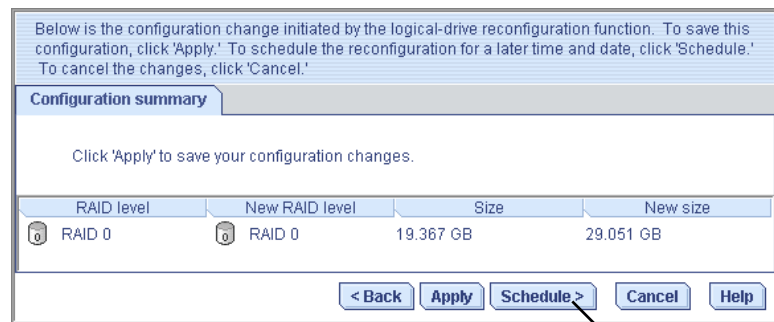
Schedule button

2 Click **Schedule**.

The schedule window opens. (The window you see may be different from the one shown in this example, depending on which type of task you are scheduling.)
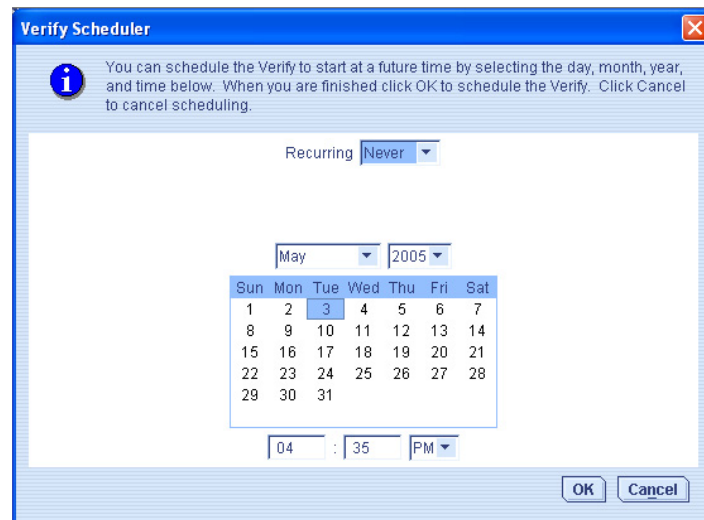
3   Set the date and time for the task.

> **Note:** Keep geography in mind—If you are scheduling tasks on remote systems located in other geographical areas, remember that the time you set for a scheduled task is *that system's* time, which may be different from local time. You will be prompted to select a new time if the one you've set occurs in the past on the remote system.

4   Set the recurrence frequency, if the option is available for this task and you want it to occur regularly.

5   Click **Apply**.

The task is saved in the Task Manager, and the scheduled task is added to the Task List. For more information about the Task Manager, see the following section.

Opening the Task Manager

You can use the Task Manager to monitor and modify the tasks you have scheduled. (To schedule a task, see page 99.)

Tasks are associated with systems. When you open the Task Manager, you see the scheduled tasks associated with that local or remote system only.

To open the Task Manager, in the tool bar, click **Configure**, select the system you want, then click **Tasks**.

The Task Manager opens on the Tasks tab of a new window. The Tasks tab has two main panels, as shown in this figure:
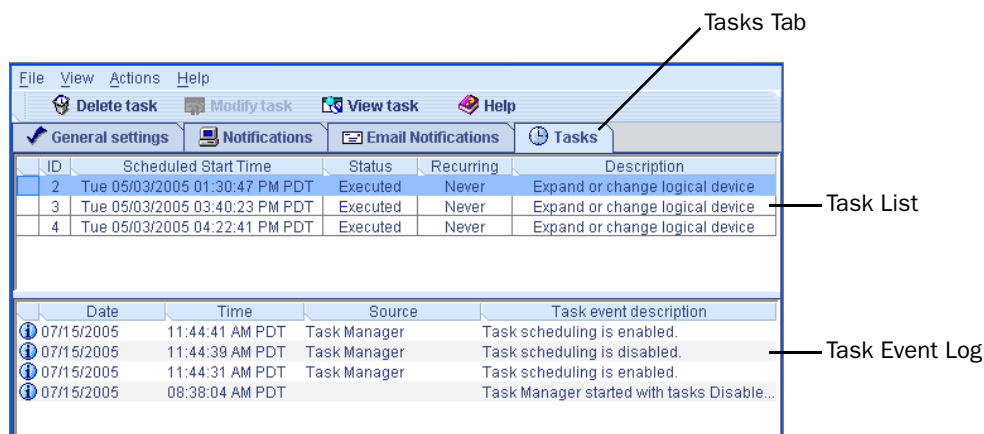
> **Note:** From the Tasks tab, you can access other utilities in this window, such as the Email Notification Manager (see page 89), by clicking their tabs.

Monitoring Tasks

Use the two main panels of the Task Manager—the Task List and the Task Event Log—to monitor your tasks.

Monitoring Upcoming Tasks in the Task List

The Task List displays all scheduled tasks in order of creation, and includes basic information about each task. Although you can't sort the tasks in any other order, you can reorganize the columns in the Task List by clicking and dragging the column heads (see the figure on page 84).

The Status column of the Task List shows the current condition of each task:

● **Scheduled**—The task is scheduled to be completed at a future date and time.

● **Executed**—The task has been completed successfully.

● **Executed***—A recurring task has been completed once and will be repeated at the scheduled time.

● **Error**—The task has not been completed successfully. (For more information about an error, double-click the task in the Task List to open the Task Properties window.)

Checking Past Tasks and Events in the Event Log

The Event Log displays detailed information about the Task Manager itself, such as when scheduled events were modified, deleted, or completed successfully.

By default, task events are listed in the order they occurred, with the most recent event first. To make it easier to find a specific event, click on the column heads to sort task events. You can also reorganize the columns by clicking and dragging the column heads (see the figure on page 84).

The Event Log uses icons to show the status of past tasks:

Icon	Status	Explanation and Solution
ⓘ	Information	The task or event completed successfully. No action required.
⚠	Warning	The task missed its start time. Reschedule the task to clear the error, as described in *Modifying a Task* on page 102.
⊗	Error	The task failed. Delete the task to clear the error. Schedule the task again, as described in *Scheduling a Task* on page 99.)

Double-click on an event to see basic information about the event. Click **Next** to see the next event in the list.
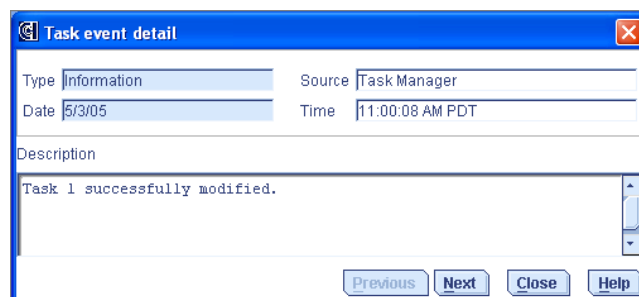
Modifying a Task

If your requirements change, you can reschedule a task to a different date or time. You can also modify the task description that appears in the Task List. Creating a custom task description makes it easier to find the task in the Task List.

To modify a scheduled task:

1 In the tool bar, click **Configure**, select the system you want, then click **Tasks** (as shown on page 100).

2 In the Task Manager, select the task you want to change, then click **Modify task**.
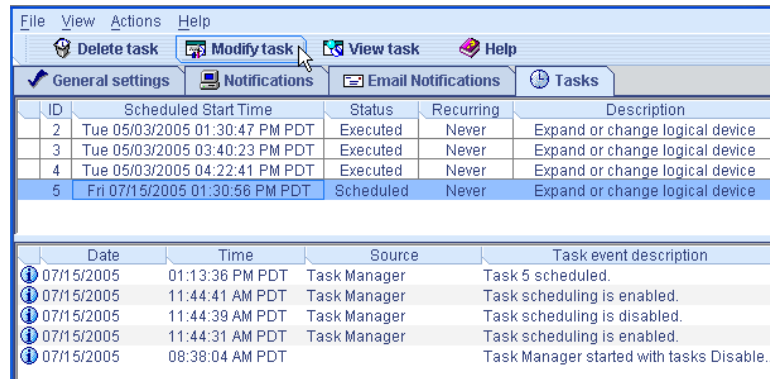
3 In the Modify Task window, make the required changes, then click **OK**.
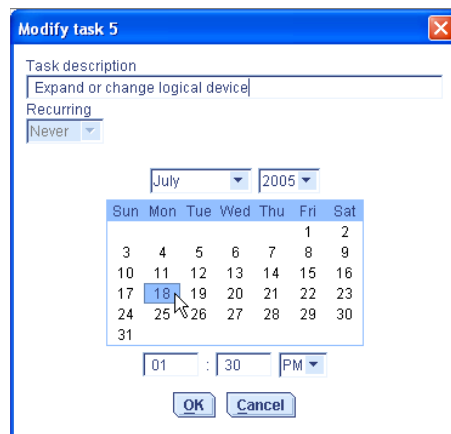
The task and Task List are updated with the new information.

What if a task misses its start time?

Tasks scheduled in Adaptec Storage Manager include an automatic 30-minute grace period following their start time, to accommodate temporary interruptions. For instance, if there's a brief power outage a task will run once normal conditions resume, if the interruption lasts no longer than 30 minutes past the scheduled start time.

If a task misses its start time, it must be rescheduled. For instructions, see *Modifying a Task*.

If a recurring task misses its start time, it is automatically rescheduled to run at the next scheduled interval.

Deleting a Task

If a scheduled task is no longer required, you can delete it from the Task Manager.

To delete a task:

1   In the tool bar, click **Configure**, select the system associated with the task you want to delete, then click **Tasks** (as shown on page 100).

2   In the Task Manager, select the task you want to delete, then click **Delete task**.
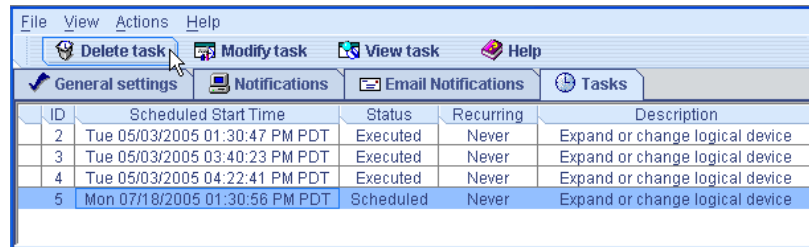
3   Click **Yes** to confirm the deletion.

The task is deleted.

Disabling the Task Manager

The Task Manager is enabled by default. If you do not wish to schedule tasks on a selected system, you can disable it.

Note: If you disable the Task Manager, no scheduled tasks will run on that system.

To disable the Task Manager:

1   In the tool bar, click **Configure**, select the system whose Task Manager you want to disable, then click **Tasks** (as shown on page 100).

2   In the menu bar, click **Actions**, then click **Disable Task Scheduler**.
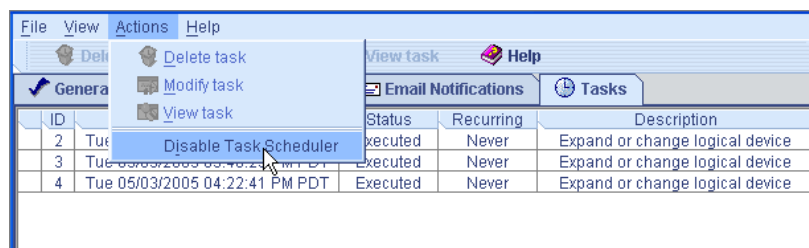
The Task Manager is disabled. The Tasks tab (shown at right) shows the red 'disabled' icon.

Note: When the Task Manager is disabled, a brief three-tone alert sounds each time you open and log in to Adaptec Storage Manager. Scheduled tasks in the Task List will not run while the Task Manager is disabled.

Re-enabling the Task Manager

To re-enable the Task Manager, repeat the steps in *Disabling the Task Manager* on page 103, selecting **Enable Task Scheduler** during Step 2.

Scheduled tasks that have missed their start times must be rescheduled if you want them to run. See *Modifying a Task* on page 102 for instructions.

Scheduled tasks that did not miss their start time while the Task Manager was disabled will run as scheduled.

Working with Display Groups

10

In this chapter...

This chapter describes how to work with and manage display groups in Adaptec Storage Manager.

To create display groups, see *Creating Display Groups* on page 53.

Adding a System to a Display Group

As your storage space grows and changes, you can add new systems to your display groups.

To add a system to a display group:

1   Right-click on the system in the Enterprise View.

2   Select **Change display group**, then click the display group name.
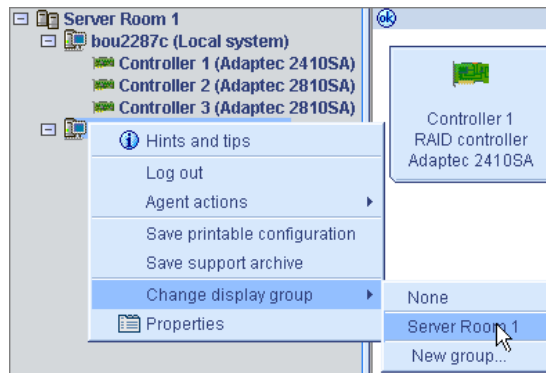
The system is added to the display group.
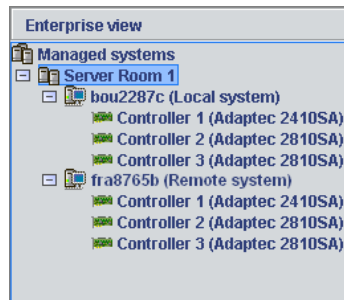
Note: A system can belong to only one display group at a time; you can't include the same system in multiple display groups.

Viewing Display Group Status

To quickly view the status of systems within a display group, you can open the display group Properties window.

To view display group status, right-click on the system in the Enterprise View, then click **Properties**. The Properties window opens for that display group, summarizing the status of the systems that belong to that group.
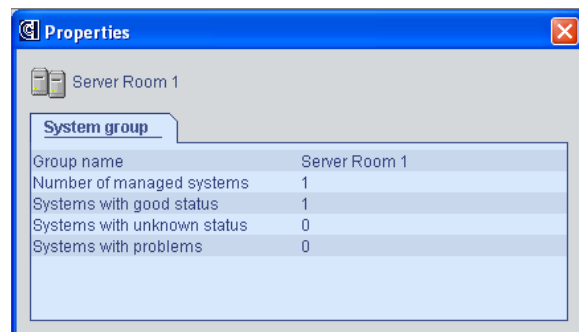
Removing a System from a Display Group

To remove a system from a display group:

1 In the Enterprise View, right-click the system you want to remove.

2 Select **Change display group**, then click **None**.
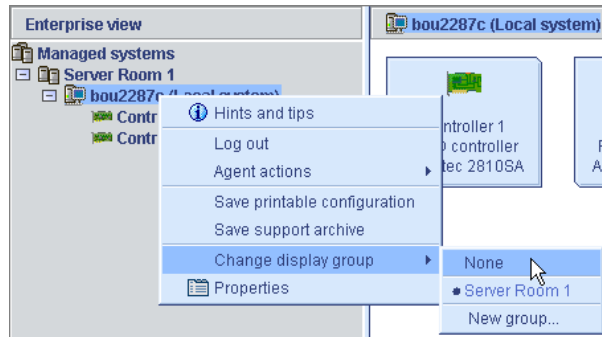
The system is removed from the display group.

Note: Systems that are *not* part of display groups are listed at the top of the Enterprise View, above any display groups.

Moving a System from One Display Group to Another

To move a system from one display group to another:

1 In the Enterprise View, right-click the system you want to remove.

2 Select **Change display group**, then click the name of the display group you want.

The system moves to its new display group.

Renaming a Display Group

You can make managing your storage space easier and more efficient by giving your display groups meaningful names. To rename a display group:

1 In the Enterprise View, right-click on the display group, then click **Rename display group**.
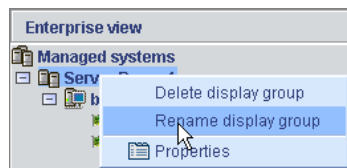
2 Enter a new name for the display group, then click **OK**.

The Enterprise View shows the new name of the display group.

Deleting a Display Group

If required, you can delete a display group. When you delete the display group, the systems that belonged to it are listed at the top of the Enterprise View, above any remaining display groups.

To delete a display group:

1   In the Enterprise View, right-click on the display group.

2   Click **Delete display group**.
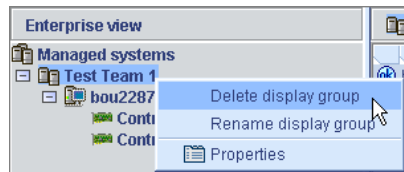
The display group is deleted and the systems that belonged to it are no longer grouped together in the Enterprise View.

Managing Controllers and Disk Drives

11

In this chapter...

This chapter describes how to manage the RAID controllers in your storage space.

Rescanning a Controller

After you connect a disk drive to or remove a 'Ready' (non-failed) disk drive from a controller, Adaptec Storage Manager may not recognize the change until it rescans the controller.

To rescan a controller:

1   In the Enterprise View, click the controller.

2   In the menu bar, select **Actions**, then click **Rescan**.
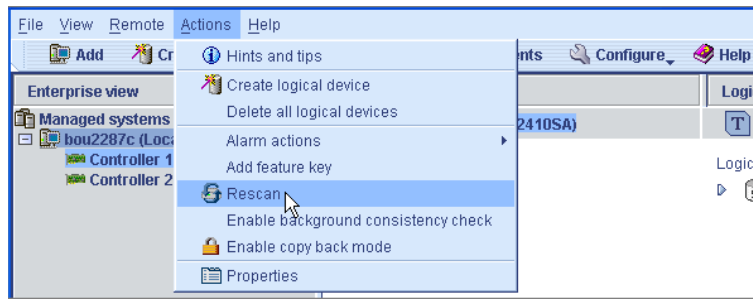
Adaptec Storage Manager scans all the channels or ports on the controller you selected.

When the scan is complete, a report appears.

3   Click **Done** after you have reviewed the scan report.

Registering New Controllers

When you log in to Adaptec Storage Manager, it searches for new controllers in your storage space. If it detects a new controller, you are prompted to register it.
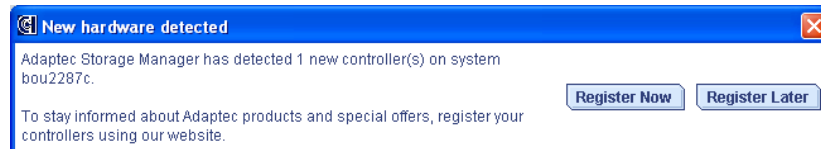
To stay informed about Adaptec products and special offers, register your controllers by clicking **Register Now**.

Follow the on-screen instructions to complete the registration.

Viewing Controller Properties

You can open a Properties window for any controller in your storage space to view model and status information, including the firmware version number.

To view controller properties:

1   In the Enterprise View, click the controller.

2   In the menu bar, select **Actions**, then click **Properties**.

The Properties window for the controller opens.
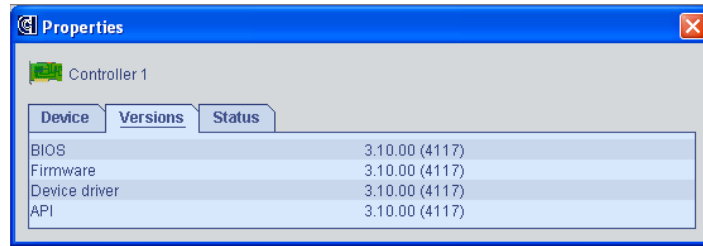
3   Click the tabs to view all available information.

4   Click the X in the upper-right corner to close the window.

Saving Your Controller Configuration

If you require a record of your controller configurations, you can use Adaptec Storage Manager to create a text file with this information about all controllers on a selected system:

● Controllers

● Disk drives

● Disk drives used in logical drives

● Logical drives

To save a system's controller configurations:

1   In the Enterprise View, click the local or remote system.

2   In the menu bar, select **Actions**, then click **Save printable configuration**.
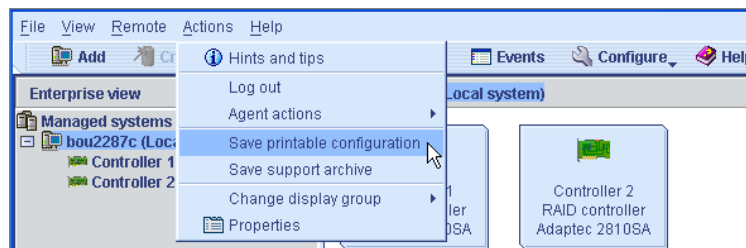
3   In the Save window, browse to the directory you want, then enter a file name for the report. (The default directory is the directory in which the Adaptec Storage Manager is installed. The default file name is RaidCfg.log.)

A text-file report is saved.

Updating Controller BIOS and Firmware

Note: This task is recommended for advanced users only.

Adaptec Storage Manager provides a wizard to help you update the BIOS and firmware for the controllers in your storage space. The ROM Update wizard updates the BIOS and firmware for all controllers of the same type on local and remote systems. You can update one type of controller at a time.

Before You Begin

Before you begin, download the latest firmware images from the Adaptec Web site at www.adaptec.com. Image files typically come in sets of two or more and have a .ufi file extension.

Updating the Controller BIOS and Firmware

To update the controller firmware:

1   In the Enterprise View, click **Managed systems** (shown in the next figure).

2   In the menu bar, select **Actions**, then click **Update controller images**.
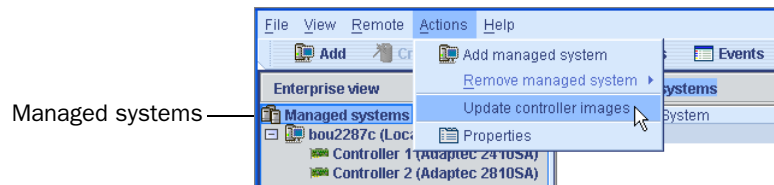
The ROM Update wizard opens.

3   Click **Next**.

4   Click **Add** to browse to the firmware image files you downloaded, then click **Open**.
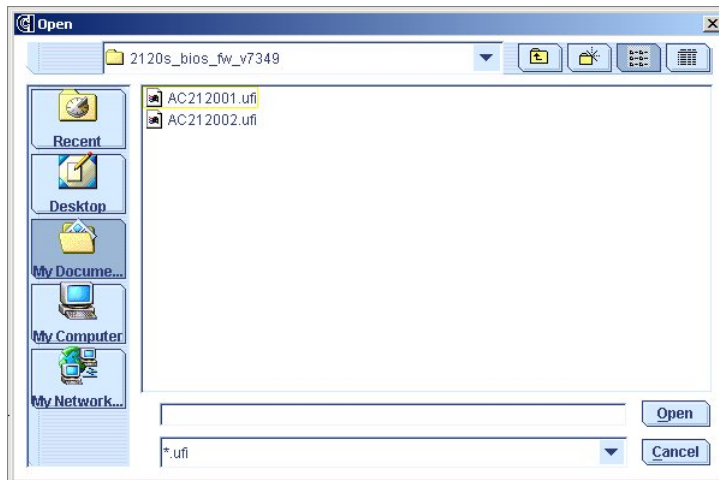
5   In the wizard, click the image files you want, then click **Next**.

6   Select the controllers you want to update, then click **Next**.
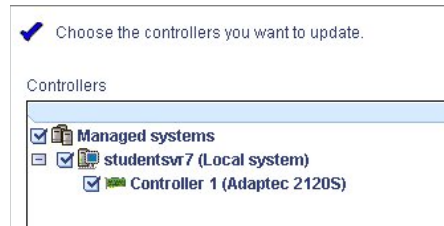
7   Review the update summary, then click **Apply**.

8   When prompted, click **Yes** to begin the update.

⚠ **Caution:** *Do not* power down the controller(s) during the update.

9   When the update is complete, click **OK**. Then, restart the server(s) to activate the new firmware images.

Setting a Disk Drive to 'Failed'

Before you can remove a disk drive from a server, you must set it to a failed state to protect your data.

⚠ **Caution:** You may lose data or damage your disk drive if you remove a disk drive without first setting it to a failed state.

You can set a disk drive to a failed state if:

● The disk drive is not part of a logical drive, *or*

● The disk drive is part of a redundant, healthy logical drive

You can't set a disk drive to a failed state if doing so will take a logical drive offline.

To set a disk drive to a failed state:

1   In the Physical Devices View, click the disk drive.

2   In the menu bar, select **Actions**, then click **Set drive state to failed**.

3   Click **Yes** to set the drive status to failed.

4   Remove and replace the disk drive.

5   If the logical drive that the disk drive belongs to is failed, see *Recovering from a Disk Drive Failure* on page 116.

Replacing Disk Drives in a Logical Drive

You can replace one or more disk drives in a logical drive. You may want to do this to upgrade to larger disk drives, or to make disk drive size uniform across the logical drive.

⚠️ **Caution:** If another disk drive in the logical drive fails during rebuild (see page 119), you may lose data.

To replace a disk drive in a logical drive:

1 In the Physical Devices View, click the disk drive you want to replace.

2 Set the drive state to failed. (See page 113.)

3 Remove and replace the disk drive with one of equal or larger size.

4 Wait for the logical drive to rebuild. (See page 119.)

5 Repeat Steps 1 to 4 for all the disk drives you want to replace.

For information about solving disk drive problems, see *Recovering from a Disk Drive Failure* on page 116.

Solving Problems

12

In this chapter...

Troubleshooting Adaptec Storage Manager

If you experience problems installing or using Adaptec Storage Manager, follow these suggestions:

- Ensure that you are logged in to Adaptec Storage Manager at the permission level you need to perform the tasks you want. (See page 28 for more information.)

- Ensure that all managed systems are powered on and that you are logged in to any remote systems you want to manage. (See page 28 for more information.)

- Check all cable connections.

- Try uninstalling and reinstalling Adaptec Storage Manager.

Identifying a Failed or Failing Component

When your are notified of a Warning- or Error-level event, use Adaptec Storage Manager's rapid fault isolation feature to quickly identify the source of the problem.

For instance, in this example, a disk drive has failed. To find the failed disk drive, follow the yellow Error icons:

Error is on the local system...

...on Controller 1...

...and both the failed disk drive (marked with red X) and hot spare (with yellow +) are affected.
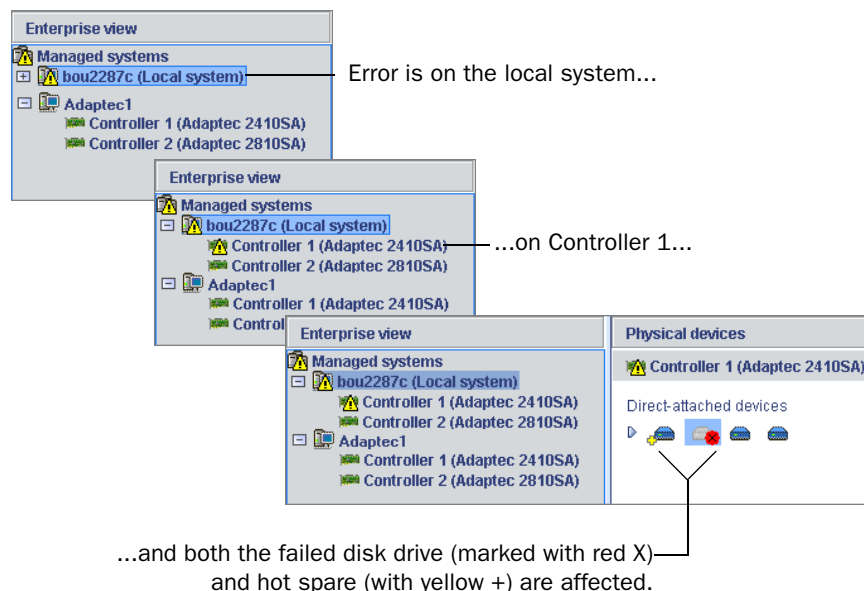
Recovering from a Disk Drive Failure

When a disk drive fails for any reason, it is represented in Adaptec Storage Manager with a red X, as shown at right.

This section explains how to recover when a disk drive fails:

- If the logical drive was protected by a hot spare (see page 117).

- If the logical drive was *not* protected by a hot spare (see page 117).

- If there is a disk drive failure in more than one logical drive simultaneously (see page 118).

- If it is a RAID 0 logical drive (see page 118).

- If multiple disk drives fail within the same logical drive (see page 118).

Failed Disk Drive Protected by a Hot Spare

When a logical drive is protected by a hot spare, if a disk drive in that logical drive fails the hot spare is automatically incorporated into the logical drive and takes over for the failed drive.

For instance, when a disk drive fails in the RAID 5 logical drive shown in the next example, the logical drive is automatically *rebuilt* (its data is reconstructed) using the hot spare in place of the failed drive. You can't access the logical drive until the rebuilding is complete.

Disk drive shows Failed status...   ...hot spare takes over...   ...and logical drive is rebuilt with hot spare
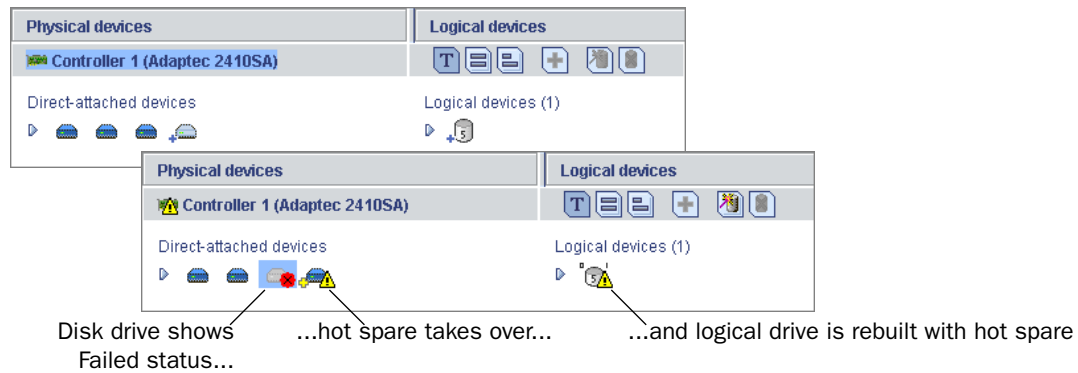
Note: In this example, the color of the hot spare changed from light-blue to dark-blue, showing that it is now part of a logical drive.

To recover from the failure:

1   Remove and replace the failed disk drive (following manufacturer's instructions).

2   *If copyback is not enabled*—Remove the 'hot spare' designation from the original hot spare (the disk drive that was built into the logical drive). See page 76 for instructions. Then, designate a new hot spare to protect the logical drives on that controller.

   If copyback is enabled—Data is automatically moved back to its original location once the controller detects that the failed drive has been replaced. No action is required. See *Enabling Copyback* on page 79 for more information.

Failed Disk Drive *Not* Protected by a Hot Spare

When a logical drive is not protected by a hot spare, if a disk drive in that logical drive fails, remove and replace the failed disk drive. The controller detects the new disk drive and begins to rebuild the logical drive.

If the controller fails to rebuild the logical drive, check that the cables, disk drives, and controllers are properly installed and connected. Then, if necessary, follow the instructions in *Rebuilding Logical Drives* on page 119.

Failure in Multiple Logical Drives Simultaneously

If there's a disk drive failure in more than one logical drive at the same time (one failure per logical drive), and the logical drives have hot spares protecting them, the controller rebuilds the logical drives with these limitations:

● A hot spare must be of equal or greater size than the failed disk drive it's replacing.

● Failed disk drives are replaced with hot spares in the order in which they failed. (The logical drive that includes the disk drive that failed first is rebuilt first, assuming an appropriate hot spare is available—see the previous bullet.)

If there are more disk drive failures than hot spares, see *Failed Disk Drive Not Protected by a Hot Spare* on page 117.

If copyback is enabled, data is moved back to its original location once the controller detects that the failed drive has been replaced. See *Enabling Copyback* on page 79 for more information.

Disk Drive Failure in a RAID 0 Logical Drive

Because RAID 0 volumes do not include redundancy, if a disk drive fails in a RAID 0 logical drive, the data can't be recovered.

Correct the cause of the failure or replace the failed disk drives. Then, restore your data (if available).

Multiple Failures in the Same Logical Drive

Except in RAID 6 and RAID 60 logical drives (see page 144), if more than one disk drive fails at the same time in the same logical drive, the data can't be recovered.

Correct the cause of the failure or replace the failed disk drives. Then, restore your data (if available).

Note: In some instances, RAID 10 and RAID 50 logical drives *may* survive multiple disk drive failures, depending on which disk drives fail. See *Selecting the Best RAID Level* on page 136 for more information.

Removing a Failed Disk Drive's Icon

Note: You can only complete this task on disk drives that are not included in any logical drive.

When a disk drive fails, it may still appear in Adaptec Storage Manager although it is no longer available. To see an accurate representation of your storage space and make it easier to monitor your disk drives, you can remove a failed disk drive from the Physical Devices View.

In the Physical Devices View, right-click the failed disk drive, then click **Remove failed drive**.

Rebuilding Logical Drives

A *hot-swap rebuild* occurs when a controller detects that a failed disk drive in a logical drive has been removed and then reinserted.

To start a hot-swap rebuild:

1   Following manufacturer's instructions, gently pull the failed disk drive from the server without fully removing it, then wait for it to spin down fully before continuing.

2   If there is nothing wrong with the disk drive, reinstall it, following manufacturer's instructions.

     If necessary, replace the failed disk drive with a new disk drive of equal or larger size.

3   The controller detects the reinserted (or new) disk drive and begins to rebuild the logical drive.

Solving Notification Problems

To test notifications on your storage space, you can send test events or emails to ensure that they're being received properly.

If your test event fails:

1   Ensure that the remote system is powered on and running Adaptec Storage Manager.

2   Open the remote system's System Properties window (see Step 3 on page 86) and double-check the TCP/IP address and port number.

3   Try sending the test event again.

If your test email fails:

1   Ensure that the recipient's email address is correct. (See *Modifying a Recipient's Information* on page 92 to modify the address.)

2   Ensure that your SMTP server address is correct. (See *Changing the Email Notification Manager Settings* on page 94 to modify the address.)

3   Try sending the test message again.

Creating an Archive File

Your Adaptec Storage Manager service representative might ask you to create a configuration and status information archive file to help diagnose a problem with your system.

To create the archive file:

1   In the Enterprise View, click the local or remote system on which the problem is occurring.

2   In the menu bar, select **Actions**, then click **Save support archive**.

3   Enter a name for the archive file or accept the default name, then click **Save**.

Understanding Error and Warning Messages

This section provides detailed information about error and warning events that occur in Adaptec Storage Manager.

Warning Messages

Warning Message Text	Explanation
ArrayCritical	Ready disk drives are still available
HotSpareTooSmall	The hot spare is too small to protect the specified array
HotSpareWontWork	At least one logical drive is not protected by the specified hot spare
InitLD	Hot spare is too small for use by at least one array
NoService	The specified logical drive was not initialized
SyncLD	Could not contact Adaptec Storage Manager agent. Adaptec Storage Manager may not function correctly. Please start the agent.

Error Messages

Error Message Text	Explanation
AbortTask	Could not stop the specified currently running task
AccessControl	Could not write the logical drive access control list
AddToDiskSet	Could not add drives to the specified diskset
AgentRemoved	Could not remove the specified agent
ArrayInUse	Could not delete the specified array. One or more initiators are logged into a logical drive(s) contained within this array
ArraysInUse	Could not delete all of the specified arrays. One or more initiators are logged into a logical drive(s) contained within this array
BreakRemoteMirror	Could not break the specifed remote mirror facet
CalibrateBatteryController	Could not recalibrate the specified battery
ChangeArraylName	Could not change the name of the specified array
ChangeBIOSMode	Could not change the BIOS-compatibility mapping
ChangeDiskSetName	Could not change the name of diskset
ChangeLogicalLun	Could not change the LUN of the specified logical drive

Error Message Text	Explanation
ChangeLogicalName	Could not change the name of the specified logical drive
ChangeNtpServer	Could not update the specified NTP server
ChangeTimeDate	Could not change the date and time
ChgAlarm	Could not change the alarm setting
ChgDataScrubRate	Could not change the background consistency check rate
ChgRebuildRate	Could not change the rebuild rate
ChgSCSIXferSpeed	Could not change the SCSI transfer speed
ChgStripeSize	Could not change the specified stripe size
ChgTaskPriority	Could not change task priority
ClearAdapterLogsFail	Could not clear the event logs for the specified system
ClearEnclosureLogsFail	Could not clear the event logs for specified enclosure
ClearHardDrive	Clear failed to start for the specified disk drive
CommFailure	You must re-establish communication with specified system
CommFailure1	Restart the Adaptec Storage Manager agent to establish communication with the local system
ControllerRescan	Could not rescan for the specified controller
ControllerRestart	Could not restart the specified controller
ControllerShutDown	Could not shut down the specified controller
CreateDiskSet	Could not create the diskset
CreateLDError	There was an error creating specified logical drive
CreateSimpleVolume	Could not create a simple volume
DataScrub	Could not change the background consistency check mode
DDDAdInternal	Failed drive—Controller internal failure
DDDDeviceNotFound	Failed drive—Device not found
DDDDeviceNotReady	Failed drive—Specified device will not come ready
DDDDriveAddedToSystem	Failed drive—Specified disk drive added to server
DDDDriveNotBelong1	Failed drive—Specified disk drive does not belong
DDDDriveNotBelong2	Failed drive—Specified disk drive does not belong
DDDDriveNotFound	Failed drive—Specified disk drive not found
DDDDriveNotPartOfCluster	Failed drive—Specified disk drive is not part of the cluster

Error Message Text	Explanation
DDDHardwareError	Failed drive—Internal hardware error
DDDInternalHW	Failed drive—Internal hardware error
DDDIOSubSystem1	Failed drive—I/O subsystem error
DDDIOSubSystem2	Failed drive—I/O subsystem error
DDDIOSubSystem3	Failed drive—I/O subsystem error
DDDSCSI1	Failed drive—SCSI error
DDDSCSI2	Failed drive—SCSI error
DDDSCSI3	Failed drive—SCSI error
DDDSCSIBusParity	Failed drive—SCSI bus parity error
DDDSCSIBusTest	Failed drive—SCSI bus test error
DDDSCSIChanNotOperational	Failed drive—SCSI channel is not operational
DDDSCSIErrUnknown	Failed drive—Unknown SCSI error
DDDUnknownDriveFound	Failed drive—Unknown disk drive on controller
DDDUnknownDriveInCluster	Failed drive—Unknown disk drive in cluster
DDDUnknownSASError	Failed drive—Unknown SAS error
DDDUserAcceptedInitChange	Failed drive—User accepted
DDDUserMarked	Failed drive—User marked 'failed'
DDDUserMarkedFailed	Failed drive—User marked 'failed'
DeleteArray	Could not delete the specified array
DeleteArrays	Could not delete all of the specified arrays
DeleteDiskSet	Could not delete the diskset
DeleteHArray	Could not delete the specified spanned array
DeleteLogDrive	Could not delete the specified logical drive
DisCopyBackMode	Could not disable copy back mode
DisReadCache	Could not disable read cache
DisUnattendedMode	Could not disable unattended mode
DisWriteCache	Could not disable write cache
EnclosureRestart	Could not restart the specified enclosure
EnclosureShutDown	Could not shut down the specified enclosure

Error Message Text	Explanation
EnCopyBackMode	Could not enable copy back mode
EnReadCache	Could not enable read cache
EnUnattendedMode	Could not enable unattended mode
EnWriteCache	Could not enable write cache
EventNotSent	Could not send the event to the system
ExportedArray	Could not export the specified array
FactoryDefault	Could not restore the configuration to the factory-default settings
FailbackDiskSet	Could not move diskset
FailedAtPort	Adaptec Storage Manager failed to start at specified port number
FailedSelfTest	Specified self-test problem code was returned from specified controller, channel, SCSI ID, S/N
FailedSelfTestStart	One or more of the selected disk drives failed to execute the self-test. View the RaidErrA.log file on the Adaptec Storage Manager agent for details
FailedToConnect	Failed to connect to specified host name at specified port number
FailedToReadNOT	Failed to read the notification list file
FailedToReadSEC	Failed to read the user accounts file
FailIncompatible	Failed to connect to the specified host name due to incompatible software versions
FailOver	Could not fail from the active device to the passive device
FailoverDiskSet	Could not move diskset
HostList	Could not write the host initiator list
HotSwap	Could not enable the automatic rebuild on replacement operation
ImageSelect	Could not change the firmware to the specified boot image
ImportConfig	Could not copy the configuration from the specified drives
ImportedArray	Could not import the specified array
IncreaseLogDrive	Could not increase the size of the specified logical drive
InitHardDrive	Could not initialize the specified disk drive
InitLogDrive	Could not initialize the specified logical drive
KillOtherController	Could not kill other controller
LDM	Could not start the the specified logical drive reconfiguration
LogIn	The user could not be logged in

Error Message Text	Explanation
LogOut	The user could not be logged out
MaybeReadCache	Could not set read cache mode to 'enabled when protected by battery'
MaybeWriteCache	Could not set write cache mode to 'enabled when protected by battery'
MergeOwnNS	Could not copy the configuration from the non-shared logical drives
Rebuild	Could not set the drive to the specified rebuild state
RemoveAHS	Could not delete the dedicated hot spare drive
RemoveFromDiskSet	Could not remove drives from the specified diskset
RemoveHSP	Could not delete the specified hot spare drive
RemoveSHS	Could not delete the specified standby hot-spare drive
ReplaceDHS	Could not replace the specified failed drive
RollbackSnapshot	Could not rollback the specified snapshot
ScanDrives	Could not perform the bus rescan
SetArrayOnline	Could not send the Array Optimal command to the specified controller
SetChannelInitiatorId	Could not set the specified SCSI initiator ID
SetContDiskCachePolicy	Could not change the specified global drive cache policy
SetHostId	Could not set the specified controller name
SetITNexusLossTime	Could not change I_T nexus loss time
SetMergeGroup	Could not set the specified merge-group number
SetPartnerId	Could not set the specified partner controller name
SetSpareSet	Could not change the specified spare set attribute
SetToAHotSpare	Could not create a dedicated hot spare drive
SetToDefunct	Could not set the specified drive to failed
SetToEmpty	Could not remove the specified failed drive
SetToHotSpare	Could not create a hot-spare drive
SetToOnline	Could not set the specified failed drive to optimal
SetToSHotSpare	Could not create a standby hot-spare drive
SetWce	Could not change the write-cache mode
SyncArray	Could not start the array verify
SyncLogDrive	Could not start the logical drive verify

Error Message Text	Explanation
TargetInfo	Could not write the logical drive target information
Unblock	Could not unblock the specified logical drive
UnkillOtherController	Could not unkill other controller
UserAccounts	Could not write the target user account list
VerifyArray	Could not start the array verify
VerifyFixHardDrive	Verify with fix failed to start
VerifyHardDrive	Verify failed to start
VolumeInUse	Could not delete the speficied logical drive. One or more initiators are logged into the logical drive.

Configuring SNMP Support

<div style="text-align: right">

A

</div>

In this appendix...

This appendix describes how to configure SNMP support for the Adaptec Storage Manager software. Adaptec Storage Manager supports SNMP "gets" and "traps" through the use of an SNMP agent.

Configuring SNMP Support on Windows

Note: Be sure your Windows installation includes SNMP support. By default, Windows 2000 and Windows XP do not install SNMP.

To install and configure SNMP support:

1 Run the Adaptec Storage Manager installation program (see page 22).

2 When prompted, select **Yes, install SNMP support**.

3 Follow the on-screen instructions to complete the installation, then restart your computer.

4 Open the Windows Computer Management tool, then select **Services** from the tree.
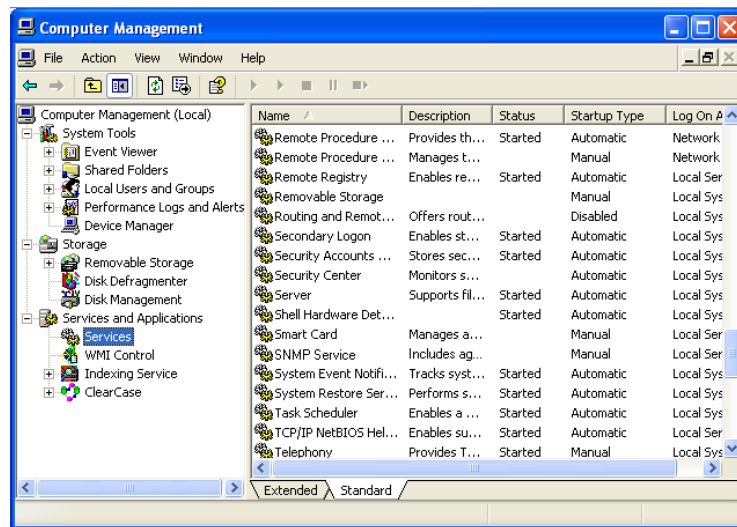
5 Double-click **SNMP Service**.

The SNMP Service Properties window opens.

6 Click the **Traps** tab, then enter the IP address of each computer on which you want to enable traps.

7 Click **OK**.

8 Start the SNMP service.

Configuring SNMP Support on Linux

For the Linux operating system, the Adaptec Storage Manager SNMP agent is a sub-agent that interfaces with the UCD-SNMP agentx architecture. UCD-SNMP is a third-party package for Linux; for information, documentation, and downloads, see www.net-snmp.org.

To configure SNMP support:

1   Install Adaptec Storage Manager (see page 22).

2   Configure the UCD-SNMP master agent to be used with agentx.

3   Start the Adaptec Storage Manager SNMP sub-agent:

From the Adaptec Storage Manager installation directory, run the aus-snmpd executable.

Refer to your Linux documentation for information on configuring UCD-SNMP, agentx, and setting up traps.

Configuring SNMP Support on NetWare

To install Adaptec Storage Manager SNMP support, at the command prompt type this command, then press **Enter**:

```
load AUS-SNMP.NLM
```

Refer to your NetWare documentation for information on configuring traps.

Part III: Quick Reference

Quick Answers to Common Questions...

Buttons and Icons At-a-Glance

Selecting the Best RAID Level

Quick Answers to Common Questions...

In this chapter...

This chapter provides quick references to frequently requested information about basic tasks and concepts in Adaptec Storage Manager.

Note: For troubleshooting tips, see Chapter 12, *Solving Problems*.

How do I...?

Set up my storage space?

Follow the five steps in the *Getting Started Checklist* on page 16.

Open the Configuration wizard?

In the Enterprise View, right-click the controller you want, then click **Create logical device**. Or, click either of the buttons shown at right. See *Building Your Storage Space* on page 39.

Turn off the alarm?

Click the **Silence** button, shown at right.

Or, from the menu bar, click **Actions**, select **Alarm actions**, then click **Silence alarm**. See page 96.

Add a new user to Adaptec Storage Manager?

Any user with a valid network user name and password can log into Adaptec Storage Manager. See page 26.

Add a remote system?

Click the **Add** button, shown at right. See page 51.

Prevent a user from changing my storage space?

See *Understanding Permission Levels* on page 28 for information on restricting access.

Check disk drive or logical drive status?

Hold your cursor over the disk drive or logical drive to reveal status information. See also page 36.

Access a feature with a padlock icon beside it?

Features such as snapshot are enhanced features that must be unlocked with a special feature key (sold separately). See page 19.

Log out of Adaptec Storage Manager?

In the Enterprise View, click on the local system. In the menu bar, select **Actions**, then click **Log out**. See page 30.

Schedule a task?

Complete each step of the task until you are prompted to click **Apply**. (*Don't* click **Apply**.) Click **Schedule**. See page 99.

Note: The Schedule button won't appear on tasks that can't be scheduled.

Find the Task Manager?

In the tool bar, click **Configure**, select the system you want, then click **Tasks**. See .

Find the Notification Manager?

In the tool bar, click **Configure**, select the system you want, then click **Notifications**. See .
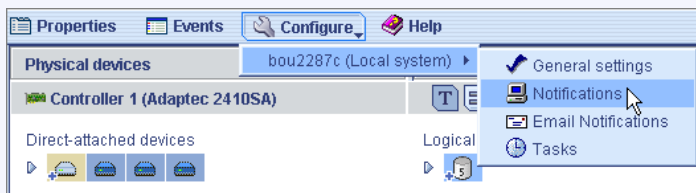
Find the Email Notification Manager?

In the tool bar, click **Configure**, select the system you want, then click **Notifications**. See .
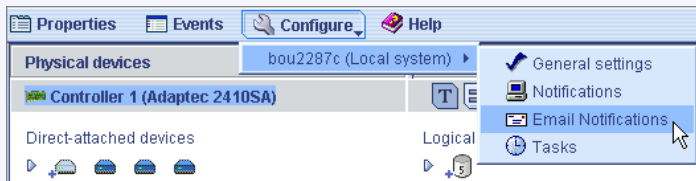
What's the difference between...?

Adaptec Storage Manager and the agent?

Adaptec Storage Manager is the full software application, including the user interface (windows, menus) described in this *Guide*. It helps you build and maintain the logical drives, controllers, and disk drives that make up your storage space.

The agent is like a service that keeps your storage space running. Its job is to monitor system health and manage event notifications, tasks schedules, and other on-going processes on each system in your storage space. The agent can run independently of the full application.

See *About Adaptec Storage Manager* on for more information.

Event notifications, email notifications, and event alerts?

Event notifications (also called logged notifications) are messages about events on one system that are sent to the Event Viewer of another system in your storage space. (See .)

Email notifications are email messages about events on a system in your storage space that are sent to specified users. (See .)

Event alerts are pop-up messages or console messages about all types of events on a specific system, which are broadcast to all the users who are logged into your storage space. (See .)

Buttons and Icons At-a-Glance

In this chapter...

This chapter provides quick references to the icons and buttons that appear in Adaptec Storage Manager.

Icons in the Physical Devices View

Icon	Description
	Ready disk drive
	Disk drive with free space
	Disk drive with no free space
	Failed disk drive
	Healthy global or dedicated hot spare
	Hot spare with error (see page 76 for more information)
	Hot spare being built into logical drive after disk drive failure
	Hot spare built into logical drive after disk drive failure
	Locked upgrade feature that can be activated with a feature key (see page 19 for more information)
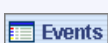
Icons in the Logical Devices View

Icon	Description
	Logical drive
	Logical drive with healthy hot spare
	Logical drive with a snapshot
	Logical drive being initialized
	Logical drive being modified
	Logical drive being rebuilt after disk drive failure
	Locked upgrade feature that can be activated with a feature key (see page 19 for more information)

Buttons in the Physical/Logical Devices Views

Button	Click to...	More on...
	...see a text description of your disk drives	...page 36
	...see the size capacities of your disk drives	...page 37
	...see the size capacities of your disk drives relative to each other	...page 37
	...create a global hot spare	...page 74
	...create a logical drive	...page 39
	...delete a logical drive	...page 73
	...expand and collapse additional information about disk drives and logical drives	...page 36

Buttons on the Main Window Tool Bar

Button	Click to...	More on...
Add	...add a remote system	...page 51
Create	...create a logical drive; open the Configuration wizard	...page 39
Silence	...silence the audible alarm	...page 96
Properties	...check status and other properties of a controller, disk drive, or other component	...page 97
Events	...view the full Event log	...page 82
Configure	...configure the Adaptec Storage Manager agent settings ...configure notification settings ...configure email notification settings ...check the status of scheduled tasks; monitor and modify scheduled tasks	...page 56 ...page 83 ...page 89 ...page 98
Help	...open the online Help	...page 38

Selecting the Best RAID Level

In this chapter...

When you create logical drives in Adaptec Storage Manager, you can assign a RAID level to protect your data.

Each RAID level offers a unique combination of performance and redundancy. RAID levels also vary by the number of disk drives they support.

This chapter provides a comparison of all the RAID levels supported by Adaptec Storage Manager, and provides a basic overview of each to help you select the best level of protection for your storage system.

Comparing RAID Levels

Use this table to select the RAID levels that are most appropriate for the logical drives on your storage space, based on the number of available disk drives and your requirements for performance and reliability.

RAID Level	Redundancy	Disk Drive Usage	Read Performance	Write Performance	Built-in Hot Spare	Minimum Disk Drives
RAID 0	No	100%	★★★	★★★	No	1
RAID 1	Yes	50%	★★	★★	No	2
RAID 1E	Yes	50%	★★	★★	No	3
RAID 10	Yes	50%	★★	★★	No	4
RAID 5	Yes	67% – 94%	★★★	★	No	3
RAID 5EE	Yes	50% – 88%	★★★	★	Yes	4
RAID 50	Yes	67% – 94%	★★★	★	No	6
RAID 6	Yes	50% – 88%	★★	★	No	4
RAID 60	Yes	50% – 88%	★★	★	No	8
Spanned Volume	No	100%	★★★	★★★	No	2
RAID Volume	No	50% – 100%	★★★	★★★	No	4

Disk drive usage, read performance, and write performance depend on the number of drives in the logical drive. In general, the more drives, the better the performance.

More information about each RAID level is available beginning on .

Understanding Drive Segments

A *drive segment* is a disk drive or portion of a disk drive that is used to create a logical device. A disk drive can include both *RAID segments* (segments that are part of a logical drive) and available segments. Each segment can be part of only one logical device at a time. If a disk drive is not part of any logical device, the entire disk is an available segment.

RAID 0 (Non-RAID Logical Drives)

A logical drive with RAID 0 includes two or more disk drives (maximum twelve) and provides data *striping*, where data is distributed evenly across the disk drives in equal-sized sections.

RAID 0 logical drives do not maintain redundant data, so they offer no data protection. However, compared to an equal-sized group of independent disks, a RAID 0 logical drive provides improved I/O performance.

Drive segment size is limited to the size of the smallest disk drive in the logical drive. For instance, a logical drive with two 250 GB disk drives and two 400 GB disk drives can create a RAID 0 drive segment of 250 GB, for a total of 1000 GB for the volume, as shown in this figure.
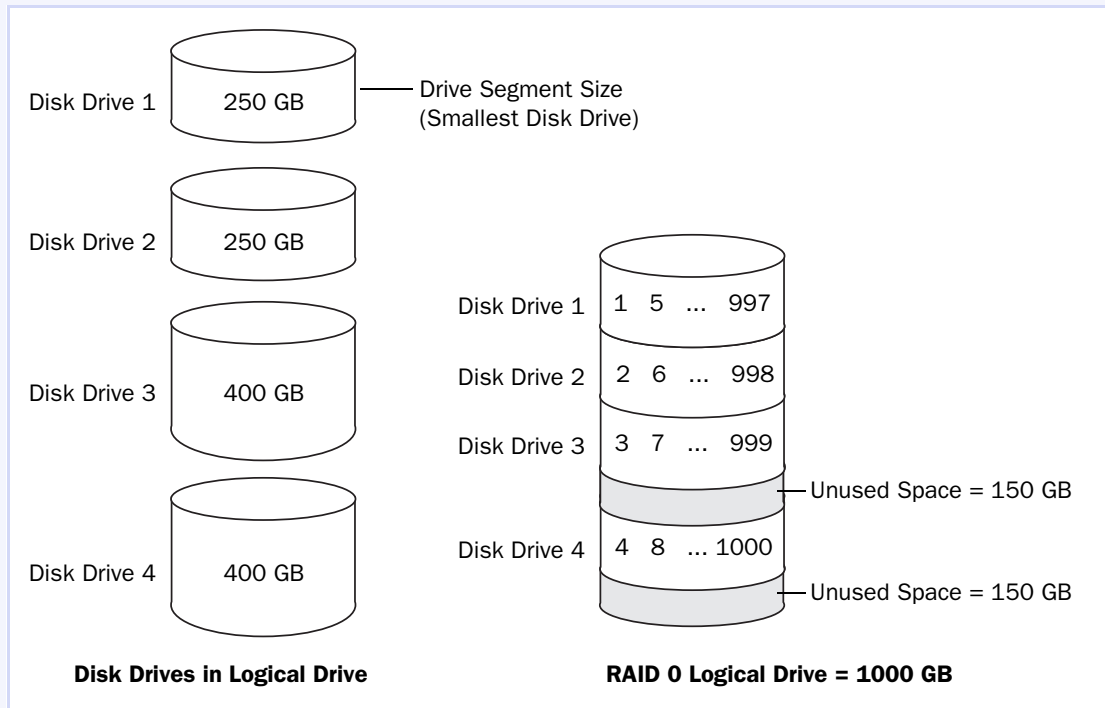
RAID 1 Logical Drives

A RAID 1 logical drive is built from two disk drives, where one disk drive is a *mirror* of the other (the same data is stored on each disk drive). Compared to independent disk drives, RAID 1 logical drives provide improved performance, with twice the read rate and an equal write rate of single disks. However, capacity is only 50 percent of independent disk drives.

If the RAID 1 logical drive is built from different-sized disk drives, the free space, drive segment size is the size of the smaller disk drive, as shown in this figure.
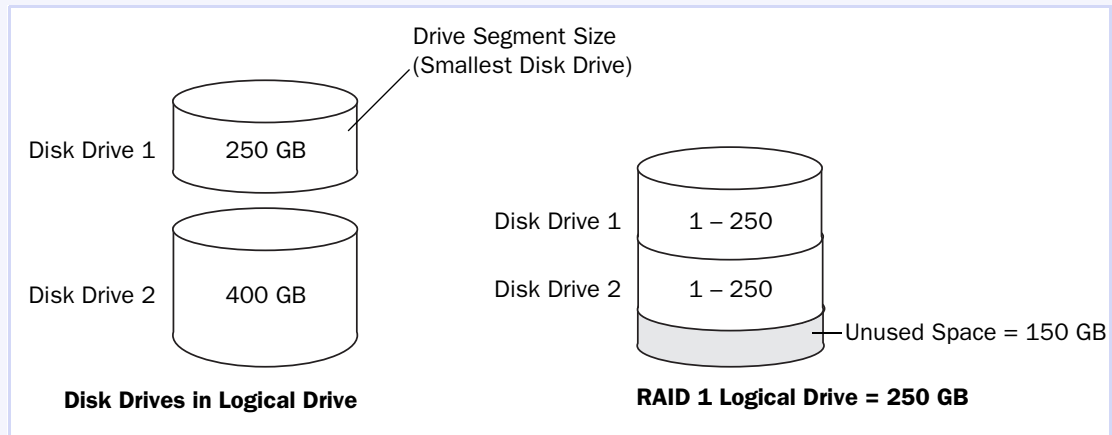
RAID 1 Enhanced Logical Drives

A RAID 1 Enhanced (RAID 1E) logical drive—also referred to as a *striped mirror*—is similar to a RAID 1 logical drive except that data is both mirrored *and* striped, and more disk drives can be included. A RAID 1E logical drive can be built from three or more disk drives—depending on the stripe size, the maximum number of disk drives ranges from eight to sixteen.

In this figure, the large bold numbers represent the striped data, and the smaller, non-bold numbers represent the mirrored data stripes.
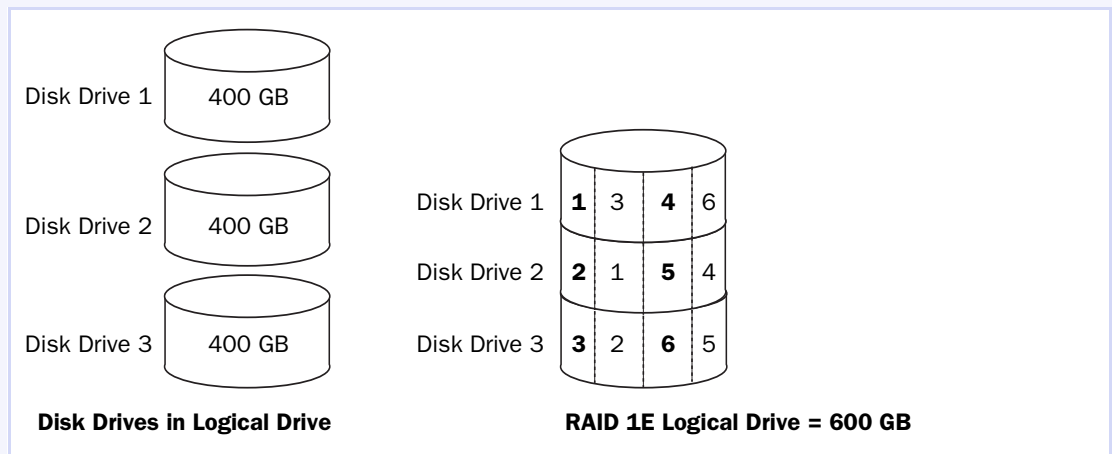
RAID 10 Logical Drives

A RAID 10 logical drive is built from two or more equal-sized RAID 1 logical drives. Adaptec RAID controllers support a maximum number of 128 disk drives in a RAID 10 logical drive.

Data in a RAID 10 logical drive is both striped and mirrored. Mirroring provides data protection, and striping improves performance.

Drive segment size is limited to the size of the smallest disk drive in the logical drive. For instance, a logical drive with two 250 GB disk drives and two 400 GB disk drives can create two mirrored drive segments of 250 GB, for a total of 500 GB for the logical drive, as shown in this figure.

Disk Drives in Logical Drive

RAID 10 Logical Drive = 500 GB
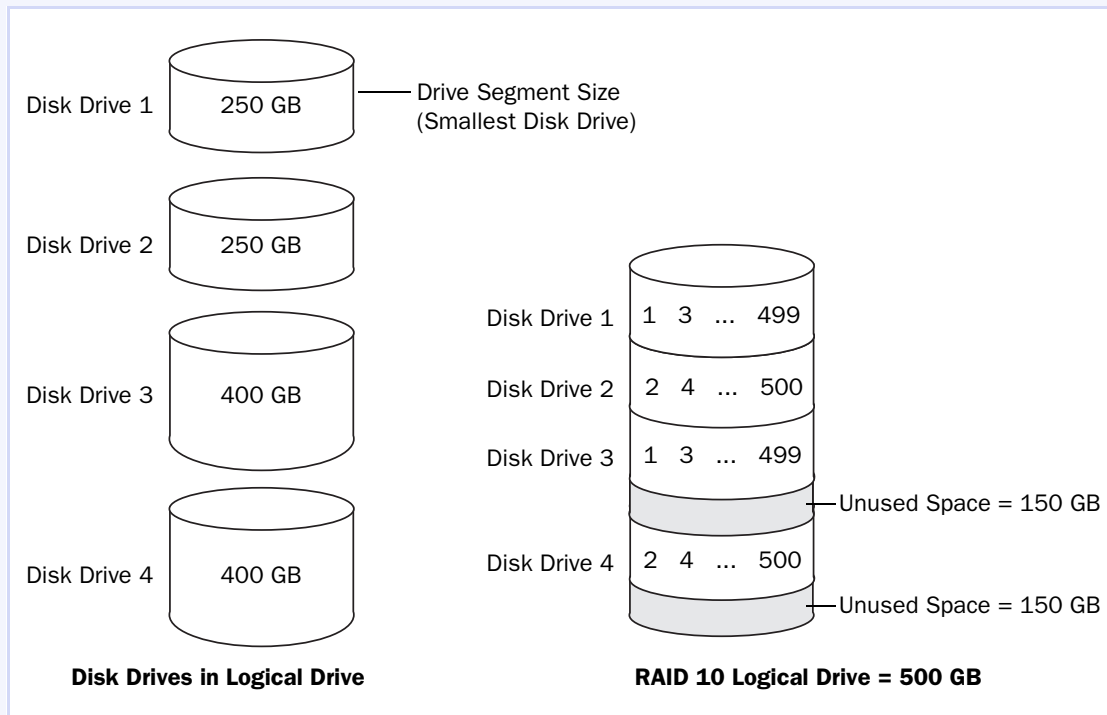
RAID 5 Logical Drives

A RAID 5 logical drive is built from a minimum of three and a maximum of sixteen disk drives, and uses data striping and *parity* data to provide redundancy. Parity data provides data protection, and striping improves performance.

Parity data is an error-correcting redundancy that's used to re-create data if a disk drive fails. In RAID 5 logical drives, parity data (represented by Ps in the next figure) is striped evenly across the disk drives with the stored data.

Drive segment size is limited to the size of the smallest disk drive in the logical drive. For instance, a logical drive with two 250 GB disk drives and two 400 GB disk drives can contain 750 GB of stored data and 250 GB of parity data, as shown in this figure.
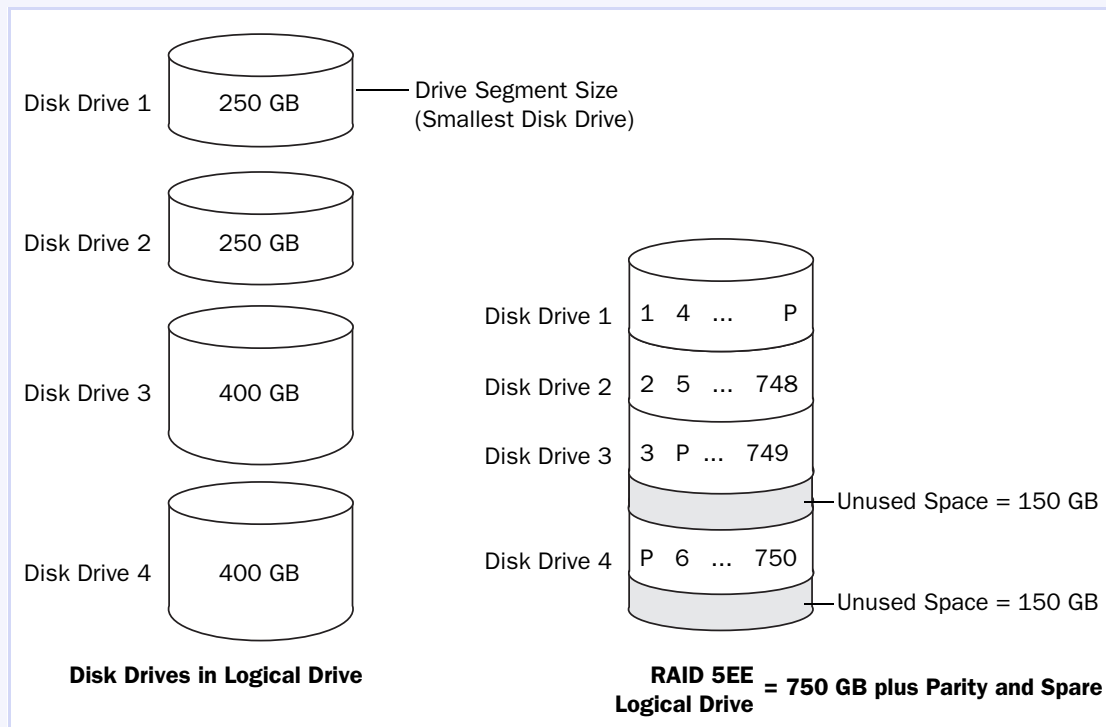
RAID 5EE Logical Drives

A RAID 5EE logical drive—also referred to as a *hot space*—is similar to a RAID 5 logical drive except that it includes a *distributed spare* drive and must be built from a minimum of four disk drives. The maximum number of disk drives is sixteen.

Unlike a hot spare (see), a distributed spare is striped evenly across the disk drives with the stored data and parity data, and can't be shared with other logical disk drives. A distributed spare improves the speed at which the logical drive is rebuilt following a disk drive failure.

A RAID 5EE logical drive protects your data and increases read and write speeds. However, capacity is reduced by two disk drives' worth of space, which is for parity data and spare data.

In this example, S represents the distributed spare, P represents the distributed parity data.

Disk Drive 1 — 250 GB — Drive Segment Size (Smallest Disk Drive)

Disk Drive 2 — 250 GB

Disk Drive 3 — 400 GB

Disk Drive 4 — 400 GB

Disk Drives in Logical Drive

Disk Drive 1 | 1 S ... P
Disk Drive 2 | 2 P ... 449
Disk Drive 3 | S 3 ... S
Unused Space = 150 GB
Disk Drive 4 | P 4 ... 500
Unused Space = 150 GB

RAID 5EE Logical Drive = 750 GB plus Parity and Spare
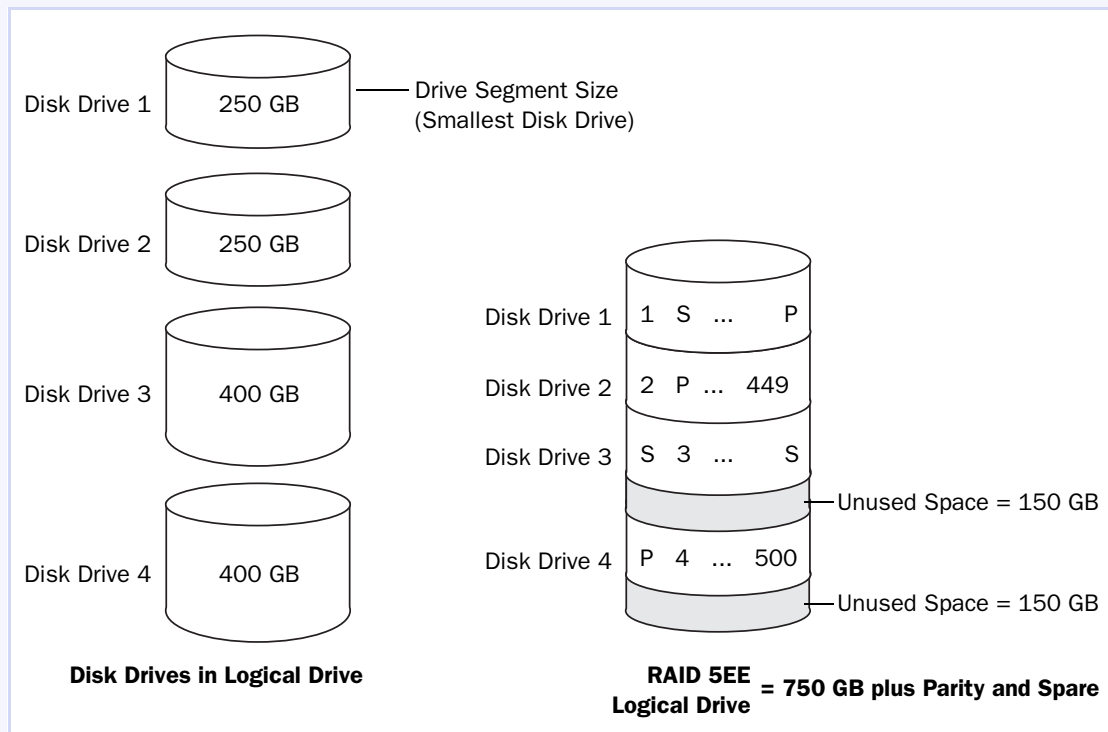
RAID 50 Logical Drives

A RAID 50 logical drive is built from six to forty-eight disk drives configured as two or more RAID 5 logical drives, and stripes stored data and parity data across all disk drives in both RAID 5 logical drives. (For more information, see *RAID 5 Logical Drives* on page 141.)

The parity data provides data protection, and striping improves performance. RAID 50 logical drives also provide high data transfer speeds.

Drive segment size is limited to the size of the smallest disk drive in the logical drive. For example, three 250 GB disk drives and three 400 GB disk drives comprise two equal-sized RAID 5 logical drives with 500 GB of stored data and 250 GB of parity data. The RAID 50 logical drive can therefore contain 1000 GB (2 x 500 GB) of stored data and 500 GB of parity data.

**RAID 50
Logical Drive
=
1000 GB
plus Parity**

**RAID 5
A**

Each RAID 5 Logical Drive has
500 GB Data Storage
250 GB Parity Data

**RAID 5
B**

1, 5, P

3, P, 9

P, 7, 11

2, 6, P

4, P, 10

P, 8, 12

Total Unused
Space = 150 GB

Drive 1
250 GB

Drive 2
250 GB

Drive 3
250 GB

Drive 4
400 GB

Drive 5
400 GB
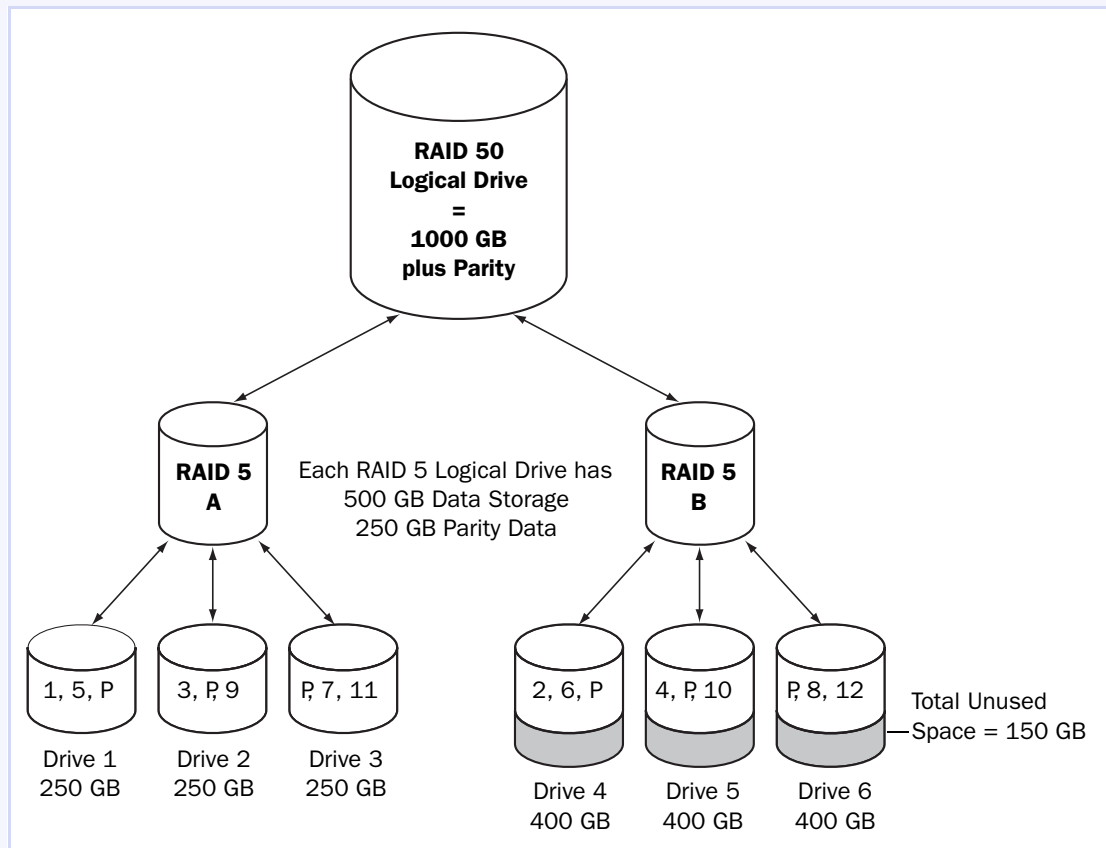
Drive 6
400 GB

In this example, P represents the distributed parity data.

RAID 6 Logical Drives

A RAID 6 logical drive—also referred to as *dual drive failure protection*—is similar to a RAID 5 logical drive because it uses data striping and parity data to provide redundancy. However, RAID 6 logical drives include *two* independent sets of parity data instead of one. Both sets of parity data are striped separately across all disk drives in the logical drive.

RAID 6 logical drives provide extra protection for your data because they can recover from two simultaneous disk drive failures. However, the extra parity calculation slows performance (compared to RAID 5 logical drives).

RAID 6 logical drives must be built from four or more disk drives, to a maximum of sixteen. Maximum stripe size depends on the number of disk drives in the logical drive.
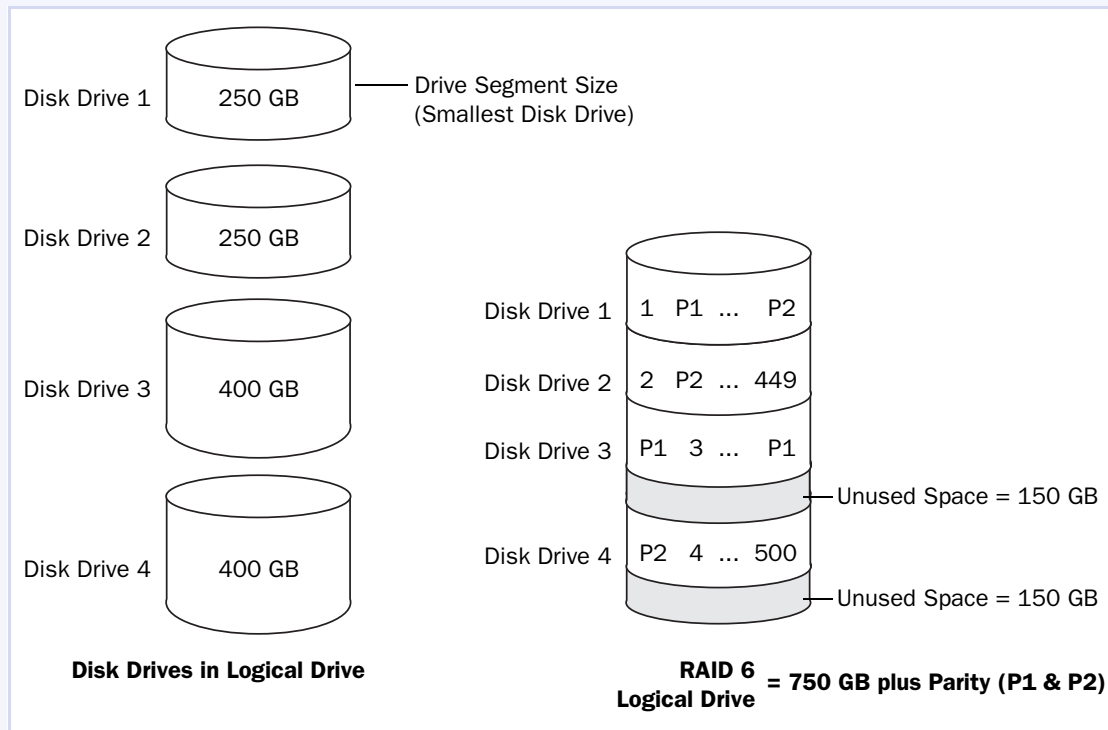
RAID 60 Logical Drives

Similar to a RAID 50 logical drive (see), a RAID 60 logical drive—also referred to as *dual drive failure protection*— is built from eight disk drives configured as two or more RAID 6 logical drives, and stripes stored data and two sets of parity data across all disk drives in both RAID 6 logical drives.

Two sets of parity data provide enhanced data protection, and striping improves performance. RAID 60 logical drives also provide high data transfer speeds.

Glossary

A

Adaptec Storage Manager agent
Runs in the background on your computer, monitoring and managing event notifications, tasks schedules, and other on-going processes in your storage space. It requires no user intervention and includes no user interface.

available space
Space on a disk drive that is not being used by a logical drive. When a logical drive is deleted, its space becomes available. *See also* logical drive.

B

background consistency check
A controller function that continually and automatically verifies your logical drives once they're in use.

bootable-CD mode
A way of running Adaptec Storage Manager, where the application is not installed but is run directly from a CD.

C

cache
A temporary, fast storage area that holds data from a slower storage device for quick access. Cache storage is normally transparent to the accessing device.

channel
Any path used for the transfer of data and the control of information between disk drives and a RAID controller.

controller
A hardware device that interprets signals between a host and a disk drive. Also known as an adapter or card. *See also* I/O.

copyback
Adaptec RAID controller feature that allows data that has been moved to a hot spare to be returned to its original location once the controller detects that the failed drive has been replaced.

D

DAS
Direct-attached Storage. Data storage that is physically connected to a server. *See also* LAN, SAN.

drive segment
See segment.

dual drive failure protection
Another name for a RAID 6 or RAID 60 logical drive.

E

Email Notification Manager
A utility within Adaptec Storage Manager that emails event messages to selected recipients. *See also* email notifications, Notification Manager.

email notifications
Event messages about remote systems that are emailed to selected recipients.

event
Activity on your storage space, such as a disk drive failure or logical drive verification.

F

fault tolerance
The ability of a system to continue to perform its functions even when one or more disk drives have failed.

firmware
A combination of hardware and software; software written onto read-only memory (ROM).

format
See initialize.

G

GB
GigaByte. 1,024 MB. *See also* MB.

H

host
A computer that's connected to a TCP/IP network. *See also* TCP/IP.

host bus adapter (HBA)
An adapter card that includes all of the I/O logic, software, and processing to manage the transfer of information between the host and the devices it's connected to.

hot space
A RAID 5EE logical drive. See page 142.

hot spare
A spare disk drive which will automatically replace a failed disk drive in a logical drive.

hot-swap
Remove and replace a failed disk drive in a logical drive without shutting down the server or disrupting activity on the logical drive.

I

initialize
Prepare a disk drive for reading and writing.

I/O
Input/Output. Data entering into or being extracted from a computer.

L

LAN
Local Area Network. A network of interconnected workstations sharing the resources of a single server, typically within the area of a small office building.

LED
Light-emitting Diode. An electronic device that lights up when powered.

local system
The computer that you're working on. In Adaptec Storage Manager, 'local' and 'remote' are relative terms. *See also* remote system.

logged notifications
Event messages about remote systems that appear in the Event Viewer of Adaptec Storage Manager. *See also* Notification Manager.

logical drive
One or more disk drives grouped together to appear as a single device to a computer. Also known as a logical device or array.

M

managed system
A computer or server in a storage space that's being managed by Adaptec Storage Manager.

MB
MegaByte. Depending on context, 1,000,000 or 1,048,576 bytes. Also 1000 KB.

mirroring
Data protection that duplicates all data from one drive onto a second drive. *See also* RAID.

N

Notification Manager
A utility within Adaptec Storage Manager that broadcasts event messages to selected managed systems.

P

parity
A form of data protection used by some RAID levels to re-create the data of a failed disk drive in a logical drive. *See also* RAID.

partition
Divides the space of a disk drive into isolated sections.

port
A connection point to a controller, disk drive, expander, enclosure, or other device.

R

RAID

Redundant Array of Independent Disks. For more information on RAID and all supported RAID levels, see *Selecting the Best RAID Level* on page 136.

rapid fault isolation

The trail of yellow or red warning icons that leads from the high-level system view to the failed or failing component.

rebuild

Re-create a logical drive after a disk drive failure.

recurring task

A scheduled task, such as logical drive verification, that occurs on a regular basis. *See also* Task Manager, scheduled task.

redundancy

The capability of preventing data loss if a disk drive fails. *See also* mirroring, parity.

remote system

In Adaptec Storage Manager, all other computers in your storage space besides your local system are remote systems. 'Local' and 'remote' are relative terms. *See also* local system.

ROM Update wizard

A program that updates the BIOS and firmware codes on the controller. *See also* firmware.

S

SAN

Storage Area Network. A storage architecture that connects servers and disk drives across a network for enhanced reliability, scalability, and performance.

scheduled task

Activity, such as logical drive verification, that is set to be completed at a specified date and time. *See also* recurring task.

segment

Disk drive space that has been assigned to a logical drive. A segment can include all or just a portion of a disk drive's space.

SMTP

Simple Mail Transfer Protocol.

snapshot

A frozen image of a logical drive at a particular point in time.

spare

See hot spare.

storage space

The controller(s) and disk drives being managed with Adaptec Storage Manager.

stripe size

Amount of data written to one partition before the controller moves to the next partition in a stripe set.

striped mirror

A RAID 1 Enhanced, or RAID 1E, logical drive. See page 139.

striping
A method of enhancing performance by spreading data evenly over multiple disk drives. Provides no data protection.

T

Task Manager
A utility in Adaptec Storage Manager that allows you to schedule a specific activity, such as expanding a logical drive, for a time that's convenient. *See also* scheduled task, recurring task.

TB
TeraByte. Approximately one million-million bytes, or 1024 GB.

TCP/IP
Transmission Control Protocol/Internet Protocol. A set of communication protocols used to connect hosts on the Internet.

V

verify
Check a logical drive for inconsistent or bad data. May also fix any data problems or parity errors.

Index

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