Adaptec Storage Manager™ Pro v1.11

User's Guide

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1

Getting Started

In This Chapter

Adaptec Storage Manager™ Pro is a storage management software application that manages the storage devices connected to your Adaptec RAID controllers. You can create and reconfigure arrays, manage spares, monitor the status of your storage devices, and more.

You can access newly created arrays immediately after creating them.

Storage Manager Pro also allows you to perform all these functions for all systems on your network that are running Storage Manager Pro. This gives you the power you need to manage all your storage devices from a single location.

Storage Manager Pro runs under multiple operating systems including Windows 95/98, Windows NT, Windows 2000, Novell NetWare, Red Hat Linux (version 6.2 only), and FreeBSD.

About This Guide

This *User's Guide* describes the features available in Storage Manager Pro and how to use them. It assumes that you are familiar with the basic functions of your operating system such as using your mouse to select information, using menus, and scrolling. If you are not familiar with these functions, refer to your operating system's documentation.

This *User's Guide* also assumes that you are familiar with basic network administration terminology and tasks and that you have some knowledge of Redundant Array of Independent Disks (RAID).

Conventions

This *User's Guide* uses several typographical conventions to help explain how to use Storage Manager Pro.

Convention	Description
Bold	Words in **bold** indicate items to select such as menu items or command buttons.
Sans serif, italics	Words in a *sans serif, italics* font indicate file names and path names.
Sans serif	Words in a *sans serif* font indicate commands or text you type exactly as shown.
	Notes give you important information that may affect how you decide to set up your system.
	Cautions warn you about actions that may permanently delete data or cause damage to your system.

Getting Online Help

Online Help is available at any time from the Help menu. You can also press **F1** or click **Help** in a dialog box to display Online Help specific to where you are.

Starting Adaptec Storage Manager Pro

For information about installing Storage Manager Pro, refer to the *User's Guide* for your controller.

When you install Storage Manager Pro, the Adaptec Storage Manager Pro service (ASMProServer) or daemon (Linux or FreeBSD) starts automatically and starts each time you boot your system. This service or daemon must be running for Storage Manager Pro to permit remote access to the system, for notification and event logging, and for the user interface to work.

Checking to See If the Service or Daemon Is Running

If you ever start the Storage Manager Pro user interface and receive a "cannot connect to local server" error message, check that the service or daemon is running:

- Windows 95/98—Press **Ctrl**, **Alt**, **Del** simultaneously. In the Close Program window, you should see ASMProServer in the list of running programs and the Storage Manager Pro icon in the bottom right corner of your screen.
- Windows NT/2000—Click **Start**, point to **Settings,** click **Control Panel,** double-click **Services**. The ASMProServer should be listed as Started and you should see the Storage Manager Pro icon in the bottom right corner of your screen.

  When you uninstall Storage Manager Pro and during normal shutdown, the service will be shut down automatically.
- NetWare—Type the following:

  ```
  java -show
  ```

  If the resulting list of running Java threads includes com.ensemble.coordinator.Launcher, then the service is running.
- Linux—Type the following:

  ```
  ps -ef | grep ASMProServer
  ```

  If the command returns a process ID (PID), the daemon is running.

- FreeBSD—Type the following:

  ```
  ps -ax | grep ASMProServer
  ```

  If the command returns a process ID (PID), the daemon is running.

Starting the Service or Daemon Manually

If the Storage Manager Pro service or daemon is not running, start it manually:

- Windows 95/98—Click **Start**, point to **Programs**, point to **Adaptec Storage Manager Pro**, and click **Start Adaptec Storage Manager Pro Server**.
- Windows NT/2000—Click **Start**, point to **Settings**, click **Control Panel**, and double-click **Services**. Select **ASMProServer**, and click **Start**.
- NetWare—From the system console, type the following:

  ```
  search add sys:\adaptec\SMPro
  asmpsrvr.ncf
  ```

  The commands are *not* case sensitive. You only need to type the first line (the search command) the first time you start the service.

  Be sure that the Java Virtual Machine is running. If it is not, type `startx` to start it.

- Linux—Go to */etc/rc.d/init.d* and type the following:

  ```
  ./ASMProServer.init start
  ```

  The command is case sensitive.

- FreeBSD—Go to */usr/local/etc/rc.d* and type the following:

  ```
  ./ASMProServer.sh start
  ```

  The command is case sensitive.

Logging In to Storage Manager Pro

When you start Storage Manager Pro, you must log in to the application. Storage Manager Pro comes with one local user account that has administrator privileges:

- Login Name—administrator
- Password—adaptec

Login names are *not* case sensitive; however, passwords *are* case sensitive.

You should change that account's password and then create the additional accounts that you need. For information about creating and editing user accounts, see Chapter 5, *Managing Storage Manager Pro Users*.

Starting Storage Manager Pro on Windows NT/2000 or Windows 95/98

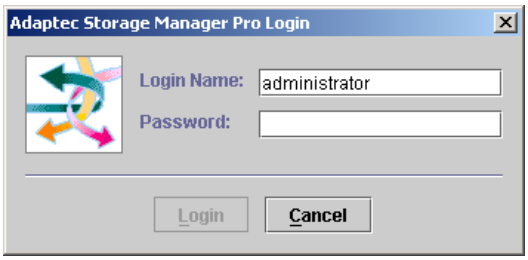
You start Adaptec Storage Manager Pro from the Start menu, just like other Windows applications.

If you want to display Storage Manager Pro in a language other than English, you must click **Start**, point to **Settings,** click **Control Panel,** double-click **Regional Settings**, and select the language you want.

To start Storage Manager Pro:

1. Click **Start**, point to **Programs,** point to **Adaptec Storage Manager Pro,** and select **Adaptec Storage Manager Pro**.

   The Adaptec Storage Manager Pro Login dialog box appears.



2. Type your Login Name.

   If this is the first time you are logging in, type administrator to use the default user account that comes with Storage Manager Pro.

3 Type your Password.

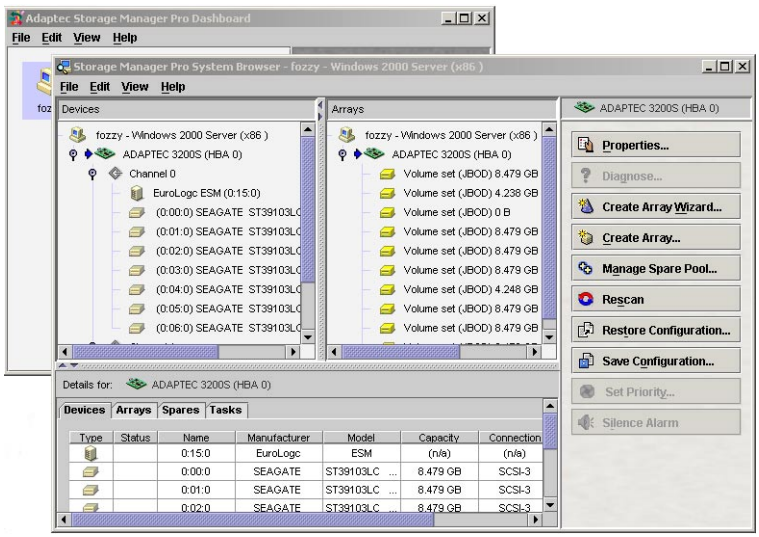
If this is the first time you are logging in, type adaptec, which is the initial password for the default user account that comes with Storage Manager Pro.

4 Click **Login**.

If this is the first time you are logging in or you are working locally only, the System Browser window appears with the Dashboard behind it. From the System Browser window, you can access the array creation and related functions.

If you have already set up remote access to other systems, only the Storage Manager Pro Dashboard appears. From the Dashboard, you can access all of the Storage Manager Pro functions. Click **Open System** to access the System Browser for the selected system. See *Understanding the Dashboard* on page 1-8.

Most steps in this *User's Guide* start from the System Browser window.



Starting Storage Manager Pro on NetWare

You start Adaptec Storage Manager Pro just like other NetWare applications.

To start Storage Manager Pro:

1. From the system console, type the following:

   ```
   search add sys:\adaptec\SMPro
   asmp
   ```

   The commands are *not* case sensitive. You only need to type the first line (the search command) the first time you start Storage Manager Pro.

   You must use an XServer console, not a serial console.

   The Adaptec Storage Manager Pro Login dialog box appears.

2. Continue with step 2 of *Starting Storage Manager Pro on Windows NT/2000 or Windows 95/98* on page 1-5.

Starting Storage Manager Pro on Linux/FreeBSD

You start Adaptec Storage Manager Pro just like other Linux applications.

If you want to display Storage Manager Pro in a language other than English, you must set an environment variable to the correct language. Here are example commands for the sh/bash/ksh shells:

Language	Command
French	export LC_CTYPE=fr_FR
German	export LC_CTYPE=de_DE
Italian	export LC_CTYPE=it_IT
Spanish (Spain)	export LC_CTYPE=es_ES

The exact command may vary because of ISO suffixes. You can find the correct file name (the part after the = in the command examples above) in the */usr/share/locale* directory.

If you are using csh or tcsh, the example will change to:

```
setenv LC_CTYPE fr_FR
```

You must set the variable before the daemon is launched. The best way to do this is to edit the *ASMProServer.init* file that gets run on start-up and add the command before the command to start the

daemon. The *ASMProServer.init* file is located in the installation directory of Storage Manager Pro.

To start Storage Manager Pro:

1. Change directories to where you installed Storage Manager Pro.
2. Type the following:

   ./ASMPro

   The command *is* case sensitive.

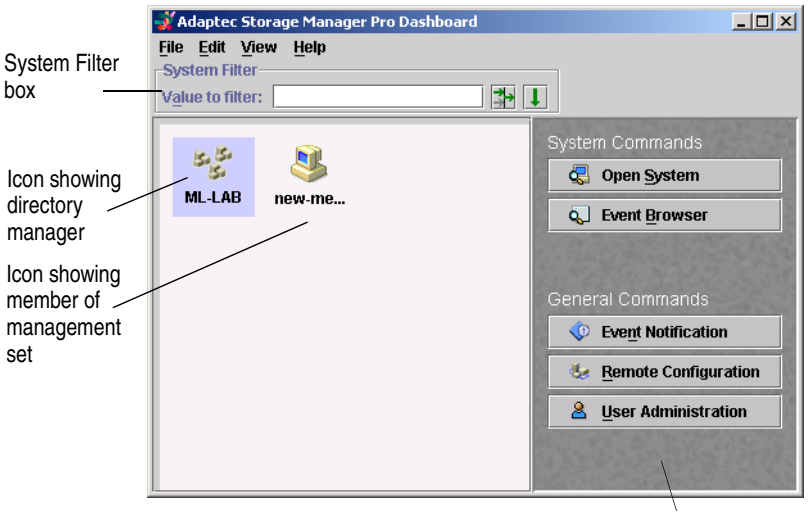
   The Adaptec Storage Manager Pro Login dialog box appears.
3. Continue with step 2 of *Starting Storage Manager Pro on Windows NT/2000 or Windows 95/98* on page 1-5.

Caution: You must shut down the ASMProServer daemon before you shut down your system or uninstall Storage Manager Pro. During normal shutdown, the daemon will be shut down automatically. To shut down the daemon manually, from the \adaptec\StorageManagerPro directory, type the following:
ServerStop
Do *not* use the kill command to shut down the daemon.

Understanding the Dashboard

The Dashboard appears when you start Storage Manager Pro. If you are working locally only, the Storage Manager Pro Dashboard is beneath the System Browser window.

If you have already set up remote access to other systems, only the Storage Manager Pro Dashboard appears when you start Storage Manager Pro.



The Dashboard allows you to access all of the Storage Manager Pro functions from the Command Buttons pane. This area is divided in two sections, *System Commands* and *General Commands*.

System Commands

These commands are applicable only to the selected system:

- Open System (System Browser)—Allows you to create and reconfigure arrays, and manage disks, spares, controllers, and enclosures. See *Understanding the System Browser* on page 1-12.
- Event Browser—Allows you to view events in the event log on the selected system. See *Viewing Events* on page 6-2.

General Commands

These commands apply to Storage Manager Pro, rather than to a specific system:

- Event Notification—Allows you to set up e-mail and e-mail pager notification so you can be informed about specified events, such as failovers, that may occur on your Adaptec SCSI RAID controllers. See *Setting Up Event Notification* on page 6-7.

- Remote Configuration—Allows you to set up remote access to other systems running Storage Manager Pro that are on your network. See Chapter 4, *Managing Controllers on Remote Systems*.
- User Administration—Allows you to set up login names and passwords. See Chapter 5, *Managing Storage Manager Pro Users*.

Changing How the Dashboard Looks

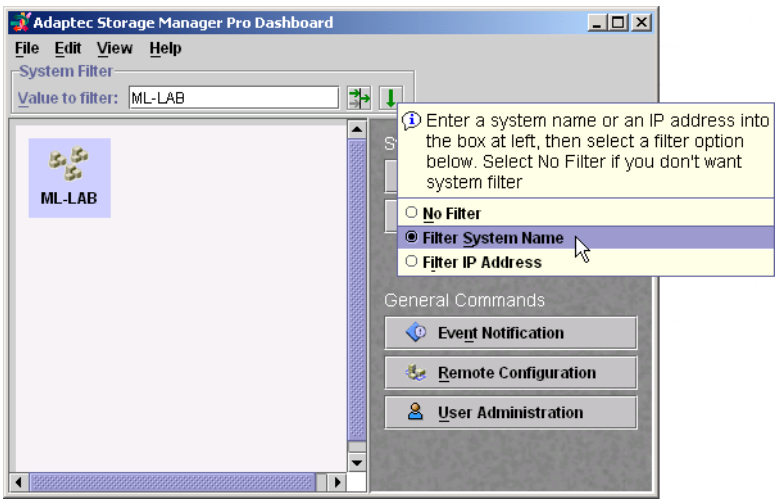
You can control how the Dashboard looks by selecting these options from the View menu:

- Normal View—This is the default view. View the icons or the details for all systems in the management set. The Normal view is shown in the figure on page 1-9.
- OS View—This option shows a tab for each operating system used by your systems. View all the systems using a specific OS by selecting the appropriate tab.
- Status View—This option shows a tab for each status: OK, Warning, and Critical. View systems by status by selecting the appropriate tab.
- Detail View—This option shows details, rather than icons, for each system. The details include: System Name, OS Type, OS Version, IP Address, and whether the system is the Directory Manager.
- Sort By—View systems sorted by Local System, Directory Manager, System Name, IP Address, or System Status. This item is not available on the View menu when you are in the Detail view. From the Detail view, you can click on the table headers to sort system by status, directory manager, IP address, system name, OS type, and OS version.
- Toolbar—This option replaces the Command Buttons pane with a toolbar, giving you more room to see systems or details. The toolbar can be viewed with icons only or with icons and text.
- Large Icon—This option lets you view larger versions of the icons. This is selected by default. To view the smaller icons, clear the check box for this option.

- Refresh—View an updated representation of your selection. This is useful, for example, when you have taken a system down for repair, then brought it back up.

Using System Filters

You can use a filter to control which system you view. You can select a system by name or by IP Address.



You can also select a group of systems to view by using the following wildcard operators:

- * is a string wildcard that matches 0 or more characters in the query.
- ? is a single-character wildcard that matches any single character in the query.

You can position wildcard operators at the beginning, middle, or end of a query word and you can combine them within a word; for example, ?yst*.

Type	Return
jo?	Systems with 3-letter names beginning with "jo," such as joe, jon, etc.
*jo**	All systems beginning with the letters "jo," such as joe, john, jones
162.1?9.222.111	Systems with any single character in the place of the question mark, such as 162.109.222.111, 162.119.222.111, 162.1293222.111, etc.
*162.**	All systems with the address prefix 162

Understanding the System Browser

When you start Storage Manager Pro, the System Browser window appears automatically if you are working locally only.

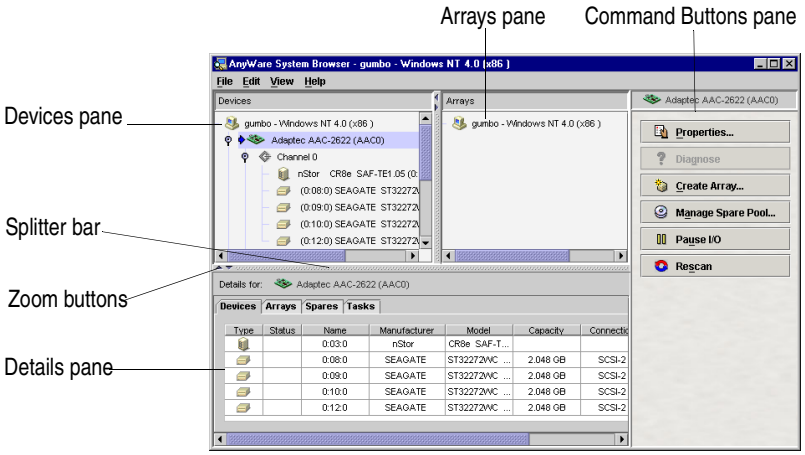
If you have already set up remote access to other systems, only the Storage Manager Pro Dashboard appears when you start Storage Manager Pro. You must select a system and click **Open System** or double-click a system icon to display the System Browser window.

The System Browser is where you perform most of your storage management functions. From the System Browser you can:

- Create and reconfigure arrays. See Chapter 2, *Creating an Array* and Chapter 3, *Managing Arrays*.
- Add and remove spares. See Chapter 7, *Managing Spares*.
- Monitor task progress and controller events. See Chapter 6, *Monitoring System Status*.
- Recondition the battery and rescan controllers. See Chapter 9, *Managing Controllers*.
- Turn off alarms and check enclosure status. See Chapter 10, *Managing Enclosures*.

System Browser Window Parts

When you first open the System Browser window, you can see the system you opened and the first controller in the Devices pane.



The primary parts of this window are:

- Devices pane—Shows a hierarchical view of the physical devices attached to the system that is at the top of the hierarchy. You can expand and collapse the tree. See *Navigating the System Browser Window* on page 1-14.
- Splitter bar—Resizes the height of the Devices, Arrays, and Details panes.
- Zoom buttons—Click a button to move the splitter bar to its extreme upper or lower position.
- Details pane—Shows the details about the device or array selected in the top part of the window. Refer to the Online Help for detailed information about each tab. You can also select items in the Details pane and perform functions associated with the selected item. The buttons in the Command Buttons pane change to reflect the functions you can perform.
- Command Buttons pane—Lists the available functions for the selected item in the Devices, Arrays, or Details pane. The buttons change based on the item selected. You can also right-click a selected item to see the same functions.

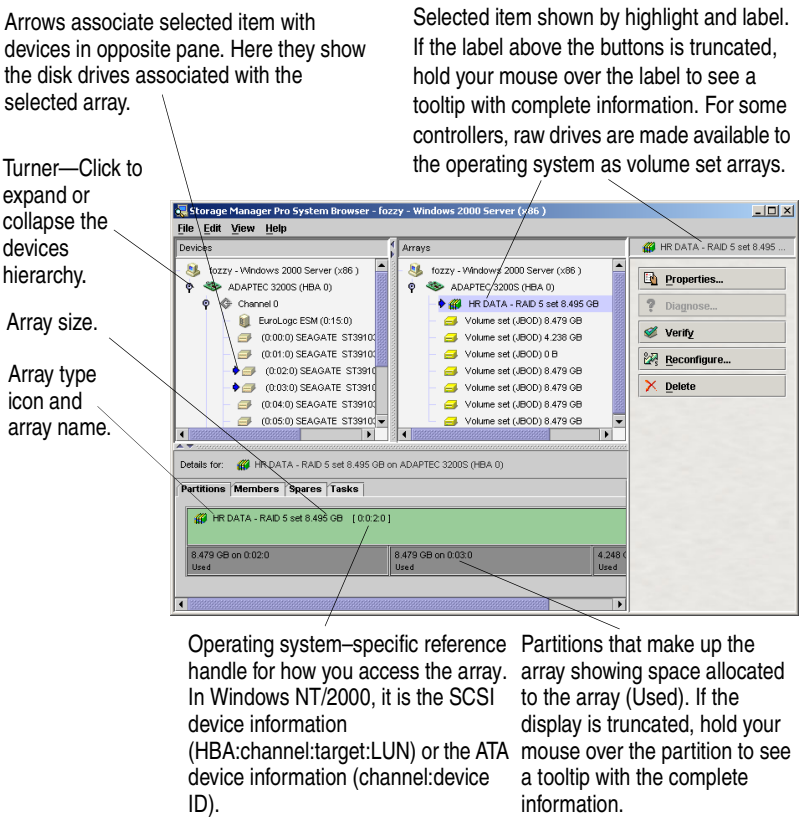
- Arrays pane—Shows all arrays created on all controllers on the open system.

Navigating the System Browser Window

The System Browser window works the same as Windows Explorer and other tree-type lists. It shows a hierarchical view of the physical devices connected to the system, along with existing arrays.

When you select a device or array, information related to that device or array is displayed in the Details pane. In the figure on page 1-15, the controller is selected. The Devices tab in the Details pane lists each physical device connected to the controller and information about each device. The Arrays tab lists the arrays existing on the selected controller and their information.

When you select an array in the Arrays pane, more information about the array is displayed in the Details pane. See page 1-15.



Each type of device and array has its own icon in the System Browser window as shown in the next table.

Icon	Device or Array Type
	System
	Directory Manager
	Controller
	Channel
	Enclosure
	Disk drive
	Uninitialized disk drive
	Volume set
	Stripe set (RAID 0)
	Mirror set (RAID 1)
	RAID 5 set
	Stripe set of mirror sets (RAID 0/1)
	Stripe set of RAID 5 sets (RAID 0/5)

The Status column for each device in the Details pane displays an indicator that changes based on the condition of the device. For more information, see *Understanding the Details Pane Status Column* on page 6-6.

Changing How the System Browser Looks

You can control two aspects of how the System Browser window looks using the View menu:

- Size of the device and array icons—Allows you to use small or large icons. The small icons permit more devices and arrays to display in the window without scrolling.
- Whether the Command Buttons pane is displayed—Allows you to show or hide the Command Buttons pane. The functions are still available when you right-click a device or array.

Uninstalling Storage Manager Pro

You uninstall Storage Manager Pro differently, depending on the operating system you are using.

Windows NT, 2000, 95, or 98

Use Add/Remove Programs from the Control Panel. You must have administrator privileges.

When you uninstall Storage Manager Pro and during normal shutdown, the Storage Manager Pro service (ASMProServer) will be shut down automatically.

NetWare

After shutting down the Storage Manager Pro service (ASMProServer), follow the steps below. You must work from the console or a serial console.

Caution: You must shut down the Storage Manager Pro service before you shut down your system or uninstall Storage Manager Pro. During normal shutdown, the service will be shut down automatically. To shut down the service manually, from the console type the following: asmpstop

1. Insert the Adaptec Storage Manager Pro CD into your CD-ROM drive and mount it.

   Mount the CD-ROM on the server or from the client. Consult your Novell NetWare *User's Guide* on CD-ROM mounting procedures.

2. Copy the contents of the *\Netware\SMPro* directory from the CD to *SYS:\smpro*

   If the files are already on the server, you can skip copying the files.

   For information on copying from a client, you must attach to the NetWare server. Novell's Client 32 can be obtained from http://support.novell.com/. Consult Novell documentation for installation of Novell's Client 32.

3. From the system console, type the following:
   Load SYS:\smpro\setup.nlm

4. From the Select Product Option window, select **Remove Above Product** and press **Enter**.

   The *SYS:\Adaptec\SMPro\data* directory will contain configuration information previously selected in Storage Manager Pro.

   You can delete the *Adaptec* directory and its contents for complete removal from the system.

Linux/FreeBSD

After closing Storage Manager Pro, follow these steps:

1. Shut down the Storage Manager Pro service by typing the following:

   StopASMProServer

2. Uninstall by typing the following:
   $INSTDIR/UninstallerData/Uninstall
   where $INSTDIR is the full path name of the directory where Adaptec Storage Manager Pro was installed.

❒

2

Creating an Array

In This Chapter

An *array* (also known as a container) is two or more physical drives grouped together to appear as a single device (logical drive) to the user. You create arrays from two or more physical drives.

You can create an array on any drive on your local system that is connected to a controller managed by Storage Manager Pro. You can also create arrays remotely on systems that you can access using your network. Storage Manager Pro must be installed and running on the remote system. See Chapter 4, *Managing Controllers on Remote Systems*.

You can create an array two different ways depending on whether you want to customize the array creation settings:

- Using the wizard—The Create Array Wizard guides you through determining the best array configuration for your needs. See *Creating an Array Using the Wizard* on page 2-2.
- Using custom settings—You can customize the array creation settings. You can also change the default array creation properties. See *Creating a Custom Array* on page 2-4.

To create an array using either method, you must perform the following tasks in sequence:

1. Create the array. See *Creating an Array Using the Wizard* on page 2-2 or *Creating a Custom Array* on page 2-4.
2. Make the array available for use. How you do this varies based on your operating system. See *Making the Array Available for Use* on page 2-13.

Caution: You should not remove a disk drive that is used by an array. This may cause you to lose data. See *Replacing a Failed Drive in an Array* on page 3-1.

For information describing each array type, see *Array Types* on page A-6. For information about selecting an array type, see Appendix B, *Choosing Your Array Type*.

For information about creating a bootable array, refer to your controller's *Installation Guide*.

Creating an Array Using the Wizard

The Create Array Wizard guides you through determining the best array configuration settings for your needs, creates an array based on your selections, and uses all the available disk drives on the controller. If you want to select specific drives or customize the array, click **Advanced** to open the Create Array dialog box.

To create an array using the Create Array Wizard:

1. In the System Browser window, select the controller where you want to create the array.
2. Click **Create Array Wizard**.

   The Create Array Wizard appears and guides you through the following array configuration criteria, each of which is defined in the Wizard:

   – Determine Fault Tolerance

   – Determine Array Performance: Array Stripe Size

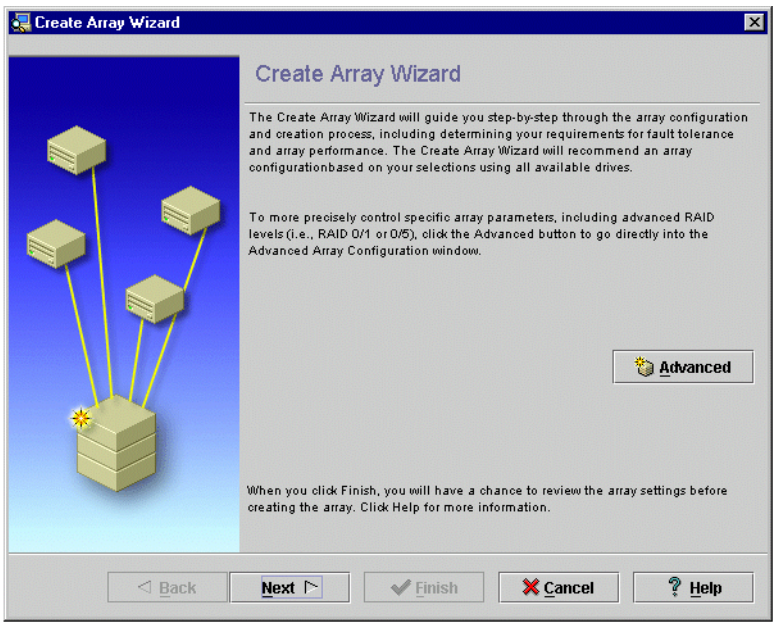
   – Determine Array Performance: Array Cache Settings

– Verify Array Creation Configuration

Based on the criteria you select, the Create Array Wizard will suggest the type of array to create as well as other array configuration settings that are appropriate for your situation.

This is also where you name you array. The number of characters you can use for the name depends on your controller. The system only allows you to type as many characters as your controller permits. That may be as few as 15 characters.

If you leave Array Name field blank, the array will have no name.



3 Follow the on-screen instructions.

You can click Next to go to the next configuration criterion or you can click Finish at any time to create the array. The Create Array Wizard will determine the type of array to create based on the available disk drives on your controller and any criteria you have specified.

4 Click **Finish** when you are ready to create the array.

The Create Array dialog box appears if you click Finish anytime before the final page of the Wizard.

5 Review the settings in the Verify Array Creation Configuration dialog box, if it appears, to be sure the array is configured the way you want it.

Click **Back** if you want to change any of the array configuration settings before creating the array.

6 Click **Create** to create the array as described.

The system creates the array using your selections and adds the array to the System Browser window. You can begin using the array while Storage Manager Pro completes the Build process. The Build task may take several hours to complete, depending on the array type, size of the array, and I/O load.

Before you can write data to the array, you need to make the array available for use. See *Making the Array Available for Use* on page 2-13.

Creating a Custom Array

From the Create Array dialog box, you can customize the following array settings, each of which is explained in the steps below:

- Array name
- Array type
- Selected drives

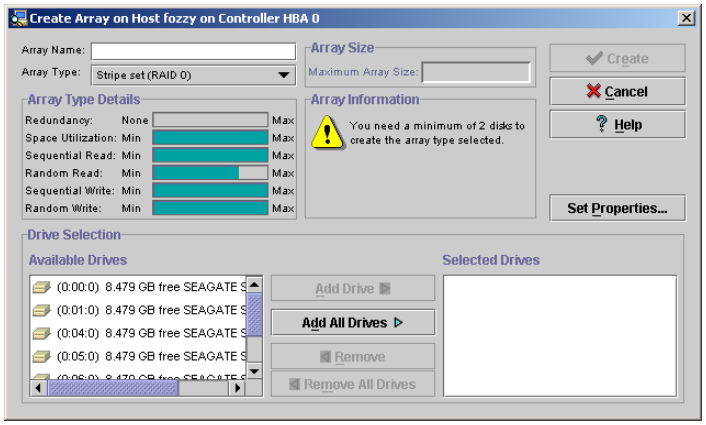
To create a customized array:

1 In the System Browser window, select the controller where you want to create the array.

2 Click **Create Array**.

– Alternate method: In the Details pane, select one or more drives you want to use for an array and click **Create Array**.

The Create Array dialog box appears.



3 Type the Array Name.

The number of characters you can use depends on your controller. The system only allows you to type as many characters as your controller permits. That may be as few as 15 characters.

If you leave this field blank, the array will have no name.

4 From the drop-down list box, select an Array Type.

The list of available array types depends on your controller. For assistance making the selection, see Appendix B, *Choosing Your Array Type*.

The Array Information section of the dialog box displays information about the size of the array you are creating or problems with your combination of selections. The Array Type Details section of the dialog box shows how the array type ranks in each of six array characteristics. For definitions of the characteristics, see *Understanding the Array Selection Criteria* on page B-8.

5 Select the drives you want to use for the array:

– See the Array Information section of the dialog box for the number of drives you can use to create the array type you selected.

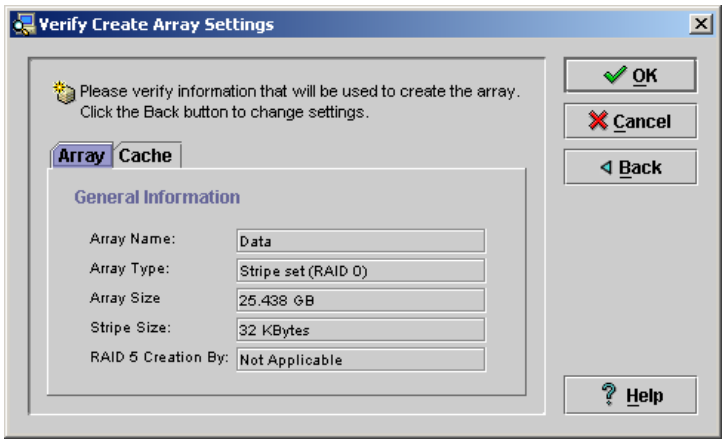
- If you selected one or more drives in the Details pane and clicked Create Array, the drives you selected are listed in the Selected Drives list. To add drives, select one or more from the Available Drives list and click **Add Drives**. You can also double-click a drive.
- To select more than one drive, press and hold the **Ctrl** key and click each drive. To select all the available drives, click **Add All Drives**.
- The drives you selected move to the Selected Drives list and display a yellow asterisk showing that they are new drives for this array. See *Understanding the Selected Drive Icons* on page 2-8.
- See the Array Information section of the dialog box for information about how much space will be used on each drive.
- In the Array Size section, Storage Manager Pro displays the size of the array based on the type of array and size of the drives you select.

6 If you want to view or change the array default properties, click **Set Properties**.

The Default Array Creation Properties dialog box appears. Change the settings as needed and click **Save**. See *Viewing and Setting the Default Array Creation Properties* on page 2-8.

7 Click **Create**.

The Verify Create Array Settings dialog box appears listing the settings for the array Storage Manager Pro will create.



If you are building a mirror set, you will see an additional tab, Copy Direction. The tab displays from which disk drive the data will be copied (from the source to the target disk drive). You can change which disk drive to copy the data to by clicking **Copy to.**

The Copy Direction tab allows you to create a mirror set with the data from a legacy drive. When using a legacy drive, make sure you copy from the legacy disk drive to a disk drive that is at least as big as the legacy drive.

Caution: You will lose all original data residing on the target disk drive (the Copy To disk drive).

8 Check each tab of the dialog box to be sure the array settings are the way you want them.

Depending on the array type, you may have two or three tabs of information to verify.

If you want to change the settings for the array before creating it, click **Back**. The system returns to the Create Array dialog box.

9 Click **OK** to create the array as listed.

Storage Manager Pro creates the array using your selections, and adds it to the System Browser window. The Build task may take several hours to complete, depending on the array type, size of the array, and the I/O load. See *Viewing Task Progress* on page 6-5.

Before you can write data to the array, you need to first make the array available for use. See *Making the Array Available for Use* on page 2-13.

Caution: If you click **Cancel**, the array creation process stops. To leave this dialog box and continue to create an array, click **Back**.

Understanding the Selected Drive Icons

When you select drives for your array in the Create Array or Reconfigure Array dialog boxes, Storage Manager Pro uses different icons to denote the new and already selected drives.

Icon	Definition
	Available drive
	New selected drive—drive that you just assigned to an array
	Selected drive—drive that was already assigned to an array

Viewing and Setting the Default Array Creation Properties

You can view and set the default array creation properties that Storage Manager Pro uses when you create arrays. You access the properties from the Create Array dialog box.

Storage Manager Pro saves these settings, associates them with your user account, and uses them whenever you create an array.

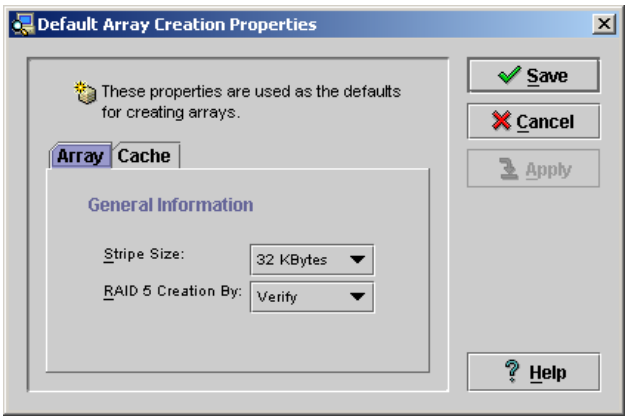
You may be able to set these properties, which are explained in the following sections:

- Stripe size. See page 2-11.
- Write cache properties. See page 2-12.

To view or set the default array creation properties:

1. From the Create Array dialog box, click **Set Properties**. See *Creating a Custom Array* on page 2-4.

   The Default Array Creation Properties dialog box appears. (The Array tab may show different information depending on the array type.)



2 Change the following properties:

Property	Description
Array tab	
Stripe Size	Sets the amount of data written to one array partition before the controller moves to the next array partition in a stripe set (RAID 0), RAID 5 set, stripe set of mirror sets (RAID 0/1), or stripe set of RAID 5 sets (RAID 0/5). See *Stripe Size* on page 2-11.
RAID 5 Creation By	(RAID 5 only) Shows the method used to created the array. Some controllers let you change the RAID 5 creation method. When you create a RAID 5 set, Storage Manager Pro uses the Verify method by default when it creates the array. The Verify method reads all the data on the drives in the array and resets the parity (redundancy) of the existing data sequentially from the beginning of the array to the end. The array is available to users during the Verify process.
Cache tab	
Write Cache	Enables or disables write cache. See *Write Cache Settings* on page 2-12.

3 Click **Save** to save the changes and return to the Create Array dialog box.

Storage Manager Pro saves your changes, which are associated with your user account. Storage Manager Pro uses these settings whenever you use your user account to create an array.

Stripe Size

The stripe size is the amount of data written to one drive before the controller moves to the next drive in a stripe set (RAID 0), RAID 5 set, stripe set of mirror sets (RAID 0/1), or stripe set of RAID 5 sets (RAID 0/5).

Select the stripe size that you want to use most often based on your needs or use the following table. For some types of arrays, the controller may override your selection to ensure good performance.

Array Type	Recommended Stripe Size for Best Performance
Stripe set (RAID 0), RAID 5 set, or stripe set of mirror sets (RAID 0/1)	• Default—Storage Manager Pro selects the best stripe size based on the array type.
Stripe set (RAID 0)	64 KB
RAID 5 set	• If write cache is enabled: 64 KB. OR • If write cache is not enabled: 8 KB or 16 KB. See *Write Cache Settings* on page 2-12.
Stipe set of mirror sets (RAID 0/1)	64 KB
Stripe set of RAID 5 sets (RAID 0/5)	Only default setting available.

You can set the default stripe size to use in array creation in the Default Array Creation Properties dialog box. See *Viewing and Setting the Default Array Creation Properties* on page 2-8.

Write Cache Settings

Storage Manager Pro supports both read and write cache. However, not all controllers support both. The cache options work only if you are using a controller that supports caching.

Write cache speeds write operations by temporarily storing write data in cache until the disk drives are available to write the data. Read cache speeds read operations by storing recently read or written data in cache and by reading ahead in the data.

Most controllers allow you to change settings only for the write cache.

You can also change these settings later if you add a controller that supports cache in the future. To see whether the cache is working, you can check the status and change the settings in the array properties, Cache tab. See *Viewing Array Properties* on page 3-8. When you perform a normal system shutdown, the controller

automatically writes all data in the write cache to disk before the shutdown.

Select the cache settings that you want to use most often:

- **Write Back**—Turns on write cache.

Caution: If your controller does not have a battery or if it is not charged, you risk losing data by selecting this option.

- **Write Through**—Turns off write cache; however, the data written to the array is still stored in the cache and is available for read cache.

You can set the default write cache properties in the Default Array Creation Properties dialog box. See *Viewing and Setting the Default Array Creation Properties* on page 2-8.

Making the Array Available for Use

After you create an array, you typically make the array available to users. In some cases, you may need to reboot the system before the array can be accessible. Use the information in the table on page 2-13 to assist you. Refer to your operating system's documentation for more information.

Operating System	What to Do to Make the Array Available for Use
Windows NT/ 2000	The array is a raw drive. You must partition it, assign it a drive letter, and format it. Refer to your Disk Administrator documentation for more information.
NetWare	The array is a raw drive. You must partition it and assign volumes. Refer to your NetWare documentation for *nwconfig* or *install*, depending the NetWare version.
Linux and FreeBSD	The array is a raw drive. You must partition, format, and mount the array. Refer to your Linux or FreeBSD documentation for more information.

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3

Managing Arrays

In This Chapter

Storage Manager Pro allows you to change many of your array settings without losing your data. Some changes take several hours to complete, depending on the array type, size of the array, the changes you made, and the I/O load. However, you can continue using the array while Storage Manager Pro makes the changes.

Replacing a Failed Drive in an Array

Failover occurs when you have a spare assigned to the spare pool and the spare drive takes over for a failed drive. If failover has occurred, then the data in your redundant array was automatically rebuilt on the spare drive that took over for the failed drive. This is the benefit of using redundant array types and assigning spares.

You must regularly check the Storage Manager Pro log to see if a failover has occurred. See *Monitoring Events* on page 6-1.

In this situation, your arrays are intact and functioning properly, but you still need to replace the drive that went bad and caused the failover.

Note: Remember that failover is only available for redundant array types: mirror set (RAID 1), RAID 5 set, stripe set of mirror sets (RAID 0/1), or stripe set of RAID 5 sets (RAID 0/5).

To replace a drive if failover has occurred:

1. Remove the failed drive.

   Refer to the documentation for your disk drive and enclosure.

2. Install the new drive.

   Refer to the documentation for your disk drive and enclosure.

3. Rescan the controller.

   See *Rescanning a Controller* on page 9-2.

4. Add the new drive to the spare pool.

   See *Adding a Drive to the Spare Pool* on page 7-2.

To replace a drive in the event of a single drive failure with no hot spare assigned:

1. Power off the system and remove the failed drive.

   Refer to the documentation for your disk drive.

2. Install the new drive.

   Refer to the documentation for your disk drive.

3. Power on the system and boot to the operating system.
4. Start Storage Manager Pro, highlight the Array icon.
5. Click **Rebuild**.

Expanding Array Capacity

You can expand array capacity by adding more drives to the array.

Note: You cannot reduce the capacity of an existing array; you can only expand it. To reduce capacity, you must create a new array and copy the data from the old array using your operating system's `copy` function. You can then delete the old array. See *Deleting an Array* on page 3-7.

You can only add drives to a stripe set (RAID 0) or RAID 5 set on systems running Windows NT/2000 using the NTFS file system.

Any added drives must have sufficient free space for Storage Manager Pro to create a properly sized partition for the array. Drives that do not have any free space are not displayed in the Available Drives list in the Reconfigure Array dialog box.

After you expand the size of the array, you must also use Disk Administrator to make the additional space available to users.

To add drives:

1. In the System Browser window, select the array whose drives you want to change.
2. Click **Reconfigure**.

   The Reconfigure Array dialog box appears. The Selected Drives list shows the current drives for the array.
3. Select the drives you want to add:
   - To add drives, select one or more in the Available Drives list and click **Add Drive**. The drives you selected move to the Selected Drives list and display a yellow asterisk showing that they are new drives for this array. See *Understanding the Selected Drive Icons* on page 2-8.
   - To add all available drives, click **Add All Drives**.
   - To select more than one drive, hold the **Ctrl** key and click each drive.
   - See the Array Information section of the dialog box for information about how much space will be used on each drive.

4 Click **Reconfigure**.

Storage Manager Pro reconfigures the array using your selected drives. You can continue using the array while Storage Manager Pro reconfigures it even though the reconfiguration may take several hours to complete, depending on the array type, size of the array, and the I/O load. See *Viewing Task Progress* on page 6-5.

After you expand the size of an array, you must also use Disk Administrator to make the additional space available to users.

Note: If you are adding drives to a RAID 5 set, your data will not be redundant until the reconfiguration process is completed.

Changing Array Settings or Properties

You can change the following array settings or properties:

- Array Name. Type a new name.
- Array size. See *Expanding Array Capacity* on page 3-2.
- Write cache. See *Changing the Write Cache Properties* on page 3-4.

Note: As a precaution, you should back up array data before making changes to the array.

Changing the Write Cache Properties

You can change the array write cache properties. The read and write cache share the same memory location on the controller. The cache options work only if you are using a controller that supports caching.

Write cache speeds write operations by temporarily storing write data in cache until the disk drives are available to write the data. Read cache speeds read operations by storing recently read or written data in cache and by reading ahead in the data.

To see whether the cache is working, you can check the status and change the properties in the Array Properties dialog box, Cache tab.

When you perform a normal system shutdown, the controller automatically writes all data in the write cache to disk before the shutdown.

To change the write cache properties:

1. In the System Browser window, select the array whose cache settings you want to change.
2. Click **Properties**.

   The Array Properties dialog box appears.
3. Click the **Cache** tab.
4. Select the new cache options you want.
   - **Write Back—**Turns on write cache.

     Caution: If your controller does not have a battery or if it is not charged, you risk losing data by selecting this option.
   - **Write Through**—Turns off write cache; however, the data written to the array is still stored in the cache and is available for read cache.
5. Click **OK**.

   Storage Manager Pro changes the properties immediately.

Saving and Restoring a Configuration to a File

Storage Manager Pro allows you to save a current configuration to a file for later use. This allows you to configure other controllers on other systems with the same size and type of drives. This is useful if you want to set up multiple systems with the same configuration or in the event you want to re-create a configuration after a crash.

Note: The Save Configuration and Restore Configuration functions are available only on local controllers; not on controllers attached to remote systems.

To save a configuration to file:

1. In the System Browser window, select the controller you want.
2. Click **Save Configuration**.

   The Save Configuration to File dialog box appears.
3. Specify a location where you want to store the file.
4. Type the File Name.
5. Click **Save**.

   Storage Manager Pro saves the configuration file.

To restore a configuration from a file:

1. In the System Browser window, select the controller you want.
2. Click **Restore Configuration**.

   The Restore Configuration from File dialog box appears.
3. Locate and select the configuration file you want to use.
4. Click **Open**.

   The Restore Configuration Warning dialog box appears.

Caution: Restoring a configuration from a file deletes any existing arrays on the controller, including any data that may reside on the arrays. Therefore, if you have made any changes since you last saved your configuration, those changes will be lost.

5. Click **Yes** to continue.

   Storage Manager Pro uses the configuration file to create a new controller configuration on the system.

Deleting an Array

Caution: Deleting an array permanently deletes all partitions and data from the array, including the file system and drive letter. The data cannot be recovered, even by a data recovery service.

When you delete an array, the space on the drives that were part of the array revert to free space, allowing you to use the space for another array.

To delete an array:

1. In the System Browser window, select the array you want to delete.
2. Click **Delete**.

   Storage Manager Pro confirms that you want to permanently delete the current array.
3. Click **Yes**.

   If a task is currently running on the array or the array is in use, Storage Manager Pro displays a warning message.

   If the array has a file system on it, Storage Manager Pro warns you that it does and confirms that you want to delete the array.
4. If you receive a warning message, click one of the buttons to take the action you want:
   - **No**—Cancels the deletion. We recommend that you cancel the deletion and wait until the task is complete or that you close all applications that are accessing the array and then try your deletion again.
   - **Yes**—Forces the deletion. You can try to force the deletion, but this may cause any applications that are writing to the array to lose data or may cause the system to crash.

Caution: If you delete a RAID 1 array, you must click **Rescan** after the array has been deleted to display the correct Viewing Array Capacity

You can view array capacity in two ways:

- From the System Browser window. See the steps that follow.
- From the Array Properties dialog box. See *Viewing Array Properties* on page 3-8.

Note: The capacity shown in Storage Manager Pro reflects only the amount of space allocated to the array. It does not reflect how much space actually contains user data.

To view array capacity from the System Browser window:

1. In the Arrays pane, select the array whose capacity you want to view.
2. In the Details pane, click the **Partitions** tab.

   The Partitions tab shows the array capacity and the size of each partition that makes up the array. See the figure on page 1-15.

Viewing Array Properties

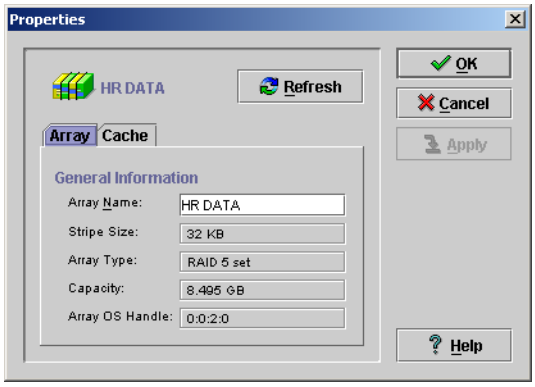
You can view the array properties, which contain tabs of information about the array:

- Array—Displays array information including array name, type, capacity, and file system.
- Cache—Displays the cache status and allows you to change the cache settings.

To view the array properties:

1. In the System Browser window, select the array you want to view.
2. Click **Properties**.

   The Array Properties dialog box appears.



For more information about each of the properties tabs, refer to the Online Help.

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4

Managing Controllers on Remote Systems

In This Chapter

You can access and manage controllers on remote systems connected to your network. The systems you can manage on the network must have:

- Storage Manager Pro–compatible controllers
- Storage Manager Pro installed and running

This allows you to configure arrays on the remote systems and use all Storage Manager Pro functions from a single location. You can use a system that does not have a controller, but you do need Storage Manager Pro installed and running on that system to manage other systems on the network.

Understanding Remote Access

You set up access to remote systems by designating one system as the directory manager for Storage Manager Pro. You do this by registering each system with the directory manager. The directory manager is the system that other systems register with and that stores all global user accounts for the management set.

Using the example shown in Figure 4-1, you must start Storage Manager Pro on systems A, B, and C, and register them with the directory manager (System D). You register with the directory manager by entering the directory manager's system name or IP address in Storage Manager Pro.

All the systems that register with a specific directory manager plus the directory manager itself are collectively called a management set.

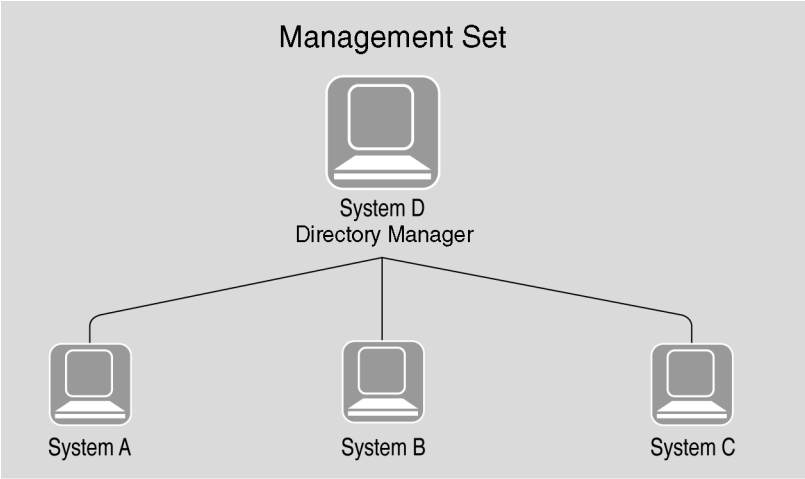
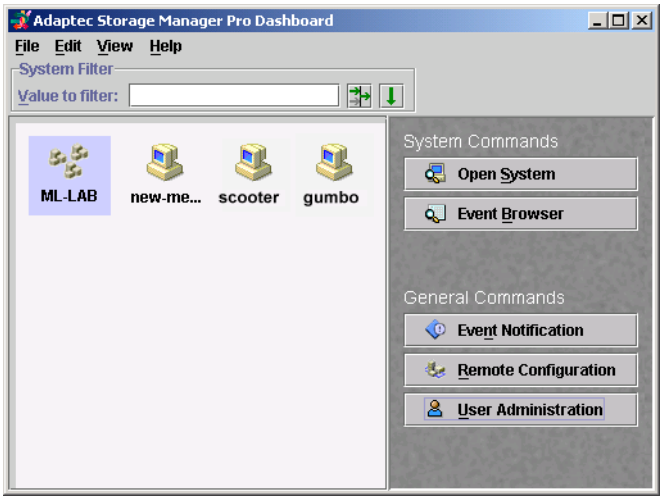


Figure 4-1. Management set example

You can set up multiple management sets. Each management set can have only one directory manager and each system can be a member of only one management set.

When you start Storage Manager Pro on any of the systems in this example management set, you will have access to all four systems from the Storage Manager Pro Dashboard. You can then select the system you want and click **Open System**.



Notice the icon for the ML-LAB system in the figure. This icon indicates that the ML-LAB system is the directory manager.

If a system icon is gray, the system either is not running Storage Manager Pro, is shut down, or is not accessible from your network for another reason.

After you set up a global user account on the directory manager, you can use that account to create, reconfigure, or delete arrays from any system in the set.

Note: We strongly recommend that you back up the directory manager system regularly to ensure that your management set configuration and global directory can be restored.

Setting Up Remote Access for the First Time

To set up remote access, you must perform the following tasks in sequence:

1. Register each system with the directory manager. See the steps that follow.
2. Set up at least one global user account. See *Adding User Accounts* on page 5-3.

Note: All systems must have the same version of Storage Manager Pro installed.

You can set up remote access from either of two systems on your network:

- System that will become the directory manager
- System that will become a member of the new management set

Setting Up Remote Access from the Directory Manager

The instructions below assume you are setting up from the directory manager, rather than from a member of the management set.

To set up remote access:

1. Decide which systems you want to be members of the management set (not the directory manager) and start Storage Manager Pro on those systems.

   Write down the system name or IP address of each system you want to be in the management set.

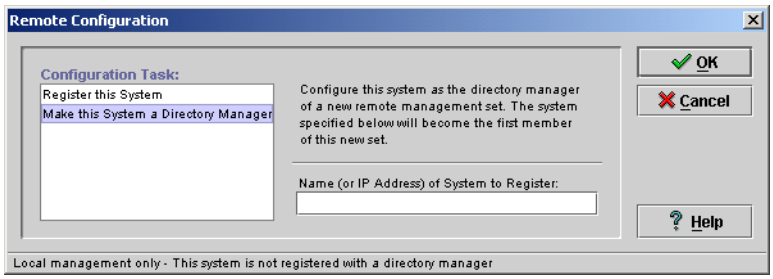
   The Storage Manager Pro service (ASMProServer) or daemon as well as the Storage Manager Pro software must be running on those systems. After you install Storage Manager Pro, the Storage Manager Pro service (ASMProServer) or daemon starts automatically when you boot the system. See *Starting Adaptec Storage Manager Pro* on page 1-3.

2. Start the Storage Manager Pro software on the system that you want to be the directory manager.

   See *Starting Adaptec Storage Manager Pro* on page 1-3.

3 From the Storage Manager Pro Dashboard on the system you used in step 2, click **Remote Configuration**.

The Remote Configuration dialog box appears.



4 From the Configuration Task list, select the **Make This System a Directory Manager**.

5 Type the system name or IP address of the first system you want to register.

6 Click **OK.**

The Remote Configuration Permission dialog box appears.

7 Type an Account Name and Password for the directory manager computer. The password *is* case sensitive.

8 Click **Login**.

Storage Manager Pro confirms that the system was successfully registered.

9 Click **OK.**

The Storage Manager Pro Dashboard appears displaying all the systems that are part of the management set.

10 Before you can use Storage Manager Pro to manage remote systems, you must set up at least one global user account from the directory manager. See *Adding User Accounts* on page 5-3.

Once you register one or more systems with the directory manager and set up at least one global account, you can use Storage Manager Pro to manage remote controllers.

Setting Up Remote Access from a Member of the Management Set

The instructions below assume you are setting up from a member of the management set, rather than from the directory manager.

To set up remote access:

1. Decide which system you want to be the directory manager and start Storage Manager Pro on that system.

   Write down the system name or IP address of the system you want to be the directory manager.

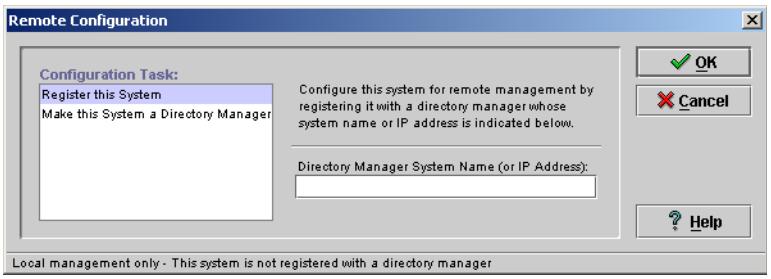
   The Storage Manager Pro service (ASMProServer) or daemon as well as the Storage Manager Pro software must be running on the system. After you install Storage Manager Pro, the Storage Manager Pro service (ASMProServer) or daemon starts automatically when you boot the system. See *Starting Adaptec Storage Manager Pro* on page 1-3.

2. Start the Storage Manager Pro software on another system that is *not* the directory manager.

   See *Starting Adaptec Storage Manager Pro* on page 1-3.

3. From the Storage Manager Pro Dashboard on the system you used in step 2, click **Remote Configuration**.

   The Remote Configuration dialog box appears.



4. From the Configuration Task list, select the **Register This System**.

5. Type the system name or IP address of the system you want to be the directory manager.

6 Click **OK.**

The Remote Configuration Permission dialog box appears.

7 Type an Account Name and Password for the directory manager computer. The password *is* case sensitive.

8 Click **Login**.

Storage Manager Pro confirms that the system was successfully registered.

9 Click **OK.**

The Storage Manager Pro Dashboard appears displaying all the systems that are part of the management set.

10 Before you can use Storage Manager Pro to manage remote systems, you must set up at least one global user account from the directory manager. See *Adding User Accounts* on page 5-3.

Once you register one or more systems with the directory manager and set up at least one global account, you can use Storage Manager Pro to manage remote controllers.

Adding a System to an Existing Management Set

You can add a system to an existing management set from any of three systems on your network:

- System you want to add to a management set
- Directory manager for the management set
- Member of a management set, but not the directory manager

The system you are adding must be a stand-alone system, that is, it must not already be a member of a management set.

If you log in using a local account, Storage Manager Pro will ask for authentication when you try to add another system to a management set. You must type a valid global account login name and password. The authentication process lets you add other systems to the set and gives you access to remote systems that are part of the management set for the rest of your Storage Manager Pro session. The process does *not* actually log you in as the global

account user. The process is similar to that used when you mount a share in Windows.

To add a system to an existing management set:

1. From the Dashboard, click **Remote Configuration**.

   The Remote Configuration dialog box appears.

2. Select the Configuration Task based on the system you are working from.

From this system	Select
System you want to add to a management set	Register This System
Directory manager	Add a System to This Set
Member of a management set, but not the directory manager	Add a System to This Set

3. Type the system name or IP address based on the system you are working from.

From this system	Type system name or IP address of
System you want to add to a management set	Directory manager
Directory manager	System you want to add
Member of a management set, but not the directory manager	System you want to add

4. Click **OK**.

5. If you logged in using a local account and you are working from the directory manager or another member of the management set, Storage Manager Pro asks for authentication. Type a valid global account login name and password and click **OK**.

   If you are adding a stand-alone system to a management set or you are changing a directory manager to a stand-alone system, you must have a local account on the system you are changing. Storage Manager Pro will ask for the local account login name and password when you make the change.

Accessing Remote Systems

Once you register one or more systems with the directory manager and set up at least one global account, you can use Storage Manager Pro to manage controllers remotely. You must have a global user account in Storage Manager Pro to manage other systems remotely. See *Understanding User Accounts* on page 5-1.

To access remote systems:

1. From the Dashboard, select the system you want to access.
2. Click **Open System**.
3. If you logged in using a local account, Storage Manager Pro asks for authentication. Type a valid global account login name and password and click **OK**.

   The authentication process gives you access to remote systems that are part of the management set for the rest of your Storage Manager Pro session. The process does *not* actually log you in as the global account user. The process is similar to that used when you mount a share in Windows.

   You can now perform all Storage Manager Pro functions on the system you opened.

How Storage Manager Pro Handles Duplicate Login Names

Storage Manager Pro does not let you create duplicate local user accounts on a system or duplicate global user accounts on the directory manager. (All global accounts are stored on the directory manager.) However, it is possible to create a local user account on one system and a global user account on the directory manager that use the same login name. See *Understanding User Accounts* on page 5-1.

For example, you create a local user account with the login name *user1* on system A and someone else creates a global user account with the same login name of *user1* on system B. If these two systems are in the same management set and you log in as user1, Storage Manager Pro will ask how you want to log in: as a local user or as a global user.

Checking Which System Is the Directory Manager

If you are not certain which system is the directory manager, you can check from any system that is part of the management set.

From the Storage Manager Pro Dashboard on any system in the set do one of the following:

- From the Normal view, look for the icon  that looks like three systems. That is the directory manager. (See page 1-13.)
- From the Detail view, look for a check mark in the Directory Manager column.

Moving a System from One Management Set to Another

You can move a system from one management set to another. You must do this from the system that you want to move.

To move a system from one management set to another:

1. From the Storage Manager Pro Dashboard on the system you want to move, click **Remote Configuration**.

   The Remote Configuration dialog box appears.

2. From the Configuration Task list, select **Register with Another Directory Manager**.

3. Type the system name or IP address of the directory manager you want to register with.

4. Click **OK.**

   Storage Manager Pro unregisters the system from the old directory manager and registers it with the new one.

   If the old directory manager is not available, Storage Manager Pro displays a message letting you know that it could not unregister you from the old management set. You should check that the old directory manager is turned on, has the Storage Manager Pro service (ASMProServer) or daemon running (see *Starting Adaptec Storage Manager Pro* on page 1-3), and that it is accessible on your network. Then try the above steps again.

Removing a System from a Management Set

You can remove a system from a management set. After you remove a system from a management set:

- You can only use Storage Manager Pro locally to manage controllers attached to that system.
- You *cannot* use Storage Manager Pro
  - to access that system from other systems in the set.
  - from that system to access other systems in the set.

You can remove a system from a management set from any of three systems on your network:

- Directory manager
- Member you want to remove from the management set
- Member of the management set, but *not* the system you want to remove from the same set

To remove a system from a management set:

1. From the Storage Manager Pro Dashboard, click **Remote Configuration**.

   The Remote Configuration dialog box appears.

2. Select the Configuration Task based on the system you are working from.

From this system	Select
Directory manager	Remove a System from This Set
Member you want to remove from the management set	Remove This System from the Set
Member of the management set, but *not* the system you want to remove from the same set	Remove a System from This Set

3 From the drop-down list box, select the System Name or IP Address based on the status of the system you are working from.

From this system	Type
Directory manager	System name or IP address of the system you want to remove from the set
Member you want to remove from the management set	Nothing
Member of a management set, but *not* the system you want to remove from the same set	System name or IP address of the system you want to remove from the set

4 Click **OK.**

Storage Manager Pro confirms that you want to remove a system from the management set.

5 Click **Yes**.

You must have a local account on the system you are changing. Storage Manager Pro will ask for the local account login name and password when you make the change.

If the old directory manager is not available, Storage Manager Pro displays a message letting you know that it could not unregister you from the old management set. You should check that the old directory manager is turned on, has the Storage Manager Pro service (ASMProServer) or daemon running (see *Starting Adaptec Storage Manager Pro* on page 1-3), and that it is accessible on your network. Then try the above steps again.

Moving the Directory Manager to Another System

You can move the directory manager to another system. You may want to do this when you need to take the system that is currently the directory manager out of service. You can only move a directory manager to a system that is not currently a member of a management set, including a directory manager.

To move a directory manager:

1. From the Storage Manager Pro Dashboard, click **Remote Configuration**.

   The Remote Configuration dialog box appears.

2. From the Configuration Task list, select **Move the Directory Manager**.

3. Type the system name or IP address of the system you want to become the new directory manager for the set.

4. Click **OK.**

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5

Managing Storage Manager Pro Users

In This Chapter

Understanding User Accounts

Storage Manager Pro comes with an account already set up that lets you add additional user accounts and change existing accounts. The table on page 5-2 defines the different types of accounts.

Account Type	Definition
Global	Can manage controllers on the local system (the computer where you are logged in) and on remote systems on your network that are running Storage Manager Pro. Global accounts are stored on the directory manager and are available to all systems in the management set. You cannot create global accounts until you set up remote access. See *Setting Up Remote Access for the First Time* on page 4-4.
Local	Can manage controllers only on the local system (the computer where you are logged in). Local accounts are stored only on the local system.

You can apply Administrator privileges to both local and global accounts. Administrator privileges provide the following:

- Global account: Create, edit, and delete only global Storage Manager Pro accounts; add or remove remote systems from management sets.
- Local account, not directory manager: Create, edit, and delete only local Storage Manager Pro accounts.
- Local account on the directory manager: Create, edit, and delete both local and global Storage Manager Pro accounts.
- Global or Local account: flush the event log

The default account is a local administrator account which is defined as follows:

- Login Name—administrator
- Password—adaptec

Note: Login names are *not* case sensitive; however, passwords *are* case sensitive.

You should change the password and then create the additional accounts that you need. You cannot change the login name on an

existing user account. If you want to change the login name, you should create a new account, log in using the new account, then delete the default account.

Adding User Accounts

You can add user accounts only if you have an administrator account. See *Understanding User Accounts* on page 5-1.

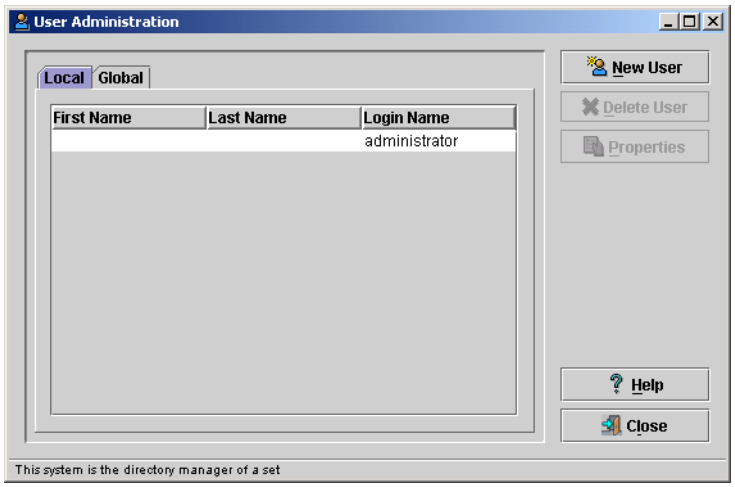
You cannot create global accounts until you set up remote access.

If you are creating your first global account, you must create it from the directory manager. See *Setting Up Remote Access for the First Time* on page 4-4. After you set up the first global account, you can create additional global accounts from any system in the management set.

To add a user account:

1. From the Storage Manager Pro Dashboard, click **User Administration**.

   The User Administration dialog box appears.



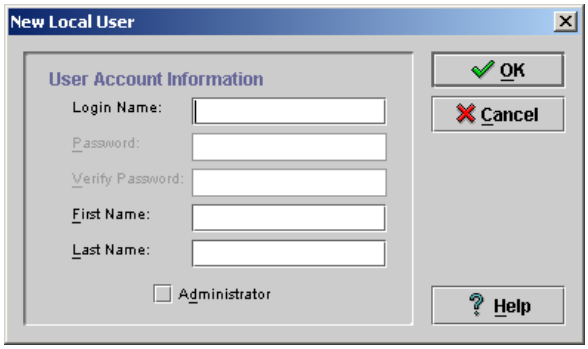
2. Click the tab you want:

   – **Local**—Stay on this tab to create a local account. See *Understanding User Accounts* on page 5-1.

– **Global**—Click this tab to create a global account. This tab is only available after you set up remote access. See *Setting Up Remote Access for the First Time* on page 4-4.

3 Click **New User**.

The New Local User or New Global User dialog box appears. (The New Local User dialog box is used in this example.)



4 Type the following information into each field:

Field	Description
Login Name	ID the user types when logging in to Storage Manager Pro. Login names are *not* case sensitive.
Password	Password for this user account. You cannot start a password with an asterisk (*). Passwords *are* case sensitive.
Verify Password	Confirmation of the password. Must match the previous field exactly.
First Name	User's first name.
Last Name	User's last name.

5 If this account needs to be able to create or edit user accounts, or add other systems to a management set, select the **Administrator** check box.

6 Click **OK**.

Storage Manager Pro lists the new account on either the Local tab or Global tab. You can change user account information, except for the login name, at any time.

7 Click **Close** to close the User Administration dialog box.

Changing User Accounts

You can change user accounts only if you have an administrator account. See *Understanding User Accounts* on page 5-1.

You cannot change an account from global to local or from local to global. If you need to make such a change, you must create a new account of the type you need. You can then delete the old account.

To change a user account:

1 From the Storage Manager Pro Dashboard, click **User Administration**.

The User Administration dialog box appears.

2 Click the tab you want.

3 Select the account you want to change.

4 Click **Properties**.

The Local User Properties or Global User Properties dialog box appears.

5 Change the information in any of the following fields.

Field	Description
Login Name	You cannot change the login name. If you want to change the login name, you must create a new account and delete the old one.
Password	• Password for this user account. You cannot start a password with an asterisk (*). Passwords *are* case sensitive. • Current password is displayed as 16 asterisks (*), regardless of the actual length of the password. As soon as you type one character in the field, Storage Manager Pro erases the old password and you must type a new one.
Verify Password	• Confirmation of the password. Must match the previous field exactly. • Current password is displayed as 16 asterisks (*), regardless of the actual length of the password. As soon as you type one character in the field, Storage Manager Pro erases the old password and you must type a new one.
First Name	User's first name.
Last Name	User's last name.

6 If this account needs to be able to create or edit user accounts, or add other systems to a management set, click the **Administrator** check box.

7 Click **OK**.

Storage Manager Pro changes the account information.

8 Click **Close** to close the User Administration dialog box.

Deleting User Accounts

You can delete user accounts only if you have an administrator account. See *Understanding User Accounts* on page 5-1.

To delete a user account:

1 From the Storage Manager Pro Dashboard, click **User Administration**.

The User Administration dialog box appears.

2 Click the tab you want.

- **Local**
- **Global**

3 Select the account you want to delete.

4 Click **Delete User**.

Storage Manager Pro deletes the account.

5 Click **Close** to close the User Administration dialog box.

Changing Your Password

You can change the password for your user account.

To change your password:

1 From the Storage Manager Pro Dashboard, click **User Administration**.

The User Administration dialog box appears.

2 Click the tab you want:

- **Local**
- **Global**

3 Select the account you used to log in to Storage Manager Pro.

4 Click **Properties**.

The Local User Properties or Global User Properties dialog box appears.

5 Change the password fields.

Field	Description
Password	• Password for this user account. You cannot start a password with an asterisk (*). Passwords *are* case sensitive. • Current password is displayed as 16 asterisks (*), regardless of the actual length of the password. As soon as you type one character in the field, Storage Manager Pro erases the old password and you must type a new one.
Verify Password	• Confirmation of the password. Must match the previous field exactly. • Current password is displayed as 16 asterisks (*), regardless of the actual length of the password. As soon as you type one character in the field, Storage Manager Pro erases the old password and you must type a new one.

6 Click **OK**.

Use your new password the next time you log in.

7 Click **Close** to close the User Administration dialog box.

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6

Monitoring System Status

In This Chapter

Monitoring Events

Storage Manager Pro generates events to inform you of changes to your array configuration, errors, failovers, and other functions. You should regularly check events to see if anything has happened to any of the devices or arrays that may require your attention.

Events are logged in a file that you can view two ways:

- Event Browser—allows you to view events. See *Viewing Events* on page 6-2.
- *EventLogs.txt*—text file that lists events. Use this file if you cannot run Storage Manager Pro to use the Event Browser. The file is in your *data* directory under the directory where you installed Storage Manager Pro.

Viewing Events

The Event Browser lets you view and filter events.

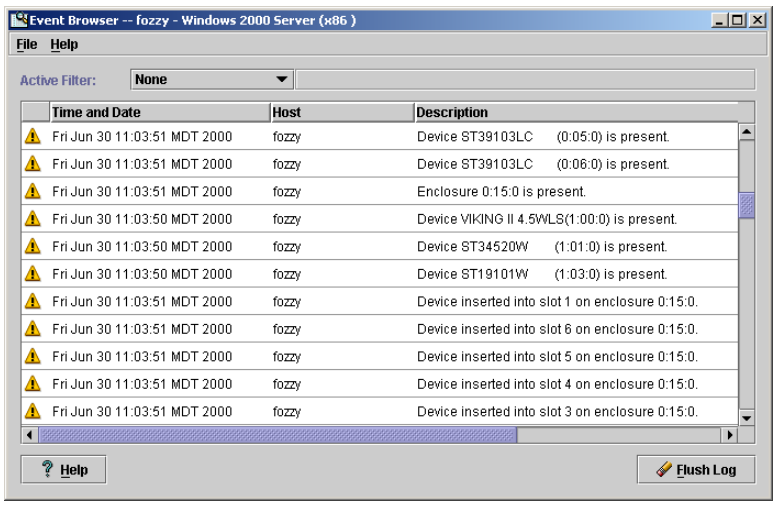
The log file has a maximum size of 15 MB, which is approximately 50,000 events. When the file reaches the size limit, Storage Manager Pro removes the first 33 percent of the events (oldest events) from the file and uses that space to write new events.

To view events:

- From the Storage Manager Pro Dashboard, click **Event Browser**.

  The Event Browser window appears and displays all events. Refer to the Online Help for event definitions.

  You can filter events by the time and date the event occurred. See *Using the Time and Date Filter* on page 6-3.



Using the System Filter

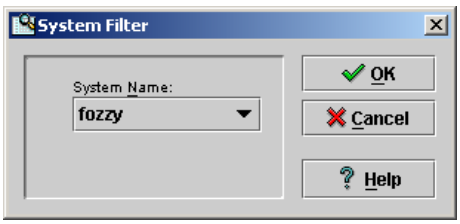
If the system you are using is part of a management set, you can filter the events that are displayed. You can see the events on all systems that are part of the set or events on just one system.

To view events from all systems in the management set, select **None** from the Active Filter drop-down list box.

To filter by system:

1. From the Event Browser window, select **System** from the Active Filter drop-down list box.

   The System Filter dialog box appears.



2. From the System Name drop-down list box, select the name of the system whose events you want to view.
3. Click **OK**.

   The Event Browser displays events related to the system whose name you selected.

Using the Time and Date Filter

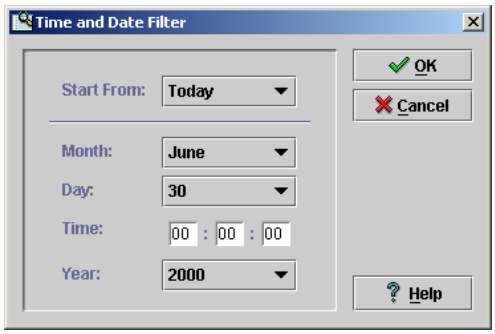
You can filter events in the Event Browser window by the time and date the event occurred.

To view all events, select **None** from the Active Filter drop-down list box.

To filter by time and date:

1. From the Event Browser window, select **Time and Date** from the Active Filter drop-down list box.

The Time and Date Filter dialog box appears.



2 From the Start From drop-down list box, select an option:

- **Today**—Displays all events that occurred today.
- **Yesterday**—Displays all events that occurred since yesterday.
- **Other**—Allows you to select a specific date and time from the lower part of the window. From the drop-down list boxes, select a Month, Day, and Year and type a Time. You cannot use a future date or time.

3 Click **OK**.

The window changes to display only the events that occurred since the time and date you selected.

Deleting Events

■ To permanently delete all events in the log, click **Flush Log**.

Caution: This permanently removes all event data from the Storage Manager Pro log file.

Only administrator user accounts can flush the log. See *Understanding User Accounts* on page 5-1.

Viewing Task Progress

When Storage Manager Pro starts a task such as creating an array (see *Understanding Array Creation* on page 6-6) or zeroing a drive, a small progress bar is displayed next to the affected device or array in the System Browser window. While the task is running, you can:

- See more detailed task progress. See the steps that follow.
- Terminate the task. See *Terminating a Task* on page 6-6.

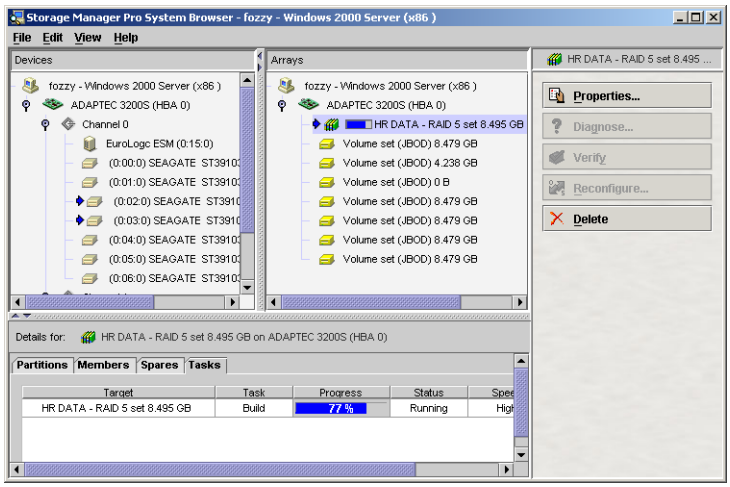
Some tasks take only a few seconds or less to complete. These tasks do not last long enough to show task progress.

To see detailed task progress:

1. In the System Browser window, select the array, disk drive, or other device that is affected by the task.
2. In the Details pane, click the **Tasks** tab.

   The Tasks tab shows detailed information about any task that is running that affects the selected device or array. The Caution icon may show that a task is running on the selected array or device, or that the array or device may not be ready for use.

When a task is running, some functions may not be available for the selected array or device. The buttons for unavailable functions are gray.



After the task is complete, its information disappears from the Tasks tab. See *Understanding the Details Pane Status Column* on page 6-6.

Understanding Array Creation

When you create an array, Storage Manager Pro creates the array immediately. If the array is a redundant array type (mirror set [RAID 1], RAID 5 set, stripe set of mirror sets [RAID 0/1], or stripe set of RAID 5 sets [RAID 0/5]), Storage Manager Pro performs a Build task after it creates the array.

It is the Build task whose progress you can view or terminate.

Caution: You risk losing data if you terminate the Build task.

Terminating a Task

You can terminate some tasks in Storage Manager Pro at any time. Some tasks take only a few seconds or less to complete. These tasks do not last long enough to permit termination.

If you terminate the Build task, the array exists but is not usable. To make the array usable, you need to delete the array and re-create it.

To terminate a task:

1. In the System Browser window, select the array, disk drive, or other device that is affected by the task.
2. In the Details pane, click the **Tasks** tab.
3. Select the task that you want to terminate.
4. Click **Terminate**.

   The task stops running.

Understanding the Details Pane Status Column

The Status column for each device in the Details pane may display an indicator that changes based on the condition of the device:

- None—Device is working.

- Information  —Shows that Storage Manager Pro has some information to report.
- Caution  —Warns you about a potential problem with the device.
- Critical  —Warns you that the device has failed.

Information, Caution, and Critical icons similar to those above are displayed next to any device or array in the Devices or Arrays pane when something has happened to the device or array.

For more information about what to do when you see the status indicators, see *Using the Diagnose Button* on page 11-2.

Setting Up Event Notification

Event Notification is a function of Storage Manager Pro that, when set up, can inform you about specified events that may occur on your Adaptec SCSI RAID controllers. Event Notification allows you to designate multiple recipients to receive an e-mail or an e-mail pager message when an event, such as failover, occurs. You can specify a minimum event severity level, such as informational, warning, or critical, for the events for which you want to receive notification. You can assign different severity levels for each recipient as well as which severity levels trigger each notification type (e-mail or e-mail pager). For example, you can assign User A to receive both e-mail and e-mail pager messages about all events with a severity of warning or greater while User B is notified only by e-mail pager and only about all critical events.

Event Notification can be set up for either a single system or for all systems that are members of a management set. What you can do depends on your login account:

- Local Accounts—Manage only the events on the local system you are running.
- Global Accounts—Manage the events on all systems that are in the management set. Any system registered with the directory manager can manage the Event Notification for all the systems that are members of the management set.

Event Notification follows the same local and global account rules as User Administration except administrative rights are not required. See *Understanding User Accounts* on page 5-1.

The following table explains the level of Event Notification available based on your login account type and system status. Edit Ability indicates you can make changes to the notification properties; Read-Only Access indicates you can view the properties, but cannot make any changes.

Account Type	System Status	Edit Ability	Read-Only Access
Local	Stand-alone	Local	N/A
Local	Member of a set	Local	Global
Local	Directory manager	Local	Global
Global	Member of a set	Global	N/A
Global	Directory manager	Global	N/A

Defining and Modifying Notification E-mail Settings

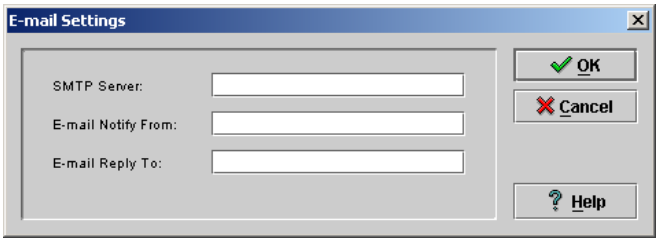
The Event Notification E-mail Settings allow you to customize your event messages, including the ability to specify your SMTP server as well as the e-mail addresses to display in the From and To fields of the event e-mails sent to your recipients. Before you can add notification recipients, you must first define the Event Notification E-mail Settings.

To define or modify the Event Notification E-mail Settings:

1. From the Dashboard, click **Event Notification**.

   If you have not already defined the e-mail settings, the E-mail Settings dialog box appears.

   If you have defined the e-mail settings previously, the Event Notification dialog box appears. To change the e-mail settings, click **E-mail Settings**.



2 In the E-mail Settings dialog box, type the following information and click **OK**:

- SMTP Server—This is the name of the server used for your mail service.
- E-mail Notify From—This is the e-mail address the recipient sees in the notification e-mail. This is useful for users to help manage their e-mail correspondence. For example, this allows them to sort these incoming notification e-mail messages into a separate folder.
- E-mail Reply To—This is typically set by the system administrator, but can be any e-mail address you want to use.

Adding Notification Recipients

To add recipients for Event Notification:

1 From the Dashboard, click **Event Notification**.

The Event Notification dialog box appears.

Note: If this is the first time you are setting up Event Notification, you need to first define your Event Notification E-mail Settings.

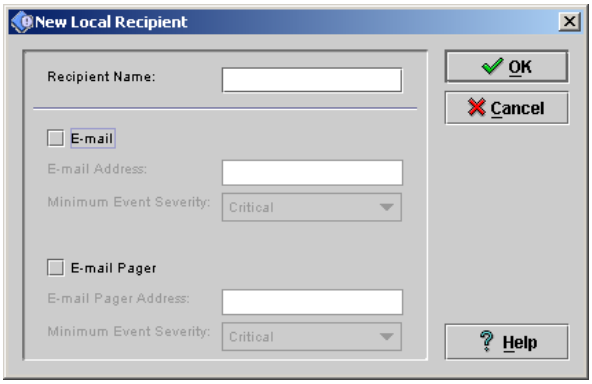
2 Select the tab that applies to the type of notification you want to set up:

- **Local**—to be notified only about events on your local, stand-alone system.
- **Global**—to be notified about events on all systems that are members of the management set.

Note: You must use a global login account, and the system you are working from must be registered with the directory manager to be able to manage global accounts. Otherwise, the Global tab is not editable.

3 Click **New**.

The New Local Recipient or New Global Recipient dialog box appears. (The New Local Recipient dialog box is used in this example.)



4 Type the name of recipient in the Recipient Name field. This is the name that appears in the list of recipients in either the Local or Global tabs of the Event Notification dialog box.

5 Select the type of notification you want the recipient to receive (you can select one or both types):

- **E-mail**—The recipient will receive an e-mail when the specified event types occurs.
- **E-mail Pager**—The recipient will receive an e-mail page when the specified event types occurs.

6 For each notification type assigned to the recipient, type the recipient's e-mail address.

You may want to send a test e-mail notification to confirm that the address is correct.

7 From the drop-down list box, select the Minimum Event Severity that will generate an e-mail or e-mail page to the recipient.

You can assign different minimum event severities for each notification type (e-mail and e-mail pager):

- **Informational**—The recipient will receive notification about all Informational, Warning, and Critical events. Informational events indicate changes to the system that do not affect performance such as when an array has been created or when a system goes online.
- **Warning**—The recipient will receive notification about all Warning and Critical events. Warning events indicate changes that may adversely impact the system, such as when an enclosure reaches the specified temperature limit or a Verify process is incomplete.
- **Critical**—The recipient will receive notification about Critical events only. Critical events indicate changes that do impact the system, such as a failover or when a drive goes bad.

8 Click **OK**.

Storage Manager Pro will notify the recipient the next time the specified event type (Informational, Warning, or Critical) occurs.

Changing Recipient Properties

Recipient properties include the assigned notification type (e-mail or e-mail pager), e-mail address, and assigned severity level for each recipient. You can also use the Recipient Properties dialog box to turn notification off for a recipient but maintain a record of the recipient's name and e-mail address. This is useful for temporarily turning off notification for a recipient who will be out of the office for a few weeks.

To permanently remove a recipient from Event Notification, see *Deleting Notification Recipients* on page 6-13.

To change the notification properties for an existing recipient:

1 From the Dashboard, click **Event Notification**.

The Event Notification dialog box appears.

2 Select the tab, **Local** or **Global**, where the recipient is listed.

3 From the list of recipients, select the name of the person whose properties you want to change.

4 Click **Properties**.

The Local Recipient Properties or Global Recipient Properties dialog box appears. You can make changes to all of the fields in the Recipient Properties dialog box except the Recipient Name. If you want to change the name, first delete the recipient and then add a new notification recipient using the new name.

5 Select the type of notification you want the recipient to receive (you can select one or both types):

- **E-mail**—The recipient will receive an e-mail when the specified events occur.
- **E-mail Pager**—The recipient will receive an e-mail page when the specified events occur.

6 For each notification type assigned to the recipient, type the recipient's e-mail address.

You may want to send a test e-mail notification to confirm that the address is correct.

7 From the drop-down list box, select the Minimum Event Severity that will generate an e-mail or e-mail pager message to the recipient.

You can assign different minimum event severities for each notification type (e-mail and/or e-mail pager):

- **Informational**—The recipient will receive notification about all Informational, Warning, and Critical events. Informational events indicate changes to the system that do not affect performance such as when an array has been created or when a system goes online.
- **Warning**—The recipient will receive notification about all Warning and Critical events. Warning events indicate changes that may adversely impact the system, such as when an enclosure reaches the specified temperature limit or a Verify process is incomplete.

– **Critical**—The recipient will receive notification about Critical events only. Critical events indicate changes that do impact the system, such as a failover or when a drive goes bad.

8 Click **OK**.

Storage Manager Pro will use the new information in the recipient's properties to notify the recipient the next time the specified event severity (Informational, Warning, or Critical) occurs.

Deleting Notification Recipients

To delete a recipient from Event Notification:

1 From the Dashboard, click **Event Notification**.

The Event Notification dialog box appears.

2 Select the tab, **Local** or **Global**, where the recipient is listed.

3 Select the name of the person you want to remove from the list of Recipients.

4 Click **Delete**.

The recipient's name is removed from the list and will no longer receive Event Notification e-mails or pages.

Sending a Test E-mail Notification

Once you set up Event Notification, you may want to send a test e-mail to be sure the recipient's e-mail address is valid and working properly.

To send a test e-mail:

1 From the Dashboard, click **Event Notification**.

The Event Notification dialog box appears.

2 Select the tab, **Local** or **Global**, where the recipient is listed.

3 From the list of Recipients, select the name of the person to whom you want to send a test e-mail.

4 Click **Test E-mail**.

The Send a Test E-mail dialog box appears.

5 In the Send To field, select one of the following:

- **E-mail Address**—to send an e-mail to the recipient
- **E-mail Pager Address**—to send an e-mail pager message to the recipient

6 In the Text field, type the message you want to appear in the body of the e-mail.

You may want to write a message asking the recipient to respond to the e-mail to confirm delivery of the message.

7 Click **Send**.

Storage Manager Pro sends an Event Notification e-mail or e-mail pager message to the recipient.

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7

Managing Spares

In This Chapter

Understanding How Spares and Failover Work

Storage Manager Pro allows you to assign spare disk drives to a spare pool. If the controller detects an unrecoverable error during I/O, it checks for an available spare drive that has sufficient free space to handle the *failover*. Failover is the process by which the controller rebuilds data on a spare drive when a drive that is part of an array fails.

Note: Spares only work with redundant array types: mirror set (RAID 1), RAID 5 set, stripe set of mirror sets (RAID 0/1), or stripe set of RAID 5 sets (RAID 0/5).

The spare drive capacity must be equal to or larger than the failed drive. The controller checks for spares available in the spare pool. If the controller cannot find a suitable spare, and Storage Manager Pro is running on the system, Storage Manager Pro displays a message that says the controller was unable to find a suitable spare for failover.

You can assign spares by adding a drive to the spare pool.

See *Spare Management Guidelines* on page 7-4 for important information and suggestions.

Managing the Spare Pool

You can assign spare disk drives to the spare pool. If a failure occurs, the controller checks the spare pool for a spare drive with sufficient space for one or more arrays on the failing drive.

Because of the total flexibility you have in managing spares, you must monitor your spares regularly to ensure that you have the level of spare security that you need. See *Spare Management Guidelines* on page 7-4 for suggestions.

There are two parts to managing the spare pool on the controller:

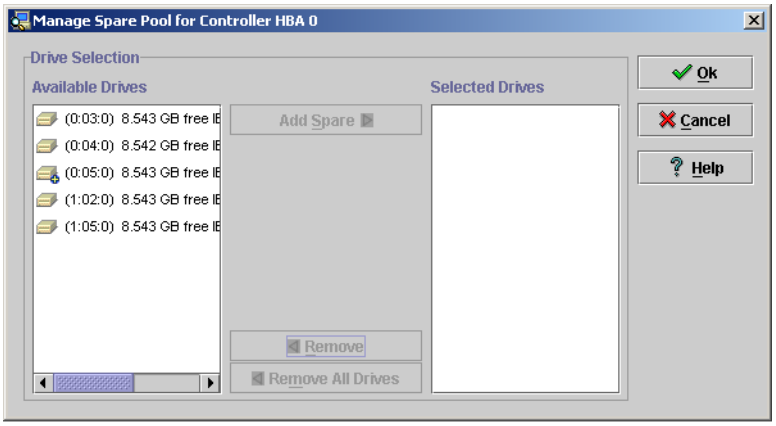
- Adding a drive to the spare pool. See page 7-2.
- Removing a drive from the spare pool. See page 7-3.

Adding a Drive to the Spare Pool

To add a drive to the spare pool:

1. In the System Browser window, select the controller to which you want to add a spare.
2. Click **Manage Spare Pool**.

   The Manage Spare Pool dialog box appears. The Available Drives list shows all drives attached to the controller that have free space. The Selected Drives list shows all drives currently assigned to the spare pool on the controller.



3 Select the drives you want to add from the Available Drives list. To select more than one drive, press and hold the **Ctrl** key and click each drive.

4 Click **Add Spare.**

The drives you just added appear in the Selected Drives list and will be used in the event of a drive failure.

5 Click **OK**.

Removing a Drive from the Spare Pool

You can remove a drive from the spare pool at any time.

To remove a drive from the spare pool:

1 In the System Browser window, select the controller from which you want to remove a spare.

2 Click **Manage Spare Pool**.

The Manage Spare Pool dialog box appears. The Selected Drives list shows all drives currently assigned to the spare pool.

3 Select the drives you want to remove from the Selected Drives list:

– To select more than one drive, press and hold the **Ctrl** key and click each drive.

– To remove all drives from the spare pool, click **Remove All Drives**.

4 Click **Remove.**

The drives are removed from the Selected Drives list and now appear in the Available Drives list.

5 Click **OK**.

Viewing Spare Assignments and Status

You should regularly check your spare assignments and the status of each spare drive. You can check spare assignments by viewing the details for the following:

- Controller—Shows spare pool drives.
- Drive—Shows whether the drive is assigned to the spare pool.

To check drives in the spare pool via the controller:

1 In the System Browser window, select the controller for which you want to check spares.

2 In the Details pane, click the **Spares** tab.

The Spares tab shows which drives are assigned as spares to the spare pool.

To check spares assigned to the spare pool by drive:

1 In the System Browser window, select a drive for which you want to check spares.

2 In the Details pane, click the **Spare For** tab.

The Spare For tab shows whether the drive is assigned to a controller as part of the spare pool.

Spare Management Guidelines

How you manage your spares is a trade-off between the level of security your applications require and the cost of spare drives.

Drives do not fail very often, but when they do, the result may be catastrophic for your business. You must determine your needs and manage your spares accordingly.

Consider the following as you manage your spares:

- General
  - Using spares does *not* replace the need for regular backups of your data.
  - You *cannot* assign spares to nonredundant arrays (stripe set [RAID 0] and volume set). Consider using these array types only for noncritical data that does not change often and that can be easily restored from backups.
- Assigning drives to the spare pool
  - Assign at least one drive to the spare pool that is large enough for the largest array on your system.
  - Regularly check which drives are spares and how much free space they have. Compare their free space to the largest array on your system. See *Viewing Spare Assignments and Status* on page 7-4.

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8

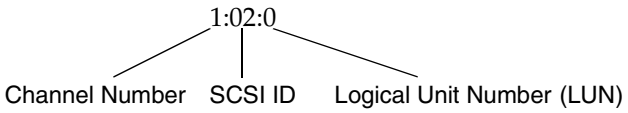
Managing Disk Drives and Partitions

In This Chapter

Understanding Disk Drives

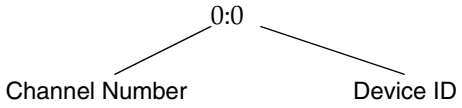
Disk drives are the physical devices that store your data. Depending on your controller, you may use either SCSI or ATA drives.

SCSI disk drives are identified by a disk ID displayed in the following format:



- Channel Number—Indicates to which channel (bus) on the controller the drive is attached.
- SCSI ID—Identifies the drive on the SCSI channel.
- Logical Unit Number (LUN)—The number assigned to a subdevice (logical unit) of a SCSI device, which is usually zero for a disk drive.

ATA disk drives are identified by a disk ID displayed in the following format:



- Channel Number—Indicates to which channel (bus) on the controller the drive is attached.
- Device ID—Identifies the drive on the ATA channel.

Storage Manager Pro displays the disk ID in the System Browser window and in the Disk Properties dialog box.

Caution: You should not remove a disk drive that is used by an array. This may cause you to lose data. See *Replacing a Failed Drive in an Array* on page 3-1.

Replacing Disk Drives

You can replace a failed drive in an array. The steps you need to take to replace a drive in an array and have the best chance to retain your data depend on the exact situation. See *Replacing a Failed Drive in an Array* on page 3-1.

Caution: You should not remove a disk drive that is used by an array. This may cause you to lose data.

Formatting a Disk Drive

Note: The Format command is only supported for SCSI drives.

The Format command performs a low-level format on the specified disk drive and makes a drive available for use in an array. The Storage Manager Pro Format command differs from an operating system (OS) format in that this command completely removes all information and does not include any OS-specific information.

Below are some conditions when you might need to format a disk drive:

- The disk drive was previously used on a different (legacy drives) controller.
- The disk drive was previously used on a different OS.
- The disk drive is corrupted and you suspect bad sectors on the disk drive.
- The disk drive is from an unknown source.

The Format command is only available for disk drives that are not part of an array.

Caution: Any existing data on the disk drive will no longer be available after you format it.

To format a disk drive:

1. In the System Browser window, Devices pane, select the disk drive you want to format.
2. Click **Format**.

   Storage Manager Pro confirms that you want to format the current disk drive.
3. Click **Yes**.

Caution: Do not interrupt a Format task in progress. This includes terminating a Format task, restarting your system, or shutting down your system while a Format task is in progress. Doing so can result in a damaged disk drive.

Storage Manager Pro formats the disk drive. This can take anywhere from several minutes to several hours depending on the manufacturer and size of the disk drive.

Blinking a Disk Drive

You can use the Blink function to blink the activity light of the selected disk drive. This lets you visually identify a specific drive.

Note: The Blink function does not work on disk drives installed in systems running NetWare.

To blink a drive:

1. In the System Browser window, select the drive you want to blink.
2. Click **Blink**.

   Storage Manager Pro confirms that it will blink the drive for approximately two minutes. You can stop the blinking by clicking **Unblink** at any time.

Viewing Disk Drive Properties

You can view the disk drive properties from the tabs on the Disk Properties dialog box. The following is a list of possible tabs. What you see will be determined by your controller.

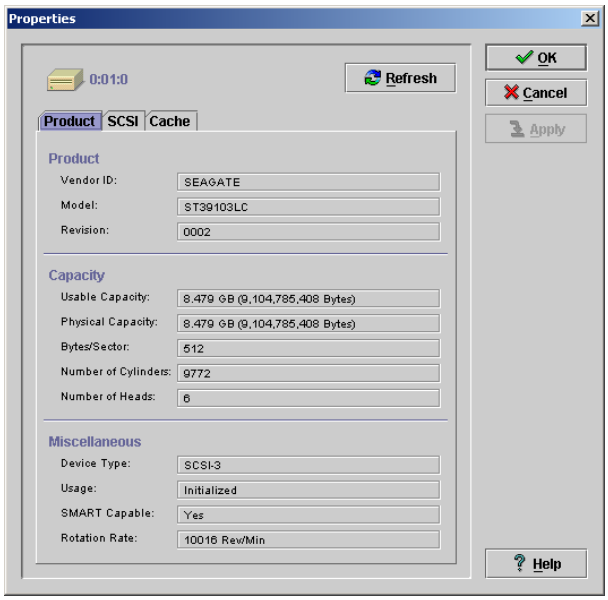
- Product—Displays manufacturer-specific information about the drive.
- SCSI—(SCSI drives only) Displays the SCSI address and connection information.

- ATA—(ATA drives only) Displays the ATA bus information and whether specific capabilities are enabled.
- Cache—(read and write cache-supported drives and cache-supported controllers only) Displays the status of the drive's cache.
- SMART—(SMART-supported drives only) Allows you to enable options related to the SMART functions.

To view the disk drive properties:

1. In the System Browser window, select the drive you want to view.
2. Click **Properties**.

   The Disk Properties dialog box appears.



   For more information about the properties, refer to the Online Help.

Understanding Partitions

A *partition* is a contiguous area of a physical drive that makes up some or all of an array. These partitions are created and managed by

the controller as by-products of array creation. That is, when the controller creates an array, the controller automatically converts free space on a drive into one or more array partitions. See *Partitions* on page A-3.

The partitions discussed here are not the same as partitions created by an operating system. Operating system partitions are subsets of the logical space presented to the operating system by the array. You can also create operating system partitions on an array using your operating system tools.

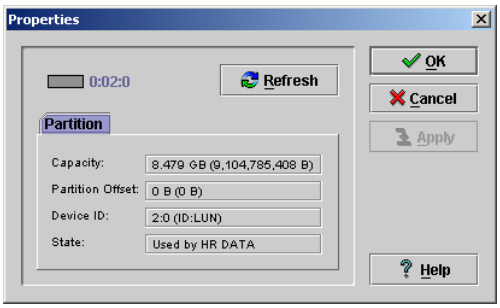
Viewing Partition Properties

You can view partition properties, which contain information about the partition.

To view the partition properties:

1. In the System Browser window, select the array whose partition properties you want to view.
2. In the Details pane, select the partition you want.
3. Click **Properties**.

   The Partition Properties dialog box appears.



   For more information about the properties, refer to the Online Help.

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9

Managing Controllers

In This Chapter

In addition to the tasks listed above, you can use Storage Manager Pro to perform the following functions related to the controller:

- Create an array. See Chapter 2, *Creating an Array*.
- Manage spares. See Chapter 7, *Managing Spares*.
- Manage remote systems. See Chapter 4, *Managing Controllers on Remote Systems*.

Setting Controller Task Priority

You can set the priority level for all tasks running on the controller to either increase or decrease the speed at which the tasks are completed. Tasks, such as the array creation or build functions, typically run in the background so that they can be performed on the controller and be transparent to the computer, allowing for normal system operation.

Background tasks are processed only when there is no disk I/O from the computer for a period of at least 250 milliseconds. As a result, background tasks take longer to complete, but they have the least amount of impact to I/O performance.

Foreground tasks consume more of the available bandwidth. As a result, foreground tasks are completed more quickly than background tasks, but they can reduce I/O performance.

Note: Regardless of the priority level set for controller tasks, 100 percent of the bandwidth is allocated to background tasks when there is no disk drive I/O from the host computer.

To set the controller task priority:

1. In the System Browser window, select the controller for which you want to set the task priority.
2. Click **Task Priority**.

   The Set Controller Task Priority dialog box appears.
3. Move the slider bar between Background and Foreground depending on the priority level you want to set:
   - Background—Completes the tasks in the background and does not compete for I/O bandwidth from the host computer. As more tasks are set to the background, it takes longer to complete tasks, but the background tasks allow for normal system operation.
   - Foreground—Speeds up the completion of the tasks; however, as more tasks are set to the foreground, more available bandwidth is consumed by these tasks, thus reducing I/O performance.
4. Click **OK**.

Rescanning a Controller

You can rescan the channels of the selected controller to verify the presence of existing devices or to recognize new devices added to a channel.

To rescan the controller's channels:

1. In the System Browser window, select the controller you want to rescan.
2. Click **Rescan**.

   Storage Manager Pro rescans the controller channels and updates the System Browser window with the devices currently attached to the channels.

Note: If your operating system is Linux, your system may freeze for about ten seconds before you can resume keyboard and mouse functions.

Reconditioning the Battery

If your controller has a battery, the battery preserves the contents of the cache memory in the event of a power loss. Power loss can occur due to a sudden interruption of power to the system or whenever the system is powered down for maintenance and upgrade tasks.

Refer to your controller's documentation for information about how long your data is protected (*holdover time).* The holdover time depends on the battery's charge level.

You can recondition the battery to ensure that the battery's capacity is being measured correctly and that the battery's full holdover time is maintained. During the reconditioning cycle, which takes approximately 8 to 10 hours, the battery's holdover time is reduced to zero (during discharge) and then restored (during full charge).

To ensure that no data is lost from nonvolatile cache memory, the controller automatically disables the write cache during a reconditioning cycle. When the cache is disabled, performance is degraded for the reconditioning period. Once the reconditioning cycle is complete, the cache is restored to its original settings.

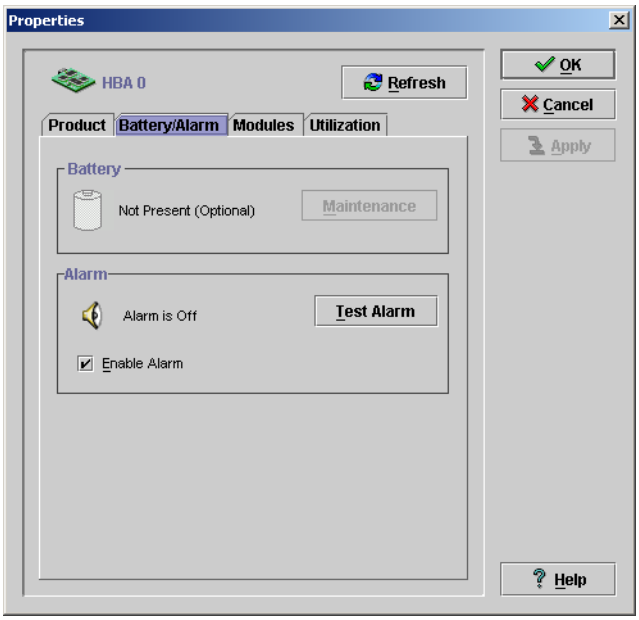
At some point the battery may not recharge properly and will need to be replaced. Refer to your controller's *Installation Guide* for more information.

You should recondition the battery when optimal performance is not needed.

To start the battery reconditioning cycle:

1. In the System Browser window, select the controller that has the battery you want to recondition.
2. Click **Properties**.

   The Controller Properties dialog box appears.
3. Click the **Battery/Alarm** tab.



4. Click **Maintenance**.

   Storage Manager Pro confirms that you want to recondition the battery. During the reconditioning cycle, which takes approximately 8 to 10 hours, the battery's holdover time is reduced to zero (during discharge) and then restored (during full charge).

   To ensure that no data is lost from nonvolatile cache memory, the controller automatically disables cache (both read and write) during a reconditioning cycle. When the cache is disabled, performance is degraded for the reconditioning

period. Once the reconditioning cycle is complete, the cache is restored to its original settings.

5 Click **OK**.

The battery icon changes from its normal icon  (just a battery) to its reconditioning icon  (battery with a lightning bolt).

Once the reconditioning cycle is complete, the battery icon changes back to the normal version.

Testing the Alarm on the Controller

If your controller has an alarm installed, you can test it to make sure it is working.

To test the alarm on the controller:

1 In the System Browser window, select the controller you want to test.

2 Click **Properties**.

The Controller Properties dialog box appears.

3 Click the **Battery/Alarm** tab.

4 Click **Test Alarm**.

You should hear the alarm sound if it is present on the controller. If no alarm is present on the controller, Storage Manager Pro displays a message box stating that the alarm is not supported.

To turn the alarm off:

1 In the System Browser window, select the controller that is sounding the alarm.

2 Click **Silence Alarm** in the Command Buttons pane.

Storage Manager Pro turns the alarm off.

Viewing Controller Properties

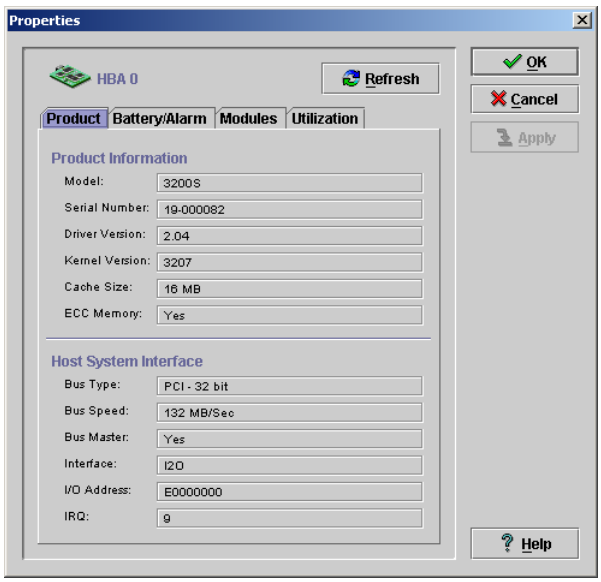
You can view the controller properties, which contain four tabs of information about the controller:

- Product—Displays manufacturer-specific information about the controller.
- Battery/Alarm—Allows you to recondition the battery (see *Reconditioning the Battery* on page 9-3) and set the alarm.
- Modules—(only available on controllers that support plug-in modules) Identifies the modules present.
- Utilization—Shows how much of the attached disk drive space is used in arrays and how much is not used.

To view the controller properties:

1. In the System Browser window, select the controller whose properties you want to view.
2. Click **Properties**.

   The Controller Properties dialog box appears.



   For more information about each of the properties tabs, refer to the Online Help.

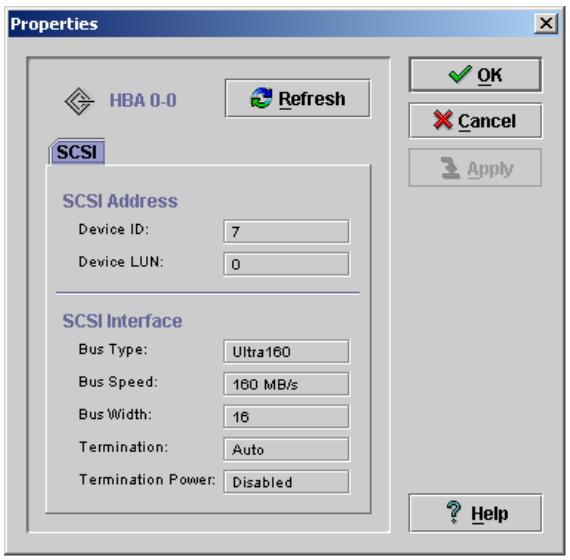
Viewing Channel Properties

You can view the channel properties, which contain information about the channel.

To view the channel properties:

1. In the System Browser window, select the channel whose properties you want to view.
2. Click **Properties**.

   The Channel Properties dialog box appears.



   For more information about each of the properties tabs, refer to the Online Help.

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10

Managing Enclosures

In This Chapter

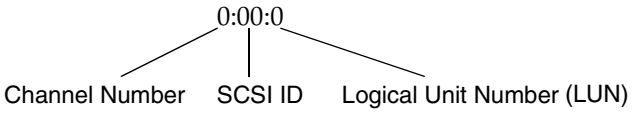
Understanding Enclosures

An enclosure is the physical housing for disk drives. Enclosures can be internal or external to the computer system and usually contain one or more power supplies, fans, and temperature sensors.

Only enclosures with SCSI Enclosure Services (SES) or SCSI Accessed Fault-Tolerant Enclosure (SAF-TE) processors can report the status of and manage these components. The SAF-TE specification is an open specification designed to provide a comprehensive standardized method to monitor and report information on the condition of disk drives, power supplies, and cooling systems used in high-availability LAN servers and storage subsystems.

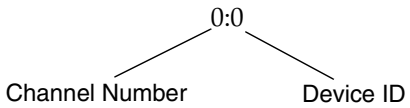
Because enclosures vary widely, some of the functions described in this chapter may not apply to your enclosure. Refer to your enclosure's documentation or manufacturer for information specific to your enclosure.

Enclosures with SES or SAF-TE processors are identified by this icon and a unique ID displayed in the following format:



- Channel Number—Indicates to which channel (bus) on the controller the enclosure is attached.
- SCSI ID—Identifies the enclosure on the SCSI channel.
- Logical Unit Number (LUN)—The number assigned to a subdevice (logical unit) of a SCSI device, which is usually zero for a single enclosure.

Enclosures with ATA disk drives are identified by a disk ID displayed in the following format:



- Channel Number—Indicates to which channel (bus) on the controller the drive is attached.
- Device ID—Identifies the drive on the ATA channel.

Storage Manager Pro displays the unique ID in the System Browser window and in the Enclosure Properties dialog box.

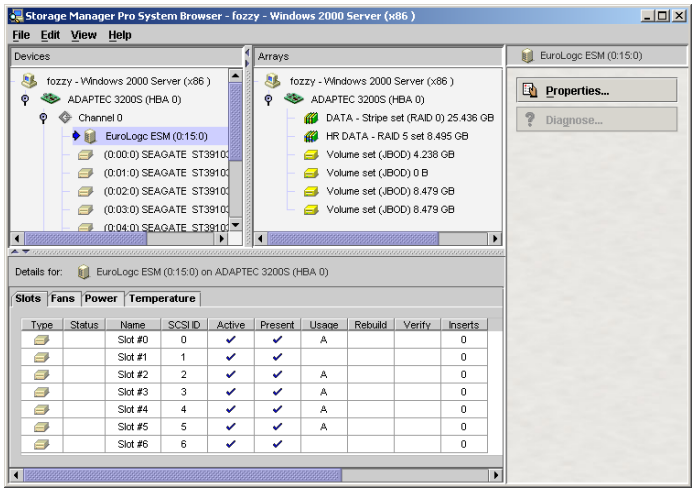
Viewing Enclosure Status

Some enclosures provide information about their components. You can view the available status information in the System Browser window.

To view available enclosure status information:

1. In the System Browser window, select the enclosure whose status you want to view.
2. Click the tabs in the Details pane of the System Browser window.

   The tabs and information in each tab depend on your enclosure. Below is an example of some of the information that may be available.



You can view additional information about the enclosure in the Enclosure Properties dialog box. See *Viewing Enclosure Properties* on page 10-8.

Turning Off Enclosure Alarms

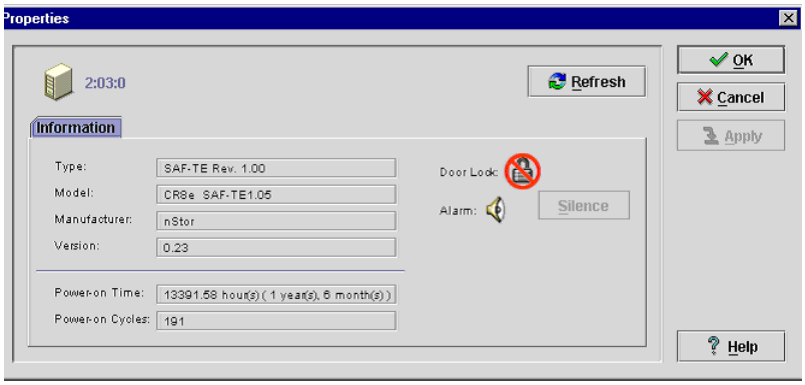
Some enclosures have audible alarms that may sound when the enclosure is open, when the temperature limit is exceeded, and when other conditions exist. The enclosure may have a button that allows you to turn off the alarm. Refer to your enclosure's documentation for information about alarm conditions.

You can use Storage Manager Pro to turn off the alarm in the Enclosure Properties dialog box. The Silence button that turns off the alarm is only available when the alarm is sounding.

To turn off the enclosure's alarm:

1. In the System Browser window, select the enclosure whose alarm you want to turn off.
2. Click **Properties**.

   The Enclosure Properties dialog box appears.



3. Click **Silence**.
4. Click **OK**.

Setting the Fan Speed

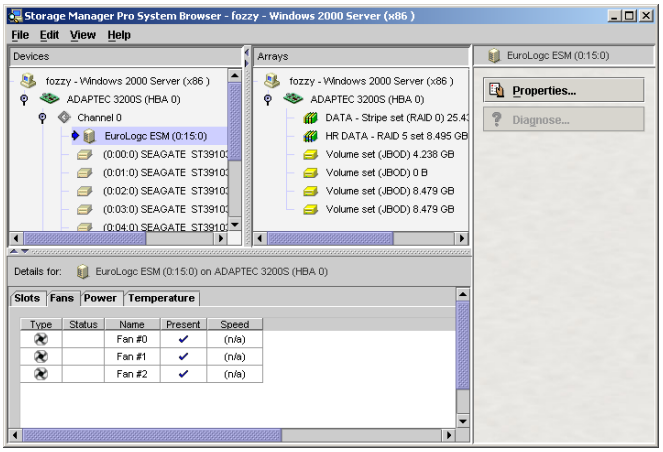
Some enclosures have one or more fans whose speed you can control. Refer to your enclosure's documentation for more information.

If your enclosure and controller support controlling the fan speed, you can use Storage Manager Pro to set or change the fan speed.

To set the fan speed:

1. In the System Browser window, select the enclosure you want.

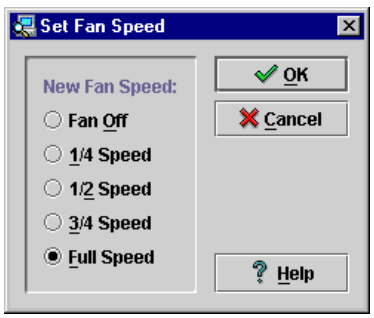
2 In the Details pane, click the **Fans** tab.



3 Select a fan.

4 Click **Set Fan Speed**.

The Set Fan Speed dialog box appears. The dialog box does *not* reflect the current status of the fan.



5 Select a New Fan Speed.

6 Click **OK**.

Preparing and Activating Slots

Some enclosures let you prepare slots for insertion or removal of a disk drive. The Prepare Slots function performs the enclosure-specific operations necessary to prepare the slot for removal or insertion of a device. For example, Prepare Slots may turn off power to the slot. Refer to your enclosure's documentation for more information.

To prepare a slot:

1. In the System Browser window, select the enclosure that has the slot you want to prepare.
2. In the Details pane, click the **Slots** tab.
3. Select the slot you want.
4. Click **Prepare Slots**.

   If the drive in the slot is part of an array, Storage Manager Pro tells you that the array may become unusable and confirms that you want to prepare the slot.
5. Click **Yes**.

The Activate Slots function performs the enclosure-specific operations necessary to make the device in the specified slot available on the SCSI channel. The Activate Slots function is only available after using Prepare Slots.

To activate a slot:

1. In the System Browser window, select the enclosure that has the slot you want to activate.
2. In the Details pane, click the **Slots** tab.
3. Select the slot you want.
4. Click **Activate Slots**.

Identifying Slots

Some enclosures let you identify slots. Identifying a slot tells the enclosure to show you which slot is selected. Enclosures do this in different ways. For example, the enclosure may flash one or more lights on the slot door. Refer to your enclosure's documentation for more information.

To turn on identification:

1. In the System Browser window, select the enclosure that has the slot you want to identify.
2. In the Details pane, click the **Slots** tab.
3. Select the slot you want to identify.
4. Click **Identify Slot On**.

   Storage Manager Pro confirms that Identify Slot has been turned on.
5. Click **OK**.

   The enclosure identifies the slot.

To turn off identification:

1. In the System Browser window, select the enclosure you want.
2. In the Details pane, click the **Slots** tab.
3. Select the slot whose identification you want to turn off.
4. Click **Identify Slot Off**.

   Storage Manager Pro confirms that Identify Slot has been turned off.
5. Click **OK**.

   The enclosure turns off identification.

Turning Power Supplies On and Off

Some enclosures let you turn power supplies on and off. You use this function when you replace the power supply. Refer to your enclosure's documentation for more information.

To turn power supplies on or off:

1. In the System Browser window, select the enclosure that has the power supply you want to turn on or off.
2. In the Details pane, click the **Power** tab.
3. Select the power supply you want to turn on or off.
4. Click **Set Power On** or **Set Power Off**.

Caution: If you turn off the only working power supply, you turn off access to the enclosure and its disk drives. This may cause loss of data or data corruption.

Storage Manager Pro confirms that you want to turn the power supply on or off.

5. Click **Yes**.

The power supply is turned on or off.

Viewing Enclosure Properties

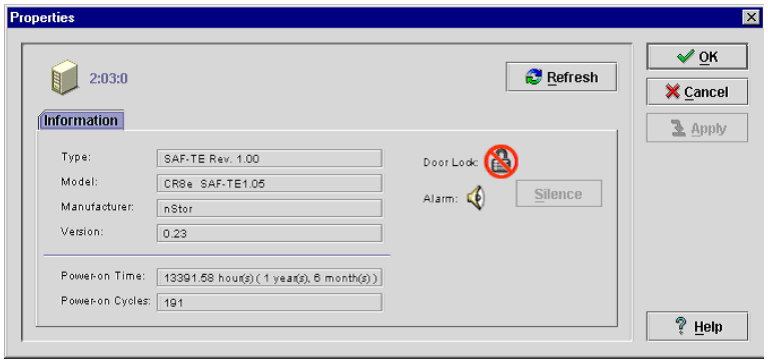
You can view the enclosure properties, which contain information about the enclosure.

To view the enclosure properties:

1. In the System Browser window, select the enclosure whose properties you want to view.

2 Click **Properties**.

The Enclosure Properties dialog box appears.



For more information about the properties, refer to the Online Help.

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11

Troubleshooting

In This Chapter

Use the information in the following sections when you have problems using Storage Manager Pro. Check this information before calling for technical support.

Problems Installing and Starting Storage Manager Pro

Problem	Solution
While installing Storage Manager Pro, you receive an error that says that the temporary space required to perform this installation is greater than what is available.	You must have 20 MB of free space for temp files. The installation uses your operating system's temporary free space. Be sure you have that much free space and then restart the installation.
You start the Storage Manager Pro user interface and receive a "cannot connect to local server" error message.	Check that the Storage Manager Pro service or daemon is running. If it is not, start it manually. See *Starting Adaptec Storage Manager Pro* on page 1-3.

Resolving Problems Shown by the Status Indicators

The Status column for each device in the System Browser Details pane displays an indicator that changes based on the condition of the device:

- None—Shows that the system has nothing to report.
- Information  —Shows that the system has some information to report.
- Caution  —Warns you about a potential problem with the device.
- Critical  —Warns you that the device has failed.

Information, Caution, and Critical icons similar to those above are displayed next to any device or array in the Devices or Arrays pane when something has happened to a device or array. You may also see a Diagnose button in the Command Buttons pane. See the next section for information about the Diagnose button.

Using the Diagnose Button

The Diagnose button appears on the System Browser Command Buttons pane and is activated when Storage Manager Pro detects a problem with the selected system, device, or array. Using the Diagnose function, you can see details about the problem including a description, the cause, and suggestions for resolving the problem.

For example, if you are creating a RAID 5 set, you will notice a Caution icon  next to the array immediately after you create the array. If you select the array in the Arrays pane, the Diagnose button is then activated. Clicking the Diagnose button would explain that the array is nonredundant during the verify process. Once the verify process is complete, the array will be redundant, the Caution icon removed, and the Diagnose button will be unavailable.

Additional information is also available by clicking Details in the Diagnose dialog box, which displays a specific help topic for that problem.

To use the Diagnose button:

1. Click **Diagnose**.

   The Diagnose dialog box appears listing details about the problem.

2. Click **Details** to see additional information about possible steps to resolve the problem.

   The specific help topic for that problem appears.

Note: The Details button is available only if there is additional information about the problem.

The following are examples of the types of problems that can be displayed in the Diagnose dialog box:

- Enclosure device slot problems
- Enclosure fan problems
- Enclosure power supply problems
- Array redundancy problems
- Device failure problems
- Battery problems

Refer to the Online Help for more information about the types of problems.

Managing Controllers on Remote Systems

If you find that you cannot manage controllers on remote systems, use the table below to determine possible solutions.

Problem	Solution
System you want displays a gray system icon in the Dashboard and shows no controllers in the System Browser window.	• On the system you want to access remotely, check that the Storage Manager Pro service or daemon is running. If it is not, start it. See *Starting Adaptec Storage Manager Pro* on page 1-3. • If the service is running, check the that the system you want to access remotely is accessible on your network.
After trying to move a system to another management set, Storage Manager Pro displays a message that it could not unregister you from the old management set.	• This message means that the system you are working from was part of another management set and Storage Manager Pro was not able to unregister the system from that management set. Storage Manager Pro must do this before adding the system to the new management set. • Check that the directory manager of the original set is turned on, has the Storage Manager Pro service or daemon running (see *Starting Adaptec Storage Manager Pro* on page 1-3), and that it is accessible on your network. Then try to add the system again.
User cannot log in using a global account login name.	• Check that the directory manager of the management set is turned on, has the Storage Manager Pro service or daemon running (see *Starting Adaptec Storage Manager Pro* on page 1-3), and that it is accessible on your network. Then try again.

A

Storage Concepts

In This Chapter

Storage Manager Pro uses specific terms to describe storage concepts and configurations. If you are new to storage technology and array configurations, this section will help you understand basic Redundant Array of Independent Disks (RAID) technology and terminology.

Devices

A *device* is any type of physical computer storage unit such as a disk drive, controller, or enclosure.

Controllers

A *controller* is a hardware device that performs input/output (I/O) functions. Controllers also perform other functions such as read and write caching and RAID management. Also known as an adapter, embedded storage controller, Host Bus Adapter (HBA), or subsystem.

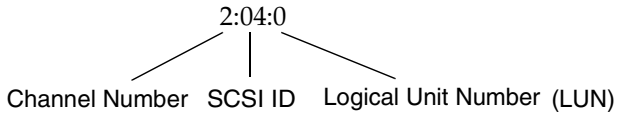
Channels

A *channel* is any path used for the transfer of data and control information between storage devices and a storage controller. Each controller's channel is identified by a number. Channels in Storage Manager Pro are numbered starting with number 0. Also known as a bus.

Disk Drives

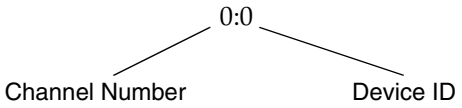
The term *disk drive* (or drive) refers to the physical disk drives that store your data. Depending on your controller, you may use either SCSI or ATA drives.

In Storage Manager Pro, the SCSI drives are identified by a disk ID, which is in the format:



- Channel Number—Indicates to which channel (bus) on the controller the SCSI drive is attached.
- SCSI ID (also known as *target ID*)—Identifies the drive on the SCSI channel.
- Logical Unit Number (LUN)—The number assigned to a subdevice (logical unit) of a SCSI device, which is usually zero for a disk drive.

ATA disk drives are identified by a disk ID displayed in the following format:



- Channel Number—Indicates to which channel (bus) on the controller the drive is attached.
- Device ID—Identifies the drive on the ATA channel.

Free Space

Free space refers to the space on a disk drive that is not in use by an array. Arrays are created from free space, therefore creating an array reduces the amount of free space on a drive. When you delete an array, its space is returned to free space.

Partitions

A *partition* is a contiguous area of a physical drive that makes up some or all of an array. These partitions are created and managed by the controller as by-products of array creation. That is, when the controller creates an array, the controller automatically converts free space on a drive into one or more array partitions. See Figure A-1.

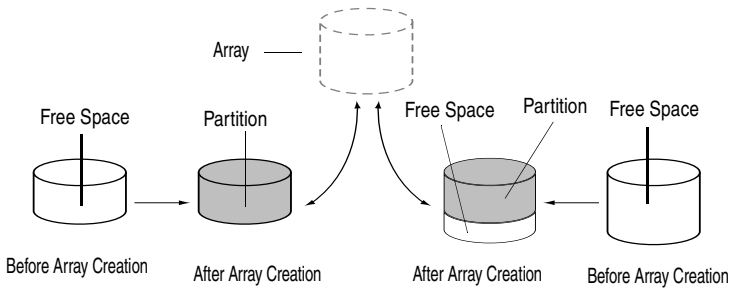


Figure A-1. Partitions

A partition cannot be used by more than one array at a time.

The partitions discussed here are not the same as partitions created by an operating system. Operating system partitions are subsets of the logical space presented to the operating system by the array.

Redundancy

Redundancy refers to the capability of preventing data loss if a drive fails. Some array types give you this capability in one of two methods:

- Two identical copies—Data is written on two disk drives, resulting in the same data being stored in two places. Mirror sets, for example, use this method.
- Parity—Error checking information is distributed across partitions on three or more disk drives. The error checking information permits the system to rebuild the data if one drive fails. RAID 5 sets, for example, use this method.

Arrays

An *array* is two or more physical drives grouped together to appear as a single device (logical drive) to the user. Also known as a container. A volume set created on a single disk is also referred to as an array. You create arrays on two or more physical drives.

An array that spans multiple physical drives can be larger than any one of the physical drives. An array's underlying partitions can be smaller than a physical drive. Consequently, several arrays' partitions can reside on a single physical drive.

The partitions that make up an array represent *used* (or allocated) space on each drive. The used space is available to store data, but cannot be allocated to another array.

Figure A-2 represents an array made up of two disk drives. The free space of the larger drive is not used.

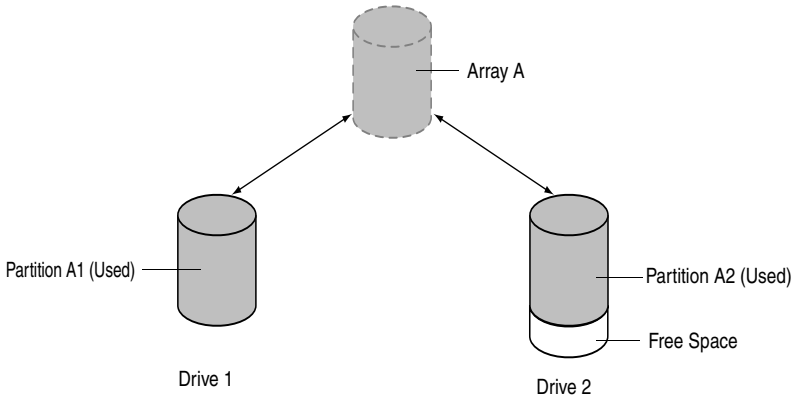


Figure A-2. One array made up of two disk drives

On Windows NT/2000, an array's file system appears in Windows Explorer as a disk drive with its own drive letter.

Array Types

The following are the most common types of arrays (each is described in more detail in the sections that follow):

Array Type	Strengths	Weaknesses
Volume Set	•Low cost	•No data protection •Low performance
Stripe set (RAID 0)	•Highest performance •Supports multiple simultaneous read and write operations.	•No data protection; if one drive fails, all data is lost.
Mirror set (RAID 1)	•Very high performance •Very high data protection	•High cost for redundancy overhead, because twice the storage capacity is required.
RAID 5 set	•Lower cost •Very high read performance •Very high data protection •Supports multiple simultaneous read and write operations. •Can be optimized for large, sequential requests.	•Write performance is slower than a stripe set (RAID 0) or mirror set (RAID 1).
Stripe set of mirror sets (RAID 0/1)	•Very high performance •Highest data protection; can tolerate some cases of multiple drive failures.	•High redundancy overhead, because twice the storage capacity is required. Requires a minimum of four drives.
Stripe set of RAID 5 sets (RAID 0/5)	•Lower cost •Higher performance •Very high read performance •Very high data protection •Supports multiple simultaneous read and write operations. •Can be optimized for large, sequential requests.	•High redundancy overhead, because twice the storage capacity is required. Requires a minimum of four drives.

The types of arrays you can create depend on the controller you are using. The minimum and maximum number of drives you can use for each array type varies based on the controller.

Volume Set

A *volume set* is a single drive that is not used in an array. A volume set can also be a partition that equals the full capacity of a given drive.

Figure A-3 represents a volume set made up of one drive.

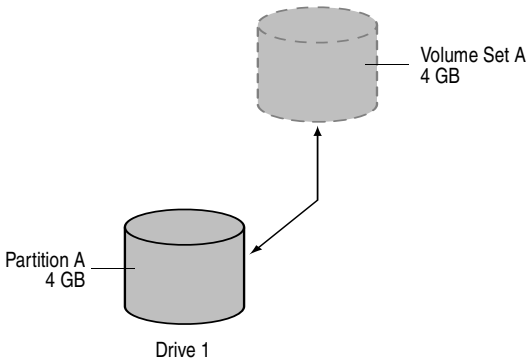


Figure A-3. Volume set

Stripe Set (RAID 0)

A *stripe set* is an array made up of two or more drives. The stripe set distributes, or stripes, data evenly across its respective drives in equal-sized sections called *chunks*.

A stripe set distributes the data among the partitions in a way that optimizes access speed (high performance). A stripe set does not have the redundancy of a mirror set or RAID 5 set.

Figure A-4 depicts a stripe set made up of three partitions on three separate drives. The free space of the larger drive is not used.

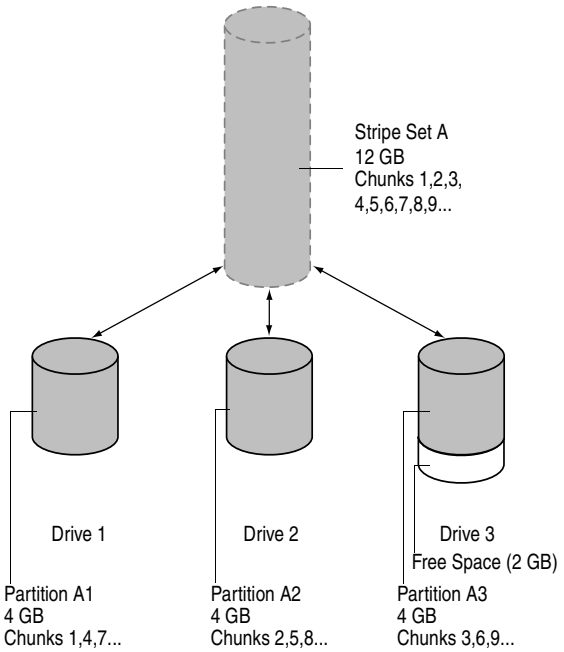


Figure A-4. A stripe set made up of the partitions, each on three different drives

Mirror Set (RAID 1)

A *mirror set* is an array made up of two different drives. A mirror set stores and maintains the same (redundant) data in each of the two partitions.

Figure A-5 represents a mirror set. The free space of the larger drive is not used.

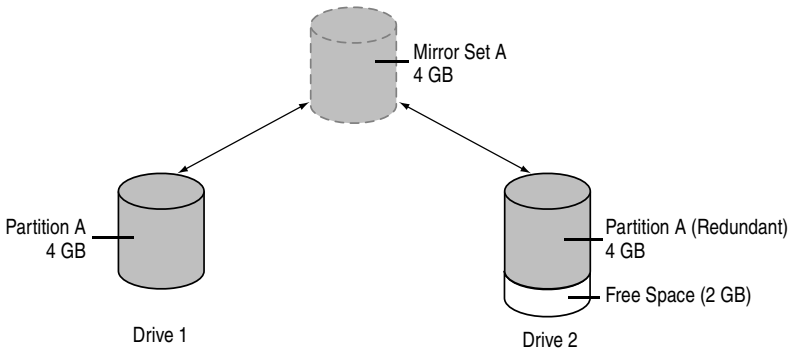


Figure A-5. Mirror set

RAID 5 Set

The *RAID 5 set* is similar to a stripe set, except that it uses parity to provide redundancy. A RAID 5 set must be made up of at least three equal-sized partitions on different drives, and the data is striped evenly across its respective drives in equal-sized chunks. You must have at least three partitions to permit the system to rebuild the data if one drive fails.

As data is striped across the partitions, one chunk of each stripe is used for parity data. The parity chunks are distributed across all participating drives of the RAID 5 set, so parity operations are evenly divided among all the partitions in the array.

Figure A-6 represents a RAID 5 set made up of four partitions, each on different drives. The free space of the larger drive is not used.

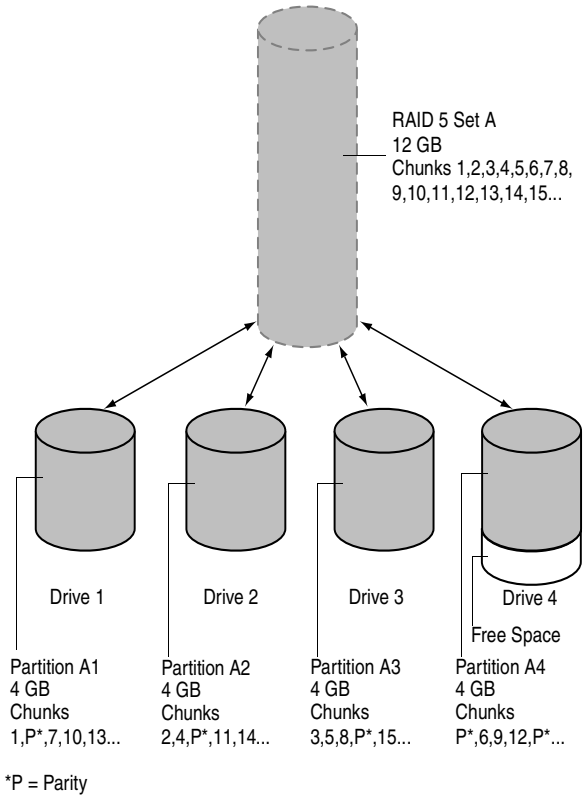


Figure A-6. RAID 5 set

Stripe Set of Mirror Sets (RAID 0/1)

RAID technology allows you to create arrays that contain other arrays. (Also known as multilevel arrays.) A *stripe set of mirror sets* is an array made up of two or more equal-sized mirror sets. The data in a stripe set of mirror sets is redundant.

Figure A-7 represents a stripe set of mirror sets created from three equal-sized mirror sets (A, B, and C) and striped across six drives. Each mirror set is made up of two partitions on two separate drives. The free space of the larger drive is not used.

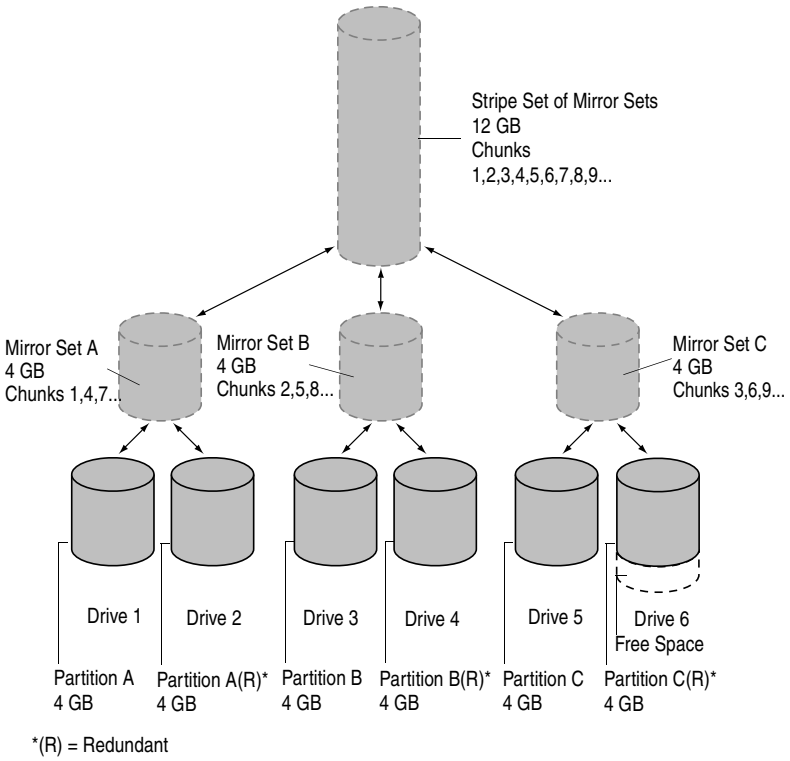


Figure A-7. Stripe set of mirror sets

The stripe set of mirror sets is the top-level array, and mirror sets A, B, and C are the underlying arrays.

Other types of multilevel arrays exist, though the stripe set of mirror sets offers the best balance of performance and redundancy of all the multilevel array types.

Stripe Set of RAID 5 Sets (RAID 0/5)

RAID technology allows you to create arrays that contain other arrays. (Also known as multilevel arrays.) A *stripe set of RAID 5 sets* is an array made up of two or more equal-sized RAID 5 sets. The data in a stripe set of RAID 5 sets is redundant.

Figure A-8 represents a stripe set of RAID 5 sets created from two equal-sized RAID 5 sets (A and B) and striped across six drives. Each RAID 5 set is made up of three equal-sized partitions on three separate drives. The free space of the larger drive is not used.

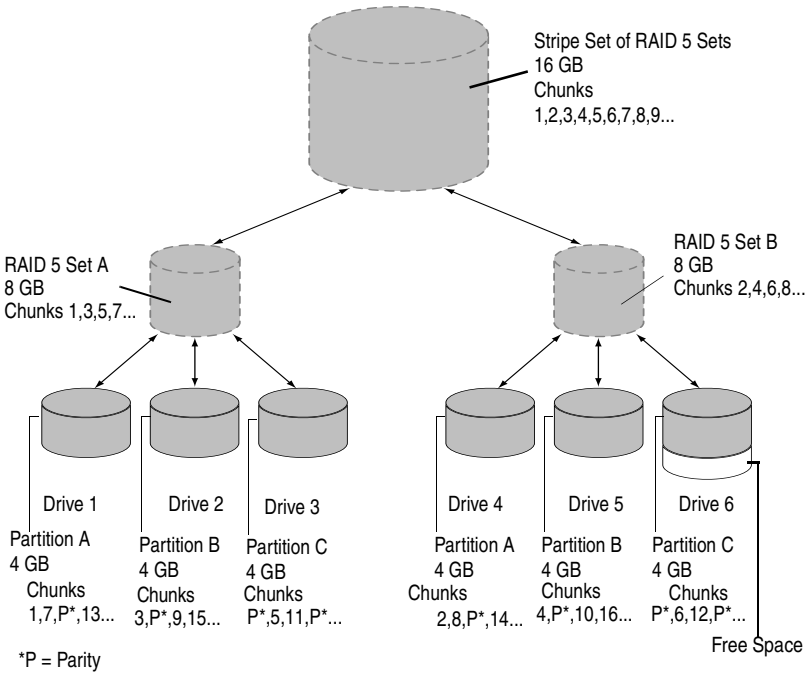


Figure A-8. Stripe set of RAID 5 sets

The stripe set of RAID 5 sets is the top-level array, and RAID 5 sets A and B are the underlying arrays.

Other types of multilevel arrays exist, though the stripe set of mirror sets offers the best redundancy of any array type.

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B

Choosing Your Array Type

In This Chapter

Determining which array type to use depends on the applications running on your server and trade-offs between performance and cost.

Before you choose your array type in Storage Manager Pro, you should evaluate your needs based on the following:

- Performance—This is based on the requirements of the applications to be run on the system you are setting up. Key performance issues to consider include:
  - Fault tolerance—Ability of the system to recover from a failure of one of more drives without interrupting user or application access to data.
  - Load balancing—Ability to spread I/O across drives.
  - Write performance—Ability to write large amounts of data.

- Configuration cost—A redundant array offers fault tolerance, but increases your costs.

The following sections explain the differences between the array types to help you determine the best configuration.

If You Are New to Arrays

For those new to arrays, we recommend the following path to help you choose:

1. Read about the array types in *Storage Manager Pro Array Types* on page B-2.
2. Read the examples in *Array Selection Examples* on page B-4.
3. Use the decision chart in *Array Decision Chart* on page B-6 to make your selection.

If You Have Experience with Arrays

For those who have experience with arrays, we recommend the following path to help you choose:

1. Read about the array types available in *Storage Manager Pro Array Types* on page B-2.
2. Read about the selection criteria in *Understanding the Array Selection Criteria* on page B-8.
3. Use the criteria comparison in *Comparing the Selection Criteria* on page B-9 to make your selection.

Storage Manager Pro Array Types

Arrays are logical drives made up of one or more partitions on one or more physical drives.

You can create the following types of arrays using Storage Manager Pro:

- Volume set—A single drive that is not used in an array. A volume set can also be a partition that equals the full capacity of a given drive.

- Stripe set (RAID 0)—An array made up of two or more drives. The stripe set distributes, or stripes, data evenly across the partitions in equal-sized sections called *chunks*.
- Mirror set (RAID 1)—An array made up of two drives. A mirror set stores and maintains the same, or redundant, data in each of its two partitions.
- RAID 5 set—An array that is similar to a stripe set, except that it uses parity to provide redundancy. A RAID 5 set must be made up of at least three equal-sized partitions. One chunk is used for parity data for each set of chunks striped across the partitions. The parity chunk is distributed across all drives containing partitions of the RAID 5 set.
- Stripe set of mirror sets (RAID 0/1)—An array made up of two or more equal-sized mirror sets that also stripes the data across all drives.
- Stripe set of RAID 5 sets (RAID 0/5)—An array made up of two or more equal-sized RAID 5 sets that also stripes the data across all drives.

For more detailed descriptions of each array type, see Appendix A, *Storage Concepts*.

Array Selection Examples

The examples in this section show you how to use the array selection criteria to determine the optimum array type for specific networking environments. You may find these examples useful in determining the array type that best meets your needs. See *Understanding the Array Selection Criteria* on page B-8.

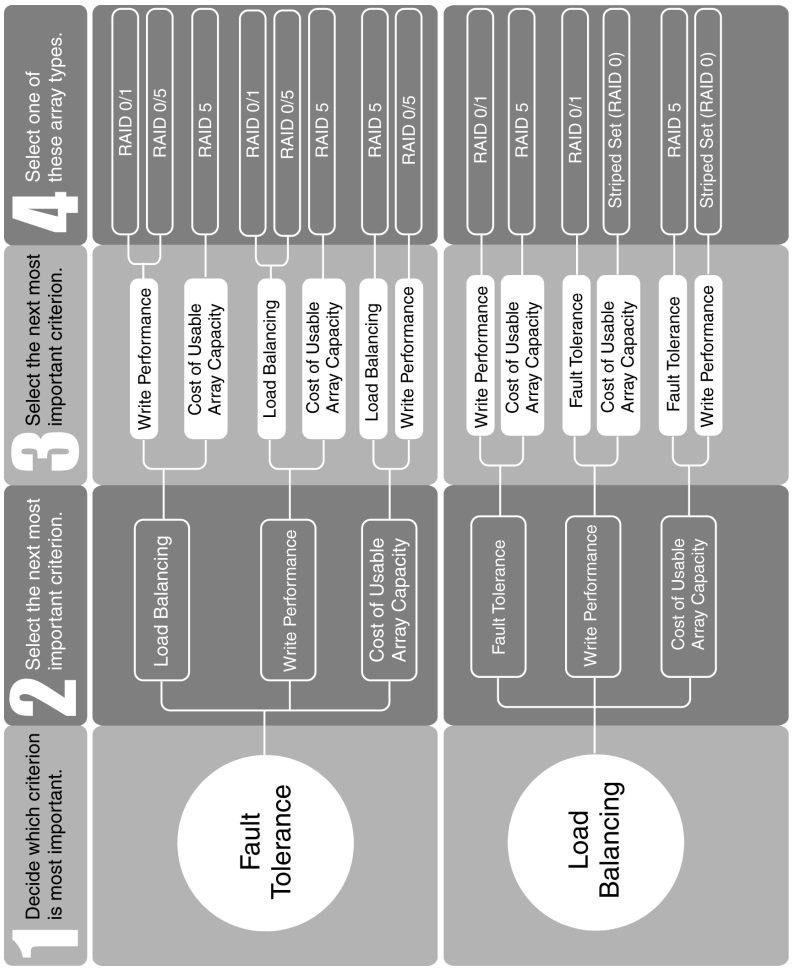
Generally, most users who require fault tolerance prefer RAID 5 configurations because of the reduced cost overhead. Users who do not require fault tolerance usually use the stripe set.

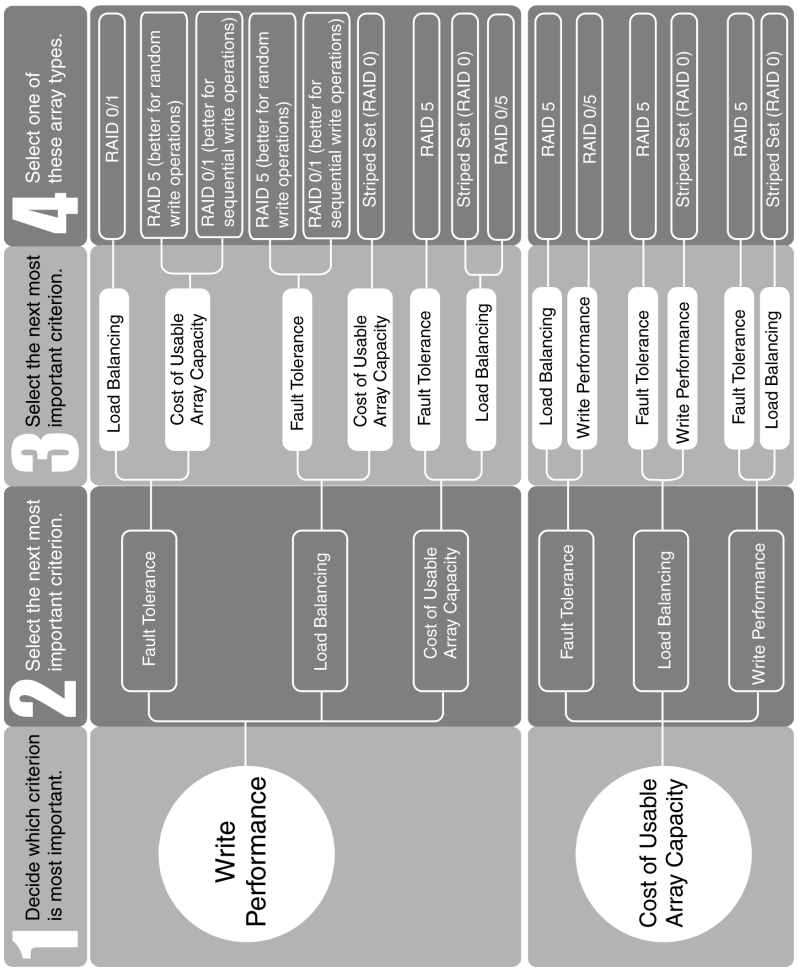
Need or System Use	Definition	Suggested Configuration
Mission-critical data	Users must have access to data, and fault tolerance is the highest priority.	•Stripe set of mirror sets (RAID 0/1) (highest write performance) •Stripe set of RAID 5 sets (RAID 0/5) •Mirror set (RAID 1) •RAID 5 set
Application server	Users access applications from the server, but they store their data on their local disk drives; requires high sequential-read performance.	•Stripe set of mirror sets (RAID 0/1) •Mirror set (RAID 1) •Stripe set of RAID 5 sets (RAID 0/5) •RAID 5 set
Developer environment	Users transfer data from the server to their local disk drives, modify the data, and return it to the server; requires high random-read and -write performance and fault tolerance.	•Stripe set of RAID 5 sets (RAID 0/5) •Mirror set (RAID 1) •RAID 5 set
Mail server	Users log in to the server to read their mail, and the server transfers the mail files to the user's local disk drive; requires high random-read and -write performance and fault tolerance.	•Stripe set of RAID 5 sets (RAID 0/5) •Mirror set (RAID 1) •RAID 5 set

Need or System Use	Definition	Suggested Configuration
Transaction server	Users at multiple PCs randomly access the server mostly for creating new files and for updating old ones (for example, hospital or banking applications), making data availability critical; requires high random-read performance and fault tolerance.	•Stripe set of mirror sets (RAID 0/1) •Stripe set of RAID 5 sets (RAID 0/5) •*Alternate configuration:* Stripe set (RAID 0) to store and manage data; mirror set (RAID 1) to maintain a transaction log file
Video server	Users transfer large blocks of sequential data from the server, edit the data, and return the data to the server; requires high sequential-read and -write performance.	•Stripe set (RAID 0) •Stripe set of RAID 5 sets (RAID 0/5) •RAID 5 set (if fault tolerance is required)
Web server	Users log in to the server to locate and view information. Sometimes they enter data such as registration information or transfer data if an FTP site allows it.	•Stripe set (RAID 0) •RAID 5 set •Stripe set of mirror sets (RAID 0/1)

Array Decision Chart

Use the chart below, which spans two pages, to narrow your array choices. Determine which criteria are most important to you and read across the chart to find the best array type to use. For definitions of the criteria, see *Understanding the Array Selection Criteria* on page B-8.




1 Decide which criterion is most important.
2 Select the next most important criterion.
3 Select the next most important criterion.
4 Select one of these array types.
Write Performance
Fault Tolerance
Load Balancing
Cost of Usable Array Capacity
Load Balancing
Cost of Usable Array Capacity
Fault Tolerance
Load Balancing
RAID 0/1
RAID 5 (better for random write operations)
RAID 0/1 (better for sequential write operations)
RAID 5 (better for random write operations)
RAID 0/1 (better for sequential write operations)
Striped Set (RAID 0)
RAID 5
Striped Set (RAID 0)
RAID 0/5
Cost of Usable Array Capacity
Fault Tolerance
Load Balancing
Write Performance
Load Balancing
Write Performance
Fault Tolerance
Load Balancing
Fault Tolerance
Write Performance
Fault Tolerance
Load Balancing
RAID 5
RAID 0/5
RAID 5
Striped Set (RAID 0)
RAID 5
Striped Set (RAID 0)

Understanding the Array Selection Criteria

To help you choose an array type, use the criteria in the following table. Decide how important each criterion is to meeting your data management and storage needs.

Criteria	Definition	Examples
Random-read performance	Ability to locate and read data directly from a file without having to search sequentially from the beginning of the file.	Databases, transaction processing programs, and operating system page file
Random-write performance	Ability to write data directly to a file without having to search sequentially from the beginning of the file.	Databases, transaction processing programs, and operating system page file
Sequential-read performance	Ability to read large numbers of consecutive data elements.	Streaming video programs and backup/restore programs
Sequential-write performance	Ability to write large numbers of consecutive data elements.	Streaming video programs and backup/restore programs
Fault tolerance	Ability to recover from a failure of one or more drives without interrupting user or application access to data.	Whenever data is more important than the cost of storing it
Expansion	Ability of the system to increase the available storage capacity for the operating system's file system.	Most systems require expansion capabilities to meet growing data storage needs.
Load balancing	Ability to spread I/O across drives.	All I/O-intensive applications benefit from load balancing.
Cost per usable unit of space	Ability to use all space in an array to store user data. (Unusable space includes parity in a RAID 5 set and the redundant half of a mirror set.)	N/A

Comparing the Selection Criteria

The table below rates how well each array type achieves each of the selection criteria. The table uses a scale of 1 to 5: 1 = least effective; 5 = most effective.

Use the table below to compare the array types according to the criteria you rated in the previous section. For example, if random-write performance and load balancing are your most important criteria, then choose a stripe set array type.

	Array Type					
Criteria	**Volume Set**	**Stripe Set (RAID 0)**	**Mirror Set (RAID 1)**	**RAID 5 Set**	**Stripe Set of Mirror Sets (RAID 0/1)**	**Stripe Set of RAID 5 Sets (RAID 0/5)**
Random-read performance	1	4	2	4	5	5
Random-write performance	3	5	2	1	3	2
Sequential-read performance	1	5	2	3	5	4
Sequential-write performance	3	4	5	1	5	2
Load balancing	1	4	1	3	3	5
Cost per usable array space	5	5	1	4	1	3
Fault tolerance	No	No	Yes	Yes	Yes	Yes
Expansion	Yes	Yes	Yes	Yes	No	No

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Glossary

A

array
Two or more physical drives grouped together to appear as a single device (logical drive) to the user. Also known as a container. See also mirror set (RAID 1); multilevel array; RAID 5 set; stripe set (RAID 0); stripe set of mirror sets (RAID 0/1); stripe set of RAID 5 sets (RAID 0/5); volume set.

B

bus
See channel.

C

channel
Any path used for the transfer of data and the control of information between storage devices and a storage controller. Each controller's channels are identified by a number. They are numbered in Storage Manager Pro starting with number 0. Also known as a bus. See also LUN; SCSI ID.

chunk
A contiguous set of data written onto a single disk when a stripe set, RAID 5 set, or stripe set of mirror sets distributes, or stripes, data across its respective disks. See also RAID 5 set; stripe set (RAID 0); stripe set of mirror sets (RAID 0/1).

chunk size
See stripe size.

container
See array.

controller
A hardware device that performs I/O functions. Controllers also perform other functions such as read and write caching and RAID management. Also known as an adapter, embedded storage controller, or subsystem.

D

device
Any type of physical computer storage unit such as a disk drive, controller, or enclosure.

device ID
See SCSI ID.

device slot
See slot.

directory manager
In setting up remote access to systems on your network, the system that other systems register with and that stores all global user accounts for the management set. See also management set.

disk array
See array.

disk drive
A physical disk drive on a SCSI bus. In Storage Manager Pro, drives are addressed by their disk ID, which includes the channel (bus) number, SCSI ID, and LUN. See also channel; disk ID; LUN; SCSI ID.

disk ID
Unique disk identifier that consists of the channel (bus) number, SCSI ID (also known as target ID), and LUN (logical unit number). For example, 1:04:0. See also channel; LUN; SCSI ID.

E

enclosure
A physical housing for drives, which can be connected internally or externally to a computer. An enclosure usually contains one or more power supplies, fans, and temperature sensors. The term enclosure also applies to a SAF-TE-compliant backplane. See also SAF-TE.

enclosure ID
Enclosures that are controlled by a SAF-TE processor are identified by an enclosure ID. The enclosure ID consists of the channel (bus) number, SCSI ID (also known as target ID), and LUN (Bus:ID:LUN). For example, 1:04:0. See also channel; LUN; SCSI ID.

enclosure management device
See enclosure.

F

failover
Failover is the process by which the controller rebuilds data onto a spare drive when a drive that is part of a redundant array fails.

file system
A layer of software that manages a collection of files within a directory structure. Storage Manager Pro supports three types of file systems on Windows NT/2000 systems: FAT, NTFS, and FAT32 (Windows 2000 only).

free space
The space on an initialized drive that is not being used by an array. Arrays are created from free space. When an array is deleted, its space is returned to free space. See also array.

H

hot-swapping
Removing a component from a system and installing a new component while the power is on, the system is running, and without pausing I/O.

J

JBOD
Just a Bunch of Disks. See volume set.

L

logical unit number
See LUN.

LUN
Stands for logical unit number. The number assigned to a subdevice (logical unit) of a SCSI device. Each SCSI device can contain up to eight subdevices numbered 0 through 7; however, most SCSI devices contain only one subdevice (LUN 0).

M

management set
Group of two or more systems on your network that can use Storage Manager Pro to manage each other's storage devices.

mirror set (RAID 1)
An array type made up of two equal-sized partitions that reside on two different drives. A mirror set stores and maintains the same (redundant) data in each of the two partitions. See also partition; redundancy.

multilevel array
An array that contains other arrays. See also array; stripe set of mirror sets (RAID 0/1); stripe set of RAID 5 sets (RAID 0/5).

P

parity
A form of error checking redundancy used to re-create the data of a failed disk in a RAID 5 set. See also RAID 5 set; redundancy.

partition
A contiguous area of a physical drive that makes up some or all of an array. These partitions are created and managed by the controller as by-products of array creation. That is, when the controller creates an array, the controller automatically converts free space on a drive into one or more array partitions. The partitions discussed here are not the same as partitions created by an operating system. File system partitions are subsets of the logical space presented to the operating system by the array. See also array; free space.

R

RAID 0
See stripe set (RAID 0).

RAID 1
See mirror set (RAID 1).

RAID 0/1
See stripe set of mirror sets (RAID 0/1).

RAID 0/5
See stripe set of RAID 5 sets (RAID 0/5).

RAID 5 set
An array type that is similar to a stripe set in that it stripes data evenly across its respective drives in equal-sized chunks, except that it uses parity to provide redundancy. A RAID 5 set must be made up of at least three equal-sized partitions on different drives. You must have at least three partitions to permit the system to rebuild the data if one drive fails. As data is striped across the partitions, one chunk of each stripe is used for parity data. See also chunk; partition; parity.

redundancy
The capability of preventing data loss if a drive fails. Some array types give you this capability using one of two methods: two identical copies or parity.

S

SAF-TE
Stands for SCSI Accessed Fault-Tolerant Enclosure. The SAF-TE specification is an open specification designed to provide a comprehensive standardized method to monitor and report status information on the condition of disk drives, power supplies, cooling systems, and other components used in high-availability LAN servers and storage subsystems. See also enclosure.

SCSI ID
The number assigned to each SCSI device attached to a SCSI channel. Also known as the target ID. See also channel; disk ID; enclosure ID.

slot
A receptacle in an enclosure for inserting and removing a SCSI device.

SMART
Stands for Self-Monitoring Analysis and Reporting Technology. This technology is designed to determine the reliability status of a disk. If the SMART system determines that a disk failure is imminent, the user is notified and advised of the appropriate action to take.

spare
Disk drive that you designate as a replacement disk as part of the spare pool. If a drive in a redundant array fails, the controller looks for a spare drive on which to rebuild the data of the failed drive.

spare pool
One or more disk drives that you designate as replacements for any arrays on a controller.

stripe set (RAID 0)
An array type that is made up of two or more drives. The stripe set distributes, or stripes, data evenly across its respective drives in equal-sized sections called chunks. See also chunk; partition.

stripe set of mirror sets (RAID 0/1)
An array type that is made up of two or more equal-sized mirror sets. The data in a stripe set of mirror sets is redundant. See also mirror set (RAID 1); multilevel array.

stripe set of RAID 5 sets (RAID 0/5)
An array type that is made up of two or more equal-sized RAID 5 sets. The data in a stripe set of RAID 5 sets is redundant. See also RAID 5 set; multilevel array.

stripe size
Amount of data written to one partition before the controller moves to the next partition in a stripe set.

T

target ID
See SCSI ID.

V

verify
A function that verifies that Storage Manager Pro can read all blocks of any redundant array type. For a mirror set, the system ensures that the data on the two drives is consistent. For an array type that uses parity for the redundancy, the Build function also checks the parity and fixes any parity errors.

volume set
An array type that is a concatenation (combination) of one or more partitions on one or more drives. The partitions in a volume set do not have to be the same size. See also partition.

Z

zero
A function that writes zeroes in every data block of an array or disk drive. Using Zero permanently deletes all data from the array or drive.

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