USER'S GUIDE

ADAPTEC CI/O MANAGEMENT SOFTWARE

Adaptec, Inc.
691 South Milpitas Boulevard
Milpitas, CA 95035

Printed in Singapore
STOCK NO.: 512061-00, Rev. B MO 2/99

▼▼▼▼ Adaptec CI/O Management Software

User's Guide

adaptec®

Copyright

Trademarks

Adaptec, the Adaptec logo, AHA, CI/O, ARO, and AAA trademarks of Adaptec, Inc. which may be registered in some jurisdictions.

Windows, Windows 95/98 and Windows NT are registered trademarks of Microsoft Corporation in the U.S. and other countries used under license.

All other trademarks are owned by their respective owners.

Changes

The material in this document is for information only and is subject to change without notice. While reasonable efforts have been made in the preparation of this document to assure its accuracy, Adaptec, Inc. assumes no liability resulting from errors or omissions in this document, or from the use of the information contained herein.

Adaptec reserves the right to make changes in the product design without reservation and without notification to its users.

Adaptec Technical Support and Services

If you have questions about installing or using your Adaptec product, check this user's guide first—you will find answers to most of your questions here. If you need further assistance, please contact us. We offer the following support and information services:

Electronic Support

Technical information, including product literature, answers to commonly asked questions, information on software upgrades and other topics is available electronically through the following:

- Adaptec World Wide Web (WWW) site at http://www.adaptec.com.
- File Transfer Protocol (FTP) server at ftp.adaptec.com.
- Adaptec USA Bulletin Board Service (BBS) at 408-945-7727; supports up to 28,800 bps (bits per second), 8 data bits, 1 stop bit, no parity. No product literature is available on the Adaptec BBS.
- Interactive Fax System at 303-684-3400; available 24 hours a day, 7 days a week.

Sales and Ordering Information

- For sales information, call 800-959-7274 or 408-945-2550, M–F, 6:00 A.M. to 5:00 P.M., Pacific Time.
- To order Adaptec software and SCSI cables, call 800-442-7274 or 408-957- 7274, M–F, 6:00 A.M. to 5:00 P.M., Pacific Time.
- To request additional documentation for Adaptec products, call 800-934-2766 or 510-732-3829, M–F, 6:00 A.M. to 5:00 P.M., Pacific Time.

▾▾▾▾ Contents

1 Getting Started

Overview of Adaptec CI/O Management Software 1-2
Conventions 1-3

2 Installing CI/O Software

Installing Adaptec CI/O Management Software on Windows NT Server or Workstation 3
- Stopping CI/O Array Management Service 4.00 9
- Modifying Automatic Start of the Services 10

Uninstalling the Adaptec CI/O Management Software in Windows 11
Installing Adaptec CI/O Management Software on a Networked Windows 95/98 or NT Client 12
Installing the TIRPC Communications Module on NetWare Servers v4.11 and v.5.0 18
Installing the Adaptec CI/O Management Software on Novell NetWare Servers 19
Installing Adaptec CI/O Management Software on UnixWare 7.0.x Servers 21
- Mount the CD-ROM for UnixWare v7.0.x 21
- Install the Adaptec CI/O Management Software on UnixWare v7.0.x 22

Uninstalling the Adaptec CI/O Management Software on UnixWare v7.0.x 23

3 Entering and Viewing System Information

Entering and Viewing System Information 3-2
- Starting the Program 3-2
- Adding a New Server Address 3-2
- Viewing System Information 3-5

Reconnecting to a Server 3-6
Deleting a Server Address 3-7
Viewing a List of Current System Events 3-7
Entering and Viewing Preference Information 3-10
Changing Filter Options 3-10
Selecting Notification Settings 3-12
Configuring Email 3-13
Viewing Historical Information 3-15
Interpreting and Responding to Event Messages 3-17
Additional Preference Information 3-18

4 Viewing SCSI Device Information

Viewing SCSI Devices 4-2
Viewing the SCSI Information Dialog Box 4-4
Viewing SCSI Adapter and Array Controller Information 4-6
Viewing SCSI Channel Information 4-8
Rescanning the SCSI Adapters and Array Controllers 4-9
Differences in Rescan Between SCSI Adapters and Array Controllers 4-9
Rescan Details 4-9
Managing SCSI Adapters 4-10

5 Configuring Arrays and Spares

Creating an Array 5-2
Making an Array the First Virtual Device 5-9
Deleting an Array 5-10
Initializing an Array 5-11
Creating Dedicated Spares or a Spare Pool 5-14
Deleting a Spare 5-17

6 Viewing Array and Device Information

Viewing Array Information 6-3
Viewing Spare Information 6-5

Viewing SCSI Device Information from an Array Controller 6-6
Rescanning the Server 6-6
Viewing Array Controller Information 6-8
Viewing Channel Information 6-10

7 Performing Array, Spare, and Disk Operations

Performing Array Operations 7-2
Reconstructing an Array 7-2
Pausing I/O on an Array 7-5
Verifying Array Integrity 7-6
Blinking Array Drive Lights 7-7
Reactivating an Off-line Array 7-8
Changing an Array Name 7-8
Forcing a Spare 7-9
Performing Spare Operations 7-10
Testing All Spares 7-10
Blinking the Spare Drive Light 7-11
Performing Disk Operations 7-12
Blinking the Drive Light 7-12
Downing the Drive 7-13
Pausing I/O to an Array Disk Drive 7-13

8 Scheduling and Monitoring Array Operations

Setting Scheduling Options 8-2
Viewing and Managing Scheduled Activities 8-4

9 Setting Security Options

Changing the Password 9-2
Setting Password Time-out Options 9-3
Controlling Guest Access 9-5

10 Managing Arrays and Spares

Responding to a Critical Array 10-2

Replacing a Spare 10-4
Replacing an Active Array Member 10-6
Responding to an Off-line Array 10-6
Notes on Replacing Disk Drives 10-8
Optimizing Array Performance 10-9
Read Caching 10-11
Write Caching 10-12
Other Performance Tips 10-13
Selecting a RAID Level for an Array 10-14

A Configuration Settings

I/O Manager Settings A-2

B SAF-TE Enclosure Management

Viewing Enclosure Information B-2
Viewing Subsystem Status Details B-4
Temperature Sensors B-4
Fans B-5
Power Supplies B-5
Identification of Events B-6
Events for SAF-TE Enclosures B-6
Events for Devices Connected to RAID Boards B-9

Glossary

Using the Glossary 1

Index

1

Getting Started

In this Chapter

➤ *Overview of Adaptec CI/O Management Software* 1-2

➤ *Conventions* 1-3

This document explains how to use the Adaptec® CI/O™ Management Software to perform the following operations:

- Install and use Adaptec CI/O Management Software
- View SCSI devices
- Create arrays and perform array, spare, and disk operations
- Replace drives

Overview of Adaptec CI/O Management Software

This User's Guide explains how to use the Adaptec CI/O Management Software most effectively. Use the Contents and Index to find instructions for specific software commands. You can use the Adaptec CI/O Management Software to perform the following functions:

- Monitor the status of SCSI devices, arrays, and other devices on the local system or remote server. The CI/O software sends status updates (event notifications) from multiple remote servers. You can simultaneously monitor servers running under different operating systems.
- Set up regularly scheduled verification of fault-tolerant arrays and testing of spares. We recommend that you respond immediately to arrays in *Critical* status by promptly replacing a failed disk using a spare.
- Use Adaptec CI/O Management Software, running either on the local console or on a networked client, to add, delete, or reconfigure arrays after the system has already been in use. (You need special access rights to change the system configuration.)
- Use the password feature to prevent unauthorized users from changing your array configuration.
- Ensure that arrays are adequately protected with a spare pool (recommended) or dedicated spares. You can create and delete spares with the Adaptec CI/O Management Software.

Conventions

This document uses the following typographic conventions:

bold
Used for key names (… press the **Enter** key …) and for options you are told to select (… select **Configure SCSI Channels**…).

Helvetica
Used for screen messages (…Save changes?…) and for text that must be typed exactly as shown.

Helvetica Italics
Used for program and file names when referenced in the text (… these changes are made to the *config.sys* file…).

This document includes three kinds of advisories:

Note: Notes are reminders, tips, or suggestions that might simplify the procedures included in this document.

Caution: Cautions alert you to actions that might cause damage to your system or your data.

❒

2

Installing CI/O Software

In this Chapter

- *Installing Adaptec CI/O Management Software on Windows NT Server or Workstation* 2-3
  - *Stopping CI/O Array Management Service 4.00* 2-9
  - *Modifying Automatic Start of the Services* 2-10
- *Uninstalling the Adaptec CI/O Management Software in Windows* 2-11
- *Installing Adaptec CI/O Management Software on a Networked Windows 95/98 or NT Client* 2-12
- *Installing the TIRPC Communications Module on NetWare Servers v4.11 and v.5.0* 2-18
- *Installing the Adaptec CI/O Management Software on Novell NetWare Servers* 2-19
- *Installing Adaptec CI/O Management Software on UnixWare 7.0.x Servers* 2-21
  - *Mount the CD-ROM for UnixWare v7.0.x* 2-21
  - *Install the Adaptec CI/O Management Software on UnixWare v7.0.x* 2-22
  - *Uninstalling the Adaptec CI/O Management Software on UnixWare v7.0.x* 2-23

This chapter describes how to install Adaptec CI/O Management Software on the following:

- Windows® 95/98 or NT client
- Windows NT® server or workstation
- Novell NetWare server
- UnixWare server

It also describes how to install the TIRPC Communications Module on NetWare.

Installing Adaptec CI/O Management Software on Windows NT Server or Workstation

Follow these steps to install the Adaptec CI/O Management Software on a Windows NT Server:

1. Start Windows NT.
2. Insert the Adaptec CI/O Management Software CD-ROM in your CD-ROM drive.
3. Locate the Adaptec CI/O Management Software Setup Application:
   - Double-click on the **My Computer** icon.
   - Double-click on the **CD-ROM drive** icon.
   - Click on **Cio400**,then click on **WINDOWS_95_NT.**
   - Click on **disk 1.**
4. Double-click the **Setup Application** icon. The Welcome screen appears as shown in Figure Figure 2-1.

Figure 2-1. Welcome Screen

5 Click on Next. The Setup Type Selection screen appears.

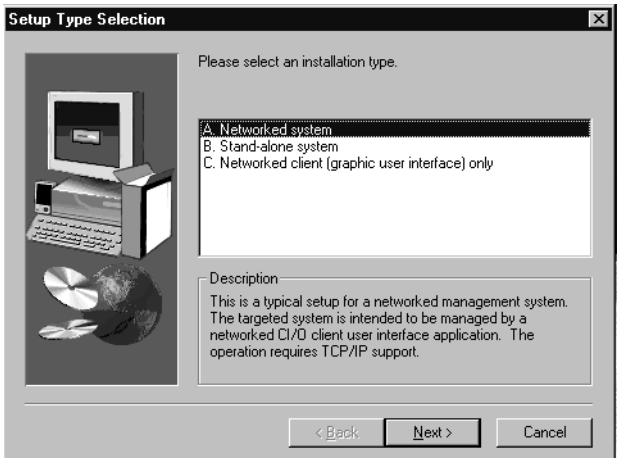

Figure 2-2. Setup Type Selection Screen

6 If you are setting up a Windows NT server, select **Networked System** and click on **Next**. If you are setting up a stand-alone Windows NT Workstation, select **Stand-alone system** and click on **Next**. The Information screen appears.

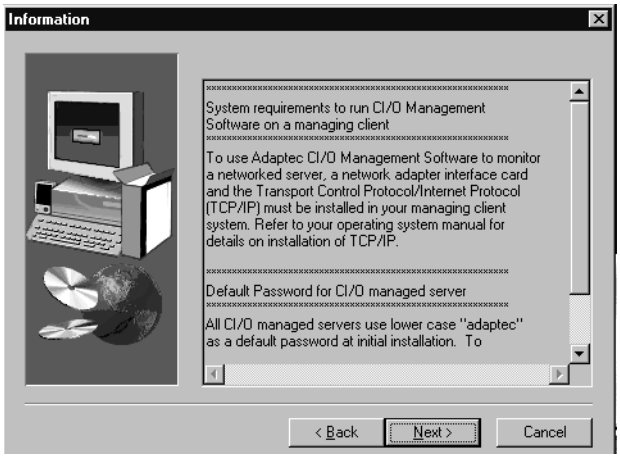

Figure 2-3. Information Screen

7 Click on **Next**. The Choose Destination Location screen appears.

Figure 2-4. Choose Destination Location Screen

8 Use the Browse button to select the **pathname** for your installation folder or select the default path. Click on **Next**. The Select Components screen appears

Note: If you are using a Stand-alone system (choice B) the Select Components Screen (Figure 2-5) will not appear.

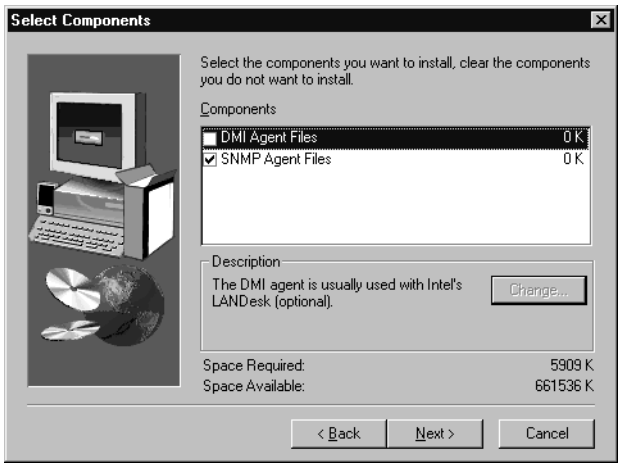

Figure 2-5. Select Components Screen

9 Select the components you want to install and clear the components you do not want to install. Click on **Next**. The Select Program Folder screen appears.

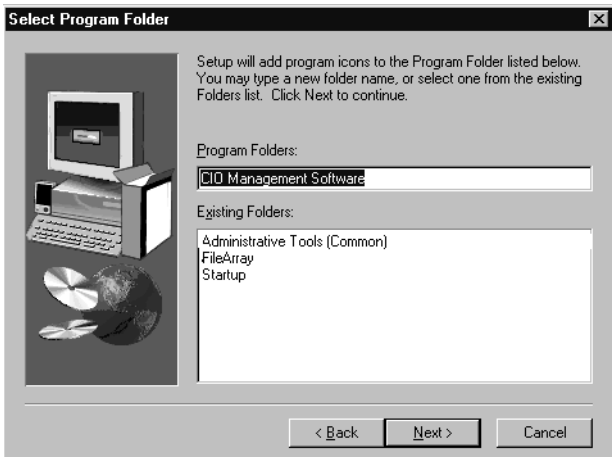

Figure 2-6. Select Program Folder Screen

10 Select the program folder from the existing folders list or type a new folder name. Click on **Next**. The Start Copying Files screen appears. If you previously selected Stand-alone system (choice B) in the Steup Type Selection (2-2) screen, the Components Selected will list only IO Manager Service and Console User Interface.

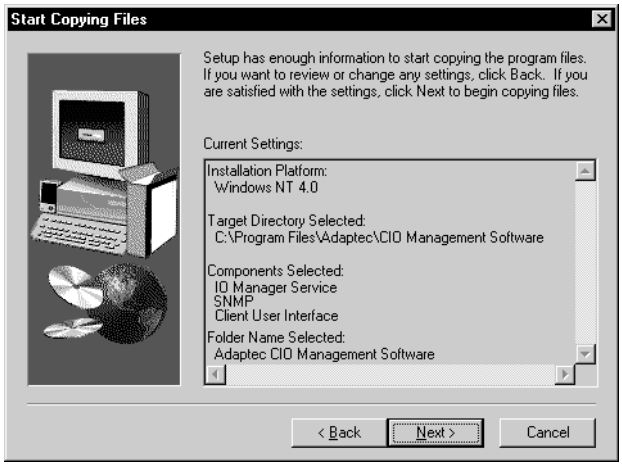

Figure 2-7. Start Copying Files Screen

11 Click on Next to begin copying files. When the files are copied, the CI/O ReadMe file appears as shown in Figure 2-8.

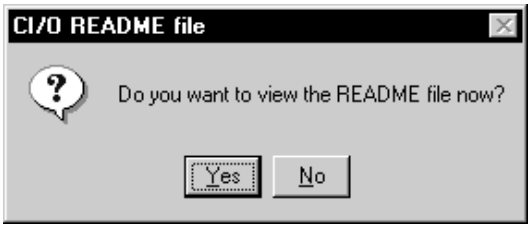

Figure 2-8. CI/O ReadMe file

12 Click **Yes** to view the ReadMe file or click **No** to view the Setup Complete screen as shown in Figure 2-9.

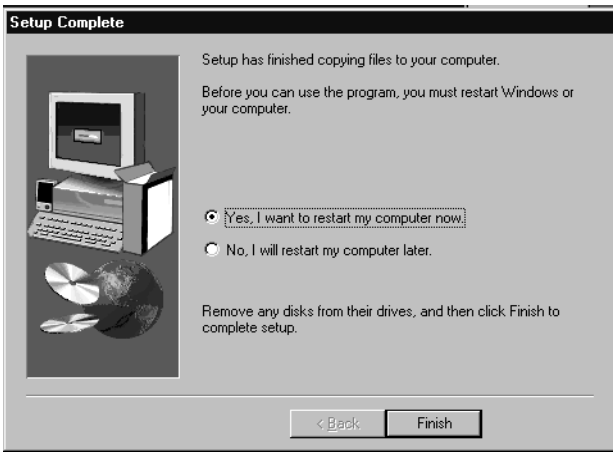

Figure 2-9. Setup Complete Screen

13 The setup is now complete. Select **Yes, I want to restart my computer now**. Click on **Finish**.

14 Wait while the system reboots.

Note: The NT services for Adaptec CI/O Management Software are configured to start automatically at boot time. After installation you can start or stop these services through the Services icon in the Windows NT Control Panel.

15 To start the user interface for Adaptec CI/O Management Software, go to Start > Programs > Adaptec CI/O Management Software. Click the  icon.

Note: You must have the proper level of Adaptec CI/O Management Software password authorization to perform operations using the CI/O software. The default, case-sensitive, password is adaptec. See Chapter 9, *Setting Security Options* for information on setting security options.

Stopping CI/O Array Management Service 4.00

Follow these steps to stop the CI/O Array Management services in Windows NT:

1 Double-click the **My Computer** icon.

2 Double-click the **Control Panel** icon.

3 Double-click the **Services** icon as shown in Figure 2-10.

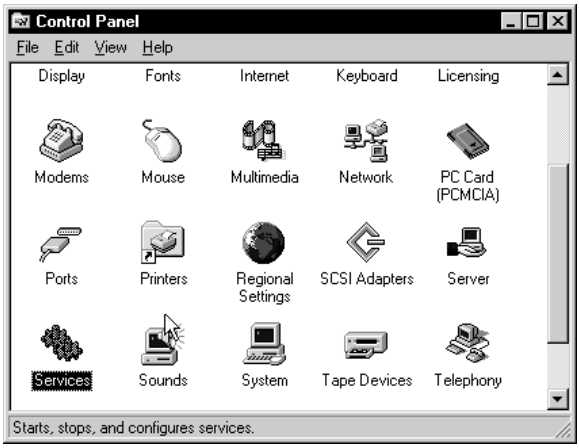

Figure 2-10. Control Panel

4 Highlight the CIO Array Management Service 4.00 and click **Stop**, as shown in Figure 2-11.

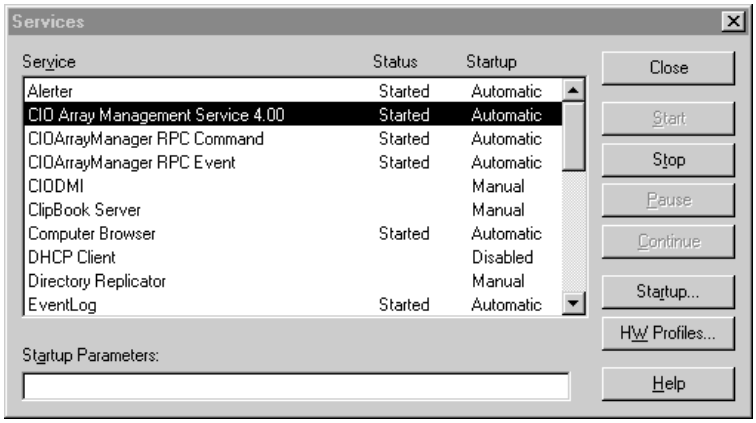

Figure 2-11. Services

5 Repeat step 4 to stop NobleNet Portmapper.

Modifying Automatic Start of the Services

1 Double-click the **My Computer** icon.

2 Double-click the **Control Panel** icon.

3 Double-click the **Services** icon.

4 Highlight **CIO Array Management Service 4.00** (see Figure 2-11) and double-click. The Service window will display as shown in Figure 2-12.

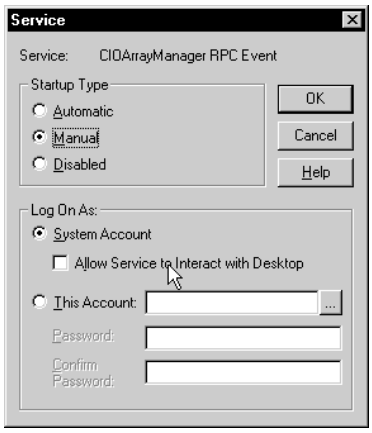

Figure 2-12. Service Window

5 Select **Manual** and click **OK**.

6 Follow steps 4 and 5 to stop the Automatic Start for **CIOArrayManagerRPC Command**, **CIOArrayManagerRPC Event** and **NobleNet Portmapper**.

Uninstalling the Adaptec CI/O Management Software in Windows

Follow these steps to uninstall the Adaptec CI/O Management Software in Windows:

1 Double-click the **My Computer** icon.

2 Double-click the **Control Panel** icon.

3 Double-click the **Add/Remove Programs** icon.

4 Select **Adaptec CI/O Management Software 4.00** and click **Add/Remove**.

Follow the instructions that appear on the screen.

Installing Adaptec CI/O Management Software on a Networked Windows 95/98 or NT Client

This section explains how to install the Adaptec CI/O Management Software on a networked client running under 32-bit Windows (Windows 95/98 or Windows NT).

If you want to manage your arrays on the server from a remote networked client, first make sure that the required Adaptec CI/O Management Software components have been installed on that server. Then continue with the remainder of this chapter. Once installed, refer to the remaining chapters in this document for instructions on using the software.

If you install Adaptec CI/O Management Software on a stand-alone system (see Figure 2-2), then all of the required components are already in place for you. If you select Networked System (A) in the Setup Type Selection screen, you do not need to setup the NT client again.

Note: Before you start the Adaptec CI/O Management Software, be sure that communication with the server via the network is already established. As long as communication is established, you do not need to log on to the server to monitor the I/O subsystem of that system via the network. (See the documentation provided with your TCP/IP software for instructions on establishing communications.)

When installing your TCP/IP software (not provided by Adaptec), follow the installation instructions provided with your TCP/IP software. You will be asked to enter information such as IP address, host name, host file, etc. The TCP/IP stack uses the host name from the TCP/IP setup.

Follow these steps to install the Adaptec CI/O Management Software on a Windows 95/98 or NT client:

1. Start Windows 95/98 or Windows NT.
2. Insert the Adaptec CI/O Management Software CD-ROM in your CD-ROM drive.

3 Double-click on the **My Computer** icon and then double-click on the **CD-ROM drive** icon.

- Click on **Cio400** and then click on **WINDOWS_95_NT.**
- Click on **disk 1**.

4 Double-click on the **Setup icon**. The Welcome screen appears.

Figure 2-13. Welcome Screen

5 Click on **Next**. If you are running under Windows NT, the Setup Type Selection screen appears. This window does not appear if you are running under Windows 95/98.

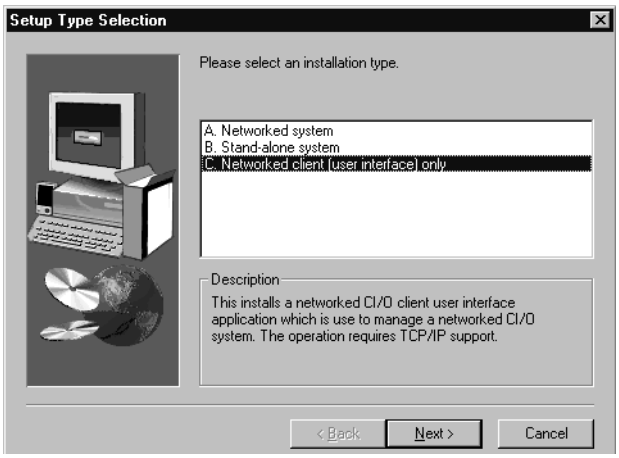

Figure 2-14. Setup Type Selection Screen

6 Select **Networked client (user interface) only** and click on **Next**. The Information screen appears.

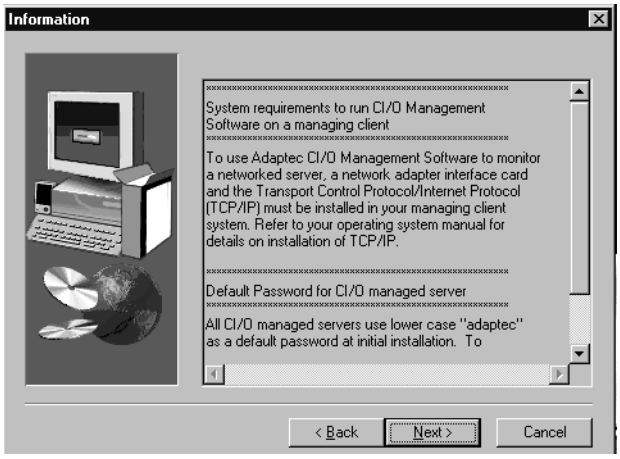

Figure 2-15. Information Screen

7 Click on **Next**. The Choose Destination Location screen appears.

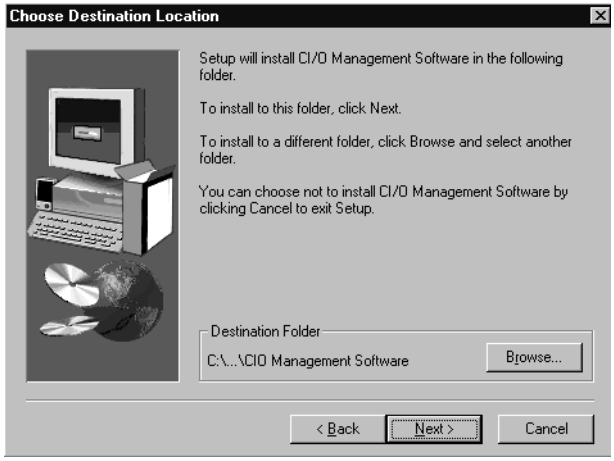

Figure 2-16. Choose Destination Location Screen

8 Use the Browse button to select the pathname for your installation folder or select the default path. Click on **Next**. The Select Program Folders screen appears.

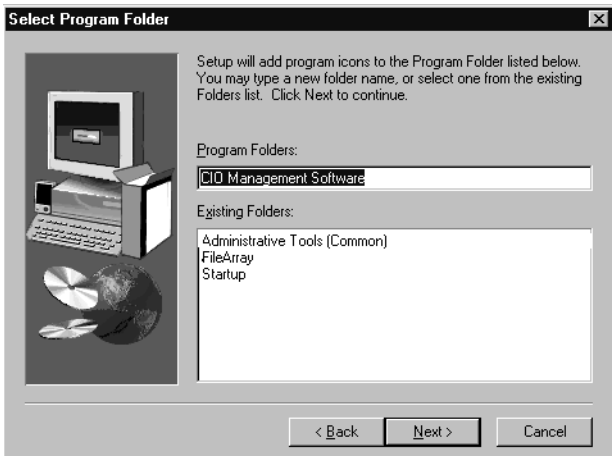

Figure 2-17. Select Program Folder Screen

9 Select the program folder from the existing folders list or type a new folder name. Click on **Next**. The Start Copying Files screen appears.

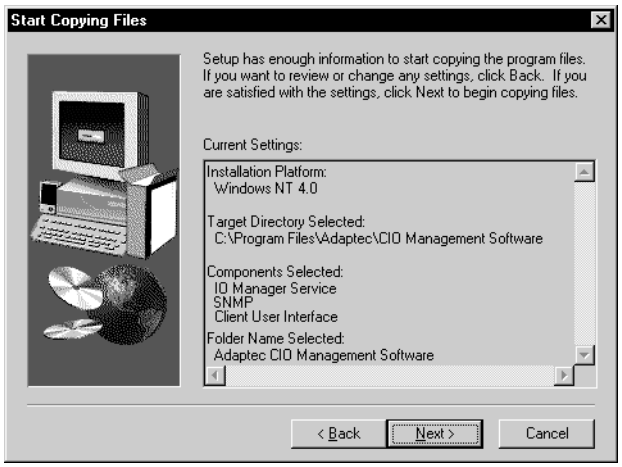

Figure 2-18. Start Copying Files Screen

10 Click on **Next** to begin copying files. Once the folders are copied, the CI/O ReadMe file appears as shown in Figure Figure 2-19.

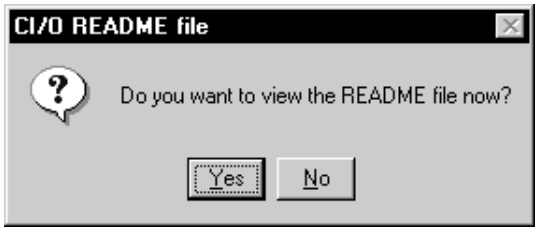

Figure 2-19. CI/O ReadMe file

11 Click **Yes** to view the ReadMe file or click **No** to view the Setup Complete screen as shown in Figure 2-20.

Figure 2-20. Setup Complete Screen

12 The setup is now complete. Select **Yes, I want to restart my computer now.** Click on **Finish**.

13 To start the user interface for Adaptec CI/O Management Software, go to Start > Programs > Adaptec CI/O Management Software. Click the  icon.

Note: You must have the proper level of Adaptec CI/O Management Software password authorization if you want to add and delete arrays and spares. The default, case-sensitive, password is adaptec. See Chapter 9, *Setting Security Options* for information on setting security options.

Installing the TIRPC Communications Module on NetWare Servers v4.11 and v.5.0

Follow these instructions to install the TIRPC communication module:

1. Insert the Adaptec CI/O Management Software CD-ROM in your DOS-mounted CD-ROM drive.
2. Bring up the server using the following pathname:

   C:\> cd nwserver

   C:\nwserver>server
3. From the NetWare System Console prompt (:), type one of the following commands and press **Enter**:

   load nwconfig (for NW 5.0)

   or

   load install (for NW 4.11)
4. Select **Product Options** (for NW 5.0) or **Installation Options** (for NW4.11) from the Configurations Options menu.
5. Select **Install a Product Not Listed** from the Other Installation Actions menu.
6. Press **<F3>** key to specify your path.
7. Enter the path to the CD-ROM (for example, d:\). The CD-ROM drive must be a DOS CD-ROM drive. For more details, refer to the "Installation and Hardware Guide" for your product.
8. Select **Continue and access the CD-ROM** from the Select An Action menu.
9. Select **NetWare 4.0 TIRPC Runtime and Configuration Files** and press **Enter**. (TIRPC must be installed in the *sys:**system*\ directory only.)

Note: Use the **NetWare 4.0 TIRPC Runtime and Configuration Files** even if you are using NetWare 5.0.

10. Press **Enter** to accept the default choice of *sys:**system*\.
11. At the Start Installation menu, select **Yes**.

12 At the Overwrite Existing Files menu, select **Yes** if you are prompted to overwrite the RPCNET.CFG file. Select **No** for other prompts.

13 At the Installation for Select Files group done message, press **Esc** twice.

14 At the Exit Installation screen, select **Yes**.

15 At the next two screens, press **Esc**.

16 At the Exit Install (for NW 4.11) or nwconfig (for NW 5.0) screen, select **Yes**.

Installing the Adaptec CI/O Management Software on Novell NetWare Servers

Note: Before you start the Adaptec CI/O Management Software, be sure the TIRPC communications module is installed (see the following section). Also, ensure that communication with the server via the network is already established. (See the documentation provided with your TCP/IP software for instructions on establishing communications.)

For communications supported over TCP/IP, the following steps must be completed:

- The *tcpip.nlm* must be loaded and the IP protocol must be bound to a valid IP address.
- The IP protocol generally must be bound to an ethernet frame type, ETHERNET_II, which must be specified when loading the LAN driver. A LAN driver can be loaded multiple times for different ethernet frame types.

Follow these steps to install Adaptec CI/O Management Software from a DOS-mounted CD-ROM drive for Novell NetWare v4.11 and Novell NetWare v5.0:

1. Insert the Adaptec CI/O Management Software in your CD-ROM drive. Adaptec CI/O NWSETUP NLM supports installation from either the DOS drive or a netware volume. You need to mount or attach the CD-ROM drive to the system according to the Novell instructions.
2. From the NetWare System Console prompt (:), type the following command (X is the CD-ROM drive or CD-ROM volume assigned) and press **Enter**:

   search add *x*:\cio400\netware
3. Type the following command and press **Enter**:

   load nwsetup

   (The *nwsetup* NLM is located at *cio400\netware\nwsetup.nlm* on the CD-ROM.)
4. From the NWSETUP Select Operation menu, select **Default Installation** or **Custom Installation** (press **F1** for help).
5. At the Install menu, press **Enter.**
6. If the message "File: SYS:SYSTEM\nwaspi.cdm already exists!" displays, select **overwrite**.
7. At the end of the installation process, press **Enter** when you are prompted to update the *autoexec.ncf* file. (This adds the appropriate NLM command lines to the file so that all software is automatically loaded when the server starts.)

   Command lines similar to the following are automatically added to the *autoexec.ncf* file when you run the *nwsetup* utility:

   ```
   #
   # NWSETUP: UPDATED ON XX-XX-XX
   SYS: SYSTEM\IOMGR.NCF
   RPCSTART
   SYS:SYSTEM\IOMGRRPC.NCF
   ```
8. Press Escape to exit Install.
9. Reboot the system.

Installing Adaptec CI/O Management Software on UnixWare 7.0.x Servers

This section explains how to install the Adaptec CI/O Management Software on UnixWare. The installation is a two-part process. First you need to mount the CD-ROM and then install the Adaptec CI/O Management Software.

Note: Before you install Adaptec CI/O Management Software you must have the proper level of administrative privileges on the UnixWare server to perform the required operations.

Mount the CD-ROM for UnixWare v7.0.x

1. Log onto UnixWare as a desktop user and open the SCO Administration Utility.
2. Double-click on the **File system Manager** to open it.
3. At the Filesystem Manager, select **Mount** -> **Add Mount Configuration** -> **Local.**
4. At the Local Mount Configuration window
   - Go to the Mount Point box and enter the mount point pathname.
   - Go to the When to Mount box and select **Now**.
   - Go to Advanced Options and click on **Set More Options.**
5. At the Advanced Options window, locate the File Name Conversion drop-down menu and select **Do Not Convert**.
6. When the Local Mount Configuration window appears again, select **OK**.
7. Select **OK** at the next window to start mounting the file system.

Install the Adaptec CI/O Management Software on UnixWare v7.0.x

1. At the System Administration window, double-click on **Software Management**.
2. Double-click on **Application Installer**.
3. At the Install From menu, select **Other** from the drop-down menu.
4. Click on **Find Folder** to open the View Folder window. Click on the correct mount-point for the CD-ROM.
5. Click on the **CIO400** directory and then click on **UnixWare**. Use the arrow keys to highlight the **cio40** directory and then click **Select**.
6. At the Application Installer Window the cio40 icon appears. Click on **Install** to begin the installation process.
7. Next, you need to remove the mount configuration. Locate the Filesystem Manager screen and select the correct CD-ROM mount point pathname.
8. Go to the Mount drop-down menu, select **Remove Mount Configuration** and then click on **Yes**.
9. You can now close the Filesystem Manger window and the Application Installer window.

Uninstalling the Adaptec CI/O Management Software on UnixWare v7.0.x

Follow these steps to uninstall the Adaptec CI/O Management Software on UnixWare v7.0.x:

1. In the System Administration window, double-click on **Software Management**.
2. Double-click on **Application Installer**.
3. In the Application Installer window, click on the **cio40** directory.
4. Click on the **Remove** button to start the uninstall process.
5. You must manually remove the **ciodata** directory from your system.

❒

3

Entering and Viewing System Information

In this Chapter

➤ *Entering and Viewing System Information* 3-2
- *Starting the Program* 3-2
- *Adding a New Server Address* 3-2
- *Viewing System Information* 3-5
- *Reconnecting to a Server* 3-6
- *Deleting a Server Address* 3-7
- *Viewing a List of Current System Events* 3-7

➤ *Entering and Viewing Preference Information* 3-10
- *Changing Filter Options* 3-10
- *Selecting Notification Settings* 3-12
- *Viewing Historical Information* 3-15

➤ *Interpreting and Responding to Event Messages* 3-17

➤ *Additional Preference Information* 3-18

Adaptec CI/O Management Software allows you to view events taking place on multiple servers or on your stand-alone Windows NT system. In addition, you can view the configuration of SCSI devices, arrays, and other hardware on the system(s). This chapter explains how to view system information. Chapter 4 describes how to view SCSI adapters and devices. Chapter 6 explains how to view arrays, disks, and other SCSI devices attached to the controllers within the system.

Entering and Viewing System Information

Starting the Program

Follow these steps to start the Adaptec CI/O Management Software. This assumes that the software is already installed and that communications have been established between the system and the networked clients or other consoles.

1. Start Windows.
2. Double-click the 

icon in the Adaptec CI/O Management Software group to start the program.

Note: You can choose how you want to launch the Adaptec CI/O Management Software by using the Launch tab in the Preferences Dialog box. You can start the application in maximized mode or you can set it up as a status bar icon. For more information refer to Figure 3-12 on page 3-20.

Adding a New Server Address

Note: If you are using the user interface from an NT server, the system automatically adds the local system address.

You must enter information about each networked server you want to monitor with Adaptec CI/O Management Software. Once this information is recorded in a configuration file, Adaptec CI/O Management Software automatically finds the server(s) when

restarting the application.The configuration will automatically be saved when you exit the application.

Follow these steps to add a new server address to Adaptec CI/O Management Software:

1 Click the  button. The Add Server dialog box appears, as shown in Figure 3-1.

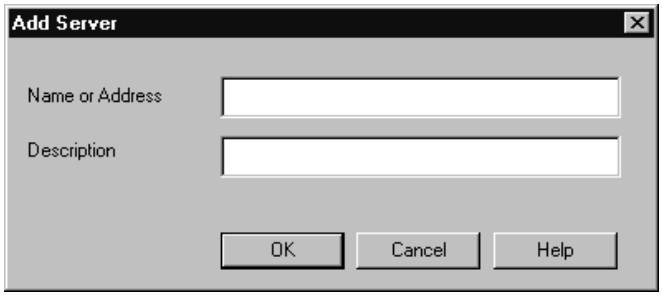

Figure 3-1. Add Server Dialog Box

2 Enter the server's IP address or name, which can be up to 32 characters. This name will appear beneath the server icon in the System Monitor window when the icon view display is chosen.

Servers running under Windows NT and NetWare use an IP protocol. You can always enter the server address, if you know it. Otherwise, enter the server name. This could be something like mainserver or mainserver.unisystem.com. Be sure that your networked client is set up with either a hosts file or with the name of a domain resolver. Ask the System Administrator if you are not sure.

The format of a TCP/IP address is *nnn.nnn.nnn.nnn*, where each group of three decimal digits is a number between 0 and 255 (for example, 123.23.45.145).

3 Enter a description of the server—for example, Application Server or Video Server. This description appears when you go to the detailed view in the System Monitor window.

4 Click **OK** to add the new server information. If the server name/address is not correct, you will see one of the following error messages

- RPC transport error. This means that you entered a server address with correct IP syntax, but there is no server with this address. Check your typing for errors and try again.
- Transport not present. This means that the TCP/IP protocol transport is not present on your system.
- Duplicate server exists. This means that you entered a server name or address that has already been added for this networked client monitoring list.

Viewing System Information

Follow these steps to view systems currently managed by Adaptec CI/O Management Software:

1 Click  to open the System Monitor window. Each system is represented by an icon in the top part of the window. The appearance of the icon indicates the system status, as shown below:

 System is online and available.

 System is unavailable, perhaps due to a busy server or a network failure. The Adaptec CI/O Management Software will automatically attempt to reattach to the server within a user-selectable time. (The default is 10 minutes. See *Additional Preference Information* on page 3-18 to learn how to change the default). Click the Reconnect button to immediately attempt a reconnect. If you still cannot reconnect, try closing the Adaptec CI/O Management Software and restarting it.

 System has generated a Critical event message.

 Guest access to system is disabled. To access system information, double-click the icon and enter the system password when prompted.

 System has generated a Warning event message, such as an array in Critical status.

2 Click the **Detail View** icon  to display detailed information about the system in the top part of the system Monitor window, as shown in Figure 3-2 on page 3-8.

3 Click the **Icon View** icon  to display only the system icon.

If the icon appears dimmed, the system is off-line or otherwise unavailable. (See *Entering and Viewing System Information* on page 3-2 for more information about system icons.)

Reconnecting to a Server

If a server has lost connection you may need to use the Reconnect command to re-establish server communication. To do this

1 Click  to open the System Monitor window.

2 Highlight the server  you need to reconnect.

3 Click  on the System Monitor window toolbar.

Note: If you are running Adaptec CI/O Management Software from a networked client and the message Guest Access Disabled appears at this point, the system to which you are trying to connect does not allow remote users to view its configuration information. See *Controlling Guest Access* on page 9-5 for more information.

Deleting a Server Address

When you delete a server address, the icon for the server no longer appears in the System Monitor window and you can no longer view information for that server or manage it with Adaptec CI/O Management Software.

Follow these steps to delete a server address:

1. Click  to open the System Monitor window.
2. Right-click the icon  of the server you want to delete and select **Delete** from the drop-down menu or select **Delete Server** from the Operations or File menu. You can also use the Delete key on the keyboard to delete a server.
3. At the prompt, click **Yes** to confirm the deletion of the currently selected server.

Viewing a List of Current System Events

When you run Adaptec CI/O Management Software, you can use the System Monitor window to monitor events on all systems to which you are connected. Event notifications can be sorted according to date, time, name, severity, or description, starting from the time you begin monitoring the system.

A color-coded circle to the left of each message gives you a quick indicator of its severity. The table on page 3-17 describes the severity levels.

If you minimize Adaptec CI/O Management Software or launch it as a Status Bar icon, you can configure the application to flash an icon whenever a new event notification is received or if there are any unacknowledged events.

Follow these steps to view a list of current events in the System Monitor window:

1 Click  to open the System Monitor window**.** Event notifications appear in the bottom part of this window, as shown in Figure 3-2.

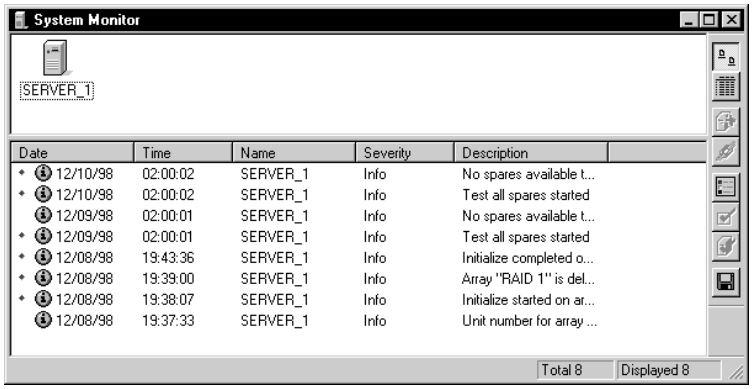

Figure 3-2. Ssytem Monitor Window

2 View the event information for one or all systems. New entries appear on the list as the system events occur, and a date and time is listed for each event.

- A green bullet to the left of an event indicates that the event has not been viewed yet.
- To specify how the events are ordered, click on the column heading you wish to sort by. See *Interpreting and Responding to Event Messages* on page 3-17 for more information on how to respond to these messages.

Note: The client sorts events from different systems after adjusting the timestamp for each event to the client's local time. That is, events are sorted correctly by absolute time of occurrence and are displayed in the remote client's local time.

3 To view detailed information about an event, Doubleclick the list entry. The Event Detail dialog box appears, as shown in Figure 3-3.

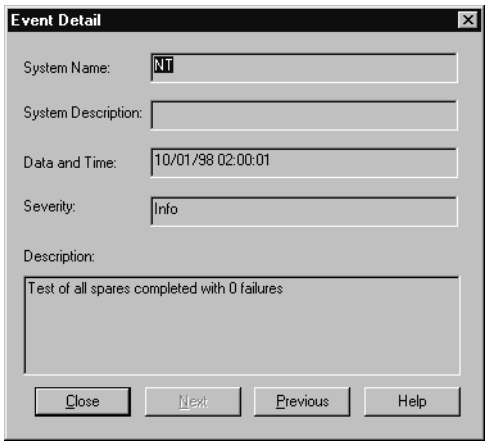

Figure 3-3. Event Detail Dialog Box

The information displayed in the Event Detail dialog box is similar to the information in the one-line log entry; however, the format is different so that no text will appear cut off. You can use the Next and Previous buttons at the bottom of the Event Detail box to view the events.

4 Click **Close** when you are finished viewing the Event Detail dialog box. When you do this, you automatically notify Adaptec CI/O Management Software that you have read the event notification.

– To mark all new event notifications *from all systems* without reading each individually, click the  button on the System Monitor window toolbar. This stops the Adaptec CI/O Management Software icon from flashing when the application is minimized (if so configured).

– To acknowledge all new event notifications *from the local system or the currently selected system* without reading each one individually, click the  button on the System Monitor window toolbar.

5 Click the **Filter** button  on the System Monitor window toolbar to filter the event notifications in this window by severity. (See *Changing Filter Options* below.) For example, you may only want to view critically important events at this time.

6 Click the **Save As** button  e the event list to a file.

7 Close the System Monitor window when you are finished viewing the events, or leave it open so you are aware of events as they occur.

Entering and Viewing Preference Information

You use the Preferences dialog box to enter or view information about how event notifications are handled and to enable and configure password protection for servers and networked clients.

Changing Filter Options

You can control what kinds of event entries are listed in both the System Monitor window and the Historic Event Log. Follow these steps to change the filter settings globally:

1 Click  to open the Preferences dialog box.

2 Click the **Filter** tab. The Filter dialog box appears, as shown in Figure 3-4.

Figure 3-4. Filter Dialog Box

3 Select or deselect the check boxes to control which kinds of messages appear in the System Monitor window and the Historic Event Log. (We recommend that you leave all boxes selected.) If you choose not to display some kinds of messages, the following occurs:

- The *Displayed* field below the log entries counts the number of messages that are actually displayed.
- The *Total* field indicates the total number of messages of all types.

4 Click **OK** to record the Filter option changes.

To change the filter options only for a specific window, open the System Monitor window or Historic Event Log and click  on the toolbar. Change the options as described above and click **OK**. The changed settings apply to this view only while it is open; the settings will return to the defaults if you close and reopen the view or if you restart Adaptec CI/O Management Software.

Selecting Notification Settings

The notification settings determine how you are notified of events that occur on systems to which Adaptec CI/O Management Software is connected. The text describing these events appears in the list of current server events and the Historic Event Log.

Follow these steps to select notification settings:

1. Click  to open the Preferences dialog box.
2. Click the **Notification** tab; the Notification dialog box appears, as shown in Figure 3-5.

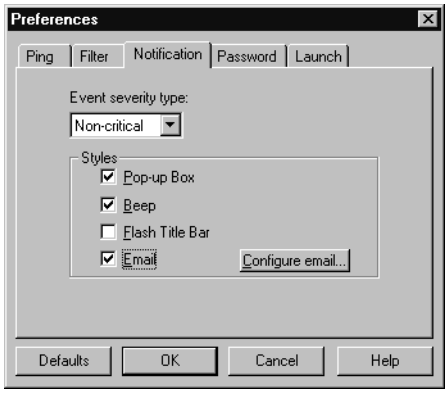

Figure 3-5. Event Notification Dialog Box

3. Select or deselect the check boxes to control how you will be notified of event notifications received from all systems to which Adaptec CI/O Management Software is connected. For non-critical events, the flashing will occur only when the application does not have the focus.

Note: Regardless of the options you select, Adaptec CI/O Management Software will always notify you of Critical events with a pop-up message, a beep, and a flashing title bar when the user interface is running.

Note: If you do not want to view the user interface, we recommend launching it as a status-bar icon (see page 3-20 for details).

4 Select the defaults or click **OK** to save these settings.

Configuring Email

If you check the Email checkbox and click on the Configure email option the Connection Settings dialog box appears, as shown in Figure 3-6

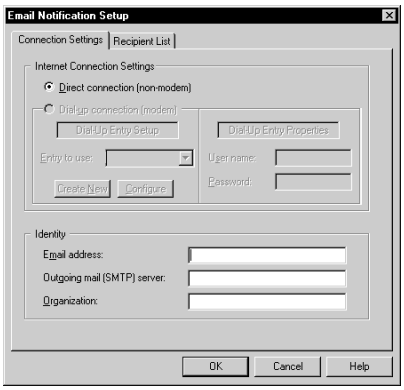

Figure 3-6. Connection Setting Dialog Box

1 In the Internet Connection Settings you can select a Direct connection (non-modem) or a Dial-up connection (modem). To enable the Dial-up connection, your system must have Windows Dial-Up Networking (DUN) installed.

If you select a Dial-up connection (modem), you must enter a User Name and the correct password in the Dial-Up Entry Properties box.

In the Dial-Up Entry Setup box, select a dial-up entry from the list. Click the Create New button if you want to create a new entry. If you want to change an existing entry, click the Configure button.

2 Complete the Identity section with the correct email address, Outgoing mail (SMTP) server (optional) and Organization (optional) information.

3 Click on the Recipient List tab to display the Recipient dialog box as shown in Figure 3-7.

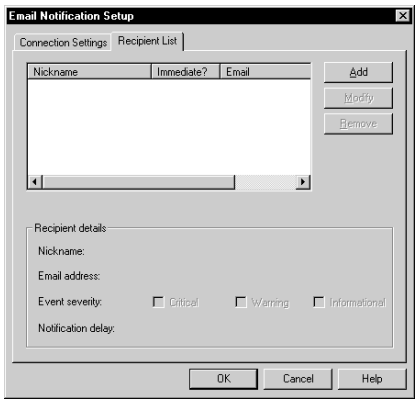

Figure 3-7. Recipient List Dialog Box

4 In this dialog box you can add, modify, or remove recipients. If you select Add, the Add Recipient dialog box will appear as shown in Figure Figure 3-8.

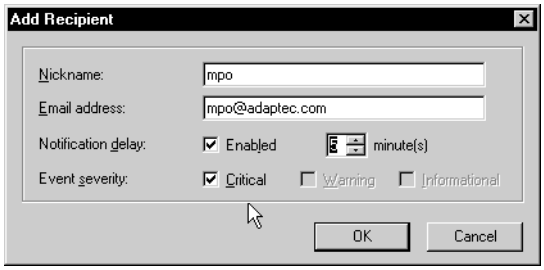

Figure 3-8. Add Recipient Dialog Box

5 Enter the following information in the Add Recipient dialog box.

- **Nickname:** Enter an alias for the email recipient.
- **Email address:** Enter the recipient's email address.

- **Notification delay:** If you select enabled, the event notification will not be sent for the period of time you specify and the Critical Event severity box will be automatically checked. Use this option to register recipients that you want to notify in case there is no response within the notification delay time.
- **Event severity:** Select the type of event(s) you want to receive. See *Interpreting and Responding to Event Messages* on page page 3-17 for additional information.

Note: In order for recipients to receive event severity notices, you must check the Email checkbox in the Preferences Event Notification dialog box (see Figure Figure 3-5). The Email box must be checked for both non-critical and critical event severity types.

6 Click **OK**.

Viewing Historical Information

Use the Historic Event Log to view historical information for any system to which you are connected. If you are running the console version of the Adaptec CI/O Management Software on a windows NT system, you can view information for this one system. If you are running the networked version of CI/O Management Software, you can view information for any system to which your are connected after you select its icon in the System Monitor window.

Follow these steps to view historical event information:

1 Click  to open the Historic Event Log for the currently selected system, as shown in Figure 3-9.

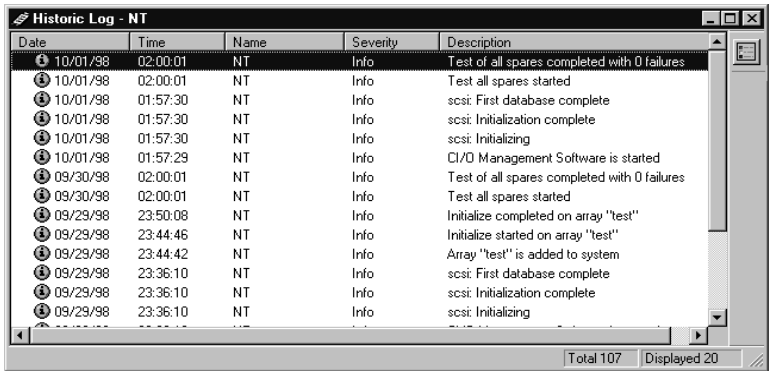

Figure 3-9. Historic Log Window

2 View the historical event information for the system. New entries are added to the top of the list as they occur. To specify the event order, click on the column heading by which you wish to sort. A color-coded circle at the beginning of each message indicates its severity. (See the next section, *Interpreting and Responding to Event Messages*, for more information.)

3 To view detailed information about an entry on the list, double-click the entry. The Event Detail dialog box appears, as shown in Figure 3-3 on page 3-9.

4 Click **Close** when you are finished viewing the Event Detail dialog box.

5 Click  to change the Filter options.

Note: When you open the Historic Event Log, only the most recent log entries are initially retrieved from the system. If you scroll down beyond these entries, another group of entries is retrieved. This avoids the delay that might occur if an entire large log file were retrieved from the system at one time. To keep the Log file from getting too large, specify a maximum size for it in the initialization file. (See Appendix A, *Configuration Settings*.)

6 Close the window when you are finished viewing log entries, or minimize it as an icon on the screen.

Interpreting and Responding to Event Messages

Server events can have three different severity levels, as described in the following table.

Symbol	Severity Level	Description
 Red dot	Critical	Indicates an array or system problem requiring immediate action. For example, an array going off-line because two array members have failed. See *Responding to a Critical Array* on page 10-2 for more information.
 Yellow dot	Warning	Indicates an array or system problem requiring attention such as a paused channel or a fault-tolerant array with a failed disk. If no spare is available to replace the failed disk, take action immediately before another disk fails. See *Responding to a Critical Array* on page 10-2 for more information.
 Blue dot	Informational	Contains information about a normal operation, such as creating a new array, adding a spare, or verifying an array.

Additional Preference Information

The information in this section describes how to use the Ping, Notification, Filter, Password and Launch tabs contained in the Preferences dialog box. Follow these steps to change or view preferences information:

1 Click  to open the Preferences dialog box, as shown in Figure 3-10.

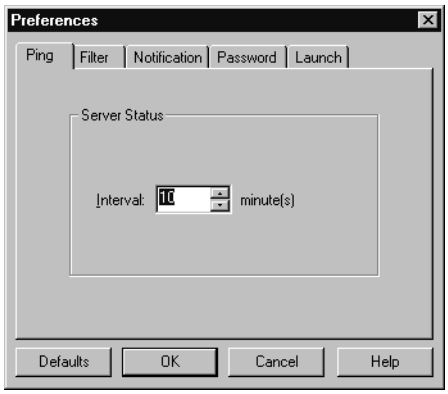

Figure 3-10. Preferences Dialog Box - Ping Tab

2 Specify a Ping interval. This is the interval at which the management client will verify continued access to all monitored servers, and check for any missed events. We recommend a value of 10 minutes.

Note: If you are using a workstation, this panel is not necessary and will not be provided. Additionally, this panel is not available if you are directly monitoring a local system without accessing it through the network.

3 Click the **Notification** tab to change the way in which you are alerted of event notifications received from all systems. The Notifications dialog box appears, as shown in Figure 3-5 on page 3-12. Select one or more of the available options.

4 Click the **Filter** tab to view the Filter dialog box. Select or deselect the check boxes, to filter the types of messages that appear in the windows. We recommend that you select all the boxes so you are fully informed of server events. The Filter Dialog box appears as shown in Figure 3-4 on page 3-11.

5 Click the **Password** tab to display the Password dialog box, as shown in Figure 3-11.

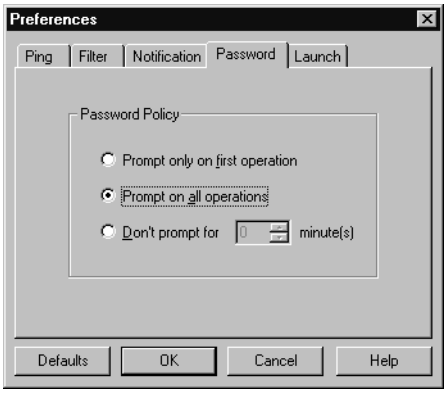

Figure 3-11. Password Dialog Box

6 Select a Password Time-out option to set the level of password protection for this workstation or server. See *Setting Security Options* on page 9-1 for more information.

7 Click the **Launch** tab to display the Launch dialog box, as shown in Figure 3-12.

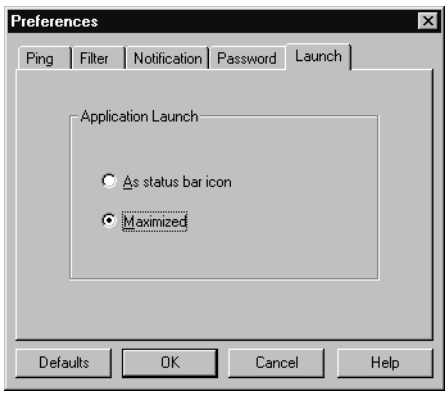

Figure 3-12. Launch Dialog Box

8 Select how you want to initially view your application. You can start Adaptec CI/O Management Software in maximized mode or you can set it up as a status bar icon.

Note: We recommend configuring your system to automatically start CI/O as a status bar icon after each reboot. That ensures that you will be notified of any problems that your RAID or SCSI subsystem encounter.

9 Click **OK** to change the option information or to close the dialog box.

❒

4

Viewing SCSI Device Information

In this Chapter

- ➤ *Viewing SCSI Devices* 4-2
- ➤ *Viewing the SCSI Information Dialog Box* 4-4
- ➤ *Viewing SCSI Adapter and Array Controller Information* 4-6
- ➤ *Viewing SCSI Channel Information* 4-8
- ➤ *Rescanning the SCSI Adapters and Array Controllers* 4-9
  - *Differences in Rescan Between SCSI Adapters and Array Controllers* 4-9
  - *Rescan Details* 4-9
- ➤ *Managing SCSI Adapters* 4-10

Viewing SCSI Devices

You can view the status of SCSI devices connected to one or more array controllers or SCSI adapters from the Physical Resources window in the Configuration View.

The Physical Resources window contains the Graphical View as shown in Figure 4-1 and the Detailed View as shown in Figure 4-2. The Detailed view provides more detail about a SCSI device and includes Utilization, Status and Capacity information.

Click  to open the Storage Configuration window.

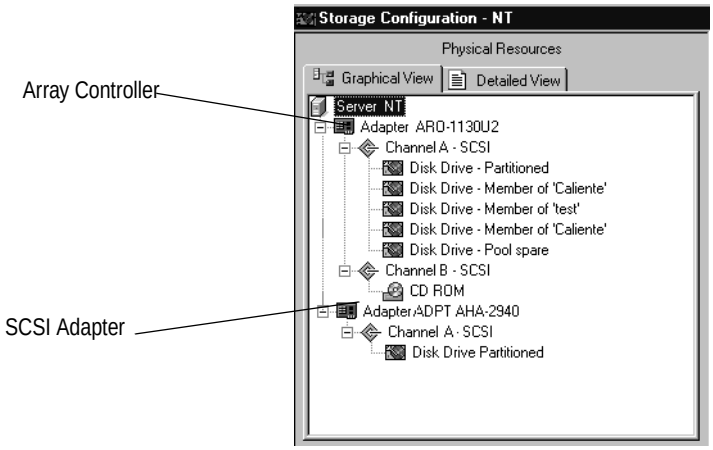

Figure 4-1. Physical Resources Window - Graphical View

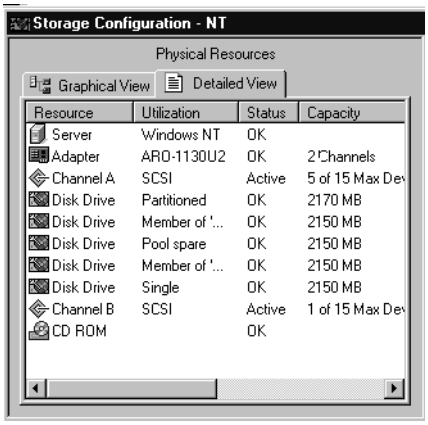

Figure 4-2. Physical Resources Window - Detailed View

Follow these steps to view configuration information for an adapter or controller:

1. Click  to open the Storage Configuration window.
2. Right-click the icon of the device and select **Information** from the drop-down menu. The icons are as follows:

   –  Controller or Adapter

   –  Channel

   –  Disk Drive

   –  CD-ROM Drive

   –  Tape Drive

   –  Scanner

–  Printer

–  Enclosure Management Processor

The SCSI Device icons shown above represent physical devices that appear on the left side of the window. *Physical* means that the icons correspond to actual devices installed in the server, such as a SCSI drive or a CD-ROM drive.

The following sections explain the information that appears for the device in the Information dialog box.

Viewing the SCSI Information Dialog Box

When you right-click a SCSI Device icon, such as a disk  or a CD-ROM drive  , and select **Information** from the drop-down menu, the SCSI Information dialog box appears, as shown in 4-4.

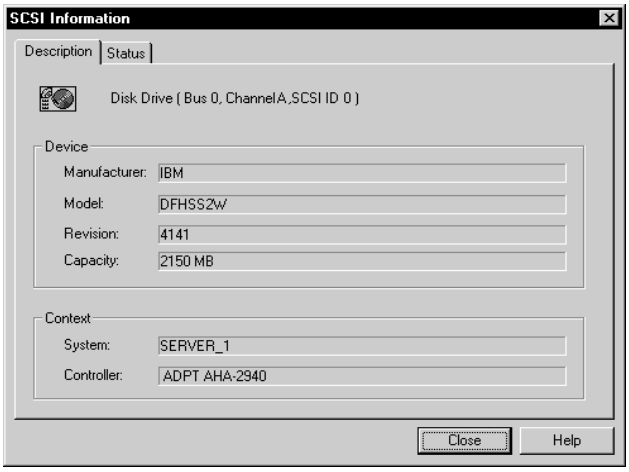

Figure 4-3. SCSI Information Dialog Box - Description

Figure 4-3 displays the Description tab, while Figure 4-4 displays the Status tab.

Click on the **Description** tab to display device information such as the manufacturer, model name, and revision number.

Click on the **Status** tab to display the current status of the selected SCSI device and O/S usage, as shown in Figure 4-4.

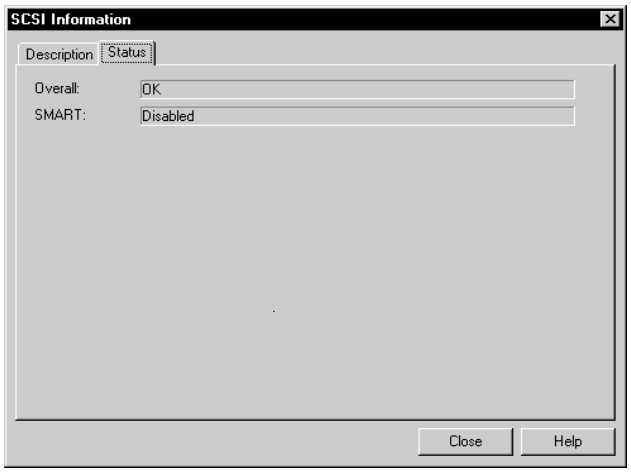

Figure 4-4. SCSI Information Dialog Box - Status

Note: For devices other than hard disks and CD-ROM drives, the Status is not provided.

Note: If the selected device is a disk drive that is being used for RAID, a RAID Usage group box displays. If the device has single usage, a string appears with the text "Member of R9" or "Pool Spare". If the device has multiple usage, a listbox appears listing all of the usages.

The following information appears in the Information Dialog box - Status tab:

- **Overall**: Current status of the device (for example, OK, Down, Failed spare, Reconstructing, or Target of Reconstruction).
- **S.M.A.R.T.**: Enabled, Disabled, or N/A. S.M.A.R.T. stands for Self-Monitoring, Analysis, and Reporting Technology.

Click **Close** to close the SCSI Information dialog box.

Viewing SCSI Adapter and Array Controller Information

When you right-click a SCSI adapter or array controller icon  and select **Information** from the drop-down menu, the Controller Information dialog box appears.

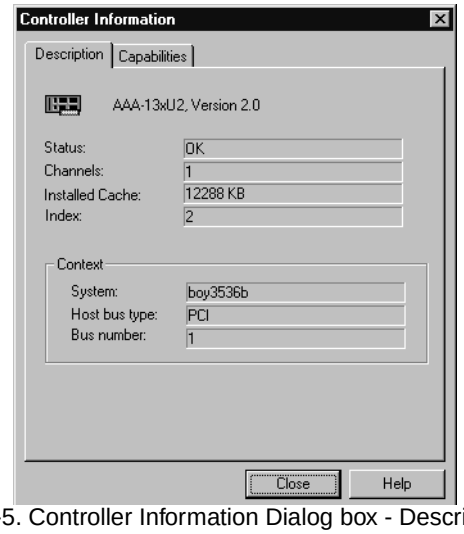

Figure 4-5. Controller Information Dialog box - Description Tab

Figure 4-5 displays the Description tab, while Figure 4-6 displays the Capabilities tab.

Click the **Description** tab for the status, number of channels, and size of the installed cache of the selected controller. The index field contains a reference to a particular adapter. The Context area in this menu displays information such as the system type, host bus type and bus number. The *PCI bus number* field indicates which PCI slot contains the card. The Host bus type and PCI bus number are not available for SCSI adapters.

.

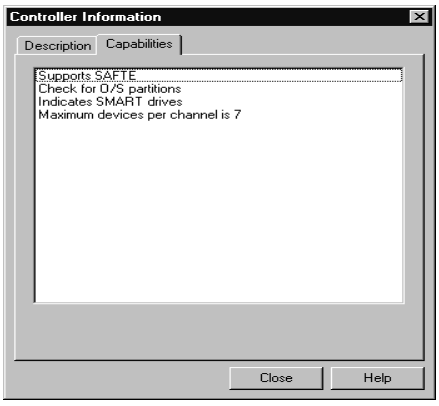

Figure 4-6. Controller Information Dialog Box - Capabilities Tab

Click the **Capabilities** tab, as shown in Figure 4-6, for a list of features that the selected device supports. Not all features appear for every product and the contents of the list may be different for SCSI and RAID products. You cannot enable or disable the capabilities on the list, it is for reference only.

If the adapter has a battery, a Battery page will be included in the Controller Information dialog box.

Click **Close** to close the Controller Information dialog box.

Viewing SCSI Channel Information

When you right-click a Channel icon  and select **Information** from the drop-down menu, the Channel Information dialog box appears, as shown in Figure 4-7.

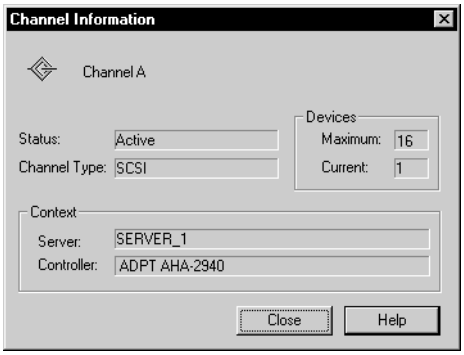

Figure 4-7. Channel Information Dialog Box

The following information appears in the Channel Information dialog box:

- **Status**: current operational status of the channel (for example, Active, Inactive).
- **Channel**: The type of channel—for example, SCSI.
- **System**: the name of the system containing the channel
- **Controller:** the type of controller**.**
- **Devices**: number of SCSI devices currently connected to the channel (current) and the maximum number of SCSI devices that the channel supports. The channel itself is counted in this maximum number. If this number is 16, for example, you can connect up to 15 devices.

Click **Close** to close the Channel Information dialog box.

Rescanning the SCSI Adapters and Array Controllers

After you have removed a device from the system, the user interface may continue to display it as disconnected in the Physical Resources window. If this happens, select  from the Configuration View toolbar to rescan the system and update the display.

It is important to note that the rescan function works differently for a SCSI adapter than for an array controller. A SCSI rescan deletes the database and then performs a Discovery phase to find all devices connected to the system. An update is made to the user interface in the Physical Resources dialog box. See *Managing SCSI Adapters* on page 4-10 for information on *discovery*.

Differences in Rescan Between SCSI Adapters and Array Controllers

There are differences in the way the Adaptec CI/O Management Software rescans SCSI adapters versus array controllers. This is due mainly to differences in complexity between an array controller and a SCSI adapter.

With array controllers, information is stored in reserved sectors on the array disk drives. When rescan is selected, the program quickly retrieves information from the reserved sectors.

In contrast, information related to SCSI adapters is stored in the *iomaspi.dev* file. When the server boots up, it reads that file for information. When rescan is selected, the program deletes the file, rewrites it, then updates the program.

Rescan Details

When **only** RAID adapters or SCSI adapters are being rescanned, the program displays an hourglass over each adapter icon to show that the rescan has not completed its discovery of all SCSI devices on that adapter. If **both** RAID adapters and SCSI adapters are being rescanned, an indicator appears on the SCSI adapters after the RAID rescan completes. The indicators are removed after the SCSI rescan completes.

If SCSI adapters and array controllers are integrated on the same system, the software will typically complete the rescan for the array controllers, repaint the screen, then continue scanning the SCSI adapters. The repaint for SCSI adapters will not occur until the discovery of all devices is complete.

Note: The software scans the server every 3 minutes to detect status changes for any installed SCSI adapters and devices. Changes to array controller status, however, are detected immediately if I/O is present.

Managing SCSI Adapters

SCSI devices that are attached to an Adaptec SCSI adapter are managed differently than those attached to an array controller. For each device attached to an Adaptec AHA®-2940U2W or similar adapters, the Adaptec CI/O Management Software checks the system to detect possible device failures.

Adaptec CI/O Management Software performs three distinct tasks for SCSI adapters: Discovery, Poll, and Statistics. The time the software takes to detect system changes is directly affected by how the Discovery/Poll cycles respond. Devices that are new or recovered are detected at the next Discovery cycle, whereas devices that have failed are detected at either the next Poll or Discovery cycle, whichever occurs first.

- **Discovery**—Analyzes the current configuration and compares it with the previous configuration. This phase requires that SCSI commands time out for every device that is no longer present. Because of this, the Discovery phase can be lengthy.

  By default, the software runs the Discovery phase every 30 minutes. This can be modified in the *iomgr.ini* file on the system.

  During the Discovery phase, the Adaptec CI/O Management Software performs the following steps:

  – Determines the number of adapters installed

  – Performs a host adapter inquiry on each installed adapter to determine the characteristics of that adapter

– For each host adapter, performs a SCSI Inquiry command to every possible target device to determine the presence and characteristics of all devices

Adaptec CI/O Management Software records all information discovered about host adapters and devices in an internal table. If an internal table already exists, discrepancies between the current system configuration and the internally recorded configuration are checked, tables are updated, and the display is updated. The user is informed of each change through logged events.

- **Poll**—Validates discovery information. Adaptec CI/O Management Software attempts to contact devices that are previously known to be present. By default, the software runs the Poll phase every 3 minutes, which can be modified in the *iomgr.ini* file on the system.

  During this phase, the Adaptec CI/O Management Software performs the following steps:

  – Verifies that the number of host adapters is the same as in the Discovery phase

  – Performs a host adapter inquiry on each host adapter that already appears in the internal tables to ensure the adapter is still responding

  – Performs a device inquiry on each device in the internal tables to ensure it is still responding

  – Verifies that the information obtained from the device matches previous information

- **Statistics**—Collects I/O statistics. Adaptec CI/O Management Software collects read and write statistics from applicable devices. By default, the software runs the statistics phase every 10 seconds, which can be modified in the *iomgr.ini* file on the system.

During this phase, the following are performed:

– Iterates through all host adapters and devices

– Gathers statistics for each host adapter or device

This data is currently only available from SNMP or DMI interfaces.

❒

5

Configuring Arrays and Spares

In this Chapter

- *Creating an Array* 5-2
- *Making an Array the First Virtual Device* 5-9
- *Deleting an Array* 5-10
- *Initializing an Array* 5-11
- *Creating Dedicated Spares or a Spare Pool* 5-14
- *Deleting a Spare* 5-17

This chapter explains how to add and delete arrays and spares with the Adaptec CI/O Management Software. You must know the Adaptec CI/O Management Software password to add and delete arrays and spares. See *Chapter 9, Setting Security Options,* for more information.

Creating an Array

The following steps describe how to create an array with Adaptec CI/O Management Software.

Note: When you create an array using different capacity drives, the smallest capacity drive used will determine the actual member size.

1 Click  to open the Storage Configuration window. All array and spare configuration tasks are done from within this view. You can select a Graphical view as shown in Figure 5-1 or a Detailed view as shown in Figure 5-2

.

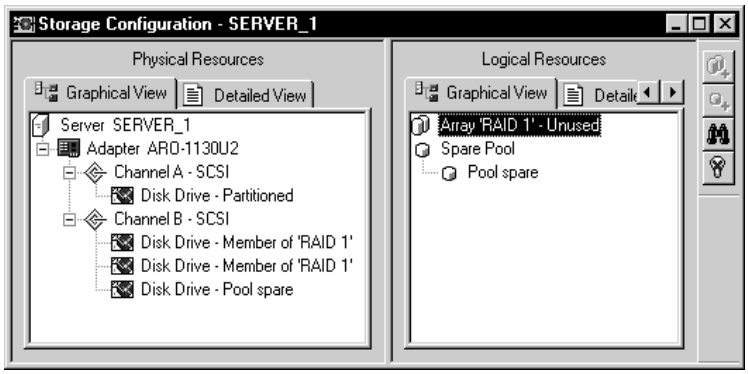

Figure 5-1. Configuration - Graphical View

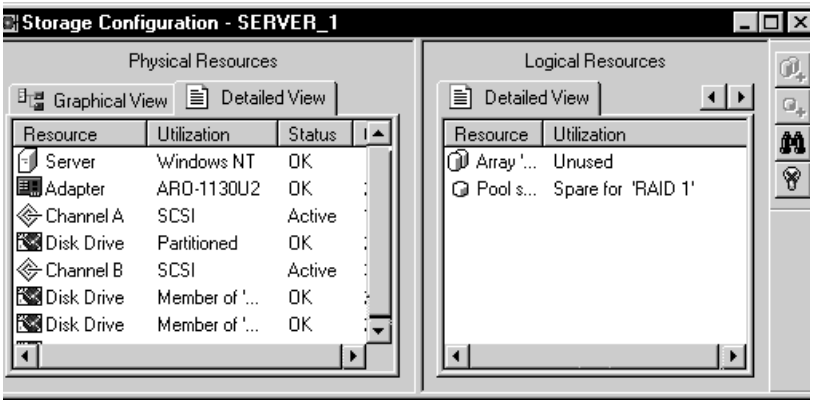

Figure 5-2. Configuration - Detailed View

The icons on the left side of the Storage Configuration window represent the server's *physical resources*—the array controller products, channels, and SCSI devices installed in the system. The icons on the right side represent the system's *logical resources*—the arrays and spares you define.

2 Before you start defining the new array, decide what RAID level you want to use, how many disks you want it to have, and whether you want to define dedicated spares (spares that can be used only by this array). See *Selecting a RAID Level for an Array* on page 10-14.

You cannot use disks with recognized partitions for the array. This prevents you from accidentally erasing the server's boot disk or deleting data from a disk. To find out if a disk has a partition, right-click the  icon in the Storage Configuration window, and select **Check Partition** from the drop-down menu. A small pop-up box displays whether the selected disk has a partition and whether the partition is visible to the operating system. To use a disk with a recognized partition in the array, exit from Adaptec CI/O Management Software, back up any data you want to keep, and delete the partition from the disk.

Caution: *All data on a disk is deleted when it becomes an array member!* Back up any data you want to keep before selecting a disk as an array member.

3 Click the **Create New Array**  on the Storage Configuration window toolbar. The Create Array - Members dialog box appears, as shown in Figure 5-3.

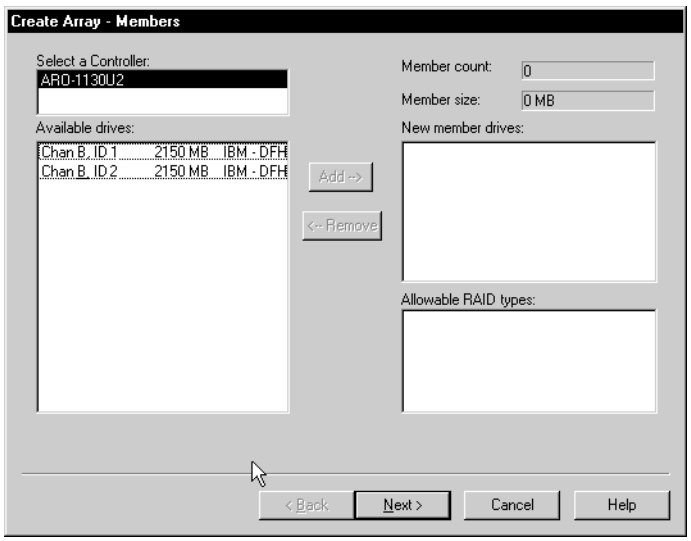

Figure 5-3. Create Array - Members Dialog Box

Note: When you create the first array, the driver will reserve a portion of cache memory for system use. This may affect the amount of cache memory assigned to that array, if the value you select is larger than the actual memory remaining.

4 Highlight the controller from the Select a Controller window. All array disks must be connected to the same array controller.

Note: Only devices attached to array controllers can be used for arrays and spares. You cannot use devices attached to SCSI adapters as array members or spares.

5 Select disks for the new array by highlighting the disk in the Available drives window and clicking **Add**. The disk moves to the New member drives window and the Allowable RAID types windows changes to reflect allowable RAID levels given the current number of disks selected.

Do not include disks that you want to use as dedicated spares. Highlight the disk from the New member drives window and click **Remove** to remove the disk from the list.

Note: Only disks available for creation of the array are displayed. Any disks with partitions, or disks used in other arrays or as spares are *not* displayed.

6 When all disks for the new array have been selected click **Next**. The Create Array - Name and Type dialog box appears, as shown in Figure 5-4.

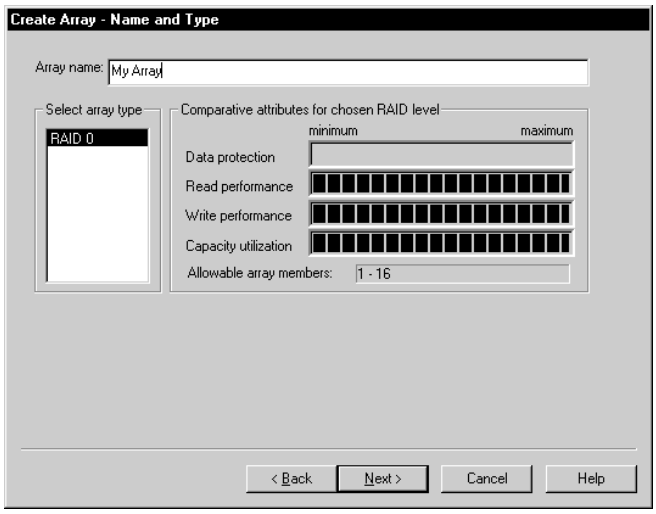

Figure 5-4. Create Array - Name and Type Dialog Box

7 Type a name for the new array. The name can be up to 15 characters, including spaces and any other printable characters.

8 Highlight the desired RAID type for the array in the Select array type window. The bar graphs on the right show the relative levels of data protection, read performance, write performance, and capacity utilization for each RAID type.

Note: Only valid RAID configurations that are possible using the specified number of disks in the new array are displayed.

9 Click **Next**. The Create Array - Advanced dialog box appears, as shown in Figure 5-5.

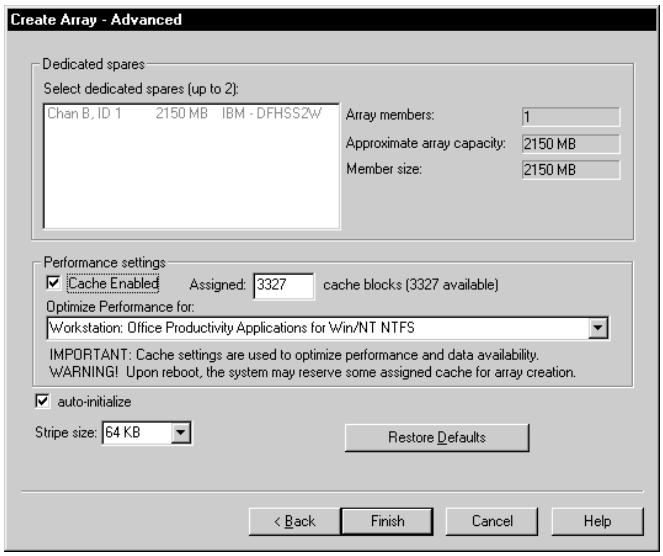

Figure 5-5. Create Array - Advanced Dialog Box

10 Select dedicated spares if desired. The disks in the list are the available disks you did not select as array members. The spare(s) you select should be at least as large as the smallest array member. Otherwise the usable capacity of each array member will be reduced to the capacity of the spare.

Note: We recommend using a spare pool instead of dedicated spares. See *Creating Dedicated Spares or a Spare Pool* on page 5-14 for more information. Spares in a *spare pool* can be used by any suitable array on the controller.

11 Select **Cache Enabled** to enable cache for the array. If the cache-enabled checkbox is greyed out, this means that no cache is available. If caching is available but you don't want to assign any, deselect the cache Enabled checkbox.

12 The assigned checkbox indicates the total number of blocks available for caching.

Note: If you want to distribute cache among arrays, do not use all of the available cache blocks for only one array.

13 Select the desired optimization option from the Optimize Performance drop-down list. Refer to *Optimizing Array Performance* on page 10-9 for more details.

14 Deselect **auto-initialize** to create the array now but initialize it at a later time. You can do this to define several arrays, then initialize them all at the same time.

Caution: All arrays except RAID 0 arrays *must* be initialized or low-level formatted before you can write data to them. We recommend that you zero-initialize RAID 0 arrays as well.

15 Select the desired stripe size from the Stripe size drop-down list.

16 Click **Finish.** The array will be initialized at this point, unless you deselected auto-initialize. (If you deselected auto-initialize, skip to Step 18.)

To abort the initialization process (not recommended), open the Activity View window, select the  icon for that array, and click the **Abort** icon  . A pop-up confirmation dialog box appears. Click **Yes** to confirm the abort.

17 An event notification is generated when the initialization process starts. An icon  for the new array appears in the Logical Resources window of the Storage Configuration window. Another event notification is generated when the initialization process finishes.

Note: Event notifications may appear as pop-ups and/or as entries in the Historic Event Log and the System Monitor window, depending on user options selected. Refer to Figure 3-5 on page 3-12 for more information.

18 When initialization is complete, exit from Adaptec CI/O Management Software and reboot the system. After you reboot, you must partition the new array just as you would partition a new stand-alone disk drive.

Note: You cannot use the new array until you reboot.

Making an Array the First Virtual Device

Follow the steps below if you want the system to boot your operating system from an array instead of from a stand-alone disk. (To use a stand-alone SCSI disk as your boot device, we recommend that you assign SCSI ID 0 to this device and that you connect it to Channel A of the array controller.)

You make an array bootable by assigning it virtual device order #0. The *virtual device order* is the sequence in which the system's operating system detects the arrays, single disks, and other devices connected to the array controller when the system boots. You may also need to move the array controller to a different PCI slot. See your array controller's *Hardware and Installation Guide* for more information.

Caution: When you make an array bootable, the drive letters assigned to other drives and arrays on the system may change, which can cause data access problems on your system.

Follow these steps to create a bootable array:

1 Click  to open the Storage Configuration window.

2 Click the icon  in the Logical Resources window for the array that you want to make bootable.

3 Right-click and select **Make first virtual device** from the drop-down menu.

4 At the prompt, confirm that you want to make this array the boot device.

5 Close all applications on the system containing the array. If the selected array does not already have a bootable partition on it, reboot the system to a floppy disk.

6 Install the operating system on the array. See your array controller's *Hardware and Installation Guide* for more information.

7 Make sure that you restart CI/O after you reboot the server.

The next time you boot the system, it will attempt to use this array as the boot device.

Deleting an Array

Caution: Back up the data on an array before you delete it. All data on the array disks is lost when you delete the array.

If you delete an array, all the disks that were part of the array become single, *stand-alone* disks. You can then use the disks as spares or as members of a new array.

Follow these steps to delete an array:

1 Click  to open the Storage Configuration window.

2 Click the icon  in the Logical Resources window for the array you want to delete.

3 Right-click and select **Delete** from the drop-down menu or press the Delete key. A warning appears if the selected array has a partition:

– If the partition is recognized by the operating system, you *cannot* delete the array.

– If the partition is *not* recognized by the operating system, you *can* delete the array.

You are prevented from deleting an array with a recognized partition. This prevents you from accidentally deleting useful data from an array. To find out if an array has a partition, right-click the  icon and select **Check Partition** from the drop-down menu. A small pop-up box displays whether the selected array has a partition and whether the partition is visible to the operating system. To delete an array with a recognized partition, back up any data you want to keep, and delete the partition from the disk. Then start Adaptec CI/O Management Software again and delete the array.

4 When the confirmation message appears, confirm that you want to delete the array.

Note: After you delete an array you can immediately use the disks that formerly belonged to the array to create spares or a new array without rebooting the server. However, you must reboot the server before you can use the disks as single disks that are not members of an array. Deleting an array may change the boot order and the drive letter assignment.

Initializing an Array

When you create a new array it is initialized immediately by default unless you deselect the auto-initialize option, as described in *Creating an Array* on page 5-2.

Note: Some array controllers do *not* allow deselection of the auto-initialize option.

If you deselect auto-initialize, you can initialize the array later by following the instructions in this section. You can also reinitialize an array that was previously zero-initialized or low-level formatted.

Caution: All arrays except RAID 0 arrays *must* be initialized or formatted before you can write data to them. We recommend that you zero-initialize RAID 0 arrays as well. All data on the disks is overwritten when you initialize an array.

Follow these steps to initialize an array to which data has previously been written or a new array that has been defined but not initialized:

1. Click  to open the Storage Configuration window.
2. Click the icon  of the array you want to initialize.
3. Right-click and select **Initialize** from the drop-down menu. (This option is greyed out if the array contains a partition.) A warning appears if the selected array has a partition:
   - If the partition is recognized by the operating system, you *cannot* initialize the array.
   - If the partition is *not* recognized by the operating system, you *can* initialize the array.

   You are prevented from initializing an array with a recognized partition so you will not accidentally erase the system's boot array. To find out if an array has a partition, right-click the  icon, and click **Check Partition** in the drop-down menu. A small pop-up box displays whether the selected array has a partition and whether the partition is visible to the operating system. To initialize an array with a recognized partition, exit from Adaptec CI/O Management Software, back up any data you want to keep, and delete the partition from the disk. Then start Adaptec CI/O Management Software again and initialize the array.
4. When the confirmation message appears, click **Yes** to confirm that you want to initialize the array.

To abort the initialization process (not recommended), click  on the main toolbar to open the Activity View Window, select the  icon, and click the **Abort** icon  .

Note: Depending on the capacity of the array, it may take a long time to initialize an array, especially a very large RAID 5 array with many disks.

Creating Dedicated Spares or a Spare Pool

Each RAID 1, 0/1, or 5 array can have *dedicated spares*, which automatically replace failed disks *only* for that array. You can create dedicated spares when you create the array, or you can add them to the array at a later time. Each array controller can have a *spare pool* of multiple disks which automatically replace a failed disk on *any* array on the controller.

We recommend using a spare pool instead of dedicated spares if you have two or more arrays on a controller. Pool spares give you more flexibility and provide good data protection with fewer disks than is required for dedicated spares.

Pool spares must be at least as large as the array's member size. Some physical drives may be larger than the member size.

Note: Adaptec CI/O Management Software is automatically configured to test all spares on the system once a day to assure they are always available to replace failed disks in arrays. We recommend that you leave this default setting.

Follow these steps to add a dedicated spare or a pool spare:

Caution: Before designating a disk as a spare, back up all data on the disk. All contents of a disk selected as a spare will be lost!

1 Click  to open the Storage Configuration window.

2 Click  to display the Create Spare dialog box, as shown in Figure 5-6.

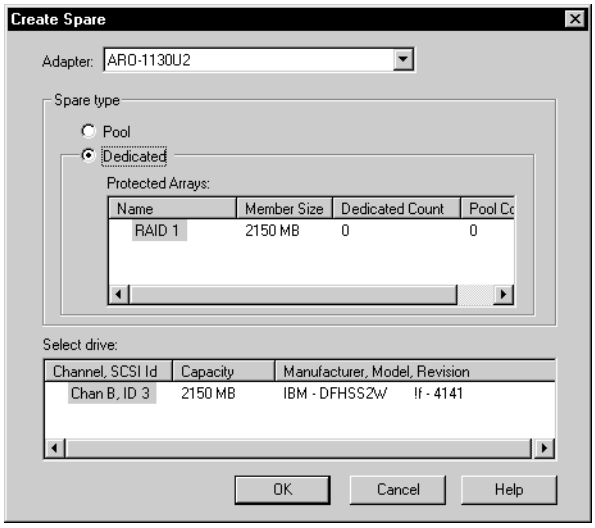

Figure 5-6. Create Spare Dialog Box

3 Select the Adapter from the Adapter list box.

4 If you want to dedicate the spare to a specific array, select **Dedicated** in the Spare type field and click the name of the array you wish to dedicate it to in the scrollable array list. If you want to add the spare to the pool of spares available to *all* arrays on the controller, click **Pool** in the Spare type field.

Note: You can add a disk of any size to the spare pool, even if the disk is too small to protect the existing arrays. For example, if you have created two arrays with 1 GByte disks, you can add a 500-MByte disk to the spare pool, even though this disk is too small to replace any failed array member. This allows you to create a third array later with 500-MByte disks, for example.

5 Click **OK** to save your changes.

6 Click **Yes** at the prompt to confirm creation of the spare.

Newly-created spares are immediately available for use, without rebooting the system. If an array is in Critical status and the spare is large enough, the array will be reconstructed as soon as you have created the spare (unless the spare is dedicated to another array).

7 Select the disk you wish to use as a spare from the Select drive window.

Disks with recognized partitions are not displayed. This prevents you from accidentally erasing any useful information from a disk. To find out if a disk has a partition, double-click the  icon and click **Check Partitions** in the SCSI Information dialog box. A small pop-up box indicates whether the selected disk has a partition and whether the partition is visible to the operating system. To use a disk with a recognized partition as a spare, exit from Adaptec CI/O Management Software, back up any data you want to keep, and delete the partition from the disk.

To see which arrays are protected by an existing spare, select the spare in the Logical Resources window of the Storage Configuration window. Right-click and select information from the drop-down menu. The Spare Information dialog box displays which array the spare protects. If this is a list of pool spares, a list of protected arrays displays.

Deleting a Spare

Follow these steps to delete a spare to use it as a stand-alone disk.

1. Click  to open the Storage Configuration window.

2. Right-click the icon of the spare  you want to delete and select **Delete** from the drop-down menu. You can also press the Delete key to delete the spare.

3. At the prompt, click **Yes** to confirm that you want to delete the spare.

After you delete an existing spare, and before you reboot the system, you can use a former spare to create a new array or spare. However, this disk does not become visible to the system's operating system as a single disk until after you reboot the system.

❒

6

Viewing Array and Device Information

In this Chapter

- *Viewing Array Information* 6-3
- *Viewing Spare Information* 6-5
- *Viewing SCSI Device Information from an Array Controller* 6-6
  - *Rescanning the Server* 6-6
- *Viewing Array Controller Information* 6-8
- *Viewing Channel Information* 6-10

The Adaptec CI/O Management Software allows you to view information about arrays, spares, and SCSI devices on any system to which you have access.

You view this information in the Storage Configuration window. Follow these steps to open the Storage Configuration window:

1. Click 

to begin the Adaptec CI/O Management software.

2. Click  to open the Storage Configuration window.

3. Right-click the icon that represents the device for which you want to view information and select **Information** from the drop-down menu. Refer to Figure 6-1.

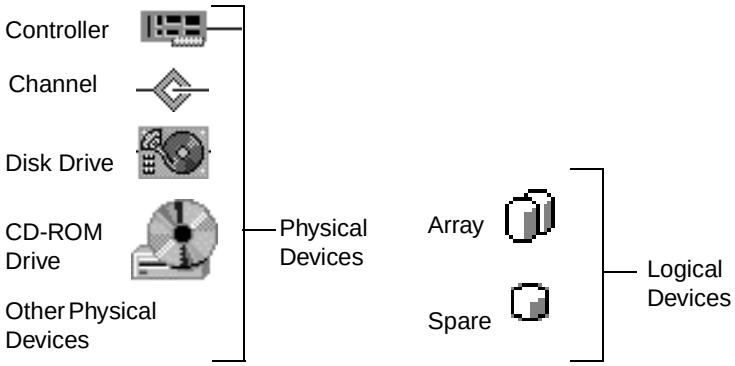

Figure 6-1. Storage Configuration Window Icons

The Array and Spare icons are logical devices that appear in the Logical Resources area of the Storage Configuration window. *Logical* means that arrays and spares do not exist until you configure them on the system.

The Product, Channel, and SCSI device icons are physical devices that appear in the Physical Resources area of the Storage Configuration window. *Physical* means that the icons correspond to actual devices installed in the system, such as a SCSI drive or a CD-ROM drive.

The following sections explain the information that appears when you click an icon for a logical or physical device.

Viewing Array Information

When you right-click an Array icon  in the Storage Configuration window and select **Information** from the drop-down menu, the Array Information dialog box appears. Figure 6-2 shows the Description Tab and Figure 6-3 shows the Status tab.

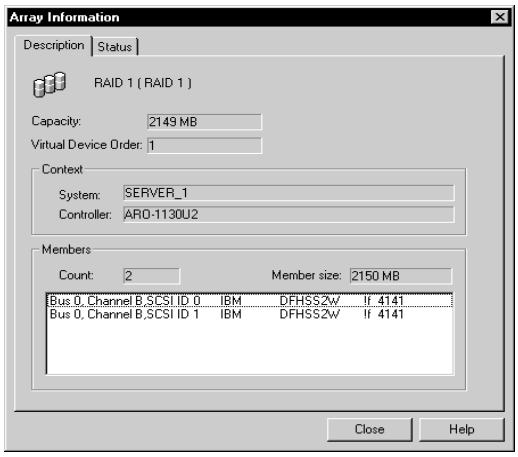

Figure 6-2. Array Information Dialog Box - Description Tab

The following information appears in the Description tab of the Array Information dialog box:

- **Capacity:** total usable disk space available in the array, in MBytes.
- **Virtual Device Order:** the sequence in which the system's operating system detects this array when it boots. If the array's virtual device order is 0 and this is the first storage controller found in the system, then this array is the device from which the operating system boots.
- **Stripe size:** data and parity striping size used on this array.
- **System:** name of the system the array is on.
- **Controller**: model name of the array controller to which the array disks are connected.
- **Member count**: number of disks in the array.
- **Member size**: the useful size of the array members.

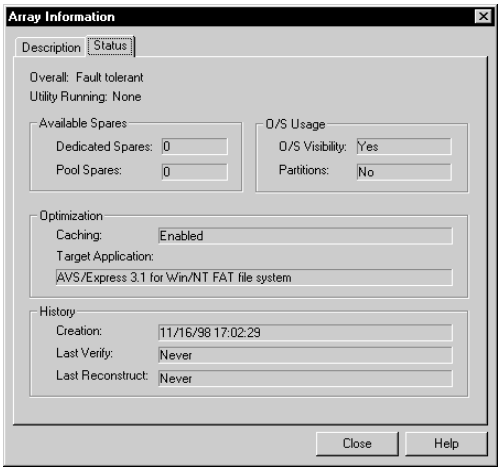

Figure 6-3. Array Information Dialog Box - Status Tab

The following information appears in the Status tab of the Array Information dialog box:

- **Dedicated spares**: number of spare disks dedicated to this array.
- **Available pool spares**: number of pool spares available to protect this array.
- **O/S Visibility:** indicates that the array is recognized by the operating system and can be used by the operating system.
- **Partitions:** indicates whether or not the disk is partitioned.
- **Caching:** indicates whether caching is enabled or disabled.
- **Target Application:** application that is selected for performance optimization.
- **Creation date**: date on which the array was created.
- **Date of last verify**: date on which the array was last verified. See *Verifying Array Integrity* on page 7-6 for information on how to verify an array.
- **Date of last reconstruct**: date on which the array was last reconstructed. See *Reconstructing an Array* on page 7-2 for information on how to reconstruct an array.

Click **Close** to close the Array Information dialog box Status tab.

Viewing Spare Information

When you right-click a Spare icon in the Logical Resources area of the Storage Configuration window and select **Information** from the drop-down list box, the Spare Information dialog box appears, as shown in Figure 6-4.

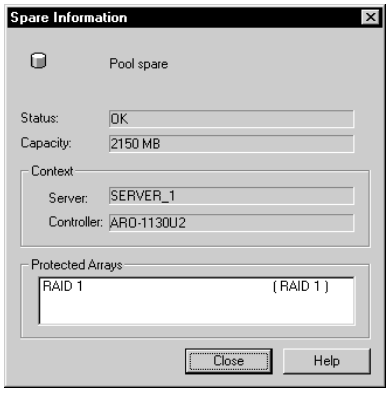

Figure 6-4. Spare Information Dialog Box

The Spare Information dialog box shows information about the spare, such as capacity and status.

Click **Close** to close the Spare Information dialog box or SCSI Information dialog box.

Viewing SCSI Device Information from an Array Controller

SCSI devices can be connected to array controllers as well as SCSI adapters. The information provided is the same as it is when connected to a SCSI adapter. See *Viewing the SCSI Information Dialog Box* on page 4-4 for a description of the SCSI Information dialog box.

Note: You cannot use a disk in an array if it has a partition that is visible to the operating system. (This prevents you from accidentally deleting data or erasing your boot disk.) To use a disk with a recognized partition in the array, exit from the Adaptec CI/O Management Software program, back up any data you want to keep, delete the partition, and then run the program again.

Rescanning the Server

Whenever you boot the system, the operating system software scans the system for installed devices such as arrays and SCSI devices. Adaptec CI/O Management Software displays icons for these devices in the Storage Configuration window.

You may need to issue a Rescan command while Adaptec CI/O Management Software is running so it can "see" the new hardware configuration. You need to do a Rescan if

- You connect a new SCSI device to the array controller without using the Pause I/O command
- You disconnect a SCSI device from the array controller without using the Pause I/O command

A Rescan is done automatically whenever you pause I/O and resume I/O to an array or a device. You do not need to issue a Rescan command to detect a failed array member. Adaptec CI/O Management Software will detect the failed member automatically if I/O is occurring on the array.

Follow these steps to rescan the system:

1. Click  to open the Storage Configuration window.
2. Click  on the Storage Configuration window toolbar.
3. At the prompt, confirm that you want to rescan the server. When the rescan is complete, any hardware changes are reflected in the icons in the Storage Configuration window.

Note: You cannot use the Rescan command to recognize an entire array that was transferred from another system. You must reboot the system before it recognizes the transferred array. However, if you remove a disk that is an array member, replace it with another disk, and issue a Rescan command, Adaptec CI/O Management Software will detect that the new disk is no longer an array member.

Viewing Array Controller Information

When you right-click a controller icon  and select **Information** from the drop-down menu, the Controller Information dialog box appears. Figure 6-5 shows the Information tab and Figure 6-7 shows the Capabilities tab.

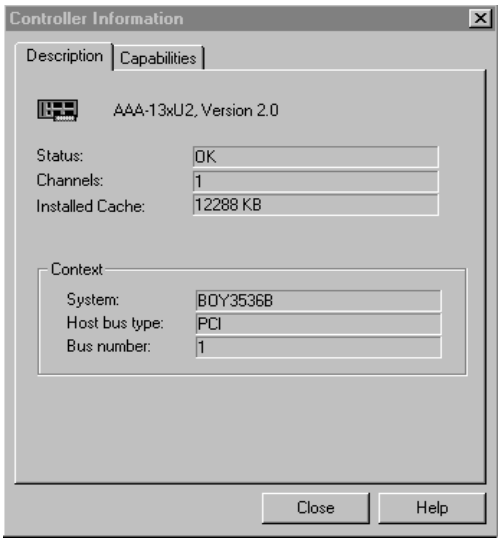

Figure 6-5. Controller Information Dialog Box - Description Tab

The Description tab of the Controller Information dialog box contains information such as the status, number of channels, and size of the installed cache. The index field contains a reference to a particular adapter. Context information includes the server type, host bus type, and the bus number that indicates in which PCI slot the array controller is installed. You may need this information to configure the system to boot from an array.

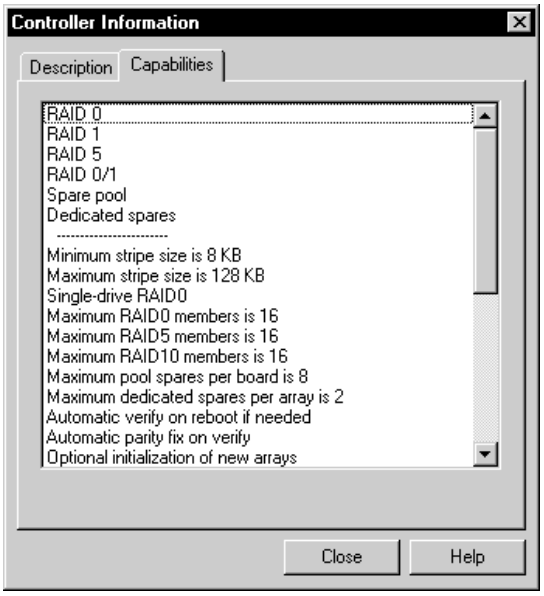

Figure 6-6. Controller Information Dialog Box - Capabilities Tab

The Capabilities tab of the Controller Information dialog box lists the features supported by this array controller. The list is informational only; you cannot enable or disable the capabilities on the list. Not all features appear for every product and the contents of the list may be different for SCSI and RAID products. The following items are controller capabilities that may appear on the list (not all features appear for every product):

- **Supported RAID Levels**: lists the RAID levels the product supports.
- **Spare Pools:** indicates that the array controller supports using spares from a spare pool.
- **Maximum/Minimum Stripe Size**: lists the range of data stripe and parity stripe sizes that the product supports.
- **Maximum Number of Drives for a Single Array**: lists the maximum number of disks the product supports for a single array.

- **Maximum Number of Pool Spares**: lists the maximum number of pool spares per array that the product supports.
- **Maximum Number of Dedicated Spares**: lists the maximum number of dedicated spares per array that the product supports.
- **Auto Verify**: indicates that the product automatically verifies SCSI parity.
- **Auto Fix**: indicates that the product automatically corrects data and parity miscompares.
- **Optional initialization of new arrays:** indicates that the product can initialize new arrays.

If the controller has a battery, a Battery tab also appears in the Controller Information dialog box. the Battery tab contains Status, Voltage and Charge information.

Click **Close** to close the Controller Information dialog box.

Viewing Channel Information

When you right-click a Channel icon  and select **Information** from the drop-down menu, the Channel Information dialog box appears, as shown in Figure 6-7.

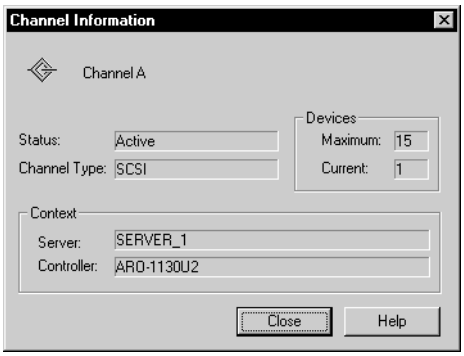

Figure 6-7. Channel Information Dialog Box

The following information appears in the Channel Information dialog box:

- **Status**: current operational status of the channel (for example, Active, Inactive).
- **Channel Type**: type of this channel—for example, *SCSI*.
- **Maximum Devices**: maximum number of SCSI devices that the channel supports. The channel itself is not counted in this maximum number. For example, if this number is 15, you can connect up to 15 devices.
- **Current Devices**: number of SCSI devices currently connected to the channel.
- **System**: indicates the system containing the channel.
- **Controller**: model name of the array controller to which the channel is connected.

Click **Close** to close the Channel Information dialog box.

❒

▼▼▼▼ 7

Performing Array, Spare, and Disk Operations

In this Chapter

➤ *Performing Array Operations* 7-2
- *Reconstructing an Array* 7-2
- *Pausing I/O on an Array* 7-5
- *Verifying Array Integrity* 7-6
- *Blinking Array Drive Lights* 7-7
- *Reactivating an Off-line Array* 7-8
- *Changing an Array Name* 7-8
- *Forcing a Spare* 7-9

➤ *Performing Spare Operations* 7-10
- *Testing All Spares* 7-10
- *Blinking the Spare Drive Light* 7-11

➤ *Performing Disk Operations* 7-12
- *Blinking the Drive Light* 7-12
- *Downing the Drive* 7-13
- *Pausing I/O to an Array Disk Drive* 7-13

Adaptec CI/O Management Software allows you to perform a number of operations on arrays, spares, and stand-alone disks. Some of the operations are performed immediately; others can be scheduled for a later time, or scheduled to occur periodically at stated intervals (See Chapter 8, *Scheduling and Monitoring Array Operations*).

Performing Array Operations

To perform array, spare, and disk operations

1. Click  to open the Storage Configuration window.
2. Right-click the icon that represents the array  , spare  , or SCSI disk  you want to work on.

   The drop-down menu lists the operations that can be performed on the selected device.
3. Select the operation you want to perform. See the appropriate section of this chapter for a description of these operations.

Reconstructing an Array

If a suitable spare disk is available when an array disk fails, the array is automatically reconstructed, and you do not need to use the Reconstruct operation. However, if a disk in an array goes down for some reason other than physical failure, and no suitable spare is available to replace it, you receive an event notification that the array is Critical. You can then reconstruct the array with the Reconstruct command.

An array member can change to a Down status for several reasons:

- physical failure
- the user downs the array member with the Down a Drive command
- the array member is removed by mistake
- the cable to the array member is accidentally disconnected

As long as the array member is physically functional, you can reconstruct it with the Reconstruct command. You can reconstruct the array immediately, or you can schedule the reconstruct to occur at a later time. Since the reconstruction process may take a long time, you may want to schedule it for a time when there is less activity on the system.

Note: The Reconstruct operation can take up to several hours for a large array.

Follow these steps to reconstruct an array when a disk fails:

1. Determine which array is in Critical status and which disk in the array has failed.

   It is possible that a RAID 0/1 array in Critical status may have more than one failed disk. The array can still be reconstructed without data loss as long as at least one disk of each mirrored pair is still good.

2. If the array enclosure does not support hot swapping[1], pause I/O to the array before you continue. (See *Pausing I/O on an Array* on page 7-5.) Skip this step if the array enclosure supports hot swapping.

3. Remove the failed disk and allow I/O to resume.

4. Insert a good disk of at least the same storage capacity. Be sure that the SCSI ID of the new disk is different from the SCSI ID of other installed devices. Or, if an array disk was accidentally disconnected, reconnect it.

5. Issue a Rescan command to detect the new disk.

6. If you installed a new disk (or disks), make the disk into a spare by following the directions in *Creating Dedicated Spares or a Spare Pool* on page 5-14. Be sure the new spare disk is at least as large as the smallest array member.

[1] *Hot swapping* support means that the array enclosure electrically isolates the bad disk's SCSI connector from the SCSI bus while the disk is being swapped to prevent data corruption. Data can still be transferred to and from the remaining good disks while the bad drive is replaced.

Note: When the spare is created, Adaptec CI/O Management Software should automatically start a Reconstruct operation on the array. If for some reason the reconstruct does *not* begin automatically, follow the remaining steps to perform it manually.

7 Click  to open the Storage Configuration window. Right-click on the **Array** icon that looks like this  and select **Reconstruct** from the drop-down menu. If the array has one failed drive the Scheduler dialog box appears.

If you have a RAID 0/1 array with two or more failed disks, and at least one disk of each mirrored pair is still good, a dialog box appears with a list of the failed drives. You must reconstruct the disks one-at-a-time, starting over each time at the beginning of these steps. Select one of the drives on the list and click **OK**; the Scheduler dialog box appears. (This assumes that you have already physically replaced all of the failed drives with good drives.)

8 Enter the required information for the Reconstruct operation in the Scheduler dialog box. You can select **Immediate** to reconstruct the drive immediately or select **Schedule** to schedule the operation for a later time. (See *Setting Scheduling Options* on page 8-2 for more information.)

9 Select an Execution Priority - **high**, **medium**, or **low**.

10 Click **OK**.

11 At the prompt, confirm that you want to reconstruct the array member.

12 Read the event notifications that appear in the System Monitor window (they may also appear as pop-ups on the screen) to determine when the reconstruct is complete.

Pausing I/O on an Array

Use this operation to pause data I/O on an array while you replace a disk, reconnect a loose connection, etc. If your array enclosure supports hot swapping[1], you do not need to pause I/O to replace a disk. See the array enclosure documentation for more information.

Note: Only a single action such as removal *or* inserting a drive (but not both) should be made with each use of Pause I/O.

When you pause an array, all other devices on all channels on the array controller are also paused. I/O is automatically resumed after a specified pause interval.

Note: The Pause I/O command is disabled if a Verify, Reconstruct, or Initialize operation is running.

Follow these steps to pause and resume I/O on an array:

1. Click  to open the Storage Configuration window.
2. Right-click the icon of the array  you want to pause and select **Pause I/O** on the drop-down menu.
3. When the Pause I/O dialog box appears, enter a pause interval that does not exceed the maximum allowable pause period, and click **OK** to pause the array. Wait a few seconds until data I/O stops.

   Note: The minimum pause period is 5 seconds; the maximum pause period is 120 seconds.

[1] *Hot swapping* support means that the array enclosure electrically isolates the bad disk's SCSI connector from the SCSI bus while the disk is being swapped to prevent data corruption. Data can still be transferred to and from the remaining good disks while the bad drive is replaced.

4 Complete your work with the array disks. Data I/O resumes automatically at the end of the pause period.

Note: *Do not* replace a non-downed drive in a paused array. The proper procedure is to down the drive, and then replace it. Failure to do so may lead to data corruption.

Verifying Array Integrity

Use this operation to verify the integrity of redundant data stored on fault-tolerant (RAID 0/1, RAID 1, RAID 5) arrays. When you run this operation, Adaptec CI/O Management Software checks the array for miscompares and corrects parity errors automatically. A *miscompare* occurs when the parity information on a RAID 5 array does not match the user data or when some part of the data on a mirrored disk pair in a RAID 0/1 or RAID 1 array does not match.

In Adaptec CI/O Management Software you can schedule the Verify operation to run later or schedule it to run at a regularly occurring interval. We recommend that you schedule a verification of all arrays at least once a week. See *Setting Scheduling Options* on page 8-2 for more information.

Note: The Verify operation will run automatically on all fault-tolerant arrays when you boot up your system following a disorderly system shutdown. *Disorderly* means that the system shuts down in an irregular manner (for example, a power failure or a system lock-up).

Follow these steps to verify the integrity of redundant array data:

1 Click  to open the Storage Configuration window.

2 Right-click on the **Array** icon. 

3 Select **Verify** from the drop-down menu.

4 Leave the **autocorrect** box checked so that any data parity or mirroring mismatches will be corrected automatically.

5. Select **OK** if you want to verify parity immediately, or select **Scheduled** if you want to schedule the operation for a future time.
6. If you select Scheduled, enter a start time, start day of the week, and other information. (See *Setting Scheduling Options* on page 8-2 for more information.)
7. Select an Execution Priority - **high**, **medium**, or **low**. This sets the system resources devoted to the operation. A high priority for the Verify operation requires a lot of system resources, which may slow down other system activity.
8. Click **OK** to start the operation (if you selected Immediate) or to enter it on the list of scheduled activities.
9. At the prompt, click **Yes** to confirm that you want to verify parity information.

Note: The Verify operation can take up to several hours for a large array.

Blinking Array Drive Lights

You can issue a command to blink the drive lights of all the disks in a selected array. This allows you to see which physical drives actually form the array.

Note: Adaptec CI/O Management Software does not support blinking the drive lights on CD-ROM drives or most other non-hard disk drives.

Follow these steps to blink the drive lights of the disks in an array:

1. Click  to open the Storage Configuration window.
2. Right-click on an **Array** icon in the Logical Resources area.
3. Select **Blink** from the drop-down menu.
4. Look at the array enclosure to see which disks are members of the array.

5 Click **OK** to the drive lights from blinking.

6 You can also click on the Stop blinking lights icon  to stop all of the drive lights from blinking.

Reactivating an Off-line Array

An array may go off-line because a cable is disconnected or because you mistakenly removed the wrong disk while trying to replace a failed disk. In these situations, the array shuts down temporarily. Depending on the reason that the array went off-line, it is possible to reactivate it and resume I/O without data loss. See *Responding to an Off-line Array* on page 10-6 for more information.

After you correct any hardware problems, follow these steps to reactivate an off-line array:

1 Click  to open the Storage Configuration window.

2 Right-click on the dimmed icon of the off-line array and select **Reactivate** from the drop-down list.

3 At the prompt, confirm that you want to reactivate the array. Be sure that any hardware problems are corrected before you do this.

Changing an Array Name

When you create an array, you assign it a name. This name appears beneath the array icon and in many of the windows and dialog boxes. It is also used to identify the source of event notifications. You can change this name at a later time.

Follow these steps to change the name of an existing array:

1 Click  to open the Storage Configuration window.

2 Right-click the icon  of the array whose name you want to change.

3 Select **Rename** from the drop-down menu.The Change Name dialog box appears.

4 Type the new array name and click **OK**.

5 At the prompt, confirm that you want to change the array name. This change appears immediately in the Storage Configuration window.

Forcing a Spare

Forcing a spare means issuing a command for a spare disk to replace a specific disk in an array. You can do this if the array disk is not performing well or is giving some indication that an array member may fail soon (for example, if a S.M.A.R.T. predictive failure notification is received). If an array member actually does fail, a spare replaces it automatically without requiring you to force a spare.

Follow these steps to force a spare:

1 Be sure that one or more spares are available for the array. These can either be dedicated spares for the array or spares from a spare pool. See *Creating Dedicated Spares or a Spare Pool* on page 5-14 for more information on configuring spares.

2 Click  to open the Storage Configuration window.

3 Right-click on the icon of the array with the suspect disk and select **Force a spare** from the drop-down menu. This menu item appears dimmed if no spares are available.

4 Select the disk that you want to replace.

5 Click **OK** to replace this disk with a spare.

6 At the prompt, confirm that you want to replace the disk with the spare.

At this point data I/O is paused to the disk, and the spare is automatically activated to replace it.

If there is a pool of available spares, you cannot control which disk from the pool is activated when you force a spare. If both dedicated spares and pool spares are available, the dedicated spares are used

first. If an error message indicates that the pool spare is not at least as large as the smallest disk in the array, add a larger spare.

Performing Spare Operations

The following are spare operations available in Adaptec CI/O Management Software:

- *Testing All Spares* on page 7-10
- *Blinking the Spare Drive Light* on page 7-11
- *Deleting a Spare* on page 5-17

Note: All spare operations apply only to the *spares on the currently selected controller.*

Testing All Spares

Reliable spares must be available to immediately (and automatically) replace any array disk that fails. Spares should be tested regularly to assure that they are working properly. We recommend that you test all spares daily. You can run this operation immediately by issuing a command, or you can use the Scheduler function to set up a recurring check of all the spares at a time when few, if any, users are logged on to the system.

Note: Adaptec CI/O Management Software automatically sets up a daily Test All Spares operation on the server. We recommend that you leave this default setting.

Follow these steps to test all spares:

1. Click  to open the Storage Configuration window.
2. Right-click the icon of any spare in the Logical Resources window and select **Test All Spares** from the drop-down menu. The Scheduler dialog box appears, as shown in *Setting Scheduling Options* on page 8-2.

3. Select **OK** if you want to test all spares immediately, or select **Scheduled** if you want to schedule the operation for a later time.
4. If you select Scheduled, enter a starting time, starting day, and other information.
5. Click **OK** to start the operation (if you selected Immediate) or to enter it on the list of scheduled activities.
6. At the prompt, confirm that you want to test the spares.
7. When the test is complete the results will be viewable as an event. (The message is also recorded in the Historic Log window and the System Monitor window.) If any spare failed the test, look at the Spare Disk icon in the Storage Configuration window. The icon of any failed disk will look like this  .
8. Replace the failed disk immediately with a good disk of at least the same capacity.

Blinking the Spare Drive Light

You can issue a command to blink the drive light of a spare. This allows you to see which physical drive is the actual spare.

Follow these steps to blink the drive light of a spare:

1. Click  to open the Storage Configuration window.
2. Right-click the spare icon in Logical Resources window and select **Blink** in the drop-down menu.
3. Look at the array enclosure to see which disk light is blinking.
4. Click **OK** to stop all the drive light from blinking.
5. You can also click  to stop the drive lights from blinking.

Performing Disk Operations

You can perform the following disk operations with a single disk or with a selected disk in an existing array:

- *Blinking the Drive Light* on page 7-12
- *Downing the Drive* on page 7-13
- *Pausing I/O to an Array Disk Drive* on page 7-13

Blinking the Drive Light

You can issue a command to blink the light of a drive whose icon you have selected. This allows you to see which physical disk corresponds to the Disk icon.

Note: Adaptec CI/O Management Software does not support blinking of the drive light on CD-ROM drives.

Follow these steps to blink a drive light:

1. Click  to open the Storage Configuration window.
2. Right-click a drive icon in the left side of the window and select **Blink** from the drop-down menu.
3. Look at the array enclosure to see which drive light is blinking.
4. Click **OK** to stop the drive light from blinking.
5. You can also click on  to stop all of the drive lights from blinking.

Downing the Drive

Use this option to stop all data I/O to a member of an array and remove it from the array. You might need this option if the disk generates a S.M.A.R.T.[1] alert indicating that it is about to fail. When you down an array member, a spare is activated immediately (if available) to replace it, and a reconstruct is triggered.

Note: The Down a Drive command can be used only for array members, not for spare disks or single disks.

Follow these steps to down a disk:

1. Click  to open the Storage Configuration window.
2. Right-click the icon of the disk you want to down and select **Down a Drive** from the drop-down menu. If a spare is available, it replaces the downed disk immediately and a reconstruct of the array is triggered.
3. Wait until the Reconstruct operation is completed, and then continue with your work in the program.

Pausing I/O to an Array Disk Drive

Use this option to pause data I/O on a disk drive that is connected to an array controller. You can use this option to replace the disk if the array enclosure does not support hot swapping[2]. See the array enclosure documentation for more information. When you pause I/O to a disk drive, *all* other devices connected to the array controller are paused as well. I/O resumes automatically at the end of the pause period.

[1] S.M.A.R.T. stands for Self-Monitoring Analysis and Reporting Technology. Hard drives that support this technology continually analyze their performance and generate an alert if they determine that the disk is likely to fail in the next few hours. Adaptec CI/O Management Software generates an event notification if it receives this alert, allowing you to replace the disk before it actually fails.

[2] *Hot swapping* support means that the array enclosure electrically isolates the bad disk's SCSI connector from the SCSI bus while the disk is being swapped to prevent data corruption. Data can still be transferred to and from the remaining good disks while the bad drive is replaced.

Note: Pause I/O cannot assure the same level of protection from electrical noise that you have when you replace a disk in an enclosure that supports hot swapping. Every time you use this feature, you should only perform one action—either disconnecting a drive or inserting a drive, but not both. *Do not* replace a non-downed drive in a paused array, as this may cause data to be corrupted. Instead, down the drive first and then replace it.

Follow these steps to pause data I/O to a disk:

1. Click  to open the Storage Configuration window.
2. Right-click the icon of the disk you want to pause and select **Pause I/O** from the drop-down menu.

   Note: The Pause I/O command is disabled if a Verify, Reconstruct, or Initialize operation is running.

3. When the Pause I/O dialog box appears, enter a pause interval that does not exceed the maximum allowable pause period, and click **OK** to pause the disk. Wait a few seconds until data I/O stops.

   Note: The minimum pause period is 5 seconds; the maximum pause period is 120 seconds.

4. Complete your work before the pause period expires. I/O resumes automatically at the end of this period.

❒

8

Scheduling and Monitoring Array Operations

In this Chapter

➤ *Setting Scheduling Options* 8-2

➤ *Viewing and Managing Scheduled Activities* 8-4

Adaptec CI/O Management Software enables you to schedule certain kinds of operations to run at a later time, or to schedule them to run at regularly recurring intervals. You create these as scheduled jobs at the time you give the command to run the activity, as described in *Reconstructing an Array* on page 7-2, *Verifying Array Integrity* on page 7-6, and *Testing All Spares* on page 7-10.

Setting Scheduling Options

The Scheduler dialog box allows you to schedule the Reconstruct an Array, Verify Integrity of an Array, and Test All Spares operations. Reconstruct an Array is a one-time event for which you can enter a date and time. Verify Integrity of Array and Test All Spares can be scheduled as hourly, daily, or weekly recurring events.

Caution: All scheduled activities must be deleted and rescheduled if you change the system time. Otherwise, the scheduled activities may not run at the specified time. *Do not* change the system time while Adaptec CI/O Management Software is running. Instead, stop all CI/O components and RPC modules, change the system time, and then restart CI/O.

Follow these steps to set scheduling options for a newly added operation:

1. Define a new scheduled operation: Reconstruct an Array, Verify Integrity of Array, or Test All Spares. The Scheduler dialog box appears, as shown in Figure 8-1.

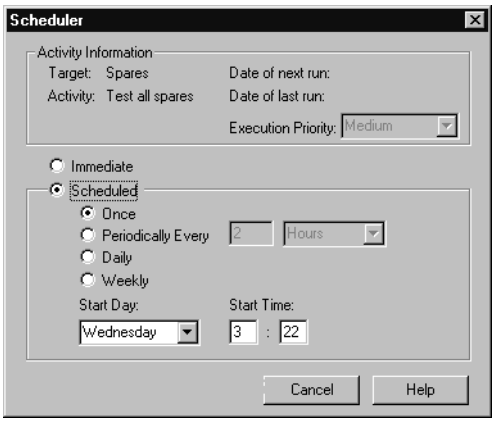

Figure 8-1. Scheduler Dialog Box

2. Select **Immediate** to perform the action immediately or **Scheduled** to schedule it for later.

3 If you select ***Scheduled***, select **Once**, **Periodically**, **Daily**, or **Weekly**. Enter other information such as day of the week or start time as required.

Note: If you are scheduling an array reconstruct you can only select the Once option. If you schedule an activity from a remote client to occur on a server in a different time zone, the activity will occur at the stated time relative to the server's time zone. For example, suppose you schedule an activity to occur at 11:00 P.M. on a server in a time zone that is three hours later than the remote client's time zone. The activity will occur at 11:00 P.M. in the server's time zone, which is 8:00 P.M. in the remote client's time zone.

4 Click **OK** to record the scheduling options. You may be prompted to confirm the activity.

Viewing and Managing Scheduled Activities

You can view information about scheduled and currently running activities in the Activity View window. You can abort activities that are running or delete scheduled activities. The Activity View window shows scheduled tasks for the *currently selected system*. To view activities on another system, select the System's icon in the System Monitor window and open a new Activity View window.

Note: Adaptec CI/O Management Software automatically sets up a daily Test All Spares operation on the system. If you want to schedule this activity for a different time, first delete the one entered automatically by the Adaptec CI/O Management Software.

Follow these steps to view and manage scheduled activities:

1. Click  on the main toolbar to open the Activity View window, as shown in Figure 8-2.

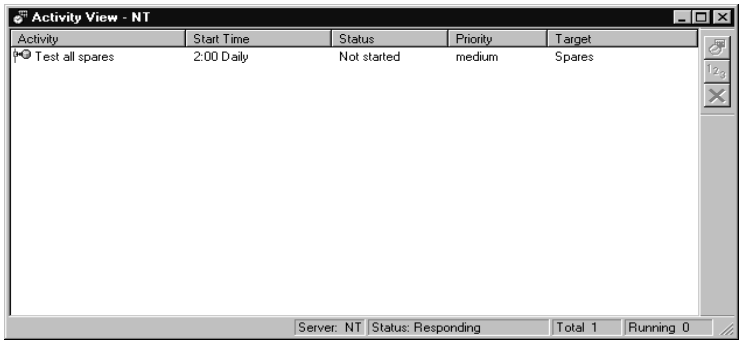

Figure 8-2. Activity View Window

2. Information about each activity is shown in the window. Each kind of activity has a unique icon. The target field indicates to which array or spare the activity applies.

To view more detailed information about the activity, right-click the **Activity** icon and select **Properties** from the drop-down menu. The Scheduler dialog box appears, as shown in Figure 8-1. Click **Cancel** to close the dialog box.

3 To change the priority of a Verify or Reconstruct operation that is currently running (as indicated by a moving icon), right-click the Activity icon on the left of the window and select **Change Priority** from the drop-down menu. Select an option and click **OK**.

Note: The priority change applies only while the activity is running this time. If it is a regularly scheduled activity, the next time it runs it will have the priority originally assigned to it. You cannot change the priority of an Initialize or Test all Spares operation that is currently running.

4 To delete an activity that is *not* currently running, right-click its icon and select **Delete** from the drop-down menu or press the Delete key. After you confirm the command, the activity is deleted from the list.

5 To abort a currently-running activity, select its icon and click the **Abort** button  . After you confirm the command, the activity stops running immediately. If this is a regularly recurring activity, such as a nightly test of all spares, it will run again in the future at the next scheduled time. Use **Abort** and then **Delete** to prevent the activity from ever running again.

Note: The status of the system is indicated in the status bar.

❒

9

Setting Security Options

In this Chapter

➤ *Changing the Password* 9-2
➤ *Setting Password Time-out Options* 9-3
➤ *Controlling Guest Access* 9-5

Adaptec CI/O Management Software provides simple but effective password protection to prevent unauthorized changes to array configuration. Users who know the password can view server information *and* can issue commands to add and delete arrays, add and delete spares, and make other changes to array configuration. Users who do not know the password can view server information but cannot change array configuration. The network administrator can disable the Guest Access option (see page 9-5) for each server to prevent users who do not know the password from even viewing server information.

When you install the Adaptec CI/O Management Software the initial password is set to adaptec. The password is case-sensitive and should not be capitalized. The network administrator can change the initial password for each server and controls users' access to passwords.

Changing the Password

You can change passwords from any client on the network.

Follow these steps to change the Adaptec CI/O Management Software password:

1. Click  to open the System Monitor window. Then select the icon of the server whose password you want to change.
2. Right-click on the system you wish to change the password for and select **Change Password**. The Set Access Password dialog box appears, as shown in Figure 9-1.

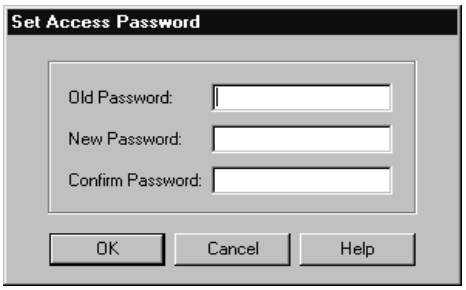

Figure 9-1. Set Access Password Dialog Box

If you are installing a password for the first time, type the default password, adaptec, in the Old Password field (the password is case sensitive).

Note: It is a good idea to change from the default password as soon as possible, to prevent unauthorized users from entering the Adaptec CI/O Management Software program.

3. Type the new password in the New Password field.

   Passwords are case sensitive and can be up to 16 characters long, including the characters A-Z, a-z, and 0-9. Spaces are not allowed. Long passwords with a mixture of numerals and letters provide better security. *Do not* use obvious passwords like your name, the name of a family member, your birthday, your social security number, etc.

4 Type the new password again in the Confirm Password field.

5 Click **OK** to accept the new password.

Setting Password Time-out Options

The Password Time-out options allow you to control the way in which users are prompted to enter the system's Adaptec CI/O Management Software password when they issue commands to change a system's array configuration. The Password Time-out options are set individually for each networked client.

Follow these steps to change the Password Time-out options:

1 Click  to open the Preferences dialog box and click the **Password** tab to display the Password dialog box as shown in Figure 9-2.

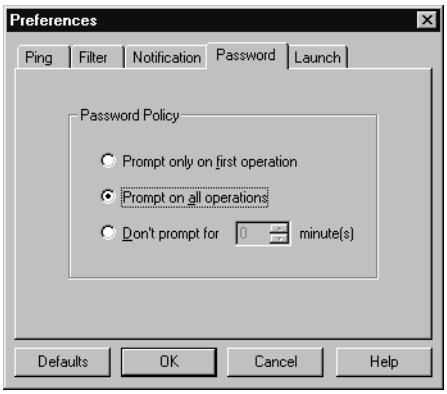

Figure 9-2. Password Dialog Box

2 Select one of the three Password time-out options. Here is a description of the options:

– **Prompt only on first operation**: Requires you to enter the password only the *first time* (during each session) that you issue a command to change array configuration. This option provides somewhat less security than the others: if you leave your client or workstation unattended after entering the password, another person can issue commands from the workstation without being prompted for the password.

- **Prompt on all operations**: Requires you to re-enter the password *every time* you issue a command to change array configuration.
- **Don't prompt for X minutes**: Requires you to re-enter the password at the stated time-out interval, whenever you issue commands to change the array configuration. For example, suppose that the time-out interval is 10 minutes. You start the program at 9:00 and issue a command to create a new array on a system. You are prompted to enter the password before the command is accepted. After entering the password, you issue a command at 9:05 to add spares to the spare pool; no password is required. At 9:16 you issue a command to delete an array; since you are beyond the 10-minute interval, you are prompted again to enter the password before the command is executed.

3 Click **Defaults** to accept the default settings or click **OK** to accept the password time-out change.

Note: You must enter the password at least once for each server after the application has started, or when the setting has changed.

Controlling Guest Access

The Guest Access option lets the network administrator control who can view information about the server configuration. Guest Access is enabled or disabled for each individual server. The Guest Access setting affects all users who try to view server information from networked clients. Here is how Guest Access works:

- When Guest Access is *Enabled* (the default), users who do not know the password can view server information from a networked client connected to that server but cannot issue commands to change the server configuration.
- When Guest Access is *Disabled*,  users who do not know the password cannot view server information from a networked client or issue commands to change the server configuration. However, users can still view event notifications generated by servers that are on the client's server list.
- When Guest Access is disabled for a server you can upgrade access privileges for a particular client to monitor or manage that server by following these steps:

  1 Click the Reconnect icon in the System Monitor widow.

  2 Enter the password when prompted.

Even though you have regained access privileges for that client, the guest access privileges will remain disabled for all other clients monitoring that server. At this point, if you close and re-open Adaptec CI/O Management Software for that particular client, guest access privilieges for that client revert back to disabled.

Note: If you *do* know the server's password you can perform array operations such as Creating and Deleting Arrays whether Guest Access is enabled or disabled.

Follow these steps to enable or disable Guest Access:

1 Click  to open the System Monitor window.

2 Right-click the server icon whose guest access setting you want to change and select **Guest Access**.

3 When the Enable/Disable Guest Access dialog box appears, select or deselect the **Enable Guest Access** check box.

4 Click **OK** to enter the change. Enter the password when you are prompted to do so. The Guest Access setting is changed on the server.

❒

10

Managing Arrays and Spares

In this Chapter

- ➤ *Responding to a Critical Array* 10-2
- ➤ *Replacing a Spare* 10-4
- ➤ *Replacing an Active Array Member* 10-6
- ➤ *Responding to an Off-line Array* 10-6
  - *Notes on Replacing Disk Drives* 10-8
- ➤ *Optimizing Array Performance* 10-9
  - *Read Caching* 10-11
  - *Write Caching* 10-12
  - *Other Performance Tips* 10-13
- ➤ *Selecting a RAID Level for an Array* 10-14

This chapter explains what to do when you need to replace a failed drive, physically reconfigure the disks in your server, and perform other tasks.

Note: These steps apply to devices connected to array controllers only, and *do not* apply to SCSI adapters.

Responding to a Critical Array

A fault-tolerant (RAID 1, RAID 0/1 or RAID 5) array enters Critical status if one disk in the array fails. The array continues to operate normally, but you may lose data if a second disk in the array fails before the array is reconstructed. (RAID 0/1 arrays can continue operating in Critical status even if two or more disks fail, as long as at least one disk in each mirrored pair remains operational.)

If a spare disk is available, the array management software will reconstruct the Critical array automatically. When the reconstruct is complete, the array returns to Fault-tolerant status. If no spare disk is available, you should respond immediately to minimize the possibility of data loss. The most effective strategy is prevention: be sure that arrays are always protected by a spare pool or by dedicated spares!

Note: We recommend that you configure your system to automatically launch CI/O as a minimized status-bar icon after each system reboot. This ensures you will be notified of any important event.

In addition, you should monitor the status of arrays at all times with Adaptec CI/O Management Software to detect arrays whose status is Critical. You can monitor arrays effectively by enabling the Pop-up Event Notification option so that a message appears on the screen whenever an array enters Critical status. You can also tell that an array is in Critical status if its icon in the Storage Configuration window looks like this  .

Follow these steps to return a Critical array to Fault-tolerant status:

1. Click the **Array** icon  and observe the Disk icons of the array members on the left side of the screen. One of the icons should look like this  , indicating that the disk has failed.

2. Right-click the  icon and then select **Blink** from the drop-down menu to blink the drive light on the failed disk.

3. Observe which drive light is blinking. This is the disk that you need to replace. If no lights are blinking, this could mean one of the following:

   a. The disk is still connected but has failed so badly that it cannot respond to the Blink command. Try blinking the drive lights of the array disks that have not failed. You may be able to determine by a process of elimination which disk has failed.

   b. The disk has been removed or its power cord or SCSI cable has been disconnected.

      If an array disk has been disconnected or removed but the server has not been rebooted, the icon for this disk will still appear in the Storage Configuration window. If you know that the disk was disconnected accidentally and has not actually failed, reconnect the drive and issue the Rescan command. You can reconstruct the array by issuing the Reconstruct command.

      If the system has been rebooted since the disk was disconnected, the disk will not appear. To determine if a disk is "missing" from an array, right-click the array icon, select **Information** from the drop-down menu, and read the Status field at the top of the Array Information dialog box. If this field says Missing member, a disk is missing from the array.

   c. The disk does not have an LED that indicates I/O activity.

4. If the array enclosure supports hot swapping[1], remove the failed drive.

5 Insert the replacement drive and issue the Rescan command.

6 If the array enclosure does not support hot swapping, pause I/O to the array before you continue. (*Skip to Step 10 if the array enclosure supports hot swapping.*) See *Pausing I/O on an Array* on page 7-5.

Note: Be sure to specify a Pause period that allows you enough time to remove the failed drive or insert the replacement drive. Wait a few seconds after issuing the Pause I/O command before you remove or insert a drive.

7 Remove the failed disk drive and allow I/O to resume.

8 Pause I/O again.

9 Insert the replacement drive and allow I/O to resume.

10 Select the icon of the new disk, and issue a Create Spare command.

11 When a Pool spare with a capacity as large as the smallest member of the critical array or a spare dedicated to the critical array is created, the reconstruct will start automatically.

When the reconstruct is completed the array is in Fault-tolerant status again, and the Array icon will look like this:

Replacing a Spare

Follow these steps to replace a spare drive that is recognized as good by Adaptec CI/O Management Software:

1 Delete the spare. (See *Deleting a Spare* on page 5-17.)

[1] *Hot swapping* support means that the array enclosure electrically isolates the bad disk's SCSI connector from the SCSI bus while the disk is being swapped to prevent data corruption. Data can still be transferred to and from the remaining good disks while the bad drive is replaced.

2. If the spare is in an enclosure that supports hot swapping, remove the spare disk drive and replace it with another disk drive. Issue the Rescan command, and then skip to Step 6.
3. If the spare is *not* in an enclosure that supports hot swapping, pause I/O (see *Pausing I/O to an Array Disk Drive* on page 7-13).
4. Remove the spare and allow I/O to resume.
5. Pause I/O again, insert the replacement drive, and allow I/O to resume.
6. Use Adaptec CI/O Management Software to mark the new disk drive as a dedicated spare or a pool spare (see *Creating Dedicated Spares or a Spare Pool* on page 5-14).

Follow these steps to replace a spare drive that is marked as down  by Adaptec CI/O Management Software. (This rarely occurs. Usually, if a spare disk fails a regular test of spares, CI/O automatically deletes the spare disk.)

1. If the array enclosure supports hot swapping, remove the spare that is marked as down.
2. Insert the replacement drive and issue the Rescan command.
3. If the spare is in an enclosure that does not support hot swapping, pause I/O. (Skip this step if the array enclosure supports hot swapping).
4. Remove the spare and allow I/O to resume.
5. Pause I/O again.
6. Insert the replacement drive and allow I/O to resume.
7. Use Adaptec CI/O Management Software to mark the new disk drive as a dedicated spare or a pool spare (see *Creating Dedicated Spares or a Spare Pool* on page 5-14).

   You can try to low-level format the spare disk that was marked as down to see if you can re-use it.

Replacing an Active Array Member

Follow these instructions if you want to remove an array member of a RAID 1, RAID 0/1, or RAID 5 array that has not actually failed and replace it with another disk drive. You may want to do this if the drive has generated a S.M.A.R.T. predictive failure alert.

1. Perform a Down operation on the array member you want to replace (see *Downing the Drive* on page 7-13).

   If a spare disk was already available, the Reconstruct operation begins automatically when you down the array member.

2. If the array enclosure supports hot swapping, remove the member marked as down.
3. Insert the replacement drive and issue the rescan command.
4. If the array member is an enclosure that does not support hot swapping, pause I/O. (Skip steps 4 though 7 if the array enclosure supports hot swapping.)
5. Remove the disk drive and allow I/O to resume.
6. Pause I/O again.
7. Insert the replacement drive and allow I/O to resume.
8. When a pool spare with a capacity as large as the smallest member of the critical array or a spare dedicated to the critical array is created, the reconstruct will start automatically.

Responding to an Off-line Array

You can tell that an array is in off-line status if OFFLINE appears in the Array Status field in Adaptec CI/O Management Software or if the Array icon in the Storage Configuration window looks like this:

 . There are several reasons for an array going off-line, as described below:

- A member of a RAID 0 has failed, a second disk in a Critical RAID 5 array has failed, or both disks of a mirrored pair in a RAID 1 or RAID 0/1 array have failed.

  If this happens, delete the off-line array, create a new array, and restore the data from your most recent backup. You cannot

recover the array data if an array went off-line due to disk failure.

- You were trying to replace a failed disk in a Critical, RAID 0/1, or RAID 5 array, but you mistakenly pulled the wrong disk out of the array enclosure.

  If this happens, reinsert the drive you mistakenly removed and issue the Rescan command and then issue the Reactivate Array command. This will return the array to Critical status. Then replace the correct disk and reconstruct the array.

- A cable to a good disk in a RAID 5 array accidentally became disconnected, and the array already had one failed drive; or a cable to a good drive in a RAID 0/1 array accidentally became disconnected, and the other disk of the mirrored pair had already failed.

  If this happens, reconnect the cable, issue the Rescan command and use the Reactivate Array command to return the drive to Critical status. Then replace the failed disk and reconstruct the array.

- You are trying to replace a failed disk in a Critical RAID 1 array, but you mistakenly pulled the wrong disk out of the array enclosure.

  If this happens, reinsert the drive you mistakenly removed, replace the failed disk, shut down the system and reboot. Reconstruct the array.

- A cable to a good disk in a RAID 1 array accidentally becomes disconnected and the array already had one failed drive.

  If this happens, shut down the system, reconnect the cable, replace the failed drive, and reboot the system. Reconstruct the array.

- A member of a RAID 0 array was accidentally removed or a cable to a good disk in a RAID 0 array accidentally becomes disconnected.

  If this happens, reinsert the drive you mistakenly removed or reconnect the cable, issue the Rescan command, and use the Reactivate command to return the array to OK status.

Notes on Replacing Disk Drives

- We recommend that if you use hot swapping to replace a drive that supports tagged command queuing (TCQ), you replace it with a drive that also supports TCQ. Otherwise, a rescan may not detect that the drive has been swapped. Also, a system hang may occur if the replaced drive does not support TCQ and the system sends commands with tags to it. This problem will not occur if you swap drives while the server is down or while it is off.
- To minimize the possibility of data corruption, we recommend that when you replace a disk drive you use a new drive of the same capacity or larger.
- We recommended that you remove old or defective disk drives from the system as soon as possible. You must low-level format a removed drive before you can use it again.

Optimizing Array Performance

Your array controller may have a built-in, onboard Read/Write caching feature that allows faster data I/O to arrays controlled by the card. The Adaptec CI/O Management Software allows you to define cache values for optimizing the performance of a specific application.

Follow these steps to set caching options:

1. Click  to open the Storage Configuration window.

2. Right-click on the **Array** icon  and select **Optimize Performance** from the drop-down menu. The Optimize Performance dialog box appears, as shown in Figure 10-1.

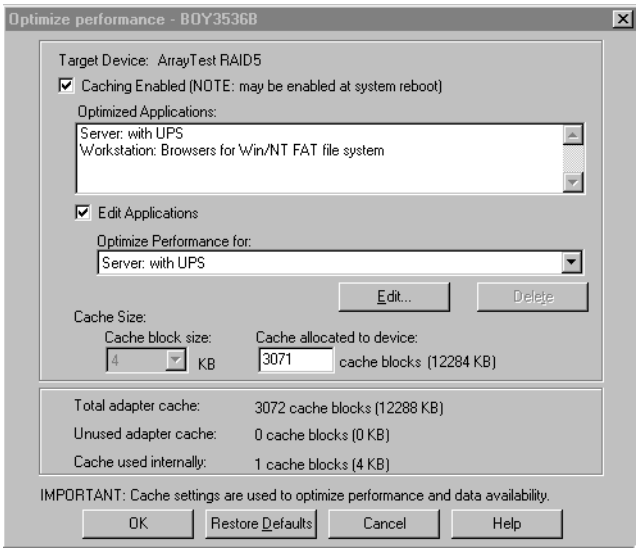

Figure 10-1. Optimize Performance Dialog Box

3. A list of Optimized Applications will appear. Each entry is prefaced by the word workstation or server, depending on its intended use. If you want to change the list of Optimized Applications, click the Edit Application check box. The **Optimize Performance for** list box, the Edit button and the Delete button appear.

4 Select the desired entry from the list. All applications optimized by this setting will appear in the Optimized Application list box.

5 Select **Caching enabled** to enable caching on this array. When you enable caching, Adaptec CI/O Management Software assigns default values to the Read and Write Cache.

6 Click the **Edit** button. The Performance Setting dialog box appears, as shown in Figure 10-2.

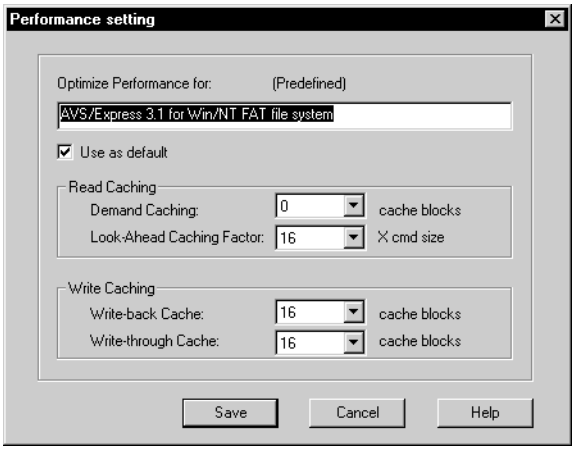

Figure 10-2. Performance Setting Dialog Box

Note: If you open a performance setting that has been designated as read-only, you will only be allowed to select or deselect the **Use as default** checkbox**.** However**,** you can create a new performance setting under a different name with complete access to all parameters.

7 To create a new setting, enter a new name for the performance setting in the *Optimize Performance for* Edit box.

8 Click the **Use as default** checkbox if you want to use this setting as the default when creating a new array.

9 Select the desired Read and Write Caching settings. (See *Read Caching* on page 10-11 and *Write Caching* on page 10-12.)

10 Click **Save** to save the new performance setting. The changes are not written to disk until you exit the application. If a new performance setting has been successfully created, it will appear in the *Optimize Performance for* list box.

11 When the Optimize Performance dialog box displays, click **OK** to save your changes.

Read Caching

There are two types Read caches: the Demand Cache and the Look-ahead Cache. Options for these caches can be adjusted separately for each array.

- **Demand Caching**— this defines the maximum Read command size (stated as a number of data blocks) that will be cached. Demand Caching can greatly improve I/O performance if your application typically reads data and then reads it again soon afterwards. For example, if Demand Caching is set to 4 blocks and the operating system issues a Read command for 4 blocks of data, all of the demand data is cached. however, if the operating system issues a Read command for 5 (or more) blocks of data, none of the demand data is cached.
- **Look-ahead Caching Factor**— this factor is a multiplier to the command size that defines the maximum number of data blocks that will be stored in the Look-ahead Cache in addition to the amount of data requested by the Read command. Look-ahead caching can greatly improve I/O performance if your application typically reads data in sequential blocks. For example, if the Look-ahead Caching factor is set to 16 and the operating system issues a Read command, the demand data is cached if the command is less than or equal to 4 blocks, and the next (sequential) 16 x 4 blocks of data is stored in the Look-ahead Cache.

Write Caching

There are two Write caches: the Write-back Cache and the Write-through Cache. Options for these caches can be adjusted separately for each array.

- **Write-back Caching**— this option defines the maximum Write command size (stated as a number of data blocks) that will be cached in the Write-back Cache. When the Write command is issued, the data is quickly written to the cache and a write completed status is sent to the host system. When the buffer is needed or when there is free time on the bus, the data is written from the cache to the disk. For example, if Write-back Caching is set to 4 blocks and the operating system issues a command to write up to 4 blocks of data, the data is stored in the Write-back Cache until it can be written to disk. However, if the operating system issues a Write command for 5 (or more) blocks of data, nothing is stored in the Write-back Cache and the data is instead written immediately to the disk.

  

  Caution: It is possible for data to be lost if the power to the system is interrupted while the data is in the Write-back Cache, before it is written to disk. To avoid this risk, set this parameter to zero. If you use Write-back Caching, we recommend that you back up your system data regularly and, if possible, utilize a uninterrupted power supply (UPS).

- **Write-through Caching**— this is the same as Write-back Caching except that the data is immediately transferred from the cache to disk before sending the status to the host system. The Write-through Caching setting defines the maximum Write command size beyond which the write data will not be cached at all but instead written immediately to disk. With write-through cache the data is written to disk and also stored in the cache. This enables faster I/O performance if the application needs to read the data that was recently written. The Write-through Caching setting must always be greater than the Write-back Caching setting.

Other Performance Tips

- If your array controller has multiple channels, you may be able to achieve better sequential data access when creating large arrays on powerful, high-end servers if some array members are connected to each channel.
- The array management software and drivers allow you to use disks of various sizes and makes in the same array. To achieve the best performance, however, we recommend that you use disks of the same capacity and same model in an array. (If you use drives of different sizes, the amount of capacity actually used on each disk will be equivalent to that of the smallest disk in the array: For example, if you use five 1-GByte drives and one 500-MByte drive, only 500 MBytes on each disk will be used.)
- You can also optimize array performance by selecting a RAID level for the array that best meets your needs for data reliability, read/write performance, and capacity use. See the following section for more information.

Selecting a RAID Level for an Array

The term RAID means Redundant Array of Independent Disks. An array is a grouping of disks that, by means of array management software, appears to the computer's operating system as one large disk. Part of the storage capacity of most kinds of arrays contains redundant information about the user data on the array[1]. If an array disk fails, the contents of the disk can be regenerated on a new disk from the redundant information on the other array disks.

Note: It is strongly recommended that you consistently and regularly backup your disk array to tape so that you may recover your data due to failure events other than disk drive failure.

Compared with single disks, arrays can provide one or more of these desirable properties:

- Improved Read and Write performance by striping data across the disks in the array. This allows data to be read from or written to two or more disks simultaneously.
- Improved data reliability by storing redundant data to regenerate a failed array disk, as described above. This is especially important for servers, where arrays are most often used to store large amounts of mission-critical data.
- Improved capacity utilization by allowing you to manage a large number of disks as if they were one large disk. This makes it easier to back up data, create directories, etc.

All disks of an array (including spares) must be connected to the same array controller, though they can be connected to different channels. You can create dedicated spare disks for each RAID 1, RAID 0/1, and RAID 5 array. You can also create a pool of spares that can be used by any RAID 1, RAID 0/1, or RAID 5 array on the array controller.[2]

[1] RAID 0 arrays, which do not store redundant data, are an exception to this definition.

[2] A disk in a spare pool can only be used to replace a failed disk in an array if it is at least as large as the smallest disk in the array.

The array management software and firmware support RAID 0, RAID 1, RAID 0/1, and RAID 5 arrays. The advantages, disadvantages, and requirements of these RAID levels are as follows:

RAID 0 Arrays
Maximum Disks Allowed: 16[1] (or as allowed by your controller)
Minimum Disks Allowed: 1[2]

In a RAID 0 array, data is distributed, or striped, across the disks in the array. The capacity of the array is approximately equal to the combined capacity of the physical disks. The I/O performance of a RAID 0 array is much better than that of a single physical disk because multiple reads and writes can be handled in parallel and because when large files are accessed the striped data is retrieved simultaneously from several disks.

RAID 0 arrays do not store redundant data and therefore are not true RAID applications. If one disk fails, the entire array fails and all data is lost. This means that the fault tolerance of a RAID 0 array is less than that of any single disk in the array. The term RAID 0 is widely used for these arrays, however, because they are conceptually similar to true RAID applications.

RAID 1 Arrays
Maximum Disks Allowed: 2
Minimum Disks Allowed: 2

RAID 1 arrays use a single pair of disks. They are called mirrored arrays because both disks in the pair contain the same data. When data is written to a RAID 1 array it is written to each disk in the pair. The read performance of a RAID 1 array can be much better than that of a single disk, while the write performance is slightly worse. Mirrored arrays are highly reliable because the data is still safe if one disk in the pair fails. They are more costly, however, because you get only one disk of actual storage capacity from the pair of disks.

---

[1] If the system has a single SCSI channel, the maximum would be 15 disks since no more than 15 drives could be installed in the system.

[2] One-disk RAID 0 arrays are used only to control the virtual device order of single disks.

RAID 0/1 Arrays
Maximum Disks Allowed: 16 (or as allowed by your controller)(must be an even number)[1]
Minimum Disks Allowed: 4

RAID 0/1 disks use from two to eight pairs of disks. They are called mirrored arrays because both disks in each pair contain the same data. The read and write performance of a RAID 0/1 array is much better than that of a single physical disk. RAID 0/1 arrays are highly reliable; the array data remains safe so long as at least one disk of each mirrored pair is good. Thus, in a 12-disk RAID 0/1 array, the array could continue working with up to six failed disks if one disk in each pair is still good. Because of the mirrored arrangement, RAID 0/1 arrays require twice as many disks as the actual amount of storage space.

RAID 5 Arrays
Maximum Disks Allowed: 16[2] (or as allowed by your controller)
Minimum Disks Allowed: 3

RAID 5 arrays contain redundant information in the form of parity data, which is calculated block-by-block for all user data. The parity data is distributed across all the disks in the array and occupies the equivalent capacity of about one disk. User data is interspersed with this parity data. If one disk in the array fails, its data can be reconstructed from the user data and parity data on the other disks. Two disks must fail before the entire array fails. The read performance of RAID 5 arrays is excellent and is comparable to that of a RAID 0 array. Write performance is slower than that of a RAID 0 array, because new parity data must also be calculated and written when user data is written.

[1] The maximum would be 14 disks if the system has a single SCSI channel.
[2] The maximum would be 15 disks if the system has a single SCSI channel.

A

Configuration Settings

This appendix describes the configuration variables that control the appearance of the Adaptec CI/O Management Software user interface and the way in which array and system operations are carried out. The variables controlling the user interface appearance are in the Windows NT registry. The other variables are defined in the *iomgr.ini*. and *cioams.ini* files

Many of the variables are configured for you once you install the software or start the program. If you are an advanced user and you want to customize your settings, you can edit the variables in the NT registry, or you can open *iomgr.ini* in a text editor and manually make changes.

I/O Manager Settings

The I/O Manager is the portion of the CI/O Management Software which runs on the target system. The I/O Manager provides the run-time intelligence to detect device failures, locate schedules to be run, and send event notifications to clients.

The behavior of the I/O Manager may be changed by entries in the *iomgr.ini* file.

[ASPIMODEL] DisableASPI = [Yes | No]

I/O Manager options for management of Adaptec SCSI host adapters are configured by certain entries in the standard I/O Manager initialization file (iomgr.ini). The *iomgr.ini* file is located in the directory where you installed the Adaptec CI/O Management Software. For example, a section headed [ARRAYOPERATIONS] and the variables under each section are described below.

[ASPIMODEL] DisableASPI = [Yes | No]

This option disables all SCSI Manager functions. This option can be used for problem isolation in I/O Manager systems that support multiple product families (SCSI, RAID).

LoadSavedConfiguration= [Yes| No]

This option determines whether the ASPI Manager retains configuration information across I/O Manager invocations. The default value for backward compatibility is *Yes*. When set to Yes, the ASPI Manager will load the last known configuration each time the I/O Manager starts. When set to No, the ASPI Manager will rediscover all host adapters and devices.

DiscoveryInterval = n

This option configures the frequency (in seconds) that the Discovery phase is run. The default value is *1800* (30 minutes). System design prevents a Poll phase or a Statistics phase from being active when a Discovery phase is activated.

PollInterval = n

This option configures the frequency (in seconds) that the Poll phase is run. The default value is *180* (3 minutes). If a Poll phase is

activated when a Discovery phase is active, the Poll phase is delayed until the Discovery phase completes. System design prevents a Statistics phase from being active when a Poll phase is activated.

StatisticsInterval = n

This option configures the frequency (in seconds) that the Statistics phase is run. The default value is *10* (10 seconds). If a Statistics phase is activated when a Discovery phase is active, the Statistics phase is delayed until the Discovery phase completes. System design prevents a Poll phase from being active when a Statistics phase is activated.

TapeBusyTolerationTime = n

A tape drive may be legitimately busy for extended periods of time (e.g., during a retension operation). On some operating systems, the SCSI Manager has no way to tell the difference between a tape drive device failure and a legitimate temporary unavailability due to the tape drive being busy. This option configures the time (in seconds) that a tape drive may be considered legitimately busy. If a tape drive fails to respond for a period of time longer than the TapeBusyTolerationTime, then a device failed trap will be generated. The default value is *180* (3 minutes). Setting this parameter to zero eliminates special handling for tape drives.

Lun0Required = [Yes | No]

This option tells the SCSI Manager whether LUN 0 must be present before LUNs other than 0 will be checked. A setting of Yes requires that LUN 0 be present before non-zero LUNs will be checked. The default value is *No*.

Lun0Only = [Yes | No]

This option tells the SCSI Manager whether or not to check LUNs other than 0. A setting of Yes disables non-zero LUNs. The default value is *No*.

ErrorInstrumentation = [Yes | No]

This option, if Yes, enables the SCSI Manager to collect error related instrumentation from instrumentation capable drivers. The default value is *No*. If both this option and the IOInstrumentation option are

set to No, then the SCSI Manager will not check for instrumentation capable drivers.

IOInstrumentation = [Yes | No]

This option, if Yes, enables the SCSI Manager to collect I/O related instrumentation from instrumentation capable drivers. The default value is *No*. If both this option and the ErrorInstrumentation option are set to No, then the SCSI Manager will not check for instrumentation capable drivers.

ResetInstrumentationOnPowerup = [Yes | No]

This option tells the SCSI Manager whether or not to issue an Instrumentation Reset to each instrumentation capable driver when the SCSI Manager initializes. The default value is *Yes*, which enables Instrumentation Resets. If both the ErrorInstrumentation and the IOInstrumentation options are set to No, this option has no effect.

ResetInstrumentationOnDiscovery = [Yes | No]

This option tells the SCSI Manager whether or not to issue an Instrumentation Reset to each instrumentation capable driver when that driver is newly discovered. The default value is *Yes*, which enables Instrumentation Resets. If both the ErrorInstrumentation and the IOInstrumentation options are set to No, this option has no effect.

SMARTPolling = [Yes | No]

This option tells the SCSI Manager whether or not to verify if SCSI devices support Self Monitoring, Analysis, and Reporting Technology (S.M.A.R.T) and if so, to monitor them for S.M.A.R.T events. The default value is *Yes*, which enables SMART support.

SMARTTest = [Yes | No | testcount]

This option tells the SCSI Manager whether or not to enable the S.M.A.R.T. test mode. For debugging purposes, S.M.A.R.T. capable devices internally have a test bit which allow them to generate S.M.A.R.T. events even when the hardware is not having a problem. The default value is *No*, which does not enable any S.M.A.R.T. debug events. Choosing option Yes turns the S.M.A.R.T. debug bit on for all S.M.A.R.T. capable devices and leaves it on. Providing a count instead of Yes turns the S.M.A.R.T. debug bit on until the

number of test count debug events are seen; then the S.M.A.R.T. debug bit is turned back off. More than the requested count of debug events may be generated before the software can turn all debug events off. This option has no effect if S.M.A.R.T. is set to No.

ForceHAWide16 = [Yes | No]
ForceHAWide32 = [Yes | No]

These two options are used to override the information obtained from the operating system driver about whether or not host adapters support Wide SCSI. These switches are especially useful with older drivers that do not report to SCSI whether or not a host adapter supports Wide SCSI. The default value for both switches is *No*, which forces SCSI to rely upon operating system driver information. If ForceHAWide16 is set to Yes, then all host adapters are assumed to support at least 16-bit Wide SCSI. If ForceHAWide32 is set to Yes, then all host adapters are assumed to support at least 32-bit Wide SCSI.

If an operating system driver reports that a host adapter supports 32-bit Wide SCSI when ForceHAWide16 is set to Yes, then that host adapter will still be treated as a 32-bit Wide SCSI device. In other words, these switches may "widen" a host adapter, but will never make it "narrower" than what the operating system driver reports.

The switch values are only applied when a host adapter is discovered; if a host adapter already exists in the device database then these switches have no effect upon that host adapter or upon subsequently added devices. Therefore, the device database should usually be cleared after changing these switches.

Caution: Use these switches with care! If they are set incorrectly, and the host adapter if forced wider than it actually is, the system may attempt I/O to a SCSI ID which cannot exist. The results of doing so are unpredictable.

AccessibleDrivers = [* | comma delimited list of driver names]

This option controls which operating system drivers (and therefore which host adapters) will be managed by the SCSI Manager. The drivers are identified by the driver name returned when the SCSI Manager performs a host adapter inquiry. The names specified are inclusive – if a driver name does not appear in the list, then the SCSI Manager will ignore all host adapters which are accessed through that driver.

This option is especially useful when the I/O Manager includes multiple manager support, for example simultaneous SCSI and RAID host adapters. The SCSI Manager can be informed through this option to leave the management of the RAID host adapters to the RAID Manager. The option can also be used to inform the SCSI Manager to ignore any drivers that may cause problems, such as third party device drivers.

The * syntax is used to specify that all host adapters are accessible. If the line:

```
AccessibleDrivers = *
```

appears in the *.ini* file, then the SCSI Manager will manage all host adapters it discovers.

The comma delimited list of driver names specifies, by name, which drivers will be managed by the SCSI Manager. The names are treated as prefixes. For example, specifying a name of AIC will allow the SCSI Manager to manage all host adapters whose driver names begin with the three character sequence AIC. The name may be specified in as many characters as the user wishes, so that the list might specify either a family of drivers or a specific driver. The names specified are not case sensitive.

The default is to manage all drivers beginning with AIC and AHA (although the driver names vary somewhat from system to system). The default allows popular Adaptec host adapters, such as the AHA-1540 and AHA-2940, to be managed by the SCSI Manager. The default is equivalent to the .INI specification:

```
AccessibleDrivers = AIC, AHA, ADAPTEC AIC, ADAPTEC
AHA, ADPT  AIC, ADPT  AHA
```

Note that putting an asterisk anywhere in the names makes all the other names meaningless. The specification:

```
AccessibleDrivers = AIC, *
```

would cause all drivers to be accessible, not just AIC drivers.

Up to 100 drivers may be specified, and the maximum length of the string of driver names is 255 characters. The names specified in the AccessibleDrivers statement may differ on different operating system platforms.

Drivers are only checked for accessibility when a host adapter is discovered; if a host adapter already exists in the device database then this option has no effect upon that host adapter or upon subsequently discovered devices on the host adapter. Therefore, the device database should usually be cleared after changing this option.

[ARRAYOPERATIONS]

RecreatePriority=
This variable specifies the priority of the automatic Re-create operation. Valid values are Low, Medium, or High. The default is *Medium*.

VerifyIfDirty=
This variable specifies whether you want to start the Verify operation if the array is dirty (meaning that the array was not shut down properly). Valid values are Yes or No. The default value is *Yes*.

[SYSTEM]

PauseEnabled=
This variable specifies whether the Pause I/O capability is enabled or disabled. Valid values are Yes and No.

ServerLogSizeInMegabytes=
This variable is used to limit the size of the Server Log database file. The Server Log database will be truncated if it grows beyond the size specified by the parameter. The size can be specified in increments of 1 MByte, up to a maximum of 10 MBytes.

StatisticsCollectionInterval=

This variable specifies the interval at which system statistics will be collected, assuming that the driver supports statistics collection. Values must be entered as whole numbers. The default value is *1*.

WarnAfterFirstPFAEvent=

If set to Yes, this variable specifies that if S.M.A.R.T. events (PFA) are received from any drive the first event will be reported as a Critical event and all events after that will be reported as Warning events. If set to No, all S.M.A.R.T. events will be reported as Critical. The default is *Yes*.

[TASKS]

TestAllSpares=

This variable schedules the Test All Spares operation. These jobs are not written to the Scheduler Database and are scheduled every time *iomgr.nlm* (NetWare) or *iomgr.exe* (Windows NT) is started. Valid values are

- Yes,H—Starts test every hour on the hour. For example, TestAllSpares=Yes,H
- Yes,D,Time—Starts test daily at a specified time (military time format). For example, TestAllSpares=Yes,D,11:34. (The default value is to test all spares daily at 2:00 A.M.)
- Yes,W,Day of the week,Time—Starts test weekly at a specified day and time (Day of the week: 0=Sun, 1=Mon, 2=Tues., etc.). For example, TestAllSpares=Yes,W,2,11:34 (starts every week on Tuesday at 11:34).
- No—No tests are scheduled. For example, TestAllSpares=No.

[CAPABILITIES]

EnableRAID5=

This variable enables or disables the option of creating RAID 5 arrays. If it is set to No users cannot create RAID 5 arrays. Valid values are Yes and No. The default is *Yes*.

EnableRAID10=

This variable enables or disables the option of creating RAID 0/1 arrays. If it is set to **No** users cannot create RAID 0/1 arrays. Valid values are Yes and No. The default is *Yes*.

[ENCLOSUREMANAGER]

EnabledEnclosureInterfaces=SAF-TE

This specifies the enclosure management interfaces which are supported by CI/O. Currently only SAF-TE is supported.

SAF-TEPollingPeriodInSeconds=5

This is the polling frequency for SAF-TE in seconds. It is the interval at which the SAF-TE enclosure is polled to check for status of all elements of the enclosure like power supplies, fans, etc.

❒

B

SAF-TE Enclosure Management

Adaptec CI/O Management Software provides easy management of SAF-TE enabled enclosures. Enclosures that support SAF-TE provide a standard, non-proprietary way for third party disk and RAID controllers to be fully integrated with peripheral packaging that supports status signals (LED's, audible alarm, LCD, etc.), hot swapping of hard drives, and monitoring of enclosure components.

Adaptec CI/O Management Software periodically checks the status of all elements (disks, power supplies, temperature, fans, etc.) of all SAF-TE enclosures connected to SCSI controllers as well as RAID controllers and generates associated events. These events can be viewed through the Historic Log window and are reflected in the Adaptec CI/O Management Software GUI. Also, CI/O will take the following actions:

- **Reflecting the status on the enclosure**: CI/O will take the appropriate action such as changing the state of the LEDs on the enclosure and setting alarms when it detects statuses such as power supply failure or temperature out of range.
- I**nsertion/Removal of devices**: Insertion and removal of devices from the enclosure is detected. If the removed drive is a single disk, CI/O automatically starts the rescan operation. If the removed drive is an array member, CI/O automatically starts the array reconstruct operation if applicable, provided there is at least one dedicated spare or pool spare.

Viewing Enclosure Information

Follow these instruction to view information on an enclosure:

1. Click t  ter the Storage Configuration window.

2. Right-click the icon  enclosure you wish to view and select **Information** from the drop-down menu. The Information dialog box- Enclosure Information tab is displayed as shown in Figure B-1.

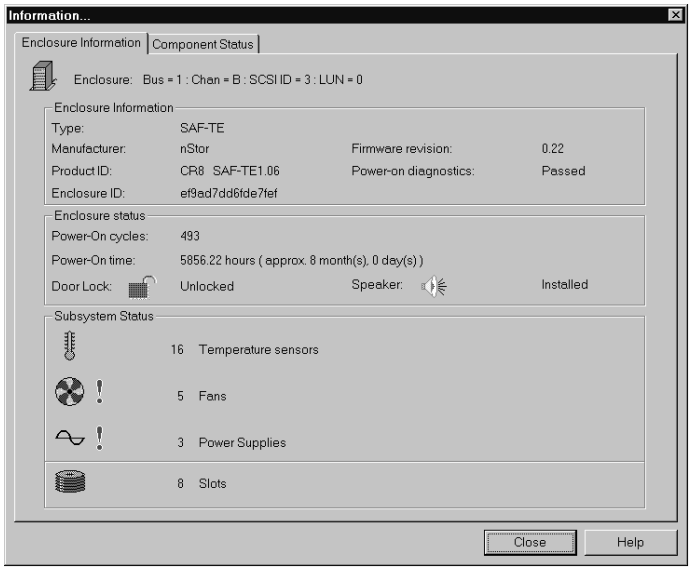

Figure B-1. Enclosure Information Dialog Box

The following information is displayed within the dialog box. (If an enclosure subsystem component has a problem, the symbol  is displayed next to the icon of that component.)

- **Enclosure** —displays the channel, SCSI ID, and LUN associated with the enclosure.
- **Enclosure Information**—displays the type, manufacturer, Product ID, and Enclosure ID.
- **Enclosure Status**—displays the following information specific to the selected enclosure:

  Power-On Cycles—displays the number of times and total cumulative time the enclosure has been powered on.

  Power-on time—displays Power-on time in hours, months and days.

  Door Lock—displays the door lock status as follows:

  Locked 

  Unlocked 

  Not Installed 

  Unknown 

  Speaker —displays the speaker status as off or on

  Alarm —displays the alarm status as off or on

- **Subsystem status** —displays the following information:

  Temperature Sensors—displays the number of temperature threshold sensors that can report an actual temperature reading and temperature threshold.

  Fan —displays the number of fans reported by the enclosure.

  Power Supplies—displays the number of power supplies reported by the enclosure.

  Slots—displays the number of slots reported by the enclosure.

The following section explains the information that appears when you click the Component Status tab on the Enclosure Properties dialog box.

Viewing Subsystem Status Details

To view detailed information on temperature sensors, fans or power supplies, click the **Component Status** tab in the Information dialog box as shown in Figure B-2.

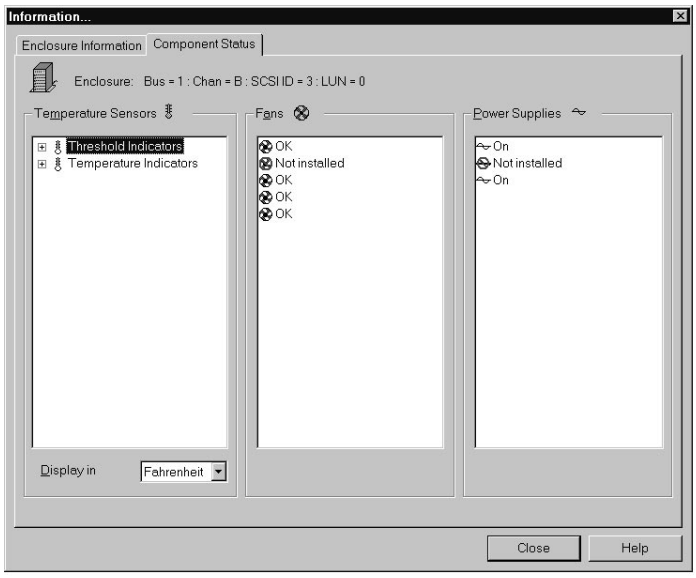

Figure B-2. Component Status Dialog Box

Temperature Sensors

The status of the temperature sensors in the enclosure is displayed in the Temperature Sensors list box. Adaptec CI/O Management Software supports both threshold indicators and temperture indicators. If the enclosure contains at least one temperature indicator, the actual temperature is displayed. If the enclosure contains a threshold indicator, a reading of Within Range or Out of Range will be displayed for each present indicator. If the temperature is out of normal range, the temperature indicator icon will be displayed with a red exclamation mark next to it.

Note: Not all enclosure temperature sensors are supported by Adaptec CI/O Management Software.

Fans

The status of the fans in the enclosure is displayed in the Fans list as follows:

 OK

 Malfunctioning

 Not Installed

 Unknown

Power Supplies

The status of the power supplies in the enclosure is displayed in the Power Supplies list, as follows:

 On (black icon)

 Off (black icon)

 Bad state on (red icon)

 Bad state off (red icon)

 Installed (status not reported)

 Not installed

Identification of Events

The Adaptec CI/O Management Software identifies events related to each SAF-TE enclosure. Each enclosure is identified by a unique address (bus/host adapter, channel, SCSI ID, and LUN). This address is specified for all events logged for that particular enclosure to allow easy identification of the enclosure.

Events for SAF-TE Enclosures

The following is a list of events that may be generated for SAF-TE enclosures:

1. ***Enclosure found [SAF-TE : unique address]***— Posted for each found and successfully initialized SAF-TE enclosure, an event identifying the unique address is generated.
2. ***Enclosure not responding [SAF-TE : unique address]***— Posted for each unrecoverable error that occurred when communicating with a SAF-TE enclosure. Adaptec CI/O Management Software will stop polling this device until communication is recovered. On recovery, monitoring of this device will start automatically.
3. ***Enclosure removed from bus [SAF-TE : unique address]***— Posted when an enclosure device is removed from the bus (for example, it was physically removed, power was switched off, etc).
4. ***Device id=SCSI_ID slot#=slot_ number inserted [SAF-TE : unique address]***— When a device is inserted into a SAF-TE enclosure slot, this event is posted. Adaptec CI/O Management Software will automatically perform a rescan on the controller to which the SAF-TE enclosure is attached.
5. ***Device id=SCSI_ID slot#=slot_number removed [SAF-TE : unique address]***— Posted when a device is removed from a SAF-TE enclosure slot. If the removed drive is SINGLE, Adaptec CI/O Management Software will automatically perform a rescan. If the removed drive is an array member, Adaptec CI/O Management Software will automatically start a reconstruct, provided there is at least one dedicated or pool spare.

6 For each change in the status of a cooling fan or temperature, the following events indicating the new status may be posted:

a ***Fan #fan_number is malfunctioning [SAF-TE : unique address]***

b ***Fan #fan_number is removed [SAF-TE : unique address]***

c ***Fan #fan_number is in an unknown state [SAF-TE : unique address]***

d ***Temperature is out of normal range, sensor #sensor_number [SAF-TE : unique address]***

e ***Overall Temperature is out of normal range [SAF-TE : unique address]***

Adaptec CI/O Management Software attempts to spin up all other fans to maximum capacity to avoid possible overheating. As a result of this action the following two events may be posted:

- ***Fans are running at maximum capacity [SAF-TE : unique address]***
- ***Fan speed increase to maximum capacity has failed [SAF-TE : unique address]***

This notification may sometimes be followed by a "SCSI error" event containing SCSI-specific information. The "SCSI error" event is posted because the SAF-TE enclosure does not support some of the SAF-TE-interface commands. This situation does not require any intervention by the user.

f ***Fan #fan_number is operational [SAF-TE : unique address]***

g ***Overall temperature is in normal range [SAF-TE : unique address]***

CI/O attempts to slow down cooling fans. As a result of this action the following two events may be posted:

Fans are running at half capacity [SAF-TE : unique address]

Fan speed decrease to half capacity has failed [SAF-TE : unique address]

This notification may sometimes be followed by a "SCSI error" event containing SCSI-specific information. The

"SCSI error" event is posted because the SAF-TE enclosure does not support some of the SAF-TE-interface commands. This situation does not require any intervention by the user.

7 For each change in the status of the power supplies connected to the enclosure, the following events indicating the new status may be posted:

   a ***PowerSupply #power_supply is operational and OFF [SAF-TE unique address]***

   b ***PowerSupply #power_supply is operational and ON [SAF-TE unique address]***

   c ***PowerSupply #power_supply is malfunctioning and OFF [SAF-TE unique address]***

   d ***PowerSupply #power_supply is malfunctioning but ON [SAF-TE unique address]***

   e ***PowerSupply #power_supply is present [SAF-TE unique address]***

   f ***PowerSupply #power_supply is not present[SAF-TE unique address]***

   g ***PowerSupply #power_supply is in unknown state[SAF-TE unique address]***

8 For each change in the status of the door lock of the enclosure, the following events indicating the new status may be posted:

   a ***Door is locked [SAF-TE unique address]***

   b ***Door is unlocked [SAF-TE unique address]***

   c ***Speaker is present [SAF-TE unique address]***

   d ***Speaker is not present [SAF-TE unique address]***

9 CI/O will set LED states of devices located inside enclosures in the following cases:

   – Drive failed (failed drive is identified)

   – Predicted Fault (identifies the drive for which PDF event was received)

   – Unconfigured drive (identifies an unconfigured drive)

Events for Devices Connected to RAID Boards

The following events are for devices connected to RAID Boards only. This information is optional depending on the enclosure implementation

- Array rebuilding (all members of an array being rebuilt are identified)
- Array off-line (all members of an off-line array are identified)
- Critical array (all members of a Critical array are identified)
- Array is being verified (all members of array being verified are identified)
- Rebuild failed (all members of array for which rebuild failed are identified)

❒

▼▼▼▼ Glossary

Using the Glossary

This glossary contains terminology used in the Adaptec CI/O Management Software User's Guide. Terms specific to CI/O will be designated as follows:

This icon indicates a term as defined in CI/O.

A

adapter, array
Similar to an I/O adapter, but includes additional hardware to facilitate array operations.

adapter, I/O
A bus-based hardware device that converts between the timing and protocol of a host's memory bus and that of an I/O bus. *See also* **Bus Controller**.

agent
A program that mediates between the client and the server.

array
Two or more disks grouped to appear as a single disk to the host system. *See also* Container.

array resources
Arrays and spares defined by Adaptec CI/O Management Software.

auto-initialize
A command that allows you to create an array but initialize it at a later time.

availability
The ability of a system to provide its services continuously, with little or no down time. RAID offers higher storage

availability through the use of data redundancy, so that data remains available even in the event of a disk failure.

B

blink
A command which blinks the drive lights of all of the disks in a selected array or of the single selected disk.

bootable array
An array configured as the boot device.

bridge controller
Connects a Fibre channel-to-SCSI or SCSI-to-SCSI external intelligent RAID array controllers to bridge the host I/O interface to multiple backend device channels.

bus
A set of conductors which connect the functional units in a computer.

C

CI/O
Stands for Comprehensive Input/Output. Refers to Adaptec's CI/O Array Management Software.

cache
An intermediate storage area providing faster access for some portion of data.

capacity
The total usable disk space available in an array, in MBytes.

channel
Any path used for the transfer of data and control information between storage devices and a storage controller or I/O adapter.

clustering
The concept of using independent computer systems working together as a single logical system. Clustering is usually implemented to address both availability and scalability.

compatible container
Containers created by FAST that are one of the RAID types that CI/O recognizes (and can display) but cannot fully manage.

controller, storage
In contrast to I/O Adapters, Storage Controllers provide additional functions such as RAID support and caching. The term is often used to refer to an Adapter with an on-board microprocessor which can process I/O commands.
In practice, used interchangeably with Adapter.

D

dedicated spare
A spare disk which automatically replaces failed array members *only* for the array it is dedicated to.

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

discovery
The process by which information about a system or subsystem is obtained.

disk
A physical disk drive on a SCSI bus.

disk ID
Consists of the bus number, SCSI ID, and LUN, for example, 1:04:0. *See also* **bus; LUN; SCSI ID.**

DMI
Stands for Desktop Management Interface. A standards-based approach to managing PC systems.

E

enclosure
A physical housing for disks, which can be connected internally or externally to a computer. An enclosure usually contains one or more power supplies, fans, and temperature sensors.

enclosure ID
Consists of the bus number, SCSI ID, and LUN, for example, 1:04:0. *See also* **bus; LUN; SCSI ID.**

enclosure management device
See **enclosure**.

event log
A file used to maintain information about controller activities or errors.

event notifications settings
Determines how you are notified of events that occur on systems to which Adaptec CI/O Management Software is connected.

expand
Increasing the capacity of an array by adding one or more disks. See also **Migrate**.

F

failover
The automatic replacement of a failed system component with a properly functioning one. Most often used in the context of redundant external array controllers. If one of the controllers fails, failover enables the second controller to take over the failed controller's I/O load.

fault tolerant
The ability of a system to keep working in the event of hardware or software faults. Fault tolerance is usually achieved by duplicating key components of the system.

fault tolerant arrays
Arrays which have duplicate components (RAID 0/1, RAID 1, and RAID 5).

file system
(a) An operating system layer that provides support for processes to create, access, and organize files and directories or storage devices. (b) a layer of software that manages a collection of files within a directory structure.

first virtual device
A device with a virtual device order #0. This device is the boot device of the system. *See also* **virtual device order**.

forcing a spare
A command which forces a spare to replace a specific disk in an array.

H

hot-swap
To remove a component from a system and install a new component while the power is on and the system is running.

I

initialized array
An array which is ready for data read and writes.

L

legacy disk
Definition to be provided.

Logical Unit Number
See **LUN.**

low-level format
A low-level format completely cleans any data off of the drive.

logical device
A device which does not exist until configured by Adaptec CI/O Management Software.

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

M

metadata
The location information for the user data that is indexed and stored by the file system.

MIB
Stands for Management Information Base. Contains the language definition, location of information, and commands for an entity managed by SNMP.

MIF
Stands for Management Information Format. The management interface for an entity managed by the Desktop Management Interface (DMI).

mirroring; mirrored array
Synonym for RAID 1. Full redundancy is obtained by maintaining identical copies of data on two or more disks. Mirroring provides fault tolerance, with a minor performance penalty.

monitoring
The process of receiving, displaying, and logging system events.

O

offline array
An array which is not responding.

offset
The distance from the beginning of a disk to the start of a partition.

online capacity expansion
The incremental expansion of a RAID container/array with no down time and while still retaining all of the attributes of the original container/array (RAID type and performance)

P

parity
In RAID, a form of redundancy used to recreate the data of a failed drive in a disk array. Used in RAID levels 2, 3, 4 and 5.

password time-out options
Options that allow you to control the way in which users are prompted to enter the system's Adaptec CI/O Management Software password when they issue commands to change a server's array configuration.

pause I/O
The temporary suspension of input/output on a channel.

physical resources
The AAC Family Adapter products, channels, and SCSI devices installed in the server.

physical view
A view showing physical devices such as SCSI disks, CD-ROMs, and enclosures.

poll
A validation of discovery information.

pool of spares
See **spare pool**.

R

RAID
Acronym for Redundant Array of Independent/Inexpensive Disks. Coined in 1987 by researchers at the University of California at Berkeley to describe a set of disk array architectures that provide fault-tolerance and improved performance.

RAID-0
An array where data is distributed, or striped, across the disks in the array.

RAID-1 (mirrored)
An array which uses a single pair of disks. Both disks in the pair contain the same data.

RAID 0/1 (mirrored)
Array which use from two to eight pairs of disks. Both disks in each pair contain the same data.

RAID-5
Arrays which contain redundant information in the form of parity data. The parity data is distributed across all the disks in the array and occupies the equivalent capacity of about one disk. User data is interspersed with this parity data.

reconstruction
The regeneration and writing onto one or more replacement disks of all of the data from a failed disk in redundant RAID array. Reconstruction is usually performed in the background, while applications are accessing data in the array.

redundancy
Maintaining duplicates for any given component in a system, so that the system can automatically replace a failed component with a working substitute. A parity RAID array's

members are redundant, since surviving members may collectively replace the data from a failed disk.

referential integrity
A set of constraints on the references between objects in a system meant to assure consistency; the state of such consistency.

replication
The process of copying and synchronizing object information across nodes. Provides fault tolerance and faster (local) access.

rescan
The process of updating the current screen to show all resources.

RPC
Stands for Remote Procedure Call. A message passing facility that allows a distributed application to call services available on various machines in a network. Used during remote administration of computers.

S

SAF-TE
Stands for *SCSI Accessed Fault-Tolerant Enclosure*. See **enclosure.**

scalability
The ability of a system to expand capacity through the addition of resources, without requiring a radical change to the system structure or encountering a severe constraint.

SCSI Device ID
See **SCSI ID.**

SCSI ID
The number assigned to each SCSI device attached to a SCSI bus. *See also* **bus; disk ID.**

Simple Network Management Protocol (SNMP)
The network management protocol of TCP-IP.

slot
A receptacle in an enclosure for housing a SCSI device, typically a disk.

S.M.A.R.T
Stands for Self-Monitoring Analysis and Reporting Technology. Hard drives that support this technology continually analyze their performance and generate an alert if they determine that the disk is likely to fail in the next few hours.

spare pool
A pool of multiple disks which automatically replace failed disks on *any* array on the controller.

stand-alone disk
A disk that is *not* part of an array.

stripe set
A container made up of two or more equal-sized partitions that reside on different disks. The stripe set distributes, or stripes, data evenly across its respective disks.

stripe set of mirror sets
A multilevel container created from two or more equal-sized mirror sets.

stripe size
The size that will be used to stripe data or parity information across the disks in the array.

striping, disk; striped array
Spreading data over multiple disks to enhance performance. Often referred to as RAID 0, simple data striping provides no redundancy scheme, and is not technically a standardized RAID lever.

subsystem
The collection of software and hardware that controls storage to be managed and monitored.

T

target ID
See **SCSI ID.**

task
An actively running process such as disk format or array verification.
An operation that occurs only on the controller, asynchronous to all other operations. For example, scrub container, clear disk, and create file system are tasks done on the controller.

V

verify
The process of checking the integrity of redundant data stored on fault-tolerant arrays.

virtual device
Arrays and spares which do not exist until they are configured on the server with Adaptec CI/O Management Software.

virtual device order
The sequence in which the server's operating system detects the arrays, single disks, and other devices connected to the AAC controller when the server boots.

volume
A storage device that is formatted to contain files and directories. A single physical volume may be divided into more than one logical volume. See **Partition**.

volume set
An array made up of one or more partitions on one or more disks.

W

warning threshold temperature
The user-specified temperature limit above which the FAST Utility displays a warning in the **Enclosure view** window, the **Enclosure Properties** dialog box, and the **Enclosure Fans**, **Temperature Sensors and Power Supplies** dialog box.

Z

zero
See **Clear** (2).

❒

▼▼▼▼ Index

A

Aborting a running activity 8-5
Activity
  scheduling 8-2
  viewing activity queue 8-4
Adaptec CI/O Management Software
  starting 3-2
Adaptec CI/O management software 12, 19
Adding a dedicated spare 5-14
Adding a new server address 3-2
Array
  blinking drive lights 7-7
  bootable, creating 5-9
  creating ??–5-9
  critical status 10-2
  deleting 5-10
  initializing 5-11
  off-line status 10-6
  optimizing performance 10-9
  pausing I/O to 7-5
  reactivating when off-line 7-8
  reconstructing 7-2
  renaming 7-8
  size of disks 10-13
  verifying 7-6
  viewing information for 6-3
Array performance
  optimizing 10-9
autoexec.ncf 20

B

Bootable array
  creating 5-9

C

Changing an activity's priority 8-5
Changing filter options 3-10
Channel information
  viewing 4-8, 6-10
Choosing notification settings 3-12
Client machine 12
Communications module 18
Controller information
  viewing 6-8
Conventions, formatting 1-3
Creating a boot array 5-9
Creating an array ??–5-9
Critical status
  responding to 10-2

D

Dedicated spare
  adding 5-14
  deleting 5-17
Deleting a scheduled activity 8-5
Deleting an array 5-10
Device icons 4-3, 6-2
Downing a disk drive 7-13
Drive light
  blinking for array 7-7
  blinking for device 7-12
  blinking for spare 7-11

E

Entering and viewing options settings 3-10, 3-18

Event notifications
  setting options for 3-10, 3-18
  severity levels 3-17

F

Filter options, changing 3-10
Forcing a spare 7-9

G

Guest access 9-5

H

Hot swapping 7-3

I

.ini files A-1
I/O Manager
  settings A-2
Icons 4-3, 6-2
Initializing an array 5-11
Installation
  Adaptec CI/O management software 12, 19
  software on remote client 12
iomgr.ini A-2

M

Monitoring an activity 8-4

O

Off-line array
  reactivating 7-8
Off-line status, responding to 10-6
Optimizing array performance 10-9

P

Parity
  verifying for array 7-6
Password 9-1
  changing 9-2
  guest access 9-5
  time-out options 9-3
Password authorization 9, 17, 18, 21
Pausing/Resuming I/O
  to a device 7-13
  to an array 7-5
Preferences dialog box 3-10, 3-18

R

RAID level
  RAID 0 10-15
  RAID 0/1 10-16
  RAID 1 10-15
  RAID 5 10-16
  selecting 10-14
Reactivating an off-line array 7-8
Reconstructing an array 7-2
Recreate operation A-7
Remote client 12
Renaming an array 7-8
Rescanning the server 4-9, 6-6
RPCSTART 20
Running activity
  aborting 8-5

S

Scheduler dialog box 8-2
Scheduling a new activity 8-2
Scheduling options
  setting 8-2
SCSI adapter
  viewing information 4-6
SCSI device
  blinking drive lights 7-12
  pausing I/O to 7-13
  viewing information 4-4, 6-6
Server address
  adding 3-2
Server events

viewing a list of 3-7
Server Historic Event Log
changing filter options 3-10
notification settings 3-12
Server information
viewing 3-15
viewing and editing 3-5
Server, scanning 6-6
Spare
viewing information for 6-5
Spare pool
creating 5-14
deleting disk from 5-17
Spare, dedicated
deleting 5-17
Spare, forcing 7-9
Spares
testing 7-10

T

TCP/IP 12
Test all spares operation A-8
Testing all spares 7-10
TIRPC communications module 18

V

Verifying an array 7-6, A-7
Viewing a list of server events 3-7
Viewing array information 6-3
Viewing channel information 6-10
SCSI adapters 4-8
Viewing controller information 6-8
Viewing historical server information 3-15
Viewing SCSI adapter information 4-6
Viewing SCSI device information 4-4, 6-6
Viewing spare information 6-5
Viewing/editing server information 3-5