SUPERMICRO
RAID Port Manual

- **Adaptec®ARO-1130CA/SA RAIDport II™**

- **Adaptec®CI/O Array Management Software Guide**

1.0

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Part 1
Adaptec® ARO-1130CA/SA RAIDport II™

Section 1: Introduction

The Adaptec® ARO™-1130xA RAID*port* II™ Card provides powerful disk array support in personal workstations/servers with RAID*port* II on-board. ARO-1130CA is for workstations and ARO-1130SA is for servers.

This *Installation and Hardware Guide* explains how to install the ARO- 1130xA, run the *Array1000xA BIOS & Driver Selection Utility*, create the first array, and then install the supporting software.

System Requirements

The minimum system requirements for the ARO- 1130xA are

- A RAID*port* II on-board system with an available PCI/RAID*port* II slot

- A minimum of one SCSI hard disk drive

- A standard 168-pin, 16-, 32-, or 64-MByte, EDO 3.3v, 60ns or faster DIMM installed on the card. (See the Adaptec Web Site at *http:// www.adaptec.com/RAID* for a list of approved DIMMs and vendors.)

- Five MBytes of free hard disk space for the ARO- 1130xA software (five MBytes of free hard disk space on the Windows system disk are also required for the temporary files created during installation of the software)

- Windows NT™ Workstation 4.0 or higher for ARO-1130xA or Windows NT™ 4.0 Server, or Novell NetWare 3.12 or 4.11 for ARO-1130SA

- A 3.5-inch 1.44-MByte primary (boot) floppy disk drive
- 64 MBytes or more of system memory recommended for Windows NT Workstation/Server
- CD-ROM drive recommended for installation of Adaptec CI/O™ Management Software

Installation Overview

The steps involved in installing the ARO- 1130xA hardware and software are:

1. Locate the PCI RAID*port* II slot or expansion slot on the motherboard.

2. Install the ARO- 1130xA in the RAID*port* II on-board system.

3. Connect any additional SCSI devices to the RAID ready SCSI connectors on the motherboard.

4. Run Array 1000xA BIOS & Driver Selection utility.

5. Create the first bootable array using the Array*Config*xA^{TM} Utility (see **page 27**)

6. Install the Array1000xA driver for your operating system.

7. Install the Adaptec CI/O Management Software on your server/workstation

8. Install the Adaptec CI/O Management Software on your networked client (optional/**ARO-1000SA only**)

Note: Before proceeding with installation, review the *readme* file found on Disk 1 of the Adaptec CI/O Management Software for Windows NT diskettes, or the *readme* file on the *\winnt\disk1* directory of the Adaptec CI/O Management Software CD-ROM.

Section 2:
Installing the ARO- 1130xA
and Connecting SCSI Devices

This chapter explains how to install your hardware. To install the ARO-1130xA and devices, you must.

▪ Verify presence of DIMM memory

▪ Back up any existing data on drives to be used in array

▪ Install the ARO-1130xA in your system/server

ARO- 1130xA Layout

Figure 2-1 identifies the major ARO- 1130xA components. You may find it helpful to refer to this information while installing the ARO-1130xA.

DIMM Memory Socket
Must be populated with
a 168-pin EDO, 3.3v
DIMM

LED Connector
Connects to the computer's LED cable to
display activity on the SCSI bus

BIOS EPROM
Provides booting
capabilities from
a SCSI hard disk
or array

Bus Contacts
Inserted into the
PCI/RAID*port* II
expansion slot

**Expansion Slot
Bracket**
Secures the
RAID*port* II card
inside your
computer
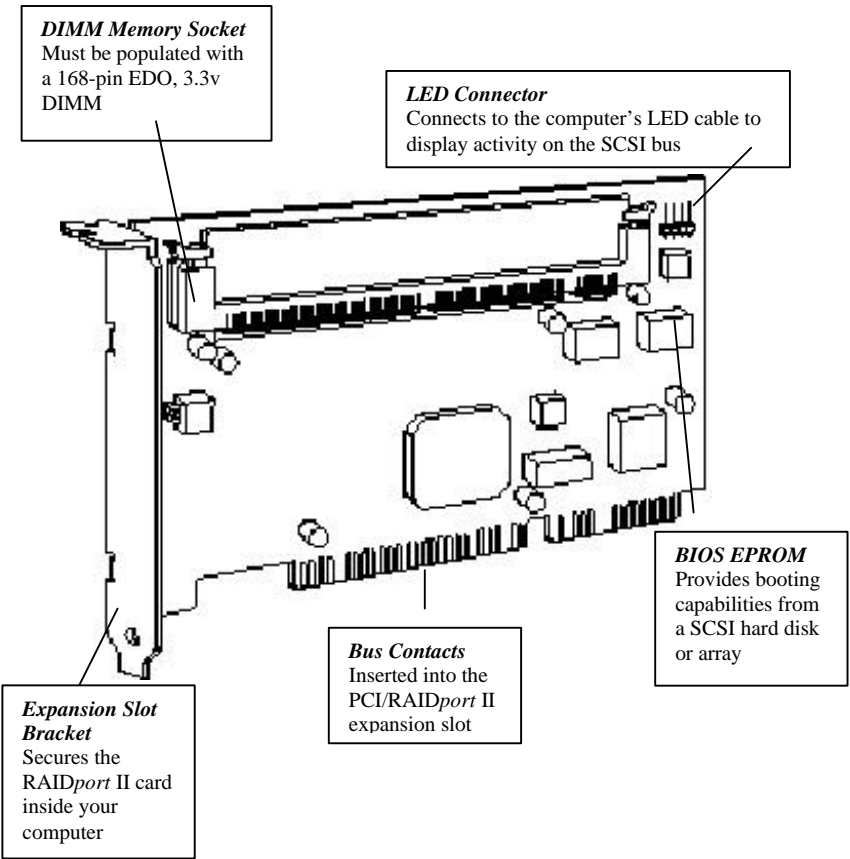
Figure 2-1: ARO-1130xA Major Components.

Verifying Presence of DIMM Memory

Before you can use the ARO- 1130xA, the DIMM memory socket must
be populated with a 168-pin, 16-, 32-, or 64-MByte, EDO 3.3v 60ns or
faster DIMM for ARO-1000xA, as shown in Figure 2-2. Install a
DIMM if one is not yet installed. (See the Adaptec Web Site at
http://www.adaptec.com/RAID for a list of approved DIMMs and
vendors.)
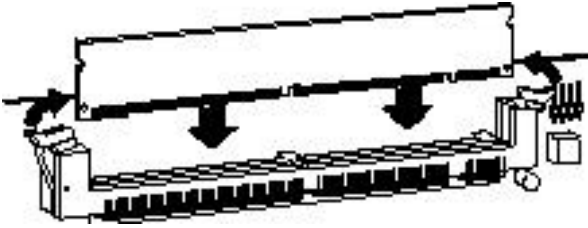
Figure 2-2: Installing a DIMM in the DIMM Memory Socket.

Installing the ARO- 1130xA

Follow these steps to install the ARO- 1130xA:

Note: If you are installing the ARO- 1130xA in an existing system that already has data, back up all data before continuing with installation. You can restore the data later, once your ARO- 1130xA arrays are created.

1. Turn OFF power to the computer, and disconnect the power cord.

2. Remove the cover from the computer case. (If necessary, refer to the instructions in your computer documentation.)

3. Locate the PCI/RAID*port* II expansion slot; unscrew and remove the expansion slot bracket that covers the card-slot opening.

4. Insert the ARO- 1130xA in the slot; press down firmly so that the bus contacts are securely seated in the slot. Secure the adapter bracket with the screw you removed in Step 3, as shown in Figure 2-3.

Expansion Slot Bracket Screw

Bus Contacts

RAIDport II Card Bracket

PCI Expansion Slots

RAIDport II Expansion Slot
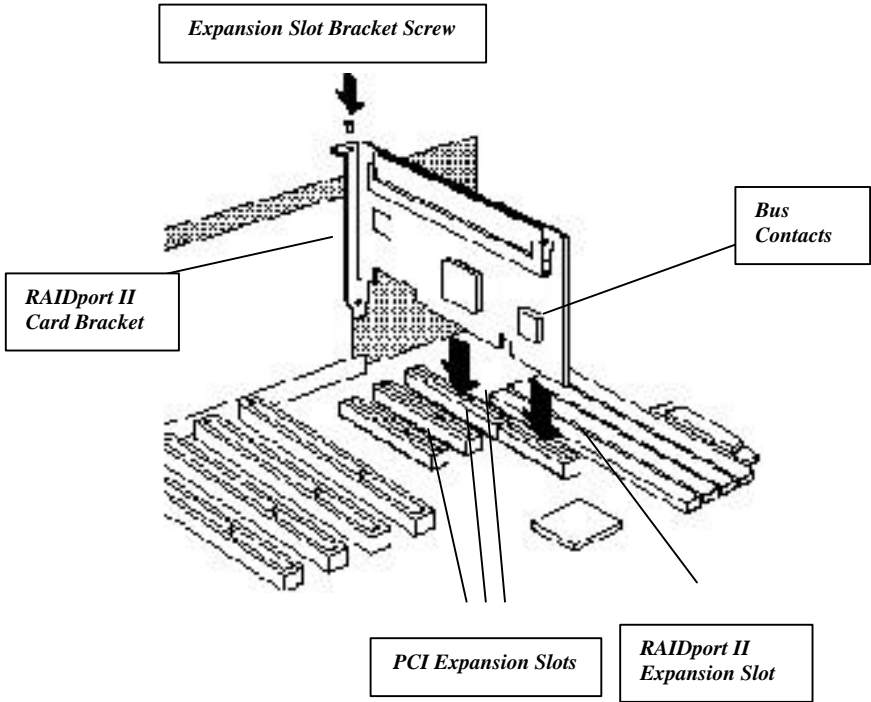
Figure 2-3: Installing the ARO-1130xA in a Typical PCI/RAIDport II Expansion Slot.

Connecting the LED Activity Indicator to the ARO- 1130xA

(*Optional feature*) An LED on the front panel of most computers lights to indicate non-SCSI hard disk activity. If you would like that LED to light whenever there is activity on SCSI channel A (controlled by ARO- 1130xA) instead, you must disconnect the LED cable from the motherboard and connect it to the LED connector on the ARO-1130xA. If the LED has a two-position cable, connect the cable to pins 1 and 2 of the LED connector, as shown in Figure 2-4.

If the ARO- 1130xA supports multiple SCSI channels, and you want the LED to light whenever there is activity on any of those channels,

refer to your motherboard documentation for instructions on setting the appropriate motherboard jumpers.

Note: If you are using non-SCSI disk drives (e.g., IDE), the LED may no longer indicate activity on these drives when you connect the LED cable to the ARO- 1130xA.
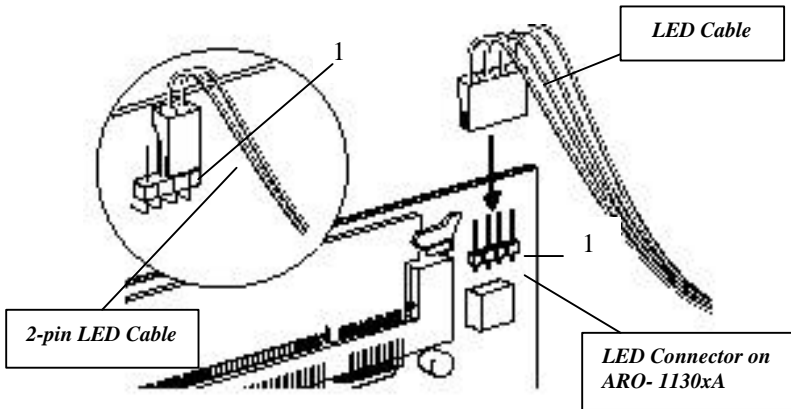
Figure 2-4: Connecting the LED Activity Indicator.

Completing the Installation

Once the ARO-1000xA is installed in your server/workstation, refer to the documentation that came with your computer and SCSI devices for specific instructions on setting up your SCSI devices and connecting them to the SCSI connectors on the motherboard.

Note: If you refer to the computer's documentation for installation instructions on running the Array1000xA BIOS & Driver Selection Utility and installing the software included in the package.

In most cases, it is not necessary to run the SCSI*Select*® utility. Should you need to configure SCSI options (e.g., ID, Parity Checking, and Termination), see **Section 4, page 21**, *Configuring* ARO-1130xA *with the SCSISelect Utility*.

Connecting SCSI Devices

The ARO- 1130xA supports both internal and external SCSI devices. Depending on the number of SCSI channels provided on the motherboard. Each channel supports up to 15 SCSI devices—either 16-bit devices alone or a combination of 16-bit and up to seven 8-bit devices.

Note: If you are installing your SCSI devices inside an array enclosure, see *Connecting SCSI Array Enclosures (Storage Subsystems)* on page 14.

Choosing SCSI Cables

To connect your SCSI devices, make sure you have the appropriate cable and connectors as described in the following table (see also *Cable Lengths* on **page 16** for additional information on cabling SCSI devices):

To Install…	You Will Need…
8-bit Internal SCSI Devices	• A 50-pin internal SCSI cable with enough connectors to accommodate all of your internal SCSI devices.
16-bit Internal SCSI Devices	• A 68-pin Ultra Wide internal SCSI cable with enough connectors to accommodate all of your internal SCSI devices.
8-bit External SCSI Devices[1]	• A 50-pin internal-to-external SCSI port expansion kit. • A 50-pin external SCSI cable for each device.
16-bit External SCSI Devices[1]	• A 68-pin Ultra Wide internal-to-external SCSI port expansion kit. • A 68-pin Ultra Wide external SCSI cable for each device.
Array Enclosure	• A 68-pin Ultra Wide internal-to-external SCSI port expansion kit. • A 68-pin Ultra Wide external SCSI cable.

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[1] Use only high-quality external cables with a single ended impedance range of 80-110 ohms.

Connecting Internal SCSI Devices

Follow these steps to connect internal devices:

1. Prepare each SCSI device for installation.

- Make sure each device (internal and external) is assigned a unique SCSI ID number from 0 to 15—no duplicate IDs are permitted on a channel. (See *SCSI ID Numbers* on **page 16** for additional information.)

- Install (or enable) the terminators on the internal device you are attaching to the end of the cable only. (See *SCSI Termination* on **page 17** for additional information.)

2. Install and mount each internal SCSI device in an available drive bay inside your computer. (Refer to your computer and device documentation for instructions.)

3. If you are connecting 8-bit internal SCSI devices, attach one end of the 50-pin cable to the 50-pin internal SCSI connector on the motherboard. If you are connecting 16-bit internal SCSI devices, attach one end of the 68-pin cable to the 68-pin internal SCSI connector on the motherboard. Figure 2-5 shows a typical installation of a 68-pin cable
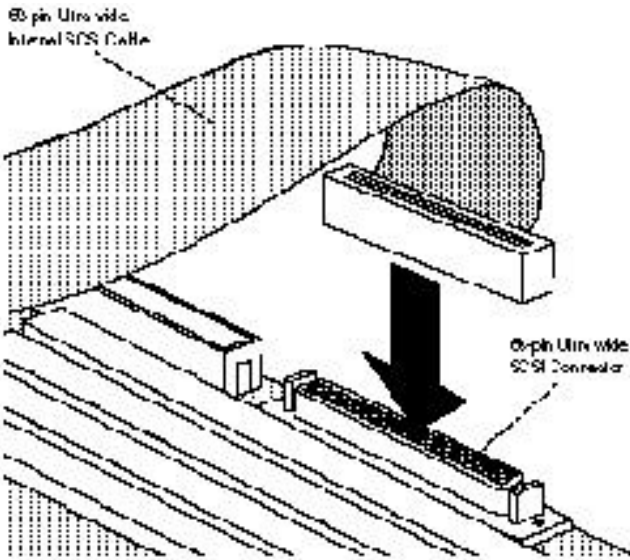
Figure 2-5: Attaching 68-pin Internal Ribbon Cable.

4. Attach the remaining connectors on the cable to the remaining
    internal devices.

5. Connect an available DC power cable (from your computer's power
    supply) to the power input connector on each SCSI device.

Connecting External SCSI Devices

To install external SCSI devices, you will first need to install an internal-to-external SCSI port expansion kit. The kit usually consists of a special cable that converts the internal SCSI connector on the motherboard to an external SCSI connector on the chassis of your computer. Refer to the expansion kit documentation for installation instructions. Figure 2-6 shows a typical installation of a 68-pin Ultra Wide internal-to-external cable.

68-Pin Ultra Wide External SCSI Connector

68-Pin Ultra Wide Internal-to-External SCSI Cable

68-Pin Ultra Wide Internal SCSI Connector
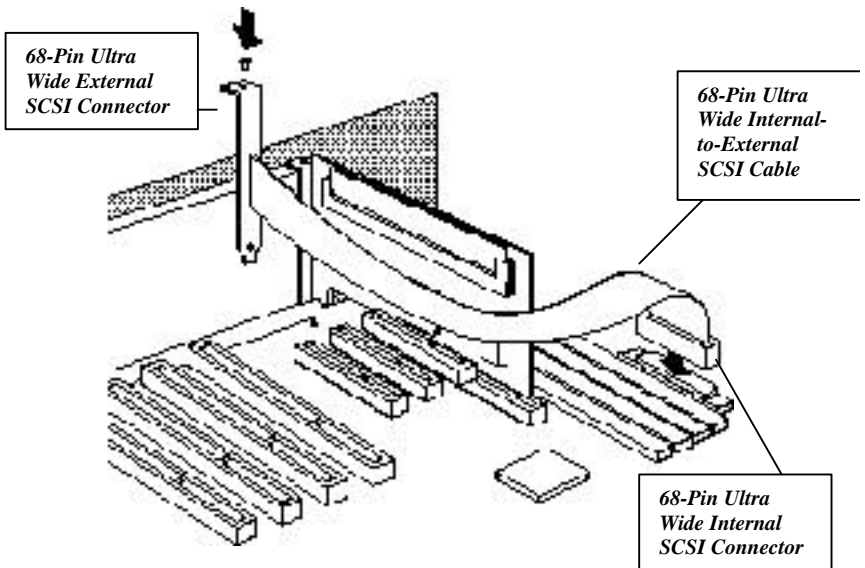
Figure 2-6: Installing an Internal to External SCSI Port Expansion Cable.

Once the SCSI port expansion kit is installed, follow these steps to connect external SCSI devices:

1. Make sure each device (internal and external) is assigned a unique SCSI ID number from 0 to 15—no duplicate IDs are permitted on a channel. (See *SCSI ID Numbers* on **page 16** for additional information.)

2. If you are connecting 8-bit external SCSI devices, attach one end of the 50-pin cable to the 50-pin external SCSI connector of the expansion kit. If you are connecting 16-bit external SCSI devices, attach one end of the 68-pin cable to the 68-pin Ultra Wide external SCSI connector of the expansion kit (shown in Figure 2-7.)
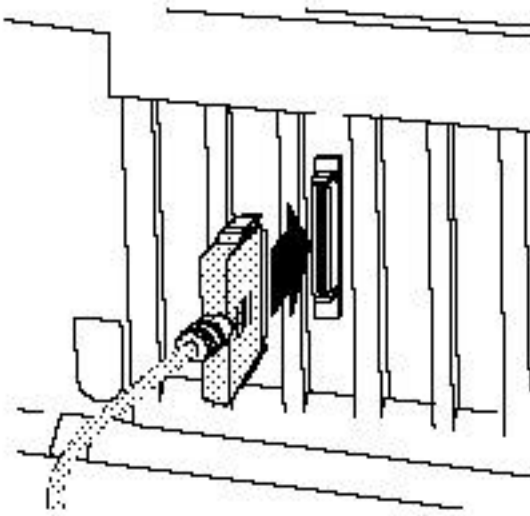
Figure 2-7: Attaching an External Cable to External SCSI Connector.

3. Attach the connector at the other end of the cable to either one of the SCSI connectors on the external SCSI device, as shown in Figure 2-8. (If you are installing only one external device, attach a terminating plug to the device.)

Terminating Plug
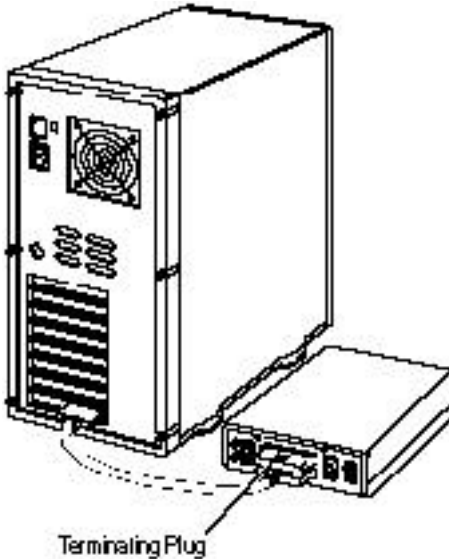
Figure 2-8: Attaching a Single External Device

4. Connect other external SCSI devices by daisy-chaining each device to the previous device until all external SCSI devices have been connected, as shown in Figure 2-9. (The device at the end of the chain must have a terminating plug installed. See *SCSI Termination* on **page 17** for additional information.)
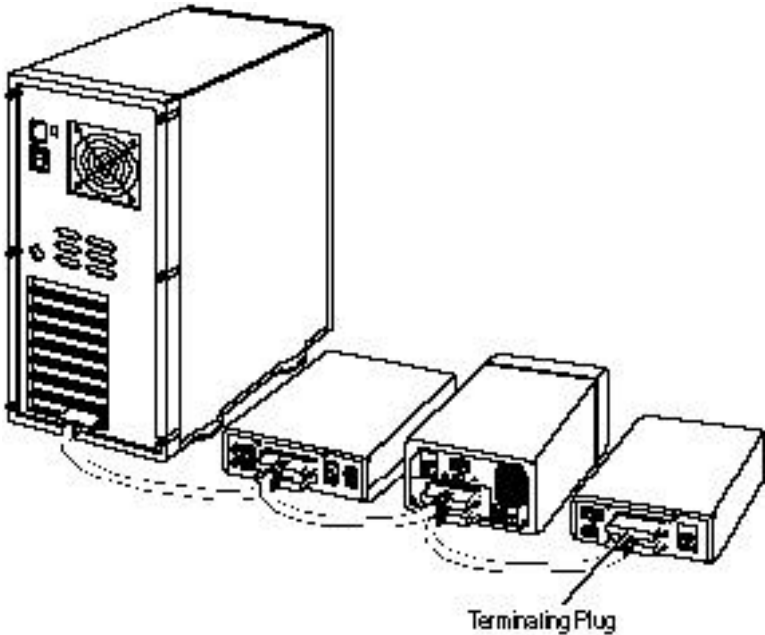
Figure 2-9: Attaching Multiple External Devices.

Connecting SCSI Array Enclosures (Storage Subsystems)

To help you conveniently manage your SCSI storage subsystems, a variety of array enclosures are available from different manufacturers. Figure 2-10 shows a typical setup between the array enclosure and the system. To install your SCSI devices in these enclosures, refer to the enclosure's documentation. The following information is provided to help you properly connect your enclosure to the system:

- All rules for SCSI ID and termination must be followed when installing SCSI devices in an array enclosure.

- Ideally, the array enclosure itself should provide termination capability and you should disable termination on all the drives in the enclosure. If you terminate the SCSI bus by enabling termination on a drive, you may run into problems if you have to replace that drive and you then forget to terminate the replacement drive.

- If the enclosure you are using for the array drives is not specifically designed as an array enclosure (such as a standard tower unit), be sure it has adequate cooling and ventilation.
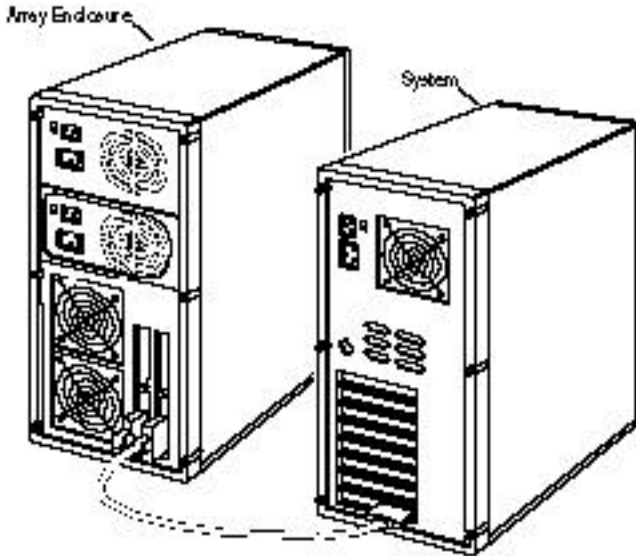
Figure 2-10: A Typical Array Enclosure Setup.

Installation Hints for Connecting SCSI Devices

All SCSI Devices

- If you are booting your system from a single SCSI hard disk drive or bootable array, the boot order of the disk or array must be set to 0. (See *Making the Array Bootable* on **page 30**.)

- Termination power should be enabled on several or all SCSI devices in the system (or array enclosure) so that if you remove a drive that is supplying termination power other devices will still provide it. The devices supplying termination power should be located near the end of the bus.

- Symptoms of SCSI cabling-related problems are drives that are not recognized, drives that lock-up, or drives that deactivate.

- Use good-quality SCSI cabling, and minimize the stub lengths. Good- quality cables should not be limp when you pick them up. The quality of the cable becomes much more critical when you use higher-speed data transfer (i.e., Ultra*SCSI* data transfer).

Cable Lengths

- The total length of cabling (internal and external) on each SCSI channel should not exceed the following:

- Three m (9.8 ft) if you are using Fast SCSI data transfer rates (10 MBytes/sec) and have 1 to 15 devices (including the Array controller).

- Three m (9.8 ft) if you are using Ultra*SCSI* data transfer rates (20 MBytes/sec for 8-bit devices, and 40 MBytes/sec for 16-bit devices) and have four or less devices (including the Array controller).

- One and one-half m (4.9 ft) if you are using Ultra*SCSI* data transfer rates and have between four and eight devices (including the Array controller).

Note: Ultra*SCSI* data transfer rates do not currently support more than eight devices per channel.

- Six m (19.7 ft) if you are using 5-MByte/sec asynchronous or synchronous data transfer rates.
- When calculating the total length of the bus, be sure to include the cabling inside any array enclosure.

SCSI ID Numbers

Each device attached to a SCSI channel supported by the ARO-1130xA must be assigned a unique SCSI ID number—0 to 15 for Wide (16-bit) devices, and 0 to 7 for Narrow (8-bit) devices. No duplicate IDs are permitted on a channel.

- We recommend that you leave the Array controller set to its default setting of SCSI ID 7. If for some reason you need to change the Array controller SCSI ID, see **Section 4**, **page 21**, *Configuring the ARO-1130xA with the SCSISelect Utility* for instructions.

- SCSI ID 7 has the highest priority on the channel. The priority of the remaining IDs, in descending order, is 6 to 0, 15 to 8.

- If you have 8-bit SCSI devices, they must use SCSI IDs 0, 1, 2, 3, 4, 5, or 6. (To change the SCSI ID on your hard disk and other SCSI devices, refer to the device's documentation.)

- If you wish to use a single SCSI disk drive (instead of an array) as your boot device, we recommend that you set the SCSI ID for the device to 0.

- In general, use lower SCSI IDs for single disks and use higher SCSI IDs for drives used as array members or spares.

SCSI Termination

To ensure reliable communication on the SCSI bus, *terminators* must be installed (or enabled) on the devices at the physical ends of each SCSI channel. The terminators on all devices between the physical ends must be removed (or disabled).

To properly terminate the SCSI channel(s) on your system, refer to the motherboard documentation. On most internal SCSI devices, the termination setting is controlled by setting a jumper or a switch, or by physically removing or installing a resistor module(s). On most external SCSI devices, termination is controlled by installing or removing a terminating plug (see Figures 2-8 and 2-9). Refer to the device's documentation to determine how to enable or disable termination on your particular SCSI device.

Completing the Installation

Reinstall your computer cover and connect all power cables. To verify that the SCSI devices work properly, turn ON the external SCSI devices first, then turn ON the computer. When the computer boots, the Array1000xA Family BIOS sign-on message should appear on the screen. If the BIOS message does not appear, see, *Troubleshooting* on **page 51**.

Note: If you need to configure the SCSI options (e.g., ID, Parity Checking, and Termination) of the SCSI channels supported by the ARO- 1130xA, see Section 5, *Configuring the ARO-1130xA with the SCSISelect Utility.*

Section 3:
Using the Array1000xA BIOS & Driver Selection Utility

Whenever you install a new ARO-1130xA in your server/workstation and before you run the Adaptec Array*Config*xA program to create the first array in your system, always run the Array1000xA BIOS & Driver Selection Utility.

Caution: We highly recommend that you back up the data on your array(s) before you use the Array1000xA BIOS & Driver Selection Utility. This ensures that your data is completely protected.

The Array1000xA BIOS & Driver Selection Utility installs the ARO-1130xA BIOS by automatically updating (flashing) the correct ARO-1130xA BIOS. The utility also determines which of the two Manager Set driver diskettes (Disk A or Disk B) is required when you install the operating system driver.

Running the Array1000xA BIOS & Driver Selection Utility

The Array1000xA BIOS & Driver Selection Utility is provided on a bootable floppy disk and runs under SOS as a stand-alone utility. A simple-to-use interface prompts you through the process. Follow these steps to run the Array1000xA Bios & Driver Selection Utility:

1. Insert the Array1000xA BIOS & Driver Selection Utility diskette in driver A and reboot your server/workstation. The utility starts automatically and the initial Array1000xA BIOS & Driver Selection Utility screen appears.

Note: The initial Array1000xA BIOS & Driver Selection Utility screen identifies which of the two Manager Set driver diskettes (Disk A or Disk B) are required when you install the operating system driver. Make a note of which diskette to use, and continue with step 2.

2.   Select either **Express** or **Advanced** setup.

**Note: If you receive an "Unsupported Hardware Configuration,"
message during setup, contact the system manufacturer. The
ARO-1130xA is not supported by the system manufacturer. The
ARO-1130xA is not supported by the system.**

▪   **Express** setup automatically updates the ARO-1130xA BIOS.
     Select Express setup and the utility will do the rest. When
     prompted, remove the floppy disk and press any key to reboot the
     server/workstation. Continue with Step 6
▪   **Advanced** setup also allows you to update the ARO1130xA BIOS.
     In addition, Advanced setup allows you to select other options
     such as:

−   Display Current BIOS Checksum. Determines current version of
     the ARO-1130xA BIOS.
−   Display New BIOS Checksum. Determines version of the BIOS
     available on the floppy.
−   Save current BIOS to a File. Saves the current ARO-1130xA
     BIOS to a file
−   Erase Current BIOS. Erases the current ARO-1130xA BIOS

To access these options, select Advanced setup and continue with Step
3.

3.   From the Main Menu, select the array adapter card you want to
      upgrade (only available array adapters can be selected). The
      Utility Menu appears.
4.   Make a selection from the Utility Menu.
5.   Follow the instructions on the screen.
6.   When prompted, remove the Array1000xA BIOS & Driver
      Selection Utility diskette from drive A and reboot your
      server/workstation.

Section 4: Configuring the ARO- 1130xA with the _SCSISelect Utility

The Array1000xA _SCSISelect® configuration utility allows you to change controller settings without opening the computer or handling the controller. This section describes the default settings, explains when you should change them, and gives instructions for doing so.

Array1000xA _SCSISelect also includes SCSI disk utilities to list the SCSI IDs of devices controlled by the ARO- 1130xA, format SCSI disk drives, and check them for defects. Instructions for using these utilities are included.

Default _SCSISelect Settings

The default _SCSISelect settings, shown in the table below, are appropriate for most systems. For situations where you might want or need to change the settings, see the descriptions of each setting beginning on **page 24**. To change any setting, or if you would like to run the _SCSISelect utilities, see *Starting the SCSISelect Utility* on **page 22**.

SCSI Bus Interface Definitions	Default
Host Adapter SCSI ID	7
SCSI Parity Checking	Enabled
Host Adapter SCSI Termination	Enabled
Host Adapter Ultra*SCSI*	Disabled
SCSI Device Configuration	**Default**
Initiate Sync Negotiation	Yes (Enabled)
Maximum Transfer Rate	40.0 MBytes/ sec[2]
Enable Disconnection	Yes (Enabled)
Initiate Wide Negotiation[3]	Yes (Enabled)
Send Start Unit Command	No (Disabled)

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[2] If Wide SCSI is not supported on the motherboard, the default setting is 20.0 Mbytes/sec.
[3] The Option is available only if Wide SCSI is supported on the motherboard.

Include In BIOS Scan	Yes (Enabled)
Additional Options	**Default**
Array 1000 BIOS	Enabled
BIOS Support for Bootable CD-ROM	Disabled

Starting the _SCSISelect Utility

To start _SCSISelect, press **Ctrl-A** when the following prompt appears when you turn on or reboot your computer:

Press <Ctrl><A> for SCSISelect (TM) Utility!

The menu that appears displays the options Configure/View Host Adapter Settings and SCSI Disk Utilities, as shown in Figure 4-1.

Figure 4-1: _SCSISelect Menu

Using _SCSISelect Menus

To select a _SCSISelect menu option, move the cursor to the option with the arrow up and arrow down keys, then press **Enter**. In some cases, selecting an option displays another menu. You can return to the previous menu at any time by pressing **Esc**.

To restore the original _SCSISelect default values, press **F6** from the main _SCSISelect screen. To toggle the display between color and monochrome modes, press **F5** from the main _SCSISelect screen (this feature does not work on some monitors).

Exiting _SCSISelect

To exit _SCSISelect, press **Esc** until a message prompts you to exit (if you changed any host adapter settings, you are prompted to save the changes before you exit). Select **Yes** to exit, then press any key to reboot the computer. Any changes you made in _SCSISelect take effect after the computer/server boots.

Using the SCSI Disk Utilities

To access the SCSI disk utilities, select the **SCSI Disk Utilities** option from the menu that appears after starting _SCSISelect. Once the option is selected, _SCSISelect immediately scans the SCSI bus (to determine the devices installed) and displays a list of all SCSI IDs and the devices assigned to each ID.

When you select a specific ID and device, a small menu appears, displaying the options Format Disk and Verify Disk Media.

- **Format Disk**—This utility allows you to perform a low-level format on a hard disk drive. Each hard disk drive must be low-level formatted before you can use your operating system's partitioning and file preparation utilities, such as MS-DOS *Fdisk* and *Format*.

Most SCSI disk devices are preformatted at the factory and do not need to be formatted again. The Adaptec Format Disk utility is compatible with the vast majority of SCSI disk drives.

Caution: A low-level format destroys all data on the drive. Be sure to back up your data before performing this operation. You *cannot* abort a low-level format once it is started.

- **Verify Disk Media**—This utility allows you to scan the media of a hard disk drive for defects. If the utility finds bad blocks on the media, it prompts you to reassign them; if you select *yes*, those blocks are longer used. You can press **Esc** at any time to abort the utility.

SCSISelect Settings

SCSI Bus Interface Definitions

The following settings are the _SCSISelect settings most likely to require any modification.

- **Host Adapter SCSI ID—** This option sets the ARO- 1130xA's SCSI ID. The default setting is SCSI ID *7*, which gives the ARO- 1130xA the highest priority on the SCSI bus. We recommend that you leave the ARO- 1130xA set to SCSI ID 7.

- **SCSI Parity Checking—**This option determines whether the ARO- 1130xA verifies the accuracy of data transfer on the SCSI bus. The default setting is *Enabled*. You should disable SCSI Parity Checking on the ARO- 1130xA and all SCSI devices if any SCSI device supported by the ARO- 1130xA does not support SCSI parity; otherwise, leave it enabled. Most SCSI devices do support SCSI parity. If you are not sure whether a device supports SCSI parity, consult the documentation for the device.

- **Host Adapter SCSI Termination—**This option is used in conjunction with your motherboard termination settings. Refer to your motherboard documentation for instructions on properly setting termination.

- **Host Adapter UltraSCSI—**This option determines whether the ARO- 1130xA supports Ultra*SCSI* data transfer speeds. The default setting is *Disabled*. If you have any Ultra*SCSI* devices installed, you should enable this setting. When this setting is enabled, the ARO- 1130xA negotiates for data transfer speeds of up to 20 MBytes/sec (40 MBytes/sec for Wide SCSI devices).

Note: If you use Ultra*SCSI* data transfer speeds, be sure to use high-quality cables to connect the disk drives supported by the ARO- 1130xA. The quality of the cable is much more critical when you use higher-speed data transfer.

SCSI Device Configuration

The SCSI device settings allow you to configure certain parameters for each device on the SCSI bus. To configure settings for a specific device, you must know the SCSI ID assigned to that device. If you are not sure of the SCSI ID, see *Using the SCSI Disk Utilities* on **page 23**.

- **Initiate Sync Negotiation—**This option determines whether synchronous data transfer negotiation (Sync Negotiation) between the device and ARO- 1130xA is initiated by the SCSI channel controlled by the ARO- 1130xA. Normally, you should leave Initiate Sync Negotiation set to enabled, because most SCSI devices support synchronous negotiation and because it allows for faster data transfer. The default setting is *Yes*.

- **Maximum Transfer Rate—**This option determines the maximum data transfer rate that the SCSI channel controlled by the ARO- 1130xA supports. The default setting is *20.0 MBytes/sec* (*10 MBytes/sec* for motherboards that do not support Wide SCSI). (The effective data transfer rate is doubled when Initiate Wide Negotiation is set to *Yes*. For example, a transfer rate of 20 MBytes/sec becomes 40 MBytes/sec.)

- **Enable Disconnection—**This option determines whether the SCSI channel controlled by the ARO- 1130xA allows the SCSI device to disconnect from the SCSI bus (sometimes called Disconnect/Reconnect). The default setting is *Yes*.

  You should leave Enable Disconnection set to *Yes* if two or more SCSI devices are supported by the ARO- 1130xA. If only one SCSI device is supported by the ARO- 1130xA, you can set Enable Disconnection to *No* to achieve slightly better performance.

- **Initiate Wide Negotiation—**This option determines whether the SCSI channel controlled by the ARO- 1130xA attempts 16-bit data transfer instead of 8-bit data transfer. The default setting is *Yes*. (The effective data transfer rate is doubled when 16-bit data transfer is used. For example, a transfer rate of 10 MBytes/sec becomes 20 MBytes/sec.)
- **Send Start Unit Command—**This option determines whether the Start Unit Command is sent to the SCSI device at bootup (most devices do not require this). The default setting is *No*.

- **Include in BIOS Scan—**This option determines whether the ARO- 1130xA BIOS supports hard disk drives attached to the SCSI channel controlled by the ARO- 1130xA. When set to *Yes*, the ARO- 1130xA BIOS controls the hard disk drive. When set to *No,* the ARO- 1130xA BIOS does not control the hard disk drive. The default setting is Y*es*.

Additional Options

Array1000xA BIOS
This option determines whether the ARO- 1130xA BIOS is installed at boot time. When set to *Enabled*, the ARO- 1130xA BIOS is installed, and all Int13 (except bootable CD-ROM) devices are supported. When set to *Disabled*, the ARO- 1130xA BIOS is not installed. The default setting is *Enabled*.

BIOS Support for Bootable CD-ROM
This option determines whether the ARO- 1130xA BIOS supports booting from a CD-ROM drive. When set to *Enabled*, the ARO- 1130xA allows booting from a CD-ROM drive.

Section 5: Creating the First Array With the _ArrayConfigxA Program/Utility

This chapter explains how to use the Adaptec _Array*Config*xA program/utility to create the first bootable or nonbootable array on your computer. Array*Config*CA is for NT workstations and Array*Config*SA is for NT Servers and NetWare servers.

Before creating the array, make sure the disks for the array are connected and installed in your computer (or array enclosure). You can use _Array*Config*xA in two ways:

Note: Array*Config*xA runs from a self-booting diskette. If you are changing the configuration of a server/workstation that is already in use on a network, log all users off the system and shut it down in an orderly manner before you start Array*Config*xA. Refer to Part 2 of this manual, *Adaptec CI/O Array Management Software Guide*, for further information.

Creating an Array for ARO-1000xA

Follow these instructions to create the first Array with Array*Config*xA:

1.   Insert the Array*Config*xA diskette in the server's drive A and reboot the server. Array*Config*xA starts automatically.
2.   Select **Disk Array** <u>**Operations**</u> from the Main Menu.
3.   Select **Create** <u>**New**</u> **Array** From the Disk Array Operations menu.
4.   Type a new array and press **Enter**. The name can be up to 15 characters long and can include spaces and any other printable characters.
5.   Select an array type. Your options are:

−   **RAID** <u>**0**</u>: Data is striped across the disks in a RAID 0 array, allowing for faster I/O performance than a single disk. RAID 0

arrays do not store redundant data; if any disk in the array fails, all data is lost.

−   **RAID 1**: Data is mirrored on a pair of disks. If one disk fails, data is available. The actual data capacity of the array equals half the available disk space.

−   **RAID 5**: (**This applies to ARO-1000SA only.**) The array contains redundant (parity) data distributed across all disks in the array. If an one disks fails, data can be reconstructed from the parity information. If a second disk fails before the array has been reconstructed, all data is lost. The actual usable data capacity of the array is equal to one less than the total number of disks. (One disk's worth of capacity is needed to hold the parity information.)

−   **RAID 0/1**: (**This applies to ARO-1000SA only.**) Data is striped and mirrored on two or more pairs of disks. If one disk in a pair fails, data is available. The actual data capacity of the array equals half the total available disk space.

See Part 2 of this manual for more information on selecting RAID level.

6.   Select the number of drives you want in the array and press **Enter**. This number should not include spares (drives that automatically replace failed array drives). The number of drives available for assignment is listed on the screen.

Note: This step does not apply to RAID 1 arrays, which have two drives by definition.

7.   Select array members. When the next screen appears, press **Tab** to highlight a channel (if more than one SCSI channel is available). Select drives for the array by pressing the arrow up and arrow down keys until the drive name is highlighted, and then press **Ins** or **Enter**. The names of selected drives that appear in the Adaptec Array # box.

To select drives on a different channel press **Tab** to select another channel and then select the drives from the SCSI Ids on Channel menu. To deselect the drive you most recently added, press **Del**.

Caution: A warning appears if you select a disk that has partitions. Do not select a partitioned disk if it contains data you want to

keep, because any existing data will be erased when the disk becomes part of the array.

When you have selected the number of drives you specified in step 6 the next screen appears automatically. If you are creating a RAID 1, RAID 0/1, or RAID 5 array, and if there are any unassigned drives, the screen prompts you to define dedicated spare drives for the array. (We recommend that you use a spare pool instead of dedicated spares.)

Note: A spare must have at least the capacity of the smallest drive in the array.

8.   Select spares. If you do not want a spare, type **n** and continue with step 10. If you want to select dedicated spares, follow these steps:

a.   At the prompt, type **y**.

b.   At the next prompt, type **1** or **2**.

c.   Select one or two spares, using the same method you used to select disks for the array.

9.   Initialize array. When the Initialize Mode menu appears, select **Initialize Array to Zero**. Formatting begins immediately. A graph on the screen shows the progress of this operation.

Caution: If the drives contain data, all the data is lost when you initialize the array.

Select **Low-Level Format** only if the drives were previously formatted on another computer or if you think they may have surface defects. Low-level formatting takes a long time for large disk drives.

10.   Select array block size. When the menu of block sizes appears, select a block size. (This menu does not appear if the array is a mirrored array with only two drives.)

The allowable block sizes are 8, 16, 32, 64 (the default), and 128 KB. The default block size gives the best overall performance in most network server/workstation environments.

11.   Wait for initialization to complete. When you see the message *Initialization of [array name]* is complete, press any key to return to the Disk Array Operations menu.

12.   Create additional arrays. To create additional arrays (if disks are available), return to Step 3. When all arrays are created, exit Array*Config*xA, remove the Array*Config*xA diskette, and reboot the server. After you reboot you can write data to the arrays.

At this point, you can make your initial array bootable as described in the next section.

Making the Array Bootable

You can make the array bootable so that the computer boots from the array instead of from a stand-alone (single) disk.

To make the array bootable, the array must be set to #0 in the boot order. We recommend that you make your initial array bootable. Follow these steps if you want the computer to boot from the newly created array:

Note: The computer/server will always attempt to boot from any installed non-SCSI disks (for example, any IDE disk drive at drive *C*). You must disable or remove all non-SCSI disks if you want the computer to boot from a SCSI disk or array.

1. Insert the _ArrayConfigxA diskette in the computer's floppy disk drive *A*.

2. Reboot the computer/server from the diskette. _ArrayConfigxA starts automatically.

3. Select **<u>Display Boot Order</u>** from the Main Menu. The Boot Order for Singles and Arrays window appears.

4. If the newly created array is at the top of the list, preceded by the words Unit 0, no changes are necessary; if it has some other unit number, highlight the array name and press **Enter**.

5. Use the arrow keys to move the selected array to the top of the list. Then press **Enter**. If you want to change the boot order of another array, select it, move it with the arrow keys, and press **Enter** again.

6. Press **Esc** to return to the Main Menu.

7. Exit _Array*Config*xA, remove the diskette from drive *A*, and reboot the computer.

8. Prepare the array as you normally would prepare a boot disk drive for your operating system. See **page 33**, *Installing Software on a Windows NT System* or **page 39***, Installing Software on a Novell NetWare Server.*

Note: You cannot use this procedure to change the boot order of a SCSI disk drive that is not part of an array. If you want to do this, create a one-disk RAID 0 array from the disk. (Data is not actually striped on a one-disk array.)

Section 6: Installing Software on a Windows NT System

This chapter explains how to install the software required to use the ARO- 1130xA in a system using Windows NT 4.0 workstation/server. ARO-1000CA is for NT workstations and ARO-1000SA is for NT Servers.

Before installing the software, make sure the ARO- 1130xA is already installed. If you plan to boot from an array, make sure the array is already created. To install all of the software, you must complete the following in the order presented:

- Install the Array1000xA driver for Windows NT

- Install the Adaptec CI/O Workstation/Server Array Management Software for Windows NT

Note: If your RAID*port* II system has an additional Adapted AHA®- 2940, AHA-3940, or any other AIC™-78x0 based host adapter installed (which is not associated with the RAID*port*), the driver for these adapters must be from the Adaptec 7800 Family Manager Set 1.3 or later

Installing the Array1000xA Driver for Windows NT

This section explains how to install the Array1000xA Miniport Driver (*cda1000.sys*) for Windows NT. To begin driver installation, see either *Installing the Driver When Installing Windows NT* below, or *Installing the Driver When Windows NT is Already Installed* on **pages 34** and **35**.

Note: We recommend that you install your Windows NT operating system on an array to take advantage of the performance or redundancy features of the array.

Installing the Driver When Installing Windows NT

To install the *cda1000.sys* driver when you are installing Windows NT, follow the instructions below.

Note: If you have multiple arrays, we recommend temporarily powering off all devices except for the boot array before installing Windows NT; otherwise, Windows NT limits the size of the partitions you can create to 1 GByte. When Windows NT installation is complete, power on all devices and reboot the system.

To install the *cda1000.sys* driver when you are installing Windows NT 4.0, follow these steps:

1. Start your system with the Windows NT Boot Diskette in the floppy disk drive or the Windows NT Boot CD-ROM in the CD-ROM drive.

Note: To install Windows NT from a bootable CD-ROM, make sure BIOS Support for Bootable CD-ROM is enabled in SCSI*Select.*

2. *Boot diskette installation*: When prompted, insert diskette #2 in your floppy drive. After a few moments you will see a blue screen. To setup Windows NT now, press **Enter** and continue with Step 3 below.

Boot CD-ROM installation: When the following message appears onscreen, press the **F6** key and skip to Step 4 below.

Setup is inspecting your computer's hardware…

3. Press **S** to skip autodetection of your SCSI host adapter.
4. Press **S** again to specify an additional device.
5. Press **Enter** to select Others; insert the appropriate Adaptec Array1000xA Family Manager Set driver diskette in your floppy disk drive.

6. The screen displays the adapter drivers supported on the diskette. Select the Adaptec Array1000xA Family Adapter and press **Enter**.

7. If you want to add drivers for other host adapters (other than the ARO- 1130xA), do so at this time by pressing **S** and repeating Step 5 for each additional adapter and inserting the appropriate disk provided by the hardware manufacturer.

8. Press **Enter** to continue with the Windows NT operating system setup. Follow the onscreen instructions in the Windows NT documentation to complete the installation.

Installing the Driver When Windows NT is Already Installed

To update or install the *cda1000.sys* driver if Windows NT is already installed, follow the instructions below.

Updating Windows NT 4.0

To install the *cda1000.sys* driver when Windows NT 4.0 is already installed, follow these steps:

1. Start Windows NT.

2. Click the **Start** button on the Windows NT task bar, and then point to Settings.

3. Click the **Control Panel**.

4. Double-click the **SCSI Adapters** icon.

5. Click the **Drivers** tab, and then click the **Add** button.

6. In the Install Driver window, click the **Have Disk** button.

7. Insert the Adaptec Array1000xA Family Manager Set drivers diskette into drive *A*; enter the following path to the installation files and then click **OK**.

        a:\winnt

The Adaptec Array1000xA Family Adapter is highlighted by default.

8. In the Install Driver window, Click **OK**.

9. Click the **New** button when asked if you want to use the currently installed driver(s) or install new one(s).

10. Type a:\winnt again, and click **Continue**. The driver is now installed.

11. You must restart your computer for the changes to take effect. Click **Yes** to restart your computer.

Installing Adaptec CI/O Workstation/Server Array Management Software for Windows NT

Note: The Adaptec CI/O Management Software installation process automatically installs both CI/O server and client components on your Windows NT Server. Before you start the Adaptec CI/O Management Software, be sure 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, and also *Hints for Establishing Communications With Your Server* on page 48)

Follow these steps to install the Adaptec CI/O Workstation/Server Array Management Software for Windows NT:

1. Start Windows NT.

2. Insert the Adaptec CI/O Workstation/Server Array Management Software CD-ROM in your CD-ROM drive. If you are installing the software from diskettes, insert Disk 1 of the Adaptec CI/O Workstation/Server Array Management Software for Windows NT in the floppy disk drive.

3. Select **Run** from the File menu, type the following and press **Enter**:

*[pathname]*setup.exe

(The *setup.exe* file is located at *\win_nt\disk1\setup.exe* on the CD-ROM, and at *\setup.exe* on Disk 1 of the Adaptec CI/O Workstation or Server Array Management Software for Windows NT.)

4. Follow the directions that appear on the screen.

5. When installation is complete, reboot the system. The following NT Services start automatically in the background:

ARO-1000CA	ARO-1000SA
▪ CIO Array Management Service	▪ CIO Array Management Service ▪ CIOArrayManager RPC Command ▪ CIOArrayManager RPC EventP ▪ CIOArrayManager RPC Event ▪ NobleNet Portmapper

Note: This NT Service is configured to start automatically at boot time. After installation you can start or stop this service through the Services icon in the Windows NT Control Panel.

6. Double-click the **CI/O Array Management Software** icon to start the program.

See Part 2: *Adaptec CI/O Array Management Guide*, for information on using the Adaptec CI/O Workstation/Server Array Management Software to add, delete, or manage your arrays. If you are experiencing problems starting the software, see *Problems Running the Software On Your Windows NT*

Note: (This note applies to ARO-1000SA only) You must have the proper level of Adaptec CI/O Management Software password authorization if you want to add and delete arrays and spares from a networked client. The default password is "adaptec." See Part 2 of this manual for information on setting security options.

Section 7: Installing Software on a Novell NetWare Server

IMPORTANT: All of the following section (Section 4) applies to ARO-1000SA only.

This chapter explains how to install the software required to use the ARO-1130SA in a novell NetWare (NetWare 3.12 and 4.11) server. Before installing the software, make sure the ARO-1130SA is already installed. If you have not already done so, run the Array1000SA BIOS & Driver Selection Utility (**see page 19**) to determine which of the two Manager Set driver diskettes (Disk A or Disk B) is required to install the NetWare driver. If you plan to boot from an array, make sure the array is already created. To install all of the software, you must complete the following in the order presented:

▪ Install the *cda 1000.dsk* driver for Novell NetWare
▪ Install the TIRPC Communications Module
▪ Install the Adaptec CI/O Management Software for Novell Netware

Once all software is installed, refer to the Adaptec CI/O management Software, Part 2 of this Manual, for instructions on adding, deleting and managing your arrays from the server console.

Note: If your RAIDport II system has an additional Adaptec AHA-2940, AHA-3940, or any other AIC-78x0 based host adapter installed, the NetWare driver form these adapters must be from the Adaptec 7800 Family Manager Set 1.3 or later.

Installing the Array1000SA Driver for Novell NetWare

This section explains how to install the Adaptec Array1000SA driver (cda 1000.dsk) for NetWare. To begin driver installation, see either Installing the Driver When Installing NetWare below, or Installing the Driver When NetWare is Already Installed on **pages 40** and **42**.

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Note: We recommend that you install your Novell NetWare operating system on an array to take advantage of the redundancy and performance features of the array.

Installing the Driver When Installing NetWare

To Install the *cda1000.dsk* driver when you are installing NetWare, follow the instructions below for the version of NetWare you are installing.

NetWare 4.11

Follow these instructions only if you are installing NetWare 4.11 for the first time:

1. Follow the procedures in your NetWare documentations for installing a new server.
2. When a screen appears that asks you to select a disk driver, press **Enter**.
3. Press **Insert** to install an unlisted driver.
4. Insert the appropriate Adaptec Array1000xA Family Manager Set Driver Diskette (Disk A or Disk B) into your floppy disk drive. (See Running the Array1000xA BIOS & Driver Selection Utility on **page 19** to determine the appropriate driver diskette.)
5. Press **F3** and specify the path to the cda1000.dsk driver. For NetWare 4.1, the driver is located in \netware\v4_1x on the diskette.
6. Select *cda1000.dsk* and press **Enter**.
7. When prompted to save the current version of *aspitran.dsk*, select **Yes** or **No**.
8. When prompted to save the current version of *nwpaload.nlm*, select **Yes** or **No**.
9. When the message File "**A:\netware\v4_1x\nwpaloas.nim** was not found…" appears, ignore the message and press **Enter** to continue.
10. Select **Continue copying the next file**.
11. Select **Yes** to install an additional disk driver.
12. Select *aspicd.dsk* and press **Enter**.
13. When prompted to so save current version of *aspicd.dsk*, select **No**.

14.   When Prompted to save current version of *aspicd.ddi*, select **No**.
15.   Select **No** when prompted to install an additional disk driver.
16.   Select **Continue Installation**.
17.   Press **Enter** to Continue.
18.   Down and exit the server. At the DOS prompt, copy the *nwpa.nlm*, *nbi.nlm*, and *nwpaload.nlm* files (located on the Novell Installation CD-ROM) to the server's startup directory (usually c:\nwserver).

Note: To load the driver automatically at Server bootup, make sure the starup.ncf file includes the load command line for the *cda 1000.dsk* driver. (If you also have an Adaptec host adapter that uses the Adaptec aic78xx.dsk driver, make sure the driver loads after the *cda1000.dsk* driver.)

NetWare 3.12

Follow these instructions only if you are installing NetWare 3.12 for the first time:

1.   Follow the procedures in your NetWare documentation for installing a new server. (For information on using a CD-ROM drive on a NetWare server, see **Appendix C**, *Using a CD-ROM Drive*.)
2.   When you See the NetWare colon prompt (:), use the load command to install the driver from the appropriate Adaptec Array1000xA Family Manager Set driver diskette (Disk A or Disk B). See Running the Array1000xA BIOS & Driver Selection Utility on **page 19** to determine the appropriate driver diskette.)

The correct syntax to load the *cda1000.dsk* driver is :

:load [pathname]cda1000

(For example, *:load a:\netware\v3_1x\cda1000*)

Note: To load the drivers automatically at server bootup, copy the *aspitran.dsk* and *cda1000.dsk* drivers to the server's startup directory and modify the startup.ncf so that the proper path to the driver is specified.

The *aspitran.dsk*, because NetWare attempts to load this file automatically. If you also have an Adaptec host adapter that used the

Adaptec *aic78xx.dsk* driver, make sure the driver loads after the *cda1000.dsk* driver.

3. Load the NetWare *install* program from the NetWare colon prompt (:load install). Follow the instructions in the NetWare documentation to complete the installation (e.g., creating disk partitions, system volumes, etc.) of your server.

Installing the Driver When NetWare is Already Installed

To update or install the *cda1000.dsk* driver if NetWare is already installed, follow the instructions in this section. The procedures are similar for all versions of NetWare. Procedures that are specific to a NetWare version are noted when necessary.

1. Copy the *cda1000.dsk* and *aspitran.dsk* files from the appropriate Adaptec Array1000SA Family Manager Set driver diskette (Disk A or Disk B) into the server's starup directory (e.g., *c:\nwserver, c:\server.312*) on your hard disk drive. (see running the Array1000xA BIOS & Driver Selection Utility on **page 19** to determine the appropriate driver diskette.)

Note: For Netware 3.12, the *cda1000.dsk* and *aspitran.dsk* files are located in the *\netware\v3_1x* subdirectory on the diskette; for NetWare 4.11, the files are in *\netware\v4_xx.*

2. If necessary, modify the **load** command line in the *startup.ncf* so that the proper path to the driver is specified. The correct syntax to load the *cda1000.dsk* driver is:

Load [pathname]cda1000

Note: If you unload *cda1000.dsk* driver, you must also unload *cioams.nlm*. When you load *cda1000.dsk* driver again, you must also load *cioams.nllm*. If *cioams.nlm* is not unloaded when you unload *cda1000.dsk*, your system may work erratically.

Installing the TIRPC Communications Module

The TIRPC communications module must be installed before you install the Adaptec CI/O Management Software. The module allows communications between the server and remote clients. Follow the instructions below for the version of NetWare installed.

NetWare 3.12

1.   Insert the Adaptec CI/O Management Software in your CD-ROM drive. If you are installing the software from diskettes, insert Disk 1 of the Adaptec CI/O Management Software for NetWare (TIRPC).
2.   From the NetWare colon prompt (:), type the following and press **Enter**:

Load install

3.   Select **Product Options** from the Installation Options Menu.
4.   Press the <**Ins**> key.
5.   Enter the path to the CD-ROM or Disk 1 (do not include the backslash).
6.   Select **Netware 3.x TIRPC Runtime and Configuration Files**. (TIRPC must be installed in the sys:system directory only.)

NetWare 4.11

1.   Insert the Adaptec CI/O Management Software CD-ROM in your CD-ROM drive. If you are installing the software from diskettes, insert Disk 1 of the Adaptec CI/O Management Software for NetWare (TIRPC).
2.   From the NetWare colon prompt (:), type the following and press **Enter**:

Load install

3.   Select **Product Options** from the Installation Options Menu.

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4.   Select **Install a Product Not Listed.**
5.   Press **<F3>** key.
6.   Enter the path to the CD-ROM or Disk 1 (include the backslash).
7.   Select **NetWare 4.0 TIRPC Runtime and Configuration Files**. (TIRPC must be installed in the sys:system directory only.)

Installing the Adaptec CI/O Management Software for Novell NetWare

Note: Before you start the Adaptec CI/O Management Software, be sure 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, and also Hints for Establishing Communications with your Server on Page 48.

Follow these steps to install the Adaptec CI/O Management Software for Novell NetWare:

1.   Insert the Adaptec CI/O Management Software CD-ROM in your CD-ROM drive. If you are installing the software from diskettes, insert Disk 2 of the Adaptec CI/O Management Software for NetWare in the floppy disk drive.
2.   From the NetWare colon prompt (:), type the following and press **Enter**:

Load [pathname]nwsetup

(The *nwsetup* NLM is located at *\netware\disk2\nwserup.nlm* on the CD-ROM, and at *\nwsetup.nlm* on Disk 2 of the Adaptec CI/O Management Software for NetWare.)

Note: If you are using NetWare 3.12, you may receive a Failed to allocate resources error message at this point. This is because the CD-ROM (or floppy disk drive) is not part of the default search path. If this happens, you must add the CD_ROM or floppy disk

drive to your search path by entering the following command before loading nwsetup:

Search add [pathname]

3.   From the NWSETUP Installation menu, select **Default Installation** or **Custom Installation** (press **F1** for help).
4.   At the end of the installation process, select **Yes** 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.)

See the *Adaptec CI/O Management Software User's Guide* for information on using the Adaptec CI/O Management Software to add, delete, or manage your arrays from your server console.

Adaptec CI/O Management Software Installation Hints

- For Communications supported over TCP/IP, the *tcpip.nil* must be loaded and the IP protocol must be bound to a valid IP address. The IP protocol generally needs to 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.

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

```
#

# NWSETUP LAST UPDATE XX-XX-XX
#
RPCSTART
IOMGR.NCF
IOMGRSRV.NCF
IOMGRRPC.NCF
```

Section 8: Installing Software on a Remote Client

IMPORTANT: All of the following section (Section 8) applies to ARO-1000SA only.

This chapter explains how to install the Adaptec CI/O Management Software on a remote network client running under Windows (Windows 3.1x, Windows® 95, and Windows NT). If you want the capability to manage your arrays on the server from a remote networked client, continue with the remainder of this chapter. Once installed, refer to Part 2 of this manual, *Adaptec CI/O Management Software User's Guide*, for instructions on using the software.

Installing Adaptec CI/O Management Software

Following these steps to install the software:

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, it is not a requirement to log-on to the server to install the software and to monitor the server via the network (See the documentation provided with your TCP/IP or SPX/IPX software for instructions on establishing communications with your Server on page 48.)

1.   Start Windows on the client.
2.   Insert the Adaptec CI/O Management Software CD-ROM drive. If you are installing the software from diskettes, insert Disk 1 of the Adaptec CI/O Management Software for Windows 95 and Windows NT Clients.
3.   Select **Run** from the File menu (Windows 95 and NT users select **Start**, and then **Run**), type the following and press **Enter**.

[pathname]setup.exe

(The *setup.exe* file is located in *\win_client\disk1\setup.exe* on the CD-ROM, and in *\setup.exe* on Disk 1 of the Adaptec CI/O Management Software for Windows 95, and Windows NT Clients.)

4.   Follow the directions that appear on the screen.
During the following installation you will be prompted to enter the host
name of the client PC. If you do not know the host name, you can add
the information later by inserting a line in the *autoexec.bat* file.
Instructions for this step appear on the screen during installation.

See the *Adaptec CI/O Software User's Guide*, Part 2 of this manual, for
information on using the Adaptec CI/O Management Software to add,
delete, or manage your arrays from the remote client.

**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 from a networked client. The default password
is "adaptec." See Part 2 of this manual, the *Adaptec CI/O
Management Software User's Guide*, for information on setting
security options.**

Hints for Establishing Communications with your Server

Communication with the server via the network must be established
prior to installing the Adaptec CI/O Management Software on a
networked client. The following information is provided to help you
set up proper communication:

TCP/IP Networks

- When installing your TCP/IP software (not provided by
  SUPERMICRO or 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 TCP/IP setup.

SPX/IPX Networks

- On an SPX/IPX network, make sure to install the NetWare Client
  Software for Windows (provided by Microsoft). During
  installation, certain DLLs required by the Adaptec CI/O
  Management Software are installed.

- The *host name* is identified through the **SET RPCHOST=** environment variable. You can enter this variable through the setup process, or you can manually add it to the *autoexec.bat* file.

Note: Under dual stack situations, we recommend using the same *host name* for both TCP/IP and SPX/IPX to minimize any naming confusion.

Appendix A: Troubleshooting

Troubleshooting Checklist

Check the following if you have problems installing or running the ARO- 1130xA and SCSI devices:

- Does the ARO- 1130xA BIOS sign-on message appear during bootup? If not, check the following items:

- Is the ARO- 1130xA properly seated in a PCI/RAID*port* expansion slot? Refer to your computer documentation for the slot location.

- Does your computer CMOS setup require you to enable PCI bus parameters (see your computer documentation)? If so, run the CMOS Setup program and assign the parameters—usually IRQ, Enable PCI Slot, and Enable Master.

- Have you run the Array1000xA BIOS & Driver Selection?

- Is the SCSI bus terminated properly, and are all SCSI devices turned on?

- Are all SCSI bus cables and power cables connected?

- Does each channel and each device on the channel have a unique SCSI ID?

- If you are having trouble booting from a SCSI disk drive or array, make sure your computer's CMOS setup is set to **No Drives Installed** (the required setting for SCSI drives). Also, verify that the drive or array has been selected as the boot-first (boot) device and that the boot partition is active.

Problems Running the Software On Your Windows NT

If the Adaptec CI/O Workstation/Server Array Management Software does not start when you double-click the program icon and you see a warning box with Unable to Initialize IOMAPI, try the following:

- Verify that the following NT service has a status of *Started* (double- click the **Services** icon in Control Panel). If it does not, select the service and press the **Start** button:

ARO-1000CA	ARO-1000SA
▪ CIO Array Management Service	▪ CIO Array Management Service ▪ CIOArrayManager RPC Command ▪ CIOArrayManager RPC EventP ▪ CIOArrayManager RPC Event ▪ NobleNet Portmapper

- Make sure you have the proper security access rights to the Windows NT services. The Windows NT services can be started, stopped, paused, etc., according to the NT service security rules defined by Microsoft (refer to the Windows NT documentation for more details).

- Verify that the Registry was updated correctly during installation. If the values do not match the values listed below, try reinstalling the Adaptec CI/O Workstation/Server Array Management Software:

– The correct entries for *HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\ CIOArrayManagement* are:

DisplayName: REG_SZ: CIO Array Management Service (v x.xx)
ErrorControl: REG_DWORD: 0x01
ImagePath: REG_SZ: [*Pathname specified during installation*]iomgr.exe
ObjectName: REG_SZ: LocalSystem
Start: REG_DWORD: 0x02
Type: REG_DWORD: 0x110
SharedMemName: REG_SZ: iomgr.shm

– The correct entries for *HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\ EventLog\System\CIOArrayManagement* are:

EventMessageFile: REG_SZ: [*pathname to system32 directory*]\system32\iomgrmsg.dll
TypesSupported: REG_DWORD: 0x7

▪ Verify that the following DLLs are located in your *system32* directory. If they are not present, try reinstalling the Adaptec CI/O Workstation/Server Array Management Software:

> *ctl3dnt.dll*
> *xnmhb420.dll*
> *xnmhn420.dll*
> *xnmte420.dll*
> *msvcrt20.dll*
> *mtld.dll*
> *xnmba420.dll*
> *iomgrmsg.dll*

▪ Verify that the following files are located in the directory where you installed the Adaptec CI/O Workstation/Server Array Management Software. If they are not present try reinstalling the software:

> *iomgr.ems*
> *cioams.hlp*
> *cioams.exe*
> *readme.txt*
> *iomgr.exe*
> *iomgr.ini*
> *iomgr.msg*

Using the ARO- 1130xA with an AHA-2940 Family Host Adapter

This section explains how to use an ARO- 1130xA and an AHA-2940 Family host adapter in the same computer system. In order to do this, you must load drivers. You also may need to make changes to the Windows NT registry.

Caution: We recommend that you do *not* attempt these configuration changes unless you are an experienced computer user.

Two scenarios are presented. Choose the one that matches what you want to do.

Scenario #1: Adding an ARO- 1130xA to a System with an AHA-2940 Family Adapter

These instructions assume that Windows NT is *already installed* on the computer system and that the boot drive is currently connected to the AHA-2940 Family adapter. If the ARO- 1130xA is already installed, shut down the computer system, remove the ARO- 1130xA from the expansion slot, and restart the system.

Installing the ARO- 1130xA Driver

1. Start the Windows NT Control Panel and double click the **SCSI Adapters** icon.

2. Click the **Drivers** tab and click **Add**.

3. Click **Have Disk …**, and insert the Array1000xA Family Manager Set diskette in the floppy disk drive. (This diskette was included with your ARO- 1130xA adapter.)

4. When the Install from Disk dialog box appears, type **A:\winnt** on the command line and click **OK**.

5. Select Adaptec **Array1000xA Family Adapter** and click **OK**.

6. When a message appears asking you if you want to restart Windows NT, click **No**.

7. Exit from Control Panel.

Changing Registry Settings

1. Back up the NT Registry, using one of the techniques described in *Backing up the Windows NT Registry* on **page 60**.

Caution: It is very important to back up the NT Registry before you make any changes to it. This allows you to restore the original NT Registry settings if there is a problem with the new configuration.

2. Run the Registry Editor (*regedit.exe*).

3. When the Registry Editor window appears, expand the tree on the left until you can see the nodes under \HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services.

4. Select **cda1000** on the left part of the screen. Write down the cda1000 Tag value that appears on the right part of the screen.

   The Tag value is a hex number followed by an equivalent decimal equivalent in brackets: for example, 0x00000002 [2].

5. Select **aic78xx** on the left part of the screen. Write down the aic78xx Tag value that appears on the right part of the screen.

6. Expand the tree on the left until you can see the nodes under \HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\ GroupOrderList.

7. Select **GroupOrderList**.

8. Click the right mouse button on **SCSI Miniport** on the right side of the window and select **Modify** from the popup menu. A table appears with columns of two- and four-number groups, something like this:

   0005 02 00 00 00 03 00 00 00
   0010 01 00 00 00 01 01 00 00
   0015 04 00 00 00 05 00 00 00
   0020 06 00 00 00 07 00 00 00
   etc.
   This table of hexidecimal numbers indicates the Tag-value sequence in which the SCSI Miniport drivers are loaded when you start Windows NT.

9. Determine what the Tag value loading sequence is. Here is how you do this:

a) Ignore the four-digit groups on the left of each row.

b) Going from left to right, and starting on the first row, divide the two-digit numbers into groups of eight. In this example, the groups are

   02 00 00 00
   03 00 00 00
   01 00 00 00
   01 01 00 00
   etc.

You need to write down *all* the number groups from all rows in the table.

c) In each group of eight numbers, reverse the sequence of the two-digit pairs, like this:

    00 00 00 02
    00 00 00 03
    00 00 00 01
    00 00 01 01
    etc.

d) Write down the series of resulting numbers, without all the extra zeroes. In this example, it is 2, 3, 1, 101, etc. This is the Tag value loading sequence for SCSI Miniport drivers. In other words, when Windows NT loads these miniport drivers, the one with Tag value 2 is loaded first, then the one with Tag value 3, and so on.

10. Compare the Tag value loading sequence to the actual tag values of cda1000 and aic78xx that you determined in steps 4 and 5. If cda1000 is loading before aic78xx, skip to step 16. If aic78xx is loading first, continue with the next step.

11. Expand the tree on the left until you can see the nodes under \HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services.

12. Select **cda1000** on the left part of the screen. Click the right mouse button on **Tag Value** on the right part of the screen and select **Modify** from the popup menu.

13. Type the tag value of the aic78xx miniport driver in the space provided and click **OK**.

14. Select **aic78xx** on the left part of the screen. Click the right mouse button on **Tag Value** on the right part of the screen and select **Modify** from the popup menu.

15. Type the tag value of the cda1000 miniport driver in the space provided and click **OK**. You have now reversed the tag values for the two miniport drivers, and the cda1000 driver will load first.

16. Exit from the Registry Editor and from Windows NT. Then shut down the computer system.

17. Physically install the ARO- 1130xA in the PCI/RAID*port* expansion slot.

18. Attach your boot drive to one of the SCSI channels controlled by the ARO- 1130xA and boot the computer system.

Scenario #2: Adding an AHA-2940 Family Adapter to a RAIDport II System with an ARO-1130xA

These instructions assume that Windows NT is *already installed* on the computer system and that the boot drive is connected to the SCSI channel controlled by the ARO- 1130xA. If the AHA-2940 Family adapter is already installed, shut down the computer system, remove the adapter from the slot, and restart the system.

Installing the AHA-2940 Family Driver

1. Start the Windows NT Control Panel and double click the **SCSI Adapters** icon.

2. Click the **Drivers** tab and click **Add**.

3. Click **Have Disk …**, and insert the AIC-78xx Family Manager Set diskette in the floppy disk drive. (This diskette was included with your 2940 Family adapter.)

4. When the Install from Disk dialog box appears, type A:\winnt on the command line and click **OK**.

5. Select Adaptec **Adaptec AHA-294x/AHA-394x or AIC-78xx PCI SCSI Controller** and click **OK**.

6. When a message appears asking you if you want to restart Windows NT, click **No**.

7. Exit from Control Panel.

Changing Registry Settings

1. Back up the NT Registry, using one of the techniques described in *Backing up the Windows NT Registry* on **pag**e **60**.

Caution: It is very important to back up the NT Registry before you make any changes to it. This allows you to restore the original NT Registry settings if there is a problem with the new configuration.

2. Run the Registry Editor (*regedit.exe*).

3. When the Registry Editor window appears, expand the tree on the left until you can see the nodes under \HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services.

4. Select **cda1000** on the left part of the screen. Write down the cda1000 Tag value that appears on the right part of the screen.

    The Tag value is a hex number followed by an equivalent decimal equivalent in brackets: for example, 0x00000002 [2].

5. Select **aic78xx** on the left part of the screen. Write down the aic78xx Tag value that appears on the right part of the screen.

6. Expand the tree on the left until you can see the nodes under \HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\GroupOrderList.

7. Select **GroupOrderList**.

8. Click the right mouse button on **SCSI Miniport** on the right side of the window and select **Modify** from the popup menu. A table appears with columns of two- and four-number groups, something like this:

         0005 02 00 00 00 03 00 00 00
         0010 01 00 00 00 01 01 00 00
         0015 04 00 00 00 05 00 00 00
         0020 06 00 00 00 07 00 00 00
         etc.

This table of hexidecimal numbers indicates the Tag-value sequence in which the SCSI Miniport drivers are loaded when you start Windows NT.

9. To determine what the Tag value loading sequence is:

a) Ignore the four-digit groups on the left of each row.

b) Going from left to right, and starting on the first row, divide the two-digit numbers into groups of eight. In this example, the groups are

      02 00 00 00
      03 00 00 00
      01 00 00 00
      01 01 00 00
      etc.

You need to write down *all* the number groups in all rows of the table.

c) In each group of eight numbers, reverse the sequence of the two-digit pairs, like this:

      00000002
      00000003
      00000001
      00000101
      etc.

d) Write down the series of resulting numbers, without all the extra zeroes. In this example, it is 2, 3, 1, 101, etc. This is the Tag value loading sequence for SCSI Miniport drivers. In other words, when Windows NT loads these miniport drivers, the one with Tag value 2 is loaded first, then the one with Tag value 3, and so on.

10. Compare the Tag value loading sequence to the actual tag values of cda1000 and aic78xx that you determined in steps 4 and 5. If cda1000 is loading before aic78xx, skip to step 16. If aic78xx is loading first, continue with the next step.

11. Expand the tree on the left until you can see the nodes under \HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services.

12. Select **cda1000** on the left part of the screen. Click the right mouse button on **Tag Value** on the right part of the screen and select **Modify** from the popup menu.

13. Type the tag value of the aic78xx miniport driver in the space provided and click **OK**.

14. Select **aic78xx** on the left part of the screen. Click the right mouse button on **Tag Value** on the right part of the screen and select **Modify** from the popup menu.

15. Type the tag value of the cda1000 miniport driver in the space provided and click **OK**. You have now reversed the tag values for the two miniport drivers, and the cda1000 driver will load first.

16. Exit from the Registry Editor and from Windows NT. Then shut down the computer system.

17. Physically install the AHA-2940 Family adapter in the expansion slot.

18. Boot the computer system.

Backing up the Windows NT Registry

It is very important to back up the Windows NT Registry before making any changes to it. This will allow you to recover if the changes make your system unusable. Here are two ways to back up the Windows NT Registry. The backup utilities described here are included with NT Workstation/Server:

▪ Use the *ntbackup* utility to create a tape copy of all data files and Registry information. Be sure to select the **Backup Local Registry** option when performing the backup.

▪ Run the *rdisk* utility with the /s option to create a copy of the Registry on a hard disk. (A typical backup file is 5 MBytes to 10 MBytes in size.) Then use *xcopy* or some other command to copy the information to removable media. You must have the three NT boot floppy disks to restore an RDISK-saved registry to your computer system.

Appendix B: Advanced Topics

Installing Multiple Adapters

You cannot install more than one ARO- 1130xA card in the same system unless the system is designed with more than one PCI/RAID*port* slot; however, you can install an ARO- 1130xA in computers that have other PCI-, ISA-, or EISA-based host adapters installed. When installing multiple adapters, keep the following considerations in mind:

- All drives in a single array must be connected to the same host adapter. A single array cannot be created with drives from two or more host adapters.

- If you are booting from a SCSI disk drive or array supported by the ARO- 1130xA, then the ARO- 1130xA must be the card that the computer scans first. Some computers boot from the device with the lowest PCI device number; others boot from the device with the highest number. (See also *Making the Array Bootable* on **page 30**.) You can disable the BIOS on cards that are scanned before the desired boot card.

- In systems with EISA- and ISA-based host adapters, the boot host adapter must have the lowest BIOS base address. The system BIOS automatically controls the ARO- 1130xA base address (the user has no control over the assigned address).

Appendix C: Using a CD-ROM Drive with DOS

To operate a SCSI CD-ROM drive connected to the ARO- 1130xA under DOS, you need:

- The SCSI driver, *aspi8dos.sys* (version 1.30 or later)
- The CD-ROM driver, *aspicd.sys*
- The Microsoft CD-ROM extensions, *mscdex.exe*

The *aspi8dos.sys* and *aspicd.sys* files must be copied from the Adaptec Array1000xA Family Manager Set drivers diskette to a directory (e.g., *c:\scsi*) on your hard disk drive. The *mscdex.exe* file is included with MS-DOS 6.x and above (see your MS-DOS documentation for details).

Note: If you use MS-DOS 5 and do not have *mscdex.exe*, we recommend that you upgrade to MS-DOS 6 or above. You can also obtain *mscdex.exe* from Microsoft's Web site, online bulletin board, or CompuServe forum.

To complete the driver installation, edit the *config.sys* file to include command lines for *aspi8dos.sys* and *aspicd.sys*, and edit the *autoexec.bat* file to include a command line for *mscdex.exe*. The following examples illustrate the command line format and the command options appropriate for most systems.

- Sample command lines for *config.sys* file:

      device=c:\scsi\aspi8dos.sys /d
      device=c:\scsi\aspicd.sys /d:aspicd0

- Sample command line for *autoexec.bat* file:

      \dos\mscdex.exe /d:aspicd0 /M:12

(This assigns the CD-ROM the next available drive letter, typically *D* if there is only one DOS drive.)

The following tables describe the *aspi8dos* and *aspicd* command line options. For a description of *mscdex* command line options, see your

Microsoft DOS documentation. You can type command line options in uppercase or lowercase letters. Leave a blank space between options.

Command Line Options for *aspi8dos.sys*

Option	Example	Use
/ccbs<*count*>	/ccbs8	Specifies the maximum number of concurrent ASPI commands that can be supported. The valid range is 1 through 16. The default is 4. If you increase this value, the size of the ASPI manager also increases. Use this option only if you want to run an ASPI program that specifies a higher number of concurrent commands.
/d	/d	Displays information about the ARO- 1130xA and attached SCSI devices when the computer boots.
/L	/L	Enables *aspi8dos* to recognize all eight possible LUNs associated with each SCSI ID. If the option is not used, *aspi8dos* can recognize only LUN 0 for each SCSI ID.
/m*n*	/m1	Causes aspi8dos to scan the PCI bus. The method used to scan the bus is determined by the value of *n*: /mb = scan PCI bus using PCI BIOS calls /m1 = scan PCI bus using Mechanism #1 /m2 = scan PCI bus using Mechanism #2 *aspi8dos* automatically scans the PCI bus for SCSI devices. It tries to determine which scanning method will work best for the given system configuration. Use the /mb, /m1, and /m2 options only if you want to override the *aspi8dos* internal scanning mechanism. Usually *aspi8dos* can determine which scanning method is optimal for your system. (PCI BIOS calls are described in the PCI BIOS spec; scanning mechanisms #1 and #2 are described in the PCI spec.
/norst	/norst	Prevents *aspi8dos* from resetting the SCSI bus when you boot your computer. By default, *aspi8dos* resets the SCSI bus when you boot the computer if the host adapter BIOS is not present. You can use /norst to prevent this from happening.

Option	Example	Use
/pause	/pause	Pauses the system after loading *aspi8dos* at bootup, so you can read the message on the screen. After you read the message, press any key to resume booting.
/rst	/rst	Forces *aspi8dos* to reset the SCSI bus when you boot your computer. By default, *aspi8dos* does not reset the SCSI bus when you boot your computer if the host adapter BIOS is present.
/s<*slot number*>	/s1/s3	Indicates the slot number(s) where you want *aspi8dos* to look for host adapters. Valid slot numbers = 1 to 15. If you do not use this option, *aspi8dos* scans all slots for host adapters, beginning at slot 1.
/d:<*name*>	/d:aspicd0	Required in the *config.sys* command line. Assigns a name to the CD-ROM drive so that *mscdex* can assign the CD-ROM a logical drive letter. The name must exactly match the CD-ROM drive name in the *mscdex* command line in *autoexec.bat*. Use any eight- character name.
/id=*{…}*	/id=2+4 / id=3+5+1: 4	Specifies CD-ROM drives controlled by *aspicd*. By default, *aspicd* controls all drives. In the first example, which is for a computer with one host adapter, *aspicd* controls the devices with SCSI IDs 2 and 4. In the second example, for a computer with two host adapters, *aspicd* controls the devices with SCSI IDs 3 and 5 on host adapter 0 and SCSI ID 4 on host adapter 1 (if you do not specify the host adapter number, *aspicd* assumes it is 0).
/L	/L	Enables *aspicd* to recognize all eight possible LUNs associated with each SCSI ID. If the option is not used, *aspicd* can recognize only LUN 0 for each SCSI ID. Add the /L option to the command line if you have a CD-ROM drive that can access multiple discs. If your computer system includes a Pioneer DRM-600 or DRM-604x multiple-disc CD-ROM drive, you do not need to add the /L option. The *aspicd* device driver automatically scans multiple LUNs if it detects one of these devices on the SCSI bus.

Option	Example	Use
/norst	/norst	Prevents *aspicd* from issuing a SCSI Bus Reset message at system start-up. The default is to issue it. The SCSI Bus Reset message (supported by Toshiba, Hitachi, and NEC drives) resets drives that are playing audio CDs when the computer reboots.
/pause	/pause	Makes your system pause after loading *aspicd* at bootup, so you can read the message on the screen. Press any key to resume booting.
/type:*<drive vendor>*	/type:sony	Allows *aspicd* to support audio play mode for CD-ROM drives that are compatible with a supported drive type but are not included on the list of supported drives. If you use the /type:*<drive vendor>* option, *aspicd* assumes that all CD-ROM drives on the SCSI bus are made by this vendor—you cannot combine different brands of CD-ROM drives on the bus. The valid entries for this option are chinon, denon, hitachi, lms, nec, panasonic, sony, texel, and toshiba.

Appendix D: Using the SNMP Agent
(This section refers to ARO-1000SA only)

This section provides information on using the SNMP agent for NetWare and Windows NT. A section describing how to load MIBs in the MIB database is also provided.

NetWare

1. Modify the *traptarg.cfg* file which specifies SNMP trap destinations.
a. Open the *traptarg.cfg (sys:\etc\traptarg.cfg)* file using any editor.
b. Scroll down to the Protocol IPX section of the file.
c. For each client PC which is to receive traps using the IPX network protocol, add a line to the file that includes the IPX network protocol, add a line to the file that includes the IPX network number (8 digits) and the MAC address (12 digits) of the client PC. Include a tab character before the IPX Network Number. For Example:

(Tab000000002:008DAD088E24)

When all of the appropriate entries are added, the Protocol IPX section should look something like the following.

Protocol IPX
00000002:008DAD088E24
00000002:0080AD0761EC

2. Similar to instructions for the Protocol IPX section, edit the *traptarg.cfg* file to specify IP addresses mapped to MAC addresses for each client PC which is to receive traps using the TCP/IP network protocol.
3. Start the SNMP agent
a. Load the SNMP agent by entering the following command:

Load cio20 [c<string>] [v]

b.   The optional parameters are:

C<string>

Load the agent using the SNMP community name contained in
<string>. The default SNMP community name is "public".

v

Load the agent in verbose mode, which will cause debugging
information to be sent to the console.

**Note: The I/O Manager must be loaded prior to loading the SNMP
agent.**

Windows NT

The SNMP agent is automatically installed when you install Adaptec
CI/O Management Software.

There are no command line options for the CI/O agent; however, if a
file named *ciosnmp.vb* is placed in the I/O Manager installation
directory, the CI/O SNMP agent will write a debugging trail to a file
named *ciosnmp.log* in the same directory. It does not matter what the
contents of the *ciosnmp.v*b file are. The log file will be over written
each time the NT SNMP agent is restarted.

**Note: The I/O Manager must be loaded prior to loading the SNMP
agent.**

Loading MIBs in the MID Database

Follow the procedure below to load MIBs in the MIB database while
running HP Open View. For more complete information refer to the
Managing MIB Data section of the HP Open View Manual.

1.   Select the **Options:Load/Upload MIBs:SNMP** menu item,
        the **MIB Load/Upload MIBs:SNMP** dialog box appears,
        listing the MIBs currently loaded.
2.   Click the **Load** button. The load MIB from File dialog box
        appears, listing the files in the default directory.

3.   Browse the CI/O Setup Diskette and double-click the MIC file
you want to load. The MIB is automatically loaded and the
MIB Load/Unload MIBs dialog box reappears, showing the
list of currently loaded MIBS.
4.   The MIB name is now included in the Loaded MIBs scrollable
list.

If a MIB does not load properly, you will receive an error message.
The problem could be one of the following:

−   A syntax error in the MIB. The MIB loader error message
contains the MIB where the error is occurring.

−   The vendor's MIB. For example, the vendor's MIB might not
match the version for the device that is on the network.

5.   Click **Close** to exit this operation.

Part 2
Adaptec® CI/O™
Management Software

Section 1: Getting Started

This document explains how to view SCSI devices and manage arrays with the Adaptec® CI/O™ Management Software. It includes instructions on using all the software features and also information on how to replace drives, reconstruct arrays, etc.

Software Overview

Adaptec CI/O Management Software— You install the Windows® client version of Adaptec CI/O Management Software on networked clients running under _Windows 3.x, Windows®95, or _Windows NT™ 3.51 or 4.0. This program is used to monitor and manage server and array activities, giving you access to information on multiple servers to which the client is connected via the network.

Note: This program only supports AIC-78xx devices with the Adaptec 7800 Family Manager Set v. 2.10 or higher or Array1000™xA devices with the Array1000xA Family Manager Set v. 3.1 or higher.

Using the Adaptec CI/O Management Software

Here is some general information on using the Adaptec CI/O Management Software most effectively. Use the Table of Contents and the Index to find instructions for specific software commands.
Use Adaptec CI/O Management Software to monitor the status of SCSI devices, arrays, and other devices on the server. This software allows you to receive status updates from multiple remote servers. You can simultaneously monitor servers running under different operating systems.

▪ Use Adaptec CI/O Management Software to set up regularly scheduled verification of fault-tolerant arrays and testing of spares. Respond immediately to arrays in *Critical* status, and replace failed spare disks promptly.

- Use Adaptec CI/O Management Software, running either on the server console or on a networked client, to add, delete, or reconfigure arrays after the server has already been in use. (You need special access rights to change the server configuration.)

- We recommend that you create a bootable array and boot the server from the array instead of from a stand-alone disk drive. You can create a bootable array with either Adaptec CI/O Management Software or the _ArrayConfigSA program.

- Use the password feature of Adaptec CI/O Management Software to prevent unauthorized users from changing your array configuration.

- Be sure that arrays are adequately protected with spare pools (recommended) or dedicated spares. You can create and delete spares with any of the array management software programs.

Note: Your Adaptec product also includes the diskette-based _ArrayConfigSA Initial Boot Array Installation Utility, which you can use to create arrays and spares. You can use _ArrayConfigSA to create an initial bootable array for the server.

Section 2: Entering and Viewing Server Information

Adaptec CI/O Management Software allows you to view events taking place on multiple servers. In addition, you can view the configuration of SCSI devices, arrays, and other hardware on the server(s). This chapter explains how to view client and server information.

Entering and Viewing Server Information

Adding a New Server Address

You must enter information about each 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.

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

1. Start the program by double-clicking the icon in the Adaptec CI/O Management Software group.

2. Click the button. The New Server dialog box appears, as shown in Figure 2-1.

```
┌─────────────────────────────────────────────────┐
│                  New Server                      │
├─────────────────────────────────────────────────┤
│                                                   │
│  Name or Address: ┌───────────────────────────┐  │
│                   └───────────────────────────┘  │
│                                                   │
│       Protocol:  ○ IP    ○ IPX                    │
│                                                   │
│     Description: ┌───────────────────────────┐   │
│                  │                            │   │
│                  │                            │   │
│                  │                            │   │
│                  │                            │   │
│                  │                            │   │
│                  └───────────────────────────┘   │
│                                                   │
│   ┌────────┐    ┌────────┐    ┌────────┐         │
│   │   OK   │    │ Cancel │    │  Help  │         │
│   └────────┘    └────────┘    └────────┘         │
└─────────────────────────────────────────────────┘
```

Figure 2-1: New Server Dialog Box

3. Select the **IP** or **IPX** radio button to indicate which kind of access is the default.

4. Enter the server's name or IP/IPX address, which can be up to 32 characters. This name will appear beneath the server icon in the Server View window.

− Servers running under NetWare usually use IPX protocol. Select the **IPX** button and type the name of the server. To view the server name, open Windows File Manager and select **Connect Network Drive** from the Disk menu. Then view the scrollable list of server names. If an error message appears when you click **OK** in the New Server dialog box, verify the server name and the use of IPX with the System Administrator.

If you need to enter an IPX address, the format is *xxxxxxxx.xx- xx-xx-xx-xx-xx*, where the first eight *x*'s are hex digits that define the network number, and the six pairs of hex digits are the host address or MAC address.

− Servers running under Windows NT usually use IP protocol. For Windows NT 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

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networked client is set up with either a host 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).

5. Enter a description of the server—for example, Application Server or Video Server. This description appears when you double-click the server icon in the Server View window.

6. Click **OK** to add the new server information. You will see one of the following error messages if the server name/address is not correct:

− **RPC transport error**. This means that you entered a server address with correct IP or IPX syntax, but there is no server with this address. Check your typing for errors and try again.

− **Transport not present**. This means that the selected protocol transport is not present.

− **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 and Editing Server Information

Follow these steps if you need to enter or change a server's network address information from the top menu bar of the CI/O Management Software main screen:

1. Click the button on the toolbar. The Server View window appears. Each server is represented by an icon in the top part of the window. The appearance of the icon indicates the server status, as shown here:

 Server is online and available.

 Server is unavailable, perhaps due to a network failure. The Adaptec CI/O will automatically attempt to reattach to the server for a

user-selectable time (default is 10 minutes). Double-click the server icon at any time to attempt a reattach.

Server has generated a critical event message.

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

Server has generated a warning event message, such as an array in Critical status.

Adaptec CI/O has lost communication with the server.

Double-click a server icon in the Server View window. The Server Information dialog box appears, similar to Figure 2-2.

Figure 2-2: Server Information Dialog

2. View the server name, IP address, or IPX address.

3. View or edit the server description. The description is for your information only and appears only in this dialog box.

4. Click **OK** to exit the Server Information dialog box and to retrieve any updated server information.

Deleting a Server Address

When you delete a server address, the icon for the server no longer appears in the Server View 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. Select **Server View** from the File menu.

2. Click the icon of the server you want to delete.

3. Select **Server Delete** from the File menu. A prompt appears asking you to confirm the deletion of the currently selected server address.

4. Click **Delete** to delete the server address.

Viewing a List of Current Server Events

When you run Adaptec CI/O Management Software, you can use the Server View window to monitor events on all servers to which you are connected. Event notifications appear at the top of the list as they are received, starting from the time when you connect to the network. A color- coded circle at the beginning of each message gives you a quick indicator of its severity.

If you minimize Adaptec CI/O Management Software, the icon flashes whenever a new event notification is received.

Follow these steps to view a list of current server events in the Server View window:
1. Select **Server View** from the File menu. The Server View window appears. The Global Current Event Log at the bottom of this window lists server events, as shown in Figure 2-3.
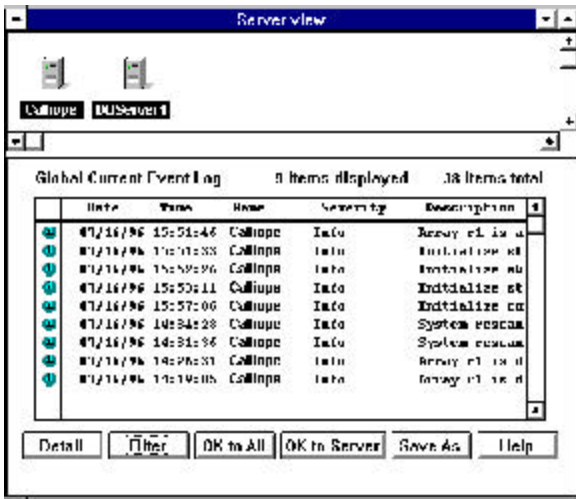
Figure 2-3: Listing of Server Events

2. View the event information for one or all servers. New entries
   appear on the list as the server events occur, and a date and time is
   listed for each event. See *Interpreting and Responding to Server
   Event Messages* on **page 85** for more information on how to
   respond to these messages.

To view detailed information about an event, double-click the list entry.
The Log Detail dialog box appears, as shown in Figure 2-4.
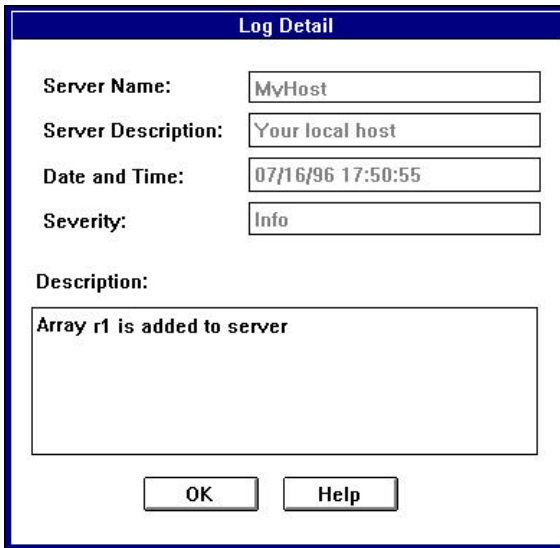
Figure 2-4: Log Detail Dialog Box

The information displayed in the Log Detail dialog box is similar to what appears in the one-line log entry, but the format is more readable.

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

–   To acknowledge all new event notifications *from all servers* without reading each individually, click **OK to All** at the bottom of the Server View window. This stops the Adaptec CI/O Management Software icon from flashing when the application is minimized.

–   To acknowledge all new event notifications *from the currently selected server* without reading each one individually, click **OK to Server** at the bottom of the Server View window.

4. Click **Filter** in the Server View window to filter the events notifications in this window by severity. (See *Changing Filter Options* below.)

5. Click **Save As** to save the event list to a file.

6. Close the Server View window when you are finished viewing the server events or leave it open so you are aware of server events as they occur.

Changing Filter Options

You can control what kinds of event entries are listed in the Global Current Event Log (part of the Server View window) and the Historic Event Log window. You can set the Filter options globally, or you can customize them for individual windows. Follow these steps to change the filter settings globally:

1. Click the ⬜☑ button on the toolbar. The Preferences dialog box appears.

2. Click **Filter**. The Default Event Viewing Filter dialog box appears, as shown in Figure 2-5.
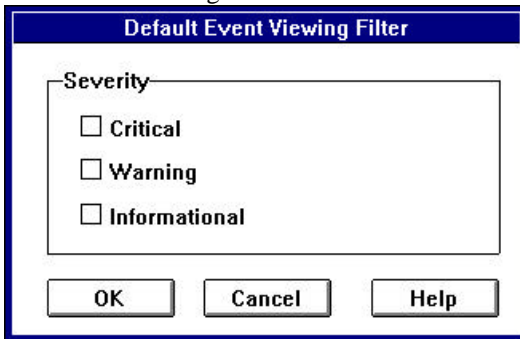
Figure 2- 5: Default Event Viewing Filter

3. Select or deselect the **Critical**, **Warning**, or **Informational** entries to control which kinds of messages appear in the Global Current Event Log and the Historic Event Log. (We recommend that you select all the boxes.) If you choose not to display some kinds of messages, the *Items displayed* number above the log entries lists the number of messages that are actually displayed. The *Items total* field always 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 Server View or Historic Event Log window and click **Filter**. Change

the options as described above and click **OK**. The changed settings apply to this window only while it is open; the settings will return to the defaults if you close and re-open the window or if you restart Adaptec CI/O Management Software .

Choosing Notification Settings

The notification settings determine how you are notified of events that occur on servers 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 window.

Follow these steps to choose notification settings:

1. Click the [button image] button on the toolbar. The Preferences dialog box appears.
2. Click **Notification**; the Event Notification Options dialog box appears, as shown in Figure 2-6.
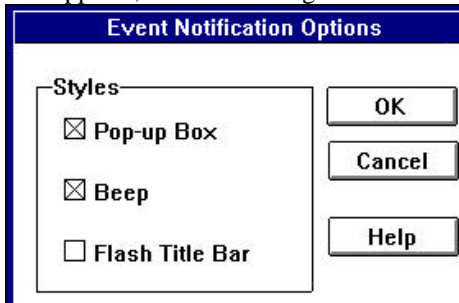
Figure 2-6: Event Notification Options Dialog Box

3. Select **Pop-up Box**, **Beep**, and/or **Flash Title Bar** to control how you will be notified of events that occur on servers to which Adaptec CI/O Management Software is connected.

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

4. Click **OK** to save these settings.

Viewing Historical Server Information

You can view a log of historical information for any single server to which Adaptec CI/O Management Software is connected. This information is retrieved from the server.

Follow these steps to view historical server information:

1. Click the ![button] button on the toolbar. The Historic Event Log window for the currently selected server appears, as shown in Figure 2-7.
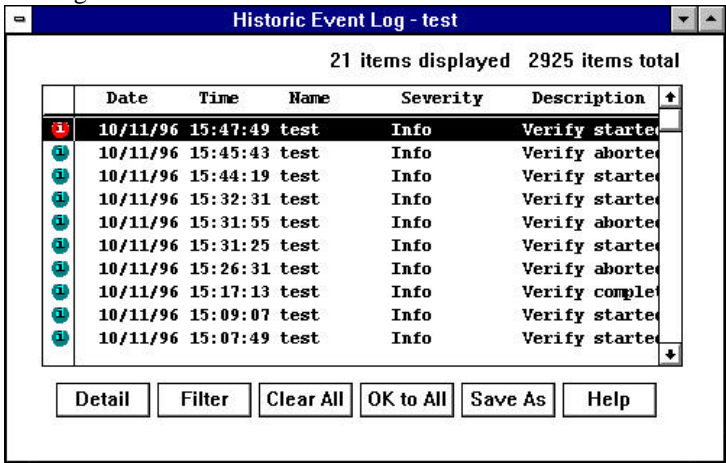
Figure 2-7: Server Historic Event Log Window

View the historical information for the server. New entries are added to the top of the list as they occur. A color-coded circle at the beginning of each message indicates its severity. (See the next heading, *Interpreting and Responding to Server Event Messages*, for more information.)

2. To view detailed information about an entry on the list, double-click the entry. The Log Detail dialog box appears, as shown in Figure 2-4.

3. Click **OK** when you are finished viewing the Log Detail dialog box.

4. Click **Filter** to change the Message Filter options. Click **OK to All** to acknowledge all new event notifications without reading each one. (This stops the minimized Historic Event Log icon from flashing.) Click **Clear All** to delete all log entries. Click **Save As** to save the log to a file.

Note: When you open the Historic Event Log window, only the most recent log entries are initially displayed. If you scroll down beyond these entries, another group of entries are retrieved. This avoids the delay that might occur if an entire large log file were retrieved from the server at one time. To keep the Server Log file from getting too large, specify a maximum size for it in the initialization file.

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

Interpreting and Responding to Server Event Messages

There are three severity levels for server events:

Critical event messages (red) indicate an array or server problem that requires immediate action. An example is an array going off-line because two array members have failed. See *Responding to an Off-Line Array* on **page 139** for more information.

Warning event messages (yellow) indicate an array or server problem

that may require attention. An example is 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 137** for more information.

Informational event messages (green) contain information about a normal operation, such as creating a new array, adding a spare, or

verifying an array.

Entering and Viewing Preference Information

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

Follow these steps to change or view preferences information:

1. Click the ![button] button. The Preferences dialog box appears, as shown in Figure 2-8.
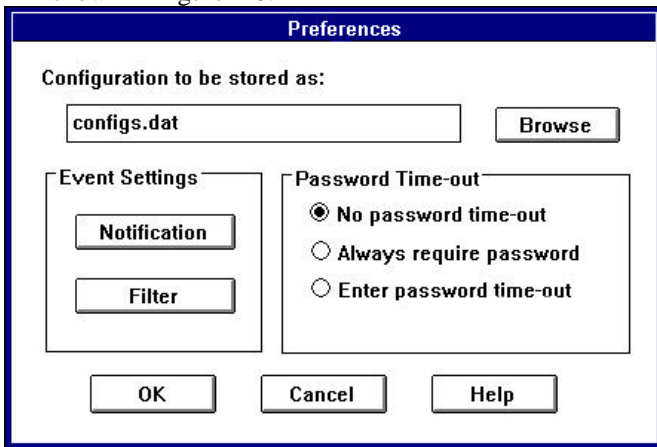

Figure 2-8: Preferences Dialog Box

You can enter a different name for the configuration file that is stored on the networked client. Click the **Browse** button if you want to store this file in a different directory on the client's hard drive.

2. Click **Notification** to change the way in which you are alerted of event notifications sent from servers. The Event Notifications Options dialog box appears, as shown in Figure 2-6. Select one or more of the available options.

3. Click **Filter** to view the Log Filter dialog box. Select or deselect the check boxes, to filter the types of messages that appear in the

window. We recommend that you select all the boxes so you are fully informed of server events.

4. Select a Password Time-out option to set the level of password protection for this workstation or server. See *Setting Password Time- out Options* on **page 134** for more information.

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

Editing the Permanent List

Each server maintains a *permanent list* and an *active list* of networked clients. Clients that communicate with the server are automatically added to the server's active list. Adding a client name to the permanent list allows that client to receive event notifications from the server even when it is not actively monitoring the server. (If a client is on the server's permanent list but not the active list, the server icon does not appear in the Server View window.) You can delete the client name if you no longer want to be notified of events on a particular server.

When you edit the permanent list, you are required to enter the server password.

Caution: We recommend that you do *not* use the Permanent Notification feature for normal communications between servers and networked clients. Servers can use the active list to rapidly communicate new events to networked clients.

Follow these steps to add clients to or delete clients from the permanent list:

1. Open the Server View window and select the icon of the server whose permanent list you want to edit.
2.   Select **Server Administration** from the View menu.
3. Select **Edit Permanent List.** Enter the server's password at the prompt. The Edit Permanent List dialog box appears, as shown in Figure 2-9.

Edit Permanent List

Client Entry

Name or Address: 162.62.15.60   ◉ IP ○ IPX

123.76.65.43

123.45.67.67

123.56.65.67

Calypso

Add

Delete

Close

Help
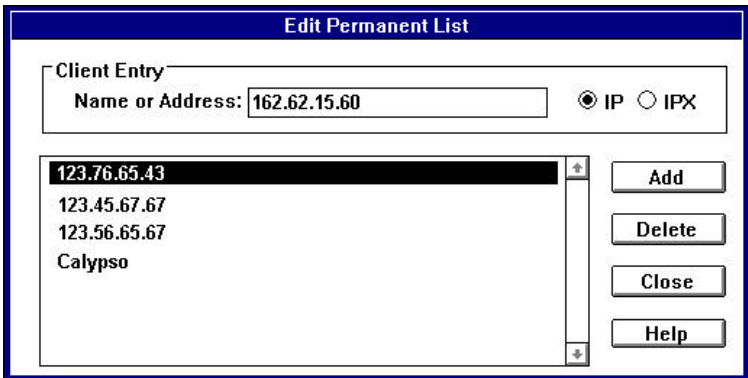
Figure 2-9: Edit Permanent List Dialog Box

The list box shows the entries that are currently in the selected server's permanent notification list.

4. To add a new networked client entry, type the IP or IPX address in the field at the top of the screen, select **IP** or **IPX**, and click **Add**.

5. To delete a networked client entry, highlight the entry in the list box and click **Delete**.

6. Click **Close** when you are finished. The changes are registered in the server's permanent list file.

Section 3: Configuring Arrays and Spares

This chapter explains how to add and delete arrays and spares with the server console version or with the networked client version of the Adaptec CI/O Management Software . The menus and commands are the same for all supported versions of Windows.

You must know the Adaptec CI/O Management Software password to add and delete arrays and spares. See **Section 7**, **page 133**, *Setting Security Options*, for more information.

The following topics are explained in this chapter:

- *Creating an Array* on **page 91**

- *Making an Array the First Virtual Device* on **page 96**

- *Deleting an Array* on **page 97**

- *Initializing an Array* on **page 99**

- *Creating Dedicated Spares or a Spare Pool* on **page 100**

- *Deleting a Spare* on **page 102**

- *Arrays from External RAID Controllers* on **page 103**

These features are available for PCI array controllers and Bridge array controllers only. They are not available for SCSI adapters.

Starting the Program

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

1. Start Windows.

2. Double-click the ![I/O icon] icon in the Adaptec CI/O Management Software group to start the program.

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 server to which you are trying to connect does not allow remote users to view its configuration information. See *Controlling Guest Access* on page 135 for more information.

3. Open the Server View window by clicking the ⬚⬚ button on the toolbar.

Note: If no Server icons appear in the upper part of the window, enter information about the servers you want to monitor before you continue. See *Adding a New Server Address* on page 75 for more information.

4. Click the icon of the server whose arrays and spares you want to configure, as shown in Figure 3-1. You can identify the server by the name that appears beneath it.
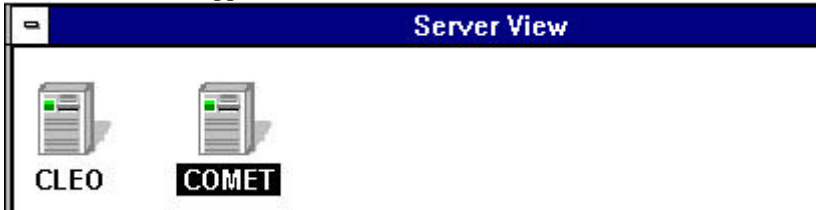
Figure 3-1: Server Icons

If the icon appears dimmed, the server is off-line or otherwise unavailable. (See *Entering and Viewing Server Information* on **page 75** for more information about server icons.)

5. Open the Storage Configuration window by clicking the ⬚ icon on the toolbar. All array and spare configuration tasks are done from within this window.

Note: Depending on your system configuration, the Storage Configuration window may open automatically when you start the Adaptec CI/O Management Software. See the *How-To Topics* section of the Adaptec CI/O Management Software online Help for more information about this window.

You can open other Storage Configuration windows for other servers to which you are connected. To do this, return to the Server View window, select a different Server icon, and click the ⬛⬛ button again.

Creating an Array

Follow these steps to create arrays with Adaptec CI/O Management Software :

1. Start Adaptec CI/O Management Software and open the Storage Configuration window, as described in *Starting the Program* on **page 89**. This window looks similar to the one shown in Figure 3-2.
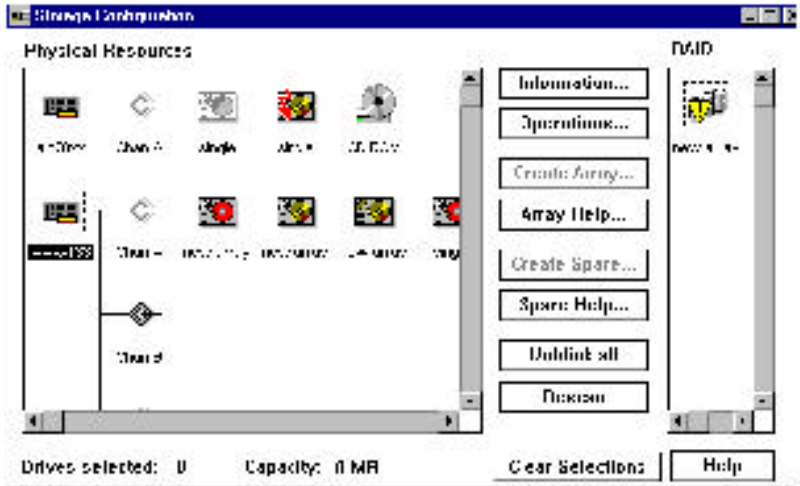

Figure 3-2: Storage Configuration Window

The icons on the left side of the Storage Configuration window represent the server's *physical resources—*the Adaptec Array1000 Family product s, AIC-78xx products, channels, and SCSI devices installed in the server. The icons on the right side represent the server's *array resources—*the arrays and spares you define. Click the buttons in the middle of the window to perform operations on selected Device icons.

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). The following table lists your Array options. See *Selecting a RAID Level for an Array* on **page 140** for information on the advantages and disadvantages of each RAID level.

RAID Level	Minimum Disks	Maximum[4] Disks	Dedicated Spares	Pool Spares
RAID 0 (Striped)	1[5]	16	None	None
RAID 1 (Mirrored)	2	2	1 or 2	up to 8
RAID 0/1 (Mirrored & Striped)[6]	4	16	1 or 2	up to 8
RAID 5 (Striped, with Distributed Parity)	3	16	1 or 2	up to 8

3. Select disks for the new array by clicking Disk icons that have the word **Single** beneath them, as shown in Figure 3-3.

Figure 3-3: Selecting Array Members

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[4] This is the maximum number of disks supported by the software driver. The maximum for your computer system may be less, depending on how many SCSI channels and devices you have.

[5] The purpose of one-disk RAID 0 arrays is to give you more control over the virtual device order of disks controlled by the Adaptec Array 1000 Family product. This is also useful for defining thesystem's boot device.

[6] RAID 0/1 arrays must have an even number of disks.

Do not include disks that you want to use as dedicated spares. Click a second time on an icon to deselect it, or click the **Clear Selection** button to deselect all disk icons. All array disks must be connected to the same Adaptec Array1000 Family product.

Note: Only devices attached to array controllers can be used for arrays and spares. Devices attached to SCSI adapters can only be viewed.

A warning appears if you select a disk that has a partition. If the operating system recognizes the partition, you *cannot* use the disk in the array. If the operating system does *not* recognize the partition (for example, if the disk was previously partitioned under another operating system), you *can* use the disk in the array.

You cannot use disks with recognized partitions for the array so you will not accidentally erase the server's boot 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 popup 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 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.

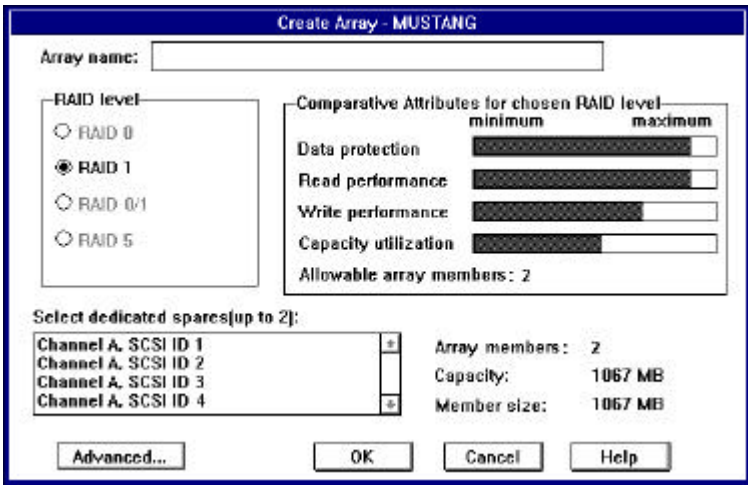4.   Click **Create Array...**. The Create Array dialog box appears, as shown in Figure 3-4.

Figure 3-4: Create Array Dialog Box

The number of disks in the array and the array capacity are listed on the right of the dialog box.

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

6. Select a RAID level for the array by clicking one of the buttons on the left. The bar graphs on the right show the relative levels of data protection, read performance, write performance, and capacity utilization for each RAID level.

RAID levels appear dimmed if they are not consistent with the number of disks you have selected. (See the table on **page 92**.) For example, RAID 0/1 appears dimmed if you selected three disks, because a RAID 0/1 array must have at least four disks.

7. Select one or two disks from the list as dedicated spares. (Use **Ctrl-Click** to select multiple disks.) The disks on the list are the single 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.

We recommend using a spare pool instead of dedicated spares. See *Creating Dedicated Spares or a Spare Pool* on **page 100** for more

information. Spares in a *spare pool* can be used by any array on the controller.

8. Click **Advanced...** to examine or change the Advanced Array options. The Advanced Array Options dialog box appears. See *Setting Advanced Array Options* on **page 95** for more information.

9. Click **OK** and then click **Yes** to confirm that you want to create the array. If error messages appear, indicating that your array selections are inconsistent, change your selections and click **OK** again. A warning appears if you selected a dedicated spare that is smaller than the array members.

The array is initialized at this point, unless you deselected auto-initialize in Advanced Array options. (If you deselected auto-initialize, skip to 11.) To abort the initialization process (not recommended), open the Array Activity Monitor window, select the

icon for that array, and click **Abort**.

10. Wait until the new array is initialized. A popup box will appear to inform you that event notifications are waiting and can be viewed

   in the Server View window. Then an icon like this   for the new array appears in the right section of the Storage Configuration window. Another event notification is generated when the initialization process finishes.

Note: Event notifications may appear as popups or as entries in the Server Historic Event Log and Event Log, depending on the Event Notification options you selected in the Client Settings dialog box.

11. Exit from Adaptec CI/O Management Software. Then reboot the server. (You cannot use the new array until you reboot.) You must partition the new array using the Windows NT Disk Administrator, just as you would partition a new stand-alone disk drive.

Setting Advanced Array Options

The Advanced Array Options dialog box is shown in Figure 3-5. *Do not* change these options from their default settings unless you have a specific reason to change them.

Figure 3-5: Advanced Array Options Dialog Box

Here is a brief description of the advanced options:

- **Stripe size** is the size that will be used to stripe data or parity information across the disks in the array. The optimal stripe size depends on factors such as the type of data being stored on the array and the server operating system. The default stripe size of 64 KBytes works best in most cases.

- 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.

- Click **Restore Defaults** to restore the default Advanced Array Options settings.

The *default settings* are the settings that existed when you opened the dialog box. If you change the settings and click **OK**, these become the new default settings for this array.

Making an Array the First Virtual Device

Use this command if you want the server to boot 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 Adaptec Array1000 Family product.)

You make an array bootable by assigning it virtual device order #0. The *virtual device order* is the sequence in which the server's operating system detects the arrays, single disks, and other devices connected to the Adaptec Array1000 Family product when the server boots. You may also need to move the Adaptec Array1000 Family product to a different PCI slot. See your Adaptec Array1000 Family product's Installation and Hardware Guide for more information.

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

Follow these steps to create a bootable array:

1. Start Adaptec CI/O Management Software and open the Storage Configuration window, as described in *Starting the Program* on **page 89**

2. Click the icon in the right part of the window for the array that you want to make bootable.

3. Click **Operations**. Click . When the message appears, click **OK** to confirm that you want to make this array the boot device.

4. Exit from the Adaptec CI/O Management Software. If the selected array does not already have a bootable partition on it, reboot the server to a floppy disk.

5. Install the operating system on the array. See your Adaptec Array1000 Family product 's Installation and Hardware Guide for more information.

The next time you boot the server, 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. Start Adaptec CI/O Management Software and open the Storage Configuration window, as described in *Starting the Program* on **page 89**.

2. Click the icon in the right area of the window for the array you want to delete.

3. Click **Operations**.

4. When the Array Operations dialog box appears, click to delete the array.

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 so you will not accidentally delete the server's boot array. To find out if an array has a partition, double-click the icon and click **Check Partitions** in the Array Information dialog box. A small popup box indicates 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, 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 delete the array.

5. When the confirmation message appears, click **OK** to 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 assignment.

Initializing an Array

When you create a new array it is initialized immediately by default unless you deselect 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.

To low-level format the array instead of initializing it with zeros, use the _ArrayConfigSA™ program. Low-level formatting checks the surface of the disks for defects.

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. Start Adaptec CI/O Management Software and open the Storage Configuration window, as described in *Starting the Program* on **page 89**

2. Click the icon of the array you want to initialize. The Operations button becomes active.

3. Click **Operations**.

4. When the Array Operations window appears, click the button.

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 server's boot array. To find out if an array has a partition, double-click the icon, and click **Check Partitions** in the Array Information dialog box. A small popup box

indicates 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.

5. When the confirmation message appears, click **Initialize** to confirm that you want to initialize the array.

To abort the initialization process (not recommended), open the Array

Activity Monitor window, select the icon, and click **Abort**. It may take a long time to initialize an array. You can watch the progress of the initialization process in the Array Activity Monitor window.

Creating Dedicated Spares or a Spare Pool

Each RAID 1, 0/1, or 5 array can have one or two *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 Adaptec Array1000 Family product can have a *spare pool* of multiple disks which automatically replace failed disks 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. Spare pools give you more flexibility and provide good data protection with fewer disks than is required for dedicated spares.

Note: Adaptec CI/O Management Software is automatically configured to test all spares on the server 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:
1. Start Adaptec CI/O Management Software and open the Storage Configuration window, as described in *Starting the Program* on **page 89**.

2. Select the disk you want to configure as a spare by clicking on its icon in the left part of the window. (Choose a disk that has the word **Single** beneath it.)

3. Click **Create Spare...** The Create Spare dialog box appears, as shown in Figure 3-6. A list of already-defined spares appear on the right. Names of existing arrays appear on the left only if the disk you selected is large enough to protect that array as a spare.
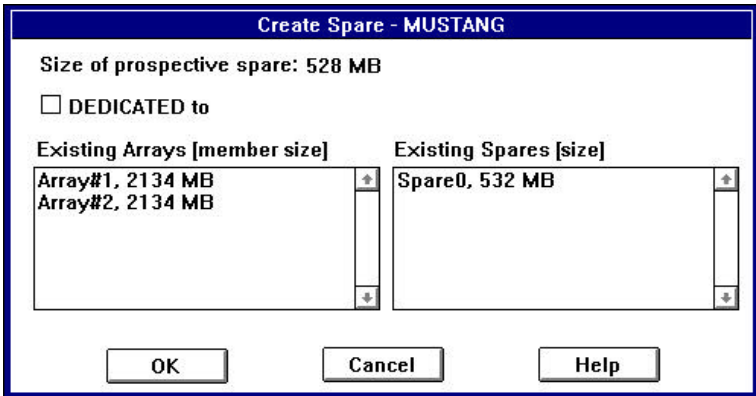

Figure 3-6: Create Spare Dialog Box

Note: In the Storage Configuration window, pool spares are labeled p-spare and dedicated spares are labeled d-spare in both the left and right parts of the window.

4. If you want to dedicate the spare to a specific array, select **Dedicated To** and click the array name in the scrollable list. If you want to add the spare to the pool of spares available to *all* arrays on the controller, *do not* select the Dedicated To box.

5. Click **OK** to create the spare. A warning message appears if you select a disk that has a partition. If the partition is recognized by the operating system, you *cannot* use the disk as a spare. If the partition is *not* recognized by the operating system (for example, if the disk was previously partitioned under another operating system), you *can* use the disk as a spare.

You are prevented from using disks with recognized partitions so you will not accidentally erase the server's boot 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 popup 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.

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

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.

To see which arrays are protected by an existing spare, select the spare in the Existing Spares list; the arrays protected by this spare are highlighted in the Existing Arrays list. You can double-click an array or a spare to view detailed information about it.

Deleting a Spare

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

1. Start Adaptec CI/O Management Software and open the Storage Configuration window, as described in *Starting the Program* on **page 89**.

2. Click the icon in the Array part of the window for the spare you want to delete.

3. When the confirmation message appears, click **OK** to confirm that you want to delete the spare.

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

Arrays from External RAID Controllers

A bridge controller connects Fibre Channel-to-SCSI or SCSI-to-SCSI external intelligent RAID array controllers to bridge the host I/O interface to multiple back-end device channels. These devices appear under a SCSI channel, but are capable of the same functionality as SCSI devices connected to array controllers. Refer to the sections on configuring and viewing arrays in this User's Guide for specific information on arrays.

Section 4:
Viewing Array and Device Information

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

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

1. Select **Configuration** from the View menu, or click the [icon] icon on the toolbar.

2. When the Storage Configuration window appears, double-click the icon that represents the device for which you want to view information.

The Array and Spare icons are virtual devices that appear on the right side of the Storage Configuration window. *Virtual* means that arrays and spares do not exist until you configure them on the server. See figure 4-1.

Figure 4-1: Storage Configuration Icons

Physical Devices	Logical Devices
Controller	Array
Channel	Spare
Disk Device	
CD_ROM Drive	
Other Physical Devices	

The Product, Channel, and SCSI device icons are 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 when you click an icon for a virtual or physical device.

Viewing Array Information

When you double-click an Array icon in the Storage Configuration window, the Array Information dialog box appears, as shown in Figure 4-2.
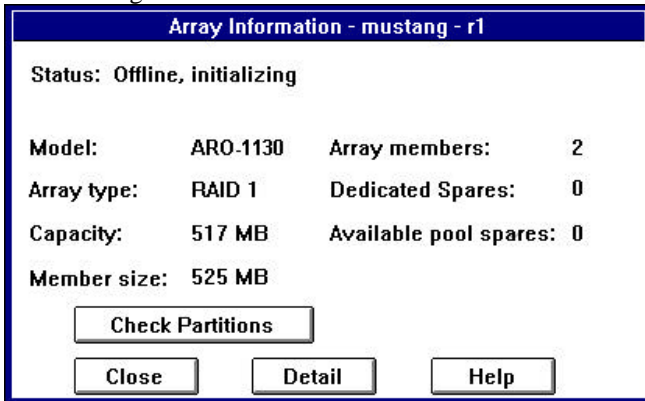
Figure 4-2: Array Information Dialog Box

The following information appears in the Array Information dialog box:

- **Status**: current status of the array, such as OK, Off-line, Fault-tolerant, Critical, etc.
- **Model**: model name of the Adaptec product to which the array disks are connected.
- **Array type**: RAID level of the array. The supported levels are RAID 0, RAID 1, RAID 0/1, and RAID 5.
- **Capacity**: total usable disk space available in the array, in MBytes.
- **Member size**: size of the array members.

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- **Array members:** number of disks in the array.

- **Dedicated spares**: number of spare disks dedicated to this array.

- **Available pool spares**: number of pool spares available to protect this array.

Click **Check Partitions**. A small dialog box indicates whether the selected array has a partition and whether the partition is visible to the operating system.

When you click **Detail**, you can view the following additional information about the array:

- **Stripe size**: data and parity striping size used on this array.

- **Virtual device order**: the sequence in which the server's operating system detects this array when it boots. If the array's virtual device order is 0, then this array is the first device the operating system detects at boot time.

- **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 117** 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 114** for information on how to reconstruct an array.

Click **Close** to close the Array Detail and Array Information dialog boxes.

Viewing Spare Information

When you double-click a Spare icon in the *right* side of the Storage Configuration window the Spare Information dialog box appears, as shown in Figure 4-3.

Figure 4-3: Spare Information Dialog Box

When you double-click a Spare icon in the *left* side of the window, the SCSI Information dialog box appears, as it does for a single SCSI disk.

The Spare Information dialog box shows which array the spare is dedicated to, whether it is a member of a spare pool, its capacity, and its current status. An *Available* status means the spare is fully functional and is available to replace a failed array disk.

Note: The Spare icons in the Storage Configuration window are labeled p-spare for pool spares and d-spare for dedicated spares.

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 to SCSI adapters. The same SCSI device information is provided in both cases.

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 server, the operating system software scans the server 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

- Connect a new SCSI device to the Adaptec Array1000 Family product without using the Pause I/O command

- Disconnect a SCSI device from the Adaptec Array1000 Family product 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 server:

1. Click the button on the toolbar. The Storage Configuration window appears.

2. Click **Rescan** in the area between the Physical Resources and Array areas of the window.

3. When the message appears, click **Yes** to 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.

4. Click **OK** when the message appears indicating that the rescan was completed successfully.

Note: You cannot use the Rescan command to recognize an entire array that was transferred from another server. You must reboot the server 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 double-click a Controller icon ![icon]   , the Controller Information dialog box appears, as shown in Figure 4-4.
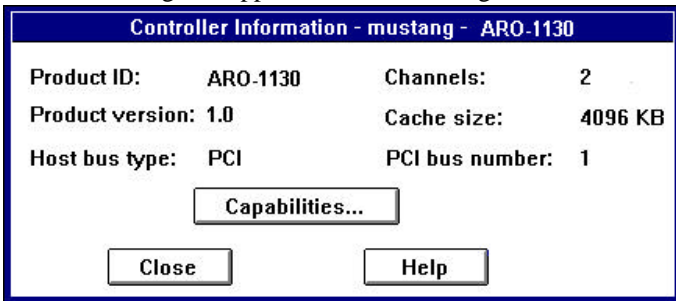
Figure 4-4: Controller Information Dialog Box

The information in the Controller Information dialog box is self-explanatory. The *PCI bus number* field indicates which PCI slot the Adaptec product is installed in. You may need this information to configure the server to boot from an array. For more information, read the server documentation.

Click **Capabilities** to view a list of the features supported by this Adaptec Array1000 Family product . The list is informational only; you cannot enable or disable the capabilities on the list. These are controller capabilities that may appear on the list (not all features appear for every product):

▪ **Auto Verify**: indicates that the product automatically verifies SCSI parity.

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- **Auto Fix**: indicates that the product automatically corrects data and parity miscompares.

- **Supported RAID Levels**: lists the RAID levels the product supports.

- **Maximum Number of Spares**: lists the maximum number of dedicated spares per array that the product supports.

- **Maximum Number of Physical Arrays**: lists the maximum number of arrays 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/Minimum Stripe Size**: lists the range of data and parity stripe sizes that the product supports.

- **Spare Pool**: indicates that the Adaptec Array1000 Family product supports using spares from a spare pool.

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

Viewing Array Channel Information

When you double-click a Channel icon ◈ , the Channel Information

dialog box appears, as shown in Figure 4-5.

Figure 4-5: 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. For example, if this number is 16, you can connect up to 15 devices, since the channel itself counts as one device.

- **Current Devices**: number of SCSI devices currently connected to the channel.

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

Section 5: Performing Array, Spare, and Disk Operations

In Adaptec CI/O Management Software you can perform a number of operations on arrays, spares, and stand-alone disks. These operations include verifying the SCSI parity of arrays, reconstructing an array, testing spares, and blinking the lights on one or more disks. Some of the operations are performed immediately; others can be scheduled for a later time, or scheduled to occur periodically at stated intervals.
To perform array, spare, and disk operations:

1. Select **Configuration** from the View menu, or click the icon on the toolbar.

2. When the Storage Configuration window appears, *single*-click the icon that represents the array , spare , or SCSI disk you want to work on.

3. When you do this, the Operations button becomes active.

4. Click **Operations**. The Array Operations, Spare Operations, or Disk Operations dialog box appears.

5. Click the button for the operation you want to perform. See the appropriate section of this chapter for a description of these operations.

Performing Array Operations

A list of the array operations follows. Note that some of these operations are described on **page 89**, *Configuring Arrays and Spares*.

- *Reconstructing an Array* on **page 114**
- *Pausing I/O on an Array* on **page 116**

- *Verifying Array Integrity* on **page 117**

- *Blinking Array Drive Lights* on **page 119**

- *Reactivating an Off-line Array* on **page 120**

- *Changing an Array Name* on **page 120**

- *Forcing a Spare* on **page 121**

- *Making an Array the First Virtual Device* on **page 96**

- *Creating an Array* on **page 91**

- *Initializing an Array* on **page 99**

Reconstructing an Array

If a 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 fails and no spare is available to replace it, you receive an event notification that the array is Critical. You may need to reconstruct the array with this command after the drive is replaced. In either case, data on the array is not lost.

You can reconstruct an array immediately after you replace the failed disk, 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 server.

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[7], pause I/O to the array. (See *Pausing I/O on an Array* on **page 116**.) This is not necessary if the array enclosure does support hot swapping.

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[7] 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.

3. Replace the failed disk (or disks) with 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.

4. If you paused I/O in Step 2, wait until it automatically resumes after the pause period. If you did not pause I/O, issue a Rescan command to detect the new disk.

5. 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 100**. Be sure the new spare disk is at least as large as the smallest array member.

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.

6. Select **Configuration** from the View menu. The Storage Configuration window appears.

7. Click on the Array icon that looks like this ![icon] . The Operations button becomes active.

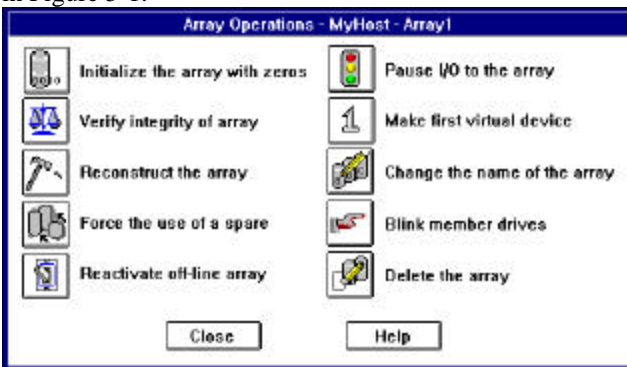Click **Operations**. The Array Operations dialog box appears, as shown in Figure 5-1.

Figure 5-1: Array Options Dialog Box

8. Click the ![button] button. 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 drivers 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.)

9. Enter the required information for the Reconstruct operation in the Scheduler dialog box. You can select **Immediate** to reconstruct the drive immediately or select **Once** to schedule the operation for a later time. (See *Setting Scheduling Options* on **page 127** for more information.)

10. Select an Execution priority - **high**, **medium**, or **low**.

11. Click **OK**.

12. When the message appears, confirm that you want to reconstruct the array member.

Read the event notifications that appear in the Server View window (they may also appear as popups on the screen) to determine when the reconstruct is complete.

Open a Watch box if you want to monitor the progress of the array reconstruction. (See *Monitoring Activities That Are Running* on **page 130**.)

Pausing I/O on an Array

Use this option 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[8], you probably do not need to pause I/O to replace a disk. See the array enclosure documentation for more information.

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[8]   *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.

When you pause an array, all other devices on all channels on the Adaptec Array1000 Family product 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. Open the Storage Configuration window and select the icon of the array you want to pause.

2. When the Array Operations dialog box appears, click the button.

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.

The Minimum pause period is 5 seconds; the maximum pause period is 120 seconds.

4. Do whatever you need to do with the array disks. Data I/O resumes automatically at the end of the pause period.

Verifying Array Integrity

Use this option 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 127** for more information.

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

1. Select **Configuration** from the View menu. The Storage Configuration window appears.

2. Click on the Array icon . The Operations button becomes active.

3. Click the **Operations** button.

4. When the Array Operations dialog box appears, click the button to verify the data on the array. The Scheduler dialog box appears, as shown in Figure 5-2.

Figure 5-2: Scheduler Dialog Box

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

6. Select **Immediate** if you want to verify parity immediately, or select **Scheduled** if you want to schedule the operation for a future time.

If you select Scheduled, enter a start time, start day of the week, and other information. (See *Setting Scheduling Options* on **page 127** 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. When the message appears, confirm that you want to verify parity information.

You can open a Watch window to monitor the progress of the operation as it is running. See *Monitoring Activities That Are Running,* on **page 130,** for more information.

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.

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

1. Select **Configuration** from the View menu. The Storage Configuration window appears.

2. Click on an Array icon in the right side of the dialog box. The Operations button becomes active.

3. Click the **Operations** button.

4. When the Array Operations dialog box appears, click the button.

5. Look at the array enclosure to see which disks are members of the array.

6. Click the **Unblink all** button in the Storage Configuration dialog box to stop 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 remove 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 139** for more information.

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

1. Select **Configuration** from the View menu. The Storage Configuration window appears.
2. Click on the dimmed icon of the off-line array. The Operations button becomes active.

3. Click **Operations**.

4. When the Array Operations dialog box appears, click the [   ] button.

5. When the message appears, 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. Select **Configuration** from the View menu. The Storage Configuration window appears.

2. Click the icon [icon] of the array whose name you want to change. The Operations button becomes active.

3. Click **Operations**.

4. When the Array Operations dialog box appears, click the [icon] button. The Change Name dialog box appears.

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

6. When the confirmation message appears, 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 and is giving some indication that an array member may fail soon. (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 100** for more information on configuring spares.

2. Select **Configuration** from the View menu. The Storage Configuration window appears.

3. Click on the icon of the array with the suspect disk. The Operations button becomes active.

4. Click **Operations**.

5. When the Array Operations dialog box appears, click the [icon] button. This button appears dimmed if no spares are available.

6. Select the disk that you want to replace.

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

8. When the confirmation message appears, 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. You can control this if there is only *one* dedicated spare or *one* pool 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 122**

▪ *Blinking the Spare Drive Light* on **page 123**

▪ *Deleting a Spare* on **page 102**

All spare operations apply only to the *spares on the currently selected server*.

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 server.

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. Select **Configuration** from the View menu. The Storage Configuration window appears.

2. Click the icon of any spare on the right side of the dialog box. The Operations button becomes active.

3. Click **Operations**.

4. When the Spare Operations dialog box appears, click the button. The Scheduler dialog box appears, as shown in Figure 6-2.

5. Select **Immediate** if you want to test all spares immediately, or select **Scheduled** if you want to schedule the operation for a later time.

6. If you select **Scheduled**, enter a starting time, starting day, and other information.

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

8. Click **OK** to start the operation (if you selected Immediate) or to enter it on the list of scheduled activities.

9. When the confirmation message appears, confirm that you want to test the spares.

10. Read the pop-up message that appears when the test is completed. (The message is also recorded in the server Historic Event Log and the Server View window.) If any spares failed the test, look at the Spare Disk icons in the Storage Configuration window. The icons of the failed disks will look like this .

11. Replace any failed disks immediately with good disks 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. Select **Configuration** from the View menu. The Storage
   Configuration window appears.

2. Click a Spare icon in the right side of the dialog box. The
   Operations button becomes active.

3. Click **Operations**.

4. When the Spare Operations dialog box appears, click the
   button.

5. Look at the array enclosure to see which disk light is blinking.

6. Click **Unblink all** in the Storage Configuration window to stop the
   drive light 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 124**

Downing the Drive on **page 125**

Pausing I/O to an Array Disk Drive on **page 126**

Blinking the Drive Light

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

Follow these steps to blink a drive light:

1. Select **Configuration** from the View menu. The Storage
   Configuration window appears.

2. Click a Disk icon in the left side of the window. The Operations
   button becomes active.

3. Click **Operations**.

4. When the Drive Operations window appears, click the button.

5. Look at the array enclosure to see which disk light is blinking.

6. Click **Unblink all** in the Storage Configuration dialog box to stop the drive light from blinking.

Downing the Drive

Use this option to stop all data I/O to a member of an array. You might need to use this option if the disk generates a S.M.A.R.T.[9] 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 for RAID levels that support it.

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:

Select **Configuration** from the View menu. The Storage Configuration window appears.

Select the icon of the disk you want to pause.

Click **Operations**.

When the Drive Operations dialog box appears, click the

button. If a spare is available, it replaces the downed disk immediately and a reconstruct of the array is triggered.

Wait until the Reconstruct operation is complete, then continue with your work in the program.

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[9] S.M.A.R.T. stand for Self-Monitoring Analysis and Reporting Technology. Hard drive 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, allowingyou to replace the disk before it actually fails.

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[10]. See the array enclosure documentation for more information. When you pause I/O to a disk drive, *all* other devices connected to the Adaptec Array1000 Family product are paused as well. I/O resumes automatically at the end of the pause period.

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

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

1. Select **Configuration** from the View menu. The Storage Configuration window appears.

2. Select the icon of the disk you want to pause.

3. Click **Operations**. When the Array Operations dialog box appears,

    click the button.

4. 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. (You may need to enter the server.) Wait a few seconds until data I/O stops.

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

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

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[10] *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.

Section 6:
Scheduling and Monitoring Array Operations

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 *Verifying Array Integrity* on **page 117**, *Reconstructing an Array* on **page 114**, and *Testing All Spares* on **pag**e **122**.

Setting Scheduling Options

The Scheduler dialog box allows you to schedule the Reconstruct an Array, Verify Integrity of 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 monthly recurring events.

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 6-1.

Figure 6-1: 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/date, as required.

Note: If you are scheduling an array reconstruct, you can only select the Once option.

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 Array Activity Monitor window. You can abort activities that are running or delete scheduled activities. The Array

Activity Monitor window shows scheduled tasks for the *currently selected server*. To view activities on another server, select the Server's icon in the Server View window and open a new Array Activity Monitor window.

Note: Adaptec CI/O Management Software automatically sets up a daily Test All Spares operation on the server.

Follow these steps to view and manage scheduled activities:

1. Select **Activities** from the View menu. The Array Activity Monitor window appears, as shown in Figure 6-2
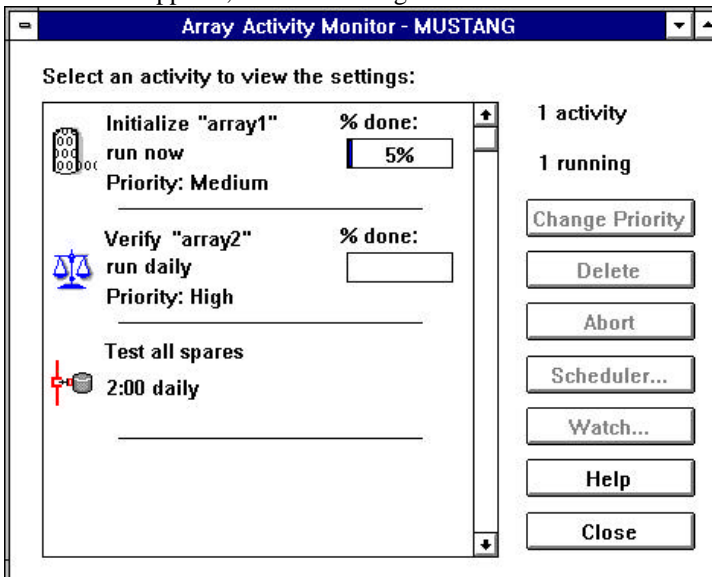

Figure 6-2: Array Activity Monitor Window

2. Select an Activity icon from the left part of the window. Information about the activity is shown in the window. Each kind of activity has a unique icon. The icon labels indicate which array or spare the activity applies to.

To view more detailed information about the activity, double-click the **Activity** icon. The Scheduler dialog box appears, as shown in Figure 6-1. 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), select the

activity icon on the left of the window and then click **Change Priority**. When the Change Priority dialog box appears, 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, select its icon and click the **Delete** button. 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** if you want the activity to never run again.

6. Click the **Watch** button to open a small window to monitor the selected, currently running activity. See the following section for more information.

Monitoring Activities That Are Running

You can open one or more Watch windows to monitor currently-running array activities. You can leave these small windows open while you continue doing other work on the computer.

When a Verify operation completes, the Watch window shows the total number of miscompares. 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. If you checked the **Auto Correct** box in the Verify dialog box, the miscompares are automatically fixed.

Follow these steps to monitor activities that are running:
Select **Activities** from the View menu. The Array Activity Monitor window appears.

Select the icon of a currently-running activity from the scrollable list at the top of the window.

Click **Watch**. A small Watch window for this activity appears, as shown in Figure 6-3. Each window has a percent complete graph and a Status field (OK or Failed). If a Verify operation is running, there is also a field listing the number of miscompares found. Click **Close** to
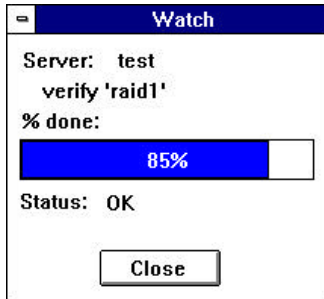
close the Watch window after the activity has completed.
Figure 6-3: Watch Window

Section 7:
Setting Security Options

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 feature (see **page 135**) for each server to prevent users who do not know the password from even viewing server information.

The network administrator sets the initial password for each server and controls users' access to passwords.
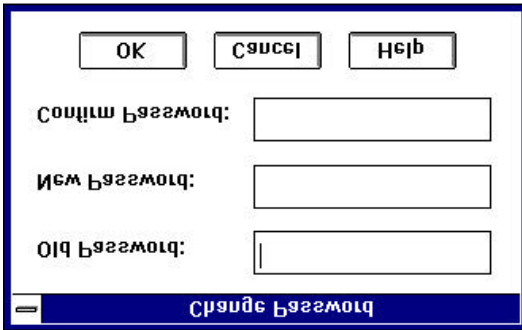
Changing the Password

The Server Manager allows you to change password from any client on the network.

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

1. Open the Server View window by clicking the button. Then select the icon of the server whose password you want to change.
2. Select **Server Administration** from the View menu. Then select **Change Password**. The Change Password dialog box appears, as shown in Figure 7-1.

Figure 7-1: Change Password Dialog Box

If you are installing a password for the first time, type the default password, "adaptec" in the Old Password field (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 server's Adaptec CI/O Management Software password when they issue commands to change a server'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 the [icon] button on the toolbar. The Preferences dialog box appears.

2. Select one of the three password time-out options listed on the right of the dialog box. Here is a description of the options:

 – **No Password Time-out**: 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 workstation unattended after entering the password, another person can issue commands from the workstation without being prompted for the password.

 – **Always Require Password**: Requires you to re-enter the password *every time* you issue a command to change array configuration.

 – **Enter Password Time-out Interval**: 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 server. 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 **OK** to accept the password time-out change. You may be required to enter the password in order to confirm the change.

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

Controlling Guest Access

The Guest Access feature lets the network administrator control who is allowed to view information about the server configuration. Guest Access is enabled or disabled for each individual server. The Guest Access setting affects all users who attempt 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 Adaptec CI/O Management Software 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 Adaptec CI/O Management Software 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 that client's server list. Users who know the password can view server information by double-clicking the

 icon and entering the password.

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.   Open the Server View window by clicking the button. Then select the icon of the server whose Guest Access setting you want to change.

2. Select **Server Administration** from the View menu. Then 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 Adaptec CI/O Management Software password when you are prompted to do so.

The Guest Access setting is changed on the server.

Section 8: Managing Arrays and Spares

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!

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 Popup 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 of the screen. One of the icons should look like this , indicating that the disk has failed.

2. Click the icon and then click **Operations**.

3. When the Drive Operations window appears, click the .button to blink the drive light on the failed disk.

4. 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 resume I/O to the array.

If the server has been rebooted since the disk was disconnected, the disk will not appear. To determine if a disk is "missing" from an array, double-click the Array icon, 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.

5. If the array enclosure does not support hot swapping[11], pause I/O to the array before you continue. (Skip this step if the array enclosure supports hot swapping.)

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[11] *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

6. Replace the failed disk with a good disk, or replace the missing disk. Be sure to complete this step before the pause period expires.

7. After I/O resumes automatically, select the icon of the new disk, and issue a Create a Spare command.

8. When the spare has been created, select the Array icon and issue a Reconstruct command, if necessary (it is possible that the reconstruct will start automatically at this point).

9. When the reconstruct is completed the array is in Fault-tolerant

    status again, and the array icon will look like this

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 for _NetWare 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 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 a second disk fails.

▪   You were trying to replace a failed disk in a Critical RAID 1, 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 Reactivate Array command, which returns the array to Critical status. Then replace the correct disk, down the server, reboot, 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 1 or RAID 0/1 array accidentally

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prevent data corruption. Data can still be transferred to and from the remaining good disks while the bad drive is replaced.

became disconnected, and the other disk of the mirrored pair had already failed.

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

Optimizing Array Performance

If your Adaptec Array1000 Family product 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 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[12]. 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.
Compared with single disks, arrays can provide one or more of these desirable properties:

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

- 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 Adaptec Array1000 Family product, 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 Adaptec Array1000 Family product .[13]

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[14]
Minimum Disks Allowed: 1[15]

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

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[13] 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.

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

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

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.

RAID 0/1 Arrays
Maximum Disks Allowed: 16 (must be an even number)[16]
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[17]
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

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

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

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.