

Installation and Hardware Guide

ARO-1130CA

**RAIDport II Card
for Personal Workstations**





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

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RAIDport II Card
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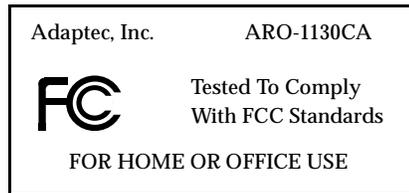
WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. However, if this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Use a shielded and properly grounded I/O cable and power cable to ensure compliance of this unit to the specified limits of the rules.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.



Canadian Compliance Statement

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Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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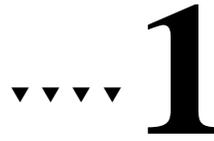
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Introduction

The Adaptec® ARO™-1130CA RAIDport II™ Card provides powerful disk array support in personal workstations with RAIDport II on-board.

This *Installation and Hardware Guide* explains how to install the ARO-1130CA, create the first array, and then install the supporting software. The *Adaptec Array1000CA Family Array Management Guide*, which is included with the ARO-1130CA, explains how to use the software to create and manage additional arrays.

System Requirements

The minimum system requirements for the ARO-1130CA are

- A RAIDport II on-board system with an available PCI/RAIDport 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-1130CA 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
- A 3.5-inch 1.44-MByte primary (boot) floppy disk drive

- 64 MBytes or more of system memory recommended for Windows NT Workstation

Using the ARO-1130CA with Other Adaptec Products

Read this section if you plan to install an ARO-1130CA in a RAIDport II computer system with AIC-7895 dual motherboard SCSI channels that already includes another Adaptec product.

- You can use an ARO-1130CA in a RAIDport II-equipped computer system that has been upgraded with an Adaptec AHA[®]-3940U/3940UW host adapter.
- You *cannot* use an ARO-1130CA in a RAIDport II-equipped computer system that has been upgraded with an Adaptec AHA-3940AU/3940AUW host adapter. This is due to a PCI ID conflict with the motherboard dual SCSI (AIC-7895 B2) implementation. In the future, Adaptec will provide a RAIDport II solution with dual motherboard SCSI that is compatible with AHA-3940AU/3940AUW host adapters. See the Adaptec Web Site at <http://www.adaptec.com/RAID> for more information.
- You can use an ARO-1130CA in a computer system that has been upgraded with an Adaptec AHA-2940 Family host adapter. To do this, however, you may need to make some Windows NT configuration changes. See Appendix A, *Troubleshooting*, for more information. In the future, Adaptec will provide a RAIDport II solution with dual motherboard SCSI that will eliminate the need for configuration changes of this sort.



Caution: We recommend that you do *not* attempt to change the Windows NT configuration unless you are an experienced computer user.

Installation Overview

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

- 1** Locate the PCI RAIDport II slot on the motherboard.
- 2** Install the ARO-1130CA in the RAIDport II on-board system.
- 3** Connect the SCSI devices to the RAID ready SCSI connectors on the motherboard.
- 4** Create the first array using the ArrayConfigCA™ program.
- 5** If needed, install Windows NT on the array, or on a stand-alone boot drive.
- 6** Install the Array1000CA driver for Windows NT.
- 7** Install the Adaptec CI/O™ Workstation Array Management Software on your system.



....2

Installing the ARO-1130CA and Connecting SCSI Devices

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

- Verify presence of DIMM memory
- Back up any existing data on drives to be used in array
- Install the ARO-1130CA in your system
- Connect SCSI devices to system's RAIDport II motherboard SCSI channels



Note: If another Adaptec host adapter is already installed in the computer system, you may need to make some changes to the Windows NT configuration. See *Using the ARO-1130CA with Other Adaptec Products* on page 1-2 for more information.

ARO-1130CA Layout

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

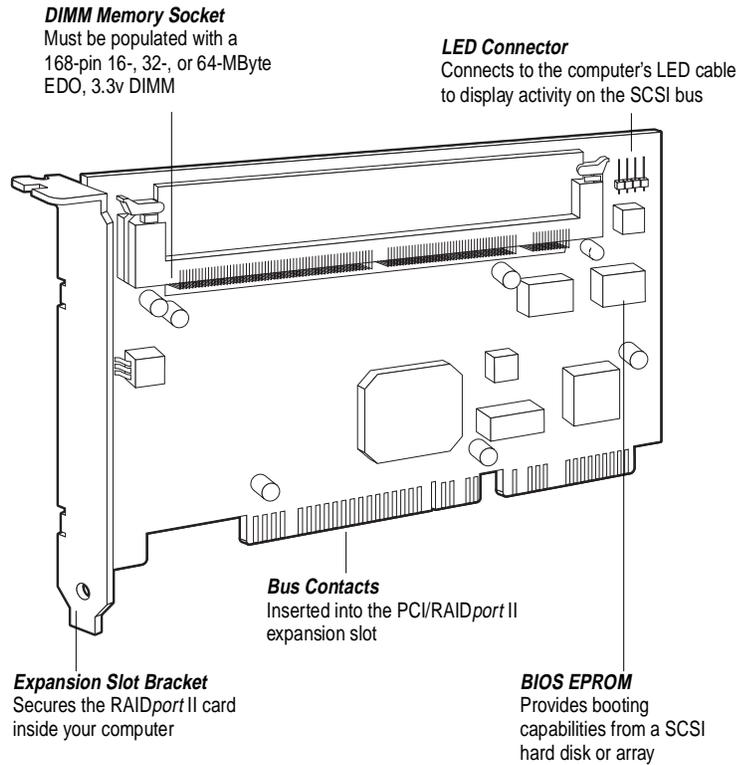


Figure 2-1. ARO-1130CA Major Components



Note: The model number that is printed on the board itself is **ARO-1130CA-B**.

Verifying Presence of DIMM Memory

Before you can use the ARO-1130CA, the DIMM memory socket must be populated with a 168-pin, 16-, 32-, or 64-MByte, EDO 3.3v 60ns or faster DIMM, 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 SIMMs and vendors.)

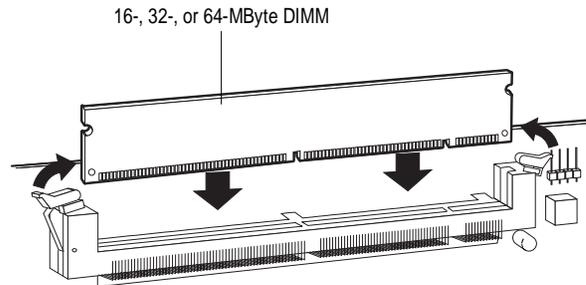


Figure 2-2. Installing a DIMM in the DIMM Memory Socket

Installing the ARO-1130CA

Follow these steps to install the ARO-1130CA:



Note: If you are installing the ARO-1130CA 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-1130CA 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/RAIDport II expansion slot; unscrew and remove the expansion slot bracket that covers the card-slot opening.
- 4 Insert the ARO-1130CA 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.

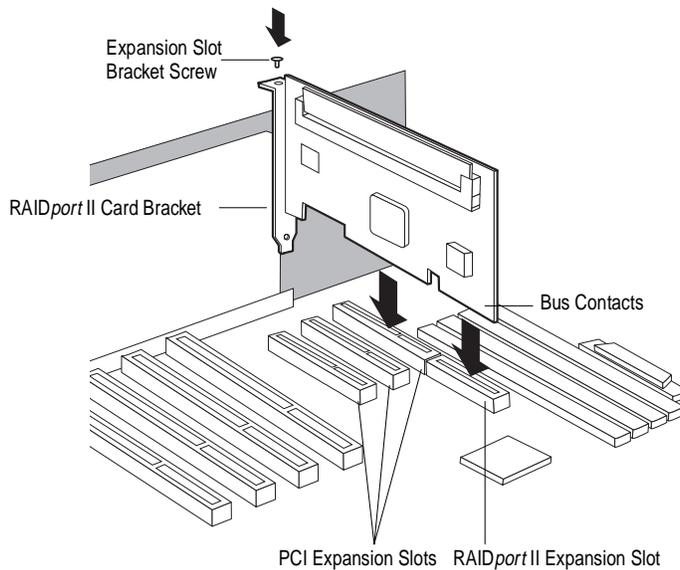


Figure 2-3. Installing the ARO-1130CA in a Typical PCI/RAIDport II Expansion Slot

Connecting the LED Activity Indicator to the ARO-1130CA

(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-1130CA) instead, you must disconnect the LED cable from the motherboard and connect it to the LED connector on the ARO-1130CA. 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-1130CA 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-1130CA.

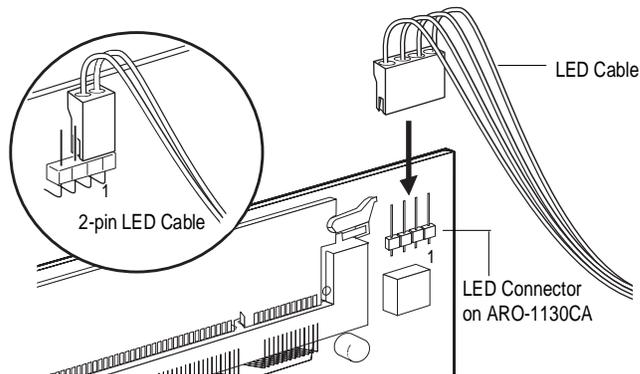


Figure 2-4. Connecting the LED Activity Indicator

Connecting SCSI Devices

The ARO-1130CA 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 2-12.

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 2-13 for additional information on cabling SCSI devices):

To Install...	You Will Need...
8-bit Internal SCSI Devices	<ul style="list-style-type: none">• A 50-pin internal SCSI cable with enough connectors to accommodate all of your internal SCSI devices.
16-bit Internal SCSI Devices	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• A 68-pin Ultra Wide internal-to-external SCSI port expansion kit.• A 68-pin Ultra Wide external SCSI cable.

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 2-14 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 2-14 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.

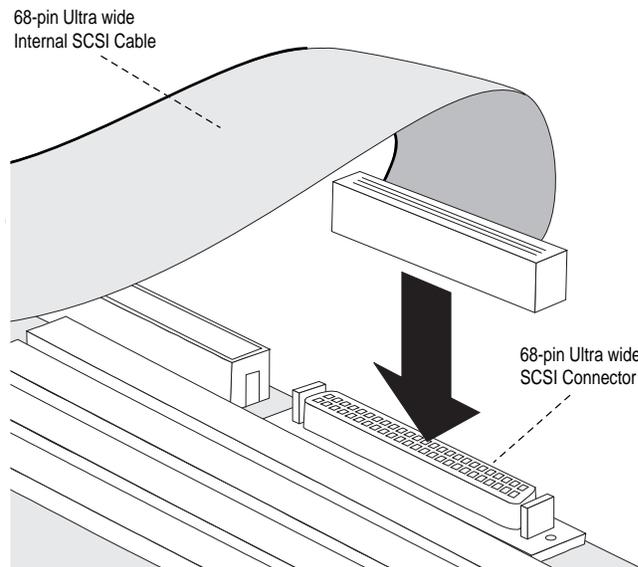


Figure 2-5. Attaching 68-pin Internal Ribbon Cable

- 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.

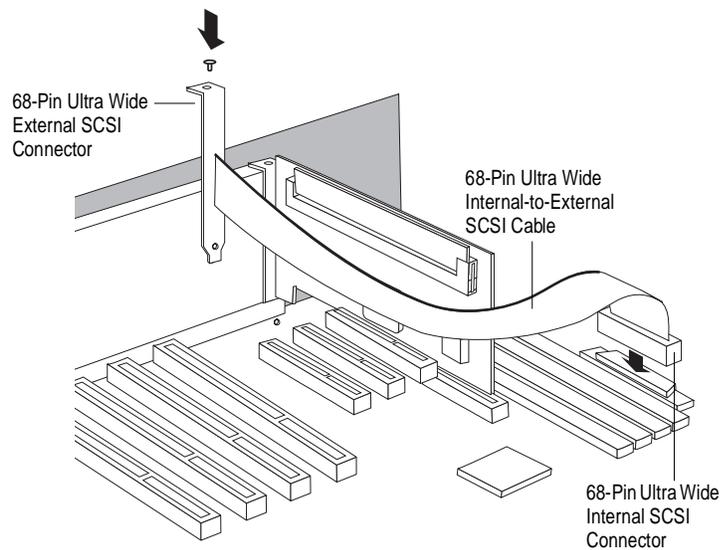


Figure 2-6. Installing an Internal-to-External SCSI Port Expansion Cable

Installing the ARO-1130CA and Connecting SCSI Devices

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 2-14 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.)

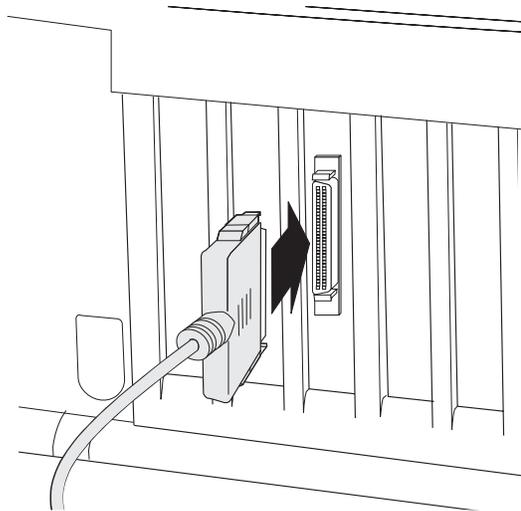


Figure 2-7. Attaching an External Cable to the External SCSI Connector

- 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.)

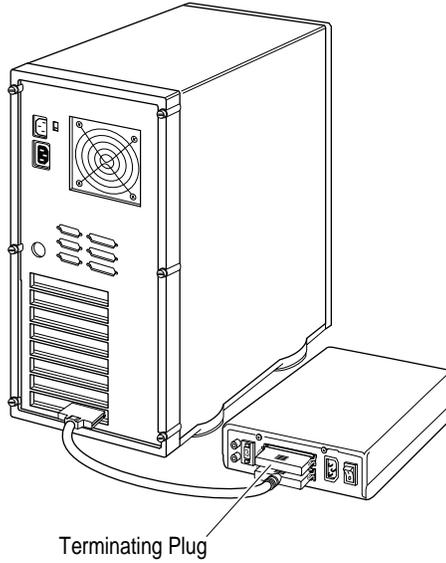


Figure 2-8. Attaching a Single External Device

Installing the ARO-1130CA and Connecting SCSI Devices

- 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 2-14 for additional information.)

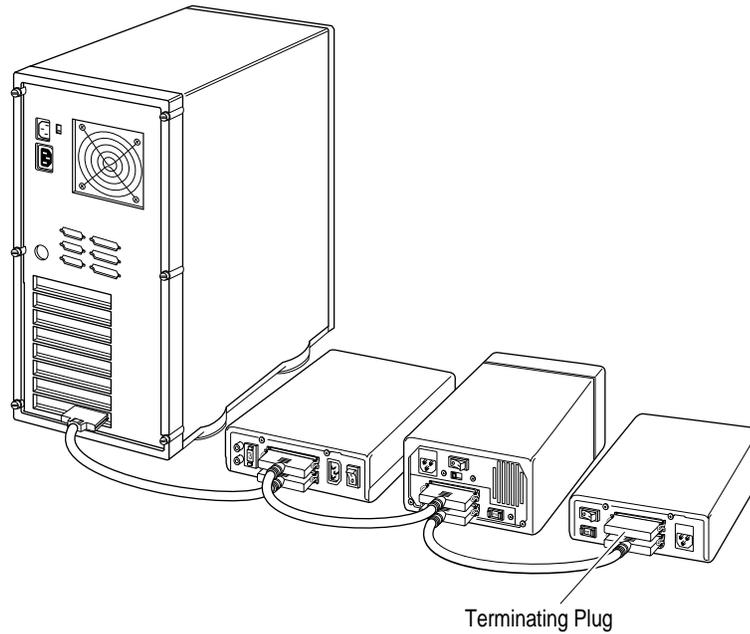


Figure 2-9. Attaching Multiple External Devices

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.

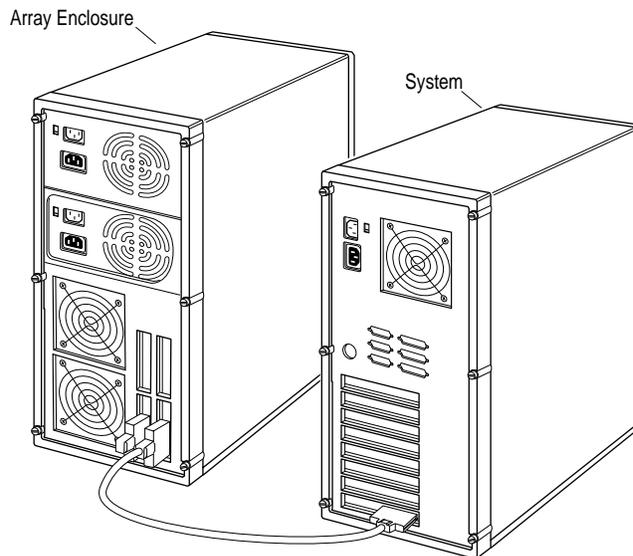


Figure 2-10. A Typical Array Enclosure Setup

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 3-7.)
- 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., UltraSCSI 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 UltraSCSI 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 UltraSCSI data transfer rates and have between four and eight devices (including the Array controller).



Note: UltraSCSI 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-1130CA 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 Chapter 5, *Configuring the ARO-1130CA 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 Array1000CA Family BIOS sign-on message should appear on the screen. If the BIOS message does not appear, see Appendix A, *Troubleshooting*.



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



... 3

Creating the First Array With the *ArrayConfigCA* Program

This chapter explains how to use the Adaptec *ArrayConfigCA* program to create the first bootable or nonbootable array on your computer. Before creating the array, make sure the disks for the array are connected and installed in your computer (or array enclosure). You can use *ArrayConfigCA* in two ways:

- Select **Express Setup** if you want to create an array quickly and easily. *ArrayConfigCA* asks you a few simple questions and uses your answers to create the kind of array that best meets your needs.
- Select **Custom Setup** if you want to perform advanced operations, such as creating an array with more than two disks or adding spare disks to an array.

ArrayConfigCA runs from a convenient, self-booting diskette. All *ArrayConfigCA* functions, except creating bootable arrays, can also be performed with Adaptec CI/O Workstation Array Management Software, which runs under Windows NT.

Additional information on using *ArrayConfigCA* to create, delete, and manage arrays and spares is available in the *Adaptec ARO-1130CA Array Management Guide*.

Creating an Array with Express Setup

ArrayConfigCA's Express Setup option allows you to quickly create an array by answering some basic questions about what kind of array you want. This process is similar to the wizards used in many Windows® programs. When you use the Express Setup option you do not need to know the technical details of how arrays are configured.

Follow these steps to create an array with Express Setup. (You can probably complete the Express Setup process simply by following the instructions that appear on the screen.)



Note: ArrayConfigCA requires at least one available SCSI hard disk drive in order to create an array (a one drive RAID 0 array is supported to achieve maximum single drive caching performance). ("Available" means that the disk drive is not already being used to store data.) To select ArrayConfigCA menu options, type the *hot key*—the letter that appears in a different color. (The hot key letters are underlined in the following instructions). You can also press the ↑ and ↓ keys until the option is highlighted and then press **Enter**.

- 1 Insert the ArrayConfigCA diskette in drive A and reboot your computer. Wait until ArrayConfigCA starts automatically.
- 2 Read the text that appears on the initial ArrayConfigCA screens. Press any key to view the next screen, or press **Esc** to return to the previous screen.
- 3 When you see the Setup Type Selection Menu, select **Express Setup**.
- 4 When the next screen appears, select the type of array you want to create:
 - Select **Optimized for Performance** if you want the fastest possible data input and output from the new array. This kind of array does not have special data protection features, however. When prompted, type the number of disks you want in this array.

Creating the First Array With the ArrayConfigCA Program

- Select **Optimized for Data Protection** if your main concern is to protect the files on the array from disk failure. This kind of array safeguards files in the array even if one of the array disks fails. (This kind of array has two disks by definition, so you will *not* be prompted to enter the number of disks you want in the array.)
- 5 When the next menu appears, select the type of application that you will run on your computer. (Select **Others** if you are not sure what type of application you will use.)
ArrayConfigCA will use your answer to create the best array configuration for your applications.
 - 6 When the next menu appears, select a boot order for the new array.
 - Select **Disk Array will be Boot Drive** if you want your computer to boot from the new array. If you selected **Optimized for Data Protection** in Step 4, booting from an array safeguards the information on your boot drive. (To boot from an array, you must also install the operating computer software on the array, as described in Chapter 4, *Installing Software on a Windows NT System*.)
 - Select **Disk Array will not be a Boot Drive** if you do not want your computer to boot from the new array.
 - 7 When you have finished all these menu selections, wait while *ArrayConfigCA* creates the array. This may take a long time, especially if the disk drives are large.

A message appears when the array has been created. An error message appears if fewer than two disks are available or if *ArrayConfigCA* encounters some other problem. If this happens, install more disk drives or run *ArrayConfigCA* again and use the **C**ustom Setup option.

Creating an Array with Custom Setup

ArrayConfigCA's Custom Setup option allows advanced users to create arrays with customized configuration and to manage arrays that are already created. Use Custom Setup if you want to

- create an array with more than two disks
- delete an array
- initialize an array
- add or delete spare disks
- make an existing array the boot array

Follow these instructions to create an array with Custom Setup.

- 1 Insert the ArrayConfigCA diskette in drive A and reboot your computer. Wait until ArrayConfigCA starts automatically.
- 2 Read the text that appears on the initial ArrayConfigCA screens. Press any key to view the next screen, or press **Esc** to return to the previous screen.
- 3 When you see the Setup Type Selection Menu, select **C**ustom **S**etup. Then wait while ArrayConfigCA scans your computer for information about your host adapter and SCSI devices.
- 4 When the Main Menu appears, select **D**isk **A**rray **O**perations.
- 5 Select **C**reate **N**ew **A**rray from the Disk Array Operations menu.
- 6 Type a name for the array and press **Enter**. The name can be up to 15 characters long and can include spaces and any other printable characters.
- 7 Select an array type from the following options:
 - **RAID 0**: Data is striped across the disks in a RAID 0 array, allowing for faster data input and output 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 one pair of disks. If one disk fails, data is still safe. The actual data capacity of the array equals half the available disk space.

See the *Adaptec ARO-1130CA Family Array Management Guide* for more information on selecting a RAID level.

- 8 Type the number of drives you want in the array (this does not include spares) and press **Enter**. The number of drives available for assignment is listed on the screen.



Note: You do not choose a number of drives when creating a RAID 1 arrays, because RAID 1 arrays have two drives by definition. A *spare* is a drive that will be used automatically as a replacement if one of the array member drives fails.

- 9 When the next screen appears, press **Tab** to highlight a channel (if your Adaptec array card uses more than one SCSI channel). Select drives for the array by pressing the **↑** and **↓** keys until the drive name is highlighted, and then press **Ins** or **Enter**. The names of selected drives appear in the box on the right side of the screen.

To select drives on a different channel (if necessary) press **Tab** to select another channel and then select the drives from the SCSI IDs on the 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 disks with partitions if they contain 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 8, the next screen appears automatically. If you are creating a RAID 1 array, and if there are any unassigned drives, the screen prompts you to define spare drives for the array.



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

- 10 If you do not want a spare, type **n** and continue with Step 12. 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.
- 11** When the Initialize Mode menu appears, select **Initialize Array to Zero**. This operation begins immediately. A graph on the screen shows the progress of this operation. You cannot cancel the initialization once it has started.



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.

- 12** 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 default block size (64 KBytes) gives the best overall performance. The allowable block sizes are 8, 16, 32, 64, and 128 KBytes.
- 13** When you see the message Initialization of [array name] is complete, press any key to return to the Disk Array Operations menu.
- 14** To create additional arrays (if disks are available), return to Step 5. When all arrays are created, exit from ArrayConfigCA, remove the ArrayConfigCA diskette, and reboot the computer. 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.

For information on other Custom Setup options, or information on using ArrayConfigCA to create, delete, and manage arrays and spares, refer to the *Adaptec ARO-1130CA Array Management Guide*.

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 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 ArrayConfigCA diskette in the computer's floppy disk drive A.
- 2 Reboot the computer from the diskette. ArrayConfigCA starts automatically.
- 3 Select **Display Boot Order** 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 ArrayConfigCA, 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 Chapter 4, *Installing Software on a Windows NT System*.



Note: You cannot designate a stand-alone SCSI disk drive the boot order of Unit 0. If you want to do this, create a one-disk RAID 0 array from the stand-alone disk drive and then designate it as Unit 0.



...4

Installing Software on a Windows NT System

This chapter explains how to install the software required to use the ARO-1130CA in a system using Windows NT Workstation 4.0. Before installing the software, make sure the ARO-1130CA 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 Array1000CA driver for Windows NT
- Install the Adaptec CI/O Workstation Array Management Software for Windows NT

Once all software is installed, refer to the *Adaptec ARO-1130CA Array Management Guide* for instructions on adding, deleting, and managing your arrays.



Note: If your RAIDport II On Board system has an Adaptec AHA-2940, AHA-3940, or any other AIC™-78x0 based host adapter installed (which is not associated with the RAIDport), the *aic78xx.sys* driver for these host adapters must be from the Adaptec 7800 Family Manager Set 1.3 or later.

Installing the Array1000CA Driver for Windows NT

This section explains how to install the Array1000CA 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 page 4-3.



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.

Windows NT 4.0 Installation

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.
- 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 Adaptec Array100 Family Manager Set drivers diskette in your floppy disk drive.
- 6 The screen displays the adapter drivers supported on the diskette. Select the Adaptec Array1000CA Family Adapter and press **Enter**.
- 7 If you want to add drivers for other host adapters (other than the ARO-1130CA), 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 Array1000CA Family Manager Set drivers diskette into drive A; enter the following path to the installation files and then click **OK**.

a:\winnt

The Adaptec Array1000CA 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 Array Management Software for Windows NT

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

- 1 Start Windows NT.
- 2 Insert the Adaptec CI/O Workstation 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 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 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:

CIO Array Management Service



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 the *Adaptec ARO-1130CA Array Management Guide* for information on using the Adaptec CI/O Workstation 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 Workstation* on page A-2.



...5

Configuring the ARO-1130CA with the *SCSISelect* Utility

The Array1000CA *SCSISelect*[®] configuration utility allows you to change controller settings without opening the computer or handling the controller. This chapter describes the default settings, explains when you should change them, and gives instructions for doing so.

Array1000CA *SCSISelect* also includes SCSI disk utilities to list the SCSI IDs of devices controlled by the ARO-1130CA, 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 5-5. To change any setting, or if you would like to run the SCSISelect utilities, see *Starting the SCSISelect Utility* on page 5-3.

SCSI Bus Interface Definitions	Default
Host Adapter SCSI ID	7
SCSI Parity Checking	Enabled
Host Adapter SCSI Termination	Enabled
Host Adapter UltraSCSI	Disabled
SCSI Device Configuration	Default
Initiate Sync Negotiation	Yes (Enabled)
Maximum Transfer Rate	40.0 MBytes/sec. ¹
Enable Disconnection	Yes (Enabled)
Initiate Wide Negotiation ²	Yes (Enabled)
Send Start Unit Command	No (Disabled)
Include In BIOS Scan	Yes (Enabled)
Additional Options	Default
Array 1000 BIOS	Enabled
BIOS Support for Bootable CD-ROM	Disabled

¹ If Wide SCSI is not supported on the motherboard, the default setting is 20.0 MBytes/sec.

² This option is available only if Wide SCSI is supported on the motherboard.

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 7-1.

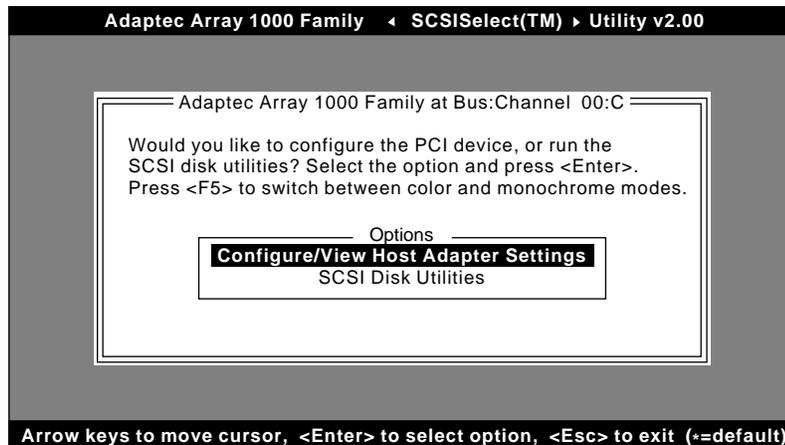


Figure 7-1. SCSISelect Menu

Using SCSISelect Menus

To select a SCSISelect menu option, move the cursor to the option with the **↑** and **↓** 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 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-1130CA's SCSI ID. The default setting is SCSI ID 7, which gives the ARO-1130CA the highest priority on the SCSI bus. We recommend that you leave the ARO-1130CA set to SCSI ID 7.
- **SCSI Parity Checking**—This option determines whether the ARO-1130CA verifies the accuracy of data transfer on the SCSI bus. The default setting is *Enabled*. You should disable SCSI Parity Checking on the ARO-1130CA and all SCSI devices if any SCSI device supported by the ARO-1130CA 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-1130CA supports UltraSCSI data transfer speeds. The default setting is *Disabled*. If you have any UltraSCSI devices installed, you should enable this setting. When this setting is enabled, the ARO-1130CA negotiates for data transfer speeds of up to 20 MBytes/sec (40 MBytes/sec for Wide SCSI devices).



Note: If you use UltraSCSI data transfer speeds, be sure to use high-quality cables to connect the disk drives supported by the ARO-1130CA. 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 5-4.

- **Initiate Sync Negotiation**—This option determines whether synchronous data transfer negotiation (Sync Negotiation) between the device and ARO-1130CA is initiated by the SCSI channel controlled by the ARO-1130CA. 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-1130CA 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-1130CA 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-1130CA. If only one SCSI device is supported by the ARO-1130CA, 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-1130CA 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-1130CA BIOS supports hard disk drives attached to the SCSI channel controlled by the ARO-1130CA. When set to *Yes*, the ARO-1130CA BIOS controls the hard disk drive. When set to *No*, the ARO-1130CA BIOS does not control the hard disk drive. The default setting is *Yes*.

Additional Options

Array1000CA BIOS

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

BIOS Support for Bootable CD-ROM

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





Troubleshooting

Troubleshooting Checklist

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

- Does the ARO-1130CA BIOS sign-on message appear during bootup? If not, check the following items:
 - Is the ARO-1130CA properly seated in a PCI/RAIDport 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.
- 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 Workstation

If the Adaptec CI/O Workstation 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:

CIO Array Management Service

- 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 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

Troubleshooting

- Verify that the following DLLs are located in your *system32* directory. If they are not present, try reinstalling the Adaptec CI/O Workstation 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 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-1130CA with an AHA-2940 Family Host Adapter

This section explains how to use an ARO-1130CA 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-1130CA 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-1130CA is already installed, shut down the computer system, remove the ARO-1130CA from the expansion slot, and restart the system.

Installing the ARO-1130CA 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 Array1000CA Family Manager Set diskette in the floppy disk drive. (This diskette was included with your ARO-1130CA adapter.)
- 4 When the Install from Disk dialog box appears, type A:\winnt on the command line and click **OK**.
- 5 Select Adaptec **Array1000CA 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 A-10



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 hexadecimal 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-1130CA** in the **PCI/RAIDport** expansion slot.
- 18 Attach your boot drive to one of the SCSI channels controlled by the **ARO-1130CA** and boot the computer system.

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

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-1130CA**. 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 page A-10



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 hexadecimal 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 in all rows of 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 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:

- 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.

Troubleshooting

- 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.





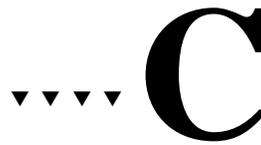
Advanced Topics

Installing Multiple Adapters

You cannot install more than one ARO-1130CA card in the same system unless the system is designed with more than one PCI/RAID-*port* slot; however, you can install an ARO-1130CA 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-1130CA, then the ARO-1130CA 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 3-7.) 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-1130CA base address (the user has no control over the assigned address).





Using a CD-ROM Drive with DOS

To operate a SCSI CD-ROM drive connected to the ARO-1130CA 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, *mcdex.exe*

The *aspi8dos.sys* and *aspicd.sys* files must be copied from the Adaptec Array1000CA Family Manager Set drivers diskette to a directory (e.g., *c:\scsi*) on your hard disk drive. The *mcdex.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 *mcdex.exe*, we recommend that you upgrade to MS-DOS 6 or above. You can also obtain *mcdex.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 *mcdex.exe*. The following examples illustrate the command line format and the command options appropriate for most systems.

ARO-1130CA Installation and Hardware Guide

- 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
<i>/ccbs<count></i>	<i>/ccbs8</i>	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.
<i>/d</i>	<i>/d</i>	Displays information about the ARO-1130CA and attached SCSI devices when the computer boots.
<i>/L</i>	<i>/L</i>	Enables <i>aspi8dos</i> to recognize all eight possible LUNs associated with each SCSI ID. If the option is not used, <i>aspi8dos</i> can recognize only LUN 0 for each SCSI ID.
<i>/mn</i>	<i>/m1</i>	Causes <i>aspi8dos</i> to scan the PCI bus. The method used to scan the bus is determined by the value of <i>n</i> : <i>/mb</i> = scan PCI bus using PCI BIOS calls <i>/m1</i> = scan PCI bus using Mechanism #1 <i>/m2</i> = scan PCI bus using Mechanism #2 <i>aspi8dos</i> 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 <i>/mb</i> , <i>/m1</i> , and <i>/m2</i> options only if you want to override the <i>aspi8dos</i> internal scanning mechanism. Usually <i>aspi8dos</i> 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.)

Using a CD-ROM Drive with DOS

Command Line Options for *aspi8dos.sys* (Continued)

Option	Example	Use
<code>/norst</code>	<code>/norst</code>	Prevents <i>aspi8dos</i> from resetting the SCSI bus when you boot your computer. By default, <i>aspi8dos</i> resets the SCSI bus when you boot the computer if the host adapter BIOS is not present. You can use <code>/norst</code> to prevent this from happening.
<code>/pause</code>	<code>/pause</code>	Pauses the system after loading <i>aspi8dos</i> at bootup, so you can read the message on the screen. After you read the message, press any key to resume booting.
<code>/rst</code>	<code>/rst</code>	Forces <i>aspi8dos</i> to reset the SCSI bus when you boot your computer. By default, <i>aspi8dos</i> does not reset the SCSI bus when you boot your computer if the host adapter BIOS is present.
<code>/s<slot number></code>	<code>/s1 /s3</code>	Indicates the slot number(s) where you want <i>aspi8dos</i> to look for host adapters. Valid slot numbers = 1 to 15. If you do not use this option, <i>aspi8dos</i> scans all slots for host adapters, beginning at slot 1.

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Command Line Options for *aspicd.sys*

Option	Example	Use
<code>/d:<name></code>	<code>/d:aspicd0</code>	Required in the <i>config.sys</i> command line. Assigns a name to the CD-ROM drive so that <i>mscdex</i> can assign the CD-ROM a logical drive letter. The name must exactly match the CD-ROM drive name in the <i>mscdex</i> command line in <i>autoexec.bat</i> . Use any eight-character name.
<code>/id={...}</code>	<code>/id=2+4</code> <code>/id=3+5+1:4</code>	Specifies CD-ROM drives controlled by <i>aspicd</i> . By default, <i>aspicd</i> controls all drives. In the first example, which is for a computer with one host adapter, <i>aspicd</i> controls the devices with SCSI IDs 2 and 4. In the second example, for a computer with two host adapters, <i>aspicd</i> 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, <i>aspicd</i> assumes it is 0).
<code>/L</code>	<code>/L</code>	Enables <i>aspicd</i> to recognize all eight possible LUNs associated with each SCSI ID. If the option is not used, <i>aspicd</i> can recognize only LUN 0 for each SCSI ID. Add the <code>/L</code> 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 <code>/L</code> option. The <i>aspicd</i> device driver automatically scans multiple LUNs if it detects one of these devices on the SCSI bus.
<code>/norst</code>	<code>/norst</code>	Prevents <i>aspicd</i> 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.
<code>/pause</code>	<code>/pause</code>	Makes your system pause after loading <i>aspicd</i> at bootup, so you can read the message on the screen. Press any key to resume booting.
<code>/type:<drive vendor></code>	<code>/type:sony</code>	Allows <i>aspicd</i> 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 <code>/type:<drive vendor></code> option, <i>aspicd</i> 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.





Obtaining SCSI Cables and Converters

High-quality cables are required in high-performance SCSI systems to ensure data integrity. Adaptec provides the highest quality SCSI cables designed specifically for use with Adaptec SCSI cards. For purchasing information, contact Adaptec:

Adaptec, Inc.
691 S. Milpitas Boulevard
Milpitas, CA 95035
USA
Tel: (800) 442-7274

Adaptec Europe - Belgium
Tel: (32) 2-352-34-11
Fax: (32) 2-352-34-00

Adaptec Japan - Tokyo
Tel: (81) 3-5365-6700
Fax: (81) 3-5365-6950

Adaptec Singapore
Tel: (65) 278-7300
Fax: (65) 273-0163

See the following page for a list of SCSI cables and converters available directly from Adaptec.

External Cables

External Cables

Part Number	Connectors	Length
ACK-W2W-E	High-density 68-pin male to High-density 68-pin male	1 m

Internal Ribbon Cables

Internal Ribbon Cables

Part Number	Connectors	Length
ACK-F2F-5IT ¹	5 position (4 devices + SCSI Card), Standard 50-pin female connectors, terminated	2.1 m
ACK-W2W-5IT ¹	5 position (4 devices + SCSI Card), High-density 68-pin male connectors, terminated	1 m

¹ ACK-F2F-5IT and ACK-W2W-5IT have built-in active terminators which eliminate the need to terminate any internal SCSI devices

Converters

Cable Converters

Part Number	Description	Connectors
ACK-GCH2L	External Converter	High-density 50-pin female to Standard 50-pin female
ACK-68P-50P-E	External Converter	High-density 68-pin female to High-Density 50-pin male
ACK-68I-68E	Internal to External Converter	Internal High-density 68-pin male to External High-density 68-pin female
ACK-50I-50E	Internal to External Converter	Internal Standard 50-pin female to External High-density 50-pin female





Listing of Vendors

This appendix contains a partial listing of array storage enclosure and SCSI disk drive manufacturers.

Array Storage Enclosure Manufacturers

JMR Electronics, Inc.
20400 Plummer Street
Chatsworth, CA 91311
USA
Tel: (818) 993-4801
Fax: (818) 993-9173
Internet: <http://www.jmr.com>

Kingston Technology Corporation
17600 Newhope Street
Fountain Valley, CA 92708
USA
Tel (U.S.): (800) 435-0642
Fax (U.S.): (714) 438-1847
Tel (Intl): (714) 437-3334
Fax (Intl): (714) 438-1820
Internet: <http://www.kingston.com>

Trimm Technologies
350 Pilot Road
Las Vegas, NV 89119
USA
Tel: (800) 423-2024
Fax: (702) 361-6067
Internet: <http://www.trimm.com>

SCSI Disk Drive Manufacturers

Fujitsu Computer Products of America, Inc.
2904 Orchard Parkway
San Jose, CA 95134-2009
USA
Tel (U.S.): (800) 626-4686
Tel (Intl): (408) 432-6333
Internet: <http://www.fujitsu.com>

IBM Corporation
1 Old Orchard Road
Armonk, NY 10504
USA
Tel: (914) 765-1900
Internet: <http://www.ibm.com>

Quantum Corporation
500 McCarthy Boulevard
Milpitas, CA 95035
USA
Tel: (800) 624-5545
Internet: <http://www.quantum.com>

Seagate Technology, Inc.
920 Disc Drive
Scotts Valley, CA 95066
USA
Tel: (408) 438-6550
Fax: (408) 429-6356
Internet: <http://www.seagate.com>



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