User's Guide

AHA-3940AU/ 3940AUW

MultiChannel PCI-to-UltraSCSI Host Adapters with SCSI*Select* Utility

adaptec®

Adaptec, Inc.
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adaptec®

Adaptec Technical Support and Services

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

Electronic Support

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

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

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Federal Communications Commission Radio Frequency Interference Statement

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.

Adaptec, Inc. AHA-3940AU/AUW

FC Tested To Comply
With FCC Standards

FOR HOME OR OFFICE USE

Canadian Compliance Statement

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

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

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Introduction

The Adaptec® AHA®-3940AU and AHA-3940AUW MultiChannel™ PCI-to-UltraSCSI Host Adapters provide a powerful interface between your computer's PCI bus and SCSI disk drives, CD-ROM drives, scanners, and other SCSI devices. Each AHA-3940AU and AHA-3940AUW host adapter has two SCSI channels, each of which functions as an independent host adapter.

- With the AHA-3940AU, you can connect up to seven 8-bit SCSI devices per channel.
- With the AHA-3940AUW, you can connect up to fifteen 16-bit (Wide) SCSI devices per channel. Up to seven of the fifteen devices can be 8-bit devices.

The AHA-3940AU is an 8-bit PCI-to-UltraSCSI host adapter with two internal connectors and one external connector. The AHA-3940AUW is a 16-bit PCI-to-UltraSCSI host adapter with three internal connectors and one external connector.

The Adaptec® AHA®-3940AU and AHA-3940AUW MultiChannel™ PCI-to-UltraSCSI Host Adapters are designed for use in computers that have 5-volt Peripheral Component Interconnect (PCI) interface slots. PCI is a local bus interface that enables high-speed data transfer. Your computer must be PCI Rev. 2.1-compliant, or higher.

This document uses the term AHA-3940AU/3940AUW to refer to both host adapter models.

This *User's Guide* is a companion to the *Installation Guide* for the AHA-3940AU/3940AUW host adapters. Both guides discuss the same topics—installing and configuring the AHA-3940AU/

3940AUW—but the *User's Guide* provides more detailed instructions. If you have installed SCSI devices before, you might find it faster to use the *Installation Guide*. Beginning users should use the more detailed instructions in this *User's Guide*.

Product Features

By utilizing a single processor chip and dual channel architecture, the AHA-3940AU/3940AUW host adapter provides high performance data throughput to meet today's increasing I/O demands. Each host adapter functions as two independent host adapters because each channel forms a separate SCSI bus.

AHA-3940AU/3940AUW host adapters can manage multiple disk drives and provide high performance. In addition, these host adapters minimize microprocessor overhead by transferring data into system memory without involving the computer's CPU.

AHA-3940AU/3940AUW host adapters can handle 32-bit bus master data transfers, including PCI-enhanced transfer commands. They support the same SCSI functions as other Adaptec host adapters, including new SCSI-2 features such as Tagged Command Queuing.

AHA-3940AU/3940AUW host adapters support multithreaded I/O operations, allowing simultaneous operations on multiple SCSI targets or logical units. The Disconnect/Reconnect feature maximizes SCSI bus usage in systems with multiple targets. The Scatter/Gather feature allows high performance even in computers with fragmented memory buffers.

AHA-3940AU/3940AUW host adapters include the on-board SCSI*Select*® configuration utility. SCSI*Select* lets you change settings such as SCSI Termination and SCSI Parity Checking without opening the computer and physically configuring the host adapter. SCSI*Select* also includes a SCSI low-level formatting utility. See Chapter 3, *Configuring Your Host Adapter* for more information.

PCI Bus Interface

- PCI 2.1 compliant
- Up to 132 MBytes/sec data transfer rate on the PCI bus
- Support for PCI single- and dual-address cycles
- PCI bus address and data parity generation
- PCI bus master for data transfer
- 32-, 24-, 16- and 8-bit host PCI bus data transfers

Data Transfer Rates

AHA-3940AU

- Up to 20.0 MBytes/sec synchronous data rate per channel for UltraSCSI devices
- Up to 10.0 MBytes/sec synchronous data rate per channel for Fast SCSI devices
- Up to 5.0 MBytes/sec synchronous data rate per channel for SCSI-1 devices
- Up to 3.0 MBytes/sec asynchronous SCSI data rate per channel

AHA-3940AUW

- Up to 40.0 MBytes/sec synchronous data rate per channel for Wide UltraSCSI devices
- Up to 20.0 MBytes/sec synchronous data rate per channel for Wide Fast SCSI devices
- Up to 10.0 MBytes/sec synchronous data rate per channel Wide SCSI-1 devices
- Up to 6.0 MBytes/sec asynchronous Wide SCSI data rate per channel

Maximum Offloading of the Host CPU

- Onboard RISC sequencer (SCSI PhaseEngine processor) automates SCSI protocol
- Low SCSI processing overhead

- Bus Master DMA implementation
- Task scheduling and message-based communication

Disk Array Support

- Boot from any drive on the SCSI bus
- Extensive support for leading disk array vendors

UltraSCSI/Fast SCSI-2 Implementation

- Concurrent support for UltraSCSI synchronous devices
- Concurrent support for Fast SCSI synchronous and asynchronous devices
- Concurrent support for 8-bit and 16-bit SCSI devices (AHA-3940AUW only)
- Single-ended output
- Scatter/Gather
- Disconnect/Reconnect
- Fully multitasking/multithreading
- Tagged Command Queuing support
- SCSI termination power-down control
- Support for multiple logical units
- Parity handling in Data, Message, Status, Selection/ Reselection, and Command phases
- Active negation

Multiple Device Support

- AHA-3940AU supports up to seven SCSI devices per channel (14 devices total)
- AHA-3940AUW supports up to 15 SCSI devices per channel (30 devices total)
- Onboard BIOS supports disk drives as large as 8 GBytes

Connectors

AHA-3940AU

- Two internal standard 50-pin
- One external high density 50-pin

AHA-3940AUW

- Two internal high density 68-pin
- One internal standard 50-pin
- One external standard 68-pin

Conventions

The following typographic conventions are used in this document:

bold
Used for keystrokes (… press the **Enter** key …) and screen selection fields (… select **Advanced Configuration Options** …).

Helvetica
Used for operator entry that must be typed exactly as shown (… device=c:\scsi\aspi7dos.sys …) and for screen messages (…Enter Password …).

Helvetica Italics
Used to represent text you must determine and type in (… enter *nn* for number…). Also used for program and file names that appear in body text (… the *autoexec.bat* file …).

Hexadecimal Numbers
Are followed by an 'h', e.g., 330h.

End Mark
The ❒ symbol marks the end of the text for each chapter.

Advisories

Advisories are short notes that stress an important point or warn of a potential hazard to the system, data, or the user. This document uses three kinds of advisories:

Note: Text set off in this way presents reminders, tips, or suggestions that may simplify the assembly and use of the host adapter.

Caution: Failure to observe this type of advisory could result in damage to your system, devices, or data.

WARNING: Failure to observe this type of advisory could result in personal injury.

Use caution when handling any electrical equipment. Advisories in this document can only cover the procedures contained here, and not all situations may have been addressed. Adaptec does not claim to have included every condition or situation that might require a Caution or Warning. You must refer to the documentation for your computer peripheral equipment when you are installing equipment or changing its configuration.

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Installing the Host Adapter and SCSI Devices

This chapter explains how to physically install an AHA-3940AU/3940AUW host adapter in your computer and connect SCSI devices to it.

Note: You may need to run your computer's *Setup* program as part of the installation process. See *Running the Computer's Setup Program* on page 2-17 for more information.

After the host adapter is physically installed, you can change its configuration with the SCSI*Select* utility, as described in Chapter 3, *Configuring Your Host Adapter*.

You can install multiple AHA-3940AU/3940AUW host adapters in your computer if enough PCI bus slots are available. Each AHA-3940AU/3940AUW host adapter has two separate SCSI channels. If you install multiple AHA-3940AU/3940AUW host adapters in your computer, you can enable the onboard BIOS on just one host adapter or on more than one of the host adapters.

Host Adapter Layout

Figure 2-1 identifies the major AHA-3940U components. Figure 2-2 identifies and describes the major AHA-3940UW components.

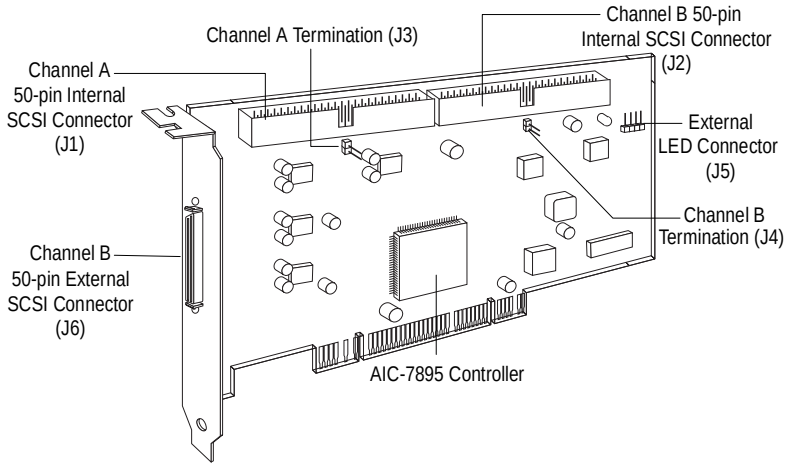

Figure 2-1. AHA-3940U Components

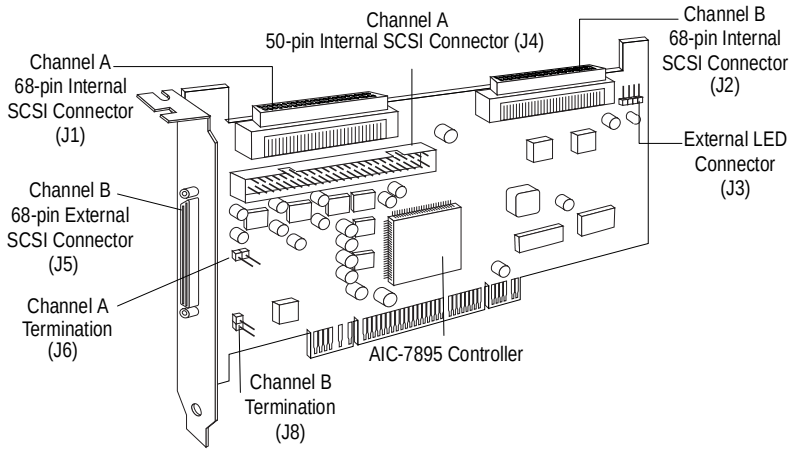

Figure 2-2. AHA-3940UW Components

Inserting the Host Adapter in a PCI Slot

WARNING: Be sure the power is turned OFF before you continue. Ground yourself by touching an unpainted surface on the computer chassis before you open the computer case.

1. Remove the cover from the computer case.
2. Carefully remove the host adapter from the antistatic bag. If you need to set the adapter down, put it on top of the bag.

Caution: Keep the host adapter in its antistatic bag until you are ready to install it. Before you pick up the adapter, ground yourself by touching an unpainted surface on the computer chassis. Even a little static electricity can destroy a host adapter component!

3. Find an unused 5-volt PCI bus expansion slot that supports bus mastering. Make sure this slot is unobstructed.

   Some computers have both bus master and non-bus master PCI slots. Read your documentation to find out which kind your computer has. PCI bus slots are typically white or ivory and are shorter than ISA or EISA slots. Usually, there are three PCI slots. One of these may be a *shared slot*. A shared slot has connectors for both ISA and PCI, but can accept only one kind of board at a time.
4. Remove the corresponding expansion slot cover from the computer chassis. The slot cover is the metal strip in the back of the computer chassis that covers the opening for the adapter's external connector.
5. Position the host adapter directly over the PCI slot and insert the end of the board in the card guide. Firmly press the bus connector on the bottom of the host adapter down into the slot, as shown in Figure 2-3. Be sure the metal contacts on the bottom of the host adapter are securely seated in the slot.

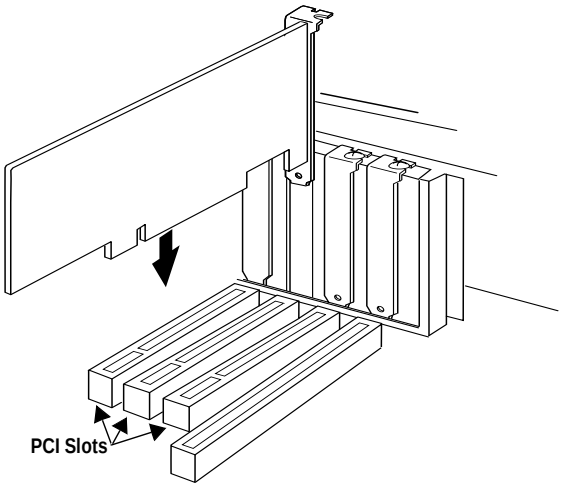

Figure 2-3. Inserting the Host Adapter

6 Attach the host adapter bracket to the computer chassis with the screw from the slot cover that you removed in step 4.

Note: *Do not* replace the computer cover or reconnect the power yet!

Connecting SCSI Cables and Devices

Choosing SCSI Cables

Always use high-quality SCSI cables to connect the host adapter to devices on the SCSI bus. Poor-quality cables can cause data corruption, parity errors, and other problems. High-quality cabling is especially critical if you use UltraSCSI or Fast SCSI data transfer rates.

The round cables used for external SCSI devices vary widely in quality and electrical characteristics. Be sure external SCSI cables meet SCSI-2 standards (ask your cable vendor). For UltraSCSI appli-

cations, SCSI cables must meet Parallel Interface SCSI standards. Here are some guidelines for external SCSI cables:

- SCSI-2: Use cables with a single-ended impedance range of 90 to 132 ohms.
- UltraSCSI: Use cables with a single-ended impedance range of 90 ± 10 ohms. For the REQ and ACK signals the impedance should be 90 ± 6 ohms.
- *Do not* use cables shorter than 30 cm (11.8 inches) between any two SCSI devices.

Adaptec sells high-quality internal and external UltraSCSI and SCSI-2 cables. Please see Appendix A, *Cables and Converters for the AHA-3940AU/3940AUW* for more information on Adaptec cables.

Maximum Cable Lengths

To assure reliable operation, the total length of the SCSI bus, including both internal and external cabling, should not exceed the following maximums:

- For configurations with only SCSI-1 or SCSI-2 devices (no UltraSCSI devices), maximum cable length is 6 meters.
- For configurations with 4 or fewer UltraSCSI devices, maximum cable length is 3 meters.
- For configurations with 5 or more UltraSCSI devices, maximum cable length is 1.5 meters.

Caution: AHA-3940AU/3940AUW host adapters support only *single-ended* SCSI devices. *Do not* connect *differential* SCSI devices, or the host adapter may be damaged. Read your device documentation to find out whether the device is single-ended or differential.

Connecting Internal SCSI Devices

Read the device documentation if you need to physically install a SCSI device inside your computer before attaching the cables. To connect internal SCSI devices to an AHA-3940AU/3940AUW host adapter, you need the following:

- A 50-pin internal SCSI ribbon cable for 8-bit devices.
- A 68-pin internal SCSI ribbon cable for 16-bit (Wide) devices.

You can connect both 8-bit and 16-bit SCSI devices to the AHA-3940UW host adapter. To attach 8-bit internal devices to Channel A of the AHA-3940UW, use the 50-pin internal connector. If you want to connect 8-bit devices to Channel B, you must use a 68-pin-to-50pin converter, as shown in Figure 2-4. See Appendix A, *Cables and Converters for the AHA-3940AU/3940AUW*, for more information.

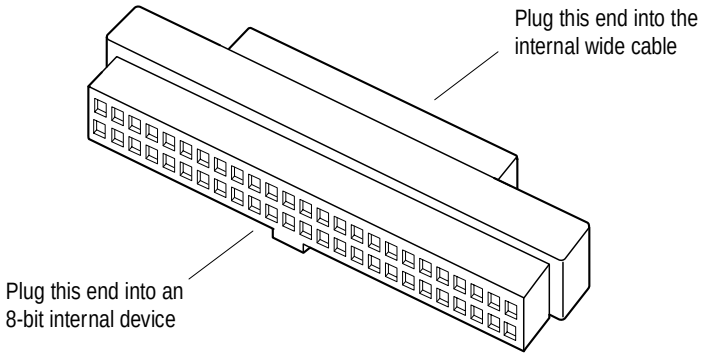

Figure 2-4. 68-pin-to-50-pin Converter

You can buy this internal 68-pin-to-50-pin converter from any authorized Adaptec reseller. For additional sales information, call Adaptec at the number listed on page iii.

Do not use this converter at the end of the cable on the AHA-3940UW; the converter does not provide termination for the high-data byte. To terminate a SCSI bus properly, you must put a 16-bit device at the end of the cable. If a converter with an 8-bit device is at the end of the cable, the bus does not terminate properly.

To attach a converter, first plug the converter into the device connector and then connect the converter to the internal ribbon cable.

Note: The following diagrams show the 50-pin internal connector used with the AHA-3940U. The AHA-3940UW uses 68-pin high-density connectors.

To connect internal SCSI devices, follow these steps:

1. Plug the SCSI connector at one end of the SCSI ribbon cable into one of the host adapter's internal SCSI connectors, as shown in Figure 2-5. Line up the colored stripe on the ribbon cable with the number 1 printed below the connector on the host adapter. This is called maintaining *pin-1 orientation*. Maintain pin-1 orientation throughout the SCSI bus, or the devices will not work properly.

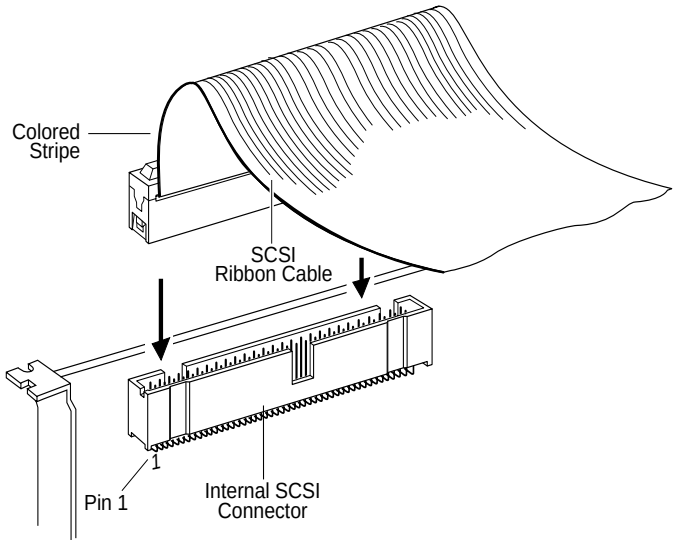

Figure 2-5. Internal SCSI Ribbon Cable to the AHA-3940U

2 Plug the last connector on the ribbon cable into the SCSI connector on the internal SCSI device, as shown in Figure 2-6.

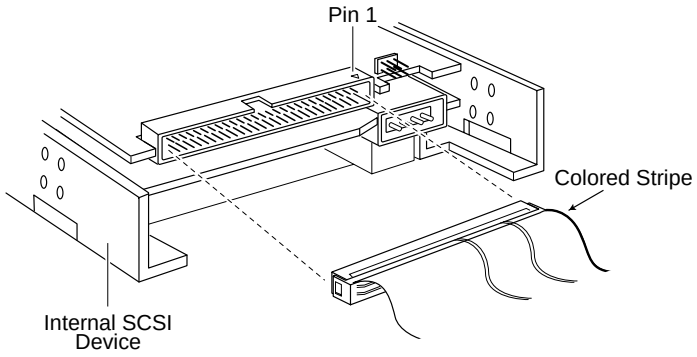

Figure 2-6. Internal SCSI Ribbon Cable to Internal SCSI Device

3 To connect a second internal SCSI device, plug the middle connector of the SCSI ribbon cable into the SCSI connector on the second internal SCSI device, as shown in Figure 2-7.

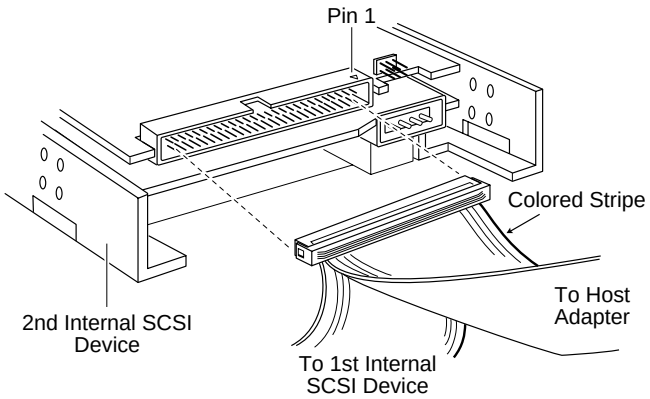

Figure 2-7. Connecting a Second Internal SCSI Device

4 To connect three or more internal SCSI devices to a SCSI bus, plug the remaining middle SCSI connectors into the other internal devices.

Connecting External SCSI Devices

You can daisy-chain up to seven external SCSI devices to Channel B of the AHA-3940U, and up to 15 external SCSI devices to Channel B of the AHA-3940UW, as shown in Figures 2-10 and 2-13, provided the allowable cable lengths do not exceed those listed in *Maximum Cable Lengths* on page 2-5.

The external SCSI cables must meet the specifications listed in *Choosing SCSI Cables* on page 2-4. External cable connectors can only be plugged in one way, so pin-1 orientation is automatic. You can buy appropriate cables and other accessories from Adaptec; call 800-442-7274 or 408-957-7274.

Follow these steps to connect external SCSI devices:

1. Attach one connector of the external SCSI cable to the external SCSI connector, as shown in Figure 2-8.

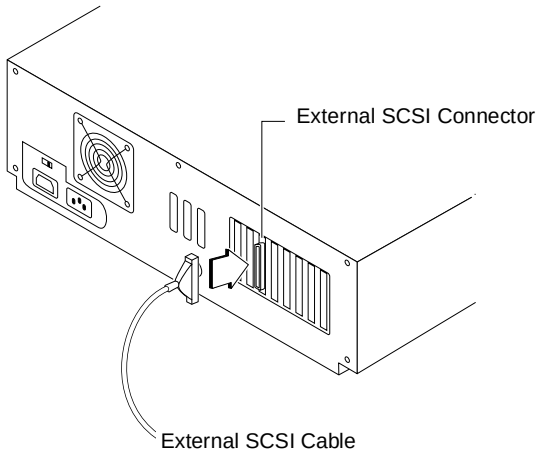

Figure 2-8. External Cable to Host Adapter

2 Attach the connector at the other end of the external cable to either one of the SCSI connectors on the external SCSI device, as shown in Figure 2-9.

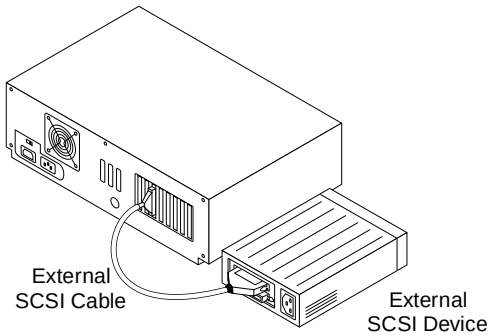

Figure 2-9. External Cable to External SCSI Device

3 To connect other external SCSI devices, daisy chain each device to the previous device until all external SCSI devices have been connected, as shown in Figure 2-10.

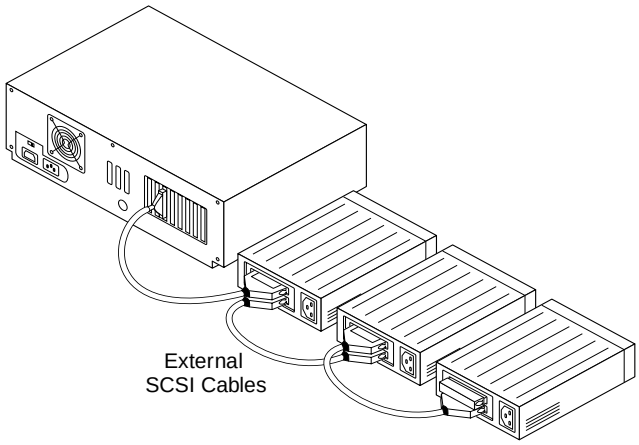

Figure 2-10. Connecting Multiple External SCSI Devices

Connecting External 8-bit and 16-bit Devices to the AHA-3940UW

When daisy-chaining external 8-bit and 16-bit devices with standard SCSI-2 connectors to the AHA-3940UW, use an external SCSI-2 male 68-pin to SCSI-2 female 50-pin converter (available from Adaptec). Follow these steps:

1. Daisy-chain all 16-bit devices together with external SCSI-2 wide cables.
2. Daisy-chain all 8-bit devices together with external SCSI-2 narrow cables.
3. Connect the first device in the 16-bit device daisy-chain to the host adapter with an appropriate external wide cable.
4. Plug the converter into the last device in the 16-bit device daisy-chain.
5. Use an external narrow cable to connect the first 8-bit device in the 8-bit device daisy-chain to the other end of the converter.

Note: Termination on all devices in the middle of the daisy-chain has to be OFF and the termination on the last device in the daisy-chain has to be ON.

See Appendix A, *Cables and Converters for the AHA-3940AU/ 3940AUW* for more details.

Terminating the SCSI Bus

SCSI termination must be enabled on the first and last physical devices on SCSI Channels A and B of your AHA-3940AU/ 3940AUW host adapter; otherwise, the devices will not operate properly. You may need to change the termination setting on some SCSI devices when you install them. In general, the procedure for terminating the SCSI bus is as follows:

1. Leave the AHA-3940AU/3940AUW default termination on *Automatic*.
2. Terminate the last internal and/or last external device on both channels.

3 Disable termination on all other devices on the SCSI bus, if it is not already disabled.

Some devices do not have a terminator. If this is the case, external terminators can be purchased separately to attach to the SCSI cables.

Terminating SCSI Devices

Most SCSI disk drives, CD-ROM drives, and other peripheral devices have a jumper or a switch close to the SCSI connector to control SCSI termination. Some SCSI devices have resistor modules that you can remove or insert to change the termination setting.

Terminate the SCSI device at the end of the internal or external SCSI cable, and disable termination on all other devices on the SCSI bus. Read the device documentation if you are not sure how to enable or disable termination on your SCSI devices.

Note: Some SCSI disk drives allow termination power to be supplied to their resistor modules from the SCSI bus instead of from the drive's power supply. AHA-3940AU/3940AUW host adapters support this option, because they always supply termination power on the SCSI bus.

Terminating the Host Adapter

Termination for Channels A and B is *Automatic* by default on AHA-3940AU/3940AUW host adapters.

Note: The *Automatic* default setting works for the vast majority of configurations. You should not have to change termination settings for the AHA-3940AU/3940AUW.

You can change the termination setting, if necessary, with the SCSI*Select* configuration utility, as described in Chapter 3, *Configuring Your Host Adapter*. The following sections describe how *Automatic* termination works for the channels on the AHA-3940AU/3940AUW host adapters.

Terminating SCSI Channel A on the AHA-3940U

This SCSI channel has an internal connector and no external connector. The host adapter will always be at the end of the cable when you attach internal SCSI devices to this channel. The default termination setting for the host adapter is *Automatic*, so host adapter termination for this channel is always enabled, as shown in Figure 2-11.

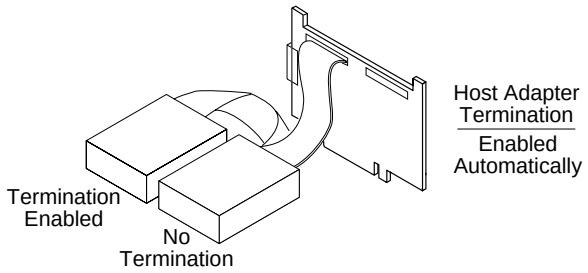

Figure 2-11. Host Adapter Termination on SCSI Channel A (AHA-3940AU/3940AUW)

Termination can be changed manually using SCSI*Select*. You can override the software setting with Jumper J4 on the AHA-3940U and Jumper J8 on the AHA-3940UW. See Chapter 3, *Configuring Your Host Adapter*, *Host Adapter SCSI Termination* on page 3-9 for more information.

Note: *Do not* set a channel's termination to *Disable* if there is no device on that SCSI bus. It may hang the system.

Terminating SCSI Channel A on the AHA-3940UW

This SCSI channel has an internal 68-pin connector and an internal 50-pin connector. The default termination setting is *Automatic*.

- If only one connector is used, the terminator is turned ON.
- If both connectors are used, the control and low-byte termination is turned OFF and the high-byte termination is turned ON.

Terminating SCSI Channel B on the AHA-3940AU/3940AUW

These SCSI channels have an external connector and an internal connector, as shown on page 2-2. You can attach SCSI devices to one of the two connectors or to both connectors. The default termination setting for the host adapter is *Automatic*.

- If you attach SCSI devices to the Channel B connector, as shown in Figure 2-12, host adapter termination is automatically *Enabled*. Always connect the host adapter to the end of the internal cable.

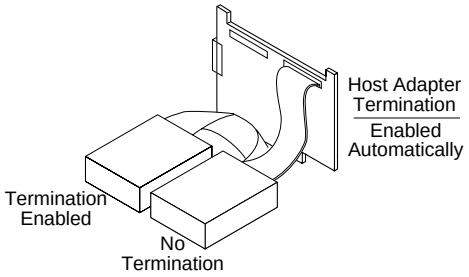

Figure 2-12. Internal Devices on SCSI Channel B

- If you attach SCSI devices to both Channel B internal and external connectors, as shown in Figure 2-13, host adapter termination is automatically *Disabled*. In this configuration, the host adapter is in the middle of the SCSI bus.

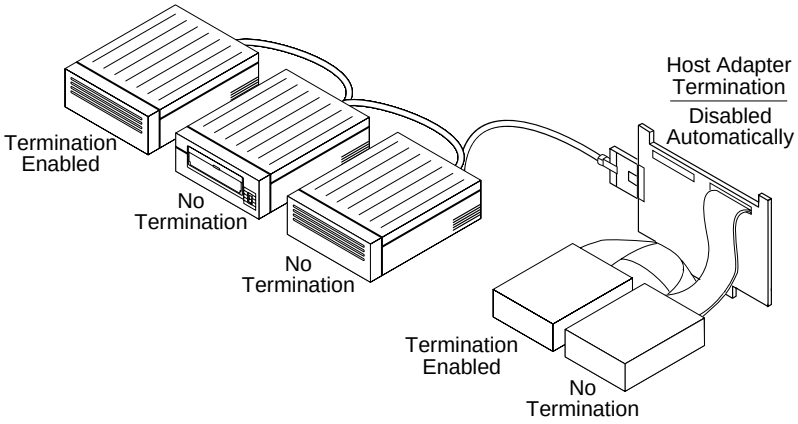

Figure 2-13. Internal and External Devices on SCSI Channel B

SCSI IDs

Each device on the SCSI bus, including the host adapter, must have a unique SCSI ID.

SCSI IDs on one channel do not interfere with the IDs on another channel. This applies to two SCSI host adapters that implement different buses as well as dual channels on a single host adapter.

Setting SCSI IDs

Setting SCSI IDs is a two-step process:

1. Determine the SCSI ID of each device on the SCSI bus.

   The default SCSI ID for Channels A and B of the host adapter is 7, the highest priority on the bus. You can change the ID(s) using SCSI*Select*, if necessary, but we recommend that you leave the ID for both channels at 7.

   To determine the SCSI IDs, read the devices' documentation and examine their switch settings or jumper settings.

2. Set the SCSI IDs so that no IDs are duplicated on the same SCSI channel.

   If you have two host adapters connected to the same SCSI bus, make sure they are set to different SCSI IDs, preferably 7 and 6.

Note: A computer with an AHA-3940AU/3940AUW host adapter can share external SCSI devices with another computer. To do this, you must install a jumper before you install the host adapter. See Appendix B, *Multiple Computer Configuration*.

SCSI ID Priority

On an 8-bit SCSI bus, SCSI ID 7 has the highest priority, and SCSI ID 0 has the lowest priority. From highest to lowest, the complete order is: 7, 6, 5, 4, 3, 2, 1, 0.

On a 16-bit SCSI bus, the priority scheme goes from SCSI ID 7 (the highest priority) to SCSI ID 0, and then from SCSI ID 15 to SCSI ID 8,

so that SCSI ID 8 is the very lowest priority. From highest to lowest, the complete order is: 7, 6, 5, 4, 3, 2, 1, 0, 15, 14, 13, 12, 11, 10, 9, 8.

SCSI Bus Activity LED Connector

Most computers have an LED disk activity light on the front panel. If you disconnect the cable from the motherboard and attach it to the LED connector on the host adapter, the LED will light whenever there is activity on either SCSI channel.

Note: You may not want to change this connection if your computer system includes non-SCSI disk drives, because the LED will no longer light when these drives are active.

Follow these steps to connect the LED cable to the host adapter:

1. Refer to your computer's documentation to locate the LED cable and unplug it from the connector on the motherboard.
2. Connect the LED cable to the SCSI activity LED connector on the host adapter, as shown in Figure 2-14.

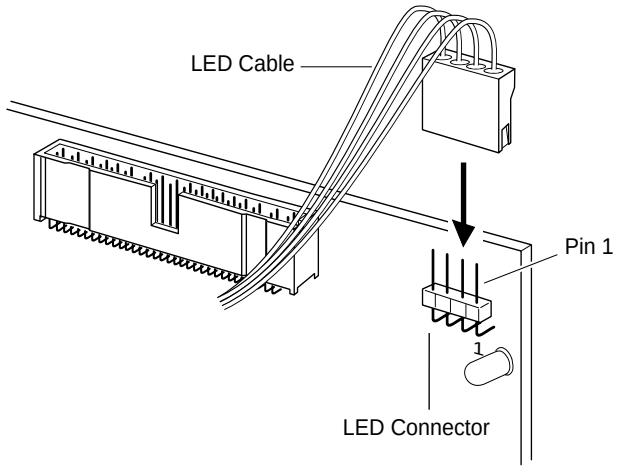

Figure 2-14. SCSI LED Connector

If the computer has a two-position LED cable, connect it to pins 1 and 2 of the LED connector.

Completing Installation

Before you reassemble your computer, be sure that

- The devices on each SCSI channel are properly terminated
- Each SCSI device on each SCSI channel has a unique SCSI ID
- The host adapter is firmly seated and secured in a 5-volt bus master PCI bus slot
- Internal SCSI devices have power plugs attached
- Internal SCSI devices are firmly connected to the host adapter and pin-1 orientation is correct
- External SCSI devices are firmly connected to the host adapter

Complete these steps to finish the installation process:

1. Replace and secure the cover of the computer case.
2. Reconnect the power cords to all external SCSI devices and the computer.
3. Turn ON the power to all external devices.
4. Boot the computer.

If you need to change the configuration of the host adapter or SCSI devices, follow the directions in Chapter 3, *Configuring Your Host Adapter*. If you encounter any problems during installation, see Chapter 5, *Troubleshooting*.

Running the Computer's Setup Program

Normally, PCI-bus computers automatically configure the AHA-3940AU/3940AUW IRQ, port address, and BIOS address. In some cases, depending on what kind of motherboard BIOS your computer uses, you may need to run the computer's *Setup* program to enable the PCI bus parameters before your computer can recognize the host adapter.

If your host computer does not recognize the host adapter after you install it, enter the *Setup* program and check for PCI configuration parameters. Usually you start the *Setup* program by pressing a key or key combination when your computer boots and the host computer BIOS message appears. The BIOS message normally states

the key or keys you must press to enter the *Setup* program. If you are not sure, check the documentation for your computer.

If your computer has a combination of ISA (or EISA) boards and PCI boards, you may need to configure the settings so that the IRQs used by ISA/EISA boards are marked as *Used* and the PCI bus does not try to assign them to other PCI boards. Also, some BIOS's reserve a set of available IRQs for PCI boards, and you have to assign these IRQs manually.

Read the documentation for your computer's *Setup* program to find out more about configuration issues.

3

Configuring Your Host Adapter

AHA-3940AU/3940AUW host adapters include an onboard SCSI*Select* configuration utility that lets you change host adapter settings without opening the computer or handling the host adapter. SCSI*Select* also provides utilities for formatting SCSI disk devices and scanning them for defects. In addition, SCSI*Select* allows you to list the SCSI IDs of devices attached to the host adapter.

If you do not need to change any of the default settings listed in *Default Configuration Settings* on page 3-2, and you do not want to run any SCSI disk utilities, there is no need to run SCSI*Select*. Your host adapter is ready for operation; you can proceed to Chapter 4, *Operating System Support*.

If you need to change any settings, or if you want to run the SCSI disk utilities, the remainder of this chapter provides instructions for running the SCSI*Select* utility and changing settings.

Default Configuration Settings

This table lists the settings you can change with SCSI*Select* and the default value for each setting. Some settings apply to the channels; other settings apply individually to each device on the bus.

SCSI Bus Interface Definitions	Default Setting
Host Adapter SCSI ID	7
SCSI Parity Checking	Enabled
Host Adapter SCSI Termination	Automatic
Boot Device Settings	**Default Setting**
Boot Channel	A First
Boot SCSI ID	0
Boot LUN Number[1]	0
SCSI Device Setting	**Default Setting**
Initiate Sync Negotiation	Yes (Enabled)
Maximum Sync Transfer Rate	10 MBytes/sec[2,3]
Enable Disconnection	Yes (Enabled)
Initiate Wide Negotiation[4]	Yes (Enabled)
Send Start Unit Command[5]	No (Disabled)
BIOS Multiple LUN Support[5]	No (Disabled)
Include in BIOS Scan	Yes (Enabled)
Advanced Configuration Options	**Default Setting**
Plug and Play SCAM Support	Disabled
Reset SCSI Bus at IC Initialization	Enabled
Extended BIOS Translation for DOS Drives > 1 GByte[5]	Enabled
Host Adapter BIOS (Configuration Utility Reserves BIOS Space)	Enabled
Support Removable Disks under BIOS as Fixed Disks[5]	Boot Only
Display <Ctrl-A> Message During BIOS Initialization[5]	Enabled
BIOS Support for Bootable CD-ROM[5]	Enabled
BIOS Support for Int 13h Extensions[5]	Enabled

[1] Setting is valid only if Multiple LUN Support is enabled.
[2] The default setting for the AHA-3940U is 10MByte/sec.
The default setting for the AHA-3940UW is 20MByte/sec.
[3] Ultra Speed for the AHA-3940U is 20MByte/sec.
Ultra Speed for the AHA-3940UW is 40MByte/sec.
[4] AHA-3940UW only.
[5] Settings are only valid if channel BIOS is enabled.

Note: To enable Ultra Speed, first enable Initiate Wide Negotiation. Then select the highest available setting in the Maximum Sync Transfer rate option.

When to Use SCSI*Select*

Use SCSI*Select* if you need to

- Change any of the default settings
- Check or change SCSI device settings that may conflict with those of other devices (e.g., SCSI ID)
- Perform low-level formatting on new SCSI disk devices

Starting SCSI*Select*

To start SCSI*Select*, press **Ctrl+A** when the BIOS banner appears during bootup, similar to the one shown in Figure 3-1.

```
Adaptec AHA-3940AU/AUW/AUWD BIOS v1.31
(c) 1997 Adaptec, Inc. All Rights Reserved.

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

SCSI ID #0 - MAXTOR    P1-17S            - Drive C:   (80h)
SCSI ID #2 - QUANTUM   P40S-94-40-04xx   - Drive D:   (81h)
SCSI ID #3 - Toshiba   CD_ROM:XX3355
SCSI ID #4 - ARCHIVE   VIPER  150   21247

BIOS Installed Successfully!
```

Figure 3-1. Sample BIOS Banner

The BIOS banner lists the model number and SCSI ID of each SCSI device connected to the host adapter.

Selecting a SCSI Channel

Each AHA-3940AU/3940AUW host adapter has two SCSI channels. Each channel operates independently and must be configured separately in SCSI*Select*. The first SCSI*Select* screen allows you to select either Channel A or Channel B, as shown in Figure 3-2. Press the ↑ and ↓ keys to highlight the channel you want to configure, then press **Enter** to select it.

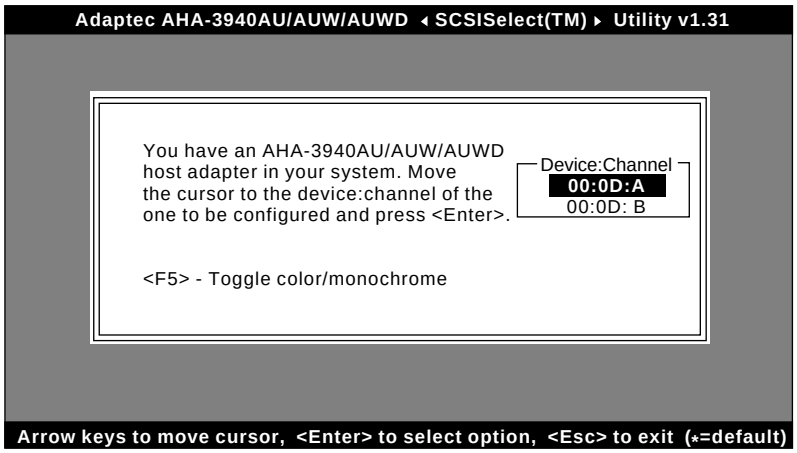

Figure 3-2. Selecting a SCSI Channel

If there are two or three AHA-3940AU/3940AUW host adapters in your computer, this screen lists the channels on all the host adapters. For example, if you have two host adapters, you will see additional entries for **00:0D:A** and **00:0D:B.** Select the host adapter and channel you want to configure, then press **Enter**.

Note: You must select SCSI Channel A if you want to enable or disable the Host Adapter BIOS. The BIOS setting cannot be changed when you are configuring Channel B. The same is true of the settings for Boot Channel, Boot Target ID, and Boot LUN number.

After you select the channel, the SCSI*Select* Options menu appears, as shown in Figure 3-3.

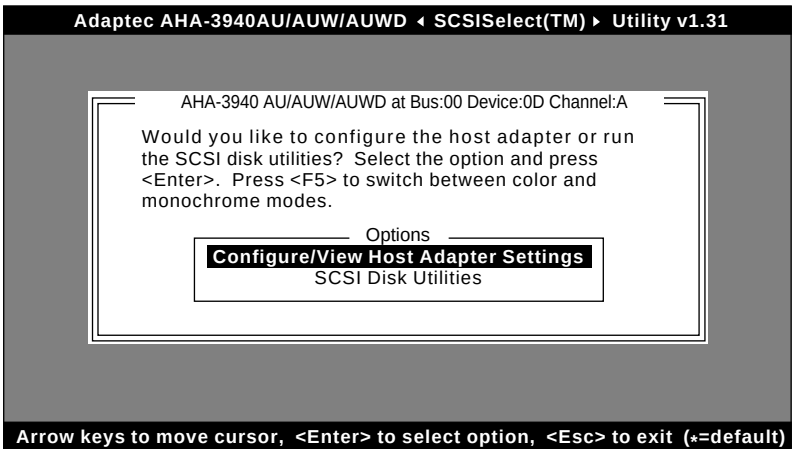

Figure 3-3. Options Menu Screen

Using the Options Menu

The Options menu has the following selections:

- **Configure/View Host Adapter Settings**
- **SCSI Disk Utilities**

To select an option in this and subsequent menus, press the ↑ and ↓ keys to highlight the option, then press **Enter**. Press **Esc** at any time to return to the previous menu.

Note: Press **F5** to toggle the display between color and monochrome. (This feature may not work on all monitors.)

Configuring/Viewing Host Adapter Settings

From the Options menu, select **Configure/View Host Adapter Settings** to see the Configuration menu, shown in Figure 3-4.

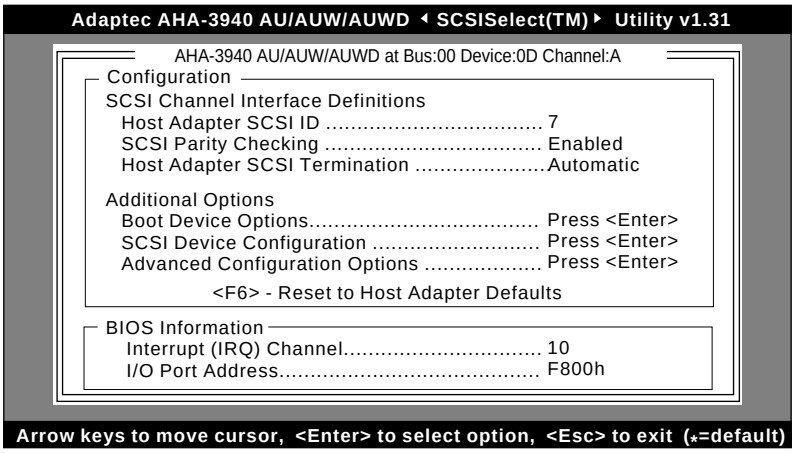

Figure 3-4. Configure/View Host Adapter Settings Screen

The configuration menu lists the following configuration option groups:

- **SCSI Bus Interface Definitions** (SCSI ID, Parity Checking, and Termination)
- **Additional Options** (Boot Device Options, Device Configuration, and Advanced Configuration)
- **BIOS Information** (Interrupt Channel [IRQ] and I/O Port Address—display only)

Each group, with the exception of the BIOS information group, can be edited by using the ↑ and ↓ keys to highlight the option; pressing **Enter** to display a pop-up menu; and then selecting a setting by highlighting it and pressing **Enter**.

Note: Channel default settings are marked with an asterisk (*) throughout the menus. Press **F6** to reset all settings to the channel defaults.

SCSI Bus Interface Definitions

This menu lists the SCSI Bus Interface Definitions options and their current settings:

- **Host Adapter SCSI ID**
- **SCSI Parity Checking**
- **Host Adapter SCSI Termination**

Host Adapter SCSI ID

Each SCSI device on the SCSI bus, including each channel on the host adapter, must have a unique SCSI ID.

The Host Adapter SCSI ID option on the Configuration menu lets you change the channel SCSI ID. The default ID is *7*, which has the highest priority on the SCSI bus. We recommend that you keep this setting.

Follow these steps to select a different ID for a channel:

1. Display the Configuration menu for the channel.
2. Highlight **Host Adapter SCSI ID**, then press **Enter**. A menu of IDs appears.

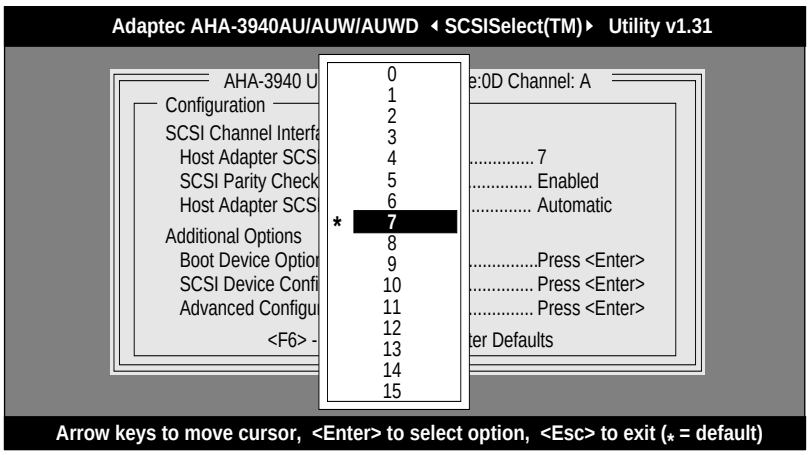

Figure 3-5. Host Adapter SCSI ID Selection Screen for AHA-3940UW

3. Highlight the ID you want to assign the channel, then press **Enter**.

When selecting the channel SCSI ID, consider the following:

- Two devices on the same channel cannot have the same ID. The host adapter itself uses one SCSI ID on each channel (SCSI ID 7, by default). See *Using SCSI Disk Utilities* on page 3-19 to learn how to determine the SCSI ID used by each device.
- If you plan to connect two host adapters in different computers to the same SCSI bus (see Appendix B, *Multiple Computer Configuration*), set the host adapters to different SCSI IDs. IDs 6 and 7 are best, since they have top priority on the SCSI bus.

SCSI Parity Checking

Select this option to enable or disable SCSI Parity Checking on the channel. The default setting is *Enabled*.

When reading from the SCSI bus, the channel always checks parity to verify the correct transmission of data from your SCSI devices. Disable SCSI Parity Checking if any attached SCSI devices do not support SCSI parity. Most currently available SCSI devices support SCSI parity. Check the device documentation if you are not sure.

To set parity checking for a channel, follow these steps:

1. Display the Configuration menu for the channel.
2. Highlight **SCSI Parity Checking**, then press **Enter**. The pop-up menu shown in Figure 3-6 appears.

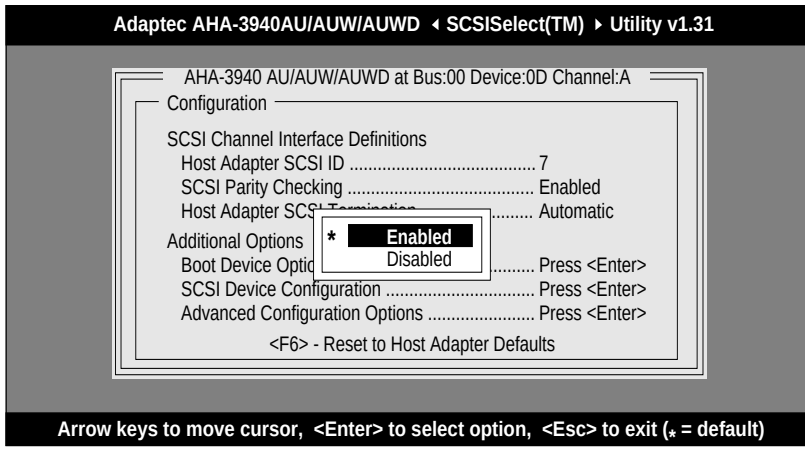

Figure 3-6. SCSI Parity Checking Selection

3 Highlight **Enabled** or **Disabled**, then press **Enter**.

Host Adapter SCSI Termination

The host adapter termination default setting for SCSI channels is *Automatic*. This means that the host adapter automatically enables or disables termination, according to the following table:

Connectors Used on Channel	Termination
Internal connector only; host adapter at end of channel	Enabled
External connector only; host adapter at end of channel	Enabled
Internal and external connectors; host adapter in middle of channel	Disabled

We recommend leaving the setting at *Automatic*.

To change the termination setting manually for a given channel

1 Display the Configuration menu for the channel.

2 Highlight **Host Adapter SCSI Termination**, then press **Enter**. The termination options for the host adapter appear in a pop-up menu. Figure 3-7 shows the termination options for the AHA-3940U.

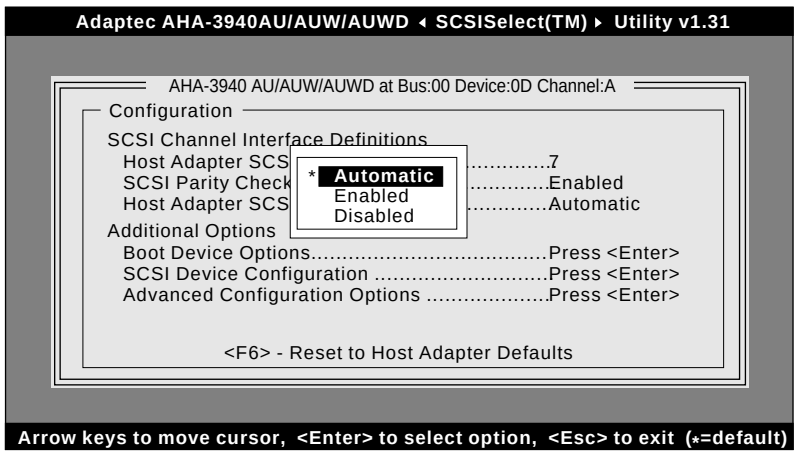

Figure 3-7. Host Adapter SCSI Termination Selection for AHA-3940U

Figure 3-8 shows the termination options for the AHA-3940UW if the devices connected to Channel A use both the 50-pin and 68-pin internal connectors. If the devices are connected to Channel B using the 68-pin external and internal connectors, the options are the same as displayed in Figure 3-7.

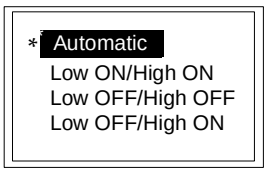

Figure 3-8. Host Adapter SCSI Termination Selection for AHA-3940UW

3 Highlight the termination option desired, then press **Enter**.

Additional Options

The Additional Options section of the Configuration menu give you access to other menus from which you can select settings for the following:

- **Boot Device Options:** Specify ID and LUN to boot from.
- **SCSI Device Configuration:** Specify for each SCSI device the maximum synchronous transfer rate, use of the Start Unit command, and other criteria.
- **Advanced Configuration Options:** Select advanced options for configuring the channel.

See *SCSI Device Configuration* on page 3-12 and *Advanced Configuration Options* on page 3-16 for more information.

Boot Device Options

This option configures parameters for a SCSI boot device. When you select this option, a screen similar to Figure 3-9 appears.

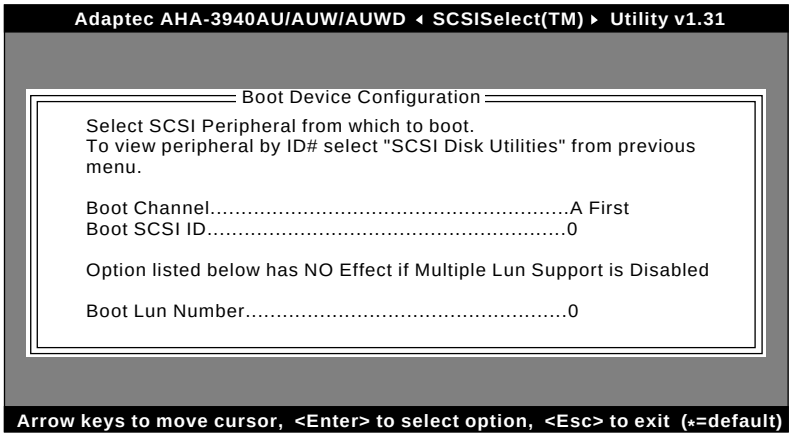

Figure 3-9. Boot Device Options

- **Boot Channel**—MultiChannel devices allow you to boot from either channel. Use this option to identify the channel which should be scanned first during bootup. The default is *A First*.
- **Boot SCSI ID**—This option allows you to identify the SCSI device to be used as a boot device. The range is 0 to 15; the default is *0*.
- **Boot LUN Number**—The AHA-3940AU/3940AUW supports up to eight logical units. This option allows you to identify the Logical Unit Number (LUN) to use during bootup. The default is *0*. This setting is only valid if BIOS Multiple LUN Support is enabled.

SCSI Device Configuration

This option allows you to configure certain parameters of each SCSI device on the SCSI bus. When you select this option for the AHA-3940U, a screen similar to Figure 3-10 appears.

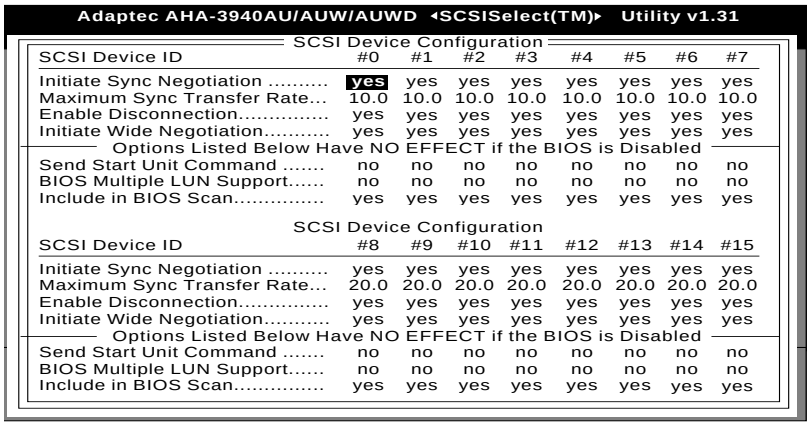

Figure 3-10. SCSI Device Configuration Screen for AHA-3940U

The screen has a column of information for each SCSI ID, including SCSI IDs that are not assigned to a device. To configure a specific SCSI device, you need to know its SCSI ID. See *Using SCSI Disk Utilities* on page 3-19 to learn how to determine the SCSI ID for each device.

To change a setting, use the arrow keys (↑↓) to highlight the option, then press **Enter** to display a pop-up menu. Use the arrow keys (↑↓) to highlight the desired setting, and press **Enter** to select it.

- **Initiate Sync Negotiation**—The setting for this option determines whether the channel initiates synchronous negotiation with the SCSI device. When set to **yes**, the channel initiates synchronous negotiation. When set to **no**, the channel does not initiate synchronous negotiation. The default setting is *Yes*.

  The channel always *responds* to synchronous negotiation when the SCSI device initiates it. Data is transferred in asynchronous mode if neither the channel nor the SCSI device negotiates for synchronous mode.

Note: Some older SCSI-1 devices do not support synchronous negotiation, so your computer might operate erratically if Initiate Sync Negotiation is enabled. Set Initiate Sync Negotiation to **no** for these devices.

- **Maximum Sync Transfer Rate**—The setting for this option determines the maximum synchronous data transfer rate that the channel can support.
  - The AHA-3940U has a 8-bit channel that provides an *effective* maximum synchronous transfer rate of 20.0 MBytes/sec.
  - The AHA-3940UW has a 16-bit channel that provides an *effective* maximum synchronous transfer rate of 40.0 MBytes/sec (20.0 MBytes/sec per 8-bit channel).

  The default is *10.0* MBytes/sec for the AHA-3940U, and *20.0* MBytes/sec for the AHA-3940UW.

  For the AHA-3940UW, the maximum synchronous transfer rates available are dependent on the Initiate Wide Negotiation setting. The available settings are shown in Figure 3-11.

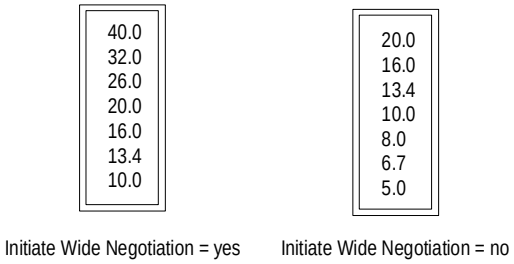

Figure 3-11. Maximum Sync Transfer Rate Ranges

Note: Some older SCSI-1 devices do not support Fast or Ultra SCSI data transfer rates (20.0, 10.0, 8.0, and 6.7). This may cause your computer to operate erratically or hang at the higher transfer rates. Refer to the device's documentation and set the transfer rate accordingly.

- **Enable Disconnection**—The setting for this option determines whether the channel allows a SCSI device to disconnect from the SCSI bus (sometimes called Disconnect/Reconnect). Enabling disconnection allows the channel to perform other operations on the SCSI bus while the SCSI device is temporarily disconnected.

  When set to **yes**, the SCSI device may disconnect from the SCSI bus. The SCSI device, however, may choose not to disconnect, even if permitted by the channel (this can usually be configured on the SCSI device). When set to **no**, the SCSI device cannot disconnect from the SCSI bus. The default setting is *yes*.

  To optimize SCSI bus performance, leave Enable Disconnection set to **yes** if the channel connects to two or more SCSI devices. If the channel connects to only one SCSI device, set Enable Disconnection to **no** to achieve slightly better performance.

- **Initiate Wide Negotiation**—The setting for this option, which appears only on AHA-3940UW host adapters, determines whether the channel initiates negotiation with the SCSI device for Wide SCSI data transfers. When set to **yes** for a SCSI device, the channel initiates Wide negotiation with the SCSI device. When set to **no**, the channel does not initiate Wide negotiation with the device. The channel, however, always *responds to* Wide negotiation if the SCSI device initiates it. The default setting is *yes*.

Note: To enable Ultra Speed, first enable Initiate Wide Negotiation. Then select the highest available setting in the Maximum Sync Transfer rate option.

The following settings are only effective if the BIOS is enabled. See *Advanced Configuration Options* on page 3-16 for information on enabling the Host Adapter BIOS.

- **Send Start Unit Command**—The setting for this option, which is supported by some SCSI devices, determines whether the channel sends the Start Unit command (SCSI command 1B) to the SCSI device (most devices do not require this). Enabling this option reduces the load on your computer's power supply by allowing the channel to turn on SCSI devices one-at-a-time

when the computer boots. Otherwise, all SCSI devices turn on at the same time. Most devices require you to set a jumper before they can respond to this command.

When set to **yes**, the channel sends the Start Unit command to the SCSI device during bootup. When set to **no**, each SCSI device powers up when the computer powers up. The default setting is *No*.

- **BIOS Multiple LUN Support**—The setting for this option determines whether booting from a SCSI device that has multiple LUNs is supported. The default setting is *Disabled*.

Note: BIOS Multiple LUN Support must be enabled in order to use the Boot LUN Number during bootup.

- **Include in BIOS Scan**—This setting gives the AHA-3940AU/3940AUW the ability to ignore any SCSI devices attached to the SCSI bus during bootup. The AHA-3940AU/3940AUW BIOS scans a specific SCSI ID looking for a stand-alone disk device to control. If Include in BIOS Scan is set to **yes** for a SCSI ID the BIOS scans the ID, and the disk device at that ID becomes accessible through Int 13h; if the option is set to **no**, the BIOS does not scan the SCSI ID. The default setting for include in BIOS Scan is *Yes*.

Advanced Configuration Options

When you select Advanced Configuration Options, a screen similar to Figure 3-12 appears. *Do not* change the settings for these options unless you fully understand what they mean.

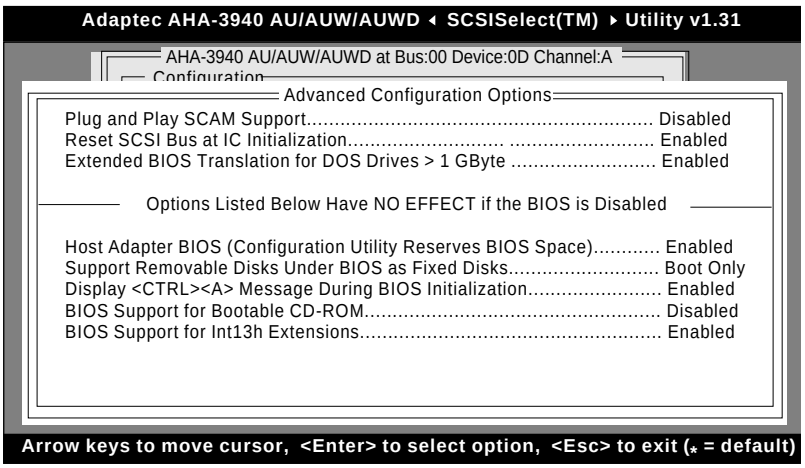

Figure 3-12. Advanced Configuration Options Screen

To change a setting, use the cursor keys (↑↓) to highlight the option, then press **Enter** to display a pop-up menu. Use the arrow keys (↑↓) to highlight a setting, and press **Enter** to select it.

- **Plug and Play SCAM Support**—The setting for this option determines whether the AHA-3940AU/3940AUW automatically assigns SCSI IDs to attached SCSI devices that support the SCAM protocol. The default setting is *Disabled*.

  Most non-SCAM devices tolerate SCAM protocol, so you can enable this option even for non-SCAM devices. In some cases, an old SCSI-1 device may not tolerate SCAM and may cause the computer to hang or operate erratically. If this happens, disable this option.

- **Reset SCSI Bus at IC Initialization**—The setting for this option determines if a SCSI bus reset will be generated by the host adapter during its power-on initialization, and after a hard reset. The default setting is *Enabled*.

- **Extended BIOS Translation for DOS Drives > 1 GByte**—The setting for this option enables or disables extended translation for SCSI hard disks with a capacity greater than 1 GByte. The setting is valid only if the channel BIOS is enabled. The default setting is *Enabled*.

  See Appendix D, *Disk Drives Over 1 GByte*, for more on this setting.

The following advanced configuration settings are only valid if the BIOS is enabled:

Note: The following SCSI Device Configuration settings are only valid if BIOS is enabled: Send Start Unit Command; BIOS Multiple LUN Support, and Include in BIOS Scan. See *SCSI Device Configuration* on page 3-12 for more information on these settings.

- **Host Adapter BIOS (Configuration Utility Reserves BIOS Space)**—The setting for this option enables or disables the hot adapter BIOS. The default setting is *Enabled*.

  If you are booting from a SCSI disk drive connected to the host adapter, the BIOS must be enabled. You should disable the host adapter BIOS if the peripherals on the SCSI bus (for example, CD-ROM drives) are all controlled by device drivers and do not need the BIOS.

- **Support Removable Disks Under BIOS as Fixed Disks**—The setting for this option controls which removable-media drives are supported by the channel BIOS. The setting is valid only if the channel BIOS is enabled. The default setting is *Boot Only*. The following choices are available:

  – **Boot Only:** Only the removable-media drive designated as the boot device is treated as a hard disk drive.

  – **All Disks:** All removable-media drives supported by the BIOS are treated as hard disk drives.

  – **Disabled:** No removable-media drives are treated as hard disk drives. In this situation, software drivers are needed because the drives are not controlled by the BIOS.

Caution: Support for removable-media drives means only that the channel BIOS *allows* you to use a removable-media drive as if it were a hard disk drive. It does *not* mean you can remove the disk during operation. If a removable-media SCSI device is controlled by the channel BIOS, *do not* remove the medium while the drive is on or you may lose data! If you want to remove media while the power is ON, install the removable-media device driver and set Support Removable Disks Under BIOS as Fixed Disks to **Disabled**.

- **Display <Ctlr A> Message During BIOS Initialization**—The setting for this option enables or disables the display of the SCSI*Select* message. The default is *Enabled*.
- **BIOS Support for Bootable CD-ROM**—The setting for this option enables or disables BIOS support for bootable CD-ROM. The default setting is *Disabled*. The AHA-3940AU/3940AUW supports the standard specifications for bootable CD-ROMs.
- **BIOS Support for Int 13h Extensions**—The setting for this option enables or disables BIOS support for Int 13h extensions. This option provides a mechanism to support disks with more than 1024 cylinders and to add support for software control of drive locking for removable media. The default setting is *Enabled*.

Note: You save configuration changes as you exit SCSI*Select*. Press **Esc** until you are prompted to save the changes, then select **Yes** to save the changes or **No** to abandon them. If you select **Yes**, the system saves the changes and reboots with the new initial values.

Using SCSI Disk Utilities

When you select SCSI Disk Utilities from the Options menu, SCSI*select* scans the SCSI bus and lists all installed SCSI devices. A screen similar to Figure 3-13 appears, listing the SCSI ID assigned to each device on the SCSI bus.

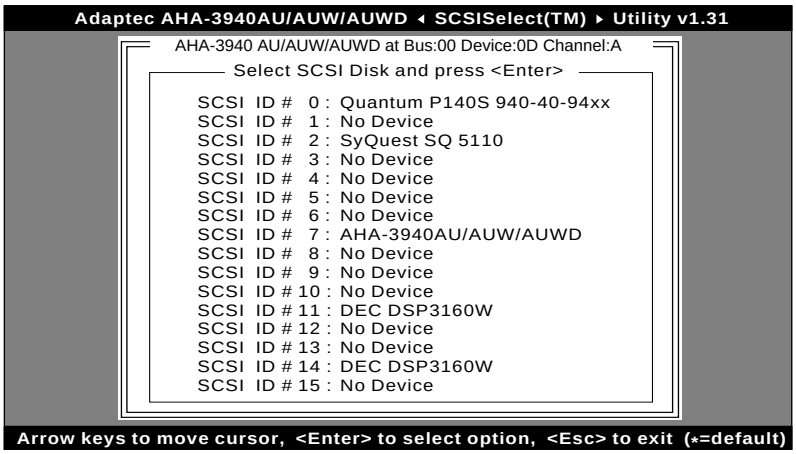

Figure 3-13. SCSI Disk Utilities Screen for AHA-3940AU/3940AUW

If you select a device, a small menu window appears. From this menu, you can select Format Disk or Verify Media. Use the arrow keys (↑↓) to highlight the option, then press **Enter** to display a pop-up menu.

Format Disk

The *Format Disk* utility performs a low-level format on disk devices. Your fixed disk media 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 and need not be formatted again. The Adaptec *Format Disk* utility is compatible with most SCSI disk drives. It may be necessary to run *Format Disk* on hard disk drives or removable-media drives that were previously used with a non-Adaptec host adapter.

Caution: A low-level format destroys all data on the drive. Back up your data before performing this operation. You *cannot* abort a low-level format once it starts.

Verify Disk Media

The *Verify Disk Media* utility scans the selected device's media for defects. If the utility finds bad blocks, it prompts you to reassign them; if you select **yes**, those blocks will no longer be used.

Note: You can press **Esc** at any time to abort the *Verify Disk Media* utility.

Configuring Multiple Host Adapters

Follow these instructions if your computer has multiple host adapters:

- If you want your computer to boot from a specific SCSI drive, install that drive's host adapter in the slot with the lowest PCI Device number. The Device number is determined by the slot number on the PCI bus. Refer to your computer documentation to determine the PCI slot number and slot number order.
- If you are booting from a drive connected to an AHA-3940AU/3940AUW and you are using ISA/EISA-based host adapters to support secondary devices, disable the BIOS on all ISA/EISA-based host adapters.
- If you are booting from a drive connected to an ISA/EISA-based host adapter and you are using the AHA-3940AU/3940AUW to support a secondary device, read the documentation for the ISA/EISA-based host adapter to ensure that the host adapter is at the lowest BIOS base address.

  ISA/EISA-based host adapters that have their BIOS enabled boot before the AHA-3940AU/3940AUW.

4

Operating System Support

The Adaptec AHA-3940AU/3940AUW host adapter kit includes two software packages for managing devices. If your system runs on Windows or DOS, install the EZ-SCSI® software. If your system runs on NetWare®, OS/2, SCO UNIX, UnixWare, Windows® 95, or Windows NT™, install the Adaptec 7800 Family Manager.

You will find the management software particularly helpful if you intend to use any of the following:

- Any device other than CD-ROM drives or disk drives, such as SCSI tape drives, scanners, plotters, or WORM drives
- more than eight hard disk drives
- removable media, such as Bernoulli cartridges

Adaptec EZ-SCSI Software

Adaptec EZ-SCSI, for DOS/Windows, Windows 95, and Windows NT, is a menu-driven applications suite that manages all your SCSI peripherals. EZ-SCSI software includes these features:

- Graphical, fully automated Windows-based installation program with extensive on-line Help
- On-line tutorial with useful information about SCSI topics
- Support for a wide variety of SCSI devices, such as single-session/multisession Photo CD™, CD-ROM drives, Floptical®, and removable (MO) drives
- SCSI tape drive back-up utility

- Audio CD-ROM player utility
- Scanner utility
- Utilities for viewing Photo CD images, writing to CD-ROMs, and more

To install support for SCSI devices such as optical disks, check the hardware documentation for those devices.

For details on how to install and use EZ-SCSI software, refer to the *Adaptec EZ-SCSI 4.0 Software Quick Reference Guide*, included in the AHA-3940AU/3940AUW package.

Adaptec 7800 Family Manager

The Adaptec 7800 Family Manager Set, for the NetWare, OS/2, SCO UNIX, UnixWare, Windows 95, and Windows NT operating systems, is included with the AHA-3940AU/3940AUW host adapter package. For details on how to install and use the Adaptec 7800 Family Manager Set, refer to the *Adaptec 7800 Family Manager Set User's Guide*.

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Troubleshooting

AHA-3940AU/3940AUW host adapters have been tested for compatibility with a wide range of SCSI devices. Most problems that occur during installation result from errors in preparing and connecting devices on the SCSI bus. If you need more assistance after reading this troubleshooting information, see *Adaptec Technical Support and Services* on page ii.

Answer these questions first if a problem occurs during installation:

- Is your computer system PCI 2.1-compliant? Make sure you are using the most up-to-date system BIOS. Check your computer system vendor's Web site for the latest BIOS version.
- Does your computer system support the BIOS Boot Specification (BBS)? If not, contact Adaptec Technical Support.
- Are the power cables and SCSI interface cables properly connected? (See *Connecting SCSI Cables and Devices* on page 2-4.) Connect internal SCSI devices to the computer power supply. Connect power cables of external SCSI devices to a grounded power outlet. Follow the instructions in the computer and SCSI device documentation.
- Is the host adapter firmly seated and secured in a 5-volt PCI bus slot that is capable of bus mastering? Check the computer's documentation, check its *Setup* program, or try another PCI slot.
- Is pin-1 orientation maintained throughout the SCSI bus? (See *Connecting Internal SCSI Devices* on page 2-6.)

- Are PCI bus and slot parameters set correctly in the computer's *Setup* program? (See *Configuring Multiple Host Adapters* on page 3-20.) The PCI bus is designed to assign IRQ, port address, and BIOS address settings automatically to the host adapter. But you may need to assign some of these values manually in the *Setup* program.
- Is the host adapter's IRQ or port address in conflict with any SCSI ID? Again, the PCI bus assigns IRQ, port address, and BIOS address settings automatically, but you may need to assign some of these values manually in *Setup*.
- Is each SCSI device, including the channel, set to a unique SCSI ID? (See *SCSI IDs* on page 2-15.)
- Is SCSI termination set correctly? (See *Terminating the SCSI Bus* on page 2-11.)

If your problem is still not resolved, continue with the next section.

BIOS Startup Messages

After you install your host adapter, the Host Adapter BIOS displays a message when you boot your computer. Normally, this message lists the SCSI ID, manufacturer, model number, and other information for each SCSI device that the BIOS detects. If initialization fails, however, the Host Adapter BIOS displays a specific error message followed by a BIOS Installation Failure message. Here are some of these error messages and their meaning:

Device connected, but not ready.

This message appears if the channel receives no answer when it requests data from an installed SCSI device. The channel skips this device and moves on to the next device on the bus.

Do the following if you see this message when you request data from a SCSI drive:

1. Run SCSI*Select* and access SCSI Device Configuration. Locate the channel's SCSI ID and set Send Start Unit Command to **yes**.
2. Exit SCSI*Select* and request data from the drive again.
3. If the message still appears, follow the drive manufacturer's instructions to make sure the drive is set to spin up when the power is ON.

Start unit request failed.
The BIOS was unable to send a Start Unit command to the device. Run SCSI*Select* and disable Send Start Unit Command for the device.

Time-out failure during SCSI Inquiry command!
or
Time-out failure during SCSI Test Unit Ready command!
or
Time-out failure during Start Unit command!
An unexpected time-out occurred. Check SCSI bus termination. Try disconnecting the SCSI peripheral cables from the channel and then starting the computer. If the computer starts successfully, check SCSI bus termination and cable connections. One of the devices on the SCSI bus could be defective.

Host adapter configuration error.
The motherboard BIOS did not assign an IRQ to the host adapter. Run the CMOS *Setup* program and check the IRQ assignments.

Disk Drive Configuration Problems

This section describes situations that may occur if your computer has multiple disk drives, e.g. both SCSI and non-SCSI disk drives[1].

Non-SCSI hard disk drives can be set to *installed* or *not installed* with the *Setup* program supplied with the host computer. The *Setup* program specifies how many non-SCSI hard disks the computer recognizes, regardless of whether they are physically installed. SCSI drives are not controlled through the *Setup* program.

If both SCSI and non-SCSI disk drives are installed, then the non-SCSI disk drive is *always* the boot device.

Booting the Computer from a SCSI Drive

- Check that both non-SCSI hard disks are mapped out of the computer using the *Setup* program; that is, set the *Setup* program to **No Drives Installed** in the system BIOS.

[1] *non-SCSI disk drive* means a disk drive attached to the computer through a standard ISA/EISA, non-SCSI disk controller—for example, an IDE drive.

- If you connect SCSI drives to both Channel A and Channel B and you want to boot from a drive on Channel B, use the Boot Channel feature of SCSI*Select* to select the Channel B drives to be scanned first. Otherwise, the host adapter BIOS will try to boot from the first drive it finds on Channel A. (The BIOS always scans Channel A first.) See *Additional Options* on page 3-10 for more information.
- Check that there are no SCSI ID conflicts. Refer to the disk drive manual to learn how to set the drive's SCSI ID. You can use SCSI*Select* to determine the SCSI IDs of devices on the SCSI bus, as described on page 3-19.
- Be sure that SCSI Parity Checking is consistently enabled or disabled on all devices on the SCSI bus. See *SCSI Parity Checking* on page 3-8.
- Always turn the computer's power OFF and ON after changing any values on a channel, in a *Setup* program, or on a SCSI device. This ensures that the new initial values are loaded.
- Check that the SCSI bus is properly terminated. See *Terminating the SCSI Bus* on page 2-11.
- Check that the intended boot disk has been formatted and has an active DOS partition. If the disk has not been formatted, run the *Format Disk* utility included in SCSI*Select*. See *Using SCSI Disk Utilities* on page 3-19.
- Check cable connections and pin-1 orientation.

Using a Standard Drive as C and a SCSI Drive as D

- Use the *Setup* program to map the second non-SCSI hard disk (if one exists) out of the configuration.
- Be sure that SCSI Parity Checking is consistently enabled or disabled on all devices on the SCSI bus.
- Verify that the channel and the SCSI devices are properly configured and installed.
- Always turn the computer's power OFF and ON after changing any values on a channel, in a *Setup* program, or on a SCSI device. This ensures that the new initial values are loaded.
- Check that the SCSI bus is properly terminated.

- Check that the disk is formatted and has a proper operating system partition. If the disk has not been formatted, run the *Format Disk* utility included in SCSI*Select*. See *Using SCSI Disk Utilities* on page 3-19.
- Check cable connections and pin-1 orientation.

Using SCSI Drives as C and D

- Make sure your computer's CMOS *Setup* program is set to **No Drives Installed**.
- The drive with the lowest SCSI ID is automatically used for boot-up. Refer to the disk drive manual to learn how to set the drive's SCSI ID. You can also use SCSI*Select* to specify the boot-up drive; see page 3-19.
- Always turn the computer's power OFF and ON after changing any values on a channel, in a *Setup* program, or on a SCSI device. This ensures that the new initial values are loaded.
- Make sure SCSI Parity Checking is consistently enabled or disabled on all devices on the SCSI bus.
- Verify that the channel and the SCSI devices are properly configured and installed.
- Check that the SCSI bus is properly terminated.
- Check that the disk is formatted and has a proper operating system partition. If the disk has not been formatted, run the *Format Disk* utility included in SCSI*Select*. See *Using SCSI Disk Utilities* on page 3-19.

Computer Hangs, or Channel Cannot Find the Drives

- Check SCSI parity for consistency.
- Check for correct SCSI termination on each device.
- Check cable length and integrity. Check pin-1 orientation.
- If the host adapter LED stays on when the computer hangs, the host adapter might be interfering with your computer's operation. Is the adapter installed in a PCI slot that does not support bus mastering? See your computer documentation.

Other Problems and Solutions

The screen is difficult to read when I run SCSI*Select.*

Press **F5** to toggle the display between color and monochrome modes. This may make it easier for you to read the screen.

When I tried to use the format/verify utility on a disk device, I got an Unexpected SCSI Command Failure pop-up box with a lot of error information. What does this mean?

This probably means that the utility found a problem with the disk device or the medium, so it can't run. The following data appear:

- SCSI Target ID of the device
- SCSI CDB Sent (e.g., 2F 00 00 00 00 00 00 08 00 00)
- Host Adapter Status (e.g., 11h - Selection Timeout)
- Target Status (e.g., 00h - Good Status)
- Sense Key (e.g., 06h - Unit Attention)
- Additional Sense Code
- Additional Sense Code Qualifier

You can probably determine from the Sense Key information both the cause of the problem and its solution. Here are some of the more common Sense Key values and their meanings:

- 02h - Not ready
  The medium is not ready to format. Check that medium is inserted in the drive and spun up.
- 03h - Medium error
  The disk medium may be defective. If it is a removable-media drive, try using a different disk. If it is a hard disk drive, the disk may be physically damaged. Verify and format the medium with SCSI*Select*.
- 04h - Hardware error
  The disk drive may be defective. Read the hardware documentation and contact the manufacturer.
- 05h - Illegal request
  The Adaptec formatting utility does not support a low-level format of this device. The device may already be low-level formatted by the manufacturer.

- 06h - Unit attention
  The removable medium may be write-protected. Disable write protection and run the utility again.

The Additional Sense Code field provides more information about the error. Check your hardware manual for explanations.

My computer locks up when I press Esc to exit SCSI*Select*.

If this happens, turn your computer OFF and then ON to reboot. Any settings you changed before you tried to exit the program were recorded in the EEPROM and are not lost.

One of the SCSI devices on my computer doesn't allow me to disable termination. How can I attach it to the SCSI bus?

You might be able to attach this device on the end of the SCSI bus so you do not need to disable termination on it. If this is not possible, contact the manufacturer about other possible solutions.

I connected my computer's LED cable to the host adapter. Now the light stays on all the time and my computer hangs.

The red LED on the AHA-3940AU/3940AUW normally lights up when there is activity on the SCSI bus. If the light stays on when there is no activity on the bus, it may mean that the internal SCSI cables are reversed. Turn OFF the computer and check the pin-1 orientation of the internal SCSI cable connectors. See *Connecting Internal SCSI Devices* on page 2-6.

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Cables and Converters for the AHA-3940AU/ 3940AUW

In high-performance SCSI systems, high-quality cables are required to ensure data integrity. Adaptec provides the highest quality SCSI cables designed specifically for use with Adaptec SCSI host adapters. For purchasing information contact Adaptec at 1-800-442-7274.

External Cables

Table A-1. External Cables

Part Number	Connectors	Length	Supported Host Adapter
ACK-H2L	High-density 50-pin male to Centronics 50-pin male	1 m	AHA-3940AU
ACK-W2W-E	High-density 68-pin male to High-density 68-pin male	1 m	AHA-3940AUW

External Connector Diagrams

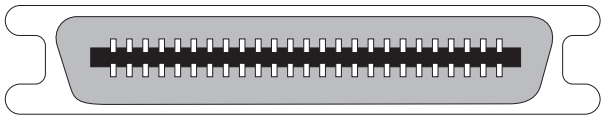


Figure A-1. Centronics 50-pin Male

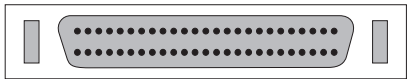


Figure A-2. High-density 50-pin Male

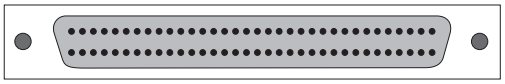


Figure A-3. High-density 68-Pin Male

Internal Ribbon Cables

Table A-2. Internal Ribbon Cables

Part Number	Connectors	Length	Supported Host Adapter
ACK-INT5	5 position (4 devices + host adapter), Standard 50-pin female connectors	1.5 m	AHA-3940AU, AHA-3940AUW
ACK-W2W-5I	5 position (4 devices + host adapter), High-density 68-Pin male connectors	1.1 m	AHA-3940AUW
ACK-F2F-5IT[1]	5 position (4 devices + host adapter), Standard 50-pin female connectors, terminated	2.1 m	AHA-3940AU, AHA-3940AUW
ACK-W2W-5IT[1]	5 position (4 devices + host adapter), High-density 68-pin male connectors, terminated	1.0 m	AHA-3940AUW

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

Internal Ribbon Cable Diagrams

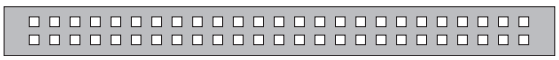


Figure A-4. Standard 50-pin Female

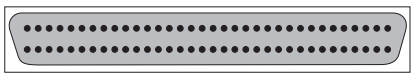


Figure A-5. High-density 68-pin Male

Converters

Table A-3. Cable Converters

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

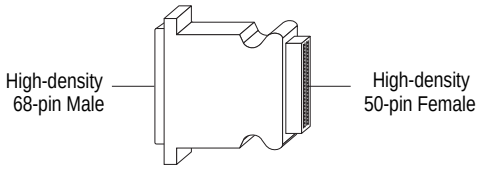
Guidelines for Using the ACK-68P-50P-E External Converter

- Only 8-bit (narrow) devices can be used on the 50-pin side of ACK-68P-50P-E.

Guidelines for Using the ACK-68P-50P-IU Internal Converter

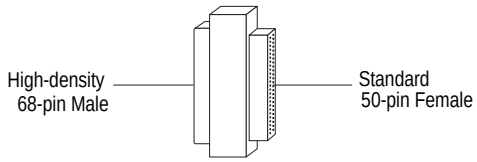
- Several ACK-68P-50P-IU internal converters can be used along a ribbon cable.
- Other connectors along the ribbon cable that are not connected to an ACK-68P-50P-IU should be used only with wide devices or remain unused.
- If the last internal device must be a narrow device, then an ACK-68P-50P-IU can be used but only with a ribbon cable that has a built-in terminator such as an ACK-W2W-IT (see Figure A-14).

Converter Diagrams



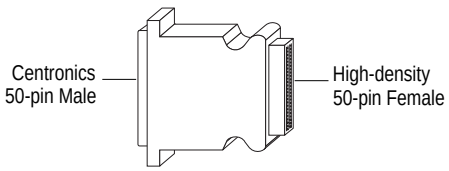
ACK-68P-50P-E

Figure A-6. High-density 68-pin Male to High-density 50-pin Female



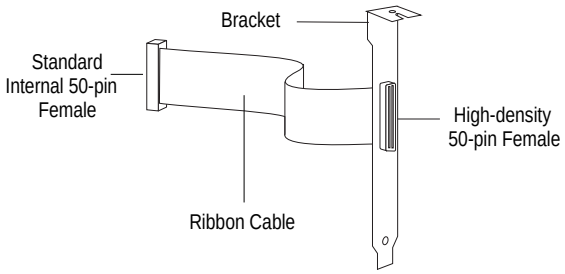
ACK-68P-50P-IU

Figure A-7. High-density 68-pin Female to Standard 50-pin Female



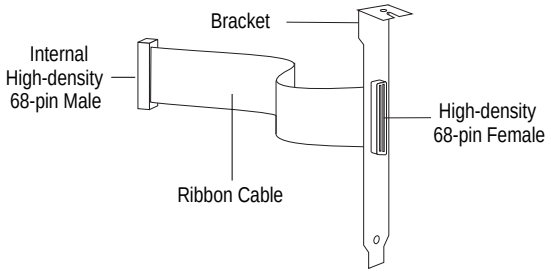
ACK-GCH2L

Figure A-8. Centronics 50-pin Female to High-density 50-pin Female



ACK-501-50E

Figure A-9. Standard Internal 50-pin Female to External High-density 50-pin Female



ACK-681-68E

Figure A-10. Internal High-density 68-pin Male to External High-density 68-pin Female

Examples of Mixing Wide and Narrow Devices

External Devices

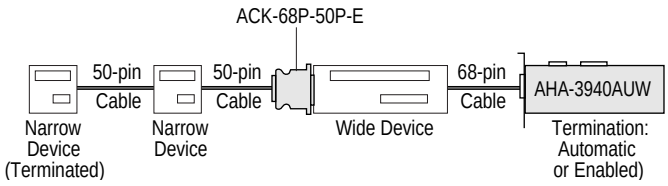


Figure A-11. Connecting Narrow and Wide External Devices

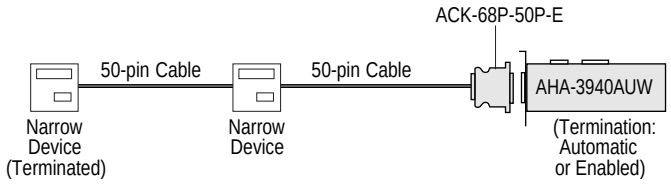


Figure A-12. Connecting Narrow External Devices

Internal Devices

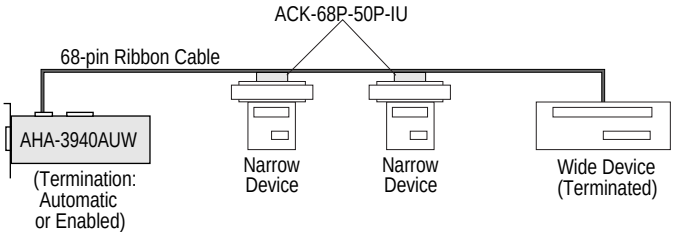


Figure A-13. Connecting Narrow and Wide Internal Devices (last device terminated)

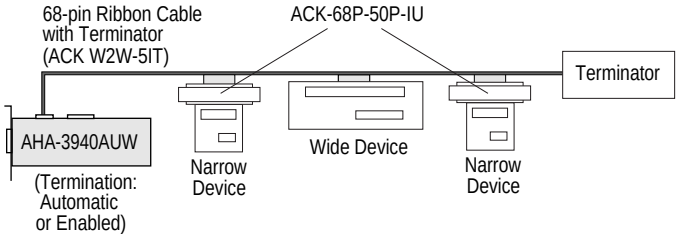


Figure A-14. Connecting Narrow and Wide Internal Devices (cable terminated)

External and Internal Devices

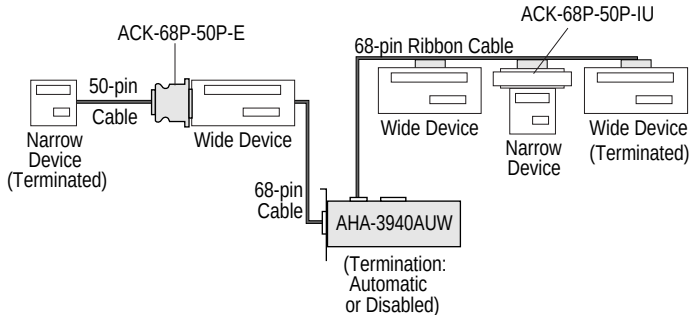


Figure A-15. Connecting Narrow and Wide External and Internal Devices

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Multiple Computer Configuration

Normally your AHA-3940AU/3940AUW SCSI bus configuration includes one host adapter installed in one computer, with one or more internal and/or external SCSI devices attached to each channel on the host adapter. However, host adapters in two computers can share SCSI devices without requiring a change in the cable configuration every time one of the computers needs access to the devices.

To allow host adapters in two computers to share SCSI devices, install a jumper shunt on the following jumpers:

- For the AHA-3940U, install shunts on J3 (Channel A Termination) and J4 (Channel B Termination). See Figure 2-1.
- For the AHA-3940UW, install shunts on J6 (Channel A Termination) and J8 (Channel B Termination). See Figure 2-2.

Installing the jumper enables termination regardless of the SCSI*Select* settings. The two host adapters must reside on the ends of the SCSI bus.

Then connect the AHA-3940AU/3940AUW channel, the SCSI peripherals, and the host adapter in the second computer. Figure B-1 shows this arrangement.

Caution: This feature works only when one computer is turned off. Booting with more than one computer turned on may interrupt initial negotiations with the devices.

The host adapter in each computer acts as a terminator at its end of the SCSI bus. There are certain restrictions to this arrangement, as explained below.

Restrictions and Requirements

- You must install a jumper shunt on the multiple computer termination jumper (J4 on the AHA-3940U and J8 on the AHA-3940UW) of the host adapter during installation.

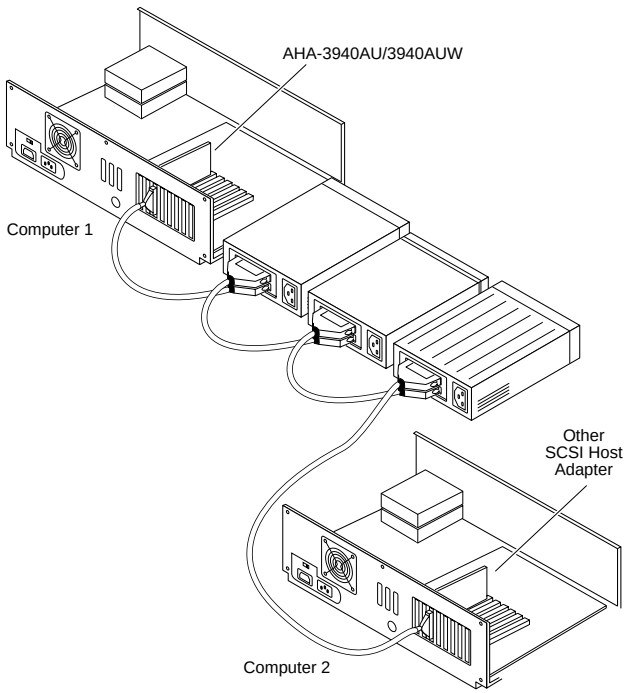

Figure B-1. SCSI Devices Shared by Two Computers

- Only *external* SCSI peripherals can be attached to the bus between the two host adapters. Devices cannot be shared if you have CD-ROM or internal SCSI drives, for example, in either computer.
- The Adaptec host adapter in the second computer does not have to be an AHA-3940AU/3940AUW, but it must be capable of active termination when it is turned off. Most Adaptec host

adapters can be actively terminated; check the host adapter documentation.

- You must assign different SCSI IDs to the AHA-3940AU/3940AUW channel and the host adapter in the second computer. IDs 6 and 7 are preferable, since they have the highest priority on the SCSI bus.

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Optimizing Performance

Read this appendix to find out how to optimize your computer's performance and take full advantage of the AHA-3940AU/3940AUW advanced design features.

Enabling Synchronous Negotiation

Synchronous negotiation is a SCSI feature that allows the SCSI channel and its attached SCSI peripheral devices to negotiate for the transfer of data in synchronous mode on the SCSI bus. Synchronous data transfer is faster than asynchronous data transfer.

The SCSI*Select* Initiate Sync Negotiation option is *Enabled* by default for each device on the SCSI bus. You should normally leave this option enabled because most SCSI devices support it and because it allows for faster data transfer; however, a few SCSI devices (e.g., some CD-ROM drives) do not support synchronous negotiation and may malfunction if they receive a request for it. If any such device is installed on your computer, you should disable Initiate Sync Negotiation for that device. See *SCSI Device Configuration* on page 3-12 for more information.

Note: Even when synchronous negotiation is disabled on the channel, the channel still switches to synchronous mode if it receives a request for synchronous data transfer from a SCSI device on the bus.

Enabling Wide Negotiation

Wide Negotiation is enabled (set to *yes*) by default on the AHA-3940UW. For each 16-bit SCSI device connected to the host adapter, wide negotiation should normally be enabled to allow for 16-bit data transfer instead of 8-bit. See *SCSI Device Configuration* on page 3-12.

Note: Even when wide negotiation is disabled on the host adapter, the host adapter will still switch to wide negotiation if it receives a request for it from the SCSI device.

Disabling the Host Adapter BIOS

Disabling the Host Adapter BIOS saves you 16 KBytes of memory address space and can also shorten boot-up time by as much as 60 seconds. *Advanced Configuration Options* on page 3-16 explains how to change the Host Adapter BIOS option in SCSI*Select*.

You should disable the Host Adapter BIOS if the peripherals on the SCSI bus (for example, CD-ROM drives) are controlled by device drivers and do not need the BIOS.

Enabling SCSI Parity Checking

SCSI Parity Checking, which is *Enabled* by default, verifies the accuracy of data transfer on the SCSI channel. To use this option, make sure that parity checking is enabled on each SCSI device and on the SCSI channel. *SCSI Parity Checking* on page 3-8 explains how to change this setting in SCSI*Select*. Read the device documentation to learn how to enable parity checking on SCSI devices.

You should disable SCSI Parity Checking on the channel only if any of your SCSI devices does not support it.

Setting Enable Disconnection

In the DOS environment you can increase performance slightly if you set Enable Disconnection to **no** when there is only one device on the SCSI bus. You should set this option to **yes**, however, if you have more devices on the SCSI bus. See *SCSI Device Configuration* on page 3-12 for more information.

Enabling Send Start Unit Command

This option, which is supported by some internal SCSI devices, reduces the load on your computer's power supply by allowing the channel to turn on disk devices and other peripherals one-at-a-time when the computer boots. Otherwise, all peripherals turn ON at the same time.

Send Start Unit Command is *Disabled* (set to *no*) by default. Check your hardware documentation before you enable (set to *yes*) this option, to make sure your devices support it. Then change the switch or jumper settings on the device to enable the option. See *SCSI Device Configuration* on page 3-12 for more information about this option.

Try enabling Send Start Unit Command for one peripheral at a time, rebooting each time to make sure each SCSI device works properly. (Some older disk devices do not support this option and may malfunction if they receive the command.)

The Send Start Unit Command has no effect if the channel BIOS is disabled.

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Disk Drives Over 1 GByte

Extended Translation (Using MS-DOS 5.0)

Adaptec host adapters have always supported the full range of disk drive capacities under all major operating systems. As disk drives have recently grown beyond 1 GByte in formatted capacity, they have run up against the DOS 1024-cylinder limit.

To continue its support for all SCSI disk drive capacities under DOS, Adaptec has included an extended translation scheme for AHA-3940AU/3940AUW host adapters. This feature supports disk drives as large as 8 GBytes under DOS. *SCSI Device Configuration* on page 3-12 explains how to change the setting of this option in the SCSI*Select* utility.

The DOS 1 GByte Limit

All current versions of DOS are limited to 1024 cylinders per drive. The standard translation scheme for SCSI host adapters, using 64 heads and 32 sectors, provides a maximum accessible capacity of 1 GByte.

To eliminate the 1 GByte limit, Adaptec's extended translation feature uses 255 heads and 63 sectors, extending the disk drive capacity limit under DOS to 8 GBytes.

If extended translation is enabled, the following translation schemes are used:

- SCSI hard disks ≤ 1 GByte use a translation scheme of 64 heads, 32 sectors per track.
- SCSI hard disks > 1 GByte use a translation scheme of 255 heads, 63 sectors per track.

Caution: Be sure to *back up* your disk drive before you change the translation method on a disk drive. All data is erased when you change from one translation scheme to another.

When Not to Use Extended Translation

- NetWare and the newer versions of UNIX do not share the 1024 cylinder limit of DOS and do not require extended translation to support large disk drives.
- Drives are sometimes formatted with two or more partitions for different operating systems. Use standard translation when the sum of the DOS partitions is less than 1 GByte. Partitions for UNIX and NetWare can be larger than 1 GByte when using standard translation.

Note: UNIX is understood to be SCO v3.2.4 (or later), SCO UnixWare all versions, and SCO Open Server.

Installing or Repartitioning Disks

To install a new disk, or to repartition an existing disk, use the *fdisk* DOS utility as you normally would. The cylinder size increases to 8 MBytes when you enable extended translation. The size of the partition you request must therefore be a multiple of 8 MBytes. If you request a partition size that is not a multiple of 8 MBytes, *fdisk* rounds up to the nearest whole multiple of 8 MBytes.

Extended Translation With SCSI Drives Smaller Than 1 GByte

Drives handled by the BIOS use extended translation if their formatted capacity is greater than 1 GByte. Drives smaller than 1 GByte of formatted capacity use standard translation regardless of whether extended translation is enabled.

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