

User's Guide

AHA-3940/3940W **MultiChannel SCSI-to-PCI Host Adapter** **with SCSI*Select***

AHA-3940/3940W User's Guide
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Adaptec, Inc.

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Print Spec Number: 492707-00
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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.
- Move the equipment away from the receiver.
- Plug the equipment into an outlet on a circuit different from that used by the receiver.
- If necessary, consult the dealer or an experienced radio/television technician for additional suggestions.

CAUTION: Only equipment certified to comply with Class B (computer input/output devices, terminals, printers, etc.) should be attached to this equipment, and must have shielded interface cables.

Document Name
Stock Number: 510600-00, Rev. A Page: iv
Print Spec Number: 492707-00
Current Date: 8/24/94 ECN Date: 08/30/94

▼▼▼▼ Table of Contents

Preface

Inside This Document xi

Conventions xii

Advisories xiii

1 Introduction

About This Chapter 1-1

Host Adapter Overview 1-3

Product Features 1-3

 PCI Bus Interface 1-4

 Fast Data Transfer Rates 1-5

 AHA-3940 1-5

 AHA-3940W 1-5

 Maximum Offloading of the Host CPU 1-5

 Disk Array Support 1-5

 Fast SCSI-2 Implementation 1-5

 Multiple Device Support 1-6

Operating System Support 1-6

 DOS/Windows 1-6

 Adaptec EZ-SCSI 1-7

 Other Operating Systems 1-8

Support and Information Services 1-8

2 Installing Your Host Adapter and SCSI Devices

About This Chapter 2-1

Overview 2-3

Host Adapter Layout 2-4

Inserting the Host Adapter in a PCI Slot 2-5

Connecting SCSI Cables and Devices 2-7

 Choosing SCSI Cables 2-7

 Maximum Cable Lengths 2-7

- Connecting Internal SCSI Devices 2-8
- Connecting External SCSI Devices 2-11
- Terminating the SCSI Bus 2-13
 - Terminating SCSI Devices 2-13
 - Terminating the Host Adapter 2-13
 - Terminating SCSI Channel A 2-14
 - Terminating SCSI Channel B 2-15
- Setting SCSI IDs 2-15
- SCSI Bus Activity LED Connector 2-16
- Completing Installation 2-17
- Running the Computer's Setup Program 2-18

3 Configuring Your Host Adapter

- About This Chapter 3-1
- The SCSI*Select* Configuration Utility 3-3
 - Default Configuration Settings 3-3
 - When to Use SCSI*Select* 3-4
- Starting SCSI*Select* 3-4
- Selecting a SCSI Channel 3-5
- Using the Options Menu 3-6
 - Configure/View Host Adapter Settings 3-7
 - Host Adapter SCSI ID 3-8
 - SCSI Parity Checking 3-10
 - Host Adapter SCSI Termination 3-11
 - SCSI Device Configuration 3-12
 - Advanced Configuration Options 3-16
 - Saving Configuration Changes 3-18
 - SCSI Disk Utilities 3-19
 - Format Disk 3-20
 - Verify Disk Media 3-20
- Configuring Multiple Host Adapters 3-21

4 Troubleshooting

- About This Chapter 4-1
- SCSI Troubleshooting Checklist 4-3
- BIOS Startup Messages 4-4

Table of Contents

Disk Drive Configuration Problems 4-6
 Booting the Computer from a SCSI Drive 4-6
 Using a Standard Drive as C and a SCSI Drive
 as D 4-7
 Using SCSI Drives as C and D 4-8
 Computer Hangs, or Channel Cannot Always Find
 the Drives 4-8
Other Problems and Solutions 4-9

A Multiple Computer Configuration

About This Appendix A-1
Overview A-3
Restrictions and Requirements A-4

B Optimizing Performance

About This Appendix B-1
Performance Tips B-3
 Enabling Synchronous Negotiation B-3
 Disabling the Channel BIOS B-3
 Enabling SCSI Parity Checking B-4
 Setting Enable Disconnection B-4
 Enabling Send Start Unit Command B-4

C Support for Large Disk Drives

About This Appendix C-1
Extended Translation (Using MS-DOS 5.0) C-3
The DOS 1 GByte Limit C-3
When to Use Extended Translation C-4
 Drives With Mixed Partitions C-4
 Using Fdisk C-4
Extended Translation Questions and Answers C-4

Glossary

Index

AHA-3940/3940W User's Guide

Stock Number: 510600-00, Rev. A

Page: viii

Print Spec Number: 492707-00

Current Date: 8/24/94

ECN Date: 08/30/94

▼▼▼▼ List of Figures

Figure

- 2-1 AHA-3940 Layout 2-4
- 2-2 AHA-3940W Layout 2-4
- 2-3 Inserting the Host Adapter 2-6
- 2-4 50-pin-to-68-pin Converter 2-8
- 2-5 Internal SCSI Ribbon Cable to Host Adapter 2-9
- 2-6 Internal SCSI Ribbon Cable to Internal SCSI Device 2-10
- 2-7 Connecting a Second Internal SCSI Device 2-10
- 2-8 External Cable to Host Adapter 2-11
- 2-9 External Cable to External SCSI Device 2-12
- 2-10 Connecting Multiple External SCSI Devices 2-12
- 2-11 Internal Devices on SCSI Channel A 2-14
- 2-12 Internal and External Devices on SCSI Channel A 2-14
- 2-13 Host Adapter Termination on SCSI Channel B 2-15
- 2-14 SCSI LED Connector 2-17

- 3-1 BIOS Banner 3-4
- 3-2 Selecting a SCSI Channel 3-5
- 3-3 Options Menu Screen 3-6
- 3-4 Configure/View Host Adapter Settings Screen 3-7
- 3-5 Host Adapter SCSI ID Selection Screen 3-8
- 3-6 Host Adapter SCSI ID Selection Screen for AHA-3940W 3-9
- 3-7 SCSI Parity Checking Selection 3-10
- 3-8 Host Adapter SCSI Termination Selection for AHA-3940/3940W 3-11

Figure

- 3-9** SCSI Device Configuration Screen for
AHA-3940 3-12
- 3-10** SCSI Device Configuration Screen for
AHA-3940W 3-12
- 3-11** Advanced Configuration Options Screen 3-16
- 3-12** SCSI Disk Utilities Screen for AHA-3940 3-19
- 3-13** SCSI Disk Utilities Screen for AHA-3940W 3-19
- A-1** SCSI Devices Shared by Two Computers A-3

▼▼▼▼ Preface

Appendix C Support for Large Disk Drives

describes Adaptec's extended BIOS translation feature, which allows you to use SCSI disk drives as large as 8 GBytes.

Conventions

The following typographic conventions are used in this *User's Guide*:

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 as a place holder for 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 ...).

Italics

Used for emphasis (... is *only* supported ...) and document reference (... refer to Chapter 2, *Installing Your Host Adapter*...).

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 quick 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.



AHA-3940/3940W User's Guide

Stock Number: 510600-00, Rev. A

Page: xiv

Print Spec Number: 492707-00

Current Date: 8/24/94

ECN Date: 08/30/94

▼▼▼▼ 1 Introduction

About This Chapter

Read this chapter to find out

- General information about AHA-3940/3940W host adapters
- Product features of AHA-3940/3940W host adapters
- Where to call if you need customer support

AHA-3940/3940W User's Guide

Stock Number: 510600-00, Rev. A

Page: 1-2

Print Spec Number: 492707-00

Current Date: 8/24/94

ECN Date: 08/30/94

▼▼▼▼ 1

Host Adapter Overview

Adaptec's AHA-3940 and AHA-3940W MultiChannel host adapters are designed for use in computers that have 5-volt Peripheral Component Interconnect (PCI) interface slots.¹ PCI is a local bus interface that enables high-speed data transfer.

Each AHA-3940 and AHA-3940W MultiChannel host adapter has two SCSI channels, each of which functions as an *independent host adapter*. Channel A has both an internal and an external SCSI connector; Channel B has only an internal SCSI connector.

- With the AHA-3940, you can connect up to seven 8-bit SCSI devices per channel.
- With the AHA-3940W, you can connect up to fifteen 16-bit (Wide) SCSI devices per channel. You can also combine 8-bit² and 16-bit SCSI devices up to a total of 15 per channel; up to seven of these can be 8-bit devices.

The two host adapter models are identical except for the difference in bus width. This document uses the term AHA-3940/3940W to refer to both host adapter models.

Product Features

AHA-3940/3940W host adapters provide a powerful dual channel, multitasking interface between your computer's PCI bus and SCSI disk drives, CD-ROM drives, scanners, and other SCSI devices. You can install multiple AHA-3940/3940W host adapters in your computer. Each host adapter functions as two independent host adapters, and its connected SCSI devices form a separate SCSI bus.

AHA-3940/3940W host adapters can manage multiple disk drivers and provide high performance. In addition, these host adapters

¹The computer must be PCI Rev. 2.0 compliant and the motherboard BIOS must support PCI-to-PCI Bridges (PPB).

²You need an 8-bit-to-16-bit converter with high-bit termination if you want to connect 8-bit devices.

minimize your computer's microprocessor overhead by transferring data into system memory without involving the computer's CPU.

The onboard AHA-3940/3940W PhaseEngine[®] sequencer independently manages data transfer between SCSI devices and the computer's memory without involving the host microprocessor. The PhaseEngine enables the best data transfer performance available in multitasking operating systems. It also automates SCSI command processing and significantly reduces interrupts and command overhead. Onboard BIOS allows AHA-3940/3940W host adapters to be used in place of, or together with, a standard hard disk controller.

AHA-3940/3940W host adapters are capable of 32-bit bus master data transfers, including PCI enhanced data transfer commands. They support all SCSI functions supported by Adaptec's other host adapters, including new SCSI-2 features such as Tagged Queuing.

AHA-3940/3940W 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-3940/3940W host adapters include the onboard 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.

PCI Bus Interface

- Up to 133 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

Fast Data Transfer Rates

AHA-3940

- Up to 20.0 MBytes/sec synchronous data rate for two Fast 8-bit SCSI channels
- Up to 6.0 MBytes/sec asynchronous SCSI data rate for each of the two SCSI channels

AHA-3940W

- Up to 40.0 MBytes/sec synchronous data rate for two Fast 16-bit SCSI channels
- Up to 12.0 MBytes/sec asynchronous SCSI data rate for each of the two SCSI channels

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

- Able to boot from any drive on the SCSI bus
- Extensive support for leading disk array vendors

Fast SCSI-2 Implementation

- Concurrent support for Fast SCSI synchronous and asynchronous devices
- Concurrent support for 8-bit and 16-bit SCSI devices (AHA-3940W only)
- Single-ended output
- Scatter/Gather
- Disconnect/Reconnect
- Fully multitasking/multithreading

- Uses the superior SCSI-2 (Alternative 1) external connector and standard internal ribbon connector
- Tagged 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-3940 supports up to seven SCSI devices per channel (14 devices total)
- AHA-3940W supports up to 15 SCSI devices per channel (30 devices total)
- Onboard BIOS fully supports capabilities of MS-DOS[®] 3.3 for up to two disk drives and MS-DOS 5.0 and above for up to eight disk drives, without additional drivers
- Onboard BIOS supports disk drives as large as 8 GBytes

Operating System Support

DOS/Windows

Under MS-DOS 5.0 or above, the AHA-3940/3940W can support up to eight hard disk drives without additional software. (To do this you must enable BIOS Support for More Than 2 Drives, which is disabled by default.) Older versions of DOS support up to two hard disk drives. You need additional software to do any of the following:

- Support more than two hard disk drives under versions of DOS prior to version 5.0
- Support more than eight hard disk drives under MS-DOS 5.0 or higher
- Remove or replace removable media (for example, Bernoulli[®] cartridges) while your computer is running
- Support CD-ROM drives

- Support devices other than CD-ROM drives and disk drives—for example, SCSI tape drives, scanners, plotters, or WORM drives

Adaptec EZ-SCSI

Adaptec EZ-SCSI is a menu-driven software package that installs drivers and configures your DOS/Windows operating environment automatically. EZ-SCSI includes these features:

- Graphical, fully automated Windows-based installation program with extensive online Help¹
- Online tutorial application with useful information about various SCSI topics
- ASPI CD-ROM device driver that supports a wide range of CD-ROM drives, including drives capable of single-session and multisession Photo CD
- ASPI hard disk device driver that supports Floptical[®], removable-media, and magneto-optical (MO) drives; it also supports up to 24 hard disk devices installed in a single computer
- SCSI tape drive backup utility
- Support for scanners
- Utility programs to format and partition SCSI devices
- Audio CD-ROM player utility
- Other utility programs for viewing photo CD images, viewing SCSI configuration information, and so forth

To install support for other kinds of SCSI devices such as optical disks, check the hardware documentation for those devices. If the device requires ASPI support, you first need to run Adaptec EZ-SCSI to install an ASPI manager, and then install any other software provided with the device. If the device is designed to interface directly with the host adapter, no ASPI manager is required.

¹ A DOS installation program is also included.

Other Operating Systems

AHA-3940/3940W host adapters support the Novell® NetWare®, OS/2, Windows NT, SCO® UNIX®, and USL UNIX (Unixware) operating systems. Contact Adaptec or your operating system vendor for information on operating system support.

Support and Information Services

AHA-3940/3940W host adapters are designed for easy installation and use. We have tried to make this document and our other documentation complete and clear. If you need further assistance, please contact Adaptec. We offer the following support and information services:

Service Provided	Description	Availability	Telephone Number
Electronic Bulletin Board Service (BBS)	Information on software upgrades, new releases, technical topics, etc.	23 hours a day, 7 days a week (out of service 1 hour each day)	408-945-7727, 1200/2400/9600/14400 baud, 8 data bits, 1 stop bit, no parity
Technical Support	Live phone help from technical support representatives	M-F: 6 a.m. to 5 p.m.	800-959-SCSI Outside the U.S and Canada: 408-945-2550
Interactive FAX Service	Current online information about Adaptec products and services	23 hours a day, 7 days a week (out of service 1 hour each day)	408-957-7150
Product Order Line	Order Adaptec software and cables	M-F: 6 a.m. to 5 p.m.	800-442-SCSI
Literature Hotline	Additional documentation for Adaptec products	M-F: 5 a.m. to 6 p.m.	800-934-2766



▼▼▼▼ 2 Installing Your Host Adapter and SCSI Devices

About This Chapter

Read this chapter to find out

- How to identify major components on AHA-3940/3940W host adapters
- How to install AHA-3940/3940W host adapters in your computer
- How to connect devices
- How to terminate the SCSI bus

AHA-3940/3940W User's Guide

Stock Number: 510600-00, Rev. A

Page: 2-2

Print Spec Number: 492707-00

Current Date: 8/24/94

ECN Date: 08/30/94

▼▼▼▼ 2

Overview

This chapter explains how to physically install AHA-3940/3940W host adapters in your computer and connect SCSI devices.

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 2-18 for more information.

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

You can install multiple AHA-3940/3940W host adapters in your computer if enough PCI bus slots are available. Each AHA-3940/3940W host adapter has two separate SCSI channels. If you install multiple AHA-3940/3940W 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

Figures 2-1 identifies the major AHA-3940 components. Figure 2-2 identifies the major AHA-3940W components. The following table describes these components.

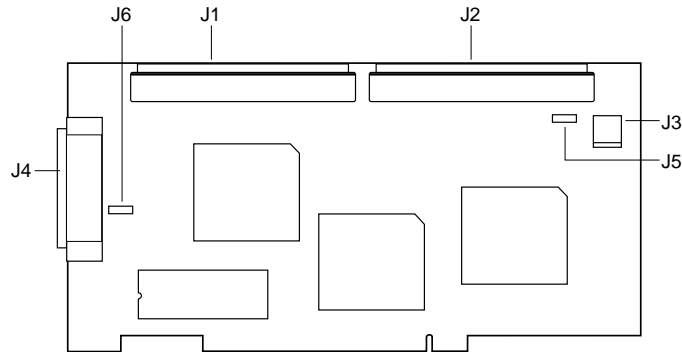


Figure 2-1. AHA-3940 Layout

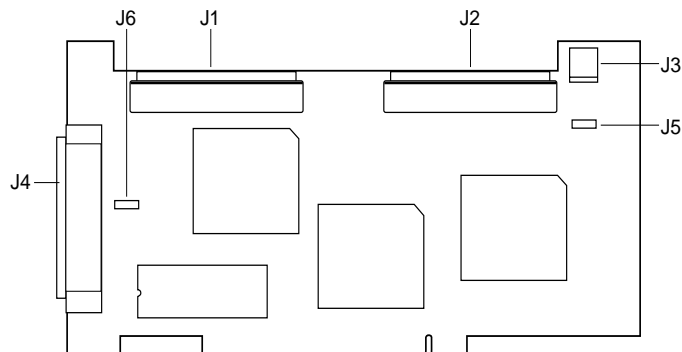


Figure 2-2. AHA-3940W Layout

Location	Description
J1	Internal SCSI connector - Channel A ¹
J2	Internal SCSI connector - Channel B ¹
J3	External LED connector
J4	External SCSI connector - Channel A ¹
J5	Multiple computer termination jumper - Channel B ²
J6	Multiple computer termination jumper - Channel A ²

¹ This connector is a 68-pin, 16-bit connector on the AHA-3940W and a 50-pin, 8-bit connector on the AHA-3940.

² See Appendix A, *Multiple Computer Configuration*.

Inserting the Host Adapter in a PCI Slot



WARNING: Be sure the power is turned OFF before you continue. Also, 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. Place it on top of the bag if you need to set it down.



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

- 3 Locate an unused 5-volt PCI bus expansion slot that supports bus mastering.¹ Be sure that this slot is not obstructed by other internal system hardware.

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*. That is, it may have both an ISA connector and a PCI connector, but only one kind of board can be inserted in the slot at any one time.

- 4 Remove the corresponding expansion slot cover from the computer chassis. (The slot cover is the metal strip that covers the opening in the back of the computer chassis into which the host adapter's external connector fits.)

¹ Some computers have both bus master and non-bus master PCI slots. Read your computer documentation if you are not sure which kind of PCI slots your computer has.

- 5 Position the host adapter directly over the PCI slot and insert the end of the board in the card guide. Carefully 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.

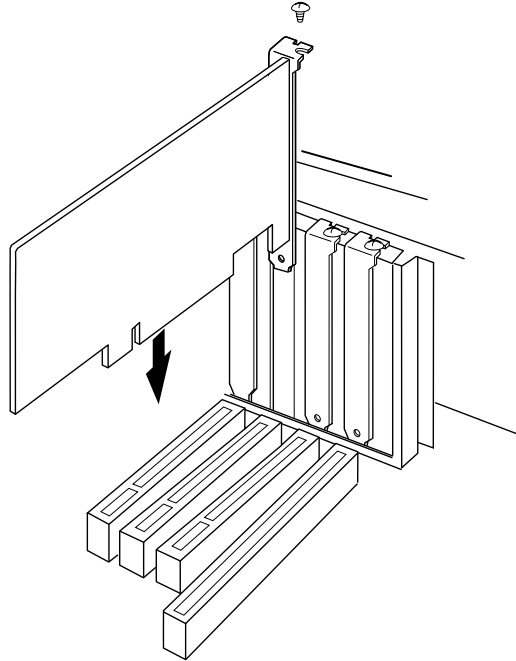


Figure 2-3. Inserting the Host Adapter

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



Note: *Do not* put the computer cover back on 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 Fast SCSI data transfer rates.

The round cables used for external SCSI devices vary widely in quality and electrical characteristics. Be sure that external SCSI cables meet SCSI-2 standards (your cable vendor can tell you this). Here are some guidelines for external SCSI cables:

- Use cables with a single-ended impedance range of 80-132 ohms.
- *Do not* use cables shorter than 30 cm (11.8 inches) between any two SCSI devices.

Adaptec sells high-quality internal and external SCSI-2 cables and 16-bit Wide SCSI cables. If your reseller does not stock these cables, call Adaptec directly at the number listed on page iii.

Maximum Cable Lengths

To assure reliable operation, the total length of the SCSI bus, including both internal and external cabling, should not exceed 6 meters (19.7 feet) if you are using asynchronous or synchronous data transfer rates, and 3 meters (9.8 feet) if you are using Fast SCSI data transfer rates.



Caution: AHA-3940/3940W host adapters support only *single-ended* SCSI devices. *Differential* SCSI devices may be damaged if you connect them to the SCSI bus. Read your SCSI device documentation if you are not sure whether a 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-3940/3940W host adapter, you need the following:

- A 50-connector SCSI ribbon cable with a 50-pin connector for the AHA-3940 host adapter. (Or two cables if you are using both internal SCSI connectors.)
- A 68-connector SCSI ribbon cable with a 68-pin connector for the AHA-3940W host adapter. (Or two cables if you are using both internal SCSI connectors.)

There must be additional connectors in the middle of the cable if you are attaching more than one internal device. Make sure your cable has enough connectors. To connect three or more internal SCSI devices to a SCSI bus, make a SCSI ribbon cable that has enough connectors for all the SCSI devices.

You can connect both 8-bit and 16-bit SCSI devices to the AHA-3940W host adapter. To attach the 8-bit devices you need a 50-pin-to-68-pin converter, as shown in Figure 2-4.

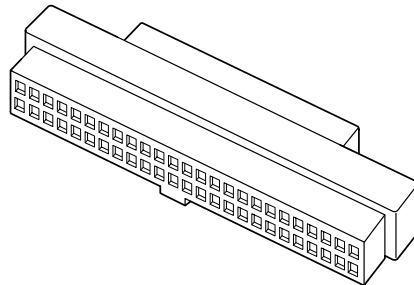


Figure 2-4. 50-pin-to-68-pin Converter

You can purchase these converters from your local computer supply store or from Adaptec at the phone number listed on page iii.



Note: The following diagrams show the 50-pin internal connector used with AHA-3940 host adapters. AHA-3940W host adapters use 68-pin high-density connectors.

Installing Your Host Adapter and SCSI Devices

Follow these steps to connect internal SCSI devices:

- 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.

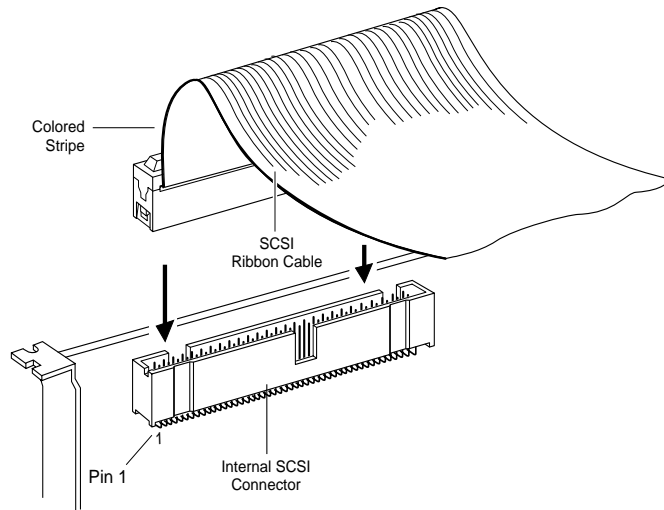


Figure 2-5. Internal SCSI Ribbon Cable to Host Adapter

The colored stripe on one side of the ribbon cable must line up with the number 1 printed on the host adapter beneath the connector. This is called maintaining proper *pin-1 orientation*. Maintain pin-1 orientation throughout the SCSI bus, or your SCSI devices will not work properly.

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

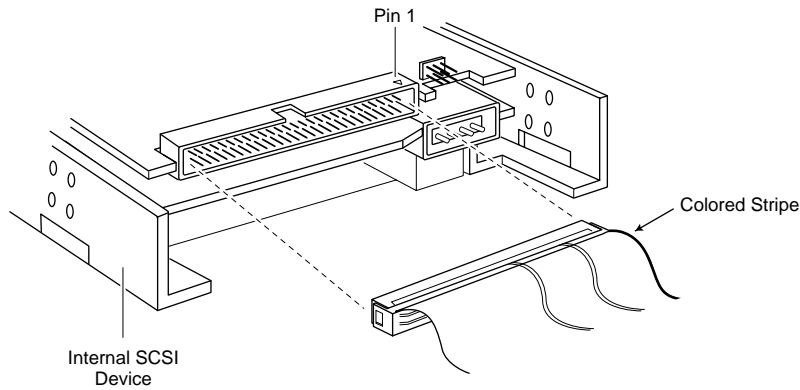


Figure 2-6. Internal SCSI Ribbon Cable to Internal SCSI Device

- 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.

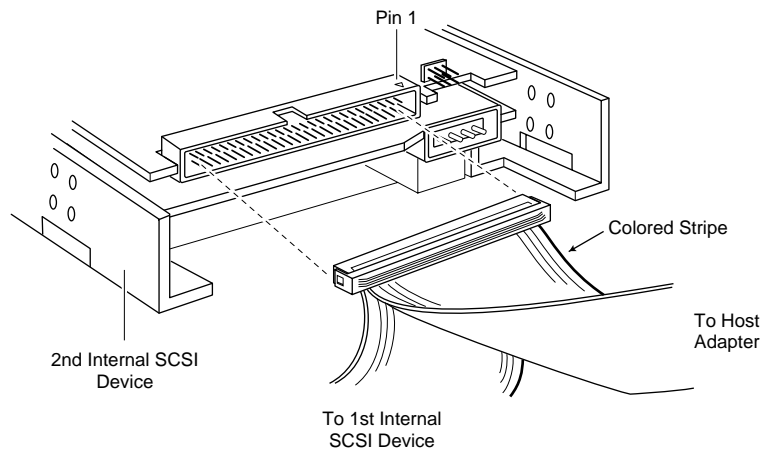


Figure 2-7. Connecting a Second Internal SCSI Device

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

- 5 If you are using both internal SCSI connectors, connect the other 8-bit or 16-bit internal devices, as needed. You must use a converter if you are connecting 8-bit SCSI devices to a Wide SCSI 68-pin cable.

Connecting External SCSI Devices

You can daisy chain up to seven external SCSI devices to Channel A of the AHA-3940 and up to fifteen external SCSI devices to Channel A of the AHA-3940W. *Daisy-chaining* means that multiple devices can be connected using more than one cable. For example, a cable runs from the external SCSI connector to the first external device. A second connector on the back of the external device allows another cable to connect it with the second device in the chain, and so forth.

The external SCSI cables must meet the specifications listed in *Choosing SCSI Cables* on page 2-7. External cable connectors can only be plugged in one way; therefore, pin-1 orientation is automatic.

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.

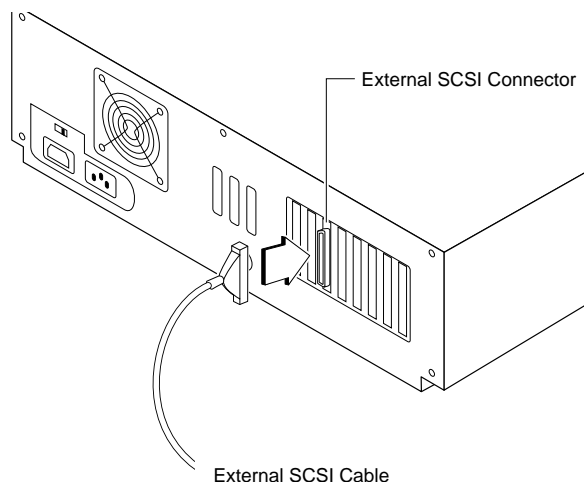


Figure 2-8. External Cable to Host Adapter

- 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.

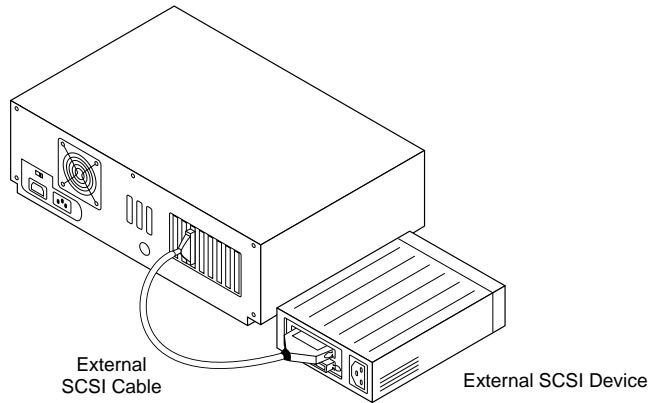


Figure 2-9. External Cable to External SCSI Device

- 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.

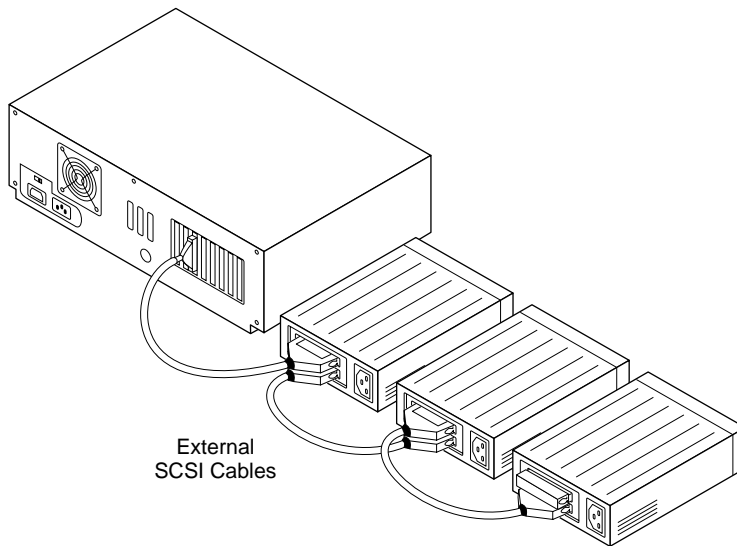


Figure 2-10. Connecting Multiple External SCSI Devices

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-3940/3940W 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 Determine which two SCSI devices (including the host adapter) are at the two ends of the SCSI channel (SCSI bus). Then terminate these devices, if they are not already terminated.
- 2 Disable termination on all other devices on the SCSI bus, if it is not already disabled.

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-3940/3940W 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 *Enabled* by default on AHA-3940/3940W host adapters. You can change this setting, if necessary, with the SCSI*Select* configuration utility, as described in Chapter 3, *Configuring Your Host Adapter*.

Terminating SCSI Channel A

SCSI Channel A has an external connector and an internal connector, as shown in Figures 2-1 and 2-2 on page 2-4. You can attach SCSI devices to one of the two connectors or to both connectors.

- Leave the host adapter termination at the default setting (*Enabled*) if you attach SCSI devices to only one of the two Channel A connectors, as shown in Figure 2-11. Always connect the host adapter to the end of the internal cable.

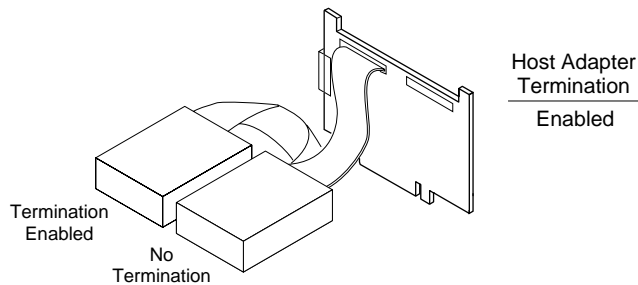


Figure 2-11. Internal Devices on SCSI Channel A

- Change the host adapter termination to *Disabled* if you attach SCSI devices to both of the Channel A connectors, as shown in Figure 2-12. In this configuration the host adapter is in the middle of the SCSI bus.

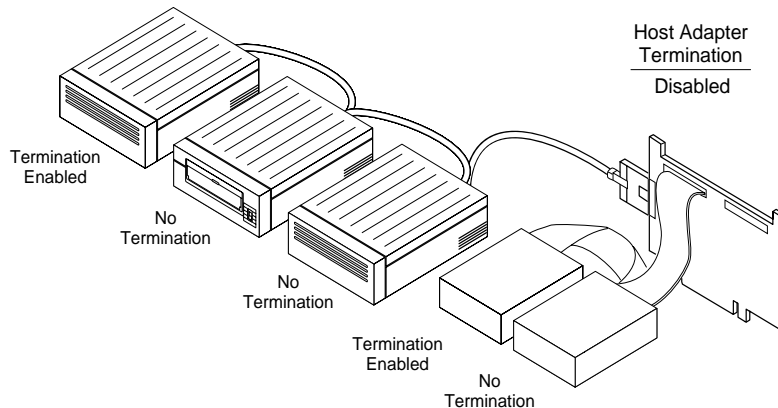


Figure 2-12. Internal and External Devices on SCSI Channel A

Terminating SCSI Channel B

SCSI Channel B has an internal connector and no external connector. The host adapter should always be at the end of the cable when you attach internal SCSI devices to Channel B. Therefore, host adapter termination for Channel B should always be enabled, as shown in Figure 2-13.

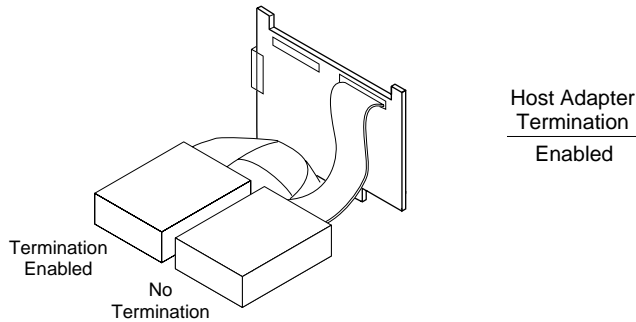


Figure 2-13. Host Adapter Termination on SCSI Channel B

Setting SCSI IDs

Each device on the SCSI bus, including the host adapter, must have a unique SCSI ID. The SCSI ID serves two purposes:

- It uniquely defines each SCSI device on the bus.
- It determines which device controls the bus when two or more devices try to use it at the same time. SCSI ID 7 has the highest priority; SCSI ID 0 has the lowest priority on an 8-bit SCSI bus, and SCSI ID 8 has the lowest priority on a 16-bit SCSI bus.

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

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 is 7, the highest priority on the bus. You can change the ID(s) using *SCSISelect*, if necessary, but we recommend that you leave the ID for both channels at 7.

To determine the SCSI IDs of disk drives, CD-ROM drives, and other devices, read their documentation and examine their switch settings or jumper settings.

- 2 Change the SCSI IDs (if needed) so that no IDs are duplicated on the same SCSI channel and each device has an appropriate ID.

If you plan to boot your computer from a SCSI hard disk drive, assign SCSI ID 0 to this drive. Assign SCSI ID 1 to the second SCSI hard disk drive, if you have one.

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



Note: The computer in which the AHA-3940/3940W host adapter is installed can share external SCSI devices with another computer. To do this, you must install a jumper before you install the host adapter. See Appendix A, *Multiple Computer Configuration*.

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.

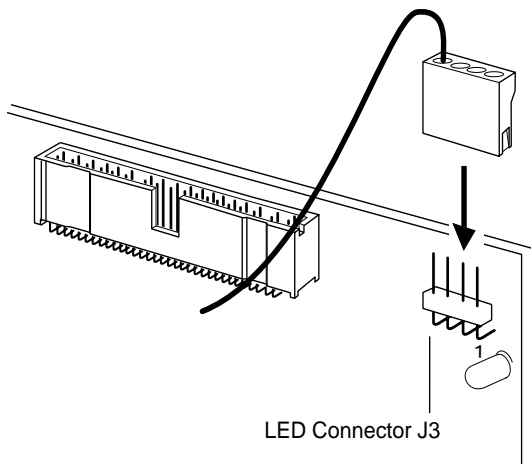


Figure 2-14. SCSI LED Connector

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 is set to a unique SCSI ID
- The host adapter is firmly seated and secured in a 5-volt bus master PCI bus slot
- 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 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 4, *Troubleshooting*.

Running the Computer's Setup Program

Normally, PCI-bus computers automatically configure the AHA-3940/3940W 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 will 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 information about these configuration issues.



▼▼▼▼ 3 Configuring Your Host Adapter

About This Chapter

Read this chapter to find out

- The default configuration settings for the channels on your AHA-3940/3940W host adapter
- When and how to change the configuration of the channels with the *SCSISelect* utility
- How to use the *SCSISelect* SCSI disk utilities
- How to configure multiple host adapters

AHA-3940/3940W User's Guide

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ECN Date: 08/30/94

3

When to Use SCSISelect

Use SCSISelect if you need to

- Change any of the default values listed on page 3-3
- 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 SCSISelect

There are two ways to start SCSISelect:

- Press **Ctrl+A** when the BIOS banner appears during bootup, as shown in Figure 3-1.

```
Adaptec AHA-3940/3940W BIOS v1.00
(c) 1994 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. BIOS Banner

This banner appears when you power up or reboot your computer. The BIOS banner lists the model number and SCSI ID of each SCSI device connected to the host adapter.

- Download the executable version of SCSISelect from the Adaptec BBS by calling the phone number listed on page ii at the front of this *User's Guide*. Then run the program by typing the file name at the DOS prompt and pressing **Enter**.

Selecting a SCSI Channel

Each AHA-3940/3940W host adapter has two SCSI channels. Each channel operates independently and must be configured separately in *SCSISelect*. The first *SCSISelect* 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.

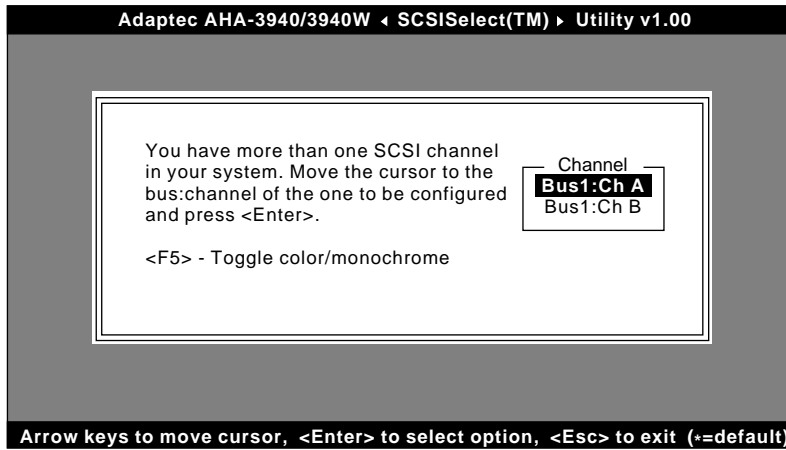


Figure 3-2. Selecting a SCSI Channel

If there are two or three AHA-3940/3940W 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 **Bus2:ChA** and **Bus2:ChB**. Select the host adapter and channel you want to configure, then press **Enter**.



Note: You must select SCSI Channel A if you want to change the host adapter BIOS setting (i.e., enable or disable the host adapter BIOS). The BIOS setting cannot be changed when you are configuring Channel B.

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

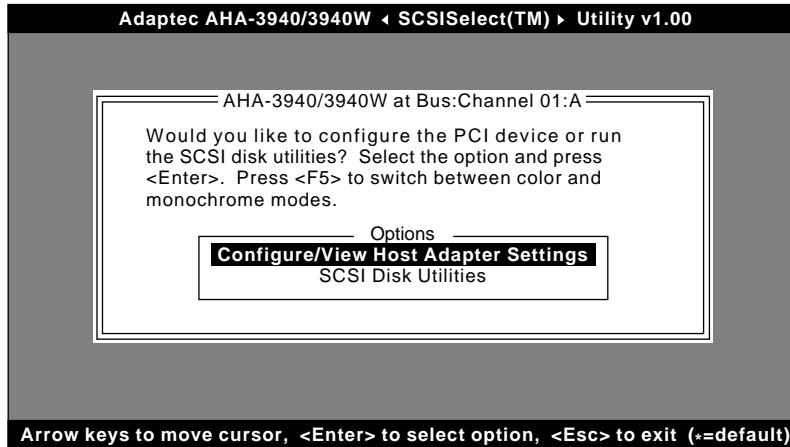


Figure 3-3. Options Menu Screen

Using the Options Menu

The Options menu has the following selections:

- Configure/View Host Adapter Settings
- SCSI Disk Utilities

To choose 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.)

Configure/View Host Adapter Settings

Select **Configure/View Host Adapter Settings** from the Options menu to view the Configuration menu. As shown in Figure 3-4, the menu lists the following selections under SCSI Channel Interface Definitions:

- **Host Adapter SCSI ID:** Change the SCSI ID of the channel from its default ID of 7.
- **SCSI Parity Checking:** Enable or disable parity checking.
- **Host Adapter SCSI Termination:** Enable or disable channel termination.

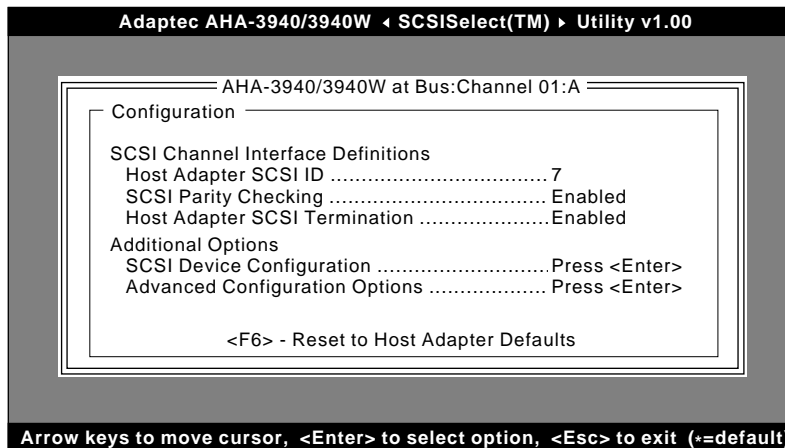


Figure 3-4. Configure/View Host Adapter Settings Screen

The current settings appear in the right column. In Figure 3-4, for example, the setting for SCSI Parity Checking is *Enabled*. To change a setting, press the **↑** and **↓** keys to highlight the setting; press **Enter** to display a pop-up menu of allowable settings; and then choose a setting by highlighting it and pressing **Enter**. The following sections in this chapter have information about each setting.



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

The Configuration menu has the following additional options for advanced users:

- **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 information on these selections.

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 SCSI ID uniquely identifies each SCSI device on the bus, and it determines the priority of the device on the bus when two or more devices request use of it (the device having the higher ID has higher priority).

The Host Adapter SCSI ID option on the Configuration menu allows you to change the channel SCSI ID. Figure 3-5 shows the available IDs (0 through 7) for each channel on the AHA-3940.

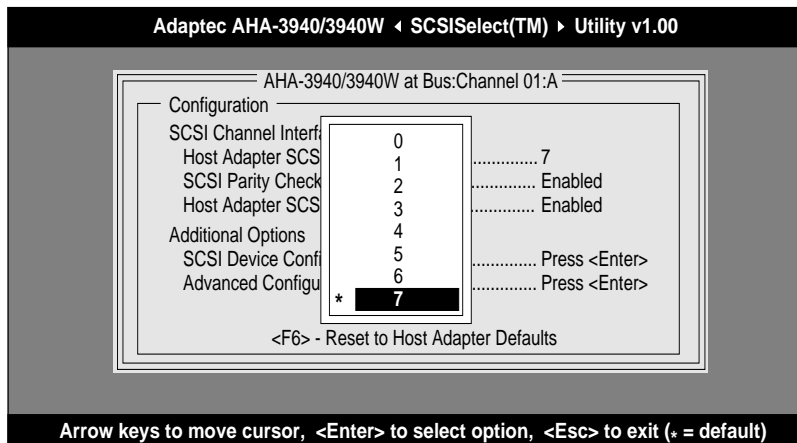


Figure 3-5. Host Adapter SCSI ID Selection Screen

Figure 3-6 shows the available IDs (0 through 15) for each channel on the AHA-3940W. The default ID for each channel for both models is 7, which has the highest priority on the SCSI bus. We recommend that you keep this setting.

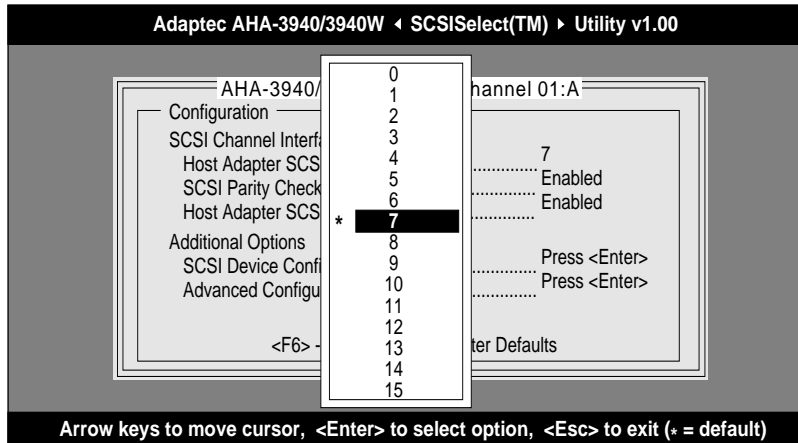


Figure 3-6. Host Adapter SCSI ID Selection Screen for AHA-3940W

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.
- 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 *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 two different computers to the same SCSI bus so they can share SCSI devices (see Appendix A, *Multiple Computer Configuration*), set the host adapters to different SCSI IDs. IDs 6 and 7 are preferable, since they have the highest priority on the SCSI bus.

Host Adapter SCSI Termination

The default host adapter termination setting for SCSI channels Channels A and B is *Enabled*. You must *disable* termination for Channel A if you attach SCSI devices to *both* the internal and external connectors of Channel A. Here are the possible options:

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

To change the termination setting for a channel, follow these steps:

- 1 Display the Configuration menu for the channel.
- 2 Highlight **Host Adapter SCSI Termination**, then press **Enter**. The pop-up menu shown in Figure 3-8 appears.
- 3 Highlight **Enabled** or **Disabled**, then press **Enter**.

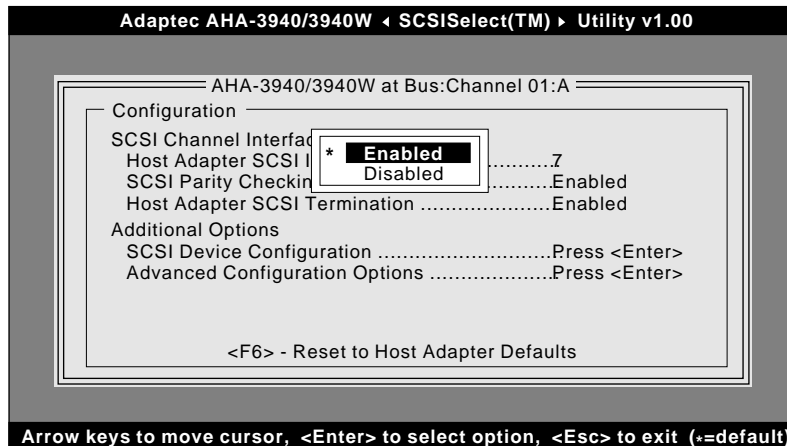


Figure 3-8. Host Adapter SCSI Termination Selection for AHA-3940/3940W

SCSI Device Configuration

This option allows you to configure certain parameters of each SCSI device on the SCSI bus. When you choose this option, a screen similar to Figure 3-9 appears if you have an AHA-3940. If you have an AHA-3940W, a screen similar to Figure 3-10 appears.

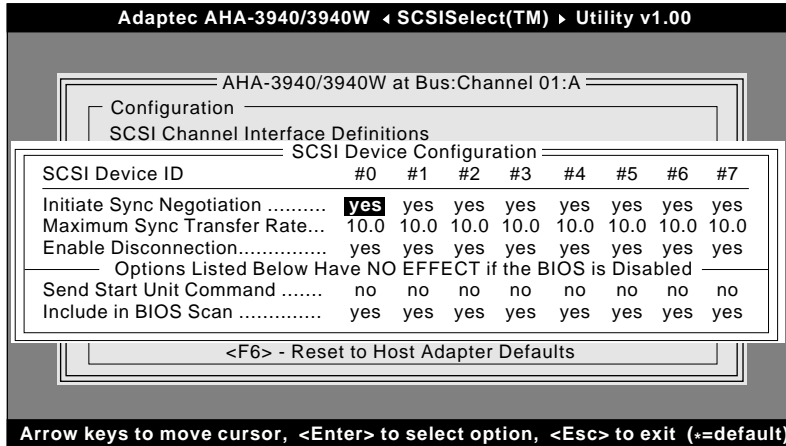


Figure 3-9. SCSI Device Configuration Screen for AHA-3940

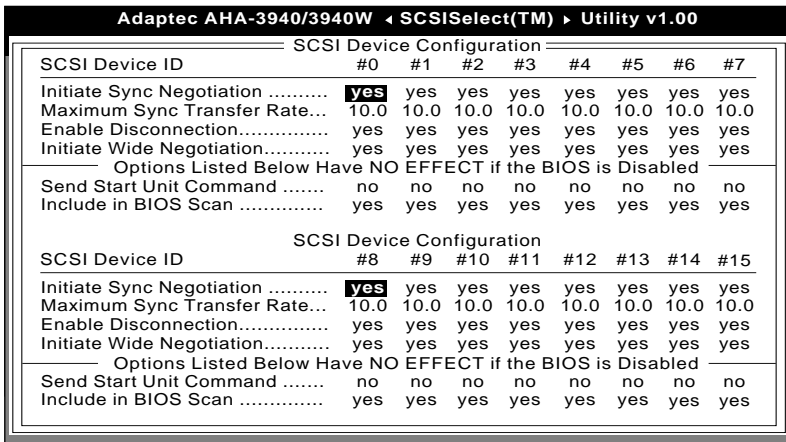


Figure 3-10. SCSI Device Configuration Screen for AHA-3940W

In most cases, you can use the maximum value of 10.0. If the channel is set *not* to negotiate for synchronous data transfer (i.e., Initiate Sync Negotiation is set to **no**), then the value selected here is the maximum rate that the channel accepts from the device during negotiation. (This is standard SCSI protocol.)



Note: Some older SCSI-1 devices do not support Fast SCSI data transfer rates (10.0, 8.0, and 6.7). This may cause your computer to operate erratically or hang if the transfer rate is set too high. Select a Maximum Sync Transfer Rate of **5.0** for these devices.

Enable Disconnection

This setting 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

This setting, which appears only on AHA-3940W 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**.

Send Start Unit Command

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*.



Note: The Send Start Unit Command setting is valid only if the channel BIOS is enabled.

If you set Send Start Unit Command to **yes** for more than one SCSI device, the channel first sends the Start Unit command to the device with the lowest SCSI ID. When this device responds, the Start Unit command is sent to the device with next highest SCSI ID with a setting of **yes**. The process continues until all supported devices respond to the channel.



Note: If many drives are set to **yes** for Send Start Unit Command, the boot time varies depending on how long it takes each drive to spin up.

Include in BIOS Scan

This setting determines whether the channel BIOS supports devices attached to the SCSI bus without the need for device driver software. When set to **yes**, the channel BIOS controls the SCSI device. When set to **no**, the channel BIOS does not search the SCSI ID for devices to control, and device driver software is needed to control the SCSI device. The default setting is *yes*.

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 Include in BIOS Scan feature to *exclude* the Channel A drives from the BIOS scan. Otherwise the host adapter BIOS will attempt to boot from the first

drive it finds on Channel A. (The BIOS always scans Channel A first.)



Note: The Include in BIOS Scan setting is valid only if the channel BIOS is enabled.

Advanced Configuration Options

When you select Advanced Configuration Options, a screen similar to Figure 3-11 appears. Do not change these five settings unless you fully understand what they mean.

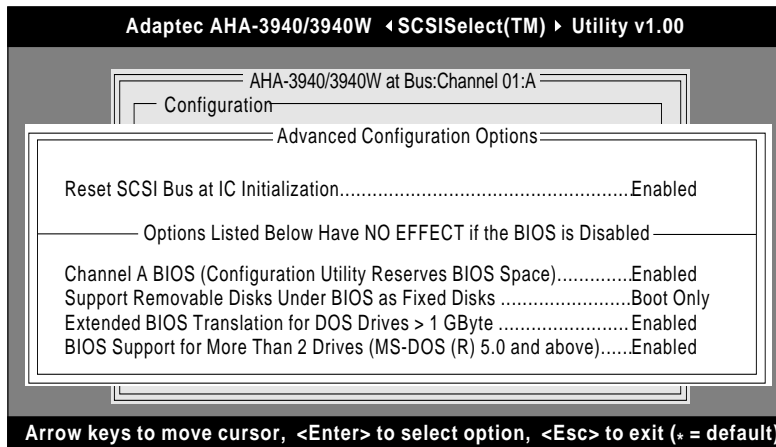


Figure 3-11. Advanced Configuration Options Screen

To change a setting, use the cursor keys ($\uparrow\downarrow$) to highlight the setting, then press **Enter** to display a pop-up menu of options. Use the arrow keys ($\uparrow\downarrow$) to highlight an option, and press **Enter** to select it.

Reset SCSI Bus at IC Initialization

This setting determines whether the SCSI bus is reset the first time the channel is initialized. If the channel BIOS is enabled, the BIOS resets the SCSI bus, then waits two seconds before scanning the bus for SCSI devices. If Reset SCSI Bus at IC Initialization is disabled, there is no two-second delay. The default setting is *Enabled*. Normally, SCSI Bus Reset at Host Adapter Initialization should always be enabled.

Channel BIOS

This setting enables or disables the host adapter BIOS. The default setting is *Enabled*. Each AHA-3940/3940W host adapter has one BIOS, which operates on both SCSI channels. The BIOS must be enabled if you want the computer to boot from a SCSI hard disk drive connected to either channel of the host adapter. Several *SCSISelect* options are only valid if the host adapter BIOS is enabled, as noted in the table on page 3-3.



Note: You can only change the Host Adapter BIOS setting when you are configuring SCSI Channel A. When you are configuring Channel B you can view the current BIOS settings in *SCSISelect*, but you cannot change them.

Support Removable Disks Under BIOS as Fixed Disks

This setting 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 media during operation. If a removable-media SCSI device is controlled by the channel BIOS, *do not* remove the media while the drive is on or you may lose data! To be able to remove media while the power is ON, install the removable-media device driver and set this option to *Disabled*.

Extended BIOS Translation for DOS Drives > 1 GByte

This setting 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*.

If this option is enabled, the following translation schemes are used:

- SCSI hard disks \leq 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.

See Appendix C, *Support for Large Disk Drives*, for more information on this setting.

BIOS Support for More Than 2 Drives

This setting enables or disables BIOS support for more than two, and up to eight, SCSI hard disk drives. The setting is valid only if the channel BIOS is enabled. This feature is supported by DOS 5.0 and above. The default setting is *Enabled*.

Saving Configuration Changes

You save configuration changes as you exit *SCSISelect*. Press **Esc** until you are prompted to save the changes, then select **Yes** to save the changes or **No** to abandon them.

SCSI Disk Utilities

When you select SCSI Disk Utilities from the Options menu, *SCSISelect* scans the SCSI bus and lists all installed SCSI devices. If you have an AHA-3940, a screen similar to Figure 3-12 appears.

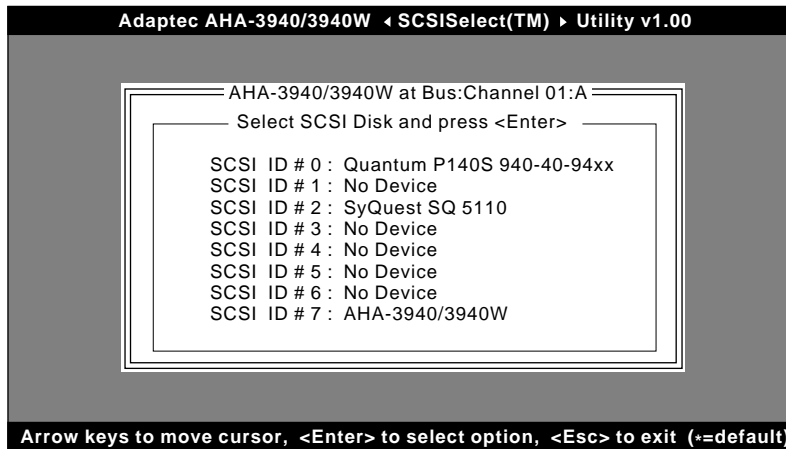


Figure 3-12. SCSI Disk Utilities Screen for AHA-3940

If you have an AHA-3940W, a screen similar to Figure 3-13 appears. You can easily determine from this screen the SCSI ID assigned to each device on the SCSI bus.

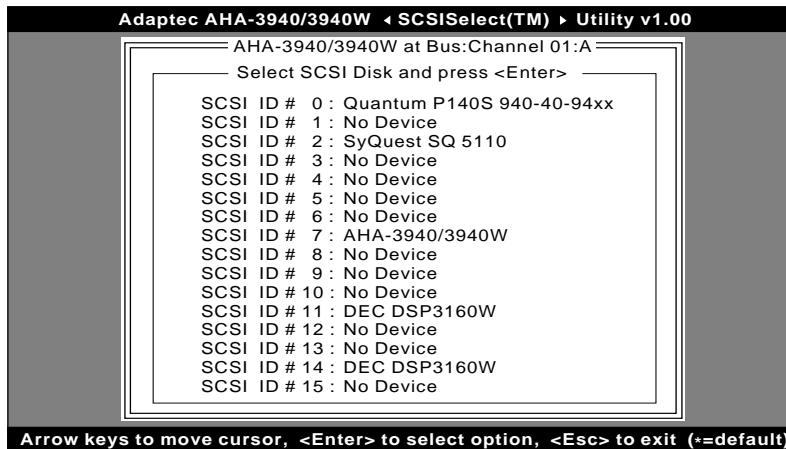


Figure 3-13. SCSI Disk Utilities Screen for AHA-3940W

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

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 do not need to be formatted again. The Adaptec *Format Disk* utility is compatible with most SCSI disk drives. Run it 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. Be sure to back up your data before performing this operation. You

Configuring Multiple Host Adapters

Follow these instructions if your computer has multiple host adapters:

- If you want your computer to boot from a SCSI drive, install the host adapter to which this drive is connected in the lowest PCI Device number. The Device number is determined by the slot number on the PCI bus.

Refer to your computer documentation to learn how to determine the PCI slot number and slot number order.

- If you are booting from a drive connected to an AHA-3940/3940W and you are using ISA/EISA-based host adapters as 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-3940/3940W as 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-3940/3940W.



AHA-3940/3940W User's Guide

Stock Number: 510600-00, Rev. A

Print Spec Number: 492707-00

Current Date: 8/24/94

Page: 3-22

ECN Date: 08/30/94

▼▼▼▼ 4 Troubleshooting

About This Chapter

Read this chapter to find out

- How to diagnose problems that may occur when you install an AHA-3940/3940W host adapter in your computer
- How to fix these problems

AHA-3940/3940W User's Guide

Stock Number: 510600-00, Rev. A

Page: 4-2

Print Spec Number: 492707-00

Current Date: 9/8/94

ECN Date: 08/30/94

▼▼▼▼ 4

SCSI Troubleshooting Checklist

AHA-3940/3940W 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* on page ii.

Answer these questions first if a problem occurs during installation:

- Did the AHA-3940/3940W BIOS banner appear when you booted your computer? If not, the motherboard BIOS does not support PCI-to-PCI bridges. Contact your computer vendor for a motherboard BIOS upgrade.
- Are the power cables and SCSI interface cables properly connected? (See *Connecting SCSI Cables and Devices* on page 2-7.) 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?
- Is pin-1 orientation maintained throughout the SCSI bus? (See *Connecting Internal SCSI Devices* on page 2-8.)
- Are PCI bus and slot parameters set correctly in the computer's *Setup* program? (See *Configuring Multiple Host Adapters* on page 3-21.) 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 each SCSI device, including the channel, set to a unique SCSI ID? (See *Setting SCSI IDs* on page 2-15.)
- Is SCSI termination set correctly? (See *Terminating the SCSI Bus* on page 2-13.)

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:

A drive larger than 1 gigabyte has been detected with 64 head / 32 sector partitioning. This drive is not compatible with the 255 head / 63 sector translation which has been enabled on this adapter. Data could be corrupted! Please check your system setup! Press any key to continue.

This message occurs only if Extended BIOS Translation is enabled in *SCSISelect*. It means that the BIOS detected a large capacity drive with invalid partition information in the master boot record.

Extended BIOS Translation is used only with MS-DOS 5.0 or above. You do not need to enable this option if you are using another operating system, such as OS/2[®] or UNIX[®].

If you are using a drive larger than 1 GByte under MS-DOS 5.0 or above and this message appears, follow these steps:

- 1 Run *SCSISelect* and set Extended BIOS Translation to **Disabled**. (See *Extended BIOS Translation for DOS Drives > 1 GByte* on page 3-18.)
- 2 Exit *SCSISelect* and back up the data on the disk drive, if you want to save it.
- 3 Perform a SCSI low-level format with the *Format Disk* utility in *SCSISelect*.



Caution: All data on the drive is lost when you run *Format Disk*. Back up your data before you run it!

- 4 In the *SCSISelect* Advanced Configuration Options menu, set Extended BIOS Translation to **Enabled**.
- 5 Partition the drive again.
- 6 Restore data to the drive, if necessary.

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 *SCSISelect* and access SCSI Device Configuration. Locate the channel's SCSI ID and set Send Start Unit Command to **yes**.
- 2 Exit *SCSISelect* 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 *SCSISelect* 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 successfully restarts, check SCSI bus termination and cable connections. One of the devices on the SCSI bus may 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, including combinations of standard disk drives¹ and SCSI disk drives.

Standard hard disk drives can be set to *installed* or *not installed* by the *Setup* program supplied with the host computer. The *Setup* program allows you to select the number of standard hard disks that are recognized by the computer, 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

- Be sure that both standard hard disks are mapped out of the computer using the *Setup* program by setting the *Setup* program to **No Drives Installed**.
- 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 Include in BIOS Scan feature of *SCSISelect* to *exclude* the Channel A drives from the BIOS scan. Otherwise the host adapter BIOS will attempt to boot from the first drive it finds on Channel A. (The BIOS always scans Channel A first.) See page 3-15 for more information.
- Be sure that the SCSI boot drive is set to SCSI ID 0 and that there are no SCSI ID conflicts. Check the disk drive manual to learn how to set the drive's SCSI ID. You can use *SCSISelect* 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 3-10.
- Try enabling Include in BIOS Scan in the SCSI Device Configuration option of *SCSISelect*. See *SCSI Device Configuration* on page 3-12.

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

- Be sure to cycle the 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.
- Be sure that the SCSI bus is properly terminated. See *Terminating the SCSI Bus* on page 2-13.
- Be sure that the intended boot disk has an active DOS partition and has been formatted. Run the *Format Disk* utility accessible through *SCSISelect*. See *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 standard hard disk (if one exists) out of the configuration.
- Be sure that the SCSI drive to be used as drive *D* is set to SCSI ID 0. Check the disk drive manual to learn how to set the drive's SCSI ID. You can also use *SCSISelect* to determine the SCSI addresses of peripherals on the SCSI bus.
- 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.
- Be sure to cycle the 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.
- Be sure that the SCSI bus is properly terminated.
- Be sure that the disk is formatted and has a DOS partition. Run the *Format Disk* utility accessible through *SCSISelect*. See *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**, as is required for SCSI host adapters.
- Be sure that the SCSI drive to be used as drive *C* is set to SCSI ID 0. Check the disk drive manual to learn how to set the drive's SCSI ID. You can also use *SCSISelect* to determine the SCSI addresses of peripherals on the SCSI bus, as described on page 3-19.
- Set the SCSI drive to be used as drive *D* to SCSI ID 1. Check the disk drive manual to learn how to set the drive's SCSI ID.
- Try enabling Include in BIOS Scan in the SCSI Device Configuration option of *SCSISelect*. See *SCSI Device Configuration* on page 3-12.
- Be sure to cycle the 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.
- 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.
- Be sure that the SCSI bus is properly terminated.
- Be sure that the disk has a DOS partition and is formatted. Run the *Format Disk* utility accessible through *SCSISelect*. See *SCSI Disk Utilities* on page 3-19

Computer Hangs, or Channel Cannot Always Find the Drives

- Check SCSI parity for consistency and be sure SCSI termination is set correctly.
- Check cable length and integrity. Check pin-1 orientation.
- If the host adapter LED remains on when the computer hangs, the host adapter may be interfering with your computer's operation. It may be 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 *SCSISelect*.

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 encountered a problem with the disk device or the media and therefore cannot run. The following information appears in the pop-up window:

- SCSI Target ID of the device
- SCSI CDB Sent (e.g., 2F 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 media is not ready to format. Be sure that media is inserted in the drive and that the media is spun up.
- 03h - Medium error
The disk media may be defective. If it is a removable-media drive, try using a different disk media. If it is a hard disk drive, the disk may be physically damaged. Verify and format the media with *SCSISelect*.
- 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; however, the device may already be low-level formatted by the manufacturer. (This error rarely occurs.)

- 06h - Unit attention

The removable media may be write-protected. Disable write protection and run the utility again.

The Additional Sense Code field provides more information about the error. The meaning of these codes may be listed in your hardware manual.

My computer locks up when I press Esc to exit SCSISelect.

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-3940/3940W 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 installed in a reversed position. Turn OFF the computer and check the pin-1 orientation of the internal SCSI cable connectors. See *Connecting Internal SCSI Devices* on page 2-8.





Multiple Computer Configuration

About This Appendix

Read this appendix to find out

- How to configure an AHA-3940/3940W host adapter for use on a SCSI bus with two computers

AHA-3940/3940W User's Guide

Stock Number: 510600-00, Rev. A

Print Spec Number: 492707-00

Current Date: 8/24/94

Page: A-2

ECN Date: 08/30/94

▼▼▼▼ A

Overview

Normally your AHA-3940/3940W 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, you can make it possible for two computers to share SCSI devices without changing the cable configuration every time one or the other computer needs to access the devices.

To allow computers to share SCSI devices, install a jumper shunt on the J5 (for Channel B) or J6 (for Channel A) termination jumper of your AHA-3940/3940W host adapter. Then connect the AHA-3940/3940W channel, the SCSI peripherals, and the host adapter in the second computer. Figure A-1 shows this arrangement.

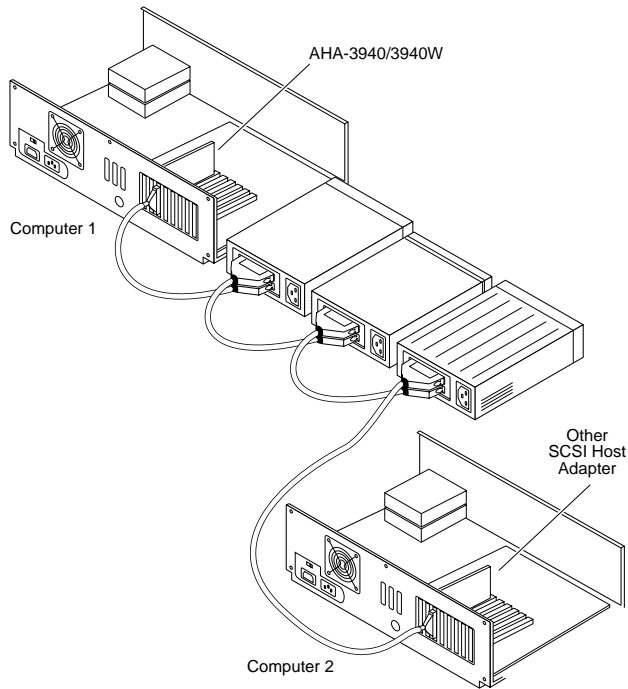


Figure A-1. SCSI Devices Shared by Two Computers

Only one computer can be turned on at any one time, and that computer can then access the devices. The host adapter in the other computer acts as a terminator at one 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 J5 (for Channel B) or J6 (for Channel A) termination jumper of your host adapter during installation.
- Only *external* SCSI peripherals can be attached to the bus between the two host adapters. Devices cannot be shared if you have internal SCSI drives, CD-ROM drives, and so forth in one or both of the computers.
- The Adaptec host adapter in the second computer does not have to be an AHA-3940/3940W, but it must be capable of active termination when it is turned off.

Most Adaptec host adapters can be actively terminated. Read the host adapter documentation to find out about this.

- You must assign different SCSI IDs to the AHA-3940/3940W 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.





Optimizing Performance

About This Appendix

Read this appendix to find out

- How to optimize your computer's performance after installing the AHA-3940/3940W host adapter

B-1

AHA-3940/3940W User's Guide

Stock Number: 510600-00, Rev. A

Print Spec Number: 492707-00

Current Date: 8/24/94

Page: B-2

ECN Date: 08/30/94

▼▼▼▼ **B**

Performance Tips

These tips will help you take full advantage of the AHA-3940/3940W 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 *SCSISelect* 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 *Initiate Sync Negotiation* on page 3-13.



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.

Disabling the Channel BIOS

Disabling the channel BIOS saves you 16 KBytes of memory address space and can also shorten boot-up time by as much as 60 seconds. *Channel BIOS* on page 3-17 explains how to change the Channel BIOS option in *SCSISelect*.

You should disable the channel 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 most effectively, be sure that it is enabled on each SCSI device, as well as on the SCSI channel. *SCSI Parity Checking* on page 3-10 explains how to change this setting in *SCSISelect*. 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 one or more 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 only the channel and a single disk device are on the SCSI bus. You should set this option to **yes**, however, if you have more devices on the SCSI bus. See *Enable Disconnection* on page 3-14 to learn more about this option.

Enabling Send Start Unit Command

This option, which is supported by some 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 *Send Start Unit Command* on page 3-15 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.





Support for Large Disk Drives

About This Appendix

Read this appendix to find out

- About extended translation and the DOS 1 GByte limit
- When to use the extended translation feature
- Answers to questions about extended translation

AHA-3940/3940W User's Guide

Stock Number: 510600-00, Rev. A

Print Spec Number: 492707-00

Current Date: 8/24/94

Page: C-2

ECN Date: 08/30/94

▼▼▼▼ C

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-3940/3940W host adapters. This feature supports disk drives as large as 8 GBytes under DOS. *Extended BIOS Translation for DOS Drives > 1 GByte* on page 3-18 explains how to change the setting of this option in the SCSISelect 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.



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 to Use Extended Translation

NetWare 386 (versions 3.0 and above) 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 With Mixed Partitions

Use standard translation, not extended translation, on drives formatted with two or more partitions for different operating systems. Partitions for UNIX and NetWare can be larger than 1 GByte when using standard translation.



Note: The term *UNIX*, as used here, includes all versions of AT&T/USL UNIX, SCO v3.2.4 (or later), and ISC v3.0 (or later).

Using Fdisk

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 Questions and Answers

What happens if I enable 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.

What if more than two hard disk drives are connected to the host adapter channel?
Under MS-DOS 5.0 or above, each AHA-3940/3940W host adapter can support up to eight drives without additional software. To do this you must enable BIOS Support for More Than 2 Drives in *SCSISelect*. (This option is *Disabled* by default.)



▼▼▼▼ Glossary

A

Adaptec EZ-SCSI

A software program that automatically configures your computer to use the Adaptec SCSI host adapter and SCSI devices connected to it. EZ-SCSI copies applications and device drivers to the computer's hard disk drive. In nearly every case, the computer and SCSI devices are configured correctly when the default values are accepted.

Advanced SCSI Programming Interface
See ASPI.

AHA-3940/3940W

A family of high-performance Adaptec host adapters designed for computers with a PCI local bus. The AHA-3940W is used with a 16-bit (Wide) SCSI bus, and the AHA-3940 is used with an 8-bit SCSI bus. These two host adapter models are designed for computers with 5-volt PCI bus slots.

ASPI

Advanced SCSI Programming Interface. A standard SCSI software interface that acts as a liaison between host adapters and SCSI device drivers. ASPI enables host adapters and device drivers to share a single SCSI hardware interface.

ASPI Manager

A software module that provides an interface between ASPI modules, a host adapter(s), and the SCSI devices connected to the adapter. A single ASPI manager can handle multiple I/O requests from multiple ASPI modules. ASPI managers are written for a specific operating system—such as DOS, OS/2, or NetWare—and a specific family of host adapters.

Asynchronous Data Transfer

A method of transferring data over the SCSI bus. In an asynchronous data transfer, bytes are sent in irregular intervals. Start and stop bits are used to signal the beginning and end of bytes. Asynchronous data transfer is slower than synchronous data transfer and is not affected by external timing constraints, such as cable length and circuit response time.

AT[®] Bus

See ISA.

B

BIOS

Basic Input/Output System. Software coded into computer chips for various purposes. The BIOS on the motherboard of a computer is the special program

used to boot and control the computer. Most Adaptec host adapters include an onboard BIOS that initializes the SCSI bus, runs boot-up diagnostics, and performs other functions.

BIOS Address

The address in computer memory where the host adapter BIOS code is stored when you boot the computer.

Bus

A pathway for data in a computer. All computers have an expansion bus, which is designed to accept add-on (expansion) devices, such as modems, sound cards, and video adapters. Expansion devices use the bus to send data to and receive data from the computer's CPU or memory. ISA, EISA, VL-Bus, and PCI are the major bus standards used in computers.

Bus Device Reset

A SCSI message that clears all pending activity in the SCSI peripheral device to which it is addressed.

Bus Mastering

A high-performance method of data transfer in which the host adapter's onboard processor handles the transfer of data directly to and from a computer's memory without intervention from the computer's microprocessor. Bus mastering is the fastest method of data trans-

fer in multitasking operating systems, such as Windows NT and OS/2.

Byte

An 8-bit unit of data. A byte is normally the smallest addressable unit of memory and the smallest unit of data transfer on the SCSI bus.

C

CD-ROM

Compact Disk Read Only Memory. A high-capacity disc medium for storing data files and software programs. Like the audio CDs used in consumer CD players, the data on CD-ROM discs cannot be changed once it is encoded. A single CD-ROM can hold 600 MBytes or more of data.

CD-ROM Drive

A disk device used to retrieve data and software programs from CD-ROMs (compact disks) for use on computer systems. Some CD-ROM drives are installed internally in the computer case, others are used as external devices. Most CD-ROM drives can also play audio CDs.

Central Processing Unit

See CPU.

Channel

See SCSI Channel.

Glossary-2

DOS Partition

A section of a disk storage device, created by the DOS *fdisk* program, in which data and/or software programs are stored. Computers have a primary DOS partition that contains the special files needed to boot the computer. A computer's disk devices may also have extended DOS partitions. Each DOS partition is assigned a unique drive letter, such as *C* or *D*. A single disk device can have multiple partitions.

Driver

See Device Driver.

E

ECU

EISA Configuration Utility. The configuration program included with all EISA class computers that allows you to configure the computer's motherboard and option boards.

EEPROM

Electrically-Erasable Programmable Read Only Memory. An integrated circuit typically used to store configuration information. Some host adapters have an EEPROM that contains configuration information entered via the *SCSISelect* utility. The data stored in an EEPROM can be updated while it is installed in the host adapter.

EISA

Extended Industry Standard Architecture. A kind of computer bus. EISA, an extension of the 16-bit ISA bus standard, allows expansion devices like network cards, video adapters, and modems to transfer data across the computer bus 32 bits at a time.

EISA Configuration

The operation that occurs when the host configures a device on the EISA bus by changing values in the device's registers. This replaces the method of using jumpers commonly found on ISA bus devices.

EPROM

Erasable Programmable Read Only Memory. An integrated circuit used to store the host adapter BIOS and firmware. EPROMs can be erased by exposure to ultraviolet light and then reprogrammed with different data.

External SCSI Device

A SCSI device such as a hard disk drive or tape drive installed outside the computer case. External SCSI devices are connected to the SCSI bus with round cables that have layered twisted-pair assemblies with electrical shielding.

EZ-SCSI

See Adaptec EZ-SCSI.

F

Fast SCSI

A SCSI standard that allows data to be transferred at up to 10 MBytes/sec on an 8-bit SCSI bus and up to 20 MBytes/sec on a 16-bit (Wide) SCSI bus. The Fast SCSI bus is limited to 3 meters of cable.

FIFO

First In/First Out. An integrated circuit that buffers data in such a manner that each byte placed in the buffer is removed from the buffer in the same order.

Firmware

A computer chip on which is embedded special permanent codes or software. It is called *firm* as opposed to *soft* because the information is designed into the chip and cannot be modified by the user. A host adapter BIOS is firmware.

First Party DMA

See Bus Mastering.

G

GByte

Gigabyte. A measure of computer storage. One GByte equals 1,073,741,824 bytes. (A byte is the amount of storage needed to hold one character.)

H

High Memory

See Upper Memory Block.

Host

A microcomputer system in which a SCSI host adapter is installed. The host uses software to request the services of the host adapter in transferring information to and from peripheral devices attached to the host adapter.

Host Adapter

A printed circuit board or integrated circuit that installs in a standard microcomputer system and provides a SCSI bus connection so that SCSI devices can be connected to the microcomputer.

Host Adapter BIOS

See BIOS.

I

IBM® PC-AT Compatible

Any computer that emulates exactly the IBM PC-AT and uses an ISA backplane bus.

ICU

ISA Configuration Utility. This utility helps users to determine optimal configurations for non Plug and Play ISA cards. It also provides users a mechanism for informing the ISA Configuration Manager and the Plug and Play BIOS of the system configuration of ISA systems. The ICU is for use on ISA systems only.

Industry Standard Architecture

See ISA.

Initiator

A SCSI device that requests an operation to be performed by another SCSI device (the target). The initiator provides all the command information and parameters required to perform the operation, but the target carries out the details of the operation. The host adapter is usually called the initiator; other devices on the SCSI bus, such as disk drives, are called SCSI targets.

Internal SCSI Device

A SCSI device, such as a hard disk drive or a CD-ROM drive, installed inside a computer case. Internal SCSI devices are connected to the SCSI bus with a flat ribbon cable.

Interrupt Request Channel
See IRQ.

IRQ

Interrupt Request Channel. An electrical channel through which a hardware device can send a message to get the immediate attention of the computer's Central Processing Unit (CPU).

ISA

Industry Standard Architecture. The type of computer bus used in most computers. An ISA bus enables expansion devices like network cards, video adapters, and modems to send data to and receive data from the computer's CPU and memory either 8 bits or 16 bits at a time. Expansion devices are plugged into

sockets in the computer motherboard. ISA is sometimes called the *AT bus*, because it was first used in the IBM PC/AT.

K

KByte

Kilobyte. A measure of computer storage. One KByte equals 1024 bytes. (A byte is the amount of storage needed to hold one character.)

L

Local Bus

An internal control path in a computer which connects peripherals like video boards or disk drives directly to a computer's CPU and memory. Local buses bypass the slower ISA and EISA expansion buses and allow much faster data transfer rates. VL-Bus and PCI are examples of local bus standards.

Logical Unit

A device that is addressed when an initiator (usually the host adapter) sends a Read or Write command to a target. For example, a tape drive is a target and the tape cartridge in the drive is the Logical Unit (LU). Most SCSI targets have only one LU; a single SCSI target can have up to eight LUs.

Logical Unit Number

An encoded 3-bit identifier for a Logical Unit.

LU
See Logical Unit.

LUN
See Logical Unit Number.

M

Manager
See ASPI Manager.

MByte
Megabyte. A measure of computer storage. One MByte equals 1,048,576 bytes. (A byte is the amount of storage needed to hold one character.)

Motherboard
The main printed circuit board in a computer. The motherboard normally contains the computer's CPU, memory chips, expansion bus, and other important components. It also has expansion slots in which host adapters and other expansion boards can be inserted.

MultiChannel
A term used to describe the AHA-3940/3940W and other Adaptec host adapters that have two or more independent SCSI channels.

Multitasking Operation
The execution of commands in such a way that more than one command is processed at the same time. Multitasking allows a computer to overlap activities by using resources that are temporarily not required for other operations. This means that

multiple programs or portions of programs may be operating in parallel.

Multithreaded I/O

A method by which data is accessed simultaneously from multiple SCSI devices to increase a computer's data transfer rate. For example, if the computer needs data from two disk devices it requests data from the first device, which temporarily disconnects from the SCSI bus while it is seeking the data. During this delay the computer requests data from the second device, and while that device disconnects from the bus to seek the data, the first device starts sending the requested data over the bus, etc.

O

Operating System

The software that controls the basic operation of the host computer. Examples are MS-DOS, UNIX, and Netware.

P

Parity Checking

A SCSI feature used to verify whether data has been transmitted correctly over the SCSI bus. A check bit is added to each byte of data to make the sum of all the 1 bits either odd or even, depending on the protocol. If the sum of the bits is even when it

should be odd, or vice-versa, data has been corrupted and an error message appears.

Partition

See DOS Partition.

PCI

Peripheral Component Interconnect. A local bus technology that allows SCSI host adapters, video cards, and other peripherals to send data directly to and receive data directly from the computer's CPU. This is much faster than transferring data on the computer's ISA or EISA bus.

PCI-to-PCI Bridges

Or PPB. A feature that allows devices on two independent PCI buses to communicate with each other. PPB enables AHA-3940/3940W host adapters to support two PCI buses on one add-in card. The computer's motherboard BIOS must also support PPB.

Peripheral Device

Any optional input or output device, such as a printer or CD-ROM drive, that connects to a computer's CPU. For SCSI peripherals this connection is made via the SCSI bus.

PhaseEngine

A customized, programmable 29-bit RISC processor included on some Adaptec chips. The PhaseEngine (sequencer) controls multitasking, multi-threaded SCSI phase operations. It offloads I/O

transactions from the host CPU and greatly increases the speed of SCSI command processing by independently handling these transactions.

Pin-1 Orientation

The orientation of pin 1 on a SCSI cable relative to the pin-1 position on the connector into which it is plugged. The SCSI bus does not work properly if this orientation is reversed. Correct pin-1 orientation is automatic with external SCSI connectors because they can only be plugged in one way. It is possible, however, to accidentally reverse the pin-1 orientation of internal SCSI cables.

PIO

See Programmed Input/Output.

Plug and Play

A hardware and software mechanism that provides an automatic way for the system to self configure and optimally allocate system resources such as memory, I/O ports, IRQ, and DMA channels to Plug and Play ISA cards and other devices in the system.

Port Address

Or *I/O Port Address*. A window through which software programs send commands to the host adapter board.

PPB

See PCI-to-PCI Bridges.

Glossary-8

Programmed Input/Output

A method of data transfer in which the host microprocessor transfers data to and from memory. PIO enables very fast data transfer rates, especially in single-tasking operating systems like DOS.

memory, minimizing interrupts and overhead.

SCSI

Small Computer Systems Inter-

R

RAM

Random Access Memory. Memory of which any byte can be accessed directly in a single memory cycle. Information can be read from and written to the memory.

Removable Media

Disk media such as the cartridges used with Iomega[®] Bernoulli[®] drives that can be removed from a disk drive after data is copied to them. The media can then be stored or can be inserted in another removable disk drive.

ROM

Read-Only Memory. Memory in which any byte can be read but not written.

S

Scatter/Gather

A device driver feature that allows the host adapter to modify the transfer data pointer so that a single host adapter transfer can access many segments of

▼▼▼▼ Index

A

Active Termination A-4
Adaptec EZ-SCSI 1-7
Adaptec Services
 information 1-8
 support 1-8
Advanced Configuration
 Options 3-16
Advisories xiii
AHA-3940/3940W
 applications support 1-6
 default values 3-3
 explanation of 1-3
 features 1-3-1-6
 jumper A-4
 multiple computer
 configuration A-3
 multiple device support 1-6
 multiple host adapters 3-5, 3-21
 termination 3-11
ASPI Manager 1-7
Asynchronous Data Transfer 3-13

B

Bernoulli 1-6
BIOS Scan 3-3, 3-15
BIOS Startup Messages 4-4
BIOS, Host Adapter 1-6
 base address 3-17
 disabling B-3
 enabling 3-17, B-3
 extended translation
 support 3-3, 3-18, 4-4
 include in BIOS scan 3-15
 removable disk drive
 support 3-17
 startup messages 4-4

 support for more than two
 drives 1-6, 3-3, 3-18, C-4

Booting

 with multiple host adapters 3-21

Booting from Removable
Media 3-17

C

Cables

 See SCSI Cables

CD-ROM Drive 1-6, B-3

Configuration Menu 3-7

Configuration Utility

 See SCSISelect

Configuration, SCSI Device 3-12-
3-16

Configure/View Host Adapter
Settings 3-7

Conventions xii

Customer Support

 See Technical Support

D

Data Transfer 1-4, 3-13

Data Transfer Rate 3-3, 3-13

Differential SCSI Devices 2-7

Disconnect/Reconnect 1-4, 3-14, B-4

Disk Array 1-5

Disk Drive

 See Hard Disk Drive

DOS 1-6

 disk capacity limit C-3

 fdisk command C-4

Index-1

AHA-3940/3940W User's Guide

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Page: -1

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E

Enable Disconnection 3-3, 3-14, B-4
Extended Translation 3-3, 3-18, 4-4,
C-3, C-4
External SCSI Device
 using with multiple
 computers A-4
EZ-SCSI
 see Adaptec EZ-SCSI

F

Fast SCSI 3-14
Fast SCSI-2 1-5
Fdisk Utility C-4
Format
 low-level 3-20
Format Disk Utility 3-20
Formatting Conventions xii

H

Hard Disk Drive
 See Also SCSI Drive
 configuration problems 4-6-4-8
 DOS disk capacity limit C-3
 extended translation 3-18, C-3
 format disk utility 3-20
 greater than 1 GByte support 1-6,
 3-18, 4-4, C-3
 mixed partitions C-4
 removable disk drive 1-6, 3-17,
 4-10
 support for more than two
 drives 3-18
 verify disk media 3-20
Host Adapter
 See AHA-3940/3940W
Host Adapter BIOS
 See BIOS, Host Adapter

I

I/O Operating Environment 1-6
I/O, Multithreaded 1-4
ID
 See SCSI ID
Information Services 1-8
Initiate Sync Negotiation 3-3, 3-13,
B-3
Installation Instructions 2-3-2-18
Internal SCSI Device, Installing 2-8

J

Jumper, Installing A-4

L

LED Cable 2-16, 4-10
LED Connector 2-16
Logical Units, Support for
 Multiple 1-6
Low-level Format 3-20

M

Multiple Computer
 Configuration A-3
Multiple Host Adapters 3-5, 3-21
Multithreaded I/O 1-4

N

Novell NetWare 1-8

O

Operating Environment 1-6
Optimizing Performance B-3
Options Menu 3-6
OS/2 1-8

Index-2

P

Parity Checking 3-3, 3-10, B-4
 Partitions 4-7, C-4
 PCI Bus
 automatic configuration 2-18
 interface 1-4
 PCI Slot
 configuration parameters 2-18
 Performance Tips B-3
 PhaseEngine 1-4, 1-5
 Pin-1 Orientation 2-9, 4-10

R

Removable Disk Drive 1-6, 3-3, 3-17,
 4-10
 Removable Media, Booting
 from 3-17
 Reset at IC Initialization 3-16

S

Scatter/Gather 1-4
 SCO UNIX 1-8
 SCSI
 differential devices 2-7
 single-ended devices 2-7
 SCSI Bus
 disconnect/reconnect 3-14
 parity checking 3-10, B-4
 reset at host adapter
 initialization 3-3
 reset at IC initialization 3-16
 SCSI ID 3-8
 termination of 2-13, 4-3
 SCSI Cables
 characteristics of 2-7
 SCSI Command Failure 4-9
 SCSI Device Configuration 3-12–
 3-16
 SCSI Disk Utilities 3-19
 SCSI Drive, Booting from 4-6

SCSI ID

for AHA-3940/3940W 3-3, 3-8
 conflicts with 4-6
 for peripheral devices 3-13
 purpose of 2-15
 setting 2-15

SCSI-2

cable standards 2-7
 implementation of 1-5

SCSISelect 1-4, 3-3–3-20

Advanced Configuration
 Options 3-16
 Configuration Menu 3-7
 Configure/View Host Adapter
 Settings 3-7
 default values 3-3
 options menu 3-6
 resetting default values 3-7

**Send Start Unit Command 3-3, 3-15,
 4-5, B-4****Sense Key Information 4-9****Setup Program 4-6, 4-7, 4-8****Single-ended SCSI 2-7****Support Removable Disks Under
 BIOS as Fixed Disk 3-17****Support Services 1-8****Synchronous Data Transfer
 Rate 3-3, 3-13****Synchronous Negotiation 3-3, B-3****T****Tagged Queuing 1-6****Termination 2-13, 4-10**

active A-4

changing for host adapter 2-13,
 3-11

changing for peripherals 2-13

termination power 2-13

Troubleshooting 4-3–4-10

checklist 4-3

U

USL UNIX 1-8

Utilities

format disk 3-20, 4-4

verify disk media 3-20

V

Verify Disk Media 3-20

W

Wide Negotiation 3-3

Windows 1-6

Windows NT 1-8

