AHA-1540C/1542C

High-Performance Bus Master ISA to SCSI Host Adapter

User's Manual

adaptec

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FCC Compliance Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

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 to which the receiver is powered
- If necessary, the user should 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.

Finally, any change or modifications to the equipment by the user not expressly approved by the grantee or manufacturer could void the user's authority to operate such equipment.

Each AHA-1540C/1542C is equipped with an FCC compliance label which shows only the FCC Identification number. The full text of the associated label follows:

FCC ID: FGT 1542C

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

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Preface

Inside This Manual

This manual provides complete instructions on how to install and use the Adaptec AHA-1540C and AHA-1542C ISA-to-SCSI Advanced Host Adapters.

Chapter One, *Introduction*, provides general information about the Adaptec AHA-1540C/1542C and its features and capabilities. It also tells you how to contact Adaptec Technical Support.

Chapter Two, *Getting Started*, has the information experienced users need to quickly install and configure a host adapter. The chapter includes cross-references to more detailed information in other chapters.

Chapter Three, *Stepping Through Installation*, provides in-depth, step-by-step instructions on physically installing the adapter in your computer, and connecting it to various combinations of SCSI peripherals. The chapter also includes a detailed description of SCSI termination.

Chapter Four, *Using the Configuration Software*, explains how to run the built-in Configuration Software and use its features to view the host adapter settings and change them as needed. The chapter also describes the built-in SCSI disk utilities and the host adapter diagnostics.

Chapter Five, *I/O Operating Environment Software*, tells you how to determine whether you need to install additional software on your system in order to use all the features of the AHA-1540C/1542C.

Appendix A, *Specifications*, lists technical specifications and switch block setting information that may be of use to the advanced user or technician.

Appendix B, *Troubleshooting*, has information to assist you in troubleshooting problems that may occur during installation and configuration.

Appendix C, *Optimizing Performance*, has various tips on maximizing the performance of your host adapter.

The *Glossary* has definitions of special terms used in this manual and in SCSI literature in general.

Conventions

The following typographic conventions are used throughout this User's Guide.

bold
Used for keystrokes (.. press the **Enter** key ..) and screen selection fields (.. select **Backup Device** and ..).

Helvetica
Used for operator entry that must be typed exactly as shown (.. device=c:\adaptec\aspidos.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 in body text (.. the *autoexec.bat* file ..).

Italics
Used for emphasis (.. is *only* supported ..) and document reference (.. refer to Chapter 2, *Setting Up* ..).

ALL CAPITALS
Used for acronyms, such as SCSI and CD-ROM.

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

Numbered Step Marker
The ➢ symbol marks the first in a series of numbered steps.

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

❒

1

Introduction

About This Chapter

Read this chapter to find out:

- The features of your new AHA-1540C/1542C ISA to SCSI host adapter
- How to get help from Adaptec Technical Support

The AHA-1540C/1542C Host Adapter

The AHA-1540C/1542C host adapter enables you to connect your computer to practically any of today's SCSI devices.

- Your computing platform will be opened up to the wide range of multimedia SCSI peripherals, such as high performance hard disk drives, CD-ROM, DAT, and rewritable optical drives, and scanners.

- Extensive compatibility testing ensures that your host adapter will work well with your computer and all your SCSI peripherals.

In this manual, and in other Adaptec documents, the AHA-1540C and AHA-1542C ISA to SCSI advanced host adapters are referred to jointly as the AHA-1540C/1542C host adapter. This User's Manual tells you how to install the AHA-1540C and AHA-1542C ISA-to-SCSI host adapters. Installation procedures are the same for both adapters, except for the AHA-1542C on-board floppy controller. (The AHA-1542C includes a standard ISA floppy diskette controller, and the AHA-1540C does not.)

SCSI Features

High-performance

The Adaptec AHA-1540C/1542C uses Bus Master® technology. Bus master Direct Memory Access (DMA) allows your host adapter to independently manage data transfer between your SCSI peripherals and the computer system memory, without requiring the involvement of your CPU.

The host adapter uses DMA bus mastering to transfer data to and from SCSI devices at the maximum possible rate. A dedicated on-board processor and optimized firmware efficiently offload I/O

tasks from the host CPU so that the CPU bandwidth can be dedicated to other system functions.

High Capacity Drive Support

The AHA-1540C/1542C supports both fixed and removable media devices with capacities above 1 Gigabyte (GByte). DOS drives with capacities to 8 GBytes are supported by the Extended BIOS Translation feature, which is accessible through the Configuration Software when you start your system.

Operating systems such as Novell® NetWare®, OS/2® and UNIX® support greater than 1024 cylinders and support drives of far greater capacity, without requiring the Extended BIOS Translation feature.

- All of the Configuration Software options are explained in Chapter Four, *Using the Configuration Software.*

Disk Device Support

The DOS operating system and the AT BIOS support two fixed disk drives, drive *C* and drive *D*. (DOS 5.0 and above supports up to eight drives, seven per host adapter.)

- If **two non-SCSI fixed disk drives** are installed, they are the first two fixed disk drives accessible from the operating system.

- If **one non-SCSI fixed disk drive** is installed, the AHA-1540C/1542C BIOS allows DOS to access the SCSI drives as drive *D* and *E*, etc.

- If **only SCSI fixed disk drives** are installed, AHA-1540C/1542C BIOS allows DOS to access the first SCSI drive as drive *C*, the next as drive *D*, etc.

The most common non-SCSI drives are IDE and ESDI type drives. Throughout this manual, references to IDE drives also apply to ESDI drives.

IDE and ESDI drives are controlled by IDE and ESDI® controllers. IDI and ESDI drives can be set to the *installed* or *not installed* state by the Setup or Configuration program supplied with each ISA and EISA host computer. Your computer's setup program lets you select the number of *non-SCSI* fixed disks that are recognized by the system, regardless of whether or not they are physically installed.

System booting is performed from the floppy drive if a floppy diskette is in the drive. If no floppy diskette is present, the system attempts to boot from the drive chosen as drive *C* through the process described above, whether the drive is a standard fixed disk or a SCSI fixed disk.

The AHA-1540C/1542C BIOS fully supports the extended partitioning capabilities of DOS 3.3 for up to two drives and of DOS 5.0 and above for up to seven drives per host adapter, eight total.

Peripheral devices such as SCSI tape, DAT, CD-ROM and others require device driver software to be installed. Adaptec supplies a range of products based on the Advanced SCSI Programming Interface (ASPI™) architecture. For information on third-party support for the AHA-1540C/1542C, contact Adaptec using the telephone *800* number listed at the end of this chapter.

Multiple Peripheral and Applications Support

The AHA-1540C/1542C supports multiple SCSI peripherals in various operating system environments. MS-DOS® and CPU-intensive computer environments, such as Windows®, OS/2, UNIX, or Novell NetWare are all supported by the AHA-1540C/1542C.

> Note
>
> The AHA-1540C/1542C supports only *Single-Ended* SCSI devices. *Differential* SCSI devices may be damaged if connected to the AHA-1540C/1542C bus. Most currently produced SCSI peripherals use single-ended grounding on the SCSI bus, so this will probably not be a problem. You should, however, consult your SCSI peripheral user documentation to make sure.

Easy Installation

Your AHA-1540C/1542C host adapter comes equipped with an on-board BIOS that allows you to use up to seven SCSI disk drives per host adapter (eight total) without additional software under MS-DOS version 5.0 and above. In addition, Novell NetWare®, IBM® OS/2 and versions of UNIX from SCO®, Sunsoft® and USL® include built-in support for the AHA-1540C/1542C.

Adaptec I/O Operating Environment Software is easy to install. Adaptec EZ-SCSI for DOS/Windows automatically configures itself to the peripherals installed on your system. If you want, you can override the defaults and customize your configuration.

Refer to Chapter Five, *I/O Operating Environment Software,* for your specific software requirements.

Your host adapter is already configured for the majority of ISA (AT® compatible) or EISA class computers. If you need to change the host adapter settings, you can do so with the built-in Configuration Software and the switches on the adapter board, as explained later in this manual.

- You do not need an EISA *.cfg* file to install the AHA-1540C/1542C on EISA computers.

- Installation directions begin in Chapter Two, *Getting Started.*

Easy Configuration

The built-in BIOS based AHA-1540C/1542C Configuration Software makes it easy to customize your host adapter. This program is accessible from the keyboard (just press **Ctrl-A**), and you will not need to open your computer again after you initially install the board.

- All options accessible through the Configuration Software are explained in Chapter Four, *Using the Configuration Software.*

Unpacking and Inspection

Your AHA-1540C/1542C should be undamaged when you receive it. The carrier or distributor where you purchased the host adapter is responsible for any damage incurred during storage or shipment.

In case of damage, return the host adapter to your distributor; if the host adapter was delivered to you directly, have the carrier note the damage on both the delivery receipt and the freight bill, then notify the freight company representative so that the necessary insurance claims can be initiated.

Kit Contents

After you open the shipping container, check the items in the container against the items listed on the packing slip to make sure everything is there.

Your AHA-1540C/1542C kit should include the following items:

- One AHA-1540C/1542C host adapter in a protective anti-static bag
- One SCSI internal interface cable
- Complete documentation
- I/O Operating Environment Software (in some kits)

Electrostatic Discharge

The AHA-1540C/1542C is carefully designed to resist the effects of static electricity. However, unusual static discharges can damage or shorten the life of any electronic equipment. Please take the proper precautions when handling the adapter board.

CAUTION
Keep the host adapter in its conductive wrapping until you are ready to install it in your system. Be sure that you are properly grounded when you install the board. See Chapter Three for detailed instructions.

Adaptec Technical Support

The AHA-1540C/1542C has been specifically developed for easy installation and use. We hope that our manuals, and the on-screen instructions and help available in both the host adapter Configuration Software and Adaptec I/O Operating Environment Software installation programs, are complete and clear enough to meet your needs. If you need further help, please contact us.

The Adaptec Electronic Bulletin Board Service (BBS) provides information on software upgrades, new releases, technical advice, and other topics.

- You can reach the BBS at: (408) 945-7727, 1200/2400/9600 baud, 8 data bits, 1 stop bit, no parity.
- You can reach the Adaptec Technical Support Hot Line at 1-800-959-SCSI (7274), or (408) 945-2550.
- The Technical Support FAX number is (408) 262-2533.
- You can call (800) 934-2766 to request additional documentation for Adaptec products, or you can write to:

  Adaptec, Inc.
  Literature Department
  691 South Milpitas Blvd.
  Milpitas, CA 95035

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2

Getting Started

About This Chapter

Read this chapter to find out:

- What steps the experienced user needs to get the AHA-1540C/1542C and SCSI peripherals up and running quickly
- References to other chapters in this manual for more information on the installation steps

Installation Basics

This chapter is the starting point for those of you who are already familiar with personal computer option card installation. The directions here will help you to get the host adapter up and running quickly. If you are new to SCSI peripherals, or if you have limited experience installing option boards in your computer, follow the detailed instructions in Chapter Three, *Stepping Through Installation.*

- The instructions in this chapter lead you through installing the host adapter, preparing your SCSI peripheral devices, connecting the devices on a SCSI bus and powering-up. There is also basic information to help you decide if you need to load other software.

Where appropriate, you will be directed to subsequent chapters in this manual, or to other manuals, for specific instructions and additional explanations.

Installing your host adapter includes the following steps:

1. Installing the AHA-1540C/1542C adapter board in your computer
2. Setting the SCSI ID of each peripheral device, and enabling bus termination on the devices at the two ends of the bus
3. Verifying and, if necessary, resetting the port address switch and other switches on the host adapter
4. Installing the SCSI cable(s) and SCSI peripherals
5. Loading software, if necessary

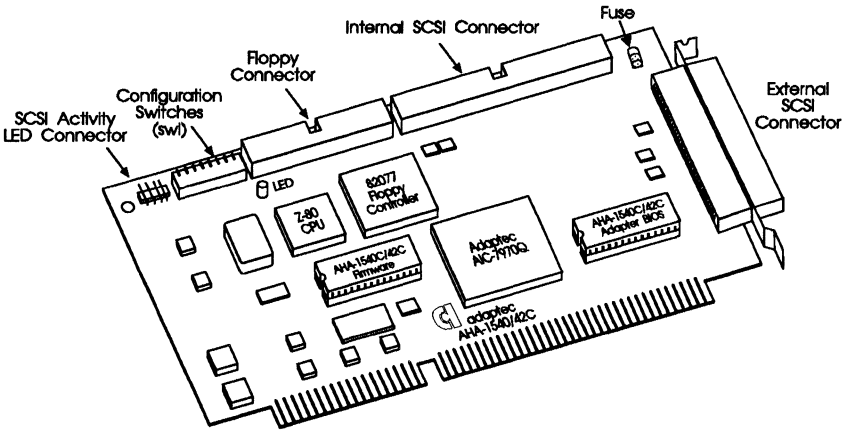

Figure 2-1. AHA-1540C/1542C

CAUTION

Turn OFF and disconnect power to the system and external equipment. Always refer to your PC documentation for instructions on opening the system cover and adding option boards.

AHA-1540C/1542C Board Installation

1 Turn OFF and disconnect power to the system and external equipment. Follow your ISA (or EISA) personal computer's instruction manual to remove the system cover and expose the expansion slots and external access covers.

2 Locate an unused expansion slot. Any standard ISA or EISA expansion slot will work. Remove the corresponding slot external access cover on the computer chassis.

3 Align and insert the ISA I/O bus connector on the bottom of the AHA-1540C/1542C into the chosen slot. Use the screw from the removed expansion slot cover to secure the AHA-1540C/1542C bracket to your ISA system chassis.

4 Do not replace the system cover or reconnect the power yet!

SCSI Bus Preparation

Follow the directions below to prepare your SCSI peripheral devices before installing and connecting them to the host adapter. Information is also provided here to help you verify and, if necessary, change switch settings on the host adapter board.

- See Chapter Three, *Stepping Through Installation* for more information about the SCSI bus and termination.

SCSI ID

Each device and the host adapter must be set to a *separate* SCSI ID, 0 through 7.

1 Your peripheral device SCSI IDs are usually set with jumpers or with a switch on the peripheral. Refer to the manufacturer's instructions to determine the ID of each device and how to change it.

2 SCSI ID 7 is the usual AHA-1540C/1542C host adapter setting. To determine and, if necessary, change the host adapter ID, finish this physical installation and power-up and refer to Chapter Four, *Using the Configuration Software.*

Termination

The *first* and *last* physical SCSI devices on the ends of the SCSI bus must have a set of resistors called *terminators.* All other SCSI devices must have terminators removed/disabled. Remember that the host adapter is also on the SCSI bus—it is only terminated when connected to the end of the bus.

Terminating SCSI Peripherals

Termination is usually set with jumpers or a switch on the peripheral. Check the hardware documentation to determine how to

able or disable SCSI bus termination on your SCSI peripheral device(s).

➤ 1 Install/enable termination on SCSI devices that you will connect to the *ends* of the SCSI bus (device-to-device cable chain).

2 Make sure that termination is disabled/disconnected on devices that will be connected between those at the ends of the SCSI bus.

Terminating the Host Adapter

The factory installed bus terminators on the AHA-1540C/1542C are enabled by default. The table below describes the three possible SCSI device and host adapter configurations. Host adapter termination should be adjusted to suit your configuration.

Table 2-1. When to Enable Host Adapter Termination

Devices Connected To Host Adapter:	Host Adapter (AHA) Termination
Internal devices only (AHA at end of cable):	On/Enabled
External devices only (AHA at end of cable):	On/Enabled
Internal and External Devices (AHA in between):	Off/Disabled

If you need to *disable* termination on the AHA-1540C/1542C:

➤ 1 Complete this physical installation section.

2 Start your system, and press Ctrl-A at the start-up banner. Follow the instructions in Chapter Four, *Using the Configuration Software* to disable host adapter SCSI termination.

Switch Versus Configuration Software Termination

You can also use the switch on the host adapter board to enable and disable host adapter termination. Enabling host adapter termination with the switch overrides the Configuration Software termination control; turning off (or opening) the switch returns control to your enable/disable choice in the Configuration Software:

- If you use the switch to enable termination, you must use the switch again if you decide to disable termination. We recommend using the software method to simplify the addition of peripherals later.

- A table identifying the switch block settings can be found in Appendix A, *Specifications* at the end of this User's Manual. The simple switch combinations are clearly set out in the table.

Host Adapter Port Address

You probably will not need to change the port address, unless you are installing more than one SCSI host adapter for more than one SCSI bus, or you know that the current host adapter port address is in conflict with other devices. The host adapter port address is set with the switch on the adapter board.

- Use the switch block table in Appendix A, *Specifications,* to read the port address setting. You may need to know this setting later if there are conflicts with other option cards. (Refer to Appendix B, *Troubleshooting.*)

Multiple Host Adapters

Select a different I/O *port address* and *BIOS address* for each host adapter installed. You must know the port address of each installed host adapter in order to adjust its settings with the Configuration Software.

Controlling Floppy Drives

The AHA-1542C host adapter floppy controller is enabled with the switch on the host adapter board (see **sw5** in the table in Appendix A).

- If your floppy diskette drives are already running under another controller, *disable* the AHA-1540C/1542C floppy controller.

- If you *want to use* the AHA-1542C floppy controller you must disable other installed floppy controllers; refer to your computer or floppy controller user documentation.

- **sw5** on the AHA-1540C *must* remain in the On/Closed position, even though there is no floppy controller on that host adapter.

Installing Peripherals

Internally Mounted SCSI Peripherals

➤ 1 Follow the manufacturer's instructions to install your internal SCSI peripherals in your computer chassis and connect to the system power supply.

2 Lay out your cables and find the *pin-1* element of each cable and peripheral connector. On *internal* cables, pin-1 is usually distinguished by a contrasting color on one edge of the ribbon cable. Make sure that pin-1 orientation is maintained throughout the bus.

3 Attach the SCSI ribbon cable to the host adapter and the peripherals, using the internal connector. Make sure to connect the *last* connector on the end of the cable to the *terminated* peripheral device. Connect the other end of the cable to the host adapter (see Figure 2-1).

External SCSI Peripherals

➤ 1 Use the supplied SCSI cables to connect the peripherals in a chain ending with the host adapter's external SCSI connector. Be sure the *terminated* device is at the *end* of the device chain.

2 Connect the SCSI peripheral devices to an electric power outlet.

- Be sure to follow manufacturer's precautions and instructions for voltage and wattage requirements.

Re-assembly and Startup

After you have completed installing and connecting the AHA-1540C/1542C host adapter and SCSI peripherals, follow your computer installation manual instructions to do the following:

1. Replace the system cover.

2. Make sure all power switches are in the OFF position and that system and external peripheral power cables are connected.

3. Turn ON peripheral and personal computer system power.

The host adapter BIOS sign-on message will appear on your computer display. The sign-on includes a listing of installed SCSI devices and should end with a BIOS status message.

- If you need to disable AHA-1540C/1542C adapter termination, press **Ctrl-A** before the startup banner disappears; the Configuration Software will start.

In most cases your personal computer, host adapter, and SCSI peripherals are now ready to use.

If your system displays error messages or will not boot from your SCSI drive, refer to Appendix B, *Troubleshooting.*

Adaptec EZ-SCSI DOS/Windows Drivers

If you are running MS-DOS or MS-DOS with Windows, Adaptec EZ-SCSI I/O Operating Environment Software makes driver installation easier than ever before.

Chapter Five, *I/O Operating Environment Software,* describes Adaptec EZ-SCSI and other Adaptec I/O Operating Environment Software.

When to Install Adaptec EZ-SCSI

Under MS-DOS 5.0 or higher, up to seven SCSI fixed disk drives can be connected to the AHA-1540C/1542C *without additional software*. (Older versions of DOS support up to two fixed disk drives.)

The host adapter treats removable media drives as fixed disk drives if you enable Treat Removable Disks Under BIOS as Fixed Disks in Advanced Configuration Options, and do not remove the media while your computer system power is on. (Refer to Chapter Four, *Using the Configuration Software.*

Software is required if you want to do the following:

- Treat removable media cartridges as removable while your computer is running
- Support more than two fixed disk drives under versions of DOS prior to MS-DOS 5.0, or more than eight drives under MS-DOS 5.0 or above.
- Use devices other than fixed disk drives such as SCSI tape, CD-ROM, scanners, etc.

Adaptec EZ-SCSI Quick Installation

The *Adaptec EZ-SCSI User's Manual* contains clear instructions on installing and using Adaptec EZ-SCSI with DOS and Windows. However, if you have determined that you want to use the drivers, and just want to get started, follow these steps:

➤ 1 Insert the Adaptec EZ-SCSI Installation diskette in a floppy diskette drive on your PC. Type the drive letter of that diskette drive (*A* or *B*) and press **Enter**.

2 Type install, and press **Enter**. Follow the on-screen instructions. In most cases you will simply press **Enter** to accept the defaults suggested by Adaptec EZ-SCSI.

3 When the *install* program is finished and you have been returned to the DOS prompt, reboot your PC so the new configuration can take effect. ❑

Stepping Through Installation

About This Chapter

Read this chapter to find out:

- How to install your AHA-1540C/1542C ISA (AT)-to-SCSI Host Adapter with different combinations of SCSI peripheral devices
- Which alternatives and options are available when you prepare the host adapter and SCSI peripheral devices
- How to connect the host adapter to the SCSI bus cable(s)
- What SCSI bus termination is, and how to terminate the bus in each combination of installed devices

3

Introduction

This chapter is primarily for those who are new to SCSI peripherals, or have never installed an option board in their computer system.

- Technically proficient users may find the brief installation procedure provided in Chapter Two, *Getting Started,* to be sufficient.

- You may begin installation in Chapter Two and switch to this chapter at any time if you need extra information.

- If you feel you need all the explanation you can get, begin the installation process here in Chapter Three, *Stepping Through Installation.*

The Host Adapter and the SCSI Bus

The Adaptec AHA-1540C/1542C acts on your computer's behalf as the *host* to your suite of SCSI peripherals. Each chain of SCSI peripheral devices and their host adapter work together, and are referred to as a *SCSI bus.*

Each AHA-1540C/1542C adapter that you install can act as host to up to seven peripheral devices (not including the adapter itself).

- In addition to seven SCSI devices, the AHA-1542C supports two non-SCSI floppy drives.

Up to 28 SCSI peripherals on four host adapters (seven per host adapter) can be installed in your computer, provided you have the available expansion slots.

- Adaptec's EZ-SCSI allows DOS/Windows users to access up to 26 drive letters (logical devices) including drives *A* and *B.* Refer to Chapter Five, *I/O Operating Environment Software.*

Figure 3-1 shows a sample SCSI bus on a single host adapter, including both internal and external devices:

- All the devices connected to a host adapter are on the same SCSI bus.
- If more than one host adapter is installed, each host adapter manages a separate SCSI bus.

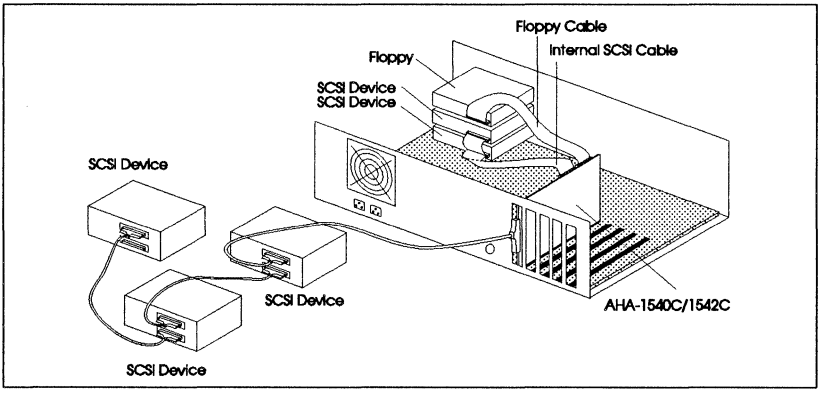

Figure 3-1. The SCSI Bus

Included in the example above are two internal devices, the host adapter, and three external devices. If an internal floppy drive (shown) is connected to the floppy connector on the host adapter, it is *not* a member of the SCSI bus; it is separately controlled by the AHA-1542C non-SCSI floppy controller.

Getting Ready

Some effort to keep things neat at this stage will help to keep things simple as you proceed. Follow these steps to prepare for installation:

➤ 1 Follow the host adapter unpacking instructions in Chapter One. Make sure that everything is present. Leave the host adapter in its protective envelope for now.

2 Unpack any other SCSI peripheral devices that you intend to install. Follow the manufacturer's instructions to unpack and inspect their kits. Locate each peripheral's manual or installation guide.

3 Arrange the host adapter and peripheral kits so that everything is accessible. Keep the various kits separate, and do not connect the SCSI cable(s) yet!

Preparing Your SCSI Devices

Before you physically install the host adapter and connect the peripheral SCSI devices, check the following settings and change them if necessary:

- SCSI ID
- Synchronous Transfer Negotiation and Parity Checking
- SCSI Bus Termination

SCSI IDs

Each device on the SCSI bus must be set to a separate SCSI ID: ID 0 through ID 7.

AHA-1540C/1542C SCSI ID

Your AHA-1540C/1542C SCSI ID is easily viewed and changed with the built-in Configuration Software program, described in Chapter Four.

- SCSI ID 7 is the usual AHA-1540C/1542C factory default setting.
- Many SCSI peripheral devices are set to an ID other than 7 by their manufacturers.

- If you are installing more than one SCSI host adapter, each host adapter may be set to the same SCSI ID (assuming they are on separate SCSI buses). Refer to *Installing Multiple Host Adapters* later in this chapter.

Peripheral Device SCSI IDs

Your other SCSI device SCSI IDs are usually set with jumpers or switches. Each SCSI peripheral device's user or installation manual should explain how to determine the current SCSI ID setting, and how to change it. Let the following points guide you in setting addresses.

- You only need to change a device's SCSI ID if it conflicts with the ID of another device or the host adapter.
- SCSI Addresses 0 and 1 are best reserved for SCSI fixed disk drives.
- The SCSI disk that will be used as your computer's boot device (drive *C*) is best set to SCSI ID 0.
- If you want to install a boot drive at an ID other than ID 0, complete this installation process, and then enable the Dynamically Scan SCSI Bus for BIOS Devices option in the Configuration Software program. Refer to Chapter Four, *Using the Configuration Software.*
- A second SCSI disk drive is best set to SCSI ID 1.
- SCSI Address 2 is often used for tape devices.

Synchronous Transfer Negotiation and Parity Checking

In addition to the SCSI ID setting, check your SCSI devices for the following options and set them accordingly:

- If a device supports Synchronous Transfer Negotiation and has jumpers related to this feature, you can usually leave them *unmodified.* Chapter Four, and Appendix C describe how the AHA-1540C/1542C BIOS deals with this feature and how you can optimize your system's use of it.

- Check the SCSI drive to ensure that Parity Checking is enabled.

  If parity checking on the device is disabled or not supported, disable parity checking on the host adapter with the Configuration Software (see Chapter Four, *Using the Configuration Software). (Do this after you have completed this installation process.)*

  We recommend enabling parity checking, but only if all SCSI devices on the bus support it. All modern SCSI devices support parity checking, only older SCSI devices may not.

SCSI Bus Termination

The first and last SCSI devices on the ends of the SCSI bus must have an installed set of resistors, called *terminators*. Devices installed in the middle of the bus (not on the ends) must have their terminators removed or disabled.

Termination?

When discussing termination, the SCSI bus can be compared to a children's jump-rope: if the *two* children holding the *ends* of the rope let go, none of the children can play! If any of the children in the *middle* of the jump rope try to hold the rope, none can play! Terminating the SCSI bus is like holding the ends of a jump rope:

- The *two* devices that are connected to the *ends* of the SCSI bus must have their bus terminators *enabled.*

- Devices connected to the *middle* of the SCSI bus must have their terminators *disabled.*

Internal versus External

There are two ways to connect devices to the AHA-1540C/1542C: *internal* and *external.*

- SCSI devices that are to be installed *inside* your computer are connected to the *internal* SCSI connector.

- SCSI devices that are to be installed *outside* your computer are connected to the *external* SCSI connector.

The following figures illustrate termination and internal/external device connection.

Internal and External Devices

When both internal and external SCSI devices are connected to the host adapter, the last external device and the last internal device should have their termination enabled, as shown in Figure 3-2.

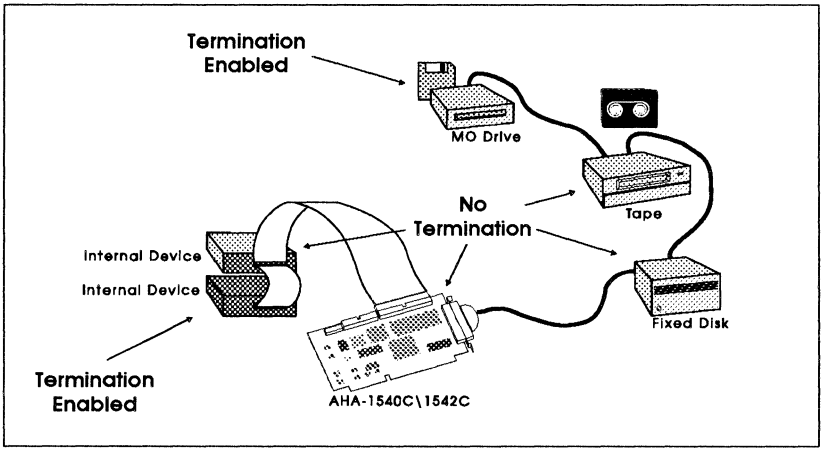

Figure 3-2. Internal and External Devices

Internal Devices Only

When only internal devices are connected to the host adapter, the last device on the ribbon cable and the host adapter should be terminated, as shown in Figure 3-3.

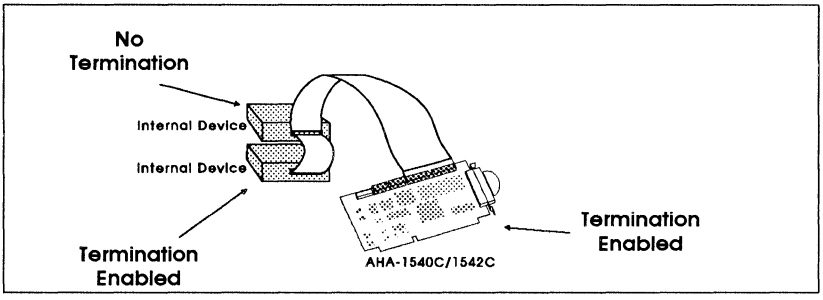

Figure 3-3. Internal Devices

External Devices Only

When only external devices are connected to the host adapter, both the last device on the external daisy-chain of devices and the host adapter itself should be terminated, as shown in Figure 3-4.

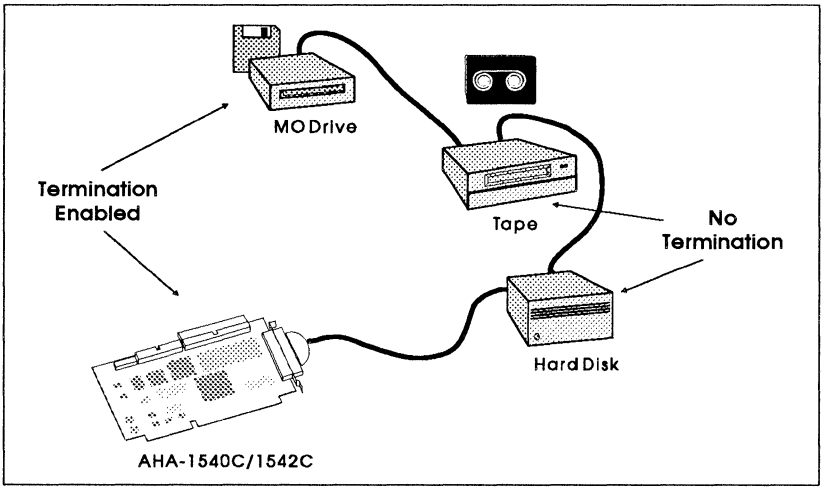

Figure 3-4. External Devices

Setting Termination on the AHA-1540C/1542C

Termination on the AHA-1540C/1542C is usually enabled by default at the factory. Changing termination on the host adapter is easy with the Configuration Software. If you need to change the setting, you can wait until you have started your computer, and

then follow the directions in Chapter Four, *Using the Configuration Software.*

If you need to disable termination on the AHA-1540C/1542C:

1. Complete this physical installation section.

2. Disable host adapter SCSI termination by following the instructions in Chapter Four.

   - Host adapter termination can also be set with the switch on the adapter board (Use **sw1** on the switch block).

   If the switch is used to enable termination on the board (On or Closed), the Configuration Software's Host Adapter SCSI Termination option will have no effect. In that case you must use the switch if you want to return termination to Configuration Software control. We recommend using the software method. For more information, refer to *Host Adapter SCSI Termination* in Chapter Four, and the table in Appendix A.

Setting Termination On Your SCSI Peripherals

1. Check the hardware documentation to determine how to enable or disable SCSI bus termination on your SCSI peripheral device(s).

2. Most SCSI devices use jumpers or a switch located close to their SCSI connector(s).

3. On some SCSI devices, you will have to physically remove resistor module(s). Be sure to follow directions and correctly identify the terminating resistors if this is the case.

Device Prep Check List

Be sure you have completed the following steps before you actually install the host adapter in your computer and connecting the SCSI peripheral devices. Refer to the previous sections for help if you need it.

1. Set each peripheral device on the bus to a separate SCSI ID.

2. Decide where you want your internal and external devices to connect to the SCSI bus, and enable termination on the two devices to be at the ends of the bus.

3. Enable Parity Checking on your peripheral devices, if they support them.

Your host adapter and SCSI peripherals are now ready for installation.

Installation

Installing the Host Adapter Board

1. Locate your computer's user or installation manual.

2. Follow the manufacturer's instructions to open the computer cover.

   - Make sure to follow all the precautions listed by the computer manufacturer. Make sure you have turned OFF and disconnected power.

3. Locate an empty ISA or EISA expansion slot. Make sure you do not use any special proprietary memory slot, short 8-bit slots, or other reserved slots.

4. Remove the expansion slot cover on the computer chassis, next to your selected slot.

   - Keep the slot cover screw; you will use it to secure the host adapter to your computer chassis.

5. After you have located a vacant expansion slot and removed the slot cover, reconnect the computer power cable. *Do not* turn on the computer power switch yet.

- Touch an area of exposed metal on the computer power supply to discharge static electricity *before* touching the host adapter.

- Minimize contact with chips and circuitry on the host adapter and your computer.

6 Carefully remove the AHA-1540C/1542C from the antistatic bag. Place the adapter board on top of the bag if you need to set it down.

7 Carefully grasp the adapter board by the bracket and board edge. Match the adapter edge connector with the computer expansion slot. The adapter board external connector should be inserted into the open slot cover on the computer chassis. Insert the adapter edge connector into the expansion slot.

8 If the host adapter slot bracket does not match your computer chassis you may need to use the alternate bracket supplied in the AHA-1540C/1542C kit. Compare the slot cover removed from your computer to the cover-bracket on the host adapter. Figure 3-5 shows both brackets.

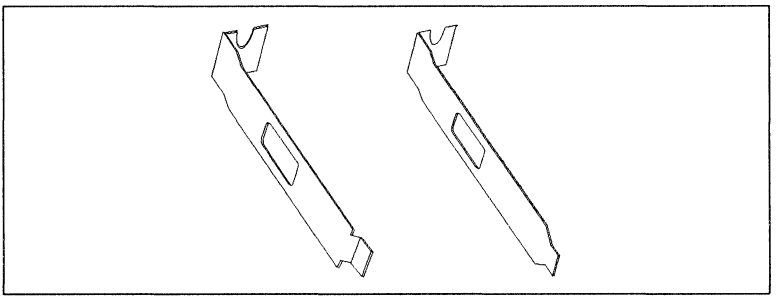

Figure 3-5. Alternate Adapter Brackets

If you need to use the alternate bracket:

a. Locate the alternate bracket in your AHA-1540C/1542C kit.

b. Use a small Phillips screwdriver to remove the bracket on the host adapter. Be careful not to lose the screws.

c. Use the screws to secure the alternate adapter slot bracket to the host adapter.

d. Insert the host adapter into the computer expansion slot.

9 Use the screw from the computer expansion slot cover to secure the host adapter to the computer chassis.

SCSI Bus Activity LED Connector

Most ISA-compatible systems have a disk drive activity light, usually an LED (Light Emitting Diode). If you connect your computer's LED cable to the host adapter, the light will indicate data transfer to and from the SCSI bus.

- If you connect your computer's LED to the host adapter the LED will no longer indicate non-SCSI disk activity. So you may not want to use this feature if you are running non-SCSI disk drives.

To use this feature:

➢ 1 Use your computer's documentation to locate and unplug the LED cable from the connector on the system board.

2 Connect the LED cable to the AHA-1540C/1542C SCSI Activity LED Connector.

- The LED connector is on the top corner of the host adapter, next to the configuration switch. (See Figure 2-1 in Chapter Two, *Getting Started).*

Installing Internal Devices

➢ 1 Follow the manufacturers instructions to install your internal SCSI peripherals in your computer chassis.

2 Connect the SCSI ribbon cable to the SCSI connector on each internal device.

- The cable element on one edge of the ribbon cable should be colored differently from all the others. This is the *pin-1* cable element.

  Note the orientation of the pin-1 element to the device SCSI connector. The pin-1 element must be oriented in the same way in all connections to other internal SCSI devices and the host adapter. The pin-1 location on the device and host adapter connectors is usually marked with and arrow-head or delta (▲) on the connector housing.

- Remember to connect the *last* connector on the *end* of the ribbon cable to the *terminated* SCSI internal device.

3 Connect the other end of the SCSI ribbon cable to the internal SCSI connector on the top of the AHA-1540C/1542C adapter board.

- Make sure that pin-1 orientation is the same as in the other SCSI device connections.

- Do not connect the ribbon cable to more than one SCSI host adapter. Each host adapter you install should have its own ribbon cable if attached to internal peripherals.

4 If you intend to use the floppy controller on the AHA-1542C, connect the floppy ribbon cable to the floppy connector on the top of the host adapter board.

5 Connect your internal SCSI peripheral devices to your computer system internal power cables.

- Refer to your computer and SCSI peripheral device manufacturer's installation instructions.

- If you are using the AHA-1542C floppy controller, make sure the floppy drive is connected to power.

Connecting External Devices

➤ 1 Use the SCSI cables obtained with your SCSI peripheral devices to connect your SCSI peripheral devices together in a

chain ending with the host adapter's external SCSI connector (see Figure 3-2 and Figure 3-4).

- Remember to connect the *terminated* device to the end of the cable daisy-chain.

- Remember that the SCSI bus may not have branches; each device may only connect to one other device or to the host adapter.

2. Connect your SCSI peripheral devices to a proper electric power outlet.

   - Be sure to follow manufacturer's precautions and instructions as to voltage and wattage requirements.

Pre-Boot Check List

Before applying power to your system, make sure you have completed the following steps:

1. The host adapter is firmly seated in the host computer's adapter slot.

2. External SCSI devices are properly installed and cabled.

3. Internal SCSI devices are connected to the host adapter with proper pin-1 orientation with the 50-pin SCSI ribbon cable.

And, as you checked before installing the host adapter:

4. Separate SCSI IDs are selected on all attached SCSI devices.

5. The correct operating modes (see *Synchronous Transfer Negotiation and Parity Checking* earlier in this chapter) are selected on all attached SCSI devices.

6. Terminators are installed/enabled or removed/disabled on the drives and host adapter as required.

System Startup

New SCSI Drives/No Existing Boot Drive

To bring up the system for the first time after installing the host adapter:

1. Insert a bootable System diskette in drive *A* and close the door.
2. Turn on the system.
   - After the system initialization and power-up diagnostics have completed, system error messages, such as **System Configuration Changed**, **Run Setup** and prompts on how to continue may be displayed.
   - After you have followed the instructions displayed on the screen, the system will boot from the floppy diskette drive.
3. Run your computer system Setup program.
4. Make sure that both (*C* and *D*) disk or Fixed Disk Drive fields in your computer's Setup program are set to **Not Installed**.
   - Remember that a SCSI drive can only be used as a boot device if both non-SCSI disks are listed as **Not Installed** here in your computer's Setup program.
5. When the setup parameters have been defined, follow the directions on the screen to restart the system. (Leave the bootable system diskette in drive *A*.)

New SCSI Drives/Existing Boot Drive

If you are upgrading a computer system that already boots from an existing drive:

1. Turn on your computer system.

- You do not need to start the system with a bootable floppy diskette.

2 System error messages, such as **System Configuration Changed**, **Run Setup** and prompts on how to continue, may be displayed.

- If no system setup error messages are displayed, skip the following steps and proceed to *Drive Preparation.*

3 Follow the on-screen instructions to run your computer system Setup program:

a. If your system boots from an existing SCSI drive: *both* disk fields must be set to **Not Installed.**

b. If your system boots from a non-SCSI drive: make sure that the second Hard Disk or Fixed Disk Drive field (*D*) in your computer's Setup program is set to **Not Installed.**

4 When the Setup parameters have been defined, follow the directions on the screen to restart the system.

Drive Preparation

Unless your new drives have already been prepared for your operating system, you will not be able to access them yet.

Low-Level Format

SCSI Disk Utilities, in Chapter Four, explains how to access the Configuration Software's built-in low-level *format* utility. Most SCSI drives are shipped from the factory with a complete low-level format, and do not need to be low-level formatted again.

- If you are installing a new factory-formatted fixed disk drive, proceed to the *Partitioning* section; your new drive does not need to be low-level formatted.

If the drive you are using was *previously* low-level formatted with a non-Adaptec host adapter or disk controller:

- Reformat the drive using the Adaptec *format* utility accessible with the Configuration Software.

Removable fixed-disk drive cartridges can also be prepared with the Adaptec *format* utility mentioned above.

Partitioning

If you are running your SCSI peripherals under DOS, your drives must be partitioned after they have been low-level formatted. Partitioning identifies portions of your drives as logical units to your operating system; i.e. the *drive letters* are set here.

- Run the DOS *fdisk* program to partition the disk for the number of cylinders to be used by DOS.

If you are using an operating system other than DOS, refer to that operating system's documentation for instructions on partitioning and high-level formatting as required.

High-Level (DOS) Format

After the DOS partition has been created and activated, the drive is ready for a DOS high-level *format*.

- Refer to the DOS manual for the DOS *format* options. If the system is going to boot from a SCSI disk, it is usually easiest to transfer the hidden system files to that disk during the DOS *format* (using the **/s** option).

The AHA-1540C/1542C BIOS fully supports the extended partitioning capabilities of DOS 3.3 and above for up to two drives, and DOS 5.0 and above for up to seven drives per host adapter.

CAUTION

If the drive you are using was previously formatted or partitioned with a *non-Adaptec* host adapter or disk controller, a DOS partition may already exist. If such a partition does exist, the drive should be low-level formatted with the Adaptec *format* utility accessible with the Configuration Software, and the partition should be recreated with DOS *fdisk*. If this precaution is not followed, erratic system operation may result.

Using Drives

The host adapter and SCSI disks are now ready for normal operation. Peripheral devices such as SCSI tape, DAT, CD-ROM, and others require I/O Operating Environment Software driver.

When you start your system, the host adapter's BIOS performs the necessary SCSI bus initialization procedures:

- Your system will boot from a floppy drive if a bootable floppy diskette is inserted.
- If no floppy is inserted, the system tries to boot from the drive chosen as drive *C*, whether the drive is a non-SCSI disk or a SCSI disk.

If **two non-SCSI** drives are installed, they are the *only* disk drives accessible from the operating system unless:

- You enable BIOS Support for More than 2 Drives MS-DOS(R) 5.0 and above in the Configuration Software.

  or:

- You install EZ-SCSI I/O Operating Environment Software.

If **one non-SCSI disk** drive is installed, the AHA-1540C/1542C BIOS allows DOS to access the non-SCSI drive as *C*, and the SCSI drives as the next available drive letters.

If **only SCSI disk** drives are installed, AHA-1540C/1542C BIOS

allows DOS to access the first SCSI drive encountered as drive *C*, the next as the next available drive letters.

Chapters Four and Five describe how to use the host adapter BIOS and install I/O Operating Environment driver software if necessary.

> Note
> The term *non-SCSI* disk refers to the disks attached to the system by a disk controller on the ISA bus, (e.g., IDE and ESDI drives). These non-SCSI disks can be set to the *installed* or *not installed* state by the Setup program supplied with each ISA host computer. The setup program allows the user to select the number of non-SCSI disks that are recognized by the system regardless of whether or not they are physically installed.

Installing Multiple Host Adapters

If you are installing more than one host adapter, follow the procedures detailed above in this chapter, and keep the following points in mind:

- Each host adapter must be set to a separate BIOS and I/O port address, set with the switch on the AHA-1540C/1542C, and with jumpers or switches on other host adapters.
- Only one drive in the system should be prepared to use as the boot device.
- Each AHA-1540C/1542C hosts its own SCSI bus.

4

Using the Configuration Software

About This Chapter

Read this chapter to find out:

- How the Configuration Software program works and what tools it provides for you
- How to make the best decisions when you use the Configuration Software to customize your host adapter and SCSI bus

Configuring the Host Adapter

Your AHA-1540C/1542C host adapter includes a built-in, menu-driven program which allows you to change almost all of the option settings of the host adapter without opening the case of your computer or handling the board.

This section describes how to use the built-in Configuration Software to verify or modify host adapter configuration settings, perform host adapter diagnostics, and perform SCSI low-level formatting.

All host adapter options are pre-set at the factory to ensure proper system operation with the majority of ISA (AT compatible) and EISA bus systems. This information is provided to help you prepare advanced device combinations, and configure the system properly if other option boards present conflicts.

You may never need to reconfigure the host adapter. If you do, however, the following instructions tell you how to access and use the program.

When to Use the Configuration Software

Use the Configuration Software if you need to:

- Check and/or change host adapter settings that may conflict with those of other devices (SCSI ID and IRQ or DMA channels)
- Change software controlled host adapter options
- Install new SCSI devices; you may need to low-level format their media, or change host adapter termination
- Run host adapter diagnostics

Compatibility with Earlier AHA-1540/1542 Host Adapters

The AHA-1540C/1542C host adapter is fully compatible with the AHA-1540B/1542B host adapters. All features of both adapters can function simultaneously on one computer.

- You can use the SCSI Disk Utilities in the AHA-1540C/1542C Configuration Software to prepare media controlled by one of the older adapters.

- Your system's DMA memory reliability with these earlier adapters can be tested with the AHA-1540C/1542C Configuration Software Host Adapter Diagnostics.

AHA-1540B/1542B host adapter configuration settings are determined and set with the jumpers on those host adapter boards.

- Configure/View Host Adapter Settings in the AHA-1540C/1542C Configuration Software cannot be used to configure the AHA-1540B/1542B.

- Refer to the *AHA-1540B/1542B User's Manual* for information on determining settings on that host adapter.

Running the Configuration Software

There are two ways to start the Configuration Software:

- Press **Ctrl+A** when prompted at system start-up. (You must press the **Ctrl** key first, and then, while holding the **Ctrl** key, press the **A** key).

- Using the DOS *debug* program

Starting from the Sign-on Banner

The AHA-1540C/1542C BIOS displays a sign-on banner message similar to the following at system reset or boot-up:

```
Adaptec AHA-1540C/1542C BIOS v1.00
(c) 1992 Adaptec, Inc. All Rights Reserved.

<<<  Press <Ctrl><A> for SCSI Utility!  >>>

Target #0 -   QUANTUM   LP05S 91010940      - Drive C: (80h)
Target #2 -   ARCHIVE   VIPER 150  Z124     - Drive D: (81h)
Target #3 -   TOSHIBA   CD-ROM XM-3301T
Target #4 -   IOMEGA    BETA9               - Drive 82h

BIOS Installed Successfully!
```

Figure 4-1. Adapter BIOS Sign-on Banner

- Press **Ctrl+A** when you see a sign-on banner similar to the one above. The peripheral target devices listed above are examples. The AHA-1540C/1542C scans the SCSI bus for the devices you have installed and lists them here.

Starting from DOS Debug

For most users, the **Ctrl+A** start-up method is the easy choice. The Configuration Software may also be started from the DOS *debug* program. If you do use the *debug* method, make sure there are no TSR programs running.

To start the Configuration Software from Debug:

1. At the DOS c:\ prompt, type debug, and press **Enter.**

2. Now enter -g=*xxxx*:6

   where *xxxx*= the host adapter BIOS address (in Hex); -g=DC00:6 is a typical example.

   - The host adapter BIOS address is set with the switch on the host adapter board. Refer to the table in Appendix A. You *do not* normally need to change this setting.

Selection Keys

- Use the arrow (↑↓) keys to make selections.

- Press the **Enter** key to access or accept your selections.

- Pressing **Esc** causes a previous menu to appear; if you have made a selection and have changed any configuration values you will be asked if you want to save the changes.

Color/Monochrome Display Option

Pressing **F5** from the first screen toggles the Configuration Software display between color and monochrome. Video interfaces currently supported include: VGA, SVGA, EGA, CGA, MDA, and MCGA.

Host Adapter Selection

The **Host Adapter Port Address** screen is the first screen to appear in the Configuration Software.

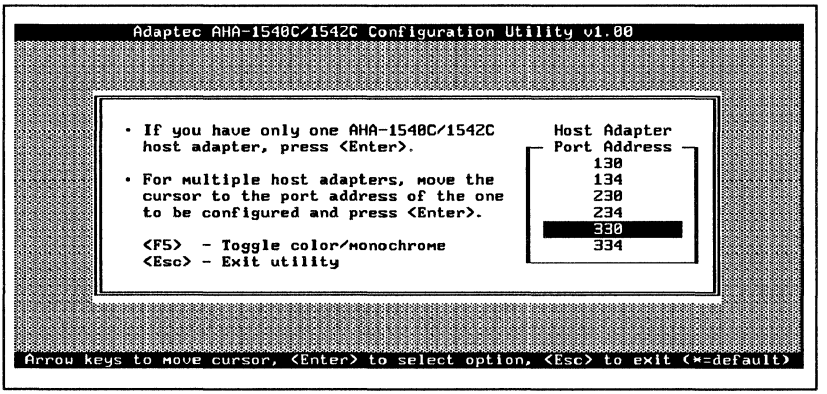

Figure 4-2. Host Adapter Port Address

If you have only one host adapter installed:

- The port address of that adapter is already highlighted. Press **Enter**.

If you have multiple host adapters:

1. Select the port address of the adapter to be reconfigured. You may reconfigure any installed AHA-1540C/1542C.

2 Press **Enter** to select the address and automatically move to the Main Menu screen.

> Note
> Remember that the port address is set physically on the host adapter board. (Refer to *SCSI Bus Preparation* in Chapter Two.)

Main Menu Options

After you have selected the host adapter port address, the following **Options** menu appears:

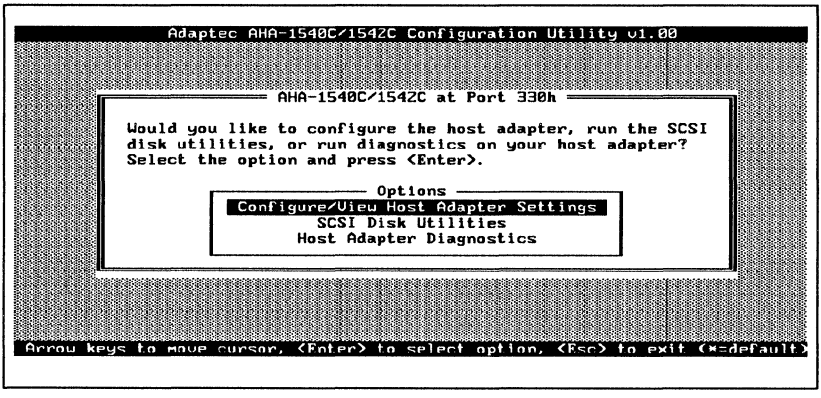

Figure 4-3. Main Menu

- Configure/View Host Adapter Settings gives you access to the software configurable options.

- SCSI Disk Utilities scans the SCSI bus, and lists the installed devices recognized by the host adapter. From here you can access the Adaptec SCSI drive media *format* and *verify* utilities. You can use these utilities for disk drives attached to AHA-1540B/1542B and AHA-1540C/1542C host adapters.

- Host Adapter Diagnostics runs a dynamic memory test between the host adapter and your computer system memory.

Configure/View Host Adapter Settings

These menu options are the ones that most often require adjustment in reconciling I/O conflicts and setting host adapter termination. The advanced features menus are also accessed here. Host adapter BIOS Base Address is displayed at the bottom left-hand corner of the screen.

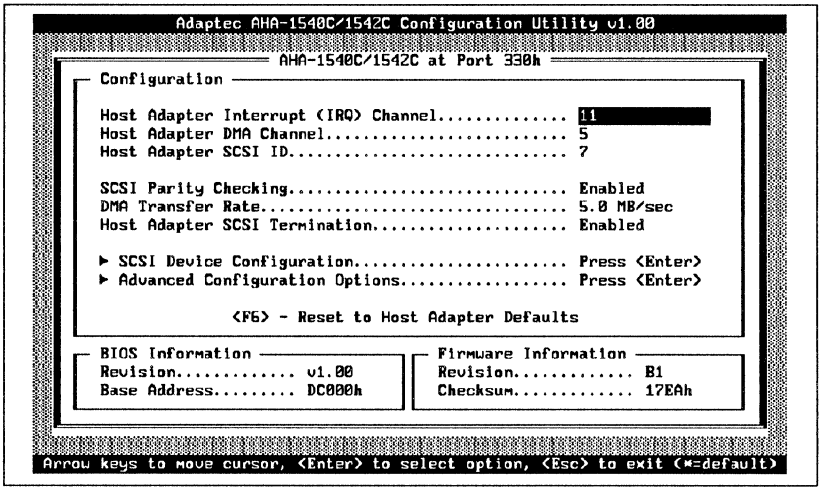

Figure 4-4. Configure/View Host Adapter Settings

Restoring Factory Settings

- Pressing **F6** while accessing the Configure/View Host Adapter Settings resets the AHA-1540C/1542C host adapter to the original settings. (The default settings are read in from the host adapter).

- Adaptec factory default settings are marked with an asterisk (*) throughout the selection sub-menus.

IRQ, DMA, and SCSI ID

The first three selections on this screen allow you to check and, if necessary, modify the AHA-1540C/1542C settings so they will not conflict with those of other devices.

- The default settings are sufficient for most installations with a single host adapter and multiple SCSI peripherals. Most PC peripheral devices use lower IRQ and DMA channels and do not conflict with the host adapter.

- Sound Effects, Video, and LAN (Local Area Network) adapters sometimes use the same settings as the AHA-1540C/1542C. If there are conflicts, change host adapter settings here in the Configuration Software, or change those settings on the other peripheral adapter card. (Refer to your LAN card user documentation.)

IRQ and DMA Channel Selection

Host adapters and other option cards in your computer may not share IRQ and DMA channel settings.

- Note that some operating systems may not run properly if you assign IRQ 9 to the host adapter.

- Some IDE and ESDI controllers use IRQ 14. Refer to the hardware documentation to determine their IRQ settings. If you cannot determine what IRQ channel they use, avoid setting the host adapter to IRQ 14.

SCSI ID Selection

All SCSI devices on one SCSI bus, including the host adapter, must be set to separate SCSI IDs.

- A host adapter controlling a SCSI *boot drive* is best left at the normal factory default SCSI ID 7.

SCSI boot drives are best set to SCSI ID 0. SCSI IDs for SCSI drives are set on the drive itself with jumpers or switches (refer to

the manufacturer's documentation). If you do need to boot from a SCSI drive at another ID, refer to *SCSI Device Configuration and Advanced Configuration* in this chapter for instructions.

SCSI Parity Checking

The AHA-1540C/1542C uses a ninth data (parity) bit on the SCSI bus to verify the data from your SCSI devices. The SCSI Parity Checking option is generally enabled by default. The host adapter employs Parity Checking with no loss of overall performance.

- Make sure Parity Checking is enabled on your SCSI devices as well as on the host adapter to take advantage of this reliability feature. (Refer to the manufacturer's documentation for instructions on enabling this SCSI feature on your SCSI peripheral.)

- A few older devices do not support Parity Checking. If one of your SCSI devices does not support Parity Checking, disable it on the host adapter.

DMA Transfer Rate

The host adapter uses DMA bus mastering to manage bursts of data input and output between the SCSI bus and your system. All of todays true IBM® compatibles support input and output at up to 5 MByte/sec (Megabytes per second).

The AHA-1540C/1542C supports a DMA transfer rate of up to 10 MByte/sec, making the host adapter compatible with the fastest systems available.

- The 5 MByte/sec default rate is compatible with 100% IBM compatible computers.

- If your computer system board supports a faster DMA transfer rate, you may try a higher setting here in the the Configuration Software.

> Note
> If your computer system documentation does not clearly state that your system board supports higher DMA transfer rates, it is best to leave the 5 MByte/sec default unchanged. Running the host adapter faster than your computer can cause intermittent errors. Always back up your data before increasing the transfer rate.

Host Adapter SCSI Termination

If you are expanding your SCSI bus by installing external (or internal) peripherals for the first time, the Configuration Software makes it easy to change host adapter termination. The Host Adapter SCSI Termination setting in the Configuration Software is generally enabled at the factory (the default setting).

Host Adapter SCSI Termination can be set here in the Configuration Software, or with the switch on the host adapter board:

- The switch on the host adapter board overrides the Configuration Software setting. If Host Adapter Termination is enabled with the switch on the adapter board, you cannot use the Configuration Software to disable termination.

- Host adapter termination can be controlled from the Configuration Software if Host Adapter Termination is not enabled with the switch on the adapter board.

Refer to Appendix A, *Specifications* for more information on switch settings.

Termination and the SCSI cabling bus are explained in Chapter Three, *Stepping Through Installation.*

SCSI Device Configuration and Advanced Configuration

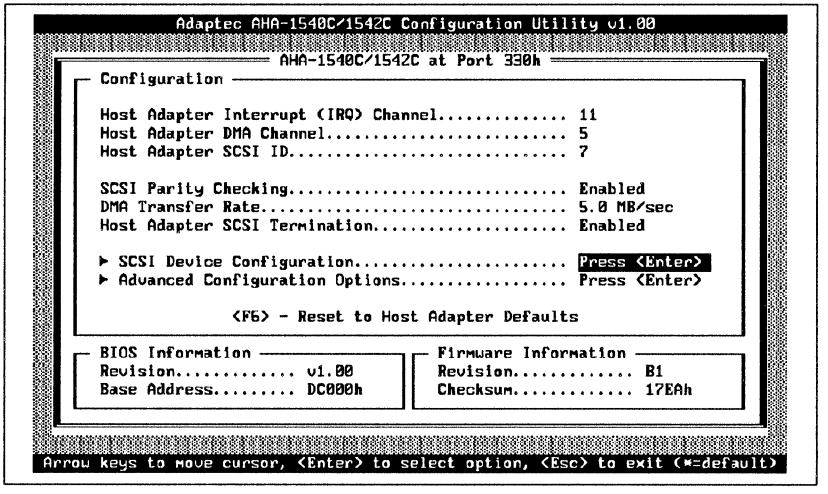

Figure 4-5. Accessing SCSI Device Configuration

Note the SCSI Device Configuration and Advanced Configuration Options selections in Figure 4-5. These selections access a number of options for advanced applications. You can use these options to achieve productive SCSI device configurations that minimize the need to rely on driver programs and physical switching and jumpering. These configuration tools allow you to:

- Boot from a SCSI drive at a SCSI ID other than 0 or 1.
- Select and apply SCSI device control options previously available through driver installations and adjusting jumpers on your host adapter and on the peripheral devices.

The *SCSI Device Configuration* and *Advanced Configuration* sections, following, contain explanations of these options.

SCSI Device Configuration

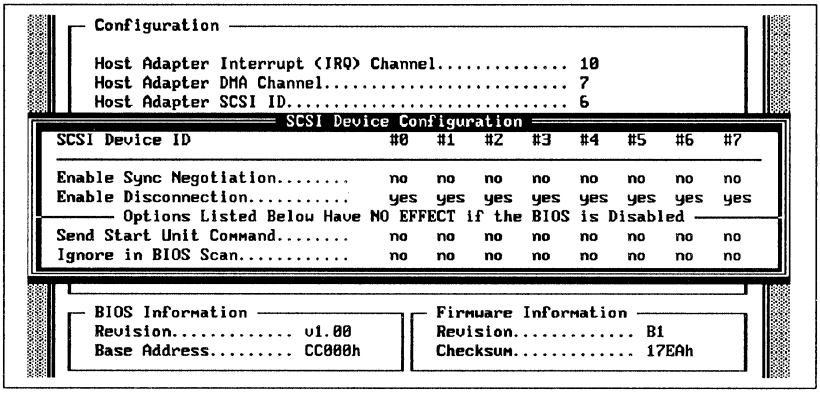

Figure 4-6. SCSI Device Configuration

Figure 4-6 shows the SCSI Device Configuration default settings.

Enable Sync Negotiation

Devices on the SCSI bus (including the host adapter) communicate intelligently with each other. (The host adapter acts as your computer's representative in these exchanges of information.)

Before data is transmitted across the bus, the sending (initiating) and receiving (target) devices negotiate and agree on how long each piece of data will be, and how many pieces will be sent at a time—that is, they agree on how fast to *talk*.

Devices that support synchronous negotiation can maintain a much higher *conversation* rate than devices that do not support this feature.

- Sync Negotiation is disabled by default because some older devices cannot respond and are disabled by an initiating device's request for this type of data transfer. (Most of today's SCSI disk drives do support Sync Negotiation.) Refer to Appendix C, *Optimizing Performance,* for instructions on the best way to enable this feature.

- If the host adapter's synchronous negotiation is enabled, the host adapter will initiate all information exchanges with a request for this fast mode of transfer.

- If the host adapter's sync negotiation feature is disabled, the host adapter will automatically go into synchronous mode if it receives a request from one of your SCSI peripherals. The host adapter can then respond to a request for fast transfer, and still maintain a dialog with slower devices.

Enable Disconnection

This feature allows SCSI devices to work while *off* the bus. A back-up tape disconnecting during rewind is a typical example. The default setting of Enable Disconnection is Yes. It is best to leave Enable Disconnection in the Yes setting.

You may change Enable Disconnection to No when:

- There are only two (2) devices on the SCSI bus: the host adapter and one other device.

> Note
> Disconnection should not be disabled in multitasking environments such as Windows, OS/2, or Unix. *Timeout* errors could occur.

Send Start Unit Command

The default setting of Send Start Unit Command is **No**. When this feature is enabled (Yes), the host adapter BIOS allows compatible disk drives on the bus to rest with their power off, until they receive a start unit command from the host adapter. This feature has no effect if the host adapter BIOS is disabled.

Your computer's power supply may strain under the load of several drives spinning-up at the same time. This feature reduces the load on your computer's power supply at system start-up.

- Your SCSI drive may require switch or jumper adjustment to enable this feature. See the manufacturers documentation.

- Some older SCSI drives do not support this feature. In most cases these drives will start running at system power-up, and simply ignore the start unit command.

  These older drives may not respond properly if the start unit command is received. If you want to take advantage of this feature, try enabling the send start unit command one drive at a time. See Appendix C, *Optimizing Performance.*

Ignore in BIOS Scan

The AHA-1540C/1542C BIOS has the ability to boot your system from drives at any SCSI ID. Earlier host adapters required that the boot device be at SCSI ID 0.

This options allows the user to enable or disable, on a per target device basis, which devices the host adapter should attempt to use as a boot device, and which should be ignored. Devices not ignored are treated as interrupt 13h boot devices as described in Advanced Configuration Options under System Boot (INT 19h) Controlled by Host Adapter BIOS later in this chapter.

To use this feature:

- Your host adapter BIOS must be enabled.

- Dynamically Scan SCSI Bus for BIOS devices must be enabled (see the *Advanced Configuration Options* section).

> Note
> The Ignore in BIOS Scan option only appears if Dynamically Scan SCSI Bus for BIOS Devices is enabled in Advanced Configuration Options.

Advanced Configuration Options

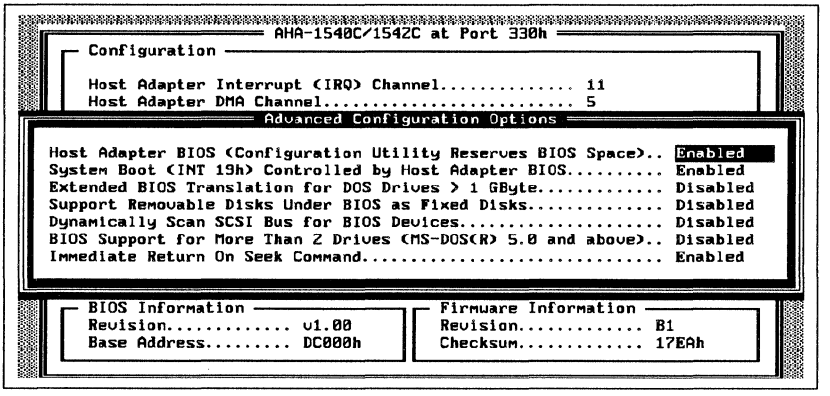

Figure 4-7. Advanced Configuration Options

Advanced Configuration Options gives you access to the powerful host adapter BIOS control features of the AHA-1540C/1542C.

As with most of the options accessible through the Configuration Software, the Adaptec default settings are sufficient for most SCSI installations.

Use Advanced Configuration Options if you want to:

- Disable the host adapter BIOS, and allow I/O Operating Environment Software drivers to control SCSI peripherals
- Enable BIOS support for drives larger than one GByte
- Treat removable disk drives as fixed disks *without* having to install I/O Operating Environment Software drivers
- Boot from a drive *not* set to SCSI ID 0
- Support more than two drives without having to install I/O Operating Environment Software drivers under MS-DOS 5.0 and above

> Note
> To protect you from data loss, the host adapter will suspend operation if it detects old software while advanced features are enabled. Certain advanced features are incompatible with early SCSI driver software versions. Refer to Chapter Five, *I/O Operating Environment Software.*

Host Adapter BIOS (Configuration Utility Reserves BIOS Space)

This option is enabled by default in the Configuration Software, *and* on the adapter board configuration switch.

Enabling the host adapter BIOS allows you to take advantage of the AHA-1540C/1542C SCSI bus control features. The host adapter BIOS can manage up to 7 SCSI drives under DOS 5.0 and above. Other operating systems, such as Novell NetWare, OS/2, and UNIX can access more. Refer to Chapter Five, *I/O Operating Environment Software.*

When to Disable the Host Adapter BIOS

If you are only running devices that require I/O Operating Environment Software drivers, you can disable the host adapter BIOS and allow the drivers to control the host adapter and bus. The host adapter BIOS can also be disabled with the *switch* on the host adapter.

Let the following points guide you in deciding when and how to disable the host adapter BIOS:

- Disable the host adapter BIOS if you are not setting up your system boot from a SCSI drive.

  For example, you do not need BIOS features if you are using a SCSI tape and/or CD-ROM drive with no other SCSI devices.

- Disable the BIOS with the *switch* if you do not need to use the Configuration Software on the host adapter. You will need to re-enable the BIOS to change host adapter configuration:

You can save up to 60 seconds whenever you boot your system. Also, using the switch will return 16 KByte of BIOS memory space to your computer.

Refer to *Switch Block Settings* in Appendix A for switch setting information. Also refer to Chapter Five, and Appendix C, *Optimizing Performance.*

- Disable the host adapter BIOS in the Configuration Software if you do not need the BIOS to control your SCSI devices, but you want to retain access to the Configuration Software at system start-up.

Note that you will have to install I/O Operating Environment drivers to access drives if the host adapter BIOS is disabled.

System Boot (INT 19h) Controlled by Host Adapter BIOS

This option is Enabled by default.

When you reset (restart and boot-up) your system, some older computers send a command to system interrupt 19h, which assumes that the boot device will be an IDE type floppy or fixed disk drive. This effectively disables any non-IDE drives as boot devices. The host adapter BIOS intercepts that device-dependent message and routes it to interrupt 13h, the more up-to-date non-device-dependent way to order a system reset.

The vast majority of todays PCs use interrupt 19h for system reset, so enabling or disabling this option will not effect most computers.

- You may disable System Boot (INT 19h) Controlled by Host Adapter BIOS if your system uses interrupt 13h for system resets. Refer to Appendix B, *Troubleshooting*, if you are having trouble booting from your SCSI drive.

- As long as this option is enabled, the host adapter will detect your system's reset interrupt and will manage booting.

Extended BIOS Translation for DOS Drives > 1 GByte

This option is Disabled by default.

Access Drives Of Up To 8 GByte Capacity

All versions of DOS are limited to 1024 *cylinders* of capacity per drive. Standard SCSI host adapter translation schemes, emulating 64 heads and 32 sectors/track, provide a maximum accessible capacity of only 1 MByte per cylinder (1 GByte per drive).

Enabling this option causes the Adaptec 255 heads 63 sectors/track translation scheme to enlarge the effective *size of each cylinder* to 8 MByte, allowing drives of up to 8 GByte capacity (2 GByte/partition) to be supported under MS-DOS 5.0.

- With this option Disabled, DOS 5.0 cannot access the full capacity of drives of more than 1 GByte.
- Drives smaller than 1 GByte are not affected by this option.

For Disk Drives Controlled By The Host Adapter BIOS Only

The Configuration Software's Extended BIOS Translation works only on drives controlled by the host adapter BIOS.

- Host adapter BIOS must be enabled.
- If there are more than two disk drives on the bus and you want to use this option, BIOS Support For More Than Two Drives must be enabled. Refer to the section on this option following in this chapter.
- If you want to access a large capacity drive that is not under host adapter BIOS control, load the Adaptec EZ-SCSI drivers described in Chapter Five, *I/O Operating Environment Software.*

Use With DOS 5.0 Only

This option is for use with DOS 5.0 (or later) only. This option is disabled by default because operating systems such as Novell NetWare, OS/2, and UNIX support greater than 1024 cylinders, and drives of far greater capacity.

CAUTION
Back up the data on your large capacity drive before changing the data translation scheme with this option. All data will be lost!

Your Drive Must Be Repartitioned After Enabling This Option!

After enabling this option, the drive must be re-partitioned and high-level formatted with the DOS *fdisk* and *format* utilities.

You must select a partition size that is divisible by 8, since the cylinder size is now 8 MBytes. If you request a partition size that cannot be divided by eight, *fdisk* will round up to the nearest whole multiple of 8 MBytes.

- Do not use this option with drives that contain two or more partitions formatted with different operating systems.

Running Multiple Operating Systems on One Drive

OS/2 2.0 supports multiple DOS and OS/2 partitions on one drive with Extended BIOS Translation.

If you are going to create multiple partitions formatted with different operating systems, use standard translation (this option Disabled). Make sure that the sum of any DOS partition is less than 1 GByte.

Support Removable Disks under DOS as Fixed Disks

This option is Disabled by default.

This host adapter BIOS control option allows you to use removable-media disk drives, such as the Iomega® Bernoulli® , and Syquest® drives, without installing additional software drivers.

- With this option Enabled, the host adapter will treat the removable-media disk drive as if it is a non-removable media drive.

> Note
> You must not remove removable-disk cartridges from the drive while your computer is running when using this option.

- If you want the ability to remove disk-media cartridges from their drives while your computer is running, you must install additional software. Refer to Chapter Five, *I/O Operating Environment Software.*

Using Removable Boot Disk Cartridges as a Security Lock

Removable disks configured as boot devices can be used to lock your system when they are removed. To do this:

1. Format a removable-disk cartridge and partition it to be a system boot device.
2. Make sure no other boot device is installed on your system.
3. Insert the boot cartridge before powering-up the system and remove it after you shut it down.
4. Your system then will have no boot device when the cartridge is removed, and cannot be used without it.

Dynamically Scan SCSI Bus for BIOS Devices

This option is Disabled by default.

When this option is Enabled, the Ignore In BIOS Scan option appears on the **SCSI Device Configuration** screen.

- Enable this option to access and boot from disk drives set to any SCSI ID, from 0 to 7.
- When this option is Disabled, SCSI boot drives must be set to SCSI ID 0.

BIOS Support for More Than 2 Drives (MS-DOS(R) 5.0 and above)

This option is Disabled by default.

If you are running DOS 5.0 or above, enabling this option causes the host adapter BIOS to recognize and control more than two disk drives, without installing driver software.

- Enable this option to access up to seven SCSI drives per host adapter, eight total, under MS-DOS 5.0 or above without additional drivers.

- For earlier MS-DOS versions, leave this option Disabled and refer to Chapter Five for instructions.

Immediate Return on Seek Command

This option is Enabled by default.

Ordinary computer benchmark testing programs are not yet valid for testing SCSI drives. When used, these programs cause invalid seek-time test results on computers with SCSI subsystems, such as the AHA-1540C/1542C and your SCSI peripherals.

- Leave this option Enabled to prevent invalid benchmark test results.

- Testing laboratories may want to Disable this option when using specialized testing tools that deliberately subject drive-heads to unusual stresses.

SCSI Disk Utilities

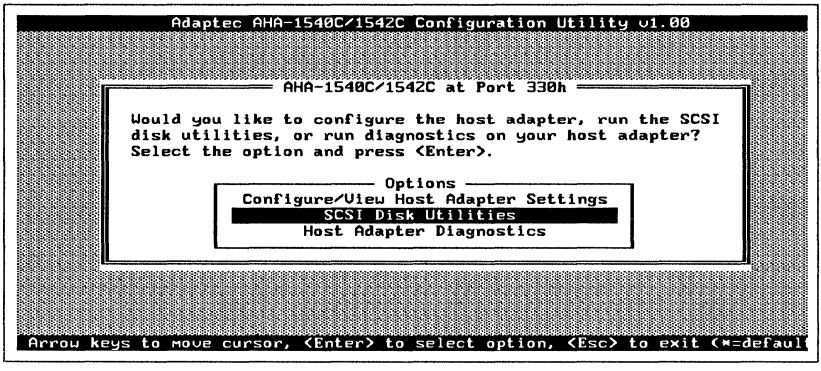

Figure 4-8. Accessing SCSI Disk Utilities

- Select **SCSI Disk Utilities** from the main Options menu.

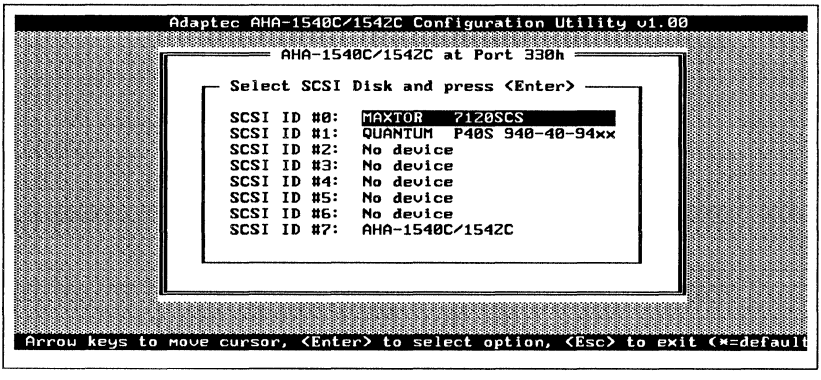

Figure 4-9. SCSI Disk Utilities Device Selection

- SCSI ID 0 through SCSI ID 7 are then displayed, showing the SCSI devices installed at each address and including your host adapter and non-disk devices.

- Selecting one of the installed devices causes the utilities sub-menu to appear.

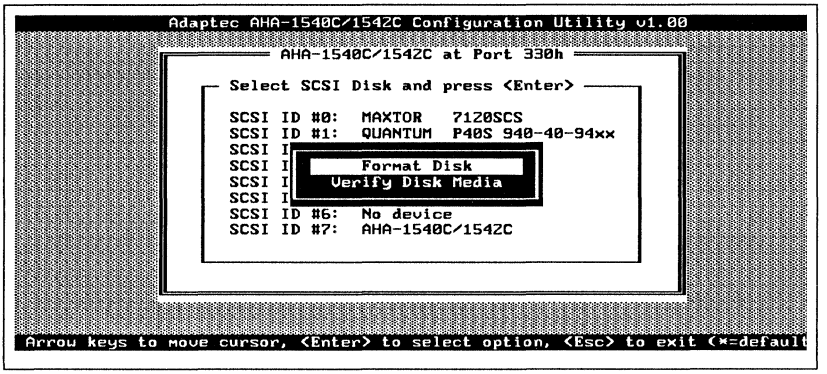

Figure 4-10. Utility Selection

Format Disk

Format Disk accesses the Adaptec SCSI Low-Level format utility.

Your fixed disk media must be low-level formatted before you can use your operating system's partitioning and file preparation commands, such as MS-DOS *fdisk* and *format*.

Most SCSI devices are pre-formatted, and *do not need* re-formatting. The Adaptec low-level formatting program is compatible with the vast majority of today's SCSI disk drives.

> **CAUTION**
> All data on the drive will be lost! Back up your data. Once the low-level format is in progress, you cannot abort the format. A flashing message is displayed telling you to wait while the drive is formatting.

- Some computer system BIOS setup utilities come with their own low-level format programs built-in. These programs are usually not for SCSI drives. Use the Adaptec Format Disk utility here in the Configuration Software.

- The AHA-1540C/1542C Format Disk utility does not ask you to specify drive interleave values. The host adapter BIOS automatically instructs your drive's SCSI controller to use the most optimal interleave value for its media.

Verify Disk Media

Verify Disk Media scans the selected device's media for defects. If bad blocks are encountered, a prompt will ask if you want the block *reassigned*; if you select **Yes**, that block will no longer be used.

- Unlike the Format Disk option, you can abort the media verification at any time by pressing **Esc**.
- A bar graph shows the percentage of completion while the program is running.

Host Adapter Diagnostics

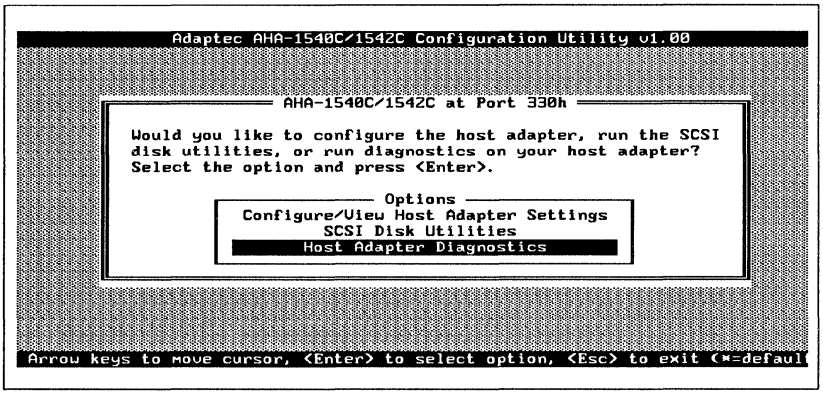

Figure 4-11. Accessing Host Adapter Diagnostics

Host Adapter Diagnostics performs a bus master DMA test on your computer's memory. Not all computer systems are fully ISA compatible and properly support bus master DMA transfers, necessary for running multi-tasking OS/2, Windows, UNIX, and others.

- If you started the Configuration Software from Debug rather than **Ctrl-A**, you must make sure that no device drivers or TSR (Terminate And Stay Resident) programs are loaded when the test is run.

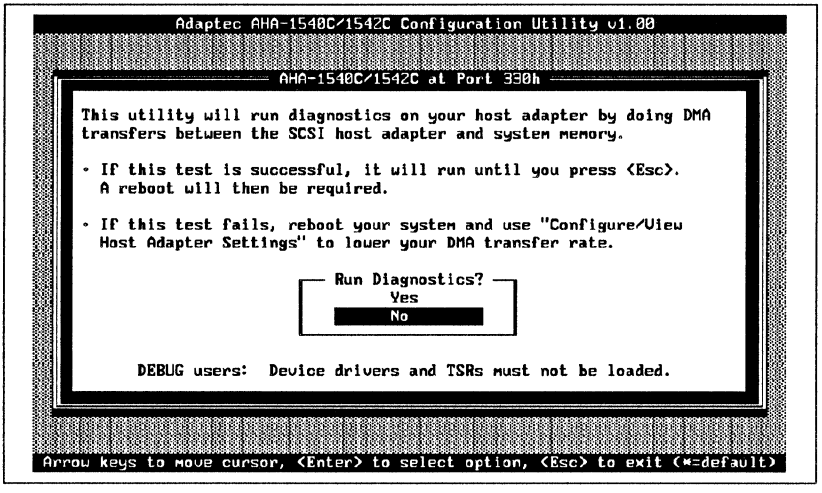

Figure 4-12. Diagnostics Startup

The diagnostics perform the memory transfer test and then repeat the process. Each successful test loop count is displayed.

- If the test fails, try lowering the DMA transfer rate to a lower setting from the Configure/View Host Adapter Settings menu.
- You can stop the test at any time by pressing **Esc**. Your computer will reboot.

Error Handling

The AHA-1540C/14542C BIOS provides detailed information whenever a SCSI error occurs. Refer to Appendix B, *Troubleshooting*, for explanations of error messages.

I/O Operating Environment Software

About This Chapter

Read this chapter to find out:

- Whether you need to install an I/O Operating Environment Software package
- Which I/O Operating Environment Software packages are available and how they are used

5

Host Adapter Support

You may not need to install additional environment software in order to use your AHA-1540C/1542C host adapter. Current versions of OS/2 and UNIX contain embedded support for the AHA-1540C/1542C and for all other Adaptec SCSI Bus Master host adapters. Future versions of NetWare will include Adaptec I/O Operating Environment Software in the NetWare box.

Read the information in this chapter to find out if you need to install additional software.

DOS/Windows

In the DOS/Windows environment, you do *not* need to install additional software if you only attach disk devices to the AHA-1540C/1542C and:

- You use eight or fewer fixed disk devices (seven per host adapter) with DOS 5.0 or above.
- You use two or fewer fixed disk devices with versions of DOS prior to 5.0.
- You do not remove or switch removable media from removable disk drives while your computer is running.

You *will* need additional software if you want to do any of the following:

- Support more than two fixed disk drives under versions of DOS prior to MS-DOS 5.0 with multiple host adapters.
- Support more than eight fixed disk drives (seven per host adapter) under MS-DOS 5.0 or higher.
- Remove or switch 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, or plotters.

The Adaptec EZ-SCSI software package supports the first four of these items and is fully compatible with the AHA-1540C/1542C. Adaptec EZ-SCSI is a menu-driven software package that configures your system automatically.

Adaptec EZ-SCSI has a number of utility programs including *afdisk* and *scsifmt*, which are used to format and partition SCSI disk devices. Adaptec EZ-SCSI also includes an ASPI device driver called *aspicd* that supports most models of CD-ROM drives and the *aspidisk* device driver, which supports up to 24 fixed-disk devices.

To install support for SCSI devices other than fixed disk devices and CD-ROM drives, 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, then no ASPI manager is required.

- Refer to *Adaptec EZ-SCSI Quick Installation* in Chapter Two to learn how to run Adaptec EZ-SCSI.

Novell NetWare

NetWare 4.*x* includes the Adaptec I/O Operating Environment and does not require additional software.

If your system uses an earlier version of Novell NetWare, such as NetWare 286 2.*x* SFT or Advanced, or NetWare386 3.*x*, you must install the ASW-1440 software package. Otherwise, SCSI devices will not work at all on your system.

OS/2

The embedded drivers in both Microsoft's® OS/2 version 1.30.1 (and higher) and IBM's OS/2 version 2.0 (and higher) support the AHA-1540C/1542C series host adapters.

If your system has an earlier version of either Microsoft OS/2 or IBM OS/2, you will need to install the Adaptec ASW-1220/1420, Version 1.3, software package.

UNIX/XENIX

Major versions of UNIX include full driver support for the AHA-1540C/1542C directly, and do not need additional software to run SCSI devices. These include the current versions of:

- SCO UNIX and Xenix
- USL UNIX
- Sunsoft Interactive UNIX®
- Everex ESIX®
- Banyan® Vines®

Refer to the documentation for these products to learn more about how they support host adapters and other SCSI devices.

Appendices

A

Specifications

About This Appendix

Read this appendix to find out:

- Technical specifications of the AHA-1540C/1542C
- Switch block settings for the AHA-1540C/1542C

Technical Information

The basic technical specifications of the AHA-1540C/1542C host adapter are described below. If you need more detailed information, contact Adaptec at the address or phone number listed in Chapter One, *Introduction.*

Physical Dimensions

Length: 7.0 inches Width: .625 inches Height: 4.5 inches
Standard ISA-compatible form factor

Power Requirements

+5.0 +/- 0.25 Volts at 0.51 Amps without supply terminator power

Environmental Requirements

Temperature: 0-55° C (operating or storage)

Reliability Information

Mean Time Between Failures:

100,000 hours (calculated per Mil Handbook 217E, ground benign, 40° C)

Mean Time Between Failures (calculated):

AHA-1540C: 101,637 hours
AHA-1542C: 96,612 hours

Fuse Type:

1.5 Amps, 125 Volts

Switch Block Settings

Table A-1 shows the settings controlled by the switch block on the upper left-hand corner of the host adapter board. Switches on some host adapters may have the words *Open* instead of *Off*, and *Closed* instead of *On*. For more information on host adapter termination, see *SCSI IDs and Termination* in Chapter Three.

Table A-1. Host Adapter Switch Block Settings

sw1	On	**Termination Installed**		**sw5**	On	**Disable Floppy+**	
	Off	**Software Controlled***			Off	**Enable Floppy***	
sw2	**sw3**	**sw4**	**I/O Port**	**sw6**	**sw7**	**sw8**	**BIOS Address**
Off	Off	Off	330–333h*	Off	Off	Off	DC000h*
On	Off	Off	334–337h	On	Off	Off	D8000h
Off	On	Off	230–233h	Off	On	Off	D4000h
On	On	Off	234–237h	On	On	Off	D0000h
Off	Off	On	130–133h	Off	Off	On	CC000h
On	Off	On	134–137h	On	Off	On	C8000h
Off	On	On	Reserved	Off	On	On	Reserved
On	On	On	Reserved	On	On	On	BIOS Disable

* *Standard setting.* The standard settings on your host adapter may be different, because Adaptec creates custom configurations for proprietary customers and resellers.

\+ *Standard setting on AHA-1540C.* **sw5** must remain On to disable the floppy controller circuits on the AHA-1540C.

> Note
>
> If switch **sw1** is switched to On (or Closed on some switches), host adapter termination will always be enabled regardless of the setting in the Configuration Software. ❐

B

Troubleshooting

About This Appendix

Read this appendix to find out:

- How to diagnose problems that may occur when you install an AHA-1540C/1542C in your system
- How to fix these problems
- How to understand and respond to error messages that may be generated by the host adapter BIOS

B

SCSI Troubleshooting Checklist

The AHA-1540C/1542C has been extensively tested for compatibility with popular SCSI peripheral devices across various operating systems. Most problems that might occur during installation can be traced to errors in preparing devices or the SCSI bus.

The following suggestions should help you to successfully solve any problems. If you need additional help in getting the host adapter running properly, you can find information on how to contact Adaptec Technical Support in Chapter One, *Introduction.*

If a problem occurs during installation, check these items first:

1. Be sure all SCSI peripheral devices are connected to power.

   Connect internal peripherals to your computer's power supply; plug external peripheral power cables into a grounded line power outlet. Follow the instructions in the hardware documentation.

2. Be sure all cables are properly connected. Check both power and SCSI interface cables.

3. Be sure the SCSI peripherals and host adapter on each SCSI bus are each set to different SCSI IDs. (Refer to Chapter Three, *Stepping Through Installation.)*

4. If you have increased the host adapter DMA speed with the Configuration Software, try reducing DMA speed to the default setting. (Refer to Chapter Four, *Using the Configuration Software.)*

5. Check SCSI bus termination. The ends of the bus must be terminated. (Refer to *Preparing Your SCSI Devices* in Chapter Three.)

6. If you have installed more than one SCSI host adapter, refer to *Conflicts with Other Options* later in this chapter.

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

Cases and Solutions

I am having trouble inserting the host adapter into an expansion slot.

You may need to use the alternate host adapter slot cover bracket. Refer to *Installing the Host Adapter Board* in Chapter Three.

The screen is very hard to read when I run the Configuration Software program.

Try pressing **F5** to toggle the display between color and monochrome modes. This may enable you to read the screen more easily.

I installed the host adapter board, and my computer will not boot from the SCSI disk drive.

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

1. Make sure your computer system's CMOS *setup* is set to No Drives Installed, which is required for SCSI host adapters.

2. Try setting the SCSI boot drive to SCSI ID 0. This is normally done by changing jumpers or switches on the drive. All SCSI devices should be set to unique SCSI IDs, which range from 0 to 7 for each SCSI bus.

3. Try enabling Dynamically Scan SCSI Bus for BIOS Devices under Advanced Configuration Options in the Configuration Software. See the detailed instructions in Chapter Four.

4. Make sure the SCSI termination is set correctly. (See Chapter Three for information on SCSI termination.)

5. You may need to low-level format the SCSI fixed disk. If so, first back up all data on the disk, then run the *format* utility accessible through the Configuration Software program.

Similar formatting utilities for removable media devices are included in the Adaptec EZ-SCSI software package for the DOS/Windows environment. Refer to Chapter Five, *I/O Operating Environment Software*. These utilities are also available from the Adaptec BBS.

6 If your host adapter is an AHA-1540C, make sure **sw5** is in the On/Closed position. The switch must remain in that position even though there is no floppy controller on that host adapter.

7 Run the Configuration Software and make sure that the System Boot (INT 19h) Controlled by Host Adapter BIOS option is enabled. Some older system boards assume that your disk device is an IDE floppy or fixed disk drive, and they will not boot if they detect other kinds of drives. (See *Advanced Configuration Options* in Chapter Four.)

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 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 media. If it is a fixed disk drive, the disk may be physically damaged.

04h - Hardware error
The disk drive may be defective. Consult the hardware documentation and contact the manufacturer.

05h - Illegal request
The Adaptec formatting utility does not support a low-level format of this device. The device may already be low-level formatted by the manufacturer. (This error rarely occurs.)

06h - Data protect
The removable media may be write-protected. Remove 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 the Configuration Software.

If this happens, turn your machine off and on to reboot. Any settings you changed before you tried to exit the program have been registered in the EEPROM and will not be lost.

One of the SCSI peripherals on my system does not allow termination to be disabled. How can I attach it to the SCSI bus?

You might be able to attach this peripheral 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 possible workarounds.

I installed my host adapter board at IRQ12, and it does not work properly. What is wrong?

Another device such as a mouse may be using IRQ12. Change the adapter board's IRQ to the default value (11) or to some other value.

Conflicts With Other Options

You will encounter problems if your host adapter and peripheral devices use overlapping memory and I/O addresses. To correct this problem:

1. Change the IRQ and DMA channel settings with the Configuration Software.

2. Use the Configuration Software to view port addresses and BIOS addresses for the host adapter and, if necessary, change them with the switch block on the adapter board. (Follow the directions in Chapter Three and in *Switch Block Settings* in Appendix A.)

BIOS Messages

After you have successfully installed your AHA-1540C/1542C, 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 has been successfully identified by the BIOS.

If an initialization failure occurs, however, the host adapter BIOS will display a BIOS Installation Failure message, followed by other more specific messages. Here are some of these error messages and their meaning:

Host Adapter configured for invalid port address!

The host adapter switch settings are configured for an invalid port address. Check the port address setting and change it if necessary. Each installed host adapter must be set to a different port address.

If necessary, follow the directions in Chapter Three and Appendix A for setting the switches on the host adapter.

Unable to disable Host Adapter mailbox!

The BIOS could not disable the host adapter standard mailbox to protect against possible data loss for older drivers that do not support the advanced features of the AHA-1540C/1542C. Refer to the *SCSI Troubleshooting Checklist* at the beginning of this appendix.

!!! WARNING !!!

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 only occurs if the Extended BIOS Translation is enabled in the Configuration Software Advanced Configuration Options, and if a large capacity drive is found to have invalid partition information in the master boot record.

Extended BIOS Translation is used only with MS-DOS 5.0 or higher. You do not need to enable this option if you are running one of the other operating systems mentioned in Chapter Five, *I/O Operating Environment Software.*

If you are running a larger than 1 gigabyte drive under MS-DOS 5.0 and this message appears:

1. Run the Configuration Software and set Extended BIOS Translation to disabled.
2. Back up the data on the disk device, if you want to save it.
3. Perform a SCSI low-level format with the *format* utility under SCSI Disk Utilities.

> **WARNING**
>
> All data on the target drive will be lost when you run the *Format* program. Back up your data!

4 Run the Configuration Software again and set Extended BIOS Translation to Enabled.

5 Restore data to the disk device, if necessary.

Device connected, but not ready.

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

If you receive this message when requesting data from a SCSI drive:

1 Follow the drive manufacturer's instructions to make sure the drive is set to spin-up when the power is switched on.

2 Run the Configuration Software and access SCSI Device Configuration. Locate the host adapter's SCSI ID. Set Send Start Unit Command to Yes.

Start unit request failed.

The BIOS was unable to send a start unit command to the device. Run the Configuration Software and disable Send Start Command for the device.

Host Adapter hard reset timeout!

An unexpected timeout occurred while hard resetting the host adapter. Check SCSI bus termination. Try disconnecting the SCSI peripheral cables from the host adapter and start the system. If the system successfully re-starts, check bus termination and cable connections. One of the devices on the SCSI bus may be defective.

Unable to enable/disable Host Adapter shadow RAM!

or

Host Adapter shadow RAM test failure!

Either of these two error messages indicates an incompatibility between the shadow RAM on the host adapter and the shadow RAM on the computer's motherboard. To correct the problem:

➤ 1 Run the Configuration Software and check for possible memory conflicts with other installed host adapters.

2 Disable *all* shadow RAM on the motherboard by running the computer's *setup* program, then reboot the computer.

3 If the error messages do not appear, re-enable only the motherboard BIOS shadow RAM and reboot the computer again.

4 If the error messages do not appear, re-enable video BIOS and reboot the computer again.

If the error messages re-appear after steps 2 or 3, you must again disable the kind of shadow RAM that is causing the problem.

Host Adapter diagnostics failed!
or
Unable to read Host Adapter EEPROM!
or
Unable to initialize Host Adapter BIOS mailbox!

These messages usually indicate that the host adapter is not working correctly. First check the items on the *SCSI Troubleshooting Checklist* at the beginning of this appendix. If the problem persists, report it to Adaptec Technical Support.

C

Optimizing Performance

About This Appendix

Read this appendix to find out:

- How to optimize your system's performance after installing an AHA-1540C/1542C host adapter

Performance Tips

Your AHA-1540C/1542C host adapter is designed to maximize the performance of your SCSI peripherals and computer. The following tips will help you take full advantage of the host adapter's advanced design features.

Enabling Synchronous Negotiation

Synchronous negotiation is disabled by default on the AHA-1540C/1542C because a few older SCSI devices (e.g., certain CD-ROM drives) do not support it and may malfunction if they receive a request for synchronous negotiation. However, you should normally enable this option on the host adapter because most SCSI devices support it and because it allows data to be transferred faster on the bus.

Note that even when synchronous negotiation is disabled on the host adapter, the host adapter will still switch to synchronous mode if it receives a request from a SCSI peripheral.

Disabling the Host Adapter BIOS

Disabling the host adapter BIOS saves you 16 KBytes of memory address space and can also shorten boot-up time by as much as 60 seconds. You should disable the host adapter BIOS if:

- The peripherals on the SCSI bus (for example, CD-ROM drives) are all controlled by device drivers and do not require BIOS control.
- You are running only one SCSI device and you are using DOS 5.0 or above.

You can disable the host adapter BIOS either by changing a switch setting on the board or by using the Configuration Software. We recommend that you use the latter method. If you disable the BIOS with switches, you will not be able to configure

the host adapter with the Configuration Software unless another AHA-1540/1542C is installed with its BIOS enabled. Also, if you have disabled the BIOS with the switch you will have to remove the cover of your PC to access the switches if you need to enable the BIOS later.

Enabling Parity Checking

Parity checking is a procedure used by the host adapter to verify the accuracy of data from devices on the SCSI bus. Data verification is a desirable option, so SCSI Parity Checking is normally set to On by default. To use this option most effectively, be sure that it is enabled on each SCSI device, as well as on the AHA-1540C/1542C host adapter. Consult your hardware documentation for instructions on enabling parity checking on peripherals.

The only time when you should disable parity checking on the host adapter is when your system includes an older type of SCSI device that does not support this option. Again, consult the hardware documentation for the device.

Setting the DMA Transfer Rate

The default DMA (Direct Memory Access) transfer rate for the AHA-1540C/1542C is 5 MBytes/second, which is supported by nearly every IBM-compatible computer. If your computer's documentation *clearly* states that it supports a higher rate, you can improve system performance by increasing the DMA transfer rate. The AHA-1540C/1542C supports a transfer rate of up to 10 MBytes/second.

Be sure to back up data on your disk device(s) before changing the DMA transfer rate. We recommend that you do *not* increase the transfer rate experimentally, if you are not sure what transfer rate your computer actually supports. If you set the rate higher than what your computer can handle, the resulting errors may occur intermittently and may not be immediately obvious to you.

Setting Enable Disconnect

In the DOS environment you can increase performance slightly if you set Enable Disconnection to No when there is only a host adapter and a single disk device on the SCSI bus. You should set this option to Yes, however, if you have more devices on the SCSI bus.

Send Start Unit Command

This option, which is supported by some SCSI peripherals, reduces the load on your computer's power supply by allowing the host adapter to power up disk devices and other peripherals one-at-a-time when you boot your system. Otherwise, the peripherals will all power up at the same time.

Send Start Unit Command is disabled by default. Check your hardware documentation before you enable this option to make sure your peripherals support it. Then change the switch or jumper settings on the peripherals to enable the options. Finally, run the Configuration Software and enable the option for the device(s) on the **SCSI Device Configuration** screen.

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.) Note that Send Start Unit Command has no effect if the host adapter BIOS is disabled.

Glossary

About this Glossary

Read this glossary to find out:

- Definitions of technical terms used in this manual
- Definitions of terms commonly used in other documents and publications which discuss SCSI-to-microcomputer peripheral connection

Glossary

Adaptec EZ-SCSI
A user-friendly software program that automatically installs SCSI devices such as fixed disks and CD-ROM drives on a PC. Adaptec EZ-SCSI copies the required software programs to the PC's fixed disk and edits the configuration files so the host adapter can access the devices.

Advanced SCSI Programming Interface
See ASPI.

AHA-1540C
The Adaptec ISA to SCSI host adapter for connecting SCSI devices to the ISA (PC-AT compatible) *or* EISA bus. The AHA-1540C/1542C is an enhancement of the AHA-1540B/1542B.

AHA-1542C
The enhanced high-performance Adaptec host adapter for connecting SCSI devices *and* standard IBM-compatible floppy disk devices to the ISA or EISA bus.

AHA-1740A/1742A/1744
The Adaptec SCSI-to-EISA host adapter exclusively for connection to the EISA (Extended Industry Standard) bus. The AHA-1740A/1742A/1744 works only on EISA bus computers.

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 board, 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 UNIX—and a specific family of host adapter boards.

Asynchronous Data Transfer
A data transfer method that involves interlocking a signal to the initiator and a signal to the SCSI target in such a way that each step of the data transfer must occur before the next step can begin. Asynchronous data transfer is usually slow. The rate is not affected by external timing constraints such as cable length and circuit response time.

AT Bus
See ISA.

BIOS
Basic Input/Output System. Software coded into computer chips for various purposes. The BIOS on the motherboard of a PC is the special program used to boot the computer. There are other kinds of BIOS, such as Host Adapter BIOS.

Bus
A pathway for data in a computer system. All PCs have an expansion bus, which is designed to host add-on (expansion) devices, such as modems, adapter boards and video adapters. Expansion devices use the bus to send data to and receive data from the PC's CPU or memory. ISA, EISA and Micro Channel® are the major bus standards used in PCs.

Bus Device Reset
A SCSI message that clears all activity in the SCSI peripheral device target to which it is addressed.

Bus Mastering
A high performance method of data transfer in which the host adapter's on-board processor handles the transfer of data directly to and from a computer's memory without intervention from the computer's microprocessor. This is the fastest method of data transfer available for multi-tasking operating systems. Adaptec's AHA-1540, AHA-1640, and AHA-1740 series host adapters use bus mastering. (Also called Bus Master DMA or First Party DMA.)

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

CCS
See Common Command Set

Common Command Set
A de facto standard SCSI command set for communication with fixed disk drives. The Common Command Set (CCS) is the basis for the SCSI-2 command set for all types of peripheral devices.

Device Driver
A software program that enables a PC to communicate with peripheral devices such as fixed disk drives and CD-ROM drives. Each kind of device requires a different driver. Device driver programs are stored on a PC's fixed disk and are loaded into memory at boot time.

Differential
See Single-Ended

Direct Memory Access
A mechanism that allows hardware control of the transfer of streams of data to or from the main memory of a computing system. The mechanism may require setup by the host software. After initialization, it automatically sequences the required data transfer and provides the necessary address information.

DMA
See Direct Memory Access

EEPROM
Electrically-Erasable Programmable Read Only Memory. An integrated circuit used to store the host adapter configuration. The

data stored in the EEPROM can be updated while it is installed on 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 to and over the PC bus 32 bits at a time. This standard was introduced in 1988.

EISA Configuration
The operation of configuring a device on the EISA bus through access to registers in the device by the host. This replaces the method of using jumpers common on ISA bus devices.

EPROM
Erasable Programmable Read Only Memory. An integrated circuit used to store the host adapter BIOS and firmware.

EZ-SCSI
See Adaptec EZ-SCSI.

Firmware
The software that controls and manages the host adapter. It is *firm* as opposed to *soft* because it is designed into the host adapter and cannot be modified by the user.

GByte
Gigabyte. A measure of computer storage. One gigabyte equals approximately one billion bytes. (A byte is the amount of storage needed to hold one character.)

Host
A microcomputer system in which a 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 SCSI bus connector of 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.

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

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 details of the operation are actually sequenced by the target. The host adapter is sometimes called the initiator.

I/O Operating Environment Software
Additional software that may be required in certain operating system environments in order to use some kinds of SCSI devices with an AHA-1540C/1542C host adapter. For example, additional software is needed in order to install CD-ROM drives on the SCSI bus in the DOS/Windows environment.

ISA
Industry Standard Architecture expansion bus. A type of computer bus used in most PCs. ISA enables expansion devices like network cards, video adapters and modems to send data to and receive data from the PC's CPU and memory 16 bits at a time. Expansion devices are plugged into sockets in the PC's motherboard. ISA is sometimes called the AT bus, because it was originally introduced with the IBM PC-AT in 1983.

KByte
Kilobyte. A measure of computer storage. One kilobyte equals

1024 bytes. (A byte is the amount of storage needed to hold one character.)

Manager
See ASPI Manager.

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

Micro Channel
A 32-bit computer bus standard introduced by IBM with the PS/2 series of PCs. Micro Channel is an extension of the 16-bit ISA standard, allowing expansion devices to move data 32 bits at a time on the PC bus while remaining backward-compatible with standard ISA expansion devices. (Also called Micro Channel architecture.)

Multi-tasking Operation
The execution of commands in such a way that more than one command is in progress at the same time. Multi-tasking allows a computer system to take advantage of overlapping activities by using resources that are temporarily not required for other operations. More than one program or more than one portion of a program may be operating in parallel.

Multi-threaded I/O
A method by which data is accessed simultaneously from multiple SCSI devices to increase a system's data transfer rate. For example, if the system 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 system 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. The 1540C/1542C and all other Adaptec host adapters fully support multi-threaded I/O.

PC-AT
A family of small computers sold by IBM, also called the Personal Computer/AT family of computers. The name is trademarked by IBM.

PIO
See Programmed Input/Output.

Programmed Input/Output
A method of data transfer in which the host microprocessor transfers data to and from memory via the computer's I/O ports. PIO enables very fast data transfer rates, especially in single-tasking operating systems like DOS.

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.

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

SCSI
Small Computer Systems Interface. A PC bus interface standard that defines standard physical and electrical connections for devices. SCSI provides a standard interface that enables many different kinds of devices, such as disk drives, magneto optical disks, CD-ROM drives, and tape drives to interface with the host computer.

SCSI Bus
One or more SCSI peripheral devices and a host adapter, connected by cables in a daisy chain configuration. The bus may include both internal and external SCSI devices. In systems that

have more than one host adapter, each adapter has its own separate SCSI bus.

SCSI Device
A device such as a host adapter board, fixed disk drive or CD-ROM drive that conforms to the SCSI interface standard and is attached to a SCSI bus cable. The device may be an initiator, a target, or capable of both types of operation.

SCSI ID
An identifier assigned to SCSI devices that enables them to communicate with a computer when they are attached to a host adapter via the SCSI bus. Each SCSI host adapter board has eight available SCSI IDs with the numbers 0 through 7. Usually the host adapter itself is assigned SCSI ID 7, and fixed disk devices are assigned to SCSI IDs 0 and 1.

Single-Ended
A term referring to the electrical characteristics of the signals used on the SCSI bus interface. Single-ended signals occupy a single conductor and are references to a common ground carried on the cable between the SCSI components attached. Most SCSI devices use *single-ended* grounding.

Some SCSI devices use a *differential* grounding scheme. These devices are not supported by the AHA-1540C/1542C. Differential devices may be damaged if you connect them and an AHA-1540C/1542C to the same SCSI bus.

Single-Threaded Operation
Operation of the computer system such that only one program can be operating or active at a time. The system must wait until all resources are available before starting an operation, and it cannot start another operation until the first one is completed.

Small Computer Systems Interface
See SCSI.

Synchronous Data Transfer
A method of data transfer in which data on the SCSI bus is clocked with fixed-length, fixed-frequency strobe pulses. The acknowledgments may be delayed several clock periods from the data requests. Synchronous data transfer can be used only for

data transmission on the SCSI bus. It cannot be used for command, message, and status transmission.

Synchronous Data Transfer Negotiation
The message exchange between the initiator and the target that allows the negotiation of the data transfer frequency and delay between requests and acknowledgments required for synchronous data transfer. Once negotiated, synchronous data transfer parameters remain unchanged until certain reinitialization activities occur.

Target (or Target Device)
A SCSI device that performs an operation requested by an initiator. The target may be a peripheral device such as a disk drive performing a service for an initiator. The target may also be a host adapter performing a processor-type device service for an initiator.

Termination
A physical requirement of the SCSI bus. The first and last devices on the SCSI bus must have terminating resistors installed, and the devices in the middle of the bus must have terminating resistors removed.

Word
A 2-byte (16-bit) unit of data.

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