



**INSTALLATION AND USER'S GUIDE**  
**ADAPTEC SERIAL ATA RAID 2410SA**



# Adaptec Serial ATA RAID 2410SA

## **Installation and User's Guide**

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

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

- Reorient or relocate the receiving antenna.
- Increase the separation between equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.
- Use a shielded and properly grounded I/O cable and power cable to ensure compliance of this unit to the specified limits of the rules.

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



### European Union Compliance Statement

This Information Technology Equipment has been tested and found to comply with EMC Directive 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC, in accordance with:

- n EN55022 (1998) Emissions
- n EN55024 (1998) Immunity:
  - EN61000-4-2 (1998) Electrostatic discharge:  $\pm 4$  kV contact,  $\pm 8$  kV air
  - EN61000-4-3 (1998) Radiated immunity
  - EN61000-4-4 (1995) Electrical fast transients/burst:  $\pm 1$  kV AC,  $\pm 0.5$  kV I/O
  - EN61000-4-5 (1995) Surges  $\pm 1$  kV differential mode,  $\pm 2$  kV common mode
  - EN61000-4-6 (1996) Conducted immunity: 3 V
  - EN61000-4-11 (1994) Supply dips and variation: 30% and 100%

In addition, all equipment requiring U.L. listing has been found to comply with EMC Directive 73/23/EEC as amended by 93/68/EEC in accordance with EN60950 with amendments A1, A2, A3, A4, A11.



### Australian/New Zealand Compliance Statement

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### **Canadian Compliance Statement**

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

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



### **Japanese Compliance (Voluntary Control Council Initiative)**

This equipment complies to class B Information Technology equipment based on VCCI (Voluntary Control Council for Interface). This equipment is designed for home use but it may causes radio frequency interference problem if used too near to a television or radio. Please handle it correctly per this documentation.



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## Introduction

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### Read this First

Read this chapter before you begin installing your new Adaptec Serial ATA RAID 2410SA controller. This is a guide to the rest of the document, providing a summary of the installation process.

## System Requirements

The following system requirements are presented:

- Operating system compatibility
- Storage requirements for drivers and software
- Motherboard compatibility.
- Device compatibility (for Serial ATA)

### Operating System Compatibility

- Microsoft Windows® 2000, Windows XP®, Windows Server 2003
- Linux
  - Red Hat 7.3 and 8.0
  - SuSE 8.0 and 8.1
  - UnixWare 7.1.1 and OpenUNIX 8



**Note:** For the latest Linux compatibility information, visit [www.adaptec.com](http://www.adaptec.com).

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### Storage Requirements

Device drivers and storage management software require approximately 20 MB of disk space.

### Motherboard Compatibility

The controller can be installed in a universal PCI slot and requires a motherboard and BIOS that:

- Complies with the *PCI Local Bus Specification*, Revision 2.2.
- Provides large memory-mapped address ranges.

### Device Compatibility

The Adaptec 2410SA controller supports up to four hard drives (Serial ATA only), using four Serial ATA cables supplied in this kit.

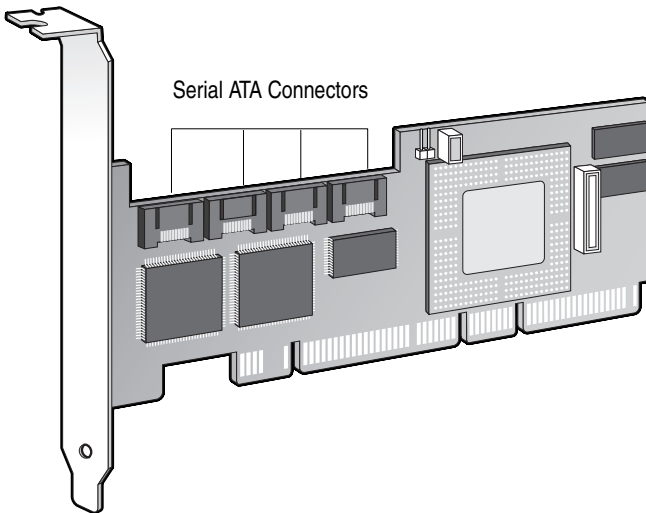
## Kit Contents

Your Adaptec controller kit includes:

- Adaptec 2410SA controller (shown below)
- Adaptec *Serial ATA RAID 2410SA Quick Installation Guide*
- Installation CD
- Low-profile bracket (in addition to the standard full-height bracket attached to the controller)
- Four Serial ATA interface cables
- Technical Support ID (TSID) label (See [page iii](#) for details.)

### Adaptec 2410SA Controller

The Adaptec 2410SA controller is shown below. Note the position of the Serial ATA interface connectors necessary for attaching the Serial ATA hard drives.



## About the Documentation

The documentation set for this kit includes:

- *Adaptec Serial ATA RAID 2410SA Quick Installation Guide*—This printed guide contains the essential information for installing the controller in most situations.
- *Adaptec Serial ATA RAID 2410SA Installation and User's Guide* (this guide)
- *Adaptec Serial ATA RAID 2410SA Command Line Interface Software Reference Guide*—Provides detailed descriptions of the command line driven RAID management utility.
- *Release Notes*—Before beginning your installation, review the release notes associated with the Adaptec 2410SA controller, software, and documentation. To read this information, select **Release Notes** from the View Documentation list or open the **Readme** file in the root directory of the CD using a text editor. For the latest updates, visit [www.adaptec.com](http://www.adaptec.com).

These documents are also available at [www.adaptec.com](http://www.adaptec.com). The documents available from the Web site may be more recent versions than those on the CD. Check the revision letter on the back cover of the guide.

## Installing the Adobe Acrobat Reader

The Adaptec installation CD contains Windows and Linux versions of Adobe Acrobat Reader. (You can also download the Reader free at [www.adobe.com](http://www.adobe.com).) You need the Reader to view Portable Document Format (PDF) documents such as the *Adaptec Serial ATA RAID 2410SA Installation and User's Guide*, which is included in the Adaptec installation CD.

To install the Reader on:

- **Windows**—Insert the Adaptec installation CD and wait for the Autorun. If the CD does not start automatically, browse to the root of the CD and click **Autorun**. Then, select the appropriate option.
- **Linux**—Browse to <CD mount point>/packages/Acrobat\_Reader/Linux. To view this location, you need to use the full path. If the path gets truncated, you may not see the correct location.



## Controller Features

The Adaptec 2410SA controller supports four Serial ATA drives. The controller offers the features and performance ideal for high-end workstations and entry-level servers.

- Conforms with PCI Local Bus Specification, Revision 2.2
- 64-bit, 66-MHz PCI interface compatible with 32-bit/33-MHz PCI slots
- 64 MB of on-board RAM
- Low-profile, MD2 form factor ideal for 1U/2U servers
- Supports the Serial ATA Specification, version 1.0, with additional Serial ATA II support for enclosure management and enhanced I/O drivers for backplane support
- RAID levels 0, 1, 5, 10 and simple volume (JBOD)
- Operating system independent configuration and RAID creation using the Adaptec RAID Configuration (ARC) utility
- Flash ROM for easy upgrades of controller BIOS and ARC
- Event logging and broadcasting, including messaging for alphanumeric pagers
- Browser-Based Management Software—Adaptec Storage Manager™ – Browser Edition provides centralized management across all Adaptec host-based RAID products. This application allows system administrators to remotely manage, monitor, and configure RAID subsystems through password-protected Web access.

## Adaptec's Advanced RAID Technology Features

With Advanced features, you can:

- **Optimized Disk Utilization**—Enables you to use the full capacity of all your drives, even if drive sizes vary.
- **Online Capacity Expansion**—Allows you to expand the capacity of your RAID during system operation.
- **Online RAID Level Migration**—Lets you change RAID levels *without* rebuilding your array from scratch.

- **Multiple Arrays**—Create multiple arrays from a single set of drives.
- **SATA Disk Hot Plug**—You can add and remove disks without shutting down your system.

## Array Migration

The Adaptec 2410SA controller supports modifying existing arrays by expansion, migration from one array type to another, and changing the stripe size, as described by the table below.

Current Array Type	New Array Type
RAID 0	RAID 5 or 10
RAID 1	RAID 0 or 5 or 10
RAID 5	RAID 0 or 10
RAID 10	RAID 0 or 5

To modify an array, refer to the Adaptec Storage Manager-Browser Edition online Help.

Windows supports Online Capacity Expansion (OCE). That is, on completion of an array expansion, the additional capacity can be used without restarting the system. Refer to your operating system documentation for instructions on using the additional capacity.

## Drive Enclosures

The Adaptec 2410SA controller supports drive enclosures that include either SES or SAF-TE enclosure management hardware per the Serial ATA II, Phase 1 specification.

## Hot Spares

A hot spare is a drive that is reserved to replace a failing drive in a redundant array. In the event of drive failure, the hot spare replaces the failed drive and the array is rebuilt.

The Adaptec 2410SA controller supports two types of hot spares:

- **Global**—Protects every array that the drive has enough available capacity to protect.
- **Dedicated**—Protects only the array that it has been assigned to protect.

## Automatic Failover

This feature allows the controller to automatically rebuild an array when a failed drive is replaced with a new drive. This feature applies only to redundant arrays in SES- or SAF-TE-enabled drive enclosures. See [page A-10](#) for details.

## Overview of the Installation Process

The following steps provide an overview of the process of installing, setting-up, and configuring the controller:

- 1 Read and understand this entire chapter.
- 2 Install and configure the controller and hard drives according to the instructions in [Chapter 2, \*Installing the Controller\*](#).
- 3 In [Chapter 3, \*Installing the Driver\*](#), the procedure depends on your system:
  - In a new system:**
    - a Build the array.
    - b Install the controller driver at the beginning of the operating system installation.
  - In an existing system:**
    - a Install the controller driver.
    - b Build the array.
- 4 Install Adaptec Storage Manager – Browser Edition as described in [Chapter 4, \*Installing Adaptec Storage Manager – Browser Edition\*](#).
- 5 Register online to receive important information about your controller at [register.adaptec.com](http://register.adaptec.com).

## Storage Management Software Overview

The Adaptec 2410SA controller includes the following software tools to manage your storage subsystem:

- **Adaptec Storage Manager – Browser Edition**—Browser-based storage management software that provides all of the creation, management, and data logging needed to manage arrays. Arrays may be set up and managed on systems using the following operating systems:
  - Windows 2000, Windows XP, and Windows Server 2003
  - Red Hat Linux 7.3 and 8.0
  - SuSE Linux 8.0 and 8.1

For details, see Chapters 4 and 5.

- **Adaptec RAID Configuration (ARC) Utility**—Part of the controller's built-in BIOS code. You start the ARC utility by pressing **Ctrl+A** during BIOS startup. For details, see [Appendix A, Adaptec RAID Configuration Utility](#). The ARC utility contains:
  - **Array Configuration Utility (ACU)**—Used to create, configure, and manage arrays. Also available as a DOS-based executable. For details, see [Appendix A, Adaptec RAID Configuration Utility](#).
  - **SATASelect**—Used to verify the hardware configuration of the controller and the drives.
  - **Disk Utilities**—Used to format and verify drives.
- **DOS Utilities**—Contained on the CD.
- **Command Line Interface (CLI)**—Enables you to automate array creation or testing in a production environment using scripts.

## Safety Information

To ensure your personal safety, as well as the safety of your equipment:

- Keep your work area and the computer clean and clear of debris.
- Before opening the system cabinet, unplug the power cord.

## Notes and Cautions

This *Installation and User's Guide* uses notes and cautions that emphasize important information, as described below:



**Note:** Emphasizes important information that, if ignored, would *not* result in injury, property damage, or data loss.

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**Caution:** Emphasizes important information that, if ignored, could cause equipment failure or loss of data.

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## Electrostatic Discharge

Electrostatic Discharge (ESD) is a natural by-product of human activity. ESD is produced by materials that accumulate and retain electrical charges which are transferred to people or other objects upon contact.



**Caution:** ESD can damage electronic components when they are improperly handled and can result in total or intermittent failures. Always follow ESD-prevention procedures when removing and replacing components.

---

To prevent ESD damage:

- Use an ESD wrist or ankle strap and ensure that it makes skin contact. Connect the equipment end of the strap to an unpainted metal surface on the chassis. If a wrist strap is not available, ground yourself by touching the metal chassis before handling the controller or any other part of the computer.

- Avoid touching the controller against your clothing. The wrist strap protects components from ESD voltages present on the body only. ESD voltages on clothing can still cause damage.
- Handle your controller by its bracket or edges only. Avoid touching the printed circuit board or the connectors.
- When you need to put your controller down, use an antistatic surface such as the bag supplied in your kit.
- If you plan to return the controller to Adaptec, put it back in its antistatic bag immediately.

# Installing the Controller

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## Overview

To install the controller and drives, all you need is up to four of each of the following:

- Serial ATA hard disk drives
- Serial ATA cables (supplied in this kit)

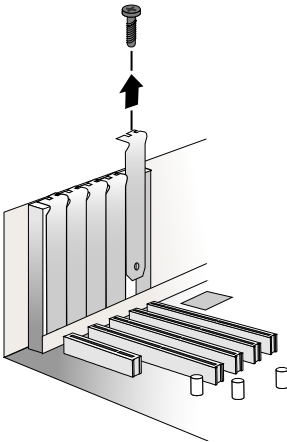
Configuration of Serial ATA devices is simple for the following reasons:

- There are no jumpers or switches to set on the controller or hard drives.
- The interface cable ends are identical, so you don't need to worry about which end to attach to the controller and which end to the drive.
- All interface connectors are keyed so that you can insert them in only one direction.

## Installing the Controller

To install the controller in the system cabinet:

- 1 Shut down your computer and disconnect the power cord.
- 2 Open the computer cabinet and identify an unused PCI slot.
- 3 If your computer accepts low-profile brackets only, install the low-profile bracket supplied with your kit in place of the standard full-height bracket.
- 4 Identify an unused PCI slot and remove the slot cover, as illustrated below.



- 5 Install the controller in the PCI slot and secure the controller bracket to the host system cabinet.
- 6 If you have not already installed your Serial ATA hard drives, do so now.
- 7 Use the cables supplied with your kit to connect your controller to the Serial ATA hard drives.

The cable connectors are all identical, so it does not matter which end you connect to your controller or hard drive. Also, the connectors are keyed to fit the connector in only one direction. Do not try to force a cable connector onto the controller or a drive. If the connector does not slide on easily, try reversing it.

- 8 Close the computer cabinet and re-attach the power cord.



## Checking Your Controller and Devices

Now that you have installed your Adaptec 2410SA controller and connected your Serial ATA hard drives, you are ready to use the ARC utility to check your controller and devices, as described below:

- 1 Turn on your computer.
- 2 When prompted, enter the ARC utility by pressing **Ctrl+A**.
- 3 If your drives have already been used in another system (even if not part of an array), select **Array Configuration Utility** and initialize the drives. Otherwise, skip to the [Step 4](#).



**Note:** If a drive appears to be missing, power down the computer and check the connections.

---

- 4 Select **SATASelect** to verify the hardware configuration of the controller and the drives.

Verify that all drives and controllers are shown. If anything appears to be missing, power down the computer and check the connections.

## Determining the Boot Controller

Your Adaptec 2410SA is a bootable controller. If your computer already contains a bootable hard drive with an installed operating system, you can set up your computer to boot a second operating system from the new controller.

To add a second bootable controller, you may need to enter Setup and change the hard disk boot sequence so that the Adaptec 2410SA controller heads the list. If Setup does not allow this change, your system BIOS may not be configurable to allow the Adaptec 2410SA controller to act as a second boot device.

# Installing the Driver

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This chapter presents several scenarios for installing the controller driver. The scenarios depend on the following terminology:

- **New system**—The computer has no operating system and the driver installation is a part of the operating system installation.
- **Existing system**—The computer has an operating system and the Adaptec 2410SA is being installed as a secondary controller.

Adaptec recommends the following driver installation workflow:

- 1 Create a driver disk. See [Creating the Driver Disk on page 3-2](#) for details.
- 2 Identify the appropriate operating system and installation scenario for your computer.
- 3 Familiarize yourself with the supported RAID types. You will need to select a RAID type during your driver installation. See [Appendix D](#) for details.
- 4 Read and understand the entire installation procedure.
- 5 Proceed with the installation.

## **Creating the Driver Disk**

Installing a driver is easier if you create a driver disk. To create the driver disk:

- 1 Set your system BIOS so that your computer boots from the CD-ROM drive.
- 2 Insert the Adaptec installation CD and turn on the computer.
- 3 Follow instructions and respond to prompts as necessary to get to the Adaptec Start Menu.
- 4 Click **Create Driver Disk**. Then, select the appropriate operating system.
- 5 Select the appropriate floppy drive letter. Then, choose the appropriate format. (You need a full format only if the disk has never been formatted or may have bad sectors.)
- 6 Insert a floppy disk and then click **OK**. The system creates the driver disk.
- 7 Remove and label the driver disk.

Now that you have created your driver disk, identify the appropriate driver installation scenario and proceed with the installation.

## **Creating the Linux Driver Disk**

When creating a driver disk for Linux, use:

- **i386**—For Intel 386 or 486 computers
- **i586**—For Pentium I or II computers
- **i686**—For Pentium III, IV, or AMD K-6 computers
- **Athlon**—AMD Athlon computers

# Windows

The following sections describe procedures for installing the controller with Windows 2000, Windows XP, or Windows Server 2003. The following installation scenarios are described:

- [Installing the Driver in a New System on page 3-3](#)
- [Adding the Driver to an Existing System on page 3-4](#)

## Installing the Driver in a New System

In this scenario, you are installing the controller in a new Windows system. To install the driver:

- 1 Install and configure the controller and hard disk drives according to the instructions in [Chapter 2](#).
- 2 Start the system and then press **Ctrl-A** to enter the BIOS-based configuration utility. Use the configuration utility to create the array and logical drive to which you will install Windows. For details, see [Checking Your Controller and Devices on page 2-3](#).
- 3 After the array is built, insert the Windows setup CD and restart the system to begin the Windows installation.
- 4 When prompted to install a third-party driver, press **F6**.



**Note:** When F6 is active, a prompt appears at the bottom of the screen for only 5 seconds. If you miss your chance to press F6, restart the computer.

---

- 5 Insert the driver disk and wait until prompted to install a driver. Press **S** to specify that the driver is on the floppy disk, and then press **Enter**. The computer reads the disk.
- 6 When the Adaptec driver is found, press **Enter**. Follow the on-screen instructions, responding as needed to complete the installation.

## **Adding the Driver to an Existing System**

In this scenario, you are adding the driver to an existing Windows system. To install the driver:

- 1** Install and configure the controller and hard disk drives according to the instructions in [Chapter 2](#).
- 2** Start Windows. Windows launches the Found New Hardware Wizard, which searches for the controller driver.
- 3** Insert the driver disk, select the floppy drive as the source and then click **Next**.
- 4** Click **Next** in the succeeding two windows that appear and follow the on-screen instructions to complete the controller installation.
- 5** Remove the driver disk and restart the system.

# Linux

The controller supports Red Hat and SuSE Linux versions as described in the table below.

Red Hat		SuSE	
Version	Kernel Version	Version	Kernel Version
7.3	2.4.18-3	8.0	2.4.18
8.0	2.4.18-14	8.1	2.4.19

## Notes

- If you do not find your kernel version listed above, either of the following conditions may apply:
  - Your kernel contains embedded drivers
  - Drivers are not available and you need to create a custom driver.
- *SuSE Linux only*—The controller is not supported as a bootable controller. In other words, you can only add the driver to an existing system.
- For the most up-to-date information on Adaptec's support of Linux, visit [www.adaptec.com](http://www.adaptec.com).

## Installing the Driver in a New Red Hat System

In this scenario, you are installing the controller in a new Red Hat 7.3 or 8.0 Linux system. To install the driver:

- 1 Install and configure the controller and hard drives according to the instructions in [Chapter 2](#).
- 2 Turn on the computer. During startup, press **Ctrl+A** to start the ARC utility. Use the ARC utility to create the array. For details, see [Checking Your Controller and Devices on page 2-3](#).
- 3 Insert the Red Hat CD Disk 1 in the CD drive.
- 4 Restart the computer.
- 5 When the Red Hat Welcome screen appears, type `expert` at the boot prompt.

- 6 When prompted, insert the driver disk and then select **OK**.
- 7 Follow the prompts to set up your preferred environment.
- 8 If you intend to install other third-party devices, proceed with the installation of those devices. Otherwise, select **Done**.
- 9 Proceed with the Linux installation according to the Red Hat instructions.

## **Adding the Driver to an Existing System**

These driver installation instructions apply to both Red Hat and SuSE Linux systems. To install the driver:

- 1 Ensure that the CD drive is mounted and then install the driver RPM. This can be done by typing:

```
rpm -Uvh <mount-point>/packages/Linux/driver_package/  
aacraid-*.i386.rpm
```

- 2 Run `fdisk`, `mkfs`, and create mount points for any new drives.

## UnixWare and OpenUNIX

Although the driver disk you create for UnixWare 7.1.1 and OpenUNIX 8 differ, the installation procedures for these operating systems are the same.

### Installing the Driver on a New System

In this scenario, you are installing the controller in a new UnixWare 7.1.1 or OpenUNIX 8 system.

To install the driver:

- 1 Install and configure the controller and hard disk drives according to the instructions in [Chapter 2](#).

Early in the operating system installation, you are shown a window labeled Choose One.

- 2 Insert the driver disk, select **Install HBA diskette** and then press **F10**.

The driver loads from the driver disk. Then, the HBA screen is displayed.

- 3 Select **Proceed with Installation** and then press **F10**.
- 4 Complete the installation as appropriate.
- 5 When the installation is finished, remove the driver disk and restart the system.

### Adding the Driver to an Existing System

In this scenario, you are adding the driver to an existing UnixWare 7.1.1 or OpenUNIX 8 system.

To install the driver:

- 1 Shut down the computer. Install and configure the controller and hard disk drives according to the instructions in [Chapter 2](#).
- 2 Turn on the computer. Then, insert the driver disk.
- 3 To run the `pkgadd` utility, type `pkgadd -d diskette1` and then press **Enter**. UNIX reads the disk and package information.
- 4 Press **Enter**.
- 5 Restart the system. The system rebuilds the kernel automatically.
- 6 Add devices to the controller.



# 4

## Installing Adaptec Storage Manager – Browser Edition

### In this Chapter...

<i>Overview</i>	4-1
<i>Supported Browsers</i>	4-2
<i>Typical, Custom, and Compact Installations</i>	4-2
<i>Installing Adaptec Storage Manager on Windows</i>	4-4
<i>Installing Adaptec Storage Manager on Linux</i>	4-8
<i>Installing Adaptec Storage Manager on UNIX</i>	4-9

### Overview

This chapter discusses the installation procedure for installing Adaptec Storage Manager – Browser Edition to enable remote and local management of arrays. For instructions on using this application, see [Chapter 5](#).

## Supported Browsers

To run Adaptec Storage Manager – Browser Edition, your computer must have a Web browser supporting JavaScript and cookies only. The following versions are supported:

- On Windows
  - Internet Explorer (IE) 5.0 or later
  - Netscape 7 or later
- On Linux
  - Adaptec-supplied and installed version of Mozilla
  - Netscape 7 or later

When using Adaptec Storage Manager, you need to log on to your system with administrator privileges.

## Typical, Custom, and Compact Installations

You can select from the following setup options:

- **Typical** (default)—Supports local and remote management; however, Adaptec SNMP is not included.
- **Custom**—For expert users. Primarily used to Web Server or when you want to make sure SNMP and Notifier are available for a managed system. You can select from the following components:
  - **Managed System Components**—If you select this option only, the installation is the same as a *Compact* installation.
  - **Adaptec Web Server**—Installs components allowing managed systems to communicate with Web browsers.
  - **Adaptec Storage Manager Notifier**—Installs messaging, including email and broadcaster capabilities.
  - **Adaptec SNMP**—Installs components used by SNMP-based applications. Requires Microsoft SNMP agents to be installed to function. Not included in a *Typical* installation.
- **Compact**—Installs only the components required on a managed system. See Managed System Components (above).



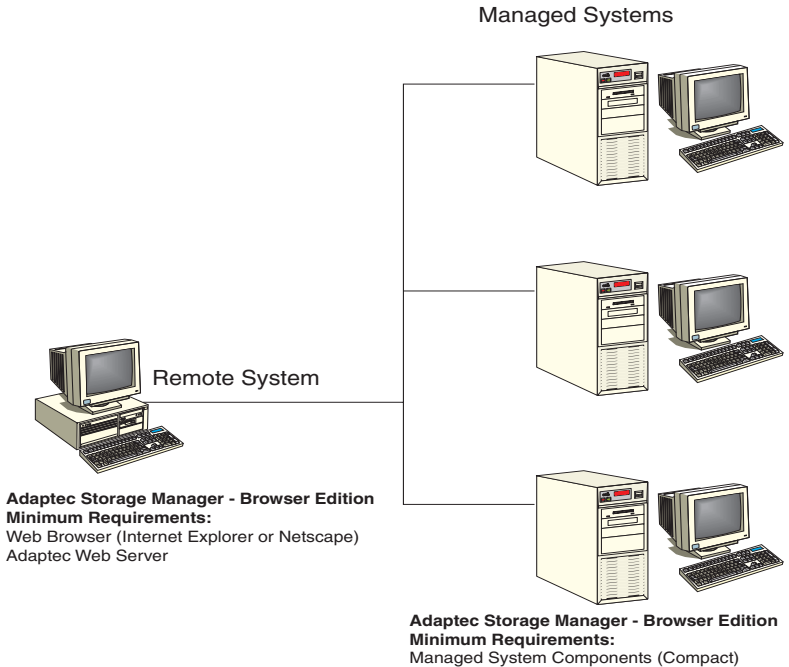
**Note:** When you perform a Typical or Compact installation, components needed for communication and remote management are installed automatically.

---

## Remote and Managed Systems

The illustration below shows a typical configuration of a single remote system connected to several managed systems. The remote system does not necessarily contain a RAID controller; however, it must contain, at minimum, the Adaptec Web Server and a browser (either Internet Explorer or Netscape).

The managed systems contain RAID controllers and arrays, and at least the Managed System Components.



## Installing Adaptec Storage Manager on Windows

---



**Note:** When installing on a FAT 32 file system, the folder being installed is automatically hidden.

---

To install Adaptec Storage Manager – Browser Edition:

- 1 Verify that a supported browser is installed. See [Supported Browsers on page 4-2](#) for details.
- 2 Insert the Adaptec installation CD and wait for the Autorun executable to start the installation. If this does not occur, browse the CD and click **Autorun**.
- 3 Click **Install Adaptec Storage Manager – Browser Edition**.
- 4 Click **Next** in the Install Shield window.
- 5 Read the license agreement. If you agree to its terms, click **Yes**. If not, click **No** and terminate the installation.

The Select a Setup Type window appears. It provides three types of installations: *Typical*, *Compact*, and *Custom*. See [Typical, Custom, and Compact Installations on page 4-2](#) for details.

- 6 Select a setup type and then click **Next**.
- 7 When you see the Destination Folder, click **Next**.
- 8 When you see the Setup Information, click **Next**.

The Setup Status window shows progress using a scroll bar. Before the scroll bar shows the installation is completed, another window pops up indicating that a security certificate has been generated.

- 9 Click **OK**.

The Root Certificate Store window appears.

- 10 Click **Yes**.

The security certificate generated during installation is added to the Certificate Store. If you click **No** now, you will need to install the certificate the first time you run Adaptec Storage Manager.

- 11 When prompted to restart your computer, accept the default (*Yes*) and click **Finish**.
- 12 The system restarts to complete the installation.
- 13 Remove the Adaptec installation CD before the system restarts.

## **Configuring Internet Browsers on Windows**

If you are managing a local storage array and your computer uses a proxy server, you need to configure your browser to enable Adaptec Storage Manager to bypass the proxy server. Also, if you are managing remote systems, you need to configure Adaptec Storage Manager to bypass the proxy server when communicating with these systems.

The following procedures are described in this section:

- [\*Configuring Internet Explorer for Local Management on page 4-6\*](#)
- [\*Configuring Internet Explorer for Remote Management on page 4-7\*](#)
- [\*Configuring Netscape Navigator for Local Management on page 4-7\*](#)
- [\*Configuring Netscape Navigator for Remote Management on page 4-7\*](#)

## Configuring Internet Explorer for Local Management

When using the *High* security setting, you must enable the following settings manually:

- JavaScript
- Cookies (not stored)

You *do not* need to enable the following custom level security settings for the local intranet in Internet Explorer 5 and 5.5. Select **Tools > Internet Options** to access these settings:

- Active Scripting
- Allow per session cookies (not stored)



**Note:** In Internet Explorer 6.0 there is no security setting for cookies. Cookie configuration was removed from the Privacy tab. There is no setting for blocking Intranet cookies.

---

If you are using a proxy server to access the Internet, you must bypass the proxy server to access the Adaptec Storage Manager Web server. To verify whether you are using a proxy server:

- 1 From **Internet Option** window, click the **Connections** tab.
- 2 Click **LAN Settings**.
  - If the **Use a proxy server** box isn't checked, exit by clicking **OK**. (You aren't using a proxy server, so ignore this setting.)
  - If the **Use a proxy server** box is checked, make sure the **Bypass proxy server for local addresses** box is also checked. Then, click the **Advanced** button. In the Exceptions window, enter `localhost` as an entry.

You are now ready to proceed to [Chapter 5, Using Adaptec Storage Manager – Browser Edition](#).

## **Configuring Internet Explorer for Remote Management**

If you know the IP address of the managed system you want to manage remotely:

- 1 Select **Tools > Internet Options > Connections > LAN Settings**.
- 2 Select **Use a proxy server for your LAN > Advanced**.
- 3 In the **Exceptions** section, type the managed system's IP address.

## **Configuring Netscape Navigator for Local Management**



---

**Note:** These instructions apply specifically to Version 7 and may differ in later versions.

---

To configure Netscape Navigator:

- 1 Log into your computer with administrator access.
- 2 Select **Edit > Preferences**.
- 3 In the **Preferences** window, click the right arrow on the **Privacy and Security** line. Ensure that one of the **Enable cookies** selections is selected.
- 4 Select the **Advanced** line. Ensure that **Enable Javascript for Navigator** is checked.
- 5 Exit Navigator, then restart it. This enables any settings you have modified.
- 6 You are now ready to proceed to [Chapter 5, Using Adaptec Storage Manager – Browser Edition](#).

## **Configuring Netscape Navigator for Remote Management**

If you know the IP address of the managed system you want to manage remotely:

- 1 Select **Edit > Preferences > Advanced > Proxies > Manual proxy configuration > No Proxy For**
- 2 Type the managed system's IP address.

# Installing Adaptec Storage Manager on Linux

---



**Note:** When performing this installation, keep in mind that Linux is case sensitive.

---

To install Adaptec Storage Manager on a Linux computer and configure the desired Internet browser:

1 Insert the Adaptec installation CD.

2 Install the software by typing:

```
sh <mount-point>/install.sh.
```

The <mount-point> differs among computers, but /mnt/cdrom, /media/cdrom, or cdrom usually works.

A Welcome window appears.

3 Click **Next**.

The License Agreement window appears.

4 Read the license agreement. If you agree to its terms, click **Accept**. If not, click **Cancel** and terminate the installation.

The Select a Setup Type window appears. It provides three types of installations: *Typical*, *Compact*, and *Custom*. See [Typical, Custom, and Compact Installations on page 4-2](#) for details.

5 Select a setup type and click **Next**.

The Start Copying window appears.

6 Click **Next**.

The Running Non-Interactive Setup window displays the files being loaded onto the system.

7 Click **Next** when prompted.

A Setup Complete window appears.

8 Click **Complete**.

A message window appears reminding you that any proxy servers must be bypassed for the RAID management application to work.



**9** Click **OK**.

The Shell window you used to launch the installation indicates that some daemons are being started.

The installation creates a shortcut to Adaptec Storage Manager in the System tab. This shortcut launches Adaptec Storage Manager using Netscape.

Unless the controller driver was installed as part of this installation, you do not need to restart your computer.

**10** Remove the Adaptec installation CD.

Your computer must have a Web browser supporting JavaScript and cookies. To use Adaptec Storage Manager, you need to log on to your computer with root privileges.

## Installing Adaptec Storage Manager on UNIX

Your UNIX system may only be used as a managed system. Therefore, you can use only the following installation options:

- **Compact**—Installs the managed system components.
- **Advanced**—You select the managed system components. If using third-party applications requiring remote communications, you can add the SNMP agent.

To install Adaptec Storage Manager, type:

```
sh <mount-point>/install.sh
```


where *<mount-point>* is usually */mnt/cdrom* or *cdrom*. (Remember that Unix is case sensitive.) The install script automatically determines the components needed for your computer and performs the installation.

# 5

## Using Adaptec Storage Manager – Browser Edition

### In this Chapter...

<i>Overview</i>	5-2
<i>Architecture Overview</i>	5-3
<i>Logging In</i>	5-4
<i>Installing a Security Certificate</i>	5-6
<i>Registering Your Software</i>	5-6
<i>The Basics</i>	5-7



## Overview

This chapter describes how to use Adaptec Storage Manager – Browser Edition to manage arrays. Once you are logged in, you will find convenient online help to guide you through the details of creating, configuring, and managing arrays.



**Note:** Your controller may not support all of the features described. In most cases if a feature is not supported by your controller the feature does not appear in the interface.

---

With Adaptec Storage Manager, you can:

- Locally manage a system containing a supported Adaptec RAID controller that has Windows or Linux and a supported browser.
- Remotely manage any system containing a supported Adaptec RAID controller that has Managed System Components. (See [Typical, Custom, and Compact Installations on page 4-2](#).) You can manage a system remotely from a system that does not contain a RAID controller.



**UNIX Systems Only:** The remote system (the system doing the managing) must have the ARCPD agent installed.

---

These same Windows and Linux systems can also be managed remotely by either of the following methods:

- Installing Adaptec Storage Manager on the remote system.
- Directing the browser on the remote system to the system you want to manage.



**Note:** To manage an array remotely from a Linux system, install Adaptec Storage Manager on the system and use the Adaptec-supplied version of Mozilla as the browser.

---

## **Architecture Overview**

A locally managed system requires all of the following components:

- A supported Web browser, which should already be installed on the system.
- The Adaptec Web service which supplies content displayed on the Web browser.
- An Adaptec-supplied storage agent.

A remotely managed system requires all of the following components:

- The remote system must contain a browser.
- The managed system must contain an Adaptec storage agent.
- Remote and managed systems must have a TCP/IP connection.

The Web service can be installed on the same remote system as the browser, the system with the RAID controller installed, or a third system.

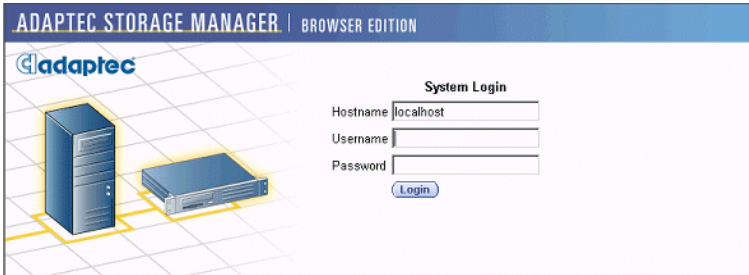
Communication security is ensured because Secure-HTTP (S-HTTP) or SSL protocols are used to encrypt all transmitted data. Connection over an Ethernet network, a corporate WAN, or VPN are supported.

# Logging In

To login:

- 1 Start Adaptec Storage Manager – Browser Edition.
  - In Windows, click **Start > Programs > Adaptec Storage Manager > Adaptec Storage Manager – Browser Edition**.
  - In Linux, click **Start > System > Adaptec Storage Manager**.

The Login screen, shown below, is presented.



- 2 Enter the host name or IP address of the system you want to manage and the username and password you would use to log into that system.
- 3 Click **Login**.

## Notes

When running Adaptec Storage Manager for the first time:

- You need to install a security certificate if you chose not to during the installation process. For instructions, see [Installing a Security Certificate on page 5-6](#).
- You are asked to register your software. For instructions, see [Registering Your Software on page 5-6](#).

To log in from any system with a Web browser:

- 1 Start the Web browser application and type the IP address for the system you want to access in the address bar and then press **Enter**. For example, `https://10.6.3.14:3513/adaptec`.

When connection to the remote system is established, the System Login screen appears.



**Note:** If you are using a proxy server to access the Internet, you must bypass the proxy server to access the Adaptec Storage Manager Web server. See [Configuring Internet Browsers on Windows on page 4-5](#) for details.

---

- 2 Enter the host name or IP address of the system you want to manage and the administrative username and password that you would normally use to log into that system.
- 3 Click **Login**.

## Installing a Security Certificate

If you chose not to install a security certificate when you installed Adaptec Storage Manager – Browser Edition, you must install the certificate when you run the application for the first time.

To create the certificate:

- 1 When the Security Alert window appears, click **View Certificate**.
- 2 When the Certificate window appears, click **Install Certificate**.
- 3 When the Certificate Import wizard, appears, click **Next**.

The Certificate Import wizard window's contents change.

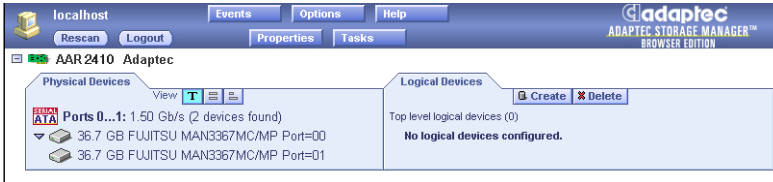
- 4 Accept the default, **Automatically select the certificate store**, and click **Next**.
- 5 On the root Certificate Store window, click **Yes**.  
Another small Certificate Import wizard appears.
- 6 Click **OK**.  
The Certificate window mentioned in [Step 2](#) reappears.
- 7 Click **OK**.  
You are returned to the Security Alert window from [Step 1](#).
- 8 Click **Yes** to finish the creation and storage of the certificate.

## Registering Your Software

After installing and creating a security certificate, you are asked to register the product. To use **Register Now**, your computer must have an Internet connection. If you need to delay registration, click **Register Later**. If you choose **Register Later**, you will be prompted to register the application the next time you run it.

## The Basics

An example of a typical Adaptec Storage Manager – Browser Edition screen is shown below.



**Note:** Depending on your operating system, browser, and color scheme you may notice some differences between this illustration and your screen.

The header frame, at the top of the screen, contains the name of the system that you are currently connected to and a number of buttons that perform various actions or open additional windows.

The action buttons are:

- **Logout**—Selecting Logout ends your session and returns you to the Login screen.
- **Rescan**—Used to rescan the configuration of the system. Typically, when a rescan is required, it occurs automatically, for example, after an array is created.

However, the system configuration can change without Adaptec Storage Manager being notified. For example, drives that are inserted or removed from a nonintelligent enclosure or an enclosure powered on after you logged into Adaptec Storage Manager would not be displayed unless you manually rescan.

The remaining buttons open additional windows that provide more detailed information and allow you to perform actions or change settings on a specific aspect of your storage subsystem.

These are:

- Events
- Options
- Help
- Properties
- Tasks



Immediately following the header frame is a controller information line including the model number of the first Adaptec RAID controller found in the system and the amount of cache memory (if any) installed on that controller.

Beneath the controller information are Physical Devices and Logical Devices views that show connected devices and existing arrays on this controller. Controller information and device views are repeated for each additional Adaptec RAID controller in the system.

Select the controller by clicking anywhere on the controller information. When the controller is selected, the Events, Properties and Tasks buttons change from blue to amber. Clicking any of them displays an additional window with information and options specific to this controller.

## **Pop-Up Tool Tips**

If you position the cursor over a device or button a pop-up tool tip appears. For buttons, the tips contain helpful information about the function of the button, while for devices they display additional information.

## **Physical Devices**

The Physical Devices view displays information about the drives and enclosures attached to the Adaptec RAID controller. The devices are shown organized by the channel or port that they are connected to and shown in numerical order.

The display for each channel includes information on maximum speed capability, the number of the channel on the controller, and the number of devices found (excluding the controller).

Selecting a channel or device turns the Events, Properties, and Tasks buttons amber. Clicking any of these buttons displays an additional window with information and options specific to that device or channel.

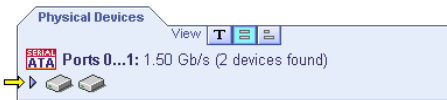
At the top of the Physical Devices view, grouped to the right of View, are three view selection buttons. These buttons select the physical devices connected to this controller.



## Changing How Drives are Displayed

By default, the Physical Devices displays a condensed view of the controller configuration that hides detailed information about the drives. More information is available by either positioning the mouse pointer over the device or clicking on the arrowhead to the left of a row of devices.


The selected display mode button will appear in a lighter shade of blue than the other two buttons. The default display is the *Text Description View*, but in the condensed view used when Adaptec Storage Manager is loaded, the display is the same in all three modes.

If you change the display mode by selecting one of the other view buttons, a yellow arrow flashes to the left of any devices where the condensed display omits information.






An icon is always the first entry on each device line. The  icon is used to represent a hard disk drive. If a + symbol appears with the hard disk drive icon , the drive is a hot spare. Different icons are used to represent other devices.


### View

 is the default display mode and when expanded, will show the following information about each device:

- Capacity of the drive
- Drive manufacturer and model number
- Drive ID, or Serial ATA port number

When expanded, the Full Size Capacity View button  and the Relative Size Capacity View button  represent each drive as a bar. A drive that is not used as part of any array is shaded blue surrounded by a dotted line.

 displays a full-length bar for each drive, regardless of capacity.

 displays a bar for each drive, with the largest capacity drive full-length and the other drives proportional to the drive capacity, relative to the largest drive.

Any part of a drive used in an array is shown as a gray segment within the bar. Selecting any gray segment will highlight it in amber and, in the Logical Devices view, highlight the array of which this segment is a member.

In either the Full Size Capacity View or the Relative Size Capacity View, a small portion at each end of the drive may be shown in dark gray.

The segment at the end of the drive may vary in size from drive to drive because, in addition to the RAID signature, the controller may also limit the usable capacity of each drive.

This is done because hard disk drives of apparently the same capacity from different manufacturers, or even different models from the same manufacturer, actually vary slightly in the true capacity available. Although, in normal operation this is not an issue, it can be when assigning hot spares or replacing a failed drive.

If the controller used the maximum capacity of each drive and a hot spare or replacement drive was just a few megabytes smaller, it would not be able to replace the failed drive. By rounding drive capacities downward, this possibility is effectively eliminated.

## **Logical Devices**

As described earlier, when Adaptec Storage Manager loads, the Logical Devices view is expanded and you can see the arrays present on the controller.

At the top of this view are the following buttons: Create, Modify, and Delete. Each button opens a wizard for the corresponding function.

Modify allows you to:

- Change an array from one RAID level to another
- Expand an array
- Change the stripe size for a RAID 0

For detailed instructions on these buttons, refer to the online Help.

The main area of the Logical Devices view is used to display the arrays on this controller. It defaults to a condensed view of top-level arrays.



**Note:** The Options button allows you to display second-level arrays if your controller supports them.

---

In this condensed view, the RAID level of each device as well as whether it is protected by a hot spare, is visible.

If a global hot spare exists, all arrays that the hot spare is large enough to protect will show as protected.

In the expanded view, the icons for the arrays are arranged vertically and alongside them are the capacity, name, and type of array.

Selecting an array by clicking on it will highlight the following in amber:

- All the drives or segments that form the array in the Physical Devices view.
- Any second-level arrays that form a top-level array in the Logical Devices view.
- The Events, Properties, and Tasks buttons in the header frame. Selecting any of these three buttons displays a new window with additional information and options specific to that array.



# Adaptec RAID Configuration Utility

In this Appendix...

<i>Using the Array Configuration Utility</i>	A-2
<i>Using SATASelect</i>	A-9
<i>Using the Disk Utilities</i>	A-11
<i>Viewing the Event Log</i>	A-12

The Adaptec RAID Configuration (ARC) utility is an embedded BIOS utility that includes:

- **Array Configuration Utility (ACU)**—Used to create, configure, and manage arrays. Also used to initialize and rescan drives. (Also available as a stand-alone DOS utility as described in [Using the Array Configuration Utility \(ACU\) on page B-11.](#))
- **SATASelect**—Used to change device and controller settings,
- **Disk Utilities**—Used to format or verify media.

To run the ARC utility, press **Ctrl+A** when prompted by the following message during system startup:

Press <Ctrl><A> for Adaptec RAID Configuration Utility

The Adaptec RAID Controller menu appears, presenting the following options:

- Array Configuration Utility
- SATASelect Utility
- Disk Utilities

To select an option from this menu, or from any of the menus within ARC, browse with the arrow keys and then press **Enter**. In some cases, selecting an option displays another menu. To return to the previous menu at any time, press **Esc**.

The following sections discuss each of these menu options.

## Using the Array Configuration Utility

The Array Configuration Utility (ACU) enables you to manage, create, and delete arrays from the controller's BIOS. You can also initialize and rescan drives.

You can use the ACU to create a bootable array for the system. We recommend that you configure the system to boot from an array instead of a single disk to take advantage of the redundancy and performance features of arrays. For details, see [Making an Array Bootable on page A-3](#).

### Managing Arrays

Use the **Manage Arrays** option to view array properties and members, make an array the boot array, manage failover assignments, and delete arrays. The following sections describe these operations in greater detail.

## Viewing Array Properties

To view the properties of an existing array:

- 1 At the BIOS prompt, press **Ctrl+A**.
- 2 From the ARC menu, select **Array Configuration Utility**.
- 3 From the ACU menu, select **Manage Arrays**.
- 4 From the List of Arrays dialog box, select the array you want to view information on and then press **Enter**.

**Single Level Arrays Only**—For RAID levels 0, 1, and 5, the Array Properties dialog box shows detailed information on the array physical disks.

**Dual-Level Arrays**—For RAID 10s, to view detailed information on the array physical disks, highlight the displayed member and then press **Enter** to display the second level. Press **Enter** again to display the physical disks associated with the array.



**Note:** A failed drive is displayed in a different text color.

---

- 5 Press **Esc** to return to the previous menu.

## Making an Array Bootable

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

- 1 At the BIOS prompt, press **Ctrl+A**.
- 2 From the ARC menu, select **Array Configuration Utility**.
- 3 From the ACU menu, select **Manage Arrays**.
- 4 Select the array you want to make bootable and then press **Ctrl+B**. This changes the selected array's number to 00, making it the controller's boot array.
- 5 Restart the system.

## Notes

- If the controller is not a boot device, you can disable its runtime BIOS, see [page A-10](#). When the BIOS is disabled, it does not occupy any of the expansion ROM region of the system's memory map. In a system with several expansion ROMs, disabling the BIOS may be helpful.
- You cannot make a non-00 array bootable while the array is in a build/verify or reconfiguration process.
- The controller always uses the lowest numbered array as its bootable array. If you delete Array 00 for any reason, the next lowest numbered array becomes the bootable array. Use the **Ctrl+B** option to mark the correct array as the bootable array (by making it Array 00).
- If you want to boot from a stand-alone (single) disk drive, first create a volume on that disk.
- The system BIOS provides additional tools to modify the boot order. For more information, refer to your system documentation.

## Deleting Arrays



**Caution:** Back up the data on an array before you delete it. When you delete the array, you lose all your data on the array. You cannot restore deleted arrays.

---

To delete an existing array:

- 1 At the BIOS prompt, press **Ctrl+A**.
- 2 From the ARC menu, select **Array Configuration Utility**.
- 3 From the ACU menu, select **Manage Arrays**.
- 4 Select the array you wish to delete and then press **Delete**.
- 5 In the Array Properties dialog box, press **Delete** again and then press **Enter**. The following message is displayed:

Warning!! Deleting will erase all data from the array.  
Do you still want to continue? (Yes/No):



- 6 Select **Yes** to delete the array or **No** to return to the previous menu. At the Array Properties dialog box, select **Delete** again and then press **Enter**.
- 7 Press **Esc** to return to the previous menu.

### **Managing Failover Drive Assignments**

To assign a hot spare drive to an array:

- 1 Select **Manage Arrays** from the Main menu.
- 2 From the List of Arrays dialog box, select the array to which you want to assign a hot spare, and then press **Ctrl+S**. The Hotspare Management for Array dialog box is displayed, which shows the drives that can be assigned as hot spare drives.
- 3 Select a drive and then press **Insert** to assign the drive as a hot spare. The specified drive is displayed in the Assigned Hotspares drives list.
- 4 Press **Enter** to save the hot spare drive assignment. the following message is displayed:

Have you finished managing Hotspare drives?

- 5 Press **Y** (for yes) to return to the Main menu.

To remove an assigned hot spare drive from an array:

- 1 Select **Manage Arrays** from the Main menu.
- 2 From the **List of Arrays** dialog box, select the array from which you want to remove the assigned hot spare drive and press **Ctrl+S**. The Hotspare Management for Array dialog box is displayed, which shows a list of drives that can be assigned as hot spare drives and a list of drives that are assigned as hot spare drives.
- 3 From the Assigned Hotspares drives list, select the drive to be removed and then press **Delete**. The specified drive is displayed in the Select Hotspares drives list.
- 4 Press **Enter** to save the removed hot spare drive assignment. the following message is displayed:

Have you finished managing Hotspare drives?

- 5 Press **Y** (for yes) to return to the Main menu.

## Creating Arrays

Before creating arrays, make sure the disks for the array are connected and installed in your system (or enclosure). Note that any disks with MS-DOS partitions, disks with no usable space, or disks that are uninitialized appear dimmed and cannot be used for creating a new array. For information on how to initialize a disk drive, see [page A-8](#).

To create an array:

- 1 Shut down and restart the system.
- 2 At the BIOS prompt, press **Ctrl+A**.
- 3 From the ARC menu, select **Array Configuration Utility**.
- 4 From the ACU menu, select **Create Array**.
- 5 Browse with the arrow keys to select a channel.
- 6 Select the disks for the new array and then press **Insert**. ACU displays the largest usable space available for each disk. You can use available space from multiple disks for the new array.

To deselect any disk, highlight the disk and then press **Delete**.



**Note:** The ACU cannot reliably find disks or enclosures that were powered up after system power-up. Therefore, power up enclosures prior to powering up the host.

---

- 7 Press **Enter** when all disks for the new array are selected. The Array Properties menu is displayed.

After you install a controller in a system and start it for the first time, the BIOS announces the configuration it has detected. This configuration may not match your system's configuration.



**Caution:** If you do not take any action within 30 seconds, the system automatically accepts the configuration. If the configuration does not match your system, reject it or enter the ARC utility. Otherwise, the array configuration may be erased.

---

If necessary, enter the ARC utility. Upon entering ARC, accept the configuration that ARC reports, and then modify the configuration to suit your needs.

## Assigning Array Properties

The ACU can be used to assign array properties only prior to array creation. (After the array is created, you need to use Adaptec Storage Manager.) To assign properties to the new array:

- 1 In the Array Properties menu, select an array type and then press **Enter**. The display shows only the array types available for the number of drives selected.

The maximum number of drives allowed and minimum number of drives required depends on the RAID level, as described in the table below.

RAID Level	Maximum Drives Allowed	Minimum Drives Required
Simple volume	4	1
RAID 0	4	2
RAID 1	2	2
RAID 5	4	3
RAID 10	4	4

- 2 Type in an optional label for the array and then press **Enter**.
- 3 Enter the desired array size. The maximum array size available based on the segments you selected is displayed automatically. If you want to designate a different array size, type the desired array size and select **MB** (megabytes), **GB** (gigabytes), or **TB** (terabytes) from the drop-down list. If the available space from the selected segments is greater than the size you specify, the remaining space is available for use in other arrays.
- 4 Select the desired stripe size. The allowable stripe sizes are 16, 32, and 64 KB (the default). The default stripe size provides the best overall performance in most network environments.
- 5 Specify whether you want to enable read and write caching for the array. When *Enabled* (the default), caching is enabled, providing maximum performance. When *Disabled*, caching is disabled.



**Caution:** When caching is *Enabled*, there is a potential for data loss or corruption during a power failure.

---

Caching should usually be enabled to optimize performance, unless your data is highly sensitive, or unless your application performs completely random reads, which is unlikely.

- 6 Specify whether you want to enable write caching for the array. When you are finished, select **Done**.

## Initializing Disk Drives

If an installed disk does not appear in the disk selection list for creating a new array or if it appears grayed out, you need to initialize it before you can use it as part of an array.



**Caution:** Initializing a disk overwrites the partition table on the disk and makes any data on the disk inaccessible. If the drive is used in an array, you may not be able to use the array again. Do not initialize a disk that is part of a boot array. The boot array is the lowest numbered array (normally 00) in the List of Arrays dialog box. (See [Viewing Array Properties on page A-3](#) for information on determining which disks are associated with a particular array.)

---

To initialize drives:

- 1 At the BIOS prompt, press **Ctrl+A**.
- 2 From the ARC menu, select **Array Configuration Utility**.
- 3 Select **Initialize Drives**.
- 4 Browse with the arrow keys to select a channel.
- 5 Browse with the arrow keys to highlight the disk you wish to initialize and then press **Insert**.
- 6 Repeat step 5 until all the drives to be initialized are selected.
- 7 Press **Enter**.
- 8 Read the warning message, ensure that you have selected the correct disk drives to initialize, and then press **Y** to continue.

## Rescanning Disk Drives

To rescan the drives connected to the controller:

- 1 At the BIOS prompt, press **Ctrl+A**.
- 2 From the ARC menu, select **Array Configuration Utility**.
- 3 Select **Rescan Drives**.

## Using *SATASelect*

*SATASelect* enables you to change device and controller settings without opening the computer cabinet or handling the card. With this utility, you can modify the Channel Interface Definitions and Device Configuration Options.

To access the *SATASelect*:

- 1 When you turn on or restart your system, press **Ctrl+A** to access the ARC utility when you see the following message:  
Press <Ctrl><A> for Adaptec RAID Configuration Utility
- 2 If multiple controllers are installed, select the controller you want to configure and then press **Enter**.
- 3 From the ARC menu, select **SATASelect Utility**.

The SATA Configuration and Controller Configuration menu options are displayed.

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

To restore the original *SATASelect* default values, press **F6** from the Configure/View Host Adapter Settings screen.

- SATA Configuration Options:
  - **Write Cache** (Default: *Enabled*)—When *Enabled*, write cache is enabled, providing maximum performance.



**Caution:** When *Enabled*, there is a potential for data loss or corruption during a power failure.

---

- **DMA** (Default: *Enabled*)—When *Enabled*, Direct Memory Access (DMA) mode is used for the drive, providing maximum performance.
- **SMART** (Default: *Disabled*)—Controls the predictive failure feature of the disk drive. When *Enabled* and the drive supports Self-Monitoring, Analysis and Reporting Technology (SMART) configuration, the SMART status of the drive (Healthy or Failed) is displayed along with the physical drive display during POST. Messages are logged to the Storage Manager log file when they occur. When Event Broadcasting is enabled for your operating system, SMART events are also sent to destinations according to your system's particular configuration (for example, system log file, Event Viewer, pop ups, email, etc.) When *Disabled*, or when the drive does not support SMART, the SMART status is not displayed.
- **Allow Read Ahead** (Default: *Enabled*)—When *Enabled*, the drive's read ahead cache algorithm is use, providing maximum performance under most circumstances.
- **Controller Configuration Options:**
  - **Drives Write Cache** (Default: *Drive's Default*)—When *Enabled*, write cache is enabled, providing maximum drive performance. When *Disabled*, no write cache is used on the drive. By default, the drive's setting is used.



**Caution:** When *Enabled*, there is a slight possibility (less than with controller cache) of data loss or corruption during a power failure.

---

- **Runtime BIOS** (Default: *Enabled*)—When *Enabled*, the Adaptec 2410SA controller BIOS allows the controller to act as a bootable device. Disabling the BIOS allows another suitable controller to act as the boot device.
- **Automatic Failover** (Default: *Enabled*)—When *Enabled*, the controller automatically rebuilds an array when the failed drive is replaced. When disabled, the array must be rebuilt manually.

- **Array Background Consistency Check** (Default: Disabled)—When *Enabled*, the controller continuously performs a verification on a redundant array to data integrity. In the case of RAID 1 or 10, consistency checks assure that the data between like blocks match. In the case of a RAID 5, consistency checks assure that data in the stripe and the calculated parity for the stripe match. Consistency checking processes reduce performance. For a RAID 5, the performance reduction is significant.
  - **BBS Support** (Default: *Enabled*)—When *Enabled* in systems that support BBS, controller is presented as a bootable device in the host system's BIOS for boot device selection.
  - **Array-based BBS Support** (Default: *Disabled*)—When *Enabled* in systems that support BBS, the controller presents attached bootable devices up to the host system's BIOS for boot device selection. This is relevant for logical arrays.
  - **Physical Drives Display during POST** (Default: *Disabled*)—When *Enabled*, attached physical devices are displayed during system POST. Displaying the devices adds a few seconds to the overall POST time.
- 4 To exit *SATASelect*, press **Esc** until a message prompts you to exit. (If you changed any host adapter settings, you are prompted to save the changes before you exit.) Select **Yes** to exit and restart the system. Any changes you made take effect after the system boots.

## Using the Disk Utilities

The disk utilities enable you to low-level format or verify the media of your Serial ATA hard disks. To access the disk utilities:

- 1 Turn on your computer and then press **Ctrl+A** when prompted to access the ARC utility.
- 2 If multiple controllers are installed, select the controller you want to configure and then press **Enter**.
- 3 From the ARC menu, select **Disk Utilities**.
- 4 Select the desired disk and then press **Enter**.

You are offered the following options:

- **Format Disk**—Simulates a format of the hard drive by removing the file system and writing zeros to the entire disk. Serial ATA drives are formatted at the factory and do not need to be formatted again.



**Caution:** Formatting destroys all data on the drive. Be sure to back up your data before performing this operation.

---

- **Verify Disk Media**—Scans the media of a disk drive for defects. Any errors found are corrected.

## Viewing the Event Log

The BIOS-based event log stores all firmware events (configuration changes, array creation, boot activity, and so on).

The event log has a fixed size. Once full, old events are flushed as new events are stored. Also, the log is volatile; therefore, it is cleared after each system restart.

To access the event log:

- 1 When you turn on or restart your system, press **Ctrl+A** to access the ARC when prompted by the following message:  
Press <Ctrl><A> for Adaptec RAID Configuration Utility
- 2 If multiple controllers are installed, select the controller you want to configure and then press **Enter**.
- 3 From the ARC menu, press **Ctrl+P**.  
The Controller Service Menu appears.
- 4 Select **Controller Log Information** and then press **Enter**. The current log is displayed.



## DOS Utilities

In this Appendix...

<i>Using the Adaptec Flash Utility (AFU)</i>	B-1
<i>Using the Array Configuration Utility (ACU)</i>	B-11

### Using the Adaptec Flash Utility (AFU)

The Adaptec<sup>®</sup> Flash Utility (AFU) is a DOS application used to update the flash EEPROM components on one or more Adaptec SCSI RAID controllers. The utility can also be used to verify a controller's current flash contents against the flash images in a specified file or to save a controller's current flash contents to a file.

Your Adaptec RAID controller uses nonvolatile flash to store on-board software, such as BIOS, microprocessor kernel, and monitor. Whenever it becomes necessary to update any of those components you can update your controller's flash components using the AFU.

AFU updates the controller's flash by reading flash image data from a supplied User Flash Image (UFI) file and writing it to the controller's flash components. A UFI file contains all of a controller's flash images, as well as information about each image. It also includes general controller information, such as controller type, to ensure that AFU uses the correct UFI file when updating the controller's flash.

The process of updating a controller's flash must be done carefully to avoid rendering the controller inoperable. AFU is designed to be easy to use with all the necessary safeguards to prevent a user from accidentally damaging the controller's flash contents.

## Overview of the AFU

The AFU performs the following primary functions:

- **Update**—Updates all the flash components on a controller with the flash image data from a UFI file.
- **Save**—Reads the contents of a controller's flash components and saves the data to a UFI file. This enables you to later restore a controller's flash to its previous contents should the need arise.
- **Verify**—Reads the contents of a controller's flash components and compares it to the contents of the specified flash image file.
- **Version**—Displays version information about a controller's flash components.
- **List**—Lists all the supported controllers detected in your system.

See [Running the AFU on page B-4](#) for command details.

## System Requirements

The requirements for AFU are as follows:

- AFU runs under MS-DOS version 5.0 or later. It cannot run from a DOS command prompt window under any version of Windows.

You must shut down your operating system and reboot to DOS to use the AFU. To start MS-DOS, boot from a bootable MS-DOS floppy disk or from a DOS partition on a bootable drive.

- AFU requires at least 8 MB of extended memory.
- AFU does *not* run with any DOS extenders installed in memory, such as EMM386.SYS and DOS4GW.

AFU does support HIMEM.SYS and is compatible with other DOS drivers running under HIMEM.SYS (for example, SMARTDRV.SYS and SETVER.SYS).

- The AFU can run from a partition on a drive or array attached to the controller you are updating. Once the flash update begins, no I/O is possible to any array attached to that controller until the flash operation is completed and the system is restarted.
- If you want to update multiple controllers in the same system, you should first update the boot controller's flash, restart the system, and then update the flash for any remaining controllers.

## Firmware Floppy Disk Kit

Controller firmware is available on Adaptec installation CD, or from [www.adaptec.com](http://www.adaptec.com).

The CD includes the AFU executable `AFU.exe`, the corresponding documentation, and a separate flash image. The flash image may be comprised of multiple UFI files.

To create a controller firmware kit on floppy disks:

- 1 Locate the necessary files on the Adaptec installation CD at:  
`packages/firmware/adpxxx`  
where `xxx` is the model number of your controller.
- 2 Create a bootable MS-DOS floppy disk and copy the following files to this disk:
  - `AFU.exe`
  - `AAxxx01.ufi`where `xxx` is the model number of your controller.
- 3 Copy the remaining UFI files to additional disks.

## Running the AFU

You can run the AFU from its graphical user interface (GUI) or from the command line.

### Accessing the AFU from the GUI

To access the AFU:

- 1 At the DOS command prompt (typically A:\>), type AFU with no arguments.  
The main menu to the AFU is displayed.
- 2 Select **Select Controllers** and select the controllers to be flashed.
- 3 Select **Select an Operation**.
- 4 Select any available AFU function and follow the on-screen instructions.

### Accessing the AFU from the Command Line

At the DOS command prompt (typically A:\>), type AFU followed by a command and any optional switches. The AFU processes the command, prompts you to insert additional floppy disks as needed, exits, and reports success or an error message code.

The syntax of the AFU command line is as follows:

```
AFU <Command> [/C<Controller ID>] [/D <UFI File Path>] [/?]
```

where *<Command>* is one of the following AFU commands:

- **HELP**—Displays AFU help text.
- **LIST**—Lists the AFU-supported controllers installed on this system.
- **SAVE**—Saves the contents of a controller's flash to the specified UFI file.
- **UPDATE**—Updates a controller's flash from the data in the specified UFI file.
- **VERIFY**—Compare the controller's current flash to the specified UFI file.
- **VERSION**—Displays the controller's current flash version information.

The AFU switches are as follows

- `/C <Controller ID>` is one or more controller IDs representing the set of controllers on which to perform the specified command. You can specify a single controller ID, for example:

```
/C 0
```

multiple IDs separated by commas, for example:

```
/C 0,2
```

or ALL to indicate all controllers.

This switch is required. If no `/C` switch is specified, the system returns a fatal error message. See each individual command for the default switch values.

- `/D <EFI File Path>` specifies the path (drive and directory) where the UFI files are located. If you do not specify the `/D` switch, the AFU looks for, or creates, its UFI files in the default location.



**Note:** You cannot specify the name of a UFI file, only its path. UFI filenames are predefined, based on the controller type.

---

## Flashing the Firmware Using AFU

The simplest way to flash the controller is to use the AFU GUI. Follow the instructions in [Accessing the AFU from the GUI on page B-4](#) to start AFU with the GUI.

To flash the firmware using the AFU utility from the command line:

- 1 Shut down your computer.
- 2 Insert the bootable disk that contains the AFU utility.
- 3 Turn on the computer.
- 4 Enter the system setup utility and verify that your computer is set up to boot from the bootable disk.

- 5 At the DOS prompt, type `afu list` and press **Enter**.

This command displays a list of the controllers in your system. Take note of the controllers you would like to update and its number (or numbers if there are more than one). Verify that the controller you wish to update is identified.

- 6 You can perform this step using any of the following alternatives:

- a **Flashing the Firmware on a Single Controller**—To flash the firmware on a single controller, type:

```
afu update /C <controller_number>
```

Where *<controller\_number>* is the number of the controller whose firmware you are updating.

For example, to upgrade Controller 0, you would type:

```
afu update /C 0
```

- b **Flashing the Firmware on Multiple Controllers**—To flash the firmware on multiple controllers, type:

```
afu update /C <controller_number_a>,<controller_number_b>
```

Where *<controller\_number\_a>* and *<controller\_number\_b>* is the number of one of the controllers whose firmware you are updating.

To upgrade controllers 0, 2, and 3 for example, you would type:

```
afu update /C 0, 2, 3
```

- c **Flashing the Firmware on All Controllers**—To flash the firmware on all controllers, type:

```
afu update /C all
```

- 7 The firmware image may be contained on multiple disks.

The AFU prompts you to put in the first firmware disk. When it detects that the disk is in the drive, the AFU reads the part of the firmware image contained on the first disk.

- 8 The AFU then tells you to remove the first firmware disk and insert the second firmware disk.

- 9 If there are additional UFI files this process is repeated until the complete image has been read, the controller flash is updated with the new image.

## AFU Commands

The following pages describe each of the AFU commands in detail. For ease of use, the commands are presented in alphabetical order.

### HELP

The `HELP` command displays a summary of AFU functions and command switches.

To display the help text for the AFU, you can also type `AFU /?`

### Options

None

### Default Switch Values

None

### Examples

```
A:\> AFU HELP
```

```
A:\> AFU /?
```

### LIST

The `LIST` command displays the AFU-supported controllers installed on your system. Use this command to see which controllers are installed on this system, or to identify the ID numbers assigned to each physical controller.

You do not have to restart the computer upon completion of this command.

### Options

None

### Default Switch Values

None

### Example

```
A:\> AFU LIST
```

```
Adaptec Flash Utility V4.0-0 B5749
```

```
(c)Adaptec Inc. 1999-2002. All Rights Reserved.
```

```
Controllers Detected and Recognized:
```

```
Controller #0 (03:05:00) Adaptec 2410
```

## SAVE

The `SAVE` command saves the contents of a controller's flash in a UFI file. The name of the UFI file is based on the controller type and cannot be changed. Use the `/D` switch to specify the drive and directory where you want AFU to create the UFI file.



**Note:** You can specify only one controller ID. If you include the `/C` switch and specify more than one controller, the AFU displays an error message and exits.

---

You must restart the computer following a `SAVE` command.

### Default Switch Values

If you do not include the `/C` switch, the AFU returns a fatal error message.

If you do not include the `/D` switch, the AFU creates the UFI file in the current default drive and directory.

### Examples

```
A:\> AFU SAVE /C 0
```

The AFU saves flash contents from controller 0 to a UFI file in the current default drive and directory.

```
A:\> AFU SAVE /C 1 /D C:\UFI_FILES
```

The AFU saves flash contents from Controller 1 to a UFI file in `C:\UFI_FILES`.

## UPDATE

The `UPDATE` command updates a controller's flash components from the flash image data in a UFI file. You can use the `UPDATE` command to update a single controller's flash components or to update multiple controllers on your system.

You must restart the computer following an `UPDATE` command.

### Default Switch Values

If you do not include the `/C` switch, the AFU returns a fatal error message.

If you do not include the `/D` switch, the AFU looks for its UFI files in the current default drive and directory.



**Example**

```
A:\> AFU UPDATE /C 0
Adaptec Flash Utility V4.0-0 B5749
(c)Adaptec Inc. 1999-2002. All Rights Reserved.
Updating Controller 0 (Adaptec 2410)
Reading flash image file (Build 5749)
AFU is about to update firmware on controllers Adaptec 2410
***PLEASE DO NOT REBOOT THE SYSTEM DURING THE UPDATE***
This might take a few minutes.
Writing Adaptec 2410 (4MB) Flash Image to controller 0...OK.
Verifying...OK
Please restart the computer to allow firmware changes to take
effect.
```

**VERIFY**

The VERIFY command compares the contents of each of the flash components on a controller to the corresponding image in a UFI file and indicates whether they match. Use this command to determine whether a controller's flash components are up-to-date when compared to a specific UFI file.

After using the VERIFY command, you must restart the computer upon completion of this command.

**Default Switch Values**

If you do not include the /C switch, the AFU returns a fatal error message.

If you do not include the /D switch, the AFU verifies against UFI files in the current default drive and directory.

**Example**

```
A:\> AFU VERIFY /C 0
Adaptec Flash Utility V4.0-0 B5749
(c)Adaptec Inc. 1999-2002. All Rights Reserved.
Reading flash image file (Build 5748)
Controller #0: Adaptec 2410
ROM: Checksum: 797B [VALID] (Build 5748)
File: Checksum: 797B [VALID] (Build 5748)
      Image Compares Correctly
```

**VERSION**

The VERSION command displays version information about the flash components on a controller.

Use the /C switch to get version information about a specific controller or multiple controllers.

After using the `VERSION` command, you must restart the computer upon completion of this command.

**Default Switch Values**

If you do not include the `/C` switch, the AFU returns a fatal error message.

**Examples**

The following example displays version information about all supported controllers.

```
A:\> AFU VERSION /C 0
Adaptec Flash Utility V4.0-0 B5749
(c)Adaptec Inc. 1999-2002. All Rights Reserved.
Version Information for Controller #0 (Adaptec 2410)
ROM: Build 5748 [VALID] Fri Sep 27 13:28:40 EDT 2002
A:\> AFU VERSION /C ALL
```

**AFU Error Handling**

Because the AFU can run without user interaction, it exits immediately whenever an error is detected. For example, if the AFU is unable to locate UFI files, it displays an error message and exits. On exit, the AFU returns its exit status—zero for success or a non-zero code for an error—in the DOS environment variable `ERRORLEVEL`. If you run the AFU from within a DOS batch file, the batch file can examine the AFU's exit status using the DOS command `IF ERRORLEVEL 1` to take action if the AFU exited with an error.

## Using the Array Configuration Utility (ACU)

Adaptec RAID Configuration (ARC) is a embedded BIOS utility that includes:

- **SATASelect**—Used for changing device and controller settings,
- **Disk Utilities**—Used for low-level formatting or verifying disk media, and for performing other functions.
- **Array Configuration Utility (ACU)**—Used for creating, configuring, and managing arrays.

When you turn on or restart your system, press **Ctrl+A** to access the ARC when prompted by the following message:

Press Ctrl+A for Adaptec RAID Configuration Utility

This chapter describes the functionality of ACU for MS-DOS only.

For information about running the ACU for MS-DOS, see [Running the ACU on page B-12](#).

### Interactive Versus Script Mode

When used in MS-DOS mode (also known as *interactive mode*), the ACU offers the same interface and features as the BIOS-based version (array creation, display, and deletion, as well as device initialization). See [Using Interactive Mode on page B-12](#) for details.

In addition, the ACU for MS-DOS offers a special command-line interface that enables you to create arrays based on parameters specified in a plain-text script file. It also enables you to configure certain controller channel properties. You can record a controller's current array and channel configuration in a plain-text script file, allowing you to easily restore your configuration or create a configuration based on a script template. See [Using the Scripting Features on page B-18](#) for details.

## Running the ACU

To run the ACU for MS-DOS:

- 1 Browse to Dos\Apps\Acu on the Adaptec installation CD.
- 2 Copy acu.exe onto a bootable MS-DOS floppy disk and insert this disk into your drive.
- 3 Restart your system.

If you issue the command ACU without any command-line switches, the ACU displays its main window and waits for your menu selection (interactive mode). If you include any command-line switches with the ACU command, ACU processes your command with no further interaction (command-line or script mode).

The remainder of this chapter explains in detail how to use the ACU in both interactive and script modes.

## Using Interactive Mode

When you issue the ACU command at the MS-DOS prompt without any command-line switches, the ACU displays its main window and waits for your menu selection. To select an ACU menu option, use the **↑** and **↓** keys, and press **Enter**. In some cases, selecting an option displays another menu. Press **Tab** to navigate between the fields within a dialog box. You can return to the previous menu at any time by pressing **Esc**.

## Creating an Array with ACU

Before creating arrays, make sure the disks to be used as members of the array are connected and installed.

### Notes

- Disks with MS-DOS partitions, disks with no usable space, or disks that are uninitialized appear dimmed and cannot be used for creating a new array.
- If necessary, restart your system to ensure that it detects all connected drives.
- If you need to initialize a device, see [page B-16](#).

To create an array, select the drive or drives to be used in the array and then assign the desired properties to the array.

## Selecting Segments for New Arrays

To select one or more segments to assign as members of the new array:

- 1 Use the arrow keys to select a channel.
- 2 Use the arrow keys to select the drives to assign to the new array and press **Insert**.

The ACU displays the largest usable space available for each drive. You can use some or all of the available space from multiple drives to create the new array.

To deselect a drive, highlight the drive and press **Delete**.



**Note:** Drives containing MS-DOS partitions, drives with no available space, or uninitialized drives appear dimmed and cannot be selected when creating a new array.

---

- 3 Press **Enter** when you have selected all segments for the new array. The ACU displays the Array Properties menu.

## Assigning Array Properties

To assign properties to the new array:

- 1 From the Array Properties menu, select an array type and press **Enter**. The display shows only the array types available for the number of drives selected.

The controller supports four drives. The maximum number of drives allowed and minimum number of drives required depends on the RAID level, as described in the table below.

Array Type	Number of Drives	
	Maximum Supported	Minimum Required
Simple Volume (JBOD)	4	1
RAID 0	4	2
RAID 1	2	2
RAID 5	4	3
RAID 10	4	4

- 2 Type in an optional label for the array and press **Enter**.
- 3 Enter the desired array size. The maximum array size available based on the segments you selected is displayed automatically. If you want to designate a different array size, type the desired array size and select **MB** (megabytes), **GB** (gigabytes), or **TB** (terabytes) from the drop-down list. If the available space from the selected segments is greater than the size specified, the remaining space is available for use in other arrays.
- 4 Select the desired stripe size. The allowable stripe sizes are:
  - For RAID 0, 1, and 5 only—16, 32, and 64 MB (the default).
  - For RAID 10 only—32 and 64 MB (the default).
- 5 The default stripe size gives the best overall performance in most network environments.
- 6 Specify whether you want to enable read and write caching for the array. When *Enabled* (the default), caching is enabled, providing maximum performance. When *Disabled*, caching is disabled.



**Caution:** When caching is *Enabled*, there is a potential for data loss or corruption during a power failure.

---

Caching should usually be enabled to optimize performance, unless your data is highly sensitive, or unless your application performs completely random reads, which is unlikely.

- 7 When you are finished, press **Done**.

## Managing Arrays

The **Manage Arrays** option enables you to perform the following functions:

- *Viewing Array Properties*
- *Assigning Hot Spares*
- *Removing Hot Spare Drives*
- *Initializing a Hard Drive*
- *Making an Array Bootable*
- *Deleting Arrays*

These operations are described in greater detail in the sections that follow.

### Viewing Array Properties

To view the properties of an existing array:

- 1 Select **Manage Arrays** from the **Main** menu.
- 2 From the **List of Arrays** dialog box, select the array you want to view information on and press **Enter**.

The Array Properties dialog box is displayed. View the information as follows:

- *RAID0, 1, 5*—The physical disks associated with the array are displayed here, except in the case of a RAID 10 array.
- *RAID 10 Only*—Highlight the displayed member and press **Enter** to display the second level. Press **Enter** again to display the physical disks associated with the array.



**Note:** The label of a failed drive is displayed in a different color.

---

- 3 Press **Esc** to return to the previous menu.

### Assigning Hot Spares

To assign a hot spare to an array:

- 1 Select **Manage Arrays** from the **Main** menu.
- 2 On the **List of Arrays** dialog box, select the array you want to assign a spare drive to, and press **Ctrl+s**.

The Hotspare Management for Array dialog box is displayed; it shows which drives that can be assigned as spare drives.

- 3 Select a drive and press the **Insert** key to assign the drive as a spare. The specified drive is displayed in the Assigned Hotspares Drives list.
- 4 Press **Enter** to save the spare drive assignment. The following prompt is displayed:  
Have you finished managing Hotspare drives?
- 5 Press **Y** (for yes) to return to the **Main** menu.

### Removing Hot Spare Drives

To remove an assigned spare drive from an array:

- 1 Select **Manage Arrays** from the **Main** menu.
- 2 From the **List of Arrays** dialog box, select the array you want to remove the assigned spare drive from and type **Ctrl+S**.  
The Hotspare Management for Array dialog box is displayed; it shows which drives can be assigned as spare drives and a list of drives that are already assigned as spare drives.
- 3 From the **Assigned Hotspares drives** list, select the drive to be removed and then press **Delete** to remove the drive as a spare.  
The specified drive is displayed in the Select Hotspares Drives list.
- 4 Press **Enter** to save the removed spare drive assignment. The following prompt is displayed:  
Have you finished managing Hotspare drives?
- 5 Press **Y** (for yes) to return to the **Main** menu.

### Initializing a Hard Drive

You must initialize a drive before you can use it as part of an array. You can tell a drive is not available (and must be initialized) if it is not listed in the disk selection list or if it is listed but grayed out.



**Caution:** Initializing a disk deletes all data on the disk. (Actually, it overwrites the partition table on the disk and makes all the previous data on the disk inaccessible.) If the drive is a member of an existing array, you might not be able to use that array again. *Do not* initialize a disk that is part of a boot array (numbered 00 in the List of Arrays dialog box). See [Viewing Array Properties on page B-15](#) for information on determining which disks are associated with a particular array.

---



To initialize a drive:

- 1 Select **Initialize Drives** from the **Main** menu.
- 2 Use the arrow keys to select a channel.
- 3 Select the disks you want to initialize and press **Insert**.
- 4 Press **Enter**.
- 5 Read the warning message and ensure that you have selected the correct devices to initialize. Press **Y** to continue.

### **Making an Array Bootable**

You can make an array bootable so the system boots from the array instead of from a stand-alone (single) device.

To make an array bootable:

- 1 Select **Manage Arrays** from the **Main** menu.
- 2 Select the array you want to make bootable and press **Ctrl+B**. This changes the selected array's number to 00, making it the controller's boot array.
- 3 Restart the system.

### **Notes**

- You cannot make a non-00 array bootable if the array is in a build/verify or reconfiguration process.
- The controller always uses the lowest numbered array as its bootable array. If you delete Array 00 for any reason, the next higher numbered array becomes the boot array. Mark the correct array as the bootable array by making it Array 00.
- If the controller is not a boot device, you can disable its runtime BIOS to conserve ROM.

## Deleting Arrays

---



**Caution:** Back up the data on an array before you delete it. All data on the array is lost when you delete the array, and you cannot restore a deleted array.

---

To delete an existing array:

- 1 Select **Manage Arrays** from the **Main** menu.
- 2 Select the array you want to delete and press **Delete**.
- 3 From the **Array Properties** dialog box, press **Delete** again and then press **Enter**. The following message is displayed:  
  
Warning!! Deleting will erase all data from the array.  
Do you still want to continue? (Yes/No):
- 4 Press **Yes** to delete the array or **No** to return to the previous menu. In the **Array Properties** dialog box, press **Delete** again and press **Enter**.
- 5 Press **Esc** to return to the previous menu.

## Using the Scripting Features

To use the ACU scripting features, issue the command ACU with one of the following required switches:

- /P—Playback mode. This mode configures arrays and channel settings from a specified script file.
- /R—Record mode. This mode saves a controller's array and channel configuration in a specified script file for later playback.

On the ACU command line, you can also specify the name of a log file to record the status of the playback or record operation. The ACU records in the log any errors or warnings encountered.

When running in playback or record mode, ACU stores the status of the playback or record operation in the MS-DOS variable `ERRORLEVEL` on exit, allowing it to be used within an MS-DOS batch file. See [Error Handling on page B-32](#) for more information on error handling.

The table below lists the required and optional ACU command-line switches.

Switch	Description
<i>/P &lt;file&gt;</i>	<p><b>Playback Mode Switch</b>—In this mode, the ACU reads the contents of the specified script file and creates arrays and configures channel settings based on the properties defined in the script.</p> <p>The <i>&lt;file&gt;</i> is the name of the script file. It can include a drive, directory, and filename and extension, but only the filename is required. If no drive or directory is specified, defaults are used. The file extension is optional.</p> <p><b>Note:</b> The ACU exits with an error if you do not include either the <i>/P</i> or the <i>/R</i> switch (but not both).</p>
<i>/R &lt;file&gt;</i>	<p><b>Record Mode Switch</b>—In this mode, the ACU scans the controller's current array and channel configuration and creates the specified script file based on the configuration.</p> <p>The <i>&lt;file&gt;</i> is the name of the script file. It can include a drive, directory, and filename and extension, but only the filename and extension (.MLC) are required. If no drive or directory is specified, defaults are used.</p> <p><b>Note:</b> The ACU exits with an error if you do not include either the <i>/P</i> or the <i>/R</i> switch (but not both).</p>
<i>/L &lt;file&gt;</i>	<p><b>Optional Log Filename Switch</b>—If you include this switch, the ACU records its activity and any errors it encounters in the log file. If you do not include this switch, the ACU displays any status and errors on the screen.</p> <p>The <i>&lt;file&gt;</i> is a standard MS-DOS file, which can include a drive, directory, filename and extension. Only the filename and extension (.LOG) are required. If no drive or directory is specified, defaults are used.</p>
<i>/C &lt;number&gt;</i>	<p><b>Optional Controller Number Switch</b>—In systems with more than one controller, this switch specifies which controller to change.</p> <p>The <i>&lt;number&gt;</i> is a controller number. Controller numbers start with zero. The default is Controller 0.</p> <p><b>Note:</b> The number assigned to a particular controller is dependent on the controller's physical PCI slot and the order in which your system scans its PCI slots.</p>

## Playback Mode

Playback mode enables you to create one or more arrays based on the properties defined in a script file. It also enables you to configure certain properties for each channel on the controller.

When you create an array, you can specify any of the array properties listed in the table below.

Property	Description
Type	Supported array types are: <ul style="list-style-type: none"> <li>■ Volume</li> <li>■ RAID 0</li> <li>■ RAID 1</li> <li>■ RAID 5</li> <li>■ RAID 10</li> </ul>
Size	Size of the array to be created. Size can be specified in megabyte (MB), gigabyte (GB), or terabyte (TB) units, or <code>Maximum</code> to specify the maximum size based on the given type and disks.
Label	Alphanumeric string uniquely identifying the array.
StripeSize	Size (in MB) of contiguous data distributed across a striped array (RAID 0, RAID 5, or RAID 10)
Cache settings	You can specify the following cache values: <ul style="list-style-type: none"> <li>■ <b>ReadCache</b>—Yes (enable), or No (disable)</li> <li>■ <b>WriteCache</b>—Yes (enable), or No (disable)</li> </ul>
Drives	Disk drives to use in creating the array. Drives are identified by their channel number, ID number, and LUN.
HotspareDrives	Disk drives to assign as spare drives for this array. Drives are identified by their channel number, ID number, and LUN.

In addition, there are other array properties that enable you to control the various array settings during creation. See [Array Definition Block Properties](#) on page B-25 for the complete list of array properties.



**Note:** You can configure each individual channel on the controller using this property, which specifies the device ID number of the controller on the channel.

---

### Initializing Drives

By default, when you use playback mode to create arrays, the ACU initializes only those drives specified by the `Drives` property keyword in the script file. It performs this initialization step before creating any new arrays. For example, consider a script file that defines the following new arrays:

- RAID 1 with `drives=0:0:0, 0:1:0`
- RAID 5 with `drives=0:1:0, 0:2:0, 0:3:0`

As a result of executing this script file, the ACU initializes all drives comprising the two arrays before creating any arrays. Any other drives connected to the controller are not affected.

Initializing a drive automatically deletes any existing arrays with that drive as their member. For example, if you specify drive 0:0:0 in an array's `Drives` property and that drive happens to be part of a RAID 0 (stripe) array, the ACU deletes the stripe array when it initializes the drive. Note that existing arrays with drive members that are not specified in any `Drives` property within the script are not affected.

In some cases, you might want the ACU to initialize all drives connected to the controller, even those that are not specified in a script's `Drives` property. This ensures that all drives are initialized and any existing arrays are deleted before any new arrays are created. You can specify `InitializeAll=Yes` within any array definition to instruct the ACU to perform this task. Unlike most array properties, the `InitializeAll=Yes` property is a global ACU setting and does not apply only to the array whose definition it appears in. Thus, you need only specify `InitializeAll=Yes` once within any array definition to produce the desired action.

Because the ACU reads the entire script file before creating any arrays, the position of the `InitializeAll=Yes` property within the script is not significant. Continuing the previous example, if `InitializeAll=Yes` is specified in the second RAID 5's definition, the ACU initializes all drives before creating the first RAID 0.



**Note:** If a build/verify is in progress when an array is deleted, it is automatically terminated.

---

See [InitializeAll Keyword on page B-28](#) for details on the syntax of the `InitializeAll` property.

### Record Mode

Record mode writes an existing controller's array configuration to a specified script file, enabling you to create the same configuration by running the ACU in playback mode with the resulting script. In addition, record mode lists certain controller properties that can be set in playback mode.

Because the ACU supports only a subset of array types available through the CLI and the GUI, it cannot record all the possible array configurations. If the ACU encounters an array that it cannot create it displays a warning (and records the warning in its log file, if that switch is used) and does not record any properties for that array in its script file.

The script file is limited to one controller and its associated array configuration files. Although you can have multiple controllers on a single system, you cannot record all of the controllers and their associated array configurations in one file. To record multiple controllers, use the ACU record mode once for each individual controller. Your result will be multiple files on the same disk with one file corresponding to each controller.

### Determining Build/Verify/Clear Status

When using playback mode to create an array, you can specify whether to wait for an array's initial build/verify or clear to complete or to continue while the build/verify or clear proceeds in the background. If you instruct the ACU to continue (`Wait=No`), you need to be able to check the status of a background build/verify or clear task and determine when it is complete.

The ACU provides a way to do this. When you use record mode to record a controller's configuration and you specify a log file (/L switch), the ACU writes build/verify and clear status information about each array in the configuration to the log file. An application or batch file can then parse the resulting log file to determine whether an array's build/verify or clear is complete, in progress (a percentage of the task completed), or failed.

The following example shows a log file of a recorded configuration consisting of three arrays:

```
Reading array information ...Passed
Scanning for Drives ...Passed
Reading cache values...Passed
Array #0 Status : OK
Array #1 Status : BUILD/VERIFY 30%
Array #2 Status : BUILD/VERIFY/CLEAR FAILED
```

Each status line consists of the prefix:

```
Array#<n> Status :
```

where <n> is the array ID, followed by the status. The possible status values are as follows:

- OK

Indicates a nonredundant array (no build required) or a redundant array whose build task completed successfully.

- BUILD/VERIFY <n>%  
CLEAR <n>%

Indicates a build/verify (or clear) is currently in progress, where <n> is the percentage of the operation that is complete. The percentage is an integer between 0 and 99, inclusive.

- BUILD/VERIFY/CLEAR FAILED

Indicates a build/verify or clear that did not complete due to a data error or other unexpected problem.

When a build/verify task runs on a multilevel array, the build/verify occurs on the child arrays and not on the parent array. Consequently, the parent task always indicates 0 percent and the child task indicates 0 percent to 100 percent. When a clear task runs on a multilevel array, the clearing occurs on the parent array and not on the child arrays. Consequently, the parent task indicates 0 percent to 100 percent and the child tasks always indicates 0 percent.

## Build/Verify Operations on RAID 10 Arrays

For a RAID 10 array, the status message indicates the percent of the build/verify completed for the parent and child tasks. The status updates to OK when the tasks are complete. A sample RAID 10 build status is as follows:

```
Array #1 Status : BUILD/VERIFY = 30%
```

## Script File Syntax

An ACU script file consists of one of the following:

- **Array definition block**—Specifies the properties of an array, such as type, size, and cache settings. The block begins with the keyword `Array` and ends with the keyword `End`.
- **Channel definition block**—Specifies the properties of a controller channel, such as `ControllerID`. The block begins with the keyword `Channel` and ends with the keyword `End`.

Each array or channel property consists of a property keyword and assigned value, separated by an equal sign (=). Each property must be on its own line in the script. The order of properties within a block (other than the starting `Array` or `Channel` keyword, and the ending `End` keyword) is not significant.

Some array properties, such as `Type`, are required; others are optional. The table below lists and describes array definition block properties, indicates which properties are optional, and provides the default value used when that property is not specified.

All keywords can be written in any combination of upper- or lowercase characters. Script lines can include any number of spaces and tabs both within keywords, or when separating keywords and their values. Blank lines are ignored.

The pound character (#) indicates the start of a comment. The ACU ignores all characters on a line that begins with a pound sign. You can use comments following array property assignments or on their own lines. See [Invoking the ACU and Using a Script on page B-34](#) for a sample script that includes comments.



## Array Definition Block Properties

The table below lists the properties that can be specified within an array definition block. The table lists each property's keyword, whether it is required, and its default value (if any). Note that the keywords are arranged so the required keywords are listed first.

Keyword	Required ?	Default Value	Description
Array	Yes	None	Indicates the start of an array definition block. See <a href="#">page B-26</a> for details.
Drives	Yes	None	Specifies the devices used in creating the array. See <a href="#">page B-26</a> for details.
Type	Yes	None	Indicates the type of array to create. See <a href="#">page B-27</a> for details.
End	Yes	None	Indicates the end of an array definition block. See <a href="#">page B-27</a> for details.
HotspareDrives	No	None	Specifies the hot spare drives to assign to the array. See <a href="#">page B-27</a> for details.
InitializeAll	No	No	Indicates whether to initialize all the drives connected to the controller. See <a href="#">page B-28</a> for details.
Method	No	Build/Verify	Indicates which method (build/verify, clear, or quick init) to use when creating a RAID 1, 5, or 10 array. See <a href="#">page B-29</a> for details.
ReadCache	No	Yes	Indicates whether read caching is enabled for this array. See <a href="#">page B-29</a> for details.
Size	No	Maximum	Specifies the size of the array. See <a href="#">page B-30</a> for details.
StripeSize	No	32	Specifies the size of contiguous I/O, in bytes. See <a href="#">page B-30</a> for details.

Keyword	Required ?	Default Value	Description
Wait	No	Yes	Indicates whether the ACU should wait for the new array's build/verify or clear to complete before continuing. See <a href="#">page B-31</a> for details.
WaitForBuild	No	Yes	Provided for backward compatibility only. See <a href="#">page B-31</a> for details.
WriteCache	No	Yes	Indicates whether write caching is enabled for this array. See <a href="#">page B-31</a> for details.

The following sections describe each of these keywords in detail.

### Array Keyword

Array is a required keyword, indicating the start of an array definition block. It accepts an optional array label value.

#### Examples

```
Array
```

```
Array=MyData
```

### Drives Keyword

Drives is a required keyword, specifying the devices to use in creating the array. There is no default value.

A drive is identified by its channel number, ID (target), and LUN, separated by colons. For example, 0:0:0 or 0:1:0. Separate multiple drive identifiers with commas.



**Caution:** Any drive specified within the script file is initialized, which destroys any data on that drive. If a drive is specified in more than one array definition block in a script, it is initialized only once.

#### Examples

```
Drives=0:0:0
```

```
Drives=0:0:0,0:1:0,0:2:0
```

## Type Keyword

Type is a required keyword, indicating the array type. There is no default value.



**Note:** For information about the maximum number of drives supported and minimum number of drives required, see [page B-14](#).

---

The Type keyword values are:

- Volume
- RAID0
- RAID1
- RAID5
- RAID10

### Examples

```
Type=Volume
```

```
Type=RAID1
```

## End Keyword

End is a required keyword, indicating the end of an array definition block.

### Example

```
End
```

## HotspareDrives Keyword

HotspareDrives is an optional keyword, specifying the spare drives to assign to the array. Spare drives are specified in the same way as the Drives property. If HotspareDrives is not specified, no spare drives are assigned to the array.

**Notes**

- When assigning spare drives to a RAID 10 array, the ACU assigns all the drives in the list to *all* the arrays within the multilevel array.
- ACU only creates dedicated hot spares. If the same drive is assigned to protect multiple arrays, only the last array that drive is assigned to is protected.
- The ACU makes no checks to ensure that the amount of available space on the specified spare drives is sufficient to serve as failover for the given array.

**Example**

```
HotspareDrives=0:0:0,0:1:0
```

**InitializeAll Keyword**

`InitializeAll` is an optional keyword, indicating that all the drives connected to the controller should be initialized and any existing arrays deleted before creating a new array. This property applies to all drives on all channels of the controller. The default is `InitializeAll=No`.

Possible values are as follows:

- **Yes**—Initialize all drives.
- **No**—Do not initialize all drives; only those drives specified with the `Drives` property keyword are initialized.

The `InitializeAll` keyword is both global and position-independent within a script file. If `InitializeAll=Yes` appears in any array definition block within the file, all drives connected to the controller are initialized and any existing arrays are deleted before any new arrays are created.

If there is no `InitializeAll=Yes` property specified anywhere in the script, the ACU initializes only those drives specified with the `Drives` property keyword. See [Initializing a Hard Drive on page B-16](#) for more details.

Note that it is not necessary to specify `InitializeAll=Yes` in more than one array definition block. If both `InitializeAll=Yes` and `InitializeAll=No` are specified within a script file, regardless of their position within the file, `InitializeAll=Yes` is the overriding value.

**Examples**

```
InitializeAll=Yes
InitializeAll=No
```

**Method Keyword**

Method is an optional keyword, indicating which method to use when creating a RAID 5 array. Possible values are:

- **Build** (the default)—Build/verify the array.
- **Clear**—Clear the array.
- **Quick Init** - Make the array available immediately

Overall, the **Build** method takes longer than **Clear**, but it enables you to begin using the array immediately. Although faster, **Clear** must complete before you can begin using the array. **Quick Init** makes the array available immediately, but for RAID 5 write performance is impacted until a **Verify with Fix** is run on the array.



**Note:** The **Method** property applies only to redundant arrays (RAID 1, 5, and 10).

---

**Examples**

```
Method=Build
WaitForClear=No
```

**ReadCache Keyword**

The **ReadCache** keyword indicates whether the array uses read caching.

Possible values are:

- **Yes** (the default)—Enable read caching.
- **No**—Disable read caching.

The default is **Yes**.

**Example**

```
ReadCache=Yes
```

## Size Keyword

The `Size` keyword specifies the size of the array. Specify the size as an integer or a decimal number, followed by the unit keyword MB (megabytes), GB (gigabytes), or TB (terabytes). A unit keyword is required with a numeric size value. If no unit keyword is specified, the ACU exits with an error.

Specify `Maximum` (the default) to create an array using the maximum available space, based on the array type and drives selected.

### Examples

```
Size=2.5GB
```

```
Size=300MB
```

```
Size=Maximum
```

## StripeSize Keyword



**Note:** This keyword supports only RAID 0, RAID 5, and RAID 10 arrays.

---

The `StripeSize` keyword specifies the size of contiguous I/O (in MB) written to each member of a striped array before switching to the next member.

The possible values for `StripeSize` are 16, 32, and 64 (kilobytes). The default is 64.

### Example

```
StripeSize=64
```

**Wait Keyword**

The `Wait` keyword indicates whether the ACU should wait for the new array's build/verify or clear to complete before continuing.

The `Wait` property is optional; if not specified, the ACU waits for the array's build/verify or clear to complete before continuing. Specify `Wait=No` to allow the ACU to continue while the build/verify or clear completes in the background.

Array build/verifies and clears any tasks executed entirely on the controller and do not depend on the ACU or any other host application to complete. If the controller is powered off before the build/verify or clear completes and is then restarted, the build/verify or clear task resumes without any user intervention.

**Example**

```
Wait=Yes
Wait=No
```

**WaitForBuild Keyword**

The `WaitForBuild` keyword is provided for backward compatibility only. Use the `Wait` keyword instead. The `WaitForBuild` keyword is still recognized and can be used interchangeably with the `Wait` keyword.

**WriteCache Keyword**

The `WriteCache` keyword indicates whether write caching is used for this array if write caching is supported for the system. Possible values are as follows:

- **Yes** (the default)—Enable the write cache.
- **No**—Disable the write cache.



**Note:** Setting an array's `WriteCache` property to `Yes` might result in data loss or corruption during a power failure.

---

The default is `Yes`.

**Examples**

```
WriteCache=Yes
WriteCache=Always
```

## Error Handling

Because the ACU scripting feature is designed to run without user interaction, the ACU handles errors during record and playback by simply exiting immediately whenever an error is detected.

Whenever the ACU encounters an error during record or playback—for example, an unrecognized keyword in a script file—it reports the error and exits. If a log file is opened, the ACU writes the error message to the log file. Otherwise, it displays the message on the screen.

Upon exit, the ACU returns its exit status in the DOS environment variable `ERRORLEVEL`. When the ACU is run within a DOS batch file, that batch file can examine the ACU's exit status using the DOS command `IF ERRORLEVEL n`. The batch file can use this command to test the ACU success or failure status. The batch file can test for a specific error using a series of `IF ERRORLEVEL n` commands.

The table below lists the possible error codes returned by the ACU.

Code	Description
0	<b>ACU ran without changes</b> —The ACU exited with no errors (success) and no report is required.
1	<b>No controller found</b> —The ACU did not detect any controllers in the system.
2	<b>Syntax or logical error in the script file</b> —The ACU encountered an invalid command or keyword in the specified script file.
3	<b>Unable to open file</b> —The ACU was unable to open the specified script or log file.
4	<b>Error in the command line parameters</b> —You passed an invalid command-line switch to the ACU. (See <a href="#">Using the Scripting Features</a> on page B-18 for the list of valid command switches.)
5	<b>Unable to read system configuration</b> —The ACU was unable to get the configuration information from the specified controller.
6	<b>No drives detected</b> —The ACU did not detect any devices attached to the selected controller.
7	<b>Specified drive not found in system</b> —The device you specified does not exist on the selected controller.
8	<b>Specified array size too small</b> —You specified an array size that is smaller than the minimum size allowed for this array.



---

Code	Description
9	<b>Specified array size too big</b> —You specified an array size that is larger than the maximum size allowed for this array.
10	<b>Number of drives do not match the array type</b> —The number of drives you selected is invalid for the type of array specified.
11	<b>Unable to initialize drive</b> —The ACU was unable to initialize one or more devices.
12	<b>Error occurred while creating array</b> —The ACU encountered an error creating an array.
13	<b>Too many spare drives assigned</b> —You attempted to assign more than the maximum number of spare drives allowed for the specified array.
14	<b>Insufficient memory to run the application</b> —There is not enough memory to run the ACU.
15	<b>Incorrect controller number</b> —The controller number you specified is invalid or out-of-range.
16	<b>Controller not responding</b> —The controller has stopped responding to the ACU.
17	<b>Build/Verify/Clear failed</b> —The build/verify or clear running on one or more arrays has failed.
100	<b>You ran ACU and made changes</b> —The ACU exited with no errors (success) and you must restart the computer.

---

## Playback and Record Notes

When using ACU in playback or record mode, note the following:

- When recording an array, the ACU does not create a `Wait` keyword within an array's definition block in a script file. When playing back any script file generated from the ACU record option, the ACU uses the default setting `Wait=Yes` when creating an array unless you first edit the script file and include a `Wait=No` line in the array's definition block.
- When recording a RAID 10, the ACU cannot map spare drives assigned to the individual mirror sets to the `HotspareDrives` list in the resultant script file. The script file syntax allows only a single list of spare drives to be assigned to any given array. In this case, the ACU creates the `HotspareDrives` list using all the drives assigned to the lower-level mirror set arrays within the RAID 10. When playing back this script, the ACU assigns all the drives in the `HotspareDrives` list to all the mirror set arrays making up the RAID 10. However, this might not exactly match the original spare drive assignments to the mirror set arrays.
- When recording an array, the ACU creates a separate channel definition block for each channel on the controller. Each block includes all the property keywords and values reflecting the channel's current settings. Edit the script file as necessary to change any of the channel's settings or delete keywords to ensure the controller's corresponding channel setting is not changed.

## Invoking the ACU and Using a Script

The following MS-DOS command invokes the ACU and creates arrays on controller 1 based on the array properties defined in the script file `A:\RAID.ACU`. It also configures the properties of Channel 0 and saves a log of the operation in the log file `C:\RAID.LOG`.

```
A:\> ACU /P A:\RAID.ACU /L C:\RAID.LOG /C1
```

The following sample script file is a sample RAID.ACUC script as referred to in the previous ACUC command. This script creates the following arrays—a 500 MB, single-disk volume and a 2-GB, two-drive RAID 1 with a hotspare.

```
# Script to create volume, mirror, and RAID 5 arrays
# Create a 500MB volume labeled 'MySystem'
Array=MySystem
Type=Volume
Size=500MB
Drives=0:0:0
End
# Create a 2GB mirror labeled 'MyMirror'
Array=MyMirror
Type=RAID1
Size=2GB
# Use drives 1 and 2
Drives=0:1:0,0:2:0

# Disable write cache
WriteCache=No
# Assign 1 spare drive
HotspareDrives=0:3:0
End
```

The following sample script file creates a maximum-size three-drive RAID 5.

```
# Create a maximum size RAID 5 labeled 'MyData'
Array=MyData
Type=RAID5
Size=Maximum
# Use the maximum stripe size
StripeSize=64
# Clear the array (don't build/verify it)
Method=Clear
# Don't wait for clear to complete
Wait=No
# Use drives 0, 1, 2
Drives=0:0:0, 0:1:0, 0:2:0
End
```

# Command Line Interface (CLI)

## In this Appendix...

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## Introduction

This Command Line Interface (CLI) enables you to configure and manage controller components. The CLI contains most of the functionality offered by Adaptec Storage Manager – Browser Edition and some additional functionality not offered by Adaptec Storage Manager.

CLI commands enable you to automate testing or array creation in a production environment using Windows command scripts and Linux and UNIX shell scripts.

This appendix describes briefly some of the commands available in the CLI. For a full description of all the CLI commands, refer to the *CLI Software Reference Guide*.

## Terminology

Your Serial ATA adapter has the following restrictions with regard to CLI terminology and nomenclature:

- **Channel/LUN**—Channel always equals 0; LUN always equals 0.
- **ID**—“ID” always means “port.”

In other words, in the device ID format C:PT:L, where C represents Channel, PT represents Port, and L represents LUN, only the value for Port is used.

The following terms are used in discussing the CLI:

- **Array, container**—A logical disk created from available space and made up of one or more segments on one or more physical disks.
- **Stripe, chunk**—Contiguous set of data distributed across all the disks in an array. A striped array distributes data evenly across all members in equal-sized sections called *stripes*.
- **Free or available space**—Space on an initialized disk that is not in use.
- **Segment, partition**—Contiguous area of a physical drive that makes up some or all of an array.
- **Hot spare, failover disk**—A hard drive, an array member, that is not used in day-to-day data storage but is instead reserved for use as a replacement for one of the other drives in the array in the event of a failure.

Additional RAID terms are defined in the [Glossary](#).

## Accessing the CLI

The method you use to access the CLI depends on the operating system, as described below.

## Accessing the CLI in MS-DOS

To access the CLI from the MS-DOS prompt, move to the directory containing the `afaccli` executable and then type `afaccli`.

## Accessing the CLI in Windows

To access the CLI:



**Note:** The following procedure assumes that you accepted the default location for the software during installation.

---

- 1 Click the **Start** button.
- 2 Click **Programs**.
- 3 Browse to **SMBE**. The Adaptec program group displays.
- 4 Click **CLI**.



**Note:** In Windows, when the CLI executes an background command, it displays status information in the title bar of a DOS command prompt window. The status information includes a percentage indicating a level of completion.

---

## Accessing the CLI in UNIX

To access the CLI, display a window and type `aaccli` in any directory. When the system displays the `CLI>` prompt, you can use CLI commands. The status information appears at the bottom of the CLI window.

For the commands to work in any directory, the path in the startup file (`.login` or `.cshrc`) must include the directory where the software is installed. Refer to your operating system documentation for information on setting up directory paths in the `.login` and `.cshrc` files.

## Using the CLI

This section contains some examples of using CLI commands to perform common tasks.

## **Opening and Closing a Controller**

To prepare a controller to receive a CLI command, you first need to *open* the controller. You may open only one controller at any time.

To open controller AAC0 and prepare it to receive more CLI commands, type:

```
CLI> open AAC0
```

The prompt changes to reflect the open controller, as shown in the next example. When you have finished with the controller, close it by typing:

```
AAC0> close
```

## Displaying Information about Your Disks

Before creating any array, use the `disk show space` command to display information about your disks.



**Note:** Before you can create arrays, you need to initialize the member drives.

In the following example, the **Usage** column indicates **Free** for each disk, which means that the space on each disk consists of available space.

```
AAC0> disk show space
Executing: disk show space
Scsi C:ID:L Usage      Size
-----
0:01:0 Free      64.0KB:8.47GB
0:02:0 Free      64.0KB:8.47GB
0:03:0 Free      64.0KB:8.47GB
0:04:0 Free      64.0KB:8.47GB
```

## Displaying Information about Your Array

After creating an array, use the `container list` command to display information about the array. In the following example, the **Num Label** column indicates the array ID 0 and the array label **Venus**. The **Type** column indicates a volume set. The **Total Size** column indicates that the array is 100 MB.

```
AAC0> container list
Executing: container list
Num      Total  Oth Stripe      Scsi  Partition
DrLabel Type   Size  Ctr Size  Usage  C:ID:L Offset:Size
-----
0        Volume 100MB                None  0:01:0 64.0KB: 100MB
Venus
```

## Creating a Volume Set

To create a volume set, use the `container create volume` command. In the following example, Volume 0 is created on device 0:01:0 from 100 MB (megabytes) of available space. The array's cache is enabled, and the label is *Venus*.

```
AAC0> container create volume /cache=TRUE /label=Venus ((0,01,0), 100M)
Executing: container create volume /cache=TRUE /
label=Venus ((CHANNEL=0,ID=1,LUN=0),104,857,600)
container 0 created
```



## Creating a RAID 0

When creating a RAID 0, you need to determine the stripe size that is most suitable for your environment. The stripe size attribute indicates the number of bytes in a stripe, the amount of data written to a segment before the I/O data stream switches to the next segment in the array. The stripe size can be 16, 32, or 64 KB. The default stripe size is 64 KB. Note that you can use the container reconfigure command at a later time to change the stripe size.

To create a RAID 0, use the `container create stripe` command. In the following example, the Array 0 is created on device 0:01:0 from 100 MB of available space. The array's cache is enabled, and the label *Mars*.

```
AAC0> container create stripe /cache=TRUE /label=Mars ((0,01,0), 100M)
Executing: container create stripe /cache=TRUE
/label="Mars" ((CHANNEL=0, ID=1, LUN=0), 104,857,600 )
container 0 created
```

## Creating a RAID 1

To create a RAID 1, use the `container create new_mirror` command. In the following example, a RAID 1 is created on devices 0:02:0 and 0:03:0 using 100 MB of available space from each device.

```
AAC0> container create new_mirror ((0,2,0), 100M) (0,3,0)
Executing: container create new_mirror ((CHANNEL=0, ID=2, LUN=0), 104,857,600 )
(CHANNEL=0, ID=3, LUN=0)
```

## Creating a RAID 5

When you create a RAID 5, you use a form of redundancy called parity. When you set up parity, the parity stripes are initialized, by default, using a scrub switch (`/scrub=TRUE`). Parity is set up in the background, and the disks are available immediately.



**Linux/UNIX only:** The `/scrub` switch is not available in Linux. For Linux, the RAID 5 is always created by building.

---

The stripe size can be 16, 32, or 64 KB. The default stripe size is 64 KB. Note that you can use the `container reconfigure` command at a later time to change the stripe size.

To create a RAID 5, use the `container create raid5` command. In the following example, a RAID 5 is created on devices 0:01:0, 0:02:0, and 0:03:0 using 100 MB of available space from each device. The `/stripe_size` switch specifies that each stripe contains 64 KB, which is the default if you specify do not specify `/stripe_size` at all.

```
AAC0> container create raid5 /stripe_size=64K ((0,1,0), 100M) (0,2,0) (0,3,0)
Executing: container create raid5 /stripe_size=65,536
((CHANNEL=0, ID=1, LUN=0), 104, 857, 600) (CHANNEL=0, ID=2, LUN=0)
(CHANNEL=0, ID=3, LUN=0)
```

### **Deleting an Array**

To delete an array, use the `container delete` command. In the following example, Array 0 is deleted.

```
AAC0> container delete 0
Executing: container delete 0
```

After running the `container delete` command, use the `container list` command to verify that the array was deleted. In the following example, no arrays are found on the controller.

```
AAC0> container list
Executing: container list
No containers found.
```

### **Managing Failover Options and Hot Spares**

To assign one or more hot spares to a single array, use the `container set failover` command. To assign one or more spare disks for all arrays, use the `container set global_failover` command. These commands enable you to add hot spares to an array prior to a drive failure so that the array contains the resources it needs to survive a failure.

Alternatively, you can use the automatic failover commands that enable you to remove a failed drive and add a hot spare in its place. The controller automatically assigns the new hot spare to replace the failed drive without your having to first assign it using the `container set failover` or `container set global_failover` commands.



**Note:** Automatic failover works only with disks that reside in an SAF-TE- or SES-enabled enclosure.

---



**Caution:** During hot spare assignment, all data is deleted from the hot spare.

---

Through the CLI, you can:

- Display a controller's automatic failover status.
- Enable automatic failover.

### Displaying the Controller's Automatic Failover Status

To display a controller's automatic failover status, use the `controller show automatic_failover` command. In the following example, automatic failover is *DISABLED*.

```
AAC0> controller show automatic_failover
Executing: controller show automatic_failover
Automatic failover DISABLED
```

### Enabling Automatic Failover

To enable automatic failover, use the `controller set automatic_failover` command with the `/failover` switch, as in the following example:

```
AAC0> controller set automatic_failover
/failover_enabled=TRUE
Executing: controller set automatic_failover
/failover_enabled=TRUE
```

After running the `controller set automatic_failover` command, use the `controller show automatic_failover` command to verify that automatic failover has been enabled. If necessary, you can now replace a failed disk with a replacement disk.

## Displaying Controller Information

Controllers exhibit a number of attributes that you can display or manage using the following CLI commands:

- controller list

Controller Attribute	Indicates...
controller (adapter) name	Name
controller (adapter) type	Product name
controller availability	Access mode

Example of controller list:

```
CLI> controller list
Executing: controller list
Adapter Name   Adapter Type   Availability
-----
\\.\AAC0      Adaptec xxxxx  read/write
```

- controller details

Controller Attribute	Indicates...
controller (adapter) name	Name
controller (adapter) type	Product name
controller availability	Access mode
controller remote computer	Name of remote computer on which an open controller resides
controller serial number	Last six hexadecimal characters of serial number
controller CPU type	CPU
number of channels	Number of channels
number of devices per channel	Maximum number of devices, not including host controller
controller CPU speed	Clock speed (in megahertz)
controller memory	Total amount of memory that programs can use

Example of controller details:

```

AAC0> controller details
Executing: controller details
Controller Information
-----
Remote Computer: .
    Device Name: AAC0
Controller Type: Adaptec xxxxxx
    Access Mode: READ-WRITE
Controller Serial Number: Last Six Digits = 8A277A
    Number of Buses: 2
    Devices per Bus: 15
    Controller CPU: i960
Controller CPU Speed: 100 Mhz
    Controller Memory: 64 Mbytes
    Battery State: Not Present
Component Revisions
-----
    CLI: 3.0-0 (Build #5478)
    API: 3.0-0 (Build #5478)
    Miniport Driver: 3.0-0 (Build #5478)
Controller Software: 3.0-0 (Build #5478)
    Controller BIOS: 3.0-0 (Build #5478)
Controller Firmware: (Build #5478)
Controller Hardware: 3.3

```

Before opening a controller, you may want to use the controller list command to display a list of controllers. In the following example, the **Adapter Name** column indicates that **AAC0** is the name of the controller installed on the computer. The example also indicates the controller's path (\\.\).

```

CLI> controller list
Executing: controller list
Adapter Name      Adapter Type      Availability
-----
\\.\AAC0           Adaptec xxxxx     read/write

```

## Displaying Disk Information

The CLI enables you to monitor or manage disk attributes, prepare a disk for use by a controller, and detect defects using the following CLI commands:

■ `disk list`

Disk Attribute	Indicates...
device ID	An ID number assigned to each device attached to a channel
device type	Whether the device is a disk, printer, scanner, and so on
removable media	Whether the media is removable (floppy disk or CD-ROM, for example)
vendor ID	Name of a device vendor
product ID	Device model number
revision number	Device revision number
number of blocks	Total number of disk block available on a device
bytes per block	Number of bytes for each block
disk usage	Either MS-DOS, Initialized, Not Initialized, Offline, or Unknown
shared channel	N/A

Example of disk list:

```
AAC0> disk list
Executing: disk list
C:ID:L Device Type Blocks Bytes/Block Usage Shared
-----
0:01:0 Disk 17783240 512 Initialized NO
0:02:0 Disk 17783240 512 Initialized NO
```

■ `disk show defects`

Disk Attribute	Indicates...
disk defects	<ul style="list-style-type: none"> <li>■ Total number and location of primary defects (defects that originate during manufacturing)</li> <li>■ Total number and location of grown defects (defects that originate after manufacturing)</li> </ul>

Example of disk show defects:

```
AAC0> disk show defects /full=true (0,1,0)
Executing: disk show defects /full=TRUE (CHANNEL=0, ID=1, LUN=0)
Number of PRIMARY defects on drive: 5
Defect 1 at cylinder 229, head 7, sector 203
Defect 2 at cylinder 575, head 0, sector 219
Defect 3 at cylinder 576, head 0, sector 55
Defect 4 at cylinder 578, head 0, sector 238
Defect 5 at cylinder 579, head 0, sector 74
Number of GROWN defects on drive: 0
```

■ disk verify

Disk Attribute	Indicates...
disk defects	<ul style="list-style-type: none"> <li>■ Total number and location of primary defects (defects that originate during manufacturing)</li> <li>■ Total number and location of grown defects (defects that originate after manufacturing)</li> </ul>

Example of disk verify:

```
AAC0> disk verify
```

## Displaying Array Information

The CLI enables you to display and manage array attributes using the following commands:

■ container list

Array Attribute	Indicates...
drive letter	Letter associated with an array. Not automatically assigned when you create an array.
root special file	<b>UNIX/Linux only</b> —root special file associated with the array and created by the operating system after array creation. Appears in the <b>Num Label</b> column.
array number	ID of an array (0 to 63).
array label	Name assigned to an array. Not automatically assigned. Appears in the <b>Num Label</b> column.
array type	Whether an array is a volume, RAID 0, RAID 1, RAID 5, RAID 10, or a reconfigured array.
creation date	Month, day, and year the array was created.
creation time	Hour, minute, and second the array was created.
total size	Number of bytes in an array. The size of an array is the size of the available space when the array was created, reconfigured, or extended.

Array Attribute	Indicates...
stripe size	Number of bytes in a stripe (amount of data written to a segment before the I/O data stream switches to the next segment/array).
read only	Whether an array is read-only accessible. An array can be set to read-only if not in use by an application.
read/write	Whether an array is read-write accessible.
lock	Whether an array is locked into volatile memory space on the currently open controller.
resident file system	Type of file system, if any, that resides on an array. Appears in the <b>Usage</b> column.
multi-partition container	That a file system resides on a multipartition array. Appears in the <b>Usage</b> column.
UNIX opened	There is a mounted file system on the array.
unknown file system	There is an unknown file system on the array.
unmapped containers	The array is unusable and cannot be mounted.
phantom container	The RAID controller software cannot configure the array or the array is offline.
valid container	The Linux operating system recognized the array and there has been a query (such as mount, fdisk, read, or write) on the array.
mirror set create	Creation of a RAID 1 (mirror).
mirror set normal	The RAID 1 is in the normal state.
reconfiguration copy container	An array is being used as a copy (hidden) array (Copy).
reconfiguration destination container	An array is being used as a destination (hidden) array (Dest).
reconfiguration RAID 5 set	An array is being used as a RAID 5 (hidden) array (RAID 5).
reconfiguration source container	An array is being used as a source (hidden) array (Source).
reconfiguration temporary container	An array is being used as a temporary (or hidden) array (Temp).
RAID 5 set unprotected	Creation of a RAID 5 (Unprot).



Example of container list:

```
AAC0> container list
Executing: container list
      Total  Oth Stripe
Label Type  Size  Ctr Size  Usage  Scsi Partition
-----
0      Volume 30MB          None   0:01:0 64KB: 15MB
Venus          02   64KB: 15MB
```

■ container show cache

Cache Attribute	Indicates...
global container read cache size	Number of blocks dedicated to the read cache.
global container write cache size	Number of blocks dedicated to the write cache.
read cache setting	Whether the read cache is enabled.

Example of container show cache:

```
AAC0> container show cache 0
Executing: container show cache 0
Global container Read Cache Size : 5345280
Global container Write Cache Size : 63332352
Read Cache Setting      : ENABLE
Write Cache Setting     : ENABLE
Write Cache Status      : Active, cache enabled
```

# CLI Command Dictionary

This section contains a command reference.

## General Control Commands

`close`

Closes the currently opened controller.

`exit`

Closes the opened controller and exits the CLI.

`help [/full] [{command}]`

Invokes general or topical help.

### Parameters

`{command}`—If a command has more subcommands, `help` lists the subcommands and their functions. If a complete command is used, such as `container list`, the `help` displays all possible switches.

### Switches

`/full`—Displays all relevant commands along with the command format and all command switches.

`history_size {buffer_size}`

**Linux/UNIX only**—Sets the size of the history buffer.

### Parameters

`{buffer_size}`—Size of the command history buffer. The default is 200.

```
open [/readonly={boolean}] [/domain={string}] {string}
```

Opens a controller for access by the CLI. The controller must be open before any command can be targeted at that controller.

**Parameters**

{string}—Computer name and the controller to open.

**Switches**

/readonly—If TRUE, the controller is opened for read-only access. (The default is *FALSE*.) If you open a controller with read-only access, you can use only the commands that do not change the controller configuration.

/domain (*Windows only*)—Domain (local or a trusted domain) in which the computer that contains the controller resides. If not specified, the CLI assumes the local domain.

```
reset_window
```

**Linux/UNIX only**—Resets the window.

## Container (Array) Commands

Before working with arrays, you must have previously opened the controller. In addition, you must have initialized your disks to prepare for array operations.

The following commands are used to display, create, and manage arrays.

```
container add_level {container}
```

Creates a multilevel volume array which contains the array as its only element.

**Parameters**

{container}—ID of the array to convert to a multilevel volume.

```
container clear [/always={boolean}] [/wait={boolean}]  
{container}
```

Clears the array.

**Parameters**

{container}—ID of the array to clear.

**Switches**

`/always`—Specifies whether to clear the array even if it has data on it. The default is *FALSE*, meaning that the command clears the array only if it has no data on it. All user files must be closed; the `/always` switch cannot override this restriction.

`/wait`—If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container create mirror [/wait={boolean}]
[/io_delay={integer}] {container} {device_ID}
```

Creates a RAID 1 from a single entry volume.

**Parameters**

`{container}`—ID of the array on which to create a RAID 1 (mirror).

`{device_ID}`—ID for the device whose available space to use for mirroring the volume specified in the `{container}` parameter.

**Switches**

`/wait`—If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

`/io_delay`—Number of milliseconds between each I/O used for the RAID 1 creation.

```
container create mmirror [/io_delay={integer}]
[/wait={boolean}] {container} {device_ID} [{device_ID}...]
```

Creates a multilevel array of RAID 1 arrays from a multilevel array of single entry volumes.

**Parameters**

`{container}`—ID of the array whose underlying volumes the command converts to RAID 1 arrays.

`{device_ID}`—ID for the device whose available space to use to create the multilevel array of RAID 1 arrays.

**Switches**

`/io_delay`—Number of milliseconds between each I/O used for the RAID 1 create.

`/wait`—If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container create mstripe [/stripe_size={integer}]
  [/label={string}] {container} [{container}...]
```

Creates a multilevel RAID 0 (stripe).

**Parameters**

`{container}`—ID of the array from which to create the multilevel RAID 0.

**Switches**

`/stripe_size`—Stripe size for the RAID 0.

`/label`—Label for the RAID 0.

```
container create mvolume {container} [{container}...]
```

Creates a multilevel volume.

**Parameters**

`{container}`—ID of the array from which to create the multilevel volume.

```
container create new_mirror [/cache={boolean}]
  [/clear={boolean}] [/label={string}]
  [</quick_init={boolean}>] [/scrub={boolean}]
  [/wait={boolean}] {free_space} [{device_ID}...]
```

Creates a RAID 1 (mirror) from two available spaces.



**Note:** For details, see `container create raid5` below.

---

```
container create raid5 [/cache={boolean}]  
  [/stripe_size={integer}] [/clear={boolean}]  
  [/label={string}] [</quick_init={boolean}>]  
  [/scrub={boolean}] [/wait={boolean}] {free_space}  
  [{device_ID}...]
```

Creates a RAID 5.

**Parameters**

{free\_space}—Device and its associated available space used to create the array.

{device\_ID}—One or more devices whose available space to use to create the array.

**Switches**

/cache—Specifies whether to enable the array’s cache.

/stripe\_size—Stripe size for the array (only applies to RAID 5).

/clear—Specifies whether to clear the entire array during initialization.

/label—Label to assign to the newly created array.

/quick\_init—Specifies to use the Quick Init process, making the array available immediately.

/scrub—Specifies whether to set up the parity by building.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container create stripe [/cache={boolean}]  
  [/stripe_size={integer}] [/label={string}]  
  {free_space} [{device_ID}...]
```

Creates a RAID 0.

**Parameters**

{free\_space}—Device and its associated available space to use to create the RAID 0.

{device\_ID}—One or more devices.

**Switches**

- `/cache`—Specifies whether to enable caching on the array.
- `/stripe_size`—Stripe size for the RAID 0. The default is 64 KB.
- `/label`—Label to assign to the new RAID 0.

```
container create volume [/cache={boolean}]  
  [/label={string}] {device_ID}, {free_space},  
  {device_ID}, [{free_space}...]
```

Creates a volume.

**Parameters**

- `{device_ID}`—Device and its associated available space to use to create the volume.
- `{free_space}`—Available space to use to create the volume.
- `{device_ID}, {free_space}`—Additional devices and associated available spaces.

**Switches**

- `/cache`—Specifies whether to enable caching on the array.
- `/label`—Label to assign to the new volume.

```
container delete [/always={boolean}]  
  [/unconditional={boolean}] {container}
```

Deletes the array.

**Parameters**

- `{container}`—ID of the array to delete.

**Switches**

- `/always`—Specifies to delete the array even if it has data <a file system>. (Cannot override open files.)
- `/unconditional`—Specifies that the array be deleted even if it has a file system. (Overrides open files.)

```
container list [/all={boolean}] [/full={boolean}]  
  [{container}]
```

Lists information about the arrays on the controller.

**Parameters**

{container}—ID of the array containing information to display.

**Switches**

/all—Specifies whether to list all containers on the system.

/full—Specifies whether to display detailed information.

```
container move {container1} {container2}
```

Moves the first array number specified to the second array number specified; in effect, to renumber an array.

**Parameters**

{container1}—ID of the array to renumber.

{container2}—ID number to assign to the array specified in container1.

```
container promote {container}
```

Creates a multilevel volume from a RAID 0 or a single entry volume.

**Parameters**

{container}—ID of the array to promote to a multilevel array.

```
container readonly {container}
```

Sets the protection on the array to read-only access.

**Parameters**

{container}—ID of the array to set to read-only access.

```
container readwrite {container}
```

Sets the protection on an array to read-write access.

**Parameters**

{container}—ID of the array to set to read-write access.



```
container reconfigure [/stripe_size={integer}]
[/mirror={boolean}] [/partition_move={boolean}]
[/partition_size={integer}] [/raid5={boolean}]
[/raid10={boolean}] [/restart={boolean}]
[/stripe={boolean}] [/volume={boolean}]
[/wait={boolean}] {container} [{device_ID}...]
```

Changes the configuration of an array.

**Parameters**

{container}—ID number of the array to reconfigure.

{device\_ID}—One or more devices.

**Switches**

/stripe\_size—Stripe size of the array.

/mirror—Reconfigure the array as a RAID 1.

/partition\_move—Specifies that the array will move partitions instead of add extra space.

/partition\_size—Size of a partition.

/raid5—Reconfigure the array as a RAID 5.

/raid10—Reconfigure the array as a RAID 10 (stripe of mirrors).

/restart—Restart reconfiguring the array.

/stripe—Reconfigure the array as a RAID 1.

/volume—Reconfigure the array as a volume.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container remove failover {container} {device_ID}
[{device_ID}...]
```

Removes one or more failover disks.

**Parameters**

{container}—ID of the array whose assigned failover disk is to be removed.

{device\_ID}—ID for the device to remove as a failover disks.

```
container remove global_failover {device_ID}
[{{device_ID}}...]
```

Removes a global failover assignment.

**Parameters**

{device\_ID}—ID for the device to remove as a failover disk.

```
container restore RAID5 {container}
```

Tries to restore a RAID 5 that has a number of dead segments as members.

**Parameters**

{container}—ID of the RAID 5 to restore.

```
container scrub [/io_delay={integer}]
[/no_repair={boolean}] [/wait={boolean}] {container}
```

Checks and repairs the consistency of a redundant array.

**Parameters**

{container}—ID of the redundant array to build.

**Switches**

/io\_delay—Number of milliseconds the controller waits between IOs when building the array.

/no\_repair—Specifies whether the build operation be performed without repairing the error.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container set cache [/read_cache_enable={boolean}]
[/unprotected={boolean}] [/write_cache_enable={boolean}]
{container}
```

Sets cache parameters for a specific array. Useful only if a native operating system's file system resides on the array.

**Parameters**

{container}—Specifies the ID of the array on which to set cache parameters.

**Switches**

`/read_cache_enable`—Specifies whether to enable the read-ahead cache.

`/unprotected`—Specifies whether to set the container's NVRAM write-back cache to disable, enable when protected, or enable always. Use this switch in conjunction with the `/write_cache_enable` switch.

`/write_cache_enable`—Specifies whether to set the container's NVRAM write-back cache to disable, enable when protected, or enable always. Use this switch in conjunction with the `/unprotected` switch.

```
container set failover {container} {device_ID}
  [{device_ID}...]
```

Assigns an automatic failover disk for a single array.

**Parameters**

`{container}`—ID of the array on which to assign an automatic failover disks.

`{device_ID}`—ID for the device to assign as a failover disk.

```
container set global_failover {device_ID} [{device_ID}...]
```

Assigns an automatic failover disk for all arrays.

**Parameters**

`{device_ID}`—ID for the device to assign as a failover disk.

```
container set io_delay {container} {integer}
```

Sets the I/O delay (in milliseconds).

**Parameters**

`{container}`—ID of the array on which to set the I/O delay.

`{integer}`—Number of milliseconds the controller waits between I/O operations.

```
container set label {container} {string}
```

Assigns a new label to the array.

**Parameters**

{container}—ID of the array to which to assign a label.

{string}—Specifies the label to assign.

```
container show cache {container}
```

Displays caching parameters for an array.

**Parameters**

{container}—ID of the array whose associated cache parameters to display.

```
container show failover [{container}]
```

Displays an array's assigned failover disks.

**Parameters**

{container}—ID of the array whose assigned failover disks to display.

```
container unmirror {container}
```

Changes the RAID 1 (mirror) to a volume and frees the redundant space.

**Parameters**

{container}—ID of the RAID 1 to unmirror.

## **Controller Commands**

The following commands are used to display the status of a variety of controller attributes and to perform such tasks as pausing or resuming I/O, and enabling or disabling automatic failover.

```
controller details
```

Shows details about the open controller and software.

```
controller firmware compare [/C{controller}]  
  [{controller}...] [/D{UFI_file_path}]
```

Compares the contents of each of the flash components on a controller to the corresponding image in User Flash Image (UFI) files and indicates whether they match.

**Switches**

/C{controller}—ID representing the set of controllers on which to perform the firmware comparison.

/D{UFI\_file\_path}—Location of the UFI files.

```
controller firmware save [/C{controller}]  
  [{controller}...] [/D{UFI_file_path}]
```

Saves the contents of a controller's flash in User Flash Image (UFI) files.

**Switches**

/C{controller}—ID representing the set of controllers on which to perform the firmware comparison.

/D{UFI\_file\_path}—Location of the UFI files.

```
controller firmware update [/C{controller}]  
  [{controller}...] [/D{UFI_file_path}]
```

Updates a controller's flash components from the flash image data in a pair of User Flash Image (UFI) files.

**Switches**

/C{controller}—ID representing the set of controllers on which to perform the firmware comparison.

/D{UFI\_file\_path}—Path where the pair of UFI files are located.

```
controller list [/domain={string}] [{string}]
```

Lists all controllers or displays information about the currently opened controller.

**Parameters**

{string}—Computer name from which to display a list of controllers or specific information about the open controller.

**Switches**

*/domain (Windows only)*—Specifies the domain in which the host to be searched resides.

```
controller pause_io [{integer}]
```

**Windows only**—Pauses all I/O activity on the open controller to allow online manipulation of hardware.

**Parameters**

{integer}—Time in seconds to cause the controller to wait before resuming I/O.

```
controller rescan
```

Rescans the channels and updates all underlying structures.

```
controller reset_channel {integer}
```

Resets a specific channel on the open controller.

**Parameters**

{integer}—Channel on which to reset this channel.

```
controller resume_io
```

Performs rescan operation and then resumes I/O after *pause\_io*.

```
controller set automatic_failover [/failover_enabled={boolean}]
```

Turns on or off automatic failover for the controller.

**Switches**

*/failover\_enabled*

Specifies whether to turn on or off automatic failover on the controller. Specify 1 to enable, 0 to disable. The default is 0.

```
controller set container_verify [/verify_enabled={boolean}]
```

Turns the container verify task on or off.

**Switches**

```
/verify_enabled
```

Specifies whether to turn on or off the container verify feature. The command defaults to *TRUE*, which means the command turns on the container verify feature.

```
controller show automatic_failover
```

Displays the automatic failover status (enabled or disabled) for the controller.

```
controller show channels
```

Displays all of the channels on the controller with the characteristics of each channel.

```
controller show container_verify
```

Displays the status of the container verify status.

## **Disk Commands**

Use the `disk` commands to manage disks connected to a RAID controller. The CLI enables you to monitor disk characteristics and parameters, prepare a disk for use, and detect defects.

```
disk blink {device_ID} {integer}
```

Causes the disk access light to blink.

**Parameters**

{device\_ID}—ID of the device to blink.

{integer}—Number of seconds for the disk to blink. A value of zero stops the blinking.

```
disk initialize [/always={boolean}]  
               [/unconditional={boolean}] {device_ID}
```

Initializes a disk on the currently opened controller.

**Parameters**

{device\_ID}—ID of the device to initialize,

**Switches**

/always—Specifies whether to initialize the disk even if the disk has existing data. (Cannot override open files.) Default is *FALSE*.

/unconditional—Specifies whether to initialize the disk even if arrays on the disk have open files. The default is *FALSE*.

```
disk list [/all={boolean}] [/full={boolean}] [{device_ID}]
```

Lists the disks available on the controller.

**Parameters**

{device\_ID}—Specifies the ID of the device to display information.

**Switches**

/all—List of all devices on the controller.

/full—Detailed information for devices. The default is *FALSE*.

```
disk remove dead_partitions {device_ID}
```

Removes all failed segments from a disk.

**Parameters**

{device\_ID}—ID of the device from which to remove failed segments.

```
disk set default {device_ID}
```

Sets the default ID for use in CLI commands.

**Parameters**

{device\_ID}—ID of the device.



```
disk set smart [/all={boolean}] [/clear={boolean}]  
  [/enable_exceptions={boolean}] [/logerr={boolean}]  
  [/perf={boolean}] [/report_count={boolean}]  
  [{device_ID}]
```

Changes a disk's Self-Monitoring, Analysis and Reporting Technology (SMART) configuration configuration.

**Parameters**

{device\_ID}—ID of the device on which to change SMART configurations.

**Switches**

/all—Specifies whether to enable SMART configurations for all disks.

/clear—Clears the SMART error counts for the disk.

/enable\_exceptions—Specifies whether to enable SMART exception reporting.

/logerr—If *FALSE* (the default), logging of SMART exception reports is dissabled. If *TRUE*, logging of SMART exception reports is enabled.

/perf—If *FALSE* (the default), reporting of exceptions according to the MRIE mode is dissabled. If *TRUE*, reporting of exceptions according to the MRIE mode is enabled.

/report\_count—Number of times an exception can be reported. A value of zero indicates no limit.

```
disk show default
```

Displays the current default for the device ID.

```
disk show defects [/full={boolean}] {device_ID}
```

Shows the number of defects and the defect list for a specific disk drive.

**Parameters**

{device\_ID}—ID of the device.

**Switches**

/full—Specifies whether to display the defect count and the list of defects.

```
disk show partition
```

Displays a list of partitions on the disks attached to the currently opened controller.

```
disk show smart [/all={boolean}] [/full={boolean}]  
  [/view_changeable={boolean}] {device_ID}
```

Displays drive Self-Monitoring, Analysis and Reporting Technology (SMART) configuration information for one or all disks.

**Parameters**

{device\_ID}—ID of the device for which to display SMART information.

**Switches**

/all—Specifies whether to display SMART configurations for all disks.

/full—Specifies whether to display detailed SMART configuration information for one or all disks.

/view\_changeable—Specifies whether to display the configuration information that can be set on a SMART disk.

```
disk show space [/all={boolean}] [{device_ID}]
```

Displays space usage information.

**Parameters**

{device\_ID}—ID of the device for which to display space usage information.

**Switches**

/all—Specifies whether to display all space usage.

```
disk verify [/repair={boolean}] [/wait={boolean}]  
  {device_ID}
```

Verifies all blocks on a device and, optionally, repairs any bad blocks.

**Parameters**

{device\_ID}—Specifies the ID of the device to verify.

**Switches**

`/repair`—If *FALSE* (the default), the command only reports failures. If *TRUE*, bad blocks are automatically repaired, if possible.

`/wait`—If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
disk zero [/repair={boolean}] [/wait={boolean}]
         {device_ID}
```

Clears an entire disk (by writing zeros). All data is erased and cannot be recovered.

**Parameters**

`{device_ID}`—ID of the device to clear.

**Switches**

`/repair`—If *FALSE* (the default), the command only reports failures. If *TRUE*, bad blocks are automatically repaired, if possible.

`/wait`—If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

**Logfile Commands**

```
logfile end
```

Ends logging of all output and closes the log file.

```
logfile start [/append={boolean}] {file}
```

Begins logging of all CLI command line activity to a file.

**Parameters**

`{string}`—Name of log file.

**Switches**

`/append`—Specifies whether to append all CLI command line activity to an existing output file if one exists.

## Task Commands

Use the CLI commands to display and manage tasks. A task is an operation that occurs only on the controller, asynchronous to all other operations. Examples of tasks are clearing a disk and creating a RAID 1. Once a task is running on the controller, the CLI enables you to display, stop, suspend, and resume the task.

```
task list [/all={boolean}] [{integer}]
```

Lists the tasks running on the controller.

### Parameters

{integer}—Task ID.

### Switches

/all—Specifies whether to list all currently running tasks.

```
task resume [/all={boolean}] {integer}
```

Resumes a task that was suspended or all of the tasks that were suspended.

### Parameters

{integer}—Task ID for the task to resume.

### Switches

/all—Specifies whether to resume all suspended tasks.

```
task stop [/all={boolean}] [{integer}]
```

Stops one or all tasks on the controller.

### Parameters

{integer}—Task ID for the task to stop.

### Switches

/all—Specifies whether to stop all suspended tasks.

```
task suspend [/all={boolean}] [{integer}]
```

Suspends one or all tasks running on the controller.

### Parameters

{integer}—Task ID for the task to suspend.

### Switches

/all—Specifies whether to suspend all running tasks.

## Enclosure Commands

The enclosure commands operate on enclosure management devices that support Version 1.0 of the SAF-TE specification. If you are not using an enclosure, the following commands will not be available.

```
enclosure activate slot {enclosure} {slot}
```

Activates a device in a slot in the SAF-TE enclosure.

### Parameters

{enclosure}—ID associated with the enclosure management device on which to activate a device.

{slot}—Unit number associated with the slot.

```
enclosure identify slot [/stop={boolean}] {enclosure}
{slot}
```

Identifies a device in the enclosure.

### Parameters

{enclosure}—ID associated with the enclosure management device on which to identify a slot.

{slot}—Unit number associated with the slot.

### Switches

/stop—Specifies whether to stop identifying the slot.

```
enclosure list [/all={boolean}] [/full={boolean}]
[ {enclosure} ]
```

Lists components for one or all enclosure devices.

### Parameters

{enclosure}—ID associated with the enclosure management device whose associated components to display.

### Switches

/all—Lists all enclosures on the system.

/full—Displays detailed component information.

```
enclosure prepare slot {enclosure} {slot}
```

Prepares a device in a slot for insertion/removal.

**Parameters**

{enclosure}—ID associated with the enclosure management device on which to prepare a slot.

{slot}—Unit number associated with the slot.

```
enclosure set alarm [/on={boolean}] {enclosure}
```

Turns the audible alarm on or off.

**Parameters**

{enclosure}—ID associated with the enclosure management device whose audible alarm to set.

**Switches**

/on—Specifies whether to turn the audible alarm on or off.

```
enclosure set fan [/off={boolean}] {enclosure} {fan} [{speed}]
```

Sets the speed of a specific fan.

**Parameters**

{enclosure}—ID associated with the enclosure management device on which to set the speed of a fan.

{fan}—Unit number associated with the fan.

{speed}—Speed at which to set the fan.

**Switches**

/off—Specifies whether to turn off the fan.

```
enclosure set interval {second}
```

Sets the monitor reporting interval (in seconds).

**Parameters**

{second}—Number of seconds for the monitor reporting interval.

```
enclosure set power [/off{=boolean}] {enclosure}  
    {powersupply}
```

Turns on or off a specific power supply.

**Parameters**

{enclosure}—ID associated with the enclosure management device.

{powersupply}—Unit number associated with the power supply.

**Switches**

/off—Specifies whether to turn on or off the power supply associated with the unit number.

```
enclosure set scsiid {enclosure} {slot} {device_ID}
```

Sets the ID of the device slot.

**Parameters**

{enclosure}—ID associated with the enclosure management device.

{slot}—Unit number associated with the device slot to assign a channel number.

{device\_ID}—ID of the device.

```
enclosure set temperature {enclosure} {degree}
```

Sets the temperature threshold.

**Parameters**

{enclosure}—ID associated with the enclosure management device on which to set a temperature threshold.

{degree}—Temperature (in degrees Fahrenheit from 0 to 255).

```
enclosure show fan [{enclosure}] [{fan}]
```

Displays the status of a specific fan.

**Parameters**

{enclosure}—ID associated with the enclosure management device for which to display fan status.

{fan}—Unit number associated with the fan.

```
enclosure show power [{enclosure}] [{powersupply}]
```

Displays the status of one or more power supplies.

**Parameters**

{enclosure}—ID associated with the enclosure management device for which to display power supply status.

{powersupply}—Unit number associated with the power supply.

```
enclosure show slot [{enclosure}] [{slot}]
```

Displays the status of a specific device slot on a specific enclosure.

**Parameters**

{enclosure}—ID associated with the enclosure management device for which to display device slot status.

{slot}—Unit number associated with the device slot whose status to display.

```
enclosure show status [{enclosure}]
```

Displays general status of a specific enclosure.

**Parameters**

{enclosure}—ID associated with the enclosure management device for which to display status.

```
enclosure show temperature [{enclosure}] [{sensor}]
```

Displays temperature status of a specific enclosure.

**Parameters**

{enclosure}—ID associated with the enclosure management device for which to temperature status.

{sensor}—Unit number associated with the temperature sensor whose status to display.



## Using Automated Command Scripts

To execute a CLI command script, type the at sign (@) followed by the file name that contains the CLI commands, for example:

```
AAC0>@commandscript.txt
```

In its simplest form, a CLI command script is a text file that contains valid CLI commands. Each line ends with a line feed inserted by pressing **Enter**. The following CLI command script:

- 1 Opens controller AAC0 by invoking the CLI command `open`.
- 2 Invokes controller details.
- 3 Closes controller AAC0 by invoking the CLI command `close`.
- 4 Exits the example CLI command script.

```
open AAC0
controller details
close AAC0
exit
```

# D

## Supported RAID Types

RAID is an acronym for Redundant Array of Independent Disks. The goal of RAID is to provide better performance and reliability from combinations of disk drives than possible with the same total storage space without RAID.

When creating RAIDs, select drives of equal capacity and performance. Otherwise, the RAID tends to be limited in capacity and performance to that of the smallest and slowest drive.

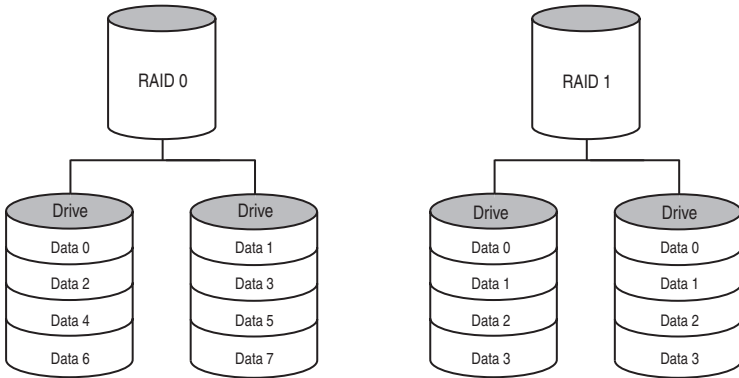
The Adaptec 2410SA controller supports up to four drives and supports RAID levels 0, 1, 5, 10, spanned volume, and simple volume. These array types are described below.

In addition to RAID capability, the Adaptec 2410SA controller supports a simple volume configuration, which consists of a single drive that is *not* part of an array. Such a drive is automatically configured as a simple volume. The controller supports up to four simple volumes.

## RAID 0

A RAID 0 is created by striping data across two or more disk drives. This striping scheme creates no redundancy to protect the data. However, because the drives share load equally, RAID 0 provides the best read and write performance of any RAID type.

An example of a RAID 0 array is shown below.



## RAID 1

A RAID 1 array is created by copying, or mirroring, all data from one drive onto a second drive. This mirroring provides redundancy, ensuring that if one drive fails no data is lost. Redundancy also means that only half of the total capacity is available.

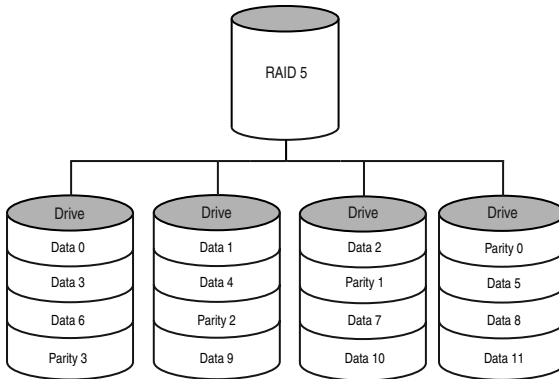
RAID 1 offers no write performance advantage over a simple volume configuration. However, because the drives share read load equally, RAID 1 provides improved read performance.

An example of a RAID 1 array is shown above.

## RAID 5

This RAID type requires at least three drives. Like RAID 0, data is striped across the drives. However, in RAID 5, parity is stored separately from data, and occupies the equivalent of one drive. The controller generates parity every time data is written to the array, and it is distributed in stripes across all the drives.

In the event of a drive failure, the contents of the failed drive can be rebuilt from the data and parity on the remaining drives.

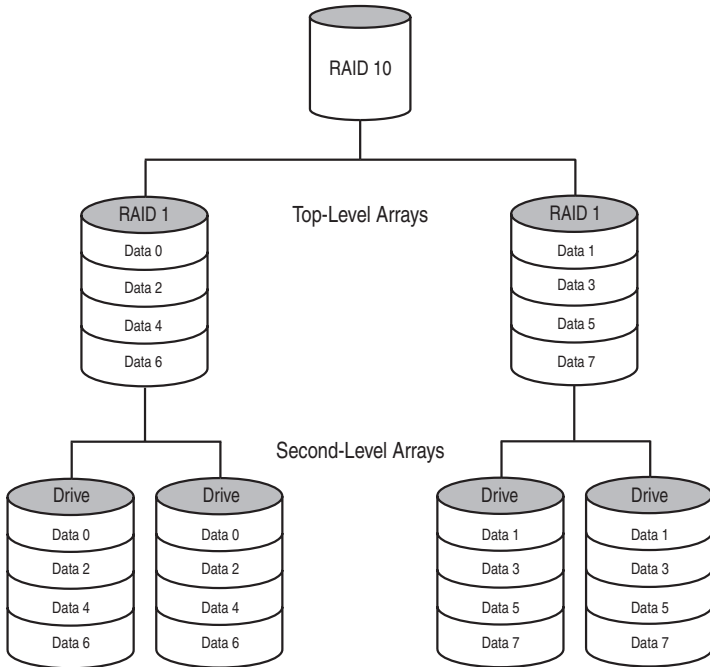


Using parity minimizes the storage cost of redundancy. Because only one drive is used to store parity, a three-drive array, which is the worst case, uses only one third of the total capacity for redundancy. In larger arrays, the storage cost of redundancy decreases proportionately.

RAID 5 write performance is limited by the need to generate parity data for every write. Read performance is good because the load is spread equally across all the drives.

## RAID 10

This dual-level RAID type is created by using two or more equal-sized RAID 1 arrays to create a RAID 0. Both read and write performance are improved due to array striping. However, the performance improvement costs additional storage space due to the mirroring of the arrays.



## Simple Volume

A simple volume consists of a single disk drive.

## Spanned Volume

A spanned volume is created by joining, or concatenating, two or more disk drives. The drives do not have to be of equal capacity and are connected end-to-end. A spanned volume offers no redundancy and no performance advantage over a single drive.

## Specifications

### DC Power Requirements

Voltage	5 V $\pm$ 10%
Ripple and noise	50 mV peak-to-peak maximum

### Current Requirements

Adaptec 2410SA	1 A maximum
----------------	-------------

### Environmental Specifications

Ambient temperature	0 °C to 50 °C
Relative humidity	10% to 90%, noncondensing
Altitude	up to 3,000 meters



**Note:** Forced airflow is recommended, but not required.

---

# Glossary

## A

### **activity**

See *task*.

### **ACU**

Array Configuration Utility. An application used to create, configure, and manage arrays from the controller's BIOS or MS-DOS.

### **array**

A logical disk created from available space and made up of one or more segments on one or more physical disks. Arrays are typically used to provide data redundancy or enhanced I/O performance. See also *container*, *segment*, *volume*, *spanned volume*, *RAID 0*, *RAID 1*, *RAID 5*, and *RAID 10*.

Also known as a *container*.

### **array initialization**

See *initialize*.

### **ATA**

AT Bus Attachment. Standard parallel interface to IDE hard disks typically used in desktop computers and some entry-level servers. *Serial ATA (SATA)*, is a successor to parallel ATA, which is sometimes referred to as PATA.

### **available space/segment**

Unused space on an initialized disk from which logical devices (arrays) are created. When an array is deleted, the space that it used is returned to the available space pool.

## B

### **bad segment**

Segment that is in an unknown state.

### **background consistency check**

Consistency check performed as a background process. See also [consistency check command](#).

### **bootable array**

Array configured as the boot device.

### **build**

Background initialization of a redundant array. The array is accessible throughout. RAID 1 copies the contents of the primary drive to a secondary drive. See also [clear](#).

### **bus**

See [channel](#).

## C

### **cache**

Fast-access memory on the controller that serves as intermediate storage for data that is read from, or written to, drives.

### **capacity**

Total usable space available in megabytes or gigabytes.

### **channel**

Any path, or *bus*, used for the transfer of data and the control of information between storage devices and a RAID controller. For Serial ATA channels, each channel has a single drive capacity.

### **chunk**

See [stripe](#).



**clear**

Foreground initialization of a fault-tolerant array. A *clear* operation zeros all blocks of the array. The array is not accessible until the clear task is complete.

**concatenation**

Joining of physical or logical drives in sequential order.

**consistency check command**

The controller continuously performs a verification on a redundant array to data integrity. In the case of RAID 1 or 10, consistency checks assure that the data between like blocks match. In the case of a RAID 5, consistency checks assure that data in the stripe and the calculated parity for the stripe match.

**container**

See *array*.

**D****dead partition**

See *failed*.

**degraded**

A redundant (for example, a RAID 1) array in which one or more members have failed. The data is intact but redundancy has been compromised. Any further failure would cause the array to fail and result in data loss.

**dirty data**

Data that has been written to a *cache* but which has not been “flushed” out to its final destination.

**disk drive**

Device for storing non-removable, rewritable media. See also *hard disk*, *hard drive*.

**disk ID**

Unique disk identifier that consists of the channel number, ID, and LUN (channel:ID:LUN), for example, 1:04:0. See also *channel*.

**drive LED**

Disk indicator LED that illuminates during read or write operations.

**event**

Notification or alert from the system, indicating that a change has occurred.

**event log**

File used to maintain information about prior controller activities or errors.

**event notification**

Process for transmitting events.

**F****failed**

State of a non*redundant* array that has suffered a single drive failure, or a redundant array that has suffered multiple drive failures. A failed array is inaccessible and data is lost.

**failed segment**

A *segment* that is no longer usable by an array because it is either logically bad and therefore no longer needed, or physically damaged.

**failover drive**

See *hot spare*.

**fault-tolerant array**

Refers to an array that can continue to function after a disk drive failure without loss of data. See also *redundant*.

**foreign disk**

Disk that has previously been initialized on another Adaptec RAID controller. The RAID signature on the disk allows the RAID controller to identify whether or not the disk was initialized on the controller it is currently connected to.

**free space/segment**

See *available space/segment*.

**H****hard disk, hard drive**

Basic unit of nonvolatile, nonremovable, magnetic storage media.

See also *disk drive*.

**hot spare**

A hard drive, an array member, that is not used in day-to-day data storage but, instead, is reserved for use as a replacement for one of the other drives in the array in the event of a failure.

**hot swap**

To remove a component from a system and install a new component while the power is on and the system is running.

**I****impacted**

An impacted array is one which has been created but for some reason the initial build operation did not complete. All member drives are present and operational, and all data written to the array is protected. To optimize the array, run a Verify with Fix Task.

**initialize**

Process of preparing a disk for use by the controller. When a disk is initialized, the controller records the RAID signature on the disk.

**initialized array**

An array that is ready for data reads and writes. Arrays can be initialized by *build* or *clear*.

## L

### **legacy disk**

Disk that contained a valid *partition* table when connected to the controller. The controller manages the disk as a legacy disk array where there is a one-to-one logical-to-physical mapping of array to disk.

### **logical device**

Volume comprised of space from one or more physical drives and presented to the operating system as if it were a single storage unit.

### **low-level format**

Process performed by the drive firmware that completely removes the file system from the disk.

## M

### **migration**

See *reconfiguration*.

### **mirrored array/mirroring**

See *RAID 1*.

### **monitoring**

Process of receiving, displaying, and logging system events.

### **multipartition array**

Array with multiple operating systems or MS-DOS partitions

## O

### **offline array**

Array that can no longer be accessed.

### **optimal**

The state of an array when it is fully operational. For redundant arrays, the entire array is protected.

## P

### partition

See *segment*.

### phantom object

Object that represents a component that cannot be configured by the controller management software; for example, a missing drive.

## Q

### quick init

An array initialized using the Quick Init option is available immediately, with no on-going background controller activity. All data written to an array that has been quick initialized is protected.

## R

### RAID

Redundant Array of Independent Disks (alternative definition Redundant Array of Inexpensive Disks).

#### RAID 0

A *single-level array* consisting of two or more equal-sized segments residing on different disks. RAID 0 distributes data evenly across its respective drives in equal-sized sections called *stripes*. RAID 0 arrays are not redundant.

#### RAID 1

Single-level array consisting of two equal segments residing on two different drives. Provides redundancy by storing identical copies on two drives.

See also *mirrored array/mirroring*.

#### RAID 5

Single-level array consisting of at least three drives. Like RAID 0, data is striped across the drives. However, in RAID 5, parity is stored separately from data, and occupies the equivalent of one

drive. The controller generates parity every time data is written to the array, and it is distributed in stripes across all the drives.

### **RAID 10**

Dual-level RAID type created by using two or more equal-sized RAID 1 arrays to create a RAID 0. Both read and write performance are improved due to array striping. However, the performance improvement costs additional storage space due to the mirroring of the arrays.

### **RAID signature**

The area on each disk reserved for use by the RAID controller.

### **RAID volume**

Concatenates two or more arrays of the same type.

### **rebuild**

Background regeneration of redundant data on a RAID 1.

### **reconfiguration**

Process of expanding an array or migrating an array from one RAID type to another; changing the *stripe size* of a RAID 0, or moving a logical device's *segments* to other disks.

### **redundant**

The ability of an array to maintain operability when one or more hardware failures occur. RAID 1 is redundant. In the event of a drive failure, redundant arrays can be restored to normal operation by replacing the failed drive and rebuilding the array.

### **rescan**

Process of updating the current screen to show all currently available resources.

## **S**

### **segment**

Contiguous area of a physical drive that makes up some or all of an array. When the software creates an array, it automatically converts space into segments.

**Serial ATA (SATA)**

A successor to ATA that uses a serial, instead of parallel, interface.

**simple volume**

A volume made up of disk space from a single disk. It can consist of a single region on a disk or concatenated, multiple regions of the same disk.

**single-level array**

Array created from one or more segments. See also *volume*, *spanned volume*, *RAID 0*, *RAID 1*.

**spanned volume**

A simple volume that spans two or more drives.

**spare**

See *hot spare*.

**stripe**

Contiguous set of data distributed across all the disks in an array. A striped array distributes data evenly across all members in equal-sized sections called *stripes*.

**stripe size**

The amount of data in each section of a striped array.

**striped array**

See *RAID 0* and *RAID 5*.

**T****task**

An operation that occurs only on the RAID controller, asynchronous to all other operations; for example, initializing a disk or verifying an array. Some tasks can take an extended period of time, particularly if the RAID controller is also performing intensive data I/O while the task is running.

## V

### **verify**

See *consistency check command*.

### **volume**

See *simple volume, spanned volume*.





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Part Number: 513602-06, Ver. AA MKL 05/03