AMCC STORAGE

User Guide

3ware®

Serial ATA RAID Controller

Supports the 9650SE, 9590SE, and 9550SX Models

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About this User Guide

This document, *3ware Serial ATA RAID Controller User Guide*, provides instructions for configuring and maintaining RAID units on 3ware 9650SE, 9590SE, and 9550SX series RAID controllers.

This guide assumes that you have already installed your controller in your system. If you have not yet done so, see the installation guide that came with your controller. If you do not have the printed copy, a PDF of the installation guide is available on your 3ware CD, or you can download it from: http://www.3ware.com/support/userdocs.asp. (Note that there are different installation guides for different 3ware RAID controller models.)

There are often multiple ways to accomplish the same configuration and maintenance tasks for your 3ware RAID controller. This manual includes instructions for performing tasks using two tools: one at the BIOS level (3ware BIOS Manager 2, referred to as 3BM 2) and one that runs in a browser (3ware Disk Manager 2, referred to as 3DM 2). You can also perform many tasks at the command line, using 3ware's Command Line Interface (CLI). The CLI is described in a separate manual: *3ware Serial ATA RAID Controller CLI Guide*. Information from both this Users Guide and the CLI Guide are also available in the *3ware HTML Bookshelf*, available in the 3ware Documentation folder and on your 3ware CD. (For more information, see "Using the 3ware HTML Bookshelf" on page ix.)

How this User Guide is Organized

Table 1: Chapters and Appendices in this Guide

Chapter/Appendix	Description
1. Introduction	Provides an overview of product features for the 3ware 9650SE, 9590SE, and 9550SX controller models. Includes system requirements and an introduction to RAID concepts and levels.
2. Getting Started	Provides a summary of the process you should follow to get started using your 3ware RAID controller.

Table 1: Chapters and Appendices in this Guide

Chapter/Appendix	Description
3. First-Time RAID Configuration Using 3BM	Provides step-by-step instructions for configuring RAID units if you have just installed the controller.
4. Driver Installation	Describes how to install drivers for the 3ware controller if you have just installed and configured it. Includes information for Windows, Linux, and FreeBSD.
5. 3ware BIOS Manager (3BM)	Describes the basics of using 3BM.
6. 3ware Disk Manager 2 (3DM 2)	Describes the basics of using 3DM. Also includes information about installing and uninstalling 3DM, and how to start the 3DM process manually, if required.
7. Configuring Your Controller	Describes how to view details about the controller, check its status, and change configuration settings that affect the controller and all associated drives.
8. Configuring Units	Describes how to configure new units and hot spares, change existing configurations, and set unit policies.
9. Maintaining Units	Describes how to check unit and drive status, review alarms and errors, schedule background maintenance tasks, and manually start them, when necessary or desirable. Includes explanations of initialization, verify, rebuild, and self-tests.
10. Maintaining Your Controller	Describes how to update the driver, move a unit from one controller to another, and replace an existing 3ware controller with a new one. Also includes information about checking battery status on a BBU (Battery Backup Unit).
11. 3DM 2 Reference	Describes the features and functions on each of the pages in 3DM.
12. Troubleshooting	Provides common problems and solutions, and explains error messages.
A. Glossary	Includes definitions for terms used throughout this guide.
B. Compliance and Conformity Statements	Provides compliance and conformity statement.
C. Warranty, Technical Support, and Service	Provides warranty information and tells you how to contact technical support.

Conventions

The following conventions are used through this guide:

- 3BM and 3BM 2 both refer to the 3ware BIOS Manager, version 2.
- 3DM and 3DM 2 both refer to the 3ware Disk Manager, version 2.
- In the sections that describe using 3DM, *current controller* is used to refer to the controller which is currently selected in this drop-down list.
- *Unit* refers to one or more disks configured through 3ware to be treated by the operating system as a single drive. Also known as an array. Array and unit are used interchangeably throughout this manual.
- **Boldface** is used for buttons, fields, and settings that appear on the screen.
- `Monospace font` is used for code and to indicate things you type.

Screenshots

The screenshots in this documentation are examples only, and may not exactly reflect the operating system and browser you are using. 3ware software works on a number of different operating systems, including Mac OS X, Microsoft Windows®, Linux®, and FreeBSD®, and runs in a number of different browsers. In addition, the version shown in screenshots may not match your version. For the current released and tested version number, see the latest release notes.

Using the 3ware HTML Bookshelf

The 3ware HTML Bookshelf is an HTML version of this user guide and the CLI Guide, combined as one resource. It is available on your 3ware CD, in the /doc folder.

To make use of the 3ware HTML Bookshelf

1 Copy the compressed version of the guide (3wareHTMLBookshelf.zip or 3wareHTMLBookshelf.tgz, depending on your operating system) to a local drive on your computer and extract it.

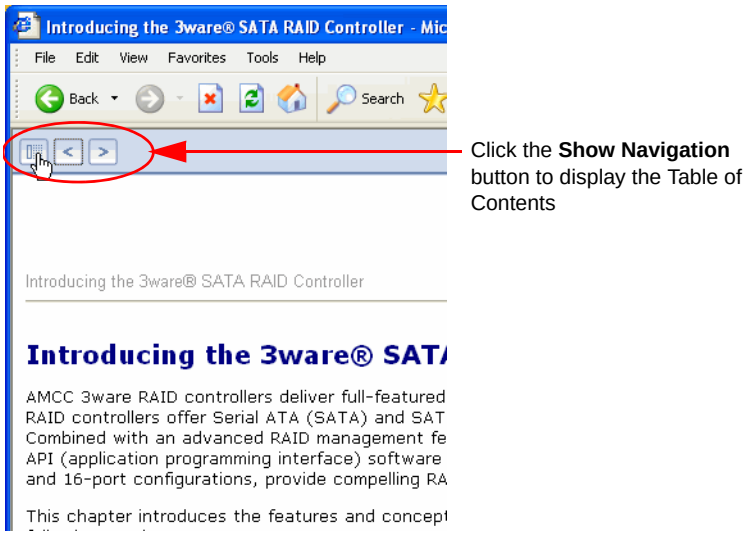
2 To launch the bookshelf at the opening page, open the 3wareHTMLBookshelf folder and double click the file `index.html`.

Opening the file from “index.html” automatically displays a navigation panel at the left that includes a Table of Contents, Index, and Search.

You can also open the bookshelf by double-clicking any other html file in the 3wareHTMLBookshelf folder. When you open an individual file, the

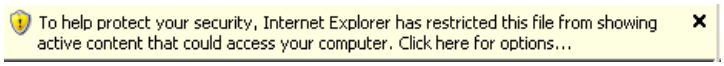
navigation pane does not automatically open. In this case, you can display the navigation pane by clicking the **Show Navigation** button at the left.

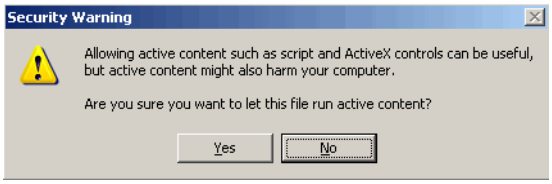
Figure 1. Navigation Button in the 3ware HTML Bookshelf Window



Note: The 3ware HTML Bookshelf is created as a set of HTML documents that are often displayed from a website. When installed on your personal computer, some browsers flag them as “active content,” and require your approval before displaying the content.

If you see messages similar to the following, you must confirm the display of active content in order to see the pages.





1

Introducing the 3ware® SATA RAID Controller

AMCC 3ware RAID controllers deliver full-featured, true hardware RAID to servers and workstations. AMCC's RAID controllers offer Serial ATA (SATA) and SATA II interfaces in both low profile and half-card footprints. Combined with an advanced RAID management feature set that includes web-based, command-based, and API (application programming interface) software components, AMCC controllers, available in 2-, 4-, 8-, 12- and 16-port configurations, provide compelling RAID solutions.

This section introduces the features and concepts of AMCC 3ware RAID controllers. It is organized into the following topics:

- What's New with 9650SE Models
- System Requirements
- Understanding RAID Concepts and Levels
- 3ware Tools for Configuration and Management
- Monitoring, Maintenance, and Troubleshooting Features

What's New with 9650SE Models

The 9650SE models in 3ware's 9000 series of RAID controllers have the following features and benefits:

- Simultaneous RAID 6 parity generation to maximize RAID 6 performance
- 8th-generation StorSwitch non-blocking switch fabric for maximum controller output
- StreamFusion optimizes RAID 5 and RAID 6 disk accesses to maximize application performance under heavy loads
- StorSave BBU with write journaling optimizes data protection and performance
- RAID levels 0, 1, 5, 6, 10, 50, Single Disk, and JBOD

  (RAID 6 and RAID 50 are available only with 3ware RAID controller models that have 8 or more ports)
- PCI Express® x4 and x8 connectivity

System Requirements

3ware 9650SE, 959SE, and 9550SX model RAID controllers have the following requirements:

Motherboard and Slot Requirements

A workstation-class or server-class motherboard, with slots that support the specific 3ware RAID controller model, as shown in Table 2.

Table 2: Required Slots for 3ware RAID Controller Models

Controller Model	PCI-E X1	PCI-E X4	PCI-E X8	PCI-E x16	PCI-X (64-bit)
9650SE-2LPML	YES	YES	YES	Yes	No
9650SE-4LPML	NO	YES	YES	Yes	No
9650SE-8LPML	NO	YES	YES	Yes	No
9650SE-12LPML	NO	NO	YES	Yes	No
9650SE-16LPML	NO	NO	YES	Yes	No
9590SE	NO	YES	YES	Yes	No
9550SX	N/S	N/S	N/S	N/S	Yes

Notes:

3ware 9650SE and 9590SE RAID controllers **must** be installed in a PCI Express slot that complies with PCI 1.0 or later standards.

The 3ware 9550SX Controller performs best when installed in a PCI-X 133MHz 64-bit slot. However, it can also operate at 66MHz or 100MHz.

PCI Slots used for the 9550SX controllers must comply with PCI 2.2 or later standards and must meet the Plug and Play and PC99 specifications.

Drive Requirements

Depending on the particular model, the 3ware RAID controller may be connected to two, four, eight, twelve, or sixteen SATA drives using the supplied interface cables.

Drives must meet SATA-1 (1.5 GB/s) or SATA-2 (3.0 Gb/s) standards.

A list of drives that have been tested is available at http://www.3ware.com/products/compatibility_sata2.asp

Drives may be of any capacity or physical form factor.

The length of shielded and unshielded interface cables may not exceed 1M (39”) for Serial ATA controllers.

Operating System

- 3ware RAID controllers may be used with:
- Windows 2000, Windows XP, Windows Server 2003, both 32-bit and 64-bit x86
- Red Hat Linux, 32-bit and 64-bit x86
- SuSE Linux, 32-bit and 64-bit x86
- Fedora Core, 32-bit and 64-bit x86
- Other versions of Linux, 32-bit and 64-bit x86, using the open source Linux 2.4 or 2.6 kernel driver
- FreeBSD, 32-bit and 64-bit x86

For the latest driver versions for all operating systems, see the Release Notes.

Other Requirements

- Adequate air flow and cooling
- Adequate power supply for drives
- 3DM 2 (3ware Disk Manager) displays information in a browser. It requires one of the following browsers:
  - Internet Explorer 5.5 and later
  - Mozilla Firefox 1.2 and later
  - Netscape 7 and later

  In addition:
  - JavaScript must be enabled
  - Cookies must be enabled
  - For best viewing, screen resolution should be 1024 x 768 or greater, with 16-bit color or greater.

For a complete listing of features and system requirements, refer to the 3ware SATA RAID Controller datasheets, available from the website at http://www.3ware.com/products.

Understanding RAID Concepts and Levels

3ware RAID controllers use RAID (Redundant Array of Inexpensive Disks) to increase your storage system's performance and provide fault tolerance (protection against data loss).

This section organizes information about RAID concepts and configuration levels into the following topics:

RAID Concepts

The following concepts are important to understand when working with a RAID controller:

- **Arrays and Units**. In the storage industry, the term "array" is used to describe two or more disk drives that appear to the operating system as a single unit. When working with a 3ware RAID controller, "unit" is the term used to refer to an array of disks that is configured and managed through the 3ware software. Single-disk units can also be configured in the 3ware software.
- **Mirroring**. Mirrored arrays (RAID 1) write data to paired drives simultaneously. If one drive fails, the data is preserved on the paired drive. Mirroring provides data protection through redundancy. In addition, mirroring using a 3ware RAID controller provides improved performance because 3ware's TwinStor technology reads from both drives simultaneously.
- **Striping**. Striping across disks allows data to be written and accessed on more than one drive, at the same time. Striping combines each drive's capacity into one large volume. Striped disk arrays (RAID 0) achieve highest transfer rates and performance at the expense of fault tolerance.
- **Distributed Parity**. Parity works in combination with striping on RAID 5, RAID 6, and RAID 50. Parity information is written to each of the striped drives, in rotation. Should a failure occur, the data on the failed drive can be reconstructed from the data on the other drives.
- **Hot Swap**. The process of exchanging a drive without having to shut down the system. This is useful when you need to exchange a defective drive in a redundant array.
- **Array Roaming.** The process of removing a unit from a controller and putting it back later, either on the same controller, or a different one, and having it recognized as a unit. The disks may be attached to different ports than they were originally attached to, without harm to the data.

For definitions of other terms used throughout the documentation, see the "Glossary".

Available RAID Configurations

RAID is a method of combining several hard drives into one unit. It offers fault tolerance and higher throughput levels than a single hard drive or group of independent hard drives. RAID levels 0, 1, 10 and 5 are the most popular. AMCC's 3ware controllers support RAID 0, 1, 5, 6, 10, 50, JBOD and Single Disk. The information below provides a more in-depth explanation of the different RAID levels.

For how to configure RAID units, see “Configuring a New Unit” on page 96.

RAID 0

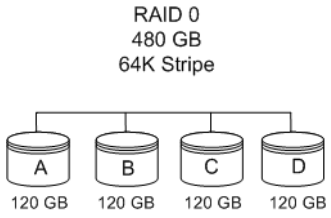
RAID 0 provides improved performance, but no fault tolerance. Since the data is striped across more than one disk, RAID 0 disk arrays achieve high transfer rates because they can read and write data on more than one drive simultaneously. The stripe size is configurable during unit creation. RAID 0 requires a minimum of two drives.

When drives are configured in a striped disk array (see Figure 2), large files are distributed across the multiple disks using RAID 0 techniques.

Striped disk arrays give exceptional performance, particularly for data intensive applications such as video editing, computer-aided design and geographical information systems.

RAID 0 arrays are not fault tolerant. The loss of any drive results in the loss of all the data in that array, and can even cause a system hang, depending on your operating system. RAID 0 arrays are not recommended for high availability systems unless additional precautions are taken to prevent system hangs and data loss.

Figure 2. RAID 0 Configuration Example



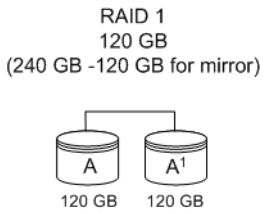
RAID 1

RAID 1 provides fault tolerance and a speed advantage over non-RAID disks. RAID 1 is also known as a mirrored array. Mirroring is done on pairs of drives. Mirrored disk arrays write the same data to two different drives using RAID 1 algorithms (see Figure 3). This gives your system fault tolerance by preserving the data on one drive if the other drive fails. Fault tolerance is a basic requirement for critical systems like web and database servers.

3ware uses a patented technology, TwinStor®, on RAID 1 arrays for improved performance during sequential read operations. With TwinStor technology, read performance is twice the speed of a single drive during sequential read operation.

The adaptive algorithms in TwinStor technology boost performance by distinguishing between random and sequential read requests. For the sequential requests generated when accessing large files, both drives are used, with the heads simultaneously reading alternating sections of the file. For the smaller random transactions, the data is read from a single optimal drive head.

Figure 3. RAID 1 Configuration Example



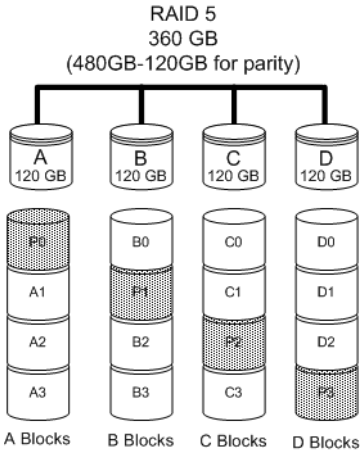
RAID 5

RAID 5 provides performance, fault tolerance, high capacity, and storage efficiency. It requires a minimum of three drives and combines striping data with parity (exclusive OR) to restore data in case of a drive failure. Performance and efficiency increase as the number of drives in a unit increases.

Parity information is distributed across all of the drives in a unit rather than being concentrated on a single disk (see Figure 4). This avoids throughput loss due to contention for the parity drive.

RAID 5 is able to tolerate 1 drive failure in the unit.

Figure 4. RAID 5 Configuration Example



RAID 6

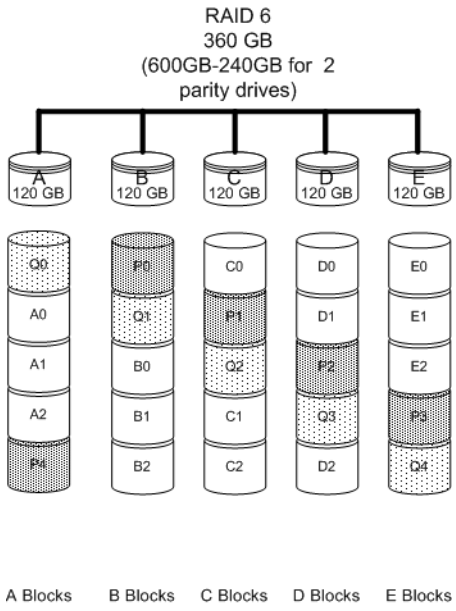
RAID 6 requires a 3ware 9650SE RAID controller.

RAID 6 provides greater redundancy and fault tolerance than RAID 5. It is similar to RAID 5, but has two blocks of parity information (P+Q) distributed across all the drives of a unit, instead of the single block of RAID 5.

Due to the two parities, a RAID 6 unit can tolerate two hard drives failing simultaneously. This also means that a RAID 6 unit may be in two different states at the same time. For example, one sub-unit can be degraded, while another may be rebuilding, or one sub-unit may be initializing, while another is verifying.

RAID 6 requires a minimum of five drives. Performance and storage efficiency also increase as the number of drives increase.

Figure 5. RAID 6 Configuration Example



RAID 10

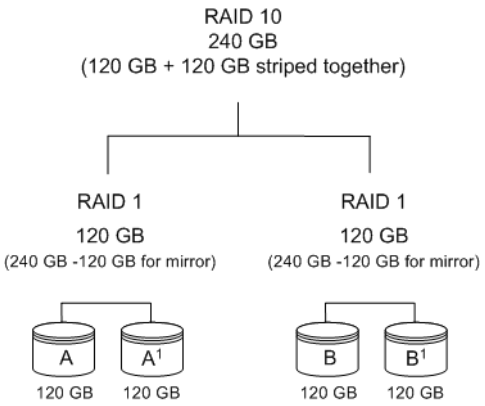
RAID 10 is a combination of striped and mirrored arrays for fault tolerance and high performance.

When drives are configured as a striped mirrored array, the disks are configured using both RAID 0 and RAID 1 techniques, thus the name RAID 10 (see Figure 6). A minimum of four drives are required to use this technique. The first two drives are mirrored as a fault tolerant array using RAID 1. The third and fourth drives are mirrored as a second fault tolerant array using RAID 1. The two mirrored arrays are then grouped as a striped

RAID 0 array using a two tier structure. Higher data transfer rates are achieved by leveraging TwinStor and striping the arrays.

In addition, RAID 10 arrays offer a higher degree of fault tolerance than RAID 1 and RAID 5, since the array can sustain multiple drive failures without data loss. For example, in a twelve-drive RAID 10 array, up to six drives can fail (half of each mirrored pair) and the array will continue to function. Please note that if both halves of a mirrored pair in the RAID 10 array fail, then all of the data will be lost.

Figure 6. RAID 10 Configuration Example



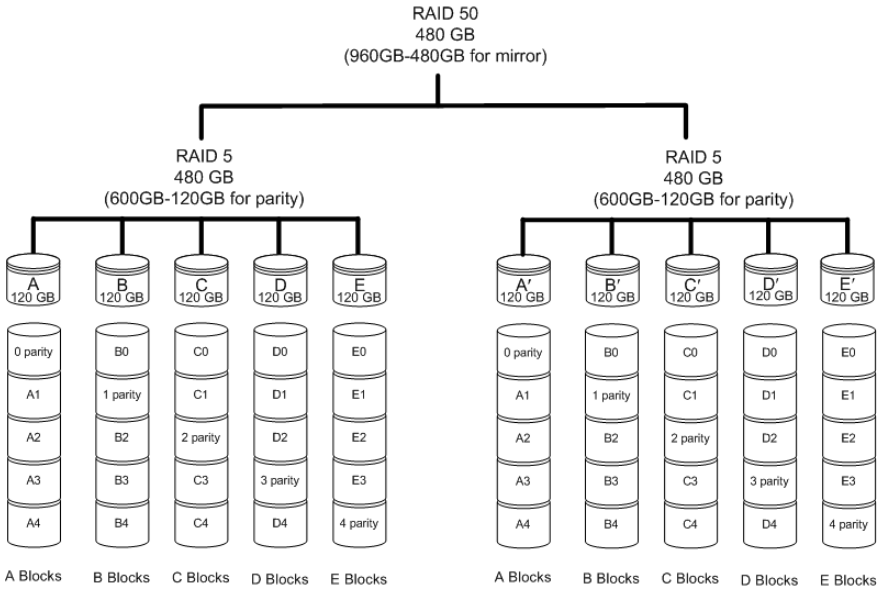
RAID 50

RAID 50 is a combination of RAID 5 with RAID 0. This array type provides fault tolerance and high performance. RAID 50 requires a minimum of six drives.

Several combinations are available with RAID 50. For example, on a 12-port controller, you can have a grouping of 3, 4, or 6 drives. A grouping of 3 means that the RAID 5 arrays used have 3 disks each; four of these 3-drive RAID 5 arrays are striped together to form the 12-drive RAID 50 array. On a 16-port controller, you can have a grouping of 4 or 8 drives.

In addition, RAID 50 arrays offer a higher degree of fault tolerance than RAID 1 and RAID 5, since the array can sustain multiple drive failures without data loss. For example, in a twelve-drive RAID 50 array, up to one drive in each RAID 5 set can fail and the array will continue to function. Please note that if two or more drives in a RAID 5 set fail, then all of the data will be lost.

Figure 7. RAID 50 Configuration Example



Single Disk

A single drive can be configured as a unit through 3ware software. (3BM, 3DM 2, or CLI). Like disks in other RAID configurations, single disks contain 3ware Disk Control Block (DCB) information and are seen by the OS as available units.

Single drives are not fault tolerant and therefore not recommended for high availability systems unless additional precautions are taken to prevent system hangs and data loss.

JBOD

A JBOD (acronym for “Just a Bunch of Disks”) is an unconfigured disk attached to your 3ware RAID controller. JBOD configuration is no longer supported in the 3ware 9000 series. AMCC recommends that you use Single Disk as a replacement for JBOD, to take advantage of advanced features such as caching, OCE, and RLM.

JBOD units are not fault tolerant and therefore not recommended for high availability systems unless additional precautions are taken to prevent system hangs and data loss.

Hot Spare

A hot spare is a single drive, available online, so that a redundant unit can be automatically rebuilt in case of drive failure.

Determining What RAID Level to Use

Your choice of which type of RAID unit (array) to create will depend on your needs. You may wish to maximize speed of access, total amount of storage, or redundant protection of data. Each type of RAID unit offers a different blend of these characteristics.

The following table provides a brief summary of RAID type characteristics.

Table 3: RAID Configuration Types

RAID Type	Description
RAID 0	Provides performance, but no fault tolerance.
RAID 1	Provides fault tolerance and a read speed advantage over non-RAID disks.
RAID 5	This type of unit provides performance, fault tolerance, and high storage efficiency. RAID 5 units can tolerate one drive failing before losing data.
RAID 6	Provides very high fault tolerance with the ability to protect against two consecutive drive failures. Performance and efficiency increase with higher numbers of drives.
RAID 10	A combination of striped and mirrored units for fault tolerance and high performance.
RAID 50	A combination of RAID 5 and RAID 0. It provides high fault tolerance and performance.
Single Disk	Not a RAID type, but supported as a configuration. Provides for maximum disk capacity with no redundancy.

You can create one or more units, depending on the number of drives you have installed.

Table 4: Possible Configurations Based on Number of Drives

# Drives	Possible RAID Configurations
1	Single disk or hot spare
2	RAID 0 or RAID 1
3	RAID 0 RAID 1 with hot spare RAID 5

Table 4: Possible Configurations Based on Number of Drives

# Drives	Possible RAID Configurations
4	RAID 5 with hot spare RAID 10 Combination of RAID 0, RAID 1, single disk
5	RAID 6 RAID 5 with hot spare RAID 10 with hot spare Combination of RAID 0, RAID 1, hot spare, single disk
6 or more	RAID 6 RAID 6 with hot spare RAID 50 Combination of RAID 0, 1, 5, 6,10, hot spare, single disk

Using Drive Capacity Efficiently

To make the most efficient use of drive capacity, it is advisable to use drives of the same capacity. This is because the capacity of each drive is limited to the capacity of the smallest drive in the unit.

The total array capacity is defined as follows:

Table 5: Drive Capacity

RAID Level	Capacity
Single Disk	Capacity of the drive
RAID 0	(number of drives) X (capacity of the smallest drive)
RAID 1	Capacity of the smallest drive
RAID 5	(number of drives - 1) X (capacity of the smallest drive) Storage efficiency increases with the number of disks: storage efficiency = (number of drives -1)/(number of drives)
RAID 6	(number of drives - 2) x (capacity of the smallest drive)
RAID 10	(number of drives / 2) X (capacity of smallest drive)
RAID 50	(number of drives - number of groups of drives) X (capacity of the smallest drive)

Through drive coercion, the capacity used for each drive is rounded down so that drives from differing manufacturers are more likely to be able to be used

as spares for each other. The capacity used for each drive is rounded down to the nearest GB for drives under 45 GB (45,000,000,000 bytes), and rounded down to the nearest 5 GB for drives over 45 GB. For example, a 44.3 GB drive will be rounded down to 44 GB, and a 123 GB drive will be rounded down to 120 GB. For more information, see the discussion of drive coercion under “Creating a Hot Spare” on page 108.

Support for Over 2 Terabytes

Windows 2000, Windows XP (32-bit), Linux 2.4, and FreeBSD 4.x, do not currently recognize unit capacity in excess of 2 TB.

If the combined capacity of the drives to be connected to a unit exceeds 2 Terabytes (TB), you can enable auto-carving when you configure your units.

Auto-carving divides the available unit capacity into multiple chunks of 2 TB or smaller that can be addressed by the operating systems as separate volumes. The carve size is adjustable from 1024 MB to 2048 MB (default) prior to unit creation.

If a unit over 2 TB was created prior to enabling the auto-carve option, its capacity visible to the operating system will still be 2TB; no additional capacity will be registered. To change this, the unit has to be recreated.

For more information, see “Using Auto-Carving for Multi LUN Support” on page 91.

3ware Tools for Configuration and Management

3ware software tools let you easily configure the drives attached to your 3ware RAID controller, specifying which drives should be used together as a RAID unit and the type of RAID configuration you want, and designating hot spares for use if a drive degrades.

3ware provides the following tools for use in configuring and managing units attached to the 3ware controller:

- **3BM (3ware BIOS Manager)**

  3BM is a BIOS level tool for creating, deleting, and maintaining disk arrays, rebuilding arrays, designating hot spares, and setting controller policies. 3BM is the tool most frequently used to configure units immediately after installation of the controller, but can also be used after installation to maintain the controller and associated drives.

  For general information about working with 3BM, see Chapter 5, “3ware BIOS Manager 2 (3BM 2) Introduction.”

- **3DM 2 (3ware Disk Manager)**

  3DM is a daemon (under Linux) and a service (under Windows) which runs in the background on the controller's host system, and can be accessed through a web browser to provide ongoing monitoring and administration of the controller and associated drives. It can be used locally (on the system that contains the 9000) or remotely (on a system connected via a network to the system containing the 9000).

  For details about working with 3DM, see "3DM 2 (3ware Disk Manager) Introduction" on page 66.

  3DM 2 is the current version of the 3ware Disk Manager. Throughout this documentation, it is referred to interchangeably as 3DM and 3DM 2.

- **3ware Alert Utility (WinAVAlarm)**

  The 3ware Alert Utility for Windows runs on the system in which the 3ware RAID controller is installed and provides direct notification by popup message and audio alarm when events occur. This utility can be configured to specify the type of events that should generate these notifications. For details, see "Using the Alert Utility Under Windows" on page 144.

- **3ware CLI (Command Line Interface)**

  The 3ware CLI provides the functionality available in 3DM through a Command Line Interface. You can view unit status and version information and perform maintenance functions such as adding or removing drives, and reconfiguring RAID units online. You can also use it to remotely administer controllers in a system.

  The 3ware CLI is described in *3ware Serial ATA RAID Controller CLI Guide* and in the *3ware HTML Bookshelf*.

Monitoring, Maintenance, and Troubleshooting Features

Several 3ware RAID controller features aid in monitoring and troubleshooting your drives.

- **SMART Monitoring** (Self-Monitoring, Analysis and Reporting Technology) automatically checks a disk drive's health every 24 hours and reports potential problems. This allows you to take proactive steps to prevent impending disk crashes. SMART data is checked on all disk drives (array members, single disks, and hot spares). Monitoring of SMART thresholds can be turned on and off in 3DM. (For details, see "Viewing SMART Data About a Drive" on page 146.)

- **Staggered Spinup** allows drives that support this feature to be powered-up into the standby power management state to minimize in-rush current at power-up and to allow the controller to sequence the spin-up of drives. Both SATAII OOB and ATA spin-up methods are supported. The standby power management state is persistent after power-down and power-up. You can set the number of drives that will spin up at the same time, and the time between staggers in 3BM (the 3ware BIOS Management utility). For details, see “Enabling and Setting Up Staggered Spin-up” on page 94.
- **Verification and Media Scans.** The verify task verifies all redundant units, and checks for media errors on single disks, spares, JBODS and RAID 0 unit members. If the disk drive is part of a redundant unit, error locations that are found and are deemed repairable are rewritten with the redundant data. This forces the drive firmware to reallocate the error sectors accordingly. (For more information, see “About Verification” on page 151.)
- **Error Correction**. Bad sectors can be dynamically repaired through error correction (Dynamic Sector Repair). Reallocation of blocks is based intelligently on the location of the block in relation to the stripe.
- **Scheduled Background Tasks.** Initialize, rebuild, verify, and self-test tasks can all be run in the background, at scheduled times. This lets you choose a time for these tasks to be run when it will be least disruptive to your system. You can also define the rate at which background tasks are performed, specifying whether I/O tasks should be given more processing time, or background rebuild and verify tasks should be given more processing time. (For more information, see “Scheduling Background Tasks” on page 161.)
- **Write Cache**. Write cache can be enabled or disabled using 3BM 2, 3DM 2 and CLI. When write cache is enabled, data will be stored in system cache, 3ware controller cache, and drive cache before the data is committed to disk. This allows the system to process multiple write commands at the same time, thus improving performance. However when data is stored in cache, it could be lost if a power failure occurred. With a Battery Backup Unit (BBU) installed, the cache stored on the 3ware controller can be restored. (For more information, see “Enabling and Disabling the Unit Write Cache” on page 113.)
- **StorSave Profiles** allow you to set the level of protection versus performance that is desired for a unit when write cache is enabled. (For more information, see “Setting the StorSave Profile for a Unit” on page 117.)
- **Drive and Unit Identification.** Units or drives in enclosures can be identified by flashing the applicable LEDs.

  When the I^2C port on the controller has been connected to a chassis with a Chassis Control Unit (CCU), you can issue drive locate commands that

blink the LEDs for particular drives, so that you can quickly identify what drive needs to be checked or replaced. (For more information, see “Locating a Drive by Blinking Its LED” on page 166.)

- **Auto Rebuild.** For times when you do not have a spare available, setting the Auto Rebuild policy allows rebuilds to occur with an available drive or with a failed drive. (For more information, see “Setting the Auto Rebuild Policy” on page 90.)

2

Getting Started with Your 3ware RAID Controller

Setting up your 3ware RAID controller involves these main steps:

- Physically Install the Controller and Drives
- Configure the RAID Unit
- Install the Driver and Make the Operating System Aware of the New Drives
- Set Up Management and Maintenance Features

Once the controller and drives have been physically installed, the order in which you perform these steps depends in part on whether one of the units you configure will act as your boot drive.

Tip: When you are first setting up your system, you may want to review “System Requirements” on page 2.

Physically Install the Controller and Drives

To install your controller and drives, follow the instructions in the installation guide that came with your 3ware controller. If you do not have a hardcopy of the installation manual, it is available in the 3ware Documentation folder on your 3ware CD, and you can download it from the 3ware website at http://www.3ware.com/support/userdocs.asp.

Configure the RAID Unit

Before configuring a RAID unit, you may want to review the information under “Understanding RAID Concepts and Levels” on page 3. This information will help you choose the appropriate RAID level for your situation. Then turn to “Configuring a New Unit” on page 96.

If you want to install the operating system on and boot from a drive managed through the new 3ware RAID controller, use the 3ware BIOS Manager (3BM) to define the configuration. You will find step-by-step instructions for initial installation in. Chapter 3, “First-Time RAID Configuration Using 3BM.” Additional information about configuration is also included in the later chapters of this user guide.

If the operating system is already installed on another drive in your system, you can configure units through 3BM, through 3ware Disk Manager (3DM), or through the Command Line Interface (CLI). If you want to use 3DM or the CLI for configuration, go ahead and boot to the operating system, install the driver and the 3DM 2 software, and then configure your units. You may want to refer to the following information:

- Chapter 6, "3DM 2 (3ware Disk Manager) Introduction"
- Chapter 8, "Configuring Units"
- *3ware Serial ATA RAID Controller CLI Guide*, available from the CD-ROM, the *3ware HTML Bookshelf* and from the website http://www.3ware.com/support/userdocs.asp

Install the Driver and Make the Operating System Aware of the New Drives

Instructions for installing drivers are available in "Driver Installation" on page 30.

You will also find instructions for updating the driver under "Updating the Driver and Firmware" on page 169.

Set Up Management and Maintenance Features

3ware RAID controllers include a number of features to help you manage and maintain the controller and your configured units. The default settings for these features allow you to begin using your newly configured units right away. You can review and change these features as a final step in your initial setup, or you can make changes to them later, at your convenience. These features include:

- Controller and unit policies, such as Auto Rebuild, Auto Verify, use of write cache, use of queuing mode, selection of a StorSave profile, and specifying how unconfigured disks (JBODs) are handled.
- Email notification of alarms and other events
- Schedules for when background tasks will be performed, to minimize the impact on day-to-day performance during peak usage times. (Background tasks include rebuild, verify, initialize, migrate, and self-test.)

Details about these features are described in this user guide. When you first set up your controller, you may want to review these sections in particular:

- "Configuring Your Controller" on page 85
- "Setting Unit Policies" on page 111
- "Setting Background Task Rate" on page 160

Initial Settings for Policies and Background Tasks

The table below lists the default settings for policies. These settings are used if you do not explicitly change the policy settings.

Table 6: Default Settings for Policies and Background Tasks

Policy	Default Value	Where to Change
Controller-Level Settings		
Auto-Rebuild	Enabled	3BM, 3DM, CLI
Auto-Carving	Disabled	3BM, 3DM, CLI
Auto-Detect	Enabled	CLI
Carve Size or Factor	2048 GB	3BM, 3DM, CLI
Drives Per Spinup	1	3BM, CLI
Delay Between Spinup	6 seconds	3BM, CLI
Export Unconfigured (JBOD) Disks	Disabled	3BM, CLI
Staggered Method	ATA-6	3BM
Staggered Spinup	Enabled	3BM
Unit-Level Settings		
Auto Verify	Disabled	3DM, CLI
Continue on Source Error During Rebuild	Disabled	3BM, 3DM, CLI
Boot Volume Size	Blank	3BM
Queuing (NCQ)	Disabled	3BM, 3DM, CLI
StorSave Profile	Protection	3BM, 3DM, CLI
Write Cache	Enabled	3BM, 3DM, CLI
Background Task Settings		
Verify Task Schedules	Daily, starting at 12:00 am and running for 24 hours	3DM, CLI
Follow Verify Task Schedule	No	3DM, CLI
Rebuild Task Schedules	Daily, starting at 12:00 am and running for 24 hours	3DM, CLI
Follow Rebuild Task Schedule	No	3DM, CLI

Table 6: Default Settings for Policies and Background Tasks

Policy	Default Value	Where to Change
Self-test Task Schedules[a]	Daily, starting at 12:00 am and running for 24 hours	3DM, CLI
Follow Self-test Task Schedule	Yes	3DM, CLI

a. Although the default Self-test Task Schedule is for 24 hours, self-test tasks are run only at the beginning of that time period and take just a few minutes. For more information about task schedules, see “Scheduling Background Tasks” on page 161.

3

First-Time RAID Configuration Using 3BM

If you will install the operating system on and boot from a unit managed through the new 3ware RAID controller, follow the steps in this chapter to use the 3ware BIOS Manager (3BM) to configure the unit and install the driver.

If the operating system is already installed on another drive in your system, you can use the steps below or you can configure units through 3DM or the CLI.

You can create one or more units on a single controller, depending on the number of drives that the specific 3ware RAID controller supports and the number of drives attached. (For more information, see “Determining What RAID Level to Use” on page 10.)

Basic Steps for Creating a Unit

The process of configuring your RAID units includes these main steps, which are detailed in the step-by-step example:

- Launch 3BM (3ware BIOS Manager)
- Select the drives to be included and indicate that you want to create a unit
- Select the desired RAID configuration
- Set other parameters, depending on the type of RAID configuration
- Confirm the unit configuration
- Save your changes and finish up

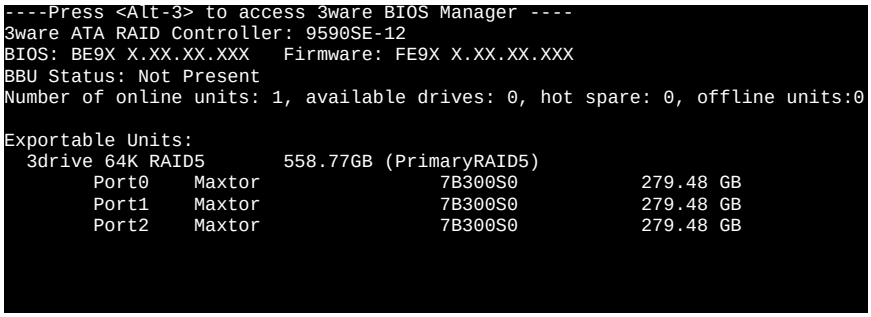
Note: If the capacity of the unit you create will exceed 2TB and you are using Windows 2000, Windows XP, Linux 2.4, or FreeBSD 4.x, you will need to enable auto-carving. Before creating your unit, follow the instructions under “Using Auto-Carving for Multi LUN Support” on page 91.

To launch 3BM

1 Power up or reboot your system.

While the system is starting, watch for a screen similar to Figure 8.

Figure 8. 3ware BIOS Screen

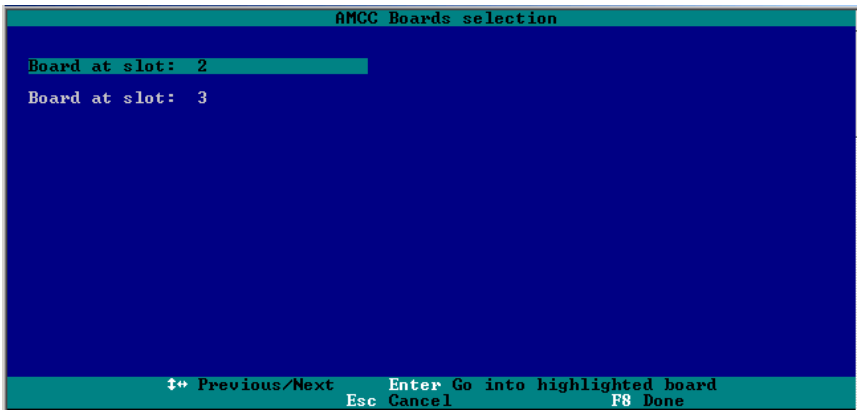


2 Press **Alt-3** immediately to bring up the **3ware BIOS Manager (3BM)**.

Normally your 3ware configuration remains on-screen for just a few seconds. However, if a unit has degraded, the screen indicates the problem and remains on your screen longer.

3 If you have more than one 9000-series controller in your system, a screen lists the available boards. (See Figure 9.) In this case, highlight the board with which you want to work and press **Enter**.

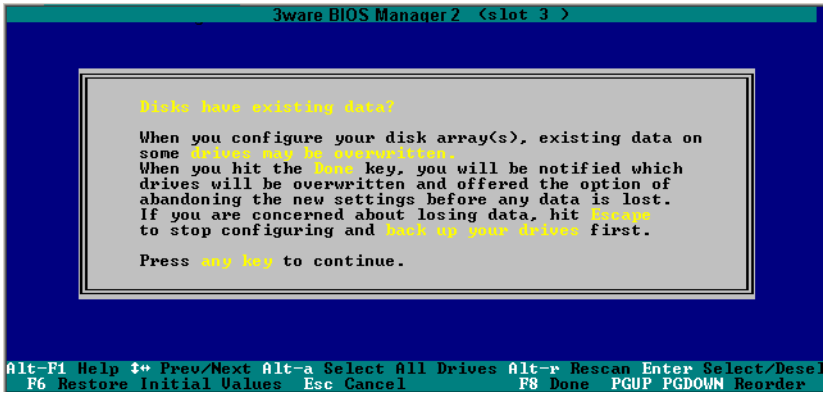
Figure 9. 3ware Controller Board Selection Screen



You see a screen similar to Figure 10, warning you that changing your disk array configuration may overwrite data on the disks.

4 If you plan to make changes to your configuration and need to backup data before continuing, press **ESC** and do so now. Otherwise, press any key to continue.

Figure 10. Warning Message When you Start 3BM



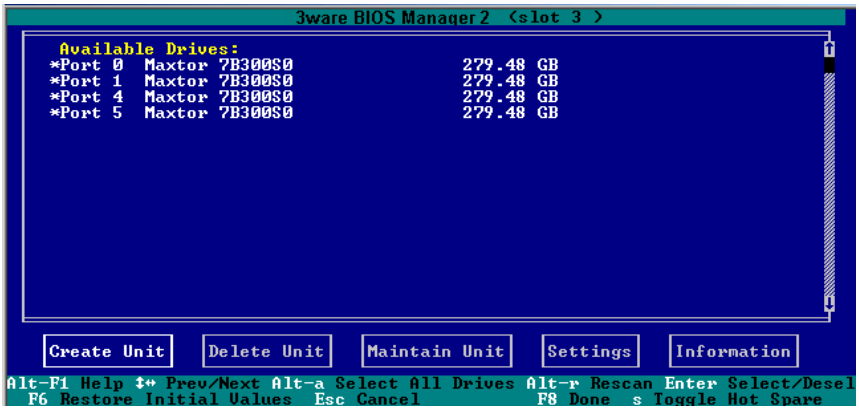
To select the drives and create a unit

1 Select the drives to be included by highlighting each one and pressing **Enter** to select it.

When you select a drive, an asterisk appears next to it in the left-most column (see Figure 11).

You may include from one to sixteen drives in the unit, depending on the number available.

Figure 11. Asterisks Next to Selected Drives

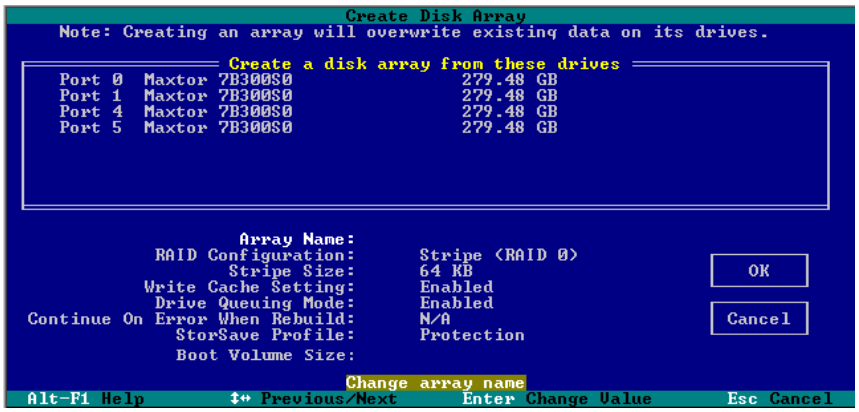


2 After all drives for the unit are selected, use the **Tab** to move to the **Create Unit** button and press **Enter**.

The **Create Disk Array** screen appears (see Figure 12).

3 Make sure that the proper drives are listed.

Figure 12. Create Disk Array Display, RAID 0 Example



To name the unit and select the desired RAID configuration

1 (Optional) Press **Enter** in the **Array Name** field and type a name for the unit. Then press **Enter** again to accept the name.

2 Use the **arrow keys** or press **Tab** to move to the **RAID Configuration** field and press **Enter** to display the available RAID levels for the number of drives you selected.

Figure 13. List of Configuration Choices for Four Drives

3 Use the **arrow keys** to highlight the desired RAID configuration and press **Enter**.

For information about the different RAID levels and when to use each, see “Understanding RAID Concepts and Levels” on page 3.

4 Use the **arrow keys** or press **Tab** to move to the field **Stripe Size** and select the desired stripe size (16KB, 64KB, or 256KB).

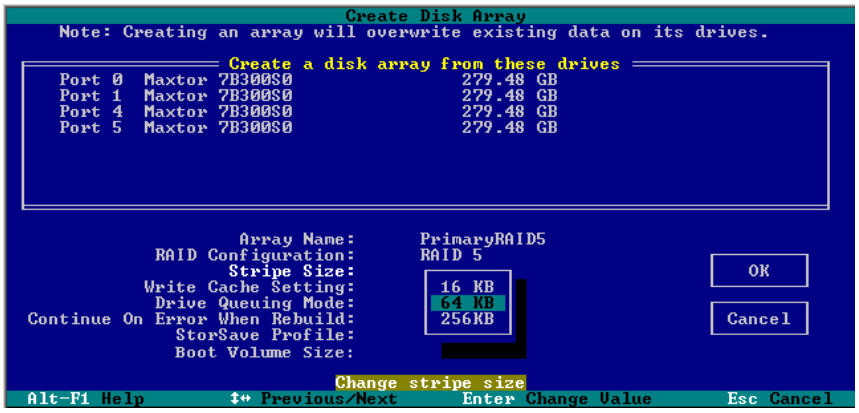
Notes:

Striping size is not applicable for RAID 1, because it is a mirrored unit without striping.

For RAID 6, only stripe size of 64KB is supported.

In general, use smaller stripe sizes for sequential access (such as video access) and larger stripe sizes for random access (such as a database).

Figure 14. Stripe Sizes for a RAID 5



To set other policies for the unit

While creating a unit through 3BM, you can set several policies that effect the unit (Write Cache, Drive Queuing Mode, and Continue on Error When Rebuild), and you can select a StorSave profile.

Each of these policies is already set to a default value, so you do not have to change them. In addition, you can change each of these policies later without affecting the configuration.

1 Use the arrow keys or press **Tab** to move to the field you want to change.

2 Press **Enter** to see the available options.

3 Use the **arrow keys** to select the option you want and press **Enter** to choose it.

For details about these parameters, see:

- “Enabling and Disabling the Unit Write Cache” on page 113
- “Enabling and Disabling Queuing for a Unit” on page 116
- “Setting the StorSave Profile for a Unit” on page 117
- “Setting Continue on Source Error During Rebuild” on page 115

To create a boot unit of a particular size

You can specify a portion of the unit you create to be used as a boot volume, if desired. This is useful if you will be installing your operating system onto the unit and want to have a designated volume for the OS. The remainder of the unit will be created as a separate volume.

Note: Setting a Boot Volume Size is optional. In addition, if you specify a boot volume, you do not have to install your operating system onto it. For more information about creating a boot volume, see “Boot volume size” on page 99. If the size your array is 2TB or greater, you may also want to review the information about carving the unit into multiple volumes. For details, see “Using Auto-Carving for Multi LUN Support” on page 91.

1 Use the arrow keys or press **Tab** to move to the **Boot Volume Size** field.

2 Press **Enter** to display a text box.

3 Enter the size in Gigabytes that should be assigned to the boot volume.

4 Press **Enter** again to accept the size.

To confirm unit configuration

1 Press **Tab** to select the **OK** button and press **Enter** to confirm creation of the unit.

Or, if you want to cancel the creation of the unit, tab to **Cancel** and press **Enter**.

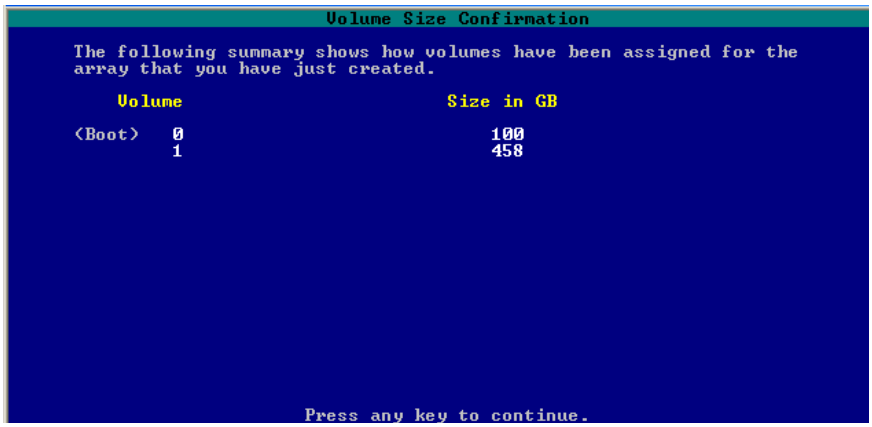
2 If you leave the **Unit Write Cache** field enabled and do not have a BBU installed, 3BM will ask you to confirm that you want enable write cache.

The unit is not actually created and no data is overwritten until you have finished making all your changes and press **F8**.

3 If the volume summary screen appears, review the information and press any key to continue.

Multiple volumes will be created if you entered a Boot Volume Size of greater than zero (0), or if auto-carving is enabled and the combined size of the drives in your unit is large enough to divide it into multiple volumes. For more information about auto-carving, see “Using Auto-Carving for Multi LUN Support” on page 91.

Figure 15. Summary of Volumes to be Created



To finish up and save your changes

1 If you have additional drives, you can go ahead and configure an additional RAID unit or designate a hot spare. Then continue on with these steps. (For details about hot spares, see page 28.)

2 If you configured more than one unit, and you plan to install the operating system on one of them, make that unit be the first unit (Unit 0) in the list of Exportable Units.

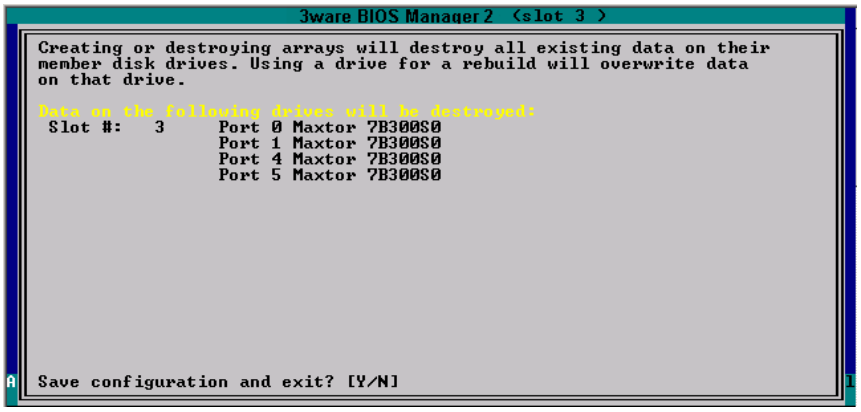
To move a unit up in the list, highlight it and press the **Page Up** key.

You will also want to make sure that the controller is the boot device for your computer. After finalizing the configuration below, be sure to follow the steps under “Checking the Motherboard Boot Sequence” on page 29.

3 When you are finished configuring units, press **F8** to save the changes and exit 3BM.

A warning message asks you to confirm that all existing data on the drives will be deleted.

Figure 16. Confirmation Message when Saving and Exiting



4 Type **Y** to continue, delete any existing data on the drives, and create the unit.

Depending on the RAID configuration you are creating, initialization of the unit may begin immediately. (RAID 6 units and some RAID 5 and RAID 50 units begin immediate initialization.) The initialization process can take several hours, depending on the size of your drives.

5 If you want to use a RAID configuration which has started initializing, you can press **Esc** to cancel the progress box. (Before doing this, be sure to read "Trade-offs to cancelling initialization," below.)

You can then exit 3BM and boot to the operating system before the process of writing zeroes to the drives is complete. Once you have booted to the operating system, background initialization of the unit will begin after a delay of up to ten minutes.

Trade-offs to cancelling initialization:

- Performance of these units will be lower until initialization is complete.
- When initializing is done after booting to the operating system, the process of initializing takes longer than it does if initialization is done by writing zeroes to the unit in the BIOS. Consequently, it will be a longer period of time until the performance of the unit is fully optimal. Data remains intact when initialization is done in the operating system.

For complete information about initialization of RAID units, see "About Initialization" on page 148.

6 If you are finished creating RAID units, be sure to check the boot sequence for your system, as described under "Checking the Motherboard Boot Sequence" on page 29.

Specifying a Hot Spare

You can designate one of the **Available Drives** as a hot spare in 3BM**.** If a hot spare is specified and a redundant unit degrades, an event notification will be generated. The hot spare will automatically replace the failed drive without user intervention.

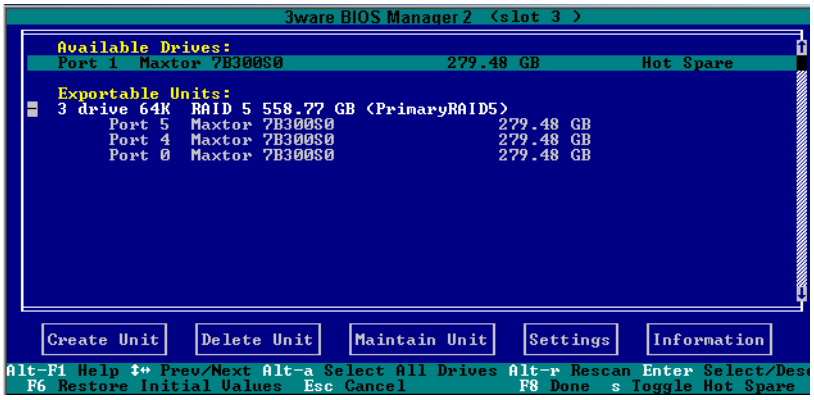
To specify a hot spare

1 In the list of **Available Drives**, highlight the drive to use**.**

2 Type **s** to specify that the selected drive will be the hot spare.

You'll see the words "Hot Spare" appear next to the drive in the Available Drives list.

Figure 17. Hot Spare Indicated



If a hot spare is already enabled, you can disable it by following the same process.

Note: In order to replace a failed drive in a degraded unit, a hot spare drive must have the same or larger storage capacity than the failed drive.

Leaving Individual Drives as JBODs

By default, if you leave individual drives unconfigured (JBODs), they will not be available to the operating system. If you want to be able to use individual drives, configure them as single-disk units.

If you have JBODs attached to an 8000 controller that you want to use with the 9000 controller, see "Moving Units from an 8000 Controller to a 9000 Controller" on page 131.

Checking the Motherboard Boot Sequence

Using your computer's Setup utility, ensure that it shows the appropriate boot device.

After installing the 3ware 9000 controller in your system, go into the BIOS for your computer system to check and change the boot order. This is necessary because most systems automatically change the boot order when they detect a newly installed controller and device. Refer to the documentation for your system for information about starting the system BIOS.

- **If the OS is already installed on a unit connected to the system**, be sure that device precedes the 3ware RAID controller in the boot sequence. If you have other disks installed on the motherboard, the 3ware RAID controller should precede them in boot order.
- **If you will install your OS on a disk or unit attached to the 3ware RAID controller**, specify the controller as the boot device. (Note that if you configured more than one unit, the drive(s) specified as Unit 0 will be treated as the boot disk.)

What Next?

The final steps in setting up your RAID units are to load the 3ware driver and make the units available to your operating system. For details, turn to Chapter 4, "Driver Installation."

After installing the driver, you may also want to install 3ware's browser-based Disk Management tool, 3DM 2, or the 3ware Command Line Interface (CLI). With 3DM 2 and CLI, you can maintain your RAID units while running Windows. For more information, see Chapter 6, "3DM 2 (3ware Disk Manager) Introduction" and the *3ware Serial ATA RAID Controller CLI Guide*.

4

Driver Installation

This chapter provides details about how to install the driver for your 3ware RAID controller and make the units available to your operating system.

- If the unit you have created will be your system's boot device, you install the driver for the controller as you install the operating system.
- If the operating system is already installed on a unit connected to another controller or to the motherboard, you start the operating system and then install the driver.

Details for both situations are described in this chapter. Driver information is organized by operating system:

- “Driver Installation Under Windows” on page 31
- “Driver Installation Under Linux” on page 39
- “Driver Installation Under FreeBSD” on page 50

Note: If you are working with a system that already has a 3ware RAID controller installed, and want to update the driver or firmware for your 3ware RAID controller to a newer version, see the information in “Updating the Driver and Firmware” on page 181.

Driver Installation Under Windows

Note: Before installing the 3ware driver, you must have already physically installed your 3ware RAID controller in the system.

Consult the installation guide that came with your controller for how to do this. You can download that guide from: http://www.3ware.com/support/userdocs.asp.

The 3ware RAID controller can be used with Microsoft Windows 2000 (SP3 or newer), Windows XP (SP1 or newer), and Windows Server 2003. Windows 2003 64-bit for AMD Opteron or Intel EM64T is also supported. It is recommended that you upgrade to the latest service pack available.

A drive or unit managed by the 3ware RAID controller may be configured to be your system's boot device. Or, you can use units managed by the 3ware controller for secondary storage and boot from another device, such as a disk attached to the motherboard, or other bootable media.

This section contains instructions for how to:

- Create a driver diskette for the 3ware RAID controller
- Install the 3ware driver and Windows on a new drive or unit.
- Install the 3ware driver when Windows is already installed on a different device.

Note: You must have administrator privileges for your system to install the Windows operating system and the 3ware driver.

Materials Required

- 3ware software CD-ROM
- Microsoft Windows 2000, XP, or Server 2003 installation CD-ROM. (Not required if Windows is already installed on another drive.).
- Floppy diskette, to create a driver diskette.

  If you are installing Windows onto the RAID unit you are creating, you must create a 3ware driver diskette. If Windows is already installed on another device, you may install the 3ware driver from either the 3ware software CD-ROM or from a diskette.

Creating a 3ware Driver Diskette

If you are installing Windows on a new unit or drive managed by the 3ware RAID controller, you must create a 3ware driver diskette.

To create a driver diskette

1 Insert the 3ware software CD into your system.

2 When the 3ware Menu appears, click **Driver and Firmware Disks**.

3 In the 3ware Driver & Firmware Images menu, click the appropriate button to create the driver diskette that you need.

Note that there are both 32-bit and 64-bit AMD drivers available for Windows. Be sure to select the correct one.

4 When the confirm message appears, insert a blank diskette into a floppy drive and click the **Yes** button to begin the process.

Installing the 3ware Driver and Windows on a New Unit

If you want to install Windows on a new drive configuration managed by the 3ware RAID controller, follow the instructions in this section.

If Windows is already installed on another drive, turn to “Installing the Driver on a System that Boots from a Different Device” on page 33.

To install Windows and the 3ware driver

1 Boot from the Windows 2000, Windows XP, or Windows Server 2003 CD and press **F6** when you see the message: “Press F6 if you need to install a 3rd party SCSI or RAID driver” at the bottom of the display.

2 When you see the message: “Setup could not determine the type of one or more mass storage devices or you have chosen to manually specify an adapter…”

Type **S** to specify that you have an additional 3ware RAID controller.

3 Insert the 3ware driver diskette and press **Enter**.

4 When a box with **AMCC 3ware Series ATA RAID Controller** appears, press **Enter** to select it.

5 Type **S** if you have additional devices to add. Otherwise, press **Enter**.

6 If the “Digital Signature Not Found” message appears, click **Yes** to continue the installation.

(If there are multiple controllers in the system, you will see this message once for each controller.)

7 Continue with the normal Windows installation at this point. There are no instructions after installing the driver that are specific to 3ware. If you need additional instructions, refer to the Windows 2000, Windows XP, or Windows Server 2003 documentation supplied by Microsoft.

8 Follow the instructions under “Making Units Managed by a 3ware Controller Available to Windows” on page 38.

Installing the Driver on a System that Boots from a Different Device

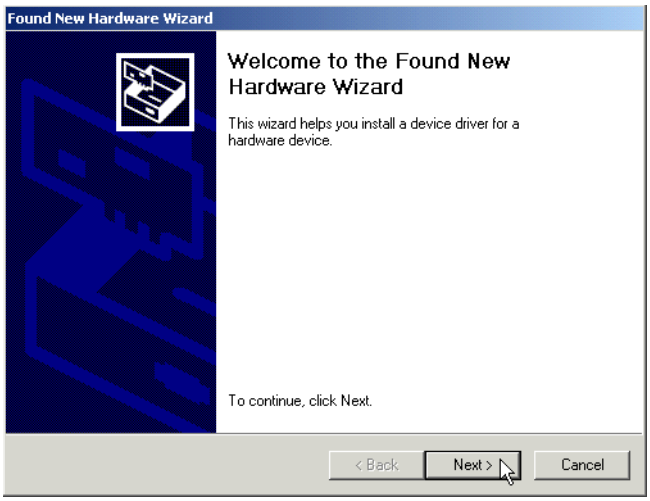
If you are installing the 3ware RAID controller on a system that already has the operating system installed on another drive, follow the instructions in this section, depending on the version of Windows installed on your system:

- “To install the 3ware driver under Windows 2000” on page 33
- “To install the 3ware driver under Windows XP or 2003” on page 35

To install the 3ware driver under Windows 2000

When you start Windows after installing a 3ware RAID controller, Windows recognizes it as a Plug and Play device, and brings up the **Found New Hardware Wizard.** This wizard guides you through installing the 3ware driver (see Figure 18). Note that you will see screens for the installation of two drivers during this process.

Figure 18. Found New Hardware Wizard, Windows 2000



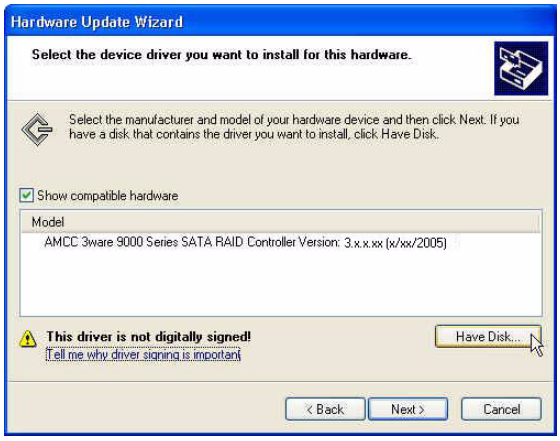
1 Click the **Next** button and respond to the questions the Wizard displays using the default selections.

2 When the Wizard prompts you to select a device driver, click Have Disk, and then indicate that it is on the CD or floppy.

3 If the “Digital Signature Not Found” message appears, click **Yes** to continue the installation.

4 When the Completing the Found New Hardware Wizard screen appears (Figure 19), click **Finish**.

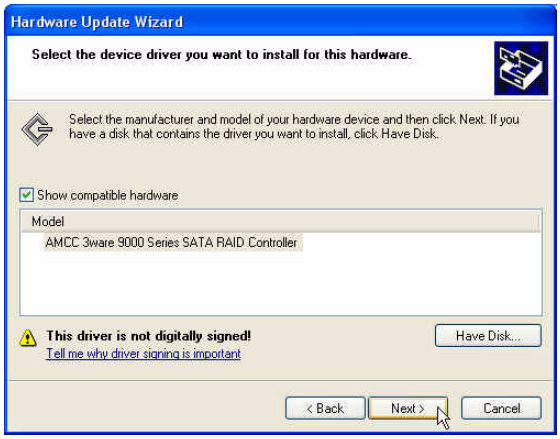
Figure 19. Completing Found New Hardware Wizard



5 If the “Completing” screen (Figure 19) indicates that you should restart your computer, do so now.

6 When the Install Hardware Device Drivers screen appears (Figure 20), click **Next** and follow the prompts on the screen to install the second driver.

Figure 20. Install Hardware Device Drivers



7 When the second Completing the Found New Hardware screen appears, click **Finish**.

Figure 21. Completing Found New Hardware Wizard

After the driver has been installed, continue with the instructions under “Making Units Managed by a 3ware Controller Available to Windows” on page 38.

To install the 3ware driver under Windows XP or 2003

When you start Windows after installing a 3ware RAID controller, Windows recognizes it as a Plug and Play device, and brings up the **Found New Hardware Wizard.** This wizard guides you in installing the 3ware driver (see Figure 22). Note that you will see screens for the installation of two drivers during this process.

Figure 22. Found New Hardware Wizard, Windows XP and 2003

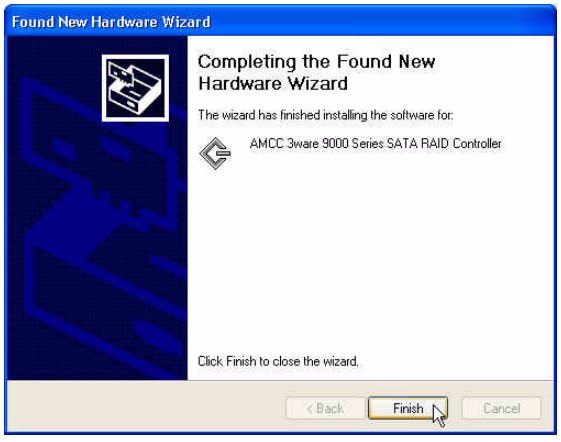
1 Click the **Next** button and respond to the questions the Wizard displays.

2 When the Wizard prompts you to select a device driver, click Have Disk, and then indicate that it is on the CD or floppy.

3 If the “Digital Signature Not Found” message appears, click **Yes** to continue the installation.

4 When the Completing the Found New Hardware Wizard screen appears (Figure 23), click **Finish**.

Figure 23. Completing Found New Hardware Wizard



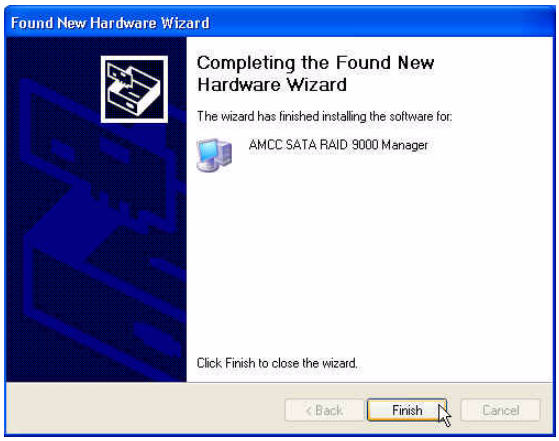
5 If the “Completing” screen similar to the one above indicates that you should restart your computer, do so now.

6 When the Welcome to the Found New Hardware Wizard screen appears again (Figure 24), click **Next** and follow the prompts on the screen to install the second driver.

Figure 24. Welcome to the Found New Hardware Wizard

7 When the second Completing the Found New Hardware screen appears, click **Finish**.

Figure 25. Completing Found New Hardware Wizard



After the driver has been installed, continue with the instructions below under “Making Units Managed by a 3ware Controller Available to Windows” on page 38.

Making Units Managed by a 3ware Controller Available to Windows

After the 3ware driver has been installed, you need to partition and format the new units or disks.

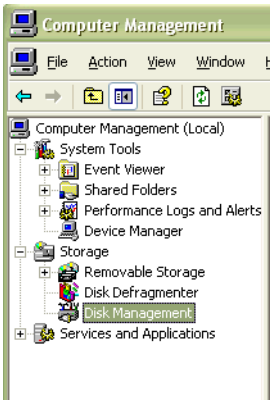
1 Remove the driver diskette or CD, reboot the system, and log in as the system administrator.

2 Use **Disk Administrator** to partition and format the new units or disks:

From the **Start** menu, choose **Administrative Tools** > **Computer Management**.

In the Computer Management window, under **Storage**, select **Disk Management.**

Figure 26. Computer Management Screen



3 Follow the steps that appear on the screen to write a signature to the drive.

4 Right-click on the drive and select **Create Volume**.

5 Follow the steps the appear on-screen to create a volume and to assign a drive letter.

Driver Installation Under Linux

Note: Before installing the 3ware driver, you must have already installed your 3ware RAID controller in the system. Consult the installation guide that came with your controller for how to do this. You can download that guide from: http://www.3ware.com/support/userdocs.asp

A drive or unit managed by the 3ware RAID controller may be configured to be your system's boot device. Or, you can use units managed by the 3ware controller for secondary storage and boot from another device, such as a disk attached to the motherboard, or other bootable media.

These steps assume that you do not have a 9500S installed in the system already. If you already have a system with a 9500S and you wish to add a 9550SX, 9590SE, or 9650SE to that same system, you will need to upgrade the 9500S driver, 3DM 2, and/or CLI with the version for the 9550SX/9590SE/9650SE.

The steps you follow to install the driver and make your RAID unit available depend on which version of Linux you are using, and whether it will be your boot device. This chapter provides step-by-step instructions for the following:

- Red Hat / Fedora Core Linux Installation
  - "Installing the 3ware Kernel Driver Module while Installing Red Hat Linux on a New Unit" on page 42
  - "Installing the 3ware Kernel Driver Module on a Red Hat or Fedora Core Linux System that Boots From a Different Device" on page 44
- SuSE Linux Installation
  - "Installing the 3ware Kernel Driver Module while Installing SuSE Linux on a New Unit" on page 48
  - "Installing the 3ware Kernel Driver Module on a SuSE Linux System that Boots from a Different Device" on page 48

The 9.4 code set from the 3ware website provides compiled drivers for these versions of Linux:

- Fedora Core 5 for AMD and Intel Platforms (32-bit & 64-bit)
- RedHat Workstation 4 (update 4) for AMD and Intel Platforms (32-bit & 64-bit)
- SuSE 10.1 Pro for AMD and Intel Platforms (32-bit & 64-bit)
- SuSE Linux Enterprise Server 10.0 for AMD and Intel Platforms (32-bit & 64-bit)

If you are using an unsupported Linux distribution or kernel for which there is not a driver available from the 3ware download page, see the following article in the 3ware knowledgebase: http://www.3ware.com/kb/

article.aspx?id=14546. You can also contact 3ware Technical Support, or email your driver request to support1@amcc.com.

For information about how to compile a driver from the 3ware driver source, see the links appended to knowledgebase article 14546 (http://www.3ware.com/kb/article.aspx?id=14546).

Obtaining 3ware Linux Drivers

Obtain the 3ware driver for Linux from one of these two sources:

- **3ware software CD-ROM**. Compiled and tested drivers for Red Hat and SuSE Linux are included on this CD.
- **3ware web site.** You can download the latest compiled and tested driver for supported Linux distributions from the 3ware web site at http://www.3ware.com/support/index.asp. Included in these downloads is the Linux driver source, which you can use to compile the latest driver for RedHat, SuSE, and other similar distributions, running similar kernel strings.

Be Sure to Use the Correct Drivers

The Linux 3w-9xxx drivers included on the 3ware CD are for 3ware 9650SE, 9590SE, 9550SX, and 9500S series controllers. 3ware 7/8000 series controllers use a Linux driver labeled 3w-xxxx. The drivers for the 9000 series controllers and the 7/8000 series controllers are not interchangeable, but can be used together when both controller types are installed in the same system. The examples in this chapter refer only to the 9000 series driver (9650SE, 9590SE, 9550SX, and 9500S). For information about using the 7/8000 driver and controller, refer to the user guide or installation procedure for the 7/8000-series controller.

Warning: Be sure to use the correct driver for your processor. It is possible to load the wrong driver onto a system, however when you boot such systems, they will not work.

For Red Hat and SuSE, AMCC offers the following drivers:

- x86 32-bit for Intel x86 and AMD Athlon
- AMD x86 64-bit, used for both AMD Opteron and Intel 64-bit Xeon (EM64T)

Determining the Current Version of your 3ware Driver

If you already have a 3ware controller installed, you can check the current driver version, using either 3DM 2 or the CLI. (For details, see "Viewing Information About a Controller" on page 85.)

You can also check it using the following method:

If you have a 2.4 kernel or earlier, type the following command:

```
cat /proc/scsi/3w-9xxx/*
```

where the asterisk (*) represents SCSI host ID and `9xxx` represents the family of the controller. For example:

```
cat /proc/scsi/3w-9xxx/0
```

If you have a 2.6 kernel with sysfs, type the following command:

```
cat /sys/class/scsi_host/<hostid>/stats
```

where <hostid> is usually host0, unless other SCSI devices are available, in which case it may be host1 or higher.

If you have a 2.6 kernel without sysfs, type the following command:

```
dmesg | grep 3w
```

(dmesg can also be used with earlier kernel versions.)

Driver Installation Under Red Hat Linux or Fedora Core 5

Materials required

- 3ware software CD-ROM
- Floppy diskette, if you need to create a driver install diskette.
- Red Hat Linux installation CD-ROM. (Not required if Red Hat Linux is already installed on another drive.)

Creating a Red Hat Linux Driver Diskette

If you are installing Linux on the new drive or unit managed by the 3ware RAID controller, you must create a 3ware driver install diskette. If Linux is already installed on another device, you may install the 3ware kernel driver module from the 3ware software CD-ROM.

To create a Red Hat Linux driver install diskette

1 Insert the 3ware software CD into your system.

2 When the 3ware Escalade Menu appears, click the **Driver & Firmware Disks** button.

3 In the 3ware Driver & Firmware Disk Images menu, click the button for the driver disk you want to create.

A confirmation window opens.

4 Insert a blank diskette into a drive and click the **Yes** button to begin creating the driver floppy diskette.

Note: If you need to create a Linux driver diskette for a Linux distribution other that what is available on the menu, see 3ware knowledgebase article 14546 http://www.3ware.com/kb/article.aspx?id=14546

To get the kernel driver module

If you only need the kernel driver module, you can get it in one of two ways:

- Browse the 3ware CD to `/packages/drivers/linux` and copy the appropriate kernel driver modules for your distribution release.

Or

- Follow the steps above to create a driver install diskette from the menu.

  Extract the kernel driver module from the modules.cgz file, using this command:

```
zcat modules.cgz|cpio -idvm
```

Installing the 3ware Kernel Driver Module while Installing Red Hat Linux on a New Unit

Note: If Red Hat Linux is already installed and bootable on another drive, turn to “Installing the 3ware Kernel Driver Module on a Red Hat or Fedora Core Linux System that Boots From a Different Device” on page 44.

Note: We have tested some older systems where a drive connected to the motherboard interfered with using a drive or unit managed by the 3ware RAID controller as a boot device. Disconnecting the drive while installing Linux will eliminate this problem. After Linux is installed, the drive can be reconnected.

To install the 3ware kernel driver module while installing Red Hat or Fedora Core Linux on a new unit

1 Boot with the Red Hat or Fedora Core CD:

   a Insert the Red Hat CD-ROM disk into your computer.

   b Make sure the boot order in your motherboard's BIOS is correct; then start or reboot your computer.

   c When the Welcome to Red Hat display appears, type:
   `linux dd`

   A number of files will load and then a message will prompt you to insert your driver install disk.

4 Install the 3ware kernel driver module, using the driver install diskette:

   Insert the driver install diskette containing the 3ware driver for Red Hat and press **Enter**.

   The system automatically reports: `Loading 3w-9xxx`

5 When prompted, select the proper language and keyboard types for your locality.

6 If asked for what type of media, select Local CD-ROM since you are installing from the Red Hat CD-ROM.

For Fedora Core 5, due to an installation bug that does not update the driver, do not reboot. Instead perform the following additional steps:

7 After the install completes, jump to a console by pressing Ctrl+Alt+F2.

8 Change directory to
   `/mnt/sysimage`

9 Type the following commands:

```
mcopy a:InstallFix .
chmod +x InstallFix
chroot /mnt/sysimage
```

10 Run the workaround script
   `./InstallFix`

   The workaround will copy in the updated driver(s) and recreate the ramdisk(s) so that upon reboot you have the updated drivers and not the ones that came on the OS installation CD.

11 When the script finishes, type the following:
   `exit`

12 Return to the installation screen by pressing Ctrl+Alt+F7.

13 Click reboot button to finish installation.

Installing the 3ware Kernel Driver Module on a Red Hat or Fedora Core Linux System that Boots From a Different Device

The steps for installing the 3ware kernel driver module vary slightly, depending on your specific installation requirements. Select the appropriate set of steps below, based on whether:

- You want to update the RAM disk
- You prefer to load the driver manually or from a script, instead of updating the RAM disk

About Variables In the Kernel Driver Module Installation Instructions

These conventions are used for variable text for kernel strings and module names in the instructions on the following pages.

Kernel String Conventions

<kernel string> refers to the kernel version.

The kernel string will have different endings, depending on the kernel you are using.

- For an SMP kernel (multi-processor), the kernel string will end in smp. For example: `2.6.16-smp`.
- For an Enterprise kernel, the kernel string will end in enterprise. For example: `2.6.16-enterprise`
- For a Bigmem kernel, the kernel string will end in bigmem. For example: `2.6.16-bigmem`
- For a Hugemem kernel, the kernel string will end in hugmem. For example: `2.6.16-hugmem`

Module Naming Conventions

3w-9xxx.* refers to the specific kernel driver module you will copy in the examples shown in steps 3 and 4. The name of the kernel driver module you will copy (`3w-9xxx.*`) varies, depending on the kernel; however you will always copy it to a file named
`3w-9xxx.o` for 2.4 kernels, or `3w-9xxx.ko` for 2.6 kernels.

The available kernel driver module files are:

- For UP kernels: `3w-9xxx.ko`
- For SMP kernels: `3w-9xxx.smp`
- For Enterprise kernels: `3w-9xxx.ent`

- For Bigmem kernels: `3w-9xxx.big`
- For Hugemem kernels: `3w-9xxx.hug`
- For IA32E kernels: `3w-9xxx.i32`

To install the 3ware driver and update the RAM disk

1 Log in as root and open a console window.

2 Mount the CD which contains the 3ware kernel driver module.

To mount the CD, type:

`mount /dev/cdrom` and press Enter.

3 Copy the kernel driver module:

For Redhat WS4 Intel x86 and AMD, type:
`cp /mnt/cdrom/packages/drivers/linux/redhat/ws4_u4/x86/3w-9xxx.<ko, smp, or hug> /lib/modules/`<put kernel string here>`/kernel/drivers/scsi/3w-9xxx.ko`

For Fedora Core on Intel x86 and AMD, type**:**
`cp /mnt/cdrom/packages/drivers/linux/fedora/core5/x86/3w-9xxx.<ko, smp, or hug> /lib/modules/`<put kernel string here>`/kernel/drivers/scsi/3w-9xxx.ko`

If prompted to overwrite, type `y`.

For Redhat workstation on AMD Opteron and Intel EM64T, type:
`cp /mnt/cdrom/packages/drivers/linux/redhat/ws4_u4/x86_64/3w-9xxx.<ko or smp> /lib/modules/`<put kernel string here>`/kernel/drivers/scsi/3w-9xxx.ko`

For Fedora Core on AMD Opteron and Intel EM64T, type:
`cp /mnt/cdrom/packages/drivers/linux/fedora/core5/x86_64/3w-9xxx.<ko or smp> /lib/modules/`<put kernel string here>`/kernel/drivers/scsi/3w-9xxx.ko`

If prompted to overwrite, type `y`.

4 **For 2.6 Kernels**, add the following line to `/etc/modprobe.conf`
`alias scsi_hostadapter 3w-9xxx.ko`

5 Update the `modules.dep` file, by issuing the following command:
`/sbin/depmod -a`

6 Run mkinitrd by entering the following:
`/sbin/mkinitrd -v -f /boot/initrd-<kernel string>.img` <kernel string1>

where <kernel string1> is the /lib/modules directory from which to copy the 3w-9xxx driver. Example:
`/sbin/mkinitrd -v -f /boot/initrd-2.6.18-14.img 2.6.18-14`

7 If you are using the GRUB boot loader, skip to Step 8.

If you are using the LILO boot loader, run LILO to update the boot record on disk by typing the following:
`/sbin/lilo`

The output should be similar to:
`Added linux *`

8 Reboot.

The 3ware kernel driver module will be loaded from the ram disk automatically at boot time.

To install the 3ware kernel driver module and load the module manually instead of using a RAM disk

1 Log in as root and open a console window.

2 Mount the CD which contains the 3ware kernel driver module.

To mount the CD, type:
`mount /dev/cdrom` and press Enter.

3 Copy the kernel driver module.

For Redhat workstation on Intel x86 and AMD x86, type:
`cp /mnt/cdrom/packages/drivers/linux/redhat/ws4_u4/x86/3w-9xxx.<ko, smp, or hug> /lib/modules/<put kernel string here>/kernel/drivers/scsi/3w-9xxx.ko`

For Fedora Core on Intel x86 and AMD x86, type:
`cp /mnt/cdrom/packages/drivers/linux/fedora/core5/x86/3w-9xxx. <ko, smp, or hug> /lib/modules/<put kernel string here>/kernel/drivers/scsi/3w-9xxx.ko`

If prompted to overwrite, type `y`.

For Redhat workstation on AMD Opteron and EM64T, type:
`cp /mnt/cdrom/packages/drivers/linux/redhat/ws4_u4/x86_64/3w-9xxx.<ko or smp> /lib/modules/<put kernel string here>/kernel/drivers/scsi/3w-9xxx.ko`

For Fedora Core on AMD Opteron and EM64T, type:
`cp /mnt/cdrom/packages/drivers/linux/fedora/core5/x86_64/3w-9xxx.<ko or smp> /lib/modules/<put kernel string here>/kernel/drivers/scsi/3w-9xxx.ko`

If prompted to overwrite, type `y`.

4 Add the following line to `/etc/modules.conf`:
`alias scsi_hostadapter 3w-9xxx`

5 Update the `modules.dep` file, by issuing the following command:
`/sbin/depmod -a`

6 Load the kernel driver module manually. Type:

```
modprobe sd_mod
insmod 3w-9xxx
```

You can also incorporate the insmod command into a startup script.

Driver Installation Under SuSE Linux

Materials required

- 3ware software CD-ROM
- Floppy diskette, if you need to make a driver install diskette.
- SuSE Linux Installation CD-ROM/DVD (Not required if SuSE Linux is already installed on another drive.)

Creating a SuSE Linux Driver Diskette

If you are installing Linux on the new drive or unit managed by the 3ware RAID controller, you must create a 3ware driver install diskette. If Linux is already installed on another device, you may install the 3ware kernel driver module from the 3ware software CD-ROM.

To create a driver install diskette

1 Insert the 3ware software CD into your system.

2 When the 3ware Escalade Menu appears, click **Driver and Firmware Disks**.

3 In the 3ware Driver and Firmware Disk Images menu, click the button for the driver disk you want to create.

A confirmation window opens.

4 Insert a blank diskette into a drive and click the **Yes** button to begin copying the driver to the floppy diskette.

Note: If you need to create a Linux driver diskette for a Linux distribution other that what is available on the menu, see 3ware knowledgebase article 14546 http://www.3ware.com/KB/article.aspx?id=14546

To get the kernel driver module

If you only need the kernel driver module, you can get it in one of two ways:

- Browse the 3ware CD to `/packages/drivers/linux` and copy the appropriate kernel driver modules for your distribution release.

Or

- Follow the steps above to create a driver install diskette from the menu.

  Extract the kernel driver module from the `update.tar.gz` file, using this command:
  tar -xzf update.tar.gz

Installing the 3ware Kernel Driver Module while Installing SuSE Linux on a New Unit

Note: If SuSE Linux is already installed on another drive, turn to "Installing the 3ware Kernel Driver Module on a SuSE Linux System that Boots from a Different Device" on page 48.

1 Boot directly from the SuSE installation CD #1 or DVD.

2 When installing SuSE, press either the F6 key or the F3 key, depending on the version.

  You will then be prompted to insert the driver install disk.

3 Insert the 3ware Linux driver installation diskette.

4 Click OK and continue with the installation.

Installing the 3ware Kernel Driver Module on a SuSE Linux System that Boots from a Different Device

1 Log in as root.

2 Edit `/etc/sysconfig/kernel` and make sure the file contains the following line:

```
INITRD_MODULES="reiserfs 3w-9xxx"
```

Note: Other modules may be listed before or after `3w-9xxx`, depending on the installation. You may see entries like `reiserfs`, `ext3` or `scsi_mod`. If present, leave them (ensuring there is a space between each module name), since the system needs them to boot properly.

Note about variables: In the instruction below, replace <kernel string> with the kernel version you are using (i.e. 2.6, etc.).

In addition, replace 3w-9xxx.* with the appropriate module file for your kernel. The available module files are:

For UP kernels: `3w-9xxx.ko`
For SMP kernels: `3w-9xxx.smp`
For BigSMP (high memory) kernels: `3w-9xxx.big`

3 If you are using SuSE 9.1 or earlier, after the existing 3w-xxx entry, add `3w-9xxx` to the file `/lib/modules/`<kernel string>`/modules.dep`

4 Mount the CD-ROM and copy and install the appropriate kernel driver module for your system.

Note: The AMD 64-bit driver is also used for 64-bit Intel Xeon systems.

```
mount /dev/cdrom /cdrom
```

Copy the kernel driver module:

For SuSE 10.1 Professional 32-bit (x86), type:

```
cp /cdrom/packages/drivers/linux/suse/su101/x86/
3w-9xxx.<ko, smp, or big>
/lib/modules/<kernel string>/kernel/drivers/scsi/3w-9xxx.ko
```

For SuSE Linux Enterprise Server 10.0 64-bit (x86_64), type:

```
cp /cdrom/packages/drivers/linux/suse/su101/x86_64/
3w-9xxx.<ko or smp>
/lib/modules/<kernel string>/kernel/drivers/scsi/3w-9xxx.ko
```

For SuSE 10.1 Professional 32-bit (x86), type:

```
cp /cdrom/packages/drivers/linux/suse/sles10/x86/
3w-9xxx.<ko, smp, or big>
/lib/modules/<kernel string>/kernel/drivers/scsi/3w-9xxx.ko
```

For SuSE Linux Enterprise Server 10.0, 64-bit (x86_64), type:

```
cp /cdrom/packages/drivers/linux/suse/sles10/x86_64/
3w-9xxx.<ko or smp>
/lib/modules/<kernel string>/kernel/drivers/scsi/3w-9xxx.ko
```

If prompted to overwrite, type `y`.

5 To load the kernel driver module, type:

```
/sbin/insmod /lib/modules/<kernel string>/kernel/drivers/scsi/
3w-9xxx.ko
```

Note: If the kernel driver module installation fails, confirm that the correct driver was installed from the CD-ROM. If a driver is not available for your system, you will need to compile your own driver. For more information, see 3ware knowledgebase article 14546 http://www.3ware.com/kb/article.aspx?id=14546.

6 Type:

```
/sbin/depmod -a
```

7 Type:

```
/sbin/mkinitrd
```

8 If you are using the GRUB boot loader, you are finished.

If you are using the LILO boot loader, run LILO to update the boot record on disk by typing the following:

```
/sbin/lilo
```

The output should be similar to:

```
Added linux *
```

Compiling a 3ware Driver for Linux

If you are using a Linux distribution for which there is not a compiled driver available from 3ware, you can copy the source from the 3ware software CD or download the source from the 3ware website and compile a new driver. For more information, see 3ware knowledgebase article 14546 http://www.3ware.com/KB/article.aspx?id=14546.

Driver Installation Under FreeBSD

Note: Before installing the 3ware driver, you must have already installed your 3ware RAID controller in the system. Consult the installation guide that came with your controller for how to do this. You can download the installation guide from: http://www.3ware.com/support/userdocs.asp

A drive or unit managed by the 3ware RAID controller may be configured to be your system's boot device. Or, you can use another device as your boot device, such as a disk attached to the motherboard.

Obtaining 3ware FreeBSD Drivers

The 3ware software CD-ROM that came with the 3ware RAID controller includes compiled and tested kernel driver modules for FreeBSD 6.1 only, and source files for 5.x and 6.x series. To see if a more recent driver is available, please see the 3ware web site at http://www.3ware.com/support/index.asp.

Materials Required

- 3ware kernel driver module

  The kernel driver module and the corresponding source files can be found on the 3ware CD-ROM, at

  `/packages/drivers/freebsd/6.1/x86`

  or

  `/packages/drivers/freebsd/6.1/x86_64`

  depending on whether you have the 32-bit or 64-bit version of FreeBSD 6.1 (respectively).

  The source for the 3ware FreeBSD kernel driver module is available at

  `/packages/drivers/freebsd/src/6.x`.

  You can also download the FreeBSD kernel driver module from the 3ware web site (http://www.3ware.com/support/index.asp).

- FreeBSD installation CD-ROM or diskette

Installing the Driver under FreeBSD

The steps you follow to install the driver and make your 3ware RAID unit available depend on whether it will be your boot device or will be used for secondary storage. These instructions provide step-by-step instructions for the following situations:

- "Installing the Kernel Driver Module while Installing FreeBSD v6.1 on a Unit on the 3ware RAID Controller" on page 51
- "Installing the 3ware Kernel Driver Module on a FreeBSD System that Boots from a Device on the Motherboard" on page 54

Installing the Kernel Driver Module while Installing FreeBSD v6.1 on a Unit on the 3ware RAID Controller

Use the steps in this section if you are installing FreeBSD on the new drive or unit managed by the 3ware RAID controller.

Note: The 3ware kernel driver module integrated into the FreeBSD installation CD supports 9500S controllers, but not 9550SX/9590SE/9650SE controllers. Since this driver is statically compiled with the kernel, newer drivers with the same name (twa.ko) cannot exist. A temporary driver is provided, named twa_9ksx.ko, which can be used to accomplish the FreeBSD installation and enable boot device support. Once up and booted, you will need to upgrade the kernel driver module by compiling the new kernel driver sources provided on the CD or website. The steps below describe how to load the temporary kernel driver module, and then how to upgrade the kernel to include it.

Note: Some versions of FreeBSD cannot boot to arrays larger than 1 TByte. If you want to create an array larger than 1 TByte, check to make sure that the version of FreeBSD you have supports it.

To install the kernel driver module while installing FreeBSD v6.1

1 Disconnect all SCSI devices in the system, except the except the CD or DVD and the ones connected to the 3ware RAID controller.

2 Create the RAID units on the 3ware RAID controller using 3BM (the 3ware BIOS Manager). For details, see “First-Time RAID Configuration Using 3BM” on page 20.

3 Copy the temporary kernel driver module (`twa_9ksx.ko`) onto a floppy.

`twa_9ksx.ko` is available on the 3ware CD-ROM, at

for 32 bit: `packages/drivers/freebsd/6.1/9550sxInstall/x86`

for 64 bit: `packages/drivers/freebsd/6.1/9550sxInstall/x86_64`

`twa_9ksx.ko` is also available at the following link http://www.3ware.com/KB/article.aspx?id=14850. Both 32-bit (x86) and 64-bit (x86_64) Versions are attached.

4 Boot the system from the FreeBSD installation CD. Immediately after the system starts booting the kernel, insert the floppy containing the appropriate 3ware 9550SX/9590SE/9650SE kernel driver module into the floppy drive.

5 Run sysinstall.

In the sysinstall menu, choose **Configure > Load KLD**.

Load `twa_9ksx.ko` from the floppy drive.

6 Install the FreeBSD OS, remove the floppy and the CD, and reboot.

7 Immediately after the system starts booting the kernel, re-insert the floppy into the floppy drive.

8 At the FreeBSD boot menu, select "Escape to loader prompt."

9 At the loader prompt, load the kernel driver module by typing

`load disk0:twa_9ksx.ko` (assuming disk0 is the floppy drive)

Then boot, by typing

`boot`

Now that you have installed the twa_9ksx.ko kernel driver module and you are up and booted into FreeBSD, the next step is to upgrade the kernel with the latest 3ware kernel driver sources.

10 Once the system boots up, replace the twa driver sources at `/sys/dev/twa` and `/sys/modules/twa` with the new sources that have 9550SX/9590SE/9650SE support, for the OS version being used.

The sources for the new kernel driver module for FreeBSD 6.1 can be found on both the 3ware CD-ROM and the 3ware website.

For step-by-step instructions, see “To update the kernel with new driver source” on page 53.

11 Build the kernel with the new driver sources.

For help with this, see http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/kernelconfig-building.html.

12 Reboot your system.

To update the kernel with new driver source

1 Copy .c and .h files to `sys/dev/twa` and `makefile` to `sys/modules/twa`

2 Go to /usr/src/sys/conf/ and edit the `files` file (use vi or any other editor)

a Remove these lines:

```
twa/twa.c
twa/twa_cam.c
twa/twa_freebsd.c
twa/twa_fwing.c
twa/twa_globals.c
```

b Replace them with:

`twa/tw_cl_fwimg.c` (omit this if using code set 9.3.0.4 or newer)

```
twa/tw_cl_init.c
twa/tw_cl_intr.c
twa/tw_cl_io.c
twa/tw_cl_misc.c
twa/tw_osl_cam.c
twa/tw_osl_freebsd.c
```

c Save changes.

3 Go to `/usr/src/sys/conf/` and edit `kern.pre.mk` (use vi or any other editor).

Below this line: `INCLUDES+= -I$S/contrib/ngatm`

Add this line: `INCLUDES+= -I$S/dev/twa`

Save changes.

4 Go to `usr/src/sys/i386/conf` or `/usr/src/sys/amd64/conf`, depending on whether you have a 32-bit or 64-bit version of FreeBSD 5.4 (respectively).

a Edit the `GENERIC` file (use vi or any other editor).

b Make sure `Device twa # 3ware 9000 series` is not commented out.

c Save changes.

d Do `config` (GENERIC, SMP, PAE), using the flags required for your hardware, followed by

```
cd  ../compile/SMP
make clean
make cleandepend
make depend
make
make install
```

5 Reboot your system.

When the system reboots, the new kernel driver module will load automatically.

Note: If you have more than 4 GBytes of system memory, you will need to use the PAE kernel. The FreeBSD PAE kernel has a bug that requires the 3ware driver to be statically compiled. Do not dynamically load the kernel driver module (e.g. `kldload twa.ko`); doing so will cause the kernel to panic.

Installing the 3ware Kernel Driver Module on a FreeBSD System that Boots from a Device on the Motherboard

Use the steps in this section if FreeBSD is installed on a boot drive attached to the motherboard ATA controller, and you will be using the unit on your 3ware RAID controller for secondary storage.

When you use the controller for secondary storage, you do not need to install the kernel driver module, however you may want to update the kernel with it.

To install the 3ware kernel driver module when FreeBSD is installed on a device on the motherboard

1 Make sure the 3ware RAID controller is not installed in the system yet.

2 Install FreeBSD to a disk attached to the motherboard ATA controller.

Be sure to install the full FreeBSD source.

3 Once FreeBSD is installed, power down the system and install the 3ware RAID controller. For assistance, see the installation guide that came with the controller.

Create the RAID units on the controller using either 3BM (the BIOS of the controller) or 3DM2/CLI (once FreeBSD is loaded).

4 Boot to FreeBSD.

5 Once the system boots up, replace the twa driver sources at `/sys/dev/twa` and `/sys/modules/twa` with the new sources that have 9550SX/9590SE/9650 support, for the OS version being used.

The sources for the new kernel driver module for FreeBSD 5.4 can be found on both the 3ware CD-ROM and the 3ware website.

For step-by-step instructions, see “To update the kernel with new driver source” on page 53.

6 Build the kernel with the new driver sources.

For help with this, see http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/kernelconfig-building.html.

7 Reboot your system.

Compiling and Loading the driver as a Module

If you want to compile the driver and load it as a module without rebuilding the kernel, follow these steps.

Note: The 6.x source files are located on the CD at /packages/drivers/freebsd/src/6.x/twa.tgz

The 5.x source files are located on the CD at /packages/drivers/freebsd/src/5.x/twa.tgz

1 Disconnect all SCSI devices in the system, except the ones connected to the 3ware RAID controller.

2 Create the RAID units on the 3ware RAID controller using 3BM (BIOS)

3 Unpack twa.tgz and copy (*.c and *.h) files to `sys/dev/twa` and Makefile to `sys/modules/twa`

4 cd /sys/modules/twa
make

5 Comment out the entry `Device twa # 3ware 9000 series` in `usr/src/sys/i386/conf` or `/usr/src/sys/amd64/conf`

6 Rebuild the kernel and reboot your system.

7 Load the kernel driver module from `/sys/modules/twa`
`kldload twa.ko`

5

3ware BIOS Manager 2 (3BM 2) Introduction

This section describes the basics of using 3ware BIOS Manager 2 (3BM 2), one of the tools you can use to configure and maintain the units connected to your 3ware RAID controller. It is organized into the following topics:

- Starting 3BM 2
- Exiting the 3BM Configuration Utility
- Working in the 3BM Screens
- Adjusting BIOS Loading Settings
- Displaying Controller Information
- Getting Help While Using 3BM

For information about doing particular tasks in 3BM, refer to the later sections in this guide.

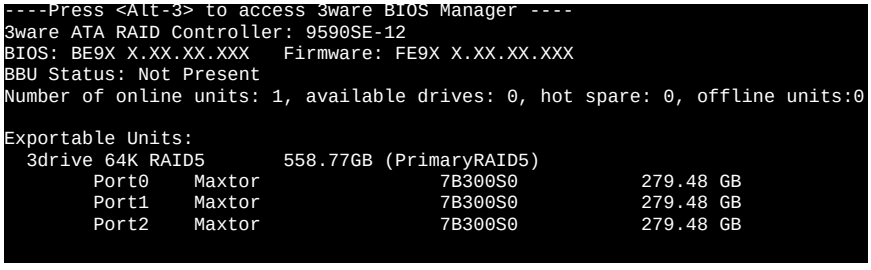
Starting 3BM 2

You access 3BM during the start-up process for your computer.

1 Power up or reboot your system.

2 While the system is starting, watch for a screen similar to the 3ware BIOS screen below.

Figure 27. 3ware BIOS Screen

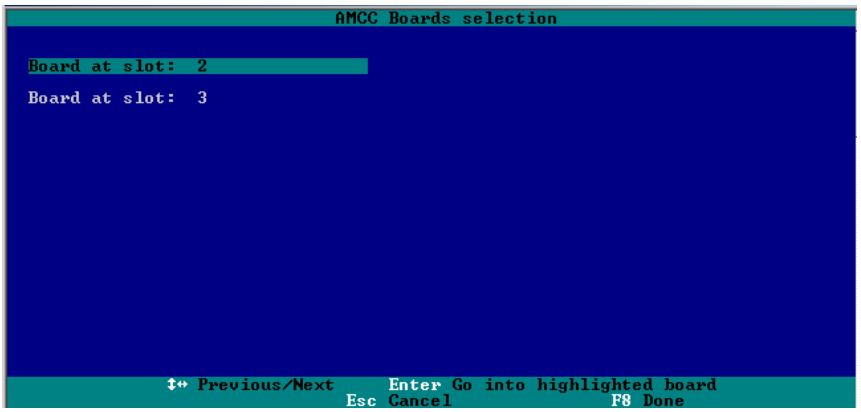


3 Press **Alt-3** immediately to bring up the **3ware BIOS Manager (3BM)**.

Normally your 3ware configuration remains on-screen for just a few seconds. However, if a unit has degraded, the screen indicates the problem and remains on your screen longer.

4 If you have more than one 9000-series controller in your system, a screen lists the available boards (see Figure 28). In this case, highlight the board with which you want to work and press **Enter**.

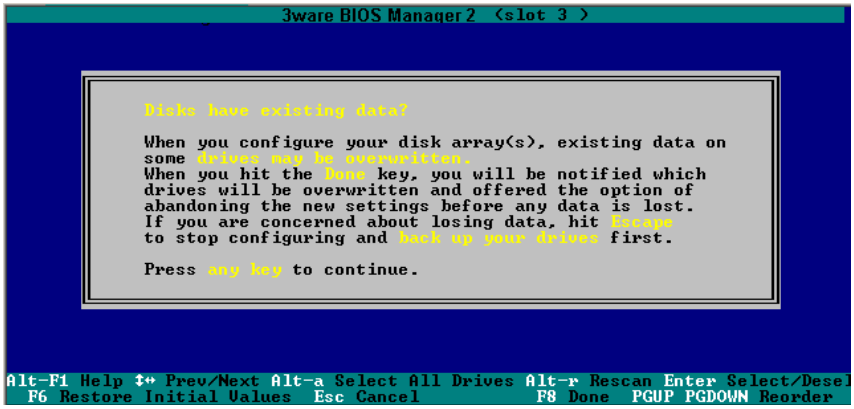
Figure 28. AMCC Boards Selection Screen



You see a screen similar to the warning message below, warning you that changing your disk array configuration may overwrite data on the disks.

5 If you plan to make changes to your configuration and need to backup data before continuing, press **ESC** and do so now. Otherwise, press any key to continue.

Figure 29. Warning Message When you Start 3BM



If 3BM detects a degraded array, a red message box appears, to alert you to the problem. For information about rebuilding a degraded array, see “Locating a Drive by Blinking Its LED” on page 166.

Note: If you have a combination of 7000/8000-series and 9000-series controllers in your system, the 7000/8000-series controllers are not listed on the selection screen shown in Figure 28. Instead, an additional BIOS summary will appear for the 7000/8000-series controller, similar to Figure 27. To access the BIOS utility for the 7000/8000-series board, press **Alt-3** when the information for that controller appears. Although similar to 3BM, some screens and features are different for the 7000/8000-series. For detailed information, see the version of the 3ware Escalade ATA RAID Controller User Guide that supports the 7000 and 8000 series controllers.

If you have two 9000 series controllers that have different versions of the BIOS installed, they will also appear in different BIOS summaries, and will launch different versions of 3BM.

Exiting the 3BM Configuration Utility

When you are ready to exit the 3BM configuration utility, you have the option to save the configuration changes you have made, or to discard the changes.

To save your configuration modifications

1 Press the **F8** or **Esc** key.

A list of affected drives appears, and a messages ask you to confirm the configuration.

2 Type Y.

The booting process resumes.

To exit without saving changes

1 Press **Esc.**

2 If you have unsaved changes, 3BM will ask you whether you want to save the changes and exit, or exit without saving the changes.

If you want to exit without saving changes, type N.

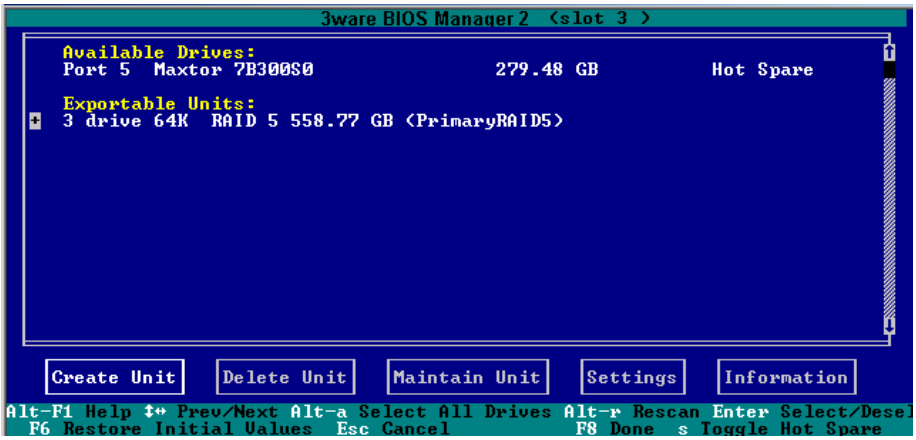
If you change your mind and want to save the changes, type Y.

Exception: Changes made to controller policies are saved when you leave the Policy screen. Pressing **F8** is not required to save those changes. For more about changing policies, see “Setting the Auto Rebuild Policy” on page 90.

Working in the 3BM Screens

The main **3BM** screen (Figure 30) shows the current configuration for the drives attached to your controller, and a list of any available drives. Unusable and incomplete drives are also shown.

Figure 30. 3BM Main Display



You will see one or more of the following sections in the main 3BM screen:

- **Available Drives** lists any unconfigured, independent drives (JBODs) that are not associated with an array, and hot spares. If this section does not appear, there are no available drives.
- **Exportable Units** lists the existing units, along with the drives contained in each. These are the units that will be available to the operating system when you boot your computer. If this section does not appear, no units have been configured.

  If you have more than one unit, the boot unit is the one at the top of the list. (You can change the order by highlighting a unit and pressing the **PgUp** or **PgDn** key.)
- **Unusable Arrays** lists any RAID configuration missing too many drives to construct the unit. For example, a RAID 5 unit with two or more drives missing would appear in this list.
- **Incomplete Drives and Others** lists drives that are remaining from a unit with missing or failed drives, drives that are not usable, and drives that were part of a unit on a 3ware 7000/8000-series controller, and contain data that needs to be updated before your 3ware 9000 series controller can use them. (If you want to move a unit from a 7/8000 controller to the 9000 controller, you must convert the drives first. For more information, see the section “Moving a Unit from One Controller to Another” on page 131.)

  When some of the drives are remaining from a unit, you can power down and add the missing drives to complete the unit. To use drives that are

listed here in other units, you must first delete them. For more information, see “Deleting a Unit” on page 125.

If any of the sections are not shown, it means that there are no items of that type connected to the controller.

Table 7 lists how to move around and select information in the 3BM screens. When these commands are available in 3BM, they appear at the bottom of the 3BM screen.

Table 7: Working in 3BM 2

To do this	Use these keys
Move between units or drives in a list, between fields, and between buttons	Up and Down Arrow Keys OR Left and Right Arrow Keys OR Tab and Shift+Tab
Select (or unselect) what is currently highlighted. A selection may be a drive in a list of drives, a button at the bottom of the screen, or a field in the middle of the screen. In lists, an asterisk appears to the left of selected drives or units	Enter or the Spacebar
Display a drop-down list of available choices in a field	Enter
Move between choices in a field list	Up and Down Arrow Keys
Select all available drives	Alt+A
In the list of units, expand a selected unit to see any subunits and drives in the unit, or contract it to see only the heading again.	Shift+ Shift-
Highlight one of the primary buttons on the main screen: • Create Unit • Delete Unit • Maintain Unit • Settings • Information	 Alt+C Alt+D Alt+M Alt+S Alt+I

Table 7: Working in 3BM 2

To do this	Use these keys
Specify (or unspecify) a drive as a hot spare	S
Return to starting values for this session in the 3ware BIOS Manager	F6 **Note:** F6 cannot bring back previous policy settings; they are saved when you exit the Policy screen.
Rescan the controller and update the status of units and drives	Alt+R
Return to the main 3ware BIOS Manager screen, from the Advanced Details screen	Any key
Move a highlighted unit up or down in the list of exportable units (The top-most unit will become the bootable unit, if you install the OS.)	Page Up Page Down (Available only when there are multiple units and a unit is highlighted.)
Display context sensitive help	F1 or Alt-F1
If you have multiple 3ware controllers in your system, return to the board selection screen.	Esc
Exit the utility and save or abandon all changes.	Esc
Exit the utility and save all changes	F8

Adjusting BIOS Loading Settings

3BM 2 includes the following settings that let you customize the behavior of the BIOS for the selected controller. You can access these settings by selecting Settings > BIOS Settings from the main 3BM screen.

- Power-On Self Test (POST) Display Options
- BIOS Loading Options
- To change BIOS settings

Power-On Self Test (POST) Display Options

Display Control. Specifies what level of detail to display on the start-up screen.

- **Full** displays all available information about the items attached to the controller, including available drives, hot spares, and configured units.
- **Unit Only** displays only configured units.
- **Summary** displays a one-sentence description of the items attached to the controller.

Array View. Specifies what level of information to show about configured units on the start-up screen.

- **Expanded** lists each unit and shows the specific drives that make up the unit.
- **Collapsed** lists only the configured units.

Pause Time. Sets the number of seconds that BIOS loading will pause to displaying the RAID configuration before continuing to boot the operating system. You can set a pause time of up to 10 seconds. The default is 6 seconds.

Full Screen Control. When you have many drives attached to a controller and choose to display the Full level of detail, the information can extend beyond a screens' worth. The Full Screen Control setting lets you specify whether to wait for a keystroke when the screen is full, before displaying additional information. This option can be either **No Key** or **Wait Key**.

BIOS Loading Options

Load Control. This setting lets you suppress loading of the BIOS for this controller. This can be useful for "headless" systems (without a monitor and keyboard) that have many types of PCI controllers and do not need to boot from the units.

Note: During the boot process, you can also bypass loading of the BIOS for all controllers for one time only by pressing **Alt-B**. This is useful to temporarily boot from a non-3ware device without having to change the system's boot order.

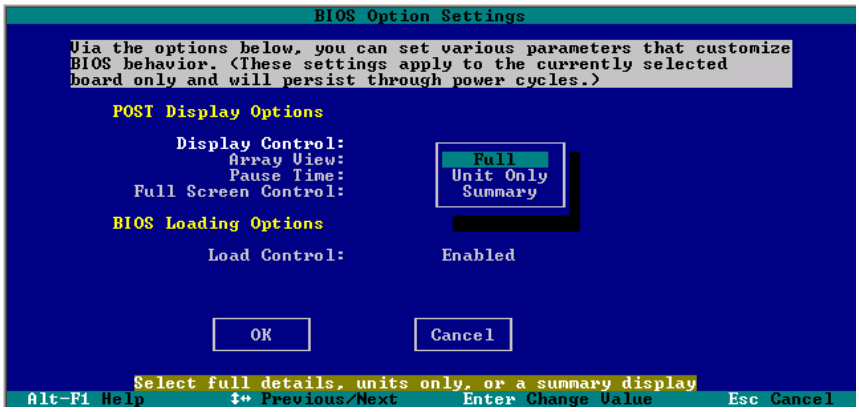
To change BIOS settings

1 On the main 3BM screen, **Tab** to **Settings** and press **Enter**.

2 On the pop-up menu, select **BIOS** and press **Enter**.

The BIOS Options Settings screen appears.

Figure 31. BIOS Option Settings Screen



3 **Tab** through the options and make the desired changes.

4 **Tab** to **OK** and press **Enter** to return to the main screen.

Displaying Controller Information

The Controller Information screen shows you details about your controller, and about the version of associated software installed on your system.

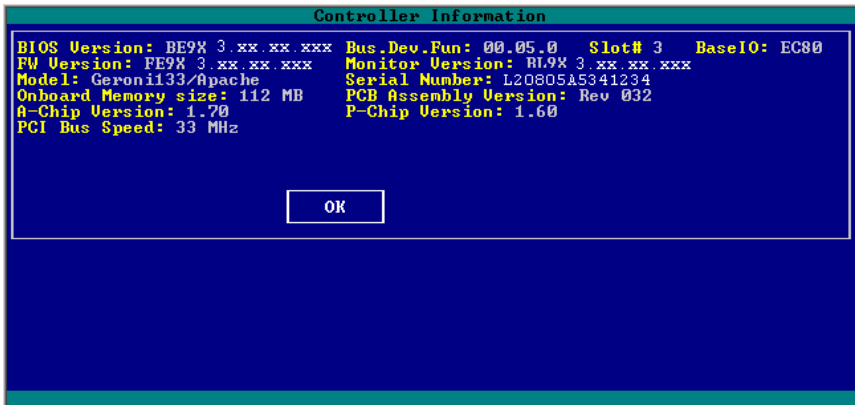
To see the controller information

1 On the main 3BM screen, **Tab** to **Information** and press **Enter**.

2 On the pop-up menu, select **Controller** and press **Enter**.

(Note that the particular versions shown in the screen shot below may not be current.)

Figure 32. Advanced Detail Screen



To return to the main screen

- Press **Enter**.

Getting Help While Using 3BM

You can get help with using 3BM while you are in the BIOS manager.

- Press **F1** or **Alt-F1** at any time.

  A description of the basic 3BM tasks appears.

  When you're finished using help, press **Esc** to close the help window.

6

3DM 2 (3ware Disk Manager) Introduction

Note: 3DM 2 includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/).

3ware Disk Manager 2 (3DM 2) allows you to manage and view the status of your 3ware RAID controllers and associated drives.

There are two parts to 3DM: a process, that runs in the background on the computer where you have installed your 3ware controller, and a web application that can be used to access it. 3DM runs as a service under Microsoft Windows, and as a daemon under Linux and FreeBSD. When the 3DM process is running, you can use your browser to go to 3DM application pages, where you can view status information about the controller and RAID units, create RAID units, and perform other administrative and maintenance tasks locally or remotely.

Two levels of access to 3DM are provided: user and administrator. Users have view-only access, and can check the status of drives and units. Administrators can view and make changes, using 3DM to configure RAID units and designate hot spares, and to perform maintenance tasks on RAID units.

In this section, information is organized into the following topics:

- Browser Requirements for 3DM
- Installing 3DM
- Starting 3DM and Logging In
- Working with the 3DM Screens
- Setting Up 3DM Preferences

For details about the settings and fields on each of the 3DM 2 screens, see “3DM 2 Reference” on page 189.

For additional information about managing and maintaining 3ware controllers using 3DM, see the remaining chapters in this guide.

Browser Requirements for 3DM

3DM runs in most current web browsers. Tested and supported browsers include:

- Internet Explorer 5.5 and above
- Mozilla Firefox
- Netscape 7 and above

Additional requirements:

- JavaScript must be enabled
- Cookies must be enabled
- For best viewing, use a screen resolution of 1024 X 768 or greater, and set colors to 16 bit color or greater.

Note: Because 3DM may be viewed in different browsers, the format and style of the 3DM browser windows illustrated in this documentation are examples only. The actual “look” of the windows will depend on the browser, 3DM version, and operating system you use.

Setting up Mozilla Firefox

Before setting up Mozilla Firefox, remember to download and install the latest available version of Mozilla Firefox. After installing the latest version, you may need to follow the instruction in the note below to have Mozilla Firefox working correctly with 3DM2.

Note: For security reasons, some web browsers do not allow connections to certain ports including port 1080 and 888. To override this on a per-port basis, the Mozilla release notes recommend adding a comma-separated list of ports to default/all.js (in your Mozilla installation directory). For example, to unblock port 888, add the following line:

```
pref(“network.security.ports.banned.override”, “888”)
```

This file is located at:

```
/usr/lib/mozilla/defaults/pref/all.js
```

Installing 3DM

3DM 2 can be installed from the 3ware CD that came with your 3ware RAID controller. You can also download the current version from the website at http://www.3ware.com/support/download.asp.

3DM must be installed on the system in which the controller is installed. 3DM does not have to be installed on remote systems in order to remotely manage a

3ware controller; you simply enter the correct URL into a browser on the remote system. You will need to enable remote access first, however.

During installation, you will be asked to enter the following preferences for 3DM use. (Each of these preferences can be changed later, from within the 3DM web application.)

- The HTTP port to be used as the listening port
- Whether remote access will be allowed
- Whether you want email notifications to be sent when errors occur, and who should receive them

Installing 3DM on a Microsoft Windows system

The 3ware RAID controller works with Windows 2000, Windows XP, and Windows Server 2003. The latest service packs should be installed for any Windows release.

To install 3DM on a Windows system

1 Insert the 3DM CD-ROM and click **Install 3DM 2** when the menu appears.

Or, if you downloaded 3DM from the website, find the file setup.exe and double-click it to launch the setup.

2 If a command window opens, press any key to begin the installation process.

3 When the License Agreement screen appears, read and agree to the license information; then let the InstallShield Wizard guide you through the installation process.

4 On the **3DM Remote Monitoring and Security Configuration** screen (see Figure 33), use the settings to specify these things:

- To change the HTTP port that 3DM will use as a listening port, check the first box.

  If you do not know which port to use, leave the box unchecked and use the default port.
- To allow remote administration, uncheck the second checkbox.

  When the second checkbox is checked, only localhost connections are allowed. Internet and Intranet connections are not allowed.

(You can change this setting later in 3DM.)

Figure 33. 3DM Remote Monitoring and Security Configuration Display

5 If the **3DM HTTP listening port setup** screen appears, enter the HTTP port you want to use.

This screen only appears when you check the first box on the **3DM Remote Monitoring and Security Configuration** screen.

(You can change this setting later within 3DM.)

6 On the **E-mail Notification Preferences** screen (see Figure 34) use the fields to specify initial email settings.

Note: If you do not want email alerts to be sent to anyone, leave "None" in these fields and click **Next** to go on to the next screen.

- In the **Server** field, enter the name or IP address of your email server.

  You can get the IP address of your mail server by typing

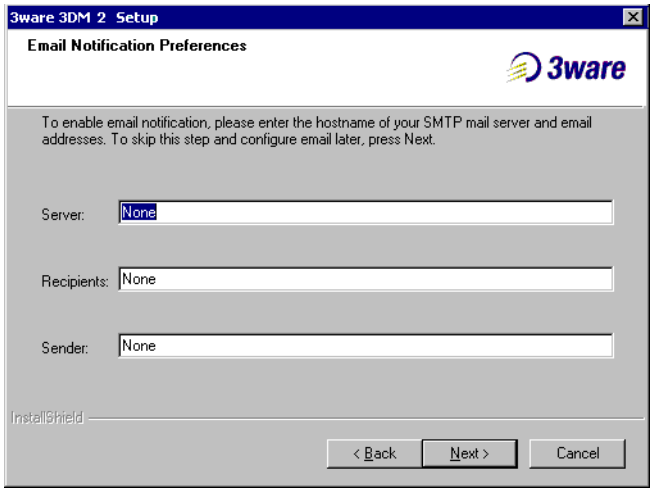
  `nslookup` <file server name>

  To find the mail server name, ask your system administrator or check the e-mail preferences or setup options on your e-mail client.
- In the **Recipients** field, enter the e-mail address of the user who should receive the 3DM e-mail status messages.

  You may enter multiple e-mail addresses, separating each entry with a comma (,).
- In the **Sender** field, enter the email address from which the email notifications will be sent. This is typically the local host name.

(You can change these settings later within 3DM.)

Figure 34. 3DM E-mail Notification Preferences



7 Continue with the installation as prompted, clicking **Next** to move to the next screen, and **Finish** when you reach the last screen.

3DM Installation gives you the option of starting 3DM and opening the browser window.

8 If you elect to launch the web interface, a Security Alert may appear, as shown in Figure 35. Click **Yes** continue.

You may install the certificate if you do not want to see this alert in the future. To do so, click View Certificate and then click Install Certificate.

Figure 35. Security Alert dialog box

9 When the first 3DM screen appears in your browser, log in as Administrator and use the default password, `3ware`.

Notes:
You can start 3DM later by choosing **3DM2** from the **Start/Programs/3ware/3DM2** menu.

If you change, add, or remove an IP address, or change the machine name of the machine on which you have installed 3DM 2, you will need to recreate the security certificate. You can do so by re-installing 3DM 2, or by deleting the file 3dm2.pem and restarting the 3DM 2 service. Under Windows, this file is located in the same directory in which you installed 3DM 2. Under Linux, the file resides in /etc/3dm2. You may also want to delete the installed/cached security certificate from your browser.

Uninstalling 3DM under Microsoft Windows

Use the Add or Remove Programs control panel to uninstall 3DM.

- From the **Startup** menu, choose **Control Panels > Add or Remove Programs**.
- In the Add or Remove Programs control panel, select **3DM** and click **Change/Remove**.

Installing 3DM for Linux or FreeBSD

Note: If you downloaded 3DM_Linux.zip from the website, unzip the file to root (or to any other working directory) and change Directory (CD) to that directory (for example: /root). Then start the following procedure at step 3, substituting /mnt with /root or your installation directory.

If you are installing for FreeBSD, replace `/linux` with `/freebsd`.

To start the installation

1 Insert the 3ware software installation CD-ROM for Linux into the CD-ROM drive.

2 Mount the CD-ROM disk:

```
mount /dev/cdrom /mnt
```

3 Change the directory and run the install script:

For Linux:

```
cd /mnt/packages/3dm2/linux
./install.3dm --i
```

For FreeBSD:

```
cd /mnt/packages/3dm2/freebsd
./install.3dm --i
```

To specify initial setup for 3DM 2

During installation, you will be prompted with a series of questions that determine initial 3DM settings. You can change these later, from within 3DM.

1
```
3DM2 supports two modes of operation.
-------------------------------------
0 - 3DM2 with remote/local GUI via WEB interface (Default)
1 - 3ware error logger only
Which version of 3DM would you like configured? [0 - 3DM2]
```

Press Enter to accept the default and install 3DM2 so that you can access it through a browser.

2
```
Would you like to have email notification enabled? (Y/N) [Y]
```

E-mail notification sends an email message when an event occurs.

The default answer to this question is “yes”.

If you enable e-mail notification you will be asked to provide additional information: the name of the mail server, the user name for the person who will send the E-mail notification (typically the local host name) and the user name for the person who will receive the e-mail notification (typically the system administrator).

```
Please enter the name of your mail server: (default is local
host name)
Please enter the name of the user you want sending e-mail
notification: (default is root)
Please enter the name of the user you want receiving e-mail
notification: (default is 3ware_admin)
```

To enter multiple e-mail addresses, separate them by a comma or a semicolon:

3
```
Please enter the port number you would like to use for web
monitoring (default is 888)
```

If you do not know what port to use, select the default:

4
```
Would you like 3DM connection security to limit connections
to localhost only? (default is yes)
```

If you want to be able to use 3DM for remote administration, change this to No.

5 Change the directory and then eject the CD-ROM disk when finished:

```
cd /home
eject cdrom
```

Uninstalling 3DM under Linux or FreeBSD

To uninstall 3DM for Linux or FreeBSD

1 Insert the 3ware software installation CD-ROM into the CD-ROM drive.

2 Mount the CD-ROM disk:

```
mount /dev/cdrom /mnt
```

3 Change the directory and run the uninstall script:

(For FreeBSD, replace “linux” with “freebsd” in the path shown in this step.)

For Linux:

```
cd /mnt/packages/3dm2/linux/x86
./install.3dm --u
```

Note that if you downloaded 3DM from the web, replace “/mnt/” in the previous command with “/root/”

4 Eject the CD-ROM disk when finished:

```
cd /home
eject cdrom
```

Note: If 3DM Linux is reinstalled or restarted, close any open web browsers before starting 3DM again to close the server socket.

Starting 3DM and Logging In

3DM runs as a service under Windows, and as a daemon under Linux and FreeBSD. Normally after installation, the 3DM process starts automatically when you start your system.

It is a good idea to leave the 3DM process running on the system that contains your 3ware RAID controller. That way email alerts can be sent by 3DM, and administrators can manage the controller remotely, if remote administration is enabled.

When 3DM is running in the background on your computer, you can access the 3DM web application through your browser to check status information and manage your 3ware RAID controller.

If you want to check the status of a controller from a different computer, see “Viewing 3DM Remotely Using a Web Browser” on page 76.

Logging In to the 3DM Web Application

When the 3DM process is running in the background, you can log into the 3DM application pages using a browser.

Two levels of access are provided:

- *Users* can check the status of the controller, units, and attached drives.
- *Administrators* can check status, configure, and maintain the units and drives on the 3ware controller.

Note: Administrator and User status in 3DM is not related to Administrator/User settings in the operating system.

To log in to the 3DM web application

1 Open your browser and enter the URL for your system.

The default URL is https://localhost:888/

You can also replace “localhost” with the IP address of the computer that contains the 3ware controller. For example:
https://<IP address>:888/

Note: If you receive a page not found message, make sure you entered the URL correctly. If you did, 3DM may not be running in the background. You can start it manually.

2 The first time you start 3DM, when the security certificate message displays, click **Show Certificate** and accept the certificate so that you do not see the security message each time you start 3DM.

Figure 36. Security Certificate Message from Browser

(You can also click **Continue**, in which case you will see this message the next time you start 3DM.)

3 When the 3DM logon screen appears, select whether you are a **User** or **Administrator**.

4 Enter your password and click **Login**.

If you are logging in for the first time after installing 3DM, the default password for both User and Administrator is `3ware`.

Note: If you forget the passwords, uninstalling and reinstalling 3DM resets the passwords to `3ware`.

Note: If you close your browser, 3DM continues to run in the background on the system.

Starting the 3DM Daemon under Linux and FreeBSD

3DM should start automatically after installation and upon bootup. If it does not, use the steps below to start it.

To start the 3DM daemon manually

1 Login as root on the machine on which 3DM is installed.

2 Afterwards, type:
```
/etc/init.d/tdm2 start
```

3 To start the 3DM web application, open your browser and enter the URL for your system.

https://localhost.888

If the 3DM connection is to a remote machine, you can replace “localhost” with the IP address of the computer that contains the 3ware controller. For example: https://<IP address>:888/

The 3DM login screen appears.

Starting the 3DM Process under Microsoft Windows

3DM should start automatically after installation and upon bootup. If it does not, use the steps below to start it.

To start the 3DM process manually

1 On the system on which 3DM is installed, login as Administrator.

2 Open **Control Panel>Administrative Tools>Services>3DM2** and select the **Start/Play** icon.

Viewing 3DM Remotely Using a Web Browser

When remote administration is enabled on the 3DM 2 Settings page, you can use 3DM to check status and administer your 3ware RAID controller from a browser on any computer, over an internet connection.

You do not need to install the 3DM software on the remote computer.

To connect to 3DM2 through your web browser

- In the address line of your browser, enter the URL or IP of the system containing the 3ware RAID controller.

  If you do not know the URL or IP for the system, you can contact your network administrator or from a Windows command prompt, type `ipconfig`. From a Linux command prompt, type `ifconfig`.

Note: When using 3DM to access a remote system, the time on the local system must match the time on the file server. If the time varies by more than 30 minutes, it will not be possible to remotely monitor the system (you will not be able to log in). If you are in a different time zone, you must first change the time of the local system to match the time of the remote system.

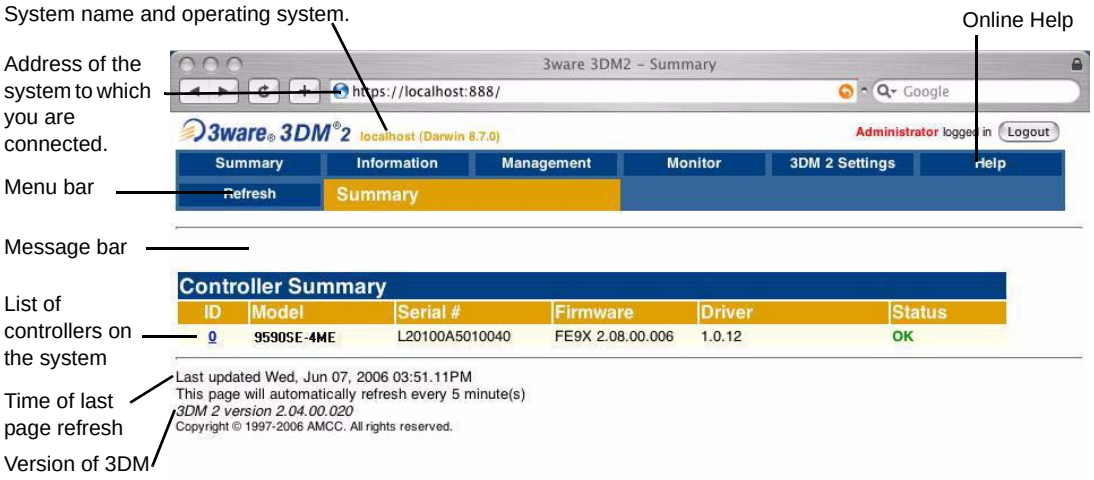
Working with the 3DM Screens

3DM's features are organized on a series of pages you view in your browser.

After you log in to 3DM, the Summary page shows a list of controllers installed in the computer at the URL you specified.

Note: If you expect to see a controller that is not listed, it may not be compatible with the driver that is loaded; a firmware flash upgrade may be required.

Figure 37. 3DM Main Screen



The menu bar across the top of the screen gives you access to other pages in 3DM. You can move between pages by using the menu bar, or by clicking a link on the page.

The main area of the page provides summary or detail information about your 3ware RAID controller and the resources connected to it.

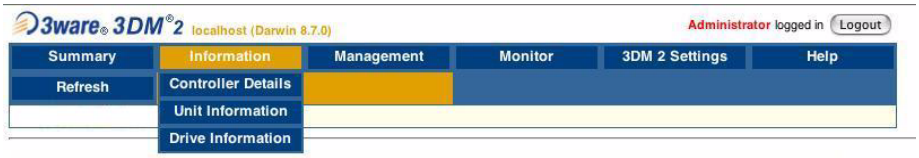
As you work in 3DM, the Messages area just below the menu bar displays information about the results of commands you have selected.

Tip: If you have a question about something you see on the screen, just click the Help button in the menu bar.

3DM Menus

The 3DM menu bar groups access to a number of 3DM pages on menus, and provides direct link access to others.

Figure 38. 3DM Menu Bar



Status information is available from the **Information menu**. You can view controller, unit, and drive information for a particular controller.

The **Management menu** gives you access to tasks used for managing controller-level settings (background task rate, unit polices such as enabling of unit write cache, and controller settings that affect all units managed by the controller), tasks that can be scheduled (rebuild, verify, and self-test), and maintenance of individual units. Unit configuration can also be done through the **Management > Maintenance** page.

The **Monitor menu** gives you access to the Alarms page, the BBU page, and the Enclosure Summary page. The **Alarms** page shows a list of alarms, including the specific alarm message, and the exact date and time it occurred. The **BBU** page shows the status of a Battery Backup Unit (BBU), if one is installed, and allows you to test the battery. The **Enclosure Summary** page provides lists the enclosures connected to the controller and lets you drill down for more detailed status information about each.

The **3DM 2 Settings** page lets you set preferences, including email notification for alarms, passwords, page refresh frequency, whether remote access is permitted, and the incoming port which 3DM will use for listening.

Help lets you access information about using 3DM. The Help is context-sensitive, so you first see information about the page you now have in view. A Table of Contents and Index are available to help you find other information.

Viewing Information About Different Controllers

If you have more than one 3ware RAID controller in the system, you select the one you want to see details about from the drop-down list at the right of the menu bar.

This drop-down is available on all pages that provide controller-specific features.

Figure 39. 3DM Controller Selection Drop-down

Note: Throughout these instructions, the term *current controller* is used to refer to the controller which is currently selected in this drop-down list.

Refreshing the Screen

You can refresh the data on the screen at any time by clicking **Refresh Page** in the menu bar. This causes 3DM to update the information shown with current information from the controller and associated drives.

Automatic refreshes can also be set. For details, see “Setting the Frequency of Page Refreshes” on page 84.

Note: If you click Refresh on the browser window instead of on the 3DM menu bar, you will be taken back to the Summary page.

3DM Screens and What They're Used For

The table below shows a list of the pages you work with in 3DM and describes what they are used for. Details about each page and the fields and features on it are provided in Chapter 11, “3DM 2 Reference”. The page names in the table provide links to details about that page.

In addition, the step-by-step instructions provided in the chapters on configuring and maintaining your RAID controller and units explain how to do particular tasks in 3DM.

Table 8: List of 3DM Pages

3DM Page	Description
Controller Summary page	Provides basic information about each 3ware RAID controller in your system. To see this page, click **Summary** in the menu bar.
Controller Details page	Provides detailed information about the current controller. To see this page, choose **Information > Controller Details** from the menu bar.
Unit Information page	Shows a list of the units on the current controller and provides summary information about each unit. To see this page, choose **Information > Unit Information** from the menu bar or click an ID number on the Controller Summary.
Unit Details page	Shows details about a particular unit. To see this page, click an ID number on the Unit Information page.
Drive Information page	Shows a list of drives on the current controller and provides summary information about each drive. To see this page, choose **Information > Drive Information** from the menu bar.
Drive Details window	Shows the SMART data for a specific drive, and shows additional detail information for the drive. To see this page, click the Port # for a drive on the Drive Information page.
Controller Settings page	Lets you view settings that affect the units on the current controller and change some of those settings. Controller-level settings that can be changed include background task rate, Auto Rebuild, Auto-Carving, and Carve Size. Some additional policies are shown that can only be changed in the BIOS or CLI. Unit-level settings include specifying the StorSave Profile and enabling or disabling the Write Cache, Auto-Verify, Continue on Error During Rebuild, and Queuing. To see this page, choose **Management > Controller Settings** from the menu bar.
Scheduling page	Lets you view and change the schedule for tasks that affect all units on the current controller. To see this page, choose **Management > Scheduling** from the menu bar.

Table 8: List of 3DM Pages

3DM Page	Description
Maintenance page	Lets you configure new units and make changes to existing units. To view this page, choose **Management > Maintenance** from the menu bar.
Alarms page	Shows a list of alarms, including the specific alarm message, and the exact date and time it occurred. To view this page, choose **Monitor > Alarms** on the menu bar.
Battery Backup page	Shows the status of a Battery Backup Unit (BBU), if one is installed, and allows you to test the battery. To view this page, choose **Monitor > Battery Backup** on the menu bar.
Enclosure Summary page	Lists the enclosures attached to your 3ware controller. To view this page, choose **Monitor > Enclosure Support** on the menu bar.
Enclosure Details page	Shows details about a particular enclosure, including status information. You can also use this page to blink the LED for a particular drive. To view this page, click the ID number of the Enclosure on the Enclosure Summary page.
3DM 2 Settings page	Lets you set preferences, including email notification for alarms, passwords, page refresh frequency, whether remote access is permitted, and the incoming port which 3DM will use for listening. To view this page, click **3DM 2 Settings** on the menu bar.

Setting Up 3DM Preferences

The 3DM 2 Settings page lets you define preference settings that affect the overall operation of 3DM. Most of these settings are specified initially during installation of 3DM.

On the 3DM 2 Settings page you can perform the following tasks:

- Setting and Changing 3DM Passwords
- Managing E-mail Event Notification
- Enabling and Disabling Remote Access
- Setting the Incoming Port #
- Setting the Frequency of Page Refreshes

Setting and Changing 3DM Passwords

3DM provides different access levels for users and administrators.

The Administrator access level allows the user to fully configure 3DM. The User access level allows the user to view pages within 3DM. These passwords work independently of each other.

The default password for both the User and Administrator is “3ware”.

Passwords are case sensitive.

You can only change passwords if you are logged in as Administrator. If you change the Administrator password, you will be automatically logged out, and must log back in with the new password.

To set or change the password

1 Click **3DM 2 Settings** on the 3DM menu bar.

2 On the 3DM 2 Settings page, in the **Password** section, select the type of password you want to change: **User** or **Administrator**.

3 Type the current password in the **Current Password** field.

If you are changing the password for the first time, the factory-set default password is `3ware`.

4 Enter the new password in the **New Password** field and again in the **Confirm New Password** field.

5 Click the **Change Password** button to enact the change.

Note: If you forget your password, you can uninstall 3DM and then reinstall it. This will reset the password to the default password, `3ware`.

Managing E-mail Event Notification

3DM can notify you when the 3ware RAID controller requires attention, such as when a disk unit becomes degraded and is no longer fault tolerant.

E-mail event notification can only occur while 3DM is running, so it is recommended that the 3DM process be left running in the background on the system that contains the 3ware RAID controller.

When events occur, notification can be e-mailed to one or more recipients. You can specify the type of events for which notifications will be sent by selecting the severity:

- **Information** will send e-mails for all events
- **Warning** will send e-mail for events with severity of Warning and Error.
- **Error** will send e-mail for events with severity of Error only.

Events are listed on the 3DM **Alarms** page.

Event notification can be set up during 3DM installation, and can be changed on the 3DM 2 Settings page.

To set up event notification

1 Click **3DM 2 Settings** on the menu bar.

2 In the **E-mail Notification** section of the 3DM 2 Settings page, enter or change the settings you want.
   - Enable or Disable all notifications.
   - Set the severity level of events for which e-mail notifications are sent.
   - Specify the email address of the sender. This will appear in the "From" field of the e-mail.
   - Enter the e-mail address(es) to which notifications are sent. (Separate multiple addresses with a comma (,) or a semicolon (;).
   - Enter the SMTP server name or IP of the mail server for the computer where the 3ware controller is installed.

3 Click **Save E-mail Settings**.

To send a test message

You can send a test message to make sure you've entered the e-mail notification settings correctly.

- Click **Send Test Message**.

Enabling and Disabling Remote Access

When remote access is enabled, a user can connect to 3DM over the internet or an intranet, to check status or administer the controller and associated drives. (See "Viewing 3DM Remotely Using a Web Browser" on page 76.)

If remote access is disabled and a user attempts to connect to 3DM remotely, they will see the following error message: "Remote Access to 3DM has been disabled. Please connect using the local machine by entering "localhost" in the URL bar."

Remote access can be enabled or disabled on the 3DM 2 Settings page.

To enable or disable remote access

1 Click **3DM 2 Settings** on the menu bar.

2 In the **Remote Access** section of the 3DM 2 Settings page, select either **Enabled** or **Disabled** in the **Allow Remote Connections** field.

The page refreshes, and a message at the top of the screen confirms that remote access has been enabled or disabled.

Setting the Incoming Port

You can set the port which 3DM uses to listen for incoming messages. If you are not sure which port would be the best to use, leave this set to the default port of 888.

To set the incoming port

1 Click **3DM 2 Settings** on the menu bar.

2 In the **Incoming Port #** section of the 3DM 2 Settings page, enter the port number in the **Listening Port** field.

3 Click **Change Port**.

The page refreshes, and a message at the top of the screen confirms that the listening port has been changed.

Setting the Frequency of Page Refreshes

Since the status of the drives attached to your 3ware RAID controller can change while you are viewing information about them in 3DM, it is important to refresh the page information regularly. That way you can be assured that the information you see in 3DM is current.

You can manually refresh the information on a page by clicking **Refresh Page** in the menu bar. But you can also have 3DM refresh the information on a regular basis.

To set the frequency of page refreshes

1 Click **3DM 2 Settings** on the menu bar.

2 In the **Page Refresh** section of the 3DM 2 Settings page, select how often you want the page to be refreshed in the **Minutes Between Refresh** field.

Note: If you do not want 3DM to refresh the screen automatically, select **Never** in the **Minutes Between Refresh** field. You can then refresh manually by clicking Refresh on your web browser.

7

Configuring Your Controller

This section describes how to view details about the controller, check its status, and change configuration settings that affect the controller and all of the drives connected to it. It is organized into the following sections:

- Viewing Information About a Controller
- Viewing Controller Policies
- Setting the Auto Rebuild Policy
- Using Auto-Carving for Multi LUN Support
- Setting the Size of Volumes Created with Auto-Carving
- Enabling and Setting Up Staggered Spin-up
- Exporting JBOD Disks

Note: Background task rate is also set for all units on a controller. For information about setting the task rate, see “Setting Background Task Rate” on page 160.

Viewing Information About a Controller

You can check the controller model, serial number, firmware and driver versions, and the status of the 3ware RAID controller in your computer.

If you have more than one controller in your system, you can easily view information about each one using 3DM. If you are working at the BIOS level, you access 3BM for each controller separately.

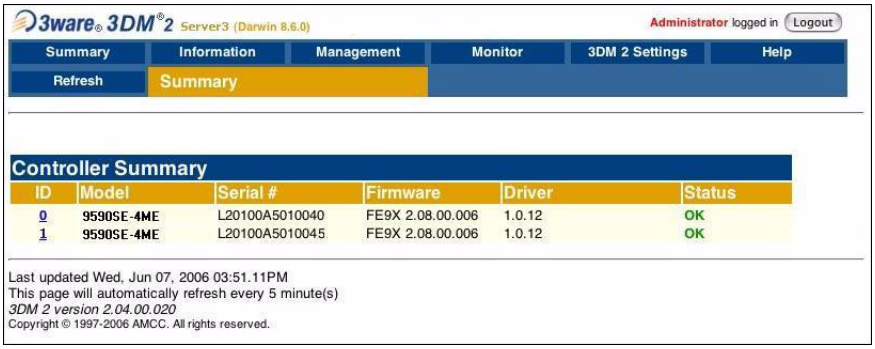
To see details about a controller in 3DM

1 Start 3DM and log in as an administrator.

The 3DM Controller Summary page appears, listing all the 3ware controllers installed in your system.

The right-most column of the list shows the status of each controller.

Figure 40. Controller Summary Page



Tip: If you are managing controllers remotely, the list of controllers is for the machine with the IP or URL you entered in the browser address bar.

2 To see more details about a particular controller, click the ID link for that controller to display the Controller Details page.

Figure 41. Controller Details Page

To see information about a different controller in the 3DM pages

If you have more than one controller in the system, you can switch between them by selecting the one you want from the **Select Controller** drop-down list at the right of the menu bar. This drop-down is available on all pages that provide controller-specific features.

When you select a different controller from this list, the page in view changes, to reflect the details for the controller you selected.

Note: Throughout this documentation, the term *current controller* is used to refer to the controller currently selected in this drop-down list.

To see information about a controller in 3BM (BIOS)

1 Power up or reboot your system.

2 While the system is starting, watch for a screen showing information about the controller and units you want to work with.

When you have more than one controller installed, information about each one will be shown, sequentially.

3 Press **Alt-3** to bring up the **3ware BIOS Manager (3BM)**.

Note: If you accidentally bypass display of the controller you want to work with, press **Ctrl-Alt-Del** to restart your computer and try again

4 **Tab** to **Information** and press **Enter**.

5 On the pop-up menu, select **Controller** and press **Enter**.

The Controller Information page displays.

About Controller Policies

The following policies affect all units and drives on a controller and can be adjusted as appropriate for your equipment. Controller policies are shown at the bottom of the Controller Settings page in 3DM (Figure 42) and on the Policy Control screen in 3BM (Figure 43).

- **Auto Rebuild.** Determines whether the Auto Rebuild policy is enabled or disabled. When disabled, degraded units can only be rebuilt with designated spares. When enabled, the controller firmware will attempt to rebuild a degraded unit if there is no spare, using either an available drive or a failed drive.
- **Auto-Carving.** Determines whether the auto-carving policy is enabled or disabled. When it is enabled, any unit larger than a specified size (known as the *carve size*) is broken into multiple volumes that can be addressed by the operating system as separate volumes. The default carve size is 2 TB.

  This auto-carving feature is sometimes referred to as multi-LUN, where each volume that is created is referred to as a “LUN.”

- **Carve Size.** (Referred to as *Carving Factor* in 3BM) Sets the size for dividing up units into volumes when Auto-Carving is enabled. This setting can be between 1024 and 2048 GB.
- **Staggered spin-up.** Spin-up allows drives to be powered-up into the Standby power management state to minimize in-rush current at power-up and to allow the controller to sequence the spin-up of drives. Compatible drives are sent a spin up command based on the settings specified with the policies **Number of drives per spin-up** and **Delay between spin-up settings**. These policies can only be set using 3BM or the CLI.
  - **Number of drives per spin-up.** Number of drives that will spin up at the same time when the controller is powered up, if staggered spin-up is enabled. From 1 to x, depending on the number of ports on the controller.
  - **Delay between spin-up.** The delay time (in seconds) between drive groups that spin up at one time on this particular controller, if staggered spin-up is enabled.

It is possible to enable or disable automatic detection of drives on the controller's ports for staggered spinup during hot-swapping of drives. This feature is only available in the CLI using the **autodetect=on|off** command. For more information, see*3ware Serial ATA RAID Controller CLI Guide*.

- **Export JBOD (unconfigured) disks.** This setting indicates whether JBOD disks should be exported to the operating system. JBOD configuration is strongly discouraged for newly added disks on a 9000 series controller, in favor of Single Disk, so by default, this setting is disabled. If you have a JBOD configuration from a 7000/8000 controller that you want to use on the 9000 series controller, you should enable this setting. This policy can only be set in 3BM and CLI.
- **Staggered method.** Indicates whether the type of staggered spin-up is ATA-6 or SATA OOB (Out Of Band). By default, when Staggered Spin-up is enabled, the ATA-6 scheme is used. If your drives support the SATA OOB method, select that method in 3BM. There is no electronic method for the controller to know if a drive supports this method, so it must be set manually. For staggering to work properly, the drives must support the selected method. This policy can only be set and only shows in 3BM.

Some additional policies can be set at the unit level. For more information, see "Setting Unit Policies" on page 111.

Viewing Controller Policies

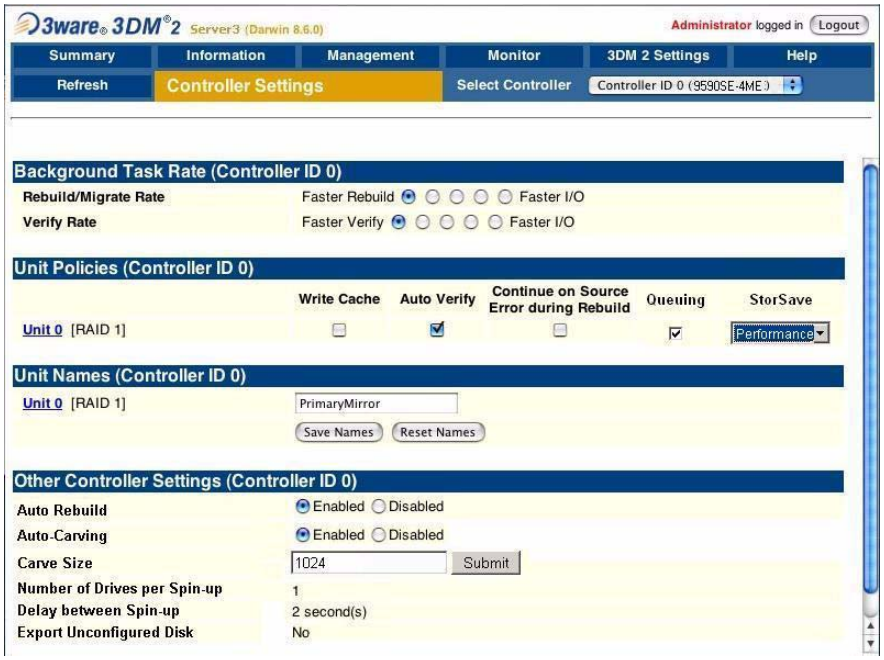
You can view the current state of controller policies in 3DM, in the **Other Controller Settings** section at the bottom of the Controller Settings page (See Figure 42.) Only the Auto Rebuild, Auto-Carving, and Carve Size policies can be changed on this page. The other policies can be changed in 3BM or through the CLI. For a summary of the initial default settings, see Table 6, “Default Settings for Policies and Background Tasks,” on page 18.

To view controller policies in 3DM

- Choose **Management > Controller Settings** from the menu bar.

  The policies that appear under Other Controller Settings vary, depending on the controller model you are using.

Figure 42. 3DM Controller Settings Page



To view controller polices in 3BM

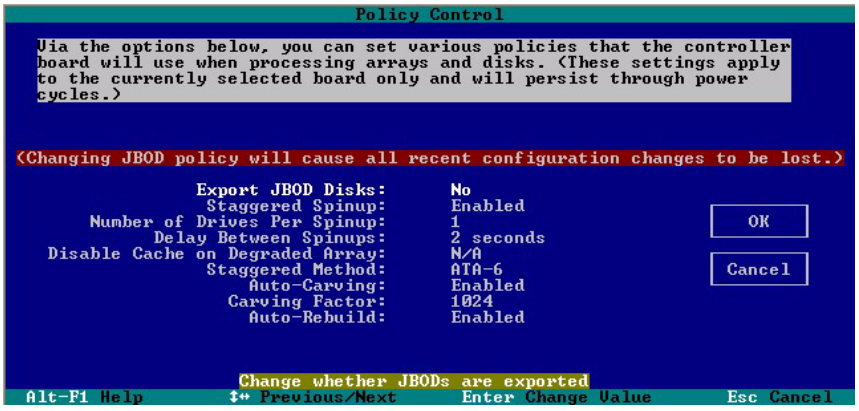
You can also view and change these controller polices in 3BM, as shown in Figure 43.

1 On the main 3BM screen, **Tab** to **Settings** and press **Enter**.

2 On the pop-up menu, select **Controller Policies** and press **Enter**.

The Policy Control screen displays.

Figure 43. 3BM Policy Control Screen



Setting the Auto Rebuild Policy

The Auto Rebuild policy determines how the controller firmware will attempt to rebuild degraded units.

When Auto Rebuild is disabled, only spares will be automatically used to rebuild degraded units. When Auto Rebuild is enabled, the firmware will select drives to use for automatically rebuilding a degraded unit using the following priority order.

- Smallest usable spare.
- Smallest usable unconfigured (available) drive.
- Smallest usable failed drive.

Enabling Auto Rebuild allows you to add a drive to the controller and have it be available for a rebuild, without having to specify it as a spare.

With Auto Rebuild enabled, if you accidentally disconnect a drive (causing the controller to see it as a failed drive) and then reconnect it, the controller will automatically try to use it again.

You can enable or disable the Auto-Rebuild policy through 3DM or 3BM.

To enable Auto-Rebuild through 3BM

1 On the main 3BM screen, **Tab** to **Settings** and press **Enter**.

2 On the pop-up menu, select **Controller Policies** and press **Enter**.

3 On the Policy Settings page, **Tab** to the **Auto-Rebuild** field, press **Enter** to display the options, select **Enable** and press **Enter** again to select it.

4 **Tab** to **OK** and press **Enter** to select it.

The policy is enabled immediately.

To enable Auto Rebuild through 3DM

1 Choose **Management > Controller Settings** from the menu bar in 3DM.

2 In the Other Controller Settings section at the bottom of the screen, select the **Enabled** option for **Auto Rebuild**.

The page refreshes, and a message at the top confirms the change you have made.

Using Auto-Carving for Multi LUN Support

When the Auto-Carving policy is on, any unit larger than a specified size (known as the *carve size*) is created as multiple volumes that can be addressed by the operating system as separate volumes. These chunks are sometimes known as multiple LUNs (logical units). However, throughout the 3ware documentation, they are referred to as *volumes*.

For example, using the default carve size of 2 TB, if the unit is 2.5 TB then it will contain two volumes, with the first volume containing 2TB and the second volume containing 0.5 TB. If the unit is 5.0 TB then it will contain 3 volumes, with the first two volumes containing 2 TB each and the last volume containing 1 TB. (**Note:** If a specific Boot Volume was also specified in 3BM, the first volume will be the size specified for the Boot Volume, and then the carve size will be applied to the remainder of the unit. For more information, see “Boot volume size” on page 99.)

Each volume can be treated as an individual disk with its own file system. The default carve size is 2 TB; you can change this to a setting in the range of 1 TB to 2 TB (1024 MB to 2048 MB). 3ware firmware supports a maximum of 8 volumes per controller, up to a total of 16 TB.

If you are migrating a unit to a size that is larger than the carve size and auto-carving is on, multiple volumes will be created.

Note: Using auto-carving can have an impact on performance.

The main use of auto-carving is to gain use of the full capacity in units greater than 2 TB. This is because Windows 2000, Windows 2003, Windows XP, and FreeBSD 4.x, do not currently recognize unit capacity in excess of 2 TB.

Note: Operating systems without this limitation include Linux 2.6, FreeBSD 5.x, Windows XP-64bit, and Windows 2003, SP 1.

Even though the Linux 2.6 kernel supports partitions larger than 2 TB, the installers for SuSE and Redhat do not. Turn auto-carving on to prevent the installation from failing.

You must turn on the Auto-Carving policy before creating the unit. Units created with this policy turned off will not be affected by a change to the policy. If the policy is turned off later, units that have been carved into volumes will retain their individual volumes; existing data is not affected.

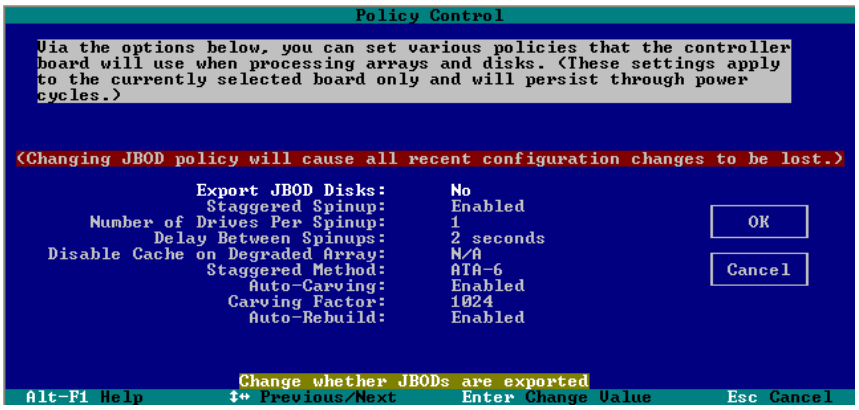
To use auto-carving

1 Enable the auto-carving feature. You can do so using 3DM or 3BM.

In 3DM, enable Auto-Carving at the bottom of the **Management > Controller Settings** page.

In 3BM, you enable Auto-Carving on the **Settings > Controller Policies** page.

Figure 44. Auto-Carve policy in 3BM



2 Create a new unit or migrate an existing unit to include the drives you want to use.

If the combined capacity of the drives exceeds the carve size, a number of volumes will be created.

3 Verify the creation of the volumes.

In 3DM 2, the number of volumes is shown on the Unit Details page.

4 Verify that the volumes appear in the operating system. They will appear as additional drives.

Notes:

- If you are configuring a unit for primary storage and it will be greater than 2 TB, be sure to enable the auto-carve policy before creating the unit.
- When volumes have been created through auto-carving, they cannot be deleted except by deleting the unit.
- If you create a bootable unit that has multiple volumes, the first volume is always used as the boot device.
- Changing the auto-carve policy does not affect existing units.

Setting the Size of Volumes Created with Auto-Carving

If you create units over 2 TB in size and use auto-carving to divide them into multiple volumes, you can control the size of the volumes to be created by setting the carve size (referred to as *carving factor* in 3BM) to use. The carve size can be between 1 TB (1024 GB) and 2 TB (2048 GB); the default is 2 TB.

When you change this policy, it applies to units you create in the future. Existing units will not be affected.

To set the carve size in 3DM

1 Choose **Management > Controller Settings** from the menu bar in 3DM.

2 In the Other Controller Settings section at the bottom of the screen, in the **Carve Size** field, enter the size you want (between 1024 GB and 204 GB) to use and click **Submit**.

The page refreshes, and a message at the top confirms the change you have made.

To set the carve size (carving factor) in 3BM

1 On the main 3BM screen, **Tab** to **Settings** and press **Enter**.

2 On the pop-up menu, select **Controller Policies** and press **Enter**.

3 On the Policy Settings page, **Tab** to the **Carving Factor** field, press **Enter** to display the text entry box, enter the size you want (between 1024 GB and 2048 GB) and press **Enter** again to accept it.

4 **Tab** to **OK** and press **Enter** to select it.

The policy is enabled immediately.

Enabling and Setting Up Staggered Spin-up

You can set the number of drives that will spin up at the same time and the delay time between drive group spinups. Three policy settings let you set the number of drives that will spin up at the same time and set the delay between drive groups that spin up at one time.

Not all drives support staggered spinup. If you enable staggered spinup and have drives that do not support it, the setting will be ignored. You can change these settings in 3BM or using the CLI.

It is possible to enable or disable automatic detection of drives on the controller's ports for staggered spinup during hot-swapping of drives. This feature is only available in the CLI using the **autodetect=on|off** command. For more information, see /cx set autodetect=on|off disk=<p:-p>|all *3ware Serial ATA RAID Controller CLI Guide*.

Note: Some hard drives require that the power management jumper (PM2) be set to enable staggered spinup, in order for the SATA OOB option to be used. For more information, see the knowledgebase article 14889, at **http://www.3ware.com/KB/article.aspx?id=14889**

To enable or disable spinup and set the delay between spinups

1 At the main 3BM screen, **Tab** to **Policy** and press **Enter**.

2 On the Policy **Control** screen, **Tab** through these fields, making the choices you want to use:

- **Staggered Spinup:** Choose enabled or disabled.
- **Number of Drives Per Spinup:** Select the number of drives—from 1 to 4, 8, 12, or 16, depending on the number of ports on the controller.
- **Delay between spinup:** Select the number of seconds—from 1 to 6.
- **Staggered Method:** Select **either ATA-6** or **SATA OOB** as the type of staggered spinup you want to use. For staggering to work correctly, the drives must support the selected method. Check the documentation for the drive to see which method is supported.

3 **Tab** to the **OK** button and press **Enter**.

You will notice a short delay as 3BM makes the policy changes.

Exporting JBOD Disks

By default, JBOD disks (unconfigured disks) connected to the 3ware RAID controller are not exported to the operating system. This means that any drives you leave unconfigured are not seen by the operating system, and cannot be used for storage. When Export JBOD Disks is set to No, you make individual disks available for use by configuring them as Single Disks.

If you want unconfigured disks to be available on your computer, you can change this setting in 3BM or using the CLI.

Note: It is recommended that JBODs not be made available to the operating system. The advantages of working with configured Single Disks over JBOD are:

If interrupted, a single disk media scan will continue from where it left off, while a JBOD media scan must restart from the beginning.

Single disks can take advantage of the controller caching and configuration is persistent.

Single disks will be able to be migrated to redundant units in the future (e.g. A single disk will be able to be mirrored to another drive, creating a RAID 1 array).

If JBOD disks are not exported to the operating system, they will appear as available drives in 3DM, and can be configured as single disks or spares, and included in other RAID configurations. If you change the policy to allow JBOD disks to be exported to the operating system, they will appear as units in 3DM if those drives were previously used as JBODs on another controller. AMCC recommends that new drives be configured as Singles and not JBODs.

To enable or disable the export of unconfigured disks

1 At the main 3BM screen, **Tab** to **Policy** and press **Enter**.

2 On the **Policy Control** screen, **Tab** to **Export Unconfigured Disks**, press **Enter** to display the choices, use the **arrow keys** to select **Yes** (to enable), or **No** (to disable) and press **Enter** again to choose it.

3 **Tab** to the **OK** button and press **Enter**.

You will notice a short delay as 3BM makes the policy changes.

Note: If you enable the Export JBOD Disks option, the controller recognizes and displays as JBODs any drives that were previously connected to 3ware 7000/8000-series controllers as JBODs. Drives that were previously connected to a 9000-series controller and configured will not be seen as JBODs.

8

Configuring Units

This section includes information and procedures on configuring units attached to your 3ware RAID controller. It is organized into the following topics:

- Configuring a New Unit
- Creating a Hot Spare
- Naming a Unit
- Setting Unit Policies
- Changing An Existing Configuration by Migrating (RAID Level Migration or Online Capacity Expansion)
- Deleting a Unit
- Removing a Unit
- Moving a Unit from One Controller to Another
- Adding a Drive
- Removing a Drive
- Rescanning the Controller

Configuring a New Unit

When you configure a new unit, you specify some details related to the type of RAID configuration that you want, and others that enable or disable features.

This section first provides an overview of the different settings you can specify during configuration and then provides step-by-step instructions for creating a unit through both 3DM and 3BM.

Configuration Options When Creating a Unit

This section provides an overview of the choices you have when configuring a new unit. For step-by-step instructions, see “Creating a Unit through 3DM” on page 99 and “Creating a Unit through 3BM” on page 102.

When you configure a new unit, you specify the following:

- Drives to be included in the unit
- Type of configuration (RAID Level)
- Name of the unit (optional)
- Stripe size, if appropriate for the RAID level
- Unit policies that affect how the unit will be handled
- Boot volume size (optional; can only be specified in 3BM)

You can make some types of changes to the RAID configuration later, and you can change the unit name and the unit policies. For details, see “Changing An Existing Configuration by Migrating” on page 120 and “Setting Unit Policies” on page 111.

Note: If you will install the operating system on and boot from a unit managed through the new 3ware RAID controller, see Chapter 3, “First-Time RAID Configuration Using 3BM.”

Drives to be included in the unit

You may include from one to sixteen drives in the unit, depending on the number of drives available and the model of the controller you have. (For information about how many drives to select for a given RAID level, see “Determining What RAID Level to Use” on page 10.)

Available drives are those that are not currently part of a unit. If you want to use drives that are currently part of a different unit, you must first delete that unit to make the drives available. (For details, see “Deleting a Unit” on page 125.) If drives are listed under “Incomplete Drives and Others,” they must be deleted before they can be used.

If you want to add drives to be used in the unit, see “Adding a Drive” on page 134.

Type of configuration (RAID Level)

Available configuration types include RAID 0, RAID 1, RAID 5, RAID 6, RAID 10, RAID 50, and Single Disk. For information about the different RAID levels, see “Understanding RAID Concepts and Levels” on page 3.

Note: Creating a unit erases all data on all drives. Although creating a RAID 1 (mirror) creates a unit that will have a duplicate of data on both drives after it is put in use, creating a RAID 1 cannot be used to make a backup copy of data that currently exists on a single drive unless you migrate from a RAID 1 to two individual single disks.

Name of the unit (optional)

Units can be given names. These names will be visible in 3DM and, 3BM.

Stripe size, if appropriate for the RAID level

In general, smaller stripe sizes are better for sequential I/O, such as video, and larger stripe sizes are better for random I/O (such as databases).

Striping size is not applicable for RAID 1, because it is a mirrored array without striping.

Using the default stripe size of 64KB usually gives you the best performance for mixed I/Os. If your application has some specific I/O pattern (purely sequential or purely random), you might want to experiment with a smaller or larger stripe size.

Unit policies

Several unit policies are set when you create a new unit:

- Write Cache (enabled, by default)
- Drive Queuing (disabled, by default)
- Auto Verify (disabled, by default)
- Continue on Source Error During Rebuild (disabled, by default)
- StorSave Profile (Protection, by default)

The particular policies that you can adjust when you create the unit vary, depending on which program you are using: 3DM, 3BM, or the CLI.

- In 3DM and the CLI, you can enable/disable write cache, enable Auto-Verify, and specify whether to continue on source error
- In 3BM, you can specify all policies except Auto-Verify

You can change all of these policies after the unit has been created.

For a summary of what these policies do, see the discussion under “Setting Unit Policies” on page 111. For how to adjust each one, see the procedures later in this chapter.

Boot volume size

When you create a unit through 3BM, you can create a special volume to function as the boot volume. You specify the size you want this volume to be. This is useful if you will be installing an operating system onto the unit, and want it to be installed in one volume and have a separate volume for data.

This is an optional feature. You do not have to create a boot volume if you plan to install the operating system on the unit.

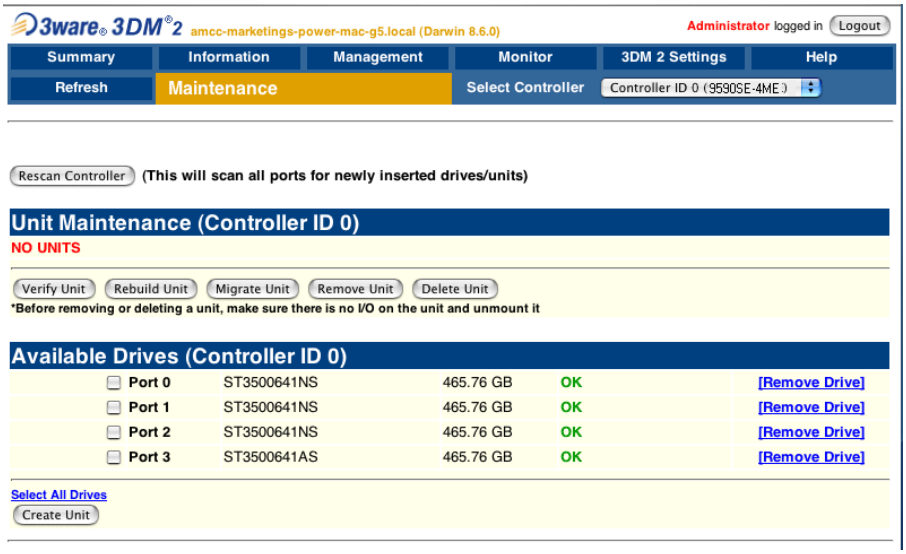
If you are creating a very large unit (2 TB or greater) and have enabled the Auto-Carving policy, the boot volume will be created in addition to any volumes created through auto-carving. For more information about auto-carving, see “Using Auto-Carving for Multi LUN Support” on page 91.

This feature can only be specified in 3BM.

Creating a Unit through 3DM

In 3DM, creating a unit starts from the **Management > Maintenance** page (Figure 45).

Figure 45. 3DM Maintenance Page



To create a unit

1 In 3DM, choose **Management > Maintenance.**

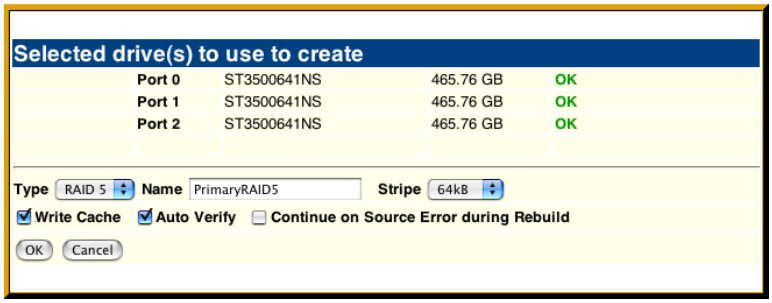
2 In the Available Drives list, select the drives you want to include in the unit by marking the checkbox in front of the Port number for each one.

If you are creating single drive units (single disks or hot spares), you can configure multiple drives at once.

3 Click **Create Unit**.

A window similar to the one below shows the drives you selected, and lets you specify configuration settings.

Figure 46. Configuring a Unit in 3DM



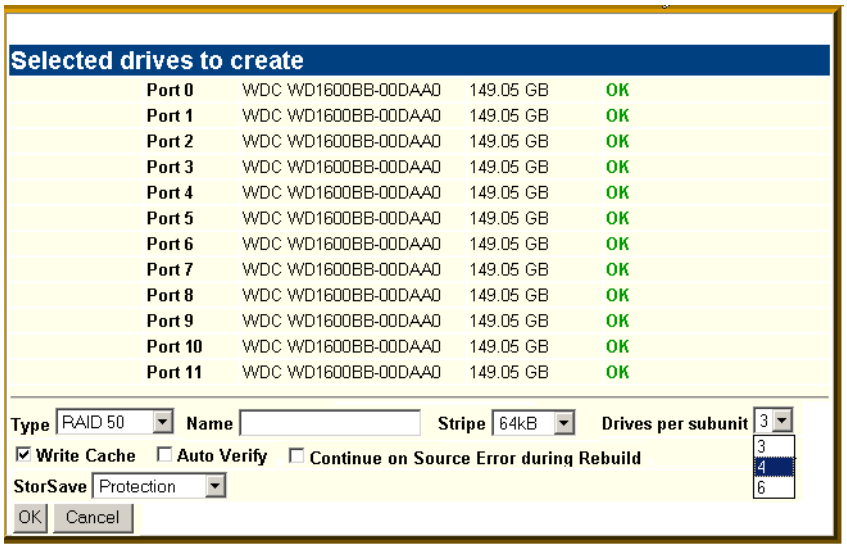
4 In the **Type** field, select the RAID configuration you want.

5 If stripe size applies to the RAID type you select, select a **Stripe Size**. (Stripe size does not apply to RAID 1.)

6 Optional: In the **Name** box, enter a name for the unit (up to 21 characters, including dashes and underscores).

7 If you have 12 drives attached to the controller and selected RAID 50 as the configuration in step 3, select whether you want 3, 4, or 6 Drives Per Subunit, as shown here.

Figure 47. Configuring a RAID 50 with 12 Drives



8 Make changes to the unit policies, as desired. You can enable or disable the **Write Cache**, **Auto Verify**, and **Continue on Source Error During Rebuild**. You can also set the **StorSave** policy.

For details about these settings, see “Setting Unit Policies” on page 111.

9 Click **OK**.

The new unit appears in the Unit Maintenance list at the top of the page and the operating system is notified of the new unit.

If you have auto-carving enabled and the size of your unit exceeds the carve size, you may see multiple unit volumes in your operating system. For details, see “Using Auto-Carving for Multi LUN Support” on page 91.

In Linux, a device node will now be associated with each unit created. In Windows, the device manager will reflect the changes under the disk drives icon.

10 Partition, format, and mount the unit. The required steps will vary depending on the operating system. For details, see “Partitioning, Formatting, and Mounting Units” on page 106.

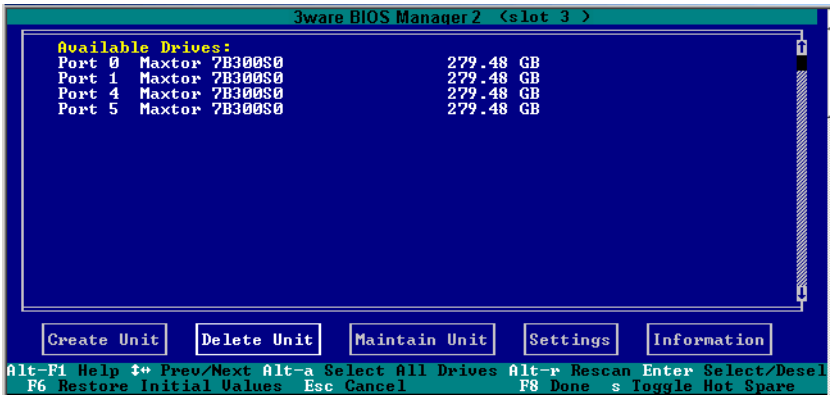
Note: For RAID 5 and RAID 6 units with 5 or more disks, and RAID 50 units with subunits of 6 drives, initialization (synchronization) of the unit begins immediately.

The unit can be used while it is initializing and is fault-tolerant.

Creating a Unit through 3BM

In 3BM, configuration tasks start from the main 3ware BIOS Manager screen shown in Figure 48.

Figure 48. 3BM Main Display



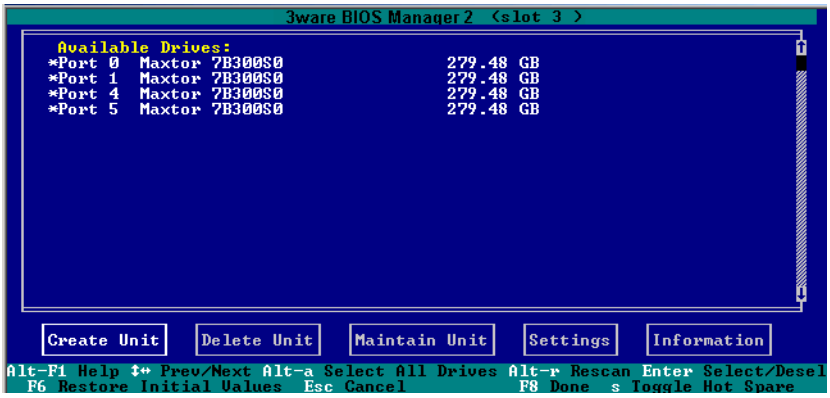
To create a unit through 3BM

1 At the main 3BM screen, select the drives to be included by highlighting each one and pressing **Enter** or **Space** to select it.

When you select a drive, an asterisk appears next to it in the left most column (see Figure 49).

Tip: If you want to use all available drives, press **Alt-A** to select them all.

Figure 49. Asterisks Next to Selected Drives

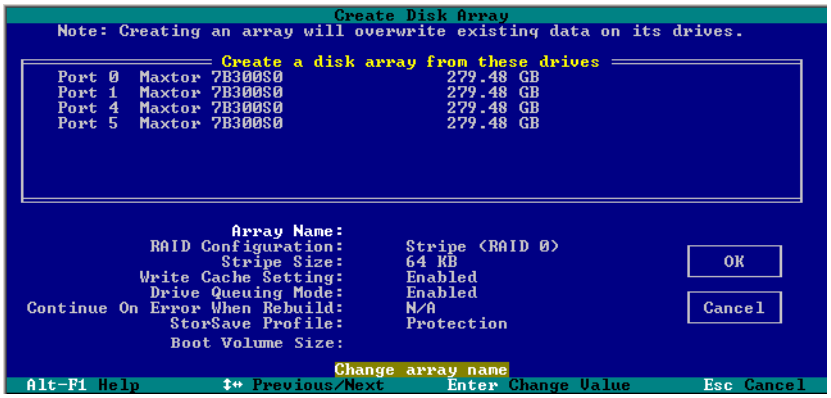


2 After all drives for the unit are selected, **Tab** to the **Create Unit** button and press **Enter**.

Tip: You can also press **Alt-C** to choose Create Unit.

3 On the **3ware Disk Array** screen, make sure that the proper drives are listed.

Figure 50. Create Disk Array Display



4 (Optional) Press **Enter** and type a name for the unit; then press **Enter** again to set the name.

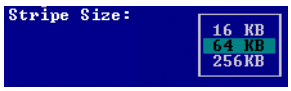
5 **Tab** to the **RAID Configuration** field and press **Enter** to display a list of available configurations for the number of drives you selected.

Figure 51. Configuration Choices for Four Drives

6 Use the **arrow keys** to select the configuration you want and press **Enter**.

7 **Tab** to the field **Stripe Size** and select the desired striping size (16, 64, or 256 KB).

Figure 52. Stripe Sizes for a RAID 5



8 (Optional) **Tab** through the policy fields and make any appropriate changes to the settings for:

- **Write Cache Setting**
- **Drive Queuing Mode**
- **Continue on Error During Rebuild**
- **StorSave Policy**

For details about these settings, see “Configuration Options When Creating a Unit” on page 97.

9 (Optional) **Tab** to the field **Boot Volume Size**, press **Enter** and type the size for the boot volume (volume 0) in gigabytes; then press **Enter** again to set the size.

10 **Tab** to the **OK** button and press **Enter** to confirm creation of the unit.

11 If the volume summary screen appears, review the information and press any key to continue.

Multiple volumes will be created if you entered a Boot Volume Size of greater than zero (0), or if auto-carving is enabled and the combined size of the drives in your unit is large enough to divide it into multiple volumes.

If you are not satisfied with how the volumes will be split up in the unit, delete the unit from the main 3BM screen and recreate it using a different Boot Volume Size. If desired, you can change the auto-carving policy or the carve size on the Policies page. For more information, see “Using Auto-Carving for Multi LUN Support” on page 91.

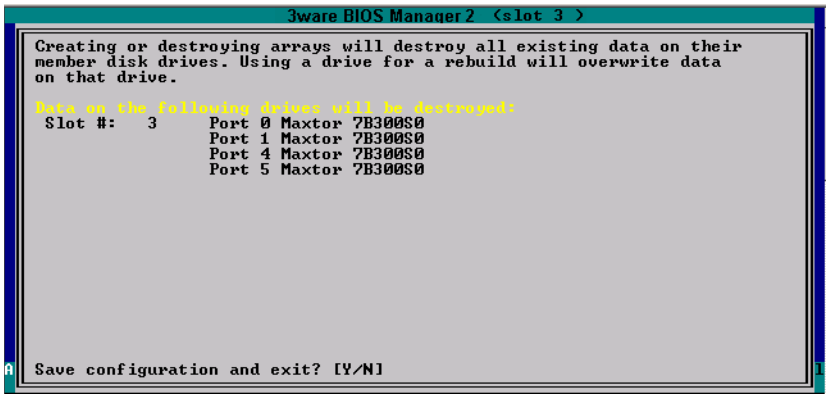
You are returned to the main 3BM screen.

Note: The unit is not actually created and no data is overwritten until you have finished making all your changes and press **F8**.

12 When you are finished making configuration changes, press **F8** to save the changes and exit 3BM.

A warning message tells you that all existing data on the drives will be deleted, and asks you to confirm that you want to proceed.

Figure 53. Confirmation Message when Saving and Exiting



If you made changes to units on more than one controller, the details about changes about to be made may extend beyond one screen. In this case, you use the **PgUp** and **PgDn** keys to bring more information into view.

13 Type Y to continue, delete any existing data on the drives, and create the unit.

14 Partition and format the units, as described under “Partitioning, Formatting, and Mounting Units” on page 106.

Note: For RAID 6, RAID 5 units with 5 or more disks, and RAID 50 units with a subunit of 6 disks, initialization of the unit begins immediately. You can postpone initialization if you want to begin using the units right away, however initialization from the BIOS is faster than it is under the operating system, so it will be a longer period of time until the unit has optimal performance. For more information, see “About Initialization” on page 148.

Ordering Units in 3BM

If you configure multiple units in 3BM and you want to install the OS on one of them so that you can boot from that unit, that unit must be the first unit.

You can change the order of the units in 3BM.

To change the order of units in 3BM

1 At the main 3BM screen, in the list of exportable units, highlight the unit you want to move.

2 Press the **Page Up** key to move the unit up the list; press the **Page Down** key to move the unit down the list.

Position the unit you want to be bootable at the top of the list of exportable units.

3 When you are finished working in 3BM, press **F8** to save your changes and exit.

Partitioning, Formatting, and Mounting Units

After you create a unit, whether through 3BM or 3DM, it needs to be formatted, partitioned, and mounted by the operating system before it can be used.

The steps vary, depending on whether your operating system is Windows, Linux, or FreeBSD. For the appropriate steps, see:

- "To partition, format, and mount under Windows" on page 106
- "To partition, format, and mount under Linux" on page 107
- "To partition, format, and mount under FreeBSD" on page 108

To partition, format, and mount under Windows

1 Boot the system and log in as a system administrator.

2 Partition and format the new arrays or disks using the **Administrative Tools** from the **Start** menu:

a Choose **Computer Management** from the **Administrative Tools** menu.

b Select **Storage.**

c Select **Disk Management**.

4 Follow the steps that appear on-screen to write a signature to the drive.

5 Right-click on the drive and select **Create Volume**.

6 Follow the steps that appear on-screen to create a volume and to assign a drive letter.

The volume is automatically mounted after formatting completes.

To partition, format, and mount under Linux

1 Boot the system and log in as root.

2 Open a terminal window.

3 Partition the unit:

```
fdisk /dev/sda
```

If the unit is over 2 TB, use:

```
parted /dev/sda

(parted) mklabel
New disk label type? gpt
(parted) p

Disk geometry for /dev/sda: 0kB - 1074GB
Disk label type: gpt
Number Start End Size File system Name Flags
parted /dev/sda

(parted) mkpart

Partition type? [primary]?
File system type? [ext2]?
Start? 0
End? 1074gb

(parted) p
Disk geometry for /dev/sda: 0kB - 1074GB
Disk label type: gpt
Number Start End Size File system Name Flags1 17kB 1074MB
1074MB
```

4 Create or make the file system:

```
mkfs /dev/sda1
```

Use of the -j option to turn on journaling is recommended for large partitions.

For example:

```
mkfs -j /dev/sda1
```

If the partition is over 2TB, use `parted` to also make the file system:

```
parted /dev/sda1

(parted) mkfs
Partition number? 1
File system? [ext2]?
writing per-group metadata (begins)...0% to 100% is
displayed)

(parted) quit (when completed)
```

5 Mount the volume:

```
mount /dev/sda1 /mnt
```

To partition, format, and mount under FreeBSD

1 Boot the system and log in as root.

2 Open a terminal window.

3 Partition the unit:

```
fdisk -BI /dev/da0;
disklabel /dev/da0 | disklabel -B -R -r da0
```

4 Create or make the file system:

```
newfs /dev/da0c
```

5 Mount the volume:

```
mount /dev/da0c /mnt
```

You can also use sysinstall to format and partition the unit.

Creating a Hot Spare

You can designate an available drive as a hot spare**.** If a redundant unit degrades and a hot spare the size of the degraded disk (or larger) is available, the hot spare will automatically replace the failed drive in the unit without user intervention.

Note: When a hot spare replaces a failed drive, an event notification is generated and appears in the list of alarms in 3DM. You can also have 3DM send you an email about this. See “Managing E-mail Event Notification” on page 82.

It is a good idea to create a hot spare after you create a redundant unit.

In order to replace a failed drive, a hot spare must have the same or larger storage capacity than the drive it is replacing.

The Auto Rebuild policy allows automatic rebuilding to occur with available drives that are not designated as spares. For more information, see “Setting the Auto Rebuild Policy” on page 90.

Note: 3ware's 9000 series RAID controllers use drive coercion so that drives from differing manufacturers and with slightly different capacities are more likely to be able to be used as spares for each other. Drive coercion slightly decreases the usable capacity of a drive that is used in redundant units.

The capacity used for each drive is rounded down to the nearest GB for drives under 45 GB (45,000,000,000 bytes), and rounded down to the nearest 5 GBytes for drives over 45 GB. For example, a 44.3 GB drive will be rounded down to 44 GBytes, and a 123 GB drive will be rounded down to 120 GBytes.

If you have 120 GB drives from different manufacturers, chances are that the capacity varies slightly. For example, one drive might be 122 GB, and the other 123 GB, even though both are sold and marketed as "120 GB drives." 3ware drive coercion uses the same capacity for both of these drives so that one could replace the other.

Specifying a Hot Spare through 3DM

If you need to add a drive to be used as the hot spare, follow the instructions under "Adding a Drive" on page 134.

To specify a hot spare after the system is booted

1 In 3DM, choose **Management > Maintenance.**

2 In the Available Drives list, select the drive you want as a hot spare by marking the checkbox in front of it's Port number.

3 Click **Create Unit**.

4 In the dialog box that appears, select the configuration type **Spare**.

5 Click **Ok**.

You will see the spare appear at the top of the page, under **Unit Maintenance**.

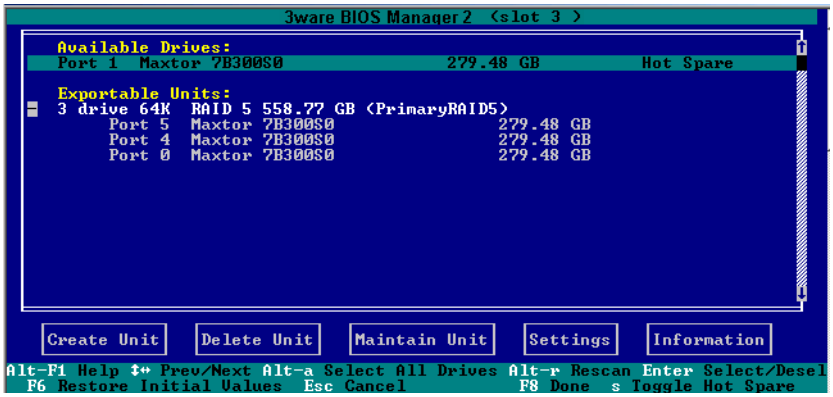
Specifying a Hot Spare through 3BM

1 On the main 3BM screen, in the list of **Available Drives**, highlight the drive you want to use**.**

2 Type **s** to specify that the selected drive will be the hot spare.

You'll see the words "Hot Spare" appear next to the drive in the Available Drives list.

Figure 54. Hot Spare Indicated



If a hot spare is already enabled, you can disable it by pressing **s** again.

3 If you are finished making changes in 3BM, press **F8** to save the changes and exit.

Note: If the drive you designated as a spare is not large enough to replace a failed drive in a fault-tolerant unit, or if there is not a fault-tolerant unit for the spare to support, 3BM will notify you.

Naming a Unit

Units attached to 9000-series controllers can be given unique names to more easily identify them. A unit can be assigned a name when it is created. It can also be named or renamed at a later time.

To name or rename a unit through 3DM

1 Make sure the appropriate controller is selected in the drop-down list at the right of the menu bar.

2 Choose **Management > Controller Settings** from the menu bar in 3DM.

3 In the **Unit Names** section of the Controller Settings page, locate the unit for which you want to change the name.

4 In the text box, enter or type over the name shown.

A name can be up to 21 characters, and can include dashes and underscores.

5 Click the **Save Names** button.

Note: If you want to cancel your change before saving it, click the **Reset Names** button.

To name or rename a unit through 3BM

1 At the main 3BM screen, select the unit by highlighting it and pressing **Enter**.

An asterisk appears in the left-most column to indicate that it is selected.

2 **Tab** to the **Maintain Unit** button and press **Enter**.

3 On the pop-up menu, select **Configure** and press **Enter**.

On the Configure Disk Array screen, the **Array Name** field is already selected.

4 Press **Enter** to open a text box.

5 Type a name for the unit and press **Enter**.

6 **Tab** to the **OK** button and press **Enter** to select it.

You return to the main 3BM screen.

7 When you are finished making changes, press **F8** to save them and exit 3BM.

Setting Unit Policies

The following polices are set when you create a unit, and can be adjusted later through settings on the **Management > Controller Settings** pages of 3DM and 3BM. Details about adjusting each policy are described on the following pages.

- **Unit Write Cache.** Determines whether write cache is enabled for the unit. When the write cache is enabled, data is stored locally on the drive before it is written to disk, allowing the computer to continue with its next task. This provides the most efficient access times for your computer system. When disabled, the computer will wait for the drive to write all the data to disk before going on to its next task. For details, see “Enabling and Disabling the Unit Write Cache” on page 113.

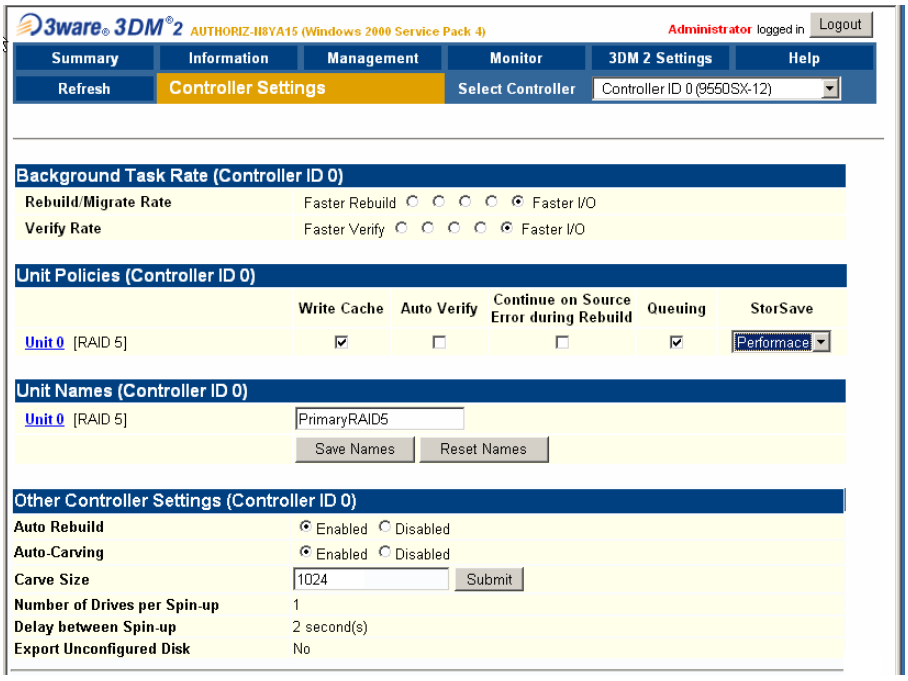
  This feature interacts with functionality of the BBU, if you have one, and with the unit’s StorSave profile. For details, see “Enabling and Disabling the Unit Write Cache” on page 113.

- **Auto Verify.** Determines whether Auto Verify is enabled for the unit (9000-series controllers only). When enabled, the Auto Verify policy causes a verify task to be performed automatically once every 24 hours.

This feature is designed to make it easier to insure regular verification of units. If verify schedules have been enabled, then Auto Verify will run only in the scheduled verify time slots. When Auto Verify is disabled, you must manually specify when you want to verify a unit, even if you have set a verify schedule. For details, see “Setting Auto Verify for a Unit” on page 114.

- **Continue on Source Error During Rebuild.** Determines whether ECC errors are ignored when they are encountered during a rebuild (9000-series controllers only). (ECC errors are an indication of errors that have occurred on a particular drive since it was last read.) When not enabled, a rebuild will abort upon encountering an ECC error and the unit will be set to Degraded. For details, see “Setting Continue on Source Error During Rebuild” on page 115.
- **Queuing.** Determines whether NCQ (Native Command Queuing) is enabled for the unit. When enabled for drives that support it, this policy can improve performance. For details, see “Enabling and Disabling Queuing for a Unit” on page 116.
- **StorSave Profile.** Determines what StorSave profile is used for the unit. Three profiles are available: Protection, Balanced, and Performance. For details, see “Setting the StorSave Profile for a Unit” on page 117.

Figure 55. Unit Policies on Controller Settings Page in 3DM



Enabling and Disabling the Unit Write Cache

Write cache is used to store data locally in memory on the drive before it is written to the disk drive media, allowing the computer to continue with its next task. This improves performance. However, there may be instances when you want the computer to wait for the drive to write all the data to disk before going on to its next task. In this case, you must disable the write cache.

Note: If write cache is enabled, in the event of a power failure, the data in the write cache will be lost if you do not have a Battery Backup Unit (BBU).To avoid a sudden power failure if you do not have a BBU, it is advisable to have an Uninterruptible Power Supply (UPS).

Write cache can be turned on or off for individual units in both 3DM and 3BM without changing the configuration or losing data from the drives.

If you have a BBU (Battery Backup Unit) installed on the controller, the battery preserves the contents of the controller cache memory for a limited period of time (up to 72 hours) in the event of a system power loss. When a BBU is installed, if the battery is not “Ready,” write cache is disabled and cannot be enabled.

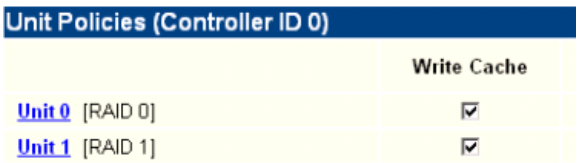
The unit's StorSave profile can also determine whether the write cache can be enabled or disabled. A warning message will be given if the change is not permitted due to the StorSave setting and the state of the unit.

Note: If the **Write Cache** checkbox is disabled (not selectable), check to see if the unit has degraded. If a unit has a StorSave policy of “Protect” and the unit degrades, the policy prevents write cache from being re-enabled until the unit has been rebuilt.

To enable or disable unit write cache through 3DM

1 Choose **Management > Controller Settings** from the menu bar in 3DM.

2 In the **Unit Policies** section of the Controller Settings page, check the Write Cache box to enable it for the designated unit.



The page refreshes, and a message at the top confirms the change you have made.

If your system has no BBU, a message will caution you about enabling write cache.

To enable or disable unit write cache through 3BM

1 At the main 3BM screen, select the unit by highlighting it and pressing **Enter**.

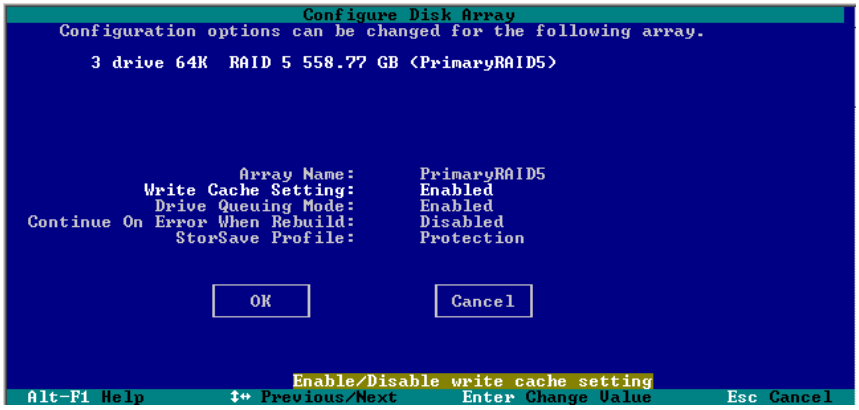
An asterisk appears in the left-most column to indicate that it is selected.

2 **Tab** to the **Maintain Unit** button and press **Enter.**

3 On the pop-up menu, select **Configure** and press **Enter**.

4 In the Configure Disk Array screen, **Tab** to the field **Write Cache Settings**.

Figure 56. Unit Write Cache State in 3BM



The current setting—Enabled or Disabled—is shown. (The initial default setting is for write cache to be enabled.)

5 Press **Enter** to display the choices, use the **arrow keys** to select the setting you want, and press **Enter** again to choose it.

6 Tab to the **OK** button and press **Enter** to select it.

You return to the main 3BM screen.

7 When you are finished making changes, press **F8** to save them and exit 3BM.

Setting Auto Verify for a Unit

The Auto Verify policy causes verify tasks to be performed automatically. This feature is designed to make verification of units easier.

If Auto Verify is set and there is no schedule set up for verify tasks, then the controller firmware can initiate a verify task once every 24 hours. If verify time windows are scheduled, then the controller will only start an automatic

verify task during the scheduled time windows. (For information about schedules, see “Scheduling Background Tasks” on page 161.)

If Auto Verify is not set, you must manually specify when you want to run a verify, on the 3DM **Controller Settings** page. If a schedule is set for verify, then the verify that you manually start will only run during the scheduled time.

You can set the Auto Verify policy while creating a unit through 3DM or you can change the setting later using the following method.

To set the Auto Verify policy for an existing unit

1 Choose **Management > Controller Settings** from the menu bar in 3DM.

2 In the **Unit Policies** section of the Controller Settings page, check the **Auto Verify** box for the appropriate unit. (To disable this policy, uncheck the box.)

The page refreshes, and a message at the top confirms the change you have made.

Setting Continue on Source Error During Rebuild

The **Continue on Source Error During Rebuild** policy is available for units which are redundant. (For units which are not redundant, this option is not shown on the screen.) When this policy is set, ECC (Error Correcting Code) errors are ignored when they are encountered during a rebuild. (ECC errors are typically defects that have been detected in the drive since initialization.) When this policy is not set, if a unit is rebuilding, the rebuild will abort when it encounters an ECC error and the unit will be set back to Degraded.

Since enabling this policy could result in the loss of some source data in the event of source errors, the default is to not enable this policy. Select this option only if you want to ensure that a rebuild will complete successfully without manual intervention. If the rebuild fails and **Continue on Source Error During Rebuild** is not selected, then you have the option to start another rebuild manually. After completing a rebuild with this policy enabled, it is recommended that you execute a file system check when the rebuild completes. Under Windows, you can do this by right-clicking on the Drive and choosing Properties; then on the Tools tab, click Check Now.

To set the Continue on Source Error During Rebuild policy in 3DM

1 Choose **Management > Controller Settings** from the menu bar in 3DM.

2 In the **Unit Policies** section of the Controller Settings page, check the boxes to select the policies you want to be in effect for each unit

The page refreshes, and a message at the top confirms the change you have made.

To set the Continue on Source Error During Rebuild policy in 3BM

1 At the main 3BM screen, select the unit by highlighting it and pressing **Enter**.

An asterisk appears in the left-most column to indicate that it is selected.

2 Tab to the **Maintain Unit** button and press **Enter**.

3 On the pop-up menu, select **Configure** and press **Enter**.

4 In the **Configure Disk Array** screen, **Tab** to the field **Continue on Source Error During Rebuild**.

5 Press **Enter** to display the choices, use the **arrow keys** to select the setting you want (Enabled or Disabled), and press **Enter** again to choose it.

6 **Tab** to the **OK** button and press **Enter** to select it.

You return to the main 3BM screen.

7 When you are finished making changes, press **F8** to save them and exit 3BM.

Enabling and Disabling Queuing for a Unit

Some drives support NCQ (Native Command Queuing), a feature that can result in increased performance for applications that require a lot of random access of data (usually server-type applications). This is accomplished by causing command reordering to be done on the drive.

In order to make use of NCQ, the feature must be enabled at both the drive and the controller. You can enable support for NCQ on a per-unit basis, as described below.

You can see whether NCQ is supported and enabled for a particular drive in the Drive Details window. For details, see “Drive Details window” on page 196.

Note: Not all drives support NCQ. If a drive does not support NCQ, the policy setting for the controller is ignored.

To enable or disable queuing for a unit through 3DM

1 Choose **Management > Controller Settings** from the menu bar in 3DM.

2 In the **Unit Policies** section of the Controller Settings page, enable queuing by checking the box under “Queuing” for the designated unit; disable it by unchecking the box.

The page refreshes, and a message at the top confirms the change that you have made.

To enable or disable queuing for a unit through 3BM

1 At the main 3BM screen, select the unit by highlighting it and pressing **Enter**.

An asterisk appears in the left-most column to indicate that it is selected.

2 Tab to the **Maintain Unit** button and press **Enter**.

3 On the pop-up menu, select **Configure** and press **Enter**.

4 In the **Configure Disk Array** screen, **Tab** to the field **Drive Queuing Mode**.

5 Press **Enter** to display the choices, use the **arrow keys** to select the setting you want (Enabled or Disabled), and press **Enter** again to choose it.

6 **Tab** to the **OK** button and press **Enter** to select it.

You return to the main 3BM screen.

7 When you are finished making changes, press **F8** to save them and exit 3BM.

Setting the StorSave Profile for a Unit

You can set the desired level of data protection versus performance for a unit by selecting the StorSave Profile. Three profiles are provided: *Protection* (maximum data protection), *Performance* (maximum performance, less data protection), and *Balanced* (a middle ground).The default is Protection.

About StorSave Profile Levels

The three profiles automatically adjust several different factors that affect protection and performance on a per unit basis. These are summarized in the table below and further explained after the table.

Table 9: StorSave Profile Definitions

	Protection (Default)	Balanced	Performance
Definition	Maximum data protection, but slower performance.	More data protection than *Performance* but less data protection than *Protection*.	Maximum performance for the unit, but less data protection.
FUA (Force Unit Access)	Honor FUA (If no BBU is present) Ignore FUA (If BBU is present)	Honor FUA (If no BBU is present) Ignore FUA (If BBU is present)	Ignore FUA
Write Journaling	Enabled	Disabled, if no BBU present. (Enabled, if BBU is present.)	Disabled (If BBU is present, this essentially disables the BBU for this unit.)
Disable Cache on Degrade	Enabled	Disabled	Disabled

- **FUA (Force Unit Access)**. FUA commands are a way that the RAID controller or a program (such as a database program) can ensure that data is actually written to the disk drive media, and is not stored in cache. When a write command is followed with a FUA command, then the disk drive will only issue “command complete” to the controller once the data is written to media. When performance is considered more important than protection, it may be desirable to ignore FUA commands.

  The Protection and Balanced profiles honor FUA commands if no BBU is present; the Performance profile ignores them regardless of whether a BBU is present.

  If you use a battery backup unit (BBU), FUA is ignored, because the BBU preserves the contents of the controller cache memory for a limited period of time (up to 72 hours), in the event of a power failure.

- **Write Journaling**. Write journaling tracks the writing of data to disk and preserves a copy of data that has not yet been written to the disk media. Following a power failure or in the event of accidental drive removal and reinsertion, the firmware can recover the unit without data loss. All pending writes sitting in the controller cache are replayed after power is restored or the drive is reinserted and are flushed from the controller to the drive.

  Using write journaling helps protect your data, however it can have an impact on performance.

The Protection profile enables write journaling; the Performance and Balanced Profile disables it. The Balanced profile disables it only if no BBU is present.

If write journaling is disabled and a BBU is present, then it is as if the BBU was disabled for that unit.

- **Write cache disabled on degrade**. In the event that a unit degrades, the use of write cache can be disabled until the unit is rebuilt. Once the unit is rebuilt, you must enable the write cache manually. The write cache will not automatically reenable when the unit is rebuilt.

  The Protection profile enables this feature, so that write cache is disabled in the event a unit degrades; the Performance and Balanced profiles disable this feature, so that write cache continues to be enabled.

Setting the StorSave Profile through 3DM

In 3DM, the StorSave Profile is a unit policy that can be set on the **Controller Settings** page.

To set the StorSave profile through 3DM

1 Choose **Management > Controller Settings** from the menu bar in 3DM.

2 In the **Unit Policies** section of the Controller Settings page, select the profile you want to use from the drop-down list in the StorSave column.

  The page refreshes, and a message at the top confirms the change you have made.

Setting the StorSave Profile through 3BM

In 3BM, the StorSave Profile is set on the **Configure Disk Array** screen.

To set the StorSave Profile through 3BM

1 At the main 3BM screen, select the unit by highlighting it and pressing **Enter**.

  An asterisk appears in the left-most column to indicate that it is selected.

2 Tab to the **Maintain Unit** button and press **Enter**.

3 On the pop-up menu, select **Configure** and press **Enter**.

4 In the **Configure Disk Array** screen, **Tab** to the field StorSave Profile.

  The current setting—Protection, Balanced, or Performance—is shown. (The default setting is Protection.)

5 Press **Enter** to display the choices, use the **arrow keys** to select the setting you want, and press **Enter** again to choose it.

6 **Tab** to the **OK** button and press **Enter** to select it.

You return to the main 3BM screen.

7 When you are finished making changes, press **F8** to save them and exit 3BM.

Changing An Existing Configuration by Migrating

You can convert one RAID configuration into another while the unit is online. This process is known as RAID Level Migration (RLM).

You can use RAID Level Migration to make two main types of configuration changes:

- RAID Level (for example, a RAID 1 to a RAID 5)
- Unit Capacity Expansion (for example, adding a 4th drive to a 3-drive RAID 5)

You can also use RLM to change the stripe size of a unit.

Note: A unit being migrated can still be used (I/O still continues), however the performance will be affected while the migrating task is active. You can control how much effect this has on performance by setting the background task rate. For more information, see “Setting Background Task Rate” on page 112.

This section includes the following topics about changing existing configurations:

- RAID Level Migration (RLM) Overview
- Changing RAID Level
- Expanding Unit Capacity
- Informing the Operating System of Changed Configuration

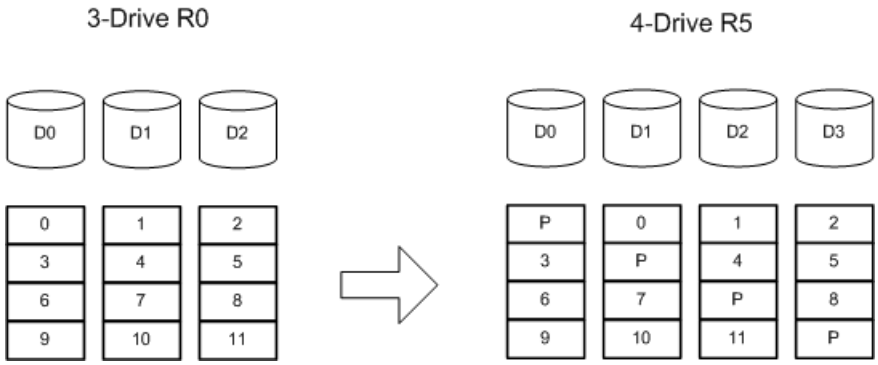
If you want to change the policy settings for an existing unit, there is no need to change the configuration. See “Setting Unit Policies” on page 111.

RAID Level Migration (RLM) Overview

RAID level migration is the process of converting one RAID configuration to another. When you migrate a unit to a different configuration, the user data on it is redistributed to the format of the new configuration. This data redistribution process is a background task, similar to the rebuild or verify processes.

Figure 57 shows an example of how data is reconfigured during a migration. In this example, the migration is from a 3-drive RAID 0 to a 4-drive RAID 5, with both having the same stripe size. As can be seen, every piece of user data is moved from its original physical location.

Figure 57. RAID Level Migration Example



Typically, a unit is reconfigured with the same or more storage capacity. Sometimes additional drives are added. The following table shows valid reconfigurations, some of which will require the addition of more drives.

Table 10: Valid Migration Paths

	Destination								
Source	**R0**	**R1**	**R5**	**R6**	**R10**	**R50**	**Single**	**JBOD**	**Spare**
R0	Yes	No	Yes	Yes	Yes	Yes	No	No	No
R1	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No
R5	Yes	No	Yes	Yes	Yes	Yes	No	No	No
R6	Yes	No	Yes	Yes	Yes	Yes	No	No	No
R10	Yes	No	Yes	Yes	Yes	Yes	No	No	No
R50	Yes	No	Yes	Yes	Yes	Yes	No	No	No

Table 10: Valid Migration Paths

	Destination								
Source	**R0**	**R1**	**R5**	**R6**	**R10**	**R50**	**Single**	**JBOD**	**Spare**
Single	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
JBOD	No	No	No	No	No	No	No	No	No
Spare	No	No	No	No	No	No	No	No	No

Warning: If you are booted from a mirror (RAID 1 unit), never split it into 2 single (identical) drives. Once the unit is split, any pending writes cannot be written to the second drive. In addition, the file system on the drive will not be clean. Instead, shut down the system, replace one of the drives, and start the rebuild from 3BM.

Note: You can only migrate a unit to a RAID level that has the same or more capacity as the existing one. A four-drive RAID 5 unit can migrate to a four-drive RAID 0, but a three-drive RAID 0 unit cannot migrate to a three-drive RAID 5, without adding another drive, due to the need for additional storage capacity for parity bits.

Changing RAID Level

You can use migrate to change the RAID level of an existing unit while the unit is online, without experiencing any data loss. When you change a RAID level, you may also add one or more drives to the unit. You can also migrate to change the unit's stripe size. For example, a four-drive RAID 5 with a 64KB stripe size can be migrated to a four-drive RAID 5 with 256KB stripe size. The steps below describe how to change a RAID level in 3DM2.

Note: Once migration starts, the unit stays in the migrating state until the migration process is complete. The migration process cannot be aborted, and must be allowed to finish before a rebuild or verify to the unit is permitted.

Warning: It is important that you allow migration to complete before adding to the unit. Making physical changes to the unit during migration may cause the migration process to stop, and can jeopardize the safety of your data.

To change the RAID level of a unit

1 In 3DM 2, choose **Management > Maintenance**.

2 In the Unit Maintenance table on the Maintenance Page, select the unit for which you wish to change the RAID level, by checking the box next to the Unit ID.

The unit to be migrated must be in a normal state (not degraded, initializing, or rebuilding) before starting the migration.

3 Click the **Migrate Unit** button.

The Migrate dialog box appears.

4 Select any drives to be added to the unit.

5 Select the new RAID level.

6 Optionally, select a new Stripe size.

7 Click **OK**.

The Maintenance page updates to show the new unit and the Migration progress.

8 Inform the operating system of the change, as described below under “Informing the Operating System of Changed Configuration”.

Expanding Unit Capacity

You can expand a unit's capacity by adding one or more drives to it without changing the RAID level, except for singles and RAID 1 units. (Since a single can only have one drive, and a RAID 1 can only have two drives, if you add a drive to either, the RAID level must be changed.)

For example, for a RAID 5 with 3 drives, you can change the capacity by adding a forth drive.

Expanding unit capacity can be accomplished while the unit is online, without experiencing any data loss. This process is also referred to as Online Capacity Expansion (OCE).

To expand a unit’s capacity

1 In 3DM 2, choose **Management > Maintenance.**

2 In the Unit Maintenance table on the Maintenance Page, select the unit you wish to expand by checking the box next to the Unit ID.

3 Click the **Migrate Unit** button.

The Migrate dialog box appears, listing the drives which can be added to the unit.

4 Select the drives(s) you wish to add to the unit by checking the Port ID box next to each one.

5 If desired or necessary, select the appropriate RAID level.

6 Click **OK**.

The Maintenance page updates to show the newly reconfigured unit. The Status column title indicates that Migration is in progress.

7 If you booted from the unit that is being migrated, when migration is complete, reboot your system. Then turn to Step 4 under "Informing the Operating System of Changed Configuration" on page 124.

8 Inform the operating system of the change, as described below.

Informing the Operating System of Changed Configuration

After you change the configuration of a unit, you must inform the operating system of the change, and you may need to re-partition the unit.

Resizing the file system to match the new partition size is not automatic. It may be necessary to expand the file-system using tools specific to your operating system.

In addition, in order to use the new capacity, you need to either resize the existing partition or add a new partition.

Note: This step can only be done after the system has completed the migration or online capacity process. The operating system will not see the capacity until that process is complete.

To inform the operating system that a unit has been changed

1 If the unit you reconfigured is the boot unit, restart the system and skip to Step 3.

If the unit you reconfigured is secondary storage, unmount the file system from the unit.

Under Windows, go to **Start > Administrative Tools > Computer Management**, and select **Disk Management.** Remove the logical drive letter for the unit.

Under Linux and FreeBSD, from a command prompt, type `sync` <enter>, `sync` <enter>, `sync` <enter>.

You can then unmount the unit with this command: umount `<mount location>`

2 In the software, remove and rescan the controller, in order to update unit information.

a In 3DM2 choose **Management > Maintenance** and select the appropriate unit.

a Click the **Remove Unit** button.

b After the unit has been removed, click the **Rescan** button. The new unit capacity displays.

3 Resize the partition and file system or create a new partition.

In Windows, use the disk management utility to determine whether the disk is a basic disk or a dynamic disk.

- Go to Administrative Tools > Computer Management, and then select Disk Management in the list on the left.

  Only dynamic disks can be expanded with Windows Disk Management. If the unit is shown as a basic disk, right-click on the disk icon and change it to a dynamic disk.
- If the unit is shown as a dynamic disk, right-click on it and choose Extend Volume to launch the Extend Volume wizard.

In Linux and FreeBSD, the tools to expand the partition and file system can vary, depending on the kernel version and file system that you are using. Please consult your Linux/FreeBSD documentation and the 3ware Knowledgebase for more information.

Deleting a Unit

You delete a unit—either an array of disks, or a Single Disk—when you want to reconfigure the unit or use the drives for other purposes.

After you delete a unit, the drives appear in the list of Available Drives.

Warning: When a unit is deleted, all of the data on that unit will be lost. The drives cannot be reassembled into the same unit because the data on it is erased. If you want to reassemble the drives into the same unit on another controller, use the **Remove Unit** button in 3DM instead of the **Delete Unit** button. Or, you can shut down the computer and physically move the drives to another 3ware RAID controller. When you restart your system, the controller will recognize the unit. For more information see “Moving a Unit from One Controller to Another” on page 131.

Warning: When a unit is deleted, all of the data on that unit will be lost. The drives cannot be reassembled into the same unit because the data on it is erased. If you want to reassemble the drives into the same unit on another controller, use the **Remove Unit** button in 3DM instead of the **Delete Unit** button. Or, if you're at the BIOS level already, you can shut down the computer and physically move the drives to another 3ware 9000 series RAID controller. When you restart your system, the controller will recognize the unit. For more information see "Moving a Unit from One Controller to Another" on page 131.

If you have incomplete drives, or drives that appear with a message such as "Unsupported DCB," indicating that they were previously part of a unit on a 3ware 7000/8000 series controller, they must be deleted before you use them. (If you want to move a unit from a 7/8000 controller to a 9000 series controller, you must convert the drives first. For more information, see "Moving a Unit from One Controller to Another" on page 131.)

Deleting a Unit through 3DM

In 3DM, the command for deleting a unit is on the **Maintenance** page. Be sure to follow steps 1 through 3 in the instructions before using the Delete command.

To delete a unit through 3DM

1 Make sure the operating system is not accessing the unit you want to remove.

For example, make sure you are not copying files to the unit, and make sure that there are no applications with open files on that unit.

2 Backup any data you want to keep.

3 Unmount the unit.

This step is very important. If a unit is not unmounted and you delete it, it is the equivalent of physically yanking a hard drive out from under the operating system. You could lose data, the system could hang, or the controller could reset.

Under Windows, go to **Start > Administrative Tools > Computer Management**, and select **Disk Management.** Remove the logical drive letter for the unit.

Under Linux and FreeBSD, you can unmount the unit with this command:
`umount <mount location>`

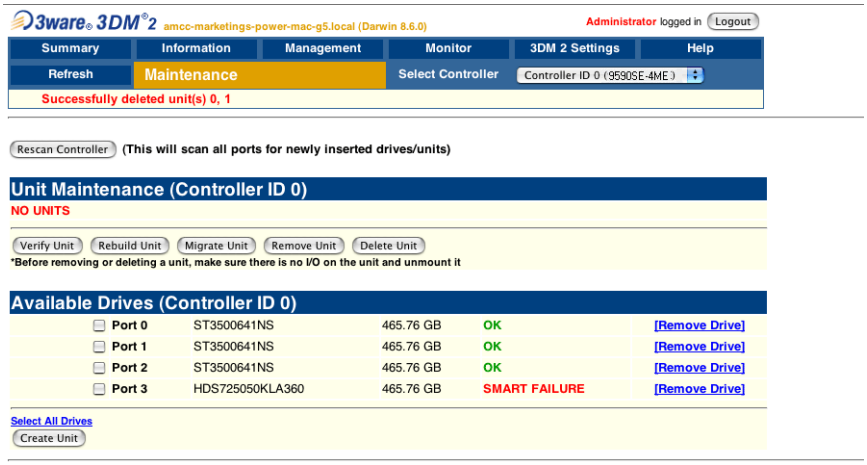
4 In 3DM, choose **Management > Maintenance**.

5 In the Unit Maintenance section of the Maintenance page, select the unit you want to remove and click **Delete Unit**.

6 When a message asks you to confirm, click **OK.**

Configuration information associating the drives with the unit is deleted, and the individual drives appear in the Available Drives list (Figure 58). You can now use them as part of another unit, or designate them as Spares, for use in a rebuild.

Figure 58. Unit Successfully Deleted through 3DM



Deleting a Unit through 3BM

In 3BM, the command for deleting a unit is on the main 3BM screen.

To delete a unit through 3BM

1 At the main 3BM screen, select the unit in the list of Exportable Units by highlighting it and pressing **Enter** or **Space**.

An asterisk appears in the left-most column to indicate that it is selected.

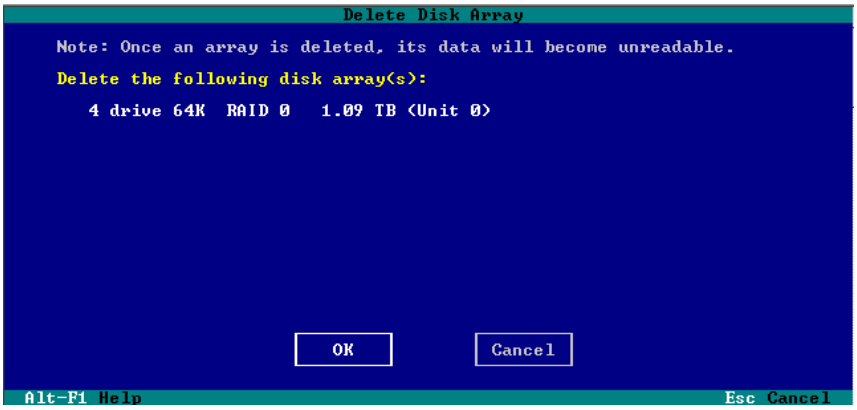
2 **Tab** to the **Delete Unit** button and press **Enter.**

Note: If you want to delete an incomplete drive or unusable unit, or a drive that appears with a message such as “Unsupported DCB,” select it in a similar manner and then select **Delete Unit**, even though it appears in the list **Incomplete Drives and Others**.

Warning: Any data on the unit will be lost once the unit is deleted. Backup any data that you want to keep.

3 On the **Delete Disk Array** screen, review the information about the unit to make sure it is the one you want to delete.

Figure 59. Deleting a Unit in 3BM



4 **Tab** to the **OK** button and press **Enter.**

You return to the main 3BM screen, and the drives associated with the unit now appear in the list of Available Drives.

Remember: The unit is not actually deleted and no data is overwritten until you press the **F8** key to save your changes, or press **Esc** and select **Yes** when asked if you want to save.

5 **Press F8** to save your changes, or press **Esc** and then **Yes**.

Removing a Unit

Removing a unit allows you to safely remove drives from a controller in order to move the unit to another controller or to store the drives for safekeeping purposes. This process is sometimes referred to as “array roaming.” Hot swap carriers are required unless you power down first.

When you remove a unit (in contrast to deleting a unit), information about the unit remains intact on the drives. This allows the drives to be reassembled into a unit again on this controller, or if moved to another controller.

Warning: It is important to remove the unit through software, before removing it physically. Failure to do so could result in a system crash or hang and may even corrupt the data and the unit configuration from being reassembled later.

Note: You can also remove a drive, if you want to force a degrade on a redundant unit, or if you want to remove a drive from the “Available Drives” list so that you can then remove it from the system. For more information, see “Removing a Drive” on page 135.

Removing a Unit Through 3DM

In 3DM, the command for deleting a unit is on the **Maintenance** page. Be sure to follow steps 1 and 2 in the instructions before using the Remove command.

To remove a unit through 3DM

Note: If you do not have hot swap carriers, you do not need to remove a unit via 3DM. Simply power down the system and remove the applicable drives. Refer to your system’s user guide for details on removing fixed disks. If you do have hot swap carriers, follow the steps below.

1 Make sure the operating system is not accessing the unit you want to remove.

For example, make sure you are not copying files to the unit, and make sure that there are no applications with open files on that unit.

2 Unmount the unit.

This step is very important. If a unit is not unmounted and you remove it, it is the equivalent of physically yanking a hard drive out from under the operating system. You could lose data, the system could hang, or the controller could reset.

Under Windows, go to **Start > Administrative Tools > Computer Management**, and select **Disk Management.** Remove the logical drive letter for the unit.

Under Linux and FreeBSD, you can unmount the unit with this command:
`umount <mount location>`

3 In 3DM, choose **Management > Maintenance**.

4 In the **Unit Maintenance** table on the Maintenance page, select the unit you want to remove and click **Remove Unit**.

5 When a message asks you to confirm, click **OK.**

The unit number and information is removed from the **Maintenance** page in 3DM.

The operating system is notified that the unit was removed. In Linux the device node associated with this unit is removed. In Windows the Device Manager will reflect the changes under the disk drives icon.

You can now physically remove the drives and move them to another controller. If you have a hotswap carrier, you can do this without shutting down the system. If you do not have a hot-swap carrier, power-down the system and ground yourself before making changes to the hardware.

If you change your mind and want to reuse the drives and unit on the current controller, click **Rescan Controller.**

Removing a Unit Through 3BM

Note: Even though removing a unit is supported in 3BM, you can also simply power down to remove the applicable drives since you are not booted yet.

To remove a unit through 3BM

1 If your drives are not in hot swap carriers, you do not need to remove a unit via 3BM. Simply power down and remove the applicable drives. Refer to your system's user guide for details on removing fixed disks.

Warning: Physically removing drives which are not in hot swap carriers can result in a system hang or may even damage the system and the drive.

2 At the main 3BM screen, highlight the unit you want to remove and press **Enter** to select it.

An asterisk appears in the left-most column to indicate that the unit is selected.

3 Tab to the **Maintain Unit** button and press **Enter**.

4 In the pop-up menu, select **Remove** and press **Enter**.

You can now physically remove the drives and move them to another controller. If you have a hot swap carrier, you can do this without shutting down the system.

Moving a Unit from One Controller to Another

After you have configured a unit on a 3ware 9000 series controller, you can move it to a different 3ware 9000 series controller, and retain the configuration on the new controller. This is referred to as “array roaming.”

When connecting the unit to the new controller, you do not have to physically connect the drives to the same ports to which they were connected on the previous controller. The firmware will still recognize the unit. This feature is referred to as “disk roaming.”

3DM includes two features that help you move a unit without powering down the system, allowing you to hot-swap the unit. The Remove Unit feature lets you prepare a unit to be disconnected from the controller, and the Rescan feature checks the controller for drives that are now connected, and updates the 3DM screens with current information. For details, see “Removing a Unit” on page 128 and “Rescanning the Controller” on page 136.

Note: Moving a unit to another controller while the unit is in the migration state is supported with one restriction. If the unit was in the middle of the migration process and the controller was shutdown uncleanly, the unit cannot be moved to another controller until the unit has recovered from the unclean shutdown.

Caution: If you have a configured RAID unit on an older controller, such as an 8506, and you move the drives to a new controller, such as 9550SX, you must first convert the units from 7xxx/8xxx format to 9xxx format using a 3ware utility available from 3ware Technical Support.

You cannot move drives back from a 9550SX, 9590SE, or 9650SE controller to an older controller and maintain the data. If you want to swap drives back and forth between controller cards, be sure to have a backup of your data.

Moving Units from an 8000 Controller to a 9000 Controller

It is possible to move your RAID units from a 3ware 8000 series RAID controller to a 3ware 9000 series controller. You will then have the advantages of the 9000 series controller.

The drive units must be in normal mode before moving the units. Incomplete, degraded, rebuilding, or initializing units cannot be converted. In addition, RAID 0, 10, and 5 units must use a standard 64 KB stripe size.

The procedure used to move units from the 8000 to the 9000 series depends on the type of storage unit that you have. For most units, follow the steps below. For units using JBOD, see “Moving Legacy JBOD Units to a 9000 Controller” on page 132.

Note: In order to preserve the data that is on the units attached to the 8000, you will need to run a special utility to convert the units to a format that the 9000 controller can use. Contact Technical Support to obtain the utility. (This utility is not required for legacy JBOD units.)

Do not remove the 8000 board from your system until you have converted the units. The units must be attached to the 8000 controller when you run the utility.

To move units under Windows

1 Install the 9000 controller in your system, while leaving the 8000 controller installed.

2 Install the Windows driver. (For details, see “Driver Installation Under Windows” on page 31.)

3 Run the conversion utility to convert the units.

4 Power down the system, disconnect the drives from the 7/8000 controller and remove that controller from the system.

5 Attach the drives to the 9000 board.

To move units under Linux or FreeBSD

1 Upgrade your driver to the 9000 series driver.

2 Run the conversion utility to convert the units.

3 Power down the system, disconnect the drives from the 8000 controller and remove the controller from the system.

4 Install the 9000 controller and attach the drives to the 9000 board, as described earlier in this section.

Moving Legacy JBOD Units to a 9000 Controller

The steps for moving legacy JBOD units vary, depending on the operating system you are using.

To move legacy JBOD units under Windows

1 Install the 9000 controller in your system, while leaving the 8000 controller installed.

2 Install the Windows driver. (For details, see *3ware Serial ATA RAID Controller User Guide* “Driver Installation Under Windows” on page 31.)

3 Power down the system, disconnect the drives from the 8000 controller and remove that controller from the system.

4 Attach the drives to the 9000 board.

5 Reboot the system and enter the 3ware 9000 series BIOS (3BM) by pressing Alt-3. Enable the Export JBOD policy on the Policy screen.

6 Press the **F8** or **Esc** key to save and exit.

To move legacy JBOD units under Linux or FreeBSD

1 Upgrade your driver to the 9000 series driver.

2 Power down the system, disconnect the drives from the 8000 controller and remove the controller from the system.

3 Install the 9000 controller and attach the drives to the 9000 board, as described earlier in this section.

4 Reboot the system and enter the 3ware 9000 series BIOS (3BM) by pressing Alt-3. Enable the Export JBOD policy on the Policy screen.

5 Press the **F8** or **Esc** key to save and exit.

Moving Units from a 9500S to a 9550SX, 9590SE, or 9650SE Controller

It is fairly straightforward to move units from a 9500S controller to a 9550SX, 9590SE, or 9650SE controller. The steps you follow depend on whether you are booting from the drives attached to the 9500S, or whether they are being used for secondary storage.

To move a bootable unit from a 9500S to a 9550SX, 9590SE, or 9650SE controller

1 If you are working with a Linux system, skip to step 2.

If you are working with a Windows system:

a Power down the computer.

b Install the 9550SX, 9590SE, or 9650SE controller in the computer, leaving the 9500S installed and its drives attached.

c Boot to the operating system.

2 Install the driver for the 9550SX, 9590SE, or 9650SE.

If you are using Linux, you will also need to update the initial RAM disk with the `mkinitrd` command.

3 Power down the computer.

4 Remove the 9500S controller.

5 If you are working with a Linux system, install the 9550SX, 9590SE, or 9650SE controller.

6 Attach the drives that were on the to the 9500S to the 9550SX, 9590SE, or 9650SE controller.

7 Power up the computer and verify that the upgrade is complete. (The existing units should be available for use.)

To move a secondary storage unit from a 9500S to a 9550SX, 9590SE, or 9650SE controller

1 Power down the computer.

2 Remove the 9500S controller.

3 Install the 9550SX, 9590SE, or 9650SE controller in the computer.

4 Attach the drives that were on the 9500S to the 9550SX, 9590SE, or 9650SE.

5 Boot to the operating system.

6 Install the driver for the 9550SX, 9590SE, or 9650SE.

If you are using Linux, you may also need to update the initial RAM disk with the `mkinitrd` command.

7 Reboot if you are prompted to do so by the operating system.

Some operating systems (for example, Windows 2003) will allow the unit(s) attached to the controller to be used at this point without an additional reboot.

Adding a Drive

If you have a hot-swap carrier, you can add a drive to your system and make it available through 3DM without powering down the system.

Without hot swap carriers, you should not add a drive via 3DM. Instead, power down the system and add the applicable drives.

Warning: Physically adding a drive without a hotswap carrier and without powering down your system can result in a system hang or may even damage the system and the drive.

Note: When you add a drive to your system and connect it to the controller, it is automatically detected and listed in 3DM. If it does not immediately display, you can use the rescan feature, as described below.

To add a drive

1 In 3DM, choose **Management > Maintenance**.

2 On the Maintenance page, click **Rescan Controller.**

The drive will appear in the list of available drives. You can now use it in a new RAID configuration, or as a replacement drive in the event that another drive degrades.

If you want to use this drive as a spare, see “Creating a Hot Spare” on page 108.

Removing a Drive

If you have a hot-swap carrier and want to physically remove a drive from your system without powering it down, you must first remove it through the 3ware software.

This is useful if you know that a drive is developing a problem and you want to replace it, or to replace a drive which has already failed.

Warnings:

Physically removing a drive that is not in a hot swap carrier can result in a system hang or may even damage the system and the drive.

The steps below will destroy any information that identifies this drive as part of a RAID unit. **Existing data on this drive will no longer be available.**

Notes:

If you want to remove a unit from your system and reassemble it in another system, do not follow these steps. Instead, turn to “Removing a Unit” on page 128.

If you physically remove a drive on a controller without first removing it in 3DM, it will be listed as removed, however it will not be completely removed unless you Rescan the controller.

To remove a drive

1 In 3DM, choose **Management > Maintenance**.

On the Maintenance page, **Remove Drive** links appear next to all drives that can be removed from units, and next to drives in the Available Drives list.

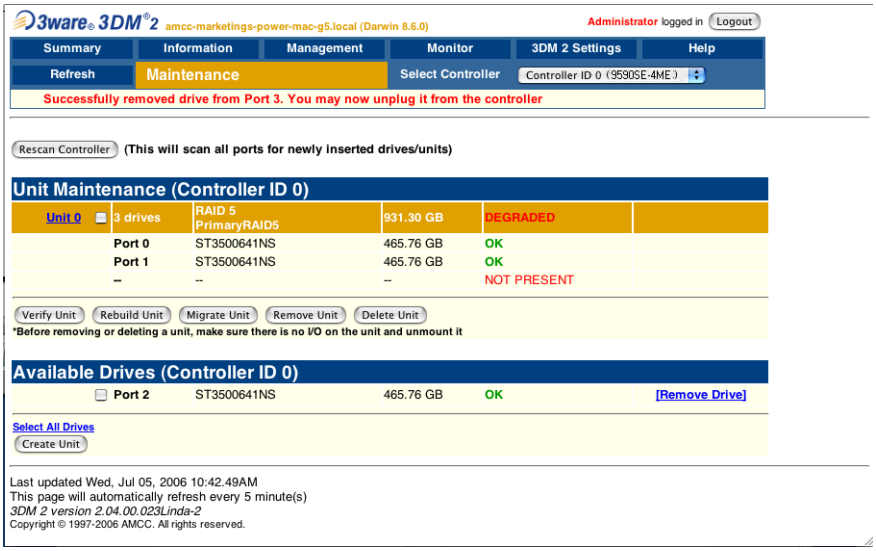
2 Locate the drive you want to remove and click the **Remove Drive** link (Figure).

3 When 3DM asks you to confirm that you want to remove the drive, click **OK**.

You can now remove the drive from your system.

If you removed a drive that was part of a unit, the unit may become degraded, as shown in (Figure 60).

Figure 60. Result of Removing Drive from Unit in 3DM



Rescanning the Controller

When you make a change by physically adding or removing drives or units, you can have 3DM rescan the controller to update the list of units and available drives shown on the **Maintenance** page.

This is useful in a variety of circumstances. For example, if you add new drives to the controller, you can make them available by rescanning the controller.

Rescanning checks all ports on the controller. It then updates the status of all ports, so if error conditions have been fixed, the status is updated to reflect that.

For more details about how the Rescan feature works, see the information in the 3DM Reference section, under “Maintenance page” on page 204.

To rescan the controller through 3DM

1 In 3DM, choose **Management > Maintenance**.

2 On the Maintenance page, click **Rescan Controller.**

3DM scans the controller for information about units and drives, and updates the information shown on the **Maintenance** page.

To rescan the controller through 3BM

1 From the main 3BM screen, press Alt-r.

You are warned that any configuration changes you have made in 3BM will be lost.

2 Type Y for Yes.

The controller is rescanned.

9

Maintaining Units

3ware RAID controllers include a number of features in the firmware that help maintain the integrity of your drives, check for errors, repair bad sectors, and rebuild units when drives degrade. In addition, 3ware BIOS Manager (3BM) and 3ware Disk Manager (3DM) provide tools to let you check unit and drive status, and manually start background maintenance tasks. 3DM also lets you review alarms and errors and schedule background maintenance tasks. On Windows systems, the WinAVAlarm utility monitors the controller and will display a message window and give an audible alarm when events occur at or above the threshold you select for it.

Details about these features are described in this section, which is organized into the following topics:

- Checking Unit and Drive Status through 3DM
  - Enclosure LED Status Indicators
  - Unit Statuses
  - Drive Statuses
- About Degraded Units
- About Inoperable Units
- Alarms, Errors, and Other Events
- Background Tasks
- Scheduling Background Tasks
- Locating a Drive by Blinking Its LED

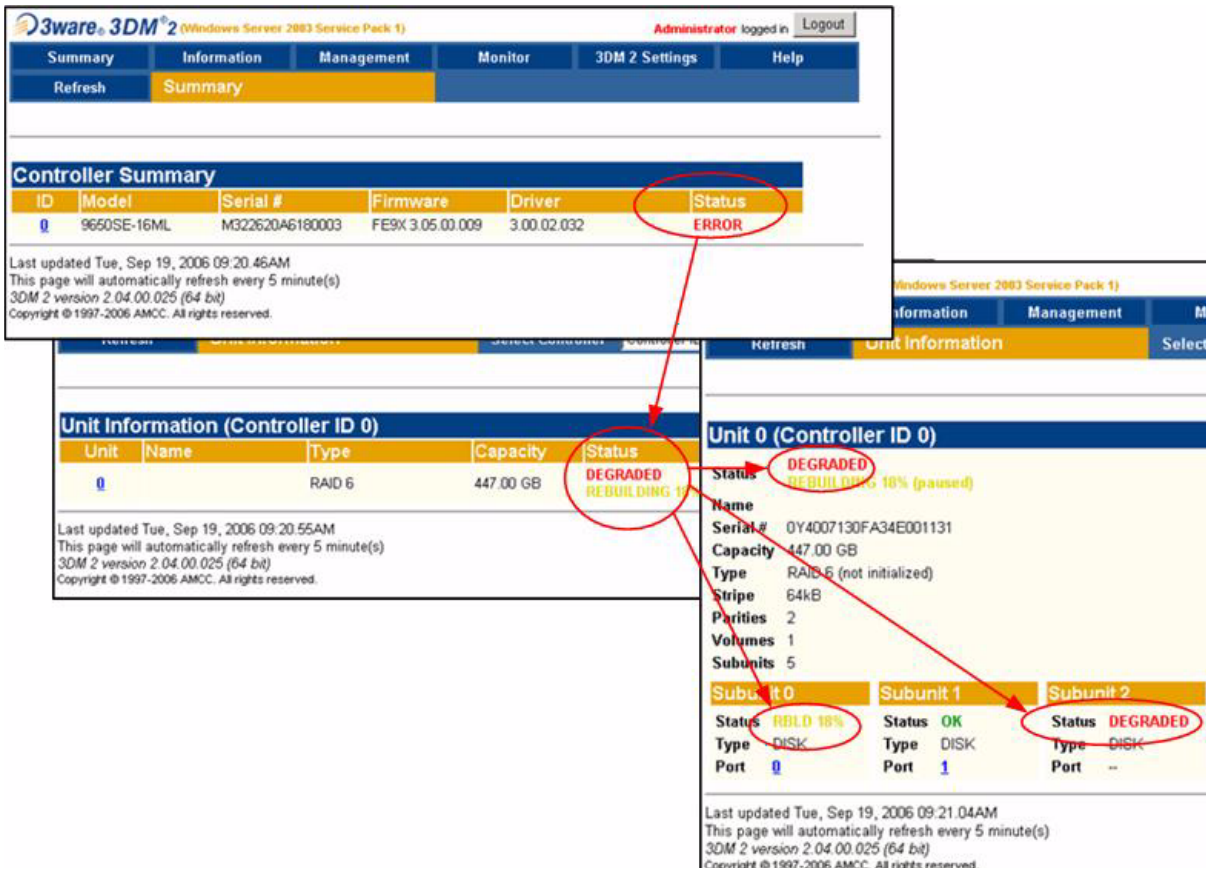
Checking Unit and Drive Status through 3DM

The information screens in 3DM let you see both summary and detailed information about your 3ware RAID controller, configured units, and available drives. You can quickly see the status of your controller and drives, and drill down to find details about any units or drives that have problems.

A status column on the controller, unit, and drive information pages lets you quickly see whether everything is working (OK), performing a task (such as initializing, verifying, or rebuilding), or has a problem (error, degraded, warning).

The next figure illustrates how you can drill down to get additional detail about units and drives in your system.

Figure 61. Drilling Down to Check Status Information



For some RAID levels (RAID 6, RAID 10, and RAID 50), a single RAID unit may have more than one status. For example, part of the unit could be rebuilding, while another part is degraded or initializing. When this is the case, you will see both statuses listed at the top unit level. When you drill in to see details, you will be able to see which the specific subunits or drives to which the status applies.

For an explanation of unit and drive status, see:

- “Unit Statuses” on page 140
- “Drive Statuses” on page 142

If you use an enclosure that has an integrated AMCC/3ware CCU (chassis control unit), the LEDs on your enclosure also provide some status information. For details, see “Enclosure LED Status Indicators” on page 140.

Enclosure LED Status Indicators

If you use an enclosure that has an integrated AMCC/3ware CCU (chassis control unit), the LEDs on your enclosure also provide some status information. The chassis should come with a cable which attaches to the I^2C port on the controller.

Note: The following table is an example only. Check with your chassis documentation for more details. Not all features may be supported or implemented in the same way.

Table 11: Meaning of LED Colors and Behavior

Color	Drive Status
Solid green	OK
Blinking green	Identify This occurs when you have used the Identify command in 3DM to locate a particular drive or unit. (See “Locating a Drive by Blinking Its LED” on page 166.)
Black	No drive
Solid Amber	Hot spare
Blinking amber	Rebuilding The drive in this slot is part of a RAID unit that is currently rebuilding. You can continue to use the unit. For more information, see “Rebuilding Units” on page 155.
Solid red	Drive fault This drive has failed. You should replace it and rebuild the unit.
Blinking red	Predicted drive fault 3ware software predicts that this drive will fail soon. You may want to replace it.

Unit Statuses

The following is a list of unit statuses you may see in 3DM:

- **OK.** The unit is optimal and is functioning normally.
- **Rebuilding.** The unit is in the process of writing data to a newly added disk in a redundant unit, in order to restore the unit to an optimal state.

The unit is not fully fault tolerant until the rebuilding is complete. For more information, see “To verify a unit through 3BM” on page 154.

- **Rebuild-Paused.** The unit is set to rebuild, however scheduling is enabled, and the present time is not during a scheduled timeslot. Rebuilding will start at the next scheduled time slot. Rebuilds are also paused for up to ten minutes after a reboot, even during a scheduled timeslot.
- **Initializing.** The unit is in the process of writing to all of the disks in the unit in order to make the array fault tolerant. For more information, see “About Initialization” on page 148.
- **Initializing-Paused.** The unit is set to initialize, however scheduling is enabled and the present time is not during a scheduled timeslot. Initializing will start at the next scheduled time slot. Initialization is also paused for up to ten minutes after a reboot, even during a scheduled timeslot.
- **Verifying.** The unit is in the process of ensuring that the parity data of a redundant unit is valid. For more information, see “About Verification” on page 151.
- **Verify-Paused.** The unit is set to verify, however, scheduling is enabled, and the present time is not during a scheduled timeslot. Verification will start at the next scheduled time slot.
- **Migrating.** The unit is in the process of being reconfigured while it is online. Migration can be used to change the RAID level, to expand the capacity by adding additional drives, or to change the stripe size. For more information, see “Changing An Existing Configuration by Migrating” on page 120.
- **Migrate-Paused.** The unit is in the process of migrating, however scheduling is enabled, and the present time is not during a scheduled timeslot. Migrating will start at the next scheduled time slot. Migration is also paused for up to ten minutes after a reboot, even during a scheduled timeslot.
- **Degraded.** One or more drives in the redundant unit is no longer being used by the controller. For more information, see “About Degraded Units” on page 142.
- **Inoperable.** This is a condition where one or more drives are missing from a unit, causing the unit to no longer be available to the operating system. Data on an inoperable unit cannot be accessed. For more information, see “About Inoperable Units” on page 143.

Drive Statuses

The following is a list of drive statuses you may see in 3DM:

- **OK.** The drive is fine and is functioning normally.
- **Not Present.** No drive is present in this slot.
- **Drive Removed.** The drive has been removed.
- **Other.** A number of other drive statuses may appear in the event of a problem. If you have a question about a status shown, contact AMCC customer support. knowing the exact drive status can help trouble-shoot the problem.

About Degraded Units

Fault tolerant RAID units provide data redundancy by duplicating information on multiple drives. These RAID units make it possible to continue use even if one of the drives in the unit has failed.

- RAID 1 and RAID 10 units each use mirroring to achieve fault tolerance. Identical data is stored on two or more drives to protect against drive failure.
- RAID 5, RAID 6, and RAID 50 units achieve fault tolerance by using a simple (exclusive OR) function to generate the parity data that is distributed on all drives.

  RAID 6 adds an extra level of protection over RAID 5 by generating a second parity when data is written. This allows two drives to fail without compromising data integrity, especially on larger units.

When one of the drives in a fault-tolerant unit fails or is removed or unplugged, the unit is said to be *degraded*.

You can still read and write data from a degraded unit, but the unit will not be fault tolerant until it is rebuilt using the Rebuild feature.

When a RAID unit becomes degraded, it is marked as such, and the drive(s) that failed are marked as **Not In Use** in the 3BM screens and **Degraded** in the 3DM pages. You should replace the failed drive and rebuild the unit as soon as it is convenient to do so. The unit will not be fault tolerant until it has been rebuilt. Rebuilding can occur automatically, depending on your settings. For more information, see “Rebuilding Units” on page 155.

About Inoperable Units

Units become inoperable when there are no longer enough drives in the unit for it to function. For example, a RAID 5 unit created from four drives becomes degraded if one drive fails or is removed, but becomes inoperable if two drives fail or are removed. A RAID 6 unit created from five drives becomes degraded if one or two drives is removed, but becomes inoperable if three drives fail or are removed.

Data on an inoperable unit cannot be accessed unless the missing drives are reconnected.

If you have data on a unit that is currently “inoperable,” contact technical support.

Alarms, Errors, and Other Events

3ware provides several levels of detail about alarms, errors, and other events. This information is available through the 3DM web application and the CLI. On Windows systems, the WinAVAlarm alert utility can also be used to notify you of events.

The next few pages describe these capabilities.

- “Viewing Alarms, Errors, and Other Events” on page 143
- “Using the Alert Utility Under Windows” on page 144
- “Downloading an Error Log” on page 146
- “Viewing SMART Data About a Drive” on page 146

CLI capabilities are described in the “3ware® CLI Guide” *3ware Serial ATA RAID Controller CLI Guide*.

Tip: If you have an enclosure that has an integrated AMCC/3ware CCU (chassis control unit), the LEDs on your enclosure also provide you with status information about drives. For more information, see “Enclosure LED Status Indicators” on page 150.

Viewing Alarms, Errors, and Other Events

The **Alarms** page in 3DM shows a log of all events (also called Asynchronous Event Notifications, or AENs) that have occurred on units. These events include alarms that occur when the 3ware RAID controller requires attention, such as when a disk unit becomes degraded and is no longer fault tolerant. They also include SMART notifications and informational notification, such as when sectors have been repaired during verification.

Event messages are categorized into the following levels of severity:

- **Errors** (high severity events), shown next to a red box
- **Warnings**, shown next to a yellow box
- **Information,** shown next to a blue box

Examples of event messages:

- **Error**: Unclean shutdown
- **Warning:** Degraded unit
- **Information:** Start and completion of rebuilding, verifying, initializing, migrating, and so forth.

3DM can e-mail notifications of these events to one or more recipients. For more information, see “Managing E-mail Event Notification” on page 82.

If your 3ware RAID controller is installed in a Windows system, the WinAVAlarm alert utility can notify you of events immediately with an audible alarm and a popup message. For details, see “Using the Alert Utility Under Windows” on page 144.

A list of the possible error and other event messages is provided under “Error and Notification Messages” on page 224.

To view alarms, errors and other events in 3DM

1 Choose **Monitor > Alarms**.

The Alarms page displays, listing all event notifications.

2 For details about a particular alarm, click it.

A Help window opens with additional information about the alarm.

To see an explanation of a specific item in 3DM

- Click on the message you are interested in, on the 3DM Alarms page.

  A help topic opens with additional information.

Using the Alert Utility Under Windows

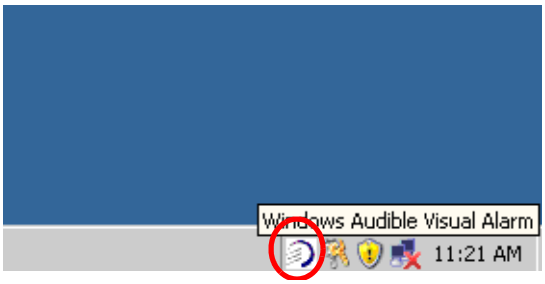
An alert utility, WinAVAlarm, is automatically installed on Windows systems when 3DM is installed. It can provide immediate notification of events, through a popup message and an audible alert. By default it is set to notify you whenever an error (high-severity event) occurs, through both a popup message and an audible alert. You can configure the alert settings to specify types of events you want to be notified of: Errors, Warnings, or Information.

WinAVAlarm is a stand-alone utility and does not require 3DM to be running, unlike e-mail notification. After it is installed, an icon for it appears in your System tray.

To change the alert utility settings

1 Double-click on the WinAVAlarm icon in the system tray.

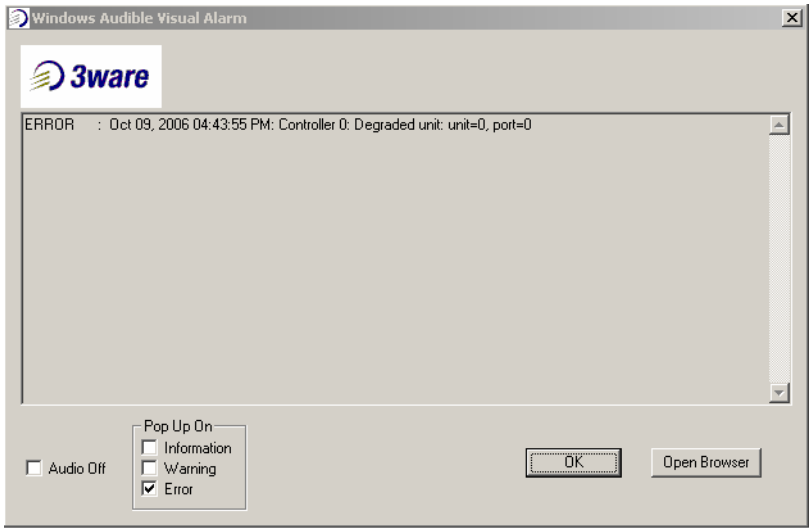
Figure 62. WinAVAlarm in the Windows System Tray



2 In the Windows Audible Visual Alarm window, select the types of alerts you want to be notified of.

If you want to turn off the sound alarm and only have a pop-up message appear, check the **Audio Off** button.

Figure 63. WinAVAlarm Popup Window



If you wish, you can open 3DM from this window by clicking **Open Browser**. This can be useful when you receive a message, because the 3DM Alarms page allows you to easily access online help associated with the events.

3 Click **OK** to close the window and accept any changes you have made.

Downloading an Error Log

You can download an error log containing information from the firmware log. This can be useful when troubleshooting certain types of problems. For example, you might want to send the saved file to 3ware Customer Support for assistance when troubleshooting.

To download the error log

1 In 3DM, choose **Information > Controller Details** from the menu bar.

2 Make sure the correct controller is displayed in the **Select Controller** field in the menu bar.

3 On the Controller Details page, click the **Download Error Log** link.

4 When the Save or Open dialog box appears, navigate to where you want to save the log and click **OK**.

Viewing SMART Data About a Drive

You can view SMART (Self-Monitoring, Analysis, and Reporting Technology) data about a drive to help troubleshoot problems that occur. SMART data is available on all disk drives (unit members, Single Disks, and Hot Spares).

You can also set self-tests that will check the SMART attributes and post messages to the Alarms page when they are exceeded. For more information, see “Selecting Self-tests to be Performed” on page 165.

To view SMART data

1 Choose **Information > Drive Information** from the menu bar.

2 On the Drive Information page, click the port number for the drive you are interested in.

A window showing details of the SMART data opens. The data is shown as hex values.

Background Tasks

Background tasks are maintenance tasks that help maintain the integrity of your drives and data. These tasks include

- Initialization of units
- Verification of units
- Rebuilds when units have become degraded
- Migration of an on-line RAID from one RAID configuration to another
- Self-tests

You can set up your system so that these tasks occur as they are needed, or you can create schedules so that they occur during non-peak times. Background tasks can have an effect on performance, so using a schedule can minimize the impact.

This section includes the following topics related to background tasks:

- About Initialization
- About Verification
- Starting a Verify Manually
- Rebuilding Units
- Cancelling a Rebuild and Restarting It with a Different Drive
- Setting Background Task Rate
- Background Task Prioritization
- Scheduling Background Tasks
- Viewing Current Task Schedules
- Turning On or Off Use of a Task Schedule
- Removing a Task Schedule
- Adding a New Task Schedule Slot
- Selecting Self-tests to be Performed

Although the migration of a unit is handled as a background task, initiating it is similar to creating a new unit. For details, see “Changing An Existing Configuration by Migrating” on page 120.

About Initialization

For 3ware SATA RAID controllers, *initialize* means to put the redundant data on the drives of redundant units into a known state so that data can be recovered in the event of a disk drive failure. For RAID 1 and RAID 10, initialization copies the data from the lower port to the higher port. For RAID 5, RAID 6, and RAID 50, initialization calculates the RAID 5 parity and writes it to disk (background initialization). This is sometimes referred to as *background initialization* or *resynching*, and does not erase user data.

Some RAID levels must be initialized for best performance. (For specifics, see “Initialization of Different RAID Types” on page 149.) When these units are created in the BIOS (through 3BM), initialization begins immediately. This type of initialization is referred to as *foreground initialization*, because it is the primary task being performed on the system, before the operating system has loaded. **This process erases existing data**, by writing zeroes to all of the drives in the unit. You can elect to cancel foreground initialization, put the units into service, and have initialization run in the background, instead.

Foreground Versus Background Initialization

Initialization makes parity information valid. Foreground initialization does this by simply writing zeroes to all the drives so that they all have the same values, overwriting any existing data in the process. In contrast, background initialization uses an algorithm to resynch the parity information on the drives and does not rewrite existing data.

A foreground initialization is run from the BIOS using 3BM. It clears all existing data from the drives. Foreground initialization can take several hours, depending upon the size of the unit. After foreground initialization completes, you can start the operating system and units will perform at peak efficiency.

If immediate access to the unit is important, you can stop foreground initialization by pressing **Esc** and booting to the operating system. Background initialization will then start automatically within about 10 minutes. Background initialization (resynching) does not write zeroes to the drives or harm your data. You can partition, format, and use the unit safely while it is initializing. The unit is fully fault-tolerant while the initialization takes place. That is, if the unit degrades before the initialization is complete, the data will remain intact.

When initializing is done after booting to the operating system, the process of initializing takes longer than it does if initialization is done by writing zeroes to the unit in the BIOS. Consequently, it will be a longer period of time until the performance of the unit is fully optimal.

Although you can use the unit while it is being initialized in the background, initialization does slow I/O performance until completed. You can adjust how much initialization will slow performance by setting the rate at which it occurs. (See “Setting Background Task Rate” on page 160.) You can also

postpone initialization until a scheduled time. (See “Scheduling Background Tasks” on page 161).

Note: Units that do not need to be immediately initialized for full performance will be automatically initialized using background initialization when they are verified for the first time. (Verification requires that the units have been previously initialized.) This will not affect the data on the drives, and the units will perform normally, although performance will be slowed until the initialization and verification are completed.

Initialization of Different RAID Types

Information about initialization for each of the different RAID types is described below and summarized in Table 12 on page 150.

Initialization of RAID 0 Units

RAID 0 units do not need to be initialized and cannot be initialized. RAID 0 units are immediately available for use with full performance when created.

Initialization of RAID 5, RAID 6, and RAID 50 Units

RAID 5 and RAID 6 units will be automatically initialized the first time they are verified.

Regardless of the size, all 9000-series RAID 5, RAID 6, and RAID 50 units are fully fault tolerant upon creation. These configurations use a specialized scheme for writing to the unit, which does not have to be valid to provide fault tolerance.

Performance of RAID 6, RAID 5 units with 5 or more disks, and RAID 50 units with 2 subunits of 5 or 6 disks will improve after the unit has been initialized. For these configurations, initialization begins automatically after you create them. If you create them in the 3BM utility, zeroes are written to all unit members. If you create them through 3DM, RAID 5 parity is calculated and written to disk, keeping any data in the unit intact.

RAID 5 units with 3 or 4 disks do not need to be initialized to have full performance upon creation. Similarly, RAID 50 units with a grouping of 3 or 4 do not need to be initialized, however RAID 50 with a grouping of 6 do need to be initialized for full performance.

Notes:

For RAID 5 with more 5 or more drives, it is strongly recommended that you initialize the unit before using it. Initializing such a unit is critical to insuring data integrity on the unit.

For RAID 5 with 3 or 4 drives, initialization before use is not required. However, initialization is required before a unit can be verified. Consequently, if you attempt to verify a RAID 5 with 3 or 4 drives that has not yet been initialized, you will see a message that the array has not been initialized, and initialization will begin. This is considered part of normal operation of the unit.

Initialization of RAID 1 and RAID 10 Units

RAID 1 and RAID 10 units do not need to be initialized when they are created to be fault tolerant and are immediately available for use with full performance when created.

Initialization of RAID 1 or RAID 10 units will take place automatically the first time the unit is verified.

Initialization of a RAID 1 unit results in data from one disk (the disk on the lower port number) being copied to the other disk. In RAID 10 units, data from one half of the unit is copied to the other half.

After the initialization, subsequent verifies to a RAID 1 or RAID 10 unit check for data consistency by comparing the data from one drive (or set of drives) to the other drive (or set of drives).

Table 12: Initialization Requirements for Different RAID Configurations

Initialization Required for Highest Performance?	RAID Configurations
No	Single drive
No	RAID 0
No	RAID 1 RAID 10
No	RAID 5 with 3 or 4 disks RAID 50 with 6, 8, or 9 disks RAID 50 with 12 disks in 3 subunits of 4 RAID 50 with 12 disks in 4 subunits of 3 RAID 50 with 16 disks in 4 subunits of 4

Table 12: Initialization Requirements for Different RAID Configurations

Initialization Required for Highest Performance?	RAID Configurations
Yes	RAID 5 with 5 or more disks
	RAID 6
	RAID 50 with 10 disks in 2 subunits of 5
	RAID 50 with 12 disks in 2 subunits of 6

Background Initialization After Power Failure

The 3ware controller detects and handles power failures, using a mechanism that ensures that redundant units have consistent data and parity. When a redundant unit is unexpectedly shutdown, there is a possibility some data and parity may be inconsistent. If a unit or sub-unit of a redundant unit is detected to have been shutdown uncleanly, the unit or sub-unit will change its mode to either 'Initializing' or 'Verifying.'

When the initialization is complete, the unit is guaranteed to be redundant again. The initialization does not erase user data.

About Verification

The verify feature combines verification of redundant units (confirming the validity of the redundant data) and media scans for non-redundant units.

Verification can provide early warning of a disk drive problem or failure. This allows you to replace drives before they fail.

You can manually request a verify, or you can enable the Auto Verify policy, and the controller will automatically start verification once every 24 hours. (See "Starting a Verify Manually" on page 153 and "Setting Auto Verify for a Unit" on page 114.)

During verification, I/O continues normally, but with a slight performance loss, depending on your verify rate setting. You can adjust how much verification will slow performance by setting a rate at which it occurs. (See "Setting Background Task Rate" on page 160.) You can also postpone verification until a scheduled time. (See "Scheduling Background Tasks" on page 161.)

Note: Not verifying the unit periodically can lead to an unstable array unit and may cause data loss.

It is strongly recommended that you schedule a verify at least 1 time per week.

What Verification Does

For a RAID 1 or RAID 10 unit, a verify compares the data of one mirror with the other. For RAID 5, RAID 6, and RAID 50, a verify calculates parity and compares it to what is written on the disk drive.

Verification checks each sector on a drive. This is important, because day-to-day use of the media may leave many sectors on a drive unused or unchecked for long periods of time. This can result in errors occurring during user operation. Periodic verification of the media allows the disk drive firmware to take corrective actions on problem areas on the disk, minimizing the occurrence of uncorrectable read and write errors.

Verifies can be performed through either 3BM (BIOS) or through 3DM. In addition, they can be scheduled to run at preferred times, through 3DM or through the CLI, or can be run automatically during the Verify schedule window, if scheduling and the Auto Verify feature are enabled.

Verification of Non-Redundant Units

Verification of non-redundant units (single disks, JBODs, spares, and RAID 0 units) read each sector of a drive, sequentially. If a sector can't be read, it is flagged as unreadable, and the next time the controller writes to that location, the drive reallocates the data to a different sector.

Verification of Redundant Units

Verification of redundant units also reads each sector, working from lowest block to highest block. If verification cannot read data in a sector, dynamic sector repair is used to recover the lost data from the redundant drive or drives; this recovered data is written to the problem sector. This forces the drive to reallocate the defective sector with a good spare sector.

If the verify unit process determines that the mirrored drives are not identical or the parity is not correct, the error is corrected. For RAID 1 and 10, this involves copying the miscompared data from the lower port(s) to the higher port(s) of the mirror. For RAID 5, RAID 6, and RAID 50, this involves recalculating and rewriting the parity that was incorrect. AEN 36 ("Verify detected and fixed data/parity mismatch") is posted to the Alarms page.

For RAID 1 and 10, verification involves copying the data from the lower port(s) to the higher port(s) of the mirror. For RAID 5 and RAID 50, this involves recalculating and rewriting the parity for the entire unit. If the unit is not redundant, a file-system check is recommended to correct the issue. If the errors persist and cannot be overwritten from a backup copy, perform a final incremental backup. You will need to replace the defective drive, recreate the unit, and reinstall the data.

How Errors Are Handled

Verification makes use of the same error checking and error repair techniques used during ordinary use of drives configured through 3ware RAID controllers.

When verification encounters an error, the controller typically retries the command. If there are cable CRC errors, there may be multiple retries including downgrade of the UDMA mode. If the error persists and is unrepairable (e.g., ECC errors), an error notification is issued to indicate the problem. (See AEN “0026 Drive ECC error reported” on page 233.)

If the disk drive is part of a redundant unit that is in a redundant state (not degraded or rebuilding), then Dynamic Sector Repair automatically rewrites the redundant data to the error location to force the drive to reallocate the error location. A notification of repair is posted to the alarms list. The result is a restoration of drive and data integrity; the primary and redundant data are again both valid.

If the unit is not redundant, it is recommended that you perform a file-system check to correct the issue. Under Windows, you can do this by right-clicking on the Drive and choosing Properties; then on the Tools tab, click Check Now. If the errors persist and cannot be overwritten from a backup copy, perform a final incremental backup. You will need to replace the defective drive, recreate the array, and reinstall the data.

Starting a Verify Manually

Verification of units can be done automatically, on a schedule, or can be started manually, as described below. (See “Setting Auto Verify for a Unit” on page 114 and “Scheduling Background Tasks” on page 161.)

Note: If the unit has not previously been initialized and you manually select **Verify Unit** in either 3BM or 3DM, the initialization process starts.

You can manually start a verify through either 3DM or 3BM.

To verify a unit through 3DM

1 In 3DM, choose **Management > Maintenance**.

2 In the **Unit Maintenance** section of the Maintenance page, select the unit you want to verify and click **Verify Unit**.

3DM puts the selected unit in verifying mode. If verify scheduling is not enabled on the Scheduling page, the verification process begins almost immediately. If verify scheduling is enabled, the unit will not start actively verifying until the next scheduled time.

A **Stop Verify** link appears next to the unit on the Maintenance page. If you need to stop the verify process, use this link. (If initialization starts because the unit had not previously been initialized, it cannot be halted, so no **Stop Verify** link appears.)

To verify a unit through 3BM

1 At the main 3BM screen, select the unit by highlighting it and pressing **Enter**.

An asterisk appears in the left-most column to indicate that it is selected.

2 **Tab** to the **Maintain Unit** button and press **Enter**.

3 On the pop-up menu, select **Verify** and press **Enter**.

Verification of the selected unit starts immediately.

Figure 64. Verifying a Unit

Notes:

If a unit that requires initialization has not previously been initialized, selecting Verify Unit starts initialization. This is because fault-tolerant units cannot be verified until after they are initialized.

If the unit is already in a state of rebuild, initialization, or verification, the unit cannot be verified in 3BM. You must boot the system and let the task finish in the background.

Rebuilding Units

Rebuilding is the process of generating data on a new drive after it is put into service to replace a failed drive in a fault tolerant unit.

If a hot spare is specified and a redundant unit degrades, it will be used to automatically replace the failed drive in the redundant unit without intervention on your part. The rebuild process will automatically be launched as a background process at the next scheduled time. If scheduling is turned off, the rebuild process will start almost immediately (within a couple of minutes). If 3DM is running and E-mail notification is enabled, an event notification will be sent to specified users when the unit degrades and again when the rebuild process is complete.

If the Auto Rebuild policy is enabled (see “Setting the Auto Rebuild Policy” on page 90), the firmware will attempt to rebuild a degraded unit with an available drive or a failed drive.

If desired, you can manually replace the drive, rescan the controller, and start the rebuild process. Manual rebuilds can be started from either 3BM or 3DM, although the rebuild itself only happens when the operating system is running.

Rebuilds on multiple units can take place simultaneously.

If multiple drives are faulted in a RAID 10 configuration, the drives are rebuilt simultaneously. In a 4-drive RAID 10 configuration, up to two drives can be rebuilt. In a 6-drive configuration, up to three drives can be rebuilt. In an 8-drive configuration, up to four drives can be rebuilt. In a 12-drive configuration, up to six drives can be rebuilt.

Note: If both drives in a RAID 10 mirrored set are faulted, the data is not recoverable. Up to half of the drives in a RAID 10 unit can become defective and still have the user data retained, as long as the failed drives are only half of each mirrored pair.

A RAID 5 unit can have one drive fail before becoming inoperable.

A RAID 50 unit can sustain multiple drive failures, as long there is only one failed drive in each RAID 5 set.

A RAID 6 unit can have two simultaneous drive failures, before becoming inoperable.

When a RAID 5 or RAID 6 is running in Degraded mode and you rebuild it, the missing data is reconstructed from all functioning drives.

Note: If a rebuild fails, check the Alarms page for the reason. If there was an ECC error on the source disk, you can force the rebuild to continue by checking the Overwrite ECC Error policy on the Controller Settings page in 3DM and then running Rebuild again. This will cause uncorrectable blocks to be rewritten, but the data may be incorrect. It is recommended that you execute a file system check when the rebuild completes. Under Windows, you can do this by right-clicking on the Drive and choosing **Properties**; then on the **Tools** tab, click **Check Now**.

Rebuilding a Unit Through 3DM

When a drive on a unit becomes defective, you replace it with an available drive and then rebuild the unit. For units on 9550SX, 9590SE, and 9650SE controllers, if Auto Rebuild is enabled and a drive is available, starting the rebuild is optional as it will start automatically.

To rebuild a unit through 3DM

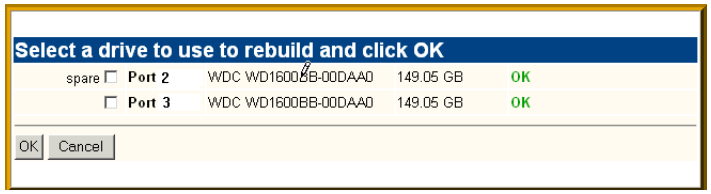
1 If necessary, add a new drive to replace the failed drive. (For details, see “Adding a Drive” on page 134.)

2 In 3DM, choose **Management > Maintenance**.

3 In the **Unit Maintenance** section of the Maintenance page, select the degraded unit and click the **Rebuild Unit** button.

4 When a dialog box displays available drives, select the drive you want to replace the failed drive and click **OK.**

Figure 65. Selecting a Drive when Rebuilding



5 If the degraded unit has more than one failed drive (for example, a RAID 10 where both mirrored pairs each have a failed drive), repeat step 3 and step 4 to select another drive.

If rebuild scheduling is not enabled on the **Scheduling** page, the rebuild process begins almost immediately in the background. If rebuild scheduling is enabled, the unit will not start actively rebuilding until the next scheduled time.

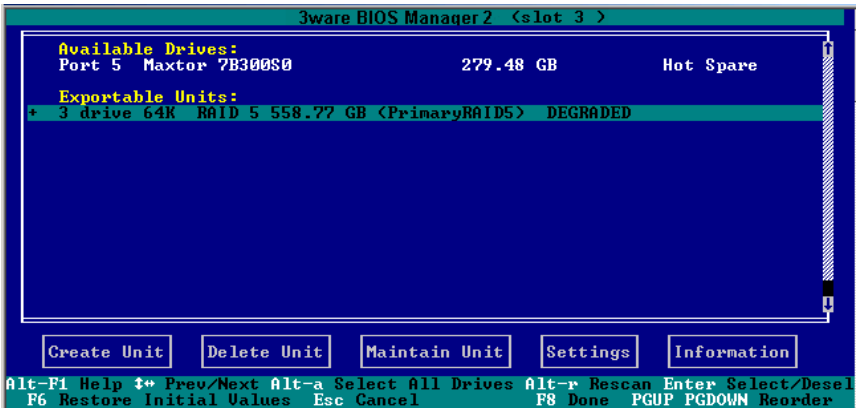
Note: If you need to cancel a rebuild, you can do so by using the **Remove Drive** link on the Maintenance page to remove the drive from the unit.

Rebuilding Units through 3BM

When a RAID unit becomes degraded, it is marked as such, and the drive(s) that failed are marked as **Not In Use** in the 3BM screens.

Figure 66, shows an example of how a degraded RAID 5 unit appears in 3BM.

Figure 66. Degraded RAID 5 Array to be Rebuilt



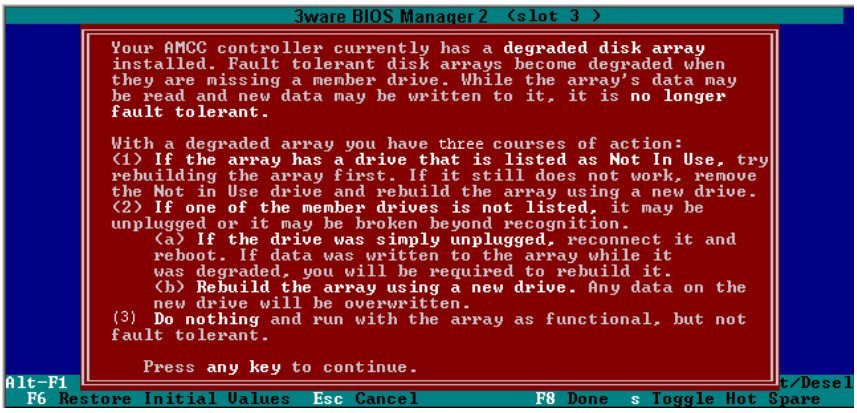
You can start the rebuild of a degraded unit manually in 3BM, or you can let the system boot and allow the rebuild to take place automatically.

To start the rebuild of a unit through 3BM

1 Reboot the system and start 3BM.

A red message box informs you that the unit is degraded, and suggests some possible approaches. Figure 67 shows an example of a degraded-array message.

Figure 67. Degraded Disk Array Warning Message



2 Press a key to continue.

3 If your degraded unit has a drive indicated as **Not in Use**, the drive may still be usable. Try rebuilding with the **Not in Use** drive intact. Simply select the unit (highlight it and press **Enter**) and then select the **Rebuild Unit** button.

4 When the **Rebuild** confirmation screen appears, confirm that you selected the correct unit by selecting **OK**.

5 Press **F8** to save your changes and exit 3BM**.** The unit will begin rebuilding after the operating system finishes loading.

If the rebuild fails and you have no available drives, do one of the following:

- If your system has hot-swap carriers, you can replace the failed or **Not In Use** drive and rescan (Alt-R) the unit.
- If your system does not have hot-swap carriers, power down the system and replace the failed or **Not In Use** drive. Then power on the system and restart 3BM.

Then follow these steps:

1 At the main 3BM screen, highlight an available drive to replace the faulted drive and press **Enter** to select it.

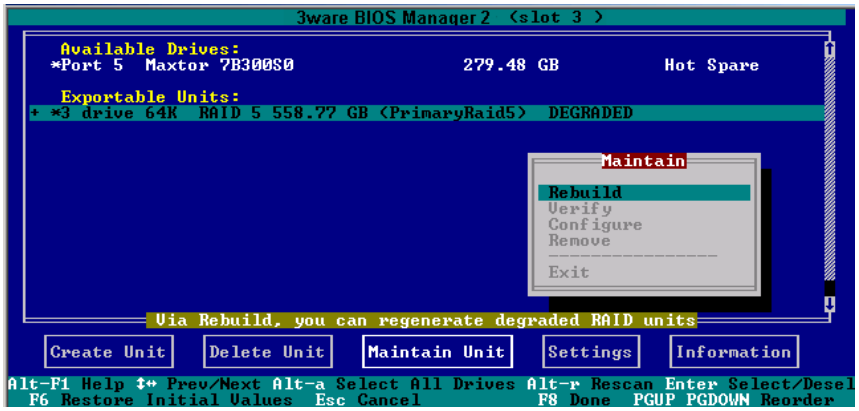
An asterisk appears in the left most column to indicate the drive is selected.

2 Press **Tab** to select the degraded unit and press **Enter** to select it.

3 **Tab** to the **Maintain Unit** button and press **Enter**.

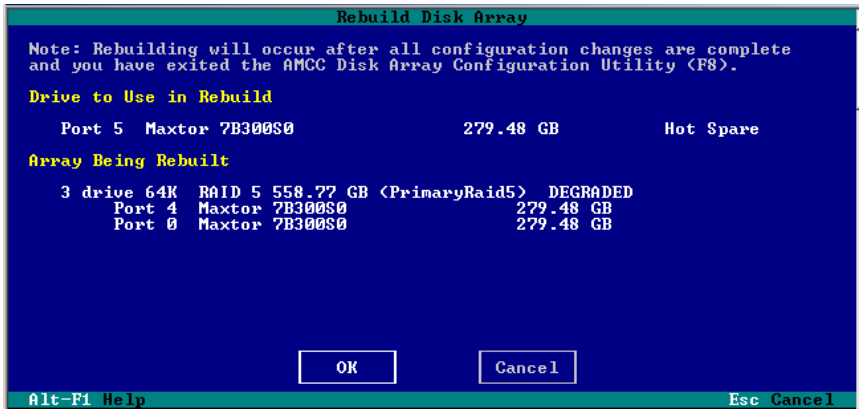
4 Select **Rebuild** from the pop-up menu and press **Enter**.

Figure 68. Rebuild Option on the Maintain Menu



The Rebuild Disk Array screen displays.

Figure 69. Rebuild Disk Array Screen



5 Press **Enter** to select the **OK** button to continue.

You are returned to the main screen; “Rebuilding” appears next to the unit you selected.

6 Press **F8** to save your changes and exit 3BM**.**

The unit will begin rebuilding about ten minutes after the operating system finishes loading and the 3ware driver has loaded.

Cancelling a Rebuild and Restarting It with a Different Drive

When you start a rebuild from 3BM, you cannot cancel from within the 3BM interface. However, if you have hot-swap carriers, you can remove and replace the drive, rescan the controller (Alt-R), and then select a new drive to be used in the rebuild. You can also boot the operating system, launch 3DM,

and cancel a rebuild by using the **Remove Drive** link on the Maintenance page.

If you do not have hot-swap carriers and do not want to boot the operating system and launch 3DM, you can also cancel a rebuild by powering down the system, physically removing a drive, and installing another one that you want to use. Then when you start 3BM, the unit will appear as degraded and you can rebuild it, using the steps described under “Rebuilding Units through 3BM” on page 157.

Note: If you want to pause the rebuild process through 3DM, you can do so by setting or changing the rebuild schedule on the Scheduling page. If you set a schedule for rebuilds that does not include the current time, the rebuild process will pause.

Setting Background Task Rate

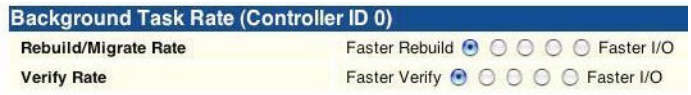
In 3DM, you can set the relative performance of background tasks (initializing, rebuilding/migrating, and verifying) in relation to normal I/O activity (reading and writing to disk).

Controllers can have separate settings for Rebuild/Migrate Rate and Verify Rate. (Initialization occurs at the Rebuild rate.)

To change the background task rate

1 Choose **Management > Controller Settings** from the menu bar.

2 In the **Background Task Rate** section of the Controller Settings page, select one of the five radio buttons to indicate the relative task rate for Rebuild and Verify Tasks.



The furthest left buttons set the firmware to the fastest rebuild and verify settings. This means that maximum processing time will be given to rebuilds or verifies rather than I/O. The furthest right buttons set the firmware to the slowest rebuild and verify settings, giving maximum processing time to I/O.

After you select one of the radio buttons, the page refreshes, and a message at the top confirms the change you have made.

Background Task Prioritization

Although migration tasks follow the same schedule as rebuild and initialization tasks, they are always given the highest priority because of the controller and disk resources required during migration.

Once a unit is put into the migration state, it must be allowed to complete the process. While migrating, rebuilds or verifies to the unit are not permitted.

Rebuilding preempts verify operations. If a unit requires rebuilding, that process will take place before the unit is verified.

Controllers can work on multiple units at the same time. This means that if you have both a redundant unit and a non-redundant unit, the verification of the redundant unit and the media scan of the non-redundant unit will occur at the same time.

Scheduling Background Tasks

You can set up scheduling windows for when background tasks occur so that routine maintenance of storage media occurs when it will be least likely to interfere with day-to-day work on the system (peak I/O times). By creating and using schedules, you can specify when active rebuilding, migrating, verifying, and testing of units should occur. For example, you might these tasks to occur at 2AM each day, or on weekends.

The initial schedule setting is to “Ignore Schedule.” This allows the controller firmware to automatically initiate background tasks.

Note: Initialization follows the rebuild/migrate schedule.

Rebuild/migrate, verify, and self-test tasks are scheduled separately, but in a very similar way. You can perform the following scheduling tasks:

- Viewing Current Task Schedules
- Turning On or Off Use of a Task Schedule
- Removing a Task Schedule
- Adding a New Task Schedule Slot
- Selecting Self-tests to be Performed

Tip: If you want to change a task schedule window, you first remove the schedule item and then add it back with the desired day, time, and duration.

Note: Setting up the scheduling window does not actually request background tasks. It simply specifies when they can run. For more information about the background tasks themselves, see “Background Tasks” on page 147.

You can also set the rate at which background tasks are performed compared to I/O tasks. For more information, see “Setting Background Task Rate” on page 160.

Scheduled Task Duration

If a rebuild completes within a scheduling window, it will not start over at the next scheduled time block, unless another rebuild is required.

If a rebuild does not complete in the scheduled time block, it will continue where it left off at the next scheduled time block.

Similarly, if a verify operation does not complete in the scheduled time block, it will continue where it left off at the next scheduled time block.

Viewing Current Task Schedules

You can see the current schedules for background tasks on the **Scheduling** page.

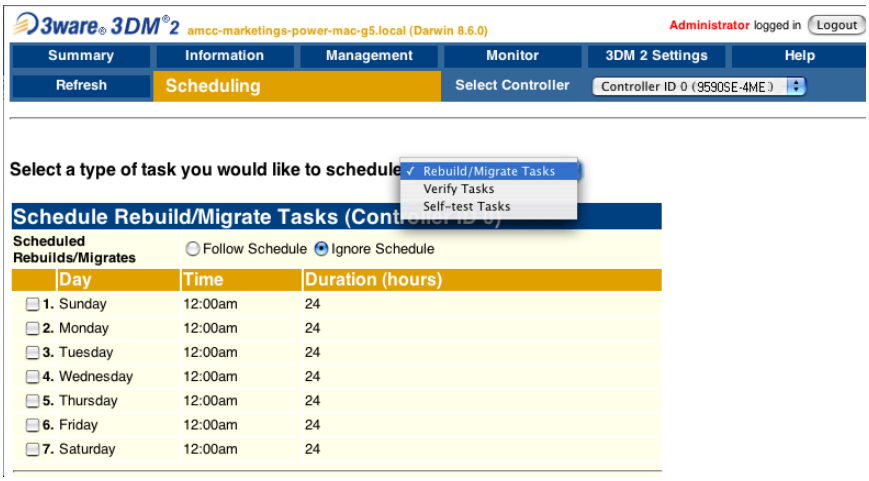
To view the current task schedule

1 Choose **Management > Schedule** from the menu bar.

The Scheduling page appears, showing the schedule for Rebuild Tasks. (Migration and initialization tasks follow the Rebuild Task schedule.)

2 To view Verify Tasks or Self-test Tasks, select it from the drop-down list at the top of the page.

Figure 70. Selecting Task Schedules to View



Turning On or Off Use of a Task Schedule

Turning on the schedule for Rebuild/Migrate and Verify tasks forces rebuilds, migrates, and verifies to be performed only during the time specified by the schedule. If the schedule is not turned on, rebuilds, migration, initialization, and verify can happen whenever they are required or are manually started.

There may be times when you want to disable scheduled rebuild/migrate or verify tasks, so that you can rebuild, migrate, or verify a unit right away, without waiting for the next scheduled time. In this case, you can disable the schedule, as described below.

Note: When you first use 3DM, daily schedules exist with 24 hour duration—that is, the schedule is for “all the time.” Until you change these 24-hour daily schedule, enabling the schedule will not have any direct effect.

You can easily disable a current Verify or Rebuild/Migrate schedule without deleting the schedule itself.

To turn on or off use of the current Verify or Rebuild task schedule

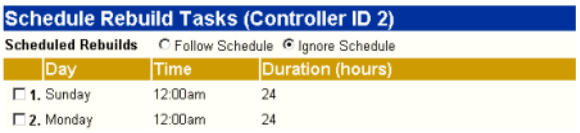
1 Choose **Management > Schedule** from the menu bar.

The Scheduling page appears, showing the schedule for Rebuild/Migrate Tasks.

2 To view Verify Tasks, select it from the drop-down list at the top of the page.

3 In the Schedule Rebuild Tasks section, select the appropriate setting: **Follow Schedule** or **Ignore Schedule**.

The illustration below shows this setting for the rebuild task schedule.



Note: Self-test schedules cannot be turned off in this way. To disable self-tests you must either remove all schedule times, or uncheck the tests listed in the **Tasks** column. For more information, see “Selecting Self-tests to be Performed” on page 165.

Removing a Task Schedule

By default, daily task schedules are defined, each starting at 12:00 am and running for 24 hours.

A maximum of seven schedules can be defined. When seven schedules are shown for any of the tasks, you must remove a schedule before you can add another.

To remove a task schedule

1 Choose **Management > Schedule** from the menu bar.

The Scheduling page appears, showing the schedule for Rebuild/Migrate Tasks.

2 To view Verify Tasks or Self-test Tasks, select it from the drop-down list at the top of the page.

3 Select the checkbox next to the schedule(s) you want to remove.

4 Click the **Remove Checked** button.

The page refreshes, and the selected schedule(s) are removed. You can now add another schedule.

Adding a New Task Schedule Slot

When you add a rebuild/migrate or verify task schedule, you specify the day of the week, time, and duration for the task. For self-test schedules, you specify day and time, but not duration. (Duration is not required for self-tests.)

Depending on the schedule and system workload, background tasks may require more than one scheduled duration to complete.

To add a task schedule slot

1 Choose **Management > Schedule** from the menu bar.

The Scheduling page appears, showing the schedule for Rebuild/Migrate Tasks.

2 To view Verify Tasks or Self-test Tasks, select it from the drop-down list at the top of the page.

3 Scroll to the section of the Scheduling page that shows the task you want to add.

4 In the fields at the bottom of the section, select the Day, Time, and Duration for the task.

5 Click the **Add New Slot** button.

The page refreshes and the new schedule is added to the list.

Note: The scheduled tasks can be added in any order. For example a new task scheduled for Tuesday (slot-2) will preempt the task originally scheduled for Wednesday (slot-1).

Selecting Self-tests to be Performed

Two self-tests can be set: one to check whether UDMA Mode can be upgraded, and another to check whether SMART thresholds have been exceeded. (For more information about these self-tests, see the 3DM Reference section, “Scheduling page” on page 201.)

Initially, these tests are set to run every 24 hours. You can change the schedule for when they are run, and you can disable the tests, if you prefer not have to have them performed.

Note: These tasks will only be run during scheduled times if they are checked in the **Schedule Self-tests** section of the Scheduling page. If neither of the tasks is checked, self-tests will never run, even if you have scheduled time slots set.

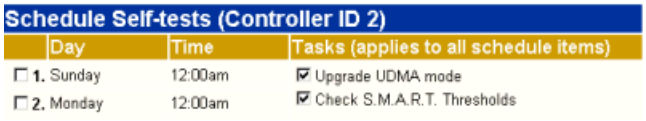
To select self-tests to be performed

1 Choose **Management > Schedule** from the menu bar.

The Scheduling page appears, showing the schedule for Rebuild Tasks.

2 Select Self-test Tasks from the drop-down list at the top of the page.

3 Check the boxes next to the self-tests you want to be performed.



To disable self-tests

Unlike scheduling of rebuilds and verifies, scheduling of self-tests is always enabled.

To disable self-tests you must either remove all schedule times, or uncheck the tests listed in the **Tasks** column.

Locating a Drive by Blinking Its LED

You can easily identify the drives in a unit, or an individual drive, by causing the LEDs associated with the drives to blink.

When you have drives installed in an enclosure that has an integrated AMCC/3ware CCU (chassis control unit) and have connected the I^2C (chassis control) connector on the 3ware RAID controller to the chassis, you can locate individual drives by blinking their associated LED.

Note: Drive Locate is supported by some chassis vendors. This feature requires a chassis with a Chassis Control Unit (CCU) designed according to AMCC/3ware specifications. Check the 3ware support web site for future updates on a list of chassis vendors that support the CCU, as they become available.

You can issue the command to blink the LED through 3DM.

(For details about what the different LED patterns on the enclosure mean, see “Enclosure LED Status Indicators” on page 140.)

To blink the LED for a drive

1 Do one of the following:

- Choose **Information > Drive Information** from the main menu in 3DM. On the Drive Information page, identify the drive you want to physically locate.
- Choose **Monitor > Enclosure** from the main menu in 3DM. On the list of enclosures, click the ID number of the enclosure. On the Enclosure Detail page, identify the drive you want to physically locate.

2 Check the box in the **Identify** column.

The LED on the enclosure begins blinking.

3 When you are finished working with the drive and no longer need to see the LED, return to this page and uncheck the **Identify** box.

To blink the LEDs for all drives in a unit

1 Choose from the main menu in 3DM.

2 On the list of units, locate the unit you want to identify.

3 Check the box in the **Identify** column.

The LEDs associated with each drive in the unit begin blinking on the enclosure.

10

Maintaining Your Controller

This section contains instructions for how to perform tasks that help you maintain your controller, including:

- Determining the Current Version of Your 3ware Driver
- Updating the Driver and Firmware
- Viewing Battery Information
- Testing Battery Capacity

Determining the Current Version of Your 3ware Driver

You can view controller and driver information in several different ways:

- Using 3DM 2 you can see both the driver and firmware versions (see the “Controller Summary page” on page 190)
- Using 3BM you can see the firmware version (see “Displaying Controller Information” on page 65)
- Using the CLI you can see both the driver and firmware versions (see *3ware Serial ATA RAID Controller CLI Guide*)

Under Linux, you can also type the following command if you have a 2.4 kernel or earlier:

```
cat /proc/scsi/3w-9xxx/0*
```

where the asterisk (*) represents controller number and “9xxx” represents the version of the controller. For example:

```
cat /proc/scsi/3w-9xxx/0
```

If you have a 2.6 kernels with sysfs, type the following command:

```
cat /sys/class/scsi_host/<hostid>/stats
```

where <hostid> is usually host0, unless other SCSI devices are available, in which case it may be host1 or higher.

If you have a 2.6 kernel without sysfs, type the following command:

```
dmesg | grep 3w
```

(dmesg can also be used with earlier kernel versions.)

Under Windows, you can follow the first 5steps under “Updating the 3ware Driver Under Windows XP” on page 176.

Updating the Driver and Firmware

You can download the latest drivers and firmware from the 3ware website, at http://www.3ware.com/support.

Note: Information in this section applies to updating drivers and firmware for the 9550SX, 9590SE, and 9650SE controllers. The 3ware website also allows you to download drivers for other 3ware controller models and associated release notes.

For Windows, the firmware and driver can be installed from the same download. When you run the utility, you can choose to update both the driver and the firmware, or only the driver.

For Linux and FreeBSD, updating the driver and updating the firmware are done separately. You can download them individually from the website.

Note: For Linux, do not use the driver from the external Linux distribution as it is older than the currently supported driver. Instead, use the driver from the 3ware CD or from the 3ware web site.

To download the driver or firmware

1. On the 3ware website (www.3ware.com), navigate to **Service and Support > Software Downloads**.
2. Click **Download Released Software**.
3. Select the product and release desired.
4. Select Driver or Firmware (as appropriate) as the item to download.
5. Select the Operating System you are using.
6. Click **Next**.
7. When details about the download you requested appear, click the link for the item you want to download.

Depending on the item you selected, you may see either .zip (for Windows) or .tgz (for Linux/FreeBSD) files to download.

Note: If using Winzip or another Windows utility to extract the Linux file, use the .zip version instead of the .tgz version. Otherwise the files will not be compatible with Linux.

8 Read and agree to the license agreement that appears.

9 Click **Save** to save the file to disk.

10 Uncompress the file to extract the driver or firmware files to a local directory or a diskette.

(Make note of the absolute path to the local directory.)

11 Turn to the driver section for your operating system, below:

- Windows, on page 176
- RedHat Linux, on page 181
- SuSE Linux, on page 183
- FreeBSD, on page 184
- Updating the firmware for Linux or FreeBSD, page 185

To make a driver diskette

If you want to create a driver diskette, extract the driver files to a floppy in step 9 above. Refer to the user manual for your operating system for more details.

Updating the 3ware Driver and Firmware Under Windows

You can update both the driver and the firmware under Windows, using the utility 3wUpdate.exe. This utility is included with the driver files when you download them.

If you only need to update the driver, you can either use the update utility as described below, or you can update it through the Windows Device Manager, as described under “Updating the 3ware Driver Under Windows XP” on page 176.

When you use the update utility, you bypass the device driver screens that you see when you update just the driver through Windows Device Manager.

Note: At the end of this process, you may need to restart the system. Restarting is always required if you update the firmware. In addition, if you boot from a unit on a 3ware RAID controller, updating the driver will require that you restart the system.

To update the 3ware driver and firmware using the update utility

1 Download and extract the driver files, as described under “Updating the Driver and Firmware” on page 169.

2 Backup any critical data prior to updating the 3ware driver.

3 Log in to your system as system administrator.

4 Locate the folder that contains the driver files you extracted in step 1.

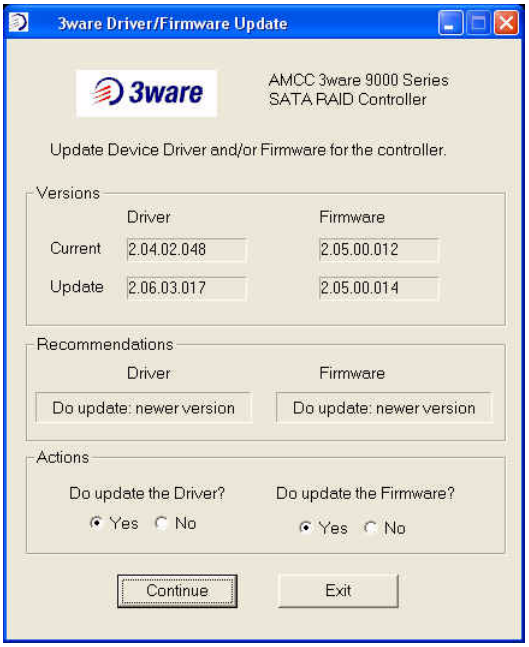
5 Double-click on the file `3wUpdate.exe`.

You see a progress dialog box while the update utility checks your system for the driver and firmware versions presently installed.

Figure 71. Update Utility Progress Dialog (System Check)

When the 3ware Driver/Firmware Update dialog box appears, it shows available updates for the device driver and for the firmware.

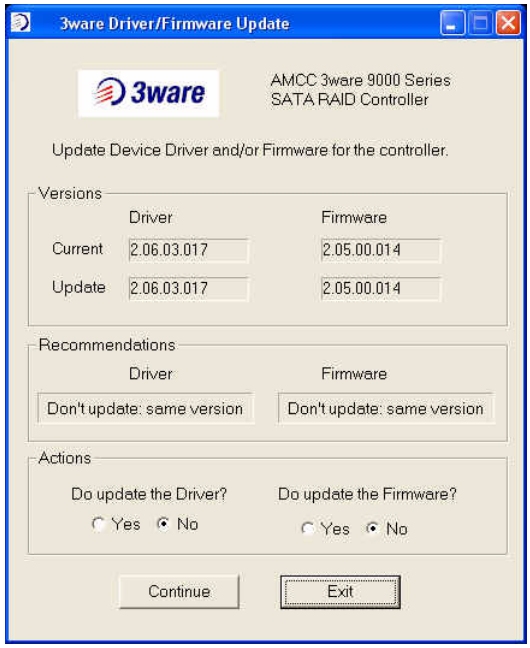
Figure 72. Update Utility Showing Available Drivers



The updater tells you whether newer updates are available, and makes recommendations for whether you should update.

If either your driver or firmware is current, the screen reflects that.

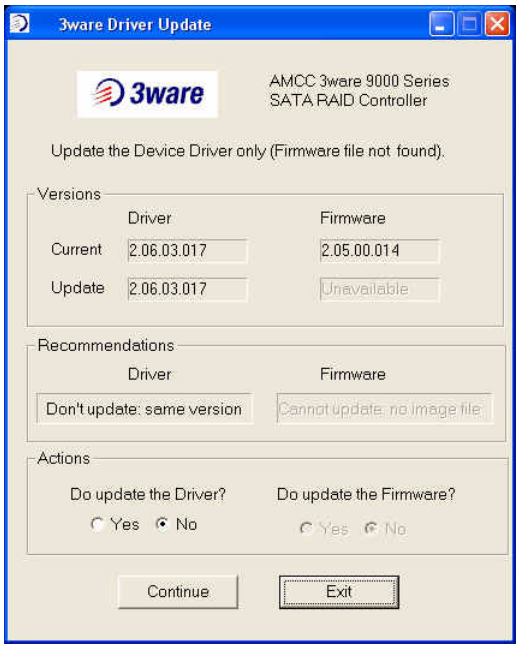
Figure 73. Update Utility Showing Drivers Already Current



In this example, both the driver and firmware are already current on the system, so the recommendation is not to update either one.

If the firmware image is not found with the driver files, the 3ware Driver/ Firmware Update dialog box will show only the driver as available.

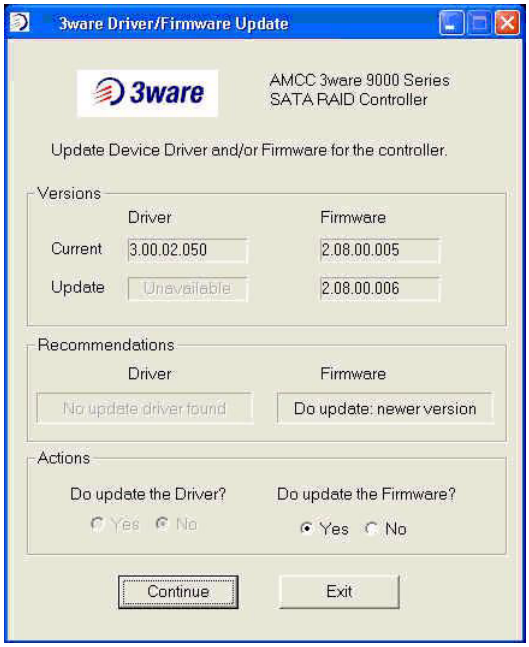
Figure 74. Update Utility Showing Only Driver Available



Only the driver is available, because the firmware image was not found.

If the driver is not found, the 3ware Driver/Firmware Update dialog box will show only the firmware as available.

Figure 75. Update Utility Showing Only Firmware Available



Only the firmware is available, because the driver image was not found.

Note: If you have multiple controllers in your system, your screen will look slightly different, so that you can update the firmware for one or all controllers. For details, see “Using the Update Utility With Multiple Controllers” on page 175

6 In the Action section of the dialog, make any changes to what will be updated and click **Continue** to install your selections.

During the update, the driver installs on your local drive. The firmware will first download and then will flash a new image to the controller.

You will see either one or two progress dialog boxes, depending on what is being installed. Progress is shown during:

- Driver installation
- Firmware download and flashing of the controller

Warning: Do not power off the system while the firmware is being flashed. Doing so will render the controller unusable.

7 If a dialog box prompts you to restart your computer, click **Yes** to do so.

(If you were working from a driver diskette, be sure to remove the floppy diskette before Windows reboots.)

8 If the driver you are installing is unsigned, you will receive a message to that effect.

To complete the installation with an unsigned driver, click **OK**.

9 If a final message box confirms that the process is complete, click **OK**.

(This message appears if you do not need to restart your computer.)

Using the Update Utility With Multiple Controllers

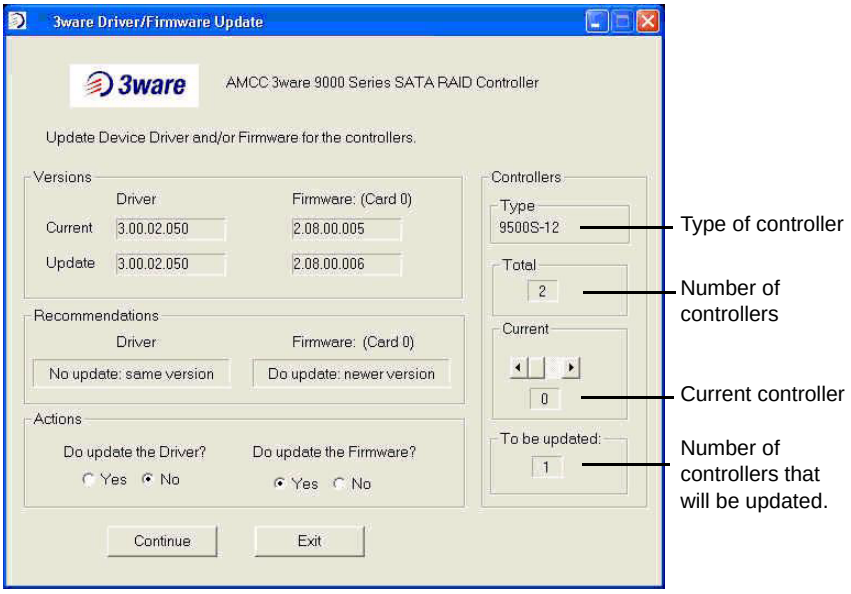
When your system has multiple 3ware RAID controllers installed, the update utility lets you update the firmware on any or all of the installed controllers.

To update the firmware on multiple controllers

1 Follow steps 1 through 5 above, under “Updating the 3ware Driver and Firmware Under Windows” on page 170.

When the 3ware Driver/Firmware Update dialog box appears, it lists the number of controllers in your system, shows available updates for the device driver, and available firmware updates for the first controller.

Figure 76. Show Update Utility Showing Available Drivers



2 Use the scroll arrows under “Current” Controller to see firmware recommendations for each controller on your system.

3 For each controller, review the option for whether the firmware should be updated, and change it if appropriate.

4 Continue with step 6 above, in the procedure “Updating the 3ware Driver and Firmware Under Windows.”

Updating the 3ware Driver Under Windows XP

If you prefer, you can update the 3ware driver through the Windows Device Driver Manager, instead of using the Update Utility described above.

To update the 3ware driver under Windows XP

(Note that during this process, you will step through driver installation wizards twice.)

1 Download and extract the driver files, as described under “Updating the Driver and Firmware” on page 169.

2 Backup any critical data prior to updating the 3ware driver.

3 Log in to your system as system administrator.

4 From the **Start** menu, open the **Control Panel** window.

5 In the **Control Panel** window, double-click on the **System** icon.

6 Click on the **Hardware** tab and then click on the **Device Manager** tab.

7 Open the **SCSI and RAID Controllers** selection.

8 Locate and double-click on the applicable **3ware Serial ATA RAID Controller**. The **3ware 9000 Series ATA RAID Controller Properties** dialog box appears.

9 Click the **Driver** tab.

Figure 77. 3ware Serial ATA RAID Controller Properties Dialog

10 Click the **Update Driver…** button.

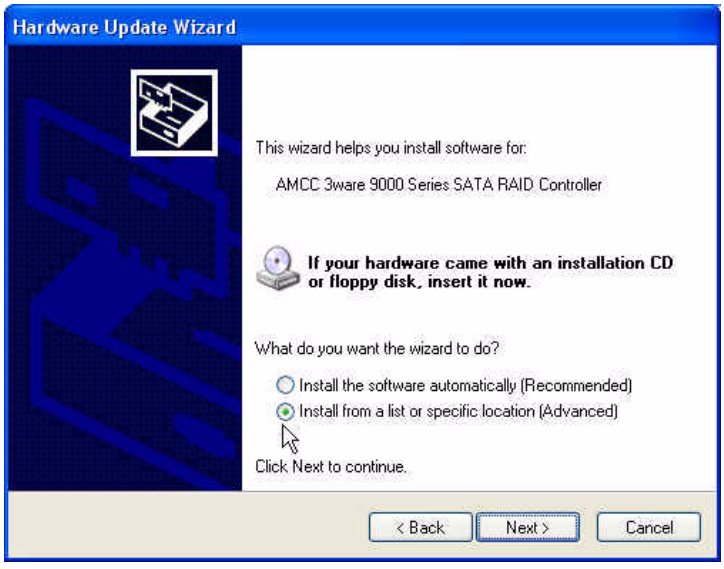
11 If your system has Windows XP Service Pack 2, the first screen asks whether you want to connect to Windows Update.

Select “No, not this time” and click **Next**.

Figure 78. Windows XP Service Pack 2 Windows Update Query

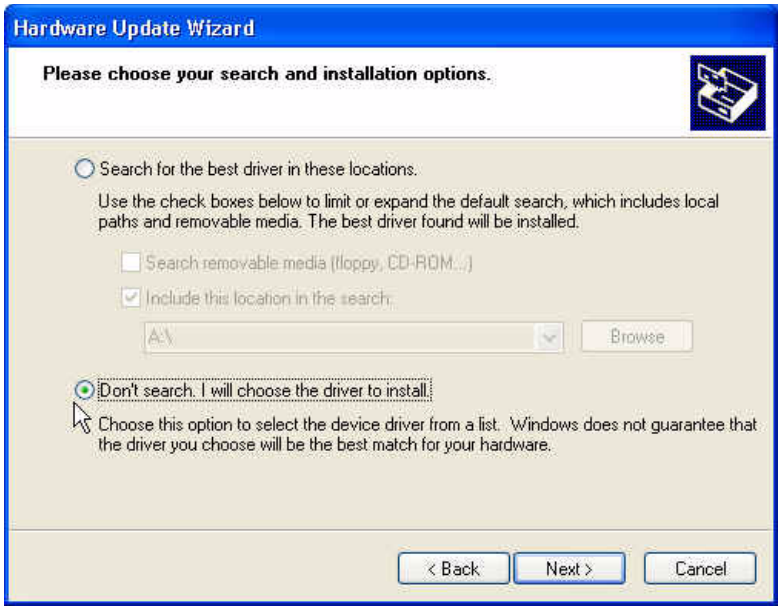
12 When you reach the **Hardware Update Wizard** screen shown below, select “Install from a list or specific location (Advanced)” and then click **Next**.

Figure 79. Upgrade/Install Device Driver Wizard



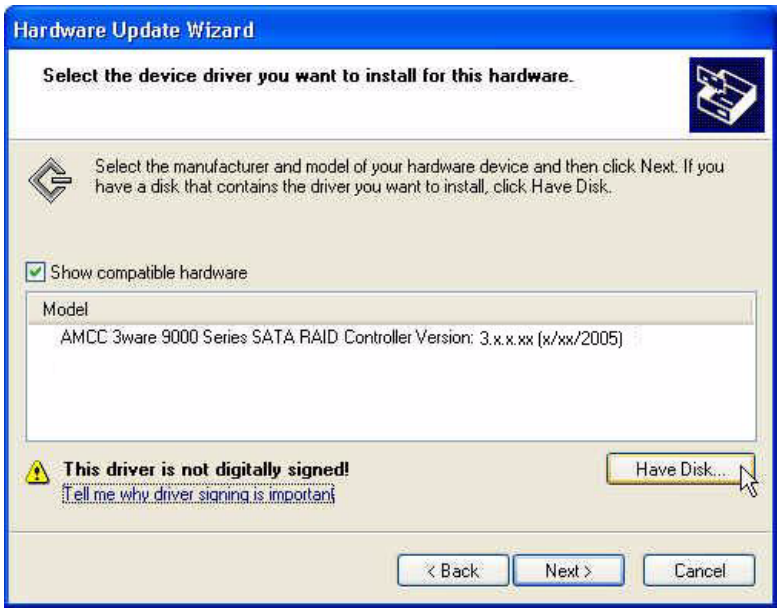
13 At the next screen (Figure 80) choose “Don’t search. I will choose the driver to install” and click **Next**.

Figure 80. Search for Driver Screen



14 When the **Select the Device Driver** screen appears (Figure 81), click the **Have Disk…** button.

Figure 81. Select the Device Driver Screen



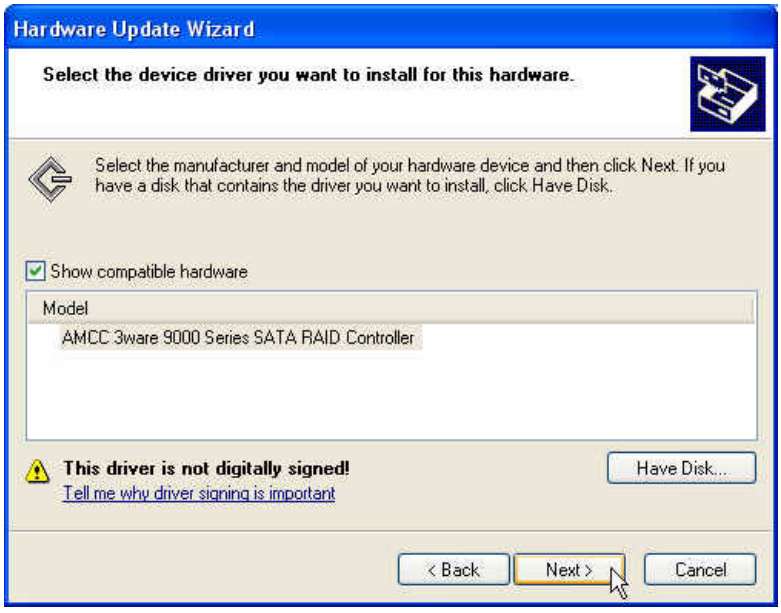
15 When the **Install from Disk** dialog box appears (Figure 82), enter the correct path name to the driver. If you created a driver diskette, insert it now. (The path will be A: if you are using a diskette in the A drive.)

Figure 82. Install From Disk Dialog Box

16 When the **Select the Device Driver** dialog box reappears, select the appropriate driver (Figure 83) and click **Next**.

Be sure to select the correct driver name, otherwise the driver upgrade will not be successful.

Figure 83. Select a Device Driver



The wizard begins installing the driver. You will see a progress box during installation.

17 If the **Digital Signature Not Found** screen appears, click **Yes** to continue and follow the instructions to complete the driver installation.

18 When the **Completing the Hardware Update Wizard** screen appears, click **Finish**.

19 If you are prompted to restart the system, do so.

Shortly after clicking **Finish**, or after the machine reboots, the first screen of the Hardware Update Wizard appears again, informing you that Windows has found new hardware.

If you are using Windows XP Service Pack 2, the screen asks whether you want to connect to Windows Update (Figure 84).

Figure 84. Found New Hardware Screen

20 Choose “No, not this time” and click **Next**.

At the next screen, leave the selection as “Install the software automatically.” Click **Next** and follow the prompts on the screen.

21 When the second **Completing the Found New Hardware** screen appears, click **Finish**.

Figure 85. Completing Found New Hardware Wizard

Updating the 3ware Driver Under Red Hat or Fedora Core

The following steps describe how to update the 3ware driver under Red Hat.

Note: Pre-compiled, tested, and supported drivers are no longer available for older RedHat or Fedora Core releases using the 2.4 kernel. The source code is still available (for a limited time) if a newer driver is still needed. Check the release notes for more details regarding supported operating systems

To update the 3ware driver under Red Hat

1 Download and extract the driver, as described under “Updating the Driver and Firmware” on page 169.

2 Backup any critical data prior to updating the 3ware driver.

3 Change the directory to the location with the extracted driver.

4 Copy the files to the appropriate directory.

(In the commands below, replace <version> with the applicable Red Hat or Fedora Core version, such as ws4_u4 or fc5, and replace <kernel> with the applicable kernel, for example 2.6.15-x)

Note: The name of the module you will copy (`3w-9xxx.*`) varies, depending on the kernel; however you will always copy it to a file named 3w-9xxx.o for 2.4 kernels, or 3w-9xxx.ko for 2.6 kernels

For Red Hat or Fedora Core Uniprocessor
`cp <version>/3w-9xxx.o /lib/modules/<kernel>/drivers/scsi/3w-9xxx.o`

For Red Hat SMP
`cp <version>/3w-9xxx.smp /lib/modules/<kernel>/drivers/scsi/3w-9xxx.o`

For Red Hat Bigmem
`cp <version>/3w-9xxx.big /lib/modules/<kernel>/drivers/scsi/3w-9xxx.o`

For Red Hat Hugemem
`cp <version>/3w-9xxx.hug /lib/modules/<kernel>/drivers/scsi/3w-9xxx.o`

5 **For 2.4 Kernels**, add the following line to `/etc/modules.conf`:
`alias scsi_hostadapter 3w-9xxx.o`

For 2.6 Kernels, add the following line to `/etc/modprobe.conf`.
`alias scsi_hostadapter 3w-9xxx.ko`

6 Complete the upgrade by upgrading the initial ramdisk.

Change the directory to the boot directory:
`cd /boot`

Run mkinitrd by entering the following:

(In the commands below, replace <kernel> with the applicable kernel, for example 2.4.20-8)

For Red Hat or Fedora Core Uniprocessor
`mkinitrd –v –f initrd-<kernel>.img <kernel>`

For Red Hat SMP
`mkinitrd –v –f initrd-<kernel>smp.img <kernel>smp`

For Red Hat Bigmem
`mkinitrd –v –f initrd-<kernel>bigmem.img <kernel>bigmem`

For Red Hat Hugemem
`mkinitrd –v –f initrd-<kernel>hugmem.img <kernel>hugmem`

7 If you are using lilo, run lilo to update to the boot loader.

You should see a printout of kernels that are able to boot on this system after running lilo.

Updating the 3ware Driver Under SuSE

The following steps describe how to update the 3ware driver under SuSE.

Note: Pre-compiled, tested, and supported drivers are no longer available for older SuSE releases using the 2.4 kernel. The source code is still available (for a limited time) if a newer driver is still needed. Check the release notes for more details regarding supported operating systems.

To update the 3ware driver under SuSE

1 Download and extract the driver, as described under “Updating the Driver and Firmware” on page 169.

2 Backup any critical data prior to updating the 3ware driver.

3 Change the directory to the location with the extracted driver.

4 Copy the files to the appropriate directory.

(In the commands below, replace <version> with applicable SuSE version, such as su10)

Replace <kernel> with applicable kernel (i.e.: 2.6.16.x)

For SuSE Uniprocessor (2.6 kernels)
```
cp <version>/3w-9xxx.ko /lib/modules/<kernel>/drivers/scsi
```

For SuSE SMP (2.6 kernels)
```
cp <version>/3w-9xxx.smp /lib/modules/<kernel>/kernel/
drivers/scsi/3w-9xxx.ko
```

For SuSE high memory systems (2.6 kernels)
```
cp <version>/3w-9xxx.big /lib/modules/<kernel>/kernel/
drivers/scsi/3w-9xxx.ko
```

5 Run `/sbin/depmod -a`

6 Make sure the `file /lib/modules/<kernel string>/modules.dep` contains an entry for 3w-9xxx. If not, add it after the `3w-xxxx` entry.

7 Complete the upgrade by upgrading the initial ramdisk. (Skip to step 10 if you prefer to use insmod 3w-9xxx.o, instead.)

Make sure the file /`etc/sysconfig/kernel`
contains the following line:
`INITRD_MODULES=”3w-9xxx”`

Note: Other modules may be listed before or after 3w-9xxx depending on the installation. You may see entries likes reiserfs, ext3 or scsi_mod. Leave these entries alone, if present, as the system may need them to boot properly.

8 Run mkinitrd.

9 If you are using lilo, use lilo to update to the boot loader.

You should see a printout of kernels that are able to boot on this system after running lilo.

10 Reboot, if booted from the 3ware controller. Otherwise, continue with step 11.

The driver is now updated.

11 Stop the current driver module, if loaded:

```
rmmod 3w-9xxx
```

12 Load the new driver module:

```
modprobe 3w-9xxx
```

If the new driver fails to load properly, confirm that you used correct driver. If your kernel or SuSE version is not supported, you will need to compile your own driver. For more information, see knowledgebase article 14546 (http://www.3ware.com/KB/article.aspx?id=14546).

Updating the 3ware Driver Under FreeBSD

The following steps describe how to update the 3ware driver under FreeBSD.

To update the 3ware driver under FreeBSD

1 Download and extract the driver, as described under “Updating the Driver and Firmware” on page 169.

2 Backup any critical data prior to updating the 3ware driver.

3 Change the directory to the location with the extracted driver.

4 Copy the files to the appropriate directory.

For FreeBSD 4.x, copy the driver into `/modules`

For FreeBSD 5.x and 6.x, copy the driver into `/boot/kernel`.

5 Load the driver

```
kldload twa.ko
```

If units are present, you should see unit information in the system log (usually, `/var/log/messages`).

6 `If you wish to load the driver automatically every time the system is rebooted,` add the line `'twa_load="YES"'` to the file

```
/boot/loader.conf
```

Updating the Firmware Under Linux and FreeBSD

The following steps describe how to update the firmware under Linux and FreeBSD. The PROM images that are installed when you update the firmware include any 3BM, A-chip, P-chip, and BBU firmware updates.

To update the firmware under Linux and FreeBSD

1 Download and extract the firmware, as described under “Updating the Driver and Firmware” on page 169.

2 Backup any critical data prior to updating the 3ware firmware.

3 Change the directory to the location with the extracted files, which include tw_update.

4 Run the tw_update utility.

```
./tw_update fw=prom0006.img
```

The utility shows the version of the driver and firmware included in the utility, the versions currently installed on your controller, and recommends whether to upgrade the firmware or not.

```
Warning: We strongly recommend backing up your data before updating
the firmware. Updating the firmware can render the device driver
and/or management tools incompatible. It is recommended to have
a copy of current firmware image for rollbacks.

Examining compatibility data from firmware image and /c0 ...

New-Firmware        Current-Firmware    Current-Driver    Current-API
------------------------------------------------------------------------
FE9X 3.0x.xx.xxx    FE9X 3.0x.xx.xxx     2.xx.xx.xxx      2.xx.xx.xxx

Both API and Driver are compatible with the new firmware.
Recommendation: proceed to update.

Given the above recommendation...
Do you want to continue ? Y|N [N]: y
```

5 If the firmware is newer and the recommendation is to proceed, type `Y` and press Enter.

```
Downloading the firmware from file /mnt/fw/9550sx/
prom0006.img ... Done.
The new image will take effect after reboot.
```

6 Reboot your system to flash the firmware upgrade.

Viewing Battery Information

The Battery Backup Unit (BBU) is an add-on card that can be attached to a 3ware 9000 RAID controller to supply power from a battery pack in the event of a system power loss. This allows the controller to use write-caching for optimal performance and to preserve data in the event of a system power failure. When fully charged, the battery preserves the contents of the cache memory for up to 72 hours. When power is restored, the cached write data is written to the disks.

You can see information about a battery backup unit attached to your controller in both 3DM 2 and 3BM.

Note: When the BBU status is not “Ready,” write caching is automatically disabled on all units attached to the controller

To view information about a BBU in 3DM 2

- On the menu bar, choose **Monitor** > **Battery Backup**.

  The Battery Backup page appears, on which you can see details and status about the unit. This page is refreshed every 30 seconds.

  For details about the fields on this page, see “Battery Backup page” on page 213.

To view information about a BBU in 3BM

- At the main 3BM screen, tab to the **Information** button and press **Enter**.

  On the pop-up menu, select **Battery Backup** and press **Enter**.

  The Battery Backup Unit screen appears.

  The fields on this screen are the same as those available through 3DM. For details about the fields, see “Battery Backup page” on page 213.

Testing Battery Capacity

Batteries in the BBU need to be replaced periodically. A battery test should be run every four weeks in order to get a reliable estimate of battery capacity, and to determine when it needs to be replaced.

The battery test is used to measure the battery's capacity to back up write data. In order to make a reliable estimate of battery capacity, the BBU pre-charges the battery before it proceeds with a full discharge cycle. The battery is automatically charged again after the test completes. The whole process usually takes between 8 and 12 hours.

While running the battery test and until charging is completed, write cache is temporarily disabled.

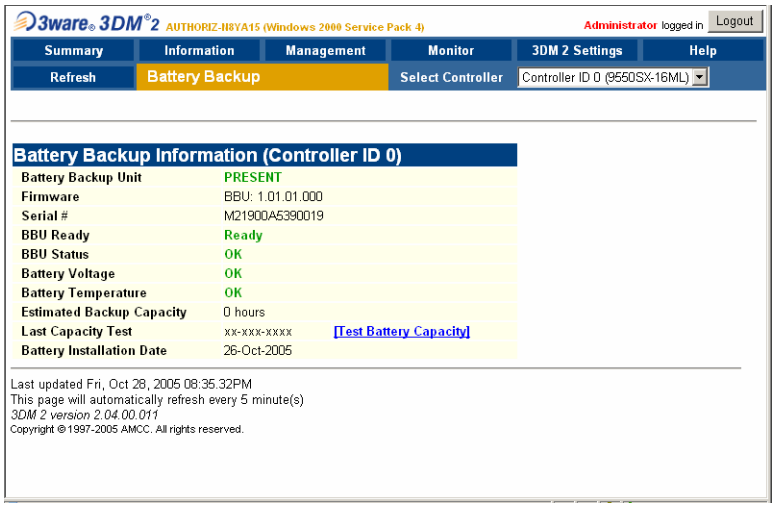
For how to replace the battery, see the installation guide that came with your controller.

To test the battery in a BBU in 3DM 2

1 On the menu bar, choose **Monitor** > **Battery Backup**.

2 On the Battery Backup page, click the **Test Battery Capacity** link.

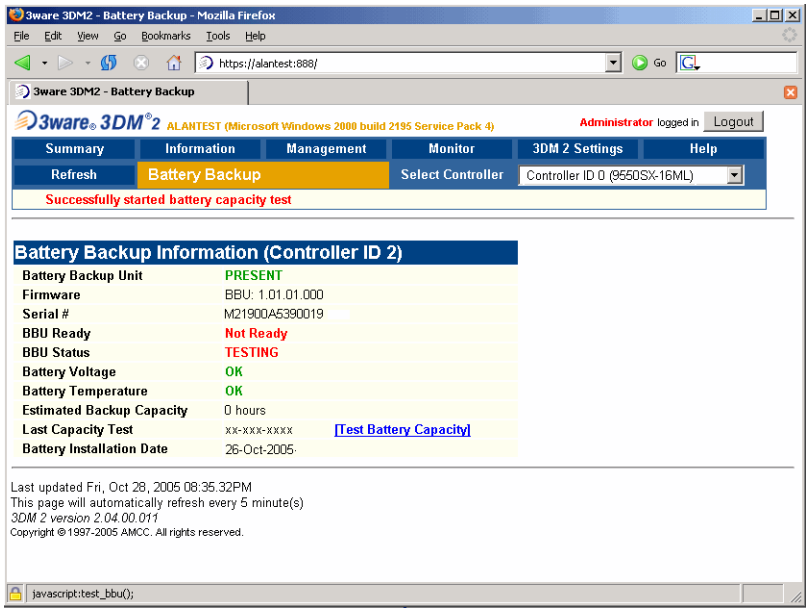
Figure 86. Battery Backup Information Screen in 3DM



3 When a message cautions you that testing the battery will disable the BBU for up to 24 hours, click **OK** to continue.

After the battery test starts, you will see the voltage start dropping; eventually the battery voltage will say "LOW". This is part of the battery test. After the voltage drops to a point, it will start charging again, and the status will change to "Charging." Eventually, the battery voltage will say "OK" again.

Figure 87. BBU Information Screen While Battery is Testing



To test the battery in a BBU in 3BM

1 At the main 3BM screen, tab to the **BBU** button and press **Enter**.

2 Tab to **Test Battery Capacity** and press **Enter**.

Figure 88. Battery Backup Information Screen in 3BM

11

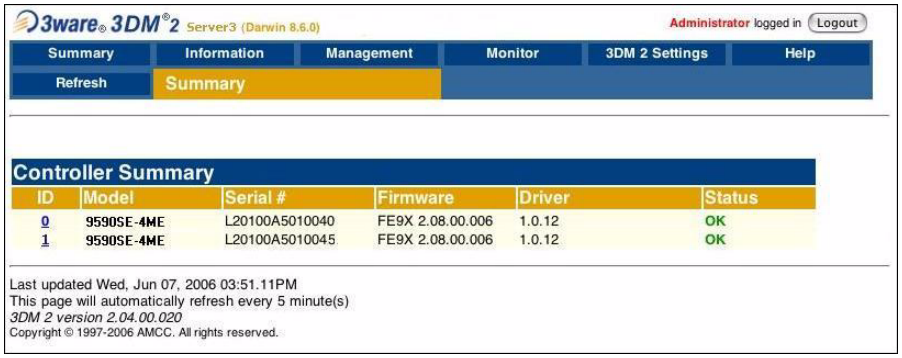
3DM 2 Reference

This section includes details about the fields and features available on the pages you work with throughout 3DM 2. It is organized by 3DM page, as the pages are organized on the 3DM menu bar.

- Controller Summary page
- Controller Details page
- Unit Information page
- Unit Details page
- Drive Information page
- Drive Details window
- Controller Settings page
- Scheduling page
- Maintenance page
- Alarms page
- Battery Backup page
- Enclosure Summary page
- Enclosure Details page
- 3DM 2 Settings page

Controller Summary page

Figure 89. Controller Summary Page



The Summary page appears after you first logon to 3DM, and when you click the Summary link in the menu bar.

This page provides basic information about each 3ware RAID controller in your system. To see details about the units in a controller, click the link in the ID column.

ID. The ID that the operating system assigns to the controller.

Note: The controller ID you see in 3DM 2 may not match the number that you see for the same controller in 3DM version 1.x.

Model. The model name of the controller. (The model number is also printed on a sticker on the outside bracket of the controller.)

Serial #. The serial number of the controller. (The serial number is also printed on a sticker on the outside bracket of the controller.)

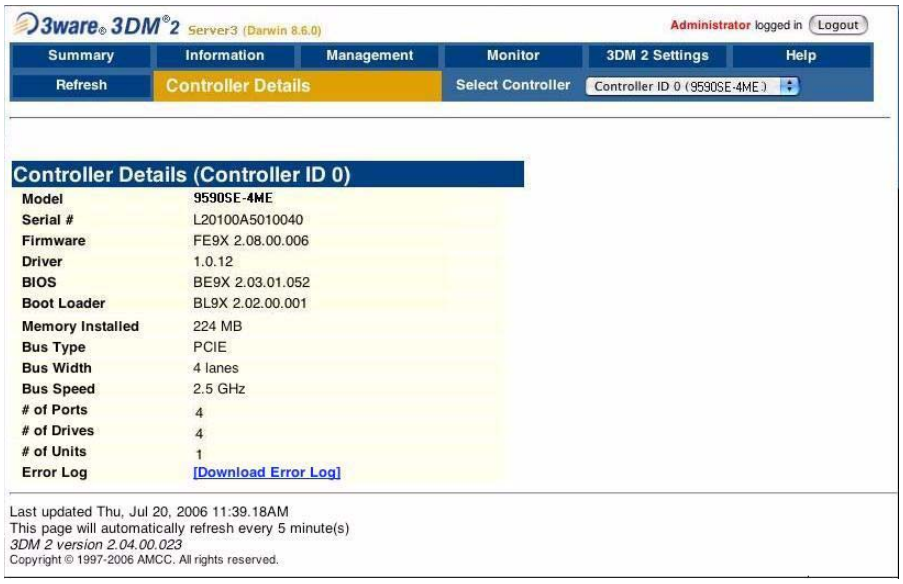
Firmware. The firmware version running on the controller.

Driver. The driver version being used to interact with the controller.

Status. The overall status of the controller. Possible statuses include OK, Warning, Error, and No Units. **Warning** indicates that a background task is currently being performed (rebuilding, migrating, or initializing). **Error** indicates that a unit is degraded or inoperable. If both Error and Warning conditions exist, the status will appear as Error. For more information, see “Checking Unit and Drive Status through 3DM” on page 138.

Controller Details page

Figure 90. Controller Details Page



The Controller Details page appears when you choose **Information > Controller Details** from the menu bar.

This page provides detailed information about the controller specified in the drop-down list on the menu bar.

You can also open or download an error log from this screen.

Model. The model name of the controller.

Serial #. The serial number of the controller.

Firmware. The firmware version running on the controller.

Driver. The driver version being used to interact with the controller.

BIOS. The BIOS version on the controller.

Boot Loader. Boot Loader version on the controller.

Memory Installed. The amount of memory installed on the controller.

Bus Type. The bus type used on the controller is shown: PCI, PCIX, or PCIE.

Bus Width. The bus width used on the controller: 32 or 64 for PCI-X slots; 4 lanes, 8 lanes, or 16 lanes for PCIE slots.

Bus Speed. The speed of the bus used on the controller is shown.

# of Ports. The number of total ports on the controller, regardless of whether each currently has a drive connected.

# of Units. The number of units on the controller.

# of Drives. The number of drives connected to the controller.

Download Error Log: Click on this link to download the firmware error log to your computer. This feature is important when contacting AMCC for support with your controller. It will help AMCC identify the problem you encountered.

Unit Information page

Figure 91. Unit Information Page

The Unit Information page appears when you choose **Information > Unit Information** from the menu bar, or when you click an ID number on the Controller Summary page.

This page shows a list of the units on the current controller and provides summary information about each unit.

To see details about a particular unit, click the link in the Unit # column.

Unit #. The unit number assigned to the unit by the firmware. For 9000-series controllers, unit numbers are in sequential order.

Name. If a name has been given to this unit, it shows here. If it is empty, no name has been assigned. You can name your unit in the **Unit Names** section of the **Management > Controller Settings** page.

Type. The type of unit, specified during configuration: RAID 0, RAID 1, RAID 5, RAID 6, RAID 10, RAID 50, Single Disk, JBOD, or Spare. For details about each of the RAID levels, see “Available RAID Configurations” on page 5.

Capacity. The logical capacity (size) of the unit. 1KB = 1024 bytes.

Note: 3DM 2 displays the capacity (in MBytes or GBytes) the same way that Microsoft Windows and Linux operating systems do: as 1KB = 1024 bytes. Previous versions of 3DM 1.x used the 1KB = 1000 bytes definition. Consequently capacities of units listed under 3DM v 1.x may appear to be larger than they do under 3DM 2.

Status. The operational status of the unit: OK, Rebuilding, Initializing, Migrating, Verifying, Degraded, or Inoperable (missing drives). When a unit is Rebuilding, Initializing, Migrating, or Verifying, the percentage (%) complete is also shown. For an explanation of the statuses, see “Unit Statuses” on page 140.

Note: If an asterisk (*) appears next to the status of a unit, there is an error on one of the drives in the unit. This feature provides a diagnostic capability for potential problem drives. The error may not be a repeated error, and may be caused by an ECC error, SMART failure, or a device error. To see if this error condition still exists, rescan the controller; rescanning will clear the drive error status if the condition no longer exists.

Identify. Check this box to cause the LED for the drives associated with this unit to blink in the enclosure. (This feature only applies when drives are in an enclosure that has a Chassis Control Unit (CCU) and is connected to the I^2C Chassis Control connector on the 9550SX, 9590SE, or 9650SE controller.

Unit Details page

Figure 92. Unit Details Page

The Unit Details page appears when you click an ID number on the Unit Information page. Because it is a sub-page of Unit Information, the page title in the menu bar continues to display “Unit Information” even when you view details of a unit.

The Unit Details page shows details about a particular unit. The specific information shown depends on what type of unit it is. For example, details about a RAID 5 unit made up of three subunits, each of which contains one

drive, will include details about the unit and each subunit, as shown in Figure 92. However, if the unit is a Single Disk, only information about one disk will be shown.

Details on this page may include all or some of the following information described below.

To see details about a particular drive, click the Port #. You'll see a list of all drives, with the drive you selected highlighted.

Status. The operational status of the unit or subunit: OK, Rebuilding, Migrating, Initializing, Verifying, Degraded, or Inoperable (missing drives). When a unit is Rebuilding, Initializing, or Verifying, the percentage (%) complete is also shown. For status definitions, see "Unit Statuses" on page 140.

Capacity. The total capacity of the unit (capacities of subunits are not shown).

Type. The type of unit or subunit. RAID 0, RAID 1, RAID 5, RAID 6, RAID 10, RAID 50, Single Disk, Spare, JBOD, or Disk

Volumes. Displays the number of volumes in a unit. This is usually 1. If you created a boot volume on this unit, or if you have a unit on which you have enabled the auto-carving policy, you will see the number of volumes into which the unit has been divided. For more information, see "Using Auto-Carving for Multi LUN Support" on page 91.

Stripe. The stripe size of the unit, if applicable.

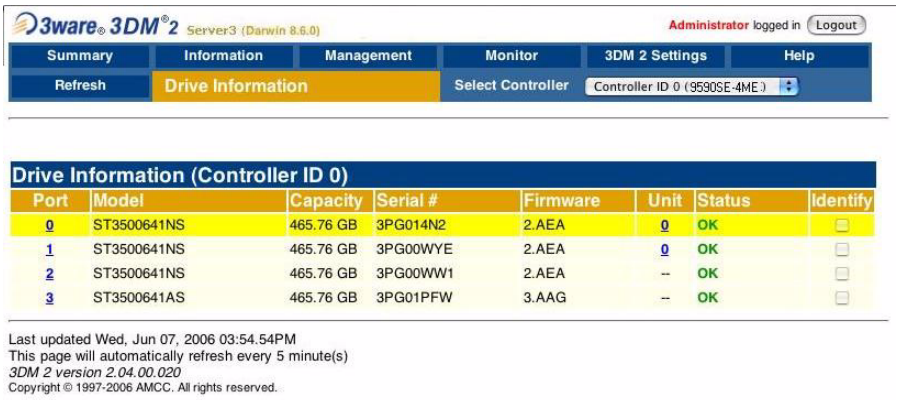
Subunits. If the unit has subunits, details of the subunits are shown.

Note: If an asterisk (*) appears next to the status of a subunit, there is an error on one of the drives in the subunit. This feature provides a diagnostic capability for potential problem drives. The error may not be a repeated error, and may be caused by an ECC error, SMART failure, or a device error. Rescanning the controller will clear the drive error status if the condition no longer exists.

Port #. If the Type is Disk, Single Disk, JBOD, or Spare, the port to which the drive is connected is shown. For multiple drive units, the port numbers are shown in the subunits section. The port number is a link to the Drive Information page.

Drive Information page

Figure 93. Drive Information Page



The Drive Information page appears when you choose **Information > Drive Information** from the menu bar, or when you click a port # on the Unit Details page. If you arrive at this page from the port # hyperlink on the Unit Information page, the line showing the port # you clicked on is highlighted.

This page shows a list of drives on the current controller and a summary of each one.

To see additional detail about a particular drive in the Drive Details window, including the SMART data, whether NCQ is supported and enabled, and the SATA Link speed, click the link in the Port # column.

Port #. The port to which the drive is connected.

Model. The model of the drive.

Capacity. The physical capacity of the drive. (Note that the capacity as shown on 3DM screen is calculated as 1KB = 1024. This amount may differ from the capacity that is printed on the disk drive, where it typically has been calculated as 1K = 1000. Consequently, the capacity of the drive may appear smaller in the 3DM screens. No storage capacity is actually lost; the size has simply been calculated differently for consistency.)

Serial #. The serial number of the drive.

Firmware. The firmware version of the drive.

Unit. The unit the drive belongs to, if applicable.

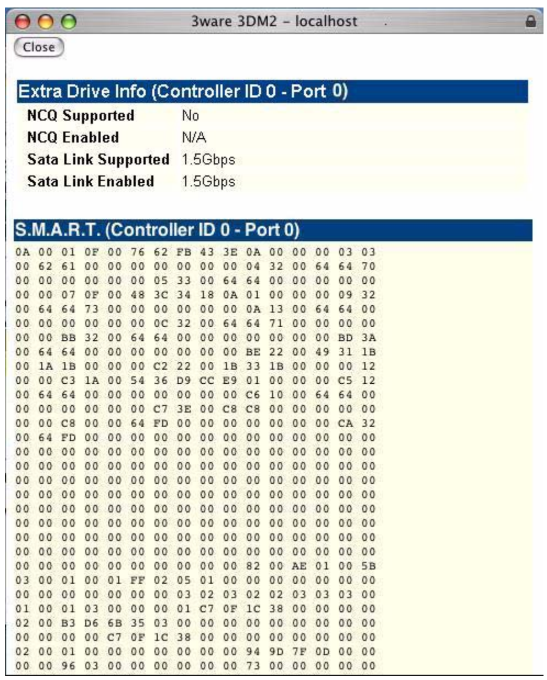
Status. The status of the drive: OK, Not Supported, Not Present, and so forth. If you need help regarding a status displayed here, please contact Technical Support. For more information, see “Drive Statuses” on page 142.

Note: In most cases, the status of the drive will not correspond to the status of the unit, shown on the Unit Information page. Different status information is provided for drives and for units.

Identify. Check this box to cause the LED for this drive to blink in the enclosure. (This feature only applies when drives are in an enclosure that has a Chassis Control Unit (CCU) and is connected to the I^2C Chassis Control connector on the 9550SX, 9590SE, or 9650SE controller.)

Drive Details window

Figure 94. S.M.A.R.T. Data Page



The Drive Details window appears when you click a Port # on the Drive Information page.

This Drive Details window shows some Extra Drive Information, including NCQ and SATA Link Speed support, and the SMART data for the drive.

Extra Drive Information

NCQ Supported and **NCQ Enabled.** Some drives support NCQ (Native Command Queuing), which can result in increased performance for some applications, usually server-type applications. In order to make use of Native

Command Queuing, the feature must be enabled at both the drive and the controller. Not all drives support NCQ. .

The NCQ values in this window indicate whether the feature is supported and enabled at the drive. At the controller level, queuing is enabled or disabled for all drives in a unit on the Controller Settings page.

SATA Link Supported and **SATA Link Enabled.** These fields show the fastest link speed that the disk drive supports and the current speed that the drive is running.

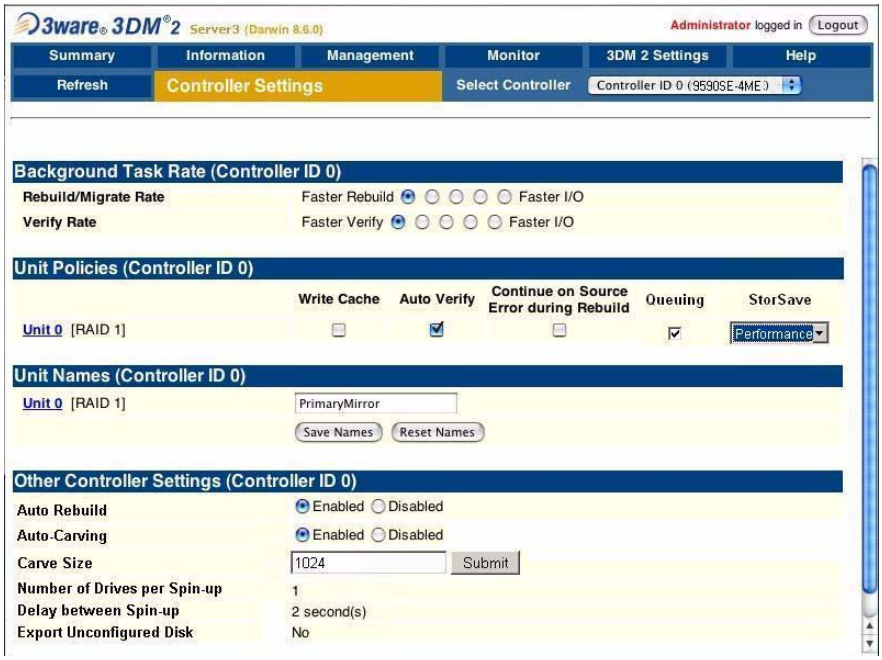
SMART Data

SMART data is displayed as hex values.

Consult your disk drive manufacturer for information on how to interpret the SMART data. The SMART data meaning varies by disk drive manufacturer and model.

Controller Settings page

Figure 95. Controller Settings Page



The Controller Settings page appears when you choose **Management > Controller Settings** from the menu bar.

This page lets you view and change settings that affect the units on the controller specified in the drop-down list on the menu bar.

There are four main sections on this page:

- Background Task Rate
- Unit Policies
- Unit Names
- Other Controller Settings

Background Task Rate

The Background Task Rate fields let you change the balance of background tasks and I/O (reading and writing to disk) performed by the controller.

There are separate settings for Rebuild/Migrate Rate and Verify Rate, Figure 95. The Rebuild/Migrate Rate also applies to initialization. Although the same rate is used for rebuilding, migrating, and initializing, migrating has the highest priority.

The five radio buttons let you set the ratio at which background tasks are performed in comparison to I/O. For additional information, see “Setting Background Task Rate” on page 160.

Unit Policies

You can enable or disable these policies: **Write Cache**, **Auto-verify, Continue on Source Error During Rebuild, Queuing**, and you can select a **StorSave Profile**. 3DM lists each unit on the current controller, and shows you whether the policies are currently enabled or disabled for each unit.

Write Cache. When write cache is enabled, data is stored locally in memory on the drive before it is written to the disk drive media, allowing the computer to continue with its next task. This improves performance. However, in the event of a power failure, the data in the write cache will be lost if you do not have a battery backup unit (BBU) or an uninterruptible power supply (UPS).

For additional information, see “Enabling and Disabling the Unit Write Cache” on page 113.

Auto Verify. When the Auto Verify policy is enabled, a verify task is performed automatically once every 24 hours. This feature is designed to make regular verification of units easier.

If a verify scheduling window has been set up and enabled, then Auto Verify will wait until the scheduled time window to start the automatic verify process.

When Auto Verify is not enabled, verify tasks are only run if you manually request one on the 3DM **Management** page. If a verify scheduling window is set and enabled, then manual verifies will wait until the scheduled time to start.

Continue on Source Error During Rebuild. This policy applies only to units which are redundant. (For units which are not redundant, a check box is not available.) When this policy is set, ECC errors are ignored when they are encountered during a rebuild. When this policy is not set, a rebuild will abort upon encountering an ECC error and the unit will be set back to Degraded.

Since this option could result in the loss of some source data in the event of source errors, select this option only if you want to ensure that a rebuild will complete successfully without manual intervention. If the rebuild fails and **Continue on Source Error During Rebuild** is not selected, then you have the option to start a rebuild manually. It is recommended that you execute a file system check when the rebuild completes. Under Windows, you can do this by right-clicking on the Drive and choosing Properties; then on the Tools tab, click Check Now.

Note: The policy **Continue on Source Error During Rebuild** is equivalent to the "Force continue on source errors" option in 3DM v 1.x and the "ignoreEcc" option in the CLI.

Queuing. This policy enables or disables Native Command Queuing (NCQ) for drives in the unit. By default, queuing is disabled. You can enable it, if desired.

NCQ only operates when the feature is enabled at both the drive and the controller. If a drive does not support NCQ, the policy setting for the controller is ignored.

Enabling NCQ can improve performance in many applications; it causes command reordering to be done on the drive itself.

StorSave Profile. The StorSave feature includes an option that lets you change the StorSave Profile used for a unit. Three profiles are available: Protection, Balanced, and Performance. These profiles automatically adjust several different factors that affect protection and performance, including whether FUA (Forced Unit Access) is honored, whether Write Journaling is enabled, and whether Disable Cache on Degrade is enabled. For additional information, see "Setting the StorSave Profile for a Unit" on page 117.

Note: If the write cache setting is disabled for a unit, the StorSave Profile capability does not apply and is automatically disabled.

Unit Names

Units can be assigned names. A name can be assigned when the unit is created and can be changed from this screen. For additional information, see “Naming a Unit” on page 110.

Other Controller Settings

The Other Controller settings displays information about additional settings, some of which can only be changed in the BIOS (3BM).

Auto Rebuild. The Auto Rebuild policy determines how the controller firmware will attempt to rebuild degraded units.

When Auto Rebuild is disabled, only spares will be used to automatically rebuild degraded units. When Auto Rebuild is enabled, the firmware will automatically select drives to use for rebuilding a degraded unit using the following priority order.

- Smallest usable spare.
- Smallest usable unconfigured (available) drive.
- Smallest usable failed drive.

For additional information, see “Setting the Auto Rebuild Policy” on page 90.

Auto-Carving. Auto-carving can be enabled or disabled by selecting the appropriate radio button.

When this feature is enabled, any unit that is over a specified size (known as the *carve size*) will be broken down into multiple volumes of that size, plus a remainder volume. The default carve size is 2048 GB (2 TB). For example, using the default carve size, if the unit is 2.5 TB then it will contain two volumes, with the first volume containing 2 TB and the second volume containing 0.5 TB. If the unit is 5.0 TB then it will contain 3 volumes, with the first two volumes containing 2 TB each and the last volume containing 1 TB. If a specific Boot Volume was also specified in 3BM, the first volume will be the size specified for the Boot Volume, and then the carve size will be applied to the remainder of the unit.

Carve Size. Sets a size for dividing up units into volumes when Auto-Carving is enabled. This setting can be between 1024 and 2048 GB.

Number of Drives Per Spin-up. Number of drives that will spin up at the same time when the controller is powered up. (This setting only applies when the feature is supported by the disk drives.)

Delay between Spin-ups. The delay time (in seconds) between drive groups that spin up at one time on this particular controller.

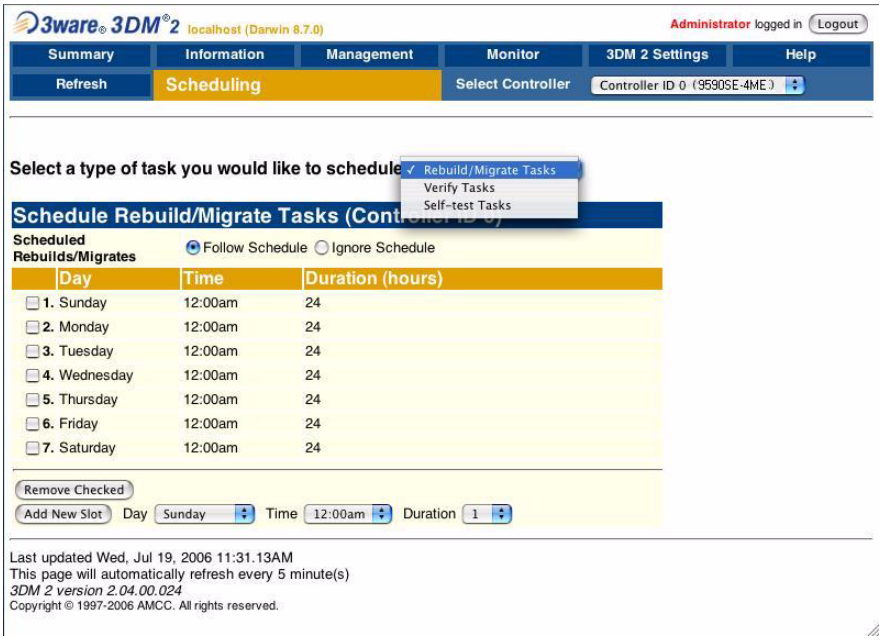
Export JBOD (Unconfigured) Disks. Indicates whether unconfigured disks (JBODs) should be exported to the operating system. By default, this setting

is disabled and JBOD drives are not exported to the operating system. For more information about this feature, see “Setting the Auto Rebuild Policy” on page 90.

For additional information, see “Setting the Auto Rebuild Policy” on page 90.

Scheduling page

Figure 96. Scheduling Page



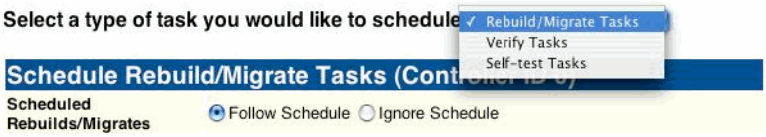
The Scheduling page appears when you choose **Management > Scheduling** from the menu bar.

The Scheduling page lets you set up a schedule for when background tasks (rebuild, migrate, initialize, verify, and self-test) should occur. Background tasks can have impact on the performance of your system, so you may prefer to schedule them at times when they will be least disruptive, such as in the middle of the night or on a weekend.

Select a type of task you would like to schedule. You start by selecting the type of task for which you want to set the schedule from the drop-down list at the top of the page.

- Rebuild/migrate tasks (also applies to initialization)
- Verify tasks (also applies to media scans)
- Self-tests

3DM then updates the page to show you schedule details for that type of task.



Follow Schedule/Ignore Schedule. You can enable or disable the schedule for the Rebuild/Migrate and Verify tasks by selecting either **Follow Schedule** or **Ignore Schedule**. When schedules are set to be ignored, these tasks can be performed at any time, and are not restricted to the scheduled times.

Note: Scheduling of these tasks is only available on the 9000-series controllers.

For details about the different background tasks, see “Background Tasks” on page 147.

Task Schedules

Initially, 7 schedule slots are defined, for 24 hours each. Even if **Follow Schedule** is enabled, this schedule is equivalent to **Ignore Schedule**, because tasks can run at any time, round the clock.

A maximum of 7 slots can be created, so to set a different schedule, start by deleting one or more of the existing scheduled slots, and then add new slots.

For step-by-step instructions for adding and removing schedules, and setting schedules to be followed or ignored, see “Scheduling Background Tasks” on page 161.

Self-test Schedules

Unlike scheduling of rebuilds and verifies, scheduling of self-tests is always followed. To disable self-tests you either remove all schedule times, or uncheck the tests listed in the Tasks column.

Note: Only the checked tasks will be run during the scheduled times. If none of the tasks are checked, self-tests will never run, even if you have scheduled time slots set.

Two self-tests can be scheduled:

Upgrade UDMA mode. This test checks the speed at which data transfer to drives is occurring, to see if the UDMA mode can be increased. (If you are already running at the fastest UDMA mode, then this self-test has no effect.)

The UDMA mode can become downgraded in the event that cable CRC errors are encountered, requiring multiple retries to read sectors. In severe cases, the UDMA mode may be downgraded from ATA 150 to ATA 133, to ATA 100, to 66, to 33.

This check is also done every time the system is booted.

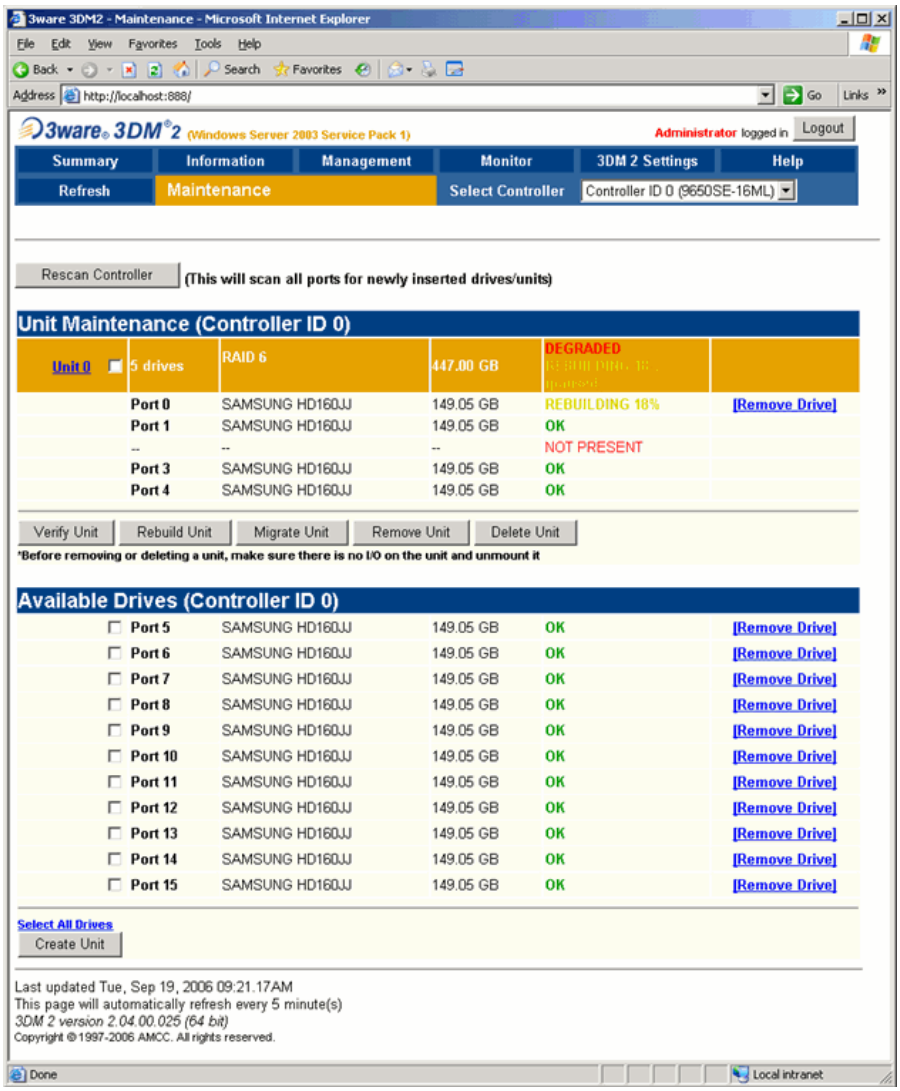
Check SMART Thresholds. This test checks to see whether SMART thresholds have been exceeded.

The SMART thresholds indicate when a drive is likely to fail, based on the number of errors that have been recorded through SMART (Self-Monitoring, Analysis and Reporting Technology).

If any of the disk drives have detected a “threshold exceeded” condition, then an AEN is logged to the 3DM Alarms page. Moreover, if anything unusual is found during any self-test, it will be logged as an Alarm.

Maintenance page

Figure 97. Maintenance Page



The Maintenance page appears when you choose **Management > Maintenance** from the menu bar.

The Maintenance page lets you perform maintenance tasks on existing units on the current controller and lets you create new units by configuring available drives.

Information about the Maintenance page is organized under these headings:

- Rescan Controller
- Unit Maintenance
- Maintenance Task Buttons
- Available Drives (to Create Units)

Rescan Controller

The **Rescan Controller** button scans the ports on the controller. Rescanning updates the list of available drives shown and updates the status of all ports. If error conditions have been fixed, the status is updated to reflect that.

Rescanning is useful in variety of maintenance tasks. For example, if you physically plug in a drive and want the controller to recognize the newly plugged in drive, Rescan will find it.

Note: If you unplug a drive without first removing it through 3DM, Rescan may not recognize it as gone unless the drive was in use or until it is required by the system. Always use the **Remove** link to remove a drive before unplugging it.

Warning: Physically removing or adding drives which are not in hotswap carriers can result in a system hang or may even damage the system and the drive.

Rescan checks all ports. It checks empty ports for newly plugged-in drives. If those drives were previously part of a 3ware RAID configuration and they still have valid DCB (Disk Configuration Block) information on them, the controller tries to piece them back together into a working unit. If a working unit can be formed, it will appear in the Unit Maintenance list when the scan is complete, and the operating system will be notified of the unit. In Linux or FreeBSD, a device node will be associated with each unit created. In Windows, the device manager will reflect the changes under the disk drives icon. This process is known as importing drives.

If new drives do not have any data indicating they were previously part of a 3ware RAID configuration, they will appear in the Available Drives list.

In addition, if there is a unit with the status Inoperable before a rescan (for example, a RAID 5 unit missing 2 or more drives), and a rescan finds drives that complete the unit, the inoperable unit will become a valid unit.

Unit Maintenance

The Unit Maintenance section of the page lists all existing units on the current controller, and displays summary information about them.

The top row shows information about the unit, while subsequent rows show summary information about each drive in the unit.

Unit Information

Unit Number. The unit number assigned to the unit by the firmware. Use the checkbox next to the unit to select a unit before clicking one of the task buttons.

 # Drives. Number of drives in the unit.

Type of Unit. Type of unit: RAID 0, RAID 1, RAID 5, RAID 6, RAID 10, RAID 50, Single Disk, JBOD, or Spare. If the unit has been given a unique name, it shows beneath the RAID type.

Name of Unit. User-assigned unique name of the unit. The default setting is blank.

Capacity. The usable capacity (size) of the unit.

Status. Operational status of the unit: Ok, Rebuilding, Initializing, Verifying, Migrating, Degraded, or Inoperable (missing drives). When Rebuilding, Initializing, Migrating, or Verifying, the percentage (%) complete is also shown. The percentage complete can be active or paused. To see whether this task is currently active or paused, click on the unit number to display the Unit Details page, which has that information. For an explanation of the statuses, see “Unit Statuses” on page 140.

Drive Information

Port. The port to which the drive is connected.

Model. The model of the drive.

Capacity. The capacity (size) of the drive.

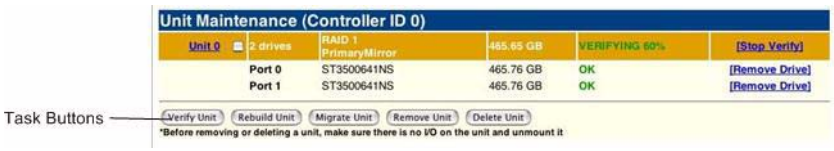
Status. The status of the drive: OK, Not Supported, Not Present, and so forth. If you need help regarding a status displayed here, please contact Technical Support. For more information, see “Drive Statuses” on page 142.

Remove Drive. The **Remove Drive** link removes a drive from the controller so that you can safely unplug it. In the Unit Maintenance section, this link is only provided for drives that can be safely removed without creating an inoperable unit. (For example, a RAID 5 missing 2 or more drives or a RAID 0 missing 1 or more drives would become inoperable.) If you remove a drive from a redundant unit, the unit will become degraded. Once a unit has become degraded, additional drives cannot be removed without making it inoperable, so no **Remove Drive** link will display.

Warning: Physically removing drives which are not in hotswap carriers can result in a system hang or may even damage the system and the drive.

Maintenance Task Buttons

Below the list of units, a row of task buttons lets you perform maintenance and configuration tasks related to the unit. Before clicking one of these buttons, select the appropriate unit.



Verify Unit. Puts the selected unit in verifying mode. If verify scheduling is enabled on the Scheduling page, the unit will not start actively verifying until the scheduled time, and the status will indicate "Verify-Paused." (The Unit Details page will indicate whether a unit is actively verifying.) If verify scheduling is not enabled, clicking Verify Unit begins the verification process.

If the unit you selected to verify is a redundant unit, the redundancy of the unit will be verified. For example it will check parity for a RAID 5 or check data consistency for a RAID 1. If the unit you checked is not a redundant unit, verify will do a surface scan of the media. During verification, I/O continues normally. For RAID 0, single disks, JBODs, and spares, there is only a slight performance loss. For redundant units, you can set the background task rate on the Controller Settings page to specify whether more processing time should be given to verifying or to I/O. For more information, see "About Verification" on page 151 and "Setting Background Task Rate" on page 160.

While a unit is verifying, the status changes to Verifying and a **Stop Verify** link appears in the right-most column of the Unit Maintenance table.

Note: If the unit has not previously been initialized and you click **Verify Unit**, the initialization process starts. Initialization cannot be halted, so no Stop Verify link appears. (Initialization can be paused, however, through Scheduling. Initialization follows the Rebuild schedule, so turning on scheduling for Rebuild will pause initialization, as well.) For more information about initialization, see "About Initialization" on page 148.

Rebuild Unit. Replaces a failed drive in a degraded unit with an available drive and begins rebuilding the RAID. When you select a degraded unit and click **Rebuild Unit**, a dialog box listing available drives appears, so that you can select the drive you want to use. If the degraded unit has more than one failed drive (for example, a RAID 10 where both mirrored pairs each have a failed drive), you will repeat this process a second time.

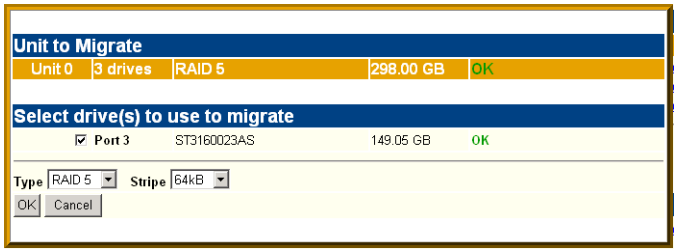
If rebuild scheduling is enabled on the Scheduling page, the unit will not start actively rebuilding until the scheduled time, and the status will change to say "Rebuild-Paused." (The Unit Details page indicates whether a unit is actively rebuilding.) If rebuild scheduling is not enabled, the rebuild process will begin right away.

For more information about rebuilds, see "To verify a unit through 3BM" on page 154.

Migrate Unit. Reconfigures a unit while it is on-line. Migration can be used to change the RAID level, to expand the capacity by adding additional drives, or to change the stripe size.

Warning: Once migration of a unit is started, it cannot be cancelled.

When you select a unit and click **Migrate Unit**, a dialog box appears which lists the drives in the unit and any additional available drives. In the dialog box are two drop-down menus, one for choosing the RAID level and one for choosing stripe size.



You can only migrate a unit to a RAID level that will be larger than the original unit. For example, you can migrate from a RAID 5 array with 4 drives to a RAID 0 with four drives but you cannot migrate from a RAID 5 with four drives to a RAID 10 with four drives.

After you have specified changes to the unit, the Unit Maintenance screen reflects your changes and shows the percentage of migration completed.

While the unit is migrating, you can still access the unit as normal but the performance will be lower. You can adjust the I/O rate with the radio buttons on the Controller Settings page. (See "Setting Background Task Rate" on page 160.)

Remove Unit. Removes a selected unit and allows you to unplug the drives and move the unit to another controller. The data on the unit remain intact.

Caution: Before you click **Remove Unit**, make sure the unit you are removing is unmounted and the system is not accessing it. (For example, make sure you are not copying files to the unit, and make sure that there are no applications with open files on that unit.)

If a unit is not unmounted and you remove it, it is the equivalent of physically yanking a hard drive out from under the operating system. You could lose data, the system could hang, or the controller could reset.

To unmount a unit under windows, use Administrative Tools > Computer Management > Disk Management. In the Computer Management window, right-click on the partition and Remove the logical drive letter associated with the unit.

To unmount a unit under Linux, unmount the mount point to where the RAID unit is mounted. For example, if you want to remove unit 0 and you know that 0 corresponds to /dev/sdb, you should unmount all partitions for sdbx (where x is the number of the partition).

```
umount /dev/sdbx
```

For FreeBSD, the command would be

```
umount /dev/twedx
```

When you click **Remove Unit**, you will be asked to confirm that you want to proceed. When you confirm the removal, the unit number and information will be removed from 3DM. (Units created in the future can reclaim this unit number.)

The operating system is notified that the unit was removed. In Linux the device node associated with this unit is removed. In Windows the Device Manager will reflect the changes under the disk drives icon.

Information about the unit remains intact on the drives. This allows the drive or drives to be reassembled into a unit again on this controller, or if moved to another controller.

Warning: Physically removing drives which are not in hotswap carriers can result in a system hang or may even damage the system and the drive.

Delete Unit. Deletes the selected unit and allows you to use the drives to create another unit. The drives appear in the list of Available Drives.

Caution: Before you click **Delete Unit,** make sure the unit you are removing is unmounted and the system is not accessing it. (For example, make sure you are not copying files to the unit, and make sure that there are no applications with open files on that unit.)

If a unit is not unmounted and you remove it, it is the equivalent of physically yanking a hard drive out from under the operating system. You could lose data, the system could hang, or the controller could reset.

Devices can be unmounted through the operating system. For details, see the discussion under **Remove Unit,** above.

Warning: When a unit is deleted, the data will be permanently deleted: the drives cannot be reassembled into the same unit. If you want to reassemble the drives on another controller and access the existing data, use **Remove Unit** instead of **Delete Unit.**

After deletion, the operating system is notified that the unit was deleted. In Linux the device node associated with this unit is removed. In Windows the Device Manager will reflect the changes under the disk drives icon.

Available Drives (to Create Units)

This section lists the drives on the controller which are not currently configured as part of a unit. The Port number, model, capacity, and status are all displayed, as they are for drives in existing units.

Remove Drive. The Remove Drive link removes a drive from the controller so that you can safely unplug it. Any drive in the Available Drives list can be removed.

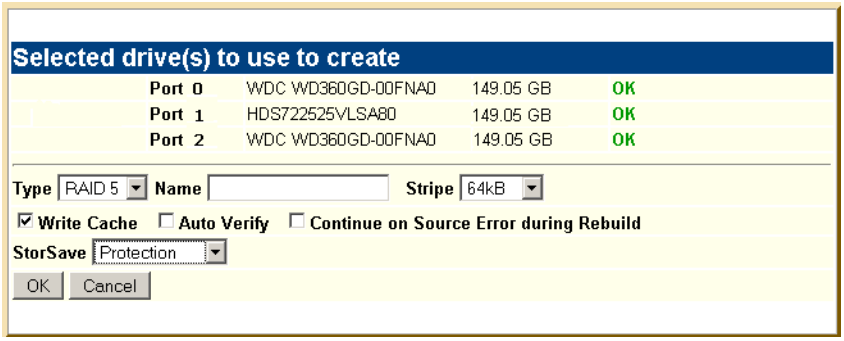
Warning: Physically removing drives which are not in hotswap carriers can result in a system hang or may even damage the system and the drive.

Create Unit

Use the **Create Unit** button to create a unit for use on the current controller. Begin by selecting the drives you want to use in the list of Available Drives, and then click **Create Unit**. You will be prompted to select the unit Type, Name, Stripe size (if applicable), and unit policy settings.

A window like the one below shows the drives you selected, and lets you specify configuration settings.

Figure 98. Configuration Window in 3DM

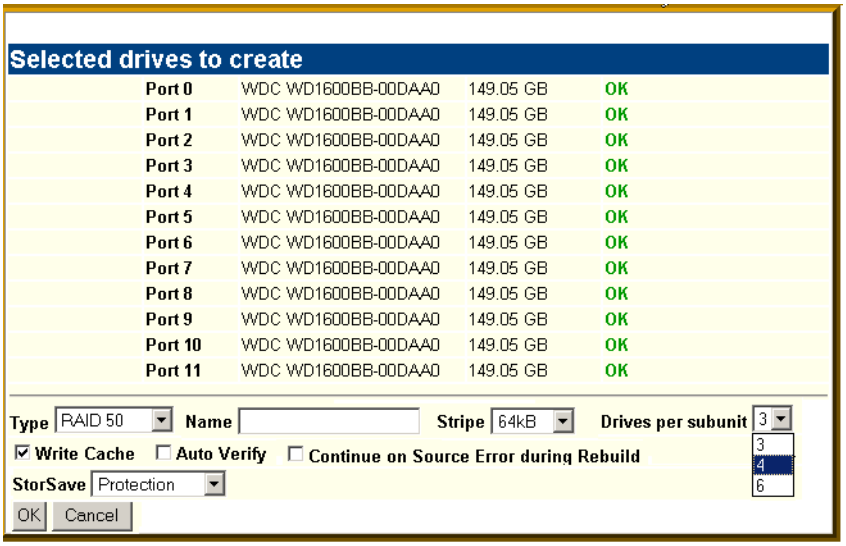


For more detailed instructions, see “Configuring a New Unit” on page 96.

Type. The drop-down list lists the possible RAID configurations for the drives selected in the list of Available Drives. Available configurations may include RAID 0, RAID 1, RAID 5, RAID 10, RAID 50, Single Disk, and Spare Disk. For information about these configurations, see “Available RAID Configurations” on page 5.

When you are configuring a RAID 50 with twelve drives, an additional field appears, in which you select the number of drives per subunit—3, 4, or 6.

Figure 99. Configuring a RAID 50 with 12 Drives



Name. You can enter a name for the unit.

Stripe. The drop-down list of stripe sizes lists the possible stripe sizes for the configuration you selected in the RAID level drop-down.

The default stripe size of 64KB will give the best performance with applications that have many sequential reads and writes. A larger stripe size will give better performance with applications that have a lot of random reads and writes. In general, the smaller the stripe size, the better the sequential I/O

and the worse the random I/O. The larger the stripe size, the worse the sequential I/O and the better the random I/O.

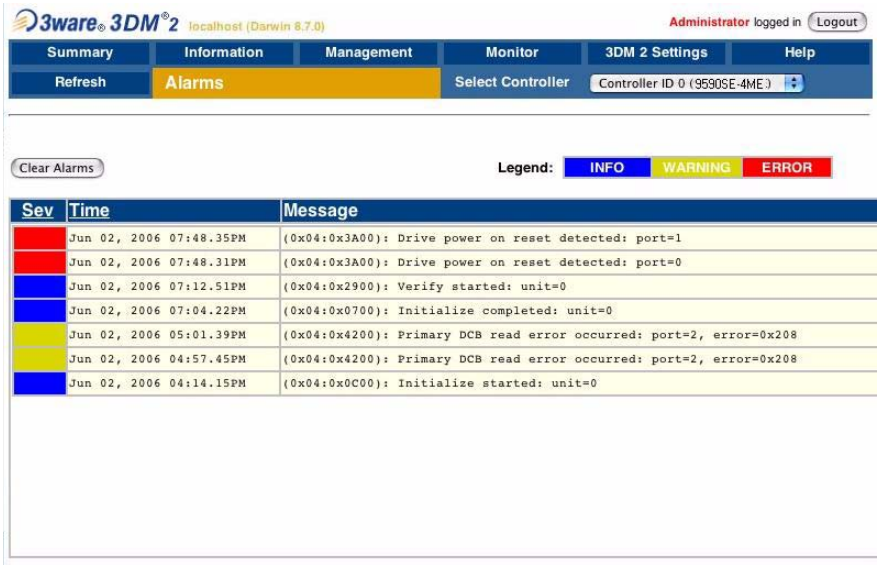
Write Cache, **Auto Verify**, and **Continue on Source Error during Rebuild.** These check boxes let you set the policies for the unit. These policies can also be set and changed on the Controller Settings page. For details about these policies, see “Unit Policies” on page 198.

Note: If the configuration window disappears while you are selecting drives, 3DM 2 may have refreshed. Click **Create Unit** again. If desired, you can reduce the frequency with which information refreshes in 3DM 2, or disable refresh temporarily, on the 3DM 2 Settings page.

StorSave. You can specify the StorSave Profile to be used for the unit. Three profiles are available: Protection, Balanced, and Performance. For more information, see “Setting the StorSave Profile for a Unit” on page 117.

Alarms page

Figure 100. Alarms Page



The Alarms page appears when you click **Monitor > Alarms** on the menu bar.

This page displays a list of AENs (asynchronous event notifications) received from the controller displayed in the drop-down list in the menu bar.

Up to 1000 events can be listed. After the 1000-limit is reached, the oldest events are deleted, as new ones occur.

You can sort the events by severity or time. To do so, just click the column header.

For information about a particular event, click it on the Alarms page; the 3DM Help will open with information about the event. For a complete listing of the alarms that appear on the Alarms page, see “Error and Notification Messages” on page 224.

Clear Alarms. The **Clear Alarms** button removes all alarms shown in the list.

Sev. Shows the severity of the event. Three levels are provided:

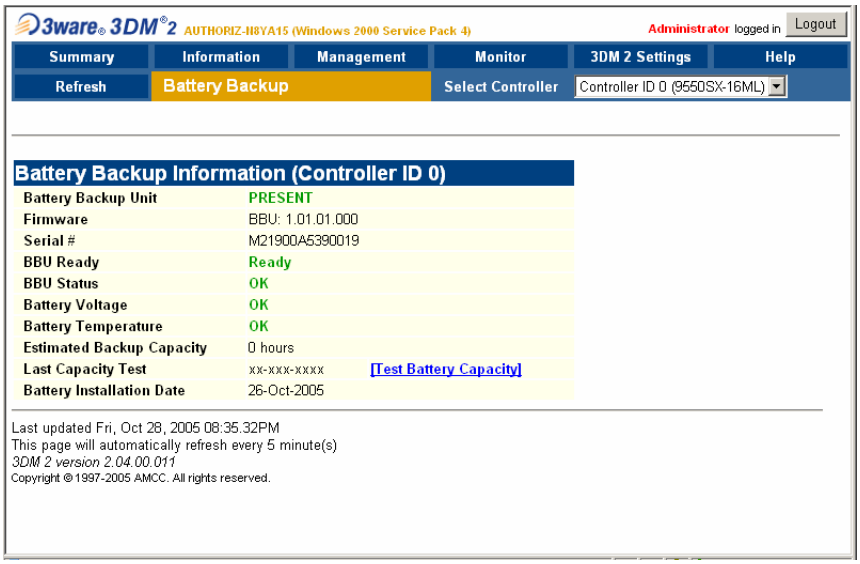
- Errors are shown next to a red box
- Warnings are shown next to a yellow box
- Information is shown next to a blue box

Time. The time shown for alarms is the time the alarm was received by the driver from firmware.

Message. The specific text relating to the alarm condition.

Battery Backup page

Figure 101. Battery Backup Page



The Battery Backup page appears when you choose **Monitor > Battery Backup** on the menu bar. Use this page to determine whether a backup battery is present, see details about it, and perform a battery test.

Battery Backup Unit. Indicates whether the BBU is present.

Firmware. Indicates the BBU firmware version.

Serial Number. Indicates the BBU serial number.

BBU Ready. Indicates if the BBU is able to backup the 3ware RAID controller or not. If the BBU is “Ready”, write cache can be enabled on the 3ware RAID controller. When the status is not “Ready,” write caching is automatically disabled on all units attached to the controller.

BBU Status. Indicates the status of the BBU. Possibly BBU statuses include the following:

- **OK**. The BBU is functioning normally.
- **Not Present**. The BBU was not detected or is disabled. (The BBU can be disabled using CLI.)
- **No Battery**. No battery pack is installed in the BBU.
- **Testing**. A battery capacity test is in process.
- **Charging**. The battery is being charged. Charging of the battery occurs automatically if the battery voltage falls too low. This normally occurs about once a week to top off the charge level; the process does not change the BBU readiness state.

  If the battery is ever discharged through a backup cycle or if the system power is off for more than two weeks, the battery status changes to “Charging” the next time the system is powered on. This indicates the BBU is not able to backup the 3ware RAID controller. When the BBU is in the charging state, write caching is disabled automatically on all units attached to the controller.
- **Fault**. The BBU detected a fault. This occurs if the voltage or temperature is outside the acceptable range.
- **Error**. Other BBU error. Please contact AMCC Technical Support.
- **Weak Battery**. The battery should be replaced soon. The results of a battery health test or capacity test indicate that the battery is below the warning threshold (48 hours).
- **Failed Battery**. The battery failed a test and must be replaced. A “Failed Battery” status is displayed if the battery failed the health test or the battery capacity is below the error threshold (24 hours). The battery must be replaced.

Battery Voltage. Indicates the voltage status of the battery. The BBU measures and evaluates the battery voltage continuously. If the voltage falls outside the normal range, warning or error level AENs are generated. In the case of a voltage error the BBU status will change to “Fault” and the battery will be disconnected electronically.

Battery Temperature. Indicates the temperature status of the battery. The BBU measures and evaluates the battery pack temperature continuously. If the temperature falls outside the normal range, warning or error level AENs are

generated based on the measured temperature. In the case of a temperature error, the BBU status will change to “Fault” and the battery will be disconnected electronically.

Estimated Backup Capacity. Indicates the estimated backup capacity in hours. This is the amount of time that the battery backup unit can protect the data in the 3ware RAID controller's cache memory. This field is set to zero at the start of a new test and is updated after the test completes. A capacity of zero will also show if the BBU is disconnected and then reconnected.

Under optimal conditions, a battery can protect for up to 72 hours. However, with a fresh battery, you may see a higher number in this field. As the battery ages, the backup capacity diminishes.

Last Capacity Test. Indicates the date when the last battery test was completed. To test the battery click the **Test Battery Capacity** link. For details, see “Testing Battery Capacity” on page 187.

Battery Installation Date. Indicates when the BBU last detected the battery pack was removed and replaced.

Enclosure Summary page

Figure 102. Enclosure Summary Page

The Enclosure Summary page appears when you choose **Enclosure > Enclosure Summary** from the menu bar.

The Enclosure Summary page provides basic information about any enclosures attached to your system.

ID. The ID that the 3ware firmware assigns to the enclosure.

Slots. The number of slots in the enclosure.

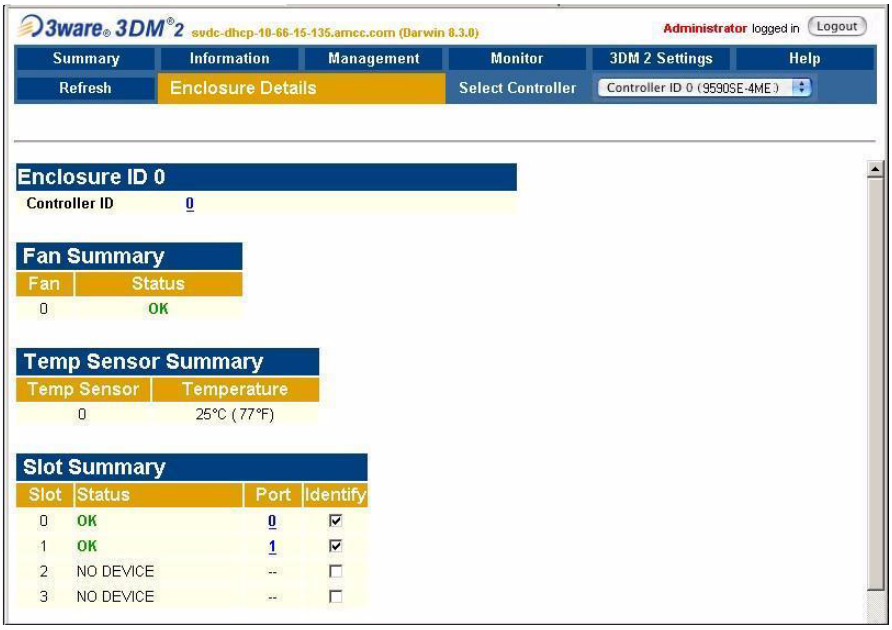
Drives. The number of drives in the enclosure.

Fans. The number of fans in the enclosure.

Temp Sensor. The number of the temperature sensor in the enclosure.

Enclosure Details page

Figure 103. Enclosure Details Page



The Enclosure Details page appears when you click the ID of the enclosure on the Enclosure Summary page.

Enclosure ID. The ID of the controller to which the enclosure is attached.

Fan Summary. Shows the ID of the enclosure and the status of the fan—either OK or Unknown.

Temp Sensor Summary. Shows the ID of the enclosure and the temperature in the enclosure.

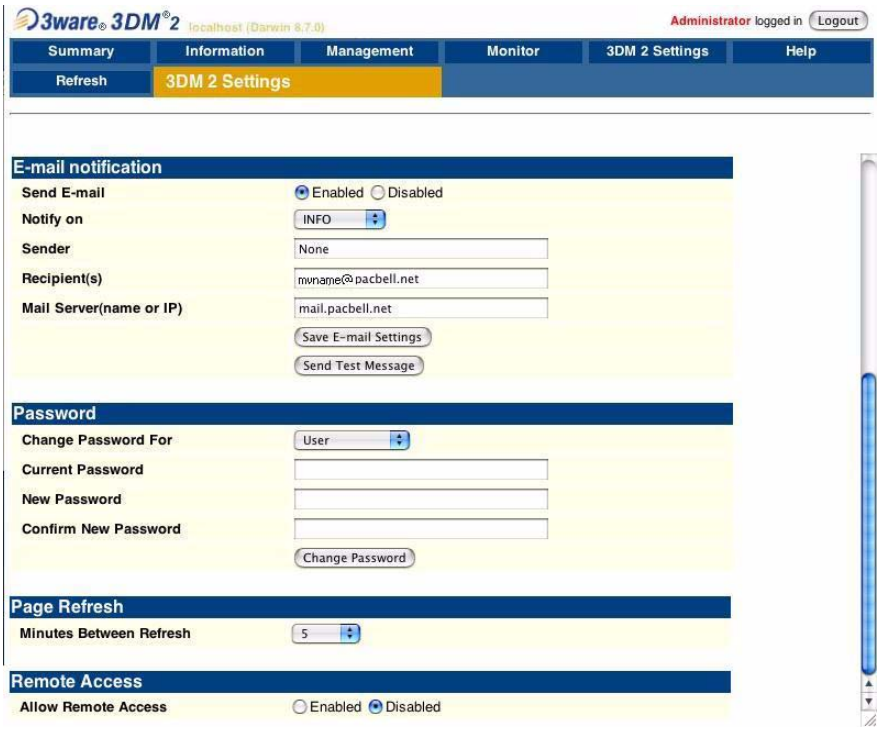
The maximum temperature for successful use of a drive should be noted in the documentation for the drive.

Slot Summary. Lists the enclosure slots and indicates which ones contain drives, and the status of each drive. The Identify checkbox can be used to blink the LED associated with that slot.

Identify. Check the box for a slot to cause the LED for it to blink in the enclosure.

3DM 2 Settings page

Figure 104. 3DM 2 Settings Page



The 3DM 2 Settings page appears when you click **3DM 2 Settings** on the menu bar. Use this page to set preferences, including email notification for alarms, passwords, page refresh frequency, whether remote access is permitted, and the incoming port for 3DM to listen for requests.

The initial settings for most of these preferences are specified during installation of 3DM.

Information about the 3DM 2 Settings page is organized under these headings:

- E-mail Notification
- Password
- Page Refresh
- Remote Access
- HTTP Settings

E-mail Notification

Use the fields in this section to set up and manage notifications of events by e-mail.

Send E-mail. This field determines whether e-mail notification is **Enabled** or **Disabled**. It is a good idea to enable this feature, so that you receive email when your units or drives have problems.

Notify On. Specifies the type of events for which notifications should be sent. A severity of **Information** will send e-mails for all alarms, a severity of **Warning** will send e-mail for alarms with severity of Warning and Error. A severity of **Error** will send e-mail for alarms with severity of Error.

Sender. Enter the email address which will appear in the “From” field.

Recipient. The e-mail address to which notifications should be sent. You can enter multiple addresses, separated by commas (,).

Mail Server (name or IP). If the machine on which you are running 3DM has access to a name server, you may enter the machine name of the mail server in the Server field. Otherwise, use the IP address.

Save E-mail Settings button. Saves the e-mail notification settings.

Send Test Message button. Sends a test message using the saved e-mail settings.

Password

Use the fields in this section to set the passwords for the User and Administrator. When 3DM is first installed, the default password for both is `3ware`.

Change Password For. Select the access level for which you are setting the password: **User** or **Administrator**. Users can only view status information in 3DM, while Administrators can make changes and administer the controller and associated drives.

Current Password. Enter the current password.

New Password. Enter the new password.

Confirm New Password. Enter the new password a second time, to be sure you have entered it correctly.

Change Password button. Saves password changes.

Page Refresh

Minutes Between Refresh. Displays how frequently pages in 3DM will be refreshed with new data from the controller. To change this setting, select another option from the drop-down. If you prefer 3DM to only refresh when you click **Refresh Page**, select **Never**.

The Login, Help and Drive SMART data pages do not automatically refresh. All other 3DM pages do.

Remote Access

Allow Remote Access. This field enables or disables the ability for users and administrators to access 3DM from a remote computer.

HTTP Settings

Listening Port. This field specifies the HTTP: port to be used by 3DM when listening for communications. The default port setting is 888.

If you change this port, make sure the port you specify is not being used. Failure to do so will cause 3DM to stop responding and you will have to restart it by hand.

Change Port button. Saves a new port number.

12

Troubleshooting

This troubleshooting section includes the following sections:

- Web Resources
- Before Contacting Customer Support
- Command Logging
- Problems and Solutions
- Error and Notification Messages

Web Resources

For support, troubleshooting tips, frequently asked questions, software releases, and compatibility information related to 3ware RAID controllers, refer to:

- 3ware support page at:
  http://www.3ware.com/support/
- 3ware knowledgebase:
  http://www.3ware.com/KB/kb.asp
- 3ware software downloads:
  http://www.3ware.com/support/download.asp
- 3ware documentation:
  http://www.3ware.com/support/userdocs.asp
- 3ware Compatibility Lists:
  http://www.3ware.com/support/sys_compatibility.asp

If you have a degraded unit or problem drive, see “Maintaining Units” on page 138.

Before Contacting Customer Support

Three screens in 3DM 2 provide controller version and status information that can be helpful when contacting 3ware Customer Support with questions or for troubleshooting: Controller Summary, Unit Details, and Unit Information.

You can copy and paste the information from these screens into an email using the system clipboard. When each page is displayed on the screen, highlight it using your mouse, press Ctrl-C to copy it to the clipboard, and then Ctrl-V to paste it into an e-mail.

You may also want to take a snapshot of these pages so that you can respond to questions about your system configuration to the Customer Support representative.

Command Logging

All changes that are made to RAID configurations using 3DM or CLI are automatically stored in a special log file. This log can be helpful to AMCC technical support if they are helping you troubleshoot problems with your RAID controller and units.

In Linux and FreeBSD, the log file is in /var/log directory.

In Windows, the log file is in the 3DM2 installation directory if 3DM2 is installed on your system. If 3DM2 is not installed, the log file is in the home directory of the current user.

Command logging is on by default. It can be disabled through the CLI. (For details see the *3ware Serial ATA RAID Controller CLI Guide*.)

Problems and Solutions

Hardware Installation

Q1: The 3ware BIOS screen never appears.

The 3ware RAID controller may not be installed properly. Reinstall the hardware and reboot.

There may also be a problem with the motherboard. Please check the Motherboard Compatibility List on the 3ware website at http://www.3ware.com/products/compatibility.asp to see if you motherboard has been tested by 3ware. If you have a different type of motherboard available, you may want to test the controller in it to see if the 3ware BIOS screen appears.

The motherboard's BIOS may need to be upgraded. Check the web site of the motherboard manufacturer to download and install their latest BIOS.

You can also try using a different PCI slot. If you are using a PCI riser card, try installing it directly. Some riser cards are not compatible with certain motherboards.

Q2: Need to boot from a non-3ware device without changing the boot order.

If the operating system is installed on a 3ware unit, you can temporarily bypass the 3ware BIOS and prevent the OS from booting from that unit by pressing Alt-b. This saves the step of changing the boot order in the motherboard BIOS and 3BM and having to change it back again.

Check the 3ware KnowledgeBase for details related to other issues: http://www.3ware.com/KB/kb.asp.

Software Installation

Q4: The 3ware RAID controller was configured without problems, but the system does not boot.

The problem could be one or more of the following:

- The BIOS may have changed the order of the boot devices. Check your system BIOS boot sequence.
- The operating system is installed on a device that is not in your system’s boot order. Use your system’s Setup utility to include the StorSwitch controller in the boot order.

- If your operating system was installed before you configured your RAID units, you may have overwritten your operating system. Remember that creating or deleting a RAID unit overwrites any existing data on the member drives. Reinstall your operating system.
- If you installed your operating system when you installed the 3ware RAID controller, you may have made a mistake in installing the operating system. Reinstall your operating system.
- There may be a compatibility problem between the motherboard system BIOS and the 3ware BIOS. Check the 3ware website (www.3ware.com) to see if your motherboard is compatible with the 3ware BIOS, and check with your motherboard manufacturer for potential BIOS updates.

Q5: A unit shows up as unusable, similar to the following:

```
4 drive 64K RAID 5 missing drive(s)

   Port 1  Maxtor  6B300S0      279.86 GB
   Port 2  Maxtor  6B300S0      279.86 GB
```

The unit has some but not all of its members available. The unit will be unusable. If this unit is your boot device, your system will not boot. You must either find the missing disk and replace it to complete the unit, or release the member disks by deleting the incomplete unit(s) listed in the display. Remember that deleting a RAID unit overwrites any existing data on the member drives.

Problems in 3DM

Q6: A 3ware RAID controller does not show in the list of controllers.

You may not have the most recent driver for your controller.

To find out the driver number currently installed, see “Determining the Current Version of Your 3ware Driver” on page 168

Current drivers are available for download on the 3ware website at http://www.3ware.com/support/download.asp.

Error and Notification Messages

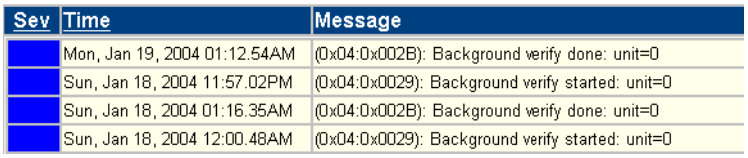
Error and notification messages are issued by the 3ware RAID controller when an error is detected or when an action is completed. These messages are sometimes referred to as AENs (asynchronous event notifications).

AEN messages are displayed on the 3DM 2 Alarms page.

On the 3DM 2 Alarms page, you can click on the message to jump to help text about that message. You can also look the message up in the list below. In 3DM 2, the message number is the last few digits within the parentheses at the beginning of the message description. For example, in the string `(0x04:0x002B)`, "`002B`" is the message number. To find additional information about the message 2B, you would look up 002B in the list below.

Note that the messages are listed below in hex order, since the message numbers are in hex.

Error and notification messages are listed in Table 13. Descriptions of each are provided after the table.



Sev	Time	Message
	Mon, Jan 19, 2004 01:12.54AM	(0x04:0x002B): Background verify done: unit=0
	Sun, Jan 18, 2004 11:57.02PM	(0x04:0x0029): Background verify started: unit=0
	Sun, Jan 18, 2004 01:16.35AM	(0x04:0x002B): Background verify done: unit=0
	Sun, Jan 18, 2004 12:00.48AM	(0x04:0x0029): Background verify started: unit=0

Table 13: Error and Notification Message List

Value	Message
0001	Controller reset occurred
0002	Degraded unit
0003	Controller error occurred
0004	Rebuild failed
0005	Rebuild completed
0006	Incomplete unit detected
0007	Initialize completed
0008	Unclean shutdown detected
0009	Drive timeout detected
000A	Drive error detected
000B	Rebuild started
000C	Initialize started

Table 13: Error and Notification Message List

Value Message
000D Unit deleted
000E Initialize failed
000F SMART threshold exceeded
0019 Drive removed
001A Drive inserted
001E Unit inoperable
001F Unit Operational
0021 Downgrade UDMA mode
0022 Upgrade UDMA mode
0023 Sector repair completed
0024 Sbuf memory test failed
0025 Cache flush failed; some data lost
0026 Drive ECC error reported
0027 DCB checksum error detected
0028 DCB version unsupported
0029 Verify started
002A Verify failed
002B Verify completed
002C Source drive ECC error overwritten
002D Source drive error occurred
002E Replacement drive capacity too small
002F Verify not started; unit never initialized
0030 Drive not supported
0032 Spare capacity too small for some units
0033 Migration started
0034 Migration failed
0035 Migration completed
0036 Verify fixed data/parity mismatch
0037 SO-DIMM not compatible
0038 SO-DIMM not detected

Table 13: Error and Notification Message List

Value Message
0039 Buffer ECC error corrected
003A Drive power on reset detected
003B Rebuild paused
003C Initialize paused
003D Verify paused
003E Migration paused
003F Flash file system error detected
0040 Flash file system repaired
0041 Unit number assignments lost
0042 Primary DCB read error occurred
0043 Backup DCB read error detected
0044 Battery voltage is normal
0045 Battery voltage is low
0046 Battery voltage is high
0047 Battery voltage is too low
0048 Battery voltage is too high
0049 Battery temperature is normal
004A Battery temperature is low
004B Battery temperature is high
004C Battery temperature is too low
004D Battery temperature is too high
004E Battery capacity test started
004F Cache synchronization skipped
0050 Battery capacity test completed
0051 Battery health check started
0052 Battery health check completed
0053 Battery capacity test is overdue
0055 Battery charging started
0056 Battery charging completed
0057 Battery charging fault

Table 13: Error and Notification Message List

Value Message
0058 Battery capacity is below warning level
0059 Battery capacity is below error level
005A Battery is present
005B Battery is not present
005C Battery is weak
005D Battery health check failed
005E Cache synchronization completed
005F Cache synchronization failed; some data lost

Error and Notification Message Details

0001 Controller reset occurred

The 3ware RAID controller has detected a soft reset from the device driver. If the 3ware RAID controller fails to respond to the device driver within a reasonable amount of time, the device driver may issue a soft reset to the 3ware RAID controller and retry the command packet. For more information, see http://www.3ware.com/KB/article.aspx?id=14923.

0002 Degraded unit

An error has been encountered and the unit is operating in degraded (non-redundant) mode. You should replace the bad drive as soon as possible and initiate a rebuild.

Removing a drive from a redundant unit will cause this message to display immediately.

For more information, see “Locating a Drive by Blinking Its LED” on page 166.

0003 Controller error occurred

The 3ware RAID controller has encountered an internal error. Please contact AMCC Customer Support as a replacement board may be required.

0004 Rebuild failed

The 3ware RAID controller was unable to complete a rebuild operation. This error can be caused by drive errors on either the source or the destination of

the rebuild. However, due to ATA drives' ability to reallocate sectors on write errors, the rebuild failure is most likely caused by the source drive of the rebuild detecting some sort of read error. The default operation of the 3ware RAID controller is to abort a rebuild if an error is encountered. If it is desired to continue on error, you can set the Continue on Source Error During Rebuild policy for the unit on the Controller Settings page in 3DM.

For more information, see "Setting Continue on Source Error During Rebuild" on page 115.

0005 Rebuild completed

The 3ware RAID controller has successfully completed a rebuild. The completion of the rebuild changes the state of the unit from rebuilding to OK. The data is now redundant.

0006 Incomplete unit detected

At power-on initialization time, or during a rescan, the 3ware RAID controller performs a "rollcall" of all drives attached to the card. After detection of the drives, the 3ware RAID controller then uses an internal algorithm to logically connect drives that belong to the same unit. If after rollcall a member of a unit is not found, the INCOMPLETE UNIT message is sent. Examples of incomplete units are as follows:

- 3-drive or larger RAID 5 unit with two or more drives missing. This also applies to RAID 5 units that are part of a RAID50 unit.
- 4-drive RAID 10 unit with three drives missing.

Replacing the missing or dead drive and initiating a rebuild will change the state of the unit from an incomplete unit to OK. No rebuild is required if you replace the missing drive before loading the driver.

0007 Initialize completed

The 3ware RAID controller has completed the "synching" background initialization sequence of RAID levels 1, 10, 50, or 5. For RAID 5 and RAID 50, the data on the unit is read and the resultant parity is written to the parity area on the unit. For RAID 1 and 10, one half of the mirror is copied to the other half (mirrors are synchronized).

For information on the differences between foreground and background initialization, see "About Initialization" on page 148

0008 Unclean shutdown detected

The 3ware RAID controller has the ability to detect if the system has been shutdown via the standard shutdown mechanism of the operating system

(clean shutdown). If the system loses power or is reset without going through the normal shutdown procedure, it is possible that the data on a redundant unit may be out of synchronization. The unclean shutdown detection will detect this case and force the unit to enter the verify state.

For more information on the verify state, see “About Verification” on page 151

To prevent unclean shutdowns, always go through the normal shutdown procedure. It is also recommended to use an uninterruptible power supply (UPS) to prevent unclean shutdowns due to sudden power loss.

0009 Drive timeout detected

The 3ware RAID controller has a sophisticated recovery mechanism to handle various types of failures of a disk drive. One such possible failure of a disk drive is a failure of a command that is pending from the 3ware RAID controller to complete within a reasonable amount of time. If the 3ware RAID controller detects this condition, it notifies you, prior to entering the recovery phase, by displaying this message.

Possible causes of drive timeouts (also known as APORT time-outs) include a bad or intermittent disk drive, power cable or interface cable.

For links to drive manufacturer diagnostic utilities and troubleshooting advice, see http://www.3ware.com/KB/article.aspx?id=14924.

000A Drive error detected

As part of the recovery mechanism of the 3ware RAID controller, various drive failures can be detected and, if possible, corrected. One such drive failure is when the drive indicates back to the 3ware RAID controller that it was unable to complete a command. If the drive returns an error to the 3ware RAID controller, you are notified by this message.

For links to drive manufacturer diagnostic utilities and troubleshooting advice, see http://www.3ware.com/KB/article.aspx?id=14925.

000B Rebuild started

The 3ware RAID controller notifies you whenever it starts a rebuild. The rebuild start may have been initiated by you (by selecting the Rebuild button in the 3DM Maintenance page), may be auto-initiated by a hot spare failover, or may be started after drive removal or insertion (due to the Auto Rebuild policy). In any of these cases, you are notified of the event by this message.

For information on scheduling rebuilds, see “Scheduling Background Tasks” on page 161. For general information on rebuilds, see “Rebuilding Units” on page 155. For information about how background tasks are prioritized, see “Background Task Prioritization” on page 161.

000C Initialize started

The 3ware RAID controller notifies you by this message whenever it starts an initialization. This is always a “synching” background initialization and does not erase user data. Initialization either occurs at unit creation time for larger RAID 5 or 50 units or later during the initial verification of redundant units.

For more information, see “About Initialization” on page 148

000D Unit deleted

The unit was deleted.

The controller firmware will warn you and request confirmation before deleting units that are mounted and known to the operating system. You should unmount any units that you plan to delete. Note that deleting a unit will erase all data on that unit.

000E Initialize failed

The 3ware RAID controller was unable to complete the initialization. This error can be caused by unrecoverable drive errors.

If this unit was a redundant unit, and the 'initialize failed' happened because of a problem on a particular disk drive, then the unit will be degraded on that disk drive's port.

000F SMART threshold exceeded

The 3ware RAID controller supports SMART Monitoring, whereby the individual drives automatically monitor certain parametric information such as error rates and retry counts. By monitoring this data, SMART may be able to predict a drive failure before it happens, allowing you to schedule service of the unit before it becomes degraded. The SMART status of each drive attached to the 3ware RAID controller is monitored daily. If a failure of any drive is determined to be likely, you are notified by this message.

3ware recommends that you replace any drive that has the SMART threshold exceeded.

If the drive is part of a redundant unit, then you can 'Remove' the drive with 3DM2 to degrade the unit. Replace the drive and start a rebuild. For information on rebuilds, see “Rebuilding Units” on page 155.

If the drive is not part of a redundant unit, then you will need to backup your data before replacing the drive.

0019 Drive removed

This message is posted whenever a drive is removed from the controller while the controller is powered on.

If you use 3DM2 to ‘Remove’ a drive from a redundant unit, you can then replace that drive and start a rebuild without needing to backup your data.

If the drive is not part of a redundant unit, then before removing it, you will need to backup your data.

For information on rebuilding degraded units, see “To verify a unit through 3BM” on page 154.

001A Drive inserted

This message is posted whenever a drive is connected to the controller while the controller is powered on.

001E Unit inoperable

Drive removal caused a unit to become inoperable. This message is sent after offline unit timer expires (20 seconds); if the unit becomes operational before the timer expires (20 seconds) there will be no message since there were no IO errors.

001F Unit Operational

Drive insertion caused a unit that was inoperable to become operational again. Any data that was on that unit will still be there. This message is sent only after the offline timer expires (20 seconds).

0021 Downgrade UDMA mode

The 3ware RAID controller communicates to the ATA disk drives through the Ultra DMA (UDMA) protocol. This protocol ensures data integrity across the ATA cable by appending a Cyclical Redundancy Check (CRC) for all ATA data that is transferred. If the data becomes corrupted between the drive and the 3ware RAID controller (e.g., an intermittent cable connection) the 3ware RAID controller detects this as a UDMA CRC or cable error. The 3ware RAID controller then retries the failed command three times at the current UDMA transfer rate. If the error persists, it lowers the UDMA transfer rate (e.g., from UDMA 100 to UDMA 66) and retries another three times. This message is sent to you when the 3ware RAID controller lowers the UDMA transfer rate.

Possible causes of UDMA CRC errors are bad interface cables or cable routing problems through electrically noisy environments (e.g., cables are too close to the power supply).

0022 Upgrade UDMA mode

During the self-test, if a drive is found to not be in the optimal UDMA mode, the controller will upgrade its UDMA mode to be optimal.

0023 Sector repair completed

The 3ware RAID controller supports a feature called dynamic sector repair to allow the unit to recover from certain drive errors that would normally result in a degraded unit situation. For redundant units such as RAID 1, 10, 50, and 5, the 3ware RAID controller essentially has two copies of your data available. If a read command to a sector on a disk drive results in an error, it reverts to the redundant copy in order to satisfy the host's request. At this point, the 3ware RAID controller has a good copy of the requested data in its cache memory. It will then use this data to force the failing drive to reallocate the bad sector, which essentially repairs the sector. When a sector repair occurs, you are notified by this message.

The fact that a sector repair message has been sent to you is an indication of the presence of grown defects on a particular drive. While typical modern disk drives are designed to allow several hundred grown defects, special attention should be paid to any drive in a unit that begins to indicate sector repair messages. This may be an indication of a drive that is beginning to fail. You may wish to replace the drive, especially if the number of sector repair errors exceeds 3 per month.

0024 Sbuf memory test failed

The 3ware RAID controller, as part of its data integrity features, performs diagnostics on its internal RAM devices. Once a day, a non-destructive test is performed on the cache memory. Failure of the test indicates a failure of a hardware component on the 3ware RAID controller. This message is sent to notify you of the problem. If the controller is still under warranty, contact 3ware Technical Support for a replacement controller.

0025 Cache flush failed; some data lost

To improve performance, the 3ware RAID controller features caching layer firmware. For write commands this means that it acknowledges it has completed a write operation before the data is committed to disk. If the 3ware RAID controller can not commit the data to the media after it has acknowledged to the host, this message is posted.

Typically, the Cache Flush Failed notification would be an indication of a catastrophic failure of the drives in the unit, such as loss of power to multiple drives in a unit.

To troubleshoot the reasons for the failure, collect the logs for your system and contact 3ware technical support at http://www.3ware.com/support/

index.asp. For information on what error logs are and how to collect them, see http://www.3ware.com/KB/article.aspx?id=12278.

0026 Drive ECC error reported

This message may be sent when a drive returns the ECC error response to n 3ware RAID controller command. The message may or may not be associated with a host command. Internal operations such as Verify post this message whenever drive ECC errors are detected.

Drive ECC errors are an indication of a problem with grown defects on a particular drive. For redundant units, this typically means that dynamic sector repair would be invoked (see message "0023 Sector repair completed" on page 232). For non-redundant units (JBOD, RAID 0 and degraded units), drive ECC errors result in the 3ware RAID controller returning failed status to the associated host command.

0027 DCB checksum error detected

The 3ware RAID controller stores certain configuration parameters on a reserved area of each disk drive called the Drive Configuration Block (DCB). As part of power-on initialization, the 3ware RAID controller performs a checksum of the DCB area to ensure consistency. If this error occurs, please contact 3ware technical support. The drive's DCB has been corrupted.

0028 DCB version unsupported

During the evolution of the 3ware product line, the format of the DCB has been changed to accommodate new features. The DCB format expected by the 3ware RAID controller and the DCB that is written on the drive must be compatible. If a unit that was created on a very old 3ware product is connected to a newer 3ware RAID controller, this message is posted and the 3ware RAID controller rejects the drive. Please contact 3ware technical support if this event occurs.

0029 Verify started

The 3ware RAID controller allows you to verify data integrity on a unit. The verification functions for different RAID levels are as follows:

- Single, JBOD, and Spare. Verify = Media Scan
- RAID 0. Verify = Media Scan
- RAID 1. Verify = Compare of Mirror Sides
- RAID 10. Verify = Compare of Mirror Sides
- RAID 5 and 50. Verify = Compare of Parity Data with User Data

For information on scheduling verifications, see "Scheduling Background Tasks" on page 161

002A Verify failed

This message indicates that the data integrity verification function (see message 0029) has terminated with an error. For each RAID level being verified, this may mean:

- Single, JBOD, and Spare. A single drive returned an error, possibly because of a media defect.
- RAID 0. A single drive returned an error, possibly because of a media defect.
- RAID 1. One side of the mirror does not equal the other side.
- RAID 10. One side of the mirror does not equal the other side.
- RAID 5 and 50. The parity data does not equal the user data.

For any RAID type, the most likely cause of the error is a grown defect in the drive. For out-of-synchronization mirrors or parity, the error could be caused by improper shutdown of the unit. This possibility applies to RAID 1, 10, 5, and 50. A rebuild will re-synchronize the unit

When this message is generated, redundant units will be automatically initialized. The initialize will not erase user data, but will recalculate and rewrite user parity data. For more information on the Initialize function, see “About Initialization” on page 148.

002B Verify completed

This message indicates the data integrity verification function (see message “0029 Verify started” on page 233) was completed successfully.

002C Source drive ECC error overwritten

If a read error is encountered during a rebuild and the controller is configured to ‘ignore ECC’ or to ‘Force continue on source errors’, the sector in error is reallocated. You are notified of the event by this message.

002D Source drive error occurred

If an error is encountered during a rebuild operation, this message is generated if the error was on a source drive of the rebuild. Knowing if the error occurred on the source or the destination of the rebuild is useful for troubleshooting.

002E Replacement drive capacity too small

The 3ware RAID controller notifies you by this message when the replacement drive capacity is smaller than required. The replacement drive must be equal to or greater capacity than the drive it is replacing.

002F Verify not started; unit never initialized

This message will be sent by the controller when a verify operation is attempted but the unit has never been initialized before. The unit will transition to initializing mode.

This is considered a normal part of operation. Not all types of RAID units need to be initialized in order to have full performance. The initialize will not erase user data, but will calculate and write parity data to the drives in the unit. For information on the Initialize function, see “About Initialization” on page 148.

0030 Drive not supported

3ware 8000 and 9500S Serial ATA controllers only support UltraDMA-100/133 drives when using the parallel to serial ATA converter. This message indicates that an unsupported drive was detected during rollcall or a hot add. This message also could indicate that the Serial to Parallel converter was jumpered in the wrong place. The converter must be correctly jumpered to correspond to UDMA 100 or 133 drives.

For a list of compatible drives, see http://www.3ware.com/products/compatibility_sata.asp.

0032 Spare capacity too small for some units

This message is sent by the controller when it finds a valid hot spare but the capacity is not sufficient to use it for a drive replacement for existing units.

0033 Migration started

This message is sent when migration of a unit is started. For more information on migration, see “RAID Level Migration (RLM) Overview” on page 121.

0034 Migration failed

This message is sent when migration of a unit fails. Review the list of events on the Alarms page for other entries that may give you an idea of why the migration failed (for example, a drive error on a specific port).

0035 Migration completed

This message is sent when migration of a unit is complete. The new unit type and/or stripe size is now ready to be used. If the capacity of the unit did not change, then you do not need to do anything else. If the capacity of the migrated unit is larger, you will need to inform the operating system of the change. See “Informing the Operating System of Changed Configuration” on page 124.

0036 Verify fixed data/parity mismatch

This message is sent by the controller when a verify error is found (parity inconsistency for RAID 5/50 or data mismatch for RAID 1/10 configuration) and recovered. If the error is not recovered the message Verify Failed is returned instead.

0037 SO-DIMM not compatible

This message applies to the 3ware 9500S controller which has removable memory. This message will be sent if there is incompatible SODIMM memory connected to the controller. In this case, the controller is inoperable and cannot be used until a compatible SO-DIMM is put on the controller. For a list of SODIMMs compatible with the 9500S, see http://www.3ware.com/KB/article.aspx?id=11748.

Other 3ware controller models do not have memory that can be removed.

0038 SO-DIMM not detected

This message applies to the 3ware 9500S controller which has removable memory. This message will be sent if there is no SODIMM memory connected to the controller. In this case, the controller is inoperable and cannot be used until a compatible SO-DIMM is put on the controller. For a list of SODIMMs compatible with the 9500S, see http://www.3ware.com/KB/article.aspx?id=11748.

Other 3ware controller models do not have memory that can be removed.

0039 Buffer ECC error corrected

This message will be sent when the controller has detected and corrected a memory ECC error.

003A Drive power on reset detected

If the controller detects that a drive has lost power and then restarted, it will send this message. The controller may degrade the unit (if possible).

For troubleshooting information and a link to drive manufacturer diagnostic utilities, see http://www.3ware.com/KB/article.aspx?id=14927.

003B Rebuild paused

This message will be sent when the rebuild operation is paused.

Rebuilds are normally paused for ten minutes after a system first boots up and during non-scheduled times when scheduling is enabled.

For more information on scheduling rebuilds, see “Scheduling Background Tasks” on page 161

003C Initialize paused

This message will be sent when the initialization is paused.

Initializations are normally paused for ten minutes after a system first boots up and during non-scheduled times when scheduling is enabled. Initializations follow the rebuild schedule.

For information on the current task schedules, see “Viewing Current Task Schedules” on page 162.

For information on initialization, see “About Initialization” on page 148

003D Verify paused

This message will be sent when the verify operation is paused.

Verifies are normally paused for ten minutes after a system first boots up and during non-scheduled times when scheduling is enabled.

003E Migration paused

This message is sent when migration is paused. Migration follows the rebuild schedule. For more information, see “Scheduling Background Tasks” on page 161.

003F Flash file system error detected

The 3ware RAID controller stores some configuration parameters as files in its flash memory. This message will be sent when a corrupted flash file system is found on the controller during boot-up. A further attempt will be made to repair the flash file system. These files usually get corrupted when a flash operation is interrupted by events such as power failures.

0040 Flash file system repaired

This message will be sent if a corrupted flash file system is successfully repaired. Some of the flash files with insufficient data may be lost in the operation. The configuration parameters which are lost will then return to their default values.

0041 Unit number assignments lost

The 3ware RAID controller tries to keep the unit numbers persistent across soft resets. This message will be sent if unit number assignments were lost

from some unknown reasons. (This event rarely happens. Please contact AMCC 3ware technical support if this event occurs.)

0042 Primary DCB read error occurred

This message will be sent when the controller finds an error while reading the primary copy of the Disk Configuration Block (DCB). The back-up copy of the DCB will be read if this error occurs. If a valid DCB is found, the primary DCB is re-written to rectify the errors found.

If this error occurs, we recommend verifying the unit. See “Starting a Verify Manually” on page 153.

0043 Backup DCB read error detected

This message will be sent when the controller sees a latent error in the backup Disk Configuration Block (DCB). A scrubbing activity will be started to repair any sector errors on getting this error. An effort is made to read the backup DCB even when the primary DCB is successfully read. When an error occurs here, this is a latent error that needs to be addressed before any future errors so this DCB is re-written with the primary copy to rectify the errors found.

If this error occurs, we recommend verifying the unit. See “Starting a Verify Manually” on page 153.

0044 Battery voltage is normal

The Battery Backup Unit measures and evaluates the battery pack voltage on a continuous basis. If the voltage falls outside the acceptable range then comes back within the acceptable range, this message will be posted to the host.

0045 Battery voltage is low

The Battery Backup Unit measures and evaluates the battery pack voltage on a continuous basis. If the voltage is below the warning threshold, this message will be posted. When this event happens, the Battery Backup Unit is still able to backup the 3ware RAID controller, but you should replace the battery.

0046 Battery voltage is high

The Battery Backup Unit measures and evaluates the battery pack voltage on a continuous basis. If the voltage is above a warning threshold, this message will be posted. When this event happens, the Battery backup Unit is still able to backup the 3ware RAID controller but you should replace the battery.

0047 Battery voltage is too low

The Battery Backup Unit measures and evaluates the battery pack voltage on a continuous basis. If the voltage is too low to operate, this message will be posted. This indicates that the battery pack must be replaced. The Battery Backup Unit becomes not ready and is unable to backup the 3ware RAID controller.

0048 Battery voltage is too high

The Battery Backup Unit measures and evaluates the battery pack voltage on a continuous basis. If the voltage is too high to operate, this message will be posted. The Battery Backup Unit becomes not ready and is unable to backup the 3ware RAID controller. This indicates that the Battery Backup Unit must be replaced.

0049 Battery temperature is normal

The Battery Backup Unit measures and evaluates the battery pack temperature on a continuous basis. If the temperature falls outside the acceptable range then comes back within the acceptable range, this message will be posted to the host.

004A Battery temperature is low

The Battery Backup Unit measures and evaluates the battery pack temperature on a continuous basis. If the temperature is below a warning threshold, this message will be posted. When this event happens, the Battery Backup Unit is still able to backup the 3ware RAID controller but you should replace the battery pack.

004B Battery temperature is high

The Battery Backup Unit measures and evaluates the battery pack temperature on a continuous basis. If the temperature is above a warning threshold, this message will be posted. You should check that there is enough airflow around the Battery Backup Unit. When this event happens, the Battery Backup Unit is still able to backup the 3ware RAID controller but you should replace the battery pack if the temperature warning persists.

004C Battery temperature is too low

The Battery Backup Unit measures and evaluates the battery pack temperature on a continuous basis. If the temperature is too low to operate, this message will be posted. When this event happens, the Battery Backup Unit becomes not ready and is unable to backup the 3ware RAID controller. You must replace the battery pack.

004D Battery temperature is too high

The Battery Backup Unit measures and evaluates the battery pack temperature on a continuous basis. If the temperature is too high to operate, this message will be posted. You should check that there is enough airflow around the Battery Backup Unit. When this event happens, the Battery Backup Unit becomes not ready and is unable to backup the 3ware RAID controller. You must replace the battery pack if the temperature error persists. The use of a PCI card in the slot adjacent to the BBU is not recommended and may result in the battery temperature being exceeded.

004E Battery capacity test started

This message is posted when the Battery Backup Unit starts a battery test. The test estimates the battery capacity in hours, which is how long the Battery Backup Unit can back up the 3ware RAID controller. This test performs a full battery charge/discharge/re-charge cycle and may take up to 20 hours to complete. During this test the Battery Backup Unit cannot backup the 3ware RAID controller; all units have their write cache disabled until the test completes.

004F Cache synchronization skipped

The 3ware RAID controller performs cache synchronization when system power is restored following a power failure. This message is posted when the cache synchronization was skipped and write data is still being backed up in the controller cache. This can occur if a unit that was present before the power failure was physically removed or became inoperable before system power was restored.

0050 Battery capacity test completed

This message is posted when the Battery Backup Unit completes a battery capacity test. All units will have their write cache settings restored to their original values since the Battery Backup Unit is now able to backup the 3ware RAID controller.

0051 Battery health check started

The Battery Backup Unit periodically evaluates the health of the battery and its ability to backup the 3ware RAID controller in case of a power failure. This message is posted to the host when this health check is started.

0052 Battery health check completed

The Battery Backup Unit evaluates periodically the health of the battery and its ability to backup the 3ware RAID controller in case of a power failure. This message is posted to the host when this health check has completed.

0053 Battery capacity test is overdue

The recommended time interval for running the battery capacity test is once every 4 weeks. If a battery capacity test has not been completed in the last 4 weeks this message will be sent to the host, and will be sent again once every week thereafter.

0055 Battery charging started

This message is posted when the Battery Backup Unit starts a battery charge cycle.

0056 Battery charging completed

This message is posted when the Battery Backup Unit completes a battery charge cycle.

0057 Battery charging fault

This message is posted when the charger of the Battery Backup Unit has detected a battery fault during a charge cycle. The Battery Backup Unit becomes not ready and is unable to backup the 3ware RAID controller.

0058 Battery capacity is below warning level

The measured capacity of the battery is below the warning level. When this occurs the Battery Backup Unit is still able to backup the 3ware RAID controller but it signals that the battery pack should be replaced soon.

0059 Battery capacity is below error level

The measured capacity of the battery is below the error level. When this occurs the Battery Backup Unit becomes not ready and is unable to backup the 3ware RAID controller. You must replace the battery pack.

005A Battery is present

This message is posted to the host when the Battery Backup Unit detects that a battery pack has been connected.

005B Battery is not present

This message is posted to the host when the Battery Backup Unit detects that the battery pack has been removed.

005C Battery is weak

The Battery Backup Unit periodically evaluates the health of the battery and its ability to backup the 3ware RAID controller in case of a power failure. This message is posted when the result of the health test is below the warning threshold. This indicates that the battery pack should be replaced soon because the battery is becoming weak.

005D Battery health check failed

The Battery Backup Unit periodically evaluates the health of the battery and its ability to backup the 3ware RAID controller in case of a power failure. This message is posted when the result of the health test is below the fault threshold. This indicates that the battery pack must be replaced. The Battery Backup Unit becomes not ready and is unable to backup the 3ware RAID controller.

005E Cache synchronization completed

If drive insertion causes unit to become operational this will be sent if retained write cache data was flushed.

The 3ware RAID controller performs cache synchronization when system power is restored following a power failure. This message is posted for each unit when the cache synchronization completed successfully.

005F Cache synchronization failed; some data lost

The 3ware RAID controller performs cache synchronization when system power is restored following a power failure. This message is posted when cache synchronization was not successful for some reason.

Appendices

The following information is available in the appendices:

A

Glossary

- **3BM 2.** The 3ware BIOS Manager, used on PC machines. The 3ware BIOS (Basic Input Output System) manager is a basic interface used to view, maintain, and manage 3ware controllers, disks, and units, without having to boot the operating system. 3BM is included with the controller and is updated when the controller firmware is upgraded. The latest firmware and code set is available for download from the 3ware web site: http://www.3ware.com/support/
- **3DM 2.** 3ware Disk Manager. The 3ware disk manager is a web-based graphical user interface that can be used to view, maintain, and manage 3ware controllers, disks, and units. It is available for download from http://www.3ware.com/support/download.asp.
- **3ware.** Named after the 3 computer wares: hardware, software and firmware. A leading brand of high-performance, high-capacity Serial ATA (SATA) RAID storage solutions.
- **A-Chip**. AccerATA chip. Automated data port to handle asynchronous ATA disk drive interface.
- **AMCC.** Applied Micro Circuits Corporation provides the essential building blocks for the processing, moving and storing of information worldwide.
- **Array.** One or more disk drives that appear to the operating system as a single unit. Within 3ware software (3BM and 3DM), arrays are typically referred to as units.
- **Array Roaming.** The process of swapping out or adding in a configured unit without having to shut down the system. This is useful if you need to move the unit to another controller.
- **Background rebuild rate**. The rate at which a particular controller initializes, rebuilds, and verifies redundant units (RAID 1, RAID 5, RAID 10, RAID 50).
- **Boot volume size.** The size to be assigned to volume 0 when creating a unit through 3BM on a PC machine. Note that the resulting volume does not have to be used as a boot volume. However, if the operating system is installed on the unit, it is installed in volume 0.

- **Carve size.** The size over which a unit will be divided into volumes, if auto-carving is enabled.
- **Chassis Control Unit (CCU).** A device within a chassis (or enclosure) used to identify a drive or display status of a RAID unit by flashing the appropriate LEDs.
- **CLI**. Command Line Interface. The 3ware CLI is a text program, rather than a GUI (graphical user interface). It has the same functionality as 3DM, and can be used to view, maintain, and manage 3ware controllers, disks, and units.
- **Configuration**. The RAID level set for a unit.
- **Controller.** The physical card from 3ware that you insert into a computer system and connect to your disk drives or enclosure. The controller contains firmware that provides RAID functionality. 3ware makes a number of different models of SATA RAID controllers. (See “System Requirements” on page 2.)
- **Controller ID number.** Unique number assigned to every 3ware controller in a system, starting with zero.
- **Create an array**. The process of selecting individual disk drives and selecting a RAID level. The array will appear to the operating system as a single unit. Overwrites any existing unit configuration data on the drives. Note that in 3ware software tools, arrays are referred to as units.
- **DCB.** Disk configuration block. This is 3ware proprietary RAID table information that is written to disk drives that are in a RAID unit, single disk, or spare. The DCB includes information on the unit type, unit members, RAID level, and other important RAID information.
- **Delete an array.** Deleting an array (or unit) is the process of returning the drives in a unit to individual drives. This erases the DCB information from the drives and deletes any data that was on them. When a unit is deleted from a controller, it is sometimes referred to as being “destroyed.” If you want to remove a unit without deleting the data on it, do not delete it; instead use the Remove feature in 3DM, and then physically remove the drives.
- **Destroying**. Same as deleting a unit.
- **Degraded unit.** A redundant unit that contains a drive that has failed.
- **Disk roaming.** When moving a unit from one controller to another, refers to putting disks back in a different order than they initially occupied, without harm to the data.
- **Distributed parity.** Parity (error correction code) data is distributed across several drives in RAID 5 and RAID 50 configurations. Distributing parity data across drives provides both protection of data and good performance.

- **Drive ID**. A unique identifier for a specific drive in a system. Also called a port ID.
- **Drive Number**. The SCSI number, or channel number, of a particular drive.
- **ECC.** Error correction code. ECC Errors are grown defects that have occurred on a drive since it was last read.
- **ECC Error policy**. Determines whether an error detected during a rebuild stops the rebuild or whether the rebuild can continue in spite of the error. Specified by the Continue on Source Error During Rebuild unit policy.
- **EMS (Enclosure Management Services).** Chassis-monitoring functions for environmental, power, mechanical monitoring, and control using the I²C (chassis control) bus port.
- **Export a unit**. To remove the association of a unit with a controller. Does not affect the data on the drives. Used for array roaming, when you want to swap out a unit without powering down the system, and move the unit to another controller. Compare to Delete, which erases all unit configuration information from the drive.
- **Exportable unit or drive**. In 3BM (BIOS), exportable units and drives are those that will be available to the operating system when you boot your computer.
- **Fault tolerant**. A RAID unit which provides the ability to recover from a failed drive, either because the data is duplicated (as when drives are mirrored) or because of error checking (as in a RAID 5 unit).
- **Firmware.** Computer programming instructions that are stored in a read-only memory on the controller rather than being implemented through software.
- **Grown defect.** Defects that arise on a disk from daily use.
- **Hot spare.** A drive that is available, online, and designated as a spare. When a drive fails in a redundant unit, causing the unit to become degraded, a hot spare can replace the failed drive automatically and the unit will be rebuilt.
- **Hot swapping**. The process of removing a disk drive from the system while the power is on. Hot swapping can be used to remove units with data on them, when they are installed in hot-swap carriers. This is referred to as array roaming. Hot swapping can also be used to remove and replaced failed drives when a hot-swap carrier is used.
- **I²C-(or Inter-IC) bus**. A two-wire serial bus solution used as a control, diagnostic, environmental, and power management for EMS (enclosure management services).

- **Import a unit**. Attach a set of disk drives with an existing configuration to a controller and make the controller aware of the unit. Does not affect the data on the drives.
- **Initialize.** For 3ware SATA RAID controllers, initialize means to put the redundant data on the drives of redundant units into a known state so that data can be recovered in the event of a disk drive failure. For RAID 1 and 10, initialization copies the data from the lower port to the higher port. For RAID 5 and 50, initialization calculates the RAID 5 parity and writes it to disk (background initialization). This is sometimes referred to as *resynching*, and does not erase user data. **Note:** If foreground initialization is done before the operating system has loaded, zeroes are written to all of the drives in the unit. This process, done through the 3ware BIOS, does erase existing data.
- **Logical Units.** This term is used in the 3ware CLI. It is usually shortened to "units." These are block devices presented to the operating system. A logical unit can be a one-tier, two-tier, or three-tier arrangement. JBOD, Spare, and Single logical units are examples of one-tier units. RAID 1 and RAID 5 are examples of two-tier units and as such will have sub-units. RAID 10 and RAID 50 are examples of three-tier units and as such will have sub-sub-units.
- **JBOD.** An unconfigured single drive. The acronym is derived from "just a bunch of disks." Note that earlier versions of the 3ware RAID controller exported JBODs to the OS. By default, this is not the case in 9000-series controllers. However, a policy in 3BM can be set that allows JBODs to be seen by the OS. By default, individual drives must be configured as Single Disks in order to be made available to the OS.
- **Migration.** The process of changing the characteristics of a unit. The change can be to expand the capacity of the unit (OCE), change the stripe size of the unit, change the unit from redundant to non-redundant, or to change the unit from non-redundant to redundant**.**
- **Mirrored disk array (unit).** A pair of drives on which the same data is written, so that each provides a backup for the other. If one drive fails, the data is preserved on the paired drive. Mirrored disk units include RAID 1 and RAID 10.
- **NCQ (Native Command Queuing).** A feature designed to improve performance of SATA hard disks in some applications that require a lot of random access of data, such as server-type applications. When NCQ is enabled, the commands are reordered on the drive itself.

  NCQ must be supported by the drive. NCQ must be turned on in both the drive and the RAID controller. By default, the RAID unit's queue policy is disabled when creating a unit.
- **Non-redundant units.** A disk array (unit) without fault tolerance (RAID 0, single disk, or JBOD.).

- **OCE (Online Capacity Expansion).** The process of increasing the size of an existing RAID unit without having to create a new unit. See also *migration*.
- **Parity.** Information that the controller calculates using an exclusive OR (XOR) algorithm and writes to the disk drives in RAID 5 and RAID 50 units. This data can be used with the remaining user data to recover the lost data if a disk drive fails.
- **PCB**. Printed circuit board.
- **P-Chip.** PCI interface chip that connects the PCI bus to the high-speed internal bus and routes all data between the two using a packet switched fabric. There is one P-chip per controller card.
- **Port.** A controller has one or many ports (typically 4, 8, 12, 16). Each port can be attached to a single disk drive. On a controller with a multilane serial port connector, one connector supports four ports.
- **Port ID**. A unique identifier for a specific port in a system. Also called a drive ID.
- **RAID.** Redundant array of inexpensive disks, combined into a unit (array), to increase your storage system's performance and provide fault tolerance (protection against data loss).
- **Rebuild task schedule**. The specification for when rebuilding, may occur, including start time and duration.
- **Rebuild a unit**. To generate data on a new drive after it is put into service to replace a failed drive in a fault tolerant unit (for example, RAID 1, 10, 5, or 50).
- **Redundancy.** Duplication of data on another drive or drives, so that it is protected in the event of a drive failure.
- **Remove a drive.** The process of making a drive unavailable to the controller.
- **Remove a unit.** The process of making a unit unavailable to the controller and the operating system. After a unit is removed it can be hot swapped out of the system. This is sometimes referred to as exporting a unit.
- **RLM (RAID Level Migration).** The process of using an existing unit of one or more drives and converting it to a new RAID type without having to delete the original unit. For example, converting a single disk to a mirrored disk or converting a RAID 0 unit to a RAID 5 unit.
- **Self-test.** A test that can be performed on a scheduled basis. Available self-tests include Upgrade UDMA mode and Check SMART Thresholds.
- **Stagger time.** The delay between drive groups that will spin up, at one time, on a particular controller.

- **Stripe size**. The size of the data written to each disk drive in RAID unit levels that support striping. The size of stripes can be set for a given unit during configuration. In general, smaller stripe sizes are better for sequential I/O, such as video, and larger strip sizes are better for random I/O (such as databases). The stripe size is user-configurable at 64KB, 128KB, or 256KB.

  This stripe size is sometimes referred as a “minor” stripe size. A major stripe size is equal to the minor stripe size times the number of disks in the unit.

- **Striping.** The process of breaking up files into smaller sizes and distributing the data amongst two or more drives. Since smaller amounts of data are written to multiple disk drives simultaneously, this results in an increase in performance. Striping occurs in RAID 0, 5, 10 and 50.

- **Subunit.** A logical unit of storage that is part of another unit. For example, the mirrored pairs (RAID 1) in a RAID 10 unit are subunits of the RAID 10 unit.

- **UDMA mode.** UDMA mode is a protocol that supports bursting data up to 133 MB/sec with PATA disk drives and 1.5Gb/sec and 3.0 Gb/sec with SATA disk drives.

- **Unit ID**. A unique identifier for a specific unit in a system.

- **Unit Number**. The SCSI number, or channel number, of a particular unit.

- **Unit**. A logical unit of storage, which the operating system treats as a single drive. A unit may consist of a single drive or several drives. Also known as an array.

- **Verify**. A process that confirms the validity of the redundant data in a redundant unit. For a RAID 1 and RAID 10 unit, a verify will compare the data of one mirror with the other. For RAID 5 and RAID 50, a verify will calculate RAID 5 parity and compare it to what is written on the disk drive.

B

Compliance and Conformity Statements

This section is organized into the following topics:

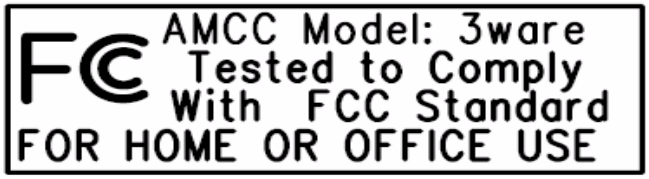
- FCC Radio Frequency Interference Statement
- Microsoft Windows Hardware Quality Lab
- European Community Conformity Statement

FCC Radio Frequency Interference Statement

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 (Federal Communications Commission) 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 instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television 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 the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with FCC radio frequency emission limits, use shielded cables and connectors between all parts of the computer system.



Microsoft Windows Hardware Quality Lab

AMCC is committed to Microsoft Windows Hardware Quality Labs (WHQL) certification for all its products. However, a product's software drivers are typically submitted for certification at nearly the same time as their release to market. Since the certification process may lag behind the release of the drivers, please refer to our WEB site at www.3ware.com for current certification information.

European Community Conformity Statement

The Controller Models 9650SE, 9590SE, and 9550SX are in conformity with the following Common Technical Regulations and/or normative documents:

EN 55022 Limits and methods of measurements of radio interference characteristics of information technology equipment

EN 61000-4-2 Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 2: Electrostatic discharge immunity test

EN 61000-4-3 Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 3: Radiated, Radio-Frequency, Electromagnetic Field Immunity Test

EN 61000-4-4 Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 4: Electrical fast transient/burst immunity test

EN 60950 Safety of information technology equipment, including electrical business equipment following the provisions of the Electromagnetic Compatibility Directive 89/23/EEC Low Voltage Directive

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Warranty, Technical Support, and Service

This section is organized into the following topics:

- Limited Warranty
- Warranty Service and RMA Process
- AMCC Technical Support and Services
- Sales and ordering information
- Feedback on this manual

Limited Warranty

RAID Controller Hardware. 3-Year Hardware Warranty: AMCC warrants this product against defects in material and workmanship for a period of thirty-six (36) months from the date of original purchase. AMCC, at no charge and at its option, will repair or replace any part of this product which proves defective by reason of improper workmanship or materials. Repair parts or replacement products will be provided by AMCC on an exchange basis and will be either new or refurbished to be functionally equivalent to new. Products or parts replaced under this provision shall become the property of AMCC.

Battery Backup Unit (BBU) Hardware. 1-Year Hardware Warranty: AMCC warrants this product against defects in material and workmanship for a period of twelve (12) months from the date of original purchase. AMCC, at no charge and at its option, will repair or replace any part of this product which proves defective by reason of improper workmanship or materials. Repair parts or replacement products will be provided by AMCC on an exchange basis and will be either new or refurbished to be functionally equivalent to new. Products or parts replaced under this provision shall become the property of AMCC.

Software Warranty: AMCC will replace a defective media purchased with this product for a period of up to 30 days from the date of purchase.

AMCC warranty service is provided by returning the defective product to AMCC.

Exclusions

This warranty does not cover any damage to this product which results from accident, abuse, misuse, natural or personal disaster, or any unauthorized disassembly, repair or modification. AMCC shall not be liable for any incidental or consequential damages, including but not limited to loss of profits, other loss, damage or expense directly or indirectly arising from the customer's misuse of or inability to use the product, either separately or in combination with other equipment, regardless of whether AMCC has been advised of the possibility of such damages. AMCC is not liable for and does not cover under warranty, any costs associated with servicing and/or the installation of AMCC products. This warranty sets for the entire liability and obligations of AMCC with respect to breach of warranty and the warranties set forth or limited herein are the sole warranties and are in lieu of all other warranties, expressed or implied, including warranties or fitness for particular purpose and merchantability.

State Law Provisions

This warranty gives you specific legal rights and you may have other rights which vary from state to state. Some states do not allow the exclusion of incidental or consequential damages or allow limitation of implied warranties or their duration, so that the above exclusions or limitations may not apply.

Warranty Service and RMA Process

To obtain warranty service during the warranty period, register at the 3ware website and submit an RMA request online at https://www.3ware.com.

You will be issued a return material authorization (RMA) number. AMCC will send a replacement in approximately two business days after receipt of the defective unit (transit time not included).

Advanced replacement is available with a credit card number with authorization in the amount equaling the then current list price of the 3ware Serial ATA RAID Controller, including shipping costs. As soon as practicable thereafter, AMCC will ship the advanced replacement to you at the address of your choosing. Upon receipt of the advanced replacement, we ask that you immediately ship the defective AMCC 3ware Serial ATA RAID Controller to AMCC, RAID Products RMA DEPT, 6290 Sequence Drive, San Diego, CA 92121. If AMCC receives the defective AMCC 3ware Serial ATA RAID Controller from you within thirty (30) days of the date of shipment of the advanced replacement, AMCC will destroy your credit card authorization and you will not be charged for the advanced replacement.

Please use the original packing material contents of the box when exchanging or returning a product.

For information about the status of a replacement, please contact AMCC Technical Support.

AMCC Technical Support and Services

Product information, Frequently Asked Questions, software upgrades, driver files and other support are available through the AMCC World Wide Web site at http://www.3ware.com. AMCC's 3ware software library is accessible at: http://www.3ware.com/support/download.asp

Web-based software downloads feature upgrading multiple switches simultaneously.

For specific answers to questions or to give feedback about the product, visit our Web site at http://www.3ware.com/support and use our convenient e-mail form. AMCC also offers toll-free 1 (800) 840-6055 or 1 (408) 542-8800 direct phone support during normal business hours.

Sales and ordering information

For sales information, send an electronic mail message to 3wareSales@amcc.com.

Feedback on this manual

Your feedback is welcome. If anything in the guide seems unclear please let us know by using the email form at http://www.3ware.com/support.

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