



User Guide

Escalade™

Storage Switch

Supports the 6000 and 7000 series

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Before You Begin

Congratulations on selecting the Escalade Storage Switch as your RAID data storage and management system. This user guide gives simple, step-by-step instructions for installing and configuring your Escalade Storage Switch. To ensure your personal safety and protect your equipment and data, carefully read the information that follows the *Features* list before you begin installing.

Features

Escalade 6000 Family (includes 6800, 6400, 6410, 6200)

- **True Hardware RAID.** Low CPU utilization
- **RAID Support.** RAID 0, 1, 5, 10 and JBOD
- **Bus Type.** PCI 32 bit / 33 Mhz
- **Management.** 3DM Disk Management Utility and e-mail event notification
- **BIOS.** PC99, PnP, BBS Compliant
- **Windows Support.** W98, WME, WinNT, Win2k, WinXP
- **Linux Support.** Redhat, SuSE. (Drivers available in Open Source.)
- **Performance.** Twinstor, Command Queuing, Elevator Seeking, Ultra DMA66
- **Field Upgrades.** Field Upgradeable Firmware, BIOS, 3DM and Drivers
- **Data Integrity.** ATA Command Readback, SMART Monitoring, Dynamic Sector Repair, Rebuild Pacing, Rebuild Scheduling, Background Scrubbing, Scheduled Scrubbing, Hot Swap, Hot Spare, Hardware Health Monitoring

Escalade 7000 Family (includes 7210, 7810, 7410, 7850, 7450)

- **True Hardware RAID.** Low CPU Utilization
- **RAID Support.** RAID 0, 1, 5, 10 and JBOD
- **Bus Type.** PCI 64 bit / 33 Mhz
- **Management.** 3DM Disk Management Utility
- **BIOS.** PC99, PnP, BBS Compliant
- **Windows Support.** W98, WME, WinNT, Win2k, WinXP
- **Linux Support.** Redhat, SuSE. (Drivers available in Open Source.)
- **Performance.** Twinstor, Command Queuing, Elevator Seeking, R5Fusion, UltraDMA100
- **Field Upgrades.** Field Upgradeable Firmware, BIOS, 3DM and Drivers
- **Data Integrity.** ATA Command Readback, SMART Monitoring, Dynamic Sector Repair, Rebuild Pacing, Rebuild Scheduling, Background Scrubbing, Scheduled Scrubbing, Hot Swap, Hot Spare, Hardware Health Monitoring

Package contents

If your package is missing any of the items listed below, contact 3ware before proceeding with installation (disk drives and disk mounting brackets are not included):

- Escalade Storage Switch in an ESD-protective bag
- 3ware driver installation media
- 3ware 3DM installation media
- ATA interface cables (one per port)
- Y-splitter cables for connecting additional drives to the power source (not provided for 2-port models)
- *Escalade Installation Guide* and *Escalade User Guide* (.pdf format)

Tools required

- An ESD grounding strap or mat
- Standard hand tools to open your system's case and install the Escalade Storage Switch into an available PCI expansion slot.

System requirements

The Escalade Storage Switch requires a workstation-class or server-class CPU whose bus complies with PCI 2.1 standards, and a PCI slot that meets the Plug and Play and PC99 specifications. The storage switch requires one full-size PCI-bus slot. It may be connected to up to two, four or eight IDE/ATA drives by the supplied 40-pin, 80-conductor ribbon interface cables.



Note: The blue end of the ribbon interface cable plugs into the Escalade Storage Switch and the black end plugs into the drive.

Drives must meet UltraATA-100, UltraATA-66 or UltraATA-33 standards, but may be of any capacity or physical form factor. Length of unshielded interface cables may not exceed 18" (45.7 cm).

Personal safety



Warning! High voltages may be found inside computer equipment. Before installing any of the hardware in this package or removing the protective covers of any computer equipment, turn off power switches and disconnect power cords. Do not reconnect the power cords until you have replaced the covers.

Protecting equipment and data



Back up your data! Creating or deleting disk arrays destroys existing files on the member drives. If your drives contain valuable data, back them up and save data elsewhere before changing your array configuration.

ESD precautions

Standard electrostatic discharge (ESD) precautions must be followed to avoid damaging computer components and accessories when installing or removing the Escalade Storage Switch.

- When the case of your computer is open and its internal parts are exposed, don't touch any internal part unnecessarily.
- Always wear a grounded strap or work on an ESD-protective mat.
- Don't remove the storage switch from its protective bag until you are properly grounded.
- Handle the storage switch by its edges or by the black rail and metal bracket at its two ends.
- Don't touch any pin, contact, lead or component on the storage switch.

Mechanical concerns

Be careful when installing the Escalade Storage Switch into your system. Excessive force can damage the board, the cables, your drives or your system.

- Be sure the board is aligned with its slot on the motherboard before installing. Do not flex the board excessively.
- Interface cable connectors must be mated carefully without bending any pins. The connectors provided are keyed to prevent you from inserting them upside-down.

- The blue end of the interface cable plugs into the board and the black end plugs into the drive.
- Interface cables are fragile and must not be crimped or pinched. Ensure that they do not impede the flow of cooling air from fans or heat sinks in the system case.

Introduction

Escalade Storage Switches allow you to use low-cost IDE/ATA drives in your storage system and still achieve performance levels and fault tolerance capabilities typically found in more expensive SCSI systems. Escalade Storage Switches are available as two, four or eight port configurations, as well as a shortened four or eight port versions designed for higher density rack-mounted applications.

StorSwitch™ architecture for scalable performance

The StorSwitch Architecture, found only in 3ware products, accelerates your storage system's performance by speeding data into system memory. Each drive has its own dedicated AccelerATA data IDE port, maximizing drive and system throughput.

RAID increases performance and adds redundancy

Escalade Storage Switches use Redundant Array of Inexpensive Disks (RAID) to increase your storage system's performance and provide fault tolerance. The storage switches offer RAID 0 variable striped arrays for performance; RAID 1 mirrored arrays for fault tolerance; variable striped mirrored RAID 10 arrays for fault tolerance and performance; and RAID 5 arrays for fault tolerance, high capacity and storage efficiency.

RAID 0 arrays maximize performance and capacity

When drives are configured in a striped disk array (see Figure 1), the Escalade Storage Switch distributes large files across the multiple disks using RAID 0 techniques. Striped disk arrays achieve high transfer rates because they can read or write data on more than one drive simultaneously. Striped disk arrays give exceptional performance, particularly for data intensive applications such as video editing, computer aided design and geographical information systems. Striping your disk array concatenates each drive's capacity

into one large volume. The stripe size is user configurable at 64K, 128K, 256K, 512K or 1M.

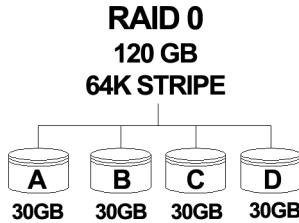


Figure 1. RAID 0 Configuration Example

RAID 1 arrays offer fault tolerance

Mirrored disk arrays write data to two drives using RAID 1 algorithms (see Figure 2). 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 mission critical systems like web and database servers.

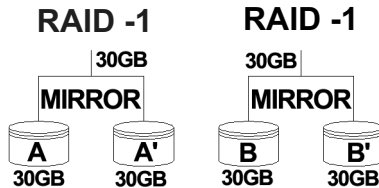


Figure 2. RAID 1 Configuration Example

TwinStor™ Technology adds performance to 3ware's mirrored disk arrays

Traditional mirroring techniques do little to improve performance. The adaptive algorithms found in 3ware's TwinStor technology boost performance by distinguishing between random and sequen-

tial 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.

Drives can be dynamically profiled, specifically for your brand of drive, during installation to customize the stripe size (for RAID configurations offering variable striping) and seek algorithms.

RAID 10 arrays maximize performance and fault tolerance

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 3). 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 (64K, 128K, 256K, 512K or 1M) the arrays. RAID 10 is available on the four and eight port Escalade Storage Switches.

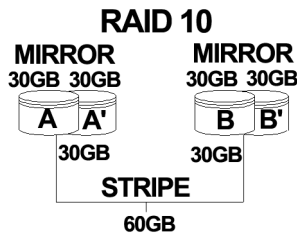


Figure 3. RAID 10 Configuration Example

RAID 5 arrays optimize performance, fault tolerance, high capacity and storage efficiency

The RAID 5 configuration features the data striping of RAID 0 combined with the parity of RAID 4. Using a simple parity (exclusive OR) function, RAID 5 can tolerate the loss of one drive. Parity information is distributed across all drives rather than being concentrated on a single disk (see Figure 4). This avoids throughput loss due to contention for the parity drive. You can use hot spares to rebuild a failed drive “on-the-fly”.

RAID 5 capacity = size of smallest drive × (number of drives - 1).
In addition, the array’s storage efficiency increases with the number of disks; from 66.7 % for 3 drives to 87.5 % for 8 drives: storage efficiency = (number of drives - 1) ÷ (number of drives).

Unlike all other RAID configurations that offer data striping, except for RAID 1, RAID 5 stripe size is limited to 64k.



Note: BIOS will reject the creation of a RAID 5 array having less than 3 drives.

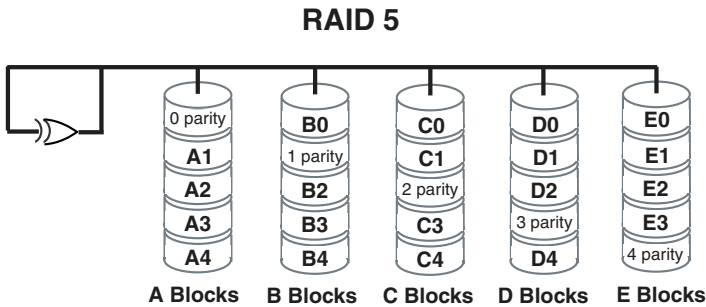


Figure 4. RAID 5 Configuration Example

R5 Fusion™ Technology significantly improves RAID 5 write performance

3ware's R5 Fusion significantly improves RAID 5 write performance for both large sequential and small random transactions. This advanced block caching firmware technology is combined with StorSwitch to deliver extremely high performance for RAID 5 write operations.



Note: R5 Fusion is available only with Escalade 7450 and 7850 storage switches.

Background Media Scan and Dynamic Sector Repair enhance data integrity

Background Media Scan is an embedded feature that performs a read-scan of all disks in an array. An error notification is posted for each read error detected (see “Screen Display Messages” on page 145). If the array is redundant (i.e., RAID 1, 10 and 5) Dynamic Sector Repair automatically recovers the redundant data and rewrites it to the logical defective location. The drive re-allocates the sector where the read error occurred and a notification of repair is posted. This results in the restoration of drive and data integrity; the primary and redundant data are again both valid.

Configure and manage your disk arrays

The **3ware Disk Array Configuration Utility** is a BIOS level tool for creating, deleting, maintaining disk arrays and rebuilding mirrored arrays. From the **3DM Disk Array Configuration Utility**, you can also specify hot spares from available drives to be dynamically substituted for a failed drive in a mirrored array. Refer to the *3ware Disk Array Configuration Utility* chapter.

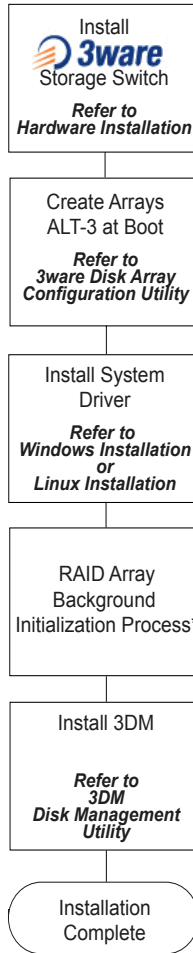
SMART Monitoring (Self-Monitoring, Analysis and Reporting Technology) adds monitoring and troubleshooting functionality by

automatically checking a disk drive's health and reporting potential problems. It allows you to take proactive steps to prevent impending disk crashes.

3DM Disk Management Utility runs in the background on the Escalade Storage Switch's host and allows you to monitor the switch and rebuild mirrored arrays remotely via a standard web browser. To remotely access 3DM, you are not required to install any software on your system but you must have access to the network with the Escalade Storage Switch. 3DM supports hot spare and hot swap for mirrored arrays. Hot swap allows users to replace a failed drive in a mirrored array while the system remains up. Refer to the *3DM Disk Management Utility* chapter.

To create, delete or verify arrays, you must use the **3ware Disk Array Configuration Utility**. To check array configuration or status, disable write cache, select a hot spare or rebuild a mirrored array, you can use the **3ware Disk Array Configuration Utility** at BIOS time or **3DM Disk Management Utility** in real time. Hot swap is only available through the **3DM Disk Management Utility**.

Quick Installation Guide



* This process does not interfere with the installation of 3DM or the use of the array.

Step 1. Install the Escalade Storage Switch

Install the two, four or eight port Escalade Storage Switch in an available PCI slot. Slots closest to the Accelerated Graphics Port give the best performance. The blue end of the ribbon interface cable must be connected to the storage switch and the black end must be connected to the drive.

Step 2. Create Arrays

Verify your boot device precedes the Escalade Storage Switch in the boot sequence, then press **Alt-3** to activate the **3ware Disk Array Configuration Utility** at boot time. Specify RAID arrays and hot spares.

Step 3. Install System Drivers

The Escalade Storage Switch drivers must be installed according to the type of installation and the operating system. Installations include:

- Installing the storage switch while installing the operating system.
- Installing the storage switch on systems that boot from a different device.
- Replacing an existing storage switch with a new version of the switch.

Operating systems supporting the Escalade Storage Switch include:

- Windows NT 4.0
- Windows 98 SE or ME
- Windows XP
- Windows 2000
- Red Hat Linux
- SuSE Linux

Step 4. RAID Array Background Initialization Process

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Step 5. Install 3DM

Install 3DM for Windows or Linux from the 3DM installation CD-ROM.

Windows

a:\setup from **Run...** in the **Start** menu.

Linux

```
mount /dev/hdc /mnt
```

```
cd /mnt
```

```
./install.3dm
```

Answer questions concerning e-mail notification and the port number for WEB monitoring.

```
cd /
```

```
umount /mnt
```



Note: When specifying multiple e-mail addresses for notification, separate e-mail addresses using a comma.

Hardware Installation

Figure 5 shows ports and connectors on the Escalade 7850 Storage Switch.



Warning: Before proceeding with hardware installation, read the *Before You Begin* section completely that describes personal and system precautions. Failing to do so may result in personal injury or damage to your computer or the Escalade Storage Switch.

JP2 LED drive status connector

Note: Pin 1 and pin 4 are 5 V and pin 2 and pin 3 are ground. Plug cable to either pins 1 and 2 or pins 3 and 4.

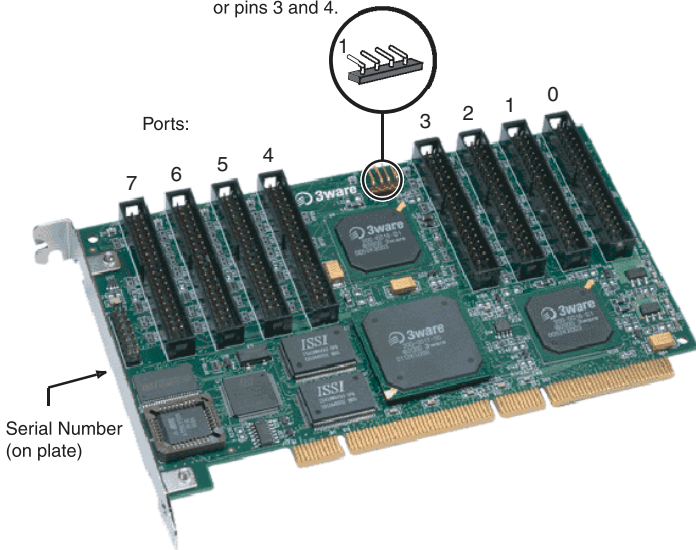


Figure 5. 8-Port Escalade 7850 Storage Switch Layout

To remove an existing Escalade Storage Switch

- 1 If the computer is running, shut it down. Turn off power to the computer and disconnect the power cord from the outlet.
- 2 Open the computer case according to the manufacturer's instructions.
- 3 Disconnect the disks from the existing Escalade Storage Switch installed in your system. If your boot disk is connected to the storage switch and you intend to retain it as your boot device, note or mark which physical disk is connected to slot 0 on the switch. This disk should be reconnected to slot 0 on the new storage switch. Preserving the slot order of how the other drives are connected is unimportant, even if the disks are part of a disk array, although it is recommended that a plug-to-plug replacement is followed.
- 4 Remove the screw in the metal bracket at the end of the old storage switch. Save the screw for installing the new switch.
- 5 Gently remove the storage switch from the PCI slot.
- 6 Remove the cables from the storage switch and discard. Reusing interface cables is not recommended.

Connect the interface cables to the Escalade Storage Switch

- 1 Connect the interface cables supplied with the product to the storage switch.



Note: UltraATA-66 and UltraATA-100 drives require 40-pin, 80-conductor ribbon cables. These cables have color coded ends. For optimum performance, the blue end must be connected to the storage switch and the black end must be connected to the hard drive.

- 2 One edge of each interface cable should have a colored (usually red) line denoting the conductor to Pin 1. Align the storage

- switch so that the colored line is toward the top edge of the switch. Mate the connectors carefully without bending any pins.
- 3 Install the other connectors in the same manner.

Install the Escalade Storage Switch in the computer

- 1 If the computer is running, shut it down. Turn off power to the computer and disconnect the power cord from the outlet.
- 2 Open the computer case according to the manufacturer's instructions.
- 3 Find the PCI slot you want to use for the storage switch.



Hint: Cable routing may be easier if you install the storage switch next to an open slot.

- 4 Remove the metal filler bracket for the slot. Save this screw; it will be used to secure the storage switch after you have seated it in the slot.



Hint: While the storage switch runs properly in any PCI slot, not all slots give equal performance due to the architecture of the PCI bus. In our laboratories, we have noticed that the slots closest to the Accelerated Graphics Port (AGP) typically give the best performance.

- 5 Line the storage switch up so that all pins make proper contact with the PCI slot pins when pushed into place. The black end rail opposite the metal bracket may be removed if needed to fit the storage switch inside the chassis. The short 4-port or 8-port Escalade Storage Switch is keyed to ensure proper installation in a full-sized PCI slot.

- 6 Ensure that the contacts will mate with both grooves in the slot. Press down gently on the edge of the storage switch directly above the slot until the it is fully seated.
- 7 Check that the storage switch's metal bracket covers the hole in the case and secure the bracket with the screw that was used to secure the filler bracket in step 4.

Connect the drives to the interface cables

- 1 Be sure to use the supplied cables. With the higher speeds of UltraATA-100 and UltraATA-66, using quality cables is important.
- 2 Before connecting your drives, check your drives' jumper setting. The range of settings provided vary by manufacturer as do the method for adjusting them. Refer to information provided with your drives for the method required to set them. To operate properly, the Escalade Storage Switch requires that drives be set as **Single** (if available on your drive) or **Master**.
- 3 If your drives are not already installed in the computer chassis, do so now. Be sure that the drives are connected to the power supply. Y-splitter power supply connectors are included in some kits in case you need additional power supply connections.
- 4 For each drive, select the black end of an interface cable not connected to the storage switch and plug it into the drive or drive carrier. The cable's colored edge denotes Pin 1 and should be adjacent to the 4-pin power plug.

Check your installation and close the case

- 1 After all of the drives are connected to the storage switch and it is installed in its slot, verify that the cables do not interfere with the operation of any other components in the case or block the flow of cooling air.
- 2 Close the case and reconnect the power cables.

Check motherboard boot sequence

Using your computer's Setup utility, ensure that your boot device precedes the Escalade Storage Switch in the boot sequence. If you have other disks installed on the motherboard, the storage switch precedes them in boot order.



3ware Disk Array Configuration Utility

The 3ware Disk Array Configuration Utility allows you to create disk arrays by combining disks, deleting disks or breaking disk arrays back into their member disks. You can also specify an available drive as a hot spare. If an array becomes degraded, the hot spare will automatically be substituted for the faulted drive.



Note: The BIOS will not be installed if no drives are attached to the Escalade Storage Switch. The storage switch shares one IRQ on the PCI bus.

Hot Spare and Hot Swap

Hot Spare is the label given to a drive that is available, active and designated as a spare. This designated drive is applied automatically when a drive degrades and the array is rebuilt. *Hot Swap* is the term applied to the process of swapping out a degraded drive, programmatically and using 3DM, with a pre-assigned spare.

There are two methods for adding a drive as a spare. You may designate a drive as a Hot Spare during the BIOS page display, or you may designate a drive as a Hot Spare through the 3DM configure page. These two methods are discussed below.

BIOS Screen

When designating spare in the BIOS screen, it is assumed that as you are creating your array, you are “setting aside” drive(s) as Hot Spares. This is done by using the S key on the selected drive. Leaving a drive undesignated results in it becoming a JBOD drive. JBOD drives become available to the operating system as distinct volumes, and, consequently, they cannot be designated as spares at

a later time. If a spare is designated in the BIOS screen, the designation and configuration is in effect from this point on. The spare drive will be displayed as a Hot Spare in the 3DM configuration page.

3DM Configure Page

In order to designate an available drive as a spare from the 3DM configure page, you must ensure that the drive is not a JBOD drive. To designate a drive as a Hot Spare from this page, you must use one of the two following methods:

- 1 Install the drive at the operating system level while the system is powered. This should only be done with an approved and recognized drive-carrier swap. If you do not use an approved and recognized drive-carrier swap, connecting interface cables and power cables can/will crash the system from bus or power supply issues.
- 2 Shut down the system (Windows/Linux system shutdown); install the drive and do not go into the BIOS screen. When 3DM is invoked, the configuration page may show this drive as dead. Select **Issue a Removed Drive** and then select **Add Spare**. The drive should appear as a Hot Spare.

Invoking the 3ware BIOS tool

Reboot your system. During the boot phase, wait until you see a screen similar to Figure 6.

```

3ware Storage Controller : Escalade 7810
BIOS: BE7X 1.07.02.008 Firmware: FE7X 1.04.00.024

Array Unit 0 - 64K RAID 0 33.8 GB
Port 0 - Maxtor 90045D4 8.4 GB
Port 1 - Maxtor 92732U9 27.3 GB
Port 2 - Maxtor 91000D8 10.0 GB
Port 3 - Maxtor 91000D8 10.0 GB

Press <Alt-3> to access 3ware Configuration Screen

```

Figure 6. 3ware BIOS Tool

Press **Alt-3** immediately to bring up the **3ware Disk Array Configuration** display.



Note: If drives are attached and you do not want to install the 3ware BIOS, press **Alt-b** to bypass the BIOS installation.

Exiting the 3ware BIOS tool

To save your configuration modifications hit the **F8** key. After you have hit the **F8** key to commit your changes, a list of affected drives will be displayed and you will be asked to confirm your configuration. The booting process will resume. If you have selected mirrored arrays after the operating system is running, the Escalade Storage Switch will automatically run a background initialization to verify that both disks in the arrays are identical.

To exit the 3ware Disk Array Configuration Utility without saving your changes hit **Esc**.

Determining your configuration



Caution: Configuring a disk array writes format-type data onto its member disks and overwrites all the files on those disks. Be sure to back up data that requires retention.

With a 2-port Escalade Storage Switch you are limited to a two-drive JBOD (Just a Bunch of Disks), or a two-drive RAID 0 or RAID 1 array. With a 4-port Escalade Storage Switch, you can combine two to four disks into a single array. With four disks you can create a four-drive RAID 0 array, two RAID 1 arrays, one RAID 5 array or one RAID 10 array.

The 4-port configuration can be duplicated using the 8-port Escalade Storage Switch. In addition, you may also create a five, six, seven or eight-drive RAID 0 or RAID 5 array, or an eight-drive RAID 10 array.

The **3ware Disk Array Configuration** main display shows the current disk drive configuration.

- **Available Drives** reports independent drives (JBOD) not associated with an array.
- **Disk Arrays** lists any existing arrays along with their member disks and hot spares.

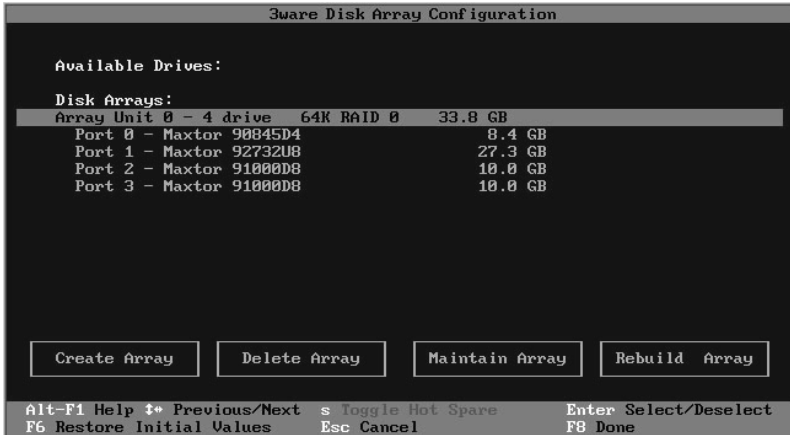


Figure 7. Disk Array Configuration Main Display, RAID 1 Example

Throughout the utility (see Figure 7) use the **Up and Down** arrow keys to navigate, **Enter** to select the disks or buttons and **F1** for context sensitive help. **Toggle Hot Spare** verbiage is black when the cursor is over a drive that can be specified as a hot spare and gray when hot spare cannot be specified. If you've made mistakes and want to start over, pressing **F6** will return your starting values. Pressing **Escape** will exit the configuration utility as well as abandon your changes. Pressing **F8** will save your changes and exit the utility.

Displaying advance details

Selecting **Shift-F5** will show the software versions (BIOS, Firmware, monitor) and slot # of the 3ware card (see Figure 8). Press **Escape** to return to the main 3ware Disk Array Configuration screen.



Figure 8. Disk Array Advance Details Screen

Creating a disk array

To create an array, first select the drives to be included by navigating the cursor over each drive and pressing **Enter** (see Figure 9). An asterisk in the left most column indicates the drive is selected. You may include from two to eight drives in the array by selecting drives from the **Available Drives** section. To include drives that are part of an existing disk array you must first delete the array.

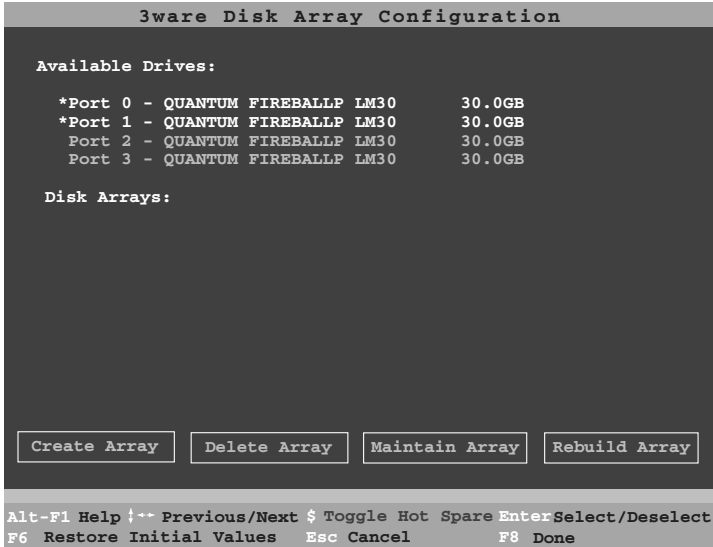


Figure 9. Selecting Drives for a Mirrored Array

Determining your configuration



Hint: The capacity of each drive is limited to the capacity of the smallest drive in the array. The total array capacity is defined as follows:

RAID 0: (the number of drives) X (the capacity of the smallest drive)

RAID 1: the capacity of the smallest drive

RAID 5: (the number of drives - 1) X (capacity of the smallest drive)

RAID10: (the number of drives / 2) X (capacity of smallest drive)

Navigate to the **Create Array** button after selecting all the drives for the array. Hit **Enter** to bring up the **Create Disk Array** display (see Figure 10 and Figure 11 for examples). Check that the proper drives are listed.

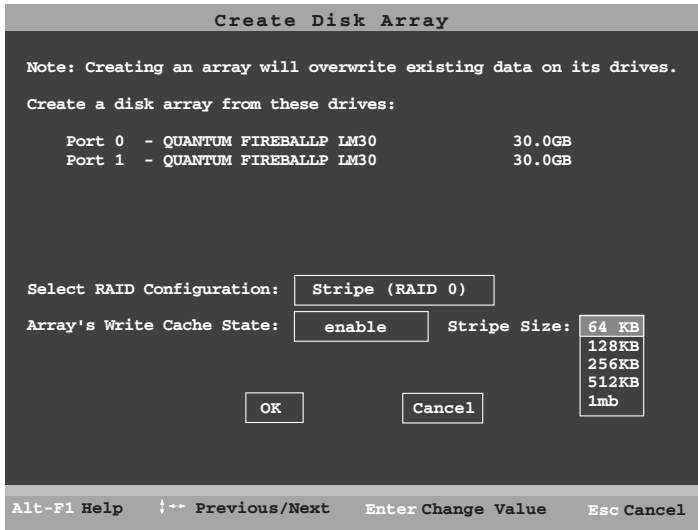


Figure 10. Create Disk Array Display, RAID 0 Example

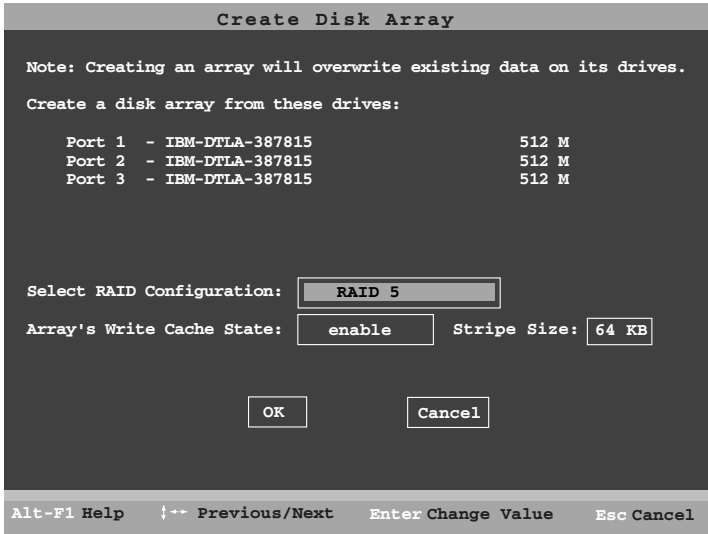


Figure 11. Create Disk Array Display, RAID 5 Example

Select RAID configuration

The Escalade Storage Switch gives you a choice of four RAID configurations. Select one.

- **Stripe (RAID 0):** maximizes performance and capacity through a process called striping. High performance arrays write portions of a single file across multiple drives. There is no fault tolerance.
- **Mirror (RAID 1):** duplicates or “mirrors” the data on both drives. No data will be lost if one of the drives fails.
- **RAID 10:** combines mirroring and striping, providing both fault tolerance and high performance. **RAID 10 arrays require a minimum of four drives.** Configurations consist of 4, 6 or 8 drives.
- **RAID 5:** combines parity data and striping, providing fault tolerance, high capacity and high storage efficiency. The parity data is distributed across all drives, rather than being concentrated on

a single disk, to avoid throughput loss due to corrections for the parity drive. **RAID 5 arrays requires a minimum of three drives.** Configurations consist of 3, 4, 5, 6, 7 or 8 drives.

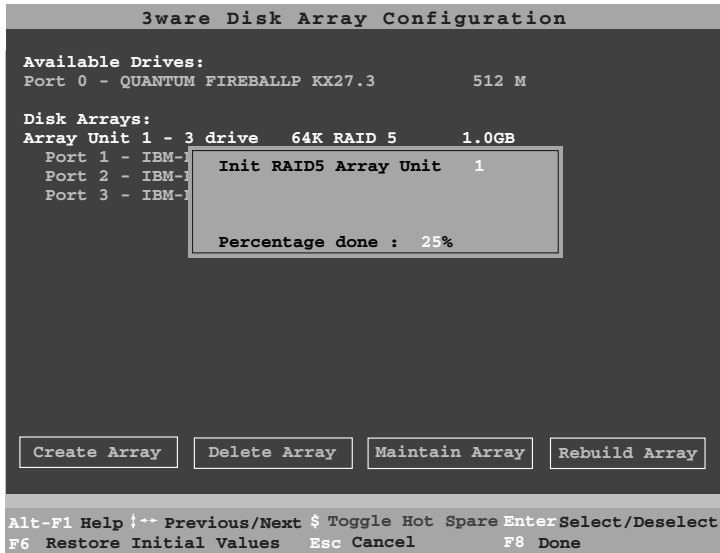


Figure 12. BIOS Initialization Screen for RAID 5

Select striping size

For a RAID 1 or RAID 10 configuration select the striping size. Sizes of 64K, 128K, 256K, 512K or 1M are selected using the **Stripe Size** box shown in Figure 10. RAID 5 only allows a 64K stripe size.

Select write cache properties

The Escalade Storage Switch gives you a choice of disabling the write cache for your disk arrays. Write cache is used to store data locally on the drive before it is written to the disk, allowing the computer to continue with its next task. Enabling the write cache results in the most efficient access times for your computer system.

There may be instances when you always want the computer to wait for the drive to write all the data to disk before going on to its next task. For this case, you must disable the write cache. To disable the write cache, select **disable** from the array's **Write Cache State** selection. The default for **Write Cache State** is **enable**.

Confirm array configuration

Select the **OK** button to confirm creating the array or **Cancel** to reject it. The array is not actually created and no data will be overwritten until you have finished making all your changes and select the **F8** key.

For RAID 5 Arrays

Because of the Read-Modify-Write operations, zeros are first written to all drives in the array before the array is functional. The screen shown in Figure 12 appears after selecting **OK** to confirm array creation.

If the write-zeros operation is aborted by the user for any reason the unit will go into initializing mode when restarted. This mode scans the entire array to verify parity. If coherency problems appear the parity will be corrected to match the data found on that stripe.



Caution: When running in initializing mode the array is not redundant. You cannot remove any drive.

For RAID 1 or 10 Arrays

Drives are dynamically profiled, specifically for your brand of drive, after selecting **OK** to confirm array creation. This is done to customize the stripe size (for RAID configurations offering variable striping) and seek algorithms.

Specifying a hot spare

The Escalade Storage Switch gives you the option to specify a hot spare from one of your **Available Drives**. If a hot spare is specified and the mirror degrades, an event notification will be generated. The hot spare will dynamically replace the failed drive in a mirrored array without user intervention. Select a hot spare by navigating to an **Available Drive**. The **Toggle Hot Spare** verbiage at the bottom of the screen will be black if the drive can be used as a hot spare. Enter **s** to select the hot spare or to disable the hot spare if it is already enabled.



Note: Hot spare drives need to have the same or larger storage capacity than the RAID 1, RAID 5 or RAID 10 drives.

Changing an existing configuration

- 1 Back up any disk arrays that contain data that you want to retain before the configuration change.
- 2 Create new disk arrays following the instructions in the **Determining your configuration, Creating a disk array and Deleting a disk array** sections. You may need to delete existing arrays to free up disks first.
- 3 Boot, partition and format any new disk arrays or free disks.
- 4 When you are finished configuring, restore from backup any data saved from previous disk arrays

Modifying a disk array

To modify an existing array you must first delete it then recreate it with the new drives. As with all disk array operations, there is no way to modify an existing array without overwriting data on the drives involved.

Deleting a disk array

To delete an array (see Figure 13) first select the array by navigating to it and hitting **Enter**. An asterisk in the left most column indicates the array is selected.

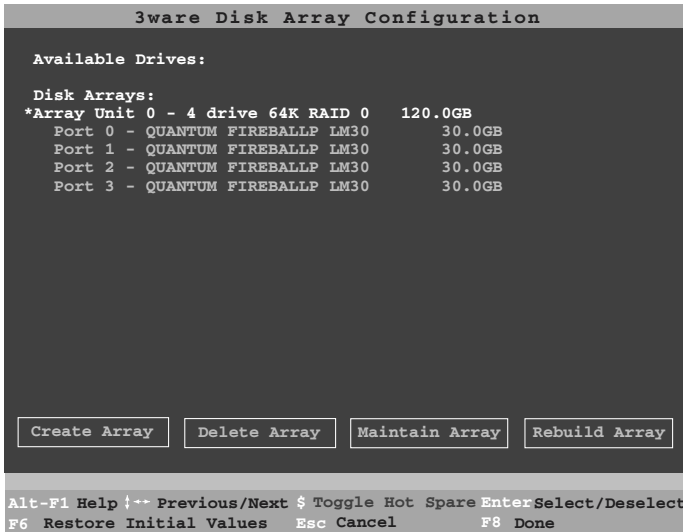


Figure 13. Delete Disk Array Display

Navigate to the **Delete Array** button and hit **Enter** to bring up the **Delete Disk Array** display. Check that the correct drives are listed. Select the **OK** key to confirm deleting the array or **Cancel** to reject it. Recall that the array is not actually deleted and no data will be overwritten until you have finished making all your changes and selected the **F8** key.

How to maintain or verify a disk array

The **Maintain Disk Array** (see Figure 14) shows the current disk array configuration that you have selected. The array's **Write Cache State** can be changed. Refer to **Select write cache properties** paragraph in the **Creating a disk array** section. **Verify Array** can be specified as **no** or **yes**. The default is **no**. **Yes** launches a foreground process that checks the data integrity of a fault tolerant array. If the verify array process determines that the mirrored drives are not identical or the parity is not correct, the mirror is degraded and the rebuild process is launched.

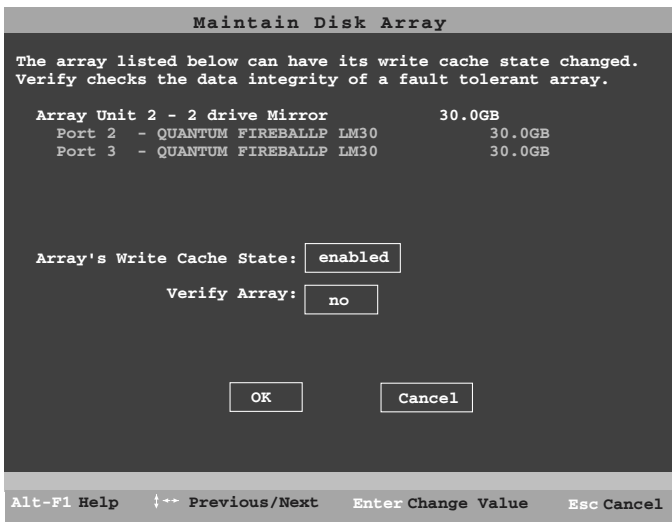


Figure 14. Maintain Disk Array Display

Rebuilding a mirrored disk array

Escalade Storage Switches allow you to create fault tolerant disk arrays by selecting a mirrored RAID 1 or RAID 10 array. These disk arrays store identical data on two or more drives to protect against drive failure. If one or more of the drives of a mirrored array is removed, unplugged or fails on read or write requests, the array is marked as **DEGRADED** and the drive is marked as **Not In Use** (see Figure 15 and Figure 16).

You can still read and write data from a degraded disk array, but the array will not be fault tolerant until it is rebuilt using the Rebuild feature, described in the *3ware Disk Array Configuration Utility* or *3DM Disk Management Utility* chapters.

```

3ware Disk Array Configuration

Available Drives:
Port 2 - QUANTUM FIREBALLP LM30      30.0GB
Port 3 - QUANTUM FIREBALLP LM30      30.0GB

Disk Arrays:
Array Unit 0 - 2 drive Mirror      30.0GB  DEGRADED
Port 0 - QUANTUM FIREBALLP LM30    30.0GB  Not in Use
Port 1 - QUANTUM FIREBALLP LM30    30.0GB

Create Array  Delete Array  Maintain Array  Rebuild Array

Alt-F1 Help ↑↑ Previous/Next $ Toggle Hot Spare Enter Select/Deselect
F6 Restore Initial Values  Esc Cancel      F8 Done

```

Figure 15. Degraded RAID 1 Array Drive When Not in Use

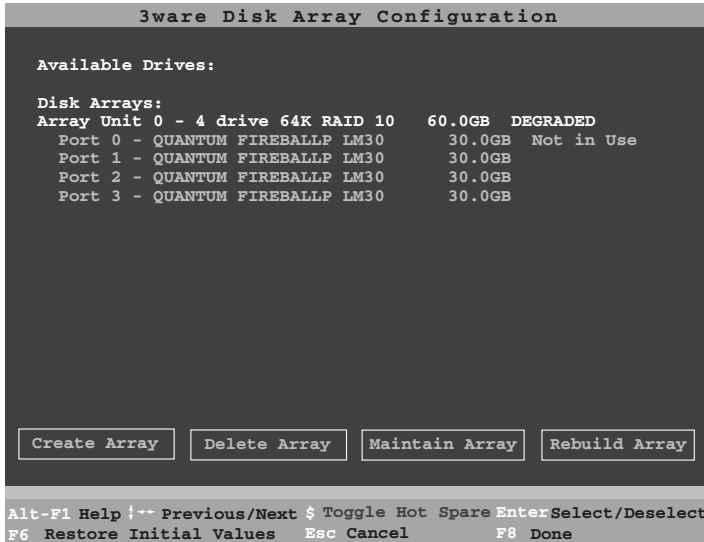


Figure 16. Degraded RAID 10 Array Drive When Not in Use



Note: A RAID 10 array can be configured with either four, six or eight disks. In a 4-drive 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.

Rebuilding a RAID 5 disk array

Escalade Storage Switches allow you to create fault tolerant RAID 5 disk arrays. These disk arrays achieve fault tolerance by using a simple (exclusive OR) function to generate the parity data that is distributed on all drives. If one of the drives is removed, unplugged or fails on read or write requests, the array is marked as **DEGRADED** and the drive is marked as **Not In Use** (see Figure 17). When running in Degraded mode, the missing data is reconstructed from all non-degraded drives.

```

3ware Disk Array Configuration

Available Drives:
Port 0 - QUANTUM FIREBALLP KX27.3          512 M

Disk Arrays:
Array Unit 1 - 3 drive  64K RAID 5  1.0GB  DEGRADED
Port 1 - IBM-DTLA-387815          512 M
Port 2 - IBM-DTLA-387815          512 M  Not in Use
Port 3 - IBM-DTLA-387815          512 M

Create Array  Delete Array  Maintain Array  Rebuild Array

Alt-F1 Help |<> Previous/Next $ Toggle Hot Spare Enter Select/Deselect
F6 Restore Initial Values  Esc Cancel  F8 Done

```

Figure 17. Degraded RAID 5 Array Drive When Not in Use

As in the case of RAID 1 and 10 arrays RAID 5 arrays allow you to read and write data from a degraded disk array, but the array will not be fault tolerant until it is rebuilt using the Rebuild feature. (Refer to the *3ware Disk Array Configuration Utility* or *3DM Disk Management Utility* chapters for more information.)

Rebuilding a mirrored or RAID 5 array with no hot spare

- 1 Reboot the system and enter the **Disk Array Configuration Utility**.
- 2 If your mirrored or RAID 5 array has a **Not in Use** member drive, the drive may still be usable. Try rebuilding with the **Not in Use** drive intact. Simply select the array and then the **Rebuild** button.
- 3 Confirm that you selected the correct array by hitting **OK** in the **Rebuild** confirmation display.
- 4 Select **F8** to exit the **Disk Array Configuration Utility**. The array will begin rebuilding after completion of the operating system load.
- 5 If the rebuild fails and you have no **Available Drives**, you must replace the drive and restart the rebuild process with the new drive. If the rebuild process fails and you have **Available Drives**, reboot the system and enter the **Disk Array Configuration Utility**.
- 6 Select an available drive to replace the faulted drive in the array by navigating the cursor over the available drive and hitting **Enter** (see Figure 18). An asterisk in the left most column indicates the drive is selected.

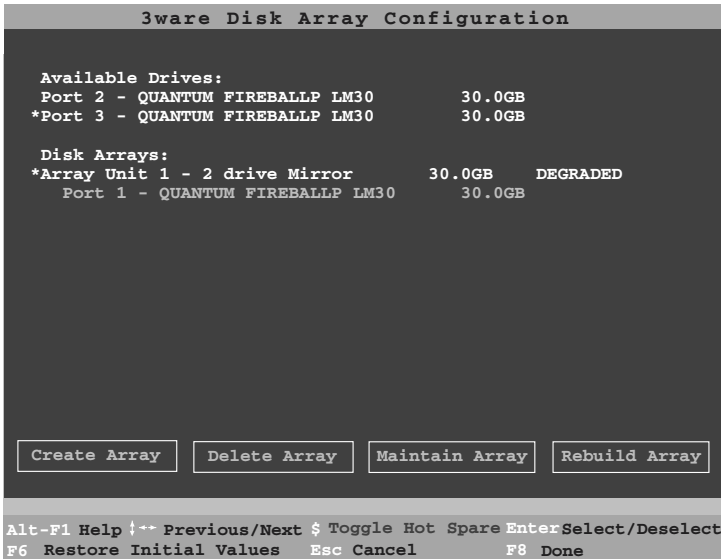


Figure 18. Select Available Drive to Replace Faulted Drive, RAID 1 Example

- 7 Navigate to the **Rebuild Array** button and press **Enter** (see Figure 19). A status screen will be displayed with your requested array and member drives.

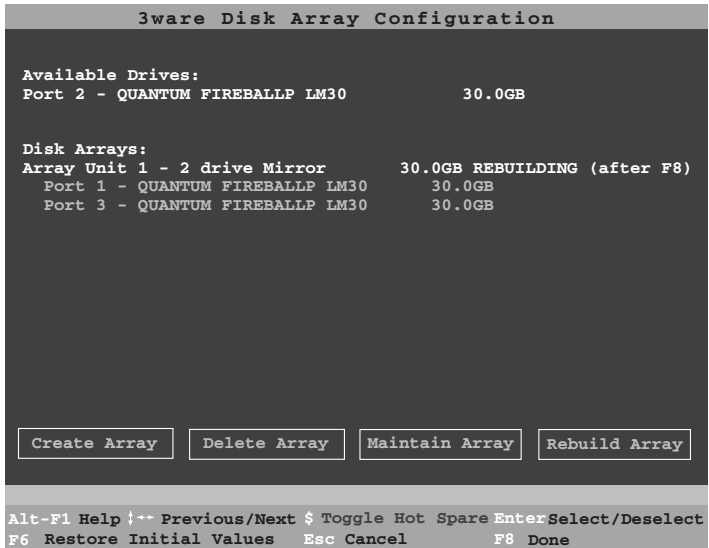


Figure 19. Rebuild Array Status Display, RAID 1 Example

- 8 Press **F8** to rebuild. The rebuild confirmation screen will be displayed (see Figure 20).

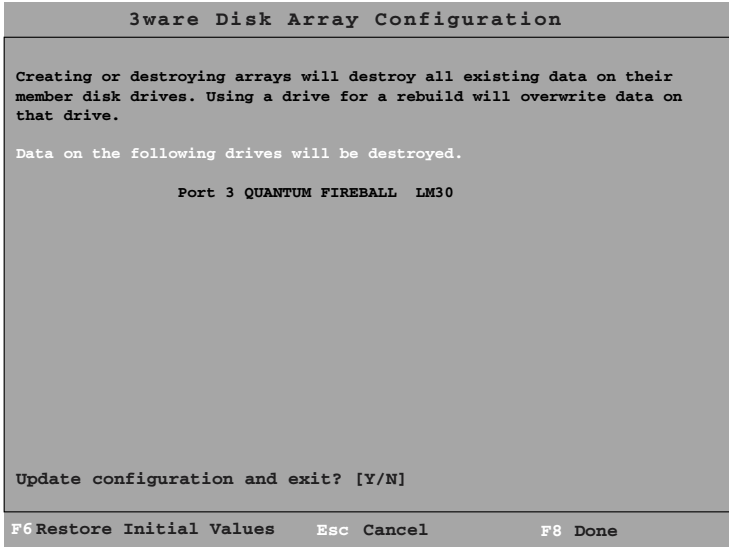


Figure 20. Rebuild Confirmation Display

- 9 Enter **Y** to update configurations and exit.

Auto rebuild of a mirrored or RAID 5 array

If a hot spare is specified and the mirrored or RAID 5 array degrades, an event notification is generated and the hot spare dynamically replaces the failed drive in the array without user intervention. Rebuild will automatically be launched as a background process and an event notification will notify the user when the rebuild process is complete.

Auto rebuild on power failure

During driver startup 3ware's auto rebuild feature sets a flag indicating that the driver loaded. Upon an orderly shutdown the flag is rewritten, indicating a clean shutdown. During the next system power cycle the firmware queries the flag. For a RAID 1 configuration, if there was a problem, the firmware degrades the secondary drive in the array and starts the background rebuild of the mirrored drive. When the rebuild is complete the two halves of the mirror will be resynchronized. For a RAID 5 configuration, if there is a problem, the firmware starts the background verification that checks that the parity matches the data.



Windows Installation



Note: If you haven't yet installed the hardware, return to the **Hardware Installation** section. The hardware must be installed before you can configure the Escalade Storage Switch.

Windows NT 4.0 Installation	page 46
Windows 98/ME Installation	page 60
Windows 2000 or XP Installation	page 76

Windows NT[®] 4.0 Installation

The Escalade Storage Switch may be configured to be your system's boot device. Or, you can use another device such as a disk attached to the motherboard as your boot device. Use your system's Setup utility to set the boot order according to how you install your operating system.

If you are installing additional drives to a Windows NT system with an existing Escalade Storage Switch, follow the instructions in: **Adding drives to an existing storage switch** (page 47).

If Windows NT has not been installed on the system, follow the instructions in either of the following sections (note: use of a boot floppy diskette may be required by some systems):
Installing the storage switch and Windows NT 4.0 (page 48).

If you are installing the Escalade Storage Switch on a system that already has Windows NT installed on a drive connected to another switch, follow the instructions in:
Installing the storage switch on systems that boot from a different device (page 52).

If you are replacing an installed Escalade Storage Switch with a new one, follow the instructions in:
Replacing an existing storage switch with a new version of the switch (page 54).



Note: Windows NT 4.0 driver requires Service Pack 4 or later. Also, you cannot install the driver or the operating system without having system administrator privileges.

Adding drives to an existing storage switch

To add new drives to an existing disk array, refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Boot the machine

- 1 Log in as system administrator.
- 2 Partition and format any new disk array or independent disk using **Disk Administrator** in the remaining steps:
 - a Choose **Programs** from the **Start** menu.
 - b Choose **Administrative Tools** from the **Programs** menu.
 - c Choose **Disk Administrator** from the **Administrative Tools** menu.

Installing the storage switch and Windows NT 4.0

Materials required:

- Windows NT 4.0 installation CD-ROM and diskettes
- 3ware CD-ROM
- 3ware Windows driver installation diskette

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Has your boot drive been partitioned?

Microsoft Windows NT 4.0 Setup occasionally has problems installing on drives that have not been partitioned. If you are having trouble you may need to create a partition on the drive where you plan to install Windows NT 4.0.

- 1 Use the **FDISK** DOS utility to get your disk partitioned and ready for installation quickly:
- 2 Boot MS-DOS and use **FDISK** to create a partition on the boot drive. The partition does not need to be formatted or made active. With **FDISK** you are limited to 4 GB for your boot partition. If you need a larger boot space create a single small (e.g., 100 MB) partition, then adjust the size during Windows NT 4.0 Setup.

Boot the system

Insert the Windows NT 4.0 CD-ROM into the CD-ROM drive, or the Windows NT 4.0 diskettes into the floppy diskette drive.

Continue with Windows NT 4.0 installation

- 1 When **Setup is Inspecting Your Computer Hardware Configuration** is displayed, press **F6** immediately.
- 2 You will see a **Windows NT 4.0 Setup** display.
- 3 Press **S** to specify that you will be installing an additional mass storage device. On the display that follows, select **Other** and press **Enter**.

Install the driver using the 3ware diskette

- 1 You will be asked to insert a manufacturer-supplied hardware support disk. Insert the 3ware Windows driver installation diskette into the floppy drive and press **Enter**. **DO NOT** use the diskette labeled specifically for Windows NT driver installation.
- 2 Select the **3ware Storage Switch** from the display that appears and press **Enter** again. Ensure the path to this driver is correct in **Copy manufacturer's files from:** at the bottom of the box. To do this, type `A:\winnt`
- 3 After the driver is loaded from the diskette, you will receive the message "Setup has recognized the following mass storage devices in your computer:" The list will contain the **3ware Storage Switch**. If not, check the hardware and restart this software installation. Otherwise, press **Enter**.

Partition device 0 to create a boot area

- 1 Follow the displayed instructions for Windows NT 4.0 installation as directed until the following message appears "The list below shows existing partitions and spaces available for creating partitions."
- 2 The partitions list should contain an entry for your Escalade Storage Switch that resembles the following: **4111 MB Disk 0 at Id 0 on bus 0 on 3waregsm**. If it does not include a 3ware entry, check your hardware and restart the software installation process.

- 3 Create a partition in the unpartitioned space of device 0 for installing Windows NT 4.0. Keep in mind that the space available in a disk array is often larger than is allowed in a single partition. Format the partition as desired with FAT or NTFS.

Follow display instructions to complete Windows NT 4.0 installation

- 1 Continue with the normal Windows NT 4.0 installation.
- 2 Log in as administrator. You should see a brief splash screen (see Figure 21) followed immediately by an “Installation Complete” notification (see Figure 22).
- 3 Partition and format any new disk arrays or independent disks using **Disk Administrator** in the remaining steps:
 - a Choose **Programs** from the **Start** menu.
 - b Choose **Administrative Tools** from the **Programs** menu.
 - c Choose **Disk Administrator** from the **Administrative Tools** menu.



Figure 21. Storage Switch Quick-Splash Screen



Figure 22. Installation Complete Notification

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install the 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



Installing the storage switch on systems that boot from a different device

Materials required:

- 3ware Windows driver installation diskette
- 3ware CD-ROM

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Install the 3ware driver

- 1 Log in as system administrator when the system finishes booting.
- 2 Go to the **Start** menu, click on **Settings** and open the **Control Panel** window.
- 3 Open **SCSI Adapters** from the **Control Panel** window.
- 4 Click on the **Drivers** tab in SCSI Adapters.
- 5 Follow the instructions in the *Install/Update 3ware driver* section (page 55) to continue.

Reboot the machine

- 1 Remove the driver diskette, then select **Yes** to restart the system. If you don't remove the diskette, the system may not boot.
- 2 Log in as system administrator. You should see a brief splash screen (see Figure 21) followed immediately by an "Installation Complete" notification (see Figure 22).
- 3 Partition and format any new disk arrays or independent disks using **Disk Administrator** in the remaining steps:
 - a Choose **Programs** from the **Start** menu.
 - b Choose **Administrative Tools** from the **Programs** menu.

- c Choose **Disk Administrator** from the **Administrative Tools** menu.

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install the 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



Replacing an existing storage switch with a new version of the switch



Caution: Install the correct driver (Escalade 7000 Storage Switch) for the new version storage switch **before** installing the switch. Your computer system will not boot with the new version of the storage switch unless the new version of the driver has been installed first.



Note: Upgrading to a new version of the Escalade Storage Switch does not require reconfiguring the drives connected to your switch and will not affect data stored in your disk arrays for this and previous versions.

Update the 3ware driver

- 1 Backup any critical data prior to upgrading the 3ware driver.
- 2 Backup the appropriate 3DM alarm log:
Windows: 3waenlog.dat
Linux: /var/log/3w-aenlog.txt
See “Update the 3ware driver” on page 69 if you are using Windows 98/ME and “Updating the 3ware driver” on page 85 if you are using Windows 2000/XP.
- 3 Log in to your system as system administrator.
- 4 Go to the **Start** menu, click on **Settings** and open the **Control Panel** window.
- 5 From the **Control Panel** window, open **SCSI Adapters**.
- 6 Click on the **Drivers** tab in **SCSI Adapters**.
- 7 Select the current driver in the **SCSI Adapters** window, then click on the **Remove** button (see Figure 23).
- 8 Follow the instructions in the *Install/Update 3ware driver* section (page 55) to continue.

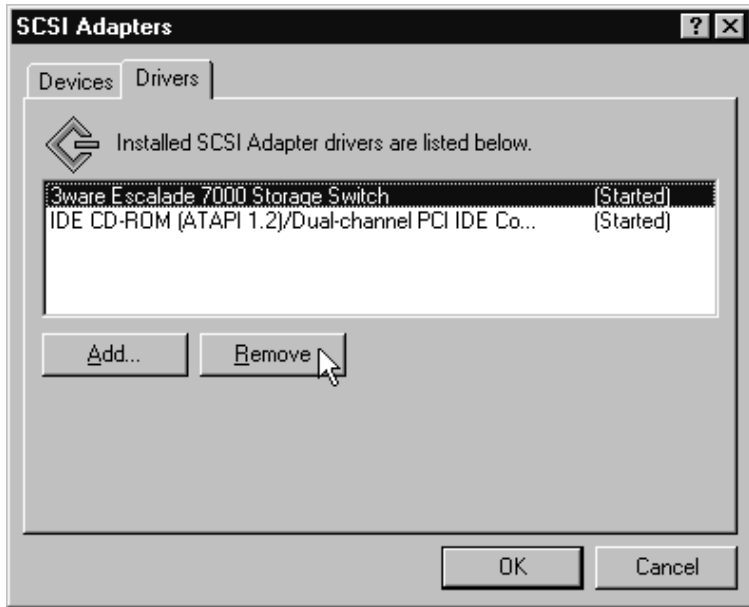


Figure 23. Remove Current Driver

Install/Update the 3ware driver

- 1 Click on the **Add...** button (see Figure 23). The **Install Driver** dialog appears (see Figure 24).



Figure 24. Install Driver

- 2 Click on the **Have Disk...** button. The **Install from Disk** (Figure 25) dialog appears. Insert the 3ware driver installation diskette. **DO NOT** use the special diskette labeled specifically for Windows NT driver installation.
- 3 Ensure that the path name is correct in **Copy manufacturer's files from:** at the bottom of the box. The correct path name will be either the root directory or A:\winnt.

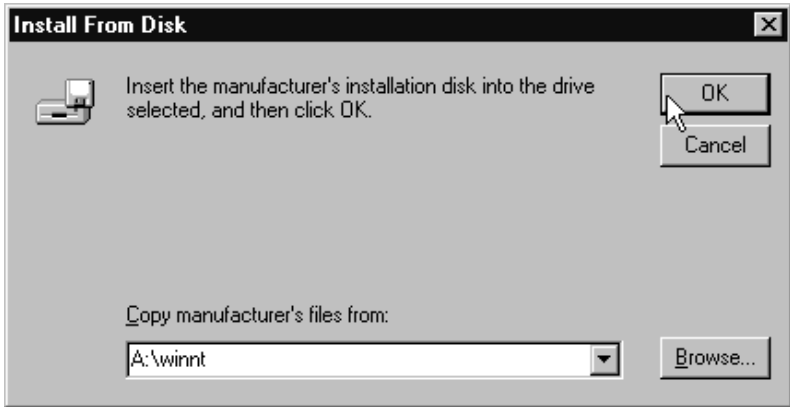


Figure 25. Install from Disk

- 4 The **Install Driver** (Figure 26) dialog box appears. Choose and click on the appropriate driver name (i.e., Escalade 7000 Storage Switch) listed in the dialog box to highlight it, then click on **OK**. Be sure to select the correct one, otherwise the driver update will not be successful. A progress bar appears briefly, followed by a **System Settings Change** dialog.
- 5 Shutdown your system.



Figure 26. Install Driver

Remove the existing Escalade Storage Switch and install the new Escalade Storage Switch

Refer to the *Hardware Installation* chapter.

Reboot the machine

- 1 Remove the driver diskette from your PC, then restart your system. If you don't remove the diskette, the system may not boot.
- 2 If you choose to reconfigure your disk arrays, press **Alt-3** to bring up the **Disk Array Configuration Utility**.
- 3 Log in at the administrator level and wait for the system to reboot. You should see a brief splash screen (see Figure 21) followed immediately by an "Installation Complete" notification (see Figure 22).

- 4 Partition and format any new disk arrays or independent disks using **Disk Administrator** in the remaining steps:
 - a From the **Start** menu, choose **Programs**.
 - b From the **Programs** menu, choose **Administrative Tools**.
 - c From the **Administrative Tools** menu, choose **Disk Administrator**.

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install the 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



Windows[®] 98/ME Installation



Note: The procedures provided below apply to Windows 98 and Windows Millennium Edition (Windows ME) installations.

As a Plug and Play device the Escalade Storage Switch may be configured to be your system's boot device. Or you can use another device as the boot device, such as a disk attached to the motherboard. Use your system's Setup utility to set the boot order according to how you install your operating system.

If you are installing an additional drive to a Windows 98/ME system with an existing Escalade Storage Switch, follow the instructions in:

Adding a drive to an existing storage switch (page 62).

If you have a new drive configuration without an operating system and want to install Windows on a drive managed by the Escalade Storage Switch, follow the instructions in:

Installing the storage switch while installing Windows 98/ME (page 63).

If you are installing the storage switch on a system that already has the operating system installed on a unit connected to another switch, follow the instructions in:

Installing the storage switch on systems that boot from another device (page 66).

If you are replacing an installed Escalade Storage Switch with a newer version, follow the instructions in:

Replacing an existing storage switch with a new version of the switch (page 69).



Note: Windows 98 driver requires Microsoft Windows 98 Second Edition.

Adding a drive to an existing storage switch

To add the new drive to an existing disk array, refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Partition and format new drive

- 1 Run **fdisk** by selecting **Run...** from the **Start** menu and typing **fdisk** in the **Run** window.
- 2 Restart the system again and format each device: select the device with the right mouse button in the **My Computer** window, then select **Format...** from the popup menu.
- 3 After formatting, reboot the system again to avoid running an incompatible DOS mode and to avoid low performance.

Installing the storage switch while installing Windows 98/ME

Materials required:

- 3ware Windows driver installation diskette
- 3ware CD-ROM

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Boot the system from the Windows 98/ME diskette

- 1 Insert Windows 98/ME boot disk into the floppy drive.
- 2 Restart your computer.
- 3 From the Windows 98 or ME **Startup Menu**, choose **1. Start computer with CD-ROM support**.

Partition the boot device using *fdisk*

- 1 If your disks have not been partitioned you will get a message like “Windows has detected that drive C does not contain a valid FAT or FAT32 partition”. From the MS-DOS command prompt, run **fdisk** to create a partition.

```
A:\> fdisk
```

- 2 When asked to enable large disk support indicate “yes” by typing **Y**.
- 3 Under **FDISK Options** select option 1, **Create a DOS partition or Logical DOS Drive**.
- 4 Under **Create a DOS Partition or Logical DOS Drive** select option 1, **Create a Primary DOS partition**.
- 5 When asked to use the maximum available size for a **Primary DOS Partition**, indicate “yes” by typing **Y**. Then, press the **Escape** key to return to the **FDISK Options** menu.

- 6 After the primary DOS partition is created for your boot device, you may partition any other devices on your system. Select option **5** to change the current drive and then repeat steps 3-5.
- 7 Press the **Escape** key several times as directed to exit fdisk and return to the MS-DOS prompt.

Restart the machine and format the boot device

- 1 As you did before, choose **1. Start computer with CD-ROM support**.
- 2 If you get the same message (e.g., “Windows has detected that drive C does not contain a valid FAT or FAT32 partition”) your partition was not created properly. Return to the **Partition the boot device using fdisk** and try again. You may have restarted without exiting all the way to the MS-DOS prompt.
- 3 At the MS-DOS prompt, format your boot device.

```
A:\> format C:
```

Continue the standard Windows 98/ME installation

- 1 Insert the Windows 98/ME CD-ROM into your CD-ROM drive.
- 2 From the MS-DOS prompt, type **setup** to continue with the standard Windows 98 or ME installation.
- 3 After **ScanDisk** finishes, type **X** for exit.
- 4 Follow the display instructions. Note that the machine restarts several times in the process.
- 5 Install the 3ware driver. Refer to the *Install 3ware driver* section.

Partition and format other devices



Note: If you have disks or disk arrays other than your boot device on the storage switch, you must partition and format them before they can be written to or read from.

- 1 If you have other disk units to partition, run **fdisk** by selecting **Run...** from the **Start** menu and typing **fdisk** in the dialog.
- 2 Restart the system again and format each device.

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install the 3DM Disk Management Utility.

Refer to the *3DM Disk Management Utility* chapter.



Installing the storage switch on systems that boot from a different device

Materials required:

- 3ware Windows driver installation diskette
- 3ware CD-ROM

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Install the 3ware driver

As a Plug and Play device Windows 98/ME will recognize the Escalade Storage Switch and automatically bring up the **Add New Hardware Wizard**, which will guide you in installing the new 3ware driver (see Figure 27). When the **Add New Hardware Wizard** screen appears continue to the *Install/Update 3ware driver* section. Perform the following steps only if this Wizard does not appear on your screen or was cancelled for some reason:

- 1 Log in after Windows installation is complete and insert the 3ware Windows driver installation diskette.
- 2 From the **Start** menu, select **Setting**, then **Control Panel**.
- 3 Double click on **Add New Hardware** icon. When the **Add New Hardware** wizard lists devices that need to be installed, select the **SCSI Controllers**.
- 4 Continue to the *Install/Update 3ware driver* section.



Figure 27. Add New Hardware Wizard

Partition and format units on storage switch

- 1 If you have other disk units to partition, run **fdisk** by selecting **Run...** from the **Start** menu and typing **fdisk** in the **Run** window.
- 2 Restart the system again and format each device: select the device with the right mouse button in the **My Computer** window, then select **Format...** from the popup menu.
- 3 After formatting, reboot the system again to avoid running an incompatible DOS mode and low performance.

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install the 3DM disk management utility

Refer to *3DM Disk Management Utility* chapter.



Replacing an existing storage switch with a new version of the switch



Caution: Install the correct driver (Escalade 7000 Storage Switch) for the new version Escalade Storage Switch **before** installing the switch. Your system may not boot with the new version of the storage switch unless the new version of the driver has been installed first.



Note: Upgrading to a new version of the Escalade Storage Switch does not require reconfiguring the drives connected to your switch and will not affect data stored in your disk arrays for this and previous versions.

Materials required:

- 3ware Windows driver installation diskette
- 3ware CD-ROM

Update the 3ware driver

- 1 Backup any critical data prior to upgrading the 3ware driver. See “Update the 3ware driver” on page 54.
- 2 Log in to your system.
- 3 Go to the **Start** menu, click on **Settings** and open the **Control Panel** window.
- 4 Click on the **System** icon from the **Control Panel** window.
- 5 Click on the **Device Manager** tab.
- 6 Open the **SCSI Adapters** selection.
- 7 Locate and double-click on **3ware Storage Switch**. The **3ware Storage Switch Properties** pop-up menu appears.

- 8 Click on the **Driver** tab (see Figure 28).



Figure 28. 3ware Storage Switch Properties Display

- 9 Click on the **Update Driver...** button and press **Next** on the **Update Device Driver Wizard**.

Install/Update the 3ware driver

- 1 When you see the window in Figure 29 you **MUST** select “Display a list of all the drivers in a specific location, so that you can select the driver you want.”



Figure 29. Install Hardware Device Drivers

- 2 The **Select a Device Driver** dialog appears (see Figure 30). Click on the **Have Disk...** button.

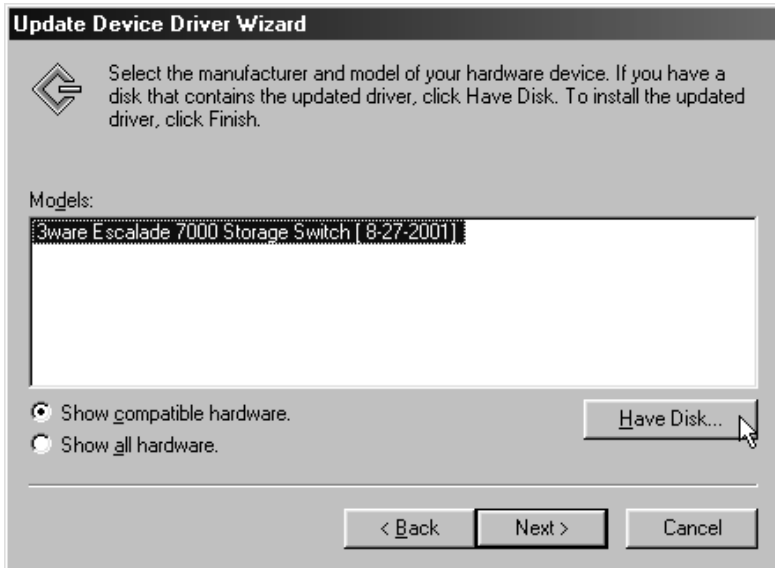


Figure 30. Select a Device Driver Display

- 3 The **Install from Disk** (Figure 31) dialog appears. Insert the 3ware driver installation diskette and type the correct path name in **Copy manufacturer's files from:** near the bottom of the box. The correct path name will be either the A:\win98 directory or the root directory.



Figure 31. Install from Disk

- 4 The **Update Driver** dialog box appears (see Figure 32). Click on the correct storage switch listed in the dialog box to select it, then click on **Next**.

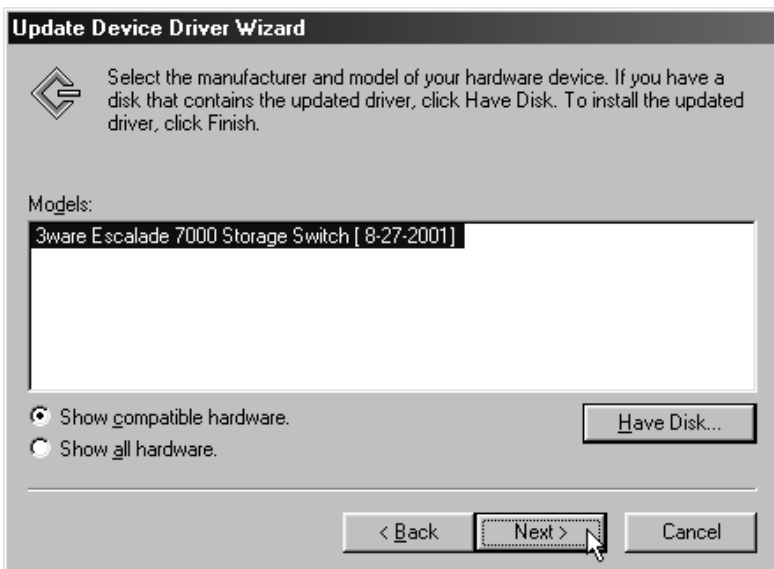


Figure 32. Update driver

- 5 The final update driver screen should appear (Figure 33), followed by a progress bar which appears briefly, then by a **System Settings Change** dialog.

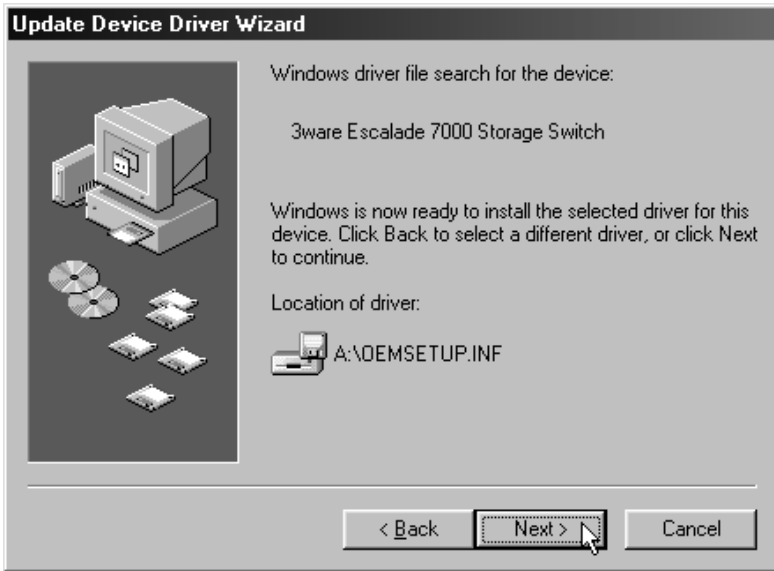


Figure 33. Final driver installation screen

- 6 Shutdown your system and log back in at the administrator level, if your system is connected to a network. When the system has rebooted you should see a brief splash screen (see Figure 34), followed immediately by an “Installation Complete” notification (see Figure 35).



Figure 34. Storage Switch Quick-Splash Screen



Figure 35. Installation Complete Notification

Remove the existing Escalade Storage Switch and install the new Escalade Storage Switch

Refer to the *Hardware Installation* chapter.

Reboot the machine

- 1 If you choose to reconfigure your disk arrays, press **Alt-3** to bring up the **Disk Array Configuration Utility**.
- 2 If you reconfigure your disk arrays, partition and format any new disk arrays or freed disks. To partition, run **fdisk** by selecting **Run...** from the **Start** menu and typing **fdisk** in the **Run** window.
- 3 To format, restart the system again and log in. Select the device with the right mouse button in the **My Computer** window and select **Format...** from the popup menu.
- 4 After formatting, reboot the system again to avoid running an incompatible DOS mode and low performance.



Windows® 2000 or Windows XP Installation

As a Plug and Play device, the Escalade Storage Switch 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. Use your system's Setup utility to set the boot order according to how you install your operating system.

If you are installing an additional drive to a Windows 2000 XP system with an existing Escalade Storage Switch, follow the instructions in:

Adding a drive to an existing storage switch (page 78).

If you have a new drive configuration without an operating system and want to install Windows on a drive managed by the Escalade Storage Switch, follow the instructions in:

Installing the storage switch while installing Windows 2000 or XP (page 79).

If you are installing the Escalade Storage Switch on a system that already has the operating system installed on a unit connected to another storage switch, follow the instructions in:

Installing the storage switch on systems that boot from another device (page 82).

If you are replacing an installed Escalade Storage Switch with a newer version, follow the instructions in:

Replacing an existing Escalade Storage Switch with a new version of the switch (page 85).



Note: 3ware supports released versions of Windows 2000 and Windows XP only. We recommend that the user upgrade to the latest service packs available for Windows 2000 and Windows XP. The driver or the operating system cannot be installed unless you have administrator privileges for your system.

Installing a drive to an existing storage switch

To add the new drive to an existing disk array, refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Boot the machine

Continue with the following steps to make the new disk array or independent disk accessible to Windows 2000 or XP:

- 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.

Installing the storage switch while installing Windows 2000 or Windows XP

Materials required:

- Windows 2000 or XP installation CD-ROM
- 3ware Windows driver installation diskette
- 3ware CD-ROM

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Installing with the Initial Operating System Build

- 1 Boot from the Windows 2000 or XP CD and press **F6** when the message: “Press F6 if you need to install a 3rd party SCSI or RAID driver” appears at the bottom of the display.
- 2 When you get the message: “Setup could not determine the type of one or more mass storage devices or you have chosen to manually specify and adapter...” press **S** to specify that you have an additional disk storage switch.
- 3 Insert the 3ware driver diskette and press **Enter**.
- 4 A box with **3ware Storage Switch** is displayed. Press **Enter** to select it.
- 5 Press **S** if you have additional devices to add. Otherwise, press **Enter**.

Continue with Windows 2000 or XP installation

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

Reboot the machine

When you reboot the system, log in as system administrator. You should see a brief splash screen (see Figure 36), followed immediately by an “Installation Complete” notification (see Figure 37).



Figure 36. Storage Switch Quick-Splash Screen



Figure 37. Installation Complete Notification.

Continue with the following steps to make any new disk arrays or independent disks accessible to Windows 2000 or XP.

- 1 Remove the driver diskette, then select **Yes** to restart the system. The system may not boot if you don't remove the diskette.
- 2 Partition and format the new arrays or disks using **Disk Administrator**:
 - a Choose **Administrative Tools** from the **Start** menu.
 - b Choose **Computer Management** from the **Administrative Tools** menu.
 - c Select **Storage**.
 - d Select **Disk Management**.

- 5 Follow the steps the appear on-screen to write a signature to the drive.
- 6 Right click on the drive and select **Create Volume**.
- 7 Follow the steps the appear on-screen to create a volume and to assign a drive letter.

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install the 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



Installing the storage switch on systems that boot from a different device

Materials required:

- 3ware Windows driver installation diskette
- 3ware CD-ROM

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Install the 3ware driver

As a Plug and Play device, Windows 2000 or XP recognizes the Escalade Storage Switch and brings up the **Found New Hardware Wizard** which guides you in installing the 3ware driver (see Figure 38). Continue to the *Install/Update 3ware driver* section.



Figure 38. Found New Hardware Wizard.

Reboot the machine

Log in as system administrator when you reboot the system. You should see a brief splash screen (see Figure 36), followed immediately by an “Installation Complete” notification (see Figure 37). Continue with the following steps to make any new disk arrays or independent disks accessible to Windows 2000 or XP.

- 1 Remove the driver diskette, then select **Yes** to restart the system. The system may not boot if you don’t remove the diskette.
- 2 Partition and format the new arrays or disks using **Disk Administrator**:
 - a Choose **Administrative Tools** from the **Start** menu.
 - b Choose **Computer Management** from the **Administrative Tools** menu.

- c Select **Storage**.
 - d Select **Disk Management**.
- 5 Follow the steps the appear on-screen to write a signature to the drive.
 - 6 Right click on the drive and select **Create Volume**.
 - 7 Follow the steps the appear on-screen to create a volume and to assign a drive letter.

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install the 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



Replacing an existing storage switch with a new version of the switch



Caution: Install the correct driver (Escalade 7000 Storage Switch) for the new version Escalade Storage Switch **before** installing the switch. Your system may not boot with the new version of the storage switch unless the new version of the driver has been installed first.



Note: Upgrading to a new version of the Escalade Storage Switch does not require reconfiguring the drives connected to your switch and will not affect data stored in your disk arrays for this and previous versions.

Materials required:

- 3ware Windows driver installation diskette
- 3ware CD-ROM

Updating the 3ware driver

- 1 Backup any critical data prior to updating the 3ware driver. See “Update the 3ware driver” on page 54.
- 2 Log in to your system as system administrator.
- 3 Go to the **Start** menu, click on **Settings** and open the **Control Panel** window.
- 4 From the **Control Panel** window, click on the **System** icon.
- 5 Click on the **Hardware** tab and then click on the **Device Manager** tab.
- 6 Open the **SCSI and Raid Controllers** selection.

- 7 Locate and double-click on **3ware Storage Switch**. The **3ware Storage Switch Properties** pop-up menu appears.
- 8 Click on the **Driver** tab (see Figure 39).

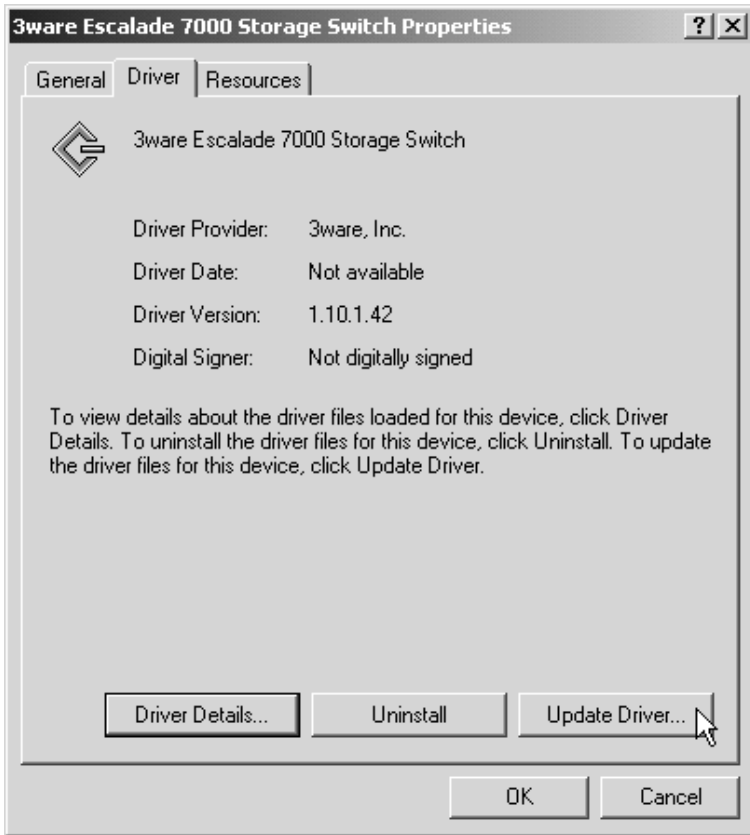


Figure 39. 3ware Storage Switch Properties Display

- 9 Click on the **Update Driver...** button.
- 10 Press **Next** on the **Upgrade Device Driver Wizard** (see Figure 40).



Figure 40. Upgrade driver welcome screen

Installing/Updating the 3ware driver

- 1 Once you reach the **Update Device Driver** screen display shown in Figure 41, ensure that you select “Display a list of known drivers for this device, so that I can choose a specific driver.” Afterwards, press **Next** and follow the instructions.

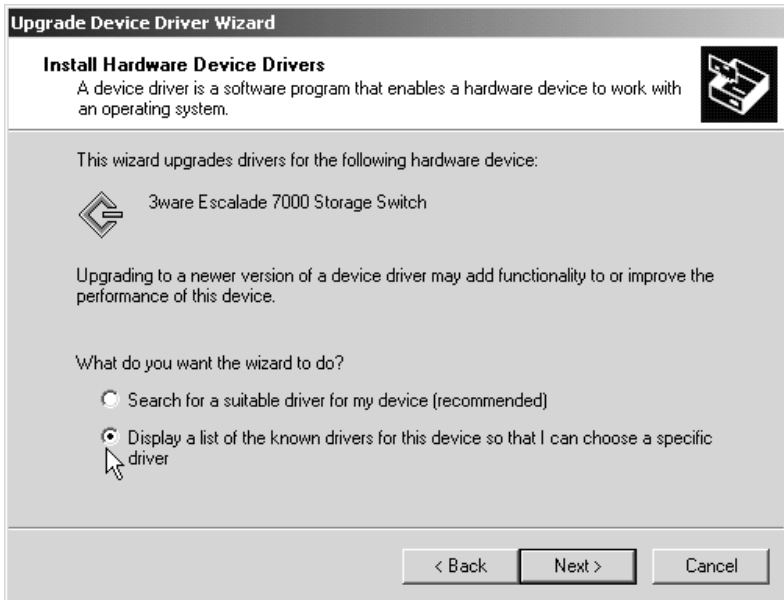


Figure 41. Update/Install device driver

- 2 The **Select a Device Driver** dialog appears (see Figure 42). Click on the **Have Disk...** button.

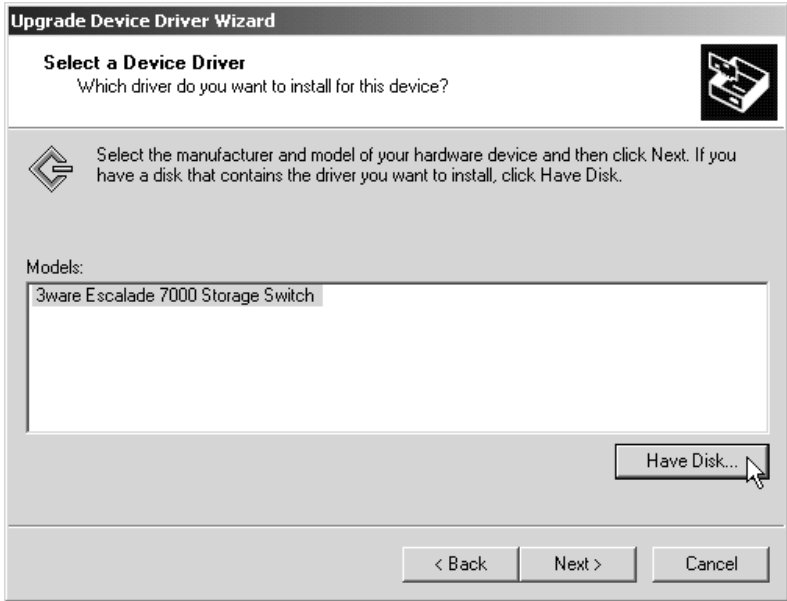


Figure 42. Select a Device Driver

- 3 The **Install from Disk** (Figure 43) dialog appears. Insert the 3ware driver installation diskette and type the correct path name in **Copy manufacturer's files from:** near the bottom of the box. The correct path name is A:\win2k.

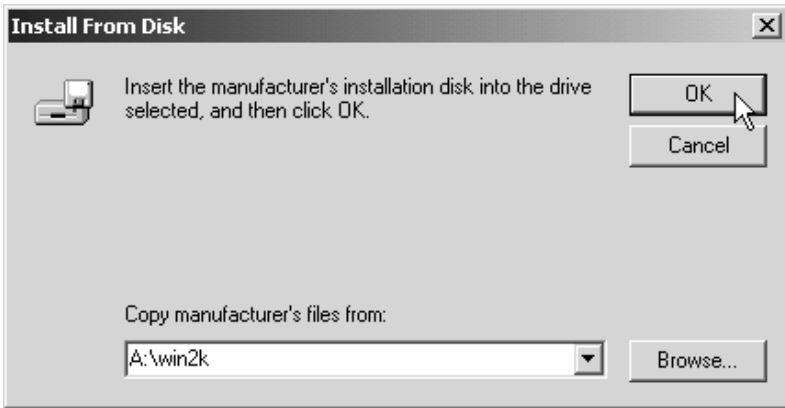


Figure 43. Install From Disk

- 4 The **Select a Device Driver** dialog box appears (see Figure 44). Click on the appropriate driver name (i.e., Escalade 7000 Storage Switch) listed in the dialog box to highlight it. Then click on **Next**. Be sure to select the correct driver name, otherwise the driver update will not be successful. The **Start Device Driver Installation** screen appears (see Figure 45).

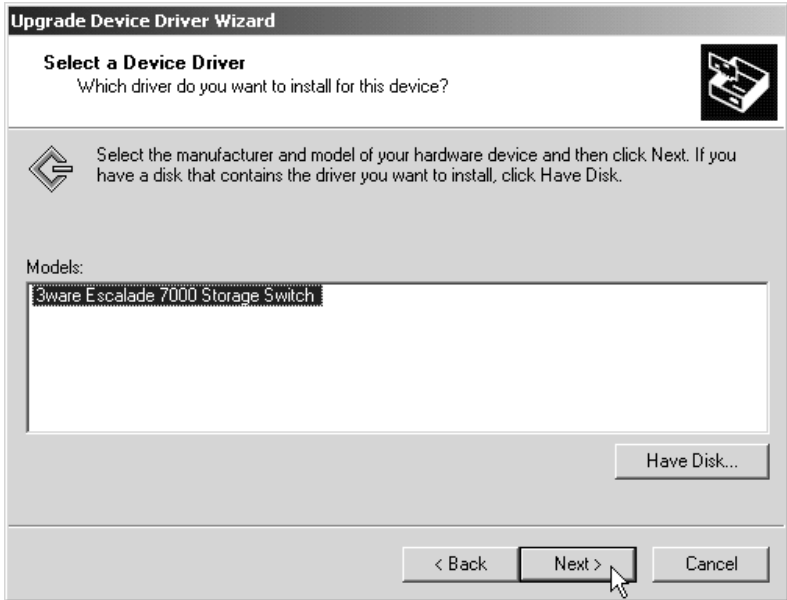


Figure 44. Select a Device Driver

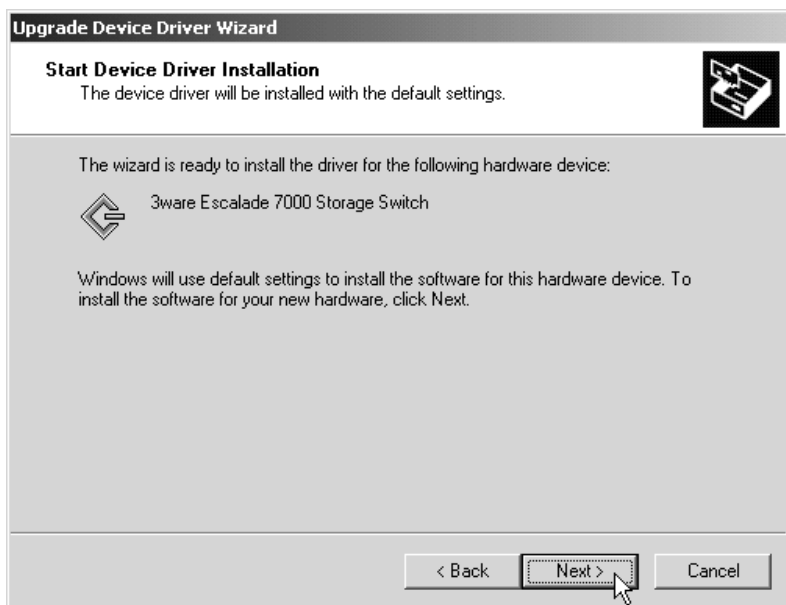


Figure 45. Start Device Driver Installation

- 5 Depending on the driver diskette that was packaged with your storage switch the **Digital Signature Not Found** screen may appear (see Figure 46). If this screen appears, click on **Yes** to continue and follow the instructions to complete the driver installation.

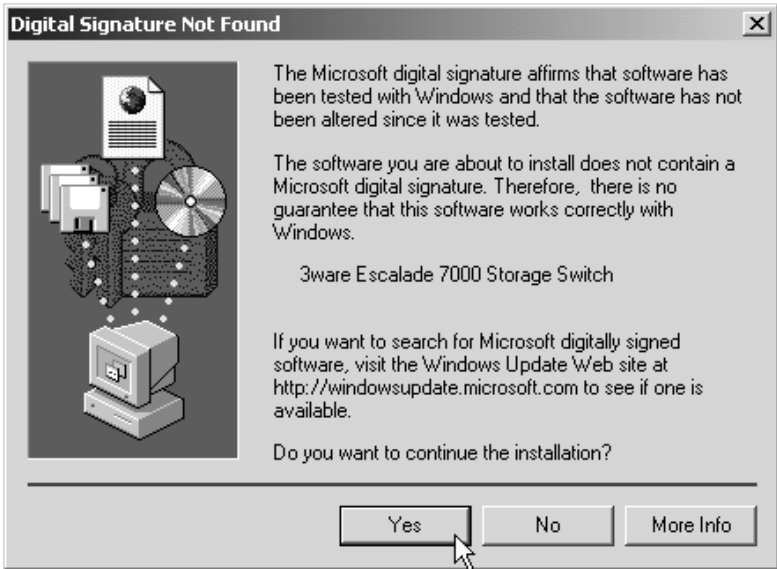


Figure 46. Digital Signature Not Found

- The final update driver screen should appear (Figure 47), followed by a progress bar which appears briefly, then by a **System Settings Change** dialog.



Figure 47. Final driver installation screen

Remove the existing Escalade Storage Switch and install the new Escalade Storage Switch

Refer to the *Hardware Installation* chapter.

Reboot the machine

- Remove the driver diskette from your PC, then install the new storage switch. Afterwards, turn your system on.
- If you choose to reconfigure your disk arrays press **Alt-3** to bring up the **Disk Array Configuration Utility**.

- 3 Log in as system administrator. When the system has rebooted you should see a brief splash screen (see Figure 36), followed immediately by an “Installation Complete” notification (see Figure 37).
- 4 Partition and format any new disk arrays or independent disks using **Disk Management** from **Administrative Tools**.
 - a Choose **Administrative Tools** from the **Start** menu.
 - b Choose **Computer Management** from the **Administrative Tools** menu.
 - c Select **Storage**.
 - d Select **Disk Management**.
- 5 Follow the steps the appear on-screen to write a signature to the drive.
- 6 Right click on the drive and select **Create Volume**.
- 7 Follow the steps the appear on-screen to create a volume and to assign a drive letter.

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install the 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



Linux Installation



Note: If you haven't yet installed the hardware, return to the *Hardware Installation* chapter. The hardware must be installed before you can configure the Escalade Storage Switch.

Red Hat Linux Installation page 98
SuSE Linux Installation page 107



Note: Check your Linux driver version number by typing the following command:
`cat /proc/scsi/3w-xxxx/0`



Note: Check 3ware's web site (www.3ware.com) for the latest release notes and for instructions on how to upgrade your driver and firmware to the latest release.

Red Hat[®] Linux Installation

As a Plug and Play device, the Escalade Storage Switch 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. Use your system's Setup utility to set the boot order according to how you install your operating system.

If you have a new drive configuration without an operating system and want to install Linux on a drive managed by 3ware's Storage Switch, follow the instructions in:

Installing the storage switch while installing Red Hat Linux
(page 99).

If you are installing the storage switch on a system that already has the operating system installed on a unit connected to another switch, follow the instructions in:

Installing the storage switch on systems that boot from a different device (page 102).

Installing the storage switch while installing Red Hat Linux

Materials required:

- 3ware 3DM CD-ROM (1)
- 3ware driver disk installation for Red Hat (1)
- Red Hat Linux installation CD-ROM and boot disk



Note: We have tested systems where an IDE drive connected to the motherboard interfered with using the Escalade Storage Switch as a boot device. Disconnecting the IDE drive while installing Linux will eliminate this problem. After Linux is installed, the drive can be reconnected.



Note: The use of the Disk Druid partitioning utility with Red Hat 6.2 is limited to 112 GB. Use fdisk if more storage capacity is required.

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Boot with the Red Hat CD-ROM or diskette



Note: The boot diskette is optional since most computers can boot directly from the Red Hat CD-ROM disk.

- 1 Insert the Red Hat boot diskette into the floppy drive of the computer. If your BIOS supports it you may boot directly from the Red Hat installation CD-ROM instead.

- 2 Restart your computer.
- 3 When the **Welcome to Red Hat** display appears type **expert** at the boot prompt.
boot: expert

Install the driver

- 1 After loading a number of files, you will be asked to insert your driver disk. Insert the 3ware driver installation diskette for Red Hat and press **OK**. For Red Hat 7.1 and later versions, the system automatically reports:
Loading 3w-xxxx driver
- 2 Select the proper language and keyboard types for your locality.
- 3 If asked for what type of media, select **Local CD-ROM** since you are installing from CD-ROM.

For Red Hat versions prior to 7.0:

- 4 When asked if you would like to specify a special device driver select **Add Device** and press **Return**.
- 5 When asked what kind of device you would like to add select **SCSI**.
- 6 Scroll down the list and select the **3ware Storage Switch**.
- 7 Installing the driver will conclude with a message: "I have found the following devices in your system" and should list the Escalade Storage Switch. Unless you have other third party devices to install in your system, select **Done**.

For Red Hat version 7.2:

Due to a Red Hat 7.2 installer bug, an older version of the 3ware driver loads instead of the latest one from the driver disk. Complete the installation, and then update the driver to get the installation correct.

Complete the normal Red Hat installation

Continue with the Red Hat Linux installation. Refer to the Red Hat documentation for questions or problems.

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install and run 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



Installing the storage switch on systems that boot from a different device

Materials required:

- 3ware driver installation for Red Hat Linux diskette (1).
- 3ware CD-ROM containing the 3DM disk management utility.



Note: The use of the Disk Druid partitioning utility with Red Hat 6.2 is limited to 112 GB. Use fdisk if more storage capacity is required.

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Install the 3ware driver



Note: *****kernel string***** refers to the kernel version (i.e. 2.2.14-5.0, 2.4.2-2 smp, etc.) Check 3ware's website for supported versions.



Note: ******* refers to the Red Hat Linux version you are installing (i.e. rh71, rh72, etc.). Check 3ware's website for supported versions.

Case 1: Your system is a non-smp system

1 Type: `mount -t msdos /dev/fd0 /mnt/floppy`

2 **For Red Hat 2.2** kernels, type:

```
cp /mnt/***/3w-xxxx.o /lib/modules/
  ***kernel string***/scsi
```

3 **For Red Hat 2.4** kernels, type:

```
cp /mnt/***/3w-xxxx.o /lib/modules/
  ***kernel string***/kernel/drivers/scsi
```

4 Edit the `/etc/rc.d/rc.sysinit` file as follows:

After the lines:

```
#Start up swapping.
```

```
action "Activating swap partitions" swapon -a
```

add the following lines:

For Red Hat 7.0 and older, type:

```
/sbin/insmod /lib/modules/***/kernel string***/scsi/
  3w-xxxx.o
```

For Red Hat 7.1 and newer, type:

```
/sbin/insmod /lib/modules/***/kernel string***/
  kernel/drivers/scsi/scsi_mod.o
/sbin/insmod /lib/modules/***/kernel string***/
  kernel/drivers/scsi/sd_mod.o
/sbin/insmod /lib/modules/***/kernel string***/
  kernel/drivers/scsi/3w-xxxx.o
```

5 Afterwards, halt the system, add the storage switch and reboot.

During reboot, the new storage switch should be recognized.

Afterwards, the **Hardware Discover** utility should pop up.

6 Press return to enter the **Hardware Discover** utility.

7 Select the **Configure Device** option. The system boot completes and drives are now available.

Case 2: Your system runs an SMP system (multi-processor).

- 1 Type the following lines:

```
mount -t msdos /dev/fd0 /mnt/floppy
```

- 2 **For Red Hat 2.2 kernels**, type:

```
cp /mnt/***/3w-xxxx.smp /lib/modules/  
***kernel string***/scsi/3w-xxxx.o
```

- 3 **For Red Hat 2.4 kernels**, type:

```
cp /mnt/***/3w-xxxx.smp /lib/modules/  
***kernel string***/kernel/drivers/scsi/  
3w-xxxx.o
```

- 4 Edit the /etc/rc.d/rc.sysinit file as follows:

After the lines:

```
#Start up swapping.
```

```
action "Activating swap partitions" swapon -a
```

add the following lines:

For Red Hat 7.0 and older, type:

```
/sbin/insmod /lib/modules/***/kernel string***/  
scsi/3w-xxxx.o
```

For Red Hat 7.1 and newer, type:

```
/sbin/insmod /lib/modules/***/kernel string***/  
kernel/drivers/scsi/scsi_mod.o  
/sbin/insmod /lib/modules/***/kernel string***/  
kernel/drivers/scsi/sd_mod.o  
/sbin/insmod /lib/modules/***/kernel string***/  
kernel/drivers/scsi/3w-xxxx.o
```

Compiling the Driver (For experts only)

If you wish to compile the driver yourself (for a different kernel version that you are running), then perform the following steps.

- 1 Copy the driver source from the floppy into a working directory.
- 2 Untar the driver source with the command, `tar xzfp 3w-xxxx.tgz`.

3 You must have a full Linux kernel source tree in `/usr/src/linux` in order to do the compile.

4 For Red Hat 6.2 and older versions:

```
To build UP module boot to desired UP kernel, type:
make -f makefile.rh
The file created is 3w-xxxx.o
```

```
To build SMP module boot to desired SMP kernel,
type:
make smp -f makefile.rh
The file created is 3w-xxxx.smp
```

5 For Red Hat 7.0 and later versions:

Red Hat 7.0 and later support multiple build targets from makefile. Boot to UP version of kernel to build against:

```
To build UP module, type:
make -f makefile.rh
The file created is 3w-xxxx.o
```

```
To build SMP module, type:
make smp -f makefile.rh
The file created is 3w-xxxx.smp
```

```
To build Enterprise module, type:
make ent -f makefile.rh
The file created is 3w-xxxx.ent
```

6 Copy the module as follows:

```
For 2.2 kernels:
Copy module to /lib/modules/***kernel string***/
scsi/32-xxxx.o
For 2.4 kernels:
Copy module to /lib/modules/***kernel string***/
drivers/scsi/3w-xxxx.o
```

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install and run 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



SuSE[®] Linux Installation

As a Plug and Play device, the Escalade Storage Switch may be configured to be your system's boot device or you can use another device, such as a disk attached to the motherboard as your boot device. Use your system's Setup utility to set the boot order according to how you install your operating system.

If you have a new drive configuration without an operating system and want to install Linux on a drive managed by 3ware's Storage Switch, follow the instructions in either:

Installing the storage switch while installing SuSE Linux 7.2 or 7.3 with YaST1 (page 108).

The storage switch cannot be installed while installing SuSE with YaST2. Refer to the SuSE installation instructions to determine which installation is right for you.

If you are installing the storage switch on a system that already has the operating system installed on a unit connected to another switch, follow the instructions in:

Installing the storage switch on systems that boot from a different device (page 112).

Installing the storage switch while installing SuSE Linux with YaST1

Materials required

- 3ware 3DM CD-ROM, 3ware driver installation disk for SuSE Linux (1)
- 3ware driver installation disk.
- SuSE Linux Installation CD-ROM/DVD and boot disk



Note: We have tested systems where an IDE drive connected to the motherboard interfered with using the Escalade Storage Switch as a boot device. Disconnecting the IDE drive while installing Linux will eliminate this problem. After Linux is installed, the drive can be reconnected.

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Boot with the SuSE CD/DVD or diskette

- 1 Insert SuSE Boot diskette into the floppy drive of the computer. If your BIOS supports it you may boot directly from the SuSE installation CD-ROM/DVD disk instead.
- 2 Select the manual or YaST1 installation method. YaST2 is not supported. If the system boots in YaST2 mode, select **Abort** and continue the install from the main installation menu.

- 3 When the **Type of Installation** display appears, **do not select anything** yet.
- 4 Insert the 3ware driver installation diskette, then press **Ctl-Alt-F2**.

Install the driver via a command shell



Note: *** refers to the SuSE Linux version you are installing (i.e. su64, su72, etc.). Check 3ware's website for supported versions.

- 1 From the command prompt, issue the following commands:

```
/ # mount -t msdos /dev/fd0 /mnt
/ # cp /mnt/***/3w-xxxx.o /modules
/ # umount /mnt
```

- 2 Eject the 3ware Software Installation diskette from the floppy drive and issue the following commands.

```
/ # cd /modules
/modules # /sbin/insmod 3w-xxxx.o
```

- 3 Press **Ctl-Alt-F1** to return to the **Type of Installation** display.



Note: If the system reports a 3ware module is already loaded, stop the driver with the command below and repeat step 3 to load the current driver:

```
/modules # /sbin/rmmod 3w-xxxx
```

- 4 Select **Abort-No Installation**.

- 5 At the **Start Installation/System** display, select **Start Installation**, then select **Install Linux from Scratch**.
- 6 Following the installation, when asked to select the kernel, select the kernel with SMP-support or select the standard kernel.
- 7 When Lilo is finished installing and the confirmation window appears, **do not continue**. Press **Ctl-Alt-F2** instead.
- 8 Proceed to the following section, “Set up the system so driver will load on boot”.

Set up the system so driver will load on boot

- 1 Insert the 3ware driver installation diskette for SuSE and type in the following:

```
/ # mkdir /mnt2
/ # mount -t msdos/dev/fd0 /mnt2
```

If you are on a non-SMP system, type:

```
/ # cp /mnt2/***/initrd /mnt/boot
```

If you are on an SMP system, type:

```
/ # cp /mnt2/***/initsmp /mnt/boot/initrd
```

- 2 Unmount and eject the 3ware Software Installation diskette from the floppy drive by entering the following:

```
/ # umount /mnt2
```

Edit the lilo.conf file

- 1 Edit /mnt/etc/lilo.conf. Note that to use vi, you must first set the LD_LIBRARY_PATH

```
/ # export LD_LIBRARY_PATH=/mnt/usr/lib
/ # /mnt/usr/bin/vi /mnt/etc/lilo.conf
```

- 2 In the lilo.conf file add the line, `initrd = /boot/initrd` after the line, `image = /boot/vmlinuz`.

```
image = /boot/vmlinuz
initrd = /boot/initrd
```


- 3 Save the `lilo.conf` file and exit the editor.
- 4 Run lilo by typing:

```
/ # /mnt/sbin/lilo -r /mnt
```



Note: Do not continue until LILO installs properly.

- 5 Press **Ctl-Alt-F1** to return to the confirmation window that came up when lilo was finished installing.
- 6 Select **OK** and reboot the system.

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install and run 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



Installing the storage switch on systems that boot from a different device

Materials required:

- 3ware CD-ROM which contains the 3DM utility.
- 3ware driver installation diskettes (2) for SuSE Linux.

Create disk arrays

Refer to the *3ware Hardware Installation* and *3ware Disk Array Configuration Utility* chapters.

Install the 3ware driver



Note: *****kernel string***** refers to the kernel version (i.e. 2.2.14-5.0, 2.4.2-2 smp, etc.) Check 3ware's website for supported versions.



Note: ******* refers to the SuSe Linux version you are installing (i.e. su64, su72, etc.). Check 3ware's website for supported versions.

Case 1: Your system runs SuSE Linux with a 2.2 kernel

- 1 Edit `/etc/rc.d/boot`, and before the line:
ECHO_RETURN=\$rc_done: add the following line:

```
/sbin/insmod /lib/modules/***kernel string***/  
scsi/3w-xxxx.o
```
- 2 Mount the floppy drive and copy the driver into a working directory.

```
mount -t msdos /dev/fd0 /floppy
```

For SuSE Linux with a 2.2 kernel:

```
cp /mnt/***/3w-xxxx.o /lib/modules/
  ***kernel string***/scsi
/sbin/insmod /lib/modules/***/kernel string***/
  scsi/3w-xxxx.o
umount /floppy
```

For SuSE Linux with a 2.4 kernel:

```
cp /mnt/***/3w-xxxx.o /lib/modules/
  ***kernel string***/kernel/drivers/scsi/
/sbin/insmod /lib/modules/***/kernel string***/
  kernel/drivers/scsi/3w-xxxx.o
umount /floppy
```

Case 2: Your system runs SuSE Linux with a 2.2 kernel and is an SMP system (multi-processor)

- 1 Edit /etc/rc.d/boot, and before the line:
ECHO_RETURN=\$rc_done: add the following line:

```
  /sbin/insmod /lib/modules/***/kernel string***/
    scsi/3w-xxxx.o
```
- 2 Mount the floppy drive and copy the driver into a working directory.

```
mount -t msdos /dev/fd0 /floppy
```

For SuSE Linux with a 2.2 kernel:

```
cp /mnt/***/3w-xxxx.smp
/lib/modules/***/kernel string***/scsi/3w-xxxx.o
/sbin/insmod
/lib/modules/***/kernel string***/scsi/3w-xxxx.o
umount /floppy
```

For SuSE Linux with a 2.4 kernel:

```
cp /mnt/***/3w-xxxx.o /lib/modules/  
***kernel string***/kernel/drivers/scsi/  
/sbin/insmod /lib/modules/***/kernel string***/  
kernel/drivers/scsi/3w-xxxx.o  
umount /floppy
```

Compiling the Driver (For experts only)

If you wish to compile the driver yourself (for a different kernel version that you are running), then perform the following steps.

- 1 Copy the driver source from the floppy into a working directory.
- 2 Untar the driver source with the command, `tar xzfp 3w-xxxx.tgz`.
- 3 You must have a full Linux kernel source tree in `/usr/src/linux` in order to do the compile.
- 4 To build UP module boot to desired UP kernel, type:
`make -f makefile.oth`
The created file is `3w-xxxx.o`
- 5 To build SMP module boot to desired SMP kernel, type:
`make smp -f makefile.oth`
The created file is `3w-xxxx.smp`
- 6 Copy the module to the scsi directory.
For 2.22 kernels, type:
`/lib/modules/***/kernel string***/ scsi`
For 2.4 kernels, type:
`/lib/modules/***/kernel string***/kernel drivers
/scsi`

RAID array initialization

The completion of the system driver installation will start the RAID array initialization process. This process may take several hours, but it does not interfere with the installation of 3DM or the use of the array.

Install and run 3DM disk management utility

Refer to the *3DM Disk Management Utility* chapter.



3DM Disk Management Utility

The 3DM disk management utility, allows you to view status and version information about your Escalade Storage Switch. 3DM alerts you when a disk array needs maintenance and you can maintain your disk arrays from 3DM. You can add or remove drives, specify an available drive as a hot spare or launch the rebuild process. Array status can be viewed or arrays can be maintained remotely via a standard web browser provided you have access to the network containing the Escalade Storage Switch. In the Windows environment, array status can also be checked in the local popup notifier.

Event notification occurs from 3DM when the storage switch requires attention, such as when a disk array becomes degraded and is no longer fault tolerant. Event notification will only occur while 3DM is running, so we recommend that 3DM be left running as a background utility on the storage switch's machine. Event notification's e-mail feature can send an e-mail to a specified recipient when there is a problem with the array.

Refer to the following sections for more information:

Windows Installation	page 118
Linux Installation	page 121
Checking Array Status	page 125
Password Setup	page 131
Selecting I/O and Rebuild Speed	page 134
Mirrored Array Maintenance	page 135

Windows Installation

Installing 3DM for Windows NT, Windows 98/ME, Windows 2000, Windows XP

- 1 Insert the 3DM installation media into the CD-ROM.
- 2 Run the 3DMsetup.exe program found on the installation disk. You may do this using Windows Explorer by double-clicking on the Setup file found on the installation disk or by executing **run a:\setup** from the **Run...** in the **Start** menu.
- 3 The **3DM Setup Standard** install window will guide you through the installation process.
- 4 At the **Remote Monitoring Configuration** window (see Figure 48), select the HTTP port that you would like 3DM to use. If you do not know what port to use, select the default. If you select port 0, the web interface will be disabled (not recommended).

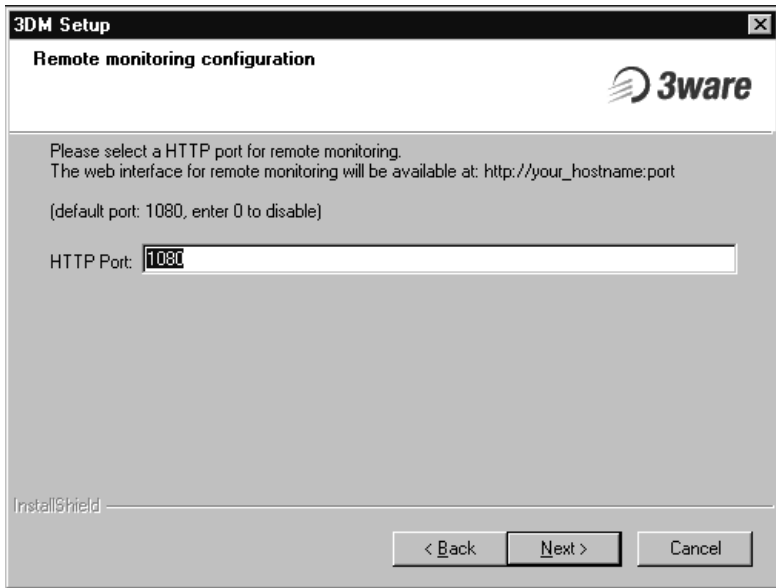


Figure 48. 3DM Remote Monitoring Configuration Display

- 5 At the **E-mail Notification Preferences** window (see Figure 49) enter the e-mail address of the user who will be receiving the 3DM e-mail status messages. You may enter multiple e-mail addresses, separating each entry with a comma (.). If you do not know your server name, ask your system administrator or check the e-mail preferences or setup options on your e-mail client.

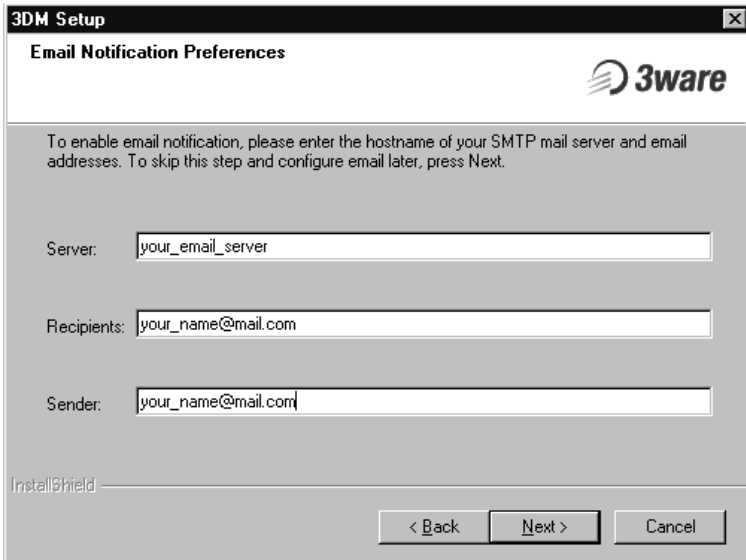


Figure 49. 3DM E-mail Notification Preferences

- 6 Continue with the installation as prompted. 3DM gives you the option of starting the application and opening the browser window when you complete the installation (recommended). You can run 3DM later by selecting **3DM** from the **Start** menu. To view 3DM remotely via a standard web browser, enter the URL of the system containing the Escalade Storage Switch in the address line of your browser. The default URL is `http://localhost:1080/`.

Linux Installation

Installing 3DM for Red Hat Linux or SuSE Linux



Note: For SuSE Linux network RPC services are required to be running, otherwise 3DM will not start.



Note: For SuSE Linux, almost all OS packages are required to be installed for 3DM e-mail notification to function.

- 1 Insert the 3ware software installation CD-ROM for Linux into the CD-ROM drive.
- 2 Mount the CD-ROM disk:

```
mount /dev/cdrom
```



Note: For older Red Hat systems, type:

```
mount -t iso9660/dev/cdrom /mnt/cdrom
```

For older SuSE systems, type:

```
mount -t iso9660/dev/cdrom /cdrom
```

- 3 Change the directory and run the install script:

For Red Hat Linux:

```
cd /mnt/cdrom
./install.3dm
```

For SuSE Linux:

```
cd /media/cdrom
./install.3dm
```

You will be prompted with the a series of questions to complete the installation.

- 4 The first question asks if RPM was used to install the Escalade driver and/or 3DM. The default answer is no.
- 5 The second question asks for the location of the help documentation:

```
Please enter the location of the help documentation
(default is /usr/local/doc)
```

- 6 The next question asks if you would like to receive an e-mail message when an event occurs. The default to this question is “yes”. If you enable e-mail notification you will be asked to provide 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). To enter multiple e-mail addresses, each address must be separated by a comma:

```
Would you like to have e-mail notification enabled
(Y/N)?
```

```
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)
```

- 7 The next question asks if you want the popup window for event notification to beep:

Would you like to have audio notification enabled when the local application starts? (default is yes)

- 8 The next question asks for the HTTP port that you would like 3DM to use. If you do not know what port to use, select the default:

Please enter the port number you would like to use for web monitoring (default is 1080)

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

```
cd /home
```

```
eject cdrom
```

Starting 3DM

3DM should start automatically after installation and upon bootup. If you need to start 3DM manually, follow these steps:

- 1 Login as root.
- 2 Afterwards, type:

For Red Hat Linux:

```
/etc/rc.d/init.d/3dm start
```

For SuSE Linux:

```
/etc/rc.d/3dm start
```

Uninstalling 3DM

To uninstall 3DM for Linux, follow these steps:

- 1 Insert the 3ware software installation CD-ROM for Linux into the CD-ROM drive.
- 2 Mount the CD-ROM disk:

```
mount /dev/cdrom
```



Note: For older Red Hat systems, type:

```
mount -f iso9660/dev/cdrom/mnt/cdrom
```

For older SuSE systems, type:

```
mount -f iso9660/dev/cdrom/cdrom
```

3 Change the directory and run the uninstall script:

```
cd /mnt/cdrom or /cdrom  
./install.3dm --u
```

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.

Checking Array Status

Array status can be viewed using a web browser. Event notification occurs when the storage switch requires attention, such as when a disk array becomes degraded and is no longer fault tolerant. Event notification will only occur while 3DM is running. Therefore, 3ware recommends that 3DM be left running as background utility on the storage switch's machine. Event notification's e-mail feature can send an e-mail to a specified recipient when there is a problem with the array.



Note: The format and style of the 3DM browser windows illustrated in this chapter are examples only. The actual “look” of the windows will depend on the browser, 3DM version and operating system in use.

View status using your standard browser

Open the 3DM browser window (see Figure 50) by starting your standard web browser and entering the URL of the system where 3DM is running in the address bar of your browser. The default URL is <http://localhost:1080/> or <http://127.0.0.1:1080/>.



Note: For security reasons, Netscape does not allow connections to certain ports including port-1080. To override this on a per-port basis, the Netscape release notes recommend to add a comma-separated list of ports to `default/all.js` (in your Netscape installation directory). For example, to unblock port 1080, use the following line:
`pref("network.security.ports.banned.override", "1080").`
If you are using SuSE 7.3 Linux, this file is located at:
`/opt/defaults/netscape6/defaults/pref/all.js.`

Disk arrays and independent disks are listed on the **3DM Home** display. Disks that are members of an array are indented and listed below their parent array. The type and size of the disks or arrays are listed as well as status of each array. For arrays undergoing rebuilds, the rebuild status for each drive and port is displayed, as shown in Figure 50.

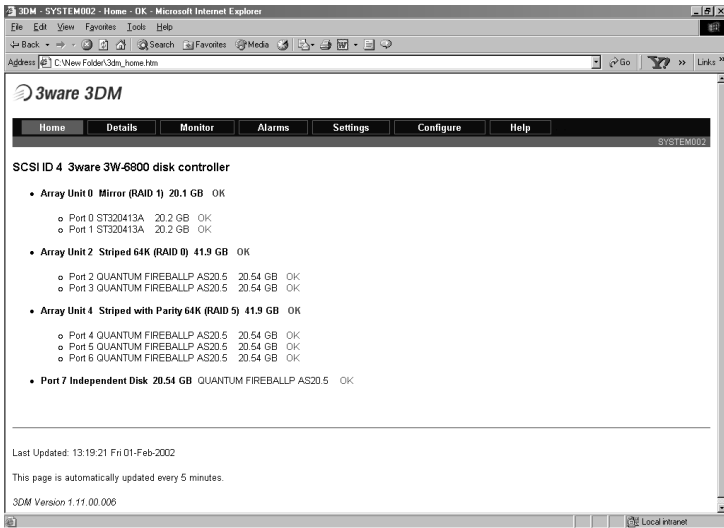


Figure 50. 3DM Home Display

The **Details** display (see Figure 51) gives storage switch version and status information in text format, which is helpful when contacting 3ware Customer Support with questions or for troubleshooting. Its text format allows you to select the text in the window with your mouse and use the system clipboard to cut and paste it into e-mail or documentation.

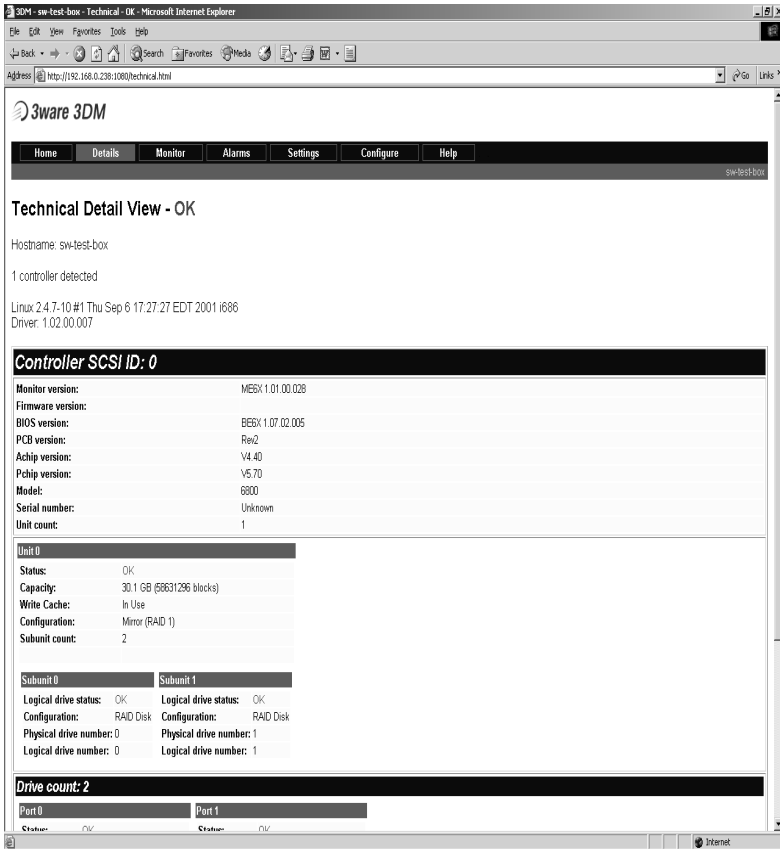


Figure 51. 3DM Details Display

Before sending an e-mail or calling 3ware Customer Service, it is a good idea to take a snapshot of the **Details** display so that you can respond to questions about your system configuration to the Customer Support representative.

The **Monitor** display (see Figure 52) is useful for overall visual status of your disk arrays. The **Monitor** display opens with either a green (all OK), orange (during array initialization or rebuild), or red (error alarm) banner. A monitor window may be opened for each system if you have multiple systems to monitor. Status for all systems can be checked at a glance by minimizing each **Monitor** display, leaving the status color indication visible.

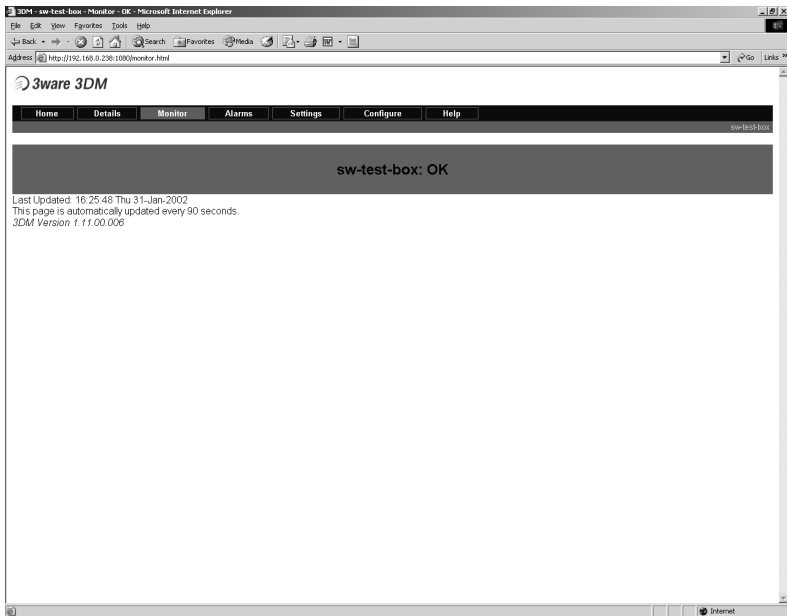


Figure 52. 3DM Monitor Display

The **Alarm** display (see Figure 53) keeps a log of all alarms, also called Automatic Event Notifications (AENs), that have occurred on the disk arrays. An alarm occurs when the storage switch requires attention, such as when a disk array becomes degraded and is no longer fault tolerant. SMART notifications appear in this display. Alarm messages are categorized by the following levels of severity:

- Errors, shown next to a red box
- Warnings, shown next to an orange box
- Information, shown next to a blue box

The **Download Error Log** button allows you to save the alarm messages and SMART data to disk. If necessary, the saved file can be shipped to 3ware Customer Support for troubleshooting assistance. A button is also provided to erase the logged data.

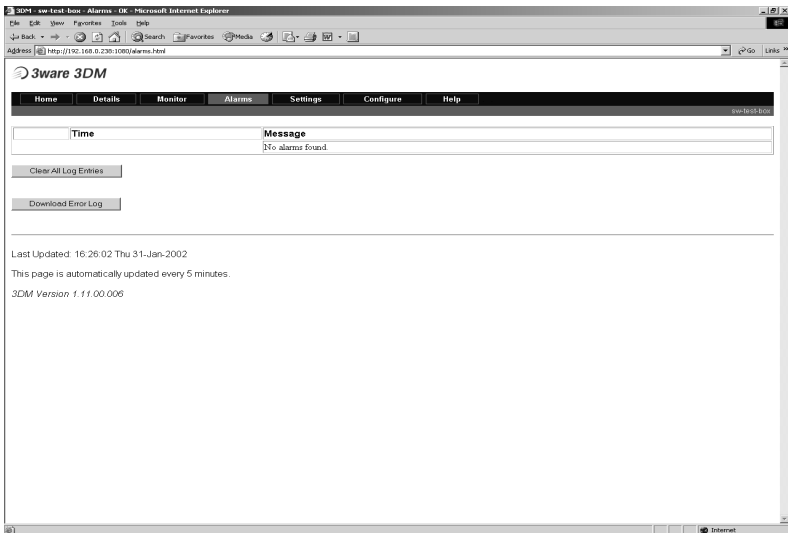


Figure 53. 3DM Alarm Display

The **Settings** display (see Figure 54) allows you to configure 3DM's email notification, password, rebuild rate and cache settings.

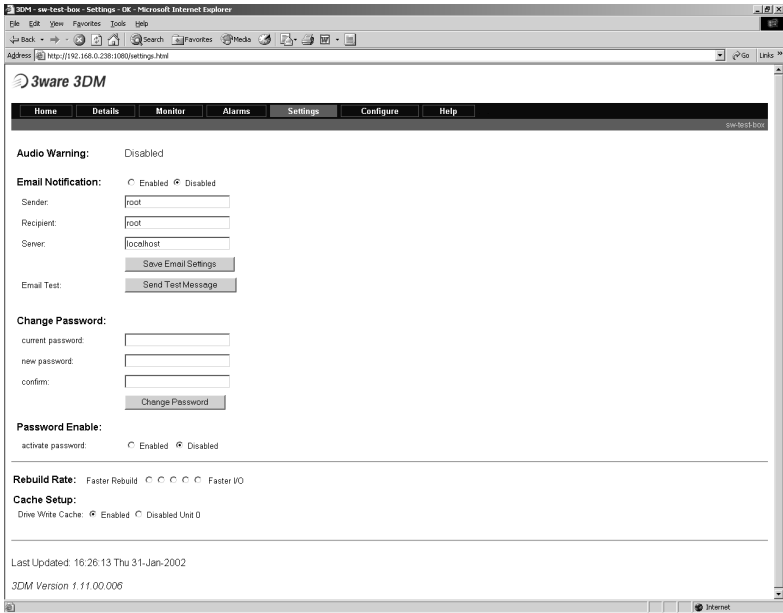


Figure 54. 3DM Settings Display

Password Setup

With password protection, using 3DM will require entering the password into the login display shown in Figure 55. Passwords are case sensitive. The password setup procedure is as follows:



Note: Do not select the **Enable** box in the 3DM Settings display before performing these steps.

- 1 Enter the current password in the **current password** box of the 3DM Settings display (see Figure 54).
-
-



Note: If password protection is being configured for the first time, enter the factory-set default password “3ware” in the box.

- 2 Enter the new password in the **new password** box and again in the **confirm** box.
- 3 Press the **Change Password** button.
- 4 Enable password protection. (Refer to page 133.)

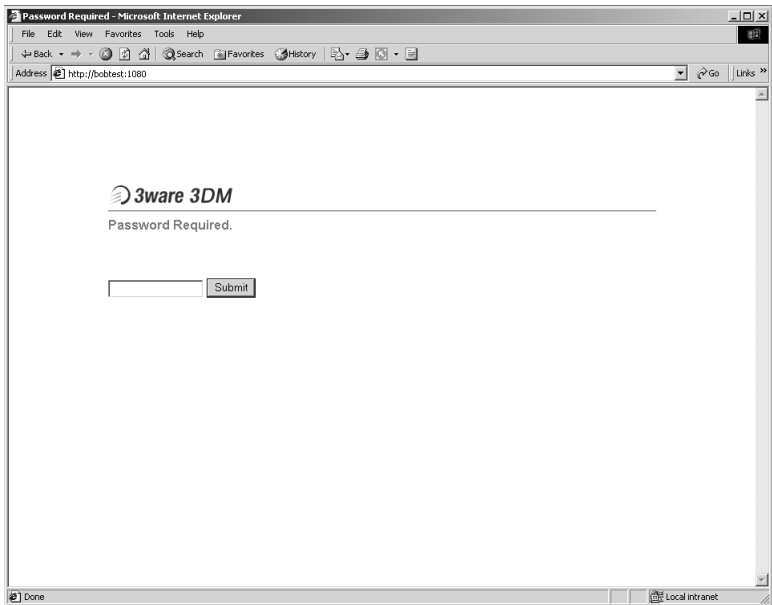


Figure 55. 3DM Login Display

Enable/Disable Password Protection

With the 3DM password utility enabled, using 3DM will require entering the password into the login display shown in Figure 55. To enable password protection, be sure to perform the setup procedure on page 131, then select the **Enabled** option in the **Password Setup** portion of the 3DM **Settings** display (see Figure 54). To disable the utility at any time, simply return to the **Settings** window and select the **Disabled** option.

Selecting Rebuild Rate

The **3DM Settings** display allows you to choose between a faster I/O rate or a faster Rebuild rate. Once the rate is selected, this function is only active during Rebuilds. Click on the desired rate in the **Rebuild Rate** portion of the **Settings** display (see Figure 54).

Selecting Cache Options

The **3DM Settings** display provides selection for enabling or disabling the drive's write cache. See "Select write cache properties" on page 32 for more information.

Event notification via e-mail

If an event occurs, an event notification will be e-mailed to the recipient identified in the e-mail setting specified at 3DM installation. The e-mail will contain the same information found on the Alarm display.

Mirrored Array Maintenance

From the **3DM Configure Display** (see Figure 56), you can designate an available drive as a hot spare, schedule rebuilds and media scans, or remove and add a drive as part of a hot swap procedure. To access the **Configure Display**, enter the URL of the 3DM port in the address bar of your standard web browser. You must be connected to the same network as 3DM. The default URL is `http://localhost:1080/` or `127.0.0.1: 1080`. Navigate to the **Configure** display. The display shows all drives attached to each 3ware controller.



Figure 56. 3DM Configure Display

Specifying a hot spare

Escalade Storage Switches give you the option to specify a hot spare from one of your available drives. Hot spares should be selected after mirror creation. Refer to *Creating a disk array* in the *3ware Disk Array Configuration Utility* chapter. To specify a hot spare after the system is booted, physically add the spare drive and click on the check box next to the available port; then click on the **Add Spare** button.



Note: Hot spare drives must be equal to or larger than the drives used for the redundant array.

Auto rebuild of a mirrored array

If a hot spare is specified and the mirror degrades, an event notification is generated and the hot spare dynamically replaces the failed drive in a mirrored array without user intervention. Rebuild will automatically be launched as background process and an event notification will notify the user when the rebuild process is complete.

Rebuilding a redundant array with a hot swap drive

Hot swap allows a user to replace a failed drive in a redundant array while the system remains up. Hot swap can be used when 24x7 system operation is a consideration. If multiple drives are faulted in a RAID 10 configuration, you must rebuild the drives sequentially by port number starting with the lowest port number.

- 1 Click on the check box of the failed drive.
- 2 Click the **Remove Drive** button.

- 3 Physically remove the failed drive and replace it with a new drive.
- 4 Click on the check box of the new drive.
- 5 Click the **Add Drive** button.
- 6 Click on the check boxes of the members of the array to be rebuilt. This should include the new drive added in step 3.
- 7 Click the **Rebuild Array** button. The rebuild process will run in the background and an event notification will be sent when it is completed.

Selecting Force Continue

Selecting the **Force Continue on Source Errors** check box prior to rebuilding the array ensures rebuilds are not terminated if ECC errors are detected on the source disk. By default, this function is disabled.

Scheduling rebuilds and media scans

The **3DM Configuration** display allows routine maintenance of storage media by scheduling array rebuilds or initializations, array verifications, and media scans. The day, time and duration of each scheduled occurrence can be specified using pull-down menus. When finished, be sure to click on the **Save Schedule** button to confirm the entries.

The **Help** display (see Figure 57) provides direct links to 3ware's website and online help documents.

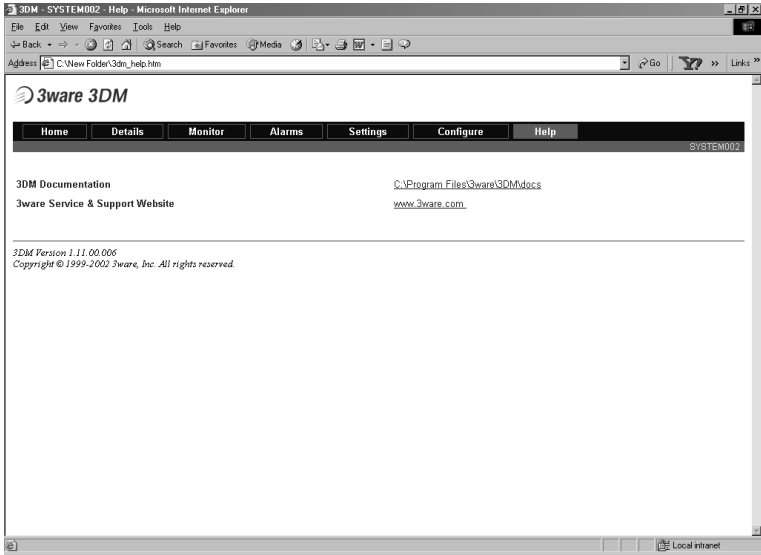


Figure 57. 3DM Help Display

Troubleshooting: Problems and Solutions



Note: For more troubleshooting tips and frequently asked questions, refer to 3ware's support web page at <http://www.3ware.com/support>.

Hardware Installation

Q1: The rail on the storage switch doesn't fit in the case.

Use a screwdriver to remove the black end rail. It aligns and secures the storage switch in the computer chassis but is not critical for operation.

Q2: My system only has two power connectors but I have four drives.

The kit includes two Y-splitter power cables. Plug them into your existing power supply lines to go from two to four power lines for your drives.

Q3: The system doesn't begin booting (no BIOS runs) when the storage switch is installed but boots OK when the switch is removed.

Check the cabling between the drives and the storage switch. A cable plugged in upside down can prevent your system from running its BIOS.

Q4: The 3ware BIOS scrolling messages never appear.

The storage switch is not installed properly. Reinstall the hardware and reboot.

Q5: Some of the drives do not appear in the Disk Array Configuration Utility's main display.

Your drives are not connected properly to the storage switch. Check that both the power and ATA cables are connected properly and that the drives are all properly jumpered. To operate properly the storage switch requires that drives be set as **Single** (if available on your drive) or **Master**.

Q6: The 3ware BIOS scrolling messages stop midway:

```
3ware StorSwitch 4 Storage Controller BIOS  
Bus A:0x00 Device #:0x70 PCI base addr:0x000010B1 units #
```

The storage switch is detected, but the disks may not be connected to their power source. Reconnect to their power source and reboot.

Q7: I am using a Dell Dimension system that locks-up when booting after a 3ware card is installed. What is going on?

This symptom is caused by a Dell BIOS bug. Basically, this bug sees the system boot drive as two primary master drives. That causes the system to hang. Enter the Dell BIOS setup and reload the BIOS defaults.

Software Installation

Q8: The storage switch was configured without problems, but the system does not boot.

The problem could be one or more of the following:

- 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 disk arrays, you may have overwritten your operating system. Remember that creating or deleting a disk array overwrites any existing data on the member drives. Reinstall your operating system.

- If you installed your operating system when you installed the storage switch, you may have made a mistake in installing the operating system. Reinstall your operating system.

Q9: Under Windows NT, disks show up at boot time but don't show up in Disk Administrator.

The driver has not been installed. See “Installing the storage switch on systems that boot from a different device” on page 52.

Q10: An array does not appear in the 3ware BIOS scrolling messages and shows up as incomplete in the Disk Array Configuration Utility's main display similar to the following:

```

Array Unit 1 - Incomplete      6.5 GB
Port 1 - FUJITSU MPC3065AH    6.5 GB
    
```

The array has some but not all of its members available. The array will be unusable. If this array is your boot device, your machine will not boot. You must either find the missing disk and replace it to complete the array, or release the member disks by deleting the incomplete array(s) listed in the display. Remember that deleting a disk array overwrites any existing data on the member drives.

Q11: Under Windows NT, disks don't appear in the Windows Explorer, but appear in the 3ware BIOS scrolling messages and appear in the Disk Array Configuration Utility's main display.

Log in as the administrator. Partition and format any new disk arrays or freed disks using Disk Administrator. Choose Programs from the Start menu, followed by Administrative Tools and Disk Administrator.

Q12: The use of Red Hat's Disk Druid partitioning utility with Red Hat 6.2 or 7.0 is limited to 112 GB.

Use fdisk if more storage capacity is required.

Q13: I have created partitions over 70G but FDISK seems to think that I have a 6G partition.

Windows 98 FDISK uses 16 bit integers to store the number of megabytes for each storage device. The largest capacity it can display correctly is 65,353MB. For example, 37G in hex is 08BBA and if you stripe two drives to create a 74G partition, the lower 16 bit is 1774. Hex to decimal conversion of 1774 is 6004MB (6G).

Q14: I am experiencing problems when I try to install the storage switch with a server that has been configured with a floppy-based version of Windows NT 4.0. What is going on?

Beginning with version 1.08.00.008 of the Windows NT driver, there is an additional installation step needed when installing a Escalade Storage Switch with Windows NT 4.0. If you are installing Windows NT 4.0 with the storage switch using the Windows NT 4.0 Setup diskettes, you must use a particular 3ware installation diskette, which has the 3ware driver and an install.exe program. This program installs an application, which provides shutdown notification to our controller. A limitation with the Microsoft floppy-based NT installation makes this extra step necessary.



Note: When installing Windows NT 4.0 exclusively from CD-ROM this extra step is not needed.

Follow these additional instructions:

- 1 Install Windows NT 4.0 as documented in this manual.
- 2 Go to the **Start** menu, click on **Settings** and open the **Control Panel**.
- 3 Complete all steps including those described in the section labeled “Follow display instructions to complete Windows NT 4.0 installation” on page 50.
- 4 Perform the following steps:
 - a. Log on to Windows NT 4.0 as Administrator.
 - b. Insert the 3ware installation diskette with the install.exe program into the floppy drive.

- c. Choose Start > Run from the taskbar and enter the following command: A:\INSTALL.EXE
-
-



Note: Alternatively, a command window can be opened into which you can type the command at a prompt.

- d. Follow the instructions that appear.
- e. Proceed with the instructions to “Installing 3DM for Windows NT, Windows 98/ME, Windows 2000, Windows XP” on page 118.

Q15: My driver fails to boot.

There is most likely a compatibility problem between the motherboard system BIOS and the 3ware BIOS. Check the 3ware website to see if your motherboard is compatible with the 3ware BIOS, and check with your motherboard manufacturer for potential BIOS updates.

Screen Display Messages

Figure 58 through Figure 63 are screen messages that might appear during installation. The AEN (asynchronous error notification) messages shown in Table 1 on page 148 appear when a hardware or software related problem has been detected after the storage switch has been installed and made operational. Descriptions of each AEN are provided after the table.

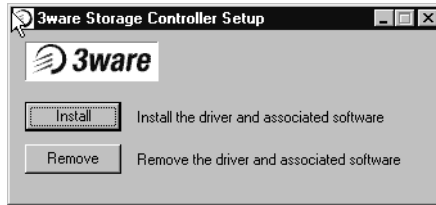


Figure 58. Installation or Removal Dialog Box



Figure 59. A Warning for All Software Removal Requests



Figure 60. Confirmation of Successful Software Removal



Figure 61. Administrator Privileges Required Warning

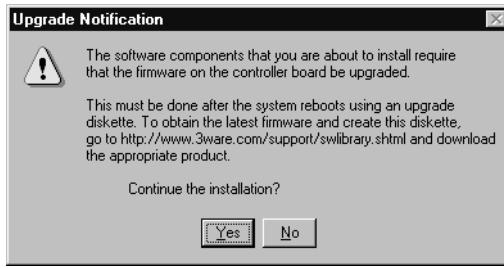


Figure 62. Firmware Upgrade Requirement Warning

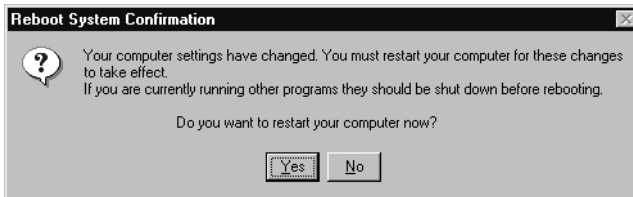


Figure 63. System Reboot Request

AEN Messages

The AEN messages issued by the storage switch when an error is detected are summarized in the table below. Descriptions of each are provided at the end of the table.

Table 1: AEN Error Messages

Message	Value
AEN_QUEUE_EMPTY	000h
AEN_SOFT_RESET	001h
AEN_DEGRADED_UNIT	002h
AEN_CONTROLLER_ERROR	003h
AEN_REBUILD_FAIL	004h
AEN_REBUILD_DONE	005h
AEN_INCOMP_UNIT	006h
AEN_INIT_DONE	0070h
AEN_UNCLEAN_SHUTDOWN	008h
AEN_APORT_TIMEOUT	009h
AEN_DRIVE_ERROR	00Ah
AEN_REBUILD_STARTED	00Bh
AEN_INIT_STARTED	00Ch
AEN_DELETED_UNIT	00Dh
AEN_SMART_FAIL	00Fh
AEN_UDMA_DOWNGRADE	021h
AEN_UDMA_UPGRADE	022h

Table 1: AEN Error Messages

Message	Value
AEN_SECTOR_REPAIR	023h
AEN_SBUF_FAIL	024h
AEN_LOST_CACHED_WRITE	025h
AEN_DRIVE_ECC_ERROR	026h
AEN_DCB_XSUM_ERROR	027h
AEN_DCB_BAD_VERSION	028h
AEN_VERIFY_STARTED	029h
AEN_VERIFY_FAILED	02Ah
AEN_VERIFY_DONE	02Bh
AEN_SECTOR_OVERWRITE	02Ch
AEN_RBLD_SOURCE_ERROR	02Dh
AEN_QUEUE_FULL	0FFh

AEN 001h SOFT_RESET

The storage switch has detected a soft reset from the device driver. Soft resets are normal at driver load and unload time. If the storage switch fails to respond to the device driver within a reasonable amount of time, the device driver may issue a soft reset to the storage switch and retry the command packet.

AEN 002h AEN_DEGRADED_UNIT

An error has been encountered and the array is operating in degraded (non-redundant) mode. The user should replace the bad drive as soon as possible and initiate a rebuild.

AEN 003h AEN_CONTROLLER_ERROR

The storage switch has encountered an internal error. Please contact 3ware customer support.

AEN 004h AEN_REBUILD_FAIL

The storage switch 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 storage switch is to abort a rebuild if an error is encountered. If it is desired to continue on error, the **Ignore errors on rebuild** radio button can be checked prior to initiating a rebuild.

AEN 005h AEN_REBUILD_DONE

The storage switch has successfully completed a rebuild. The completion of the rebuild changes the state of the array from rebuilding to OK. The data is now redundant.

AEN 006h AEN_INCOMP_UNIT

At power on initialization time, the storage switch performs a “roll-call” of all drives attached to the card. After detection of the drives, the storage switch then uses an internal algorithm to logically connect drives that belong to the same array. If after rollcall a member of an array is not found, the **INCOMPLETE UNIT AEN** is sent. Examples of incomplete units are as follows:

- 4 drive RAID 5 with 1 drive missing.
- 2 drive RAID 1 with 1 drive missing.

Replacing the missing or dead drive and initiating a rebuild will change the state of the array from an incomplete unit to OK.

AEN 007h AEN_INIT_DONE

The storage switch has completed the initialization sequence and performs the initialization step at array creation time of RAID levels 1, 10 and 5. For RAID 5, the data on the array is read and the resultant parity is written to the parity area on the array. For RAID 1 and 10, one half of the mirror is copied to the other half (mirrors are synchronized).

AEN 008h AEN_UNCLEAN_SHUTDOWN

The storage switch 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 array may be out of synchronization. The unclean shutdown detection will detect this case and force the array to enter the rebuilding state. This has the effect of synchronizing the array back to a fully redundant state.

To prevent unclean shutdowns, the user should always go through the normal shutdown procedure for the operating system in use and use an uninterruptible power supply (UPS) to prevent unclean shutdowns due to sudden power loss.

AEN 009h AEN_APORT_TIMEOUT

The storage switch 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 storage switch to complete within a reasonable amount of time. If the storage switch detects this condition, it notifies the user, prior to entering the recovery phase, by displaying this AEN.

Possible causes of APORT time-outs include a bad or intermittent disk drive, power cable or ATA interface cable.

AEN 00Ah AEN_DRIVE_ERROR

As part of the recovery mechanism of the storage switch, various drive failures can be detected and if possible corrected. One such drive failure is when the drive indicates back to the storage switch that it was unable to complete a command. If the drive returns an error to the storage switch, the user is notified by this AEN.

AEN 00Bh AEN_REBUILD_STARTED

The storage switch notifies the user whenever it starts a rebuild. The rebuild start may be user initiated (by selecting the rebuild button in the 3DM Disk Management Utility) or it may be auto initiated by a hot spare failover. In either case, the user is notified of the event by this AEN.

AEN 00Ch AEN_INIT_STARTED

The storage switch notifies the user by this AEN whenever it starts an Initialization. Initialization occurs at array creation time.

AEN 00Fh AEN_SMART_FAIL

The storage switch 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 a user to schedule service of the array before it becomes degraded. The SMART status of each drive attached to the storage switch is monitored daily. If a failure of any drive is determined to be likely, the user is notified by this AEN.

AEN 021h AEN_UDMA_DOWNGRADE

The storage switch 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 Redun-

dancy Check (CRC) for all ATA data that is transferred. If the data becomes corrupted between the drive and the storage switch (e.g., an intermittent cable connection) the storage switch detects this as a UDMA CRC or cable error. The storage switch 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 AEN is sent to the user when the storage switch lowers the UDMA transfer rate.

Possible causes of UDMA CRC errors are intermittent or bad ATA interface cables or cable routing problems through electrically noisy environments (e.g., cables are too close to the power supply).

AEN 023h AEN_SECTOR_REPAIR

The storage switch supports a feature called dynamic sector repair to allow the unit to recover from certain drive errors that would normally result in a degraded array situation. For redundant arrays such as RAID 1, 10 and 5, the storage switch essentially has two copies of the users 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 storage switch 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, the user is notified by this AEN.

The fact that a sector repair AEN has been sent to the user 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 an array that begins to indicate sector repair messages. This may be an indication of a drive that is beginning to fail. The user may wish to replace the drive, especially if the number of sector repair errors exceeds 3 per month.

AEN 024h AEN_SBUF_FAIL

The storage switch, 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 storage switch. This AEN is sent to notify the user of the problem.

AEN 025h AEN_LOST_CACHED_WRITE

To improve performance, this storage switch 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 storage switch can not commit the data to the media after it has acknowledged to the host, this AEN is posted to the user.

Typically, the LOST CACHED WRITE notification would be an indication of a catastrophic failure of the drives in the array, such as loss of power to multiple drives in an array.

AEN 026h AEN_DRIVE_ECC_ERROR

This AEN may be sent when a drive returns the ECC error response to a storage switch command. The AEN may or may not be associated with a host command. Internal operations such as Background Media Scan post this AEN whenever drive ECC errors are detected.

Drive ECC errors are an indication of a problem with grown defects on a particular drive. For redundant arrays, this typically means that dynamic sector repair would be invoked (see AEN 023h). For non-redundant arrays (JBOD, RAID0 and degraded arrays), drive ECC errors result in the storage switch returning failed status to the associated host command.

AEN 027h AEN_DCB_XSUM_ERROR

The storage switch 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 storage switch

performs a checksum of the DCB area to ensure consistency. If an error occurs, please contact 3ware technical support. The drive's DCB has been corrupted.

AEN 028h AEN_DCB_BAD_VERSION

During the evolution of the Escalade product line, the format of the DCB has been changed to accommodate new features. The DCB format expected by the storage switch and the DCB that is written on the drive must be compatible. If an array that was created on a very old Escalade product is connected to a newer Escalade storage switch, this AEN is posted and the storage switch rejects the drive. Please contact 3ware technical support if this event occurs.

AEN 029h AEN_VERIFY_STARTED

The storage switch allows the user to verify data integrity on an array. The verification functions for different RAID levels are as follows:

- JBOD. Verify = Media Scan
- RAID 0. Verify = Media Scan
- RAID 1. Verify = Compare of Mirror Sides
- RAID 10. Verify = Compare of Mirror Sides
- RAID 5. Verify = Parity Data = User Data

When the verification starts, this AEN is posted to the user.

AEN 02Ah AEN_VERIFY_FAILED

This AEN indicates that the data integrity verification function (see AEN 029h) has terminated with an error. For each RAID level being verified, this may mean:

- JBOD. 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. The parity data does not equal the user data.

For JBOD and RAID0, the most likely cause of the error is a grown defect in the drive. For out-of-synchronization mirrors, the error could be caused by improper shutdown of the array. This possibility applies to RAID 1, 10 and 5. A rebuild will re-synchronize the array.

AEN 02Bh AEN_VERIFY_DONE

This AEN indicates the data integrity verification function (see AEN 029h) was completed successfully. No errors were encountered.

AEN 02Ch AEN_SECTOR_OVERWRITE

If a read error is encountered during a rebuild and the user chooses to ignore the error, the sector in error is reallocated. The user is notified of the event by this AEN.

AEN 02Dh AEN_RBLD_SOURCE_ERROR

If an error is encountered during a rebuild operation, this AEN 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.

AEN 0FFh AEN_QUEUE_FULL

This is an internal error. Please 3ware contact technical support.

Appendix A

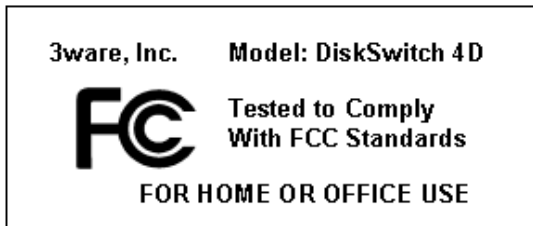
Compliance and Conformity Statements

Federal Communications Commission 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 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 (WHQL)

3ware, Inc. 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 StorSwitch Controller Card Model StorSwitch 4D is 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.



Appendix B

Warranty, Technical Support and Service

Limited Warranty

3-Year Hardware Warranty: 3WARE, INC. warrants this product against defects in material and workmanship for a period of thirty-six (36) months from the date of original purchase. 3ware, 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 3ware 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 3ware.

Software Warranty: 3WARE, INC. will replace a defective media purchased with this product for a period of up to 30 days from the date of purchase.

For detailed terms and conditions, please see the Limited Hardware Warranty and Software License Agreement at our website <http://www.3ware.com/support/rma.shtml>

3ware warranty service is provided by returning the defective product to 3ware.

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. 3WARE 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 3WARE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. 3WARE IS NOT LIABLE FOR and DOES NOT COVER UNDER WARRANTY, ANY COSTS ASSOCIATED WITH SERVICING AND/OR THE INSTALLATION OF 3WARE PRODUCTS. THIS WARRANTY SETS FOR THE ENTIRE LIABILITY AND OBLIGATIONS OF 3WARE 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.

Obtaining Warranty Protection

To obtain warranty service during the warranty period call 3ware toll free at (877)-883-9273 or (650) 327-8600 direct as soon as you have identified a problem with your Escalade Storage Switch unit. You will be issued a return material authorization (RMA) number. 3ware will send a replacement within two business days after receipt of the defective unit.

Advanced replacement is available with a credit card number with authorization in the amount equaling the then current list price of the Escalade Storage Switch, including shipping costs. As soon as practicable thereafter, 3ware 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 Escalade Storage Switch to 3ware at 701 East Middlefield Road, Suite 300, Mountain View, California 94043. If 3ware receives the defective Escalade Storage Switch from you within thirty (30) days of the date of shipment of the advanced replacement, 3ware 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.

3ware Technical Support and Services

Product information, Frequently Asked Questions, software upgrades, driver files and other support are available through the 3ware World Wide Web site at <http://www.3ware.com>. 3ware's software library is accessible at <http://www.3ware.com/support/swlibrary.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 www.3ware.com/support and use our convenient e-mail form. 3ware also offers toll-free (877) 883-9273 and (650) 327-8600 direct phone support during normal business hours.

Sales and ordering information

For sales information, send an electronic mail message to sales@3ware.com.

Feedback on this manual

Your feedback is welcome. If anything in the guide seems unclear please let us know by sending e-mail to support@3ware.com.

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