ForceWare Software

MediaShield User's Guide

Version 7.0
(for NVIDIA MediaShield Storage v10.xx)

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CHAPTER

1

ABOUT NVIDIA® MEDIASHIELD™

NVIDIA brings Redundant Array of Independent Disks (RAID) technology—which is used by the world's leading businesses—to the common PC desktop. This technology uses multiple drives to either increase total disk space or to offer data protection.

RAID techniques were first published in 1988 by a multivendor consortium—the RAID Advisory Board. RAID techniques were divided into different categories or levels. Originally, RAID levels focused on improving resiliency or data availability. As additional RAID levels were defined, one was introduced for improving performance. For all levels, RAID techniques optimize storage solutions by using multiple disks grouped together and treating them as a single storage resource.

This chapter describes NVIDIA MediaShield in the following sections:

- "System Requirements" on page 2.
- "RAID Arrays" on page 5 describes the RAID levels supported by NVIDIA MediaShield.
- "NVIDIA MediaShield Features" on page 7 describes additional features offered by NVIDIA MediaShield.

System Requirements

Hardware Support

Table 1.1 lists the NVIDIA® nForce™ platforms supported by NVIDIA MediaShield, and the RAID arrays supported on each platform.

Table 1.1 Supported nForce Platforms, RAID Arrays, and Pass-through Disk Management

NVIDIA nForce Platform	Pass-through Disk Management	RAID 0	RAID 1	RAID 0+1	RAID 5	JBOD
NVIDIA nForce 780i SLI	X	X	X	X	X	X
NVIDIA nForce 750i SLI	X	X	X	X	X	X
NVIDIA nForce 680i SLI	X	X	X	X	X	X
NVIDIA nForce 680i LT SLI	X	X	X	X	X	X
NVIDIA nForce 680a SLI	X	X	X	X	X	X
NVIDIA nForce 650i SLI	X	X	X	X	X	X
NVIDIA nForce 650i Ultra	X	X	X	X	X	X
NVIDIA nForce 630a	X	X	X	X	X	X
NVIDIA nForce 590 SLI	X	X	X	X	X	X
NVIDIA NFP 3600	X	X	X	X	X	X
NVIDIA NFP 3400	X	X	X	X	X	X
NVIDIA NFP 3050	X	X	X	X	X	X
NVIDIA nForce 570 SLI	X	X	X	X	X	X
NVIDIA nForce 570 Ultra	X	X	X	X	X	X
NVIDIA nForce 570	X	X	X	X	X	X
NVIDIA nForce 560	X	X	X	X	X	X
NVIDIA nForce 550	X	X	X	X	X	X
NVIDIA nForce 520	X	X	X	X	X	X
NVIDIA nForce 430		X	X	X	X	X
NVIDIA nForce 430 (NVIDIA Business Platform)		X	X			
NVIDIA nForce 410		X	X			
NVIDIA nForce 405		X	X			
NVIDIA nForce 400		X	X			
NVIDIA nForce4		X	X			
NVIDIA nForce4 Ultra		X	X			
NVIDIA nForce4 Ultra Intel Edition		X	X			
NVIDIA nForce4 SLI		X	X			
NVIDIA nForce4 SLI Intel Edition		X	X			
NVIDIA nForce4 SLI X16		X	X			

Table 1.1 Supported nForce Platforms, RAID Arrays, and Pass-through Disk Management

NVIDIA nForce Platform	Pass-through Disk Management	RAID 0	RAID 1	RAID 0+1	RAID 5	JBOD
NVIDIA nForce4 SLI XE Intel Edition		X	X			
NVIDIA nForce4 Professional IO-4		X	X			
NVIDIA nForce4 Professional Pro		X	X			
NVIDIA nForce4 Professional Pro SLI		X	X			
NVIDIA nForce3 Pro250		X	X			
NVIDIA nForce3 250Gb		X	X			
NVIDIA nForce3 Ultra		X	X			
NVIDIA nForce3 250		X	X			
NVIDIA nForce3 150		X	X			
NVIDIA nForce2 MCP2S		X	X			

Operating System Support

NVIDIA MediaShield supports the following operating systems:

- Windows Vista (both 32-bit and 64-bit editions)
  - Windows Vista Home Basic
  - Windows Vista Home Premium
  - Windows Vista Business
  - Windows Vista Enterprise Edition
  - Windows Vista Ultimate
- Windows® XP Home Edition
- Windows XP Professional Edition
- Windows Server 2003

Software

This document describes MediaShield accessible through the NVIDIA Control Panel—Storage interface, available with NVIDIA ForceWare graphics drivers Release 158 and higher.

RAID Arrays

This section describes the following types of RAID arrays that MediaShield supports:

Note: Not all nForce platforms provide support for all the RAID levels listed. See Table 1.1, "Supported nForce Platforms, RAID Arrays, and Pass-through Disk Management" on page 2 for a matrix of supported RAID levels.

RAID 0

In a RAID 0 array, the controller "stripes" data across multiple drives in the RAID subsystem. RAID 0 breaks up a large file into smaller blocks and then performs disk reads and writes across multiple drives in parallel. The size of each block is determined by the stripe size parameter, which you set during the creation of the RAID 0 set. Performance of applications running with a RAID 0 can vary greatly depending on the stripe size configured when creating the array. The default stripe size is 64K, but 32K or 16K may be more efficient if the application issues many smaller I/O operations. Some amount of trial and error may be appropriate to find the optimum stripe size.

RAID 0 is ideal for applications that require high bandwidth but do not require fault tolerance. RAID 0 has the best performance and capacity of any RAID level, but the lowest availability (no fault tolerance). If one drive fails, the entire array fails because part of the data is missing with no way to recover it other than restoring from a backup.

RAID 1

In a RAID 1 array, every read and write is carried out in parallel across two disk drives. The mirrored—or backup—copy of the data can reside on the same disk or on a second redundant drive in the array. RAID 1 provides a hot-standby copy of data if the active volume or drive is corrupted or becomes unavailable due to a hardware failure. RAID 1 techniques can be applied for high-availability solutions, or as a form of automatic backup that eliminates tedious manual backups to more expensive and less reliable media.

RAID 1 provides complete data redundancy, but at the cost of doubling the required data storage capacity, resulting in 50% capacity utilization. Performance is roughly the same as for a single drive, although in some instances the dual write may be somewhat slower.

RAID 0+1

RAID 0 drives can be mirrored using RAID 1 techniques, resulting in a RAID 0+1 solution for improved performance plus resiliency

The controller combines the performance of data striping (RAID 0) and the fault tolerance of disk mirroring (RAID 1). Data is striped across multiple drives and duplicated on another set of drives.

RAID 5

RAID 5[1] stripes both data and parity information across three or more drives. It writes data and parity blocks across all the drives in the array. Fault tolerance is maintained by ensuring that the parity information for any given block of data is placed on a different drive from those used to store the data itself

JBOD

JBOD stands for "Just a Bunch of Disks". Each drive is accessed as if it were on a standard SCSI host bus adapter. This is useful when a single drive configuration is needed, but it offers no speed improvement or fault tolerance

Summary of RAID Configurations

Table 1.2 RAID Configuration Summary

Array	Uses	Advantages	Drawbacks	# Hard Disks	Fault Tolerance
RAID 0	Non-critical data requiring high performance.	High data throughput.	No fault tolerance.	multiple	None
RAID 1	Small databases or any other small capacity environment requiring fault tolerance.	100% data redundancy. Allows spare disks	Requires two drives for the storage space of one drive.	2	Yes
RAID 0+1	Critical data requiring high performance.	Optimized for both 100% data redundancy and performance. Allows spare disks.	Requires two drives for the storage space of one drive—the same as RAID level 1.	4+	Yes
RAID 5	Critical data and reasonable level of performance.	Fault tolerance and better utilization of disk space.	Decreased write performance due to parity calculations. Requires at least three drives.	3+	Yes
JBOD	Combining odd size drives into one big drive.	Combines and uses the capacity of odd size drives.	Decreases performance because of the difficulty in using drives concurrently or to optimize drives for different uses.	multiple	No

1. RAID 5 is supported on select boards only. Please check with your motherboard manufacturer to determine whether RAID 5 is supported for the type and model of your motherboard.

NVIDIA MediaShield Features

Additional RAID Features

NVIDIA MediaShield offers the following additional features:

- **Dedicated Spare Disk**

  A dedicated spare disk is automatically used in case one drive in a fault-tolerant array fails. NVIDIA MediaShield defines a fault-tolerant array as either RAID 1, RAID 0+1, or RAID 5. A dedicated spare disk can be used only by the array to which it is assigned.

- **Bootable RAID**

  This allows you to install the operating system onto the RAID volume.

- **Migrating**

  Migrating is the ability to convert from one RAID mode to another RAID mode. This allows the user to upgrade their current disk or array for better performance, higher security, and increased capacity. More importantly, this is accomplished without having to go through multiple steps. The migrating feature gives the user an upgradeable option to manage storage easily.

- **Disk Failure Identification**

  The NVIDIA MediaShield application includes a disk alert feature that provides a graphical indication of the status of the hard disks in the system. It notifies you when a disk fails and indicates which one to replace.

- **Self-Monitoring, Analysis, and Reporting Technology** (SMART) lets you monitor the health of the drives in the array at regular intervals.

Changes in this Release

- **RAID Pass-through Disk Management**

  Depending on the motherboard support, NVIDIA MediaShield Release 10 lets you manage “pass-through” disks using the NVIDIA Control Panel Storage interface.

  This provides greater flexibility for creating RAID arrays on systems that support this feature. With direct pass-through disk management, you can add or remove array disks within Windows without having to restart the system and enter the RAID section of the system BIOS.

- **SMART Self-test**

  This allows you to run a SMART diagnostic test on individual disk drives within a RAID array.

CHAPTER 2

CONFIGURING THE BIOS

This chapter provides instructions for two basic BIOS configuration tasks:

- Enabling RAID in the System BIOS

  This task is required to create a RAID array or to add disks to an existing array.

- Creating a RAID Array Using the RAID BIOS

  This task is required when you are creating a bootable RAID array, but can also be used to create non-bootable RAID arrays.

You perform these tasks in the process of creating arrays as described in the chapter "Creating RAID Arrays" on page 21.

Enabling RAID in the System BIOS

1 Start your computer, then press **Delete** to enter the BIOS setup.

The BIOS CMOS Setup Utility window appears.

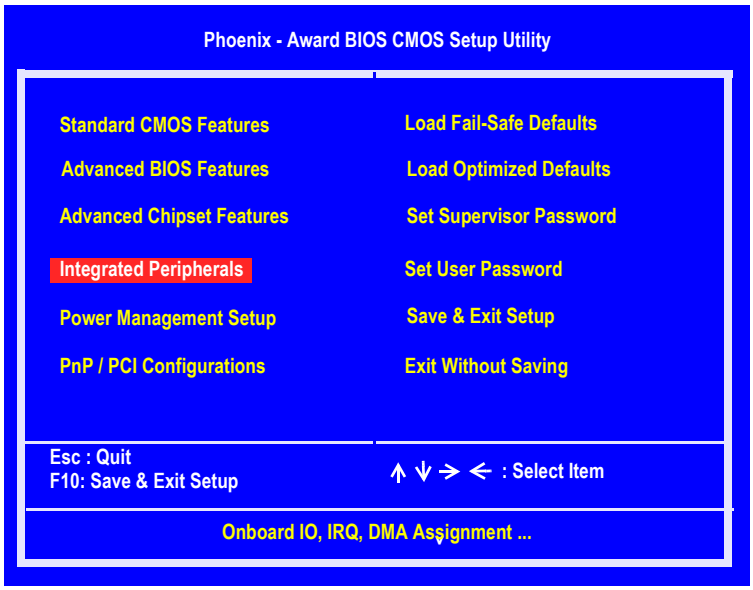

Figure 2.1 BIOS CMOS Setup Utility Main Window

2 Use the arrow keys to select **Integrated Peripherals**, then press **Enter**.

The Integrated Peripherals window appears.

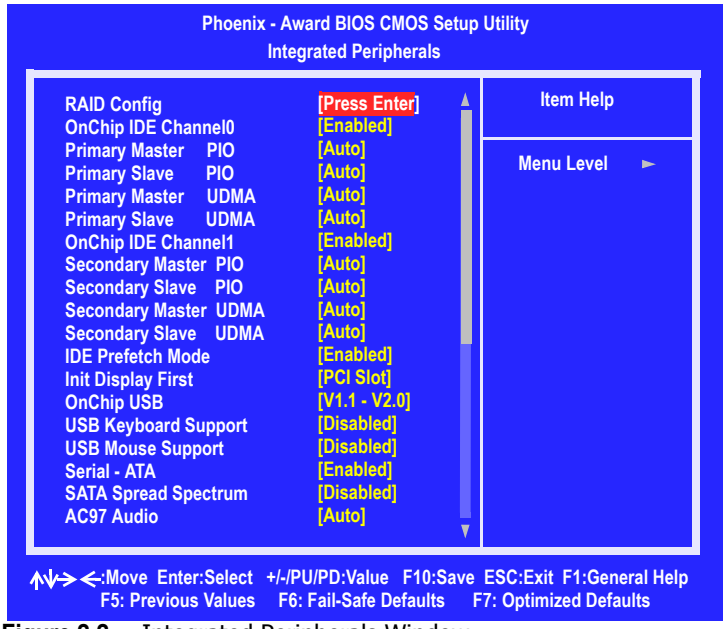

Figure 2.2 Integrated Peripherals Window

3 Use the arrow keys to select the **RAID Config** (see Figure 2.2), then press **Enter**.

The RAID Config window appears. .

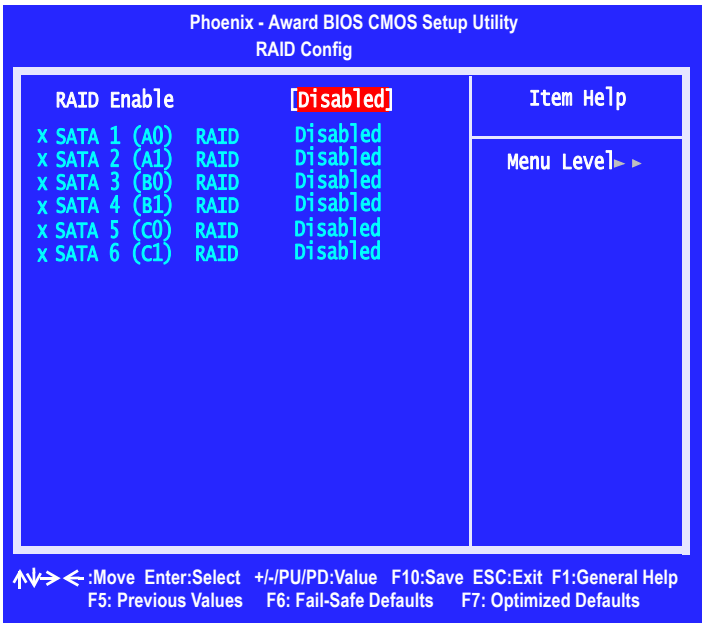

Figure 2.3 RAID Config Window–RAID disabled

4 Globally enable RAID.

Press **Enter** and then use the arrow keys to select the *Enabled* option and press **Enter** to accept. .

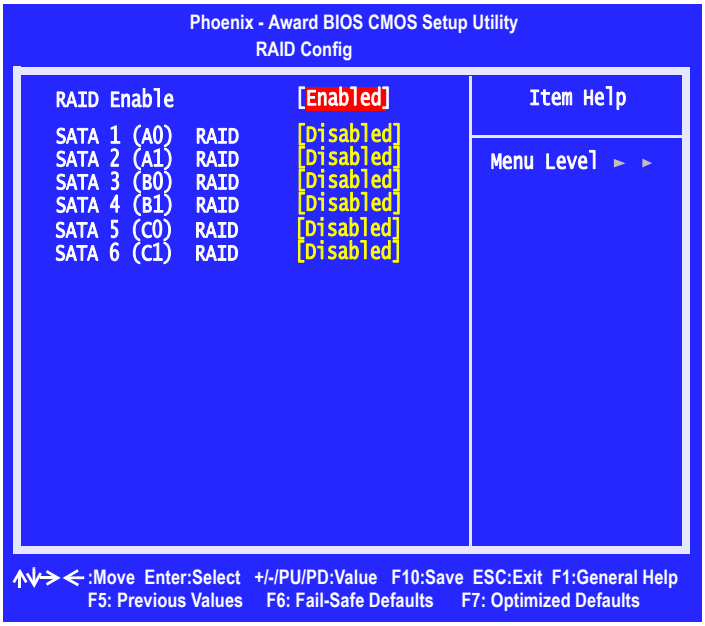

Figure 2.4 RAID Config Window

- On systems that support NVIDIA's RAID pass-through disk management, the individual SATA ports are not listed. After you globally enable RAID, all SATA disks are automatically available for use in RAID or non-RAID applications.
- If your system does not support NVIDIA's RAID pass-through disk management, then you will need to enable the SATA ports for any disks that you want to use in RAID arrays or as "free" RAID disks.

5 Press **F10** to save the configuration and exit.

The PC reboots.

Creating a RAID Array Using the RAID BIOS

The NVIDIA RAID BIOS setup lets you choose the RAID type and which hard drives you want to make part of the array.

You can also create a RAID array using the MediaShield application (see "Create an Array" on page 35).

Entering the RAID BIOS Setup

1 After rebooting the system, wait until you see the RAID software prompting you to press **F10**.

The RAID prompt appears as part of the system POST and boot process prior to loading of the OS. You have a few seconds to press **F10** before the prompt disappears.

2 Press **F10.**

If you have already created a RAID array, the MediaShield BIOS—**Array List** screen appears, listing the arrays in the system.

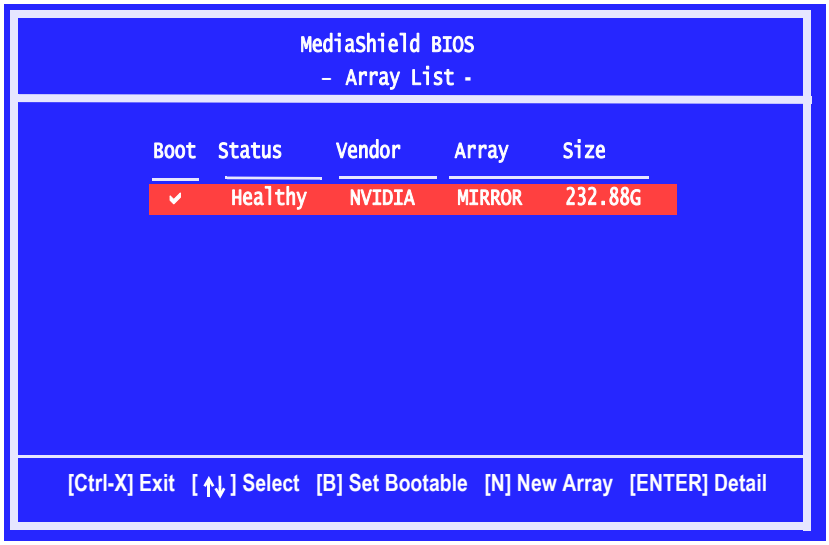

Figure 2.5 MediaShield BIOS–Array List Window

Press **N** to go to the MediaShield BIOS—**Define a New Array** screen.

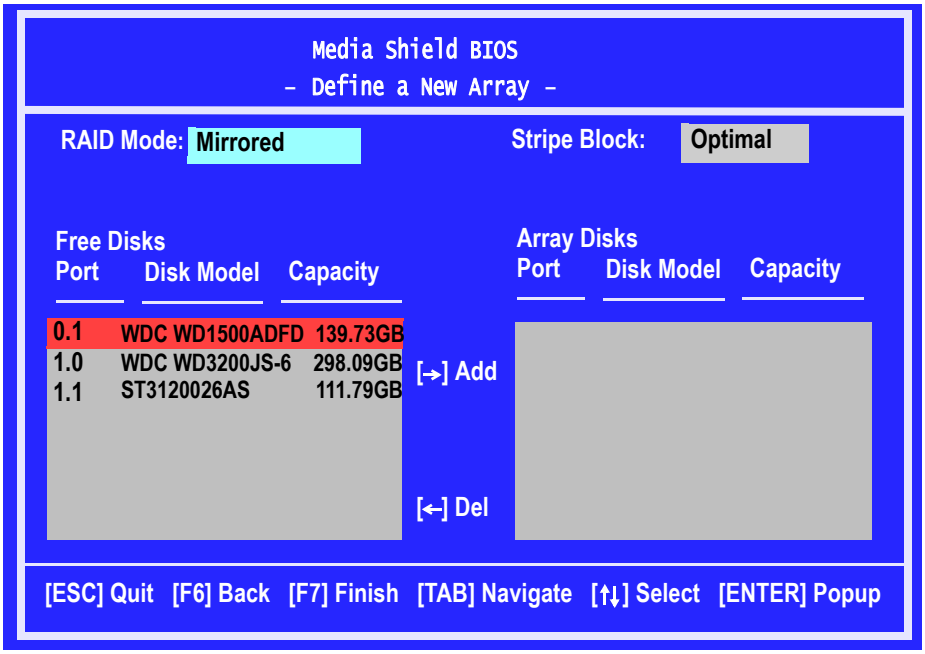

Figure 2.6 MediaShield BIOS–Define a New Array

- If you have not already created a RAID array, this screen appears instead of the Array List screen.
- By default, RAID Mode is set to Mirroring and Stripe Block is set to Optimal.

Understanding the Define a New Array Window

Use the Define a New Array window to

- Select the RAID Mode
- Set up the stripe block
- Specify which disks to use for the RAID Array

  The SATA ports are called channels and they are associated with adapters. The first digit in the Location field defines the adapter that the port is associated with. The 2nd digit defines the channel.

  Note: Both digits (adapter and channel) begin with 0, so 0.0 indicates the first channel on the first adapter.

In Figure 2.7, 1.1. means the hard drive is attached to Adapter 1, Channel 1.

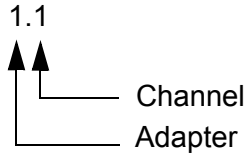

Figure 2.7 Port Column Information

The location, disk model and capacity fields should allow you to identify disks. It may be useful to try attaching a SATA hard drive to the ports provided with your platform and determine which location IDs are associated with SATA ports on your motherboard.

Using the Define a New Array Screen

If necessary, press the tab key to move from field to field until the appropriate field is highlighted.

Selecting the RAID Mode

By default, this is set to Mirroring. To change to a different RAID mode, press the down arrow key until the mode that you want appears in the RAID Mode box—either Mirroring, Stripe, Spanning, Stripe Mirroring or RAID 5.

Note: Not all RAID levels are supported on all platforms.

Selecting the Stripe Block Size

Stripe block size is given in kilobytes, and affects how data is arranged on the disk. It is recommended to leave this value at the default Optimal, which is 64KB, but the values can be between 4 KB and 128 KB (4, 8, 16, 32, 64, and 128 KB).

Note: Stripe block size selection is not available for Mirroring or Spanning RAID arrays.

Assigning the Disks

Any disks in your system that are not part of a RAID array appear in the Free Disks block. These are the drives that are available for use as RAID array disks.

To designate a free disk to be used as a RAID array disk,

1. Tab to the Free Disks section.

   The first disk in the list is selected.

2. Move it from the Free Disks block to the Array Disks block by pressing the right-arrow key (→).

   The first disk in the list is moved, and the next disk in the list is selected and ready to be moved.

3 Continue pressing the right-arrow key (→) until all the disks that you want to use as RAID array disks appear in the Array Disks block.

Figure 2.8 illustrates the Define a New Array screen after two disks have been assigned as RAID1 array disks

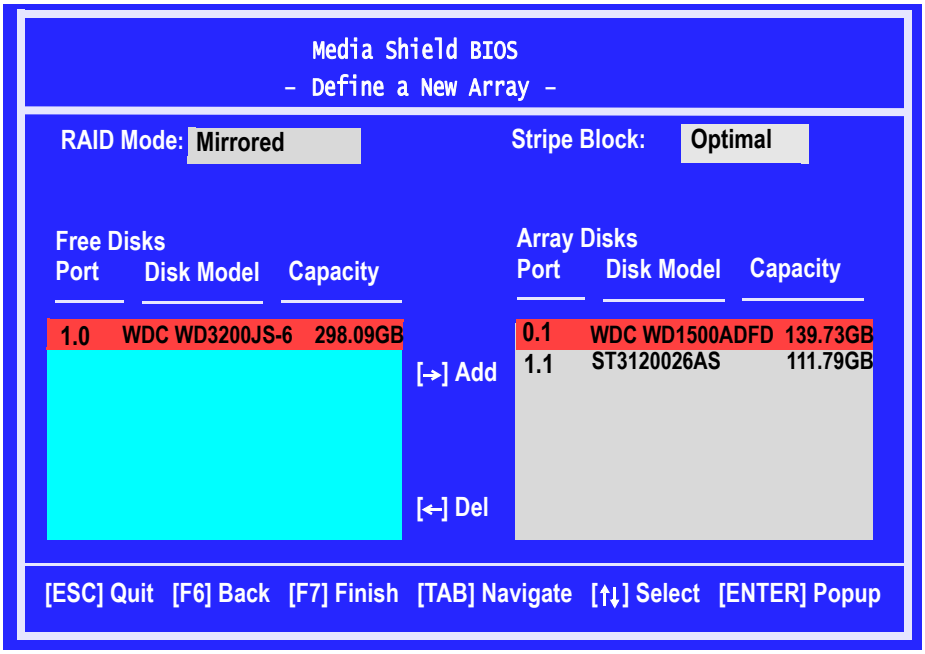

Figure 2.8 MediaShield BIOS—Array Disks Assigned

Completing the RAID BIOS Setup

1 After assigning your RAID array disks, press **F7.**

The Clear disk array prompt appears.

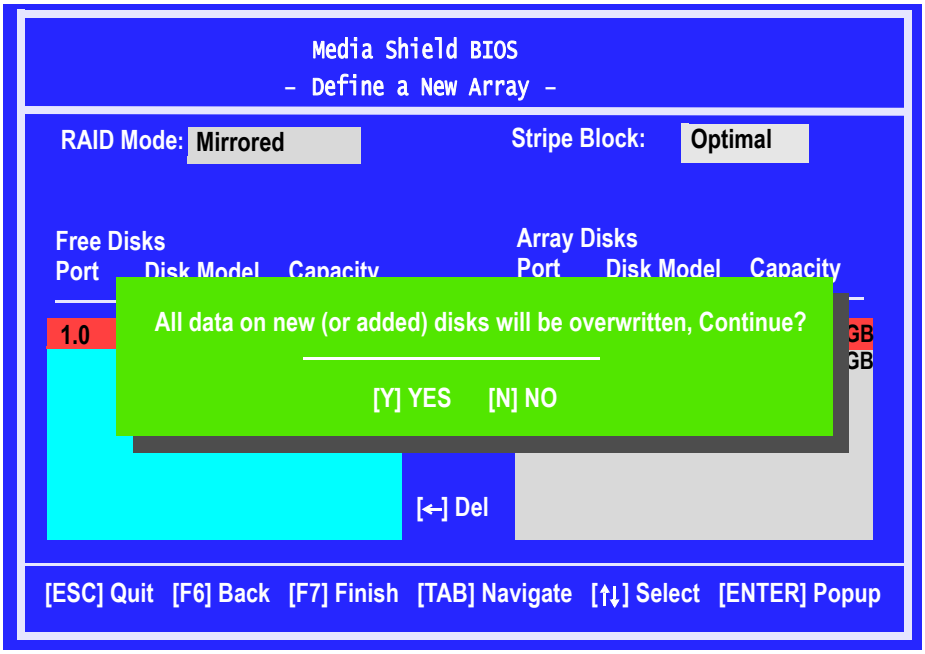

Figure 2.9 Clear Disk Data Prompt

2 Press **Y** to clear the disk data.

The Clear MBR prompt appears.

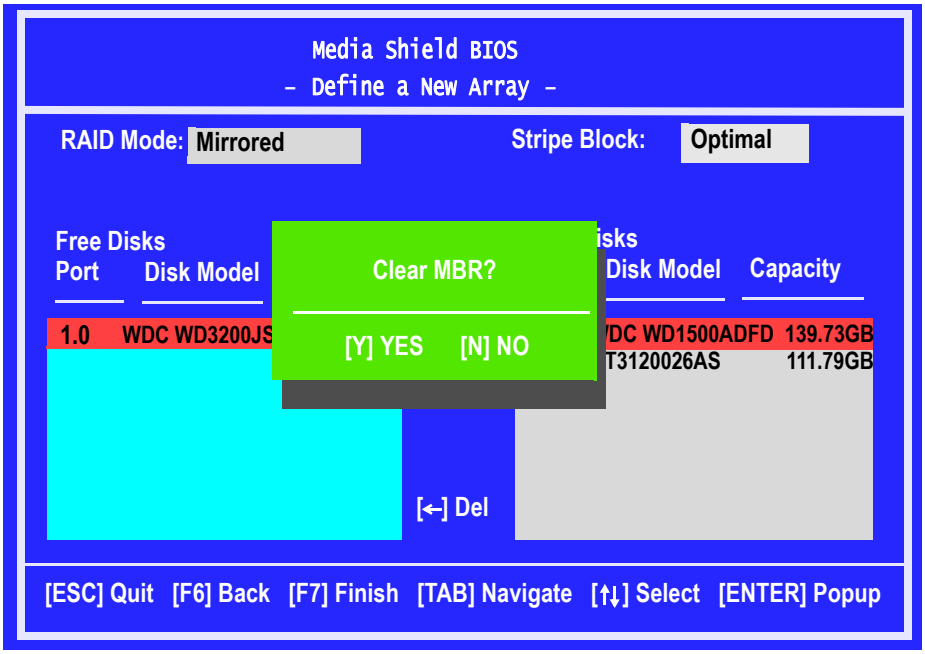

Figure 2.10 Clear MBR Prompt

3 Press **Y** to clear the MBR.

The **Array List** screen appears, where you can review the RAID arrays that you have set up.

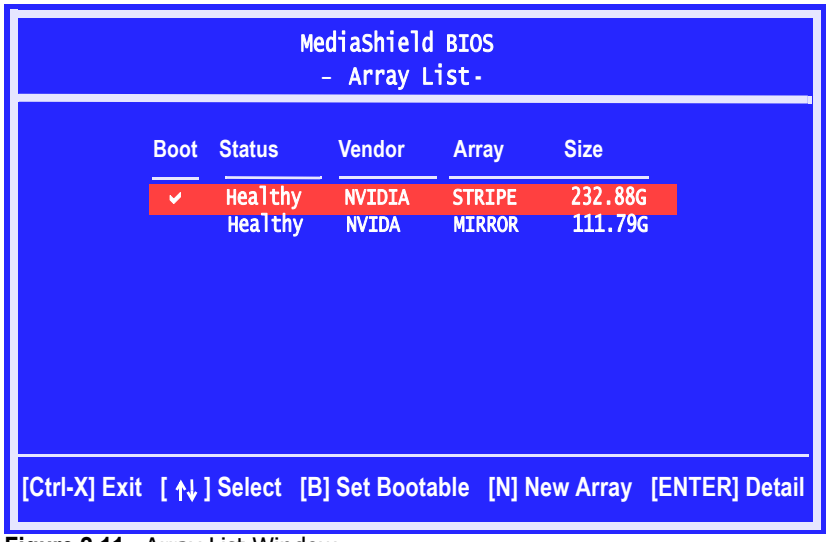

Figure 2.11 Array List Window

4 If you are creating a bootable array, then use the arrow keys to select the array that you want to set up and press **B** to specify the array as bootable.

5 Press **Enter** to view and verify details for the selected array..

The **Array Detail** screen appears.

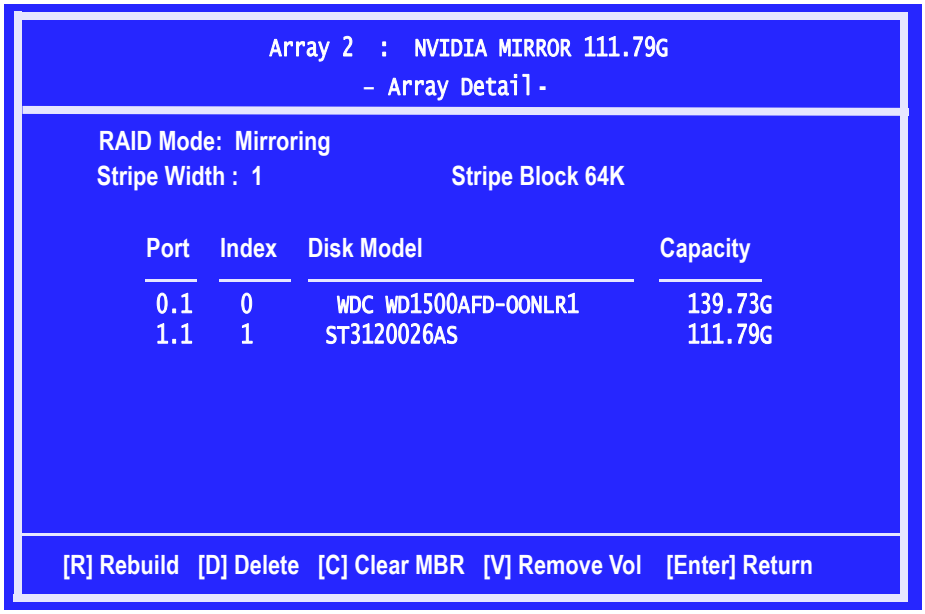

Figure 2.12 Array Detail Screen

The Array Detail screen shows various information about the array that you selected, such as Stripe Block, RAID Mode, Stripe Width, Disk Model Name, and disk capacity.

From this screen you can

- Rebuild the array (press **R**, then use the arrow keys to select the disk to rebuild and press **F7**)
- Delete the array (press **D**, then press **Y** at the prompt).
- Clear the MBR (press **C**, then press **Y** at the prompt).
- Remove the volume (press **V**, then use the arrow keys to select the disk volume to remove and press **F7**).

  For Mirroring (RAID1), single-disk Stripe (RAID0), and single-disk Spanning arrays, removing a volume is a way to remove a disk from an array and convert it to a basic disk without deleting any data. In a Mirroring (RAID1) array, the array becomes degraded (if there are still disks in the array) and must be rebuilt.

  The *Remove Vol* option is not available with systems that do not support NVIDIA's RAID pass-through disk management.

6 Press **Enter** again to go back to the previous screen and then press **F10** to exit the RAID setup.

CHAPTER 3

CREATING RAID ARRAYS

This chapter provides instructions on creating bootable and non-bootable RAID arrays.

- Creating a Bootable Array

  You can configure a RAID array and then install the operating system over it.

- Creating a Non-Bootable Array

  This is the standard method of using non-bootable disks in a RAID array.

Creating a Bootable Array

This section explains how to create a RAID array where you intend to install the Windows operating system and make bootable.

You cannot install Windows onto arrays that are greater than 2 TB.

Arrays greater than 2 TB must use the GPT format, and only Windows XP x64 for Itanium-based systems and Windows Server 2003 for Itanium-based systems can boot off of GPT partitioned disks.

For further information, see the following Microsoft articles:

- Large Logical Unit Support and Windows Server 2003 SP1

  (http://www.microsoft.com/whdc/device/storage/LUN_SP1.mspx)

- Windows and GPT FAQ

  (http://www.microsoft.com/whdc/device/storage/GPT_FAQ.mspx)

Step 1: Enable RAID in the system BIOS

See "Enabling RAID in the System BIOS" on page 10 for detailed instructions.

Step 2: Create a RAID array using the RAID BIOS

See "Creating a RAID Array Using the RAID BIOS" on page 13 for detailed instructions.

Step 3: Install the RAID Drivers

- Installing the RAID Drivers Under Windows XP
- Installing the RAID Drivers Under Windows Vista

Installing the RAID Drivers Under Windows XP

If your Windows installation CD includes NVIDIA RAID drivers, then the drivers will be installed when you install Windows and you can skip this section.

If your Windows installation CD does ***not*** include RAID drivers (or you are trying to install a new version of Windows), then you will need an NVIDIA RAID driver F6 install floppy. Check to see if one came with your system. If not, you can create one by downloading the appropriate driver package and following the steps in this section.

Creating the F6 Installation Floppies

1. Obtain two formatted floppy disks.
2. Label one of the floppy disks "Disk1" and then copy the contents of folder "... \IDE\WinXP\sataraid\floppy\Disk1\" to the disk.

   Copy the contents, not the folder "Disk1".
3. Label the other floppy disk "Disk2" and then copy the contents of folder " ... \IDE\WinXP\sataraid\floppy\Disk2\" to the disk.

   Copy the contents, not the folder "Disk2".

Performing the F6 Installation

1. After you complete the RAID BIOS setup, boot from the Windows CD.

   The Windows Setup program starts.
2. Press **F6** at the prompt at the bottom of the screen to install a third party or RAID driver.

The setup program continues to load files and then the Windows Setup screen appears.

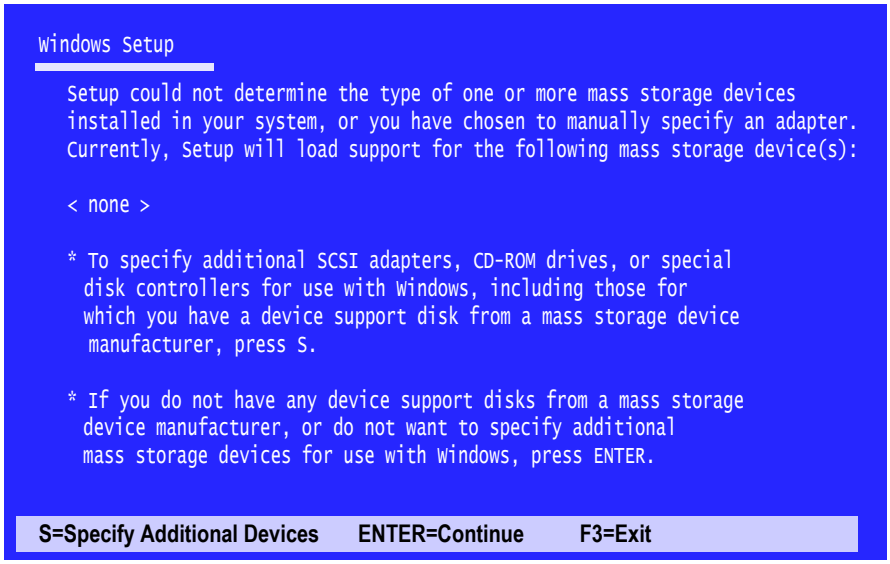

Figure 3.1 Windows Setup—Specify Devices

3 Specify the NVIDIA drivers.

a Insert the floppy Disk 1, press **S**, then press **Enter**.

The following Windows Setup screen appears:

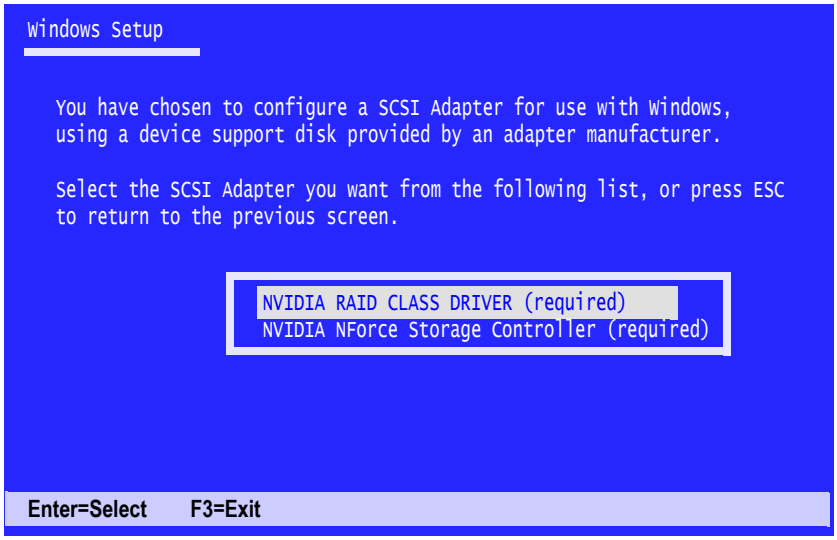

Figure 3.2 Windows Setup—Select SCSI Adapter

b Select "NVIDIA RAID CLASS DRIVER (required)" and then press **Enter**.

c Press **S** again at the **Specify Devices** screen, then press **Enter.**

d Select "NVIDIA NForce Storage Controller (required)" and then press **Enter.**

The following Windows Setup screen appears listing both drivers:.

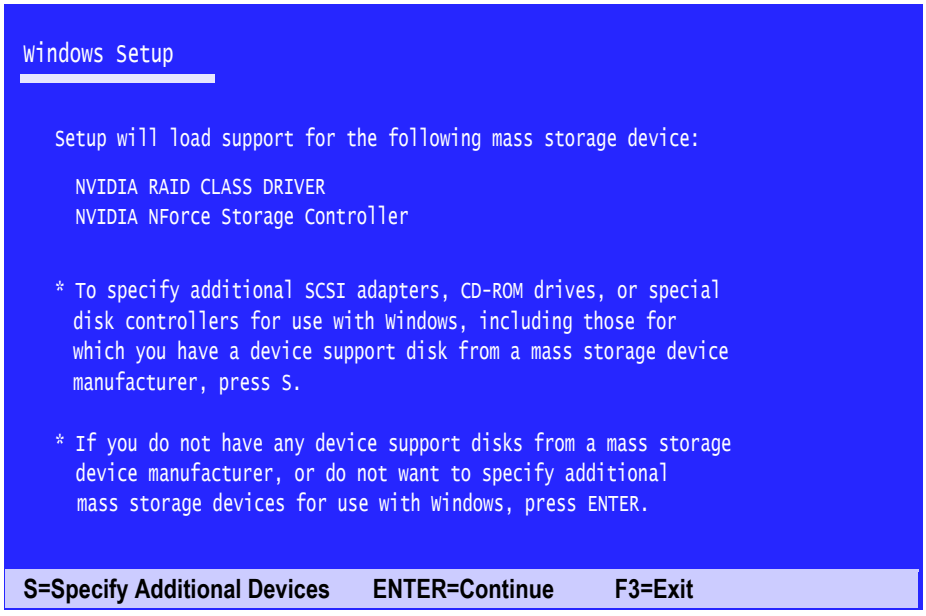

Figure 3.3 Windows Setup—NVIDIA drivers listed

4 Press **Enter** to continue with Windows XP Installation.

Setup continues to load files from Disk 1.

Be sure to leave the floppy disk inserted in the floppy drive until prompted to remove it.

5 Follow the instructions on how to install Windows XP.

6 When prompted to "insert the disk labelled NVIDIA RAID Driver (SCSI) disk 2", remove Disk1 and insert Disk2, then press **Enter**.

Setup continues copying files from Disk 2.

7 When prompted to "insert the disk labelled NVIDIA RAID Driver (SCSI) disk 1", remove Disk2 and insert Disk1, then press **Enter**.

Setup continues copying files from Disk 1.

8 When prompted to "insert the disk labelled NVIDIA RAID Driver (SCSI) disk 2", remove Disk1 and insert Disk2, then press **Enter**.

Setup continues copying files from the Disk 2, then continues with the Windows Setup.

Note: Windows copies the data from both disks into two different locations. Due to limitations in the OS, this involves swapping the disks several times.

9 Windows Setup will restart your system. Be sure to remove the floppy.

After Windows XP is completely installed, it is recommended that you install the ForceWare software in order to access the MediaShield Storage interface. See "Installing the NVIDIA MediaShield Software Under Windows" on page 32.

Note: Each time you add a new hard drive to a RAID array, the RAID driver will have to be installed under Windows once for that hard drive. After that, the driver will not have to be installed.

Installing the RAID Drivers Under Windows Vista

The process for installing the NVIDIA RAID drivers depends on whether your Windows Vista installation disc includes NVIDIA RAID drivers.

If your Windows installation CD includes NVIDIA RAID drivers, then the drivers will be installed when you install Windows. After installing Windows, be sure to use Windows Update to get the latest NVIDIA RAID drivers.

If your Windows installation CD does ***not*** include RAID drivers (or you are trying to install a new version of Windows), then follow these steps:

1. After you complete the RAID BIOS setup, boot from the Windows CD.

   The *Install Windows* screen appears.

2. Click **Install Now** and then continue the installation process until you get to the *Which type of installation do you want?* screen.

3. Click **Custom (advanced)**.

   The *Where do you want to install Windows?* screen appears.

4. Click **Load Driver**.

5. At the *Load Driver* dialog box, click **Browse** and then navigate to the folder containing the installation files.

   The *Select the driver to be installed* screen appears.

6. Select **NVIDIA nForce RAID Controller**, then click **Next**.

   When the RAID controller finishes installing, the *Where do you want to install Windows?* page appears again.

7. Click **Load Driver**.

8. At the *Load Driver* dialog box, click **Browse** and then navigate to the folder containing the installation files.

   The *Select the driver to be installed* screen appears.

9. Select **NVIDIA nForce Serial ATA Controller**, then click **Next**.

Note: You do not need to install the nForce RAID Device because Windows handles it automatically as part of the RAID and SATA controller installation process.

When the Serial ATA controller finishes installing, the *Where do you want to install Windows?* page appears again.

10 Select the disc where you want to install Windows and proceed with the installation.

After Windows Vista is completely installed, it is recommended that you install the ForceWare software in order to access the MediaShield Storage interface. See "Installing the NVIDIA MediaShield Software Under Windows" on page 32.

Note: Each time you add a new hard drive to a RAID array, the RAID driver will have to be installed under Windows once for that hard drive. After that, the driver will not have to be installed.

Creating a Non-Bootable Array

This section explains how to create a RAID array that is not intended to be bootable.

Note: Windows XP 32-bit editions cannot read drives or arrays with a capacity greater than 2 TB.

1 Enable RAID in the system BIOS

If you have not already done so, globally enable RAID in the system BIOS.

See "Enabling RAID in the System BIOS" on page 10 for detailed instructions.

2 Create the RAID Array

There are two methods you can use to create a RAID array:

Using the RAID BIOS

Follow the instructions under "Creating a RAID Array Using the RAID BIOS" on page 13.

Using the MediaShield software

a Install the NVIDIA RAID drivers.

See "Installing the NVIDIA MediaShield Software Under Windows" on page 32 for instructions.

b Open the NVIDIA Control Panel, then from the *Select a Task* pane under the Storage category, click **Create array** to start the Create Array Wizard.

c Follow the Wizard's instructions.

You can press **F1** to access online help that walks you through the array creation process.

3 Initialize the RAID Array

After creating the array, reboot the PC and then initialize the newly created array under Windows as follows:

a Launch Computer Management by clicking Start → Control Panel, then open the Administrative Tools folder and double click on Computer Management.

b Click Disk Management (under the Storage section).

Under Windows XP, the The Initialize and Convert Disk Wizard appears.

Figure 3.4 Initialize and Convert Disk Wizard - Windows XP

Under Windows Vista, the Initialize Disk dialog box appears.

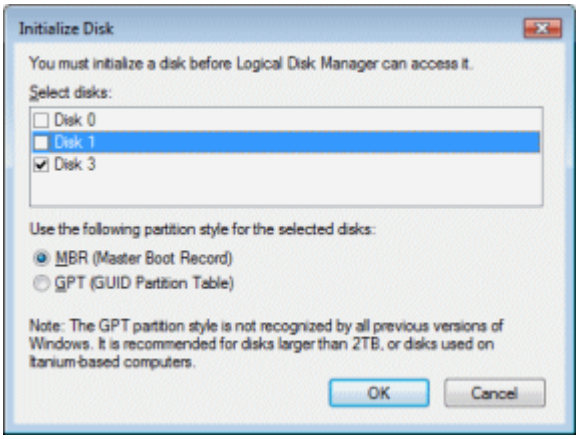

Figure 3.5 Initialize Disk - Windows Vista

c Follow the instructions in the wizard or dialog box to initialize your disks.

4 Format the Unallocated Disk Space

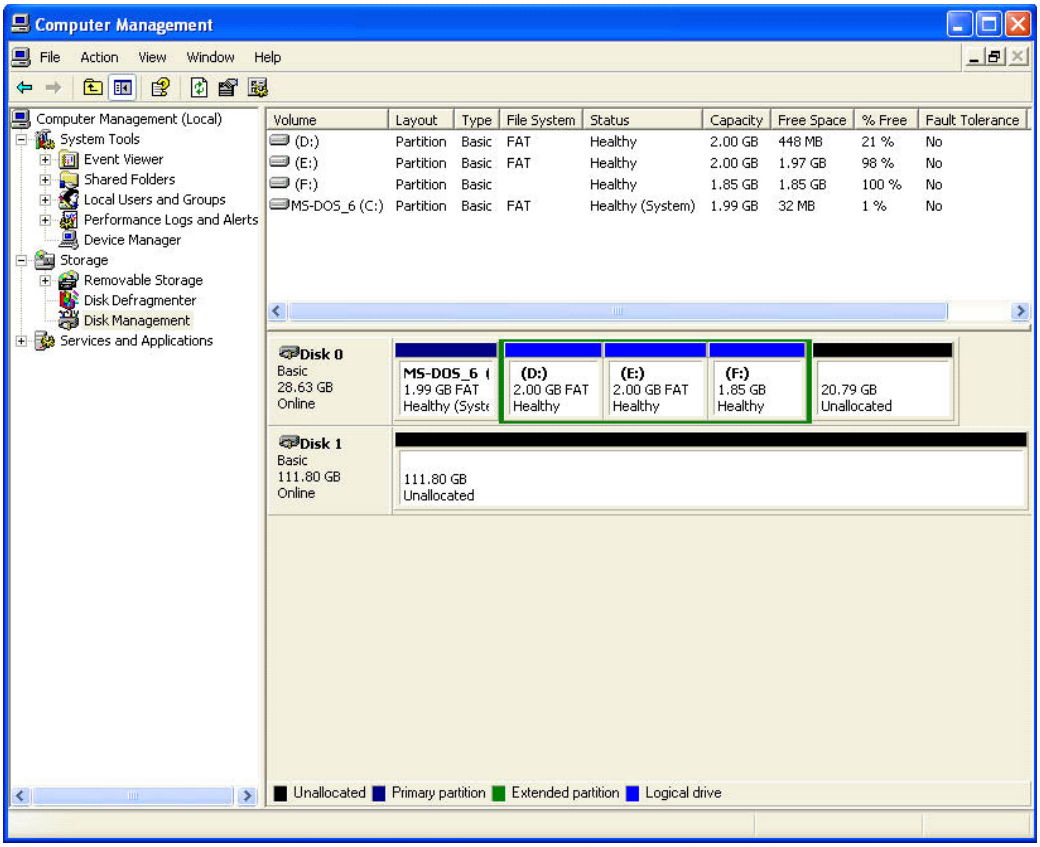

Figure 3.6 Computer Management Window

The actual disks listed will depend on your system. In Figure 3.6, there is a 111 GB unallocated partition (which is the total combined storage of two 60 GB HD). You must format the unallocated disk space in order to use it.

Under Windows XP:

a Right-click "Unallocated space", select "New Partition…" and follow the Wizard instructions.

b After the drive has been formatted, it is ready for use. See "Using the MediaShield Software" on page 33 for instructions on performing other storage management tasks.

Under Windows Vista:

a Right-click "Unallocated ", select "New Simple Volume" and follow the Wizard instructions.

For additional information on initializing, partitioning, and formatting the newly created array, refer to the section on Disk Management in your system's Help and Support Center.

5 After the drive has been formatted, it is ready for use. See "Installing and Using the NVIDIA MediaShield Software" on page 31 for instructions on performing other storage management tasks.

CHAPTER

4

INSTALLING AND USING THE NVIDIA MEDIASHIELD SOFTWARE

The MediaShield RAID software ships with an application called MediaShield, which you access from the NVIDIA Control Panel. This chapter describes the MediaShield software in the following sections:

Installing the NVIDIA MediaShield Software Under Windows

This section describes how to run the setup application and install the RAID software.

1 Start the nForce Setup program to open the NVIDIA Windows nForce Drivers page.

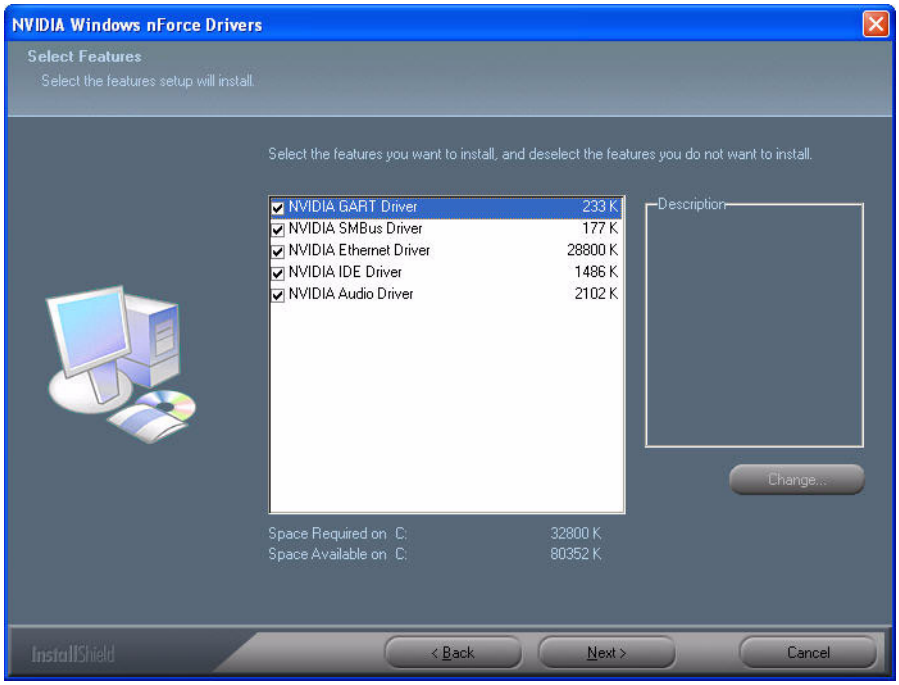

Figure 4.1 nForce Driver Installation Window

2 Select the modules that you want to install.

Make sure that the "NVIDIA IDE Driver" is selected.

You must install the NVIDIA IDE driver in order to enable NVIDIA MediaShield. If you do not install the NVIDIA IDE driver, NVIDIA MediaShield will not be enabled.

3 Click **Next** and then follow the instructions.

4 After the installation is completed, be sure to reboot the PC.

5 After the reboot, initialize the newly created array as described in the next section.

Using the MediaShield Software

The user interface for the MediaShield software appears in the NVIDIA Control Panel, under the Storage module.

Accessing the NVIDIA Control Panel Storage Pages

To access the NVIDIA Control Panel Storage pages:

1. Right-click the desktop and then click **NVIDIA Control Panel** from the pop-up menu to open the NVIDIA Control Panel.

   The NVIDIA Control Panel opens to the last page that was visited.

2. From the *Select a Task* pane, under the Storage category, click **View storage configuration** to view the storage devices in your system.

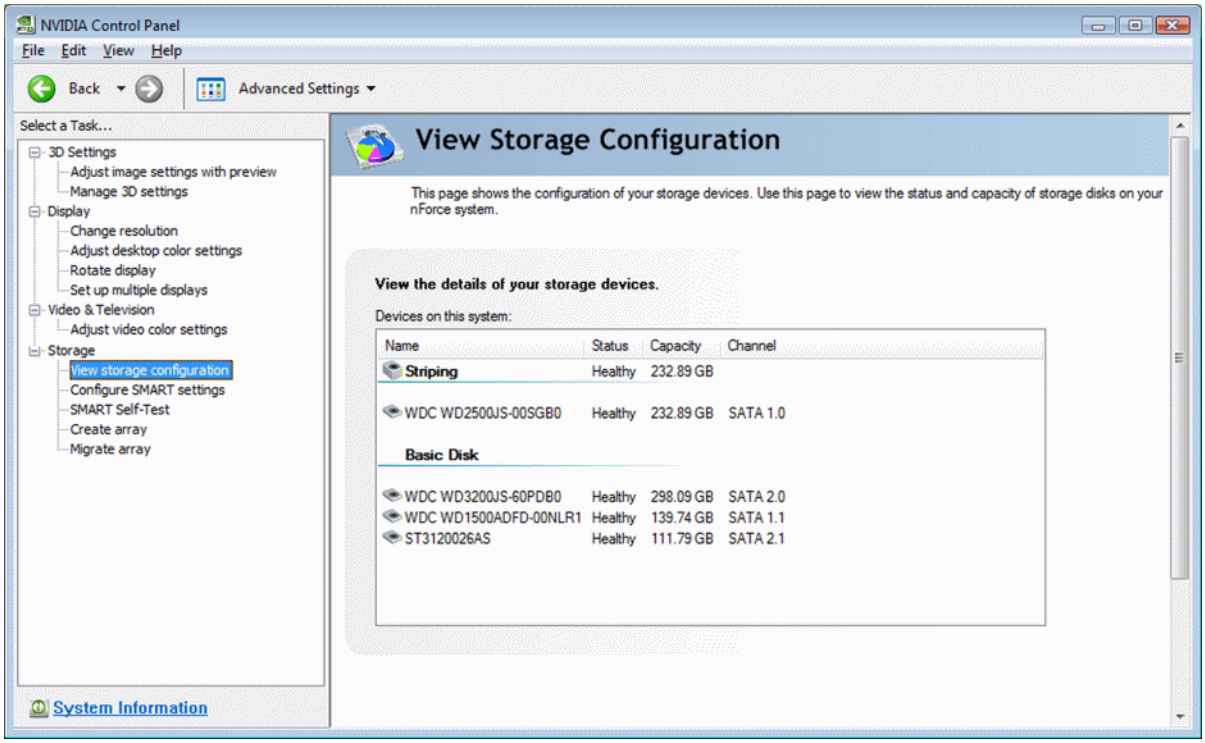

Figure 4.2 NVIDIA Control Panel View Storage Configuration Page

Understanding the View Storage Configuration Page

The View Storage Configuration page provides the following information about the hard drives in your system.

Devices on this system

- **Name**: Indicates the disk drive model information and where they are used–
  - **RAID Array type**–for example, Striping, Mirrored, etc.
  - **Free Disk** (applicable on systems that do not support NVIDIA's RAID pass-through disk management)–free disks are spare RAID disks that can be re-assigned to an array or as a spare disk for an array.
  - **Basic Disk** (applicable on systems that support NVIDIA's RAID pass-through disk management)–basic disks are pass-through disks that the OS can use as non-array disks. They can also be re-assigned to an array or as a spare disk for an array.
- **Status**: Indicates the process state of the array.

  For example, "Healthy", "Rebuilding", "Initializing", "Synchronizing", or "Upgrading"
- **Capacity**: Indicates the size of each hard drive.

  For example, "110.00 GB"
- **Channel**: Indicates the adapter and channel (SATA port) information for each hard drive.

  For example, "1.0." means the hard drive is attached to Adapter 1, Channel 0.

Notes Section

- **Partitions**: Indicates any partitions created on the selected array or disk.
- **Status**: Indicates the applicable status for the selected hard disk–such as SMART, rebuilding, or synchronize status.

Accomplishing Other Storage Tasks

In addition to viewing your storage information, you can accomplish the following tasks through the links in the Storage category menu:

- Create an Array
- Delete an Array
- Rebuild an Array
- Synchronize an Array
- Designate a Spare Disk
- Remove a Spare
- Migrate an Array
- Using the SMART Disk Feature

Create an Array

This option is available only if there are available disks that are not already assigned to an array.

Click **Create array** to start the Create Array Wizard and then follow the instructions.

You can press **F1** to access the online help that walks you through the Wizard with step-by-step instructions.

Delete an Array

This option is available only if RAID arrays have been created.

Click **Delete array** to start the Delete Array Wizard and then follow instructions.

You can press **F1** to access the online help that walks you through the Wizard with step-by-step instructions.

Rebuild an Array

About Rebuilding

Rebuilding is the process of restoring data to a hard drive from other drives in the array. For example, if you have a three disk RAID 5 array and one of the drives fails, you will need to replace the failed drive with a new one, and rebuild the array to re-generate the lost data on the newly added drive.

Rebuilding applies only to fault-tolerant arrays such as RAID 1, RAID 0+1, or RAID 5 Arrays[1].

Instructions

Click **Rebuild array** to start the Rebuild Create Array Wizard and then follow the instructions.

You can press **F1** to access the online help that walks you through the Wizard with step-by-step instructions.

The rebuilding process takes some time to complete, and occurs in the background so as not to affect the performance of the system.

Synchronize an Array

Synchronizing an array will force a rebuild of redundancy or parity. The operation applies to any fault-tolerant array such as RAID 1, RAID0+1, or RAID 5[1].

Click **Synchronize array** to start the Synchronize Array Wizard and then follow instructions.

You can press **F1** to access the online help that walks you through the Wizard with step-by-step instructions.

Designate a Spare Disk

About Spare Disks

You can designate a hard drive to be used as a spare drive for a RAID 1, RAID 0+1 or RAID 5 array[1]. The spare drive can take over for a failed disk. MediaShield RAID supports the following types of spare drives:

Free Disk

*Available only on systems that do **not** support NVIDIA's RAID pass-through disk management.*

A free disk is a disk that is not part of any RAID array, but can be used by any available RAID 1, RAID 0+1, or RAID 5 array that requires another disk when one of its disks crashes or becomes unusable. The process is automatic and requires no user interaction.

1. See Table 1.1, "Supported nForce Platforms, RAID Arrays, and Pass-through Disk Management" on page 2 for a matrix of supported RAID levels.

Example: A system may have four hard disks where one disk is used to boot the OS, two hard drives are set up in a mirrored array, and a fourth hard disk is set up as a free disk. If one of the mirrored array drives fails, the free disk will be assigned automatically to the mirrored array to replace the failed disk.

Dedicated Spare Disk

A dedicated spare disk is a disk that is assigned to a RAID 1, RAID 0+1, or RAID 5 array. The dedicated disk is used by that array only when needed - for example, during a system crash where a RAID mirrored drive is broken. The dedicated spare disk is used only by the array that it is assigned to and not by any other array.

Requirements for Designating a Spare Disk

The Designate Spare option appears only if all the following conditions are met.

- On systems that support NVIDIA's RAID pass-through disk management, there must be at least *one* fault-tolerant array already created.
- On systems that *do not* support NVIDIA's RAID pass-through disk management, there must be at least *two* fault tolerant arrays already created.

  (Some OEMS allow a designated spare to be created when only one fault tolerant array exists.)
- There must be at least one free disk with capacity equal to or greater than the smallest disk in the given fault tolerant array.

  For example, if a mirror array is created with disk capacities of 40 GB and 80 GB, there should be at least one free disk available of capacity equal to or greater than 40GB to be used as a spare disk for that array.

Instructions

Click **Designate spare disk** to start the NVIDIA Designate Spare Disk Allocation Wizard and then follow instructions.

You can press **F1** to access the online help that walks you through the Wizard with step-by-step instructions.

Remove a Spare

The Remove spare option appears only if you have a RAID array with a spare disk allocated to it.

Click **Remove spare** to start the Remove Spare Wizard and then follow the instructions.

You can press **F1** to access the online help that walks you through the Wizard with step-by-step instructions.

Migrate an Array

In a traditional RAID environment, the process of changing the current state of a disk or a current array to a new RAID configuration typically involves multiple steps. You must back up the data, delete the array, re-boot the PC, and then reconfigure the new array.

MediaShield RAID simplifies this by allowing you to change the current state of the disk or array to another with a one-step process called "Migrating". This section describes the NVIDIA Migrating process and explains how to use Migrating to convert from one RAID array type to another.

General Migrating Requirements

- The new array capacity must be equal to or greater than the previous array.

  For example, it is possible to migrate from a RAID 1 array to a RAID 0 array as long as the RAID 0 array is the same size as (or larger than) the RAID 1 array.

- The number of disks in the new array cannot be less than the number of disks in the original array.

- You cannot migrate
  - To or from a JBOD (Spanning) array
  - From RAID 1 to RAID 1
  - From RAID 0+1 to RAID 1
  - From RAID 5 to 1

Migrating to an Array Larger Than 2 TB

Your disks must be partitioned using the GUID partition table (GPT) if you plan to migrate to an array with greater than 2 TB storage.

If your original array is not a GPT disk and you expand your array's capacity using the migration feature to over 2 TB, you will not be able to access the additional storage above 2 TB in the new array. To use the additional storage in this situation, back up your data, repartition the array using GPT, then restore your data to the new volume.

Note: Be sure to make the volume dynamic if you plan to have more than four partitions.

Specific Migrating Requirements

The following table lists the disk requirements for a new RAID array for various migrating combinations.

Table 4.1 RAID Array Disk Requirements for Migrating

From	To	New Array Disk Requirements[i]
RAID 0	**RAID 0**	*m* > *n* Number of disks in the new array must be greater than the original array.
	RAID 1	*m*=2, *n*=1 RAID 1 array must include two disks, converted from a one disk RAID 0 array.
	RAID 0+1	*m* >= 2 x *n* Number of RAID 0+1 disks must be equal to or greater than twice the number of RAID 0 disks.
	RAID 5	*m* >= *n* + 1
RAID 1	**RAID 0**	No additional restrictions.
	RAID 1	**** Not a valid combination ****
	RAID 0+1	No additional restrictions.
	RAID 5	*m* >= 3
RAID 0+1	**RAID 0**	*m* >= *n* Number of RAID 0 disks must be equal to or greater than the number of RAID 0+1 disks.
	RAID 1	**** Not a valid combination ****
	RAID 0+1	*m* >= *n* + 2; where *m* must be an even number of disks. The new array must include at least two more disks than the original array, and can include any even number of disks beyond that.
	RAID 5	*m* >= *n*
RAID 5	**RAID 0**	*m* >= *n*
	RAID 1	**** Not a valid combination ****
	RAID 0+1	*m* >= 2 x (*n* - 1); where *m* is an even number of disks.
	RAID 5	*m* > *n*

i. *m* = quantity of disks in the new array. *n* = quantity of disks in the original array.

Instructions

Click **Migrate array** to start the Migrate Array Wizard and then follow instructions.

You can press **F1** to access the online help that walks you through the Wizard with step-by-step instructions.

Using the SMART Disk Feature

S.M.A.R.T. stands for **S**elf-**M**onitoring, **A**nalysis, and **R**eporting **T**echnology. It is a disk drive feature that allows software to monitor degradations in disk drive specifications.

Using this technology, NVIDIA MediaShield lets you monitor the health of disk drives in a RAID array and alerts you when certain degradations indicate an impending hardware failure, giving you time to back up data and replace the drive.

When you click on an array disk from the View Storage Configuration page, the SMART status appears, indicating whether (as of the last polling) the disk is healthy (good) or whether there is a problem that can result in a catastrophic failure within 24 hours.

Configuring SMART Settings

To configure the SMART settings:

1. Click **Configure SMART settings** to open the associated page.
2. Select the **Enable SMART monitoring** radio button.
3. If you want to track the test results, check the **Record events in the system log** check box.
4. Click the **Polling interval** list arrow and then select one of the time options corresponding to how often you want MediaShield to run the SMART test.
5. Click **Apply** when done.

Viewing the SMART Status

To see the SMART status for a specific disk:

1. Click **View storage configuration** to open the associated page .
2. Click on a disk from the list of array disks.

The SMART status, if available, appears in the STATUS notes section..

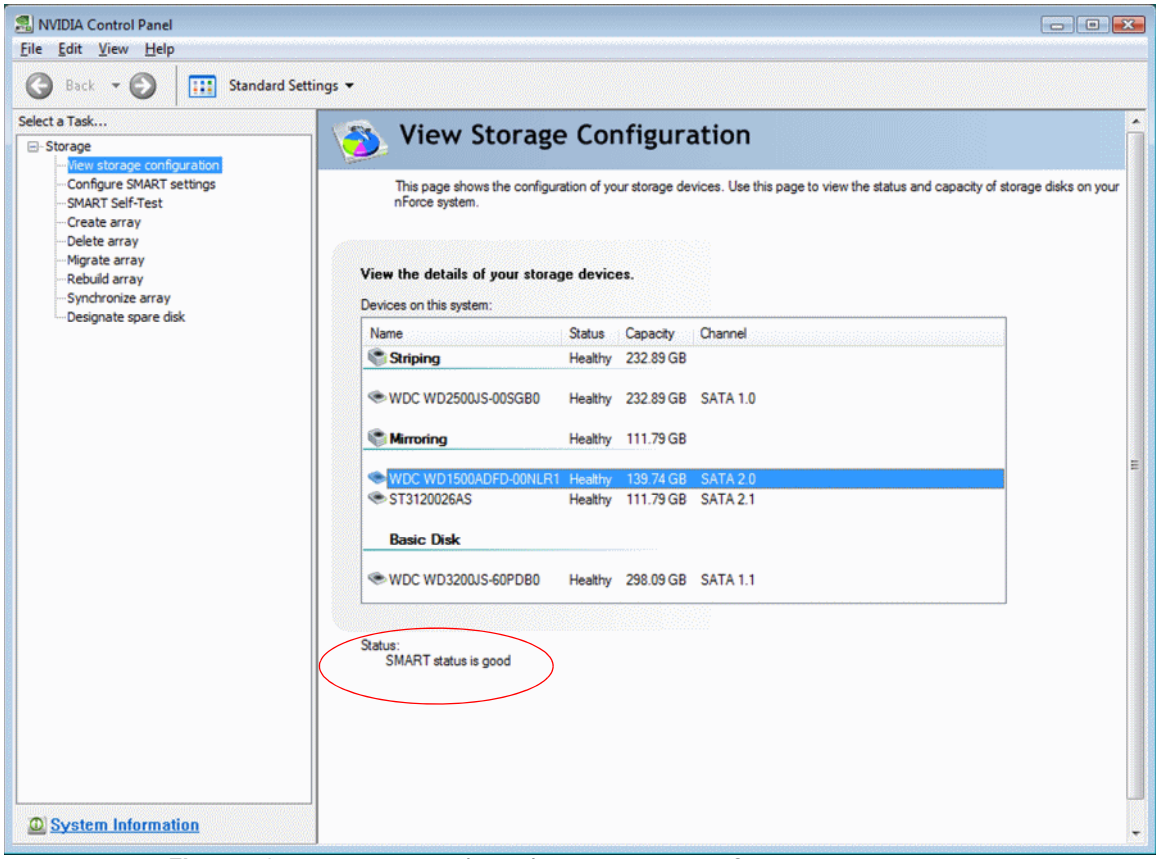

Figure 4.3 NVIDIA Control Panel View Storage Configuration Page

Viewing the SMART Status Event Logs

To view the SMART status event logs:

Windows XP

1. Open the Windows Control Panel.
2. Double-click Administrative Tools, then double-click Computer Management.
3. Under System Tools->Event Viewer->Windows Logs, click **System**.

   The events are listed in the NVRAIDSERVICE Source entries.

Windows Vista

1. Open the Windows Control Panel.
2. Double-click Administrative Tools, then double-click Computer Management.
3. Under System Tools->Event Viewer->Windows Logs, click **Application**.

   The events are listed in the NVRAIDSERVICE Source entries.

Running the SMART Self-Test

You can run a SMART self-test on the fly in drives that support the self-test feature. The SMART Self-Test provides more detailed information in the event of a hard disk problem, such as whether the problem is electrical, mechanical, or data-related.

To run the SMART self-test,

1. Click **SMART Self-Test** to open the associated page.
2. From the 'drives on this system' list box, select the disk that you want to test, then click **Run Self-Test**.

   The test takes a few minutes to complete.

   The Status column shows the test status - whether the test is in progress, passed, or failed.
3. When the test has completed, click the disk for additional information regarding the test results.

CHAPTER

5

USING DISK ALERT

About Disk Alert

The RAID manager application includes a disk alert feature that provides a graphical indication of the status of the hard disks in the system.

When the RAID manager application detects a failure condition of an attached drive, a pop-up box appears in the clock area of the Windows system tray. Click the pop-up box to view the manufacturer-provided bitmap image of the system motherboard. The image shows the hard drive connector ports and provides a visual indication of the location and status of the drives as follows:

- **Red rectangle**: A red rectangle will flash around the port connector that is attached to the failed drive.
- **Green rectangle:** Ports that have a drive attached, and are in a healthy state, are indicated with a green rectangle around the port connector.
- **Yellow rectangle**: Ports that have a drive attached, are members of a failed RAID array, but are not the cause of the failure have a yellow rectangle around the port connector.

Unconnected ports have no visual indication.

Disk Alert Examples

Figure 5.1 through Figure 5.3 illustrate how the Disk Alert feature is implemented on an NVIDIA reference board. The actual picture in your system will depend on the motherboard.

Example of All Good Drives

Figure 5.1 shows four green connections indicating four active SATA ports—all SATA ports are OK.

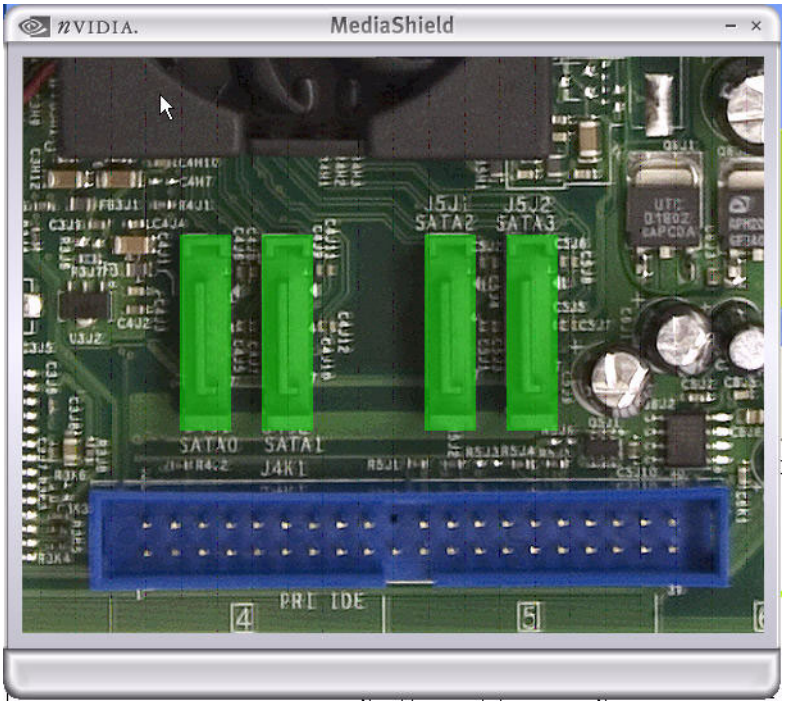

Figure 5.1 Disk Alert Example—All SATA Drive Connections OK

Example of a Degraded Array

Figure 5.2 shows a yellow SATA port indicating that an array has been degraded as well as a single black SATA port indicating that there is no longer a SATA hard drive connected to that port.

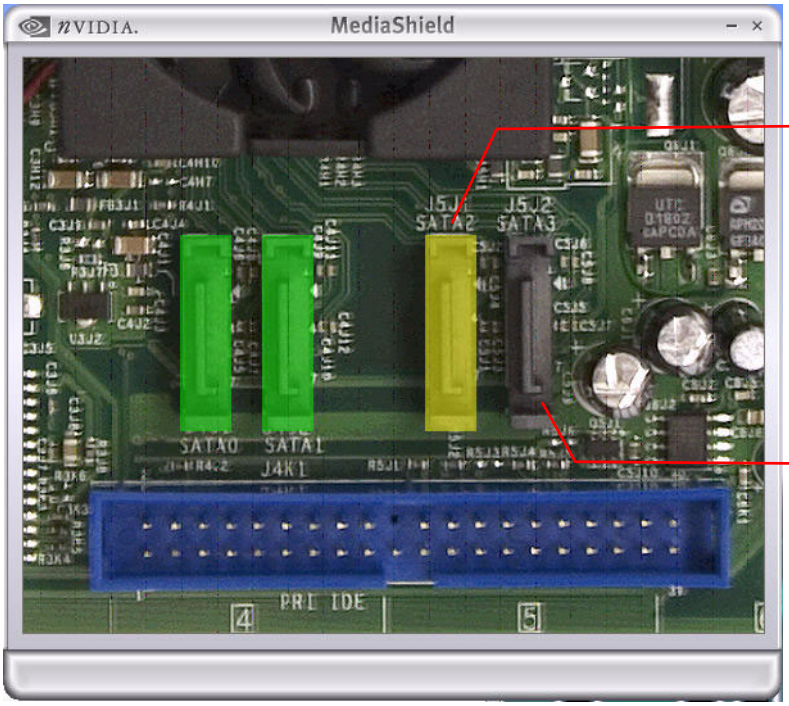

Figure 5.2 Disk Alert Example—Degraded and Missing SATA Connection

Example of a Failed Drive

Figure 5.3 shows a red SATA port indicating that a drive failure (or a RAID error) has occurred.

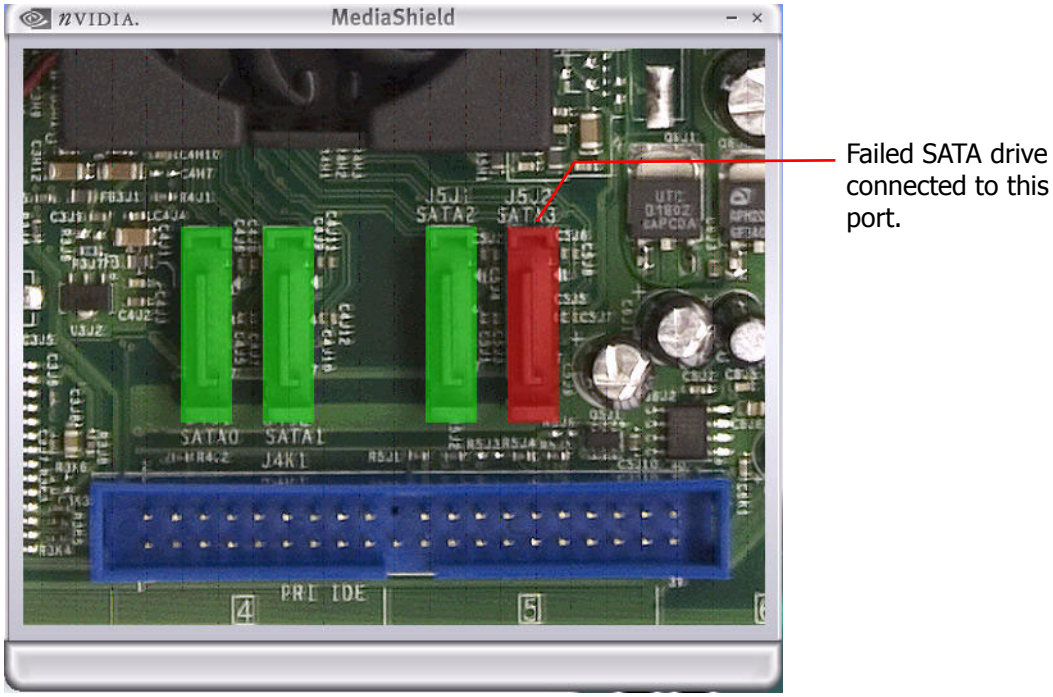

Figure 5.3 Disk Alert Example—Failed SATA Drive

CHAPTER

6

MEDIASHIELD RAID FREQUENTLY ASKED QUESTIONS

The FAQ in this chapter are organized by the following categories:

- Basic RAID Questions
- RAID ROM Setup Questions
- Rebuilding Arrays Questions
- Dedicated Disk Questions
- Array Migrating Questions
- MediaShield Application Questions

Basic RAID Questions

- ***What is RAID?***

  RAID stands for ***R****edundant* ***A****rray of* ***I****ndependent* ***D****isks,* and refers to the grouping of 2 or more disk drives that the system views as a single drive. Different groupings have difference advantages that include better performance and data fault tolerance.

  See "About NVIDIA® MediaShield™" on page 1 for detailed descriptions of the different types of RAID arrays.

- ***What type of RAID array is right for me?***

  In general, for better throughput of non-critical data, use RAID 0; for fault tolerance, use RAID1 or RAID 5, and for better throughput as well as fault tolerance use RAID 0+1.

  See "About NVIDIA® MediaShield™" on page 1 for detailed descriptions of the different types of RAID arrays.

- ***What is the difference between a bootable and a non-bootable RAID array?***

  A system with a non-bootable RAID array includes a separate hard disk that contains the OS and is not part of the RAID array.

  See "Creating a Non-Bootable Array" on page 27 for more information.

  In a bootable RAID array, the OS is installed on the RAID array disks.

  See "Creating a Bootable Array" on page 21 for more information.

- ***I just configured a RAID 1 array—why is the array size one-half the total cumulative size of the drives?***

  RAID 1 uses one-half the total disk space for data redundancy.

  See "RAID 1" on page 5 for more information on RAID1 arrays.

- ***What is the optimal hard drive configuration for RAID 1 (mirror)?***

  In a mirrored array, a mirror is created using the maximum drive size of the smaller of the two drives. Ideal configuration is achieved using drives of identical size.

- ***How do I configure a multiple array system?***

  Up to eight different RAID arrays can be configured and active at the same time. You need to configure each array separately in the RAID BIOS as well as initialize the arrays in Windows.

- ***Why is the cumulative size of a RAID 0 (Stripe) or RAID 0+1 (Stripe-Mirror) not equal to the sum of the drives?***

  The drive size is controlled by stripe blocks.

  For RAID 0: Array size = (smallest drive size) x (number of disks in the array)

  For RAID 0+1: Array size is = ((smallest drive size) x (number of disks in the array)) / 2

- ***Why can I not get into Windows after adding a non-bootable array?***

  Possible cause would be adding the boot drive to the array and then clearing the array.

RAID ROM Setup Questions

- ***Why can I not get into the RAID ROM Setup?***

  You must enable RAID functionality in the system BIOS as explained in "Enabling RAID in the System BIOS" on page 10.

- ***What is the Optimal Striping Block Size in the RAID ROM Setup?***

  The default optimal striping block size is 64KB. NVIDIA recommends using the optimal block size.

- ***What does BBS stand for in the RAID ROM [F10] setup?***

  BBS stands for ***B****IOS* ***B****oot* ***S****pecification.* This indicates that the boot device is defined in the BIOS.

- ***What do I need to clear the MBR (Master Boot Record) when creating an array in the RAID ROM Setup?***

  This is needed to prevent invalid data from appearing in the MBR space on any of the drives included in the array. Not doing so could render the system unstable.

Rebuilding Arrays Questions

- ***How long does the RAID rebuilding process take?***

  In the rebuilding process, all data is copied from one hard drive to another and then the data is synchronized between the two hard drives. Because the rebuilding process occurs in the background in a way that does not affect system performance, the process can take some time and the time it takes depends on the size of the drive, system performance and other factors.

  See "Rebuild an Array" on page 36 for more information.

Dedicated Disk Questions

- ***Can I assign a dedicated disk to a striped array/JBOD or use a free disk with striped array/JBOD?***

  No, free disks and dedicated disks can be only used with a mirrored array, striped-mirror array, or a RAID 5 array.

- ***Once a dedicated disk has been assigned to a RAID 1, RAID 0+1, or RAID 5 array, can I remove it?***

  Yes, a dedicated disk can be removed from a RAID 1, RAID 0+1, or a RAID 5 array.

Array Migrating Questions

- ***Is it possible to migrate a single bootable drive to a two-disk stripe array?***

  That is, if I have a single drive in the system that is not RAID enabled, then decide to add a second drive to the system, will I then be able to migrate the single bootable drive to a two-disk stripe array?

  If "RAID Enable" in the BIOS RAID Config screen is not enabled when the OS is installed, it is not possible to convert the SATA boot drive into a multi-disk bootable RAID array.

  Therefore, if you want to retain the capability to migrate a single SATA boot drive into a multi-disk RAID array at a future time, you must perform the OS install onto a single disk stripe array. You can do this by following the instructions in "Creating a Bootable Array" on page 21 and selecting "RAID Mode" striping and then adding just your single boot disk. Then install the OS using the **F6** install mechanism as described in Step 3: Install the RAID Drivers.

  Later, when you want to migrate the single disk into a multi-disk RAID array, follow the instructions in "Migrate an Array" on page 38.

- ***Can I delete an array while it is being migrated?***

  Yes, but doing so will erase all the data stored on the soon to be migrated array.

- ***Can I migrate a bootable RAID array?***

  Yes, you can migrate to and from any supported RAID configuration.

MediaShield Application Questions

- ***What functions can be performed using the MediaShield application?***

  The following tasks can be performed:

  - View information about RAID 0, RAID 1,RAID 0+1, RAID 5 and JBOD (as well as any supported configuration if you have more than one RAID array active)
  - View Free Disks
  - Assign a dedicated disk to RAID 1, RAID 0+1, and RAID 5
  - Remove a dedicated disk from a RAID 1, RAID 0+1, or RAID 5 array
  - Rebuild a RAID 1, RAID 0+1, or RAID 5 array
  - View the status of the rebuilding process
  - Create a RAID Array
  - Delete a RAID Array
  - Migrate a RAID Array
  - Synchronize an Array

  Note: Not all nForce platforms provide support for all the RAID levels listed. See Table 1.1, "Supported nForce Platforms, RAID Arrays, and Pass-through Disk Management" on page 2 for a matrix of supported RAID levels.

- ***What is S.M.A.R.T. ?***

  S.M.A.R.T. stands for Self-Monitoring, Analysis, and Reporting Technology. It is a disk drive feature that allows software to monitor degradations in disk drive specifications.

  Using this technology, NVIDIA MediaShield lets you monitor the health of disk drives in a RAID array and alerts you when certain degradations indicate an impending hardware failure, giving you time to back up data and replace the drive.