

ForceWare Software MediaShield User's Guide



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CHAPTER



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 4 describes the RAID levels supported by NVIDIA MediaShield.
- "NVIDIA MediaShield Features" on page 10 describes additional features offered by NVIDIA MediaShield.

System Requirements

Hardware Support

NVIDIA MediaShield supports the following NVIDIA[®] nForceTM versions:

- NVIDIA nForce 590 SLI
- NVIDIA nForce 570 SLI
- NVIDIA nForce 570
- NVIDIA nForce 550
- NVIDIA nForce 430
- NVIDIA nForce 410
- NVIDIA nForce4
- NVIDIA nForce4 Ultra
- NVIDIA nForce4 Ultra Intel Edition
- NVIDIA nForce4 SLI
- NVIDIA nForce4 SLI Intel Edition
- NVIDIA nForce4 SLI X16
- NVIDIA nForce4 SLI XE Intel Edition
- NVIDIA nForce4 Professonal IO-4
- NVIDIA nForce4 Professonal Pro
- NVIDIA nForce4 Professonal Pro SLI
- NVIDIA nForce3 Pro250
- NVIDIA nForce3 250Gb
- NVIDIA nForce3 Ultra
- NVIDIA nForce3 250
- NVIDIA nForce3 150
- NVIDIA nForce2 MCP2S

Operating System Support

NVIDIA MediaShield supports the following operating systems:

- Windows[®] XP Home Edition
- Windows XP Professional Edition
- Windows 2000 Professional
- Windows Server 2003

RAID Arrays

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

• RAID 0

RAID 0 defines a disk striping scheme that improves the disk read and write times for many applications.

• RAID 1

RAID 1 defines techniques for mirroring data.

• RAID 0+1

RAID 0+1 combines the techniques used in RAID 0 and RAID 1 arrays.

• RAID 5¹

RAID 5 provides fault tolerance and better utilization of disk capacity.

• JBOD

JBOD provides a method for combining drives of different sizes into one large disk.

Note: Not all nForce platforms provide support for all the RAID levels listed.

^{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.

RAID 0

How RAID 0 Works

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.



Figure 1.1 RAID 0 Array Diagram

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.

- Benefits: Provides increased data throughput, especially for large files.
- **Drawbacks:** No fault tolerance—all data is lost if any drive in the array fails.
- **Uses:** Intended for non-critical data requiring high data throughput, or any environment that does not require fault tolerance.
- Drives: Minimum: 1. Maximum: Up to 8, depending on the platform.
- Fault Tolerance: No.

RAID 1

How RAID 1 Works

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.



Figure 1.2 RAID 1 Array Diagram

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.

- **Benefits:** Provides 100% data redundancy. Should one drive fail, the controller switches to the other drive.
- **Drawbacks:** Requires two drives for the storage space of one drive. Performance is impaired during drive rebuilds.
- **Uses:** RAID 1 is ideal for small databases or any other application that requires fault tolerance and minimal capacity.
- Drives: Minimum, 2. Maximum, 2.
- Fault Tolerance: Yes

RAID 0+1

How RAID 0+1 Works

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



Figure 1.3 RAID 0+1 Array Diagram

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.

- **Benefits:** Optimizes for both fault tolerance and performance, allowing for automatic redundancy. May be simultaneously used with other RAID levels in an array, and allows for spare disks.
- **Drawbacks:** Requires twice the available disk space for data redundancy, the same as RAID level 1.
- Drives: Minimum: 4. Maximum: 6 or 8, depending on the platform.
- Fault Tolerance: Yes

RAID 5

How RAID 5 Works

RAID 5 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.



Figure 1.4 RAID 5 Array Diagram

- **Benefits:** An ideal combination of good performance, good fault tolerance, and high capacity and storage efficiency.
- **Drawbacks:** Individual block data transfer rate same as a single disk. Write performance can be CPU intensive.
- Uses: RAID 5 is recommended for transaction processing and general purpose service.
- Drives: Minimum, 3
- Fault Tolerance: Yes

JBOD

How JBOD Works

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.



Figure 1.5 JBOD Array Diagram

- **Benefits:** JBOD provides the ability to combine odd size drives using all of the capacity of the drives.
- Drawbacks: No additional fault tolerance or performance relative to individual disks.
- Uses: JBOD works best if you have odd sized drives and you want to combine them to make one big drive.
- Fault Tolerance: No

Summary of RAID Configurations

Table 1.1 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

NVIDIA MediaShield Features

Additional RAID Features

NVIDIA MediaShield offers the following additional features:

• Free Disk and Dedicated Spare Disk

A Free Disk or Dedicated Disk can be automatically used in case one drive of a fault-tolerant array fails. NVIDIA MediaShield defines a fault-tolerant array as either RAID 1, RAID 0+1, or RAID 5. A free disk can be used by any available fault-tolerant array, while a dedicated 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.

• Hot Plug Array

A nice flexibility feature is the ability to move MediaShield RAID arrays from one nForce system to another. Since most nForce systems support SATA hot plug capability, you can add/remove a RAID array even while the system is running. This is done using the Hot Plug Array wizard.

Features and Benefits Summary

Features	Benefits
Spare Drive and Dedicated Drive Support	• Allows the user to dedicate a "spare" disk as a hot standby in the event of a array failure.
	• Offers additional protection in case of a failure in a mirrored array.
Bootable RAID	• Supports the use of a RAID drive for loading the operating system at power up for optimal performance
Migrating	• Allows the user to upgrade for more performance, security, and capacity.
	• Allows the user to change the current state of a disk/ array to another array with a one step process called "migrating", without losing any data during the configuration change.
Disk Failure Identification	Notifies the user when a disk fails and indicates which one to replace
Hot Plug Array	• Allows the user to safely add a drive to the array when needed.

CHAPTER 1 About NVIDIA® MediaShield™

C H A P T E R

SETTING UP YOUR RAID CONFIGURATION

This chapter provides instructions for:

- Setting Up a Non-Bootable RAID Array
- Setting Up a Bootable RAID Array

Setting Up a Non-Bootable RAID Array

RAID arrays can be created/deleted using both MediaShield RAID BIOS and the MediaShield RAID Manager from Windows. This section only covers basic BIOS setup required for non-bootable array.

- See the section "Setting Up a Bootable RAID Array" for instructions on configuring the RAID array in BIOS.
- See "Creating RAID Arrays" on page 43 for instructions on how to create a RAID array for your unused SATA storage devices.
- See "Using the NVIDIA MediaShield RAID Management Utility" on page 33 for details on configuring non-bootable RAID from Windows.

Setting Up the BIOS

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

Phoenix - Award BIOS CMOS Setup Utility		
Standard CMOS Features Advanced BIOS Features Advanced Chipset Features	Load Fail-Safe Defaults Load Optimized Defaults Set Supervisor Password	
Integrated Peripherals Power Management Setup PnP / PCI Configurations	Set User Password Save & Exit Setup Exit Without Saving	
Esc : Quit F10 : Save & Exit Setup	$\wedge \psi \rightarrow \leftarrow$: Select Item	
Onboard IO, IRQ, DMA Asşignment		

The BIOS CMOS Setup Utility window appears.



2 Use the arrow keys to select **Integrated Peripherals** (see Figure 2.1), then press **Enter**. The Integrated Peripherals window appears.



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

Phoenix - Award BIOS CMOS Setup Utility RAID Config				
RAID Enable	[Enable]	Item Help		
SATA 1 Primary SATA 1 Secondary SATA 2 Primary SATA 2 Secondary SATA 3 Primary SATA 3 Secondary	RAID [Enabled] RAID [Enabled] RAID [Enabled] RAID [Enabled] RAID [Disabled] RAID [Disabled]	Menu Level ►►		
₩→ ← :Move Enter:Select F5: Previous Values	+/-/PU/PD:Value F10:Save F6: Fail-Safe Defaults F	ESC:Exit F1:General Help 7: Optimized Defaults		

The RAID Config window appears.

Figure 2.3 RAID Config Window

4 From the RAID Config window, globally enable RAID, then enable the SATA ports with disks that you want to use for RAID.

If RAID is enabled globally but not enabled on the individual SATA port, disks on that port can only be used for non-RAID applications.

In the example in Figure 2.3, four SATA ports are enabled, so the non-bootable RAID array can include up to four SATA disks. If there is a disk connected to "SATA 3 Primary" or "SATA 3 Secondary", it can not be used for RAID.

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

The PC reboots.

Installing the NVIDIA MediaShield Software Under Windows

This section describes how to run the setup application and install the RAID software¹.

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



Figure 2.4 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.

^{1.} See the application note "Installing the NVIDIA IDE Driver in Windows 2000" on page 150 for information on how to install the NVIDIA IDE Driver under Windows 2000.

Using RAID Arrays Under Windows

After rebooting the PC, initialize the newly created array under Windows as follows:

- 1 Launch Computer Management by clicking Start → Settings → Control Panel then open the Administrative Tools folder and double click on Computer Management.
- **2** Click Disk Management (under the Storage section).

The Initialize and Convert Disk Wizards appears.



Figure 2.5 Initialize and Convert Disk Wizard

3 Click Next.

The Select Disks to Initialize window appears.

nitialize and Convert Disk Wizard	×
Select Disks to Initialize You must initialize a disk before Logical Disk Manager can access it.	Ŷ
Select one or more disks to initialize. Disks:	
Disk 1	
,	
<pre></pre>	:el

Figure 2.6Select Disks to Initialize Page

The disks listed depend on how many arrays you have configured

4 Click Next.

The Select Disks to Convert window appears.

Initialize and Convert Disk Wizard	
Select Disks to Convert The disks you select will be converted to dynamic disks.	
Select one or more disks to convert: Disks:	
Disk 1	
KBack	Next > Cancel

Figure 2.7 Select Disks to Convert Page

5 Check the disk in the list if you want to make the array a dynamic disk, then click Next. The Completing the Initialize and Convert Disk Wizard window appears.

Initialize and Convert Disk Wizard					
	Completing the Initialize and Convert Disk Wizard You have successfully completed the Initialize and Convert Disk Wizard. You selected the following settings: Initialize: Disk 1 Convert: None				
	< Back Finish Cance	1			

Figure 2.8 Completing the Initialize and Convert Disk Wizard Page

6 Click Finish.

The Computer Management window appears.

📕 Computer Management										
💻 File Action View Window H	elp									_ & ×
	1									
 ← → E III 2 2 E E Computer Management (Local) System Tools Event Viewer Shared Folders Coal Users and Groups Performance Logs and Alerts Device Manager Storage Disk Defragmenter Disk Defragment Services and Applications 	Volume (D:) (E:) (F:) MS-DOS_6 (C:) Solution Solution (C) Solution Solution Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) Solution (C) (C) (C) (C) (C) (C) (C) (C)	Layout Partition Partition Partition Partition MS-DO 1.99 GB Healthy 1111.80 (Unalloca	Type Basic Basic Basic Basic FAT (Syste GB	File System FAT FAT FAT (D:) 2.00 GB FA Healthy	Status Healthy Healthy Healthy (System)	Capacity 2.00 GB 2.00 GB 1.85 GB 1.99 GB (F:) 1.85 GB Healthy	Pree Space 448 MB 1.97 GB 1.85 GB 32 MB 20.72 Unall	% Free 21 % 98 % 100 % 1 %	Fault No No No	Tolerance (
< >	Unallocated	Primary pa	irtition 📘	Extended pa	artition <mark>–</mark> Logical d	rive				
		2000							1.	

Figure 2.9 Computer Management Window

The actual disks listed will depend on your system. In Figure 2.9, 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.

- 7 Format the unallocated disk space.
 - Right click "Unallocated space", select "New Partition..." and follow the Wizard instructions.
 - After the drive has been formatted, it is ready for use. See "Using the NVIDIA MediaShield RAID Management Utility" on page 33 for instructions on how to create and configure RAID arrays.

Setting Up a Bootable RAID Array

This section explains how to configure a bootable RAID array.

Setting Up the BIOS

1 Start your computer, then press **Delete** to enter the BIOS setup. The BIOS CMOS Setup Utility screen appears.



Figure 2.10 BIOS CMOS Setup Utility Main Screen

2 Use the arrow keys to select **Integrated Peripherals** (see Figure 2.10), then press **Enter**.



The Integrated Peripherals screen (or a screen similar to it) appears.

Figure 2.11 Integrated Peripherals Screen

- **3** Use the arrow keys to select the RAID Config (see Figure 2.11).
- 4 Press Enter.

Phoenix - Award BIOS CMOS Setup Utility RAID Config				
RAID Enable	[Enable]	Item Help		
SATA 1 Primary SATA 1 Secondary SATA 2 Primary SATA 2 Secondary SATA 3 Primary SATA 3 Secondary	RAID [Enabled] RAID [Enabled] RAID [Enabled] RAID [Enabled] RAID [Disabled] RAID [Disabled]	Menu Level 🕨		
∧↓-> ← :Move Enter:Select F5: Previous Values	+/-/PU/PD:Value F10:Save F6: Fail-Safe Defaults F	ESC:Exit F1:General Help 7: Optimized Defaults		

The RAID Config screen appears.

Figure 2.12 RAID Config Screen

5 From the RAID Config window, globally enable RAID, then enable the SATA ports with disks that you want to use for RAID.

If RAID is enabled globally but not enabled on the individual SATA port, disks on that port can only be used for non-RAID applications.

In the example in Figure 2.12, four SATA ports are enabled, so the non-bootable RAID array can include up to four SATA disks. If there is a disk Connected to "SATA 3 Primary" or "SATA 3 Secondary", it cannot be used for RAID.

6 Press F10 to save the configuration and exit.

The PC reboots.

7 Enter the RAID BIOS Setup by pressing **F10** when prompted, and proceed to set up the RAID BIOS as described in the next section.

Configuring the NVIDIA 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.

Entering the RAID BIOS Setup:

1 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 screen disappears.

2 Press F10.

The NVIDIA MediaShield Utility – Define a New Array screen appears (Figure 2.13).

Media Shield Utility – Define a New Array –				
RAID Mode: Mirroring	Striping Block: Optimal			
Free Disks	Arrav Disks			
Loc Disk Model Name	Loc Disk Model Name			
1.0.M ST380023AS				
1.1.M ST380023AS	[→] Add			
	<mark>(←]</mark> Del			
[F6] Back [F7] Finish [TAE	B] Navigate [ʌ͡ᡎ] Select [ENTER] Popup			

Figure 2.13 NVIDIA MediaShield Utility

By default, RAID Mode is set to Mirroring and Striping 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 Striping 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. (The "M" field, which used to specify Master or Slave, is obsolete.)



Figure 2.14 Loc Column Information

In Figure 2.14, 1.0. means the hard drive is attached to Adapter 1, Channel 0.

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, Striping, Spanning, Stripe Mirroring or RAID 5.

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

• Selecting the Striping Block Size

Striping 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)

Assigning the Disks

The disks that you enabled from the RAID Config BIOS setup page 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 rightarrow 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 (\rightarrow) until all the disks that you want to use as RAID array disks appear in the Array Disks block.

Figure 2.15 illustrates the Define a New Array screen after two disks have been assigned as RAID1 array disks.



Figure 2.15 MediaShield Utility—Array Disks Assigned

Completing the RAID BIOS Setup

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

The Clear disk array prompt appears.



Figure 2.16 Clear Disk Data Prompt

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

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



Figure 2.17 Array List Window

- **3** Use the arrow keys to select the array that you want to set up, then press **B** to specify the array as bootable.
- **4** Press **Enter** to view and verify details.

The **Array Detail** screen appears.

Array 2 : NVIDIA MIRROR 74.56G - Array Detail -								
RAID M Striping	ode: Mirro y Width : 1	oring		Striping Block 32K				
Adapt	Channel	M/S	Index	Disk Model Name	Capacity			
1	0 1	Master Master	0 1	ST380023AS ST380023AS	74.56GB 74.56GB			
[R] Rebuild [D] Delete [C] Clear Disk [Enter] Return								

Figure 2.18 Array Detail Screen

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

- **5** If you want to mark this disk as empty and wipe out all its contents, press **C**.
- 6 At the prompt, press Y to wipe out all the data, otherwise press N.
- **7** Press **Enter** again to go back to the previous screen and then press **F10** to exit the RAID setup.

Installing the RAID Drivers

Your system may come with a Windows install CD that already includes NVIDIA RAID drivers. If so, then this section is not relevant.

If that is not the case (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.

- 1 Create an F6 install floppy by using the "-x" option, then copy all files in "...\IDE\ WinXP\sataraid" to a floppy disk. (For Windows 2000, substitute "Win2K" in the path.)
- **2** After you complete the RAID BIOS setup, boot from the Windows CD.

The Windows Setup program starts.

3 Press **F6** and wait a few moments for the Windows Setup screen to appear.

Windows Setup							
Setup could not determine the type of one or more mass storage devices installed in your system, or you have chosen to manually specify an adapter. Currently, Setup will load support for the following mass storage device(s):							
<none></none>							
* To specify additional SCSI adapters, CD-ROM drives, or special disk controllers for use with Windows, including those for which you have a device support disk from a mass storage device manufacturer, press S.							
* If you do not have any device support disks from a mass storage device manufacturer, or do not want to specify additional mass storage devices for use with Windows, press ENTER.							
S=Specify Additional Devices ENTER=Continue F3=Exit							
Figure 2.19 Windows Setup—Specify Devices							

- **4** Specify the NVIDIA drivers.
 - **a** Insert the floppy that has the RAID driver, press **S**, then press Enter.

The following Windows Setup screen appears:



Figure 2.20 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:.

Windows S	etup						
Setup w NVIDI/ NVIDI/	ill load support for th A RAID CLASS DRIVE A NForce Storage Co	e following mass stora ER ntroller	age device:				
* To specify additional SCSI adapters, CD-ROM drives, or special disk controllers for use with Windows, including those for which you have a device support disk from a mass storage device manufacturer, press S.							
* If you do not have any device support disks from a mass storage device manufacturer, or do not want to specify additional mass storage devices for use with Windows, press ENTER.							
S=Specify	Additional Devices	ENTER=Continue	F3=Exit				
Figure 2.21	Windows Setup-NV	IDIA drivers listed					

5 Press Enter to continue with Windows XP Installation.

Be sure to leave the floppy disk inserted in the floppy drive until the blue screen portion of Windows XP installation is completed, then take out the floppy.

6 Follow the instructions on how to install Windows XP.

After Windows XP is completely installed, it is recommended that you install the ForceWare software in order to access the MediaShield RAID Management tool.

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.

CHAPTER 2 Setting Up Your RAID Configuration
CHAPTER



USING THE NVIDIA MEDIASHIELD RAID MANAGEMENT UTILITY

About the MediaShield RAID Management Utility

The MediaShield RAID software ships with an application called MediaShield. This chapter describes the MediaShield tasks in the following sections:

• Viewing RAID Array Configurations

View an array configuration (mirrored, striped, mirrored-striped, JBOD, RAID 5 or any supported combination)

- Setting Up a Spare RAID Disk
 - View free and/or dedicated free disks
 - Designate a free disk to a particular array
- Creating RAID Arrays
- Deleting a RAID Array
- Migrating From One RAID Array to Another
- Hot Plug Array

Viewing RAID Array Configurations

To view your RAID configuration from Windows, launch the MediaShield RAID Management utility by double-clicking MediaShield.

The RAID configuration information appears in the right-side pane, as shown in Figure 3.1.

	MediaSh	MediaShield						
System Tasks	Name	Status	Capacity	Interface	Channel	Device		
🐗 Hot Plug Array	Mirroring	Healthy	34.48 GB					
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master		
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master		
	Striping	Healthy	138.50 GB					
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Secondary	Master		
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Primary	Master		
Details								

Figure 3.1 MediaShield RAID Management Utility Window

The following are examples of the information displayed for the various RAID levels. While the details of your own configuration will likely vary from what is shown, the examples serve to illustrate the basic differences between the RAID levels.

Mirrored RAID Array

Figure 3.2 shows an example of a two hard drive mirrored array using identical 34.4 GB¹ SATA hard drives (WD360GB), where one drive is configured as Primary and the other drive is configured as Secondary.The total hard disk space used is 34.4 GB.

Name	Status	Capacity	Interface	Channel	Device
Mirroring	Healthy	34.48 GB			
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master

Figure 3.2 MediaShield Mirrored Array Information

^{1. 1} GB = 1,073,741,824 bytes

Striped RAID Array

Figure 3.3 shows an example of a two hard drive striped array using identical 34.48 GB SATA hard drives (WD360GB), where one drive is configured as Primary and the other drive is configured as Secondary. The total disk space used is 68.95GB.

Name	Status	Capacity	Interface	Channel	Device
Striping	Healthy	68.95 GB		1945 - 19	75.4
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master



Mirrored-Stripe RAID Array

Figure 3.4 shows an example of a four hard drive mirrored-stripe array. The total disk space used is 68.95 GB.

The total storage space is 68.95 GB because the two upper drives (the drives with the 34.48 GB size) are first striped, and then they are mirrored onto the 69.25 GB drives.

Name	Status	Capacity	Interface	Channel	Device
Stripe Mirroring	Healthy	68.95 GB			
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master
WDC WD740GD-00FLA0	Healthy	69.25 GB	SATA	Primary	Master
WDC WD740GD-00FLA0	Healthy	69.25 GB	SATA	Secondary	Master

Figure 3.4 MediaShield Stripe Mirroring Array Information

Spanning (JBOD) RAID Array

Figure 3.5 shows an example of a two hard drive spanning array. The total disk space used is 68.95 GB.

Name	Status	Capacity	Interface	Channel	Device
Spanning	Healthy	68.95 GB	10.	\$0.	10
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master



Mirrored RAID Array and Striped RAID Array

Figure 3.6 shows an example of a two hard drive mirrored array as well as a two hard drive striped array.

≥ <i>n</i> vidia.	MediaSh	ield				-
System Tasks	Name	Status	Capacity	Interface	Channel	Device
🐗 Hot Plug Array	Mirroring	Healthy	34.48 GB			
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master
	Striping 😪	Healthy	138.50 GB			
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Secondary	Master
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Primary	Master
Details						
	<					

Figure 3.6 MediaShield Mirrored Array and Striped Array Information

Setting Up a Spare RAID Disk

You can designate a hard drive to be used as a spare drive for a RAID 1, RAID 0+1 or RAID 5 array². The spare drive can take over for a failed disk. MediaShield RAID supports two types of spare drives:

• Free Disk

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 a particular disk when one of its disks crashes or becomes unusable. The process is automatic and doesn't require any user interaction.

For example, if you have a system with 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, then if one of the mirrored array drives fails, the free disk will be automatically assigned to the mirrored array to be used instead of the failed disk.

Dedicated Disk

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

Note: You must have at least two RAID arrays to use this feature.

^{2.} Spare disks cannot be used for RAID0 or JBOD arrays.

Assigning a Free Disk

To mark a disk as free, or not a part of any array, do the following:

- 1 Enter the system BIOS setup and make sure that the drive that you want to mark as free is RAID enabled.
- **2** Enter the RAID BIOS and make sure that the drive is not part of any array (if one exists).
- **3** Boot into Windows and run the MediaShield program.

The drive appears under the Free Disk section.

Figure 3.7 shows an example of the MediaShield display if you have a mirror array and two free disks.

MediaSh	ield				5
Name	Status	Capacity	Interface	Channel	Device
Mirroring	Healthy	34.48 GB			
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master
WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master
Free Disk					
WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Secondary	Master
WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Primary	Master
	MediaSh Mirroring WDC WD360GD-00FNA0 WDC WD360GD-00FNA0 Free Disk WDC WD740GD-00FLA2 WDC WD740GD-00FLA2	MediaSnield Name Status Mirroring Healthy WDC WD360GD-00FNA0 Healthy WDC WD360GD-00FNA0 Healthy Free Disk WDC WD740GD-00FLA2 Healthy WDC WD740GD-00FLA2 Healthy	Name Status Capacity Mirroring Healthy 34.48 GB WDC WD360GD-00FNA0 Healthy 34.48 GB WDC WD360GD-00FNA0 Healthy 34.48 GB WDC WD360GD-00FNA0 Healthy 34.48 GB Free Disk WDC WD740GD-00FLA2 Healthy WDC WD740GD-00FLA2 Healthy 69.25 GB	Name Status Capacity Interface Mirroring Healthy 34.48 GB WDC WD360GD-00FNA0 Healthy 69.25 GB WDC WD740GD-00FLA2 Healthy 69.25 GB WDC WD740GD-00FLA2 Healthy 69.25 GB	Name Status Capacity Interface Channel Mirroring Healthy 34.48 GB 34.48 GB WDC WD360GD-00FNA0 Healthy 34.48 GB SATA Secondary WDC WD360GD-00FNA0 Healthy 34.48 GB SATA Secondary WDC WD360GD-00FNA0 Healthy 34.48 GB SATA Primary Free Disk WDC WD740GD-00FLA2 Healthy 69.25 GB SATA Secondary WDC WD740GD-00FLA2 Healthy 69.25 GB SATA Primary

Figure 3.7 MediaShield Free Disk Information

Assigning a Dedicated Disk

To mark a disk as dedicated, or reserve it for use by a specific array, you must have at least one free disk and you must also have at least two RAID 1, RAID 0+1, or RAID 5 arrays created. In this example, there are two mirrored arrays and two free disks.

Step 1: Mark the Disk as a Free Disk

- 1 Enter the system BIOS setup and make sure that the drive that you want to mark as free is RAID enabled.
- **2** Boot into Windows and run the MediaShield program.

If the disk is not part of any RAID array, then it will appear under the Free Disk section of the RAID GUI.

Step 2: Dedicate the Free Disk to an Array

While running MediaShield, dedicate a free disk to an array by doing the following:

1 Right click one of the two Mirrored arrays as shown below

System Tasks	Name	Status	Capacity	Interface	Channel	Device
🐗 Hot Plug Array	Mirroring	Healthy	34.48 GB			
Rebuild Array	✓WDC WD36 ✓WDC WD36	Hot Plug Array	48 GB 48 GB	SATA SATA	Primary Secondary	Master Master
Create Array	Mirroring	Designate Spare Create Array	🔓 25 GB			
🗳 Synchronize Array	WDC WD74 WDC WD74	Delete Array Convert Array Synchronize Array	25 GB 25 GB	SATA SATA	Primary Secondary	Master Master
	Free Disk					
Details	ST380011A	Healthy	74.53 GB	PATA	Secondary	Master
	ST380011A	Healthy	74.53 GB	PATA	Secondary	Slave

Figure 3.8 Designate Spare Pop-up Menu





Figure 3.9 Spare Disk Allocation Wizard

3 Click Next.

The Free Disk Selection page appears.



Figure 3.10 Free Disk Selection Page

- From the Free Disk Selection page, select one of the two free disks available. This would be the disk that will be designated to the mirror array.Note: In Figure 3.10 there are two disks available.
- 5 Click Next.

The Completing the NVIDIA Spare Disk Allocation page appears.

NVIDIA Spare Disk Allocati	on Wizard 🛛 🛛 🔀
	Completing the NVIDIA Spare Disk Allocation Wizard This is the final step of the NVIDIA Spare Disk Allocation Wizard. You have chosen to allocate: ST380011A As a Spare Disk for the following RAID array: NVIDIA MIRROR 34.47G To designate the selected Spare Disk, click Finish
	< Back Finish Cancel

Figure 3.11 Completing Spare Disk Allocation Wizard Page

6 Click Finish.

As shown in Figure 3.12, the ST380011A drive is now a dedicated free disk in the mirrored array.

≥ nvidia.	MediaSh	ield				
System Tasks	Name	Status	Capacity	Interface	Channel	Device
🐗 Hot Plug Array	Mirroring	Healthy	34.48 GB			
Tesignate Spare Disk	ST380011A	Healthy	74.53 GB	PATA	Secondary	Master
Create Array	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master
	Wirroring	Healthy	69.25 GB			
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Primary	Master
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Secondary	Master
Details	Free Disk					
DECONS	ST380011A	Healthy	74.53 GB	PATA	Secondary	Slave

Figure 3.12 Designated Spare Disk

If a system crash occurs that causes any of the two WD360GD drives to fail, the ST380011A hard drive will take over and be used in the newly formed mirrored array.

Removing a Dedicated Disk

Once a dedicated disk has been assigned to a particular array, it can be removed at any time. To remove the disk, right click on the dedicated disk and select "Remove Disk…" to remove it. In the previous example, simply right click on the ST380011A drive and select "Remove Disk…". as shown in the screen shot below:

ystem Tasks	Name		Status	Capacity	Interface	Channel	Device
🐗 Hot Plug Array	Mirror	ring	Healthy	34.48 GB			
Add Spare Disk to this Array Remove Spare Disk Convert Array Create Array Delete Array Synchronize Array	ST3800 SWDC SWDC	Hot Plug Array Designate Spare. Remove Disk Create Array Delete Array Convert Array	Healtby y y	74.53 GB 34.48 GB 34.48 GB 69.25 GB 69.25 GB	PATA SATA SATA SATA	Secondary Primary Secondary Primary	Master Master Master Master
etails	Free D	Disk D11A	Y y Healthy	69.25 GB 74.53 GB	PATA	Secondary	Master Slave

Figure 3.13 Removing a Dedicated Disk

Creating RAID Arrays

This section covers use of the MediaShield Creation Wizard. This wizard will step through configuration of your available storage.

There are three ways in which the MediaShield Create Wizard can be launched:

• Using the balloon popup that appears when the system boots:

🔥 Before formatting your new disks	×
Your system has 3 new disks available. Before formatt NVIDIA MediaShield can help you configure them to be your storage needs.	ing, est meet
To configure your disks, click this message.	

This balloon indicates that MediaShield has discovered free disks in your system available for configuration. If you click on the bubble, the MediaShield Create Wizard will be launched.

- **Note:** This balloon will only pop up if you have up to three available disks. If you have four or more disks available, you must use one of the remaining two methods to start the MediaShield Create Wizard.
- Using the following dialog that appears when launching MediaShield:



If you select **Yes**, the MediaShield Create Wizard will be launched, and will step you through configuration of your storage.

• You can also select the Create option under System Tasks to launch the MediaShield Create Wizard.

Using the MediaShield Create Wizard

The MediaShield Create Wizard walks you through the creation of your available storage resources.

NVIDIA MediaShield Setup	Wizard 🛛 🔀
	Welcome to the NVIDIA MediaShield Setup Wizard
S	This wizard will help you optimize the storage configuration of your new disks.
	MediaShield allows you to configure your disks to best meet your storage needs.
	You have the following disks available:
	Hard Drive 1: 69.25 GB Hard Drive 2: 69.25 GB
	To continue, click Next.
	< Back Next > Cancel

Figure 3.14 MediaShield Wizard Welcome Screen

The welcome screen lists the disks that are available for configuration.

1 Click Next to go to the following screen:



Figure 3.15 MediaShield Wizard–Select a Configuration Screen

Note: You will only see this screen if you have less than 4 free disks in the system. If there are 4 or more free disks available, you will proceed to directly to custom setup.

As shown in Figure 3.15, there are three options:

- Protection
- Capacity
- Custom

Protection

Select this option and MediaShield will automatically configure the best RAID option based on the number of drives and with the criteria that if a drive fails you will not lose your data. The total capacity of the volume that will be created is displayed. You can click on **more information** to see a detailed description of the volume that will be created.

1 Click Next.

The following screen appears:

NVIDIA MediaShield Setup	Wizard	X
	Completing the NVIDIA MediaShield Setup Wizard This is the final step of the MediaShield Setup Wizard. You have selected the Protection configuration: Total capacity: 69.25 GB Disk failure protection: FULL	
	After this wizard is finished, you will need to initialize, partition and format your disks using Windows Disk Manager. Launch Windows Disk Manager when finished To apply this configuration, click Finish	
	< <u>B</u> ack Finish Cano	el

The checkbox titled "Launch Windows Disk Manager when finished" will automatically bring up Windows Disk Manager to complete the configuration.

See the chapter titled "Initializing and Using the RAID Array Under Windows" for more information on using Windows Disk Manager.

2 Click Finish.

Your RAID volume will be configured and ready for use.

Capacity

Select this option and MediaShield will automatically configure the best RAID option based on the number of drives and the desire for maximum capacity. This array will NOT be fault-tolerant, so choose this option only if your data is non-critical or is being backed up. The total capacity of the volume that will be created is displayed. You can click on **more information** to see a detailed description of the volume that will be created.

1 Click Next.

The following screen appears:

NVIDIA MediaShield Setup	Wizard 🛛
	Completing the NVIDIA MediaShield Setup Wizard This is the final step of the MediaShield Setup Wizard. You have selected the Capacity configuration: Total capacity: 138.50 GB Disk failure protection: NONE
	After this wizard is finished, you will need to initialize, partition and format your disks using Windows Disk Manager.
	< Back Finish Cancel

The checkbox titled "Launch Windows Disk Manager when finished" will automatically bring up Windows Disk Manager to complete the configuration. See the chapter titled "Initializing and Using the RAID Array Under Windows" for more information on using Windows Disk Manager.

2 Click Finish.

Your RAID volume will be configured and ready for use.

Custom

Select this option to perform the RAID array configuration yourself.

Note: Custom is the only option if there are 4 or more free disks in system.

Click **Next** to see the RAID Array Selection screen. The next sections explain how to custom create various types of RAID arrays.

Creating a Striped Array

MediaShield can be used to create a striped array from one disk up to the maximum supported number of disks in the system.

To create a two-disk Striped Array do the following:

- 1 Make sure the drives that you want to use are RAID-enabled in the system BIOS.
- **2** Select the Custom option in the MediaShield Create Wizard.
- **3** :Click **Next** and the following screen shot will appear:

NVIDIA Create Arra	y Wizard			X
RAID Array Select Please select the	ion ⊨type of RAID array to	create.		<u></u>
Select the type of	of RAID array to create.			
RAID Mode:	Mirroring	•		
Stripe Size:	64k 💌			
		< Back	Next >	Cancel

Figure 3.16 RAID Array Selection Page

4 Click the RAID Mode list arrow and select Striping, and leave the "Stripe Size" with its default value as shown in the following screen shot:

NVIDIA Create Array	Wizard			×
RAID Array Selecti Please select the	ion type of RAID array to ci	reate.		
Select the type o	f RAID array to create.			
RAID Mode:	Striping	•		
Stripe Size:	<mark>64k</mark>			
		V.		
		< Back	Next >	Cancel

Figure 3.17 RAID Array Selection—Striping

5 Click **Next**, and the following screen shot will appear:

Wante Channer Device WDC WD360GD-00FNA0 Primary Master WDC WD360GD-00FNA0 Secondary Master WDC WD740GD-00FLA0 Primary Master WDC WD740GD-00FLA0 Secondary Master	Free Disks:	Chappel	Device	
	WDC WD360GD-00FNA0 WDC WD360GD-00FNA0 WDC WD740GD-00FLA0 WDC WD740GD-00FLA0	Primary Secondary Primary Secondary	Master Master Master Master	

Figure 3.18 Free Disk Selection Page

6 Select the two disks that you want to include in the stripe set.

In this example the upper two disks were selected as shown in Figure 3.19.

WDC WD360GD-00FNA0 Primary Master	Name	Channel	Device		
WDC WD740GD-00FLA0 Secondary Master	WDC WD360gD-00FNA0	Secondary Primary Secondary	Master Master Master	R	

Figure 3.19 Free Disk Selection Page—Selecting Disks

To create a striped array with more disks, select additional disks from the list.

7 Click Next and click Next again, then the following screen shot will appear:



Figure 3.20 Clearing System Data

8 To clear all system data from the drives click on Next and the following will appear:



Figure 3.21 Completing the NVIDIA Create Array Wizard

9 Click **Finish** and the following screen shot will appear:

Hot Plug Array Striping Healthy 153.39 GB Create Array HDS728080PLSA80 Healthy 76.69 GB SATA Primary HDS728080PLSA80 Healthy 76.69 GB SATA Primary	Master Master
Create Array WHD5728080PL5A80 Healthy 76.69 GB 5ATA Primary WHD5728080PL5A80 Healthy 76.69 GB 5ATA Primary	Master Master
HDS728080PLSA80 Healthy 76.69 GB SATA Primary	Master
Free Disk	
HDS728080PLSA80 Healthy 76.69 GB SATA Secondary	Master
HDS728080PLSA80 Healthy 76.69 GB SATA Secondary	Master



As you can see from the above screen shot a striped array with two SATA disks has been created, while the other two disks are allocated as Free Disks.

To create an array with three or more disks, be sure to add the number of disks that you want to use in the array during creation. To "extend" the size of an existing striped array, use the process described in "Migrating From One RAID Array to Another" on page 69.

Creating a Mirrored Array

The MediaShield application can be used to create a Mirrored Array. By definition, a mirrored array consists of two drives. Data is written to both drives, and if one drive fails then data can be recovered from the other drive.

To create a Mirrored Array, do the following:

- 1 Make sure the drives that you want to use are RAID-enabled in the system BIOS.
- 2 Select the Custom option in the MediaShield Create Wizard.
- **3** Click **Next** and the following screen will appear:

Name		Channel	Device	
	WDC WD360GD-00FNA0 WDC WD360GD-00FNA0 WDC WD740GD-00FLA0 WDC WD740GD-00FLA0	Primary Secondary Primary Secondary	Master Master Master Master	

Figure 3.23 Free Disk Selection Page

4 Select the two drives that you want to use in the Mirrored array.

In this example the upper two disks were selected as shown in Figure 3.24.

		Channer	Device		
♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥ ♥	VD360GD-00FNA0 VD360GD-00FNA0 VD740GD-00FLA0 VD740GD-00FLA0	Secondary Primary Secondary	Master Master Master	ß	

Figure 3.24 Free Disk Selection Page—Selecting Disks

5 Click **Next** and click **Next** again, then the following screen shot will appear:

NVIDIA Create Array Wizard	X
Clear system Data Clear system data from disks to prepare for use in array.	1
Expert Only: You may choose to keep the system data by unchecking the Clear System Data check box below. Note that this may not preserve the data in any usable form, and may cause system instability and other undesirable effects.	
✓ Clear System Data Initialize Array	
< Back Next > Cancel	כ

Figure 3.25 Clearing System Data



6 To clear all system data from the drives click on **Next** and the following will appear:

Figure 3.26 Completing the NVIDIA Create Array Wizard

7 Click Finish.

≥ <i>n</i> vidia.	Media	Shield	4	_	_		-
System Tasks	Name	Status	Capacity	Interface	Channel	Device	
🐗 Hot Plug Array	Mirroring	Healthy	76.69 GB				
🐝 Create Array	✓HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master	
	HD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master	
	Free Disk						
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master	
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master	
Details							

Figure 3.27 Mirrored RAID Array Created

A mirrored array has been created, while the other two disks are set to free disks.

Creating a Stripe Mirroring Array

MediaShield can be used to create a Stripe Mirroring array which requires at least four disks to start such an array.

To create a Stripe Mirror Array do the following:

- **1** Make sure the drives that you want to use are RAID-enabled in the system BIOS.
- **2** Select the Custom option in the MediaShield Create Wizard.
- **3** Click **Next** and the following screen will appear:

NVIDIA Create Array	Wizard	
RAID Array Select Please select the	on type of RAID array to create.	
Select the type o	RAID array to create.	
RAID Mode:	Mirroring	
Stripe Size:	64k 💌	
	< Ba	:k Next > Cancel

Figure 3.28 RAID Array Selection

4 Click on "RAID Mode:" and select "Stripe Mirroring" while leaving the Stripe Size set to its default value as shown in the following screen shot:

NVIDIA Create Array Wizard	×
RAID Array Selection Please select the type of RAID array to cr	eate.
Select the type of RAID array to create.	
RAID Mode: Stripe Mirroring	
Stripe Size: 64k 💌	
	< Back Next > Cancel

Figure 3.29 RAID Array Selection—Stripe Mirroring

5 Click **Next** and the following screen will appear:

NVID	A Create Array Wizard			
Fre	ee Disk Selection Select the disks to add to the nev	v RAID array	,	<u>s</u>
	Free Disks:			
	Name	Channel	Device	
	WDC WD360GD-00FNA0 WDC WD360GD-00FNA0 WDC WD740GD-00FLA0 WDC WD740GD-00FLA0	Primary Secondary Primary Secondary	Master Master Master Master	
	A Striping array requires 1 or mor	e free hard c	disks. < Back Next >	Cancel

Figure 3.30 Free Disk Selection Page

6 Select the four drives that you want to use in the Stripe Mirroring array.

In this example all of the drives are selected as shown in the following screen shot:

WDC WD360GD-00FNA0 Primary Master WDC WD360GD-00FNA0 Secondary Master
W WDC WD740GD-00FLA0 Primary Master WDC WD740GD-00FLA0 Secondary Master

Figure 3.31 Free Disk Selection Page—Selecting Disks

7 Click Next and click Next again, then the following screen shot will appear:



Figure 3.32 Clearing System Data



8 To clear all system data from the drives click on Next and the following will appear:

Figure 3.33 Completing the NVIDIA Create Array Wizard

NVIDIA.	Media	Shield	1				- ×
System Tasks	Name	Status	Capacity	Interface	Channel	Device	1
🐗Hot Plug Array	Mirroring	Healthy	76.69 GB				
of Create Array	✓HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master	
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master	
	Free Disk						
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master	
	HD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master	
Details							
	10- 10- 10-						

9 Click **Finish** and the following screen shot will appear:

Figure 3.34 RAID Stripe Array Created

A Stripe Mirroring array has been created.

Creating a Spanning Array

MediaShield can be used to create a Spanning Array which requires at least one disk to start such an array.

To create a Spanning Array do the following:

- **1** Make sure the drives that you want to use are RAID-enabled in the system BIOS.
- **2** Select the Custom option in the MediaShield Create Wizard.
- **3** Click **Next** and the following screen will appear:

NVIDIA Create Array	Wizard	
RAID Array Select Please select the	on type of RAID array to create.	
Select the type o	RAID array to create.	
RAID Mode:	Mirroring	
Stripe Size:	64k 💌	
	< Ba	:k Next > Cancel

Figure 3.35 RAID Array Selection Page

4 Click the RAID Mode list arrow and select "Spanning" while leaving the Stripe Size set to its default value as shown in the following screen shot:

NVIDIA Create Array Wizard	×
RAID Array Selection Please select the type of RAID array to cre	ate.
Select the type of RAID array to create.	
RAID Mode: Spanning	•
Stripe Size: 64k 💌	
	< Back Next > Cancel

Figure 3.36 RAID Array Selection Page—Spanning

5 Click **Next** and the following screen shot will appear:

NVIDIA	Create Array Wizard			
Free S	Disk Selection ielect the disks to add to the new	v RAID array	i	
F	ree Disks:			
	Name	Channel	Device	
Δ	WDC WD360GD-00FNA0 WDC WD360GD-00FNA0 WDC WD740GD-00FLA0 WDC WD740GD-00FLA0	Primary Secondary Primary Secondary	Master Master Master Master	
			< Back Next >	Cancel

Figure 3.37 Free Disk Selection Page

6 Select the two drives that you want to use in the Spanned array.

In this example the upper two disks were selected as shown in the following screen shot:

Name	Channel	Device		
WDC WD360GD-00FNA0	Primary	Master		
WDC WD360GD-00FNA0	Secondary	Master	2	
WDC WD740GD-00FLA0	Primary	Master	~	
A Striping array requires 1 or mor	re free hard c	lisks.		

Figure 3.38 Free Disk Selection Page—Selecting Disks

7 Click Next and Next again, the following screen shot will appear:



Figure 3.39 Clearing System Data

8 To clear all system data from the drives click on Next and the following will appear:



Figure 3.40 Completing the NVIDIA Create Array Wizard

9 Click **Finish** and the following screen shot will appear:

System Tasks	Name	Status	Capacity	Interface	Channel	Device
🐗 Hot Plug Array	Spanning	Healthy	68.95 GB			
Create Array	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master
	Free Disk					
	WDC WD740GD-00FLA0	Healthy	69.25 GB	SATA	Primary	Master
	WDC WD740GD-00FLA0	Healthy	69.25 GB	SATA	Secondary	Master
Details						

Figure 3.41 RAID Spanned Array Created

A Spanned Array has been created.

Creating a RAID 5 Array

MediaShield can be used to create a RAID 5 array using at least 3 disks and up to the maximum supported number of disks in the system.

To create a 3 disk RAID 5 Array do the following:

- 1 Make sure the drives that you want to use are RAID-enabled in the system BIOS.
- **2** Select the Custom option in the MediaShield Create Wizard.
- **3** :Click **Next** and the following screen shot will appear:

NVIDIA Create Arra	/ Wizard	
RAID Array Select Please select the	ion type of RAID array to create.	
Select the type (f RAID array to create.	
RAID Mode:	Mirroring	
Stripe Size:	64k 💌	
	< Back	Next > Cancel

Figure 3.42 RAID Array Selection Page

4 Click the RAID Mode list arrow and select RAID 5, and leave the "Stripe Size" with its default value as shown in the following screen shot:

NVIDIA Create Arra	y Wizard	×
RAID Array Select Please select the	ion type of RAID array to create.	©.
Select the type (f RAID array to create.	
RAID Mode:	RAID 5	
Stripe Size:	64k 🖌	
	< Back	lext > Cancel

Figure 3.43 RAID Array Selection—RAID 5

5 Click **Next**, and the following screen shot will appear:

NVIDI	A Create Array Wizard			X
Fre	ee Disk Selection Select the disks to add to the	e new RAID a	rray.	
	Free Disks:			
	Name	Channel	Device	
	A RAID 5 array requires 3 or	Primary Secondary Primary Secondary more free ha	Master Master Master Master	
_			<pre>Back Next ></pre>	Cancel

Figure 3.44 Free Disk Selection Page

6 Select the three disks that you want to include in the RAID 5 array. In this example the upper three disks were selected as shown in Figure 3.19.

Name	Channel	Device	
 ✓ → HDS728080PLSA80 ✓ → HDS728080PLSA80 ✓ → HDS728080PLSA80 ✓ → HDS728080PLSA80 	Primary Secondary Primary Secondary	Master Master Master Master	

Figure 3.45 Free Disk Selection Page—Selecting Disks

To create a RAID 5 array with more disks, select additional disks from the list.

7 Click Next and Next again, the following screen shot will appear:



Figure 3.46 Clearing System Data



8 To clear all system data from the drives click Next.

Figure 3.47 Completing the NVIDIA Create Array Wizard

9 Click Finish and the following screen shot will appear:

👁 nvidia.	Media	Shiel	1			- >
System Tasks	Name	Status	Capacity	Interface	Channel	Device
🐗 Hot Plug Array	Sector Raid 5	Healthy	153.39 GB			
🗳 Create Array	HD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master
	Free Disk					
	HD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master
Details						

Figure 3.48 RAID 5 Array Created

As you can see from the above screen shot a RAID 5 array with 3 SATA disks has been created, while the other one disk is allocated as a Free Disk. Similarly, to create an array with four or more disks, simply make sure to add the number of disks that you want to use in the array during creation.

You can also "extend" the size of an existing RAID 5 array but that requires that you use migrating— the ability to convert from one RAID array to another as described in "Migrating From One RAID Array to Another" on page 69

Deleting a RAID Array

MediaShield can be used to delete an Array.

To delete an Array do the following:

1 Launch the MediaShield application and right click on the RAID array that you want to delete (assuming that you have a RAID array already created) as shown in the following screen shot:

iystem Tasks	Name	Status	Capacity	Interface	Channel	Device	
🐗 Hot Plug Array	Mirroring) Healthy	76.69 GB				
 Rebuild Array Convert Array Create Array Delete Array 	❤ HD572808 ♥ HD57281	OPI SA80 Healthy Hot Plug Array Rebuild Array	76-69 GB 19 GB	SATA SATA	Primary Secondary	Master Master	
Synchronize Array	Free Di	Create Array Delete Array	N				
	≪HD5728 ≪HD5728	Convert Array Synchronize Arra	√ ¦9 GB ∕ j9 GB	SATA SATA	Primary Secondary	Master Master	
retails							

Figure 3.49 Selecting "Delete Array" from the Pop Up Menu

The above screen shot shows that there is a Mirrored array that will be deleted.



After the "Delete Array..." has been selected, the following screen shot appear:

Figure 3.50 Delete Array Wizard—Welcome Page

2 Click **Next** and the following screen shot will appear:



Figure 3.51 Completing the NVIDIA Delete Array Wizard Page

3 Click **Finish** and the array will be deleted and the following screen shot will appear showing all the free disks:

≥ <i>n</i> vidia.	MediaShield						-)	
System Tasks	Name	Status	Capacity	Interface	Channel	Device	1	
🐗 Hot Plug Array	Free Disk							
🗳 Create Array	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master		
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master		
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master		
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master		
Details								
							_	

Figure 3.52 RAID Array Deleted

A similar process can be applied to delete any array created by MediaShield RAID.
Migrating From One RAID Array to Another

In a traditional RAID environment, when a user wants to change the current state of a disk or a current array to a new RAID configuration, the process of reconfiguring the new array involves multiple steps. The user must back up the data, delete the array, re-boot the PC, and then reconfigure the new array.

MediaShield RAID allows the end user 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 Principles

MediaShield RAID includes extensive support for migrating, a process of converting from one RAID mode to another RAID mode.

General Requirements and Limitations

• 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.

- 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
- Free disks used for migrating must be no smaller than any of the current disks in the array.

Specific Migrating Requirements

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

From	То	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	<i>m</i> =2, <i>n</i> =1
		RAID 1 array must include two disks, converted from a one disk RAID 0 array.
	RAID 0+1	$m \ge 2 \ge n$
		Number of RAID 0+1 disks must be equal to or greater than twice the number of RAID 0 disks.
	RAID 5	$m \ge n+1$
RAID 1	RAID 0	No additional restrictions.
	RAID 1	** Not a valid combination **
	RAID 0+1	No additional restrictions.
	RAID 5	$m \ge 3$
RAID 0+1	RAID 0	$m \ge n/2$
		Number of RAID 0 disks must be equal to or greater than half the number of RAID 0+1 disks.
	RAID 1	** Not a valid combination **
	RAID 0+1	$m \ge n + 2$; where <i>m</i> 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	$m \ge (n/2 + 1)$
RAID 5	RAID 0	$m \ge n - 1$
	RAID 1	** Not a valid combination **
	RAID 0+1	$m \ge 2 \ge (n - 1)$; where <i>m</i> is an even number of disks.
	RAID 5	$m \ge n$

Table 3.1 RAID Array Disk Requirements for Migrating

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

Migrating Instructions

This sections includes specific instructions for the following RAID migrating combinations:

- "Migrating from RAID 0 to RAID 0—Adding a Disk to a Stripe Set" on page 72
- "Migrating from RAID 0 (with One Disk) to RAID 1 (with Two Disks)" on page 77
- "Migrating from RAID 0 to RAID 0+1" on page 81
- "Migrating from RAID 1 to RAID 0" on page 86
- "Migrating from RAID 1 to RAID 0+1" on page 90
- "Migrating from RAID 0+1 to RAID 0" on page 95
- "Migrating from RAID 0+1 to RAID 0+1" on page 99
- "Migrating from RAID 0 to RAID 5" on page 103
- "Migrating from RAID 1 to RAID 5" on page 108
- "Migrating from RAID 0+1 to RAID 5" on page 112
- "Migrating from RAID 5 to RAID 0" on page 115
- "Migrating from RAID 5 to RAID 0+1" on page 118
- "Migrating from RAID 5 to RAID 5" on page 121

Migrating from RAID 0 to RAID 0—Adding a Disk to a Stripe Set

The following example shows you how to expand a RAID 0 array with two disks to include an additional disk.

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a Striped Array" on page 47 to create a two disk stripe array.

Media	Shield	1				- ×
Name	Status	Capacity	Interface	Channel	Device	n i
Striping 😻	Healthy	153.39 GB				
HDS728080PLSA80 HDS728080PLSA80	Healthy Healthy	76.69 GB 76.69 GB	SATA SATA	Primary Primary	Master Master	
Free Disk						
WHD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master	
*** HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master	
	Media	Media Shield	Media Shield	Media Shield Name Status Capacity Interface Striping Healthy 153.39 GB HD5728080PL5A80 Healthy 76.69 GB SATA HD5728080PL5A80 Healthy 76.69 GB SATA Free Disk HD5728080PL5A80 Healthy 76.69 GB SATA HD5728080PL5A80 Healthy 76.69 GB SATA	Name Status Capacity Interface Channel Striping Healthy 153.39 GB Healthy 153.39 GB HD5728080PL5A80 Healthy 76.69 GB SATA Primary HD5728080PL5A80 Healthy 76.69 GB SATA Primary Free Disk	Name Status Capacity Interface Channel Device Striping Healthy 153.39 GB HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master Free Disk

When that is done, you should see a screen shot similar to the following:

Figure 3.53 RAID Array Created

Now that a two disk stripe array has been created, you can use the MediaShield convert feature to migrate the array from a two-disk RAID 0 into a three-disk RAID 0 array.

3 Right click on the newly created striped array (or existing striped array) and a select "Convert Array..." as shown from the following screen shot:

\bigcirc <i>n</i> VIDIA.	MediaShield	- ×
System Tasks	Name Status Capacity Interface Channel	Device
💑 Convert Array 丈 Create Array 🛃 Delete Array	HD572808/09/50 Son Healthou 76.69 GB SATA Primary HD572808 Hot Plug Array 9 GB SATA Secondary Create Array Free Dist Convert Array	Master Master
	HD5728080PLSA80 Healthy 79.69 GB SATA Primary HD5728080PLSA80 Healthy 76.69 GB SATA Secondary	Master Master
Details		

Figure 3.54 Selecting "Convert Array" from the Pop Up Menu

4 After selecting "Convert Array..." the following screen shot will appear:



Figure 3.55 Convert Array Wizard—Welcome Screen



Figure 3.56 RAID Mode Selection Page

6 Click Next and the following screen shot will appear:

NVIDI	A Convert Array Wizard					×
Fre	ee Disk Selection Select the disks to add to the	new RAID	array.			#
	Free Disks:				191	
	Name	Capacity	Channel	Device		
	HDS728080PLSA80	76.69 GB 76.69 GB	Primary Secondary	Master Master		
-	Selecting a free disk removes be erased and replaced with	it from the content fro	free disk poo n the RAID a < Bac	I. The conten rray. k Next	ts of the disk will	

Figure 3.57 Free Disk Selection Page

7 Select the disk (or disks) that you want to add to the existing striped array.

In this example, we are adding one disk (which is the upper disk) to the existing twodisk striped array. So, select the first disk and click **Next** and the following screen shot will appear:



Figure 3.58 Completing the NVIDIA Convert Array Wizard Screen

8 Click **Finish** then click on the newly created three disk striped array and the following screen shot will appear:

≥ nvidia.	Media	Shield				- >
System Tasks	Name	Status	Capacity	Interface	Channel	Device
🐗Hot Plug Array	Striping	Upgrading (0%)	230.08 GB			
Convert Array	HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master
	Free Disk					
	HD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master
Details						
Upgrading: 0.04% complete	<					>

Figure 3.59 New RAID Array

The Migrating Process

As you can see from the screen shot above, a three disk stripe array has been created and the migrating process has begun. A pop up window similar to the following will appear:



followed by the following pop up window:

🔱 Upgrade I	n Progress. 🗵
NVIDIA STRIPE	230.07G

It will take some time before the entire process is completed. The time it takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

More About This Example

When creating a stripe array using hard drives of different sizes, the stripe array uses the stripe size of the smallest drive. For example, if you try to create a 3-disk stripe array that consists of a 10 GB, 20 GB and 40 GB hard drive, the resulting 3-disk stripe array will have a capacity of 30 GB (since 10 GB x 3 = 30 GB).

Migrating from RAID 0 (with One Disk) to RAID 1 (with Two Disks)

The following example shows you how to convert a RAID 0 array with one disk to a RAID 1 array (with two disks)

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a Striped Array" on page 47 with the exception that you need to select one disk instead of two disks.

When that is done, you should see a screen shot similar to the following:

≥ <i>n</i> vidia.	Media	Shield	1				-
System Tasks	Name	Status	Capacity	Interface	Channel	Device	
💰 Hot Plug Array	Striping 🦋	Healthy	76.69 GB				
Create Array		Healthy	76.69 GB	SATA	Primary	Master	
	Free Disk						
		Healthy	76.69 GB	SATA	Primary	Master	
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master	
	HD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master	
Details							

Figure 3.60 RAID Array Created

3 Click click on **Striping** and select "Convert Array..." as shown in the following screen shot:

iystem Tasks	Name	Status	Capacity	Interface	Channel	Device	
🐳 Hot Plug Array	Striping	Healthy	76.69 GB				
Convert Array Create Array Delete Array	HD572808 H Free Disl D	lot Plug Array reate Array elete Array	9 GB	SATA	Primary	Master	
	HD572808	onvert Array A80 Healthy	9 GB 76.69 GB	SATA SATA	Secondary Primary	Master Master	
	* HD5728080PL5	A80 Healthy	76.69 GB	SATA	Secondary	Master	
vetails							

Figure 3.61 Selecting "Convert Array" from the Pop Up Menu



After selecting "Convert Array..." the following screen shot will appear:

Figure 3.62 Convert Array Wizard—Welcome Screen

4 Click **Next** and the following screen shot will appear:

NVIDIA Convert Array Wizard	
RAID Mode Selection Please select the RAID Mode to convert the array to.	
Select the RAID mode to change this array into.	
New RAID Mode:	
You must select free disks to add to the new Striping array. Each disk's capacity must be at least 76.69 gigabytes. At least 1 disks must be added.	
<pre></pre>	Cancel

Figure 3.63 RAID Mode Selection Page

5 For the "New RAID Mode:" entry select Mirror as shown in the following screen shot:

NVIDIA Convert Array W	'izar d			×
RAID Mode Selection Please select the RAII) Mode to convert the	array to.		HR.
Select the RAID mode	to change this array in	ito.		
New RAID Mode:	Mirroring	~		
You must select a free Each disk's capacity	disk to add to the new / must be at least 76.6	v Mirroring array. 9 gigabytes.		
	(< Back Ne	ext > Cancel	

Figure 3.64 RAID Mode Selection Page—Selecting Mirroring

6 Click Next and the following screen shot will appear:

IA Convert Array Wizard				
ee Disk Selection Select the disks to add to the	new RAID	array.		۲
Free Disks:				
Name	Capacity	Channel	Device	
HDS728080PLSA80	76.69 GB	Secondary	Master	
HDS728080PLSA80	76.69 GB	Primary	Master	
HD5728080PL5A80	76.69 GB	Secondary	Master	
Selecting a free disk removes be erased and replaced with	it from the content fror	free disk poo n the RAID ai	l. The contents of rray.	the disk will
		< Bac	k Next >	Cance

Figure 3.65 Free Disk Selection Page



7 Select one of the disks and click Next, then Finish.

Figure 3.66 New RAID Array

The Migrating Process

As soon as the new two disk mirror array has been created, a pop up window similar to the following will appear:



It will take some time before the entire process is completed. The time it takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 0 to RAID 0+1

The following example shows you how to convert from a RAID 0 array with two disks to a four disk RAID 0+1 array.

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a Striped Array" on page 47 to create a two-disk striped array.

a widin.	Media	sineu	4	_	_	_	19.572
System Tasks	Name	Status	Capacity	Interface	Channel	Device	10
🐗 Hot Plug Array	Striping	Healthy	153.39 GB				
Second Create Array		Healthy	76.69 GB	SATA	Primary	Master	
	See HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master	
	Free Disk						
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master	
	**HD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master	
Dotaile							
Decons							

When that is done, you should see a screen shot similar to the following:

Figure 3.67 RAID Array Created

Now that a two-disk striped array has been created, you can use the MediaShield convert feature to migrate the array from a two-disk RAID 0 into a four-disk RAID 0+1 array.

3 Right click on the newly created striped array (or existing striped array) and a select "Convert Array..." as shown from the following screen shot:



Figure 3.68 Selecting "Convert Array" from the Pop Up Menu

After selecting "Convert Array..." the following screen shot will appear:



Figure 3.69 Convert Array Wizard—Welcome Screen

NVIDIA Convert Array Wizard	
RAID Mode Selection Please select the RAID Mode to convert the array to.	N
Select the RAID mode to change this array into.	
New RAID Mode: Striping	
You must select free disks to add to the new Striping array. Each disk's capacity must be at least 76.69 gigabytes. At least 1 disks must be added.	
< Back Next >	Cancel

Figure 3.70 RAID Mode Selection Page

5 Change the "New RAID Mode:" to Stripe Mirroring as shown in the following screen shot:

NVIDIA Create Array Wizard		
RAID Array Selection Please select the type of RAID array to cr	eate.	<u>i</u>
Select the type of RAID array to create.		
RAID Mode: Stripe Mirroring	•	
Stripe Size: 64k 💌		
	< Back Next >	Cancel

Figure 3.71 RAID Mode Selection Page—Selecting Stripe Mirroring

Name	Capacity	Channel	Device	1
HDS728080PLSA80	76.69 GB	Primary Secondary	Master	
electing a free disk remove:	; it from the	free disk poo	l. The conte	nts of the disk

Figure 3.72 Free Disk Selection Page

7 Select the two disks that you want to add to the new stripe mirror array.

In this example, we are adding two disks (which are both of the upper disks) to the existing two-disk mirrored array. So, select both disks and click **Next** and the following screen shot will appear:



Figure 3.73 Convert Array Wizard—Welcome Screen

8 Click **Finish**, then click the newly created four-disk stripe mirror array and the following screen shot will appear:

≥ <i>n</i> VIDIA.	MediaShield						
System Tasks	Name	Status	Capacity	Interface	Channel	Device	
Hot Plug Array Rebuild Array Convert Array Delete Array Synchronize Array	Stripe Mirroring HD5728080PL5A80 HD5728080PL5A80 HD5728080PL5A80 HD5728080PL5A80 HD5728080PL5A80	Upgrading (0%) Healthy Healthy Healthy Healthy	153.39 GB 76.69 GB 76.69 GB 76.69 GB 76.69 GB	SATA SATA SATA SATA	Primary Secondary Primary Secondary	Master Master Master Master	
Details Upgrading: 0.01% complete	8						

Figure 3.74 New RAID Array

The Migrating Process

As soon as the new four-disk stripe mirror array has been created, a pop up window similar to the following will appear:



followed by the following pop up window:



It will take some time before the entire process is completed. The time it takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 1 to RAID 0

The following example shows you how to convert from a RAID 1 array with two disks to a RAID 0 array with two disks.

- **1** Goto the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows and launch the MediaShield application then follow the steps outlined in "Creating a Mirrored Array" on page 51 to create a two-disk mirror array.

≥ <i>n</i> vidia.	Media	Shield	1				- 3
System Tasks	Name	Status	Capacity	Interface	Channel	Device	1
🔹 Hot Plug Array	Mirroring	Healthy	76.69 GB				
🗳 Create Array	HDS728080PLSA80	Healthy Healthy	76.69 GB 76.69 GB	SATA SATA	Primary Secondary	Master Master	
	Free Disk	64					
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master	
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master	
Details							

When that is done, you should see a screen shot similar to the following:

Figure 3.75 RAID Array Created

Now that a two disk mirrored array has been created, you can use the MediaShield convert feature to migrate the array from a two-disk RAID 1 into a two-disk RAID 0 array.

3 Right click on Mirroring and select "Convert Array..." as shown in the following screen shot:

		11	12				
ystem Tasks	Name	Statu	s Capacity	Interface	Channel	Device	
📫Hot Plug Array	Mirrori	ng Health	y 76.69 GB				
Array	HD5728	080PI SA80 Health	v76.69 GB	SATA	Primary	Master	
Create Array	HDS7:	Hot Plug Array Rebuild Array	5.69 GB	SATA	Secondary	Master	
🚭 Delete Array	Free	Create Array					
Synchronize Anay	100 UD CT	Delete Array		~***	Dite		
	WHDS7.	Synchronize Array	1,69 GB	SATA	Primary	Master	
				24111	Jocondar,	(label)	
etails							

Figure 3.76 Selecting "Convert Array" from the Pop Up Menu

4 After selecting "Convert Array..." the following screen shot will appear:

NVIDIA Convert Array Wiz	ard 🛛 🔀
NVIDIA Convert Array Wiz	Ard Welcome to the NVIDIA Convert Array Wizard This wizard will guide you through the process of converting a RAID array from one array type to another. Converting a RAID array includes: Adding disks to an existing RAID array. For example, changing a 2-disk Striping array to a 3-disk Striping array. Changing a RAID array to a different array type. For example, changing a Mirroring array to a Stripe Mirroring array. To continue, click Next.
	< Back Next > Cancel

Figure 3.77 Convert Array Wizard—Welcome Screen

NVIDIA Convert Array Wizard	
RAID Mode Selection Please select the RAID Mode to convert the array to.	a a a a a a a a a a a a a a a a a a a
Select the RAID mode to change this array into.	
New RAID Mode: Stripe Mirroring	
You must select free disks to add to the new Stripe Mirroring array. Each disk's capacity must be at least 76.69 gigabytes. At least 2 disks must be added.	
< Back Next >	Cancel

Figure 3.78 RAID Mode Selection Page

6 Click on **Stripe Mirroring** and select **Striping**, then click **Next** and the following screen shot will appear:

NVIDIA Co	nvert Array Wizard					
Free Dis Sele	sk Selection act the disks to add to the	new RAID	array.			0
Free	e Disks:					
Na	ame	Capacity	Channel	Device	11	
	HD5728080PL5A80	76.69 GB 76.69 GB	Primary Secondary	Master Master		
Sele be e	cting a free disk removes rased and replaced with	it from the content fror	free disk poo n the RAID a	l. The content rray.	s of the disk wi	11
			< Bac	k Next	>	ancel

Figure 3.79 Free Disk Selection Page

- 7 Click Next, then click Finish to complete the process.
 - If you want to convert the existing two-disk mirrored array into a three-disk (or more) striped array, then you need to select the number of disk(s) that you want to add to the newly created striped array and click **Next**.
 - In this example, there is no need to select any additional disks since we are simply converting the existing two-disk mirrored array into a two-disk striped array.
- **8** Click on Striping and the following screen shot will appear:

INVIDIA. MediaShield						-
System Tasks	Name	Status	Capacity	Interface	Channel	Device
🐗Hot Plug Array	Striping	Upgrading (0%)	153.39 GB			
Convert Array	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master
Delete Array	WHDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
	Free Disk					
	WHDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master
	HD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master
Details						
Upgrading: 0.16% complete						
	<)

Figure 3.80 New RAID Array

The Migrating Process

As soon as the new array has been created, a pop up window similar to the following will appear:



followed by the following pop up window:



It will take some time before the entire process is completed. The time it takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 1 to RAID 0+1

The following example shows you how to convert from a RAID 1 array with two disks to a RAID 0+1 array with four disks.

- **1** Goto the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a Mirrored Array" on page 51 to create a two-disk mirrored array. When that is done, you should see a screen shot similar to the following:

n VIDIA.	Media	Shiel	1	_	_	_	- ×
System Tasks	Name	Status	Capacity	Interface	Channel	Device	
🐗 Hot Plug Array	Mirroring	Healthy	76.69 GB				
Create Array	 HDS728080PLSA80 HDS728080PLSA80 	Healthy Healthy	76.69 GB 76.69 GB	SATA SATA	Primary Secondary	Master Master	
	Free Disk						
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master	
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master	
Details							

Figure 3.81 RAID Array Created

Now that a two-disk mirrored array has been created, you can use the MediaShield convert feature to migrate the array from a two-disk RAID 1 into a four-disk RAID 0+1 array.

3 Right click on Mirroring and select "Convert Array..." as shown in the following screen shot:

NVIDIA.	Me	diaShield	1				-	×
System Tasks	Name Wirroring	Status Healthy	Capacity 76.69 GB	Interface	Channel	Device	l	
Convert Array Convert Array Create Array Delete Array	HDS728080PI SA HDS7; Hot Plu Rebuild Free Create Delete HDS7; Conver Synchr	80 Healthy 19 Array 1 Array Array Array t Array onize Array	76.69 GB 5.69 GB 5.69 GB 5.69 GB	SATA SATA SATA SATA	Primary Secondary Primary Secondary	Master Master Master Master		
Details								

Figure 3.82 Selecting "Convert Array" from the Pop Up Menu

4 After selecting "Convert Array..." the following screen shot will appear:



Figure 3.83 Convert Array Wizard—Welcome Screen

NVIDIA Convert Array W	/izard		
RAID Mode Selection Please select the RAII	D Mode to convert the a	array to.	
Select the RAID mode	to change this array in	to.	
New RAID Mode:	Striping	~	
You must select free c Each disk's capacity At least 1 disks mu	disks to add to the new y must be at least 76.69 st be added.	Striping array. 9 gigabytes.	
	(< Back Next >	Cancel

Figure 3.84 RAID Mode Selection Page

6 From the "New RAID Mode:" entry select "Stripe Mirroring" as shown in the following screen shot:

NVIDIA Convert Array V	Vizard			
RAID Mode Selection Please select the RAI	D Mode to convert the ar	rray to.		<u>.</u>
Select the RAID mode	e to change this array into	р.		
New RAID Mode:	Stripe Mirroring	•		
You must select free Each disk's capacit At least 2 disks mu	disks to add to the new S y must be at least 34.48 Ist be added.	triping array. gigabytes.		
		< Back	Next >	Cancel

Figure 3.85 RAID Mode Selection Page—Selecting Stripe Mirroring

elect the disks to add to the ree Disks:	HEW KAID	array.		
Name	Capacity	Channel	Device	
HDS728080PLSA80	76.69 GB 76.69 GB	Primary Secondary	Master Master	
electing a free disk removes e erased and replaced with	it from the content from	free disk poo n the RAID a	l. The conte rray.	nts of the disk v

Figure 3.86 Free Disk Selection Page

- **8** Select both of the disks and click **Next**, then click **Finish**.
- **9** Click on Strip Mirror and the following screen shot will appear:

💿 nVIDIA.	Media	Shield				- ×
System Tasks	Name	Status	Capacity	Interface	Channel	Device
Hot Plug Array Rebuild Array Convert Array Delete Array	 Stripe Mirroring HDS728080PLSA80 HDS728080PLSA80 HDS728080PLSA80 HDS728080PLSA80 	Upgrading (0%) Healthy Healthy Healthy Healthy	153.39 GB 76.69 GB 76.69 GB 76.69 GB 76.69 GB	SATA SATA SATA SATA	Primary Secondary Primary Secondary	Master Master Master Master
Details Upgrading: 0.01% complete	<		- June			

Figure 3.87 New RAID Array

The Migrating Process

As soon as the new four-disk stripe mirror array has been created, a pop up window similar to the following will appear:



followed by the following pop up window:

🔱 Upgrade In Progress.	×
NVIDIA RAID 0+1 153.38G	

It will take some time before the entire process is completed. The time it takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 0+1 to RAID 0

The following example shows you how to convert from a RAID 0+1 array with four disks to a RAID 0 array with four disks.

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a Stripe Mirroring Array" on page 54 to create a four-disk mirrored stripe array. When that is done, you should see a screen shot similar to the following:

NVIDIA.	Media	Shield	1				
5ystem Tasks	Name	Status	Capacity	Interface	Channel	Device	1
🐗Hot Plug Array	Mirroring	Healthy	76.69 GB				
🐝Create Array		Healthy	76.69 GB	SATA	Primary	Master	
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master	
	Free Disk						
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master	
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master	
Details							

Figure 3.88 RAID Array Created

Now that a four-disk mirrored stripe array has been created, you can use the MediaShield convert feature to migrate the array from a four-disk RAID 0+1 into a four-disk RAID 0 array.

3 Right click on Stripe Mirroring and select "Convert Array..." as shown in the following screen shot:

System Tasks Name Status Capacity Interface Channel Device Chornert Array Stripe Miscould Horay 153.39 GB 153.39 GB Convert Array Hot Plug Array 76.69 GB SATA Primary Master Delete Array Delete Array 76.69 GB SATA Secondary Master Synchronize Array Synchronize Array 76.69 GB SATA Primary Master
Details

Figure 3.89 Selecting "Convert Array" from the Pop Up Menu

4 After selecting "Convert Array..." the following screen shot will appear:



Figure 3.90 Convert Array Wizard—Welcome Screen

NVIDIA Convert Array Wizard	
RAID Mode Selection Please select the RAID Mode to convert the array to.	
Select the RAID mode to change this array into.	
New RAID Mode:	
You must select free disks to add to the new Stripe Mirroring array. Each disk's capacity must be at least 76.69 gigabytes. At least 1 disks must be added.	
< Back Next >	Cancel

Figure 3.91 RAID Mode Selection Page

6 From the "New RAID Mode:" entry select "Striping" as shown in the following screen shot:

NVIDIA Create Array	Wizard			
RAID Array Select Please select the	i on type of RAID array	to create.		a a a a a a a a a a a a a a a a a a a
Select the type o	f RAID array to crea	ate.		
RAID Mode:	Striping			
Stripe Size:	64k	•		
		< Back	Next >	Cancel

Figure 3.92 RAID Array Selection Page—Selecting Striping

- 7 Click Next, then click Finish.
- 8 Click on Striping and the following screen shot will appear:

NVIDIA.	Media	Shield				-
System Tasks	Name	Status	Capacity	Interface	Channel	Device
🐗Hot Plug Array	Striping	Upgrading (0%)	306.77 GB			
💐 Delete Array	WHDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master
	WHDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
	WHDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master
	✓ HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
Details						
Upgrading: 0.04% complete	<					

Figure 3.93 New RAID Array

The Migrating Process

As soon as the new four-disk striped array has been created, a pop up window similar to the following will appear:



followed by the following pop up window:



It will take some time before the entire process is completed. The time it takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 0+1 to RAID 0+1

The following example shows you how to convert from a RAID 0+1 array with four disks to a RAID 0+1 array with six disks.

- **Note:** To migrate from a RAID 0+1 array with four disks to a RAID 0+1 array with six disks, you must have at least six hard drives in the system. In this example, the system has six free RAID enabled disks.
- **1** Goto the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a Stripe Mirroring Array" on page 54 to create a four-disk mirrored stripe array. When that is done, you should see a screen shot similar to the following:

NVIDIA.	<i>n</i> vrai	d	_		_	-
System Tasks	Name	Status	Capacity	Interface	Channel	Device
🗳 Hot Plug Array	Stripe Mirroring	Healthy	68.95 GB			
otreate Array	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master
	WDC WD740GD-00FLA0	Healthy	69.25 GB	SATA	Primary	Master
	WDC WD740GD-00FLA0	Healthy	69.25 GB	SATA	Secondary	Master
	Free Disk					
Details	ST380011A	Healthy	74.53 GB	PATA	Secondary	Master
Decails	ST380011A	Healthy	74.53 GB	PATA	Secondary	Slave

Figure 3.94 RAID Array Created

Now that a four-disk stripe mirror array has been created, you can use the MediaShield convert feature to migrate the array from a four-disk RAID 0+1 into an six-disk RAID 0+1 array.

3 Right click on Stripe Mirroring and select "Convert Array..." as shown in the following screen shot:

NVIDIA.	Media	Shield				
System Tasks	Name	Status	Capacity	Interface	Channel	Device
Hot Plug Array Rebuild Array Convert Array Create Array Delete Array Synchronize Array	WDC WDC WDC WDC WDC WDC WDC WDC Free Disk	ray ay ay ay yy yy ray e Array	68.95 GB 34.48 GB 34.48 GB 69.25 GB 69.25 GB	SATA SATA SATA SATA	Primary Secondary Primary Secondary	Master Master Master Master
Details	ST380011A	Healthy Healthy	74.53 GB 74.53 GB	РАТА РАТА	Secondary Secondary	Master Slave

Figure 3.95 Selecting "Convert Array" from the Pop Up Menu

4 After selecting "Convert Array..." the following screen shot will appear:



Figure 3.96 Convert Array Wizard—Welcome Screen

NVIDIA Convert Array Wizard	
RAID Mode Selection Please select the RAID Mode to convert the array to.	S.
Select the RAID mode to change this array into.	
New RAID Mode: Stripe Mirroring	
You must select free disks to add to the new Stripe Mirroring array. Each disk's capacity must be at least 34.48 gigabytes. At least 2 disks must be added.	
< Back Next >	Cancel

Figure 3.97 RAID Mode Selection Page

6 From the "New RAID Mode:" make sure that "Stripe Mirroring" is selected, then click **Next** and the following screen shot will appear:

NVID	IA Convert Array V	Vizard				X
Fre	ee Disk Selection Select the disks to ad	d to the new	w RAID array			
	Free Disks:					
	Name	Capacity	Channel	Device		
	Selecting a free disk r be erased and replace	emoves it fr	Secondary Secondary com the free (Master Slave disk pool. The RAID array.	e contents of the	disk will
				< Back	Next >	Cancel

Figure 3.98 Free Disk Selection Page

- **7** Select the disks that you want to migrate (in increments of two), then click **Next** and **Finish**.
- **8** Click on Stripe Mirroring and the following screen shot will appear:

<i>n</i> ∨ IDIA.	MediaSh	ield			1	- ×
System Tasks	Name	Status	Capacity	Interface	Channel	Dev
📽 Hot Plug Array A Rebuild Array Convert Array Delete Array Synchronize Array	ST380011A ST380011A ST380011A WDC WD360GD-00FNA0 WDC WD360GD-00FNA0 WDC WD740GD-00FLA2 WDC WD740GD-00FLA2	Upgrading (0%) Healthy Healthy Healthy Healthy Healthy Healthy	103.43 GB 74.53 GB 74.53 GB 34.48 GB 34.48 GB 69.25 GB 69.25 GB	PATA PATA SATA SATA SATA SATA	Secondary Secondary Primary Secondary Primary Secondary	Mas Slav Mas Mas Mas Mas
Details Upgrading: 0.05% complete	<	<u>m</u>				>

Figure 3.99 Array Migrating Started

When migrating from one RAID 0+1 array to another RAID 0+1 array, be sure to have a total of at least six available disks in the system, otherwise you will not be able to complete the operation.

The Migrating Process

As soon as the new six-disk stripe mirror array has been created, a pop up window similar to the following will appear:



followed by the following pop up window:



It will take some time before the entire process is completed. The time it takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 0 to RAID 5

The following example shows you how to migrate from a RAID 0 array with two disks to a RAID 5 array with three disks.

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a Striped Array" on page 47 to create a two disk stripe array.

MediaShield @ nVIDIA. - × System Tasks Status Capacity Interface Channel Device Name Striping 😪 Healthy 153.39 GB WHot Plug Array 🏙 Create Array HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master Free Disk HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master Details

When that is done, you should see a screen shot similar to the following:

Figure 3.100 RAID Array Created

Now that a two disk stripe array has been created, you can use the MediaShield convert feature to migrate the array from a two-disk RAID 0 into a three-disk RAID 5 array.

3 Right click on the newly created striped array (or existing striped array) and a select "Convert Array..." as shown from the following screen shot:



Figure 3.101 Selecting "Convert Array" from the Pop Up Menu

4 After selecting "Convert Array..." the following screen shot will appear:



Figure 3.102 Convert Array Wizard—Welcome Screen
5 Click **Next** and the following screen shot will appear:

NVIDIA Convert Array Wizard	
RAID Mode Selection Please select the RAID Mode to convert the array to.	.
Select the RAID mode to change this array into.	
New RAID Mode: Striping	
You must select free disks to add to the new Striping array. Each disk's capacity must be at least 76.69 gigabytes. At least 1 disks must be added.	
< Back Next >	Cancel

Figure 3.103 RAID Mode Selection Page

6 Click on **Striping** and select RAID 5 then click on **Next** and the following screen shot will appear:

ree Disks: Name	Capacity	Channel	Device	
 ☐ ❤ HD5728080PL5A80 ☐ ❤ HD5728080PL5A80 	76.69 GB 76.69 GB	Primary Secondary	Master Master	
electing a free disk removes e erased and replaced with	; it from the content fror	free disk poo n the RAID a	l. The conter rray.	ts of the disk will

Figure 3.104 Free Disk Selection Page

7 Select the disk (or disks) that you want to add to migrate to the RAID 5 array.

In this example, we are adding one disk (which is the upper disk) to the new three disk RAID 5 array. So, select the first disk and click **Next** and the following screen shot will appear:



Figure 3.105 Completing the NVIDIA Convert Array Wizard Screen

8 Click **Finish** then click on the newly created three disk striped array and the following screen shot will appear:

<i>n</i> ∨ IDIA.	Media	Shield	_	_	_	- ×
System Tasks	Name	Status	Capacity	Interface	Channel	Device
Hot Plug Array Rebuild Array Convert Array Create Array Delete Array	Raid 5 HDS728080PLSA80 HDS728080PLSA80 HDS728080PLSA80 Free Disk HDS728080PLSA80	Upgrading (0%) Healthy Healthy Healthy Healthy	153.39 GB 76.69 GB 76.69 GB 76.69 GB 76.69 GB	SATA SATA SATA SATA	Primary Secondary Primary Secondary	Master Master Master Master
Details Upgrading: 0.01% complete	<u><</u>		- Juli			

Figure 3.106 New RAID Array

Note: As you can see from the above screen shot, only 2/3 of the disk space is actually used by RAID 5 since 1/3 of the disk space is used for to store parity information.

The Migrating Process

As you can see from the screen shot above, a three disk RAID 5 array has been created and the migrating process has begun. A pop up window similar to the following will appear:



followed by the following pop up window:

🔱 Upgrade 9	Started. 🗵
NVIDIA RAIDS	153.38G

It will take some time before the entire process is completed. The time is takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 1 to RAID 5

The following example shows you how to convert a RAID 1 array with two disks to a RAID 5 array with three disks.

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a Mirrored Array" on page 51.

@ nVIDIA. MediaShield Status Capacity Interface Channel System Tasks Name Device Mirroring Healthy 76.69 GB d 👹 Hot Plug Array Create Array HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master Free Disk HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master Details

When that is done, you should see a screen shot similar to the following:

Figure 3.107 RAID Array Created

3 Click click on Mirroring and select "Convert Array..." as shown in the following screen shot:

NVIDIA.	Mee	diaShield	1	_	_	_	- ×
System Tasks	Name Mirroring	Status Healthy	Capacity 76.69 GB	Interface	Channel	Device	
Convert Array Convert Array Create Array Delete Array Synchronize Array	HDS7220000100 HDS72 HDS72 Free Delete	on uashbu Ig Array I Array Array Array	-76.69 GB 3.69 GB	SATA SATA	Primary Secondary	Master Master	
	HDS72 Conver HDS72 Synchr	rt Array onize Array	5.69 GB	SATA SATA	Primary Secondary	Master Master	
Details							

Figure 3.108 Selecting "Convert Array" from the Pop Up Menu



After selecting "Convert Array..." the following screen shot will appear:

Figure 3.109 Convert Array Wizard—Welcome Screen

4 Click **Next** and the following screen shot will appear:

NVIDIA Convert Array W	/izard			
RAID Mode Selection Please select the RAI	D Mode to convert th	e array to.		
Select the RAID mode	to change this array	into.		
New RAID Mode:	Stripe Mirroring	~		
You must select free c Each disk's capacit At least 2 disks mu	lisks to add to the ne y must be at least 76 st be added.	w Stripe Mirroring .69 gigabytes.	l array.	
		< Back	Next >	Cancel

Figure 3.110 RAID Mode Selection Page

5 For the "New RAID Mode:" entry select RAID 5 as shown in the following screen shot:

NVIDIA Convert Array Wizard	
RAID Mode Selection Please select the RAID Mode to convert the array to.	
Select the RAID mode to change this array into.	
New RAID Mode: RAID 5	
You must select free disks to add to the new Stripe Mirroring array. Each disk's capacity must be at least 76.69 gigabytes. At least 1 disks must be added.	
< Back Next >	Cancel

Figure 3.111 RAID Mode Selection Page—Selecting RAID 5

6 Click **Next** and the following screen shot will appear:

IDIA Con	vert Array Wizard	<u>l</u>				
Free Disk Select	Selection the disks to add to the	new RAID	array.			0
Free D)isks:					
Nam	ne	Capacity	Channel	Device		
	 HDS728080PLSA80 HDS728080PLSA80 	76.69 GB 76.69 GB	Primary Secondary	Master Master		
Select be era	ing a free disk removes ised and replaced with	it from the content from	free disk poo n the RAID a	l. The conter rray.	nts of the disł	< will
			< Bac	k Ne:	d > 🗌 🚺	Cancel

Figure 3.112 Free Disk Selection Page

NVIDIA.	Media	Shield	_	_	_	-
System Tasks	Name	Status	Capacity	Interface	Channel	Device
🗳 Hot Plug Array	Raid 5	Upgrading (0%)	153.39 GB			
Copyert Array	HD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master
*Create Array	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
Delete Array	HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master
Synchronize Array	Free Disk					
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master
Details						
Upgrading: 0.01% complete	<					

7 Select one of the disks and click Next, then Finish..

Figure 3.113 New RAID Array

Note: As you can see from the above screen shot, only 2/3 of the disk space is actually used by RAID 5 since 1/3 of the disk space is used for to store parity information.

The Migrating Process

As you can see from the screen shot above, a three disk RAID 5 array has been created and the migrating process has begun. A pop up window similar to the following will appear:



followed by the following pop up window:



It will take some time before the entire process is completed. The time is takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 0+1 to RAID 5

The following example shows you how to convert a RAID 0+1 array with four disks to a RAID 5 array with four disks.

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a Stripe Mirroring Array" on page 54.

TVIDIA. MediaShield							- >	
System Tasks	Name	Status	Capacity	Interface	Channel	Device	I.	
🐗Hot Plug Array	Stripe Mirroring	Healthy	153.39 GB					
	HD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master		
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master		
	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master		
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master		
Details								

When that is done, you should see a screen shot similar to the following:

Figure 3.114 RAID Array Created

3 Click click on "Stripe Mirroring" and select "Convert Array..." as shown in the following screen shot:

♥ nVIDIA.		MediaShield	1				- ×
System Tasks Tot Plug Array Rebuild Array Convert Array Synchronize Array	Name Strip HD572 HD572 HD572 HD572 S	Status Hot Plug Array Rebuild Array Delete Array Convert Array Synchronize Array	Capacity 	Interface SATA SATA SATA SATA	Channel Primary Secondary Primary Secondary	Device Master Master Master Master	
Details							

Figure 3.115 Selecting "Convert Array" from the Pop Up Menu



After selecting "Convert Array..." the following screen shot will appear:

Figure 3.116 Convert Array Wizard—Welcome Screen

4 Click **Next** and the following screen shot will appear:

NVIDIA Convert Array W	'izar d		
RAID Mode Selection Please select the RAII) Mode to convert the ar	rray to.	<u></u>
Select the RAID mode	to change this array into	o.	
New RAID Mode:	RAID 5	~	
You must select free d Each disk's capacit; At least 1 disks mu:	lisks to add to the new S / must be at least 76.69 st be added.	tripe Mirroring array. gigabytes.	
	C	< Back Next	> Cancel

Figure 3.117 RAID Mode Selection Page

5 Make sure RAID 5 is selected.

6 Click **Next**, then **Finish** and the following screen shot will appear showing the four disk RAID 5 array.

<i>n</i> ∨IDIA.	Media	Shield	_	_	_	-	×
System Tasks	Name	Status	Capacity	Interface	Channel	Device	
Hot Plug Array Rebuild Array Convert Array Delete Array Synchronize Array	 ■ Raid ■ HDS728080PLSA80 ■ HDS728080PLSA80 ■ HDS728080PLSA80 ■ HDS728080PLSA80 ■ HDS728080PLSA80 	Upgrading (0%) Healthy Healthy Healthy Healthy	230.08 GB 76.69 GB 76.69 GB 76.69 GB 76.69 GB	SATA SATA SATA SATA	Primary Secondary Primary Secondary	Master Master Master Master	100 000 000 000
Details Upgrading: 0.03% complete	<		101				>

Figure 3.118 New RAID Array

Note: As you can see from the above screen shot, only 3/4 of the disk space is actually used by RAID 5 since 1/4 of the disk space is used for to store parity information.

The Migrating Process

As you can see from the screen shot above, a four disk RAID 5 array has been created and the migrating process has begun. A pop up window similar to the following will appear:



followed by the following pop up window:



It will take some time before the entire process is completed. The time is takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 5 to RAID 0

The following example shows you how to convert a RAID 5 array with three disks to a RAID 0 array with three disks.

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a RAID 5 Array" on page 62.

@ nVIDIA. MediaShield - × System Tasks Name Status Capacity Interface Channel Device Raid 5 Healthy 153.39 GB 🀗 Hot Plug Array Arrav HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master difference Array HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master 🛃 Delete Array 👑 Synchronize Array Free Disk HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master Details

When that is done, you should see a screen shot similar to the following:

Figure 3.119 RAID Array Created

3 Click on RAID 5 and select "Convert Array..." as shown in the following screen shot:

<i>n</i> ∨ IDIA.	Media	aShield	ł	_	_	_	- ×
System Tasks	Name Hot Plug Array Hot Plug Array Create Array Delete Array Delete Array	Status y 	Capacity 153.39 GB 76.69 GB 76.69 GB 76.69 GB	Interface SATA SATA SATA SATA	Channel Primary Secondary Primary	Device Master Master Master	
¥Synchronize Array Details	Synchronize / Frce was HDS728080PLSA80	Array 🔥	76.69 GB	SATA	Secondary	Master	

Figure 3.120 Selecting "Convert Array" from the Pop Up Menu



After selecting "Convert Array..." the following screen shot will appear:

Figure 3.121 Convert Array Wizard—Welcome Screen

4 Click **Next**, then select **Striping** and click on **Next**, then the following screen shot will appear:

A Convert Array Wizard The Disk Selection Select the disks to add to the	new RAID	array.			•
Free Disks:					
Name	Capacity	Channel	Device		
Selecting a free disk removes be erased and replaced with	it from the content fro	free disk poo m the RAID a	ol. The conte rray.	nts of the disk (will
		< Bac	:k Ne	xt >	Car

Figure 3.122 Free Disk Selection Page

5 Click **Next**, then **Finish**.

In this example, the WD360GD was chosen as shown in Figure 3.66.

NVIDIA.	Media	Shield	_	_		-
System Tasks	Name	Status	Capacity	Interface	Channel	Device
🐗Hot Plug Array	Striping 😸	Upgrading (1%)	230.08 GB			
of Create Array	HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master
	Free Disk					
	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
Details						
	K					

Figure 3.123 New RAID Array

The Migrating Process

As you can see from the screen shot above, a three disk RAID 0 array has been created and the migrating process has begun. A pop up window similar to the following will appear:



followed by the following pop up window:



It will take some time before the entire process is completed. The time is takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 5 to RAID 0+1

The following example shows you how to convert a RAID 5 array with three disks to a 0+1 array with four disks.

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a RAID 5 Array" on page 62.

MediaShield NVIDIA. - × System Tasks Name Status Capacity Interface Channel Device Raid 5 Healthy 153.39 GB Hot Plug Array 義 Rebuild Array HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master Create Array HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master d Delete Array Svnchronize Arrav Free Disk HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master Details

When that is done, you should see a screen shot similar to the following:

Figure 3.124 RAID Array Created

3 Click on RAID 5 and select "Convert Array..." as shown in the following screen shot:



Figure 3.125 Selecting "Convert Array" from the Pop Up Menu



After selecting "Convert Array..." the following screen shot will appear:

Figure 3.126 Convert Array Wizard—Welcome Screen

4 Click **Next**, then select **Stripe Mirroring** and click on **Next**, then the following screen shot will appear:

NVID	A Convert Array Wizard					
Fre	ee Disk Selection Select the disks to add to the	sk Selection act the disks to add to the new RAID array. a Disks: ame Capacity Channel Device MDS728080PLSA80 76.69 GB Secondary Master				₩
	Free Disks:					
	Name	Capacity	Channel	Device		
	Selecting a free disk removes be erased and replaced with	it from the	free disk poo n the RAID a	I. The conter	its of the di	sk will
			< Bac	k Ne×	t > [Cancel

Figure 3.127 Free Disk Selection Page



5 Select a Free Disk, then Click **Next**, then **Finish**.

Figure 3.128 New RAID Array

The Migrating Process

As you can see from the screen shot above, a four disk RAID 0+1 array has been created and the migrating process has begun. A pop up window similar to the following will appear:



followed by the following pop up window:



It will take some time before the entire process is completed. The time is takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Migrating from RAID 5 to RAID 5

The following example shows you how to convert a RAID 5 array with three disks to a RAID 5 array with four disks.

- **1** Go to the system BIOS and make sure that the drives that you want to use are RAID **enabled.**
- **2** Boot to Windows, launch the MediaShield application, then follow the steps outlined in "Creating a RAID 5 Array" on page 62.

@ nVIDIA. MediaShield - × System Tasks Name Status Capacity Interface Channel Device Raid 5 Healthy 153.39 GB 🀗 Hot Plug Array Arrav HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master difference Array HDS728080PLSA80 Healthy 76.69 GB SATA Primary Master 🛃 Delete Array 👑 Synchronize Array Free Disk HDS728080PLSA80 Healthy 76.69 GB SATA Secondary Master Details

When that is done, you should see a screen shot similar to the following:

Figure 3.129 RAID Array Created

3 Click on RAID 5 and select "Convert Array..." as shown in the following screen shot:

<i>n</i> ∨ IDIA.	Media	aShielo	ł	_	_	_	- ×
System Tasks Hot Plug Array Rebuild Array Convert Array Create Array Delete Array Synchronize Array	Hot Plug Array Rebuild Array Create Array Delete Array Synchronize / Freedom	Status 9 7 9 9 9	Capacity 153.39 GB 76.69 GB 76.69 GB 76.69 GB	Interface SATA SATA SATA	Channel Primary Secondary Primary	Device Master Master Master	
Details	WHD5728080PL5A80	Healthy	76.69 GB	SATA	Secondary	Master	

Figure 3.130 Selecting "Convert Array" from the Pop Up Menu



After selecting "Convert Array..." the following screen shot will appear:

Figure 3.131 Convert Array Wizard—Welcome Screen

4 Click **Next**, then select **RAID 5** and click on **Next**, then the following screen shot will appear:

NVIDIA Convert Array Wizard	Ĵ				
Free Disk Selection Select the disks to add to the	e new RAID	array.			₩. <mark>`</mark>
Free Disks:					
Name	Capacity	Channel	Device	38	
Selecting a free disk remove be erased and replaced with	s it from the	free disk poo	I. The conter rray.	nts of the disk	c will
		< Bac	k Nex	t >	Cancel

Figure 3.132 Free Disk Selection Page

5 Select a Free Disk, then Click **Next**, then **Finish**.

		1.				
System Tasks	Name	Status	Capacity	Interface	Channel	Device
📫 Hot Plug Array	Raid	Upgrading (0%)	230.08 GB			
Rebuild Array	HDS728080PLSA80	Healthy	76.69 GB	SATA	Primary	Master
Convert Array	WHDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
*c	HD5728080PL5A80	Healthy	76.69 GB	SATA	Primary	Master
Synchronize Array	HDS728080PLSA80	Healthy	76.69 GB	SATA	Secondary	Master
Details						
Upgrading: 0.03% complete	<					

Figure 3.133 New RAID Array

The Migrating Process

As you can see from the screen shot above, a four disk RAID 5 array has been created and the migrating process has begun. A pop up window similar to the following will appear:



followed by the following pop up window:



It will take some time before the entire process is completed. The time is takes to convert an array is dependent on several factors such as the speed of the CPU, the size and type of hard drive being used, the operating system, etc.

Hot Plug Array

NVIDIA MediaShield arrays can be moved from one NVIDIA-based system to another. There are two scenarios for doing this.

• System has been properly shut down

See Hot Plug Array with System Shutdown.

• System is running

See Hot Plug Array with System Running.

Hot Plug Array with System Shutdown

When the system is properly shutdown, the Hot Plug Array Wizard is not required. You can simply add or remove the array, modify the BIOS RAID settings accordingly, and then power the system back up.

Hot Plug Array with System Running

If required, you can also add or remove a MediaShield array while the system is still running by using the nForce SATA hot plug capability. However, in order to do this without the state of the array changing to Degraded or an Error state, you need to alert MediaShield that the array is about to be removed/added. This is done using the Hot Plug Array wizard. When the wizard prompts that it is safe to add disks, disks for the array can be added/removed at that time.

See the following instructions and screen shots for the Hot Plug Array wizard:

1 Launch MediaShield and click on "Hot Plug Array" and the following screen shot will appear:



Figure 3.134 NVIDIA Hot Plug Array Wizard—Welcome Screen

2 Click **Next** and the following screen shot will appear:



Figure 3.135 Hard Disk Insertion Screen

3 Connect the RAID disk that you want to use with any given RAID array.



4 Click **Next** and the following screen shot will appear:

Figure 3.136 Completing the NVIDIA Hot Plug Array Wizard Page

5 Click Finish.

CHAPTER



INITIALIZING, REBUILDING, AND SYNCHRONIZING RAID ARRAYS

This chapter describes the following MediaShield tasks:

- Initializing a RAID Array
 - Erase the data on the array by writing all zeros to the sectors of each hard disk.
- Rebuilding a RAID Array
 - Rebuild a broken mirrored array
 - Watch the progress of rebuilding of an array
 - Only applies to RAID 1, RAID 0+1, and RAID 5 arrays
- Synchronizing a RAID Array
 - Rebuild the redundancy in RAID 1 or RAID 0+1 arrays (copy the data to the redundant disk—the same operation as rebuilding)
 - Rebuild the parity in RAID 5 arrays

Initializing a RAID Array

Initializing a RAID array erases all the data that is stored on that array, and writes all zeros to the disks. Initialization of newly configured RAID arrays is recommended to ensure consistency and reliable performance on any supported fault tolerant array such as RAID 5, RAID 0, and RAID 0+1.

Use this feature only if you are absolutely sure that you want to wipe out all the data on that array.

Initialization of a fault tolerant array can only be done when the array is being created. To initialize an array, perform the following steps:

Note: In this example, a mirror array is initialized.

1 From the MediaShield window, right click on any available free disk and select **Create Array** as show in Figure 4.1.

<i>n</i> ∨ IDIA.	Medi	aShield				- ×
System Tasks	Name	Status	Capacity	Interface	Channel	Device
Create Array	Free Disk	g Array Array FRNAO Healthy	69.25 GB 69.25 GB 34.48 GB 34.48 GB	SATA SATA SATA SATA	Primary Secondary Primary Secondary	Master Master Master Master

Figure 4.1 Create an Array to be Initialized

The Create Array Wizard opens.

2 Follow the Wizard to create a Mirror array.

See "Creating a Mirrored Array" on page 51.

- **3** At the Create Array Wizard Welcome screen, click **Next**.
- **4** At the RAID Array Selection page, make sure that RAID Mode is set to "**Mirroring**" and Stripe Size is set to its default value of 64K, then click **Next**.
- **5** At the Free Disk Selection page, select the two drives that you want to Mirror and click **Next**.

6 Click Next again and the following screen shot will appear:

NVIDIA Create Array Wizard	
Clearing System Data Clear system data from disks to prepare for use in array.	N
Expert Only: You may choose to keep the system data by unchecking the Clear System Data check box below. Note that this may not preserve the data in any usable form, and may cause system instability and other undesirable effects.	
☑ Clear System Data ☐ Initialize Array	
< Back Next >	Cancel

Figure 4.2 Clearing System Data Screen

7 Check "Intialize Array" and then click Next.

The Initialization Warning dialog appears.

NVIDIA F	Raid Wizard 🛛 🔀
⚠	All data stored on this array will be erased. If you do not wish to initialize the array at this time, click Cancel.
	OK Cancel

Figure 4.3 Initialization Warning

8 Click OK.

The Clearing System Data screen appears again with the Initialize Array check box checked as shown in Figure 4.4.



Figure 4.4 Clearing System Data and Initialize Array

9 Click **Next**, then click **Finish** at the Completing the NVIDIA Create Array Wizard screen.

The MediaShield window shows the created RAID array as shown in Figure 4.5.

n <i>n</i> vidia.	MediaSh	ield				- ×
System Tasks	Name	Status	Capacity	Interface	Channel	Devic
🐗 Hot Plug Array	Mirroring	Initializing (0%)	69.25 GB			
🔹 Rebuild Array 🔹 Convert Array 🗳 Create Array	WDC WD740GD-00FLA2	Healthy Healthy	69.25 GB 69.25 GB	SATA SATA	Primary Secondary	Maste Maste
Delete Array	Free Disk					
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Maste
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Maste
Details Initializing: 0.14% complete	<	IUI				>

Figure 4.5 Mirrored RAID Array Initializing

The Initialization Process

As you can see from the screen shot above, the initialization process has started and it will be completed in a short period of time. As soon as the Initialization process starts, a pop-up window similar to the following will appear:



followed by the following pop-up window:



Rebuilding a RAID Array

Rebuilding is the process of restoring data to a hard drive from other drives in the array. This applies only to fault tolerant arrays such as RAID 1, RAID 0+1, as well as a RAID 5.

For example, assuming you have a three disk RAID 5 array, and one of the drives fail, then you need to replace the failed drive with a new one, and rebuild the array to regenerate the lost data on the newly added drive.

Rebuilding Instructions

After creating a mirrored array, you can rebuild the array using the following steps:

1 Go to Windows and run the NVIDIA MediaShield RAID Management utility.

Figure 4.6 shows an example of a system with one mirrored array and two free disks.

≥ nVIDIA.	MediaSh	MediaShield					
System Tasks	Name	Status	Capacity	Interface	Channel	Device	
👹 Hot Plug Array	Mirroring	Healthy	34.48 GB				
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Master	
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Master	
	Striping .	Healthy	138.50 GB				
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Secondary	Master	
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Primary	Master	
Details							
	<					>	

Figure 4.6 Mirrored Array

2 Right-click on Mirroring.

The popup menu appears.

System Tasks Mame Status Chot Plug Array Minutes Ithy Convert Array Create Array Ithy Create Array Delete Array Convert Array Synchronize Array Synchronize Array WDC WD740GD-00FLA2 Healthy WDC WD740GD-00FLA2 Healthy Details Details			_	- ×
Hot Plug Array Rebuild Array Convert Array Delete Array Synchronize Array WDC WD740GD-00FLA2 Healthy Details	Capacity	Interface	Channel	Device
WDC WD740GD-00FLA2 Healthy WDC WD740GD-00FLA2 Healthy Details	34.48 GB 34.48 GB 34.48 GB	SATA SATA	Primary Secondary	Master Master
	69.25 GB	SATA SATA	Primary Secondary	Master Master

Figure 4.7 Array Pop-up Menu

3 From the popup menu, click **Rebuild Array**.

The NVIDIA Rebuild Array Wizard appears.



Figure 4.8 NVIDIA Rebuild Array Wizard

4 Click Next.

The Disk Selection page appears.

NVIDIA Rebuild Array Wizard			
Disk Selection Select a disk from within the Ra	AID array.		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Select a member disk from the	list:		1
Name	Channel	Device	
WDC WD360GD-00FNA0	Primary Secondary	Master Master	
		<back next=""> Cancel</back>	Nr - 841 L

Figure 4.9 Disk Selection Page

5 Select the drive that you want to rebuild by clicking it from the list, then click Next. The Completing the NVIDIA Rebuild Array page appears.



Figure 4.10 Completing the NVIDIA Rebuild Array Wizard Page

6 Click Finish.

The array rebuilding starts after a few seconds, and a small pop-up message appears towards the bottom right corner of the screen as shown in Figure 4.11.



Figure 4.11 Rebuild Bubble Message

When the rebuilding process is finished you will see the pop up box shown inFigure 4.12.

🄱 Rebuild Fini	ished.	×
NVIDIA MIRROR	34.479	;
		Ē

Figure 4.12 Rebuild Finished Bubble Message

During the rebuilding process, the NVIDIA MediaShield RAID Management utility screen shows the status under the System Tasks and Details sections.

NVIDIA.	MediaSh	ield	_	_	_	- 3
System Tasks	Name	Status	Capacity	Interface	Channel	De
🐗Hot Plug Array	Mirroring	Rebuilding (1%)	34.48 GB			
of Create Array	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	Ма
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	Ma
	Free Disk					
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Primary	Ma
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Secondary	Ma
Details						
	<					1

Figure 4.13 Array Rebuilding Status Detail

More About Rebuilding Arrays

• Rebuilding Occurs in the Background

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

• Rebuilding Applies Only to RAID 1, RAID 0+1, or RAID 5 Arrays

Rebuilding an array works only when using RAID 1, RAID 0+1, or RAID 5. Rebuilding does not apply to RAID 0 and JBOD arrays.

• Rebuilding applies to a degraded fault tolerant array

You can rebuild a degraded mirrored array using any available Free Disk or Dedicated Disk.

For example, Figure 4.14 shows a mirrored array using two 34.48 GB drives while having two Free Disks each 55.90 GB large.

💽 nVIDIA.	MediaSh	MediaShield					
System Tasks	Name	Status	Capacity	Interface	Channel	Device	
🐗 Hot Plug Array	Mirroring	Healthy	34.48 GB				
	WDC WD360GD-00FNA0 WDC WD360GD-00FNA0	Healthy Healthy	34.48 GB 34.48 GB	SATA SATA	Secondary Primary	Master Master	
	Striping	Healthy	138.50 GB				
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Secondary	Master	
	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Primary	Master	
Details							
	<) >	
1							

Figure 4.14 Free Disks Available for Rebuilding

To use one of these available free disks to rebuild your array, follow the same steps as explained in "Rebuilding a RAID Array" on page 132, except when prompted to select a disk, choose one of the two available free disks.

Synchronizing a RAID Array

Synchronizing an array will force a rebuild of redundancy or parity. The operation is applicable to any fault tolerant array such as RAID 1, 0+1 and RAID 5.

- For RAID1 and RAID 0+1, "sync" results in copying the data to the redundancy disk,
- For RAID 5, "sync" results in rebuilding the parity

To sync an array, do the following (This example assumes you have already created a fault tolerant array such as RAID 1):

1 Right click on "Mirroring" and select Synchronize Array as shown in Figure 4.15.

öystem Tasks	Name		Status	Capacity	Interface	Channel	Device
🐗 Hot Plug Array	Mirrori	ng	Healthy	69.25 GB			
Rebuild Array Convert Array Create Array Delete Array Synchronize Array	WDC \ WDC \ Free I	Rebuild Array Create Array Delete Array Convert Array.		69.25 GB 69.25 GB	SATA SATA	Primary Secondary	Master Master
		Synchronize Ar 0360GD-00FNA0 0360GD-00FNA0	ray Healtrý Healthy	34.48 GB 34.48 GB	SATA SATA	Primary Secondary	Master Master
Details							

Figure 4.15 Array Pop-up Menu

The Synchronize Array Wizard Welcome screen appears.



Figure 4.16 Synchronize Array Wizard—Welcome Screen

2 Click on Next and then click **Finish** at the Wizard Completion screen.

The MediaShield window indicates that the array is synchronizing, as shown in Figure 4.17.

≥ <i>n</i> VIDIA.	MediaSh	ield				×
System Tasks	Name	Status	Capacity	Interface	Channel	[
🐗 Hot Plug Array	Mirroring	Synchronizing (0%)	69.25 GB			
Rebuild Array	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Primary	M
Create Array	WDC WD740GD-00FLA2	Healthy	69.25 GB	SATA	Secondary	M
Delete Array	Free Disk					
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Primary	M
	WDC WD360GD-00FNA0	Healthy	34.48 GB	SATA	Secondary	M
Details Synchronizing: 0.03%	<					>

Figure 4.17 Mirrored Array Synchronizing

As you can see from the screen shot above, the synchronization process has started and it will be completed in a short period of time.

CHAPTER



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 occured.



Figure 5.3 Disk Alert Example—Failed SATA Drive

C H A P T E R



MEDIASHIELD RAID FREQUENTLY ASKED QUESTIONS

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

- "Basic RAID Questions" on page 144
- "RAID ROM Setup Questions" on page 145
- "Rebuilding Arrays Questions" on page 145
- "Dedicated Disk Questions" on page 146
- "Array Migrating Questions" on page 146
- "Windows RAID Application" on page 146

Basic RAID Questions

• What is RAID?

RAID stands for *Redundant Array of Independent Disks*, 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® MediaShieldTM" 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® MediaShieldTM" 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 "Setting Up a Non-Bootable RAID Array" on page 13 for more information.

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

See "Setting Up a Bootable RAID 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 6 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?

Two different arrays can be configured and active at the same time. For example, a mirrored array with two hard drives, as well as a striped array using three hard drives can exist at the same time. You need to configure each array separately in the RAID BIOS as well as initialize the arrays in Windows as described in "Setting Up Your RAID Configuration" on page 13.

• 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 "Setting Up the BIOS" on page 13.

• Why do my hard drives not appear in the RAID ROM Setup?

From the **RAID Config** window, you must enable RAID and then enable the disks that you want to use as RAID disks. See "Setting Up the BIOS" on page 13 for more information.

• 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 *BIOS Boot Specification*. This indicates that the boot device is defined in the BIOS.

• What does "Clear Disk" mean in the RAID ROM Setup?

Clear Disk clears the MBR (Master Boot Record). 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 "Rebuilding a RAID Array" on page 132 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 or a striped-mirrored 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 "Setting Up a Bootable RAID 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 Installing the RAID Drivers.

Later, when you want to migrate the single disk into a multi-disk RAID array, follow the instructions in "Migrating From One RAID Array to Another" on page 69.

• Can I delete an array while it is being migrateed?

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

• Can I migrate a bootable RAID array?

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

Windows RAID Application

- *What functions can be performed using the MediaShield application?* The following tasks can be performed:
 - View information about RAID 0, 1, 0+1, 5 and JBOD (as well as any supported configuration if you have more than one RAID array active)

- 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
- View Free Disks
- 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
- Hot Plug Array
- Initialize Array
- Synchronize Array

CHAPTER 6 MediaShield RAID Frequently Asked Questions

CHAPTER



MEDIASHIELD APPLICATION NOTES

This chapter includes several application notes that address specific issues that may be encountered when trying to install the NVIDIA MediaShield software or other software required to run NVIDIA RAID.

• "Windows 2000 Limitation with Bootable RAID" on page 150

describes how to create a bootable RAID volume with Windows 2000 via the migrating method.

• "Installing the NVIDIA IDE Driver in Windows 2000" on page 150

describes how to install Windows 2000 Service Pack 4, which required for installing the NVIDAI IDE driver.

• "Using GHOST with NVIDIA RAID" on page 151

describes how to use disk cloning software with a RAID array.

• "How to Build a Slipstream XP-SP2 CD" on page 152

describes how to use NVIDIA storage drivers to build an XP-SP2 slipstream that can be installed onto an NVIDIA SATA RAID controller.

Windows 2000 Limitation with Bootable RAID

Problem

In Windows 2000 (Service Pack 2 or previous versions), the end user cannot install this operating system to a bootable RAID volume.

Solution

The user must create a combination installation CD that includes Windows 2000 and SP3 or SP4 fixes integrated in. To create the combination installation CD, refer to the following website:

http://www.microsoft.com/windows2000/downloads/servicepacks/sp4/HFdeploy.htm

Note: If the end user chooses not to install Windows 2000 Service Pack 3 or 4, RAID is still supported on Windows 2000. However, the end user will not be able to create a bootable RAID volume.

Installing the NVIDIA IDE Driver in Windows 2000

Problem

In Windows 2000 (Service Pack 2 or previous versions), the end user cannot install the NVIDIA IDE Driver without upgrading Windows 2000 with Service Pack 4.

Solution

In order to upgrade Windows 2000 with Service Pack 4:

- **1** Install Windows 2000 on a selected hard drive.
- 2 Download and install Windows 2000 Service Pack 4 from the Microsoft website.
- **3** Reboot the system.
- **4** When in Windows 2000, install the NVIDIA nForce Driver Package The user will have an option to install the NVIDIA IDE driver during the installation process.
- **5** Reboot the system.

Using GHOST with NVIDIA RAID

Problem

GHOST can interface with hard disk controllers by accessing the appropriate memory and hardware locations directly. However, in doing so, this can bypass the RAID enhancements that are provided by the system BIOS. The system BIOS understands the underlying disk and RAID array structures and formats. In order to properly use GHOST to interact with a RAID volume, the user should ensure that the tool is operating in a mode where it does not talk directly to the hardware resources, but rather communicates using the system BIOS.

Solution

In order to use GHOST in a RAID volume, the user must:

- Disable the GHOST Direct Disk Access
- Force it to rely on Extended INT13 to access the disk

To set GHOST to use Extended Interrupt 13h (INT13) access:

- **a** Start GHOST from the DOS prompt. (Not the Windows Command Prompt session)
- **b** Select the "Options" (ALT+O) menu
- c Scroll to the "HDD Access" Tab
- d Select the "Use Extended Interrupt 13h disk access" (ALT+E)
- e Select the "Disable direct IDE access support" (ALT+B)
- f Select the "Disable direct ASPI/SCSI access support" (ALT+B)
- g Press (ALT+A) to activate the "Accept" button to use the new settings
- h Proceed to run GHOST as normal

These steps will then allow the user to use GHOST to copy the disk image through the RAID array.

Note: Typically, disk cloning software accelerates data transfer through direct disk access, which also allows for overlapping read and write calls, further accelerating the process. Because INT13 calls cannot "overlap", read and write operations must be performed in series, which causes the disk cloning process to perform slower when RAID is enabled.

How to Build a Slipstream XP-SP2 CD

Problem

Create a CD that will install XP-SP2 onto a bootable RAID array.

Solution

Create a slipstream CD that includes MediaShield RAID drivers using the following steps

Initial Setup

There are a number of options on how to setup the directory structures. This is just an example and is not meant to suggest other methods are incorrect.

- **1** Create the following 3 folders:
 - C:\slipstream\XP
 - C:\slipstream\XP-SP2
 - C:\slipstream\XP-BootImage

You can use any directory names and structure you wish to create the slipstream. The names and structure used in this app note are for example only.

- **2** Copy XP Gold CD contents into "XP" (make sure your Folder Options View tab has [Show hidden files and folders] radio button is selected and [Hide protected operating system files] is unchecked.)
- 3 Download (NOT INSTALL) SP2 from Microsoft website into "XP-SP2" folder
- **4** Extract SP2 to "XP-SP2" folder with following command: WindowsXP-KB835935-SP2-ENU.exe –x
- **5** Run SP2 on c:\slipstream\XP with the following:

 $C\slipstream\XP-SP2\i386\Update\Update.exe\-S:C:\slipstream\XP$

6 Use IsoBuster or equivalent application to extract the bootable image file to c:\ slipstream\XP-BootImage.

Add NVIDIA Drivers

- 1 Extract the NVIDIA driver files from the nForce package using '-x' option.
- **2** Copy all *.sys, *.dll, *.inf and *.cat files from "...\IDE\WinXP\sataraid" to "c:\ slipstream\XP\i386".
- 3 Edit "c:\slipstream\XP\i386\txtsetup.sif" and add the following
 - **a** Under [WinntDirectories] section add:

```
300 = nvidia\nvraid
```

This will add a directory to hold the storage driver files.

b Directly under header [SourceDisksFiles] add the following lines:

```
nvraidco.dll = 1,,,,,,300,0,0
nvraid.sys = 1,,,,,300,0,0
nvraid.inf = 1,,,,,300,0,0
nvraid.cat = 1,,,,,300,0,0
NvAtaBus.sys = 1,,,,,300,0,0
idecoi.dll = 1,,,,,300,0,0
NvAtaBus.sys = 100,,,,,4,0,0,,1,4
nvraid.sys = 100,,,,4,0,0,,1,4
```

This tells installer to copy all driver files to "%systemroot%\nvidia\nvraid" and then the two .sys files to "%systemroot%\system32\drivers"

c Now add the device IDs for your SATA controller directly under the [HardwareIdsDatabase] section.

This will tell OS which drivers to load for SATA controllers on your platform.

You can get this information from the file <code>nvraid.inf</code>. Search for "[NVIDIA]" and you should see something like the following:

```
[NVIDIA]
%CK804SSS%=Crush11_Inst,PCI\VEN_10DE&DEV_0055&CC_0104
%CK804SSS%=Crush11_Inst,PCI\VEN_10DE&DEV_0054&CC_0104
%NVRAID_DESC%=nvraid,GenNvRaidDisk
%NVRAID_BUS_DESC%=nvraidbus,*_NVRAIDBUS
%NVRAID_BUS_DESC%=nvraidbus,*NVRAIDBUS
```

You will require an entry for each of these lines in the following format.

[HardwareIdsDatabase]

PCI\VEN 10DE&DEV 0054 = "nvatabus"

PCI\VEN 10DE&DEV 0055 = "nvatabus"

GenNvRaidDisk	= "nvraid"
*_NVRAIDBUS	= "nvraid"
*NVRAIDBUS	= "nvraid"

Note: Your platform will likely have different device IDs, so you should modify your entries accordingly.

d Add NVIDIA storage drivers to the SCSI preload section.

```
[SCSI.Load]
nvatabus = NvAtaBus.sys,4
nvraid = nvraid.sys,4
```

e Add the message that will get displayed during text setup driver load.

```
[SCSI]
nvraid = "NVIDIA RAID CLASS DRIVER"
nvatabus = "NVIDIA nForce SATA Controller"
```

4 Modify **hivesft.inf** to include the driver files location info into the DevicePath registry key.

This tells the GUI mode setup where to find the driver files. Since this example places them in "%systemroot%\nvidia\nvraid", that is what we use here:

```
HKLM,"SOFTWARE\Microsoft\Windows\
CurrentVersion","DevicePath",0x00020002,"%SystemRoot%\
inf";"%systemroot%\nvidia\nvraid"
```

Burning a CD

There are a number of tools that allow you to burn a bootable CD image. Here are some tips when using Nero.

- Select CD-ROM [Boot] option
- Select the Boot tab and
 - Set image to file in c:\slipstream\XP-BootImage
 - Select "Enable expert settings"
 - Set Kind of Emulation to No Emulation
 - Set load segment to 07C0
 - Set number of loaded segments to 4 (Very important!)
- Select ISO 9660 Volume label to
 - XP Professional enter WXPCCP_EN
 - XP Home enter WXHCCP_EN

- XP Professional OEM enter WXPOEM_EN
- XP Home OEM enter WXHOEM_EN
- Select everything from c:\slipstreap\XP for burning onto CD