Release Note

This document has been modified from the original Nvidia Media Shield User's Guide. Some of the Nvidia screen captures may be different than your system.

Please Note: In order to access the RAID utility, press F10 repeatedly once the boot screen appears.

Press Ctrl-X to exit the RAID utility, it will automatically save any changes. There is not an option to exit without saving changes.

Windows Vista sees the RAID as a single logical drive, but it does not "color code" it as a RAID storage solution in Administrative Tools. The RAID logical drive is color coded the same as a single physical drive.

The RAID utility does not auto-rebuild a defective or replacement RAID HDD. The rebuild process must be initiated in the RAID utility. The rebuild process may take several hours depending on the size of the drives.

Here are some additional RAID definitions that may prove useful when configuring the RAID array.

Striping = RAID 0
Mirroring = RAID 1
Stripe Mirroring = RAID 0+1
RAID 5 = RAID 5
Spanning = JBOD

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Note pages 9,10, and 14 were removed from this document.

Published by
NVIDIA Corporation
2701 San Tomas Expressway
Santa Clara, CA 95050

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ABOUT NVIDIA RAID

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 RAID in the following sections:

- "System Requirements" on page 2.

- "RAID Arrays" on page 3 describes the RAID levels supported by NVIDIA RAID.

- "NVIDIA RAID Features" on page 9 describes additional features offered by NVIDIA RAID.

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 5 [1]

  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.
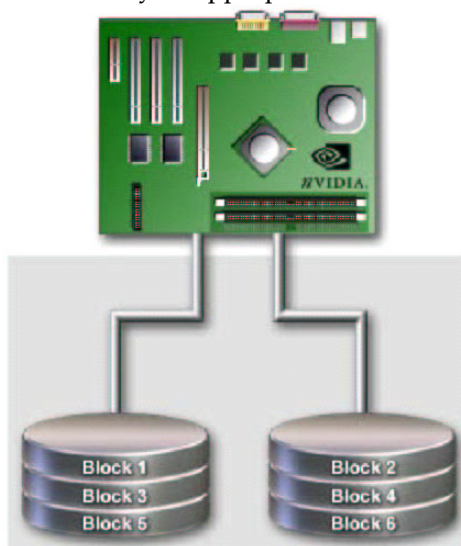
Figure 1.1   RAID 0 Array Diagram

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.

Summary of Features and Benefits

- **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.
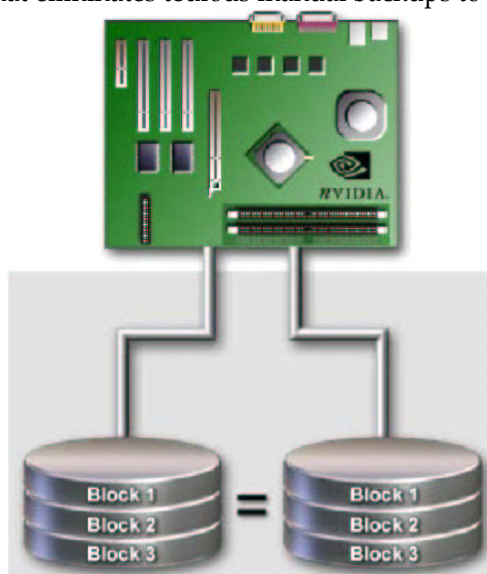
Figure 1.2 RAID 1 Array Diagram

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.

Summary of Features and Benefits

- **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.
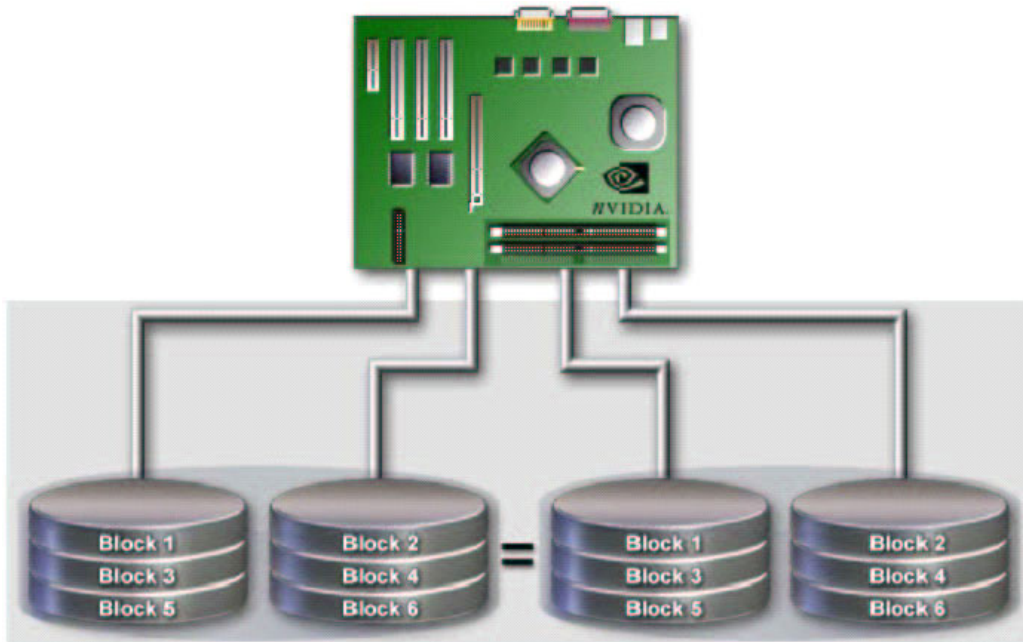
Figure 1.3   RAID 0+1 Array Diagram

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.

Summary of Features and Benefits

- **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.
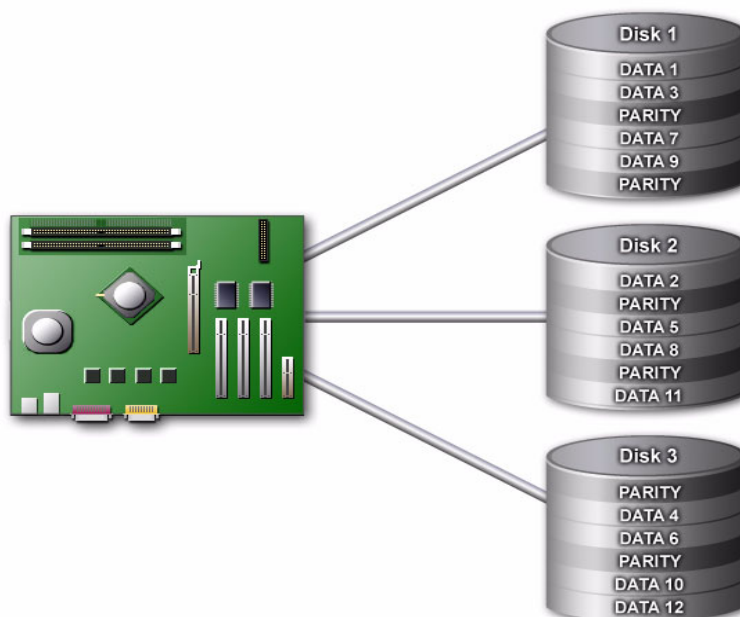
Figure 1.4 RAID 5 Array Diagram

Summary of Features and Benefits

- **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.
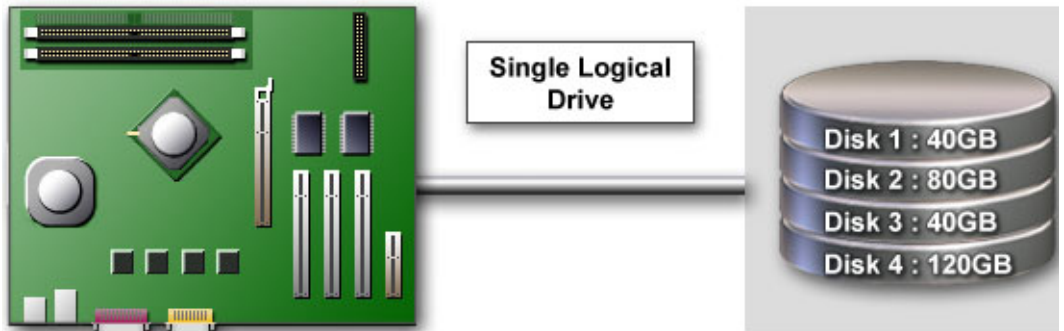
Figure 1.5   JBOD Array Diagram

Summary of Features and Benefits

- **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

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 sections on using the MediaShield RAID Manager 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.

The BIOS CMOS Setup Utility window appears.

Phoenix - Award BIOS CMOS Setup Utility

Standard CMOS Features	Load Fail-Safe Defaults
Advanced BIOS Features	Load Optimized Defaults
Advanced Chipset Features	Set Supervisor Password
Integrated Peripherals	Set User Password
Power Management Setup	Save & Exit Setup
PnP / PCI Configurations	Exit Without Saving

Esc : Quit
F10 : Save & Exit Setup

↑ ↓ → ← : Select Item

Onboard IO, IRQ, DMA Assignment ...

Figure 2.1   BIOS CMOS Setup Utility Main Window

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

The Integrated Peripherals window appears.

Phoenix - Award BIOS CMOS Setup Utility
Integrated Peripherals

RAID Config	[Press Enter]	Item Help
OnChip IDE Channel0	[Enabled]	
Primary Master PIO	[Auto]	Menu Level ►
Primary Slave PIO	[Auto]	
Primary Master UDMA	[Auto]	
Primary Slave UDMA	[Auto]	
OnChip IDE Channel1	[Enabled]	
Secondary Master PIO	[Auto]	
Secondary Slave PIO	[Auto]	
Secondary Master UDMA	[Auto]	
Secondary Slave UDMA	[Auto]	
IDE Prefetch Mode	[Enabled]	
Init Display First	[PCI Slot]	
OnChip USB	[V1.1 - V2.0]	
USB Keyboard Support	[Disabled]	
USB Mouse Support	[Disabled]	
Serial - ATA	[Enabled]	
SATA Spread Spectrum	[Disabled]	
AC97 Audio	[Auto]	

↑↓→←:Move Enter:Select +/-/PU/PD:Value F10:Save ESC:Exit F1:General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

Figure 2.2   Integrated Peripherals Window

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

The RAID Config window appears.

```
        Phoenix - Award BIOS CMOS Setup Utility
                    RAID Config

 RAID Enable              [Enable]          Item Help

 SATA 1 Primary           RAID [Enabled]
 SATA 1  Secondary        RAID [Enabled]    Menu Level   ► ►
 SATA 2 Primary           RAID [Enabled]
 SATA  2 Secondary        RAID [Disabled]




 ↑↓→←:Move  Enter:Select  +/-/PU/PD:Value   F10:Save  ESC:Exit  F1:General Help
        F5: Previous Values    F6: Fail-Safe Defaults    F7: Optimized Defaults
```

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, three SATA ports are enabled, so the non-bootable RAID array can include up to 3 SATA disks. If there is a disk Connected to "SATA 2 Secondary", it can not be used for RAID.

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

The PC reboots.

Setting Up a Bootable RAID Array

This section explains how to configure a bootable NVIDIA RAID array.

Setting Up the BIOS

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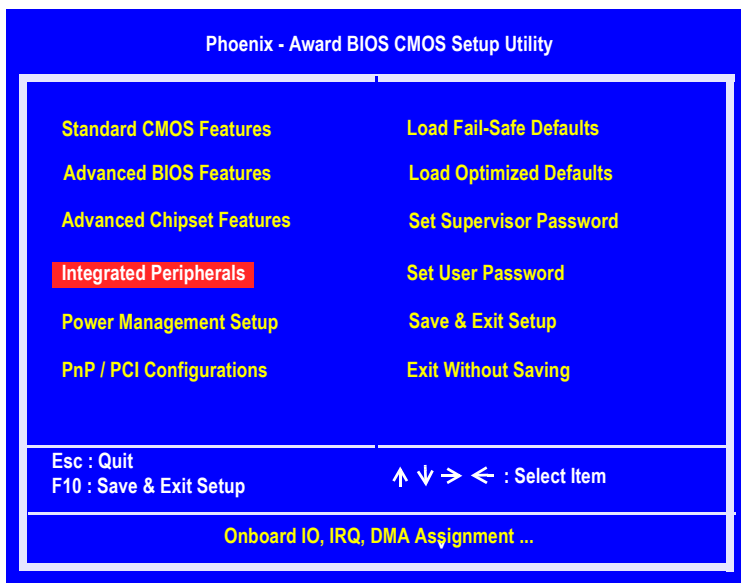
The BIOS CMOS Setup Utility screen appears.

Phoenix - Award BIOS CMOS Setup Utility

Standard CMOS Features	Load Fail-Safe Defaults
Advanced BIOS Features	Load Optimized Defaults
Advanced Chipset Features	Set Supervisor Password
Integrated Peripherals	Set User Password
Power Management Setup	Save & Exit Setup
PnP / PCI Configurations	Exit Without Saving

Esc : Quit
F10 : Save & Exit Setup   ↑ ↓ → ← : Select Item

Onboard IO, IRQ, DMA Asşignment ...

Figure 2.5   BIOS CMOS Setup Utility Main Screen

2 Use the arrow keys to select **Integrated Peripherals** (see Figure 2.5), then press **Enter**.
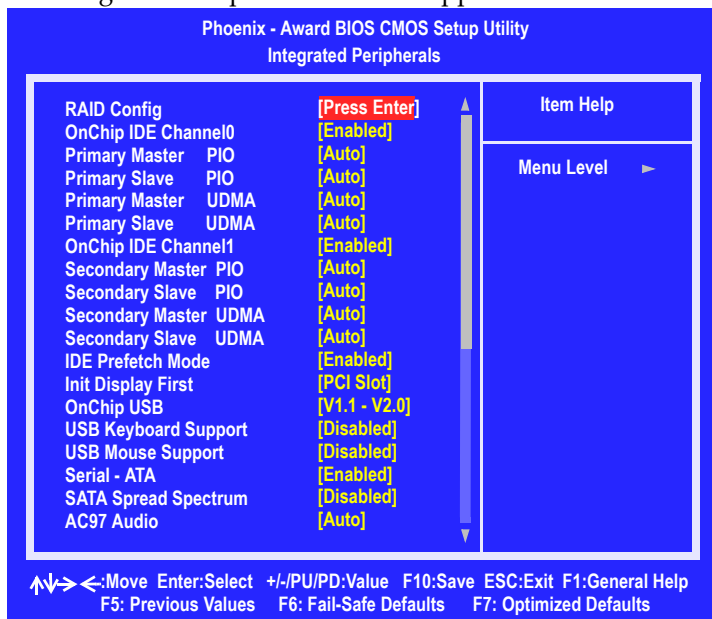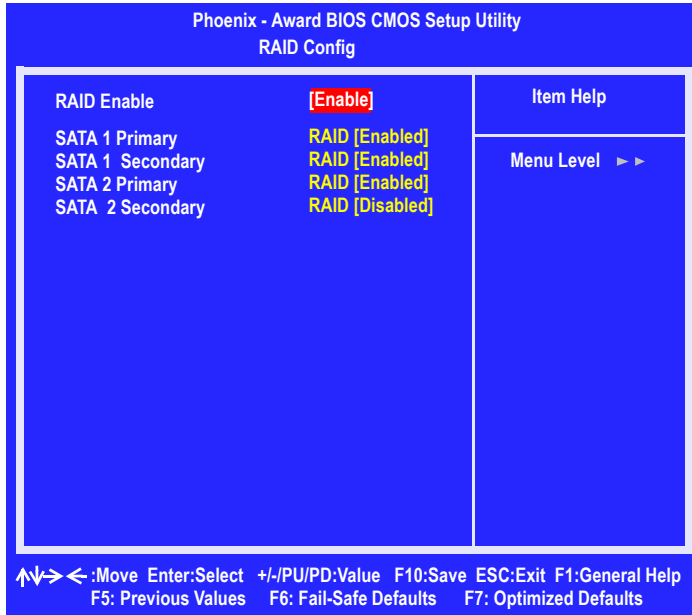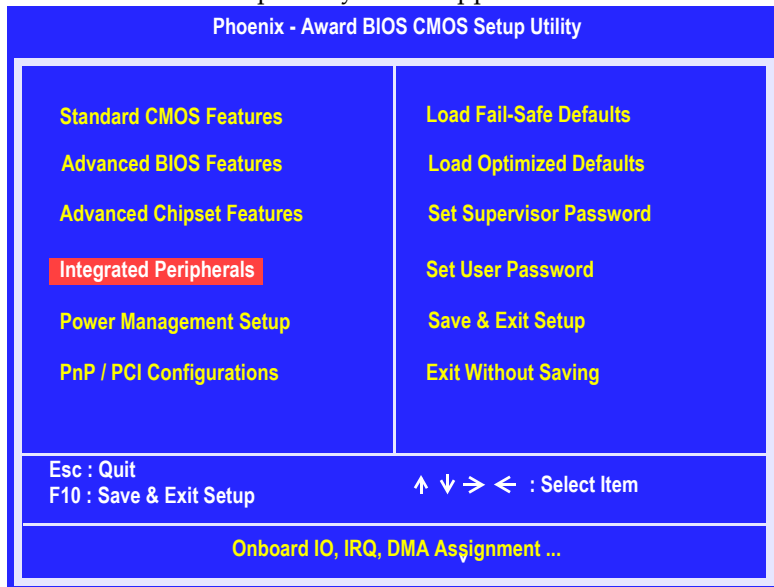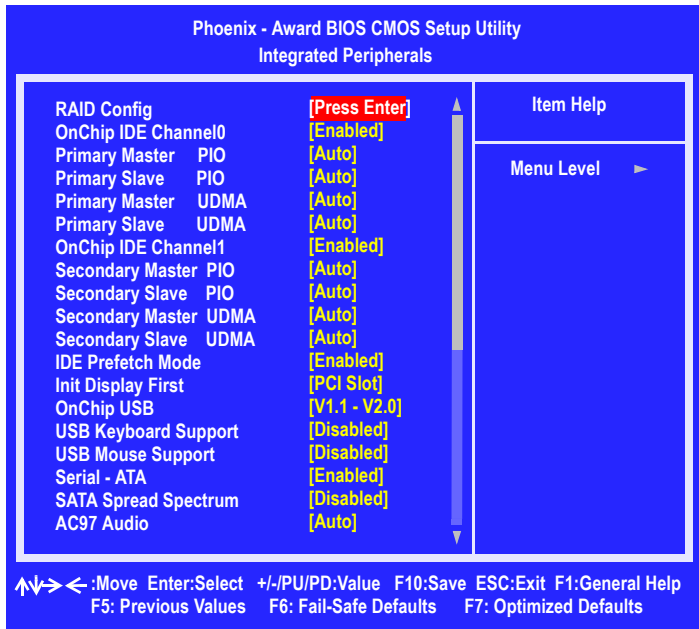
The Integrated Peripherals screen (or a screen similar to it) appears.

```
           Phoenix - Award BIOS CMOS Setup Utility
                   Integrated Peripherals

 RAID Config                   [Press Enter]  ▲      Item Help
 OnChip IDE Channel0           [Enabled]
 Primary Master    PIO         [Auto]
 Primary Slave     PIO         [Auto]             Menu Level      ►
 Primary Master    UDMA        [Auto]
 Primary Slave     UDMA        [Auto]
 OnChip IDE Channel1           [Enabled]
 Secondary Master  PIO         [Auto]
 Secondary Slave   PIO         [Auto]
 Secondary Master  UDMA        [Auto]
 Secondary Slave   UDMA        [Auto]
 IDE Prefetch Mode             [Enabled]
 Init Display First            [PCI Slot]
 OnChip USB                    [V1.1 - V2.0]
 USB Keyboard Support          [Disabled]
 USB Mouse Support             [Disabled]
 Serial - ATA                  [Enabled]
 SATA Spread Spectrum          [Disabled]
 AC97 Audio                    [Auto]        ▼

 ↑↓→← :Move  Enter:Select  +/-/PU/PD:Value  F10:Save  ESC:Exit  F1:General Help
       F5: Previous Values    F6: Fail-Safe Defaults    F7: Optimized Defaults
```

Figure 2.6   Integrated Peripherals Screen

3 Use the arrow keys to select the RAID Config (see Figure 2.6).

4 Press **Enter**.

The RAID Config screen appears.

```
          Phoenix - Award BIOS CMOS Setup Utility
                        RAID Config

  RAID Enable              [Enable]              Item Help

  SATA 1 Primary           RAID [Enabled]
  SATA 1  Secondary        RAID [Enabled]        Menu Level  ► ►
  SATA 2 Primary           RAID [Enabled]
  SATA  2 Secondary        RAID [Disabled]









  ↑↓→←:Move  Enter:Select  +/-/PU/PD:Value  F10:Save  ESC:Exit  F1:General Help
       F5: Previous Values    F6: Fail-Safe Defaults    F7: Optimized Defaults
```
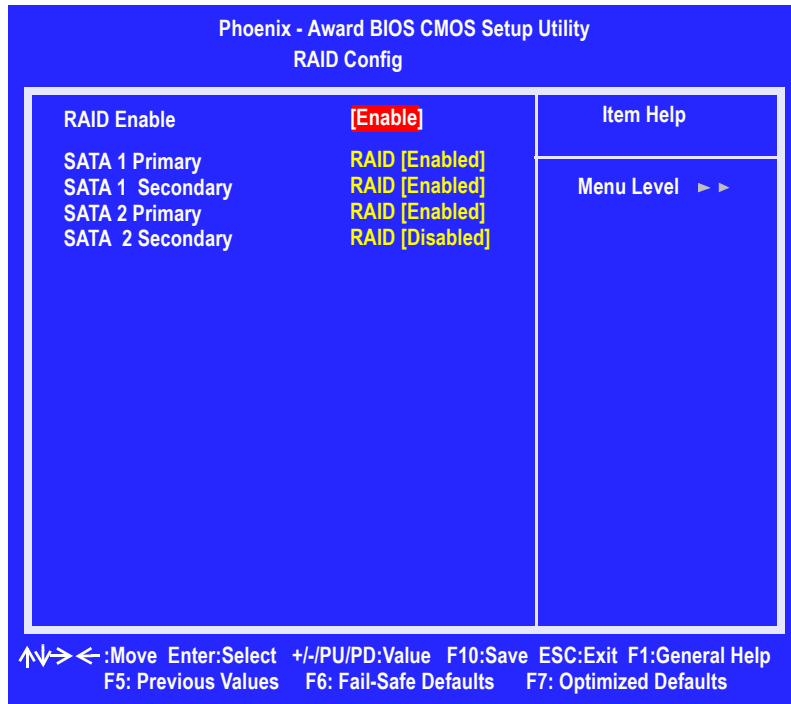
Figure 2.7   RAID Config Screen

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 2.7, three SATA ports are enabled, so the non-bootable RAID array can include up to 3 SATA disks. If there is a disk Connected to "SATA 2 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 NVIDIA RAID BIOS as described in the next section.

Configuring the NVIDIA RAID BIOS

The NVIDIA RAID BIOS set up lets you choose the RAID type and which hard drives you want to make part of the array.
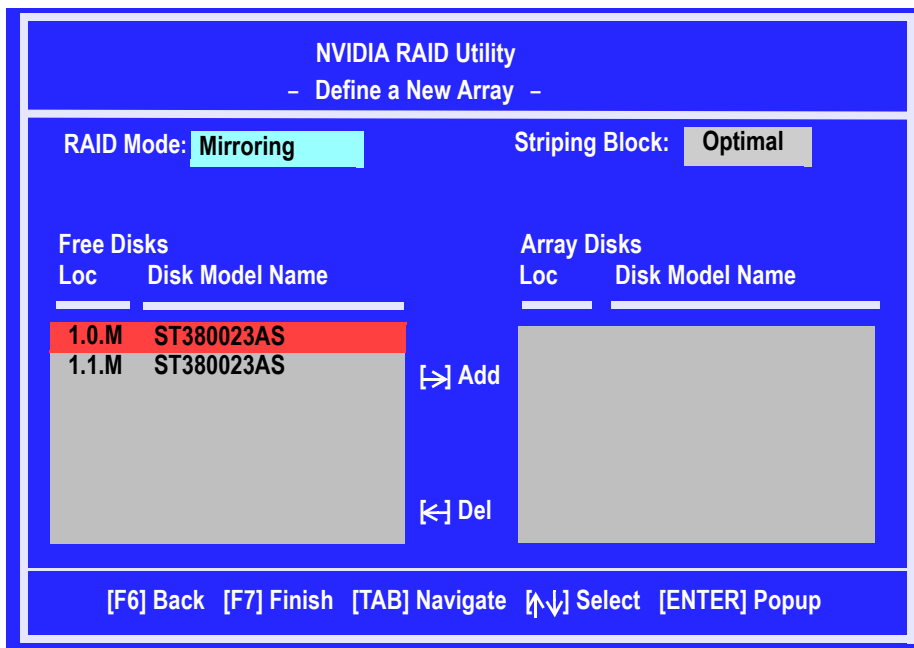
Entering the RAID BIOS Setup:

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 RAID Utility—**Define a New Array** screen appears (Figure 2.8).

```
                    NVIDIA RAID Utility
                  –  Define a New Array  –

   RAID Mode: Mirroring              Striping Block:  Optimal


   Free Disks                        Array Disks
   Loc      Disk Model Name          Loc      Disk Model Name


   1.0.M    ST380023AS
   1.1.M    ST380023AS            [→] Add



                                  [←] Del



      [F6] Back   [F7] Finish   [TAB] Navigate  [↑↓] Select   [ENTER] Popup
```

Figure 2.8   NVIDIA RAID 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.)
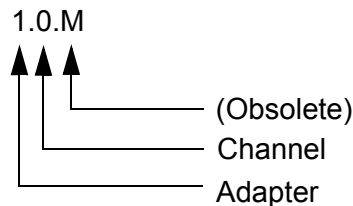
Figure 2.9   Loc Column Information

In Figure 2.9, 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 right-arrow key (→).

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

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

Figure 2.10 illustrates the Define a New Array screen after two disks have been assigned as RAID1 array disks.
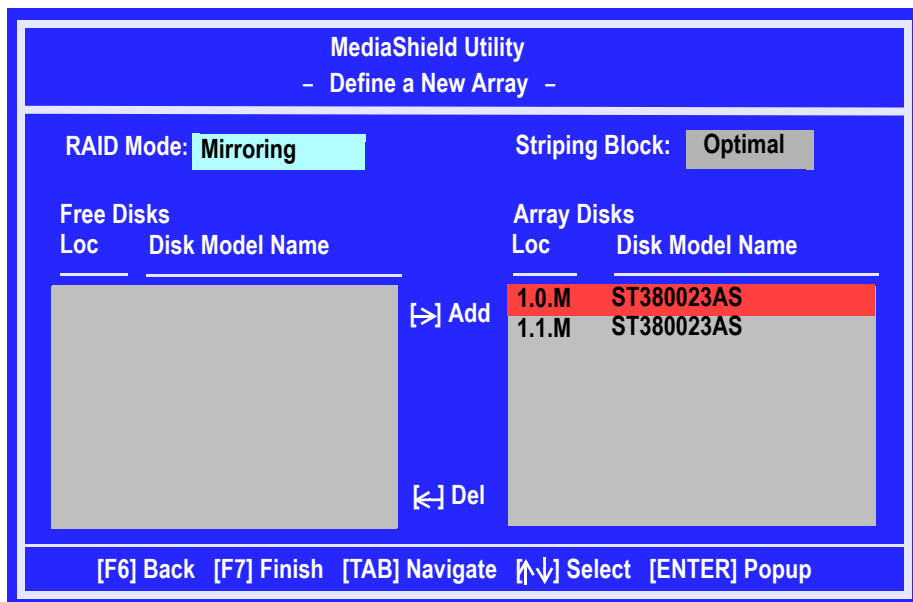
```
                        MediaShield Utility
                     –  Define a New Array  –

  RAID Mode:  Mirroring              Striping Block:   Optimal

  Free Disks                        Array Disks
  Loc     Disk Model Name           Loc      Disk Model Name

                                    1.0.M    ST380023AS
                          [→] Add   1.1.M    ST380023AS



                          [←] Del

   [F6] Back   [F7] Finish   [TAB] Navigate  [↑↓] Select  [ENTER] Popup
```
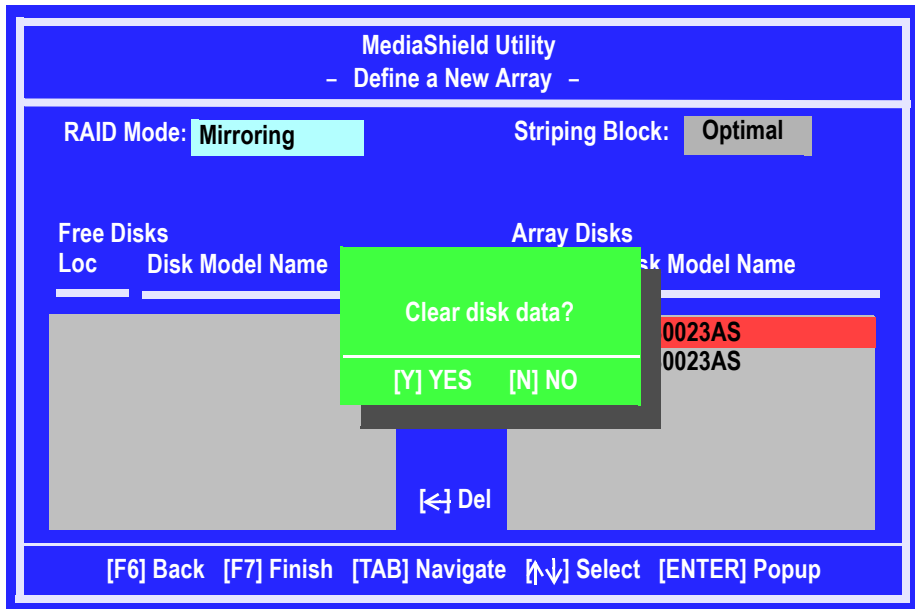
Figure 2.10   MediaShield Utility—Array Disks Assigned

Completing the RAID BIOS Setup
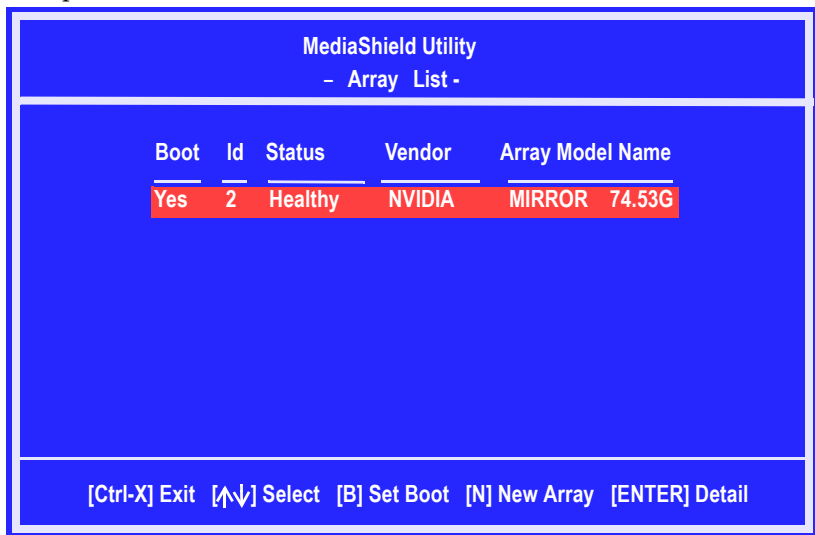
1 After assigning your RAID array disks, press **F7.**

The Clear disk array prompt appears.

MediaShield Utility
– **Define a New Array** –

RAID Mode: **Mirroring**   Striping Block: **Optimal**

Free Disks   Array Disks
Loc   Disk Model Name   [sk Model Name]

Clear disk data?   0023AS
                              0023AS
[Y] YES   [N] NO

[←] Del

[F6] Back   [F7] Finish   [TAB] Navigate   [↑↓] Select   [ENTER] Popup

Figure 2.11   Clear Disk Data Prompt

2 Press **Y** to clear the disk data.
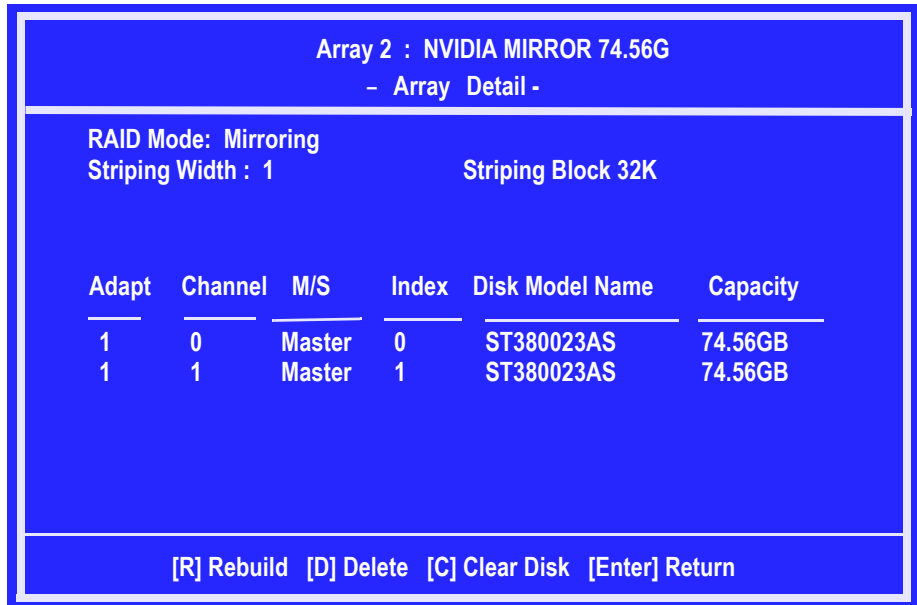
The **Array List** screen appears, where you can review the RAID arrays that you have set up.

MediaShield Utility
– **Array   List -**

Boot	Id	Status	Vendor	Array Model Name
Yes	2	Healthy	NVIDIA	MIRROR 74.53G

[Ctrl-X] Exit   [↑↓] Select   [B] Set Boot   [N] New Array   [ENTER] Detail

Figure 2.12   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 Mode: Mirroring
Striping Width : 1   Striping Block 32K

Adapt	Channel	M/S	Index	Disk Model Name	Capacity
1	0	Master	0	ST380023AS	74.56GB
1	1	Master	1	ST380023AS	74.56GB

[R] Rebuild   [D] Delete   [C] Clear Disk   [Enter] Return

Figure 2.13 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.

Rebuilding a Mirrored RAID HDD

NOTE: When one of the RAID HDD fails, Windows Vista may not show a change of status in Disk Management in Administrative Tools.

Below are the steps to rebuild the RAID storage solution.

1. Press F10 during boot up to access the RAID utility.
2. Identify the defective/degraded drive. The utility should only list the good drive.
   Once you replace the defective HDD, the RAID utility will mark both drives degraded.
3. If the drive is defective, turn off the computer and replace it with one of identical size.
4. Access the RAID utility again.
5. Make sure the drive that is good is marked as bootable YES.
6. Select the HDD that is defective.
7. Delete the RAID Array.
8. Select the HDD that you wish to make bootable.
9. Select "(R) Rebuild" to Rebuild the RAID Array.
10. Select Add
11. Exit the RAID Utility Screen.

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