



RAID OPTION ROM

USER MANUAL

Version 1.6

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Chapter 1: Introduction

- Functions (page 1)
 - Installation (page 2)
 - About This Manual (page 2)
-

The RAID Option ROM is an application that runs on your motherboard's Basic Input Output System (BIOS). RAID Option ROM appears when you first boot your computer, before your operating system loads.

Figure 1. RAID Option ROM screen during boot-up

RAID Option ROM Version 3.0.1540.xx (c) 2008 Advanced Micro Devices, Inc. All rights reserved.				
ID	MODE	LD SIZE	TRACK-MAPPING	STATUS
01	1x2 RAID 1	79.00G	9604/255/63	Functional
Port	Device Name			
3	WDC WD360GD-00FNA0			
4	Maxtor 6B300S0			
Press <Ctrl-F> to enter RAID Option ROM Utility...				

Functions

The RAID Option ROM includes a Utility with tools to set up your physical drives as RAID logical drives. The RAID Option ROM Utility can perform these functions:

- Monitoring RAID and JBOD status
 - Viewing physical drive assignments
 - Secure erasing of all data on physical drives
 - Creating RAID logical drives
 - Creating multiple logical drives using the same physical drives
 - Deleting RAID logical drives
 - Diagnosing critical and offline RAID logical drives
 - Displaying the IRQ and base address (for system diagnosis)
-

Installation

There is no installation required. RAID Option ROM comes factory-installed on your AMD motherboard.

About This Manual

This *User Manual* describes how to setup and maintain your RAID system with the RAID Option ROM Utility.

This manual includes a full table of contents, chapter task lists, and numerous cross-references to help you find the specific information you are looking for.

Also included are four levels of notices:



Note

A *Note* provides helpful information such as hints or alternative ways of doing a task.



Important

Important calls attention to an essential step or point required to complete a task. Important items include things often missed.



Caution

A *Caution* informs you of possible equipment damage or loss of data and how to avoid them.



Warning

A *Warning* notifies you of probable equipment damage or loss of data, or the possibility of physical injury, and how to avoid them.

Chapter 2: Using RAID Option ROM

- Opening RAID Option ROM (below)
- Using the Main Menu (page 4)
- Viewing Drive Assignments (page 5)
- Secure Erasing a Physical Drive (page 6)
- Creating a Logical Drive (page 9)
- Deleting a Logical Drive (page 14)
- Viewing Controller Configuration (page 15)
- Responding to Logical Drive Problems (page 16)

Opening RAID Option ROM

The RAID Option ROM and the RAID Option ROM Utility are built-in components of the AMD motherboard.

When the RAID Option ROM loads during boot-up, it displays pertinent information about the RAID logical drives that it finds.

```
RAID Option ROM Version 3.0.1540.xx
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```

ID	MODE	LD SIZE	TRACK-MAPPING	STATUS
01	1x2 RAID 1	79.00G	9604/255/63	Functional
Port	Device Name			
3	WDC WD360GD-00FNA0			
4	Maxtor 6B300S0			

Press <Ctrl-F> to enter RAID Option ROM Utility...

When the RAID Option ROM screen appears, press Ctrl-F to enter the Utility. The RAID Option ROM screen displays the following information:

- **ID** – An identification number assigned to each logical drive by the Option ROM.
- **Mode** – The RAID mode (level) configuration of the logical drive
- **Size** – The data capacity of the logical drive in GB (Gigabytes).
- **Track-Mapping** – This is the CHS (Cylinder/Head/Sector) equivalent of the logical drive geometry as hosted by the RAID Option ROM int 13h disk services.

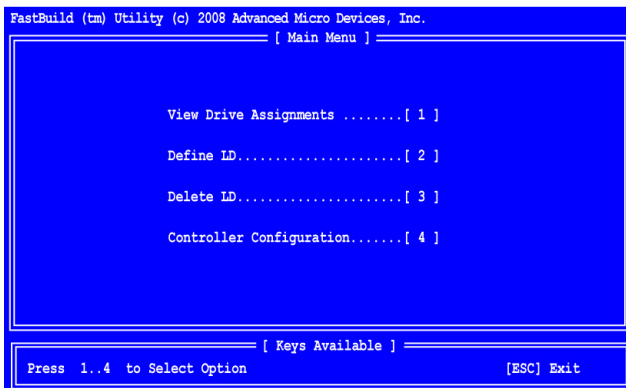
- **Status** – Shows one of three logical drive conditions:
 - **Functional** – The logical drive is fully operational, and no problems are present.
 - **Critical** – The logical drive is still operational, meaning you can read and write data to it. But the logical drive has lost fault tolerance.
For RAID levels 1, 5, and 10, the logical drive contains a failed physical drive. You must identify and replace the failed physical drive, then rebuild the logical drive using the RAIDXpert software.
 - **Offline** – The logical drive is no longer operational, meaning you cannot read and write data to it. You must identify and replace the failed drive(s). Then you can create a new logical drive and copy your data to it from the last tape backup or other device.
For RAID levels 1, 5, and 10, two or more physical drives in the logical drive have failed.

For a RAID 0 or JBOD at least one physical drive has failed.

A RAID Ready logical drive disappears from the user interface when its physical drive fails.
- **Port** – The port number to which the Single Disk (unassigned physical drive) is attached.
- **Device Name** – The manufacturer's name and model number of this physical drive.

Using the Main Menu

When the RAID Option ROM displays on your computer screen, press Ctrl-F to enter the Utility and display the Main Menu.



The Main Menu (above) has five options:

- Press 1 to view physical drive assignments
- Press 2 to create a logical drive or view information about an existing logical drive.
- Press 3 to delete a logical drive.
- Press 4 to view the controller configuration.
- Press Esc (Escape) to exit the utility.

Viewing Drive Assignments

From the Main Menu screen, press 1 to see the View Drive Assignments screen (below).

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.

[View Drives Assignments]

Channel:ID	Drive Model	Capabilities	Capacity (GB)	Assignment
1:Mas	ST380023AS	SATA 1.5 G	80.02	
	Extent 1		79.96	LD 1-1
2:Mas	ST380023AS	SATA 1.5 G	80.02	
	Extent 1		79.96	LD 1-2
3:Mas	ST380023AS	SATA 1.5 G	80.02	
	Extent 1		79.96	LD 1-3
4:Mas	ST380023AS	SATA 1.5 G	80.02	
	Extent 1		79.96	<Single Disk>

[Keys Available]

[F1] Up [F4] Down [ESC] Exit [Ctrl+H] Secure Erase [PgUp/Dn] Page Change

This screen reports physical drive assignments and provides the following information:

- **Channel: ID** – Shows the AMD motherboard channel ID (1 through 4) to which a particular physical drive is attached.
- **Drive Model** – Identifies the manufacturer, model, and model number (if applicable) of each physical drive.
- **Capabilities** – The type and speed of the physical drive, such as SATA 1.5 Gb/s or 3.0 Gb/s
- **Capacity (GB)** – Reflects the capacity in GB (gigabytes) of the physical drive.
- **Assignment** – This field identifies the logical drive to which the physical drive belongs. In the example above, there is one logical drive composed of two physical drives. LD 1-2 means logical drive 1, physical drive 2.

Unassigned drives are labeled *Single Disk*. You can use unassigned drives to create a new logical drive.

- **Extent** – An extent is a portion of the physical drive. The RAID Option ROM Utility allows you to split the capacity of a physical drive between two logical drives. The portion of a physical drive available to be used in a logical drive is called an *extent*. The sum of the two extents is slightly smaller than the total capacity of the physical drive.

See “Viewing Drive Assignments, Split Physical Drives” on page 13 for an example of two extents for each physical drive.

Secure Erasing a Physical Drive



Warnings

- When you secure erase a physical drive, you permanently delete all data on the physical drive. There is no way to restore your data after a secure erase.
 - Do not secure erase a physical drive that belongs to a logical drive. This action will cause the logical drive to go Critical or Offline.
 - Backup any important data before you use this feature!
-



Important

Once you begin, you cannot exit the RAID Option ROM Utility until the Secure Erase operation is finished. Secure Erase takes about the same amount of time as a partition and format. Plan ahead and allow yourself enough time.

The Secure Erase feature overwrites all sectors on a physical drive.

To secure erase a physical drive:

1. From the Main Menu screen, press 1 to see the View Drive Assignments screen (below).

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.

[View Drives Assignments]

Channel	ID	Drive Model	Capabilities	Capacity (GB)	Assignment
1:Mas		ST380023AS	SATA 1.5 G	80.02	
		Extent 1		79.96	LD 1-1
2:Mas		ST380023AS	SATA 1.5 G	80.02	
		Extent 1		79.96	LD 1-2
3:Mas		ST380023AS	SATA 1.5 G	80.02	
		Extent 1		79.96	LD 1-3
4:Mas		ST380023AS	SATA 1.5 G	80.02	
		Extent 1		79.96	<Single Disk>

[Keys Available]

[F] Up [I] Down [ESC] Exit [Ctrl+H] Secure Erase [PgUp/Dn] Page Change

2. Press the arrow keys to highlight a physical drive you want to secure erase and press Ctrl-H.

The caution screen appears.

```
CAUTION!!

This Function Will Erase All Data In Your Hard Disk.
Please Confirm Before You Do It.

Y - To Do / ESC - Back

Note:
This Function Will Be Executed By The Default Value That
The Erase Pattern Is 55AA And Erase Count Is 1 If You
Do Not Input Any Value.
```

3. Press Y to continue.

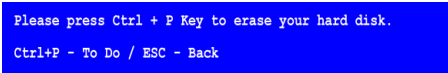
The settings screen appears.

```
Channel ID      : 01
Drive Model     : ST380013AS
Erase Count     : 1
Erase Pattern   : 55AA

[Ctrl+E] Execute [ESC] Back
[F] Up [I] Down [BackSpace] Delete
[0-9] Erase Count [A-Z/a-z/0-9] Erase Pattern
```

4. Optional. Press the arrow keys to highlight the settings you want. Press the Backspace key to delete, then enter a new value for:
 - Erase Count. The default is 1.
 - Erase Pattern The default is 55AA (hexadecimal)
5. Press Ctrl-E to continue.

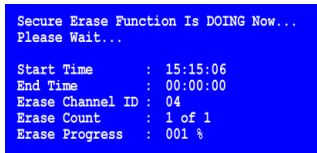
The confirmation screen displays.

A blue rectangular box with white text. The text reads: "Please press Ctrl + P Key to erase your hard disk." followed by "Ctrl+P - To Do / ESC - Back" on the next line.

```
Please press Ctrl + P Key to erase your hard disk.  
Ctrl+P - To Do / ESC - Back
```

6. Press Ctrl-P to secure erase your physical drive.

Watch the screen to monitor the progress.

A blue rectangular box with white text. The text reads: "Secure Erase Function Is DOING Now..." followed by "Please Wait..." on the next line. Below that is a table of status information.

```
Secure Erase Function Is DOING Now...  
Please Wait...  
  
Start Time      : 15:15:06  
End Time       : 00:00:00  
Erase Channel ID : 04  
Erase Count    : 1 of 1  
Erase Progress  : 001 %
```

Secure Erase runs until all sectors of the selected physical drive have been overwritten. Depending on the size of your physical drive, this operation can take some time. You cannot exit the RAID Option ROM Utility until the Secure Erase is done.

Creating a Logical Drive

- From the Main Menu screen, press 2 to display the Define LD Menu (below).

```

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.
===== [ Define LD Menu ] =====

  LD No      RAID Mode    Total Drv    Capacity (GB)    Status
  ----      -
LD 1         ----         ----         -----         ---
LD 2         ----         ----         -----         ---
LD 3         ----         ----         -----         ---
LD 4         ----         ----         -----         ---
LD 5         ----         ----         -----         ---
LD 6         ----         ----         -----         ---
LD 7         ----         ----         -----         ---
LD 8         ----         ----         -----         ---

===== [ Keys Available ] =====
[↑] Up [↓] Down [ESC] Exit [Enter] Select
  
```

- Press the arrow keys to highlight a logical drive number you want to define and press Enter to select it.

The Define LD Menu appears for the number you selected (below).

```

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.
===== [ Define LD Menu ] =====

  LD No      RAID Mode    Total Drv
  LD 1         RAID 5           3

Stripe Block: 64 KB                      Fast Init: ON
Gigabyte Boundary: ON                     Cache Mode: WriteThru

===== [ Drive Assignments ] =====

Channel ID    Drive Model          Capacity (GB)    Assignment
1:Mas ST380013AS      80.03           Y
2:Mas ST380013AS      80.03           Y
3:Mas ST380013AS      80.03           Y
4:Mas ST380013AS      80.03           N

===== [ Keys Available ] =====
[↑] Up [↓] Down [ESC] Exit [Space] Change Option [Ctrl-Y] Save [PgUp/Dn] Page Change
  
```

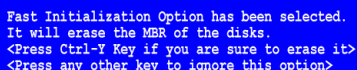
- Choose the RAID Level you want. In the Define LD Menu section, press the Spacebar to toggle through logical drive types:
 - RAID 0 (Stripe)
 - RAID 1 (Mirror)
 - RAID 5 (Stripe with Distributed Parity)
 - RAID 10 (Stripe / Mirror)
 - RAID Ready (Single Drive)
 - JBOD (Just a Bunch of Disks)

See “Choosing a RAID Level” on page 24 for more information.

4. Press the arrow keys to move to the next option. Option choices depend on the RAID level you selected.
 - Fast Init erases the Master Boot Record (MBR) of the physical drives when this feature is set to ON. For more information, see page 27.
 - Stripe Block Size. Press the Spacebar to toggle between 64 KB and 128 KB. For more information, see page 27.
 - Gigabyte Boundary. Press the Spacebar to toggle between ON and OFF. For more information, see page 27.
 - Cache Mode. Only WriteThru is available.
5. Press the arrow keys to move to Disk Assignments. Press the spacebar to toggle between N and Y for each available drive. Y means this physical drive will be assigned to the logical drive.

Assign the appropriate number of physical drives to your logical drive. See “Choosing a RAID Level” on page 24 for more information.
6. Choose your Initialization option. See “Initialization” on page 27 for more information.
 - For *Fast* initialization, set Fast Init to ON. This option is preferred.
 - For *No* initialization, set Fast Init to OFF.
7. Press Ctrl-Y to save your logical drive configuration.

If you set Fast Init to ON, the following message displays:

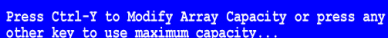


Fast Initialization Option has been selected.
It will erase the MBR of the disks.
<Press Ctrl-Y Key if you are sure to erase it>
<Press any other key to ignore this option>

Press Ctrl-Y to perform the fast initialization. Press any other key to skip initialization.

You have the option of using all of the physical drive capacity for one logical drive or allocating a portion to a second logical drive.

This option is *not* available for JBOD or RAID Ready logical drives.



Press Ctrl-Y to Modify Array Capacity or press any other key to use maximum capacity...

8. Choose one of the following:
 - Allocate the full capacity of the physical drives to a single logical drive. Go to “One Logical Drive” on page 11.
 - Split the capacity of the physical drives between two logical drives. Go to “Two Logical Drives” on page 11.

One Logical Drive

Continued from *Create Logical Drive* step 8, above.

1. Press any key (except for Ctrl-Y) to use the full portion of the logical drive for one logical drive.
2. Press Esc to exit to the Main Menu. Press Esc again to exit the Utility.
3. Press Y to restart the computer.

You have successfully created a new RAID logical drive.



Note

You must be partition and format your new logical drive before you can use it. See “Appendix A: Partition and Format” on page 29.

Two Logical Drives

Continued from *Create Logical Drive* step 8, above.

1. Press Ctrl-Y to allocate a portion of the physical drives to the first logical drive.

```

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.
===== [ Define LD Menu ] =====
LD No      RAID Mode   Total Drv   Capacity(GB)
LD 1       RAID 5      3           79.96
Stripe Block: 64 KB                      Fast Init: ON

===== [ Drives Assignments ] =====
Channel ID   Drive Model      Capacity (GB)   Assignment
1:Ma        ST380013AS        80.03           Y
2:Ma                                     Y
3:Ma  Enter array capacity (in GB) here: 40  Y
4:Ma                                     N

===== [ Keys Available ] =====
[0-9] Input Capacity [Enter] Save [BackSpace] Delete [ESC] Escape [PgUp/Dn] Page Change
  
```

2. Enter the desired capacity in GB for the first logical drive and press Enter.

The Define LD Menu displays again.

```

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.
[ Define LD Menu ]

LD No      RAID Mode    Total Drv    Capacity (GB)    Status
LD 1       RAID 1       2            39.99            Functional
LD 2       ----        ----          ----            ----
LD 3       ----        ----          ----            ----
LD 4       ----        ----          ----            ----
LD 5       ----        ----          ----            ----
LD 6       ----        ----          ----            ----
LD 7       ----        ----          ----            ----
LD 8       ----        ----          ----            ----

[ Keys Available ]
[↑] Up [↓] Down [ESC] Exit [Enter] Select
  
```

- Press the up and down arrow keys to select an available logical drive number and press Enter.

```

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.
[ Define LD Menu ]

LD No      RAID Mode    Total Drv
LD 2       RAID 5       3

Stripe Block: 64 KB      Fast Init: ON
Gigabyte Boundary: ON    Cache Mode: WriteThru

[ Drive Assignments ]

Channel ID    Drive Model    Capacity (GB)    Assignment
1:Mas ST380013AS    39.96            Y
2:Mas ST380013AS    39.96            Y
3:Mas ST380013AS    39.96            Y
4:Mas ST380013AS    80.03            N

[ Keys Available ]
[↑] Up [↓] Down [ESC] Exit [Space] Change Option [Ctrl-Y] Save [PgUp/Dn] Page Change
  
```

- Choose the RAID level and options for the second logical drive.
Note that the physical drives in Channels 1, 2, and 3 reflect smaller capacities because a portion of their original capacity belongs to a different logical drive.
The physical drive in Channel 4 is not yet assigned to a logical drive, so it shows the original capacity.
- Press Ctrl-Y to save your logical drive configuration.
- Press Esc to exit to the Main Menu. Press Esc again to exit the Utility.
- Press Y to restart the computer.

You have successfully created a new RAID logical drive.



Note

You must be partition and format your new logical drive before you can use it. See “Appendix A: Partition and Format” on page 29.

Viewing Drive Assignments, Split Physical Drives

After you create two logical drives from the same set of physical drives, press 1 on the Main Menu screen to see the View Drive Assignments screen (below).

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.				
[View Drives Assignments]				
Channel	ID	Drive Model	Capabilities	Capacity (GB)
1:	Mas	ST380023AS	SATA 1.5 G	80.02
		Extent 1		39.99
		Extent 2		39.95
2:	Mas	ST380023AS	SATA 1.5 G	80.02
		Extent 1		39.99
		Extent 2		39.95
3:	Mas	ST380023AS	SATA 1.5 G	80.02
		Extent 1		39.99
		Extent 2		39.95
4:	Mas	ST380023AS	SATA 1.5 G	80.02
		Extent 1		79.96
				<Single Disk>
[Keys Available]				
[↑] Up	[↓] Down	[ESC] Exit	[Ctrl+H] Secure Erase	

In this example, observe how each of the physical drives in Channels 1, 2, and 3 are split between two logical drives. Extent 1 belongs to logical drive 1 (LD 1). Extent 2 belongs to logical drive 2 (LD 2).

Under Assignment, the physical drives are divided into LD 1 and LD 2. For example, LD 1-2 means logical drive 1, physical drive 2. LD 2-3 means logical drive 2, physical drive 3.

Note that the combined size of the extents is slightly smaller than the total capacity of the physical drive.

Unassigned physical drives are labeled *Single Disk*. You can use an unassigned physical drive to create a new logical drive.

Deleting a Logical Drive



Warning

When you delete a logical drive, you delete all data on the logical drive. Be sure to backup any important data before you delete a logical drive!

To delete a logical drive:

- From the Main Menu screen, press 3 to display the Delete LD Menu (below).

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.

[Delete LD Menu]

LD No	RAID Mode	Total Drv	Capacity (GB)	Status
LD 1	RAID 1	2	39.99	Functional
LD 2	RAID 1	2	39.95	Functional
LD 3	----	----	-----	----
LD 4	----	----	-----	----
LD 5	----	----	-----	----
LD 6	----	----	-----	----
LD 7	----	----	-----	----
LD 8	----	----	-----	----

[Keys Available]

[↑] Up [↓] Down [ESC] Exit [Del or Alt+D] Delete

- Highlight the logical drive you wish to delete and press the Del key or Alt-D. The Delete LD Menu for the selected logical drive appears (below).

Option ROM Utility (c) 2008 Advanced Micro Devices, Inc.

[View LD Definition Menu]

LD No	RAID Mode	Total Drv	Capacity (GB)	Status
LD 2	RAID 5	3	39.95	Functional

Stripe Block: 64 KB Cache Mode: WriteThru

[Drives Assignments]

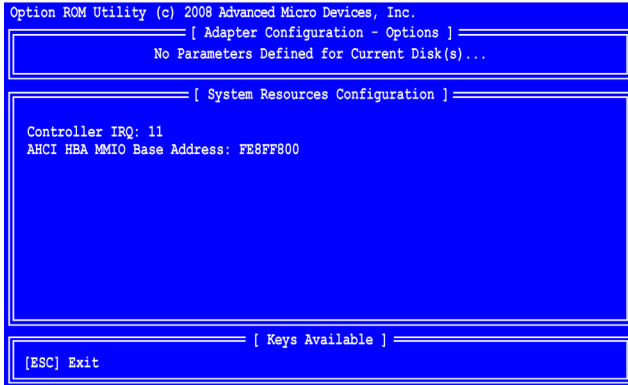
Channel ID	Drive Model	Capacity (GB)
1:Mas	ST380023AS	80.03
2:Mas	ST380023AS	80.03
3:Mas	ST380023AS	80.03

Press Ctrl-Y to delete the data in this disk!
or press any other key to abort...

- Press Ctrl-Y to confirm and complete logical drive deletion. The screen returns to the Delete LD Menu. Press Esc to return to the Main Menu.

Viewing Controller Configuration

From the Main Menu screen, press 4 to display the Controller Configuration Options screen (below).



The Controller Configuration Options screen provides diagnostic information.

System Resources

The information in the System Resources section might be helpful for troubleshooting purposes:

- The system IRQ used by the RAID controller
- Base Address

Responding to Logical Drive Problems

While physical drives are highly reliable, on occasion a physical drive can fail.

- Fault-tolerant (RAID 1, 5, and 10) logical drives go *Critical* when a physical drive fails.
- Non-fault-tolerant (RAID 0 and JBOD) logical drives go *Offline* when a physical drive fails.
- A RAID Ready logical drive disappears from the user interface when its physical drive fails.

```
RAID Option ROM 3.0.1540.xx
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ID      MODE      SIZE      TRACK-MAPPING      STATUS
-----
1       1x2 RAID 1     79.00G     9604/255/63       Critical

Problem is detected with Array : 1
Critical Status:
A disk member of an array has failed or is not responding.
Please refer to your User Manual for further details.

Press <Ctrl-F> to enter RAID Option ROM Utility...
```

When you boot your system, the RAID Option ROM screen informs you if there is a critical or offline logical drive.

Allow your PC to finish booting and use RAIDXpert to identify the failed drive and to rebuild your logical drive.

See the *RAIDXpert User Manual* for more information.

Chapter 3: Technology Background

- Introduction to RAID (below)
 - Choosing a RAID Level (page 24)
 - Stripe Block Size (page 27)
 - Gigabyte Boundary (page 27)
 - Initialization (page 27)
 - Partition and Format the Logical Drive (page 28)
-

Introduction to RAID

RAID (Redundant Array of Independent Disks) allows multiple physical drives to be combined together into a logical drive. The operating system sees the logical drive as a single storage device, and treats it as such. The RAID software and/or controller handle all of the individual drives on its own. The benefits of a RAID can include:

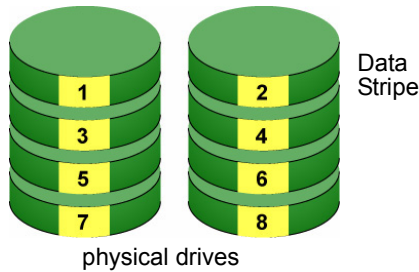
- Higher data transfer rates for increased server performance
- Increased overall storage capacity for a single drive designation (such as, C, D, E, etc.)
- Data redundancy/fault tolerance for ensuring continuous system operation in the event of a hard drive failure

Different types of logical drives use different organizational models and have varying benefits. See Choosing RAID Level on page 24. The following outline breaks down the properties for each type of RAID logical drive:

RAID 0 – Stripe

When a logical drive is striped, the read and write blocks of data are interleaved between the sectors of multiple physical drives. Performance is increased, since the workload is balanced between drives or “members” that form the logical drive. Identical drives are recommended for performance as well as data storage efficiency. The logical drive's data capacity is equal to the number of drive members multiplied by the smallest logical drive member's capacity.

Figure 1. RAID 0 interleaves data across two physical drives



For example, one 100 GB and three 120 GB drives will form a 400 GB (4 x 100GB) logical drive instead of 460 GB.

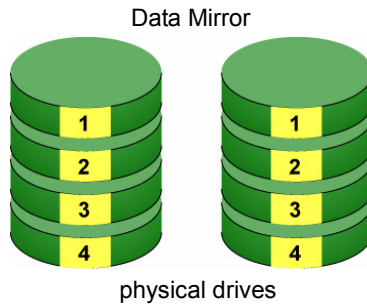
RAID 0 logical drives on the AMD SB6xx/SB7xx Controller consist of one or more physical drives.

RAID 1 – Mirror

When a logical drive is mirrored, identical data is written to a pair of physical drives, while reads are performed in parallel. The reads are performed using elevator seek and load balancing techniques where the workload is distributed in the most efficient manner. Whichever drive is not busy and is positioned closer to the data will be accessed first.

With RAID 1, if one physical drive fails or has errors, the other mirrored physical drive continues to function. Moreover, if a spare drive is present, the spare drive will be used as the replacement drive and data will begin to be mirrored to it from the remaining good drive.

Figure 2. RAID 1 mirrors identical data across to two physical drives



Due to the data redundancy of mirroring, the capacity of the logical drive equals the size of the smallest physical drive. For example, two 100 GB physical drives which have a combined capacity of 200 GB instead would have 100 GB of usable storage when set up in a mirrored logical drive. Similar to RAID 0 striping, if physical drives of different capacities are used, there will also be unused capacity on the larger drive.

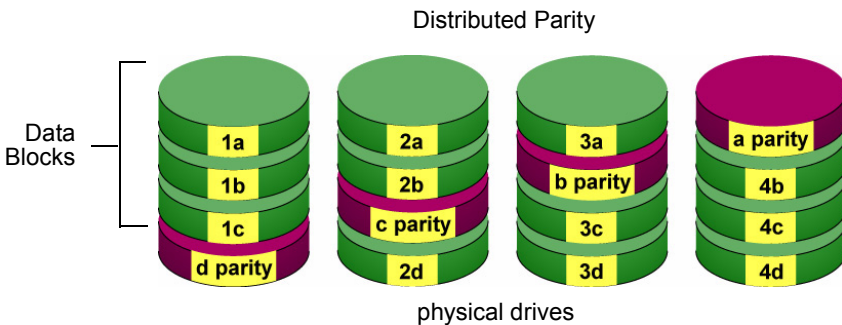
RAID 1 logical drives on the AMD SB6xx/SB7xx Controller consist of two physical drives. You can create multiple RAID 1 logical drives on the same Controller.

RAID 5 – Block Striping with Distributed Parity

RAID 5 stripes data and distributes parity information across the physical drives along with the data blocks. This organization increases performance by accessing multiple physical drives simultaneously for each operation, as well as fault tolerance by providing parity data. In the event of a physical drive failure, data can be re-calculated by the RAID system based on the remaining data and the parity information.

RAID 5 makes efficient use of hard drives and is the most versatile RAID Level. It works well for file, database, application and web servers.

Figure 3. RAID 5 Stripes all drives with data and parity information



The capacity of a RAID 5 logical drive is the smallest physical drive size multiplied by the number of physical drives, less one. Hence, a RAID 5 logical drive with four 100 GB physical drives will have a capacity of 300 GB. A logical drive with two 120 GB physical drives and one 100 GB physical drive will have a capacity of 200 GB.

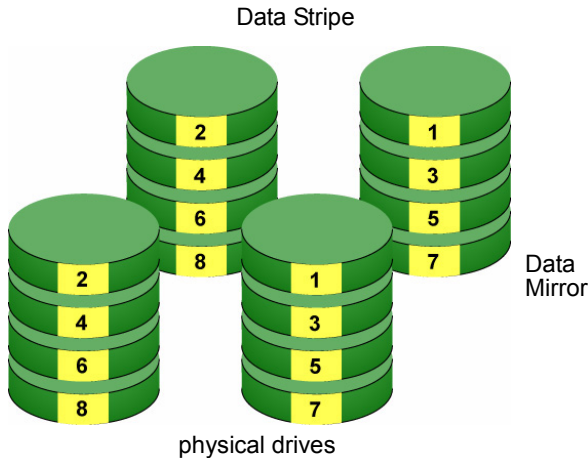
Only the AMD SB650 and SB750 Controllers support RAID 5.

RAID 5 logical drives on the AMD SB650/SB750 Controller consist of 3 or 4 physical drives.

RAID 10 – Mirror/Stripe

RAID 10 combines the properties of RAID 0 and RAID 1 logical drives. RAID 10 increases performance by reading and writing data in parallel while protecting data with duplication. Four physical drives are required for RAID 10. One drive pair is mirrored together then striped over a second drive pair.

Figure 4. RAID 10 mirrors data over one drive pair and stripes it over the other drive pair



The data capacity is similar to a RAID 1 logical drive, with half of the total storage capacity dedicated for redundancy. An added plus for using RAID 10 is that, in many situations, RAID 10 offers double fault tolerance. Double fault tolerance may allow your logical drive to continue to operate depending on which two physical drives fail.

RAID 10 logical drives on the AMD SB6xx/SB7xx Controller consist of four physical drives.

RAID Ready – Single Drive

RAID Ready arranges individual physical drives the same as if they were attached to the PC's motherboard controller. The advantage is that the AMD SB6xx/SB7xx Controller can accommodate up to four physical drives, more than most PC motherboards.

Figure 5. RAID Ready deals with individual physical drives



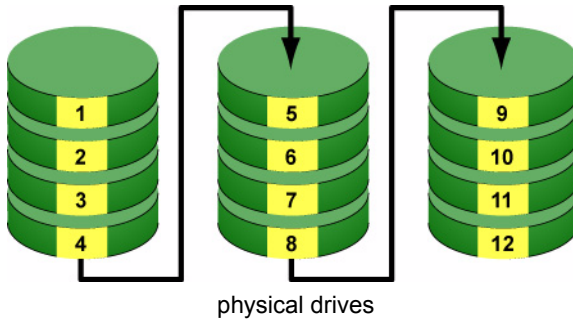
As a single physical drive, RAID Ready does not offer the performance or security advantages of other RAID logical drives.

You create, manage, and delete a RAID Ready the same as a logical drive. A RAID Ready logical drive has only one physical drive. You can designate from one to four of your physical drives as RAID Ready.

JBOD

JBOD stands for “Just a Bunch of Disks” and normally refers to one or more physical drives working independently. The AMD SB6xx and SB7xx Controllers offer the added feature of concatenation, where the capacity of multiple drives is added together. When one drive is full, the data is saved to the next drive automatically. By way of example, using this feature, three 500 GB physical drives concatenated together have the equivalent capacity of single 1.5 TB drive.

Figure 6. JBOD concatenates physical drives together



As independent physical drives, JBOD does not offer the performance or security advantages of RAID logical drives. However, in RAID Option ROM, you create, manage, and delete a JBOD the same as a logical drive.

You can designate from two to four physical drives in RAID Option ROM, with online capacity expansion in RAIDXpert.

If you attach a single physical drive that was previously partitioned, RAID Option ROM will recognize it as a JBOD. However, RAID Option ROM does not allow you to create a single-drive JBOD.

Choosing a RAID Level

There are several issues to consider when choosing the RAID Level for your logical drive. The following discussion summarizes some advantages, disadvantages, and applications for each choice.

RAID 0

Advantages	Disadvantages
Data is broken down into blocks and each block is written to a separate physical drive I/O performance is greatly improved by spreading the I/O load across multiple channels and drives No parity calculation overhead is involved	Not a true RAID because it is not fault-tolerant The failure of just one drive will result in all data in a logical drive being lost Should not be used in mission critical environments

Recommended Applications for RAID 0:

- Image Editing
- Pre-Press Applications
- Any application requiring high bandwidth

RAID 1

Advantages	Disadvantages
Simplest RAID storage subsystem design Can increase read performance by processing data requests in parallel since the same data resides on two different drives	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 1:

- Accounting
- Payroll
- Financial
- Any application requiring very high availability

RAID 5

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate	Disk failure has a medium impact on throughput

Recommended Applications for RAID 5:

- File and Application servers
- WWW, E-mail, and News servers
- Intranet servers
- Most versatile RAID level

RAID 10

Advantages	Disadvantages
Implemented as a mirrored logical drive whose segments are striped logical drives High I/O rates are achieved thanks to multiple stripe segments	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 10:

- Imaging applications
- Database servers
- General fileserver

RAID Ready

Advantages	Disadvantages
Easy management of multiple independent physical drives	No increase in performance, capacity or fault tolerance.

Recommended Applications for RAID Ready:

- Non-critical file storage
- Swappable data storage

When combined with a backup drive, RAID Ready is comparable to RAID 1. See the *RAIDXpert User Manual* for more information.

JBOD

Advantages	Disadvantages
Enables you to manage a large number of physical drives from a single controller	An alternative to RAID without any RAID advantages Do not use in mission-critical environments

Recommended Applications for JBOD:

- Any application requiring multiple physical drives where read/write speed or fault-tolerance are not important
- Applications where low-cost operation is critical

Stripe Block Size

For RAID 0, 5, and 10 logical drives, the stripe block size value can be set to 64 KB or 128 KB. 64 KB is the default. Your choice will directly affect performance. There are two issues to consider when selecting the stripe block size.

- Choose a stripe block size equal to or smaller than the smallest cache buffer found on any physical drive in your logical drive. A larger value slows the logical drive down because physical drives with smaller cache buffers need more time for multiple accesses to fill their buffers.
- If your data retrieval consists of fixed-size data blocks, such as some database and video applications, choose that data block size as your stripe block size.

Generally speaking, email, POS, and web servers prefer smaller stripe block sizes. Video and database applications prefer larger stripe block sizes.

Gigabyte Boundary

The Gigabyte Boundary feature is designed for logical drives in which a drive has failed and the user cannot replace the drive with the same capacity or larger. Instead, the Gigabyte Boundary feature permits the installation of a replacement drive that is slightly smaller (within 1 gigabyte) than the remaining working drive (for example, an 80.5GB drive would be rounded down to 80GB). This can be helpful in the event that a drive fails and an exact replacement model is no longer available.

Gigabyte Boundary is available for all RAID levels. If you split the capacity of your physical drives between two logical drives, you can choose Gigabyte Boundary for the second logical drive. See “Creating a Logical Drive” on page 9.

Initialization

In RAID Option ROM, there are two options for Initialization:

- Fast Initialization – Preferred
- No Initialization

Fast Initialization sets the data bits of the physical drive’s Master Boot Record (MBR) to zero. Any other data on the physical drive remains untouched, however you can no longer access the data because the MBR has been overwritten.

Fast Initialization is available for all RAID levels. The process happens immediately when the logical drive is created and takes only a moment. See “Creating a Logical Drive” on page 9.

If you want to initialize a new logical drive, set the Fast Init option to ON. If you do not want to initialize, set the Fast Init option to OFF. See page 10.

When you use RAIDXpert to create a RAID 1, 5, or 10 logical drive, you also have the option of *Full* Initialization. See the *RAIDXpert User Manual* for more information.

Partition and Format the Logical Drive

Like any other type of fixed disk media in your system, a RAID logical drive must also be partitioned and formatted before use. See “Appendix A: Partition and Format” on page 29.

Appendix A: Partition and Format

In order for your operating system to recognize and work with the physical drives attached to your AMD SB6xx/SB7xx Controller, the drives must be partitioned and formatted.

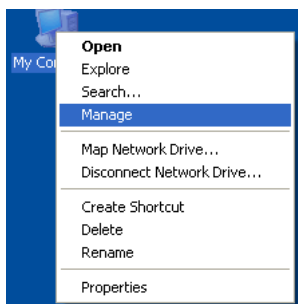
- If your drives were previously partitioned and formatted they are ready to use and you can skip this procedure
- If your drives have not been partitioned and formatted, you must do that job before you can use them

The actions of partitioning and formatting create a file structure on the physical drives with which your operating system can work. In the example below, we show how this is done in Windows. A similar procedure is required for Linux PCs. However, partitioning and formatting in Linux is not automated, therefore please refer to your system documentation for the exact procedure.

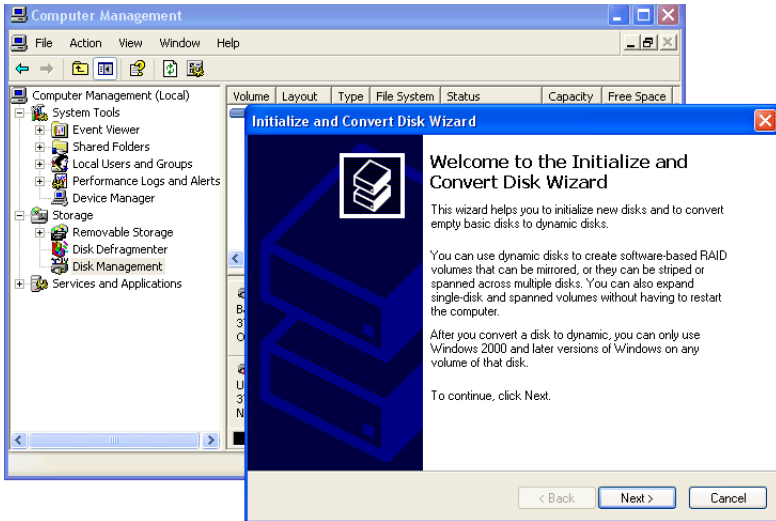


Note

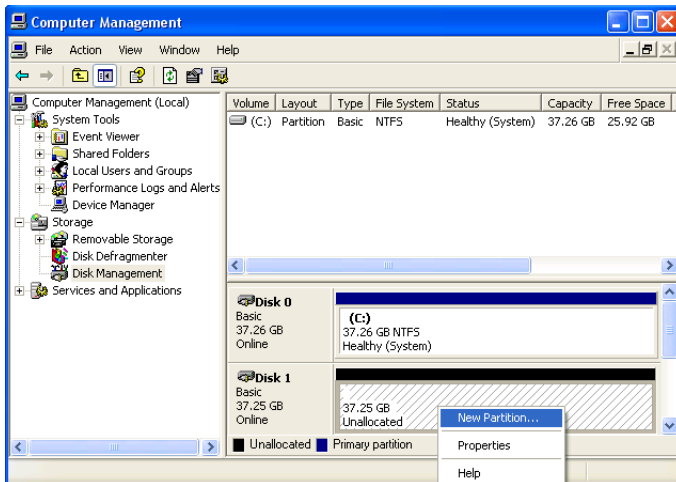
If you plan to boot your computer from this logical drive partitioning and formatting take place as part of the OS installation process. The instructions here are for data logical drives only.



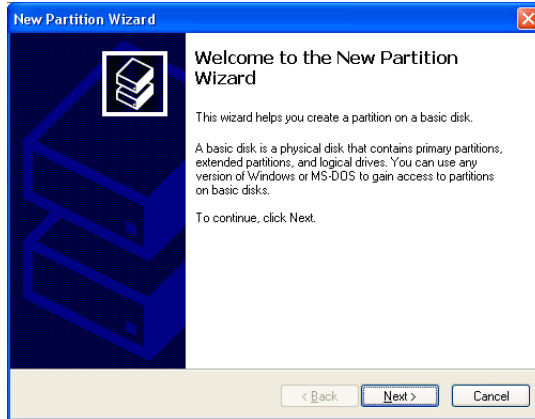
1. From the desktop, right-click the My Computer icon and choose *Manage* from the popup menu. The Computer Management window opens.
2. From the left menu, click **Disk Management**. The Disk Management window opens with your new logical drive identified as Disk 1. The Initialize Wizard appears automatically.



3. Click the **Next** button to start the Wizard.
4. In the following windows, choose Disk 1 to Initialize. Do not choose any disks to Convert. Click the **Finish** button to Initialize the logical drive.



5. Right-click on the Unallocated portion of Disk 1 and choose *New Partition...* from the popup menu. The New Partition Wizard appears.

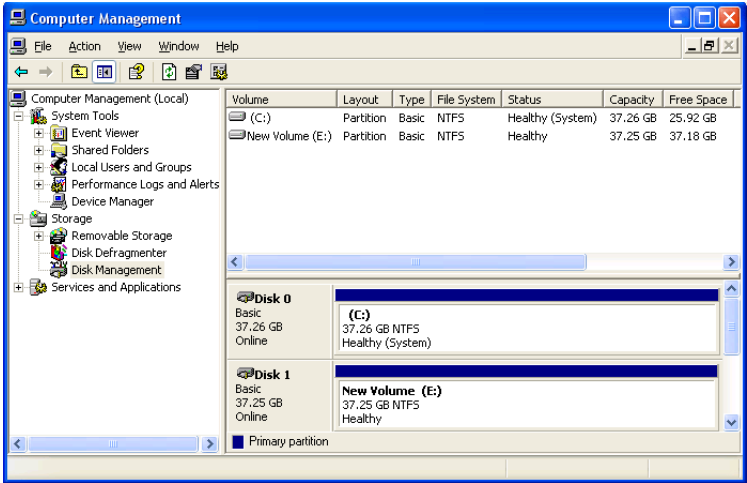


6. Click the **Next** button to start the wizard.
7. In the following windows, do the following actions.
 - Choose *Primary Partition*
 - Specify the maximum available partition size in MB
 - Assign the available drive letter of your choice
 - Choose *Format this partition* with the following settings:
 - File system: NTFS
 - Allocation unit size: Default
 - Volume label: Enter your choice of name
 - Do not check "Perform a quick format" or "Enable file and folder compression"

Click **Next** to move to the next window.

8. Review your selections and click **Finish**. The New Partition Wizard will disappear while partitioning and formatting begin.

This process will take some time. The Disk Management window displays the progress.



When formatting is complete, your logical drive will appear as a hard disk drive in the Disk Management window (above) and the My Computer window (below).

