



LSI 2108/2208
SAS MegaRAID
Configuration Utility

USER'S MANUAL

Revision 1.0

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Manual Revision 1.0

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Preface

About This Manual

This manual is written for system integrators, PC technicians and knowledgeable PC users. It provides instructions on how to use the LSI™ 2108/2208 MegaRAID® Configuration Utility to configure RAID settings for Supermicro motherboards or systems.

Manual Organization

Chapter 1 Provides an overview on the LSI™ 2108/2208 MegaRAID® Software Utility.

Chapter 2 Provides instructions on how to run the LSI 2108/2208 SAS MegaRAID Utility to configure RAID settings.

Conventions Used in This Manual

Pay special attention to the following symbols for proper installation and to prevent damage to the system or injury to yourself.

Warning: Important information given to prevent erroneous RAID configuration and to ensure proper system setup.



Note: Additional information given to ensure correct RAID configuration setup.

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Chapter 1

Introduction

After you have installed hardware components, you must first configure LSI 2108/2208 SAS MegaRAID settings before you install an operating system and other software drivers.

 **Note:** If you do not wish to configure LSI Software RAID settings, proceed with the OS installation. For OS installation instructions, refer to related documents posted on our website at www.supermicro.com.

1-1 Overview of the LSI 2108/2208 SAS Controller

The LSI 2108/2208 SAS Controller, based on the RoC (RAID-on-Chip) architecture, integrates the most advanced SAS and PCI-Express Generation 2 (LSI2108) or Generation 3 (LSI2208) technologies to offer a cost-effective RAID management tool for high-end workstations or servers that require high system availability and data security. By providing a next generation high bandwidth storage capability, the LSI 2108/2208 Controller excels in I/O transaction and data transferring, and is ideal for video streaming and data processing applications.

In addition, the LSI 2108/2208 controller is SAS2 or SATA3 based and supports up to eight ports with transfer rates of up to 6.0 Gb/s (SAS/SATA infrastructure). By integrating SAS, SATA and hardware RAID support, the LSI 2108/2208 controller offers small-to-mid sized data centers exceptional flexibility to deliver advanced data protection and system performance using high-performance SAS, SATA or solid state devices.

Features of the LSI 2108/2208 Controller

The LSI SAS 2108 Controller supports the following features:

Integrated RAID

- RAID 0, RAID 1, and RAID 10 supported
- RAID 5, RAID 6, RAID 50 and RAID 60 supported

PCI-Express to 8-Port SAS/SATA Controller with data rates of 8.0 GT/s for PCI-E 3.0 and 5.0 GT/s for PCI-E 2.0

High Performance

- Single PowerPC core at 800 MHz (LSI2108 only), 512MB Write Cache
- Dual PowerPC cores at 800 MHz (LSI2208 only), 1GB Write Cache

6Gb/s SAS Interface

- 8-port SAS/SATA controller
- 1.5 Gb/s, 3 Gb/s, and 6 Gb/s SAS/SATA data transfer rates supported
- Spread Spectrum Clocking supported
- SSP, SMP (Symmetric Multiple Processing), STP (Spanning Tree Protocol), and SATA (Serial-ATA) protocols supported
- SAS and SATA devices supported
- T-10 data protection

PCI-Express 2.0 / 3.0

- PCI-E x8 with a transfer rate of up to 8.0/5.0 GT/s per lane, full duplex
- End-to-End CRC (ECRC) and Advanced Error Reporting (AER) supported

Power Management Support

- Sleep and Standby power mode support for SATA
- Programmable SAS link power down

Network Communication

- I²C support for enclosure management and debugging
- UART interface for debugging

SFF-8485 SGPIO (Serial General Purpose I/O) Specification Compliant

Functions of the LSI MegaRAID Utility

- Support for BIOS Boot Specification (BBS) (if supported by the system BIOS)
- Support for Enhanced Disk Drive Specification
- Support for Enable/Disable BIOS Boot
- Support for Hot-plug and Hot Auto Rebuild (during a hot plug event and the physical drive is forced off-line)

Drive Features Supported by the LSI MegaRAID Utility

The following drive features are supported by the LSI MegaRAID Software utility:

- Support for RAID 0, RAID 1, RAID 10, RAID 5, RAID 6, RAID 50 and RAID 60
- Online mirror rebuilding
- Online consistency checking
- Array system management
- Error logging and notification
- Automatic resume of rebuilding on restart
- Support for manual rebuilding
- Auto-configuration support of newly-added physical drive
- Support for global hotspare
- Array initialization support
- Logical drive available immediately after creation
- Stripe size of 1024 KB supported

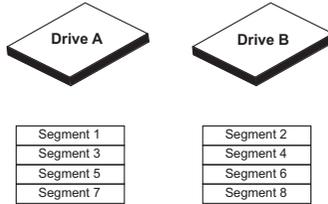
1-2 RAID Levels Supported by the 2108/2208 Controller

The LSI Embedded MegaRAID Software Configuration Utility adds RAID functions to enhance system efficiency and data security by supporting RAID 0, RAID 1, RAID 10, RAID 5, RAID 6, RAID 50 and RAID 60. .

 **Note:** A maximum of 16 physical disk drives is supported for RAID.

RAID 0

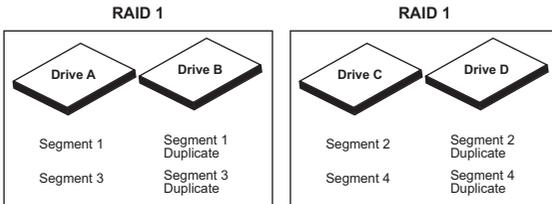
RAID 0 (Integrated Striping) can greatly enhance hard disk I/O performance by striping data across all disk drives in an array or drive group. This RAID configuration does not provide data redundancy, but it offers the best RAID performance and a high bandwidth. The following illustration provides a visual example of a RAID 0 drive group.



RAID 0 Example

RAID 1

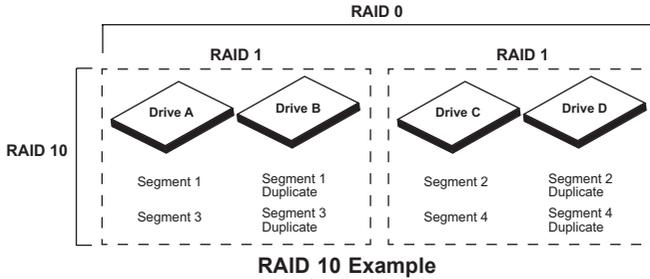
RAID 1 (Integrated Mirroring) allows data to be simultaneously written to multiple drives. This RAID configuration increases data integrity by providing redundancy, but requires twice the amount of data storage capacity. RAID 1 requires 2 drives. The following illustration provides a visual example of a RAID 1 drive group.



RAID 1 Example

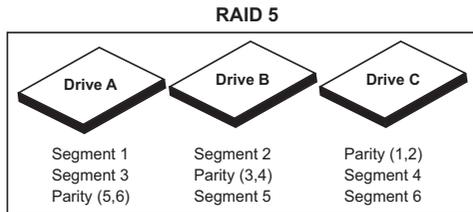
RAID 10

RAID 10, a combination of RAID 1 and RAID 0, provides superb system performance and system security. RAID 10 mirrors small blocks of data to a series of RAID 1 drive groups. Then the first RAID 1 drive in a drive group duplicates its data to the second drive. RAID 10 requires a minimum of 4 drives. Any additional drives must be added in pairs (6 drives, 8 drives, etc). The following illustration provides a visual example of a RAID 10 virtual drive group.



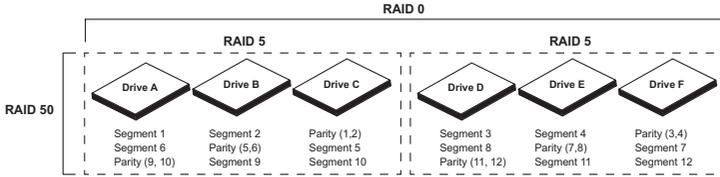
RAID 5

RAID 5 provides high data throughput by implementing block-level striping with parity data distributed across all drives. A RAID 5 configuration can survive the loss of a single drive failure because the parity drive can be used to re-create the missing data. RAID 5 requires at least 3 drives. The following illustration provides a visual example of a RAID 5 virtual drive group with three drives.



RAID 50

RAID 50 is a combination of RAID 5 and RAID 0. This type of drive group is called a spanned drive group because data is striped across multiple RAID 5 drive groups. RAID 50 requires at least 6 drives. The following illustration provides a visual example of a RAID 50 virtual drive group.

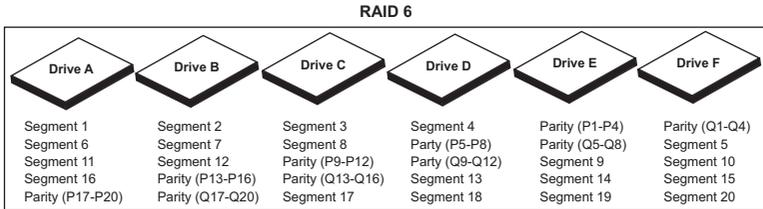


RAID 50 Example

RAID 6

Similar to RAID 5, RAID 6 also provides block-level striping with parity data distributed across all drives, except that there are two parity blocks per stripe instead of just one. A RAID 6 configuration can survive the loss of any two drives in a virtual drive without losing data and requires a minimum of 3 drives. The following illustration provides a visual example of a RAID 6 virtual drive group.

 **Note:** In the following RAID 6 illustration, the P drives represent the RAID 5 parity scheme. The Q drives represent the second set of parity drives.

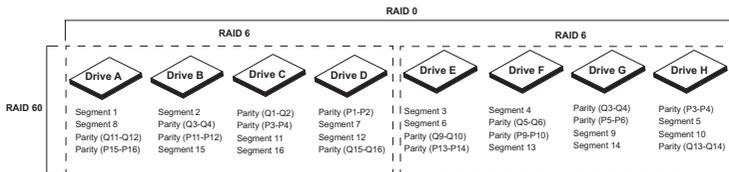


RAID 6 Example

RAID 60

RAID 60 combines the features of RAID 6 and RAID 0. RAID 60 implements distributed parity (two independent parity blocks per stripe in a RAID set) and disk striping. The dual parity allows RAID 6 to survive two drive failures in each RAID 6 set without losing data. RAID 60 requires at least 8 drives. The following illustration provides a visual example of a RAID 60 virtual drive group.

 **Note:** In the following RAID 6 illustration, the P drives represent the RAID 5 parity scheme. The Q drives represent the second set of parity drives.



RAID 60 Example

Notes

Chapter 2

Configuring the LSI MegaRAID Settings

This chapter provides instructions on how to configure MegaRAID settings for the LSI 2108/2208 SAS controller. If you do not wish to configure LSI Software RAID settings, skip this section and go directly to OS Installation. For OS installation instructions, please refer to our web site at www.supernmicro.com.

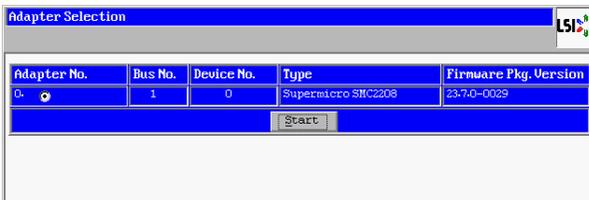
 **Note:** To use the drives connected to the 2108/2208 controller, a RAID must be created. If using drives like in JBOD, each single drive must be created as a RAID 0 individually.

 **Note:** For system stability, do not use both SAS and SATA drives in the same array.

2-1 Using the LSI MegaRAID Configuration Utility

Follow the steps below to configure arrays and logical drives.

1. Power on the system.
2. Press <CTRL> and <H> to enter the LSI MegaRAID Configuration Utility after the controller is initialized. The Adapter Selection screen displays, as shown below.

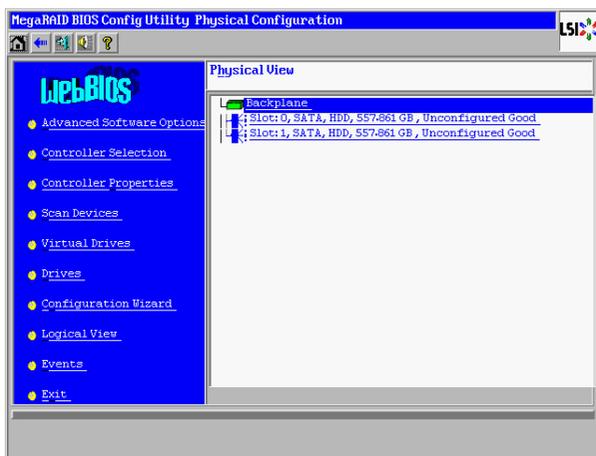


Adapter Selection

3. In the Adapter Selection screen, choose *LSI SAS 2108/2208* then select **Start** to display the MegaRAID main screen.

 **Note:** To make a selection, use the mouse or use the <Tab> key to navigate between the selectable items on the screen and press <Enter> to confirm. If your USB Keyboard/Mouse is not supported by the MegaRAID BIOS Config Utility, enter the BIOS Setup Utility and enable Port 64/60 Emulation support (Advanced > Chipset Config > South Bridge Config > Port 64/60 Emulation).

2-2 The LSI MegaRAID Main Screen



LSI Configuration Utility Main Screen

On the left side of the LSI MegaRAID main screen is a list of configurable items. To configure the settings for an item, use the mouse or press the <Tab> key to select the item and press <Enter>. The main screen includes the following items:

- **Advanced Software Options**
- **Controller Selection**
- **Controller Properties**
- **Scan Devices**
- **Virtual Drives**
- **Drives**
- **Configuration Wizard**
- **Logical View/Physical View**
- **Events**
- **Exit**

2-3 Advanced Software Options

The MegaRAID advanced software options enable enhanced features and functionality that may not be available in the standard controller configuration. Advanced software options are not a standard feature and are not provided by Supermicro. For more information on this feature, go to:

www.lsi.com/products/storagesw/Pages/LSIAdvancedSoftwareLicensing.aspx

2-4 Controller Selection

If your system has multiple MegaRAID controllers installed, choose Controller Selection from the MegaRAID configuration utility main page to return to the *Adapter Selection* screen (see page 2-1) and view or select a different controller.

2-5 Controller Properties

This feature allows you to configure the properties settings of a controller installed on the adapter card. Follow the instructions below to configure the controller settings.

1. From the MegaRAID configuration utility main page, use the mouse or the <Tab> key to select *Controller Properties* to display the *Controller Information* screen (shown below). This screen displays information about the selected controller such as Serial Number, WebBIOS Version, Firmware Version, Drive Count, and Memory Size.



Controller Information

2. Select **Next** to view additional controller information.

3. Select **Next** again to display the *Controller Properties* screen (shown below).



Controller Properties

4. The Controller Properties screen allows you to view and configure the following items:

 **Note:** Select **Next** to see additional configurable items.

Item	Description
Battery Backup	This item indicates if a backup battery is installed in the system. If installed, select <u>Present</u> to view the battery details.
Coercion Mode	Select a desired setting for the coercion mode. The options are None, 128MB-way, and 1GB-way.
Set Factory Default	Select Yes to load factory default settings. Select No if you do not want to use the factory default settings.
S.M.A.R.T Polling	Enter a number (in seconds) for the interval between the first and the next S.M.A.R.T (Self-Monitoring, Analysis, and Reporting Technology) Polling.
Cluster Mode	A cluster is a group of servers that connects to a common set of clients and can access the same data storage. Select <i>Disabled</i> to disable cluster support. Select <i>Enabled</i> to enable cluster support.
Alarm Control	Use this item to enable, disable, or silence the onboard alarm.

Item	Description
Rebuild Rate	The rebuild rate determines the percentage of system resources that will be applied toward rebuilding a drive that has failed. Enter a number between 1 and 100 to control the rebuild rate.
Patrol Read Rate	A patrol read monitors physical disks to find and resolve any problems that may result in disk failure. Enter a number between 0 and 100 for the patrol read rate.
BGI Rate	The BGI (Background Initialization) Rate determines the rate at which virtual drives are initialized in the background. Enter a number between 0 and 100.
Cache Flush Interval	Enter a value in the field to specify (in seconds) how often the system will flush the cache memory.
CC Rate	The CC (Check Consistency) Rate determines the rate at which consistency check scans are performed on a disk to determine if data is corrupted. Enter a number between 0 and 100.
Spinup Drive Count	Enter a number to control the amount of drives that spin up at one time.
Reconstruction Rate	The reconstruction rate determines the rate at which a virtual drive is reconstructed. Enter a number between 0 and 100.
Spinup Delay	After the RAID controller completes initialization, the spinup delay is the initial amount of seconds that pass before the first disk interrogation request is sent to the array.
NCQ	Enable NCQ (Native Command Queuing) to increase the performance of an HDD by allowing it to optimize the operation sequence in retrieving outstanding requests and executing read/write commands.
Spin Down Delay Time	This item indicates how long a spin-down drive will wait before the next command is executed
Stop CC On Error	Select Yes to stop a consistency check when an error is encountered.
Schedule CC	Use this item to schedule a consistency check.
Maintain PD Fail History	Enable this feature to track bad PDs (Physical Disk) across reboot.
Stop on Error	Enable this feature to stop system POST if an error is detected.
Controller BIOS	This item enables the controller BIOS. The default is Enabled.
Disk Activity	Enable this option if you want disk activity indicated by a green activity LED. The disks must be installed in an enclosure for this option to work.

Item	Description
Emergency Spare	Specify whether to use GHS (Global Hot Spares) or UG (Unconfigured Good) drives as emergency spares.
Emergency for SMARTer	Select to enable or disable this feature. The default is disabled.
Link Speed	Use this item to manage the link speed between the controller and a drive that is connected to the controller.
Data Protection	Use this item to enable or disable data protection.
SSD Caching	Use this item to manage SSD caching on virtual drives.

After all settings have been configured, select **Submit** to implement the changes or select **Reset** to reset the settings.

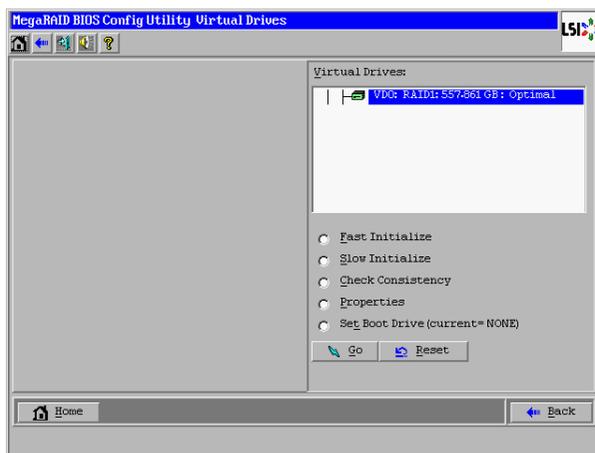
2-6 Scan Devices

From the configuration utility main screen, use the mouse or the <Tab> key to select *Scan Devices*. This feature checks the physical and virtual drives for any changes in drive status. Any changes in drive status are displayed in the drive descriptions.

2-7 Virtual Drives

This feature displays all virtual drives detected in the system and allows you to perform an action on the drive selected.

1. From the configuration utility main screen, use the <Tab> key or the mouse to select *Virtual Drives* and press <Enter>. The following screen displays.



Virtual Drives

2. In the window on the right, select a virtual drive and perform one of the following actions:
 - **Fast Initialize:** Initializes the selected drive by writing zeros to the first sector of the drive, then continue the initialization in the background after system boot.
 - **Slow Initialize:** Initializes the selected drive by writing zeros to the entire drive volume. This process can take hours or days to complete, depending on the drive size.
 - **Check Consistency:** Verify that redundancy data is correct and available for arrays or disk groups using RAID 1, 5, 6, 10, 50, or 60. If a difference in data is found, MegaRAID WebBIOS assumes that the data is accurate and automatically corrects the parity value.
 - **Properties:** Check this item to view and change the properties of the selected drive (see #3 below).
 - **Set Boot Drive:** Check this item to make the selected drive a bootable drive.

After selecting an action to perform, click **Go** to perform the action or click **Reset** to reset the setting.

3. If you select *Properties*, the following screen displays.

The screenshot shows the 'MegaRAID BIOS Config Utility Virtual Drive 0' window. The 'Properties' section displays RAID Level: 1, Status: Optimal, Strip Size: 64 KB, Capacity: 557.861 GB, and Mirror Data Size: 557.861 GB. Below this is a link for 'Advanced Properties'. The 'Policies' section includes dropdown menus for Access (RW), I/O (Cached), Read (Always Read Ahead), Disk Cache (Unchanged), Disable BGI (No), Default Write (Write Back with BBU), and Current Write (Write Through). A 'Reason for Difference in Write Policy' field shows 'BBU not installed' with a 'Change' button. The 'Operations' section contains radio buttons for Delete, Locate, Expand, Set Top Locate, Adv Opers, Fast Init, and Slow Init, along with a 'Go' button. At the bottom are 'Home' and 'Back' buttons.

Virtual Drive Properties

The following information can be viewed/changed in the Properties screen:

Properties: This section displays the properties of the drive. Select Advanced Properties to display other drive properties.

Policies: This section allows you to view and change the read, write, disk cache, BGI, access, and I/O policies on the drive. To change any settings, choose the desired setting from the pull-down menu and select **Change** to confirm the change.

Operations: This section allows you to perform the following operations on the virtual drive:

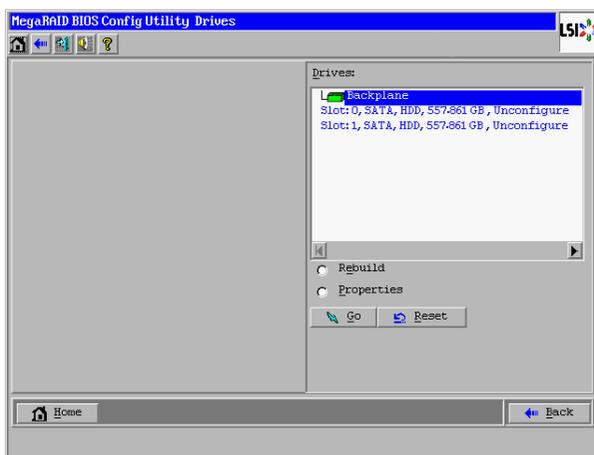
- Delete
- Locate/Stop Locate
- Adv Opers (Advanced Operations)
- Fast/Slow Init (fast/slow initialization)
- CC (Consistency Check)
- Expand

After selecting a desired operation, click **Go** to perform the operation.

2-8 Drives

This feature displays all physical drives detected on the controller and allows you to rebuild or view the properties of the selected drive.

1. From the MegaRAID configuration utility main page, use the <Tab> key or the mouse to select *Drives*. The following screen displays.



Drives

2. Highlight a drive and select one of the following items to perform an action.

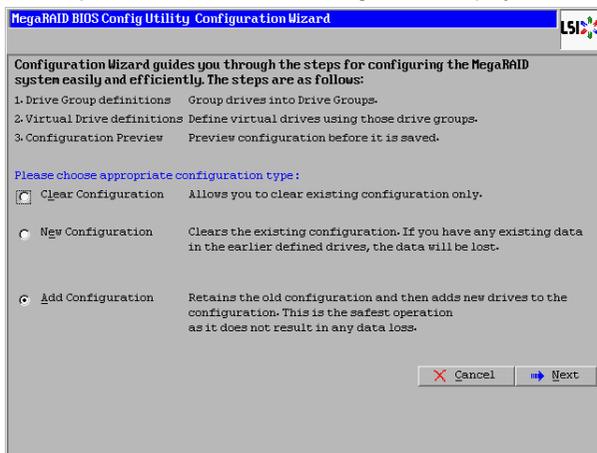
- **Rebuild:** Check this item to rebuild the drive selected.
- **Properties:** Check this item to display the properties of the drive selected.

After you've selected an action to perform, click **Go** to perform the action. Click **Reset** to reset the setting.

2-9 Configuration Wizard

This feature enables you to create a new configuration, add a configuration, or clear a configuration. The following quick configuration instructions will show you how to easily and efficiently configure MegaRAID settings.

1. From the configuration utility main page, use the <Tab> key or the mouse to select *Configuration Wizard*. The following screen displays.



Configuration Wizard

2. Check one of the following items to perform an action.

- **Clear Configuration:** Check this item to clear the existing RAID configuration settings.
- **New Configuration:** Check this item to delete all RAID configuration settings and create new a RAID Volume. Data previously stored in the drive will be erased.

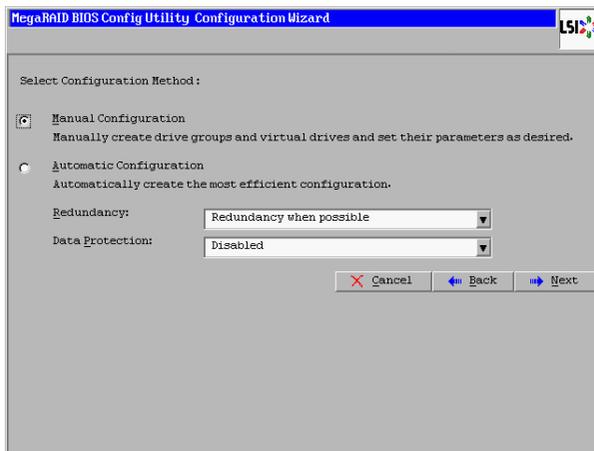
Warning: When creating a new RAID volume, all existing RAID arrays will be erased.

- Add Configuration: Check this item to keep the existing configuration settings and to add new settings to the drive. This is a safe operation because there is no risk of losing data.

After you have checked an item, select **Next** to proceed with the action or select **Cancel** to return to the configuration utility main page.

Adding a Configuration

If you selected *Add Configuration*, the following screen displays.



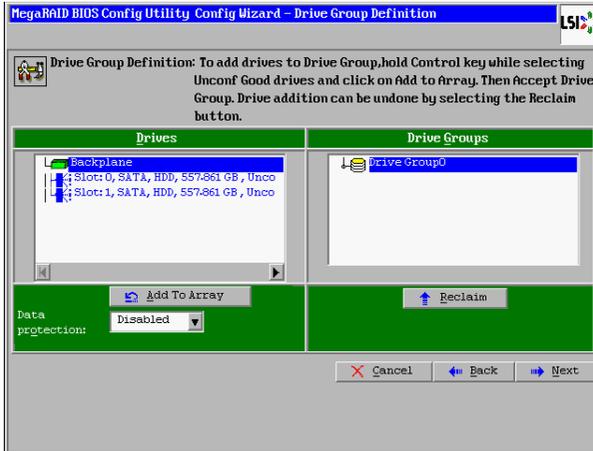
Add Configuration

3. Select one of the following configuration methods:
 - Manual Configuration: Check this item to manually create drive groups and virtual drives and manually set their parameters. All drives including configured drives will display.
 - Automatic Configuration: Check this item to allow the LSI SAS RAID Controller to configure the MegaRAID settings automatically.
 - Select a Redundancy option for Automatic Configuration. Select *Redundancy When Possible* to configure RAID 1 for systems with only two drives or configure RAID 5 or RAID 6 if the system has three or more drives. Select *No Redundancy* to configure all drives as RAID 0 virtual drives.
 - Select whether to enable or disable Data Protection.

 **Note:** RAID 10, 50, and 60 cannot be automatically configured.

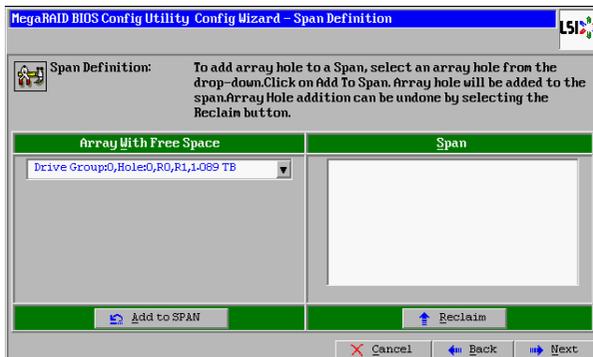
Configuring Drives Manually

1. In the *Add Configuration* screen, select Manual Configuration and click **Next** to begin adding drives. The following screen displays.



Add Drives

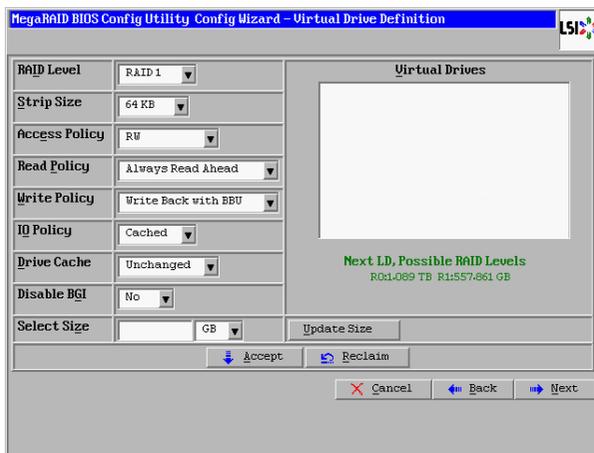
2. Select the drives you want to add to the array and click **Add to Array**. To undo any drive addition, select the drive and click **Reclaim**.
3. After all desired drives are added to the drive group, select **Accept DG** to create a drive group. Multiple drive groups can be created by adding additional available drives. When finished creating drive groups, select **Next**.
4. In the pull-down menu of the Span Definition screen, select the drive group you want to add to SPAN and click **Add to SPAN**, then click **Next**.



Span Definition

 **Note:** For RAID 10, 50, and 60, two or more drive groups must be added to SPAN.

5. The *Virtual Drive Definition* screen displays, as shown below.



Virtual Drive Definition

In the Virtual Drive Definition screen, configure the following options as needed:

RAID Level: Select the desired RAID level. The available options are:

- RAID 0 (data striping)
- RAID 1 (data mirroring)
- RAID 5 (data striping with parity)
- RAID 6 (distributed parity and disk striping)
- RAID 10 (striped mirroring)
- RAID 50 (striped mirroring)
- RAID 60 (distributed parity with two independent parity blocks per stripe)

Stripe Size: Select the desired stripe size.

Access Policy: Select the desired data access policy.

Read Policy: Select either Always Read Ahead or No Read Ahead. Selecting Always Read Ahead will improve performance during sequential reads.

Write Policy: Select between the following options:

- Write-Through: Use this option to write data to both the controller cache and the drive once the data is retrieved.
- Write-Back With BBU: Use this option to write data only to the controller cache, provided that a battery backup is installed and functional.

- **Always Write-Back:** Use this option to write data only to the cache, even if a battery backup is bad or missing. (This option is **not recommended** because cached data will be lost in the event of a power outage.)

IO Policy: The IO Policy applies only to reads on a specific virtual drive and does not affect the Read Policy or the Write Policy. Select between the following options:

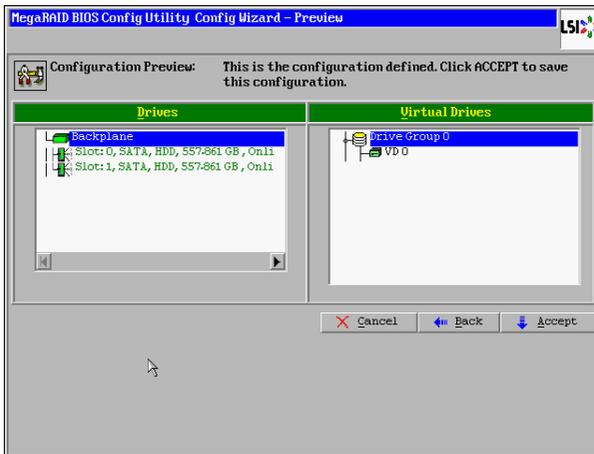
- **Cached:** Use this option to buffer all IO reads in cache memory.
- **Direct:** Use this option to simultaneously transfer data to the cache and host.

Drive Cache: This applies to the cache on physical drives in the array. Select between Enable, Disable, and Unchanged.

Disable BGI: Select whether or not to disable background initialization.

Select Size: Enter a value to set the desired size of the virtual drive. The maximum capacity that can be set is displayed in the Virtual Drives window (right side of Virtual Drive Definition screen)

6. When finished configuring the virtual drive options, select **Accept** then select **Next** to proceed to the configuration preview screen (shown below).

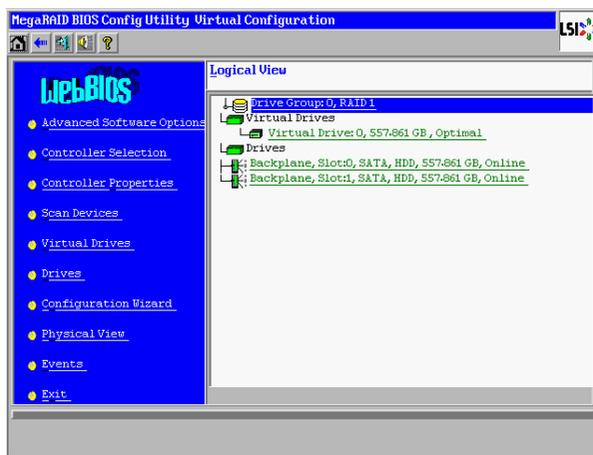


Configuration Preview

7. Select **Accept** to save the configuration. Continue to select **Accept** in the following screens until you are prompted to initialize the virtual drive.
8. Select **Yes** when prompted to initialize the drive. Initialization options are identical to Virtual Drives section (see page 2-6).

2-10 Logical View

This feature displays the status of logical drives of the system. From the MegaRAID utility configuration main page, use the <Tab> key or the mouse to select *Logical View*. The following screen displays to indicate the status of logical drives installed in the system.



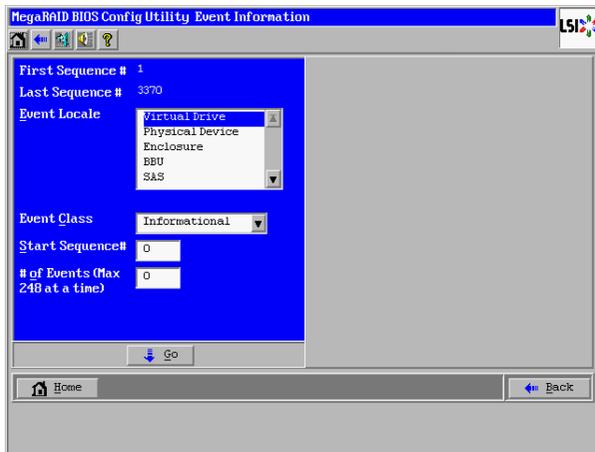
Logical View

Physical View

To view physical drives (instead of logical drives) in the main window, select *Physical View* in the left pane of the main page to display the status of all physical drives detected in the system.

2-11 Events

This feature displays system event information. From the configuration utility main page, use the <Tab> key or the mouse to select *Events*. The following screen displays.



Event Information

Use the left pane of the screen to set the parameters, then select **Go** to display the associated events. The parameters are:

First Sequence# / Last Sequence#: The first and last sequence are for display only. They indicate the range of events that have been captured.

Event Locale: Select the location for the event search. Available locations include:

- Virtual Drive
- Physical Device
- Enclosure
- BBU (Battery Backup)
- SAS (SAS devices)
- Controller
- Configuration
- Cluster

Event Class: Select the class level for the event search. Available classes include:

- **Informational:** This type of event is informative only and does not require user action.
- **Warning:** This type of event indicates a component that may cause a failure.
- **Critical:** This type of event affects system stability. User intervention is required to solve the problem before the system becomes unstable.
- **Fatal:** This type of event indicates that some component has failed and that data loss will occur or has occurred.
- **Dead:** This type of event indicates that a devastating error occurred, resulting in controller failure. This error will only be seen if the controller has been restarted.

Start Sequence#: Based on the range of sequences (events) that are logged, enter a sequence starting point for the event search.

of Events (Maximum 248 at a time): Enter the number of events to search beyond the Start Sequence#. For example, if the Start Sequence# is set at 200 and the # of Events is set at 40, a search will be performed on events 200 - 240.

2-12 Exit

After you have configured RAID settings, return to the main page and use the <Tab> key or the mouse to select *Exit*. A screen displays prompting you to confirm exiting. Select **No** to return to the LSI RAID Utility. Select **Yes** to exit, at which point you are prompted to reboot your system. Press <Ctrl> + <Alt> + to reboot the system.

(Disclaimer continued)

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