PIKE 2208

LSISAS RAID card

User Guide
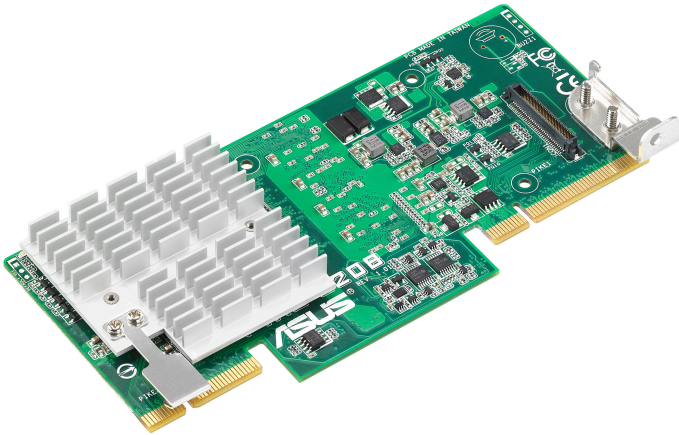
E7568

First Edition (V1)
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Australia statement notice

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About this guide

This user guide contains the information you need when installing and configuring the server management board.

How this guide is organized

This guide contains the following parts:

- **Chapter 1: Product introduction**

  This chapter offers the PIKE 2208 SAS RAID card features and the new technologies it supports.

- **Chapter 2: RAID configuration**

  This chapter provides instructions on setting up, creating, and configuring RAID sets using the available utilities.

- **Chapter 3: Driver installation**

  This chapter provides instructions for installing the RAID drivers on different operating systems.

Where to find more information

Refer to the following sources for additional information and for product and software updates.

1. **ASUS websites**

    The ASUS website provides updated information on ASUS hardware and software products. Refer to the ASUS contact information.

2. **Optional documentation**

    Your product package may include optional documentation, such as warranty flyers, that may have been added by your dealer. These documents are not part of the standard package.

Conventions used in this guide

To make sure that you perform certain tasks properly, take note of the following symbols used throughout this manual.

DANGER/WARNING: Information to prevent injury to yourself when trying to complete a task.

CAUTION: Information to prevent damage to the components when trying to complete a task.

IMPORTANT: Instructions that you MUST follow to complete a task.

NOTE: Tips and additional information to help you complete a task.

Typography

Bold text	Indicates a menu or an item to select.
Italics	Used to emphasize a word or a phrase.
<Key>	Keys enclosed in the less-than and greater-than sign means that you must press the enclosed key.
	Example: <Enter> means that you must press the Enter or Return key.
<Key1+Key2+Key3>	If you must press two or more keys simultaneously, the key names are linked with a plus sign (+).
	Example: <Ctrl+Alt+Del>
`Command`	Means that you must type the command exactly as shown, then supply the required item or value enclosed in brackets.
	Example: At the DOS prompt, type the command line: `format a:`

PIKE 2208 specifications summary

Controller	LSI 2208 6Gb/s SAS Controller
Interface	ASUS PIKE interface
Ports	8 ports
Support Device	SAS / SAS II devices SATA / SATA II / SATA III devices
Data transfer rate	SATA III and SAS II 6Gb/s per PHY
RAID level	• RAID 0 / 1 / 10 / 5 / 50 / 6 / 60 • Max. physical Disk qty for RAID: 32
Cache	1GB onboard SDRAM
Backup Support	Header reserved for LSI Cache Vault (acquired from LSI existing distribution channel)
OS support*	Windows® Server 2003 Enterprise Edition R2 SP2 Windows® Server 2008 Enterprise Edition R2 SP1 Windows® 7 (Ultimate) SP1 Red Hat Enterprise Linux AS 5.8 Red Hat Enterprise Linux AS 6.2 SuSE Linux Enterprise Server 10.4 SuSE Linux Enterprise Server 11.2 Cent OS 5.7 Cent OS 5.8 Cent OS 6.2 Free BSD 8.3 Free BSD 9.0 Fedora 17 Citrix Xen Server 6.0.2
Form factor	6.44 in x 3.02 in (2U compatible)

* The OS support depends on the motherboard's OS support list.

** Specifications are subject to change without notice.

This chapter offers the PIKE 2208 SAS RAID
card features and the new technologies it
supports.

Product
introduction

1

1.1 Welcome!

Thank you for buying an ASUS® PIKE 2208 SAS RAID card!

The ASUS PIKE 2208 allows you to create RAID 0, 1, 10, 5, 50, 6, and 60 sets from SATA/SATA II/SATA III/SAS/SAS II hard disk drives connected to the SAS connectors on the motherboard.

Before you start installing the RAID card, check the items in your package with the list below.

1.2 Package contents

Check your package for the following items.

	Standard Gift Box Pack	Standard Bulk Pack
ASUS PIKE 2208 SAS RAID card	1	1
Support CD	1	1
User Guide	1	1
SATA cable*	8	—
Packing Quantity	1 pc per carton	3 pcs per carton

> • The number of the SATA cable varies with product SKU.
>
> • If any of the above items is damaged or missing, contact your retailer.

1.3 Card layout

The illustration below shows the major components of the RAID card.

Front
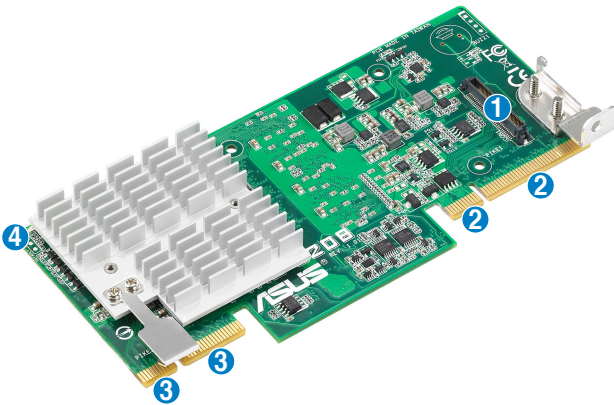
1. CacheVault connector
2. ASUS PIKE interface-1: PCI-E Gen3 x8
3. ASUS PIKE interface-2: 8-port SAS signal with SGPIO interface*

> *The SGPIO interface is used for visibility into drive activity, failure and rebuild status, so that users could build high-performance and reliable storage systems. Refer to the motherboard manual for detailed information about using the SGPIO connectors on the motherboard.

4. SAS RAID card status LED (lights up and blinks to indicate that the card is working normally)

Rear
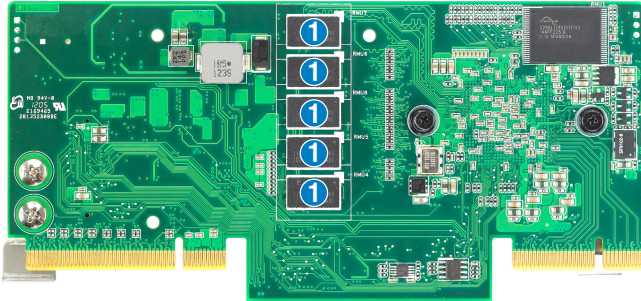
1. 1GB DDR3 SDRAM

1.4 System requirements

Before you install the PIKE 2208 SAS RAID card, check if the system meets the following requirements:

- **Workstation or server motherboard with a PIKE RAID card slot**
- **SAS or SATA hard disk drives**
- **Supporting operating system:**

  Windows® and Linux operating systems (refer to website for details)
- **Other requirement:**

  - Appropriate thermal solution
  - Certified power supply module

1.5 Card installation

Follow below instructions to install the RAID card to your motherboard.

1. Locate the PIKE RAID card slot on the motherboard then remove the screws beside PIKE1 connector as shown.
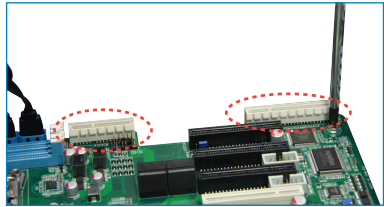
2. Align the golden fingers of the RAID card with the PIKE RAID card slot then Insert the RAID card into the card slot. Ensure the card is completely inserted into the card slot, and the heatsink latch is completely hooked to the edge of the card slot.
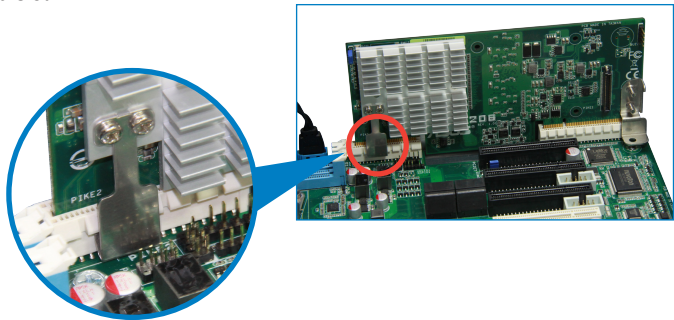
3. Secure the PIKE RAID card with the screw that you removed earlier.

⚠️ DO NOT overtighten the screw, or the motherboard component can be damaged.
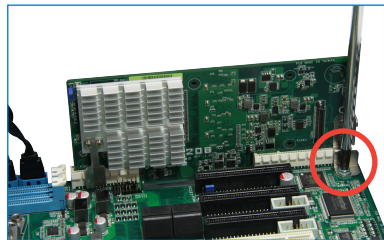
4. Connect the hard disk drives to the SAS connectors on the motherboard.
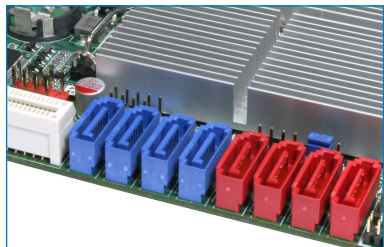
This chapter provides instructions on setting up, creating, and configuring RAID sets using the available utilities.

RAID configuration

2

2.1　Setting up RAID

The RAID card supports RAID 0, 1, 10, 5, 50, 6, and 60.

2.1.1　RAID definitions

RAID 0 *(Data striping)* optimizes two identical hard disk drives to read and write data in parallel, interleaved stacks. Two hard disks perform the same work as a single drive but at a sustained data transfer rate, double that of a single disk alone, thus improving data access and storage. Use of at least two new identical hard disk drives is required for this setup.

RAID 1 *(Data mirroring)* copies and maintains an identical image of data from one drive to a second drive. If one drive fails, the disk array management software directs all applications to the surviving drive as it contains a complete copy of the data in the other drive. This RAID configuration provides data protection and increases fault tolerance to the entire system. Use two new drives or use an existing drive and a new drive for this setup. The new drive must be of the same size or larger than the existing drive.

RAID 10 is a striped configuration with RAID 1 segments whose segments are RAID 1 arrays. This configuration has the same fault tolerance as RAID 1, and has the same overhead for fault-tolerance as mirroring alone. RAID 10 achieves high input/output rates by striping RAID 1 segments. In some instances, a RAID 10 configuration can sustain multiple simultaneous drive failure. A minimum of four hard disk drives is required for this setup.

RAID 5 stripes both data and parity information across three or more hard disk drives. Among the advantages of RAID 5 configuration include better HDD performance, fault tolerance, and higher storage capacity. The RAID 5 configuration is best suited for transaction processing, relational database applications, enterprise resource planning, and other business systems. Use a minimum of three identical hard disk drives for this setup.

RAID 50 is a combination of RAID 0 and RAID 5. It uses distributed parity and disk striping and works best with data that requires high reliability, high request rates, high data transfers, and medium-to-large capacity.

RAID 6 uses distributed parity, with two independent parity blocks per stripe, and disk striping. A RAID 6 virtual drive can survive the loss of two drives without losing data. A RAID 6 drive group, which requires a minimum of three drives, is similar to a RAID 5 drive group. Blocks of data and parity information are written across all drives. The parity information is used to recover the data if one or two drives fail in the drive group.

RAID 60, a combination of RAID 0 and RAID 6, uses distributed parity, with two independent parity blocks per stripe in each RAID set, and disk striping. A RAID 60 virtual drive can survive the loss of two drives in each of the RAID 6 sets without losing data. It works best with data that requires high reliability, high request rates, high data transfers, and medium-to-large capacity.

> • Having RAID 0 and RAID 5 virtual disks in the same physical array is not recommended. If a drive in the physical array has to be rebuilt, the RAID 0 virtual disk will cause a failure during the rebuild.
>
> • If you want to boot the system from a hard disk drive included in a created RAID set, copy first the RAID driver from the support CD to a floppy disk before you install an operating system to the selected hard disk drive.

2.1.2   Installing hard disk drives

The RAID card supports SAS for RAID set configuration. For optimal performance, install identical drives of the same model and capacity when creating a disk array.

To install SAS hard disks for RAID configuration:

1.   Install the SAS hard disks into the drive bays following the instructions in the system user guide.
2.   Connect a SAS signal cable to the signal connector at the back of each drive and to the SAS connector on the motherboard.
3.   Connect a power cable to the power connector on each drive.

2.2 LSI WebBIOS Configuration Utility

The LSI WebBIOS Configuration Utility (CU) is an integrated RAID solution that allows you to create RAID 0, 1, 10, 5, 50, 6, and 60 sets from SATA/SATA II/SATA III/SAS/SAS II hard disk drives supported by the LSI 2208 6Gb/s SAS controller.

You can also use the WebBIOS CU to do the following tasks:

- Create drive groups and virtual drives for storage configurations
- Delete virtual drives
- Migrate a storage configuration to a different RAID level
- Detect configuration mismatches
- Import a foreign configuration
- Display controller, virtual drive, drive, and change parameters.
- Scan devices connected to the controller
- Initialize virtual drives
- Check configurations for data consistency
- Create a CacheCade™ configuration

- You may use disks of different sizes; however, the size of the smallest disk determines the "logical" size of each member disk.

- DO NOT combine Serial ATA and SAS disk drives in one volume.

- The RAID setup screens shown in this section are for reference only and may not exactly match the items on your screen due to the controller version difference.

2.2.1   Starting the WebBIOS CU

Follow these steps to start the WebBIOS CU and access the main screen.

1.   Turn on the system after installing all SAS hard disk drives.

2.   During POST, press <Ctrl+H> when the following screen appears

> ⚠️   Press <Ctrl+Y> for Preboot CLI: this option is for advanced debug only!

```
LSI MegaRAID SAS-MFI BIOS
Version 5.33.00 (Build March 15, 2012)
Copyright(C) 2012 LSI Corporation

HA -0 (Bus 1 Dev 0) LSI MegaRAID SAS PCI Express ROMB
Battery Status: Not present

PCI SLOT  ID  LUN  VENDOR   PRODUCT                     REVISION        CAPACITY
--------  --  ---  ------   -------                     --------        --------
0                   LSI      LSI MegaRAID SAS PCI Exp   3.190.15-1686   512MB
0          0   0    SEAGATE  ST3300657SS                0000            286102MB
0          1   0    SEAGATE  ST3300657SS                0000            286102MB
0          2   0    SEAGATE  ST3300657SS                0000            286102MB
0          3   0    SEAGATE  ST3300657SS                0000            286102MB
0 Virtual Drive(s) found on the host adapter.

0 Virtual Drive(s) handled by BIOS
Press <Ctrl><H> for WebBIOS or press <Ctrl><Y> for Preboot CLI
```

3.   The Adapter Selection screen appears. If the system has multiple SAS
       adapters, select an adapter.

4.   Click **Start** to continue. The main WebBIOS CU screen appears.

2.2.2 WebBIOS CU main screen options
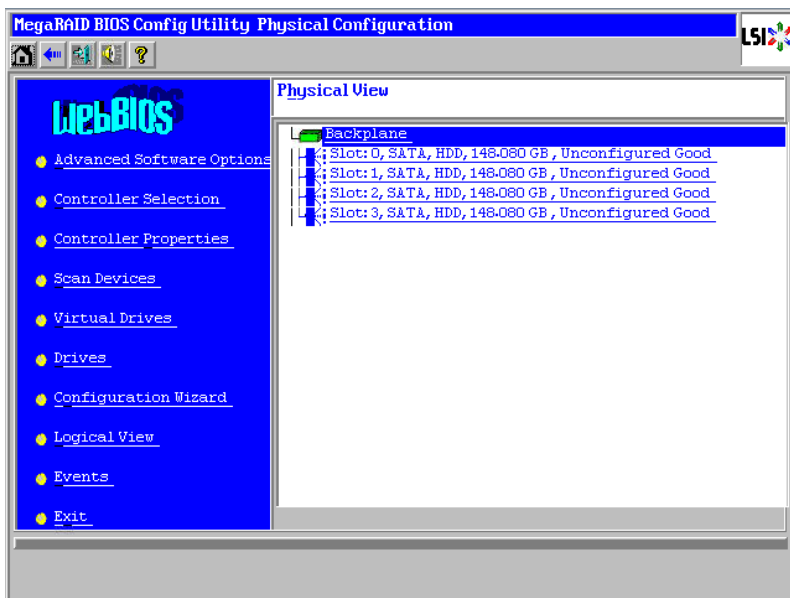
This is the Physical View screen which displays the drives that are connected to the controller. To toggle between the physical view and logical view of the storage devices connected to the controller, click **Physical View** or **Logical View** in the menu on the left. When the Logical View screen is displayed, you can see all the virtual drives that are configured on this controller.

WebBIOS CU Toolbar Icons

Icon	Description
	Click this icon to return to the main screen from any other WebBIOS CU screen.
	Click this icon to return to the previous screen that you were viewing.
	Click this icon to exit the WebBIOS CU program.
	Click this icon to turn off the sound on the onboard controller alarm.
	Click this icon to display information about the WebBIOS CU version, bus number, and device number.

Here is a description of the options listed on the left of the main WebBIOS CU screen:

- **Advanced Software Option:** Select this to allow you to enable the special functionality or features that may not be available in the standard configuration of the controller.

- **Controller Selection:** Select this to view the Adapter Selection screen, where you can select a different SAS adapter. You can then view information about the controller and the devices connected to it, or create a new configuration on the controller.

- **Controller Properties:** Select this to view the properties of the currently selected SAS controller.

- **Scan Devices:** Select this to have the WebBIOS CU re-scan the physical and virtual drives for any changes in the drive status or the physical configuration. The WebBIOS CU displays the results of the scan in the physical and virtual drive descriptions.

- **Virtual Drives:** Select this to view the Virtual Drives screen, where you can change and view virtual drive properties, initialize drives, and perform other tasks.

- **Drives:** Select this to view the Drives screen, where you can view drive properties, and perform other tasks.

- **Configuration Wizard:** Select this to start the Configuration Wizard and create a new storage configuration, clear a configuration, or add a configuration.

- **Logical View:** Select this to toggle between the Physical View and Logical View screens.

- **Events:** Select this to view system events in the Event Information screen.

- **Exit:** Select this to exit the WebBIOS CU and continue with system boot.

2.2.3 Creating a Storage Configuration

This section explains how to use the WebBIOS CU Configuration Wizard to configure RAID arrays and virtual drives to create storage configurations.

> The default settings of the configuration items mentioned in this section are subject to change without notice, but the functions of the items will not be affected.

Selecting the Configuration with the Configuration Wizard

Follow these steps to start the Configuration Wizard, and select a configuration option and mode:

1. Click **Configuration Wizard** on the WebBIOS main screen. The first Configuration Wizard screen appears, as shown in the right figure.

2. Select a configuration option.
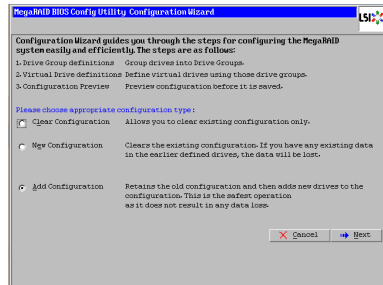
> If you choose the first or second option, all existing data in the configuration will be deleted. Make a backup of any data that you want to keep before you choose an option.

-   **Clear Configuration:** Clears the existing configuration.
-   **New Configuration:** Clears the existing configuration and lets you create a new configuration.
-   **Add Configuration:** Retains the existing storage configuration and adds new drives to it (this does not cause any data loss).

3. Click **Next**. A dialog box warns that you will lose data if you select Clear Configuration or New Configuration.

4. On the next screen, select a configuration mode:

-   **Manual Configuration:** Allows you to control all attributes of the new storage configuration.
-   **Automatic Configuration:** Automatically creates an optimal RAID configuration.

If you select **Automatic Configuration**, you can choose the redundancy mode:

- **Redundancy when possible:** Automatically creates an optimal RAID configuration, providing data redundancy.
- **No Redundancy:** Automatically creates a non-redundant RAID 0 configuration.

5.   Click **Next** to continue.

Using Automatic Configuration

Follow these instructions to create a configuration with automatic configuration, either with or without redundancy:

1.   When WebBIOS displays the proposed new configuration, review the information on the screen, and click **Accept** to accept it. (Or click **Back** to go back and change the configuration.)

- **RAID 0:** If you selected **Automatic Configuration** and **No Redundancy**, WebBIOS creates a RAID 0 configuration.
- **RAID 1:** If you selected **Automatic Configuration** and **Redundancy when possible**, WebBIOS creates a RAID 1 configuration if only two disk drives are available.
- **RAID 6:** If you selected **Automatic Configuration** and **Redundancy when possible**, WebBIOS creates a RAID 6 configuration if three or more disk drives are available.

2.   Click **Yes** when you are prompted to save the configuration.
3.   Click **Yes** when you are prompted to initialize the new virtual drive(s).

WebBIOS CU begins a background initialization of the virtual drives.

Using Manual Configuration: RAID 0

RAID 0 provides drive striping across all drives in the RAID drive group. RAID 0 does not provide any data redundancy but does offer excellent performance. RAID 0 is ideal for applications that require high bandwidth but do not require fault tolerance. RAID 0 also denotes an independent or single drive.

RAID level 0 is not fault-tolerant. If a drive in a RAID 0 drive group fails, the whole virtual drive (all drives associated with the virtual drive) fails.

When you select **Manual Configuration** and click **Next**, the Drive Group Definition screen appears. You use this screen to select drives to create drive groups.

1.   Hold <Ctrl> while selecting two or more ready drives in the Drives panel on the left until you have selected all desired drives for the drive group.

2.   Click **Add To Array** to move the
     drives to a proposed drive group
     configuration in the **Drive Groups**
     panel on the right, as shown in the
     right figure.

3.   Select a preferred power save
     mode. The power save mode can
     be **Max**, **Max without cache**, **Auto**,
     None, and **Controller defined**. If
     you need to undo the changes, click
     the **Reclaim** button.
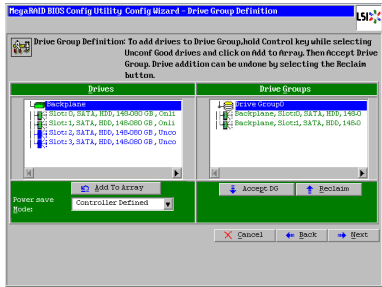
4.   When you have finished selecting drives for the drive group, click **Accept DG**.

5.   Click **Next**. The **Span Definition** screen appears. Select one of the available
     drive groups, and then click **Add to SPAN**.

6.   When finish, click **Next**. The **Virtual
     Drive Definition** screen appears,
     as shown in the right figure. Use
     this screen to select the RAID level,
     strip size, read policy, and other
     attributes for the new virtual drives.
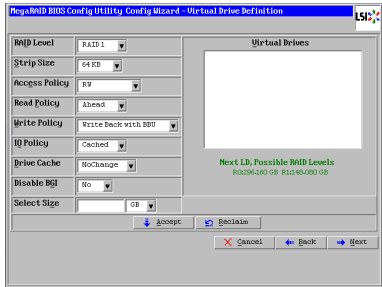
7.   Change the virtual drive options
     from the defaults listed on the
     screen as needed.

     Here are brief explanations of the
     virtual drive options:

     •   **RAID Level:** The drop-down menu lists the possible RAID levels for the
          virtual drive. Select **RAID 0**.

     •   **Strip Size:** The strip size specifies the size of the segment written to
          each disk in a RAID configuration. You can set the strip size up to 1 MB.
          A larger strip size produces higher read performance. If your computer
          regularly performs random read requests, choose a smaller strip size.
          The default is 256 KB.

     •   **Access Policy:** Select the type of data access that is allowed for this
          virtual drive:

          ◊ **RW:** Allow read/write access. This is the default.

          ◊ **Read Only:** Allow read-only access.

          ◊ **Blocked:** Do not allow access.

     •   **Read Policy:** Specify the read policy for this virtual drive:

          ◊ **No Read Ahead:** This disables the read ahead capability.

◊ **Always Read Ahead:** This enables read ahead capability, which allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data. This is the default.

- **Write Policy:** Specify the write policy for this virtual drive:

    ◊ **Write Through:** In Write Through mode, the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.

    ◊ **Always Write Back:** In Writeback mode, the controller sends a data transfer completion signal to the host when the controller cache has received all of the data in a transaction. This setting is recommended in Standard mode.

- **IO Policy:** The IO Policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.

    ◊ **Direct:** In direct I/O mode, reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This is the default.

    ◊ **Cached:** In cached I/O mode, all reads are buffered in cache memory.

- **Drive Cache:** Specify the drive cache policy:

    ◊ **Unchanged:** Leave the current drive cache policy unchanged. This is the default.

    ◊ **Enable:** Enable the drive cache.

    ◊ **Disable:** Disable the drive cache.

- **Disable BGI**: Specify the background initialization status:

    ◊ **No:** Leave background initialization enabled. This means that a new configuration can be initialized in the background while you use WebBIOS to do other configuration tasks. This is the default.

    ◊ **Yes:** Select Yes if you do not want to allow background initializations for configurations on this controller.

- **Select Size:** Specify the size of the virtual drive in terabytes, gigabytes, megabytes, or kilobytes. Normally, this would be the full size for RAID 0 shown in the Configuration panel on the right. You may specify a smaller size if you want to create other virtual drives on the same drive group.

8. Click **Accept** to accept the changes to the virtual drive definition, or click **Reclaim** to return to the previous settings.

9. Click **Yes** to confirm the write policy mode you have chosen.

10. Click **Next** after you finish defining virtual drives. The configuration preview screen appears, as shown in the right figure.

11. Check the information in the configuration preview screen.

12. If the virtual drive configuration is acceptable, click **Accept** to save the configuration. Otherwise, click **Back** to return to the previous screens and change the configuration.

13. If you accept the configuration, click **Yes** at the prompt to save the configuration.

14. Click **Yes** at the prompt to start initialization.

15. After the virtual drive is successfully created, the **Manage SSD Caching** screen appears. Click **Cancel** to close the sceen.
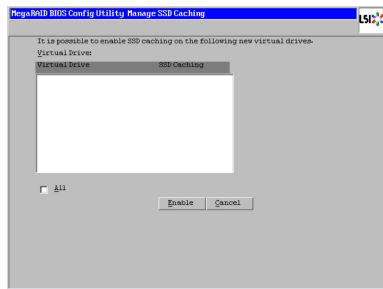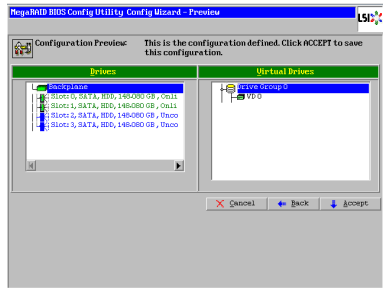
Using Manual Configuration: RAID 1

In RAID 1, the RAID controller duplicates all data from one drive to a second drive. RAID 1 provides complete data redundancy, but at the cost of doubling the required data storage capacity. It is appropriate for small databases or any other environment that requires fault tolerance but small capacity.

When you select **Manual Configuration** and click **Next**, the **Drive Group Definition** screen appears. Use this screen to select drives to create drive groups.

1. Hold <Ctrl> while selecting two ready drives in the **Drives** panel on the left.

2. Click **Add to Array** to move the drives to a proposed drive group configuration in the **Drive Groups** panel on the right.

3. Select a preferred power save mode. The power save mode can be **Max**, **Max without cache**, **Auto**, **None**, and **Controller defined**. If you need to undo the changes, click the **Reclaim** button.

4. When you have finished selecting drives for the drive group, click **Accept DG**.

5. Click **Next**. The **Span Definition** screen appears. Select one of the available drive groups, and then click **Add to SPAN**.

6. When finish, click **Next**. The **Virtual Drive Definition** screen appears. Use this screen to select the RAID level, strip size, read policy, and other attributes for the new virtual drives.

7. Change the virtual drive options from the defaults listed on the screen as needed.

    Here are brief explanations of the virtual drive options:

    -   **RAID Level:** The drop-down menu lists the possible RAID levels for the virtual drive. Select **RAID 1**.

    -   **Strip Size:** The strip size specifies the size of the segment written to each disk in a RAID configuration. You can set the strip size up to 1 MB. A larger strip size produces higher read performance. If your computer regularly performs random read requests, choose a smaller strip size. The default is 256 KB.

    -   **Access Policy:** Select the type of data access that is allowed for this virtual drive:

        ◊ **RW:** Allow read/write access. This is the default.

        ◊ **Read Only:** Allow read-only access.

        ◊ **Blocked:** Do not allow access.

    -   **Read Policy:** Specify the read policy for this virtual drive:

        ◊ **No Read Ahead:** This disables the read ahead capability.

        ◊ **Always Read Ahead:** This enables read ahead capability, which allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data. This is the default.

    -   **Write Policy:** Specify the write policy for this virtual drive:

        ◊ **Write Through:** In Write Through mode, the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.

        ◊ **Always Write Back:** In Writeback mode, the controller sends a data transfer completion signal to the host when the controller cache has received all of the data in a transaction. This setting is recommended in Standard mode.

    -   **IO Policy:** The IO Policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.

◊ **Direct:** In direct I/O mode, reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This is the default.

◊ **Cached:** In cached I/O mode, all reads are buffered in cache memory.

- **Drive Cache:** Specify the drive cache policy:

  ◊ **Unchanged:** Leave the current drive cache policy unchanged. This is the default.

  ◊ **Enable:** Enable the drive cache.

  ◊ **Disable:** Disable the drive cache.

- **Disable BGI**: Specify the background initialization status:

  ◊ **No:** Leave background initialization enabled. This means that a new configuration can be initialized in the background while you use WebBIOS to do other configuration tasks. This is the default.

  ◊ **Yes:** Select Yes if you do not want to allow background initializations for configurations on this controller.

- **Select Size:** Specify the size of the virtual drive in terabytes, gigabytes, megabytes, or kilobytes. Normally, this would be the full size for RAID 1 shown in the Configuration panel on the right. You may specify a smaller size if you want to create other virtual drives on the same drive group.

8. Click **Accept** to accept the changes to the virtual drive definition, or click **Reclaim** to return to the previous settings.

9. Click **Yes** to confirm the write policy mode you have chosen.

10. Click **Next** after you finish defining virtual disks. The configuration preview screen appears.

11. Check the information in the configuration preview screen.

12. If the virtual drive configuration is acceptable, click **Accept** to save the configuration. Otherwise, click **Back** to return to the previous screens and change the configuration.

13. If you accept the configuration, click **Yes** at the prompt to save the configuration.

14. Click **Yes** at the prompt to start initialization.

15. After the virtual drive is successfully created, the **Manage SSD Caching** screen appears. Click **Cancel** to close the sceen.
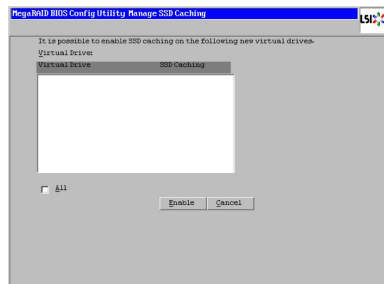
Using Manual Configuration: RAID 10

RAID 10, a combination of RAID 1 and RAID 0, has mirrored drives. It breaks up data into smaller blocks, then stripes the blocks of data to each RAID 1 drive group. Each RAID 1 drive group then duplicates its data to its other drive. The size of each block is determined by the strip size parameter. RAID 10 can sustain one drive failure in each array while maintaining data integrity.

RAID 10 provides both high data transfer rates and complete data redundancy. It works best for data storage that must have 100 percent redundancy of RAID 1 (mirrored drive groups) and that also needs the enhanced I/O performance of RAID 0 (striped drive groups); it works well for medium-sized databases or any environment that requires a higher degree of fault tolerance and moderate to medium capacity.

When you select **Manual Configuration** and click **Next**, the **Drive Group Definition** screen appears.

You can use the **Drive Group Definition** screen to select drives to create drive groups.

1.   Hold <Ctrl> while selecting two ready drives in the **Drives** panel on the left.

2.   Click **Add to Array** to move the drives to a proposed two-drive drive group configuration in the **Drive Groups** panel on the right.

3.   Select a preferred power save mode. The power save mode can be **Max**, **Max without cache**, **Auto**, **None**, and **Controller defined**. If you need to undo the changes, click the **Reclaim** button.

4.   Click **Accept DG** to create a RAID 1 drive group.

      An icon for the next drive group displays in the right panel.

5.   Click on the icon for the next drive group to select it.

6.   Hold <Ctrl> while selecting two more ready drives in the Drives panel to create a second RAID 1 drive group with two drives.

7.   Click **Add To Array** to move the drives to a second two-drive drive group configuration in the **Drive Groups** panel.

      If you need to undo the changes, click the **Reclaim** button.

8.   Repeat the previous three steps until you have selected all the drives you want for the drive groups.

9.   After you finish selecting drives for the drive groups, select each drive group and click **Accept DG** for each.

10.   Click **Next**. The **Span Definition** screen appears. This screen displays the drive group holes you can select to add to a span.

11.   Select one of the available drive groups with two drives from the Array With Free Space drop-down list, and then click **Add to SPAN**.

12. Select a second drive group from the **Array With Free Space** drop-down list, and click **Add to SPAN**.

    Both drive groups display in the right frame under **Span**.

13. If there are additional drive groups with two drives each, you can add them to the virtual drive.

14. When finish, click **Next**. The **Virtual Drive Definition** screen appears.

    You can use this screen to select the RAID level, strip size, read policy, and other attributes for the new virtual drives.

> The WebBIOS Configuration Utility displays the maximum available capacity while creating the RAID 10 drive group. In version 1.03 of the utility, the maximum size of the RAID 10 drive group is the sum total of the two RAID 1 drive groups. In version 1.1, the maximum size is the size of the smaller drive group multiplied by two.

15. Change the virtual drive options from the defaults listed on the screen as needed.

    Here are brief explanations of the virtual drive options:

    • **RAID Level:** The drop-down menu lists the possible RAID levels for the virtual drive. Select RAID 10.

    • **Strip Size:** The strip size specifies the size of the segment written to each disk in a RAID configuration. You can set the strip size up to 1 MB. A larger strip size produces higher read performance. If your computer regularly performs random read requests, choose a smaller strip size. The default is 256 KB.

    • **Access Policy:** Select the type of data access that is allowed for this virtual drive:

      ◊ **RW:** Allow read/write access. This is the default.

      ◊ **Read Only:** Allow read-only access.

      ◊ **Blocked:** Do not allow access.

    • **Read Policy:** Specify the read policy for this virtual drive:

      ◊ **No Read Ahead:** This disables the read ahead capability.

      ◊ **Always Read Ahead:** This enables read ahead capability, which allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data. This is the default.

    • **Write Policy:** Specify the write policy for this virtual drive:

      ◊ **Write Through:** In Write Through mode, the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.

◊ **Always Write Back:** In Writeback mode, the controller sends a data transfer completion signal to the host when the controller cache has received all of the data in a transaction. This setting is recommended in Standard mode.

- **IO Policy:** The IO Policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.

◊ **Direct:** In direct I/O mode, reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This is the default.

◊ **Cached:** In cached I/O mode, all reads are buffered in cache memory.

- **Drive Cache:** Specify the drive cache policy:

◊ **Unchanged:** Leave the current drive cache policy unchanged. This is the default.

◊ **Enable:** Enable the drive cache.

◊ **Disable:** Disable the drive cache.

- **Disable BGI**: Specify the background initialization status:

◊ **No:** Leave background initialization enabled. This means that a new configuration can be initialized in the background while you use WebBIOS to do other configuration tasks. This is the default.

◊ **Yes:** Select Yes if you do not want to allow background initializations for configurations on this controller.

- **Select Size:** Specify the size of the virtual drive in terabytes, gigabytes, megabytes, or kilobytes. Normally, this would be the full size for RAID 10 shown in the Configuration panel on the right. You may specify a smaller size if you want to create other virtual drives on the same drive group.

16. Click **Accept** to accept the changes to the virtual drive definition, or click **Reclaim** to to undo the changes.

17. Click **Yes** to confirm the write policy mode you have chosen.

18. When you finish defining virtual drives, click **Next**. The configuration preview screen appears.

19. Check the information in the configuration preview screen.

20. If the virtual drive configuration is acceptable, click **Accept** to save the configuration. Otherwise, click **Cancel** to end the operation and return to the WebBIOS main menu, or click **Back** to return to the previous screens and change the configuration.

21. If you accept the configuration, click **Yes** at the prompt to save the configuration.

22. Click **Yes** at the prompt to start initialization.

23. After the virtual drive is successfully created, the **Manage SSD Caching** screen appears. Click **Cancel** to close the sceen.
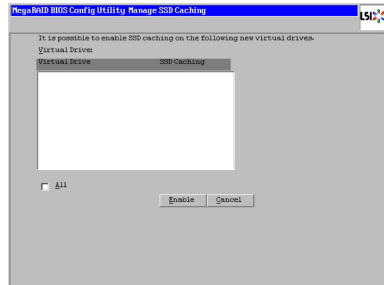
Using Manual Configuration: RAID 5

RAID 5 uses drive striping at the block level and parity. In RAID 5, the parity information is written to all drives. It is best suited for networks that perform a lot of small input/output (I/O) transactions simultaneously. RAID 5 provides data redundancy, high read rates, and good performance in most environments. It also provides redundancy with lowest loss of capacity.

RAID 5 provides high data throughput. RAID 5 is useful for transaction processing applications because each drive can read and write independently. If a drive fails, the RAID controller uses the parity drive to recreate all missing information. You can use RAID 5 for office automation and online customer service that require fault tolerance. In addition, RAID 5 is good for any application that has high read request rates but low write request rates.

When you select **Manual Configuration** and click **Next**, the **Drive Group Definition** screen appears. You use this screen to select drives to create drive groups.

1. Hold <Ctrl> while you select at least three ready drives in the **Drives** panel on the left.
2. Click **Add To Arrary** to move the drives to a proposed drive group configuration in the **Drive Groups** panel on the right.
3. Select a preferred power save mode. The power save mode can be **Max**, **Max without cache**, **Auto**, **None**, and **Controller defined**. If you need to undo the changes, click **Reclaim**.
4. After you finish selecting drives for the drive group, click **Accept DG**.
5. Click **Next**. The **Span Definition** screen appears. Select one of the available drive groups, and then click **Add to SPAN**.
6. When finish, click **Next**. The **Virtual Drive Definition** screen appears. You use this screen to select the RAID level, strip size, read policy, and other attributes for the new virtual drives.
7. Change the virtual drive options from the defaults listed on the screen as needed.

Here are brief explanations of the virtual disk options:

- **RAID Level:** The drop-down menu lists the possible RAID levels for the virtual drive. Select **RAID 5**.

- **Strip Size:** The strip size specifies the size of the segment written to each disk in a RAID configuration. You can set the strip size up to 1 MB. A larger strip size produces higher read performance. If your computer regularly performs random read requests, choose a smaller strip size. The default is 256 KB.

- **Access Policy:** Select the type of data access that is allowed for this virtual drive:

  ◊ **RW:** Allow read/write access. This is the default.

  ◊ **Read Only:** Allow read-only access.

  ◊ **Blocked:** Do not allow access.

- **Read Policy:** Specify the read policy for this virtual drive:

  ◊ **No Read Ahead:** This disables the read ahead capability.

  ◊ **Always Read Ahead:** This enables read ahead capability, which allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data. This is the default.

- **Write Policy:** Specify the write policy for this virtual drive:

  ◊ **Write Through:** In Write Through mode, the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.

  ◊ **Always Write Back:** In Writeback mode, the controller sends a data transfer completion signal to the host when the controller cache has received all of the data in a transaction. This setting is recommended in Standard mode.

- **IO Policy:** The IO Policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.

  ◊ **Direct:** In direct I/O mode, reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This is the default.

  ◊ **Cached:** In cached I/O mode, all reads are buffered in cache memory.

- **Drive Cache:** Specify the drive cache policy:

  ◊ **Unchanged:** Leave the current drive cache policy unchanged. This is the default.

  ◊ **Enable:** Enable the drive cache.

  ◊ **Disable:** Disable the drive cache.

- • **Disable BGI**: Specify the background initialization status:
  - ◊ **No:** Leave background initialization enabled. This means that a new configuration can be initialized in the background while you use WebBIOS to do other configuration tasks. This is the default.
  - ◊ **Yes:** Select Yes if you do not want to allow background initializations for configurations on this controller.
- • **Select Size:** Specify the size of the virtual drive in terabytes, gigabytes, megabytes, or kilobytes. Normally, this would be the full size for RAID 5 shown in the Configuration panel on the right. You may specify a smaller size if you want to create other virtual drives on the same drive group.

8. Click **Accept** to accept the changes to the virtual drive definition, or click **Reclaim** to return to the previous settings.

9. Click **Yes** to confirm the write policy mode you have chosen.

10. Click **Next** after you finish defining virtual drives. The configuration preview screen appears.

11. Check the information in the configuration preview screen.

12. If the virtual drive configuration is acceptable, click **Accept** to save the configuration. Otherwise, click **Back** to return to the previous screens and change the configuration.

13. If you accept the configuration, click **Yes** at the prompt to save the configuration.

14. Click **Yes** at the prompt to start initialization.

15. After the virtual drive is successfully created, the **Manage SSD Caching** screen appears. Click **Cancel** to close the sceen.

Using Manual Configuration: RAID 50

RAID 50 provides the features of both RAID 0 and RAID 5. RAID 50 uses both distributed parity and drive striping across multiple drive groups. It provides high data throughput, data redundancy, and very good performance. It is best implemented on two RAID 5 drive groups with data striped across both drive groups. Though multiple drive failures can be tolerated, only one drive failure can be tolerated in each RAID 5 level drive group.

RAID 50 is appropriate when used with data that requires high reliability, high request rates, high data transfer, and medium to large capacity.

When you select **Manual Configuration** and click **Next**, the **Drive Group Definition** screen appears. You use this screen to select drives to create drive groups.

1. Hold <Ctrl> while selecting at least three ready drives in the **Drives** panel on the left.
2. Click **Add To Array** to move the drives to a proposed drive group configuration in the **Drive Groups** panel on the right.
3. Select a preferred power save mode. The power save mode can be **Max**, **Max without cache**, **Auto**, **None**, and **Controller defined**. If you need to undo the changes, click **Reclaim**.
4. Click **Accept DG** to create a RAID 5 drive group.

   An icon for a second drive group displays in the right panel.
5. Click on the icon for the second drive group to select it.
6. Hold <Ctrl> while selecting at least three more ready drives in the **Drives** panel to create a second drive group.
7. Click **Add To Array** to move the drives to a proposed drive group configuration in the **Drive Groups** panel on the right.

   If you need to undo the changes, click **Reclaim**.
8. After you finish selecting drives for the drive groups, select each drive group and click **Accept DG** for each.
9. Click **Next**. The **Span Definition** screen appears. This screen displays the drive group holes you can select to add to a span.
10. Select one of the available drive groups from the **Array With Free Space** drop-down list, and then click **Add to SPAN**.
11. Select a second drive group from the **Array With Free Space** drop-down list, and click **Add to SPAN**.

    Both drive groups display in the right frame under Span.
12. When finish, click **Next**. The **Virtual Drive Definition** screen appears. You use this screen to select the RAID level, strip size, read policy, and other attributes for the new virtual drive(s).

13. If there are additional drive groups with three or more drives each, you can add them to the virtual drive.

14. Change the virtual drive options from the defaults listed on the screen as needed.

Here are brief explanations of the virtual drive options:

- **RAID Level:** The drop-down menu lists the possible RAID levels for the virtual drive. Select RAID 50.

- **Strip Size:** The strip size specifies the size of the segment written to each disk in a RAID configuration. You can set the strip size up to 1 MB. A larger strip size produces higher read performance. If your computer regularly performs random read requests, choose a smaller strip size. The default is 256 KB.

- **Access Policy:** Select the type of data access that is allowed for this virtual drive:

  ◊ **RW:** Allow read/write access. This is the default.

  ◊ **Read Only:** Allow read-only access.

  ◊ **Blocked:** Do not allow access.

- **Read Policy:** Specify the read policy for this virtual drive:

  ◊ **No Read Ahead:** This disables the read ahead capability.

  ◊ **Always Read Ahead:** This enables read ahead capability, which allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data. This is the default.

- **Write Policy:** Specify the write policy for this virtual drive:

  ◊ **Write Through:** In Write Through mode, the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.

  ◊ **Always Write Back:** In Writeback mode, the controller sends a data transfer completion signal to the host when the controller cache has received all of the data in a transaction. This setting is recommended in Standard mode.

- **IO Policy:** The IO Policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.

  ◊ **Direct:** In direct I/O mode, reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This is the default.

  ◊ **Cached:** In cached I/O mode, all reads are buffered in cache memory.

- **Drive Cache:** Specify the drive cache policy:
  - ◊ **Unchanged:** Leave the current drive cache policy unchanged. This is the default.
  - ◊ **Enable:** Enable the drive cache.
  - ◊ **Disable:** Disable the drive cache.
- **Disable BGI**: Specify the background initialization status:
  - ◊ **No:** Leave background initialization enabled. This means that a new configuration can be initialized in the background while you use WebBIOS to do other configuration tasks. This is the default.
  - ◊ **Yes:** Select Yes if you do not want to allow background initializations for configurations on this controller.
- **Select Size:** Specify the size of the virtual drive in terabytes, gigabytes, megabytes, or kilobytes. Normally, this would be the full size for RAID 50 shown in the Configuration panel on the right. You may specify a smaller size if you want to create other virtual drives on the same drive group.

15. Click **Accept** to accept the changes to the virtual drive definition, or click **Reclaim** to undo the changes.

16. Click **Yes** to confirm the write policy mode you have chosen.

17. Click **Next** after you finish defining virtual drives. The configuration preview screen appears.

18. Check the information in the configuration preview screen.

19. If the virtual drive configuration is acceptable, click **Accept** to save the configuration. Otherwise, click **Cancel** to end the operation and return to the WebBIOS main menu, or click **Back** to return to the previous screens and change the configuration.

20. If you accept the configuration, click **Yes** at the prompt to save the configuration.

21. Click **Yes** at the prompt to start initialization.

22. After the virtual drive is successfully created, the **Manage SSD Caching** screen appears. Click **Cancel** to close the sceen.

Using Manual Configuration: RAID 6

RAID 6 is similar to RAID 5 (drive striping and distributed parity), except that instead of one parity block per stripe, there are two. With two independent parity blocks, RAID 6 can survive the loss of any two drives in a virtual drive without losing data. Use RAID 6 for data that requires a very high level of protection from loss.

RAID 6 is best suited for networks that perform a lot of small input/output (I/O) transactions simultaneously. It provides data redundancy, high read rates, and good performance in most environments.

In the case of a failure of one drive or two drives in a virtual drive, the RAID controller uses the parity blocks to recreate all of the missing information. If two drives in a RAID 6 virtual drive fail, two drive rebuilds are required, one for each drive. These rebuilds do not occur at the same time. The controller rebuilds one failed drive, and then the other failed drive.

When you select **Manual Configuration** and click **Next**, the **Drive Group Definition** screen appears. You use this screen to select drives to create drive groups.
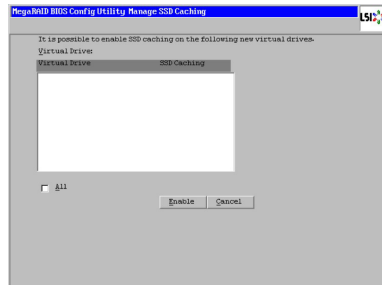
1. Hold <Ctrl> while you select at least three ready drives in the **Drives** panel on the left.

2. Click **Add To Arrary** to move the drives to a proposed drive group configuration in the **Drive Groups** panel on the right.

3. Select a preferred power save mode. The power save mode can be **Max**, **Max without cache**, **Auto**, **None**, and **Controller defined**. If you need to undo the changes, click **Reclaim**.

4. After you finish selecting drives for the drive group, click **Accept DG**.

5. Click **Next**. The Span Definition screen appears. Select one of the available drive groups, and then click **Add to SPAN**.

6. When finish, click **Next**. The Virtual Drive Definition screen appears. You use this screen to select the RAID level, strip size, read policy, and other attributes for the new virtual drives.

7. Change the virtual drive options from the defaults listed on the screen as needed.

    Here are brief explanations of the virtual disk options:

    •   **RAID Level:** The drop-down menu lists the possible RAID levels for the virtual drive. Select **RAID 6**.

    •   **Strip Size:** The strip size specifies the size of the segment written to each disk in a RAID configuration. You can set the strip size up to 1 MB. A larger strip size produces higher read performance. If your computer regularly performs random read requests, choose a smaller strip size. The default is 256 KB.

- **Access Policy:** Select the type of data access that is allowed for this virtual drive:

  ◊ **RW:** Allow read/write access. This is the default.

  ◊ **Read Only:** Allow read-only access.

  ◊ **Blocked:** Do not allow access.

- **Read Policy:** Specify the read policy for this virtual drive:

  ◊ **No Read Ahead:** This disables the read ahead capability.

  ◊ **Always Read Ahead:** This enables read ahead capability, which allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data. This is the default.

- **Write Policy:** Specify the write policy for this virtual drive:

  ◊ **Write Through:** In Write Through mode, the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.

  ◊ **Always Write Back:** In Writeback mode, the controller sends a data transfer completion signal to the host when the controller cache has received all of the data in a transaction. This setting is recommended in Standard mode.

- **IO Policy:** The IO Policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.

  ◊ **Direct:** In direct I/O mode, reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This is the default.

  ◊ **Cached:** In cached I/O mode, all reads are buffered in cache memory.

- **Drive Cache:** Specify the drive cache policy:

  ◊ **Unchanged:** Leave the current drive cache policy unchanged. This is the default.

  ◊ **Enable:** Enable the drive cache.

  ◊ **Disable:** Disable the drive cache.

- **Disable BGI**: Specify the background initialization status:

  ◊ **No:** Leave background initialization enabled. This means that a new configuration can be initialized in the background while you use WebBIOS to do other configuration tasks. This is the default.

  ◊ **Yes:** Select Yes if you do not want to allow background initializations for configurations on this controller.

- **Select Size:** Specify the size of the virtual drive in terabytes, gigabytes, megabytes, or kilobytes. Normally, this would be the full size for RAID 6 shown in the Configuration panel on the right. You may specify a smaller size if you want to create other virtual drives on the same drive group.

8. Click **Accept** to accept the changes to the virtual drive definition, or click **Reclaim** to return to the previous settings.

9. Click **Yes** to confirm the write policy mode you have chosen.

10. Click **Next** after you finish defining virtual drives. The configuration preview screen appears.

11. Check the information in the configuration preview screen.

12. If the virtual drive configuration is acceptable, click **Accept** to save the configuration. Otherwise, click **Back** to return to the previous screens and change the configuration.

13. If you accept the configuration, click **Yes** at the prompt to save the configuration.

14. Click **Yes** at the prompt to start initialization.

15. After the virtual drive is successfully created, the **Manage SSD Caching** screen appears. Click **Cancel** to close the sceen.

Using Manual Configuration: RAID 60

RAID 60 provides the features of both RAID 0 and RAID 6, and includes both parity and drive striping across multiple drive groups. RAID 6 supports two independent parity blocks per stripe. A RAID 60 virtual drive can survive the loss of two drives in each of the RAID 6 sets without losing data. RAID 60 is best implemented on two RAID 6 drive groups with data striped across both drive groups. Uses RAID 60 for data that requires a very high level of protection from loss.

RAID 60 can support up to eight spans and tolerate up to 16 drive failures, though less than total drive capacity is available. Two drive failures can be tolerated in each RAID 6 level drive group.

RAID 60 is appropriate when used with data that requires high reliability, high request rates, high data transfer, and medium-to-large capacity.

When you select **Manual Configuration** and click **Next**, the **Drive Group Definition** screen appears. You use this screen to select drives to create drive groups.

1. Hold <Ctrl> while selecting at least three ready drives in the **Drives** panel on the left.

2. Click **Add To Array** to move the drives to a proposed drive group configuration in the **Drive Groups** panel on the right.

3. Select a preferred power save mode. The power save mode can be **Max**, **Max without cache**, **Auto**, **None**, and **Controller defined**. If you need to undo the changes, click **Reclaim**.

4. Click **Accept DG** to create a RAID 6 drive group.

   An icon for a second drive group displays in the right panel.

5. Click on the icon for the second drive group to select it.

6. Hold <Ctrl> while selecting at least three more ready drives in the Drives panel to create a second drive group.

7. Click **Add To Array** to move the drives to a proposed drive group configuration in the **Drive Groups** panel on the right.

   If you need to undo the changes, click **Reclaim**.

8. Choose whether to use drive encryption. After you finish selecting drives for the drive groups, select each drive group and click **Accept DG** for each.

9. Click **Next**. The **Span Definition** screen appears. This screen displays the drive group holes you can select to add to a span.

10. Select one of the available drive groups from the **Array With Free Space** drop-down list, and then click **Add to SPAN**.

11. Select a second drive group from the **Array With Free Space** drop-down list, and click **Add to SPAN**.

    Both drive groups display in the right frame under **Span**.

12. When finish, click **Next**. The **Virtual Drive Definition** screen appears. You use this screen to select the RAID level, strip size, read policy, and other attributes for the new virtual drive(s).

13. If there are additional drive groups with three or more drives each, you can add them to the virtual drive.

14. Change the virtual drive options from the defaults listed on the screen as needed.

    Here are brief explanations of the virtual drive options:

    • **RAID Level:** The drop-down menu lists the possible RAID levels for the virtual drive. Select **RAID 60**.

- **Strip Size:** The strip size specifies the size of the segment written to each disk in a RAID configuration. You can set the strip size up to 1 MB. A larger strip size produces higher read performance. If your computer regularly performs random read requests, choose a smaller strip size. The default is 256 KB.
- **Access Policy:** Select the type of data access that is allowed for this virtual drive:
  ◊ **RW:** Allow read/write access. This is the default.
  ◊ **Read Only:** Allow read-only access.
  ◊ **Blocked:** Do not allow access.
- **Read Policy:** Specify the read policy for this virtual drive:
  ◊ **No Read Ahead:** This disables the read ahead capability.
  ◊ **Always Read Ahead:** This enables read ahead capability, which allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data. This is the default.
- **Write Policy:** Specify the write policy for this virtual drive:
  ◊ **Write Through:** In Write Through mode, the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.
  ◊ **Always Write Back:** In Writeback mode, the controller sends a data transfer completion signal to the host when the controller cache has received all of the data in a transaction. This setting is recommended in Standard mode.
- **IO Policy:** The IO Policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.
  ◊ **Direct:** In direct I/O mode, reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This is the default.
  ◊ **Cached:** In cached I/O mode, all reads are buffered in cache memory.
- **Drive Cache:** Specify the drive cache policy:
  ◊ **Unchanged:** Leave the current drive cache policy unchanged. This is the default.
  ◊ **Enable:** Enable the drive cache.
  ◊ **Disable:** Disable the drive cache.
- **Disable BGI**: Specify the background initialization status:

◊ **No:** Leave background initialization enabled. This means that a new configuration can be initialized in the background while you use WebBIOS to do other configuration tasks. This is the default.

◊ **Yes:** Select Yes if you do not want to allow background initializations for configurations on this controller.

• **Select Size:** Specify the size of the virtual drive in terabytes, gigabytes, megabytes, or kilobytes. Normally, this would be the full size for RAID 60 shown in the Configuration panel on the right. You may specify a smaller size if you want to create other virtual drives on the same drive group.

15. Click **Accept** to accept the changes to the virtual drive definition, or click **Reclaim** to undo the changes.

16. Click **Yes** to confirm the write policy mode you have chosen.

17. Click **Next** after you finish defining virtual drives. The configuration preview screen appears.

18. Check the information in the configuration preview screen.

19. If the virtual drive configuration is acceptable, click **Accept** to save the configuration. Otherwise, click **Cancel** to end the operation and return to the WebBIOS main menu, or click **Back** to return to the previous screens and change the configuration.

20. If you accept the configuration, click **Yes** at the prompt to save the configuration.

21. Click **Yes** at the prompt to start initialization.

22. After the virtual drive is successfully created, the **Manage SSD Caching** screen appears. Click **Cancel** to close the sceen.

2.2.4 Viewing and Changing Device Properties

This section explains how you can use the WebBIOS CU to view and change the properties for controllers, virtual drives, and drives.

WebBIOS allows you to view information for the LSI SAS controller. To view the properties for the controller, click **Controller Properties** on the main WebBIOS screen. There are three Controller Properties screens. The right figure shows the first screen.


The information on this screen is read-only and cannot be modified directly. Most of this information is self-explanatory. The screen lists the number of virtual drives that are already defined on this controller, plus the number of drives connected to the controller.
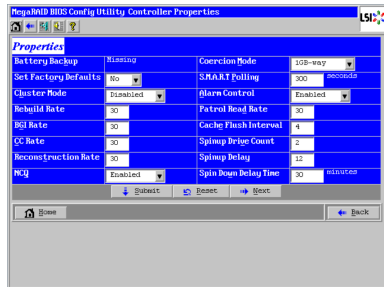
Click **Next** to view the second Controller Properties screen, as shown in the right figure.

Click **Next** to view the third Controller Properties screen, as shown in the following figure.
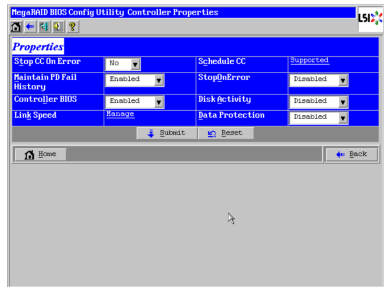
The following table describes the entries/options listed on the second and third Controller Properties screen. We recommend that you leave these options at their default settings to achieve the best performance, unless you have a specific reason for changing them.

Controller Properties Menu Options

| Option	Description
Battery Backup	This entry indicates whether the selected controller has a BBU. If present, you can click Manage to view information about the BBU.
Set Factory Defaults	Use this option to load the default MegaRAID® WebBIOS CU settings. The default is **No**.
Cluster Mode	Use this option to enable or disable Cluster mode. The default is **Disabled**. A cluster is a grouping of independent servers that can access the same data storage and provide services to a common set of clients. When Cluster mode is disabled, the system operates in Standard mode.
Rebuild Rate	Use this option to select the rebuild rate for drives connected to the selected controller. The default is 30 percent. The rebuild rate is the percentage of system resources dedicated to rebuilding a failed drive. The higher the number, the more system resources devoted to a rebuild.
BGI Rate	Use this option to select the amount of system resources dedicated to background initialization of virtual drives connected to the selected controller. The default is 30 percent.
CC Rate	Use this option to select the amount of system resources dedicated to consistency checks of virtual drives connected to the selected contrroller. The default is 30 percent.
Reconstruction Rate	Use this option to select the amount of system resources dedicated to reconstruction of drives connected to the selected controller. The default is 30 percent.
NCQ	Native Command Queuing (NCQ) gives an individual drive the ability to optimize the order in which it executes the read and write commands. The default is **Enabled**.
Coercion Mode	Drive coercion is a tool for forcing drives of varying capacities to the same size so they can be used in a drive group. The coercion mode options are None, 128MB-way, and 1GB-way. The default is **1GB-way**. The number you choose depends on how much the drives from various vendors vary in their actual size. We recommend that you use the 1GB coercion mode option.
S.M.A.R.T. Polling	This option determines how frequently the controller polls for drives reporting a predictive drive failure (S.M.A.R.T. error). The default is 300 seconds (5 minutes).
Alarm Control	Select this option to enable, disable, or silence the onboard alarm tone generator on the controller. The default is **Enabled**.

Controller Properties Menu Options (Cont.)

Option	Description
Patrol Read Rate	Use this option to select the rate for patrol reads for drives connected to the selected controller. The default is 30 percent. The patrol read rate is the percentage of system resources dedicated to running a patrol read.
Cache Flush Interval	Use this option to control the interval (in seconds) at which the contents of the onboard data cache are flushed. The default is 4 seconds.
Spinup Drive Count	Use this option to control the number of drives that spin up simultaneously. The default is 4 drives.
Spinup Delay	Use this option to control the interval (in seconds) between spinup of drives connected to this controller. The delay prevents a drain on the system's power supply that would occur if all drives spun up at the same time. The default is 12 seconds.
Stop CC on Error	Use this option if you want to stop a consistency check when the controller BIOS encounters an error. The default is **No**.
Maintain PD Fail History	Use this option to maintain the history of all drive failures. The default is **Enabled**.
Controller BIOS	Use this option to enable or disable the BIOS for the selected controller. The default is **Enabled**. If the boot device is on the selected controller, the BIOS must be enabled. Otherwise, the BIOS should be disabled or it might not be possible to use a boot device elsewhere.
Link Speed	Use this option to change the link speed between the controller and an expander or between the controller and a drive that is directly connected to the controller.
Schedule CC	"Supported" will be displayed if the controller supports consistency check schedule.
StopOnError	Enable this option if you want the boot process to stop when the controller BIOS encounters an error during boot-up. The default is **Enabled**.
Disk Activity	Enable this option if you want to locate a particular disk. This disk can be identified with a continuous blinking of green activity LED. This works only if the disks are installed in an enclosure. The default is **Disabled**.

If you make changes to the options on this screen, click **Submit** to register them. If you change your mind, click **Reset** to return the options to their default values.

Viewing and Changing Virtual Drive Properties

To access the Virtual Drive screen, click a virtual drive icon in the right panel on the WebBIOS CU main screen. The following figure shows the Virtual Drive screen.
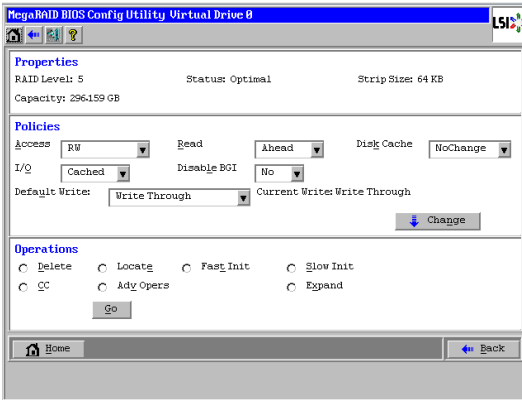
The configuration items in the screen above vary with the existing RAID level.

The **Properties** panel of this screen displays the virtual drive's RAID level, state, capacity, and strip size.

The **Policies** panel lists the virtual drive policies that were defined when the storage configuration was created. To change any of these policies, make a selection from the drop-down menu, and click **Change**.

The **Operations** panel lists operations that can be performed on the virtual drive. To perform an operation, select it, and click **Go**. Choose from the following options:

- Select **Delete** to delete this virtual drive.
- Select **Locate** to make the LEDs flash on the drives used by this virtual drive. This works only if the drives are installed in a drive enclosure that supports SCSI-Accessed-Fault-Tolerant-Enclosure (SAFTE).
- Select **Fast Init** or **Slow Init** to initialize this virtual drive. A fast initialization quickly writes zeroes to the first and last 10-MB regions of the new virtual drive and then completes the initialization in the background. A slow initialization is not complete until the entire virtual drive has been initialized with zeroes. It is seldom necessary to use this option, because the virtual drive was already initialized when you created it.

Before you run an initialization, back up any data on the virtual drive that you want to save. All data on the virtual drive is lost when you initialize the drive.

- Select **CC** to run a consistency check on this virtual drive.

> ⚠ Before you change a virtual drive configuration, back up any data on the virtual drive that you want to keep.

- Select **Adv Opers** to set the advanced operations on this virtual drive.

    1. Select either **Change RAID Level** or **Change RAID Level and Add Drive**.

        ◊ If you select **Change RAID Level**, change the RAID level from the drop-down menu.

        ◊ If you select **Change RAID Level and Add Drive**, change the RAID level from the drop-down menu and then select one or more drives to add from the list of drives.
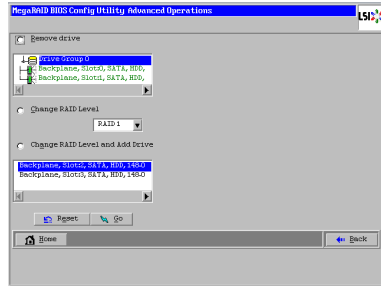
    2. Click **Go**. When the message appears, confirm that you want to migrate the RAID level of the virtual drive.

        A reconstruction operation begins on the virtual drive. You must wait until the reconstruction is completed before you perform any other tasks in the WebBIOS CU.

- Select **Expand** to increase the size of a virtual drive to occupy the remaining capacity in the drive group. In addition, you can add drives to the virtual drive in order to increase capacity.

    1. Enter the percentage of the available capacity that you want the virtual drive to use.

        For example, if there are 100 GB of capacity available and you want to increase the size of the virtual drive by 30GB, select 30 percent.

    2. Click **Calculate** to determine the capacity of the virtual drive after expansion. Click **Ok**.
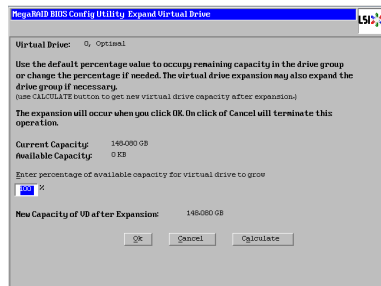
        The virtual drive expands by the selected percentage of the available capacity.
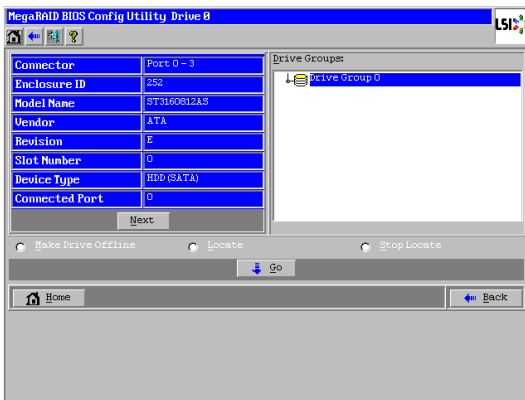
Viewing Drive Properties

The **Physical Drive** screen displays the properties of a selected drive and also enables you to perform operations on the drive.

There are two ways to access the **Physical Drive** screen:

- On the main menu screen, click on a drive in the right panel under the heading **Physical View**.
- On the main menu screen, click on **Drives** in the left panel to display the **Drives** screen. Then click on a drive in the right panel. Click on the **Properties** button, and click **Go**. The properties for the selected drive display.

The below figure shows the **Physical Drive** screen.

The drive properties are view-only and are self-explanatory. Note that the properties include the state of the drive. The operations listed at the bottom of the screen vary depending on the state of the drive. After you select an operation, click **Go** to start the operation. If the drive state is Online, the following operations appear.

- Select **Make Drive Offline** if you want to force the drive offline.

> If you force offline a good drive that is part of a redundant drive group with a hot spare, the drive will rebuild to the hot spare drive. The drive you forced offline will go into the **Unconfigured Bad** state. Access the BIOS utility to set the drive to the **Unconfigured Good** state.

- Select **Locate** to make the LED flash on the drive. This works only if the drive is installed in a drive enclosure.
- Select **Stop Locate** to disable the LED flash on the drive.

If the drive state is Unconfigured Good, four additional operations appear on this screen:

- Select **Make Global HSP** to make a global hot spare, available to all of the virtual drives.

- Select **Enclosure Affinity** so if there are drive failures present on a split backplane configuration, then the hot spare will be used first on the backplane side that it resides in.

- Select **Make Unconf Bad** to make the drive state to become Unconfigured Bad.

- Select **Prepare for Removal** to prepare the drive for removal from the enclosure.

2.2.5 Viewing System Event Information

The SAS controller firmware monitors the activity and performance of all storage configurations and devices in the system. When an event occurs (such as the creation of a new virtual drive or the removal of a drive) an event message is generated and is stored in the controller NVRAM. You can use the WebBIOS CU to view these event messages. To do this, click **Events** on the main WebBIOS CU screen. The Event Information screen appears, as shown in the following figure.
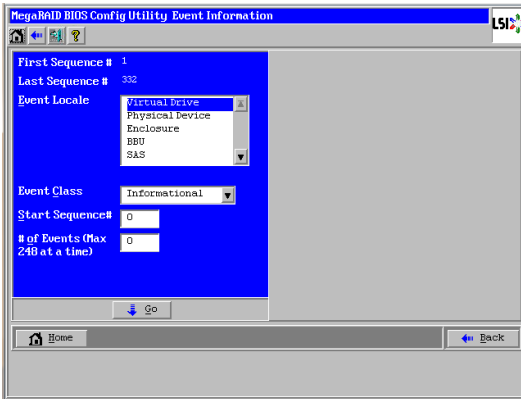
The right side of the screen is blank until you select an event to view. The **First Sequence** and **Last Sequence** fields in the upper left of the screen show you how many event entries are currently stored.

To view event information, follow these steps:

1. Select an event locale from the **Event Locale** drop-down menu. For example, select **Enclosure** to view events relating to the drive enclosure.

2. Select an event class: Informational, Warning, Critical, Fatal, or Dead.

3. Enter a start sequence number, between the first sequence and last sequence numbers. The higher the number, the more recent the event.

4. Enter the Number of events of this type that you want to view, and click **Go**.

    The first event in the sequence appears in the right panel.

5. Click **Next** or **Prev** to page forward or backward through the sequence of events.

6. If you want, select different event criteria in the left panel, and click **Go** again to view a different sequence of events.

    Each event entry includes a time stamp and a description to help you determine when the event occurred and what it was.

2.2.6   Managing Configurations

This section includes information about maintaining and managing storage configurations.

Running a Consistency Check

You should periodically run a consistency check on fault-tolerant virtual drives. A consistency check verifies that the redundancy data is correct and available for RAID 1, RAID 5, RAID 6, RAID 10, RAID 50, and RAID 60 arrays. To do this, follow these steps:

1.   On the main WebBIOS CU screen, select a virtual drive.

2.   When the Virtual Drive screen appears, select **CC** in the lower left panel, and click **Go**.

3.   Click **Yes** to continue. The consistency check begins.

If the WebBIOS CU finds a difference between the data and the parity value on the redundant drive group, it assumes that the data is accurate and automatically corrects the parity value. Be sure to back up the data before running a consistency check if you think the data may be corrupted.

Deleting a Virtual Drive

You can delete any virtual drive on the controller if you want to reuse that space for a new virtual drive. The WebBIOS CU provides a list of configurable drive groups where there is a space to configure. If multiple virtual drives are defined on a single drive group, you can delete a virtual drive without deleting the whole drive group.

> Back up any data that you want to keep before you delete the virtual drive.

To delete a virtual drive, follow these steps:

1.   On the main WebBIOS CU screen, select a virtual drive.

2.   When the Virtual Drive screen appears, select **Delete** in the bottom panel under the heading Operations, and click **Go**.

3.   When the message appears, confirm that you want to delete the virtual drive.

Importing or Clearing a Foreign Configuration

A **foreign configuration** is a storage configuration that already exists on a replacement set of drives that you install in a computer system. In addition, if one or more drives are removed from a configuration, by a cable pull or drive removal, for example, the configuration on those drives is considered a foreign configuration by the RAID controller.

The WebBIOS CU allows you to import the foreign configuration to the RAID controller, or to clear the configuration so you can create a new configuration using these drives.

When you create a new configuration, the WebBIOS CU shows only the unconfigured drives. Drives that have existing configurations, including foreign configurations, do not appear. To use drives with existing configurations, you must first clear the configuration on those drives.

If a foreign configuration is detected during POST, press <C> when the following screen appears.

```
Foreign configuration(s) found on adapter
Press any key to continue or 'C' to load the configuration utility,
or 'F' to import foreign configuration(s) and continue.
```

When the following screen appears, press <Ctrl+H> to enter the WebBIOS CU.

```
1 Virtual Drive(s) handled by BIOS
Press <Ctrl><H> for WebBIOS or press <Ctrl><Y> for Preboot CLI
```

If WebBIOS CU detects a foreign configuration, the following screen appears when enter the WebBIOS CU.
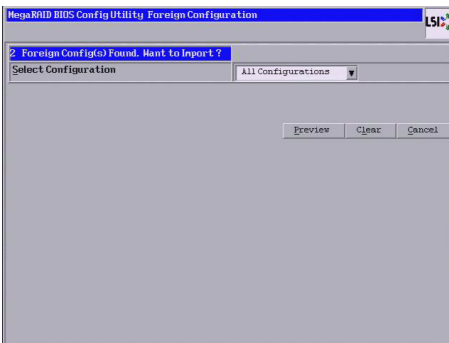

Follow these steps to import or clear a foreign configuration:

1. Click the drop-down list to show the configurations.

    The GUID (Global Unique Identifier) entries on the drop-down list are OEM names and will vary from one installation to another.

2.   Select a configuration or **All Configurations**.

3.   Perform one of the following steps:

   • Click **Preview** to preview the foreign configurations. The **Foreign Configuration Preview** screen appears, as shown in the right figure.

   • Click **Clear** to clear the foreign configurations and reuse the drives for another virtual drive.
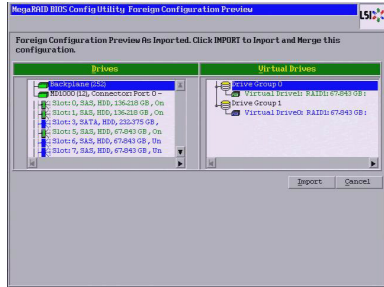
   If you click **Cancel**, it cancels the importation or preview of the foreign configuration.

   The right panel shows the virtual drive properties of the foreign configuration. In this example, there are two RAID1 virtual drives with 67.843GB each. The left panel shows the drives in the foreign configuration.

4.   Click **Import** to import this foreign configuration(s) and use it on this controller.

   Foreign Configurations in Cable Pull and Drive Removal Scenarios
   If one or more drives are removed from a configuration, by a cable pull or drive removal, for example, the configuration on those drives is considered a foreign configuration by the RAID controller.

   Use the **Foreign Configuration Preview** screen to import or clear the foreign configuration in each case.

   The following scenarios can occur with cable pulls or physical drive removals.

   > If you want to import the foreign configuration in any of the following scenarios, you should have all the drives in the enclosure before you perform the import operation.

1.   Scenario #1: If all of the drives in a configuration are removed and re-inserted, the controller considers the drives to have foreign configurations.

   Import or clear the foreign configuration. If you select **Import**, automatic rebuilds will occur in redundant virtual drives.

   > Start a consistency check immediately after the rebuild is complete to ensure data integrity for the virtual drives.

2. Scenario #2: If some of the drives in a configuration are removed and re-inserted, the controller considers the drives to have foreign configurations.

Import or clear the foreign configuration. If you select **Import**, automatic rebuilds will occur in redundant virtual drives.

Start a consistency check immediately after the rebuild is complete to ensure data integrity for the virtual drives.

3. Scenario #3: If all the drives in a virtual drive are removed, but at different times, and re-inserted, the controller considers the drives to have foreign configurations.

Import or clear the foreign configuration. If you select **Import**, all drives that were pulled before the virtual drive became offline will be imported and then automatically rebuilt. Automatic rebuilds will occur in redundant virtual drives.

4. Scenario #4: If the drives in a non-redundant virtual drive are removed, the controller considers the drives to have foreign configurations.

Import or clear the foreign configuration. No rebuilds will occur after the import operation because there is no redundant data to rebuild the drives with.

2.3 MegaRAID Storage Manager

MegaRAID Storage Manager software enables you to configure, monitor, and maintain storage configurations on LSI SAS controllers. The MegaRAID Storage Manager graphical user interface (GUI) makes it easy for you to create and manage storage configurations.

2.3.1 Hardware and Software Requirements

The hardware requirements for MegaRAID Storage Manager software are as follows:

- PC-compatible computer with an IA-32 (32-bit) Intel Architecture processor or an EM64T (64-bit) processor and at least 128 Mbytes of system memory (256 Mbytes recommended)
- Disk drive with at least 50 Mbytes available free space

Refer to your server documentation and to the operating system documentation for more information on hardware and operating system requirements.

2.3.2 Installing MegaRAID Storage Manager Software on Microsoft Windows OS

Follow these steps if you need to install MegaRAID Storage Manager software on a system running Microsoft Windows OS:

1. Insert the ASUS PIKE 2208 Support CD in the optical disc drive. The CD automatically displays the **Utilities** menu if Autorun is enabled in your computer.

   > If Autorun is NOT enabled in your computer, browse the contents of the Support CD to locate **Setup.exe**. Double-click Setup.exe to run the Support CD.
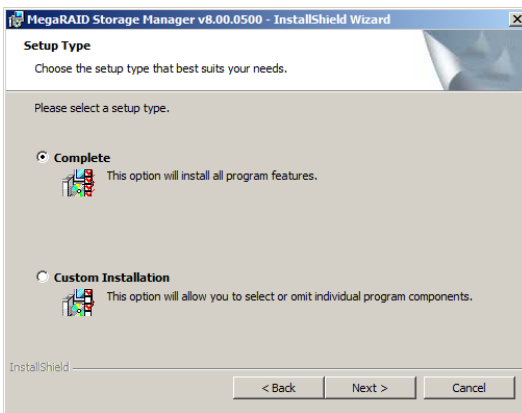
2. Click **LSI MegaRAID Storage Manager**.

3. When the Welcome screen appears, click **Next**.

   If MegaRAID Storage Manager software is already installed on this system, the Program Maintenance screen appears. Read the screen text and select **Modify**, **Repair**, or **Remove**.

4. When the next screen appears, read and accept the user license, and click **Next**.

   The Customer Information screen appears, as shown in the following figure.
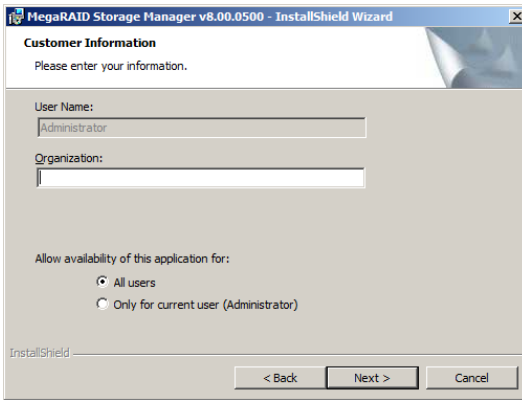
5. Enter your user name and organization name. In the bottom part of the screen, select an installation option:

   – If you select **All users**, any user with administrative privileges can use this version of MegaRAID Storage Manager software to view or change storage configurations.

   – If you select **Only for current user**, the MegaRAID Storage Manager shortcuts and associated icons will be available only to the user with this user name.

6. Click **Next** to continue.

7. On the next screen, accept the default Destination Folder, or click **Change** to select a different destination folder. Click **Next** to continue.

   The Setup Type screen appears, as shown in the following figure.

8. Select one of the Setup options. The options are fully explained in the screen text.

   – Normally, you would select **Complete** if you are installing MegaRAID Storage Manager software on a server.

   – Select **Custom Installation** if you want to select individual program components.

9. Click **Next** to continue.

   If you selected **Custom Installation** as your setup option, the second Setup Type screen appears, as shown in the following figure.

   If you select **Complete** as your setup option, the Installation Wizard is ready to install MSM. To begin installation, click on Install on the next screen that appears.
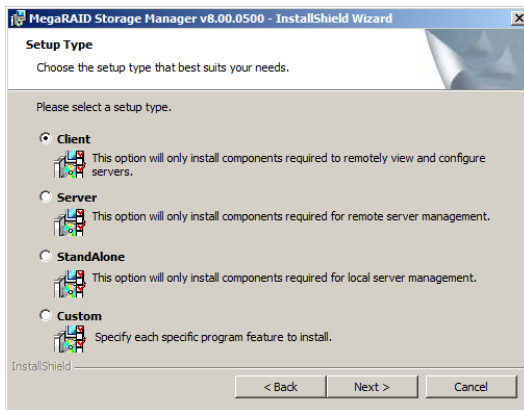

10. Select one of the custom setup options. The options are fully explained in the screen text.

   – Select **Client** if you are installing MegaRAID Storage Manager software on a PC that will be used to view and configure servers over a network. To begin installation, click on **Install** on the next screen that appears.

   – Select **Server** to install only those components required for remote server management. To begin installation, click on **Install** on the next screen that appears.

   – Select **StandAlone** if you will use MegaRAID Storage Manager software to create and manage storage configurations on a standalone workstation. To begin installation, click on **Install** on the next screen that appears.

   – Select **Custom** if you want to specify individual program features to install.

If you select **Custom**, a window listing the installation features appears, as shown in the following figure. Select the features you want on this screen.
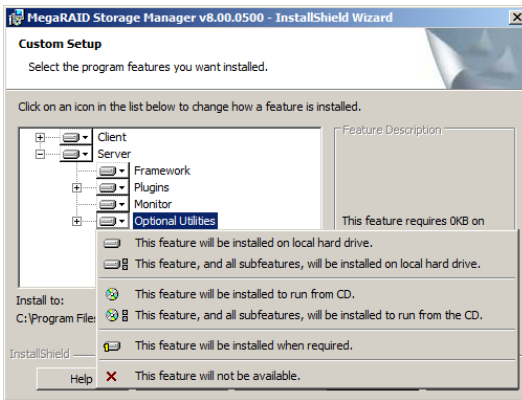
11. Click **Next** to proceed.

12. Click **Install** to install the program.

13. When the final Configuration Wizard screen appears, click **Finish**.

    If you select **Client** installation for a PC used to monitor servers, and if there are no available servers with a registered framework on the local subnet (that is, servers with a complete installation of MegaRAID Storage Manager software), the server screen appears, as shown in the following figure. The server screen will not list any servers. You can use this screen to manage systems remotely.
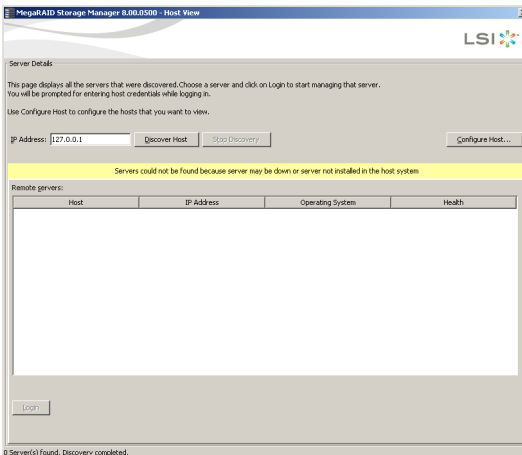
2.3.3   Installing MegaRAID Storage Manager Software for Linux

Follow these steps if you need to install MegaRAID Storage Manager software on a system running Red Hat Linux or SUSE Linux:

1.   Copy the **MSM_linux_installer...tar.gz** file to a temporary folder.
2.   Untar the **MSM_linux_installer...tar.gz** file using the following command:

      tar -zxvf MSM_linux_installer...tar.gz

      A new **disk** directory is created.
3.   Go to the new **disk** directory.
4.   In the **disk** directory, find and read the **readme.txt** file.
5.   To start the installation, enter the following command:

      csh install.sh -a

If you select **Client** installation for a PC used to monitor servers, and if there are no available servers with a registered framework on the local subnet (that is, servers with a complete installation of MegaRAID Storage Manager software), the server screen appears. The server screen does not list any servers. You can use this screen to manage systems remotely.

2.3.4   Linux Error Messages

The following messages may appear while you are installing MegaRAID Storage Manager software on a Linux system:

- **More than one copy of MegaRAID Storage Manager software has been installed.**

  This message indicates that the user has installed more than one copy of MegaRAID Storage Manager software. (This can be done by using the rpm-force command to install the rpm file directly, which is not recommended, instead of using the install.sh file.) In such cases, the user must uninstall all the rpm files manually before installing MegaRAID Storage Manager software with the procedure listed previously.

- **The version is already installed.**

  This message indicates that the version of MegaRAID Storage Manager software you are trying to install is already installed on the system.

- **The installed version is newer.**

  This message indicates that a version of MegaRAID Storage Manager software is already installed on the system, and it is a newer version than the version you are trying to install.

- **Exiting installation.**

  This is the message that appears when the installation is complete.

- **RPM installation failed.**

  This message indicates that the installation failed for some reason. Additional message text explains the cause of the failure.

### 2.3.5 Starting the MegaRAID Storage Manager Software

Follow these steps to start the MegaRAID Storage Manager software and view the main window:

1. Start the program using the method required for your operating system environment:

    – To start MegaRAID Storage Manager software on a Microsoft Windows system, select **Start > All Programs > MegaRAID Storage Manager > StartupUI**, or double-click the MegaRAID Storage Manager shortcut on the desktop.

    If a warning appears stating that Windows Firewall has blocked some features of the program, click **Unblock** to allow the MegaRAID Storage Manager software to start. (The Windows Firewall sometimes blocks the operation of programs that use Java.)

    – To start MegaRAID Storage Manager software on a Red Hat Linux system, select **Applications > System Tools > MegaRAID Storage Manager StartupUI**.

    – To start MegaRAID Storage Manager software on a SUSE SLES system, select **Start > System > More Programs > MegaRAID Storage Manager**.

2. When the program starts, the select server window appears, as shown in the following figure.
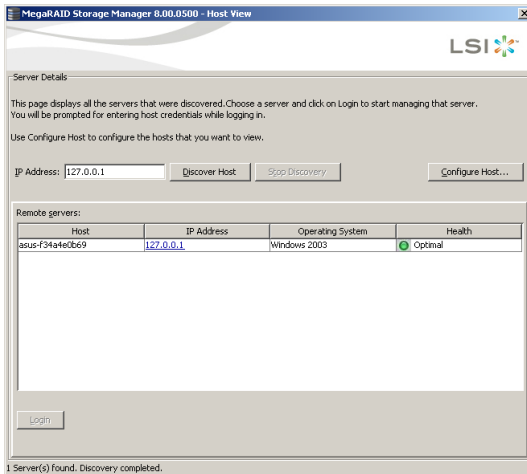
If the circle in Health column of the corresponding server is orange instead of green, it means that the server is running in a degraded state—for example, because a drive used in a virtual drive has failed. If the circle is red, the storage configuration in the server has failed.

You can click **Configure Host** if you want to select the display preferences for the server. You can choose to display only the local server, systems from a list, or display all of the systems in the network of the local server.

3. Double-click the icon of the server that you want to access. The server login window appears, as shown in the following figure.

4. Select an access mode from the drop-down menu.
    –   Select **Full Access** if you need to both view the current configuration and change the configuration.
    –   Select **View Only** if you need to only view and monitor the configuration.
5. Enter your user name and password, and click **Login**.

> If the computer is networked, this is the login to the computer itself, not the network login.

You must enter the root/administrator user name and password to use Full Access mode. If your user name and password are correct for the Login mode you have chosen, the main MegaRAID Storage Manager window appears.

2.3.6   MegaRAID Storage Manager Window

After you log in, the dashboard view provides an overview of the system and covers the properties of the virtual drives and the physical drives, total capacity, configured capacity, unconfigured capacity, background operations in progress, MegaRAID Storage Manager features and their status (enabled or disabled), and actions you can perform, such as creating a virtual drive and updating the firmware, as shown in the following figure.
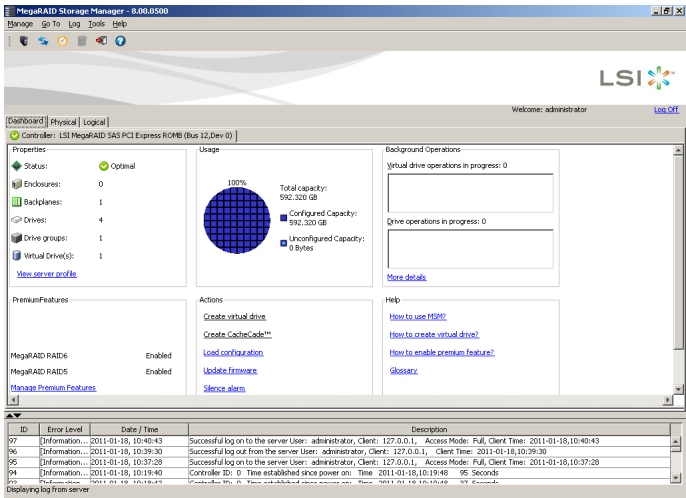
You can click the Physical tab to view the drives connected to the controller or Logical tab to view the virtual drives connected to the controller.
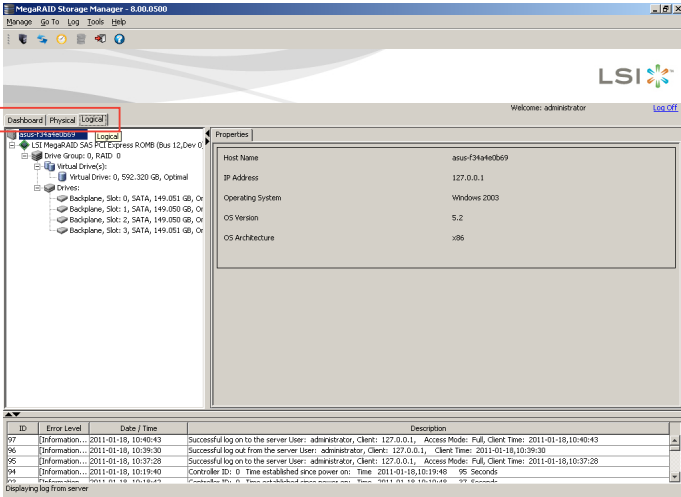
The following icons in the left panel represent the controllers, drives, and other devices:

- System
- Controller
- Slot for a drive
- Drive group
- Virtual drive

A red circle to the right of an icon indicates that the device has failed. For example, this icon indicates that a drive has failed: .

A yellow circle to the right of an icon indicates that a device is running in a degraded state. For example, this icon indicates that a virtual drive is running in a degraded state because a drive has failed: .

Properties View Panel

The right panel of the MegaRAID Storage Manager window has the **Properties** tab that displays information about the selected device. For example, if a controller icon is selected in the left panel, the Properties tab lists information such as the controller name, NVRAM size, and device port count.

Event Log Panel

The lower part of the MegaRAID Storage Manager window displays the system event log entries. New event log entries appear during the session. Each entry has an ID, a timestamp and date, an error level indicating the severity of the event, and a brief description of the event.

Menu Bar

Here are brief descriptions of the main selections on the MegaRAID Storage Manager menu bar.

Manage Menu

The **Manage** menu has an **Exit** option for exiting from the MegaRAID Storage Manager software. It also has a **Refresh** option for updating the display in the MegaRAID Storage Manager window. (Refresh is seldom required; the display normally updates automatically.)

The **Manage** menu options also include **Check Consistency**, **Initialize**, and **Show Progress**.

Go To Menu

The **Go To** menu is available when a controller, physical drive, or virtual disk is selected in the MegaRAID Storage Manager window. The **Go To** menu options vary depending on what type of device is selected in the left panel of the MegaRAID Storage Manager window. For example, the **Scan Foreign Configuration** option is available only when a controller is selected. The options also vary depending on the current state of the selected device. For example, if you select an offline physical drive, the **Make Drive Online** option will be available in the **Go To** menu.

Log Menu

The Log menu includes options for saving and clearing the message log.

Tools Menu

On the Tools menu you can select **Configure Alerts** to access the Event Configuration Notification screen, which you can use to set the alert delivery rules, event severity levels, exceptions, and email settings.

Help Menu
On the Help menu you can select **Help > Contents** to view the MegaRAID
Storage Manager online help file. You can select **Help > About MegaRAID
Storage Manager** to view version information for the MegaRAID Storage
Manager software.

- When you use the MegaRAID Storage Manager online help, you may see a warning message that Internet Explorer has restricted the file from showing active content. If this warning appears, click on the active content warning bar and enable the active content.

- If you are using the Linux operating system, you must install Firefox® or Mozilla® for the MegaRAID Storage Manager online help to display.

This chapter provides instructions for installing the RAID drivers on different operating systems.

3

Driver installation

3.1 RAID driver installation

After creating the RAID sets for your server system, you are now ready to install an operating system to the independent hard disk drive or bootable array. This part provides instructions on how to install or update the RAID card drivers.

> The RAID card driver might be included in the Linux OS installation CD, and could be loaded automatically during OS installation. However, we recommend using the RAID driver packaged in the RAID card support CD for better reliability.
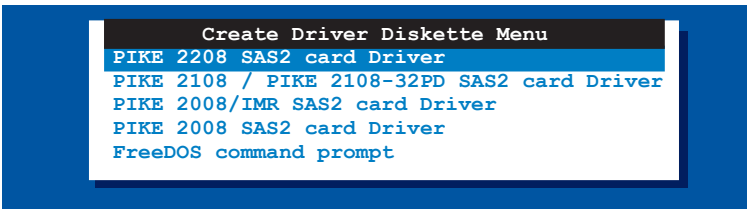
Creating a RAID driver disk

> You may have to use another system to create the RAID driver disk from the RAID card support CD or from the Internet.
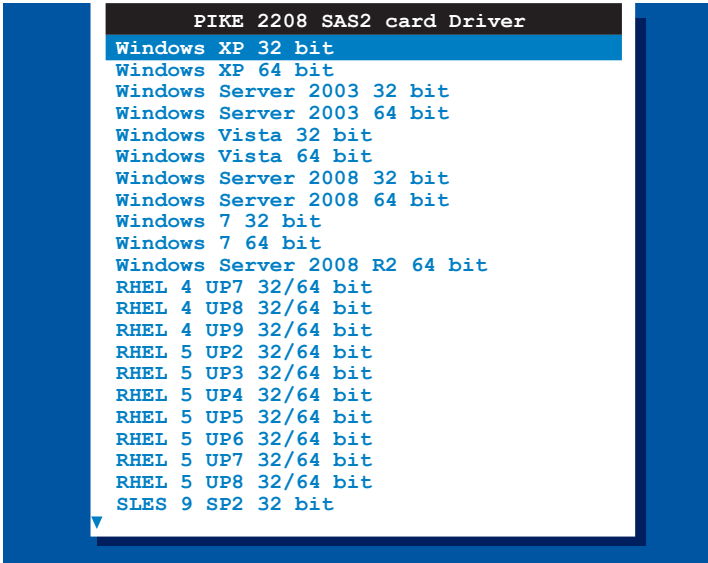
A floppy disk with the RAID driver is required when installing Windows® Server 2003 or Linux operating system on a hard disk drive that is included in a RAID set. You can create a RAID driver disk in DOS (using the Makedisk application in the support CD).

To create a RAID driver disk in DOS environment:

1. Place the RAID card support CD in the optical drive.

2. Restart the computer, then enter the BIOS Setup.

3. Select the optical drive as the first boot priority to boot from the support CD. Save your changes, then exit the BIOS Setup.

4. Restart the computer.

5. The Make Disk menu appears. Select **PIKE 2208 SAS2 card Driver,** and press <Enter> to enter the sub-menu.

```
          Create Driver Diskette Menu
PIKE 2208 SAS2 card Driver
PIKE 2108 / PIKE 2108-32PD SAS2 card Driver
PIKE 2008/IMR SAS2 card Driver
PIKE 2008 SAS2 card Driver
FreeDOS command prompt
```

6.   Use the arrow keys to select the type of RAID driver disk you want to create.

```
          PIKE 2208 SAS2 card Driver
Windows XP 32 bit
Windows XP 64 bit
Windows Server 2003 32 bit
Windows Server 2003 64 bit
Windows Vista 32 bit
Windows Vista 64 bit
Windows Server 2008 32 bit
Windows Server 2008 64 bit
Windows 7 32 bit
Windows 7 64 bit
Windows Server 2008 R2 64 bit
RHEL 4 UP7 32/64 bit
RHEL 4 UP8 32/64 bit
RHEL 4 UP9 32/64 bit
RHEL 5 UP2 32/64 bit
RHEL 5 UP3 32/64 bit
RHEL 5 UP4 32/64 bit
RHEL 5 UP5 32/64 bit
RHEL 5 UP6 32/64 bit
RHEL 5 UP7 32/64 bit
RHEL 5 UP8 32/64 bit
SLES 9 SP2 32 bit
▼
```
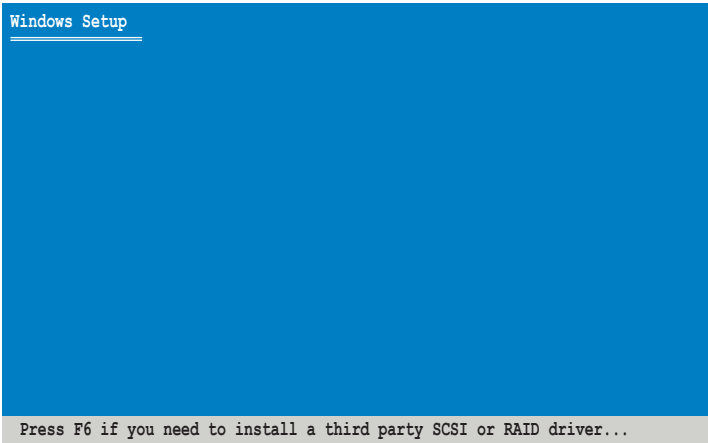
7.   Place a blank, high-density floppy disk to the floppy disk drive.

8.   Press <Enter>.

9.   Follow screen instructions to create the driver disk.

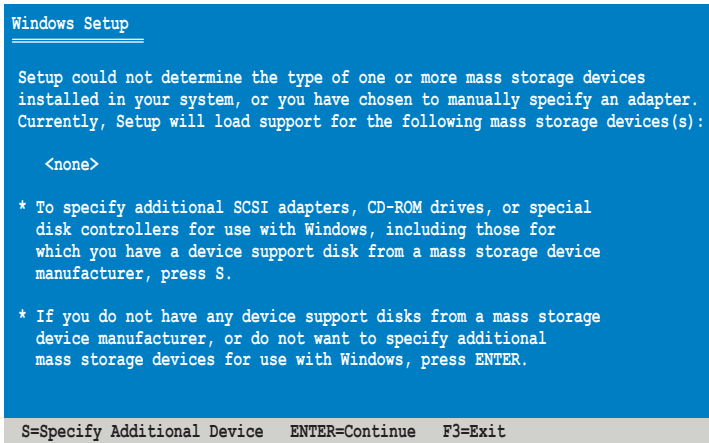## 3.2   Windows® Server 2003 OS Driver Installation

3.2.1   During Windows® Server 2003 OS installation

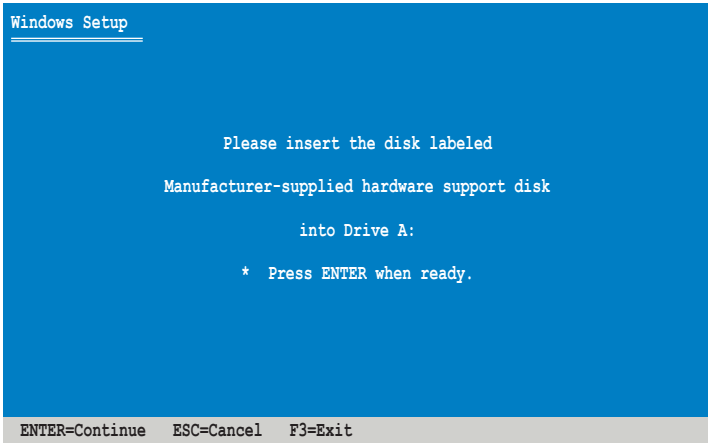To install the RAID card driver when installing Windows® Server 2003 OS:

1.   Boot the computer using the Windows® Server 2003 OS installation CD. The **Window® Setup** starts.

2.   Press <F6> when the message "Press F6 if you need to install a third party SCSI or RAID driver..." appears at the bottom of the screen.
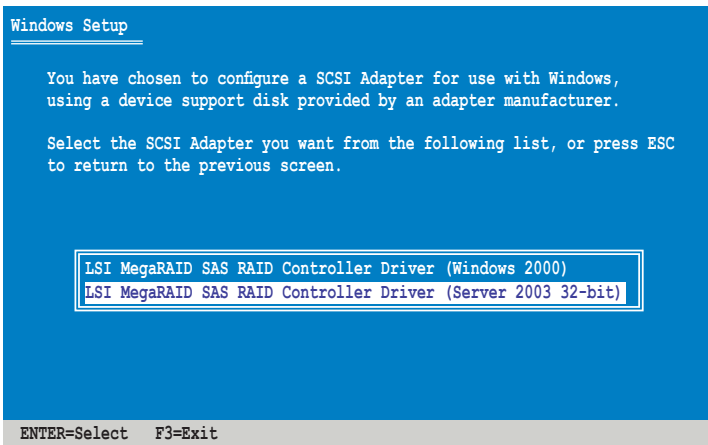
```
Windows Setup
────────────




















  Press F6 if you need to install a third party SCSI or RAID driver...
```

3.   The next screen appears. Press <S> to specify an additional device.

```
Windows Setup
────────────

 Setup could not determine the type of one or more mass storage devices
 installed in your system, or you have chosen to manually specify an adapter.
 Currently, Setup will load support for the following mass storage devices(s):

    <none>

 * To specify additional SCSI adapters, CD-ROM drives, or special
   disk controllers for use with Windows, including those for
   which you have a device support disk from a mass storage device
   manufacturer, press S.

 * If you do not have any device support disks from a mass storage
   device manufacturer, or do not want to specify additional
   mass storage devices for use with Windows, press ENTER.


  S=Specify Additional Device    ENTER=Continue    F3=Exit
```

4. Insert the RAID driver disk you created earlier to the floppy disk drive, then press <Enter>.

```
Windows Setup




                        Please insert the disk labeled

                 Manufacturer-supplied hardware support disk

                              into Drive A:

                        *  Press ENTER when ready.




   ENTER=Continue    ESC=Cancel    F3=Exit
```

5. Select **LSI MegaRAID SAS RAID Controller Driver (Server 2003)**, and then press <Enter>.

```
Windows Setup

     You have chosen to configure a SCSI Adapter for use with Windows,
     using a device support disk provided by an adapter manufacturer.

     Select the SCSI Adapter you want from the following list, or press ESC
     to return to the previous screen.



       LSI MegaRAID SAS RAID Controller Driver (Windows 2000)
       LSI MegaRAID SAS RAID Controller Driver (Server 2003 32-bit)




   ENTER=Select    F3=Exit
```

6. The Windows® Setup loads the RAID card drivers from the RAID driver disk. When next screen appears, press <Enter> to continue installation.

7. Setup then proceeds with the OS installation. Follow screen instructions to continue.

3.2.2 After Windows® Server 2003 OS installation

To update the RAID card driver after installing Windows® Server 2003 OS:
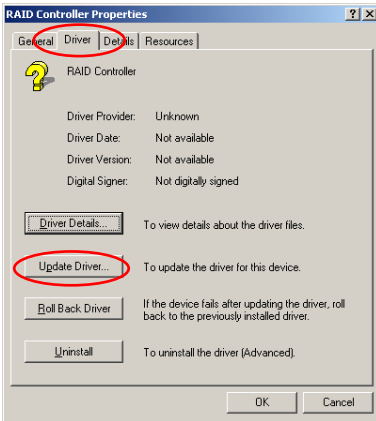
1. Click **Start**, right-click **My Computer** and select **Manage** from the menu.
2. In the **Computer Management** window, click the **Device Manager** item.
3. Double-click **RAID Controller** under the **Other Devices** item.

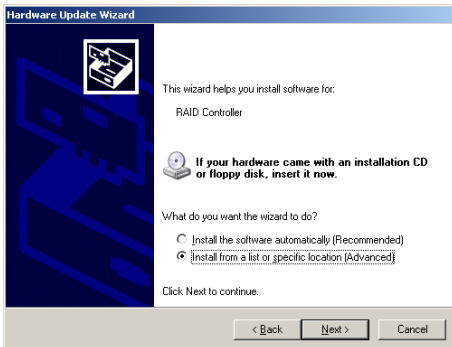> The controller name differs according to the installed SAS RAID card.
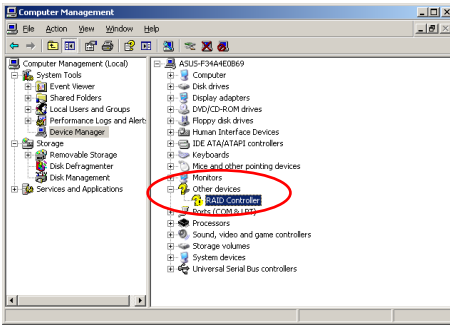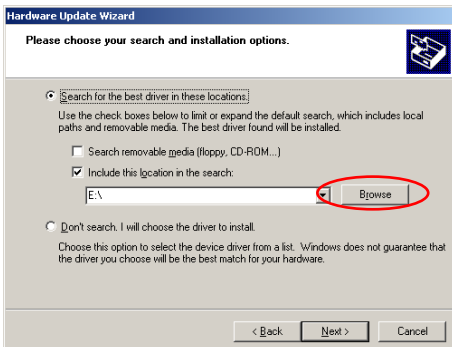

4. Click the **Driver** tab on the top, then click **Update Driver**.

5. Toggle **No, Not this time** to cancel searching driver from Windows Update, and then click **Next** to continue.

6. Toggle **Install from a list or specific location (Advanced)**, then click **Next** to continue.

7. Select the **Include this location in the search:** check box, and then click **Browse**.

7. Insert the SAS RAID card Support CD into the optical drive.

8. Locate the driver in the corresponding folder of the Support CD, and then click **OK** to continue.
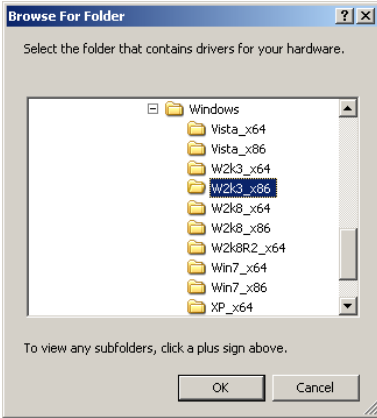
9. The system automatically updates the driver. After completing driver update, click **Finish** to close the wizard.
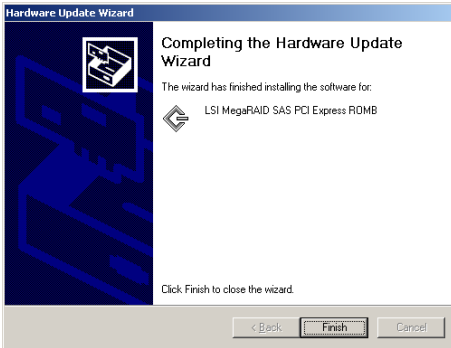
## 3.3 Windows® Server 2008 OS Driver Installation

3.3.1 During Windows® Server 2008 OS installation

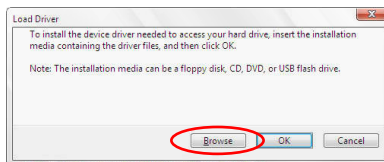To install the RAID card driver when installing Windows® Server 2008 OS:

1. Boot the computer using the Windows® Server 2008 OS installation disc. Follow the screen instructions to start installing Windows Server 2008.

2. When prompted to choose a type of installation, click **Custom (advanced)**.
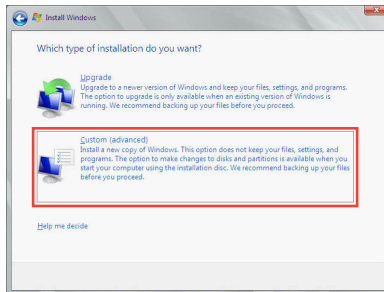

3. Click Load Driver.
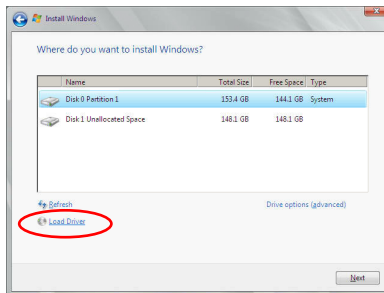
4. A message appears, reminding you to insert the installation media containing the driver of the SAS RAID card. If you have only one optical drive installed in your system, eject the Windows OS installation disc and replace with the PIKE SAS RAID card Support CD into the optical drive. Click **Browse** to continue.
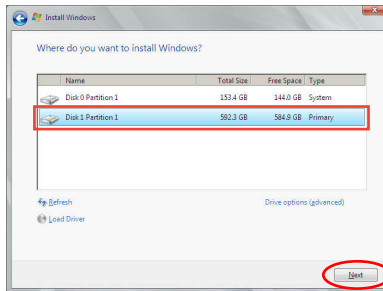
5.   Locate the driver in the corresponding folder of the Support CD, and then click **OK** to continue.
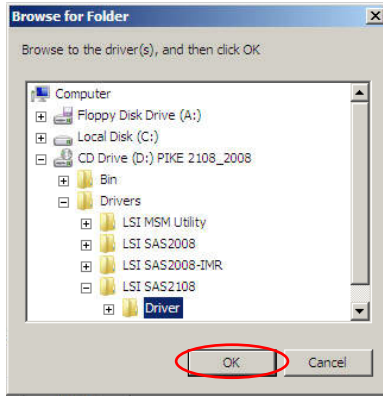
6.   Select **LSI MegaRAID SAS PCI Express ROMB** and click **Next**.
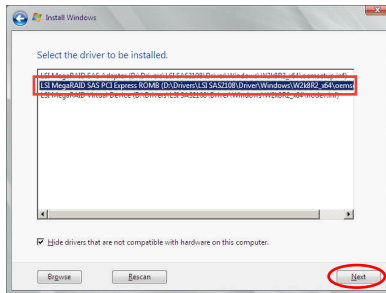
7.   When the system finishes loading the RAID driver, replace the SAS RAID card Support CD with the Windows Server installation disc. Select the drive to install Windows and click **Next**.

8.   Setup then proceeds with the OS installation. Follow screen instructions to continue.

3.3.2 After Windows® Server 2008 OS installation

To update the RAID card driver after installing Windows® Server 2008 OS:

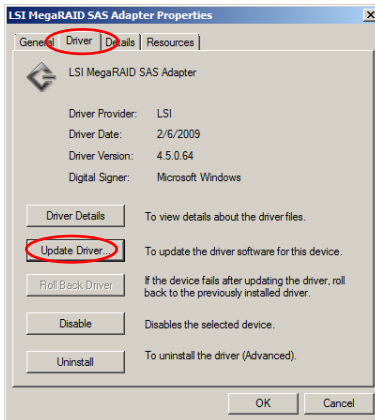1.   Click **Server Manager** on the Windows taskbar. In the Server Manager window, click the "**+**" sign before **Diagnostics** and click **Device Manager**. Click the "**+**" sign before **Storage controllers**, and double-click **LSI MegaRAID SAS Adapter**.

> The controller name differs according to the installed SAS RAID card.
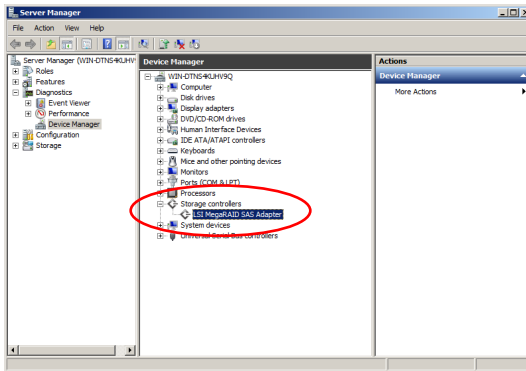
4.   Click the **Driver** tab on the top, then click **Update Driver**.

5. Click **Browse my computer for driver software**.
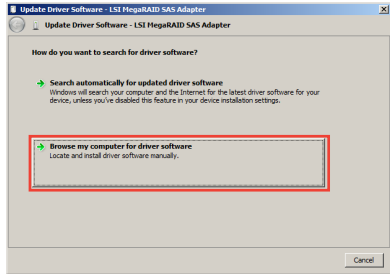
6. Insert the SAS RAID card Support CD into the optical drive. Click **Browse**.

7. In the **Browse for Folder** window, locate the driver in the corresponding folder of the Support CD, and then click **OK** to continue.
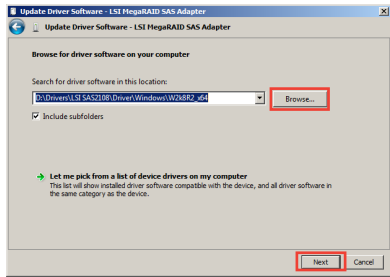
8. In the **Update Driver Software** window, click **Next** to continue.

9. The system automatically updates the driver. After completing driver update, click **Close** to exit the wizard.

3.4   Red Hat® Enterprise Linux OS 5 Driver Installation

To install the RAID card driver when installing Red Hat® Enterprise OS:

1.   Boot the system from the Red Hat® OS installation CD.

2.   At the `boot:`, type `linux dd`, then press <Enter>.

```
-  To install or upgrade in graphical mode, press the <ENTER> key.
-  To install or upgrade in text mode, type: linux text <ENTER>.
-  Use the function keys listed below for more information.
[F1-Main] [F2-Options] [F3-General] [F4-Kernel] [F5-Rescue]
boot: linux dd
```
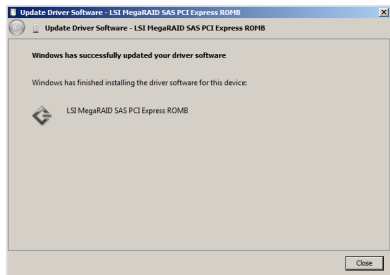
3.   Select **Yes** using the <Tab> key when asked if you have the driver disk, then press <Enter>.

```
                   ┤ Main Menu ├

        Do you have a driver disk?


           Yes              No

```
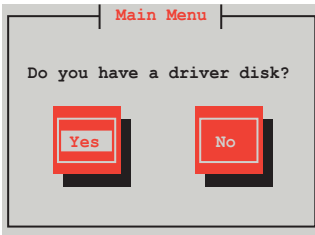
4.   Insert the Red Hat® Enterprise RAID driver disk to the USB floppy disk drive, select **OK**, then press <Enter>.

```
               ┤ Insert Driver Disk ├

        Insert your driver disk into /dev/sda
        and press "OK" to continue.


           OK              Back

```
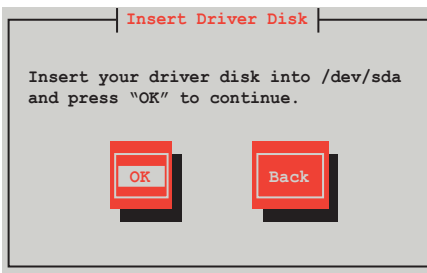
The drivers for the RAID card are installed to the system.

5.   When asked if you will load additional RAID controller drivers, select **No**, then press <Enter>.

```
┤ More Driver Disks? ├

Do you wish to load any more
driver disks?

        Yes              No
```
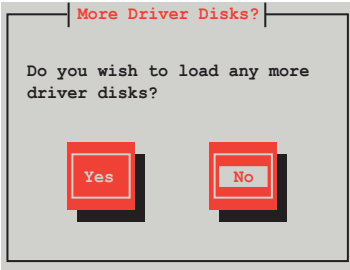
6.   Select **Skip** and press <Enter> to continue.

```
┤ CD Found ├

To begin testing the CD media before
installation press OK.

Choose Skip to skip the media test
and start the installation.

        OK              Skip
```
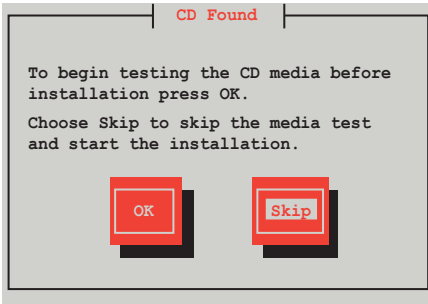
7.   Follow the screen instructions to continue the OS installation.

3.5   SUSE® Linux OS 11 Driver Installation

To install the RAID card driver when installing SUSE Linux Enterprise Server OS:

1.   Boot the system from the SUSE OS installation CD.

2.   Use the arrow keys to select **Installation** from the **Boot Options** menu.

3.   Press <F6>, then select **Yes** from the menu. Press <Enter>.

4.   Insert the RAID driver disk to the USB floppy disk drive. Ensure that **Installation** from the **Boot Options** menu is selected, then press <Enter>.

5.   When below screen appears, select the USB floppy disk drive (sdx) as the driver update medium. Select **OK**, then press <Enter>.
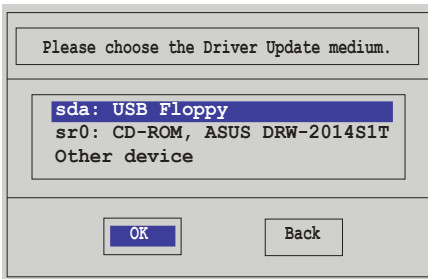
The drivers for the RAID controller are installed to the system.

ASUS contact information

ASUSTeK COMPUTER INC.

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Telephone (System/Notebook/Eee/LCD)	+49-1805-010920*
Support Fax	+49-2102-9599-11
Online support	support.asus.com

* EUR 0.14/minute from a German fixed landline; EUR 0.42/minute from a mobile phone.

DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2. 1077(a)

Responsible Party Name: Asus Computer International

Address: 800 Corporate Way, Fremont, CA 94539.

Phone/Fax No: (510)739-3777/(510)608-4555

hereby declares that the product

Product Name : RAID Card

Model Number : PIKE 2208

Conforms to the following specifications:

☒ FCC Part 15, Subpart B, Unintentional Radiators

Supplementary Information:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Representative Person's Name : _____ Steve Chang / President

Signature : _____

Date : _____ **Jul. 27. 2012**

EC Declaration of Conformity

We, the undersigned,

Manufacturer:	ASUSTek COMPUTER INC.
Address, City:	No. 150, LI-TE RD., PEITOU, TAIPEI 112, TAIWAN R.O.C.
Country:	TAIWAN
Authorized representative in Europe:	ASUS COMPUTER GmbH
Address, City:	HARKORT STR. 21-23, 40880 RATINGEN
Country:	GERMANY

declare the following apparatus:

Product name :	RAID Card
Model name :	PIKE 2208

conform with the essential requirements of the following directives:

☒2004/108/EC-EMC Directive

☒ EN 55022:2010	☒ EN 55024:2010
☒ EN 61000-3-2:2006	☒ EN 61000-3-3:2008
☐ EN 55013:2001+A1:2003+A2:2006	☐ EN 55020:2007+A11:2011

☐1999/5/EC-R &TTE Directive

☐ EN 300 328 V1.7.1(2006-10)	☐ EN 301 489-1 V1.9.2(2011-09)
☐ EN 300 440-1 V1.6.1(2010-08)	☐ EN 301 489-3 V1.4.1(2002-08)
☐ EN 300 440-2 V1.4.1(2010-08)	☐ EN 301 489-4 V1.3.1(2002-08)
☐ EN 301 511 V9.0.2(2003-03)	☐ EN 301 489-7 V1.3.1(2005-11)
☐ EN 301 908-1 V4.2.1(2010-03)	☐ EN 301 489-9 V1.4.1(2007-11)
☐ EN 301 908-2 V3.2.1(2007-05)	☐ EN 301 489-17 V2.1.1(2009-05)
☐ EN 301 893 V1.4.1(2005-03)	☐ EN 301 489-24 V1.5.1(2010-09)
☐ EN 302 544-2 V1.1.1(2009-01)	☐ EN 302 326-2 V1.2.2(2007-06)
☐ EN 50360:2001	☐ EN 302 326-3 V1.3.1(2007-09)
☐ EN 50371:2002	☐ EN 301 357-2 V1.3.1(2006-05)
☐ EN 50385:2002	☐ EN 302 623 V1.1.1(2009-01)

☐2006/95/EC-LVD Directive

☐ EN 60950-1 / A11:2009	☐ EN 60065:2002+A1:2006+A11:2008
☐ EN 60950-1 / A12:2011	☐ EN 60065:2002 / A12:2011

☐2009/125/EC-ErP Directive

Regulation (EC) No. 1275/2008	Regulation (EC) No. 278/2009
☐ EN 62301:2005	☐ EN 62301:2005
Regulation (EC) No. 642/2009	
☐ EN 62301:2005	Ver. 120601

☒CE marking

(EC conformity marking)

CE

Declaration Date: Jul. 27, 2012
Year to begin affixing CE marking:2012

Position : **CEO**
Name : **Jerry Shen**

Signature : _____