

Maestro & Nova Series GUI Software Manual

42-34000-5034

8G Fibre to SAS

6G SAS to SAS

10G iSCSI to SAS

Disk Array Systems

Version 1.0

8G Fibre to SAS
6G SAS to SAS
10G iSCSI to SAS

Model:

Maestro 30S/R, Maestro 32S/R, Maestro 40S/R, Maestro 42S/R
Nova 20S/R, Nova 26S/R, Nova 27S, Nova 29S
Nova 30S/R, Nova 36S/R, Nova 37S, Nova 39S, Nova 34S/R
Nova 40S/R, Nova 46S/R, Nova 47S, Nova 49S, Nova 44S/R

Maestro & Nova series Software Manual

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Chapter 1 - Overview

1.1 About This Manual

This manual provides information about managing an RAID system by using its embedded web based GUI interface, as well as a front LCD panel provides a visible interface for quickly monitoring.

1.2 Symbols

Symbols used in this manual:



Caution

This icon indicates the existence of a potential hazard that could result in personal injury, damage to your RAID system or data if the safety instruction is not observed.



Note

This icon indicates useful tips on getting the most of RAID system.

1.3 Graphical User Interface (GUI)

The GUI is a Web-based program embedded in RAID controller for use in managing RAID system. User needs only to point and click a mouse button to select an icon to determine which options are operated.

The GUI also displays the current status of various disk or enclosure components by respective icons.

Chapter 2 - GUI Operation

2.1 Introduction

Connect to the LAN port on the RAID system and type the managed IP address to open the GUI console from a browser. Default LAN port is DHCP enable.



Note

You can find out the current IP address on LCD panel by pressing the **Enter** and **ESC** buttons twice simultaneously.

The GUI includes 2 modes, **Monitor mode** will appear once first GUI opening, for monitoring all status of RAID system. **Config Mode** appears after loading password, user can configure all functions of RAID system.

2.1.1 Monitor Mode

Monitor mode contents four main components, **User Login**, **Assistant Function**, **Status Windows** and **Multiple Viewer**.







User Login

Type the username and password into the Config mode.

The RAID GUI provides two sets of default login members, **admin** and **user**. All default password is **0000** (for zero).

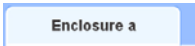










Assistant Function

Assistant functions locate at the top right of the page. Refer to the following table to know the detail.

Icon	Detail information
	Switch between Monitor and Config Mode.
	Log out the user.
	Open the Help file.
	Displays the GUI, firmware, and boot code version.

Status Window

In the window, all status of RAID system is shown as graphic. You can click the respective icons to know the detail of the components.

Icon	Detail information
	Click the Enclosure a tab to view the information of the local RAID subsystem. Click the Enclosure b, c, or d tabs for viewing the status of external JBOD.
	Hard disk Information. The number of HDD trays displayed may differ depending on the model. (Refer to Appendix B. Symbols of Disk Status)
	FAN, Power and Host Port Information. The figure displayed may differ depending on the model.
	System Information (Model Name, Firmware version)
	Virtual Disk Information
	Beeper Alert Information
	Voltage Information
	Temperature Information
	Event Log Information
	UPS Information
	JBOD Enclosure Identify

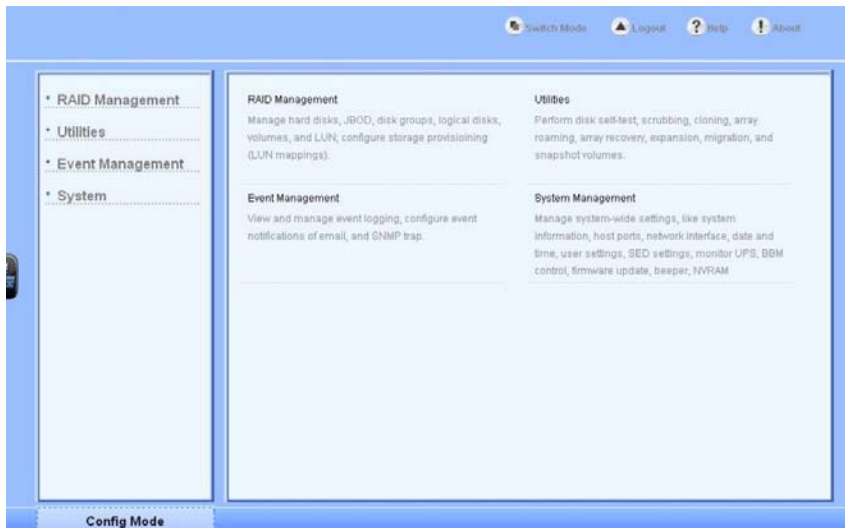
Multiple Viewer

Multiple Viewer can scan and connect to another GUI of RAID system in the LAN. Move on the **Multiple Viewer** icon and the list appears as below. Just click one of system icon to open the other GUI window.

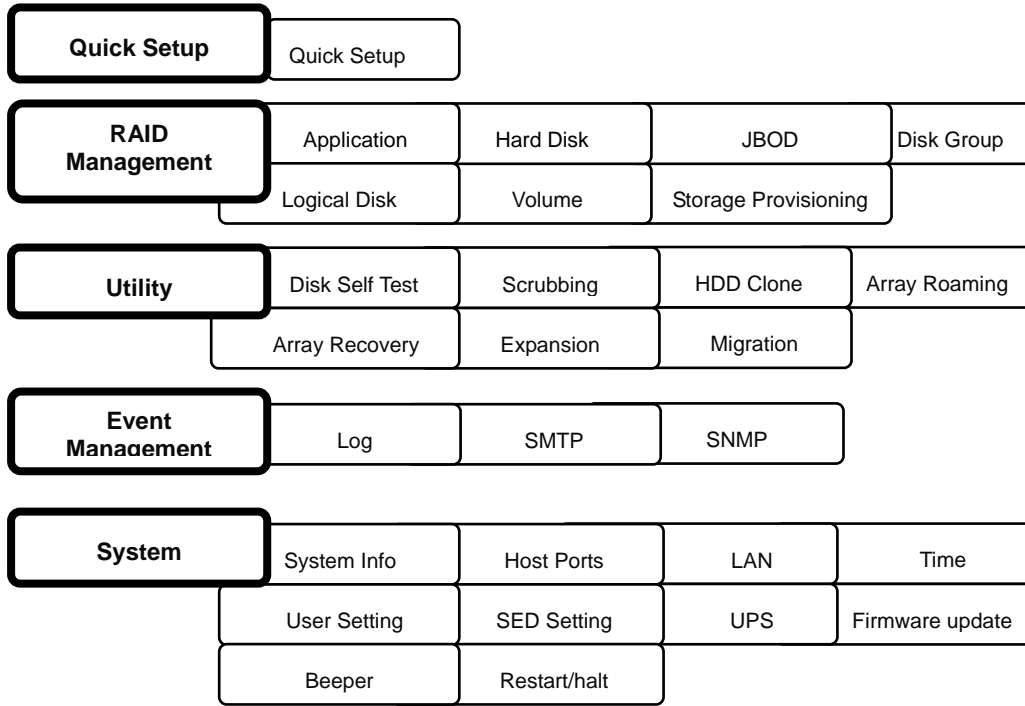


2.1.2 Config Mode

Once log in as **admin** (Default password is **0000** [four zero]), you can start to configure the RAID in the Config Mode. There are four main menus in this GUI and the detail operation will be described at next chapter.



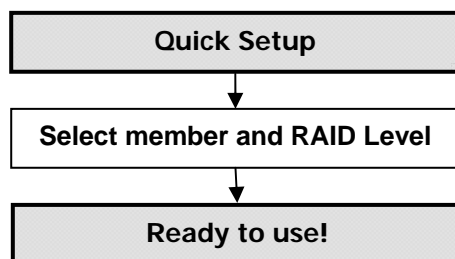
2.1.3 Menu Tree



2.2 Quick Setup

Quick Setup provides a quick way to configure array system, user can create the popular used RAID Level 5 and 6 in one page. If other RAID Levels are preferred, please refer to the chapter Advanced Setup.

Flowchart



Follow the steps below to quick setup an array.

Step1: In menu [Quick Setup], click **Create** and complete the follows.

Disk For Creating RAID	- Select the “ enclosure ” tab and click unused disk as RAID member. - Or click “ Select all unused disks ” button.
Data Security Option	- RAID 5, requires a minimum of 3 disks. - RAID 6, requires a minimum of 4 disks.

Step2: Confirm the result and click **OK**. The array will to be initialized by background.



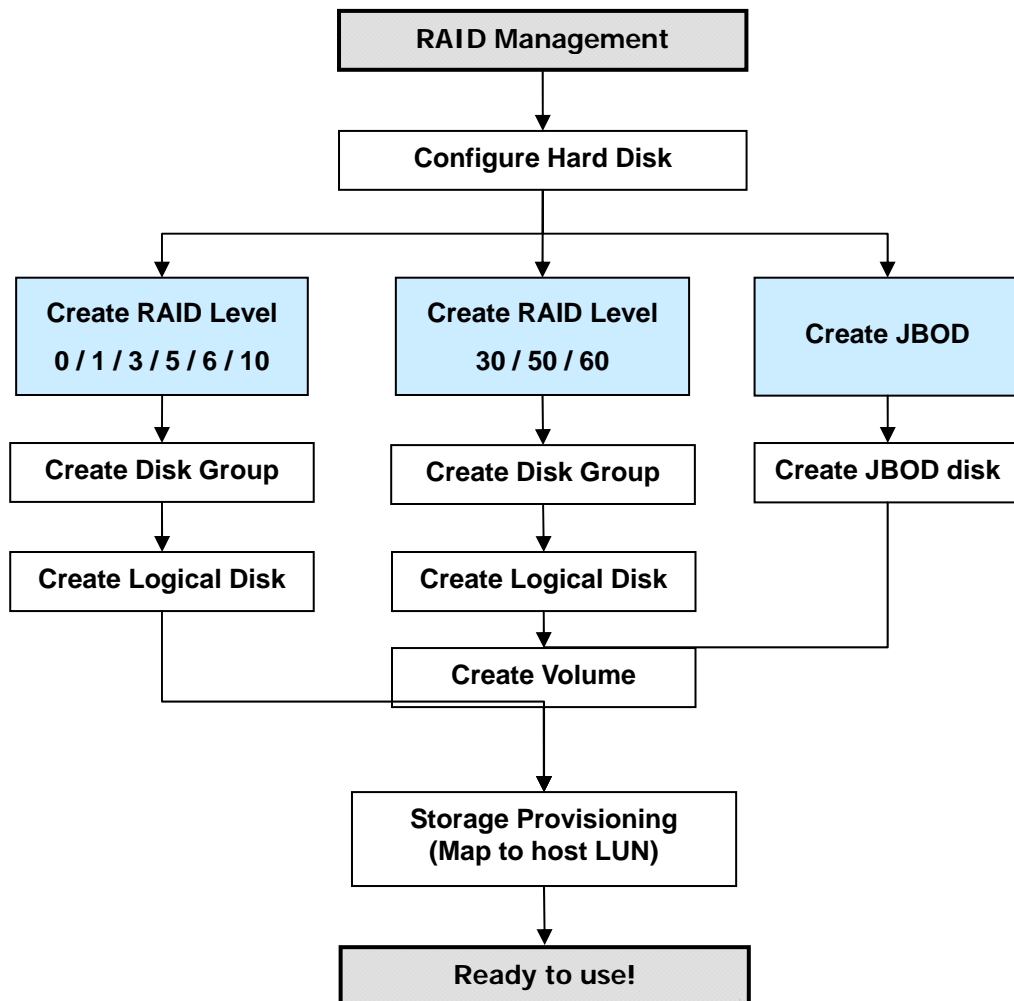
Note:

- Select member disk cannot cross different enclosure.
 - The array initialization will perform by background.
 - The array will be auto-mapped to all available host channels.
 - If there is SED disk, default Auto-Lock mode is **On**.
-
-

2.3 RAID Management

RAID management provides the method to manually configure array for more varied RAID Levels and mapping to host LUN.

Flowchart



2.3.1 Application

There are three application profiles for you to apply the preset settings to the RAID configuration. This allows users to achieve the optimal performance for a specified application.

General Storage	Best for general applications, like file-sharing, backup or data-base server. (Default)
Random Access	Best for small files access application, like web server, email server or log server.
AV Streaming	Best for sequent files access, like video editing, playback or video-on-demand server.

2.3.2 Hard Disks

2.3.2.1 Identify Hard Disk

The function can correctly identify a hard disk at which slot and enclosure. The disk LED will keep flashing till the activity is disabled.

Step1. In menu [Hard Disks], select a hard disk and click **Modify**.

Step2. Select the **Disk Identify** to **On** in the drop down list, and click **Apply**, the disk LED will start to flash.



Note:

- If the hard disk belongs to a disk group, you can check the **Apply to all members of this DG** option to flash all member disks in a disk group.
 - Select the **Disk Identify** to **off**, the disk flash will stop.
-
-

2.3.2.2 Enable Hard Disk SMART

This option is only for SMART function supported hard disks. The SMART function serves as a device status monitor.

Step1. In menu [Hard Disks], select a hard disk and click **Modify**.

Step2. Select the **SMART Alert** to **On** in the drop down list, and click **Apply** to enable.



Note:

- Once enable disk SMART function, all of disks inside the RAID system will enable.
-
-

2.3.2.3 Enable Hard Disk Standby

Select this option to enable or disable disk standby mode after a period of host inactivity

Step1. In menu [Hard Disks], select a hard disk you want to identify and click **Modify**.

Step2. Select the **Disk Standby Mode** to **On** in the drop down list, and click **Apply** to enable.



Note:

- Select **Disk Standby Mode** to off, once you want to disable.
-
-

2.3.3 JBOD

Following procedure shows to properly create JBOD disk.

Step1. In menu [JBOD], click **Create** to add a new JBOD disk.

Specify the following options for configuration.

JBOD ID	Select a JBOD ID from the drop-down menu.
Name	Use the system default name or uncheck the ' Use system default name ' box and enter the name in the Name field. The maximum name length is 63 bytes.
Member Disk	Select member disk to be used.
Preferred Controller	Controller A or B. Select the preferred controller to be in charge of managing the logical disk.

Step2. Click **Apply**. The setting is effective immediately. Repeat Step1, 2 to create more JBOD disk.



Note:

- **Preferred Controller**, select the preferred controller to be in charge of managing the JBOD disk.
 - Once delete a JBOD disk, select the JBOD disk you want to delete and click **Delete**. Check the '**Force to delete LUN mapping(s)**' box or to delete all LUNs mapped in storage provisioning. All access to the JBOD will be stopped.
-
-

2.3.4 Disk Group

Following procedure guides to properly setup DG(Disk Group).

Step1. In menu [Disk Groups], click **Create** to add a new disk group. Specify the following options for configuration.

DG ID	Select a DG ID from the drop-down menu.
Name	Use the system default name or uncheck the ' Use system default name ' box and enter the name in the Name field. The maximum name length is 63 bytes.
Members and Spares	Select member disks and local spare disks to be grouped.

Step2. Click **Apply**, and the settings are effective immediately.



Note:

- The minimum number of member disks in a DG is 2.
- The number of member disks also determines the RAID level that can be used in the DG. Refer to *Appendix A – RAID Terminology*

2.3.5 Logical Disk

Following procedure guides to properly setup LD (Logical Disk) with desired RAID level and capacity.

Setp1. In menu [Logical Disks], click **Create** to add a new logical disk. Specify the following options for configuration.

DG ID	Select a DG ID from the drop-down menu.
LD ID	Select an LD ID from the drop-down menu.
Name	Use the system default name or uncheck the ' Use system default name ' box and enter the name in the Name field. The maximum name length is 63 bytes.
RAID Level	NRAID, 0, 1, 3, 5, 6, and RAID10. Select a RAID level for the LD. Different LDs in a DG can have different RAID levels.
Capacity (MB)	Enter an appropriate capacity for the logical disk.
Preferred Controller	Controller A or B. Select the preferred controller to be in charge of managing the logical disk.
Stripe Size (KB)	The stripe size determines the maximum length of continuous data to be placed on a member disk.

Initialization Option	<p>Background (default) Start a background task to initialize the logical disk and the logical disk can be accessed.</p> <p>Noinit: No initialization process and the logical disk can be accessed immediately.</p> <p>Regular: Initialize the logical disk by writing zeros to all sectors on all member disks of the logical disk. The logical disk can be accessed until the process complete.</p>
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Step2. Click **Apply**, the settings are effective immediately, and LD is initialed.

2.3.6 Volume (Striped RAID)

Following procedure guides to properly setup Volume (striped RAID), RAID 30/50/60 are supported by creating striping volumes over RAID 3/5/6 logical disks.

Step1. In menu [Volumes], click **Create** to add a new volume, specify the following options for the configuration.

VOL ID	Select a VOL ID from the drop-down menu.
Name	Use the system default name or uncheck the ' Use system default name ' box and enter the name in the Name field. The maximum name length is 63 bytes.
LD Level	Select a RAID level to filter a list of member LDs. (e.g. if you want create a RAID 50, select "RAID 5")
Member LDs	Select two LDs to be grouped.
Stripe Size (KB)	It determines the maximum length of continuous data to be placed on a member disk.

Step2. Click **Apply**, and the settings are effective immediately.



Note:

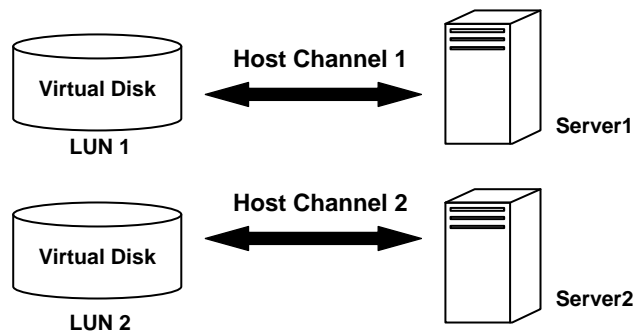
- All LDs must be in the same RAID level and in the optimal state.
 - None of two LDs can be in the same disk group.
 - None of the LDs can be used by other volumes or be bound to any LUNs.
-

2.3.7 Storage Provisioning (Mapping to host LUN)

The RAID system provides three storage provision methods; **Simple**, and **Selective** to properly mapping LD/VOL (virtual disk) to LUN.

2.3.7.1 Simple method (default)

Simple storage is used in direct attached storage (DAS) environment, any computer is allowed to access the LUNs presented by the controller after gaining access to the host ports of the controller. LUNs are assigned to each virtual disk in RAID so the host can address and access the data in those devices.



Step1. In menu [Storage Provisioning], click **Add** and specify the following options for the configuration.

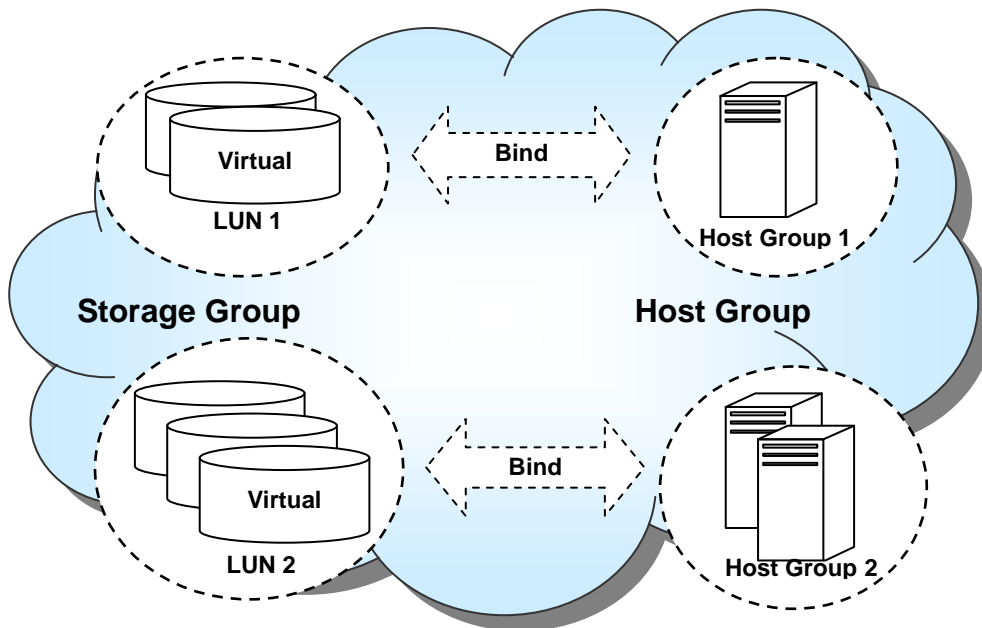
HTP ID	Select a host port ID from the drop-down menu, which is determined to the physical port on the controller.
LUN ID	Select a LUN ID from the drop-down menu.
Mapping VD	Select a virtual disk from the drop-down menu for LUN mapping.
Sector Size	512Byte (default) For Window 2003-SP1/XP 64-bit/2008/Vista and Linux 2.6.x kernel. (up to 144PB per virtual disk) 1KB (2~4TB) / 2KB (4~8TB) / 4KB (8~16TB) For Windows 2000/2003/XP 32-bit.

Step2. Click **Apply**, and the settings are effective immediately.

2.3.7.2 Selective method

Selective is used in complicated SAN environments, where have multiple hosts accessing the controller through a switch. This method provides the ability of LUN masking to manage the logical connectivity between host and storage resources exported by the RAID system.

The HG (Host Group) can be a host or a group of hosts that share the same access control settings in the controller. SG (Storage Group) represents the LUNs as a storage group. Bind the host/host group and storage group to the same host port.



Step1. In menu [Storage Provisioning], select **Selective** and press **Confirm** in the window displayed.

Step2. Create Host Group. Click **Host** -> **Add** to add host. Specify the following options for the configuration. And then click **Back** to return to main page.

Host ID	Select a Host ID from the drop-down menu. A maximum of 32 hosts can be added to the RAID system.
WWPN	Each FC port needs a WWPN for communicating with other devices in an FC domain. Users can choose each WWPN of Fiber HBA from the ' Choose from detected hosts ' box or directly enter the WWPN in this field.
Host Name	Use the system default name or uncheck the ' Use system default name ' box and enter the name in the Name field. The maximum name length is 63 bytes.
HG ID	Select a Host Group ID from the drop-down menu. You can select from hg0 to hg31 or No group. HG ID must be set for Symmetric Active-Active Redundant controllers.

Step3. Click **SG** -> **Add** to add host. Specify the following options for the configuration.

SG ID	Select a SG ID from the drop-down menu. A maximum of 34 SGs can be created in the RAID system.
LUN ID	Select a LUN ID from the drop-down menu, where up to 128 IDs are available for the selection. A total of 1024 LUNs can be created in the RAID system.
Mapping Virtual Disk	Select a virtual disk from the drop-down menu for LUN mapping.
Mask Status	Unmask / Mask This option makes a LUN available to some hosts and unavailable to other hosts.
Access Right	Read-only / Read-writable The access right is applied to individual LUNs in a SG.
Sector Size	512Byte (default) For Window 2003-SP1/XP 64-bit/2008/Vista and Linux 2.6.x kernel. (up to 144PB per virtual disk) 1KB (2~4TB) / 2KB (4~8TB) / 4KB (8~16TB) For Windows 2000/2003/XP 32-bit.

Step4. Click **Apply**, and the settings are effective immediately. Click **Back** to return to main page.

Step5. Click **Bind** and select the **HG ID** and **SG ID** in the drop-down menu for binding.

Step6. Click **Apply**, and the settings are effective immediately.

2.4 Utility

2.4.1 Disk Self Test

DST (Disk Self Test) is a hard disk diagnostic tool to perform a scan for bad block of hard disks in RAID system.

Step1. In menu [Disk Self Test], select hard disks and click **DST**.

Specify the following options for the configuration.

Extended DST	Check this option to start an extended disk self test.
Schedule	Configure to start by Immediately, Once, Daily, Weekly or Monthly .

Step2. Click **Confirm** to begin testing.



Note:

- Hard disks must support DST
 - Disk S.M.A.R.T. must be turned on, refer to chapter *Enable hard disk S.M.A.R.T.*
-
-

2.4.2 Perform Scrubbing

Over long periods of time, disk blocks may not be consistent with data blocks. Scrubbing can scan for bad sectors and/or parity errors in a RAID array. The RAID system reconstructs bad sectors from other sectors and re-assigns it to an undamaged area. At the same time it also detects parity inconsistency. Follow the steps below to configure scrubbing.

Step1. In menu [Scrubbing], click **Scrub**.

Specify the following options for a disk scrubbing task.

Target Type	Select either HDD or DG as the scrubbing disk type.
Parity Check	This option is only available for parity-based RAID level LDs.
None	No parity check is performed.
Check Only	The controller checks the parity for logical disks.
Regenerate	Any parity inconsistency detected is regenerated by the controller.
Schedule	Configure to start by Immediately, Once, Daily, Weekly or Monthly .

Step2. Click **Apply**. The task will start according to the specified time.

2.4.3 HDD Clone

When a hard disk is likely to become faulty or develop errors, for example, when the number of reported errors or bad sectors of a physical disk increases over a certain threshold, or a disk reports SMART warning, the function helps to copy all data to another spare / unused disk before the disk been defined as faulty. Follow the steps below to configure HDD clone.

Step1. In menu [HDD Clone], click **Clone**.

Specify the following options for a disk clone task.

Source Disk	Select a source disk you want cloned. The disk must not be in an NRAID disk group.
Target Disk	Select the target disk to be the clone. The disk must be either unused, a global spare, or a local spare of the same disk group as the Source Disk.
Schedule	Configure to start by Immediately , Once , Daily , Weekly or Monthly .
Automatic Resume	During cloning, if the target disk fails, the controller will use another disk and resume cloning.

Step2. Click **Apply**. The task will start according to the specified time.

Step3. Click **Trigger**, you can also configure to perform clone automatically by set the criteria of **bad sector%** and **SMART Alert**.



Note:

- If the disk group of the source disk contains faulty disks, cloning is suspended until the disk group completely rebuilds its disks.
 - Click **Trigger** to start HDD Clone by any criteria of too many bad blocks or S.M.A.R.T. alert happened.
 - **Automatic Resume** follows the order of disk status to resume cloning [**Local spare disks**]>[**Unused disks**]. If there is no disk to resume cloning, cloning is aborted when the target disk fails.
-
-

2.4.4 Array Roaming

Array roaming will be activated when hard disks are moved from one slot to another or from one RAID system to a new RAID system. The hard disk configurations will cause **foreign/conflicts** when moved to a new RAID system.

Follow the steps below to import the array.

Step1. In menu [Array Roaming], select an **ID** (which may be a JBOD ID, disk group ID, or volume ID) to be used after import.

Step2. Select the foreign/conflict hard disks to be imported and restored the configurations.

Step3. Click the **Import** button to import the original array back.



Note:

- Check **Force to import abnormal group** to allow the import of incomplete disk groups. Without check this option, only normal disk groups and volumes can be restored.
-
-

2.4.5 Array Recovery

Parity array has fault tolerance to protect data in operation. But if failure disks exceed the limitation of tolerance quantity, that will make data destroy. Array Recovery provides a way to resume the parity data in this situation.

When there are any hard disk conflicts, there might be faulty disk groups, logical disks, or volumes on your RAID system. You can perform disk group recovery to restore lost member disks to a disk group. The faulty logical disks on the disk group are recovered automatically when the disk group is recovered.

Follow the steps below to perform array recovery.

Step1. In menu [Array Recovery], select **DG** in the drop down menu.

Step2. Select a disk group, and click **Recover**.

Step3. The **Restore the Array** window displays. Select the original member disks to restore.

Step4. Click **Apply** and click **Confirm** in the confirmation window.

Step5. The disk group recovery starts. Rebuilding will also start for degraded logical disks on a disk group.



Caution

- To perform array recovery, you must fully understand the original member of disk group. Incorrect disk member will cause the data recovery unsuccessfully.
 - Check **Force to recover disk** to force recovering array by select disk. If wrong disk be forced to recovery, the data will destroy.
 - Please contact the reseller for more technical support.
-

2.4.6 Expansion

2.4.6.1 Expand a Logical Disk (RAID Level 1/3/5/6/10)

The RAID system allows expansion on existing array by adding one or more disks, thus increasing the usable capacity of the array.

Follow the steps below to perform expansion.

Step1. In menu [Expansion], select **DG** in drop-down menu, click **Expand**. Specify the following options.

DG ID	Select a disk group for expansion from the drop-down menu.
Expanding HDDs	Move one or more unused hard disks from the Available HDDs list to the Expanding HDDs list.
Schedule	Configure to start by immediately.
Defragment during expanding	Check this option to allow for defragmentation during expansion.

Step2. Click **Apply** to review the current settings. Click **Confirm** to start immediately.

Step3. Once the expanding DG completes, to select **LD** in drop-down menu, click **Expand** and specify the following options.

DG ID/LD ID	Select a DG ID and a LD ID from the drop-down menu for expansion.
Capacity (MB)	Specify the capacity.
Schedule	Configure to start by immediately.
Starting Free Chunk Ending Free Chunk	This option specifies the start and end of free chunks to be used for the expansion.
Initialization Option	Background (default) Start a background task to initialize the logical disk and the logical disk can be accessed. Noinit: No initialization process and the logical disk can be accessed immediately.

Step4. Click **Apply** to review the current settings. Click **Confirm** to start immediately

Limitations of the number of member disks

New \ Old	RAID 0	RAID 1	RAID 10	RAID 3/5	RAID 6
RAID 0		OK	OK	OK	OK
RAID 1	N/A		N/A	N/A	N/A
RAID 10	$N_n \geq N_o * 2$	OK		$N_n \geq (N_o - 1) * 2$	$N_n \geq (N_o - 2) * 2$
RAID 3/5	$N_n \geq N_o + 1$	OK	OK		OK
RAID 6	$N_n \geq N_o + 2$	OK	OK	$N_n \geq N_o + 1$	

* Where "Nn" means the number of member disks in the new RAID level, "No" means the number of member disks in the original/old RAID level

2.5 Event Management

2.5.1 Event Log

2.5.1.1 Change Severity

When the state of a logical or physical component in the controller changes, such as failure of hard disks or completion of a background task, an event occurs. Events are classified into different severity levels. You can view the events according to the different categories and specify the severity level at the top of the page. **(Severity Level: Notice (default) / Warning / Error / Fatal)**

2.5.1.2 Download Event Log

To download all the records in the event log and RAID system configuration, click **Download**. Event log and configuration files will be downloaded in a compressed file.

2.5.2 SMTP

The SMTP can notify you when an event occurs by sending a mail to the specified user account. Follow the steps below for configurations.

Step1. In menu [SMTP], at the **SMTP servers**, select Primary or Secondary server, and click **Modify**.

Step2. Enter the information for the following options.

Server Address	Set the SMTP server address.
Port	Enter the SMTP port for the outgoing mails. Check with your ISP provider for the port number to use. By default, the port is set to 0.
SSL Setting	Enable or disable the SMTP server to use secure connection.
Sender Account	Set the account to be used on the SMTP server.
Authentication	Turn the authentication on or off for the SMTP server.
Password	Set the password of the account on the SMTP server.
Name	Set the name to be shown in the sender field. If this option is not set, the sender account on the SMTP will be used.

Step3. Select a **Server** and click **Test SMTP** to ensure the SMTP server is correctly configured. The Send Test Mail window displays. Enter an email address for testing.

2.5.3 SNMP

SNMP (Simple Network Management Protocol) is a widely used protocol based on TCP/IP for monitoring the health of network-attached equipments. The RAID controller is equipped with an embedded SNMP Agent to support SNMP-based monitoring. You can use SNMP applications (SNMP v1 or v2c-compliant) at remote computers to get event notification by SNMP traps and watch the status of a RAID system.

Follow the steps below to configure SNMP.

Step1. In menu [SNMP], configure the **SNMP agent**.

Notify State	Set to On
SNMP Agent State	Set to On
Port	Set to 161 (default)
Community Name	Set to Public (default)

Step2. Configure the **SNMP server**.

Server ID	Select 0, 1 or 2
Server Address	Set the IP address
Port	Set to 162 (default)
SNMP Version	Set to v1 (default) / v2c
Community Name	Set to public (default)
Severity Level	Set to Notice (default) / Warning / Error / Fatal

Step3. Select the **SNMP server** to which a test SNMP trap will be sent, and click **SNMP**.

The test SNMP trap will contain message “This trap is for testing purpose only.”



Note:

- The RAID system support Management Information Base (MIB), it is a collection of information that is organized hierarchically. MIB accessed using a network-management protocol such as SNMP. Please contact your reseller for getting detail information of MIB.
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2.6 System

2.6.1 System Information

2.6.1.1 View System Information

To view the detail information of RAID system and JBOD system, in the menu [System Information], select the enclosure in the drop-down menu.

2.6.1.2 Set System Name

You can set the system name of RAID system by following steps.

Step1. In menu [System Information], click **Set Name**.

Step2. Specify the name and click **OK**.

2.6.2 Host Port

This shows information about host ports. Follow the procedure below to configure the host ports.

2.6.2.1 Fibre Channel

Step1. In menu [Host Ports], select a port and click **Modify**.

Step2. Specify the following options to configure host port parameters.

Name	Type a name associated with each host port. The maximum name length is 15 bytes.
Hard Loop ID	Select a fixed loop ID for each FC port from the drop-down menu. Default is set to Auto .
Connection Mode	Auto: Determine the connection mode automatically. Arbitration loop: Loop connection mode. Fabric: Point to point connection mode.
Data Rate	Auto (default) / 1GB / 2GB / 4GB / 8GB Select a preferred data rate for FC ports.

2.6.3 LAN

The LAN port is the management port for GUI browser to manage RAID system.

Step1. In menu [LAN]->[NIC setting], select **Static**, **DHCP** or **DHCP+APIPA (default)** method.

Static	Assign the IP address, network mask, gateway, and DNS Server to the network.
DHCP	Assign the DNS server address.
DHCP+APIPA	Assign the DNS server address (default)

Step2. Click **Apply**, and the settings are effective immediately.



Note:

- APIPA stands for Automatic Private IP Addressing. If DHCP+APIPA is selected and the controller cannot get response from DHCP servers on the network, the controller will choose an unused IP address in the private address space between 169.254.0.0 and 169.254.255.255 (address conflict is avoided by probing the network).
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2.6.4 Time

To modify the parameter of system time, date, time zone and daylight saving time if need.

Step1. In menu [Time], select either **Static** or **NTP**.

Static	Specify the date and time. The data and time is set in form as <i>MM/DD/YY</i> and <i>hh/mm</i> .
NTP	Specify the IP address or the domain name of the NTP server. The NTP server automatically synchronizes the controller clock at 23:59 every day.

Step2. In the **Time Zone Mode** menu, select location of country.

Step3. In the **DST** (daylight saving time) menu, select **On / Off** (default).

Step4. Click **Apply**, and the settings are effective immediately.

2.6.5 User Setting

2.6.5.1 Modify Password

To change the password of a specified user, do the following:

Step1. In menu [User Setting], specify either Administrator or User from the **Specified User** drop-down menu.

Step2. Check the “**Change Password**” checkbox, and a pull-down menu appears. Fill in the passwords in each field.

Step3. If you want to enable or disable password checking before login, specify the options from the **Password Check** dropdown menu.

Step4. To enable or disable the auto logout function, select either **On** or **Off** from the **Auto Logout** drop-down menu. By default, the auto logout time is 10 minutes.

Step5. Click **Apply** to make them effective immediately.

2.6.5.2 Set Password Remind Setting

Set the **Password Reminding Mail** option to **On** to enable the controller to send out a password reminding email when users forget their password. An email account is also required. Click **Apply** to make it effective immediately.

2.6.5.3 Enable SSL

SSL (Secure Sockets Layer) is a secure connection, **SSL Forced** is enabled by default and users are forced to connect to the system via HTTPS. Select either **On** or **Off** from the **SSL Forced** drop-down menu. When all the settings are complete, click **Apply** to make them effective immediately.

2.6.6 SED Setting

The RAID system support SED (self encryption drive) disk, you can set the encryption function by following procedure.

2.6.6.1 Erase / Unlock SED disk

Step1. Select disks in SED list.

Step2. Click **Erase** or **Unlock** to make it effective on the disks.

2.6.6.2 Manage SED key

Step1. Click **Modify** to modify a new SED key.

Step2. Click **Download** to download the SED key.

2.6.7 UPS

The RAID system supports to manage and monitor SMART UPS (Uninterruptible Power Supply) device.

Step1. In menu [UPS], configure the following options.

Change Date	This option resets the latest battery replacement date.
Delay Shutdown	When a power failure occurs, the UPS will shutdown after the specified delay seconds.

Delay Boot	Once the AC power returns, the UPS automatically powers on after the specified delay seconds.
Low Battery Threshold	This option notifies the user that the UPS battery is lower than specified remaining seconds.
Charge Restart Percentage	After the AC power returns, the UPS does not power on until the battery charge reaches the specified capacity.

Step2. Click **Apply** to confirm the current settings.

2.6.8 Update Firmware

To update the system's firmware, boot code and external enclosure firmware, do the following:

Step1. In menu [Firmware Update], check on the **Firmware**.

Step2. Click **Browse** to select an update file.

Step3. Click **Apply**, and a confirmation prompt displays. Click **Confirm** to start to update firmware.

Step4. When the firmware update complete, and then click **Restart** to reboot the RAID system to make it effective.



Note:

- When updating the firmware, do not perform any actions in GUI or power off the RAID system.
 - Please fully read the firmware release note or contact your RAID system supplier before updating the firmware.
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2.6.9 Beeper

To modify the beeper setting for the RAID system, do the following:

Step1. In menu [Beeper], select **On (default) / Off** in the drop-down menu.

Step2. Check the **Mute**, to clear the event alert at the moment.

2.6.10 Restart

2.6.10.1 Reset to Factory Default

Step1. Check the **Erase configuration on NVRAM** and click **Apply**.

Step2. After RAID system restart, the configuration is back to default.

2.6.10.2 Restart / Halt

Step1. Configure the following options.

Controller ID	Controller a, b or both.
Action	Restart, Shutdown

Step2. Check **Apply to all external enclosures** to act to all external JBOD system.

Step3. Click **Apply** to make it active.

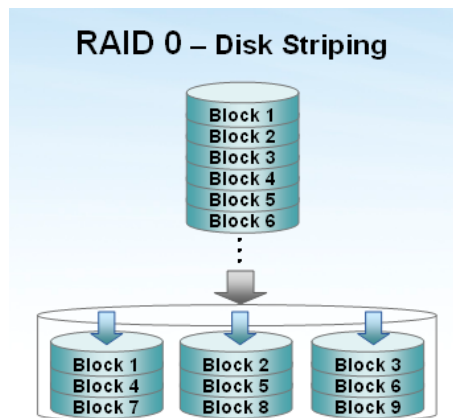
Appendix A – RAID Terminology

A.1 RAID Level

Redundant Array of Independent Disk (RAID) is a storage technology used to combine multiple inexpensive drives into a logical drive to obtain performance, capacity and reliability over single-disk storage, by depending on various RAID Levels.

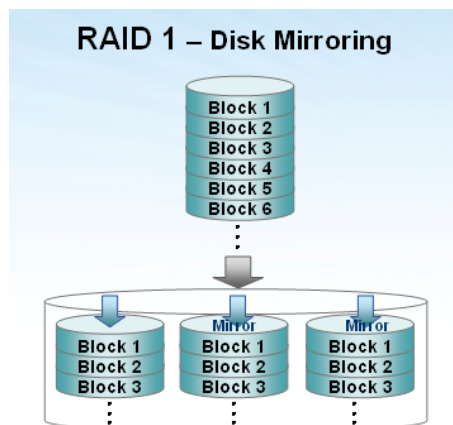
RAID 0 - Disk Striping

In RAID 0, data is divided into pieces and written to all disks in parallel. This process is called striping because the pieces of data form a stripe across multiple disks. This improves access rate, but makes availability lower, since a single disk failure will cause the failure of the array. A RAID 0 array is unsuitable for data that can not easily be reproduced, or for mission-critical system operation.



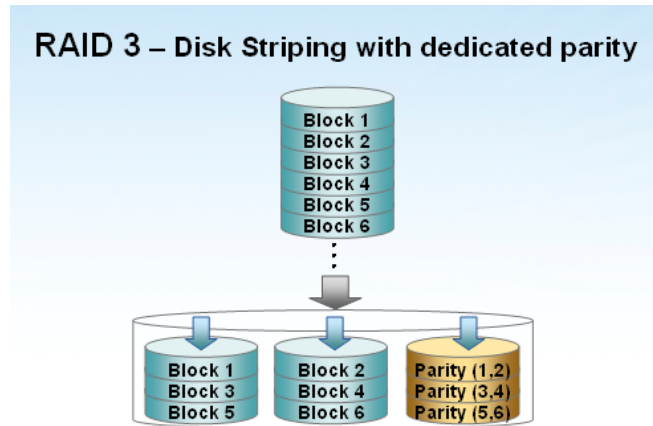
RAID 1 - Disk Mirroring

In RAID 1, data is duplicated on two or more disks to provide high access rate and very high data availability. This process is called mirroring. If a disk fails, the RAID controller directs all requests to the surviving members.



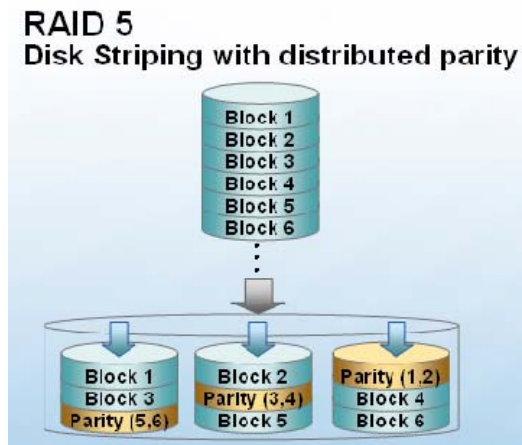
RAID 3 - Disk Striping with dedicated parity

In RAID 3, data is divided into pieces and a single parity is calculated. The pieces and parity are written to separate disks in parallel. The parity is written to a single dedicated disk. This process is called striping with dedicated parity. The parity disk stores redundant information about the data on other disks. If a single disk fails, then the data can be regenerated from other data and parity disks.



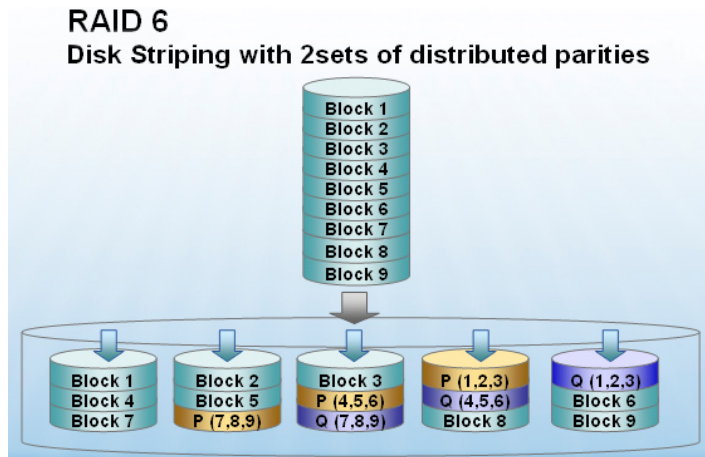
RAID 5 - Disk Striping with distributed parity

In RAID 5, data is divided into pieces and a single parity is calculated. The pieces and parity are written to separate disk in parallel. The parity is written to a different disk in each stripe. Parity provides redundant information about the data on other disks. If a single disk fails, then the data can be regenerated from other data and parity disks.



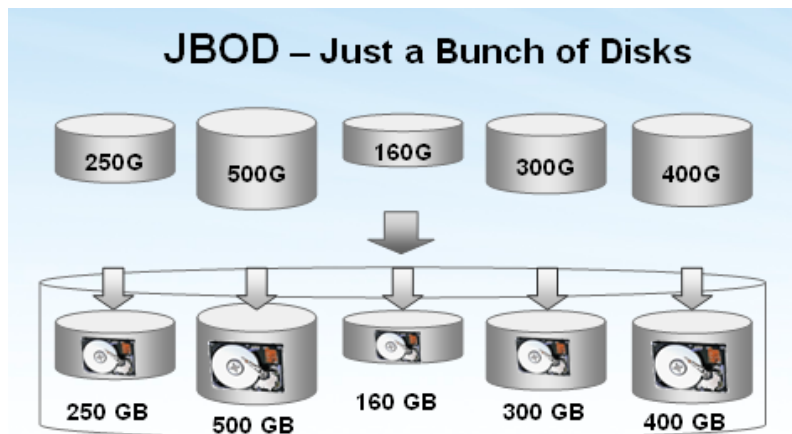
RAID 6 - Disk Striping with 2 sets of distributed parities

In RAID 6, data is divided into pieces and two sets of parities are calculated. The pieces and parities are written to separate disks in parallel. The two parities are written to different disks in each stripe. If two disks fail at the same time, the data can still be regenerated from other data and parity disks.



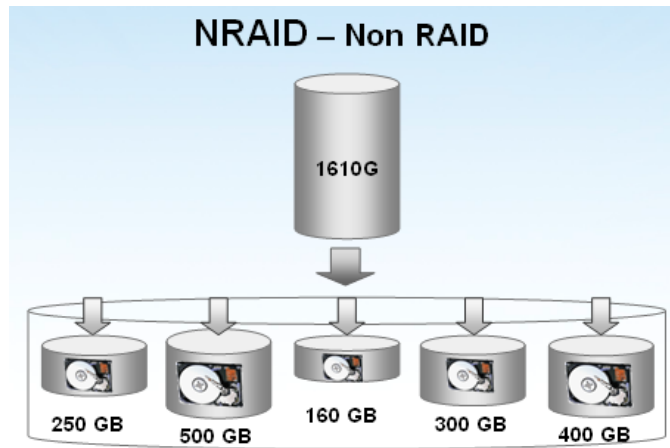
JBOD - Just a Bunch of Disks

JBOD stands for just a bunch of disks. In JBOD mode, the host will see each drive as an independent logical disk. There is no fault-tolerance in JBOD.



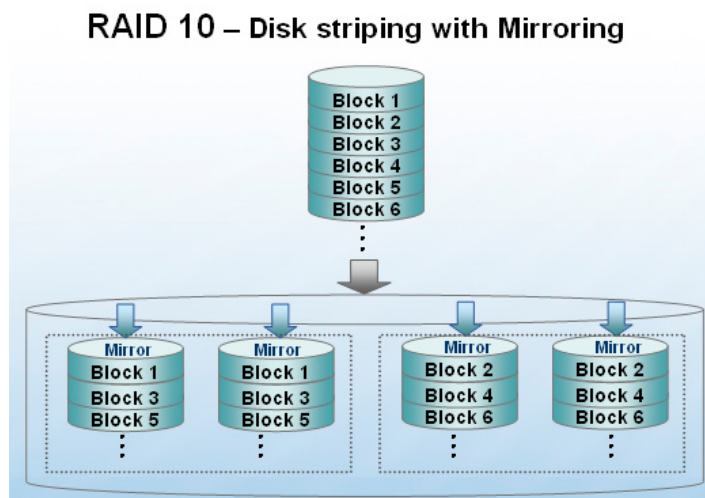
NRAID - Non RAID

In NRAID mode, all drives are configured as a single logical drive without fault-tolerance. The total capacity of NRAID will be the sum of each drives.



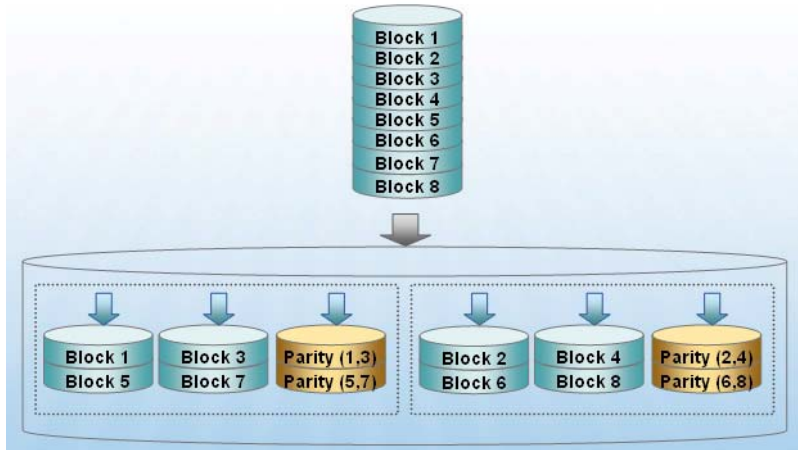
RAID 10 - Disk striping with mirroring

RAID 0+1 is a combination of RAID 0 and RAID 1 to form an array.



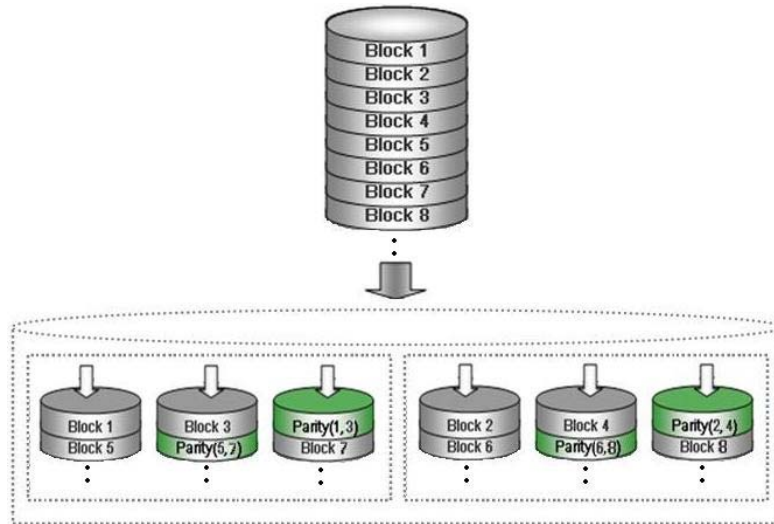
RAID 30 – Striping of RAID 3

RAID 30 is a combination of RAID 0 and RAID 3 to form an array. It provides better data redundancy compared with RAID 3.



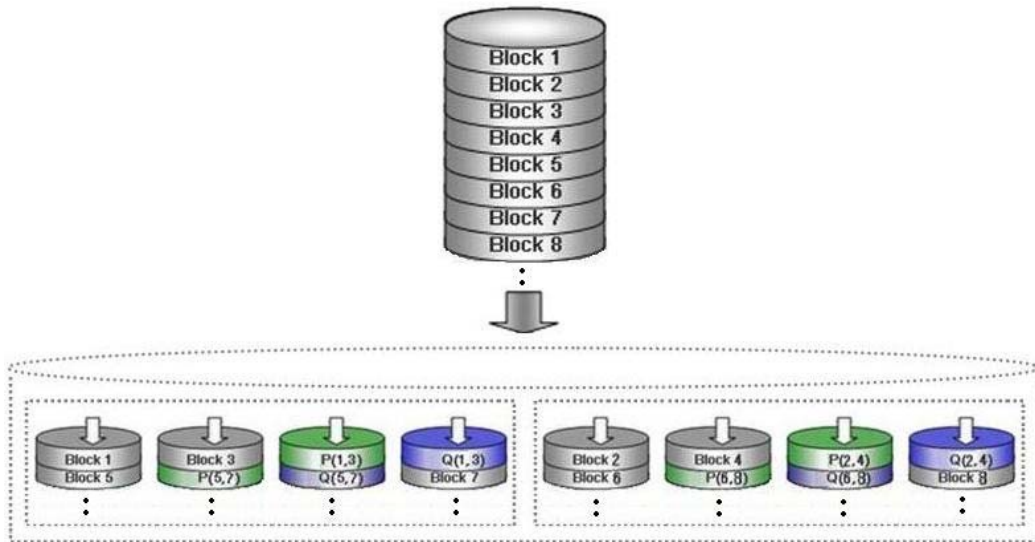
RAID 50 – Striping of RAID 5

RAID 50 is a combination of RAID 0 and RAID 5 to form an array. It provides better data redundancy compared with RAID 5.



RAID 60 – Striping of RAID 6

RAID 60 is a combination of RAID 0 and RAID 6 to form an array. It provides better data redundancy compared with RAID 6.

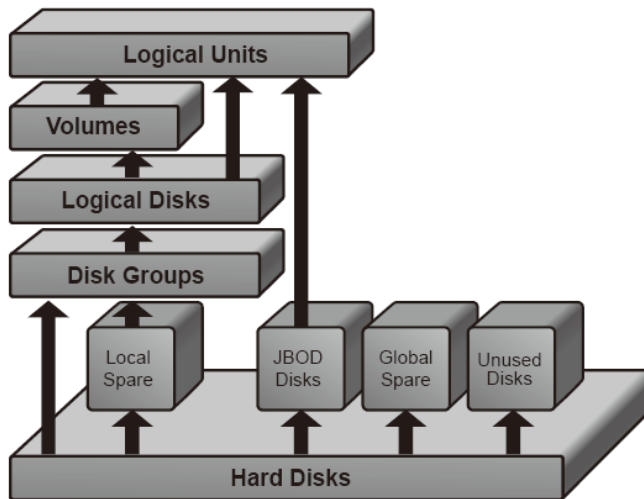


Summary of RAID Levels

The following table provides a brief overview of RAID levels. A high data availability number indicates high fault tolerance.

Level	Description	Capacity	Fault Tolerant	Minimum disks
RAID 0	Disk striping	N	0	1
RAID 1	Disk mirroring	N/N	N-1	2
RAID 3	Striping with dedicated parity	N-1	1	3
RAID 5	Striping with distributed parity	N-1	1	3
RAID 6	Striping with 2 sets of parity	N-2	2	4
RAID 10	Striping with RAID 1	N/2	2	4
RAID 30	Striping with RAID 3	N-2	2	6
RAID 50	Striping with RAID 5	N-2	2	6
RAID 60	Striping with RAID 6	N-4	2	6
JBOD	Just a bunch of disks	N	0	1
NRAID	Non-RAID	N	0	1

A.2 RAID Structures



The storage resources are managed as storage objects in a hierarchical structure. The hard disks, the only physical storage objects in the structure, are the essence of all other storage objects. A hard disk can be a JBOD disk, a data disk of a disk group, a local spare disk of a disk group or a global spare disk. The capacity of a disk group is partitioned to form logical disks with different RAID configurations, and multiple logical disks can be put together to create volumes using striping, concatenation, or both. The JBOD disks, logical disks, and volumes, are virtual disks, which can be exported to host interfaces as a logical units (LUN) and serve I/O access from the host systems. Below are more descriptions about each storage objects.

- **Local and global spare disk**

A spare disk is a hard disk that will automatically replace a failed disk and rebuild data of the failed disk. A local spare disk is dedicated to single DG (disk group), and a global spare disk is used for all DG. When a disk in a DG fails, the controller will try to use local spare disks first, and then global spare disks if no local spare is available.

- **Disk group**

A disk group (DG) is a group of hard disks, on which LD (logical disk) can be created. Operations to a DG are applied to all hard disks in the disk group.

- **Logical disk**

A logical disk (LD) is formed by partitioning the space of a DG. LD always use contiguous space, and the space of a LD is evenly distributed across all member disks of the DG. A LD can be exported to hosts as a LUN or to form volumes.

- **Volume**

A volume is formed by combining multiple LDs using striping (RAID0) algorithms. A volume can be exported to hosts as a LUN.

- **Logical unit**

A logical unit (LUN) is a logical entity within a target (RAID) that receives and executes I/O commands from initiators (Hosts). I/O commands are sent to a target device and executed by a LUN within the target.

- **Virtual disk**

A virtual disk is a storage entity that can service I/O access from LUNs. It could be JBOD disk, logical disk, or volume.

- **LUN mapping**

A LUN mapping is a set of mapping relationships between LUNs and virtual disks in the controller. Host computer systems can access the LUNs presented by the controller after inquiring host ports of the controller.

Appendix B – Symbols of Disk Status

In this table, you can understand the meaning of every character of disk status displayed in the monitor mode.

Symbol	Meaning
A	Adding disk
B	Faulty disk
# (No)	Member of Disk Group #
F	Foreign / Conflict disk
G	Global spare disk
J	JBOD mode
L	Local spare disk
T	Clone Target disk
U	Unused disk
W	SMART warning or BBR alert
X	No disk
?	Unreadable status