A12T3-Share

User Guide

Accusys Storage Ltd.,

2024
Version: V1.3

Revision Sheet

Release No.	Date	Revision Description
V1.0	2017/6	Officially released.
V1.1	2017/6	Content updated.
V1.2	2020/8	Master-Slave feature revised as Primary-Secondary feature.
V1.3	2024/9	Content updated.

PREFACE

Notice

The product features and specifications described in this guide are subject to change without notice.

The manufacturer shall not be liable for any damage, or the loss of information resulting from the performance or use of the information contained herein.

Guide to Conventions

Inside the double boxes is the important information that users should be aware of:

> **Caution**
> This indicates the existence of a potential hazard that could result in personal injury, damage to your equipment or loss of data if the safety instruction is not observed.

> **Note**
> This indicates useful tips on getting the most from your RAID system.

Trademarks

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Preparing to Install Tshare A12T3-SHARE

To ensure safe and smooth operation of your Tshare A12T3-SHARE, it is essential that you choose an appropriate location for the system, and provide an appropriate operating environment and adequate power for all components of the system. As you plan for installation, follow the guidelines below to ensure that the system and its environment are safely and appropriately positioned for efficient operation and service.

Precaution for Handling the System

Take the following precautions to avoid Damage To the system or potential injury to you.

1. Prepare a flat, sturdy surface before removing the system from its packaging. The table or cart that will hold the system should be as close as possible to the system's carton.
2. Ensure that all power switches have been turned off and all power cords disconnected to prevent personal injury and damage to the hardware.
3. Static electricity can damage electronic components of your system. Follow the guidelines below to avoid such damage:
    a. Work in a static-free environment
    b. Wear a grounded anti-static wrist strap
    c. Store uninstalled components in anti-static bags
    d. Handle circuit boards by their edges and avoid touching chips and connectors

Choosing the Location for the System

The Tshare A12T3-SHARE is designed as a rack-mount solution. Depending on where your rack is located, you should keep the following points in mind when determining where to place your system.

1. Measure the amount of available space in the rack. The amount of space required for the A12T3-SHARE is 3U rack space. (dimensions are: L: 567mm W: 441mm H: 131mm)
2. Measure the distance between any two components that need to be connected via cable(s). This measurement will help you determine the length of the required cable(s). Or if you've already purchased the cables, determine the proximity of the components in question.
3. Leave sufficient room, at least two inches, around the unit to allow air ventilation.
4. Do not block or cover any of the ventilation holes in the front and back panels of the unit. Consistent airflow is essential to keeping the system operating efficiently.
5. Allow additional room at the front and back of the unit for service.
6. The Tshare A12T3-SHARE uses several cables and cords. It's a good idea to determine how they will be arranged at the rear of the system, and where the cables will be routed to connect to the host systems and RAID disk systems.

Electrical Power

At your chosen location for the Tshare A12T3-SHARE, make sure that the electrical circuitry and power outlets are sufficient for the combined power needs of all hardware components. To plan for safe and adequate power to the system, follow these guidelines:

1. Check the documentation for all hardware components at the chosen location to determine their power requirements. Then make sure that the available power supply for that location is sufficient for the planned components.
2. If you need assistance determining the power needs of the components at the chosen location, consult an electrical expert who is familiar with your facility.
3. When possible use surge protectors or power conditioners as part of the installation.
4. When planning for electrical power, make sure you have more power than the total power requirements specified for all components. Also make certain that the power load is distributed evenly among circuits to that location. Consult an electrician or other expert if you need assistance with planning for the power needs of your components.
5. When possible, plug the redundant power supplies onto different circuits.
6. Make sure that the power outlets for all hardware components are grounded according to local and national standards. Consult an electrician if you need assistance with grounding.

Operating Environment

The operating environment for the Tshare A12T3-SHARE must meet certain requirements:

1. Verify that the temperature range of the chosen location is within the limits established for the system and all other components.
2. Make certain that the chosen location has adequate ventilation to maintain the necessary temperature range.
3. If there are multiple hardware components installed at the chosen location, consider additional cooling measures to assure efficient operation of the system and other components.
4. Environment parameters:
    a. Operating temperature: 0°C to 40°C (32°F to 104°F)
    b. Non-operating temperature: -40°C to 70°C (-40°F to 158°F)
    c. Operating humidity: 5-85%, non-condensing
    d. Storage humidity: 0-95%, non-condensing

Security

To ensure the security of the Tshare A12T3-SHARE, make certain that the chosen location meets your security requirements.

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Table of Content

1. Introduction of Shareable Thunderbolt RAID System

1. Introduction of Shareable Thunderbolt RAID System

1.1 Overview

1.1.1 What is Shareable Thunderbolt RAID System

Accusys has leveraged its years of experience as a PCIe SAN designer and high performance transmission technology provider in the video post-production industry, and created the all-in- one A12T3-Share Thunderbolt shareable storage solution, which takes the original peer to peer Thunderbolt interface and transforms it into a more flexible Thunderbolt storage network well suited for Media and Entertainment budgets and workflows. The advanced technology and innovative thinking will eliminate the high cost of Fibre Channel SAN or 10 Gigabit Ethernet.

The A12T3-Share is equipped with the functionality of a complete SAN solution within a single Thunderbolt storage device, the high performance of Thunderbolt 3 without any protocol conversion latency, and the reliability derived from an independent hardware RAID system. The A12T3-Share has four Thunderbolt 3 ports and one PCIe 3.0 port, which allows a maximum of five hosts to access the storage directly. With the full performance of Thunderbolt 3 in a shared storage environment, A12T3-Share will be the perfect storage solution for the burgeoning 4K video market.

1.1.2 A12T3-Share features

1. **Hardware Specifications**
   - Thunderbolt 3 (40Gb/s) x4 and PCIe (QSFP) port x1
   - Support 12 x 3.5”/2.5” SAS/SATA drive and SSD
   - Hardware XOR/Multi-Parity engine
   - 2GB DDRIII memory, ECC-protected
   - 400W power module, Single/Redundant (optional)

2. **Software Specifications**
   - Support T-Pairing to bind dual Thunderbolt paths, increasing 2 times performance
   - Support T-Share Expansion to expand host port to 8 and drive number to 96
   - Multiple RAID levels: 0, 1, 5, 6, 0+1 and enhance JBOD
   - Up to 5 disk array groups
   - Selective initialization method (on-the-fly and performance evaluation)
   - Online RAID set expansion and level migration
   - Support write-back and write-through caching of controller and drive
   - Automatic rebuilding
   - Disk RW Test to measure the real IO throughput on each disk
   - Disk health monitoring by S.M.A.R.T.
   - Array roaming and disk traveling
   - Dual firmware images for firmware recovery
   - Disk Lag Proof technology to guarantee disk timely response
   - Equalization mode to smooth the performance of sequential data transfers

3. **Management**
   - Java based GUI-RAIDGuardX, centralized multiple RAID system management
   - LED indicator to monitor status of RAID enclosure
   - Event notification by email (SMTP)
   - Support SNMP traps

4. **Enclosure**
   - Dimensions: L: 369mm, W:175mm, H: 394.6mm
   - Weight: 15.2 Kg, 33.5 lbs (w/o drives)

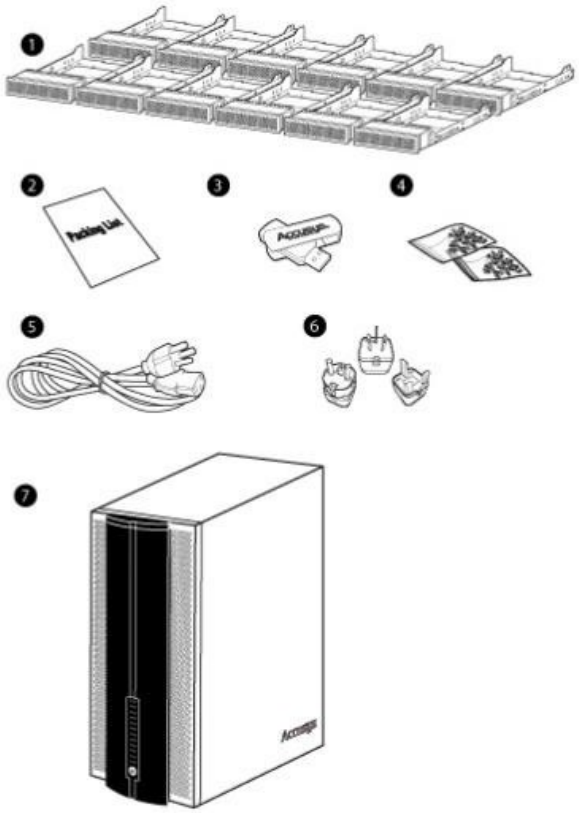
5. **Support OS**
    - Windows: 10 32bit / 64bit and later
    - Mac OS X: 10.12.x

6. **Operating Conditions**
    - Humidity: 5% - 85%
    - Operating Temperature: 0°C– 40°C

7. **Certification**
    - RoHS, CE, FCC, BSMI

1.2 What's in the Box

Your A12T3-Share is shipped in special package to provide protection during transportation. Carefully check your carton contents against the included packing list, or the inside flap of the box, and your original purchase order. You should have the items as described in the sections below.



The accessories package includes the following items. These items can also be ordered and shipped separately from Accusys resellers.

1. Disk tray (x12)
2. Packing list (x1)
3. Installation USB (x1)
4. Screw pack (x2)
5. AC Power Cord cable (x1)
6. EU, AU, UK converter (x3)
7. A12T3-Share Storage (x1)

1.3 Your A12T3-Share at a Glance

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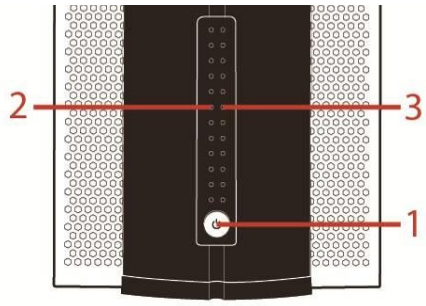
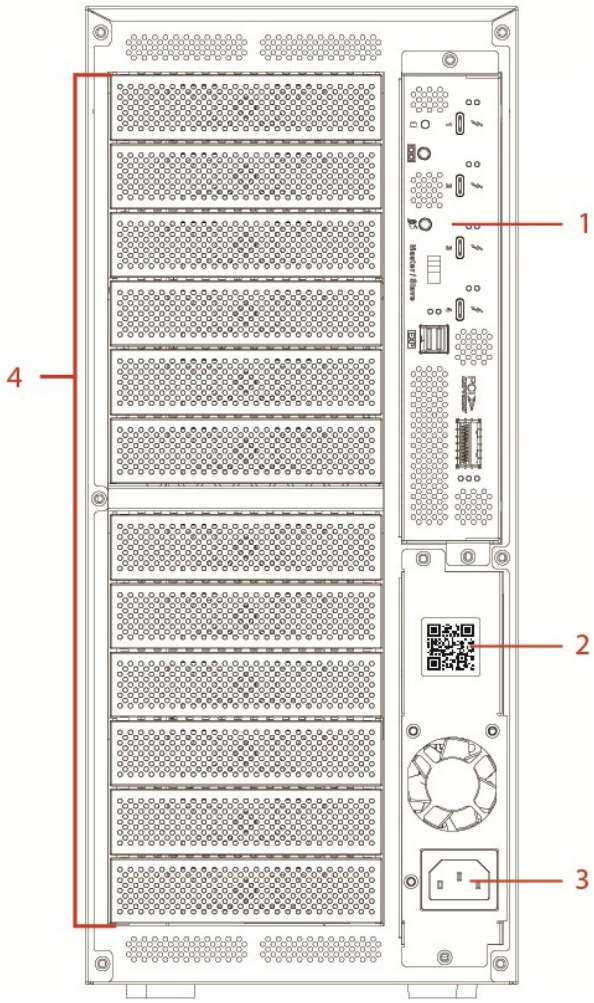
1.3.1 Front Panel & LED Indicators

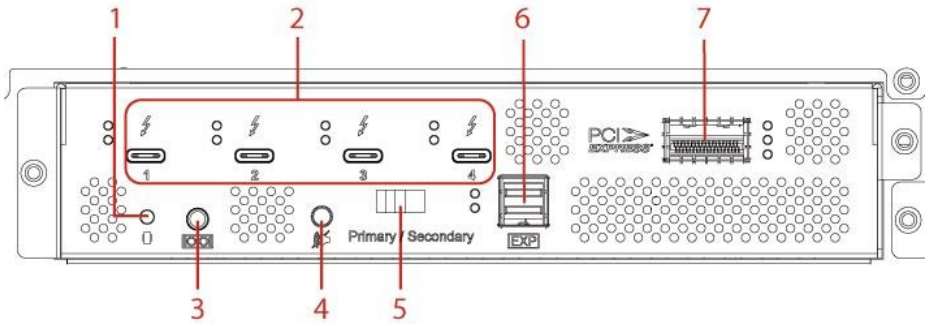


No.	Name	Description
1	Power Button	**Click** to power up **Push for 5 seconds** to shut down
2	Disk 1~12 status	**Green** disk online **Red** disk fail or offline **Green/Red Switching** disk rebuild, migrate or expand
3	Disk 1~12 activity	**Blue** disk in access

1.3.2 A12T3-Share Rear Panel



No.	Name	Description
1	RAID controller	The controller of RAID system
2	QR code	Scanned to link to Accusys website
3	Power Supply	Support 100-240V power input
4	Hard Drive Tray	Hard Drive Tray 1 (top) ~ 12



No.	Name	Description
1	Heart beat LED	Flashing green indicates it works normally.
2	Thunderbolt port	Thunderbolt 3 host port 1(Left)~ 4 **LED1** **Blue** Data access status **LED2** **Green** Link status
3	Debug port	For engineer debugging only
4	Mute button	Click to mute system beeper alert
5	T-Share Expansion switch	Setting the chassis to be Primary (Master) or Secondary (Slave)
6	JBOD Expansion port	Expanding to another JBOD enclosure **LED1** **Blue** Data access status **LED2** **Green** Link status
7	PCIe port	Connecting to PCIe Host (Z2M, C2M) or expanding the other RAID system for T-Share Expansion. **LED1** **Blue** Data access status **LED2** **Green** Link status **LED3** **Amber** Connected to the other RAID

2. Prepare to Install the A12T3-Share

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To ensure safe and smooth operation of your A12T3-Share, it is essential that you choose an appropriate location for the system, provide an appropriate operating environment, and adequate power for all components of the system. As you plan for installation, follow the guidelines below to ensure that the system and its environment are safely and appropriately positioned for efficient operation and service.

2.1 Precaution for Handling the System

Take the following precautions to avoid damage to the system or potential injury to you.

1. Prepare a flat and sturdy surface before removing the system from its package. The table or cart that holds the system should be as near as possible to the system carton.
2. Make sure that all power switches have been turned off and all power cords disconnected to prevent personal injury and damage to the hardware.
3. Static electricity can damage electronic components of your system. Follow the guidelines below to avoid such damage:
    a. Work in a static-free environment.
    b. Wear a grounded anti-static wrist strap.
    c. Store uninstalled components in anti-static bags.
    d. Handle circuit boards by their edges and avoid touching chips and connectors.

2.2 Choose Location for the System

The A12T3-Share is designed as a tower solution. Depending on where your desk, rackmount cabinet, or other install location is, you should keep the following in mind when determining where to place your system.

1. Measure the available space of your desk for the space required for the A12T3-Share. (Refer to chapter 1.1.2 for the dimension.)
2. Measure the distance between any two components that need to be connected via cable(s). This measurement will help you determine the length of the required cable(s). If you've already purchased the cables, it helps you to determine the proximity of the components in question.
3. Leave sufficient room, at least two inches, around the unit to allow air ventilation.
4. Do not block or cover any of the ventilation holes in the front and back panels of the unit. Consistent airflow is essential to keep the system operating efficiently.
5. Make ample room at the front and back of the unit for service.
6. The A12T3-Share uses several cables and cords. It's a good idea to determine how they will be arranged at the rear of the system, and where the cables will be routed to connect the host systems and RAID disk systems.

2.3 Electrical Power

At your chosen location for the A12T3-Share, make sure that the electrical circuitry and power outlets are sufficient for the combined power needs of all hardware components.

To plan for safe and adequate power for the system, follow these guidelines:

1. Check the documentation for all hardware components at the chosen location to determine their power requirements. Then make sure that the available power supply for that location is sufficient for the planned components.
2. It is better to use surge protectors or power conditions as part of the installation.
3. When planning for electrical power, make sure you have more power than the total power requirements specified for all components. Also make certain that the power load is distributed evenly among circuits on that location. Consult an electrician or an expert if you need assistance in planning for the power needs for your components.
4. Make sure that the power outlets for all hardware components are grounded according to local and national standards. Consult an electrician if you need assistance in grounding.

2.4 Operating Environment

The operating environment for the A12T3-Share must meet certain requirements:

1. Verify that the temperature range of the chosen location is within the limits established for the system and all other components.
2. Make sure that the chosen location has adequate ventilation to maintain the necessary temperature range.
3. If there are multiple hardware components installed at the chosen location, consider additional cooling measures to assure efficient operation of the system and other components.
4. Environment parameters:
    a. Operating temperature: 0°C to 40°C (32°F to 104°F)
    b. Operating humidity: 5-85%, non-condensing
    c. Storage humidity:5%-95%, non-condensing

2.5 Security

To ensure the security of the A12T3-Share, make certain that the chosen location meets your security requirements.

3. Install the A12T3-Share

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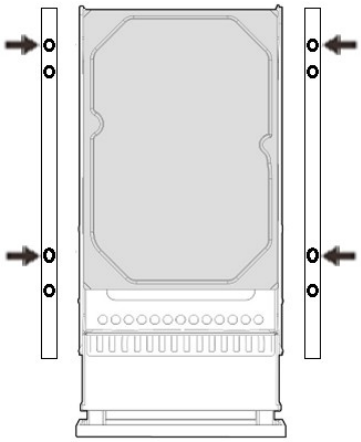
Follow the steps in this chapter to install your A12T3-Share RAID system.

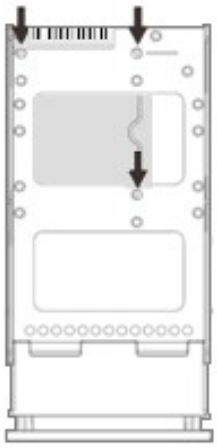
3.1 Install Disk Drives

Follow the steps below to install your drives.

1. Place the drives with connector align with the edge of the disk tray and secure drive with screws as below figures.

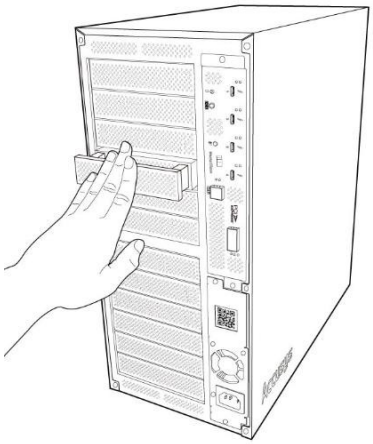


Four screws for 3.5”



Three screws for 2.5”

2. Slide the disk tray into the disk bays of the chassis.



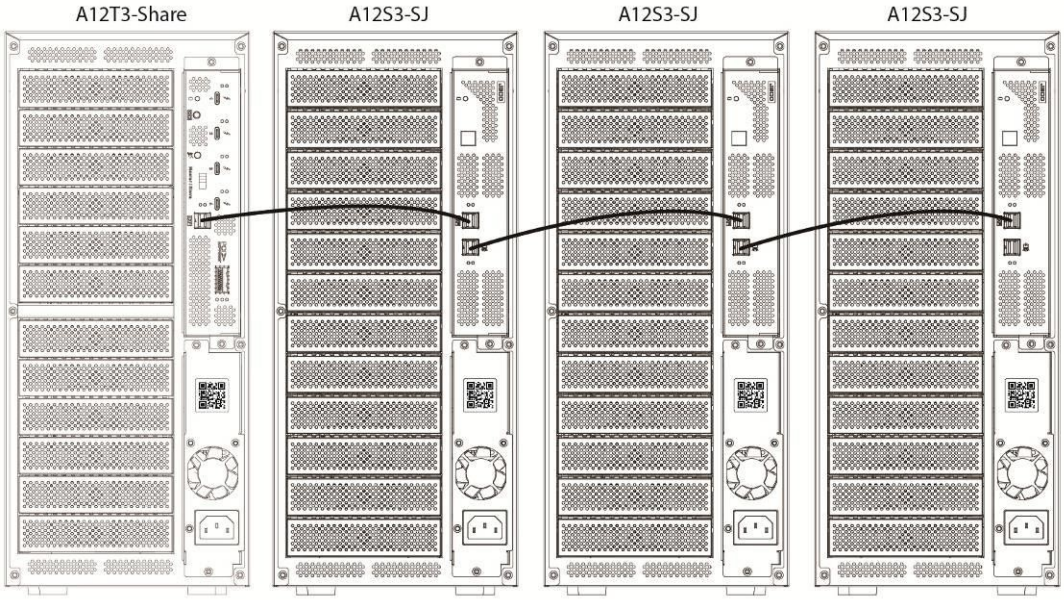
3. Push the tray inward until the tray firmly connects and you hear the tray click into place.
4. Repeat for all drives to be installed into the A12T3-Share.

> **Note**
> Recommend using drives with same size, speed, model and firmware version.

3.2 Connect JBODs

A12T3-Share support JBOD expansion, you can expand the capacity via connecting up to 3 A12S3-SJ JBOD enclosure. Follow the steps below to connect JBODs.

1. Use mini SAS HD cable (equipped in A12S3-SJ accessory package) to connect the "EXP" port of A12T3-Share and "SAS" port of A12S3-SJ.



2. Set ID dip switch of A12S3-SJ to 1.

Note

If you have three A12S3-SJ JBOD enclosures, set ID as below;

1st A12S3-SJ ID =1 

2nd A12S3-SJ ID =2 

3rd A12S3-SJ ID =3 

If ID conflicted, some drives on JBOD would not recognize.

3. Power on: First to power on all JBOD enclosures, then power on RAID system.
4. Power off: First to power off RAID system, then power off all JBOD enclosures.

3.3 Install Driver and GUI on Host

Installation files can be found in installation USB, or you can download the latest version from our website (https://www.accusys.com.tw/page491)If you need further technical support, please contact your reseller or Accusys support team. (see Appendix B “Customer Service and Technical Support” for more information)

1. Find installer file from USB drive or Accusys website.
2. Double clicking the file and follow the onscreen instructions to install, a **Restart** is needed to complete installation.

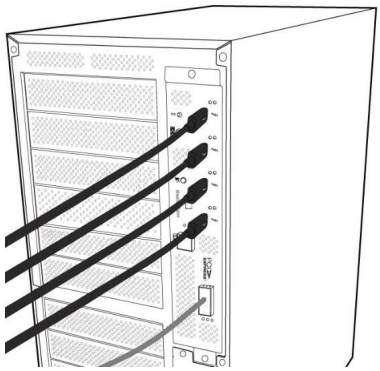
3.4 Connect Host Port

A12T3-Share supports four Thunderbolt 3 and one PCIe 3.0 host ports, depends on your plan, you can create multiple arrays for dedicated host or create an array be visible by all hosts to build a SAN environment.

The PCIe port can for T-Share Expansion by connecting 2 A12T3-Share RAID systems. (refer to Chapter 3.5 T-Share Expansion)

Follow the steps below to setup a host connection.

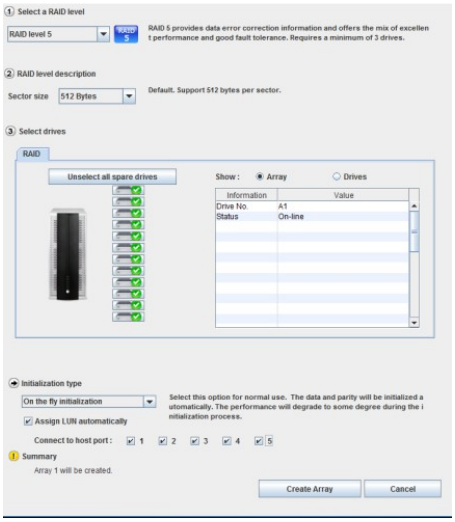
1. Connect cable to one of host port.



Note

1. Use valid Thunderbolt 3 cable , or the connection will fail.
2. Connect to **SAN port** (Z2M, C2M) when connect to PCIe host.

On RAIDGuardX, create array and select Thunderbolt host port, e.g. plan to build a SAN, set array can visible for all host ports.



2. Click **Create Array**, the new volume shell be recognized by host in seconds.

3.5 T-Share Expansion

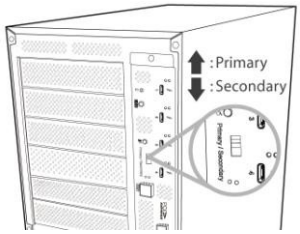
By utilizing T-Share Expansion, users are able to pair two A12T3-Share devices doubling the available Thunderbolt 3 ports to eight. Each port provides rapid transfer speeds and allows large workgroups to simultaneously collaborate on projects with extreme workflow efficiency.

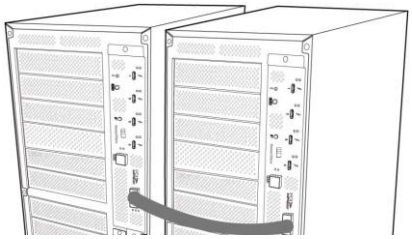
Requirement

- Two A12T3-Share RAID systems
- 2M PCIe cable

Installation

1) Set T-Share Expansion switch of 1st RAID system to ‘Primary (Master),’ 2nd RAID system to ‘Secondary (Slave)’.



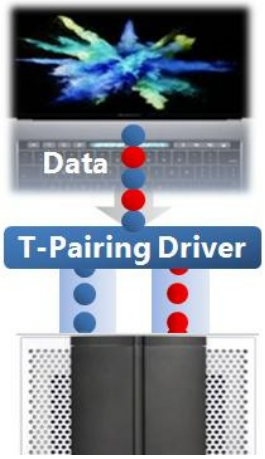


2) Use a PCIe cable to connect PCIe port of both RAID systems.

3) Power on 2nd RAID system first and then power on 1st RAID system in 1 minute, then you can install drive and setup RAID system.

3.6 T-Pairing

T-Pairing (Thunderbolt Pairing) allows users to double transfer speeds by pairing two Thunderbolt connections between clients and T-share storage devices.



With T-Pairing, two Thunderbolt ports can be utilized to connect a new Mac Pro with an Accusys T-share device, and with four Thunderbolt ports available, this allows two users to create dual paths increased speeds simultaneously. Similar to other MPIO functions, T-Pairing allows for the use of multiple ports to experience enhanced performance.

T-Pairing is protocol independent and all T-share devices are pre-installed with Accusys Mac Installer which includes the driver for T-Pairing. Once the driver is installed it will automatically communicate with the T-Share RAID controller for easy configuration.

Accusys' T-share devices employ the Thunderbolt interface in a SAN environment to provide a high capacity, high performance storage solution for business-critical tasks. Mac Pro users with time sensitive projects such as post production tasks will now be able to increase their workflow twofold with T-Pairing deployed.

Follow the steps in this chapter to enable T-Pairing.

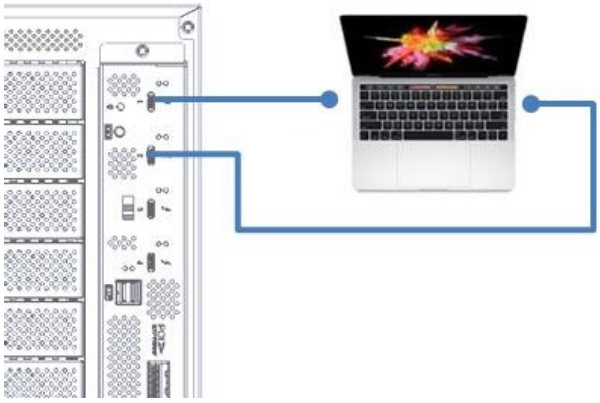
Requirement

- RAID System Code must be version 3.5.x or later.
- Accusys Installer must be version 3.5.x or later.
- Host must equip two USB-C ports of independent Thunderbolt bus (Not daisy-chain).

Installation

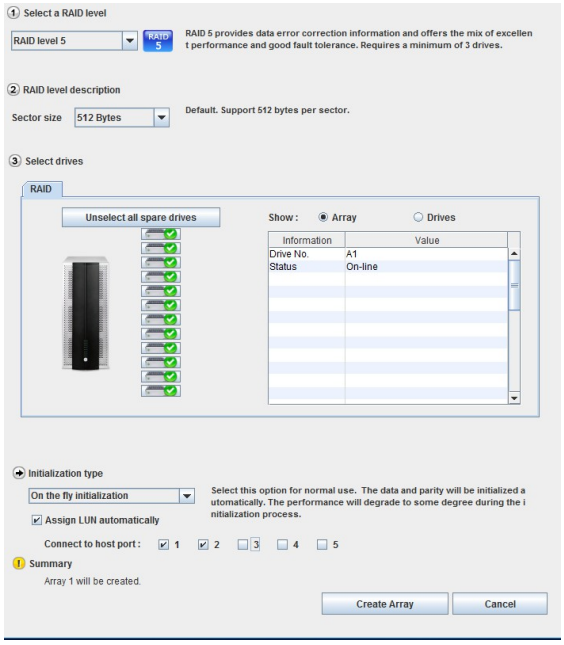
1) Power on RAID system.

2) Connect RAID system and Host with two Thunderbolt cables.



3) Power on Host and install Accusys Installer.

4) Create an array, check Assign LUN automatically and select 2 Thunderbolt host ports.



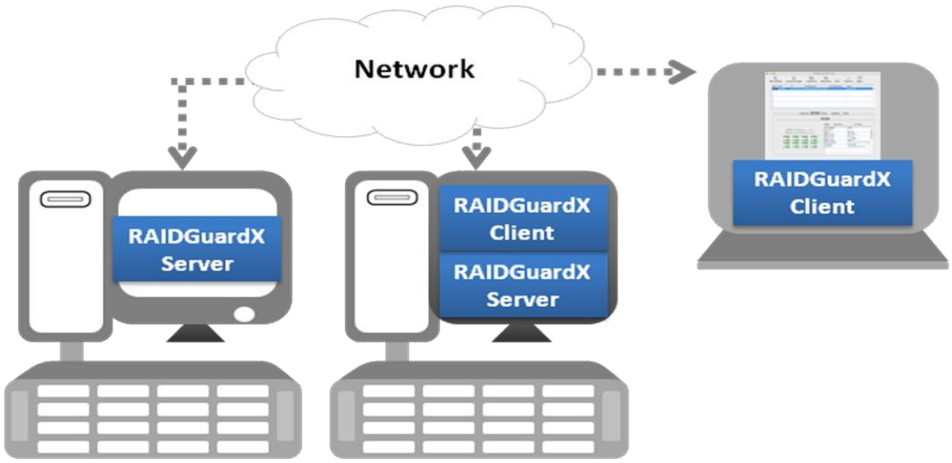
Note
T-Pairing does not support Hot-Plug and Fail-Over; If cable re-plugged, have a host reboot can get T-Pairing function back automatically.

4. RAIDGuardX

4. Use RAIDGuardX GUI

4.1 RAIDGuardX Overview

RAIDGuardX support local and remote monitoring of multiple controllers that are connected to the same network, which consist of 2 components: **RAIDGuardX-Server** and **RAIDGuardX- Client**.



RAIDGuardX-Client: A java-based console for managing and monitoring RAID system.

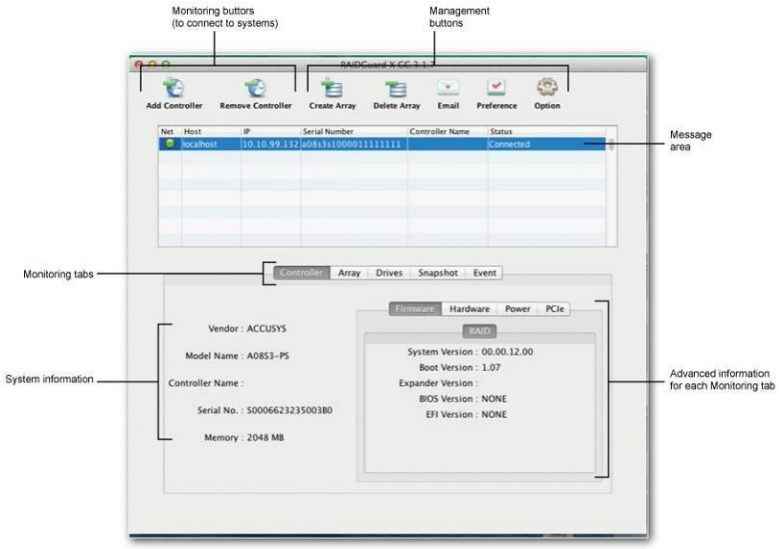
RAIDGuardX-Server: RAIDGuardX-Server is an agent service in charge of communication between RAIDGuardX-Client and RAID controller; it MUST be installed to the host directly connected to RAID system.

4.1.1 Menu Bar

The menu bar across the top contains the following functions:

Function		Description
File	Exit	Close the program
	Load Controller List	Refresh the controller list
	Language	English and Japanese are supported
Controller	Manual Add Controller	Add remote controller by IP address of RAIDGuardX-Server
	Update	Update firmware (System Code, Boot Code, etc.)
	Dump controller log	Download controller log for troubleshooting
	Disk RW Test	Test Read/Write speed on each disk
Help	Search	Search keyword in RAIDGuardX
	Help Center	Displays the help for RAIDGuardX

4.1.2 RAIDGuardX Main Console



Function	Description	
Monitoring Buttons	**Add controller** into RAIDGuardX (for DAS only)	
	Remove controller from RAIDGuardX	
Management Buttons	**Create array** in the RAID system	
	Delete array in the RAID system	
	Email to set email notification	
	Preference	**Drive Lag Proof** Enable/ Disable
		NCQ mode Enable/ Disable
		SMART Mode Enable/ Disable
		Beeper Enable/ Disable
		Equalization Enable/ Disable
		Cache of controller and drives can be enable/disable
		MISC for controller Time setup
	Option	**Slicing** an existing array for multiple slices
		LUN Map setup for multiple slices
		LUN Connect setup for specific host port
		Expansion with new drive into an array
		Migration between different RAID level
		Snapshot for backup data in a particular time
		Health Center for check array status
		Unlock Drives from locked mode

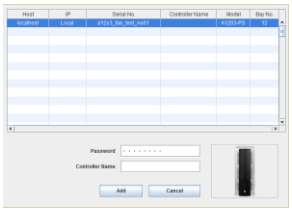
4.2 Add/Remove Controller

RAIDGuardX can manage the RAID controller locally or remotely via intranet access.

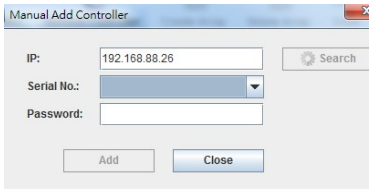
4.2.1 Add Controller

1. Open RAIDGuardX-Client, you may add controller by **locally** or **remotely**; **Locally**:

   Click **Add Controller** to display a list of available controllers.



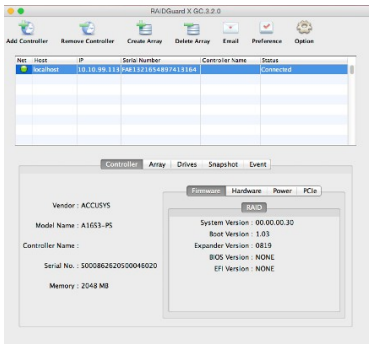
   Remote: Click Controller tab > Manual Add Controller, type the remote host IP address (Where the RAIDGuard-Server installed is), click search to display all available controllers.



2. Click on a controller and enter password (default is 00000000, 8 zeros), then you can type a controller name to remark, click **Add** to open main console.

> **Note**
> Password can be changed in section **Preference > MISC**.

3. In main console, you can monitor and manage this RAID system.



4.2.2 Remove Controller

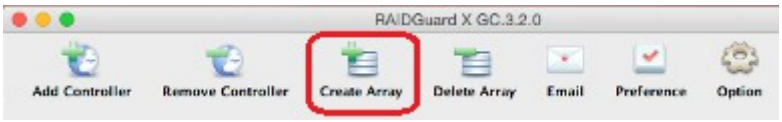
Click **Remove Controller** icon can remove this RAID system out of RAIDGuardX.

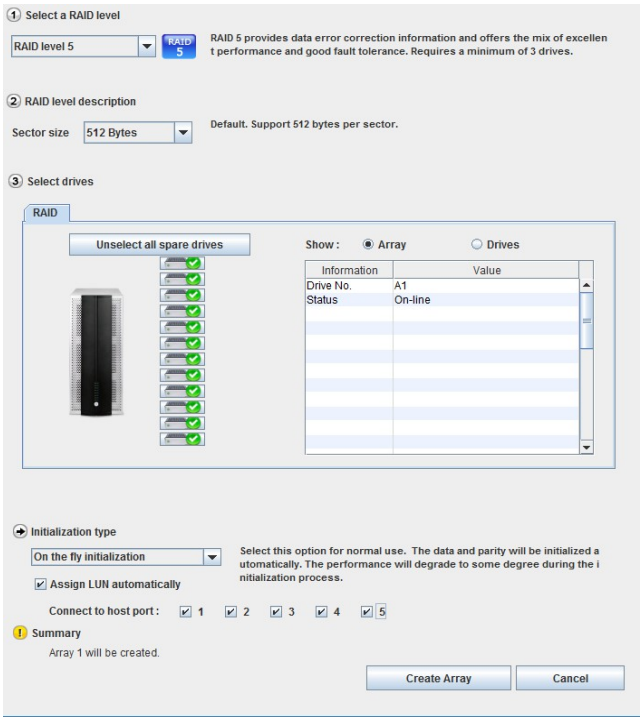
4.3 Create/Delete an Array

This chapter will guide you how to use RAIDGuardX to create/delete disk array.

4.3.1 Create Array

1. Click icon **Create Array**, then create array page will pop up as below.



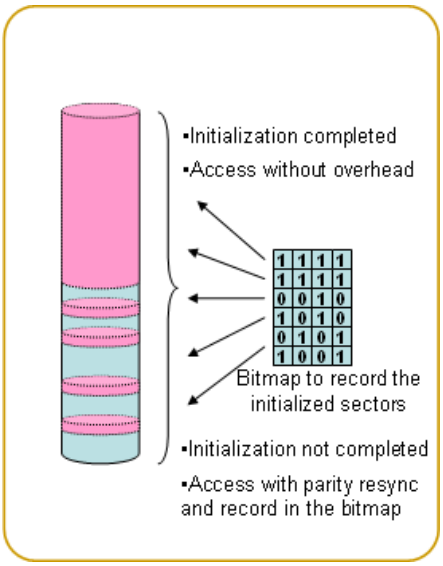


> **Note**
> 1. Check **LUN assign automatically** and you can select host port.
> 2. You can change the setting of host port on **Options > LUN connect**.

2. Select the RAID level from the drop down menu. Available levels are: 0, 1, 5, 6, 0+1, enhanced JBOD. Find more details in **Chapter 5 RAID Overview.**
3. Select the sector size. Available sector sizes are 512 bytes (default) and 4096 bytes. The sector size 4096 bytes is only used on WinXP for recognized over 2TB volume.
4. Click on the drive icon or **Select all spare drivers** to select all available drives.

Note
Unselected drive will be set to Hot (Global) spare drive. If an array member drive fails, spare drive will start to rebuild automatically.

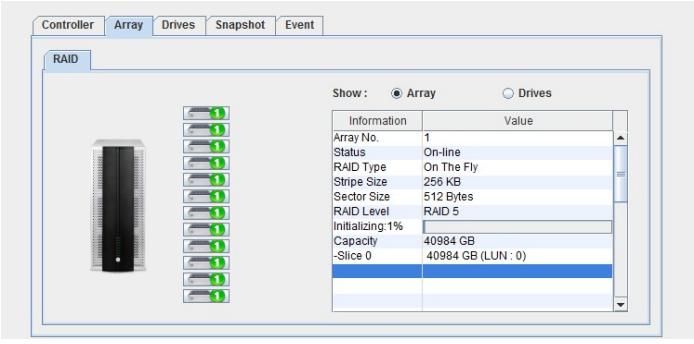
5. Click the initialization type: **On-the-fly initialization** or **Performance evaluation.**
   On-the-fly initialization (Default) – While RAID systems record the initialized sectors in the bitmap, you can still use the RAID system during the initialization.



   Performance evaluation – Select to evaluate the performance of the target array. It will take no time for array initialization; there is no data protection, only for testing purpose.

Caution
Array created by **Performance evaluation** could not do array rebuild, DO NOT use this type for production environment.

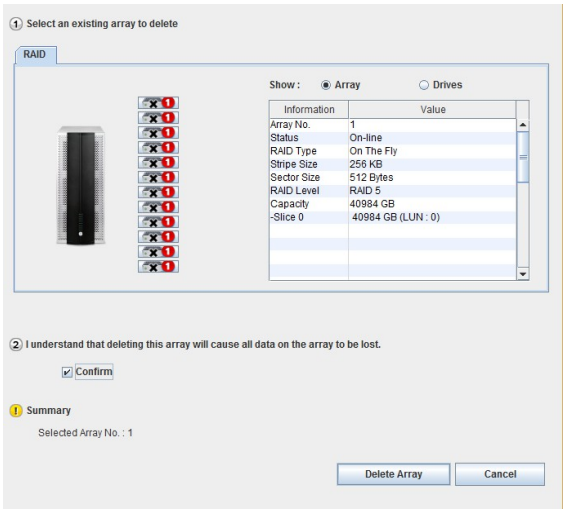
6. Check **Assign LUN automatically**. You can change LUN map in **Options** anytime.
7. Select which host port could be visible this array.
8. Click **Create Array** to start array initialization, you can see the status of array initialization progress.



Note
A12T3-Share can support up to 5 array groups.

4.3.2 Delete an Array

1. Click icon **Delete Array** on RAIDGuardX, then it will pop up a dialog as below picture.



2. Click on the drive icon of the array to be deleted.
3. Check the **Confirm** box. Click **Delete Array** to complete the process.

Note
Array cannot be deleted during any actions, e.g. initialing, rebuilding.

Caution
When delete an array, all data on the hard disk drives will be lost.

4.4 Email Notification

It may be necessary for network administrators to receive e-mails in the event of errors, alerts, and changes to the RAID array. These alerts can be e-mailed to a maximum of 20 e-mail addresses.

1. Mailing List

Enter the e-mail address of people to receive controller error reports. Click **Remove** to delete e-mail addresses from the list.

Click **Send Test Email** to check that the e-mail is working.

2. SMTP Setting

Mail Server Name – Enter the address of the mail server.

From Email Address – Enter the e-mail address of the mail server.

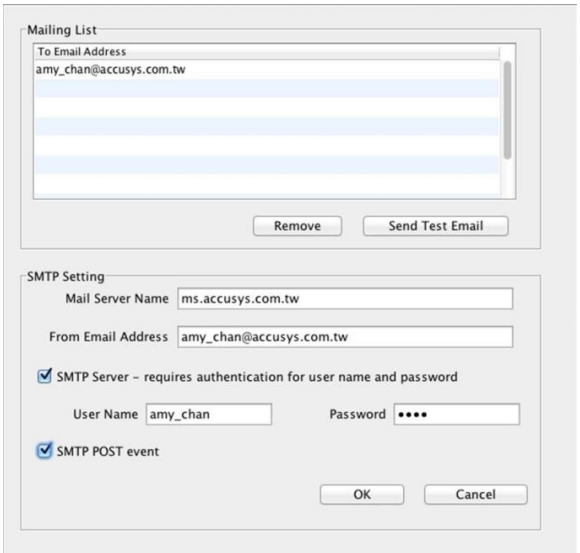
3. SMTP Server – Set authenticated user name and password

Check this box if your mail server requires a user name and password.

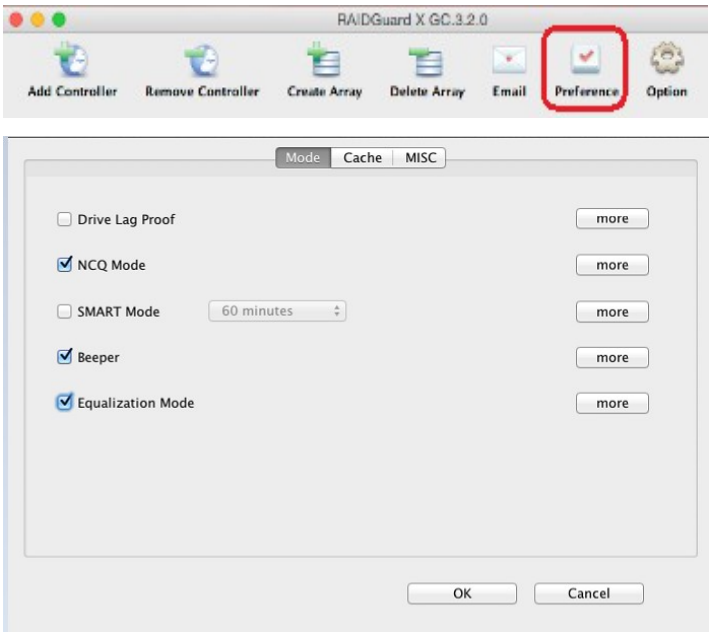
4. SMTP POST event

Check this box. When error happened, RAID controller will automatically send notice email to specified mailing list.

> **Note**
> 1. Ask your systems administrator for SMTP Server details.
> 2. Support outbound SMTP mail service, e.g. Hotmail, Yahoo.
> 3. Contact to tech support for more detail.

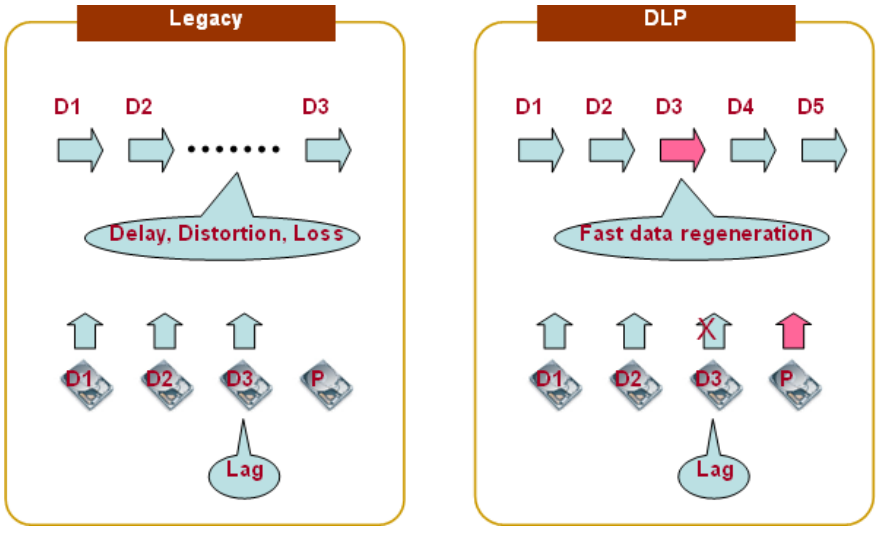


4.5 Preference



4.5.1 Disk Lag Proof

This feature ensures the stability and continuity of the RAID performance. In RAID 5 and RAID 6, DLP prevents the aging or slow responds of a single hard disk from influencing the overall performance. The advantage of this feature is making sure the data be protected if some hard disks fail to perform well.

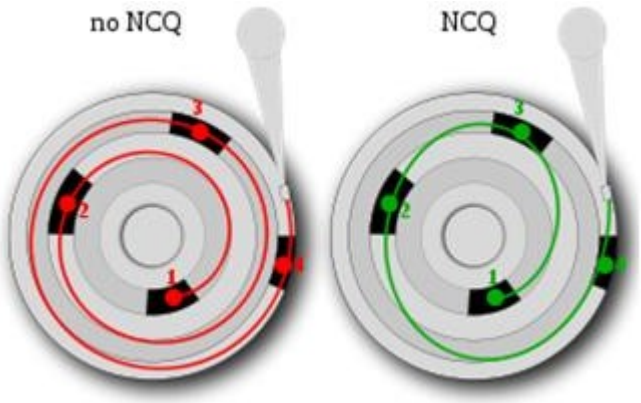


In the event of performance degradation or delay of a single drive due to aging, the RAID system reads both data and parity stripes concurrently. It bypasses the slow reads and returns data to the host with the regenerated data and to provide stable performance based on the RAID parity.

> **Note**
> Slow response of some hard disks can be tolerated in DLP mode, you may use S.M.A.R.T. function to check the conditions of hard disks in an array and replace the faulty ones.

4.5.2 NCQ

Native Command Queuing (NCQ) is an extension of the Serial ATA protocol allowing hard disk drives to internally optimize the order in which received read and write commands are executed. This can reduce the amount of unnecessary drive head movement, resulting in increased performance (and slightly decreased wear of the drive) for workloads where multiple simultaneous read/write requests are outstanding.



The figure above illustrates the access sequence in NCQ and non-NCQ mode. The content sequences of the two hard disks are the same: 1, 2, 3, 4. However, the access sequence in NCQ mode may vary to improve the performance.

4.5.3 SMART Mode

S.M.A.R.T. is a monitoring system of disk drives to detect and report on various indicators of reliability, in the hope of anticipating failure. Accusys RAID system supports S.M.A.R.T. Once this function is selected, you can select the check interval from the drop-down list. Choose from 1 minute to 8 hours for SMART Mode to be active. The RAID controller will command each hard disk to perform S.M.A.R.T. according to the check interval selected. The check results will be shown as an Event message in the main menu.

When running S.M.A.R.T. mode, the performance of the system will be slightly affected. The higher the check frequency, the more the sequential accesses are affected. It is recommended to turn off S.M.A.R.T. if high performance required. On the other hand, running S.M.A.R.T. constantly allows you to monitor the conditions of hard disks at any time.

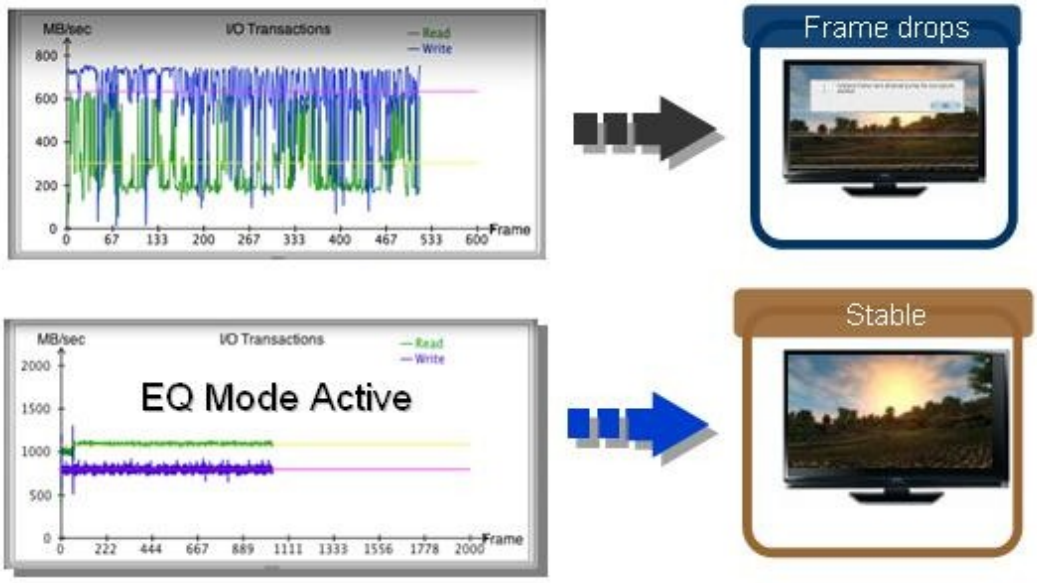
The options of time to check disk's S.M.A.R.T are 1, 15, 30, 60 minutes and 2, 4, 8 hours. We strongly suggest set to 8 hours. Frequently checking will reduce the life time of hard drives.

4.5.4 Beeper

To enable/disable system beeper, default is enabled.

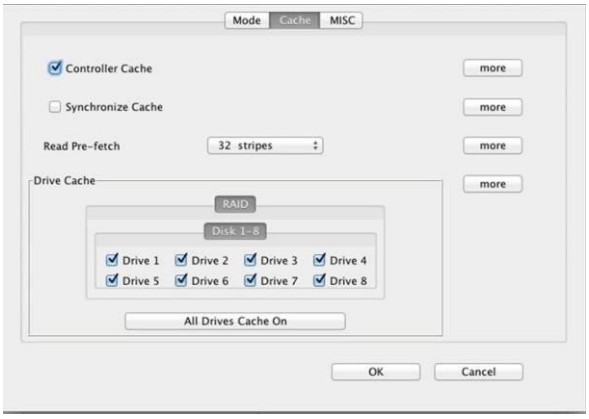
4.5.5 Equalization Mode

Regardless the transmission method, the data transmission speed cannot be guaranteed at all times. This feature allows the continuous I/Os to operate more smoothly and substantially reduce large fluctuations in efficiency during data transfer. For video editing, enable equalization to prevent video frame drops.



4.5.6 Cache

In this section, cache of RAID controller and drive can be configured by manual; default setting is tuned for video streaming application.



Controller Cache – Check this box to enable the controller cache. This speeds up the data transfer to and from the disks.

> **Caution**
> Data in cache may be erased if power down unexpected. Suggest using a UPS (uninterruptible power supply) to prevent this scenario.

Synchronize Cache – Check this box to enable cache synchronization with drives, to ensure all write data is correct, there is a frequently latency time within. For video capture, disable synchronization, because the video capture needs to be able to constantly write data to the RAID storage without long latency.

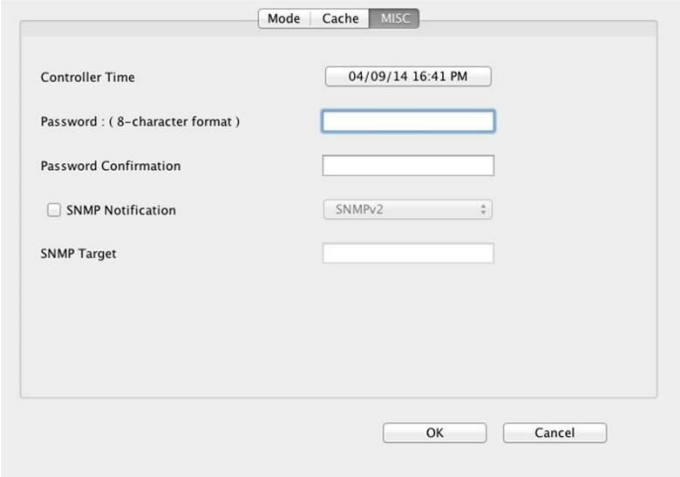
Read Pre-fetch – Identifies sequential access patterns and aggressively pre-fetches patters into cache. From the drop down list, choose the number of stripes to pre-fetch. The default is 32; this is the recommended number.

Drive Cache – Choose which drives to cache. When more than one application accesses the database, the first applications cache needs to synchronize with the second. Each drive contains a built in write cache; checking these boxes chooses which drives to enable the caching on. Caching improves the efficiency and speed of data transfer.

All Drives Cache On/All Drives Cache Off – Click this button to enable/disable the caching on for all available drives.

> **Note**
> If **Equalization mode** enabled, **Synchronize Cache** and **Read Pre-fetch** will be disabled automatically.

4.5.7 MISC



MSIC (Minimal Instruction Set Computer) has standard RAID controller time settings. The time of each event is displayed in the event logs in Event message.

Controller Time – Click this button to see a calendar and to change the time and date of the controller.

Password – Enter the new controller password. The default password is 00000000 (8 zeros). Type another 8 characters.

Password Confirmation – Confirm the new controller password.

> **Note:**
> If you forget your password, you will have to contact your agent or the Accusys Support Team.

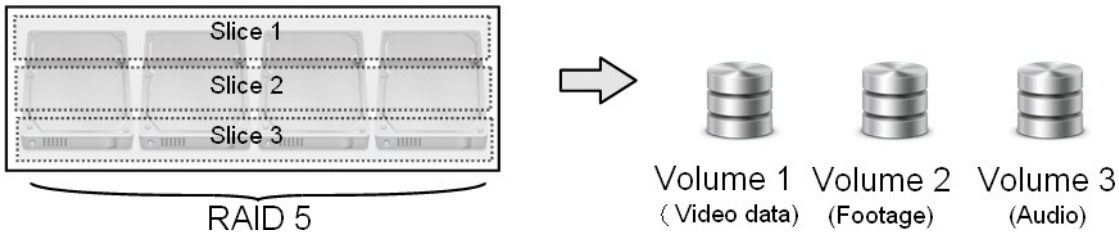
SNMP Notification – Select **SNMPv1** or **SNMPv2** to send notifications for error conditions and possible problems to the SNMP servers. SNMP stands for Simple Network Management Protocol.

SNMP Target – Enter the IP address for sending the SNMP notifications.

4.6 Option

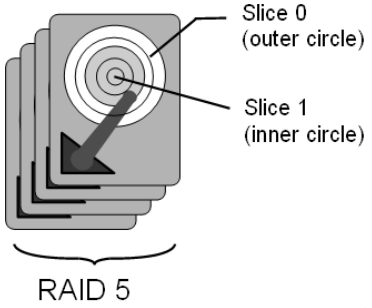
4.6.1 Slicing

RAID slicing overcomes the inherent design of how data is stored on a drive or RAID system by subdividing a RAID array into segments, or slices. These slices are effective hardware partitions of all drives in the array. Each slice is a separate LUN and appears as a separate volume on the host computer. After slicing, the LUN map must be set for each slice.

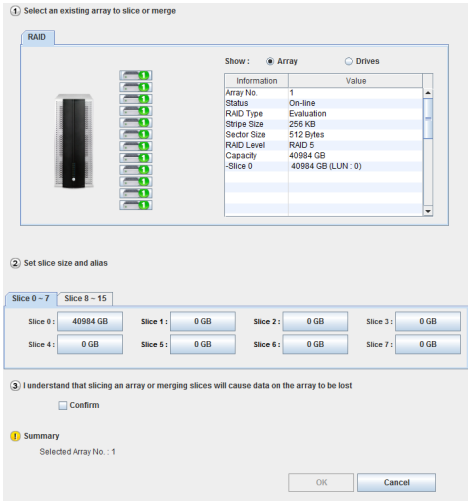


Slicing concept

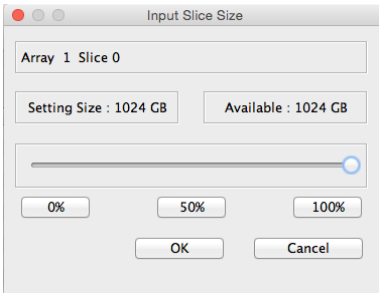
Usage Scenario:
The access speed of the data stored in the outer circle is faster than the inner circle. Suppose there are two slices in a hard drive, Slice 0 locates in the outer circles while Slice 1 in the inner circle, for audio/video editing, you may store video data in Slice 0 and audio data in Slice 1.



Follow the steps below to select an array to slice or merge.



1. Select the array by clicking on a drive with an array number. The capacity is displayed. By default, Slice 0 contains the entire capacity of the disk array.
2. Click on Slice 0, use the slide bar or button of percentage to slice space and click OK to confirm. Repeat the same steps to slice more spaces if need.



Note
- Up to 16 slices per array.
- The total number of unique arrays' slices cannot exceed 16.

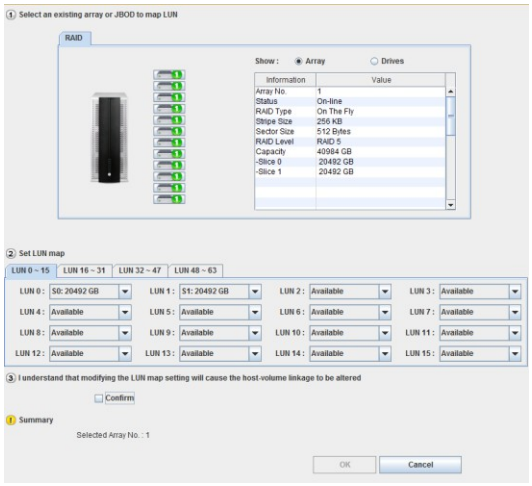
4.6.2 LUN Map

LUN, which stands for **L**ogical **U**nit **N**umber, is used to identify a logical unit in computer storage. When creating an array, you may select **Assign LUN automatically** to automatically assign a LUN to the new array. If **Assign LUN automatically** is not selected, you need to assign the LUN manually using LUN map.

Note
- One slice can only be assigned one LUN.
- The RAID controller supports up to 64 LUNs

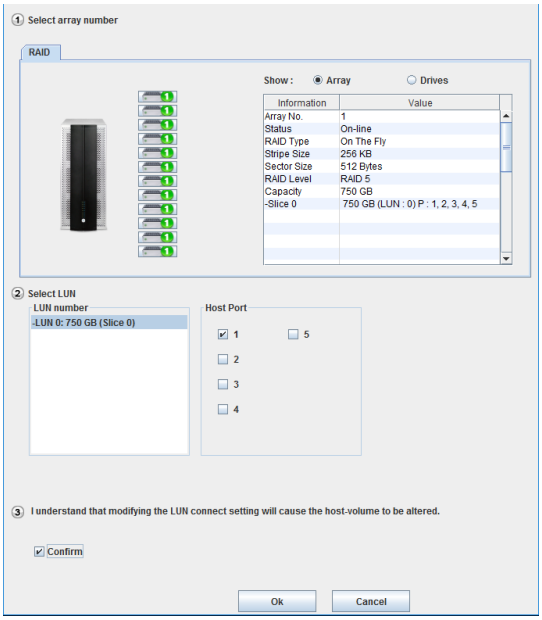
1. Select the array to map by clicking on a drive with an array number.

2. Choose a LUN and from the drop down list select a slice to map to, check the **Confirm** box and click **OK**.
3. Repeat the steps to set more LUN maps if need.



4.6.3 LUN Connect

In LUN Connect, user can manually define LUN can be visible by which host port.



1. Select the array to connect by clicking on a drive with an array number.
2. Select a LUN in Select LUN area.
3. Check the **Confirm** box and click **OK**.
4. Repeat the steps to create more LUN Connect if need.

> **Note**
> **LUN Map** must be set and then you can set **LUN Connect.**

4.6.4 Expansion

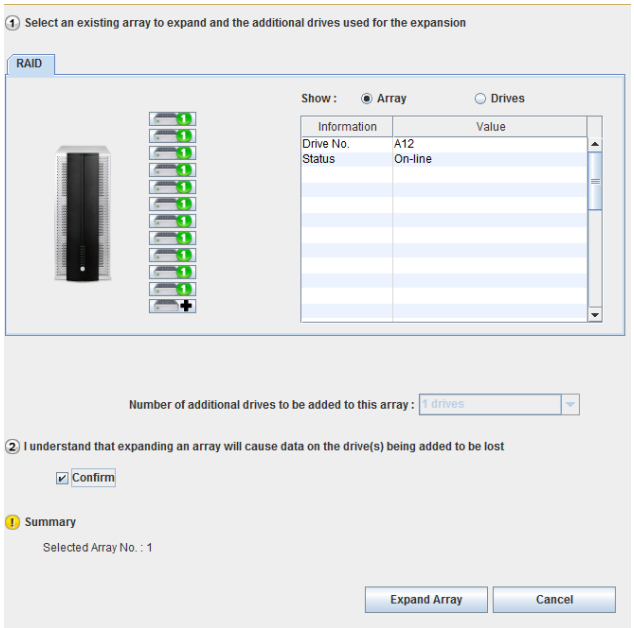
Expansion adds spare disk to an existing array. This is no need to create a new array or stop an array; you may add new disks online while the array is in use, its performance is affected considerably. You may check the progress of Expansion in the main view.

Example:

Note
The new hard drive must larger than the existing drives of array.

Follow the steps below to select an array to expand.

1. Select the array to add additional drives, and select the number of drives to be added. A “+” sign appears above the drives to be added.
2. Check the **Confirm** box and click **Expand Array**.



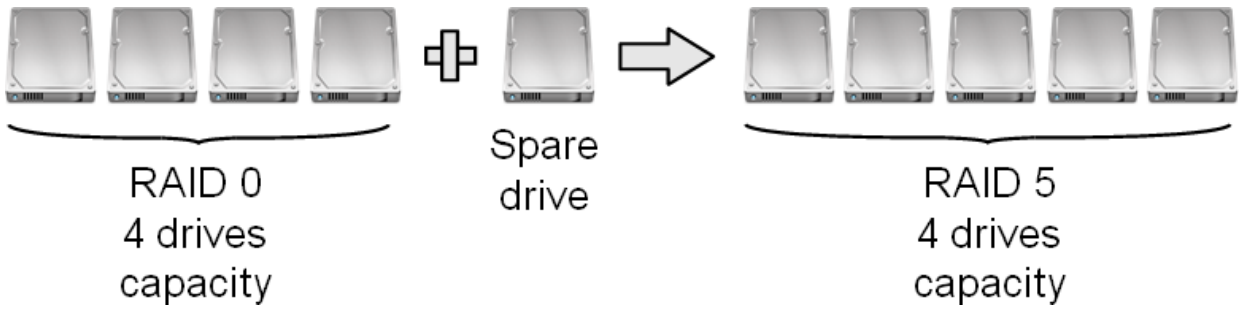
4.6.5 Migrations

Different from Expansion, which enlarges an array by adding hard drives to a fixed RAID level, Migration changes the RAID level of an array. It allows live changes to the RAID without the need to delete the array and rebuild. This can be useful when new drives have been added, and a new array type needs to be created.

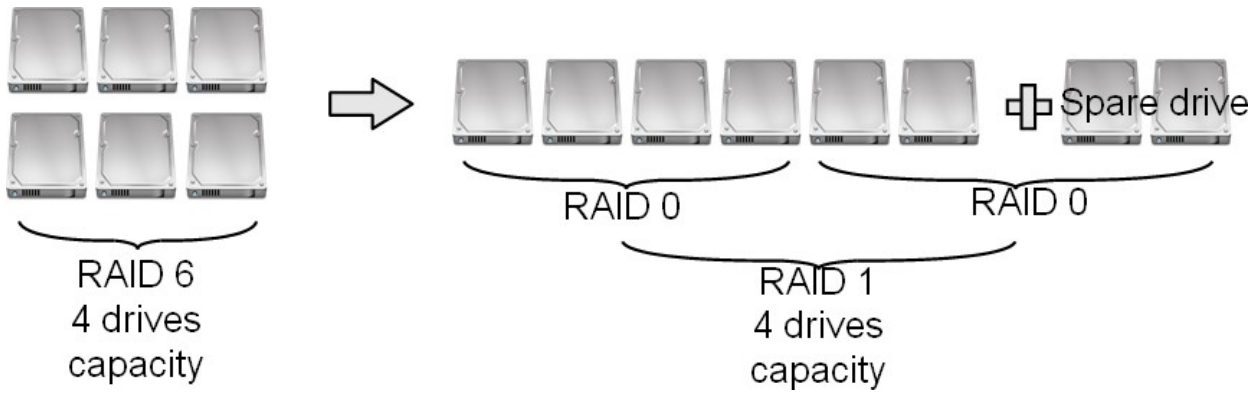
Example 1:

RAID 5 (12 drives) –Migrating→ RAID 0 (>11 drives)
RAID 5 (12 drives) –Migrating→ RAID 6 (>13 drives)
RAID 5 (12 drives) –Migrating→ RAID 0+1 (>22 drives)

Example 2:



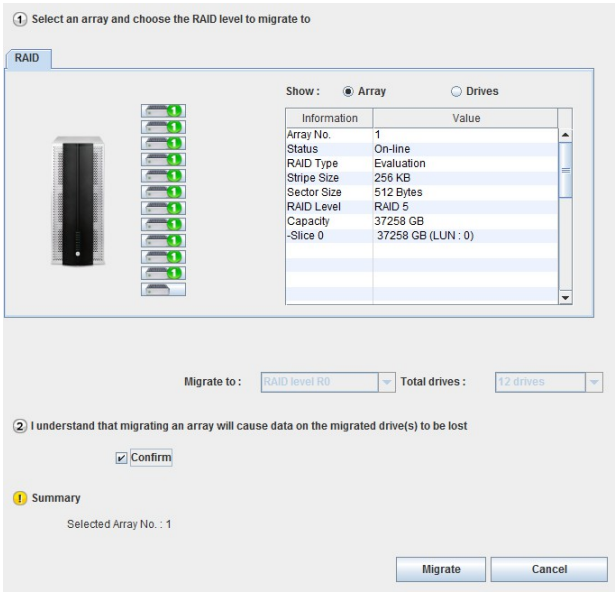
Example 3:



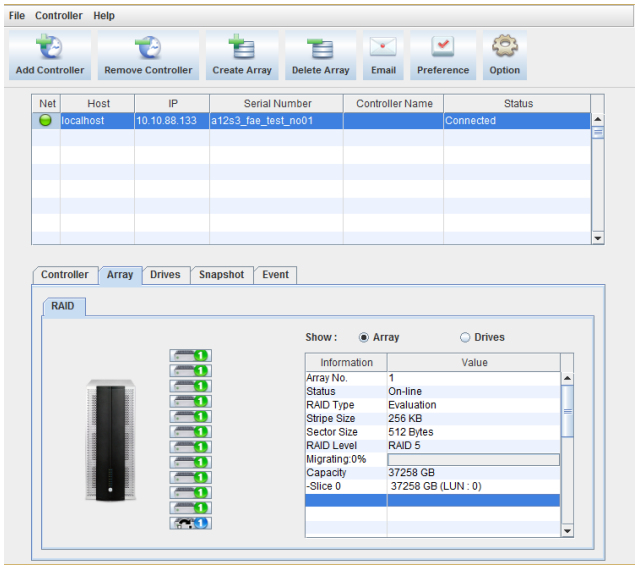
Note
The new hard drive must larger than the existing drives of array.

Follow the steps below to select an array to migrate. This changes the RAID level, such as from RAID 1 to RAID 5.

1. Select the array to migrate. From the drop down menu, select the RAID level to migrate to, and then select the total number of drives to include in the array. A “+” appears above the drive(s) to be added, and a “-” sign above the drive(s) to be removed.
2. Check the **Confirm** box and click **Migrate**.



3. The main array information screen will indicate that the array is currently migrating.



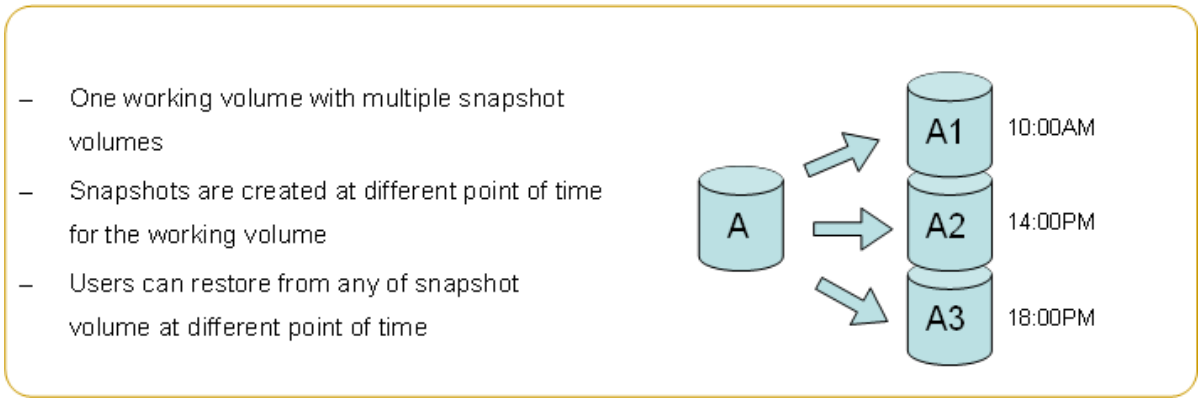
4.6.6 Snapshot

A snapshot is initialized with a data duplicate from a source to a target. The mirror snapshot is offered by the ExaSAN RAID controller.

> **Note**
> The source and target volume of the snapshot must be identical.

Before setting a snapshot, you need to set the slice in the array. The capacity of each slice and the number of shots should be in accordance with the space you need.

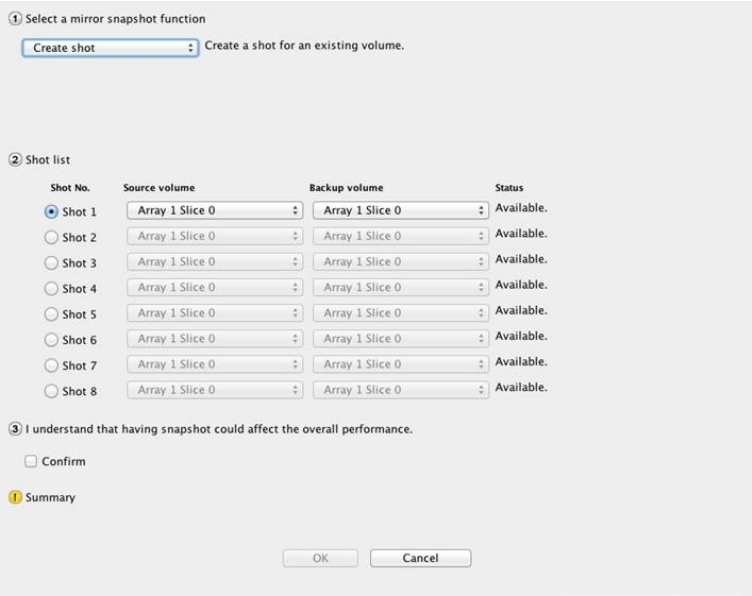
In the figure above, a snapshot can be created by splitting the source and target after the background sync is completed. The I/O mirroring is stopped, and the difference is under tracking in a bitmap table to support fast re-sync.



Create Shot

Create a snapshot of the selected slice. A maximum of 8 shots can be created. Once all shots have been used, older shots must be deleted before new ones can be taken.

1. Select the **Create Shot** function from the drop down menu.
2. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.
3. Check the **Confirm** box and click **OK** to take a snapshot.



Delete Shot

Delete the selected shot.

1. Select the **Delete Shot** function from the drop down menu.
2. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.
3. Check the **Confirm** box and click **OK** to delete a snapshot.

Split Shot

Split Now –

Split the selected shot or changes scheduling. The shot is split and read as two separate shots; therefore, it becomes two separate slices after being split.

1. Select the **Split Shot** function from the drop down menu.
2. Select the Split Now radio button.
3. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.
4. Check the **Confirm** box and click **OK** to split the snapshot.

Split Scheduling –

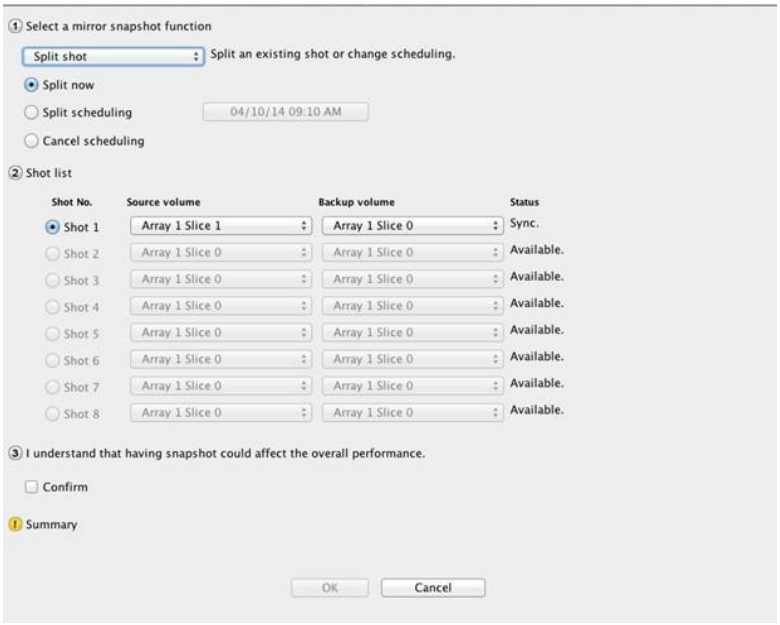
Set any time to split shot.

1. Select the **Split Shot** function from the drop down menu.
2. Select the Split Scheduling radio button.
3. Click on the time and date button to set split time.
4. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.
5. Check the **Confirm** box and click **OK** to split the snapshot.

Cancel Scheduling –

Cancel the split shot scheduling.

1. Select the **Split Shot** function from the drop down menu.
2. Select the Cancel Scheduling radio button.
3. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.
4. Check the **Confirm** box and click **OK** to split the snapshot.



Resynchronize Shot

Resynchronize the selected shot. This function can speed up mirroring for previous snapshots.

1. Select the **Resynchronize shot** function from the drop down menu.
2. Select the required shot by clicking on the Shot No. radio button. You can only select split shot for resynchronization.
3. Check the **Confirm** box and click **OK** to split the snapshot.

Note

1. The destination volume must be equal or larger in size than the source volume.
2. The source volume and the destination volume can be on different arrays.
3. The destination volume must NOT be mapped to a LUN.
4. A shot will not be deleted if the details of the array change. The only way to delete a shot is using the Delete Shot function under Snapshot.

4.6.7 Health Center

To ensure the accuracy of the RAID parity data, RAID controller offers Background checking and “Rebuild parity data.” During checking or rebuilding parity, the performance of the array will be affected. You could check the progress in the Main view or in the Health Center.

Follow the steps below to select an array to verify, rebuild, or condition.

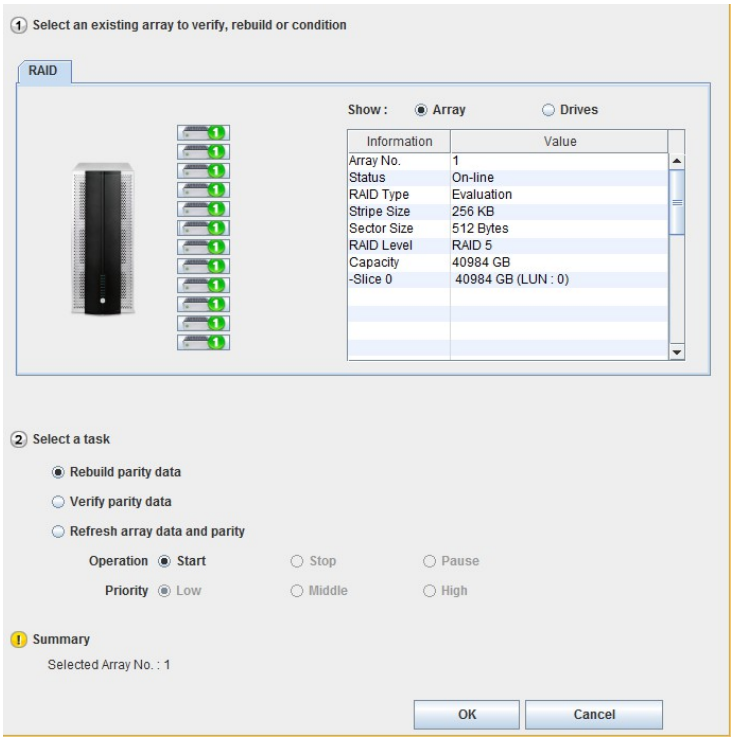
1. Select the Array to verify, rebuild, or condition.
2. Click the radio button to:

   Rebuild the parity data – Rebuilding parity on an array uses the data on the array to create new parity data, no repair problems with the data.

   Verify the parity data – Verify that the data is free of errors.

   Refresh array data and parity – Select the priority between Low, Med., or High. This process scans, rewrites, and scrubs bad data conditions caused by excessive vibration during drive I/Os, or data degradation caused by Adjacent Track Interference (ATI).

3. Click OK to start the operation.



4. The main array information screen will indicate that the array is undergoing rebuilding, verification, or refreshing.

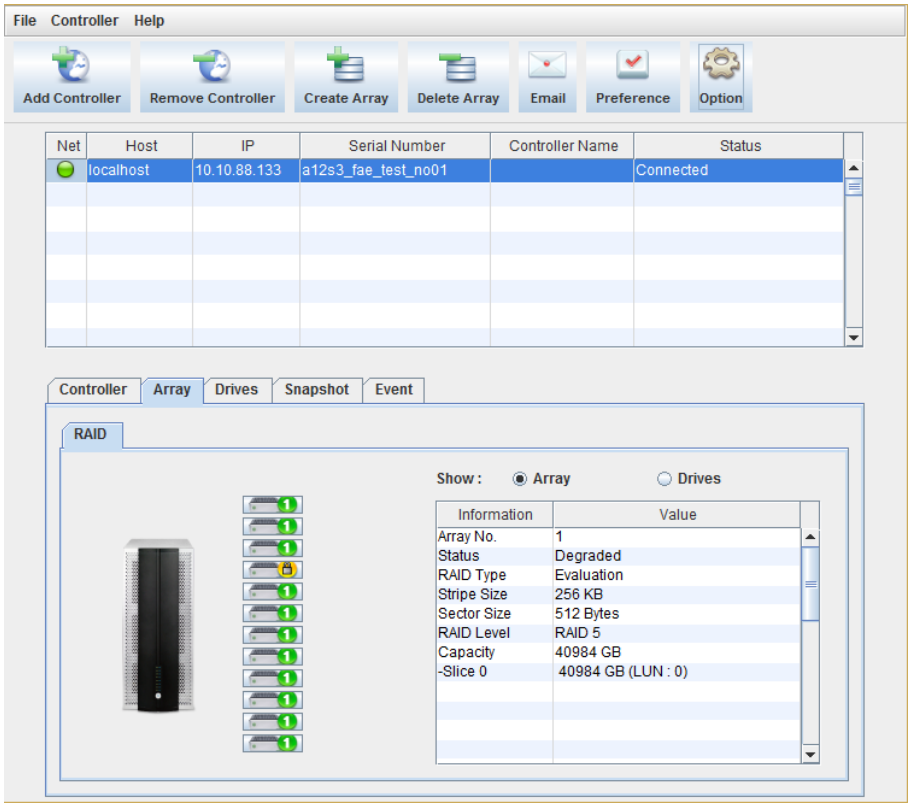
4.6.8 Unlock Drives

The RAID controller may lock abnormal drives in an array. You may unlock these drives and rejoin them in an array. Drives may be locked with one of two conditions:

1. If a drive returns data too slowly, the controller will determine the drive is experiencing a failure and execute Drive Drop. When you unlock the drive, it will be added directly to the array if there has not been drive access during the locked period. Otherwise, the controller will rebuild parity data on the drive when the drive is online.

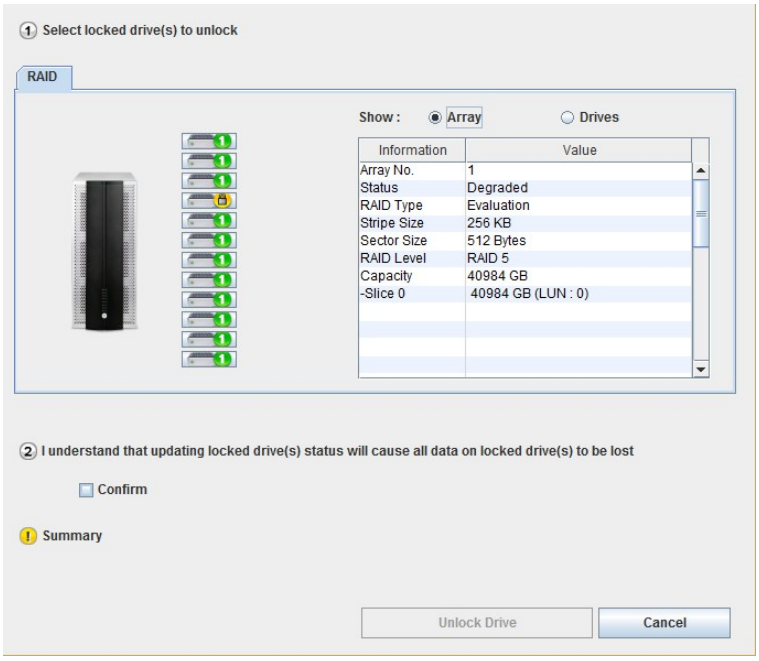
> **Note**
> If “Drive Drop" occurs, it is recommended to use S.M.A.R.T. to check the drive condition and replace it if necessary.

2. When a drive has been used by RAID system, that drive will be locked if insert it to another RAID system.

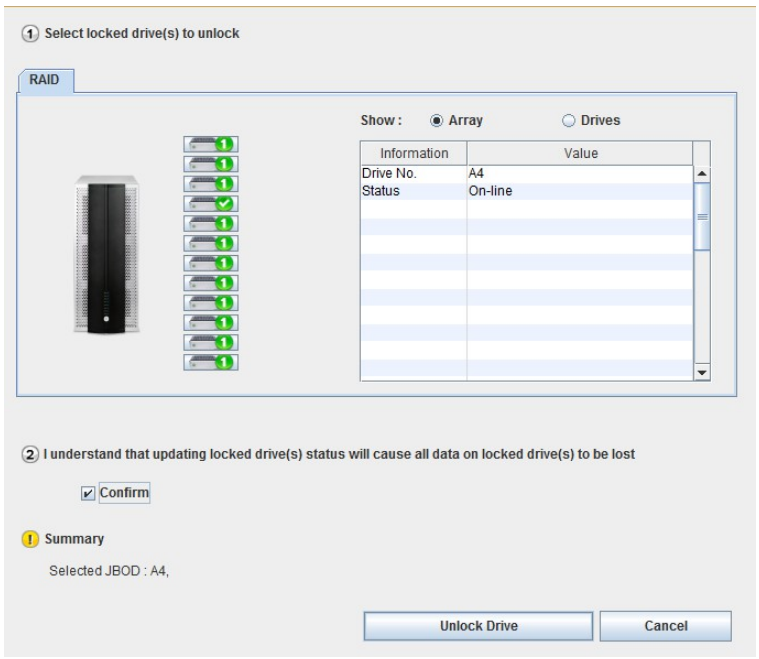


Follow the steps below to select a drive to unlock.

1. Select the drive with the  icon. It will change to the  icon.



2. Check the **Confirm** box and click **Unlock Drive**.



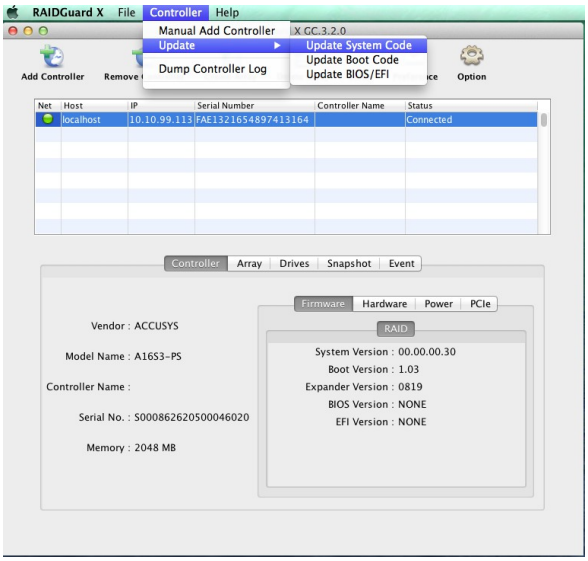
4.7 Update the RAID System Firmware

Follow the steps in this section to update the firmware of your RAID system.

1. Note the current firmware version (System Code, Boot Code, Expander Code, etc) from RAIDGuardX.
2. Download the latest firmware from website https://www.accusys.com.tw/page491

> **Caution**
> - Do NOT writing data, shutdown, interrupt RAID system during updating, in order to avoid any damage.
> - Firmware update time will take 2~5 minutes.

3. Select **Controller** in the Menu bar, move to **Update** > **Update System Code** in drop menu.



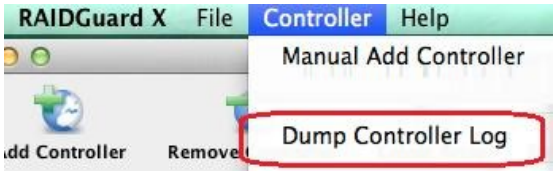
4. Choose correct **System Code** file to start updating. During the update process, the RAID system will stop all data access.

> **Caution**
> Do NOT interrupt or stop updates that are in progress. Firmware update will take 2~5 minutes.

5. Once the update is complete, make sure to restart (power off / on) the RAID system to make new firmware available.
6. Repeat the steps to update other firmware.

4.8 Download Controller Log

Download the event log for troubleshooting by pressing **Dump Controller Log**, log file (zip) will be saved at RAIDGuardX installed folder.



Note
Default folder to save zipped log file.
MAC: /Application/RAIDGuardX/Log
Windows: /Program Files/Accusys/RAIDGuardX/Log
Linux: /*{RAIDGuardX-Client folder}*/RAIDGuardX/Log

4.9 Disk RW Test

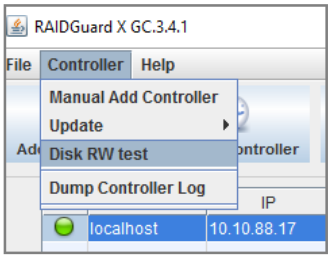
Read/Write throughput is highly depending on the condition of disk inserted in RAID system. When one of disks begins to drop down in Read/Write, the entire RAID system would slow down, and sometimes SMART function cannot figure out which one is the slow disk; Disk RW Test funtion executes read/write test on each disk and list the result on Event page for reference. User can replace the slowest disk to improve the whole system performance.

When performing Disk RW Test.

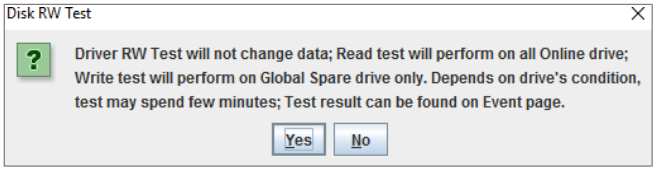
- All disks in RAID/JBOD enclosures would be individually executed sequently in a few seconds.
- Both read/write test on all spare disk.
- ONLY read test on all array member disk.

Executing Disk RW Test

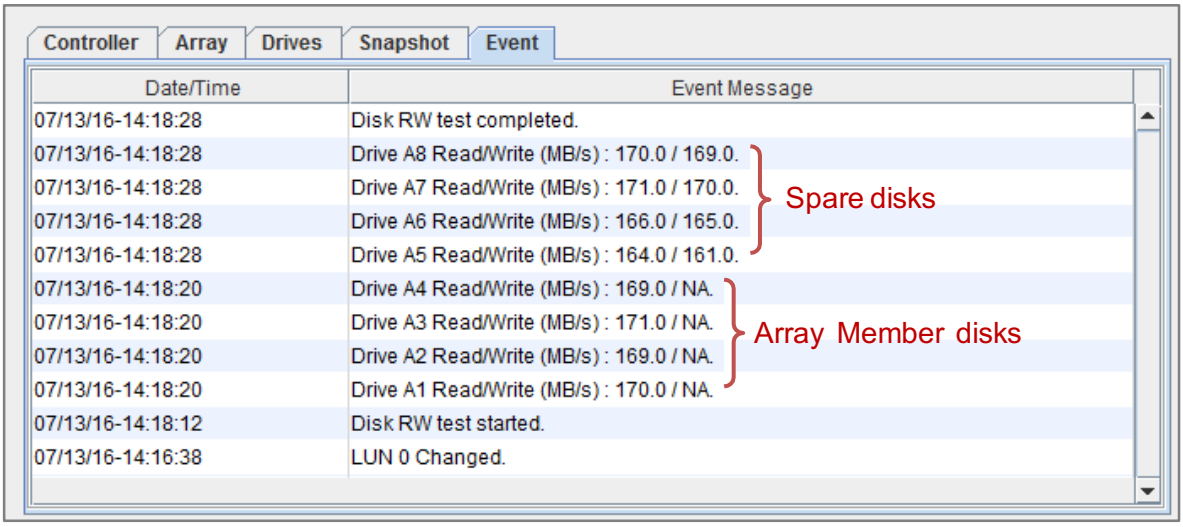
1. Stop IO access into RAID system.
2. Click RAIDGuardX > Tab/Controller > Disk RW test.



3. Click Yes on dialog window.



4. Display test result on Event page.



5. RAID Overview

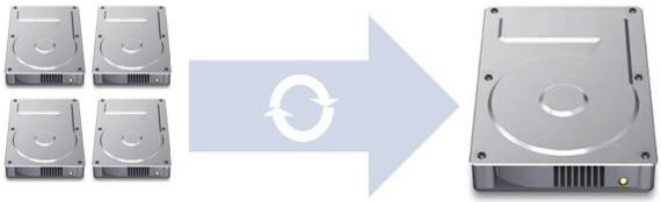
5. RAID Overview

5.1 How RAID Works

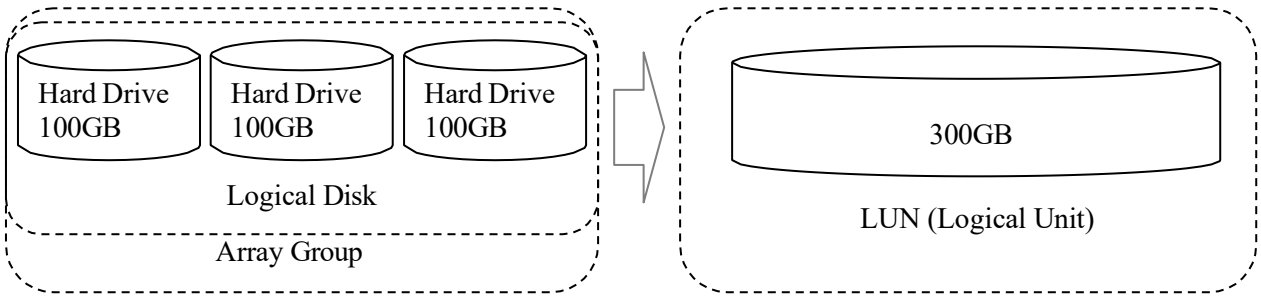
RAID, or Redundant Array of Independent Disks, is a data-storage technology that spreads data across multiple drives. This technology provides several benefits:

- Data redundancy for protection and availability.
- Higher performance as a result of reading or writing on several drives simultaneously.
- Scalability for expansion of storage.

Accusys RAID systems use a hardware controller to manage multiple drives as one or more RAID array group, which offloads RAID task from host, and provides independent, fast and highly efficient storage.



The way of controller stores and retrieves data on the RAID system is determined by the RAID level and storage method you choose. Once you have defined a group of drives as an array group, each logical disk appears to the host system as one Logical Unit (LUN), regardless of the number of actual drives in that logical unit.



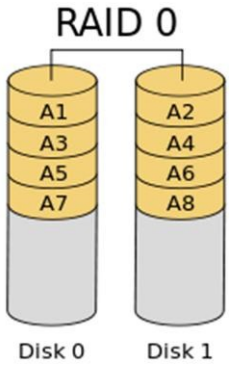
RAID System **Host System**

5.2 RAID Levels

The RAID system supports several RAID levels and configurations. Each level has a different architecture and provides varying degrees of performance and fault tolerance.

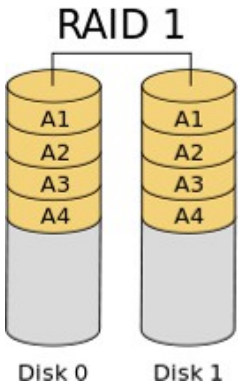
5.2.1 RAID 0: Striping

RAID level 0, striping only, is the fastest and most efficient array type, but offer no fault-tolerance. Any drive failure will destroy the data in the array.



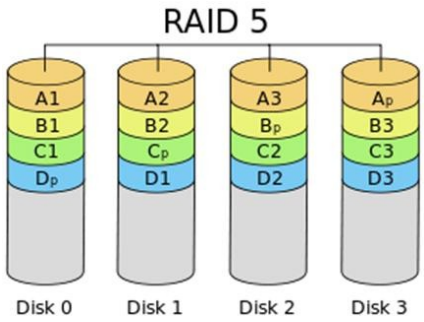
5.2.2 RAID 1: Mirroring

RAID level 1, mirroring, each drive stores identical data. RAID 1 provides very high data reliability and improved performance for read-intensive applications, but this level has a high capacity cost because it retains a full copy of your data on each drive in the mirror set.



5.2.3 RAID 5: Striping Disks with Distributed Parity

By distributing the parity information across all drives in a set, RAID level 5 achieves high reliability and data availability, which allows one of the array member disk to have failure and keeps the storage working. Disk failure has a moderate impact on the total transfer rate.

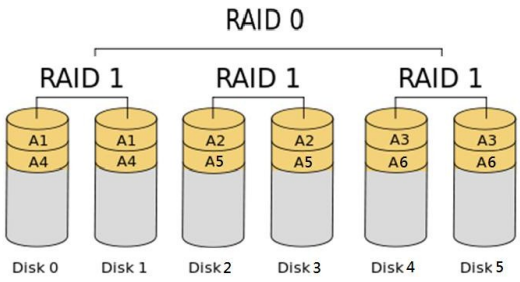


5.2.4 RAID 6: Independent Data Disks with Two Independent Parity Schemes

RAID level 6 extends RAID level 5 by adding an additional parity block; thus it uses block-level striping with two parity blocks distributed across all member disks. RAID 6 allows two of the array member disks to have failures at the same time and keeps the storage working.

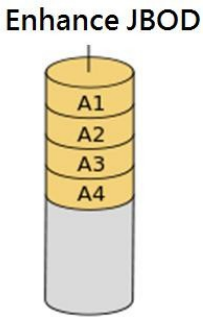
5.2.5 RAID 0+1: Striped Set with Mirroring

RAID 0+1 combines the advantages of RAID 0 and RAID 1 with no disadvantages. RAID 0+1 creates a mirror of the primary striped set. RAID 0+1 provides optimal speed and reliability.



5.2.6 Enhance JBOD: Single Disk

Enhance JBOD is just export single disk to the host system. The capacity and speed are the same as the original single disk.



RAID Level	Data Format	Minimum Drive	Total Capacity (N = number of drive)	Redundancy	Performance
RAID0	Stripe	2	Single Drive * N	None	High
RAID1	Mirror	2	Single Drive * 1	N - 1	Low
RAID5	Stripe with 1 Parity	3	Single Drive * (N-1)	1	Medium
RAID6	Stripe with 2 Parities	4	Single Drive * (N-2)	2	Medium
RAID 0+1	Stripe + Mirror	4	Single Drive * (N/2)	2	Low
Enhance JBOD	Single Drive	1	Single Drive * 1	None	Low

6. Appendix

Appendix A: FAQs

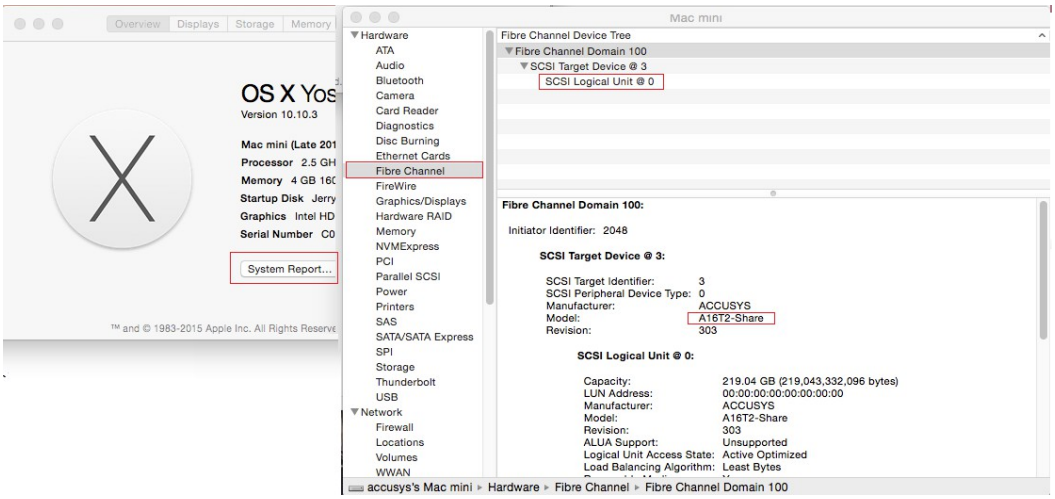
1. **Q: Host and RAID system are connected and up, but I cannot find any controller in RAIDGuardX > Add Controller console.**
   A:
   a. Make sure the Thunderbolt 3 is valid.
   b. Make sure the PCIe host is connecting to SAN port of Z2M or C2M.
   c. Check all hardware connections between host and RAID (Link LED is up)
   d. Have a host reboot to restart RAIDGuardX server.
   e. Re-install the installer (driver and GUI) again.

2. **Q: After creating an array in RAIDGuardX, the volume doesn't appear on the host? A:** Check in Option of RAIDGuardX, if the [LUN Map] and [LUN Connect] is set.

3. **Q: Why doesn't the performance reach the expected levels while testing the A12T3- Share? Why isn't the performance steady enough?**
   A: If the performance is unsteady or not achieving the expected level, following reasons could be the cause.
   a. some of hard drives does not work well.
   b. too many fragmented data.
   To replace problematic drives and try to run defragment function of file system to rearrange fragmented data.

4. **Q: Insert a drive, RAID system start warning with 3 short beeps, the drive's status is locked on RAIDGuardX, why?**
   A: The drive could be initialized in other Accusys product and it contains a portion of a RAID configuration and data. If the data isn't important you can unlock the drive in GUI>Options>Unlock.

5. **Q: How can I make sure my MacOS has probably installed driver and recognized volume?**
   A: Click on **About This Mac** and click on the **More Info…** button, then Click on the **System Report…** button. Normally, MacOS will recognize RAID system as Fibre device, under the **Hardware** category, click on **Fibre Channel** to bring up information. If there is a volume created, a **SCSI logical unit** will be listed under **Fibre Channel Domain**.



6. Q: RAID system alerts 3 short beeps repeatedly, what does it mean?

A: Error could be related to Fan, Power, RAID controller module, or there is a disk been locked. Refer to below table of Beeper Code for more detail.

Beeper mode	**Description**
1 short beep (boot up)	RAID system is ready
1 short beep	Array init, rebuild, expansion, migratrion
2 short beeps	Wrong ID setting of JBOD enclosure
3 short beeps	Error of Fan, Power, RAID or Disk locked
1 long beep	System Panic
long beep repeatedly	PCIe port connects error (Connect to wrong HBA, or Primary (Master) / Secondary (Slave) mode sets wrong)

Appendix B: Customer Service and Support

System Log

When you contact us for technical support, our support staff might ask for your system log file for troubleshooting purpose.

1) RAID controller log by Dump controller log of RAIDGuardX

2) Host operation system log with RAID related error.

Contact Us

Email us for customer services and technical support; Sales: sales@accusys.com.tw

Technical Support: support@accusys.com.tw

Our Website

Please visit our websites frequently for the most up-to-date product and support information. All countries: www.accusys.com.tw