12G SAS NAS System

Hardware Manual

Revision 1.0

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Preface

About this manual

This manual provides information regarding the hardware features, installation and configuration of the **SAS NAS System**. Information contained in the manual has been reviewed for accuracy, but not for product warranty because of the various environment/OS/settings. Information and specifications will be changed without further notice. Some pictures and screenshots might be different with the actual machine.

This manual uses section numbering for every topic being discussed for easy and convenient way of finding information in accordance with the user's needs. The following icons are being used for some details and information to be considered in going through with this manual:

NOTES:
These are notes that contain useful information and tips that the user must give attention to in going through with the subsystem operation.

IMPORTANT!
These are the important information that the user must remember.

WARNING!
These are the warnings that the user must follow to avoid unnecessary errors and bodily injury during hardware and software operation of the subsystem.

CAUTION:
These are the cautions that user must be aware of to prevent damage to the equipment and its components.

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Changes

The material in this document is for information only and is subject to change without notice.

Before You Begin

Before going through with this manual, you should read and focus on the following safety guidelines. Information about the NAS system's packaging and delivery are also included. To provide reasonable protection against any harm on the part of the user and to obtain maximum performance, user is advised to be aware of the following safety guidelines particularly in handling hardware components:

Upon receiving of the product:

❖ Place the product in its proper location.
❖ To avoid unnecessary dropping out, make sure that somebody is around for immediate assistance.
❖ It should be handled with care to avoid dropping that may cause damage to the product. Always use the correct lifting procedures.

Upon installing of the product:

❖ Ambient temperature is very important for the installation site. It must not exceed 30°C. Due to seasonal climate changes; regulate the installation site temperature making it not to exceed the allowed ambient temperature.
❖ Before plugging-in any power cords, cables and connectors, make sure that the power switches are turned off. Disconnect first any power connection if the power supply module is being removed from the enclosure.
❖ Outlets must be accessible to the equipment.
❖ All external connections should be made using shielded cables and as much as possible should not be performed by bare hand. Using anti-static hand gloves is recommended.
❖ In installing each component, secure all the mounting screws and locks. Make sure that all screws are fully tightened. Follow correctly all the listed procedures in this manual for reliable performance.

Controller Configuration

This NAS system supports single RAID controller configuration.

Packaging, Shipment and Delivery

❖ Before removing the subsystem from the shipping carton, you should visually inspect the physical condition of the shipping carton.
❖ Unpack and verify that the contents of the shipping carton are complete and in good condition.
❖ Exterior damage to the shipping carton may indicate that the contents of the carton are damaged.
❖ If any damage is found, do not remove the components; contact the dealer where you purchased the subsystem for further instructions.

Chapter 1   Introduction

The NAS System

1.1   Key Features

- Configurable to 19" rack-mountable 3U chassis
- Supports up to Sixteen (16) 2.5" and 3.5'' hot-swappable 12G/s SAS/SATA hard drives
- Supports RAID levels 0, 1, 5, 6, 10, 50 and 60
- Support four Gigabit Ethernet port for NAS file-sharing application
- Supports hot spare and automatic hot rebuild.
- Centralization of Data and Storage Management
- Real-time drive activity and status indicators
- Allow online capacity expansion within the enclosure
- Locally audible event notification alarm

1.2 Technical Specifications

Hardware Specification
Intel Quad Core Xeon 3.1GHz Processor
Cache memory : 8GB DDR3 ECC SDRAM up to 32GB
Four Gigabit Ethernet ports (10 Gigabit Ethernet for options)
Up to Sixteen (16) 2.5" and 3.5" hot-swappable 12Gb/s SAS. 6Gb/s SATA hard drives
Real-time drive activity and status indicators
Connect up to 128 3Gb/s, 6Gb/s, or 12Gb/s SATA and SAS devices
Two(2) 460W 80plus hot- swappable power supplies with PFC
Spare PCIE/PCI slot for H/W upgrade
RAID Controller
1.2GHz dual core RAID on Chip (ROC) storage processor
RAID level RAID 0, 1, 5, 6, 10, 50, 60
Supports 1GB DDRIII cache memory
Supports hot spare and automatic hot rebuild
Allows online capacity expansion within the enclosure
Local audible event notification alarm
Environmental
Relative humidity : 10%~85% Non-condensing
Operating temp : $10^{o}C \sim 40^{o}C(50^{o}F \sim 104^{o}F)$
Power requirements
AC 100V ~ 240V Full range
10A ~ 5A, 47~63Hz
Physical Dimension
133(H) x 482(W) x 730(D) mm

Specifications are subject to change without notice.
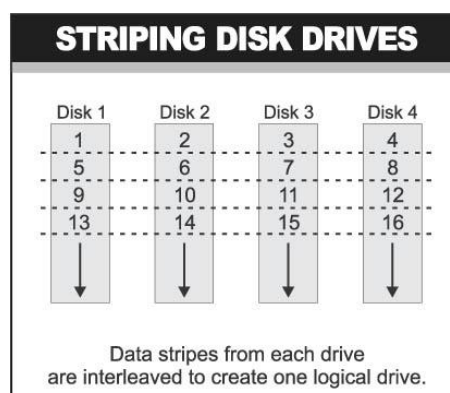
1.3 RAID Concepts

RAID Fundamentals

The basic idea of RAID (Redundant Array of Independent Disks) is to combine multiple inexpensive disk drives into an array of disk drives to obtain performance, capacity and reliability that exceeds that of a single large drive. The array of drives appears to the host computer as a single logical drive.

Five types of array architectures, RAID 1 through RAID 5, were originally defined; each provides disk fault-tolerance with different compromises in features and performance. In addition to these five redundant array architectures, it has become popular to refer to a non-redundant array of disk drives as a RAID 0 arrays.

Disk Striping

Fundamental to RAID technology is striping. This is a method of combining multiple drives into one logical storage unit. Striping partitions the storage space of each drive into stripes, which can be as small as one sector (512 bytes) or as large as several megabytes. These stripes are then interleaved in a rotating sequence, so that the combined space is composed alternately of stripes from each drive. The specific type of operating environment determines whether large or small stripes should be used.

Most operating systems today support concurrent disk I/O operations across multiple drives. However, in order to maximize throughput for the disk subsystem, the I/O load must be balanced across all the drives so that each drive can be kept busy as much as possible. In a multiple drive system without striping, the disk I/O load is never perfectly balanced. Some drives will contain data files that are frequently accessed and some drives will rarely be accessed.

STRIPING DISK DRIVES

Disk 1	Disk 2	Disk 3	Disk 4
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Data stripes from each drive
are interleaved to create one logical drive.

By striping the drives in the array with stripes large enough so that each record falls entirely within one stripe, most records can be evenly distributed across all drives. This keeps all drives in the array busy during heavy load situations. This situation allows all drives to work concurrently on different I/O operations, and thus maximize the number of simultaneous I/O operations that can be performed by the array.

Definition of RAID Levels

RAID 0 is typically defined as a group of striped disk drives without parity or data redundancy. RAID 0 arrays can be configured with large stripes for multi-user environments or small stripes for single-user systems that access long sequential records. RAID 0 arrays deliver the best data storage efficiency and performance of any array type. The disadvantage is that if one drive in a RAID 0 array fails, the entire array fails.
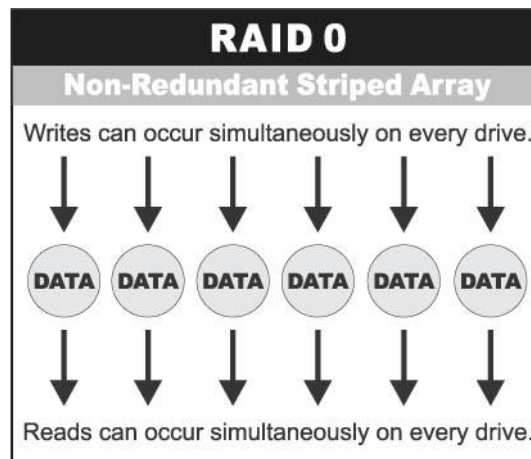

RAID 1, also known as disk mirroring, is simply a pair of disk drives that store duplicate data but appear to the computer as a single drive. Although striping is not used within a single mirrored drive pair, multiple RAID 1 arrays can be striped together to create a single large array consisting of pairs of mirrored drives. All writes must go to both drives of a mirrored pair so that the information on the drives is kept identical. However, each individual drive can perform simultaneous, independent read operations. Mirroring thus doubles the read performance of a single non-mirrored drive and while the write performance is unchanged. RAID 1 delivers the best performance of any redundant array type. In addition, there is less performance degradation during drive failure than in RAID 5 arrays.
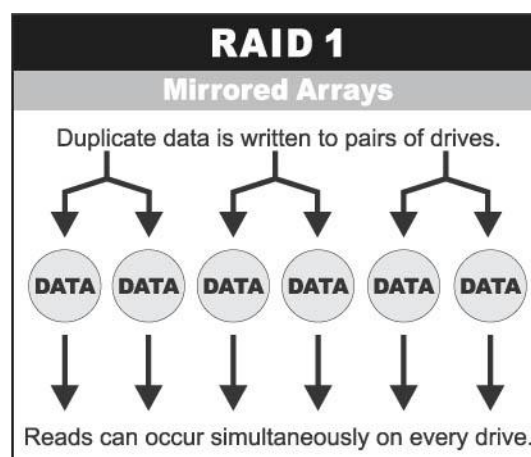
Under **RAID 5** parity information is distributed across all the drives. Since there is no dedicated parity drive, all drives contain data and read operations can be overlapped on every drive in the array. Write operations will typically access one data drive and one parity drive. However, because different records store their parity on different drives, write operations can usually be overlapped.
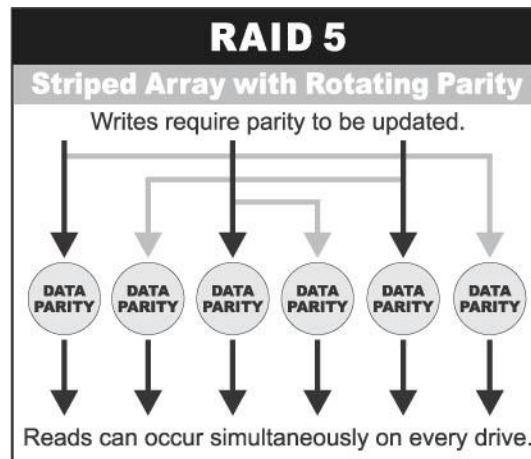
RAID 6 is similar to RAID 5 in that data protection is achieved by writing parity information to the physical drives in the array. With RAID 6, however, *two* sets of parity data are used. These two sets are different, and each set occupies a capacity equivalent to that of one of the constituent drives. The main advantage of RAID 6 is High data availability – any two drives can fail without loss of critical data.
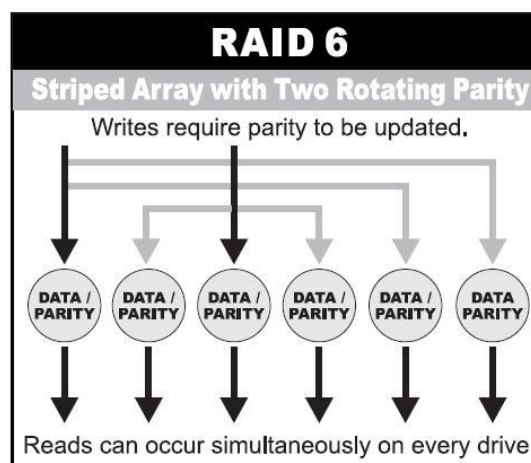
Dual-level RAID achieves a balance between the increased data availability inherent in RAID 1 and RAID 5 and the increased read performance inherent in disk striping (RAID 0). These arrays are sometimes referred to as RAID 0+1 or RAID 10 and RAID 0+5 or RAID 50.

In summary:

- RAID 0 is the fastest and most efficient array type but offers no fault-tolerance. RAID 0 requires a minimum of two drives.

- RAID 1 is the best choice for performance-critical, fault-tolerant environments. RAID 1 is the only choice for fault-tolerance if no more than two drives are used.

- RAID 5 combines efficient, fault-tolerant data storage with good performance characteristics. However, write performance and performance during drive failure is slower than with RAID 1. Rebuild operations also require more time than with RAID 1 because parity information is also reconstructed. At least three drives are required for RAID 5 arrays.

- RAID 6 is essentially an extension of RAID level 5 which allows for additional fault tolerance by using a second independent distributed parity scheme (two-dimensional parity). Data is striped on a block level across a set of drives, just like in RAID 5, and a second set of parity is calculated and written across all the drives; RAID 6 provides for an extremely high data fault tolerance and can sustain multiple simultaneous drive failures. It is a perfect solution for mission critical applications.

1.4   Array Definition

1.4.1   Drive Group

A Drive Group is a group of physical drives attached to the RAID controller, and where one or more Virtual Drives (VD) can be created. All Virtual Drives in the Drive Group use all of the physical drives in the Drive Group.

It is not possible to have multiple Disk Groups on the same physical disks. If physical disks of different capacity are grouped together in a Drive Group, then the capacity of the smallest disk will become the effective capacity of all the disks in the Drive Group.

1.4.2   Virtual Drive

A Virtual Drive is seen by the operating system as a single drive or logical device. A Virtual Drive is a storage unit created by the RAID controller from one or more physical drives. If there is an existing Drive Group and there is available Free Space, then a new Virtual Drive can still be created.

Depending on the RAID level used, the Virtual Drive may retain redundant data in case of a drive failure.

Chapter 2   Getting Started

2.1   Packaging, Shipment and Delivery

❖ Before removing the subsystem from the shipping carton, you should visually inspect the physical condition of the shipping carton.

❖ Unpack the subsystem and verify that the contents of the shipping carton are all there and in good condition.

❖ Exterior damage to the shipping carton may indicate that the contents of the carton are damaged.

❖ If any damage is found, do not remove the components; contact the dealer where you purchased the subsystem for further instructions.

2.2   Unpacking the NAS System

The package contains the following items:

NAS System Unit	
Two (2) power cords	
Four (4) Ethernet LAN cables	
One (1) RS232 null modem cable (phone jack to DB9)	
Installation Reference Guide	
Spare screws, etc.	

If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.
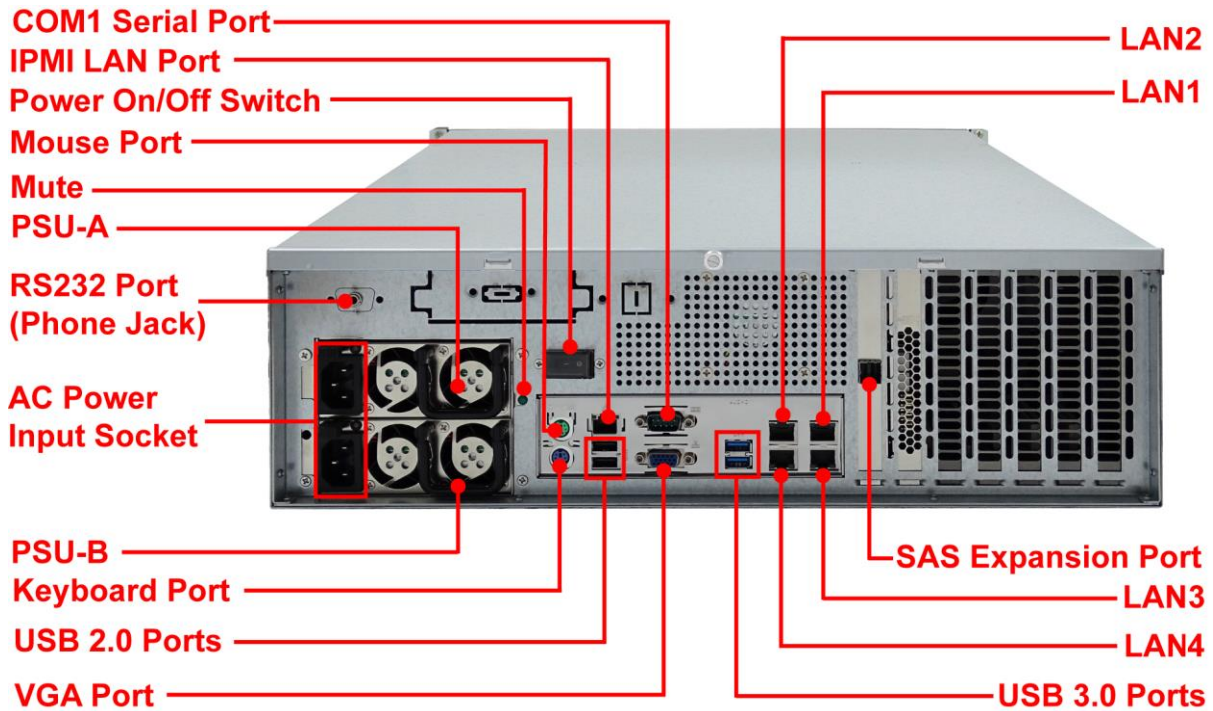
2.3 Identifying Parts of the NAS System

The illustrations below identify the various parts of the subsystem.

2.3.1 Front View
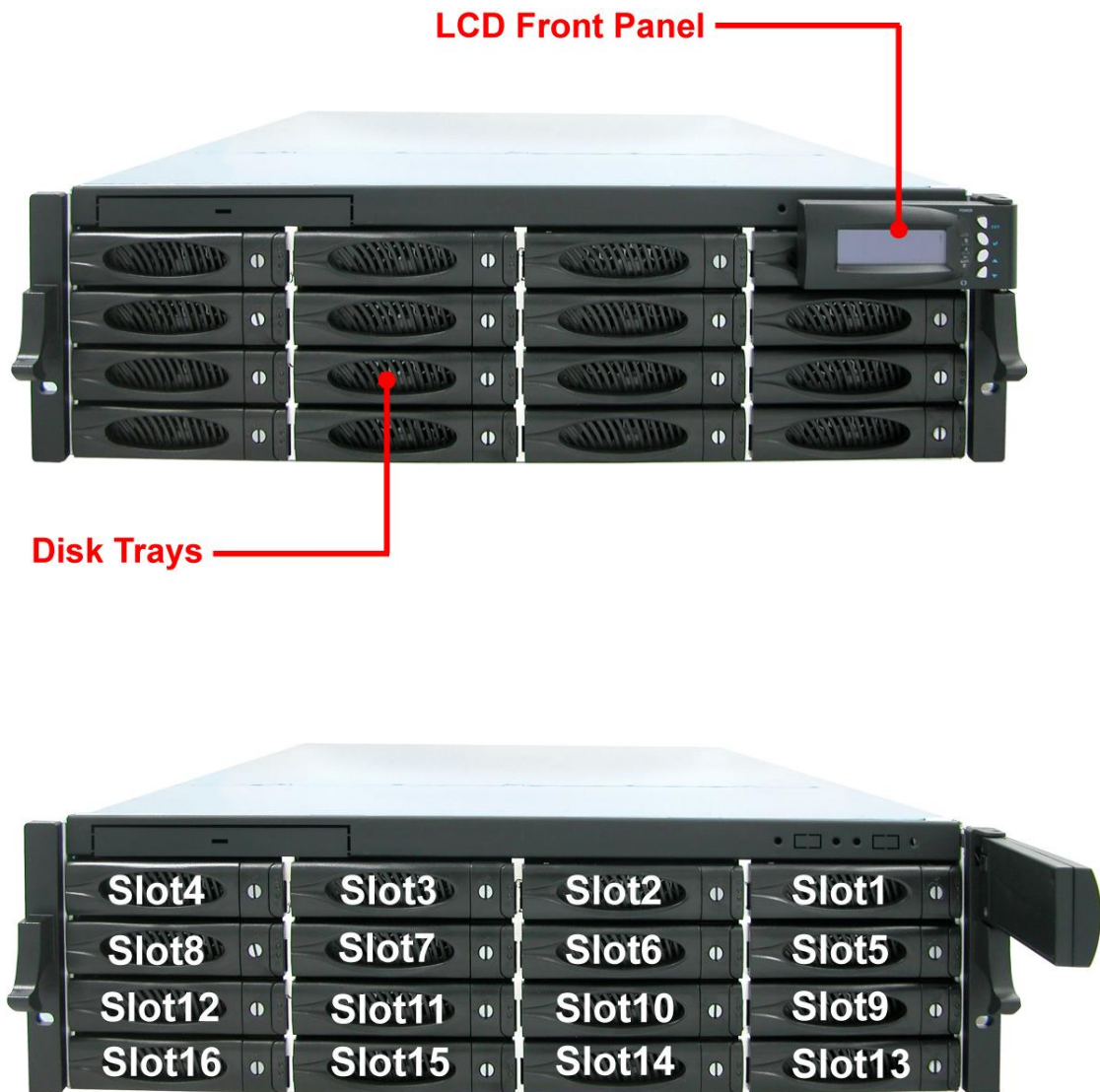
2.3.2 Rear View

1. **COM1 Serial Port** –The system has one COM1 serial port.

2. **Power On/Off Switch** – Use this switch to power on the system.

3. **Mute** – Use the mute button to stop the power supply buzzer alarm.

4. **Power Supply A, B** – Two power supplies PSU-A and PSU-B are located at the rear of the NAS system.

5. **RS232 Port (Phone-Jack)** – This is used for upgrading the firmware of JBOD Controller SAS Expander board.

6. **AC Power Input Socket** – Use this to plug in the power cable connected from power source.

7. **USB 2.0 ports** – Two USB 2.0 ports are located at the rear of the system.

8. **VGA Port** – Use this to connect a VGA monitor.

9. **LAN Ports** – The system comes with four 1Gigabit Ethernet ports LAN1, LAN2, LAN3 and LAN4.

10. **SAS Expansion Port** – For connecting to SAS Expansion Chassis.

11. **USB 3.0 Port –** Two USB 3.0 ports are located at the rear of the system. The USB 3.0 port supports the USB 3.0 specification and is compatible to the USB 2.0/1.1 specification.

2.4 Drive Carrier Module

The Drive Carrier Module houses a 2.5 inch / 3.5 inch hard disk drive. It is designed for maximum airflow and incorporates a carrier locking mechanism to prevent unauthorized access to the HDD.

2.4.1 Disk Drive Status Indicators

Every Drive Carrier has 2 status indicator lights. One indicator light is used for Power On/Error. When this light is **GREEN** the power is on and everything is functioning normally. When the Power On/Error light is **RED**, then an error has occur that requires the user's attention.

The other status indicator light is the hard disk drive access light. When the hard disk drive is being accessed, this light will flash **BLUE**.

In addition, both indicator lights are viewable within a 170° arc.

Disk Activity Indicator

Disk Status Indicator
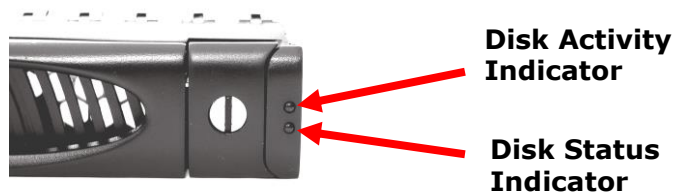
2.4.2 Lock Indicator

Every Drive Carrier is lockable and is fitted with a lock indicator to indicate whether or not the carrier is locked into the chassis or not. Each carrier is also fitted with an ergonomic handle for easy carrier removal.

When the Lock Groove is horizontal, this indicates that the Drive Carrier is locked. When the Lock Groove is vertical, then the Drive Carrier is unlocked. Lock and unlock the Drive Carriers by using a flat-head screw driver.

Drive Carrier is unlocked

Drive Carrier is locked
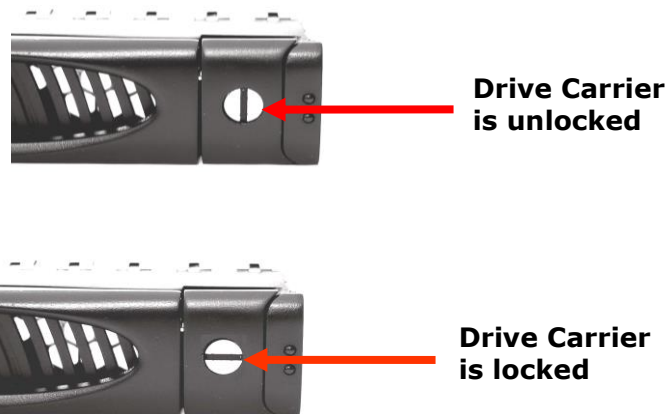
2.5 Installing Hard Drives
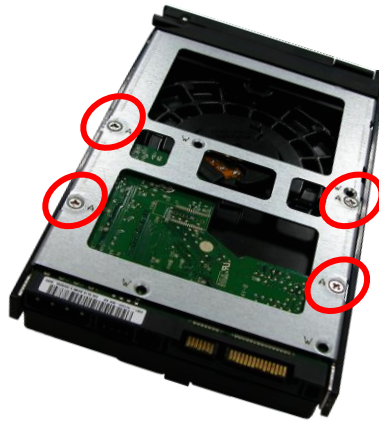
2.5.1 Installing 3.5" Disk in a Disk Tray

a. Make sure the lock indicator is in unlocked position. To pull out a disk tray, press the tray open button.

Tray Open Button
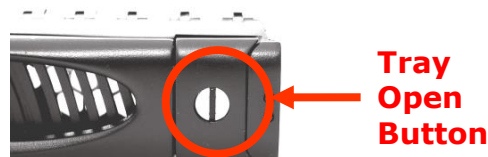
b. Pull out an empty disk tray. Pull the lever handle outwards to remove the carrier from the enclosure.

c. Place the hard drive in the disk tray.

d. Install the mounting screws on the bottom part to secure the drive in the disk tray.

Tray Hole A

e. Slide the tray into a slot.

f. Close the lever handle until you hear the latch click into place.

2.5.2 Installing 2.5" Disk in a Disk Tray

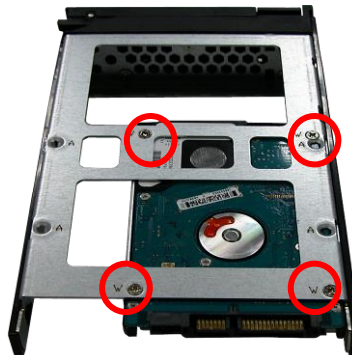a. Make sure the lock indicator is in unlocked position. To pull out a disk tray, press the tray open button.

Tray Open Button

b. Pull out an empty disk tray. Pull the lever handle outwards to remove the carrier from the enclosure.

c. Place the 2.5" hard drive in the disk tray.

d. Install the mounting screws on the bottom part to secure the drive in the disk tray.

Tray Hole W

e. Slide the tray into a slot.
f. Close the lever handle until you hear the latch click into place.

2.6 Preparing the System

1. Attach network cable to Ethernet port LAN1. Connect the other end to your network switch. You may also connect the other Ethernet LAN1 port if needed.

2. Connect monitor to the VGA port.

3. Connect PS/2 keyboard and mouse.

2.7 Powering On

1. Plug in the two power cords into the AC Power Input Socket of PSU located at the rear of the NAS system.

> **NOTE: The NAS system is equipped with redundant, full range power supplies with PFC (power factor correction). The system will automatically select voltage.**

2. Open the protective cover of the Power On/Off Switch.
3. Press the Power On/Off Switch to power on the NAS.
4. The Power LED on the front Panel will turn green.