SAS JBOD Enclosure

ARC-4038 series

(8/12-Bays 12Gb/s SAS Tower JBOD Enclosure)

USER'S Manual

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FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

Manufacturer's Declaration for CE Certification

We confirm ARC-4038 series has been tested and found comply with the requirements set up in the council directive on the approximation of the low of member state relating to the EMC Directive 2004/108/EC. For the evaluation regarding to the electromag-netic compatibility, the following standards where applied:

EN 55022: 2006, Class B
EN 61000-3-2: 2006
EN 61000-3-3: 1995+A1: 2001+A2: 2005

EN 55024:1998+A1:2001=A2:2003
   IEC61000-4-2: 2001
   IEC61000-4-3: 2006
   IEC61000-4-4: 2004
   IEC61000-4-5: 2005
   IEC61000-4-6: 2006
   IEC61000-4-8: 2001
   IEC61000-4-11: 2004

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INTRODUCTION

1. Introduction

This section presents a brief overview of the ARC-4038 compact tower 12Gb/s SAS JBOD enclosure.

1.1 Overview

The ARC-4038 SAS-to-SAS JBOD box provides a compact external storage chassis capable of accommodating up to 8/12 12Gb/s Serial-Attached SCSI (SAS) drives or 6Gb/s Serial ATA (SATA) drives. The box can support both 3.5-inch disk drives and 2.5-inch disk drives, each one contained in its individual hole on the disk carrier. The expander module on ARC-4038 is designed with an integrated ARM Cortex-R4 processor for topology management functions such as discovery, enclosure and drive management, and LED management. Each ARC-4038 compact tower JBOD supports four 12Gb/s SFF-8644 and one 6Gb/s SFF-8088 SAS host and expansion connections. Out-of-band CLI can re-define manufacture default setting on those connections. Configuration and environmental information is accessible either via in-band (SES-3.0 over SMP) or out-of-band serial port.

Unparalleled Performance

The 12Gb/s ARC-4038 offers 28 ports of connectivity in a 8/12-bay desktop tower. It can provide internally connectivity for up to 8/12 direct attached SAS/SATA HDDs and or SSDs and 20 external ports (using 4 x SFF-8644 and 1 x SFF-8088 connector) for storage host/expansion connections. High performance architecture sets new boundaries of industry performance expectations: 12Gb/s SAS or 6.0Gb/s and 3Gb/s SAS/SATA. The ARC-4038 incorporates the latest enhancements in SAS along with new LSI DataBolt bandwidth optimizer technology. This is designed to help facilitate the industry transition to 12Gb/s SAS-enabled systems by allowing users to take advantage of 12Gb/s speeds while utilizing existing 6Gb/s drives and backplanes. Using DataBolt, the ARC-4038 buffers 6Gb/s data and then transfers it out to the host at 12Gb/s speeds in order to match the bandwidth between faster hosts and slower SAS or SATA devices.

INTRODUCTION

Easy Management

The ARC-4038 contains an embedded expander manager that can access via in-band SES-3.0 over SMP protocol and out-of band RS-232 port. An out-of-band serial port is available for managing the configuration and monitoring the expander. The ARC-4038 expander firmware and EPLD has implemented the SES-3.0 protocol and disk activity map to the individual fault/activity status indicator on the backplanes. It has implemented autonomous chassis management of power supply status connectors, two fan monitor/speed control connectors through the SES-3.0 protocol. In data center environments, identifying issues with drives and environments are crucial. The hardware monitor can monitor system voltage and emperature. The warning message will be shown in alarm buzzer and respect LED.

Maximum Interoperability

Areca presents its ultra-high performance and high reliability 12Gb/s SAS expander module for a cost-effective and enterprise-class JBOD storage enclosure. A 12Gb/s SAS expander module literally expands the number of end devices that you can connect together. Expander devices, typically embedded into an expander module to connect system backplane, support large configurations of SAS end devices, including SAS host/RAID adapters and SAS and SATA disk drives. The SAS protocol defines a mechanism that has been implemented in the SAS expanders to guarantee fair access between drives in a domain. The ARC-4038 is ideal for 12Gb/s SAS storage systems with external interfaces and get the benefits of more storage capacity. The type and total amount of drives you use are based on the host interface in the server that the JBOD is connected. Host-based RAID configuration is supported via an external connectors on PCIe to 12Gb/s SAS RAID controller, external series SAS/Fibre/iSCSI to 12Gb/s SAS RAID and SAS host adapters.

INTRODUCTION

1.2. Features

Drives

SAS hard drives
- Up to 8/12 2.5-inch or 3.5-inch SAS hot-plug hard drives (12.0 Gb/s) at speeds of 7.2K, 10K or 15K rpm

SATA hard drives
- Up to 8/12 2.5-inch or 3.5-inch SATA hot-plug hard drives (12.0 Gb/s) at speeds of 7.2K or 10K rpm

JBOD Controller Module

Expander board	1 module
Sensors	1 sensor

Backplane Board

Connectors
- 8/12 SAS hard-drive connectors
- 1 power supply connector
- 2 cooling fan module connectors
- 1 sets of expander board connector

Controller Back-Panel Connectors

I/O connectors
- 2 x SFF-8644 "Host In" connectors for connection to the host
- 1 x SFF-8088 "Host In" connectors for connection to the host (only for 8-bays enclosure)
- 2 x SFF-8644 "Expansion Out" connectors for expansion to an additional JBOD enclosure

Management connectors
- 1 x 6-pin UART RJ-11 connector
- 1 x RJ-45 LAN connector (manufacture manager only)

LED Indicators

Hard-drive carrier
- 1 blue single-color activity LED status indicator
- 1 two-color fault/power LED status indicator

Expander board
- 2 x One-color LED status indicators for each SAS host port, one for SAS host port link and one for the activity status
- 2 x One-color LED status indicators for each SAS expansion port, one for SAS expansion port link and one for the activity state

Power Supplies
- Wattage   220 W maximum continuous
- Voltage   90–256 V rated
- Frequency   50–60 Hz
- Amperage   +12V/16A, +5V/16A, +3.3V/14A

Cooling Fan
- Speed   2 X 2700rpm/brushless fan
- Amperage   2 X 0.135A

Physical
ARC-4038-8
- Height   302 mm
- Width   146 mm
- Depth   290 mm
- Weight   14.9lbs/6.8 kg (without disk)

ARC-4038-12
- Height   310 mm
- Width   206 mm
- Depth   290 mm
- Weight   20.8lbs/9.5 kg (without disk)

Environmental
Temperature:
Operating   0° to 40°C
Storage   −40° to 60°C

Relative humidity:
Operating   10% to 80% (non-condensing)
Storage   5% to 95% (non-condensing)

HARDWARE INSTALLATION

2. Hardware Installation

This section describes how to install the ARC-4038 compact tower 12Gb/s SAS JBOD enclosure with host computer and disks.

2.1 Before You First Installing

Thanks for purchasing the ARC-4038 as your compact tower JBOD data storage enclosure. The following manual gives simple step-by-step instructions for installing and configuring the ARC-4038 JBOD enclosure.

Unpack
Unpack and install the hardware in a static-free environment. The ARC-4038 JBOD enclosure is packed inside an anti-static bag between two sponge sheets. Remove it and inspect it for damage. If the ARC-4038 JBOD enclosure appears damaged, or if any items of the contents listed below are missing or damaged, please contact your dealer or distributor immediately.
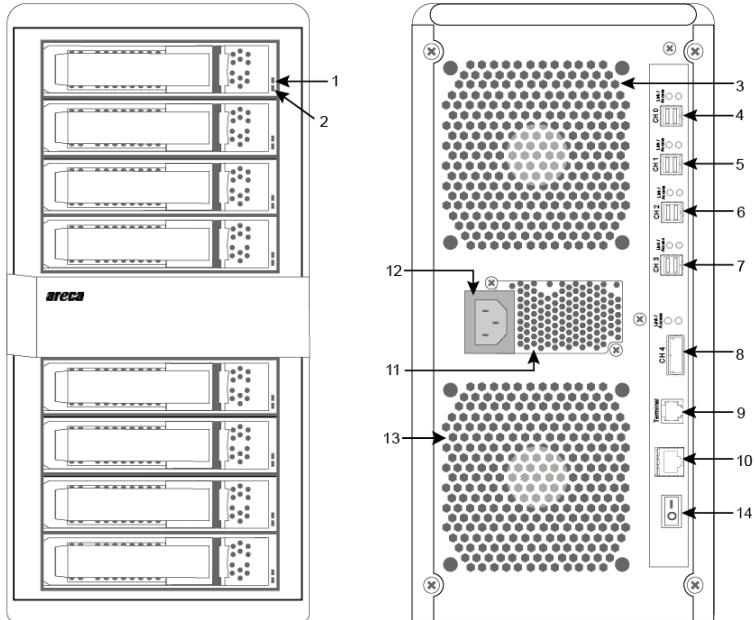
Checklist
• ARC-4038 8/12-bays compact tower JBOD enclosure
• SFF-8088 to SFF-8088 cable (optional)
• SFF-8644 to SFF-8644 cable (optional)
• 1 x Power cord
• 1 x RJ11 to RS-232 DB9 cable
• 1 x RJ-45 LAN cable
• 32/48 x drive mounting screws (4 per drive tray)
• 1 x ARC-4038 quick installation guide

2.2 ARC-4038 JBOD Enclosure View

The following diagram is the ARC-4038-8 compact tower JBOD enclosure front view and rear view.

Front View	Rear View
1. Disk Activity LED 2. Disk Fault/Power LED	3. System Fan 4. SAS Host Port0 (CH0)* 5. SAS Host Port1 (CH1)* 6. SAS Expansion Port0 (CH2)* 7. SAS Expansion Port1 (CH3)* 8. SAS Host Port2 (CH4)* 9. RS232 Port 10. LAN Port 11. Power Supply Fan 12. Power Connector 13. System Fan 14. On/Off Switch

* Note: This is the default configuration. You can use the CLI to set it as a expansion port or host port.

HARDWARE INSTALLATION

The following diagram is the ARC-4038-12 compact tower JBOD enclosure front view and rear view.

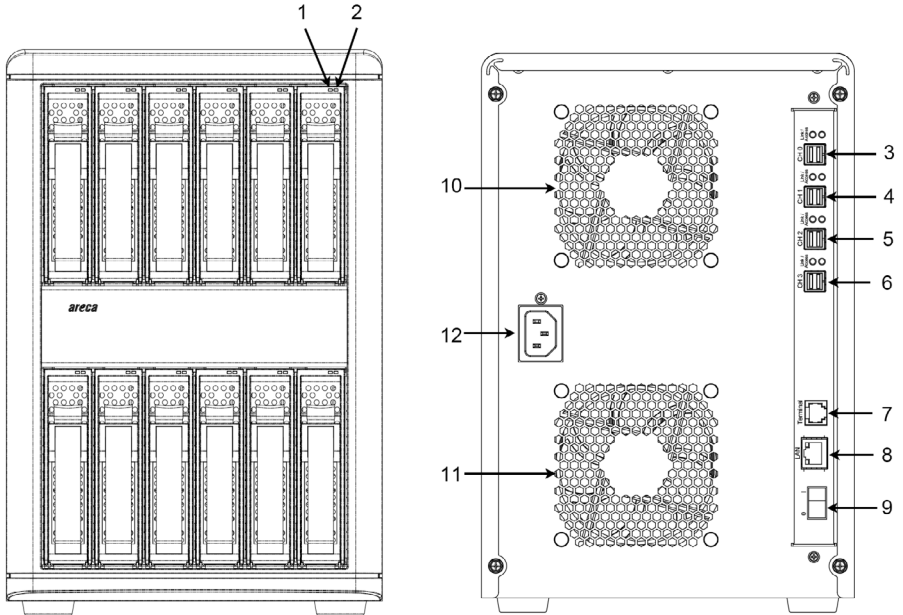| Front View	Rear View
1. Disk Activity LED 2. Disk Fault/Link LED	3. SAS Host Port0 (CH0)* 4. SAS Host Port1 (CH1)* 5. SAS Expansion Port0 (CH2)* 6. SAS Expansion Port1 (CH3)* 7. RS232 Port 8. LAN Port 9. On/Off Switch 10. System Fan 11. System Fan 12. Power Connector

* Note: This is the default configuration. You can use the CLI to set it as a expansion port or host port.

HARDWARE INSTALLATION

2.3 Locations of the Subsystem Component

The following describes the activity and fault LED location and function.

2.3.1 Drive Tray LED Indicators
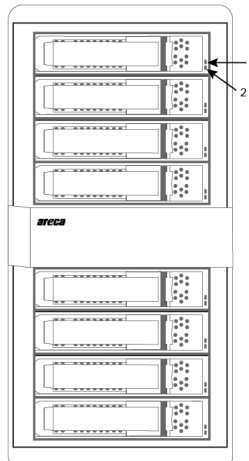
Figure 2-1, Activity/Fault LED for ARC-4038 compact tower JBOD enclosure

LED	Normal Status	Problem Indication
1. Activity LED (Blue)	When the activity LED is illuminated, there is I/O activity on that disk drive. When the LED is dark, there is no activity on that disk drive.	N/A
2. Fault/Power LED (Red/Green)	When the fault LED is solid illuminated, there is no disk present. When the power LED is solid illuminated and fault LED (red) is off, there is a disk present and normal status.	When the fault LED (red) is slow blinking (2 times/sec.), that disk drive has failed and should be hot-swapped immediately. When the activity LED (blue) is illuminated and fault LED (red) is fast blinking (10 times/sec.) there is rebuilding activity on that disk drive.

HARDWARE INSTALLATION

2.3.2 SAS Host/Expander LED Indicators
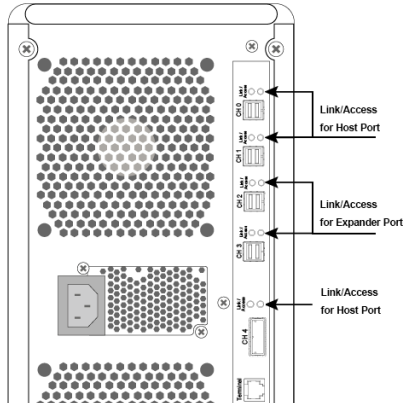
The following table describes the ARC-4038 SAS compact tower JBOD enclosure host port link/activity LED.

Host Function LED	Status
Link LED (Green light)	When host port link LED is illuminated for 1 second and light off for 3 seconds that indicates one link has connected. When host port Link LED is illuminated for 2 seconds and light off for 2 seconds that indicates two links have connected. When host port Link LED is illuminated for 4 seconds that indicates four links have connected.
Activity LED (Blue light)	When activity LED is illuminated that indicates SAS host adapter accesses to the ARC-4038 JBOD enclosure.

The following table describes the ARC-4038 SAS compact tower JBOD enclosure expander port link/activity LED.

JBOD Function LED	Status
Link LED (Green light)	When expander port link LED is illuminated for 1 second and light off for 3 seconds that indicates one link has connected. When expander port Link LED is illuminated for 2 seconds and light off for 2 seconds that indicates two links have connected. When expander port Link LED is illuminated for 4 seconds that indicates four links have connected.
Activity LED (Blue light)	When activity LED is illuminated that indicates ARC-4038 expander port accesses to the SAS JBOD.

2.4 Installation

Your enclosure supports up to 8 3.5-inch disk drives or 2.5-inch SAS or SATA 12.0Gb/s drives, each one contained in its individual drive carrier. Each drive is hot-pluggable, allowing you to remove and insert drives without shutting down your enclosure.

Following the instruction below to install ARC-4038 compact tower JBOD enclosure.

Step 1. Installing SAS/SATA Drives in the ARC–4038 JBOD Enclosure

Follow the steps below to install the 3.5-inch drives or 2.5-inch drives into the drive tray.

a. Install the drives into the drive tray and make sure the holes of the disk trays align with the holes of the drive.
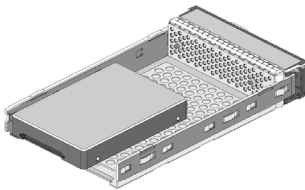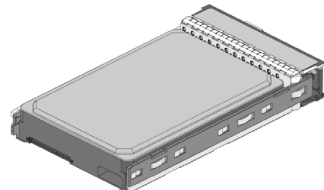
Figure 2-2, Put 2.5-inch SAS/SATA drive into disk tray

Figure 2-3, Put 3.5-inch SAS/SATA drive into disk tray

b. Turn the drive tray upside down and using a screwdriver to se-cure the drive to the drive tray by four of the mounting screws.

For 6TB drive

Figure 2-4, Installing 2.5-inch SAS/SATA Drive
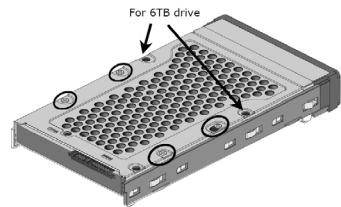
Figure 2-5, Installing 3.5-inch SAS/SATA Drive

c. After all drives are in the drive tray, slide all of them back into the ARC-4038 JBOD enclosure and make sure you latch the drive trays.
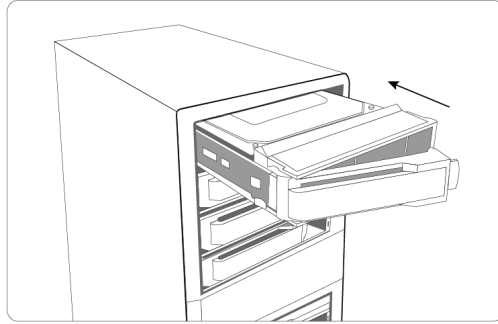
Figure 2-6, Slide drive tray back into the ARC-4038

Note:

Please secure four of the mounting screws to the tray, otherwise the ARC-4038 may produce an annoying BUZZ sound in a few environments.

Step 2. Connecting ARC-4038 SAS JBOD Enclosure to Host Computer or Next JBOD

The external host and expansion connectors are provided on the back of the SAS JBOD enclosure for connecting the JBOD to external RAID controller, server host adapter or next JBOD. There are four host SFF-8644 connectors and one expansion SFF-8088 connectors on the rear of ARC-4038.

• Host Port Connection
By installing host port adapter and ARC-4038 Host Port0 and Host Port1 using the correct external cables which are included in your SAS JBOD enclosure kits. Then connect ARC-4038 SAS JBOD enclosure and host port adapter as shown below:

(a). Basic Connection

Connect the ARC-4038 to a single host using one SFF-8088 cable.
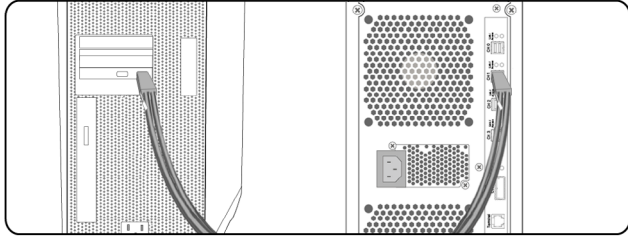
Figure 2-7, Connect ARC-4038 SAS JBOD enclosure and host adapter

Note:

Turn on the ARC-4038 SAS JBOD enclosure first to make sure the host adapter or RAID controllers on the server recognizes the drives in the subsystem.

(b). Performance Connection

Connect the ARC-4038 to dual connectors on the host controller board using two SFF-8644 cables. This configuration can get the benefit of better performance.
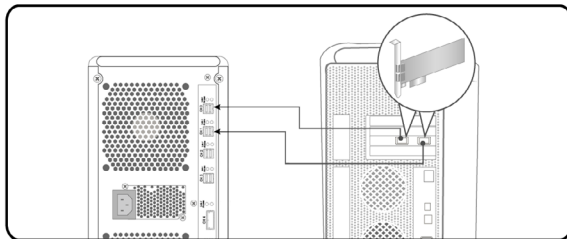
Figure 2-8, Connect ARC-4038 SAS JBOD enclosure and host adapter

(c). Failover Connection

Connect the ARC-4038 dual host ports to dual host controller boards using two SFF-8644 cables. This configuration can get the failover funcion on the host controllers.

HARDWARE INSTALLATION
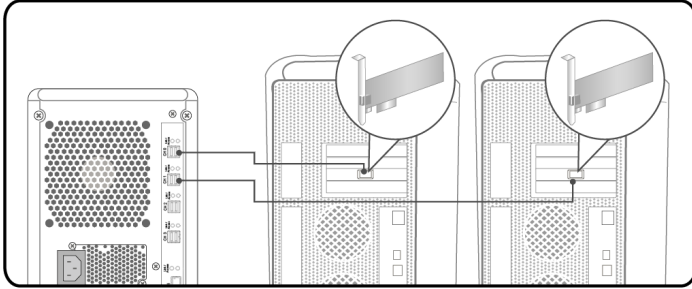
Figure 2-9, Connect ARC-4038 SAS JBOD enclosure and two host adapters

• Expander Port Connection

ARC-4038 SAS JBOD enclosure is a device that contains two expander ports. Expander ports may support being attached to SAS initiator ports, SAS and/or SATA target ports, and to other expander ports. The SAS JBOD enclosure can support daisy-chain how many SAS JBOD enclosures which depend on the host RAID controller's or server host adapter's firmware. The following figure shows how to connect the external Min SAS cable from the ARC-4038 SAS JBOD enclosure to the external connectors on the ARC-1883x. Daisy-chains longer than the limitation of subsystems are not supported even if it may be workable.
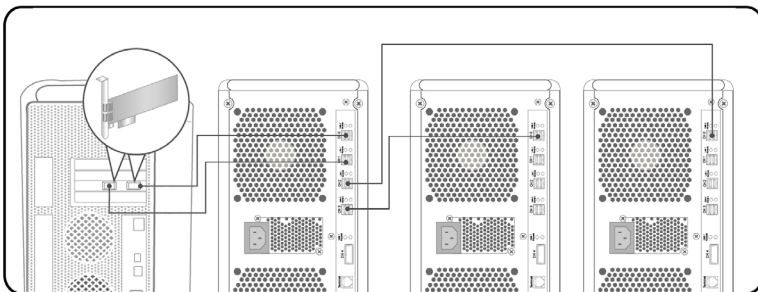
Note:

Turn on the expander enclosure first to make sure the SAS RAID controller or SAS host adapter recognizes the drives in the enclosure.

Step 3. Connecting RS232C Monitor Port

You can connect RS-232 port to the manager clinet system. It is easy to configure and manage the JBOD enclosure from the client system. The ARC-4038 JBOD enclosure can be configured via a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program. You can attach a serial (Character-Based) terminal or server com port to the SAS JBOD enclosure for access to the text-based setup menu.

Step 4. Power Up the JBOD Enclosure

Turn on the AC power switch from power supply on the rear side of the ARC-4038 JBOD enclosure.

a. Using the included power cord, connect this power cord to a grounded electronical outlet and to the ARC-4038 JBOD enclosure. (manufacture recommends that you use an uninterruptible power supply to protect your ARC-4038 SAS JBOD enclosure.)

b. Turn on the AC power switch from the back of ARC-4038 JBOD enclosure.
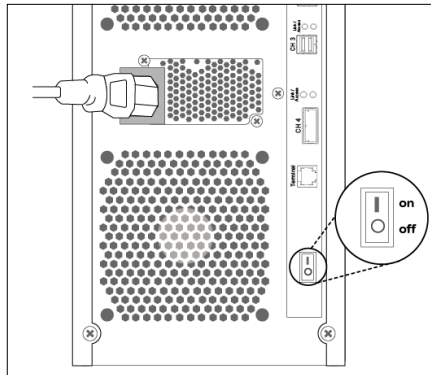
Figure 2-10, Connect the power cord to a grounded electrical outlet and to the ARC-4038 JBOD enclosure.

HARDWARE INSTALLATION

Step 5. Configure JBOD Enclosure

Your ARC-4038 JBOD enclosure can be configured by using a serial device (terminal emulation). The ARC-4038 JBOD enclosure can be configured via a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program. You can attach a serial (Character-Based) terminal or server com port to the JBOD enclosure for access to the text-based setup menu. For additional information on using the RS-232 port to configure the JBOD enclosure see the Chapter 3 of CLI Features.

Step 6. Turn on Host Computer Power

Safety checks the installation. Connect all power code. Turn on the AC power switch at the rear of host computer then press the power button at the front of the host computer.

> **Note:**
>
> It is a good idea to turn on your ARC-4038 Compact Tower-JBOD enclosure before turning on the host computer. This will insure that the host computer recognizes the volumes and drives in the ARC-4038 JBOD enclosure. If you turn on the host computer first, be sure of your host subsystem supporting hot-plug function or rescan command to recognize the ARC-4038 JBOD enclosure again.

Step 7. Format, Partition and Mount the ARC-4038 JBOD Enclosure Volumes

After the volume set is ready for system accesses, it needs to be partitioned, formatted, and mounted by the operating system. There are various steps, depending on what operating system you are using (Windows, Linux, FreeBSD or Mac, etc.). Detailed steps for each operating system are provided on their disk utility. After that, the ARC-4038 JBOD enclosure can be fully used.

3. CLI Features

This Command Line Interface (CLI) is provided for you to configure the 8 bays compact tower JBOD enclosure functions. The CLI is useful in environments where a graphical user interface (GUI) is not available.

• Locations of RS-232C Port
The ARC-4038 JBOD enclosure uses the RJ11 port as the serial port interface. Please use the cable included on the shipping box to configure the expander controller.
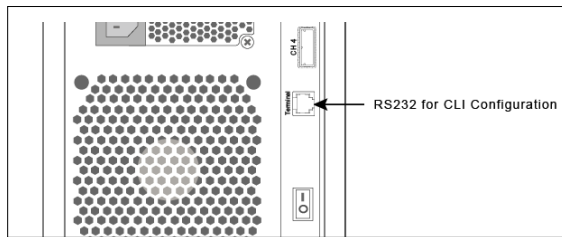
• Establishing the Connection for the RS-232 Port

The CLI function can be done by using an ANSI/VT-100 compatible terminal emulation program. You must complete the appropriate installation procedure before proceeding with the CLI function. Whichever terminal emulation program is used must support the 1K XMODEM file transfer protocol.

The serial port on the SAS expander controller's back panel can be used in VT100 mode. The provided interface cable converts the RS-232 signal of the RJ11 connector on the SAS expander controller into a 9-pin D-Sub male connector. The firmware-based terminal SAS expander management interface can access the expander through this RS-232 port. You can attach a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program to the serial port for accessing the text-based setup menu.

3.1 Expander RS-232C Port Pin Assignment
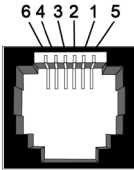
To ensure proper communications between the SAS expander controller and the VT-100 Terminal Emulation, Please configure the VT100 terminal emulation settings to the values shown below:

CLI FEATURES

Terminal requirement	
Connection	Null-modem cable
Baud Rate	115,200
Data bits	8
Stop	1
Flow Control	None

The controller RJ11 connector pin assignments are defined as below.

Pin Assignment				
Pin	Definition	Pin	Definition	
1	RTS (RS232)	4	GND	
2	RXD (RS232)	5	GND	
3	TXD (RS232)	6	GND	

6 4 3 2 1 5

3.2 Start-up VT100 Screen

By connecting a VT100 compatible terminal, or a PC operating in an equivalent terminal emulation mode, all CLI administration functions can be exercised from the VT100 terminal. There are a wide variety of Terminal Emulation packages, but for the most part they should be very similar. The following setup procedure is an example setup VT100 Terminal in Windows XP system using Hyper Terminal use Version 3.0 or higher.

Step 1. Open the "Taskbar Start"/"Programs"/"Accessories"/"Co mmmunications"/"Heyper Terminal". (Heyper Terminal requires version 3.0 or higher) (Figure 3.2-1)
Step 2. Open "HYPERTRM.EXE". (Figure 4.3-2)
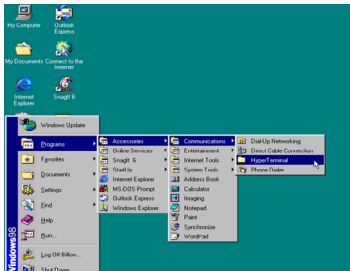
Figure 3.2-1
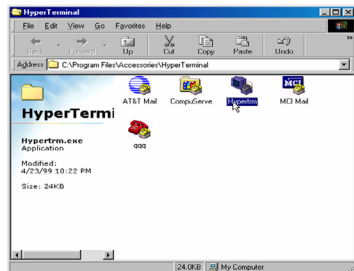
Figure 3.2-2

Step 3. Enter a name you prefer and then click "OK". (Figure 3.2-3)

Step 4. Select an appropriate connecting port and then click "OK". (Figure 3.2-4)

Figure 3.2-3
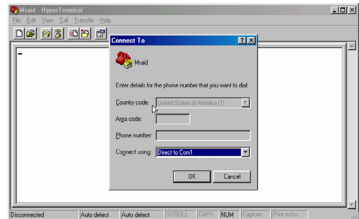
Figure 3.2-4

Step 5. Configure the port parameter settings and then click "OK".
Bits per second: 115200
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None (Figure 3.2-5)

Step 6. Open the file menu and select "Properties". (Figure 3.2-6)
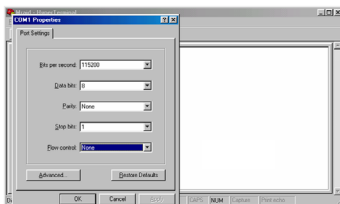
Figure 3.2-5
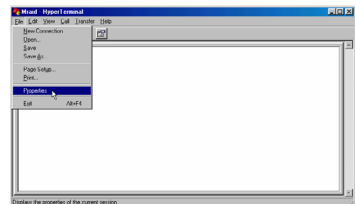
Figure 3.2-6

Step 7. Configure the "Connect To" setting. (Figure 3.2-7)

Step 8. Configure the "Settings" items and then click "OK".
Function, arrow and ctrl keys act as: Terminal keys
Backspace key sends: Crtl+H
Emulation: VT100
Telnet terminal: VT100
Back scroll buffer lines: 500 (Figure 3.2-8)

CLI FEATURES
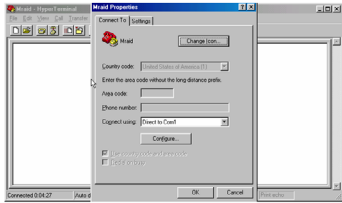
Figure 3.2-7
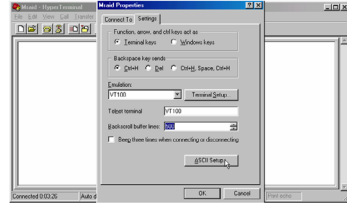
Figure 3.2-8

Now, The VT100 is ready to be used.
After you finished the VT100 Terminal setup, you may press " X "
key (in your Terminal) to link the expander CLI setup screen and
Terminal together.
Press "X" key to display the expander CLI utility screen on your
VT100 Terminal. The CLI prompt is displayed in a DOS console
window. Press "H" to display the sub-manual.

3.3 CLI Command

This section provides detail information about the SAS expander-box's CLI function. All the commands please type in lower case.

● HELP Command

This command provides an on-line table of contents, providing brief descriptions of the help sub-commands. You can use the <CLI> help to get detail information about the CLI commands summary.

Syntax
CLI>help[Enter]

Example:
CLI>help

pass	- Set Password
lo	- Logout CLI Shell
link	- Link Rate Control
edfb	- Bandwidth Optimizer
th	- Temperature Control
group	- Set the PHY Group
sys	- System Information
bu	- Alarm Control
fan	- Fan Speed Control
spin	- Drive SpinUp Control
st	- Store System Setting
lsd	- List Devices Status
showlogs	- Show the Current Logs
fdl	- File Download
counters reset (optional)	- Display/Reset all phy counters
sasaddr	- Display expander SAS address
sub	- Set the subtractive ports on expander
con	- Set expander external ports as SES internal slots.

CLI Manager

● PASS Command

The pass command allows user to set or clear the expander box password protection feature. Once the password has been set, the user can only monitor and access the expander box setting by providing the correct password. The password can accept max.

8 chars and min. 4 chars. The manufacture default password is **"0000"**.

Syntax
CLI>pass

Example:
CLI>pass
Old Password:****
New Password:****
Verify New Password:****
Password Changed But Not Save Permanently!
Note, use CLI command "st" to keep permanently.

● LO Command

To exit the selected expander box CLI shell, use the lo command.

Syntax
CLI>lo

Example:
CLI>lo
Password:

● LINK Command

The link command allows you to set the operate device link rate that has been connected on expander. Typical parameters include: Max and Min disk speed connected the SAS expander box and High and Low external cable link speed connected the SAS expander box.

CLI Manager

1. Set external cable link speed rate

    Syntax
    CLI>link c[0|1|2|3] High Low]
    Index: c[0|1|2|3] External Cable Index
    The cable c0, c1, or c2 is view from right to left or start from top to bottom.
    High-Rate, Low-Rate: [11|10|9] or [12g|6g|3g]
    PS. Pls. Save Config. & Reboot To Take Effect
    CLI>st

    Example:
    CLI>link c0,c1 6g 3g   ;;;;; set cable0 and cable1 link speed range [6G(10), 3G(9)]
    CLI>st
    CLI>
    Reboot to take effect.

2. Set all slots with same link speed rate

    Syntax
    CLI>link [Index(D)| 255] High-Rate(D) Low-Rate(D)
    Index: Slot Index
    High-Rate(D), Low-Rate(D): [11|10|9] or [12g|6g|3g]
    PS. Pls. Save Config. & Reboot To Take Effect
    CLI>st

    Example:
    CLI>link 255 12g 3g   ;;;;; set all slots with same link speed rate, max=11(12G), min=9(3G)
    CLI>st
    CLI>
    Reboot to take effect.

3. Set internal slot link speed rate

    Syntax
    CLI>link [Index Max Min]
    Index: Slot Index
    High-Rate, Low-Rate: [11|10|9] or [12g|6g|3g]
    PS. Pls. Save Config. & Reboot To Take Effect
    CLI>st

CLI Manager

Example:
CLI>link
ArrayDevice Element (0x17):
===

NAME	PHY	NGO	EDFB	MAX	MIN	TYPE	ADDRESS
SLOT 01	4	6G	6G	12G	3G	SATA	5001B469-189AE00D
SLOT 02	5	6G	6G	12G	3G	SAS	5011B469-189AE00C
SLOT 03	6	6G	6G	12G	3G	SATA	5011B469-189AE00E
SLOT 04	7	6G	6G	12G	3G	SATA	5011B469-189AE00F
SLOT 05	8	6G	6G	12G	3G	SATA	5011B469-189AE009
SLOT 06	9	6G	**6G**	**12G**	3G	SATA	5011B469-189AE008
SLOT 07	10	6G	6G	12G	3G	SATA	5011B469-189AE00A
SLOT 08	11	6G	6G	12G	3G	SATA	5011B469-189AE00B

//Set the slot 0x6 max. speed to 3G

CLI>link 6 3g 3g
CLI>st
CLI>
Reboot to take effect.

CLI>link
ArrayDevice Element (0x17):
===

NAME	PHY	NGO	EDFB	MAX	MIN	TYPE	ADDRESS
SLOT 01	4	6G	6G	12G	3G	SATA	5001B469-189AE00D
SLOT 02	5	6G	6G	12G	3G	SAS	5011B469-189AE00C
SLOT 03	6	6G	6G	12G	3G	SATA	5011B469-189AE00E
SLOT 04	7	6G	6G	12G	3G	SATA	5011B469-189AE00F
SLOT 05	8	6G	6G	12G	3G	SATA	5011B469-189AE009
SLOT 06	9	**6G**	**3G[1]**	**3G**	3G	SATA	5011B469-189AE008
SLOT 07	10	6G	6G	12G	3G	SATA	5011B469-189AE00A
SLOT 08	11	6G	6G	12G	3G	SATA	5011B469-189AE00B

NOTE: 1. If EDFB is enabled, it will keep NLR=12G.

● EDFB Command (Same as "DHPM")

Use for 3G/6G SAS/SATA drive speed up as 12G drive performance. DataBolt™ Bandwidth Optimizer is designed to help facilitate the industry transition to 12Gb/s SAS-enabled systems by allowing users to take advantage of 12Gb/s speeds while utilizing existing 6Gb/s drives or backplanes.

Syntax
CLI>edfb [on | off] [i,j,..]
on - turn on all drive slot as 12G performance mode.
off - turn off all drive slot 12G performance mode.
i,j,.. - turn on/off drive slot i,j, …12G performance mode.

Example:
CLI>help edfb
Drive High Performance   edfb { [on | off] [i,j,..] }

CLI>link
ArrayDevice Element (0x17):

```
=========================================
  NAME    PHY  NGO  EDFB  MAX  MIN  TYPE       ADDRESS

  SLOT 01    4   6G    6G   12G   3G   SATA  5001B469-189AE00D
  SLOT 02    5   6G    6G   12G   3G    SAS  5011B469-189AE00C
  SLOT 03    6   6G    6G   12G   3G   SATA  5011B469-189AE00E
  SLOT 04    7   6G    6G   12G   3G   SATA  5011B469-189AE00F
  SLOT 05    8   6G    6G   12G   3G   SATA  5011B469-189AE009
  SLOT 06    9   6G    6G   12G   3G   SATA  5011B469-189AE008
  SLOT 07   10   6G    6G   12G   3G   SATA  5011B469-189AE00A
  SLOT 08   11   6G    6G   12G   3G   SATA  5011B469-189AE00B
```

CLI>edfb on 2   ;;;;; set drive slot 2 on
CLI>st
Reset or PowerCycle

CLI Manager

```
CLI>link
ArrayDevice Element (0x17):
==========================================
   NAME   PHY  NGO  EDFB  MAX  MIN  TYPE      ADDRESS

  SLOT 01    4   6G    6G  12G   3G  SATA  5001B469-189AE00D
  SLOT 02    5   6G   12G  12G   3G  SAS   5011B469-189AE00C
  SLOT 03    6   6G    6G  12G   3G  SATA  5011B469-189AE00E
  SLOT 04    7   6G    6G  12G   3G  SATA  5011B469-189AE00F
  SLOT 05    8   6G    6G  12G   3G  SATA  5011B469-189AE009
  SLOT 06    9   6G    6G  12G   3G  SATA  5011B469-189AE008
  SLOT 07   10   6G    6G  12G   3G  SATA  5011B469-189AE00A
  SLOT 08   11   6G    6G  12G   3G  SATA  5011B469-189AE00B

CLI>edfb on                    ;;;;; set all drives on
CLI>st
Reset or PowerCycle
```

…….

● TH Command

The th command allows you to set the operate device temperature warning limit. Typical parameters include: High-Warn and Low-Warn are warning temperature in Celsius.

Syntax
CLI>th   Index High-Warn Low-Warn

Example:
CLI>th

```
Temperature Element (0x04):
==========================================
    NAME       ID    CT('C)     HTW     LTW    OTWarn

  ENC. Temp     01     30        60       5       No
  Chip Temp     02     64        85       5       No
```

NAME	ID	CT(`C)	HTW	LTW	OTWarn
Slot01 Temp	03	31	60	5	No
Slot02 Temp	04	32	60	5	No
Slot03 Temp	05	30	60	5	No
Slot04 Temp	06	31	60	5	No
Slot05 Temp	07	36	60	5	No
Slot06 Temp	08	32	60	5	No
Slot07 Temp	09	32	60	5	No
Slot08 Temp	10	35	60	5	No

CLI>th 2 79 0
Temperature Element (0x04):
==

NAME	ID	CT(`C)	HTW	LTW	OTWarn
ENC. Temp	01	30	60	5	No
Chip Temp	02	64	79	0	No
Slot01 Temp	03	31	60	5	No
Slot02 Temp	04	32	60	5	No
Slot03 Temp	05	30	60	5	No
Slot04 Temp	06	31	60	5	No
Slot05 Temp	07	36	60	5	No
Slot06 Temp	08	32	60	5	No
Slot07 Temp	09	32	60	5	No
Slot08 Temp	10	35	60	5	No

CLI>st
CLI>
Reboot to take effect.

CLI>th
Temperature Element (0x04):
==

NAME	ID	CT(`C)	HTW	LTW	OTWarn
ENC. Temp	01	30	60	5	No
Chip Temp	02	64	79	0	No

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Slot01 Temp	03	31	60	5	No
Slot02 Temp	04	32	60	5	No
Slot03 Temp	05	30	60	5	No
Slot04 Temp	06	31	60	5	No
Slot05 Temp	07	36	60	5	No
Slot06 Temp	08	32	60	5	No
Slot07 Temp	09	32	60	5	No
Slot08 Temp	10	35	60	5	No

• GROUP Command

The group command is used to associate the external port with the devices/phys as one zone group. The three external cable ports and all devices/phys slots will default associate with one zone group.

Syntax
gr {dev GroupNo[1..] {ci, cj, ck,..} Start-Index(D) End-Index(D) }
gr {off | [t10 off] }
dev   : use drive slot index
GroupNo : groupno start from 1, max 8 groups ci, cj, ck,..: external cable connector. i, j, k,.. is the index which range from 0 to 3. According to view from connector side, index start from right to left or top to bottom. The cable c0, c1, c2, c3, or c4 is view from top to bottom.
Start-Index : Start slot index of zone range, [1.. max drive]
End-Index : End slot index of zone range, [1.. max drive]
off   : clear the zone group setting.
t10 off   : turn T10 mode off.

Example:
CLI>gr
Current PHY Group Mode: T10
Group-1: C0, C1, C2, C3, C4 Slot: 1, 2, 3, 4, 5, 6, 7, 8
Value: 0x0000000FFFFFFFFF

//Set the cable0 and slot 1 to slot 6 as group 1
CLI>gr dev 1 c0 1 6

New PHY Group Mode: T10
Group-1: C0, Slot: 1, 2, 3, 4, 5, 6
Value: 0x00000000000FFC00
Current PHY Group Mode: T10
Group-1: C0, C1, C2, C3, C4 Slot: 1, 2, 3, 4, 5, 6, 7, 8
Value: 0x0000000FFFFFFFFF

//Set the cable1 and cable2 and slot 7 to slot 8 as group 2
CLI>gr dev 2 c1, c2 7 8

New PHY Group Mode: T10
Group-1: C0, Slot: 1, 2, 3, 4, 5, 6
Value: 0x00000000000FFC00
Group-2: C1, C2, Slot: 7, 8
Value: 0x000000000FF003FF

Current PHY Group Mode: T10
Group-1: C0, C1, C2, C3, C4 Slot: 1, 2, 3, 4, 5, 6, 7, 8
Value: 0x0000000FFFFFFFFF

CLI>st
Power Cycle to reboot

CLI>gr

Current PHY Group Mode: T10
Group-1: C0, Slot: 1, 2, 3, 4, 5, 6
Value: 0x00000000000FFC00
Group-2: C1, C2, Slot: 7, 8
Value: 0x000000000FF003FF

● SYS Command

The sys command is used to view the expander's information. Typical information includes: vendor, model name, serial/unit number, expander port number, product revision, chip name/chip revision, customer code, manufacture data revision and work time.

Syntax
CLI>sys

CLI Manager

Example:
CLI>sys
==
Hardware Revision Information:-
==

Vendor ID	: Areca Technology Co Ltd. Taiwan, R.O.C
Model ID	: ARC-4038
Serial No.	: 0000000000000000
Unit Serial No.	:
Expander SAS Address	: 0x5001B469189AE03F
Product Revision	: 0
Expander Chip ID	: 0x0233 (Ports : 28)
Expander Chip Revision	: C0
Customer Code	: 0x35 (R01)
Manufacturer Data Revision	: 0x01 06/12/15
Working Time	: Day00000-00:00:06
Dual Mode	: Single

==
Firmware Revision Information:-
==
Boot Image:

  Revision: 100.BD.00.0A 06/16/15
  Firmware Family: 0 OemFamily: 0
  Fast Boot: Yes Image Address: 0x10000000

Firmware Copy 1:

  Revision: 100.BD.01.0A 06/16/15
  Firmware Family: 0 OemFamily: 0
  Fast Boot: Yes Image Address: 0x10100000

Firmware Copy 2: [Active]

  Revision: 100.BD.01.0A 06/18/15
  Firmware Family: 0 OemFamily: 0
  Fast Boot: Yes Image Address: 0x10200000

HAL Revision: 0.1.0.0 SES Revision: 0.1.0.0 SCE Revision:
0.1.0.0

• BU Command

The BU command allows you to control the buzzer attributes that
have been controlled by SAS expander H/W. There are four sound
levels defined by the expander H/W. The default warning is sound
level 2 and critical: sound level 3.

Syntax
CLI>BU [Warning Critical] [MUTE]

Example:
CLI>BU
Buzzer Attribute:
Warning Beep: Sound 2
Critical Beep: Sound 3
CLI>BU 0x1 0x3
CLI>BU
Buzzer Attribute:
Warning Beep: Sound 1
Critical Beep: Sound 3
CLI>
When expander alarm with buzzer, you can temporarily mute it
with the following command. The buzzer still can be activated by
the next different event.
CLI>BU MUTE

When expander alarm with buzzer, you can disable it completely
by command "bu 0 0". If you would like to enable beeper, the
command for default settings will be "bu 2 3".

CLI Manager

● FAN Command

The fan command allows you to set the operate fan speed. Typical parameters include: LowestSpeed and WarningSpeed are fan speed in speed code from level 1 to 7.
The LowestSpeed is the speed code that fan operate in normal state, and the WarningSpeed is the speed code that fan operate in warning state; like as detect a device in over-temperature.

Syntax
CLI>fan   LowestSpeed   WarningSpeed

Example:
CLI>fan

Cooling Element (0x03):
==
                SPEED
NAME   CODE   RPM   STATUS
Fan 01   5   2250   OK
Fan 02   5   2230   OK

Saved FAN Speed Attribute:
Lowest SpeedCode: 5
Warning SpeedCode: 7

CLI>fan 3 7

New FAN Speed Attribute:
Lowest SpeedCode: 3
Warning SpeedCode: 7
Saved FAN Speed Attribute:
Lowest SpeedCode: 5
Warning SpeedCode: 7

CLI>st
CLI>
Reboot to take effect.

CLI>fan
Cooling Element (0x03):

```
==========================================
          SPEED
NAME      CODE     RPM     STATUS
Fan 01      3      1980      OK
Fan 02      3      1930      OK
```

Saved FAN Speed Attribute:
Lowest SpeedCode: 3
Warning SpeedCode: 7

● SPIN Command

The spin command defines the mode of staggering SATA drive spin-up function connected on the expander box. This command gives expander box the ability to spin up the disk drives sequentially or in groups, allowing the drives to come ready at the optimum time without straining the system power supply. Staggering drive spin-up in a multiple drive environment also avoids the extra cost of a power supply designed to meet short-term startup power demand as well as:

Syntax
CLI>spin [Delay(D)[ms] Num(D)]
Expander issues the spin up the drives by [Num] drives with [Delay] ms.

Example:
CLI>spin
Saved SpinUp Attribute:
Drive Number: 1
Delay: 1024 ms

CLI>spin 512 3

New SpinUp Attribute:
Drive Number: 3
Delay: 512 ms

Saved SpinUp Attribute:
Drive Number: 1
Delay: 1024 ms

CLI Manager

● ST Command

The st command stores system configurations or factory default configurations in flash. Since all the revised parameter setting is temporarily stored in the working RAM, the ST command saves those parameters permanently in flash ROM.

1. Store temporarily configurations in flash

    Syntax
    CLI>st

    Example:
    CLI>st
    CLI>

2. Store factory default configurations in flash

    Syntax
    CLI>st [default]

    Example:
    CLI>st default   ;;;;; restore the setting to default
    CLI>

● LSD Command

The lsd command is use for show the element devices status in the expander controller. With parameter, this command only show the seletct device status.

Syntax
CLI>lsd [hdd | temp | volt | con | ..]
Show SES elements information:

Example:
CLI>lsd

ArrayDevice Element (0x17):
==

NAME	PHY	NGO	EDFB	MAX	MIN	TYPE	ADDRESS
SLOT 01	4	6G	6G	12G	3G	SATA	5001B469-189AE00D
SLOT 02	5	6G	**12G**	12G	3G	SAS	5011B469-189AE00C
SLOT 03	6	6G	6G	12G	3G	SATA	5011B469-189AE00E
SLOT 04	7	6G	6G	12G	3G	SATA	5011B469-189AE00F
SLOT 05	8	6G	6G	12G	3G	SATA	5011B469-189AE009
SLOT 06	9	6G	6G	12G	3G	SATA	5011B469-189AE008
SLOT 07	10	6G	6G	12G	3G	SATA	5011B469-189AE00A
SLOT 08	11	6G	6G	12G	3G	SATA	5011B469-189AE00B

Connector Element (0x19):
==

NAME	PHY	NLR	TYPE	ROUTE	CONNECTED-ADDRESS
Connector00	0	12G	05	S	50004D9F-74992000
Connector00	1	12G	05	S	50004D9F-74992000
Connector00	2	12G	05	S	50004D9F-74992000
Connector00	3	12G	05	S	50004D9F-74992000
Connector01	24	12G	05	S	50004D9F-74992000
Connector01	25	12G	05	S	50004D9F-74992000
Connector01	26	12G	05	S	50004D9F-74992000
Connector01	27	12G	05	S	50004D9F-74992000
Connector02	20	12G	05	S	50004D9F-74992000
Connector02	21	12G	05	S	50004D9F-74992000
Connector02	23	12G	05	S	50004D9F-74992000
Connector02	24	12G	05	S	50004D9F-749920
Connector03	16	12G	05	S	50004D9F-74992000
Connector03	17	12G	05	S	50004D9F-74992000
Connector03	18	12G	05	S	50004D9F-74992000
Connector03	19	12G	05	S	50004D9F-74992000
Connector04	12		04		
Connector04	13		04		
Connector04	14		04		
Connector04	15		04		

CLI Manager

Cooling Element (0x03):
===

NAME	SPEED CODE	RPM	STATUS
Fan 01	3	1980	OK
Fan 02	3	1930	OK

Temperature Element (0x04):
===

NAME	ID	CT(`C)	HTW	LTW	OTWarn
ENC. Temp	01	30	60	5	No
Chip Temp	02	48	90	5	No

Voltage Element (0x12):
===

NAME	VOLT(V)	OVLMT	UVLMT	STATUS
0.95V	0.96	1.01	0.89	OK
1.8V	1.84	1.90	1.68	OK

AudibleAlarm Element (0x06):
===

NAME	STATUS	ALMSTATE
Audible-Alarm	Normal	0

CLI>

● SHOWLOGS Command

The showlogs command allows you to display system event notifications that have been generated event by the SAS expander box.

Syntax
CLI>showlogs [DisplayMode(hex, detail, default)]

Example:
CLI>showlogs
00000000-00000000:PLATFORM:Firmware initialization started

Day00000-00:00:00 ENCLOSURE-Fan 01 Failed

● FDL Command

The box has added the expander firmware update through the CLI on the external RS-232 port. Before you process the firmware update, there are two block regions that you can update expander microcode on SAS expander box.
1. CODE region - for FW file : sas3xfwYYMMDD.fw
2. MFGB region - for Data file : mfg12gYYMMDD.dat

To update the expander controller firmware, follow the procedure below:

Syntax: all the commands please type in lower case
CLI>fdl { code | mfgb }
Then use XModem/(Checksum) protocol transmit file to update ROM Region. The following procedures is used to update firmware through the RS-232:
1. Open any UART communication tools like HypeTerminal(115200,n,8,1).

2. Press any key on HyperTerminal window, the window will show "CLI>" prompt.

3. Type help will show help screen.

4. One command to update firmware. Step as follow.
5. Issue download & update command under "CLI>".
   CLI>fdl code
   Please Use XModem Protocol for File Transmission.
   Use Q or q to quit Download before starting XModem.
   <-----expander prompt for ready to receive file to update.

6. Then under HyperTerminal program, use the pull down menu item transfer "Send" -> send files when dialog box prompt, choose "Xmodem" and the file in the directory then press "send".
   (a). If the expander receive the file under the timeout limit (60s), the process starts.
   (b). If time out, please retry the step 5 again.

7. You can also cancel the program step by type 'q'.

8. If transfer OK, the transfered data is updated. Cold-start expander (Power cycle again) to take effect.

Example:
Update procedure, use Xmodem to transfer, refer to "fdl" command for detail operation.
CLI>fdl { code | mfgb }

Use HyperTerminal or TeraTerm utility with Xmodem mode to transfer and update files.
If transfer OK, the transfered data is updated. Cold-start expander (Power cycle again) to take effect.

The following firmware and data are available in the following filename format.
1. FW file (CODE) : sas3xfwYYMMDD.fw
2. Data file (MFGB) : mfg12gYYMMDD.dat

Update SAS expander firmware:
CLI>fdl code
Use HyperTerminal or TeraTerm utility with Xmodem mode to transfer sas3xfwYYMMDD.fw.
If transfer OK, the transfered data is updated. Cold-start expander (Power cycle again) to take effect.

Update SAS expander data file:
CLI>fdl mfgb

Use HyperTerminal or TeraTerm utility with Xmodem mode to transfer mfg12gYYMMDD.dat.
If transfer OK, the transfered data is updated. Cold-start expander (Power cycle again) to take effect.

• Counters Reset Command

Display/Reset all phy counters   counters reset (optional).
CLI>counters reset
Phy counters successfully reset.

CLI>counters

```
Phy Layer Error Counters=================
== InvWrdCnt ==DispErrCnt ==LossSyncCnt ==RstSeqFailCnt=
Phy 00  0x00000000  0x00000000  0x00000000  0x00000000
Phy 01  0x00000000  0x00000000  0x00000000  0x00000000
Phy 02  0x00000000  0x00000000  0x00000000  0x00000000
Phy 03  0x00000000  0x00000000  0x00000000  0x00000000
Phy 04  0x00000000  0x00000000  0x00000000  0x00000000
Phy 05  0x00000000  0x00000000  0x00000000  0x00000000
Phy 06  0x00000000  0x00000000  0x00000000  0x00000000
Phy 07  0x00000000  0x00000000  0x00000000  0x00000000
Phy 08  0x00000000  0x00000000  0x00000000  0x00000000
Phy 09  0x00000000  0x00000000  0x00000000  0x00000000
Phy 10  0x00000000  0x00000000  0x00000000  0x00000000
Phy 11  0x00000000  0x00000000  0x00000000  0x00000000
Phy 12  0x00000000  0x00000000  0x00000000  0x00000000
Phy 13  0x00000000  0x00000000  0x00000000  0x00000000
Phy 14  0x00000000  0x00000000  0x00000000  0x00000000
Phy 15  0x00000000  0x00000000  0x00000000  0x00000000
Phy 16  0x00000000  0x00000000  0x00000000  0x00000000
Phy 17  0x00000000  0x00000000  0x00000000  0x00000000
Phy 18  0x00000000  0x00000000  0x00000000  0x00000000
Phy 19  0x00000000  0x00000000  0x00000000  0x00000000
Phy 20  0x00000000  0x00000000  0x00000000  0x00000000
Phy 21  0x00000000  0x00000000  0x00000000  0x00000000
Phy 22  0x00000000  0x00000000  0x00000000  0x00000000
Phy 23  0x00000000  0x00000000  0x00000000  0x00000000
Phy 24  0x00000000  0x00000000  0x00000000  0x00000000
Phy 25  0x00000000  0x00000000  0x00000000  0x00000000
Phy 26  0x00000000  0x00000000  0x00000000  0x00000000
Phy 27  0x00000000  0x00000000  0x00000000  0x00000000
Link Layer Event Counters
Phy Event Counter Not Configured.
Generic Broadcast Counter
Broadcast Counter Not Configured.
Generic Broadcast Counter
Broadcast Counter Not Configured.
```

CLI Manager

● Sasaddr Command

CLI>sasaddr

Expander New SAS Address: 0x5001B4690400083F
Expander Current SAS Address:
SXP Port SAS Address: 0x5001B4690400083F
SXP Port SAS Address: 0x5001B4690400083D
SXP Port SAS Address: Disabled

● Sub Command

The subtractive command allows you to set the subtractive ports on expander.

1. Set external cable link ports

   Syntax
   CLI>sub [{c0..c3} l def]
   Index: c0..c3 External Cable Index
   The cable c0, c1, c2, or c3 is view from right to left or start from top to bottom.

   Example:
   CLI>sub c0,c1 ; set cable0 and cable1 as subtractive ports
   CLI>st
   CLI>
   Reboot to take effect.

2. Set internal slot link ports

   Syntax
   CLI>sub [0..47]
   Index:0..47 Internal Slot Index

   Example:
   CLI>sub 8,9,10,11   ; set phy 8/9/10/11 as subtractive ports
   CLI>st
   CLI>
   Reboot to take effect.

● CON Command

The con command is used to set expander external ports as SES internal slots.

Syntax:
CLI>con [drive | cable | def] {c0,c1,c2, …}

drive : set ext-port as drive slot.
cable: set ext-port as cable-connected attribute.
def : set as default.
c0,c1,c2, … : connector name.

after setup, remember to store the setting and reboot.

Example:
CLI>con

Saved Connector Attribute:
C0: Connector
C1: Connector
C2: Connector
C3: Connector
C4: Connector

CLI>con drive c2,c3

New Connector Attribute:
C0: Connector
C1: Connector
C2: Drive
C3: Drive
C4: Connector

Saved Connector Attribute:
C0: Connector
C1: Connector
C2: Connector
C3: Connector
C4: Connector

CLI Manager

CLI>st
CLI>reset
reboot
…………….

CLI>link

ArrayDevice Element (0x17):
===

NAME	PHY	NGO	EDFB	MAX	MIN	TYPE	ADDRESS
SLOT 01	4	6G	6G	12G	3G	SATA	5001B469-189AE00D
SLOT 02	5	6G	6G	12G	3G	SAS	5011B469-189AE00C
SLOT 03	6	6G	6G	12G	3G	SATA	5011B469-189AE00E
SLOT 04	7	6G	6G	12G	3G	SATA	5011B469-189AE00F
SLOT 05	8	6G	6G	12G	3G	SATA	5011B469-189AE009
SLOT 06	9	6G	6G	12G	3G	SATA	5011B469-189AE008
SLOT 07	10	6G	6G	12G	3G	SATA	5011B469-189AE00A
SLOT 08	11	6G	6G	12G	3G	SATA	5011B469-189AE00B
ESLOT21	20			12G	3G		
ESLOT22	21			12G	3G		
ESLOT23	23			12G	3G		
ESLOT24	24			12G	3G		
ESLOT31	16			12G	3G		
ESLOT32	17			12G	3G		
ESLOT33	18			12G	3G		
ESLOT34	19			12G	3G		