wiwynn®

Honey Badger

User Manual

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Revision History

Date	Version	Changes
2015/01/06	1.0	First release
2015/01/22	1.1	Used new Panther+ board, LSI baseboard and SAS expander board. New photos in section 3.22 Debug Card.
2015/02/10	1.1	Added Battery Warning in section 3.13
2015/03/13	1.2	Added item 7 in section 3.1.
2015/04/28	1.3	Revised sections 2.1, 2.4, 3.22, 3.9.1, 3.12.1 and 5.2.
2015/05/08	1.3	Change PCIE CONN to GF1 in section 2.4
2015/05/26	1.4	Revised sections 3.7 and 3.11.
2015/11/20	1.5	Added Chapter 4 Firmware Update
2015/12/02	1.6	Update Section 2.1 System Specification
2015/12/24	1.7	1. Updated BMC and BIOS firmware updates in Chapter 4. 2. Added **4. Expander Firmware Update via in-band SAS Interface** in Chapter 4.

Contents

1. Preface

Designed to support up to thirty SAS and SATA hard drives in a 2U chassis, Honey Badger stands out from other storage servers with the highest storage density in the industry. In addition, Honey Badger is not just a storage subsystem but also a computing server with up to two Intel® Atom server nodes.

1.1 Introduction

Honey Badger supports high availability with hot-plug hard drives and redundant cooling. Its tool-less design makes it easy to maintain and replace.

1.2 About this Manual

The contents in this manual include:

Chapter 2 – describes the system specification, front and rear components, and the different boards

Chapter 3 – shows how to replace the system and system components

Chapter 4 – shows how to update the firmware

Chapter 5 – lists the Wiwynn supported SES pages

Chapter 6 – lists the checkpoints and errors

For more product information, please refer to:
http://www.wiwynn.com/static/honeybadger.html

2.   System Tour

2.1   System Specification

Node	
Processor	Intel® Atom C2700 series
Memory	Up to 32GB; 2GB/4GB/8GB DDR3 up to 1600MT/s; 4 SODIMM slots
Storage and IO	
Expander	SAS 12G Expander
Storage	Thirty 3.5" hot-plug drive bays: ・SAS HDD (10K rpm) ・Nearline SAS HDD (7.2K rpm) ・SATA HDD (7.2K rpm) One EXT mini-SAS 12G port
Remote Management	IPMI V2.0 compliant Remote Management Controller (option) Serial-over-LAN
Expansion Slots	One PCI-E x8 mezzanine slot with x4 signal: ・Single 10GbE SFP+ port
Power Supply, Physical and Packaging Specifications	
Power Supply	Centralized 12V DC bus bar
Power Consumption	305W (Idle); 515W (Max)
Form Factor and Dimensions	2 OU rack; 93.5 (H) * 536 (W) * 878 (D) (mm)
Weight	38 kg ~ 55 kg
OS Support List	CentOS 6.x (64 bits)

2.2   Front Panel

The illustration below shows the system front panel.
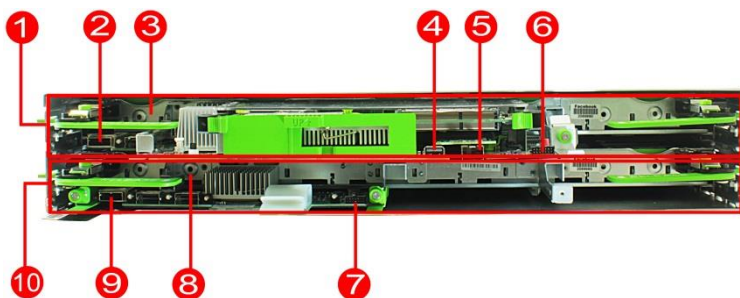
Item	Component
1	HDD Tray 1
2	Mini-SAS External Connector
3	HDD Tray 1 Primary Side
4	USB Connector
5	10G Card Connector
6	Debug Card Connector
7	Debug Card Connector
8	HDD Tray 2 Primary Side
9	Mini-SAS External Connector
10	HDD Tray 2

2.3   Rear Panel
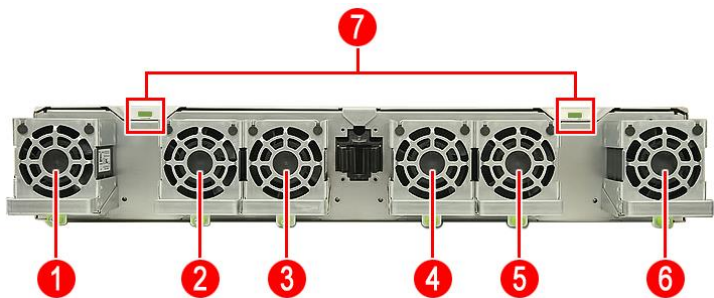
Item	Component
1	Fan 1
2	Fan 2
3	Fan 3
4	Fan 4
5	Fan 5
6	Fan 6
7	Top Cover Thumbscrews

![wiwynn logo]

2.4   SAS Expander Board
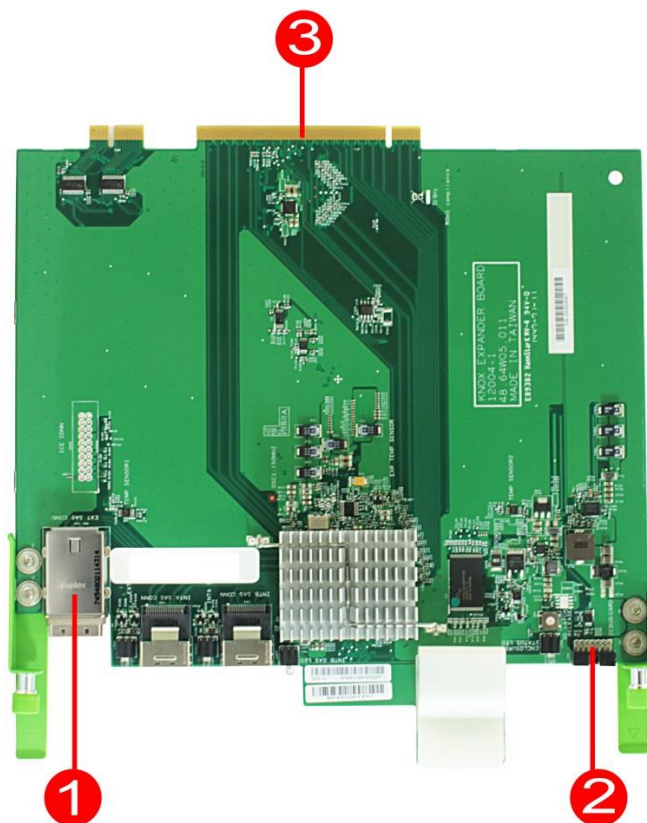
Item	Connector	Description
1	EXT SAS CONN	External Mini-SAS Connector
2	DEBUG	Debug Card Connector
3	GF1	Golden Finger

2.4.1   SAS Expander Board LED Indicator Status
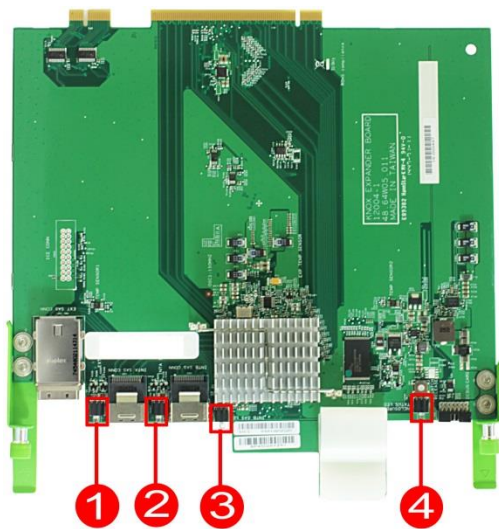
Item	LED Indicator	LED Color	LED State	Status
1	External Mini SAS LED	🔵	Solid Blue	SAS Links Healthy
		🔴	Solid Red	Loss of SAS Links
		⚪	Off	No SAS Links
2	Internal Mini SAS LED	🔵	Solid Blue	SAS Links Healthy
3		🔴	Solid Red	Loss of SAS Links
		⚪	Off	No SAS Links
4	Enclosure Status LED	🔵	Solid Blue	Normal System Operation
		🔴	Solid Red	Any Error in Whole Enclosure

2.5 Panther+ Board

2.5.1 Panther+ Board Top View
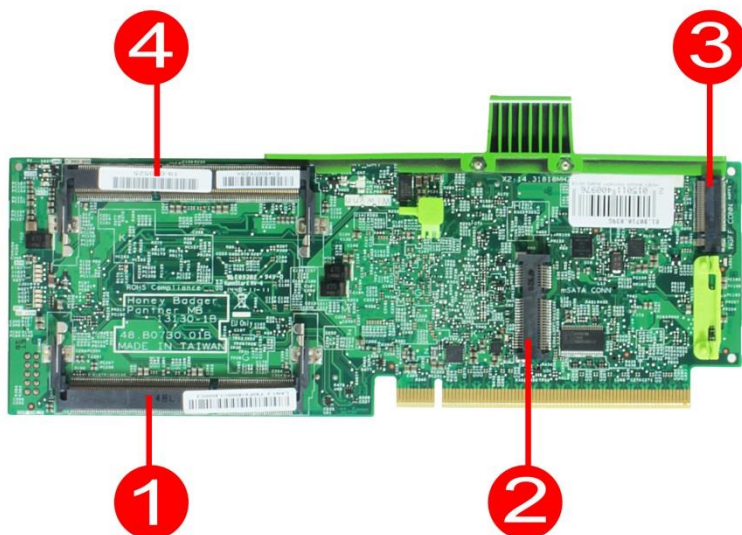
Item	Connector	Description
1	DDR CHB_0	DIMM3 Slot
2	mSATA CONN	mSATA Connector
3	NGFF CONN	NGFF M.2 Connector
4	DDR CHA_0	DIMM1 Slot

2.5.2   Panther+ Board Bottom View
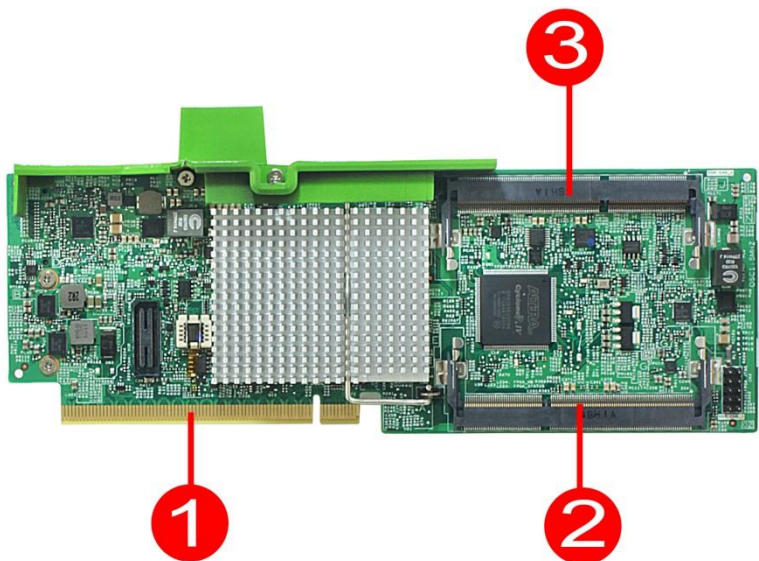
Item	Connector	Description
1	GF1	Golden Finger
2	DDR CHB_1	DIMM4 Slot
3	DDR CHA_1	DIMM2 Slot

2.6 LSI Baseboard
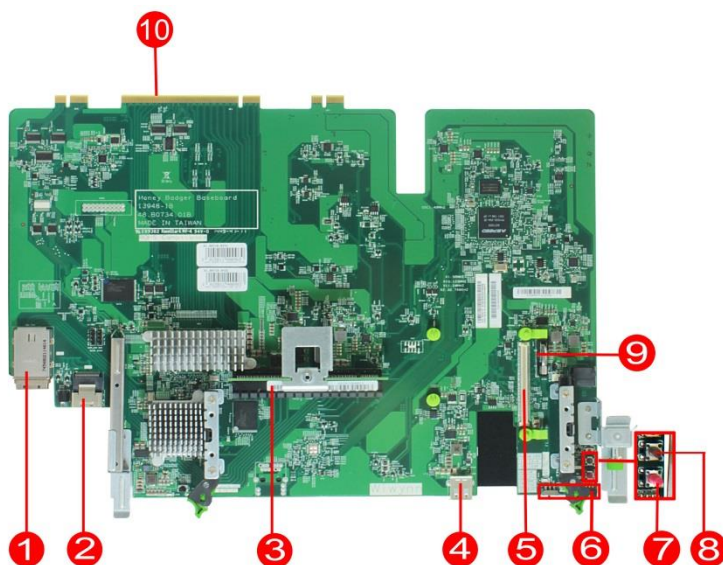
Item	Connector	Description
1	CN1	External Mini-SAS Connector
2	CN2	Internal Mini-SAS Connector
3	CN8	Riser Card Connector
4	SKT1	USB Port
5	MEZCN1	Mezzanine Card Connector
6	CN3	Debug Card Connector
7	PWR	Power Button
8	RST	Reset Button
9	BAT1	RTC Battery Holder
10	GF1	Golden Finger

2.7　Drive Plane Board
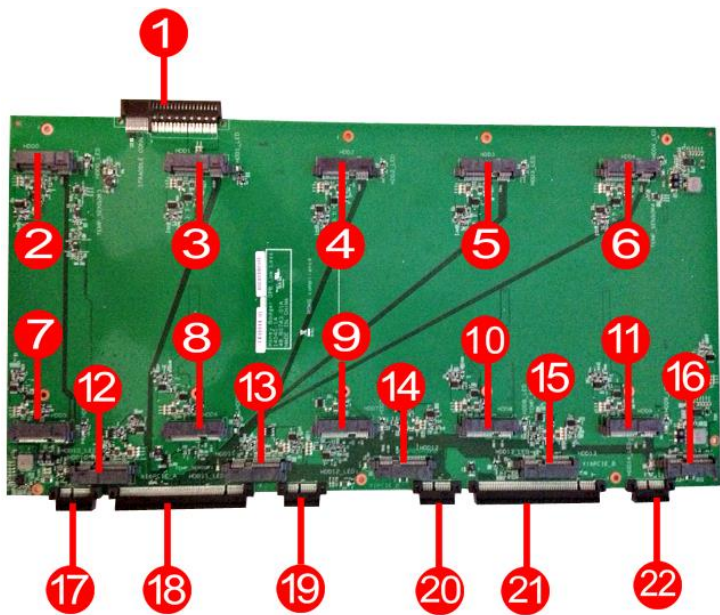
Item	Connector	Description
1	STRADDLE	Straddle Connector
2	HDD0	HDD0 Connector
3	HDD1	HDD1 Connector
4	HDD2	HDD2 Connector
5	HDD3	HDD3 Connector
6	HDD4	HDD4 Connector
7	HDD5	HDD5 Connector
8	HDD6	HDD6 Connector

Item	Connector	Description
9	HDD7	HDD7 Connector
10	HDD8	HDD8 Connector
11	HDD9	HDD9 Connector
12	HDD10	HDD10 Connector
13	HDD11	HDD11 Connector
14	HDD12	HDD12 Connector
15	HDD13	HDD13 Connector
16	HDD14	HDD14 Connector
17	X1PCIE_A1	PCIE X1 Connector A for signals
18	X16PCIE_A	PCIE X16 Connector A for differential
19	X1PCIE_A2	PCIE X1 Connector A for power
20	X1PCIE_B1	PCIE X1 Connector B for signals
21	X16PCIE_B	PCIE X16 Connector B for differential
22	X1PCIE_B2	PCIE X1 Connector B for power

![wiwynn logo]

2.8 Fan Controller Board
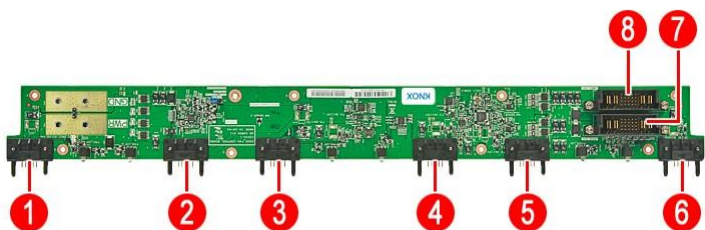
Item	Connector	Description
1	FAN HEADER 1	Fan 1 Connector
2	FAN HEADER 2	Fan 2 Connector
3	FAN HEADER 3	Fan 3 Connector
4	FAN HEADER 4	Fan 4 Connector
5	FAN HEADER 5	Fan 5 Connector
6	FAN HEADER 6	Fan 6 Connector
7	CN9	Power Cable Connector 1
8	CN10	Power Cable Connector 2

3.   System Upgrades

3.1   Safety instructions

Read these instructions carefully. Keep this document for future reference. Follow all warnings and instructions for your safety and to avoid damaging the system.

1   Use both hands on the Tray Handles at all times and keep the HDD tray in the horizontal position when pulling it out or pushing it in to avoid damaging the HDDs and SAS Expander Boards.

2   To avoid any injury, do not hold and use the latches or other parts of the HDD Tray to pull out or push it in.

3   For safety reason, after pulling out the HDD tray, keep holding the tray handles to prevent the HDD tray from dropping.

4   HDD latches on the HDD tray may pop out if systems are inappropriately handled during transport, for example, if it dropped upside down. This will prevent you from pulling out the upper or lower HDD tray alone. To fix this, you need to pull out the two HDD trays together, find the HDD latches that popped out and press them back into place. If you still cannot pull out the HDD tray, **DO NOT FORCE IT** and contact Customer Service for assistance.
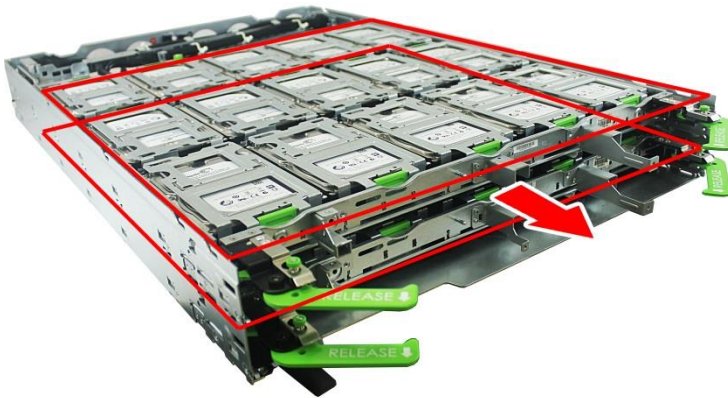
5   When pulling the system out of the rack for performing system
       upgrade, maintenance and debug, make sure to always place the
       system in a flat rigid surface.

       Caution: DO NOT place the system on a foam pad or other
       non-rigid surface; doing so may cause the chassis to warp,
       damaging the SAS Expander Boards and damaging the drive plane
       board connectors while pulling out the HDD tray.

6   Before you pull out one HDD Tray, make sure the other HDD Tray
       is latched and secured by latch handles.

7   **Caution:** The power energy in your system have energy hazards
       which can cause bodily harm. Unless you are instructed otherwise,
       only **TRAINED** service technicians are authorized to remove the
       covers and access any of the components inside the system.
       Remove the power before executing any of the following
       processes:
       - Replacing the Power cable; or
       - Replacing the Bus Bar Cables; or
       - Replacing the Fan Controller Board.

3.2　　Recommended Tools

In performing the disassembly and assembly process, you will need the following tools:

- Philips screwdriver

- Flat screwdriver

- Torx screwdriver

3.3 Replacing the Side Ear Brackets

The system is shipped with two side ear brackets installed as a safety precaution during transport. Remove the brackets before installing the system in its rack.

3.3.1 Removing the Side Ear Brackets

1 Remove the four screws securing the side ear brackets to the chassis.
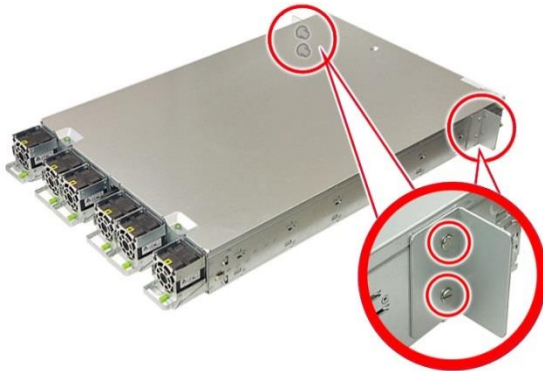
2 Detach the two side ear brackets from the chassis.

3.3.2   Installing the Side Ear Brackets

1   Place the two side ear brackets into the chassis.
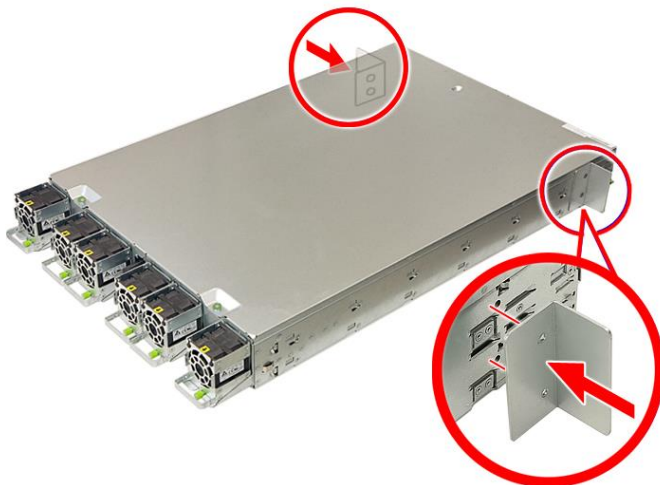
2   Secure the side ear brackets to the chassis by using four screws. Tighten screws using 1.0 kgf-cm torque. Do not over-tighten screws; damage to the HDD trays may result.
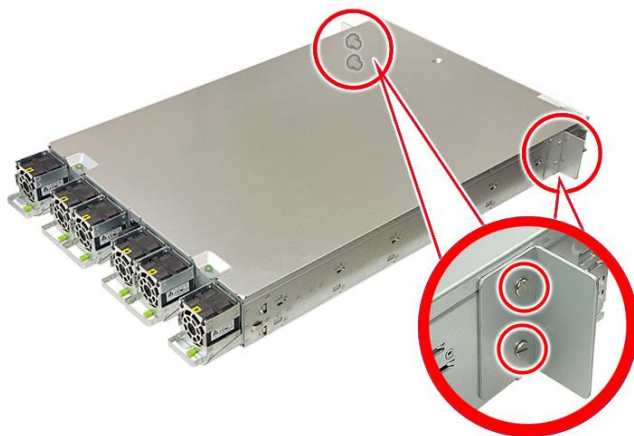
3.4 Replacing the System

3.4.1 Removing the System from the Rack

1   Lift the tabs to release the latch handles that secure the two HDD
    trays to the chassis.
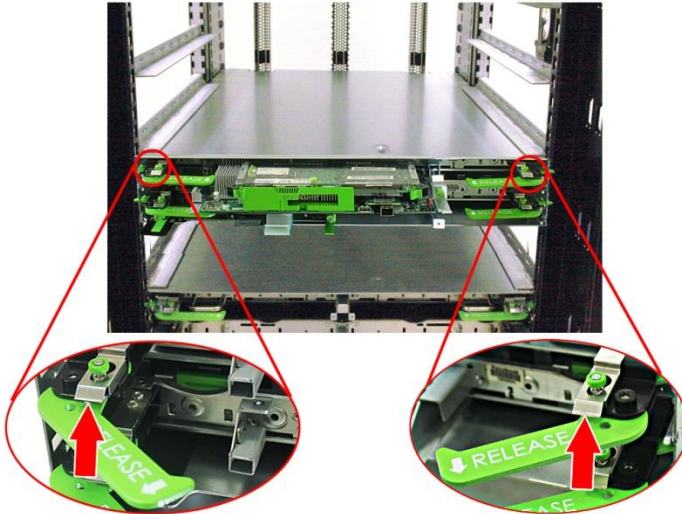
2   Slide the system slowly out of the rack using two hands.

![wiwynn logo]
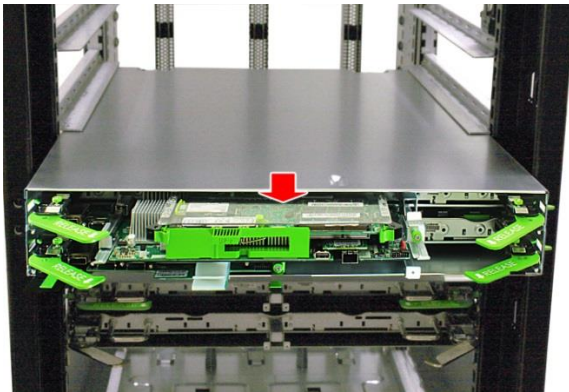
3   When the latch handles clear the rack posts, return the latch
     handles to the lock position (**1**), then slide the system out of the
     rack (**2**).
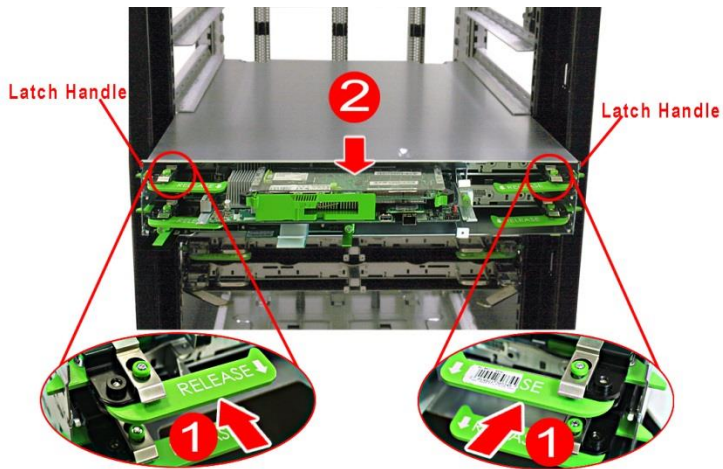
Caution: The system is very heavy. Use a server lift or at least two
people to lift the system into or from the rack.

3.4.2 Installing the System into the Rack

1   Insert the system into the chassis (1), and then lift the tabs to release the latch handles (2).
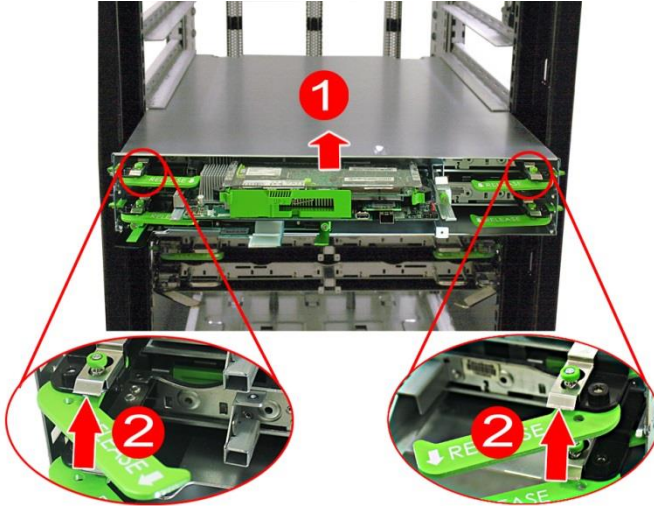
Caution: The system is very heavy. Use a server lift or at least two people to lift the system into or from the rack.

![wiwynn logo]

2   Push the system all the way into the rack.
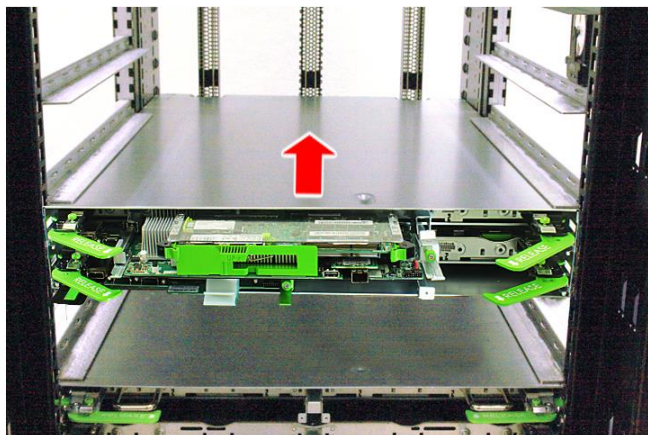
3   Push the latch handles until they lock into place.
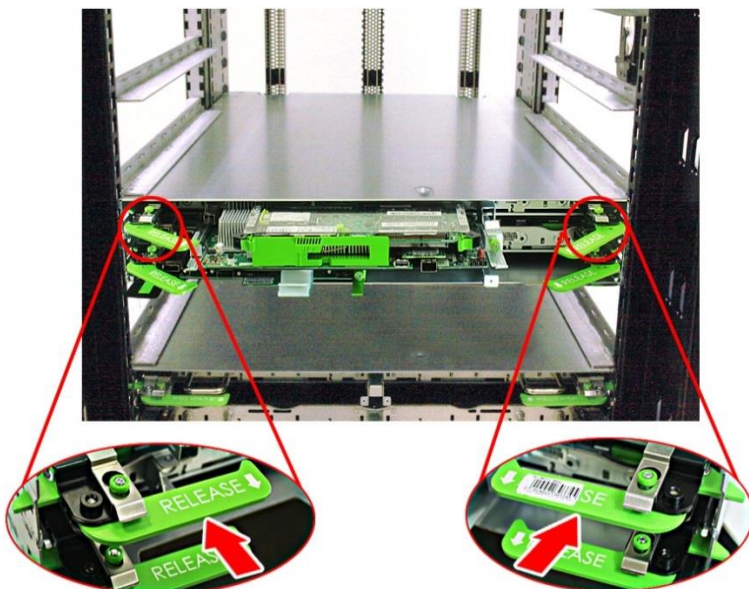
3.5 Opening the System

3.5.1 Removing the Top Cover

1   Remove the system from the rack (see **Removing the System from the Rack** on page **23**).

2   Loosen the two thumbscrews securing the top cover to the chassis.

3   Slide the top cover towards the rear and lift it off the chassis.
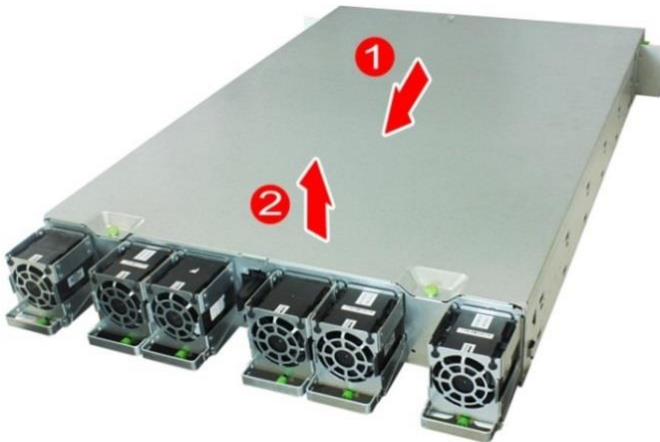
3.5.2 Installing the Top Cover

1   Lower the top cover onto the chassis and slide it towards the front until the thumbscrews are aligned with the screw holes.
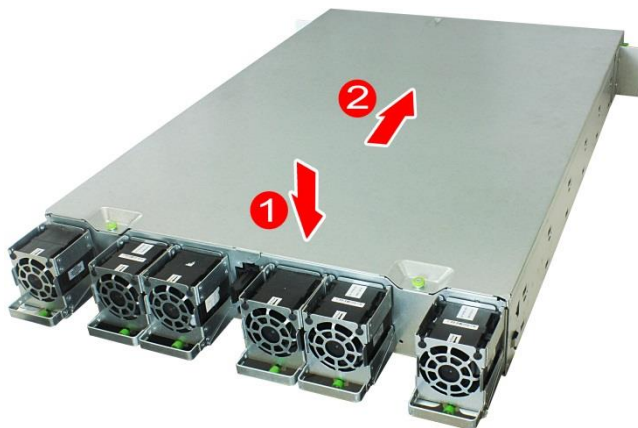
2   Secure the top cover to the chassis by tightening the two thumbscrews.

3   Install the system into the rack (see **Installing the System into the Rack** on **page 25**).

3.6 Replacing the System Fans

3.6.1 Removing the Fan Module

1 Remove the system from the rack (see **Removing the System from the Rack** on page **23**).

2 Loosen the thumbscrew securing the fan module to the chassis.
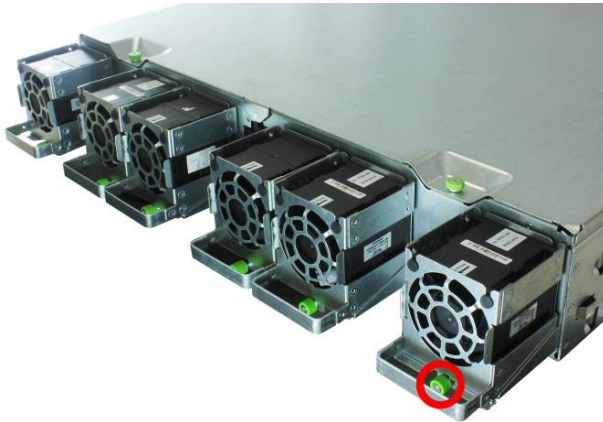
3 Pull out the fan module (**1**) and lift it (**2**) off the chassis.
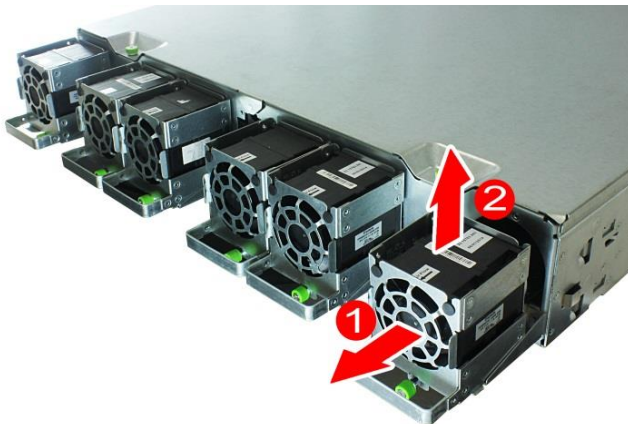
3.6.2 Installing the Fan Module

1   Insert the fan module (**1**) and push (**2**) until it is seated firmly into the chassis.
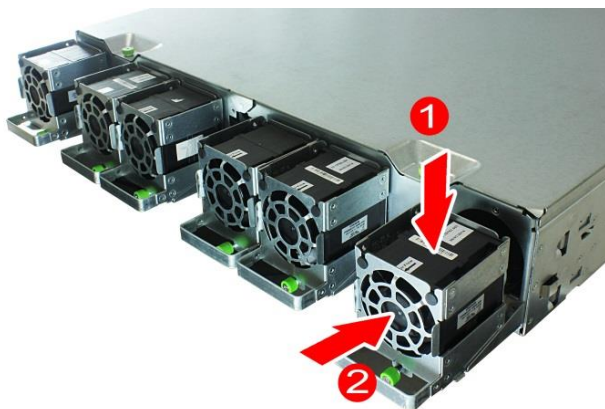
2   Secure the fan module to the chassis by tightening the thumbscrew.

3   Install the system into the rack (see **Installing the System into the Rack** on **page 25**).

3.7 Replacing the Panther+ Board

WARNING

The heat sink on the bottom side of the Panther+ board may be hot. To avoid possible burns, do not touch the heat sink.

CAUTION

Panther+ board does not support hot-plug. Please follow the instructions in the following sections to remove/install the Panther+ board. Incorrect procedure may cause damages to the system and/or components.

TiP

To replace the Panther+ Board without having to turn off the system power, skip this section and proceed to section 3.11 Replacing the LSI Baseboard.

3.7.1 Removing the Panther+ Board

1 Make sure the system power is turned off.

2 Unlock the clips securing the Panther+ board to the LSI baseboard.
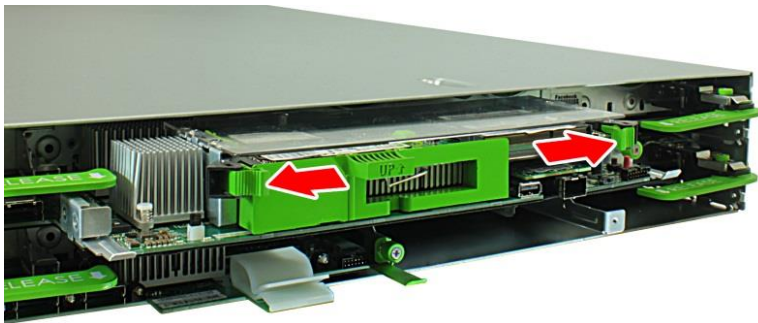
3   Pull out the Panther+ board.
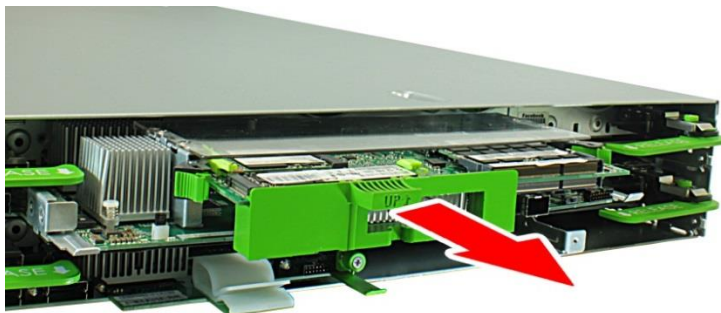
3.7.2   Installing the Panther+ Board

1   Make sure the system power is turned off.

2   Insert the Panther+ board into the clips on the LSI baseboard and push until the Panther+ board is firmly latched into place.
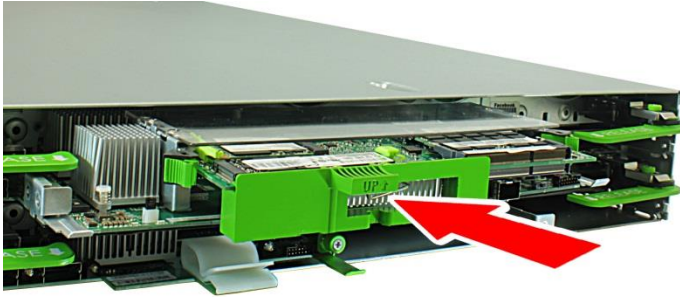
3   Lock the clips to secure the Panther+ board in place.

3.8 Replacing the Memory

3.8.1 Removing the Memory

1   Remove the Panther+ board (see **Removing the Panther+ Board** on **page 31**).

2   Open the locking clips to release the memory module.

3   Gently pull the memory module upward to remove it from the memory slot.

4   Repeat steps 1 and 2 until you have removed all the memory modules from the top and bottom sides of the Panther+ board.

3.8.2 Installing the Memory

1   Insert the memory module into the memory slot on the Panther+
     board.

2   Gently press the memory module downward until the locking clips
     latch into place.

3   Repeat steps 1 and 2 until you have installed all the memory
     modules on the top and bottom sides of the Panther+ board.

4   Install the Panther+ board (see **Installing the Panther+ Board** on
     page 33).

3.9 Replacing the mSATA SSD Module

3.9.1 Removing the mSATA SSD Module

1 Remove the Panther+ board (see **Removing the Panther+ Board** on **page 31**).

2 Push the two corners of the green plastic holder to release the mSATA SSD module.

3 Remove the mSATA SSD module from the Panther+ board.

3.9.2   Installing the mSATA SSD Module

1   Insert the mSATA SSD module into its connector.

2   Gently press the mSATA module until it latches into place.

3   Install the Panther+ board (see **Installing the Panther+ Board** on **page 33**).

3.10   Replacing the M.2 SSD Module

3.10.1   Removing the M.2 SSD Module

1   Remove the Panther+ board (see **Removing the Panther+ Board** on **page 31**).

2   Pry the green plastic holder to release the M.2 SSD module.
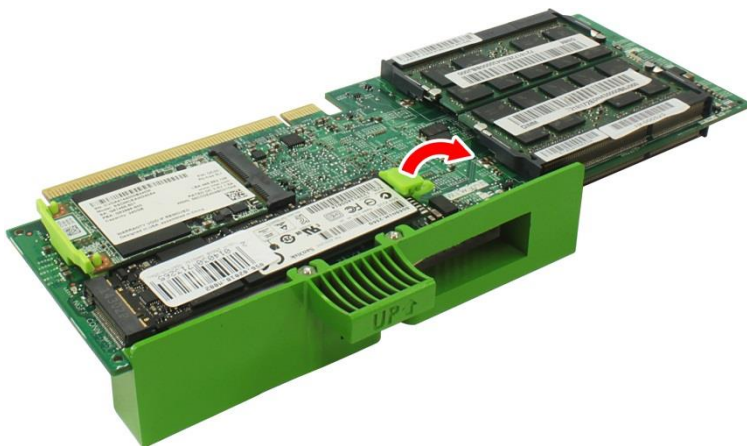
3   Remove the M.2 SSD module from the Panther+ board.
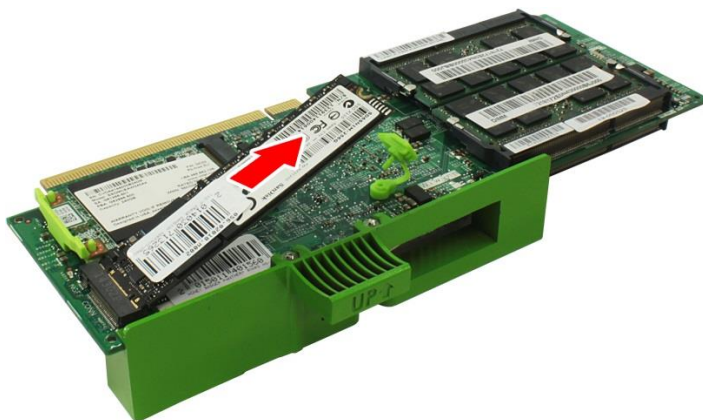
3.10.2 Installing the M.2 SSD Module

1   Insert the M.2 SSD module into its connector.

2   Press and hold the M.2 SSD module (**1**), then close the green plastic holder (**2**) to secure the M.2 SSD module in place.
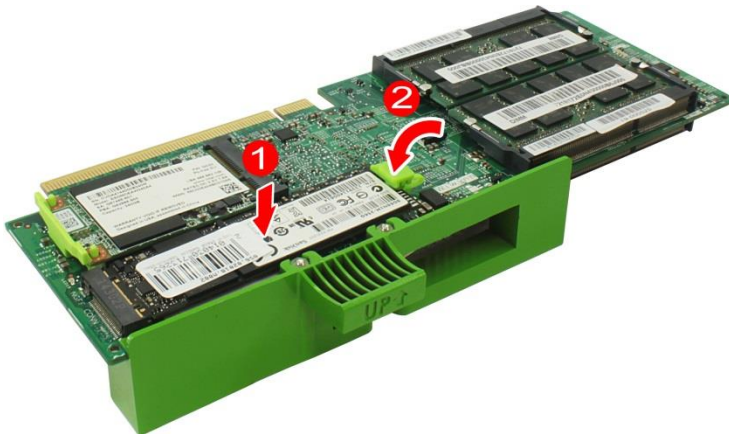
3   Install the Panther+ board (see **Installing the Panther+ Board** on page **33**).

3.11 Replacing the LSI Baseboard

WARNING

The heat sink on the LSI baseboard may be hot. To avoid possible burns, do not touch the heat sink.

3.11.1 Removing the LSI Baseboard

1   Loosen the thumbscrew securing the LSI baseboard to the HDD tray.

2   Use the two tabs to pull out the LSI baseboard from the HDD tray.

3   Remove the Panther+ board if it is still attached to the LSI baseboard (see steps 2 and 3 in **Removing the Panther+ Board** on **page 31**).

3.11.2   Installing the LSI Baseboard

1   Install the Panther+ board (see steps 2 and 3 in **Installing the Panther+ Board** on **page 33**).

2   Insert the LSI baseboard into the HDD tray.
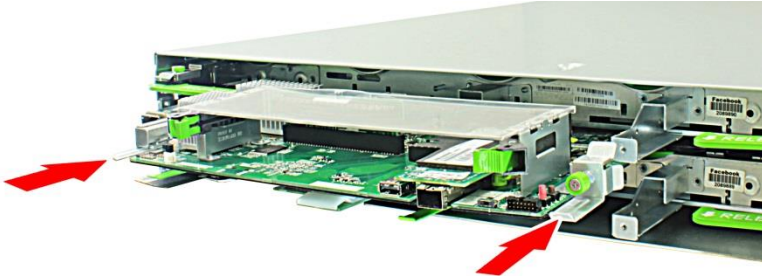
3   Secure the LSI baseboard to the HDD tray by tightening the thumbscrew.

3.12   Replacing the Mezzanine Card

3.12.1   Removing the Mezzanine Card

1   Remove the LSI baseboard (see **Removing the LSI Baseboard** on
page 40).

2   Pinch the two retainer plugs (**1**) and press the two latches (**2**) to
remove the mezzanine card (**3**).
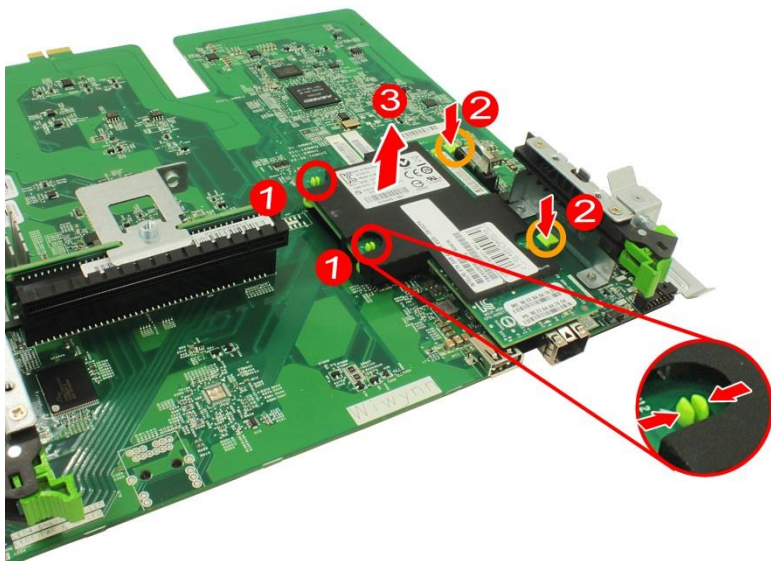
3.12.2 Installing the Mezzanine Card

1   Align the holes on the mezzanine card with the corresponding
     retainer plugs and posts on the LSI baseboard.

2   Press down the mezzanine card gently until it latches into place.
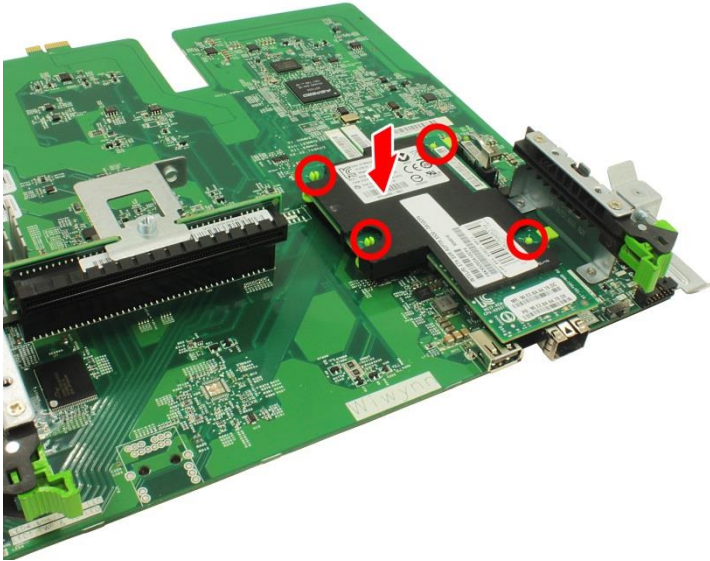
3   Install the LSI baseboard (see **Installing the LSI Baseboard** on
     page 41).

3.13 Replacing the Battery

⚠ **WARNING**	There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer.

3.13.1 Removing the Battery

1   Remove the LSI baseboard (see **Removing the LSI Baseboard** on **page 40**).

2   Push the battery clip (**1**) and remove the battery (**2**) from its holder.
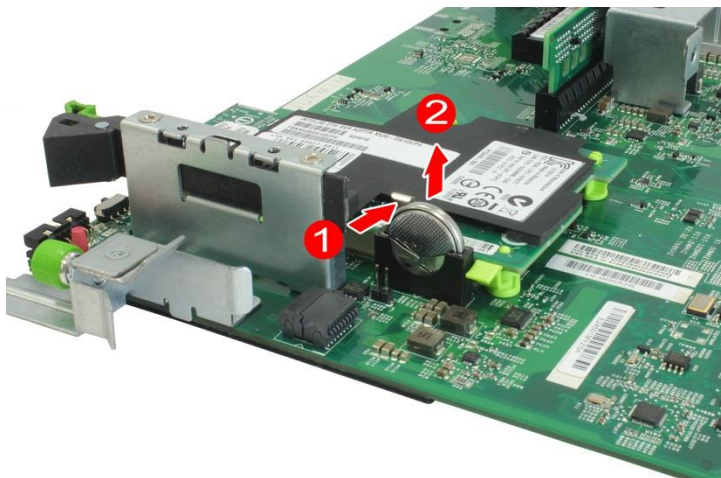
3.13.2 Installing the Battery

1   Insert the battery into the battery holder and push until the battery
     is properly seated.
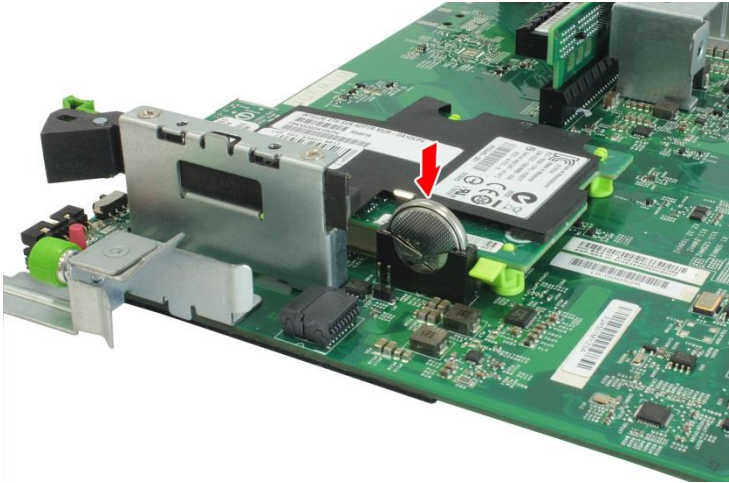
2   Install the LSI baseboard (see **Installing the LSI Baseboard** on
     page 41).

3.14   Replacing the SAS Expander Board

3.14.1   Removing the SAS Expander Board

1   Loosen the thumbscrew securing the SAS expander board to the
     HDD tray.
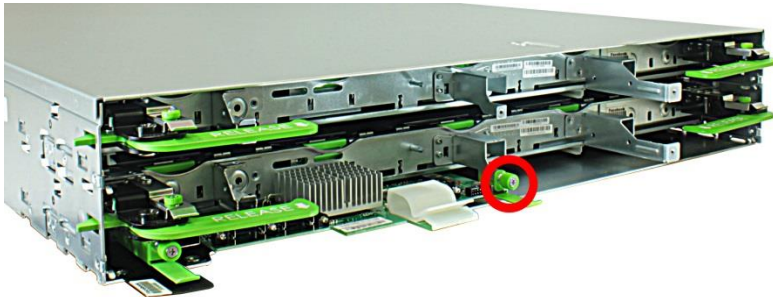
2   Use the two tabs to pull out the SAS expander board from the HDD
     tray.
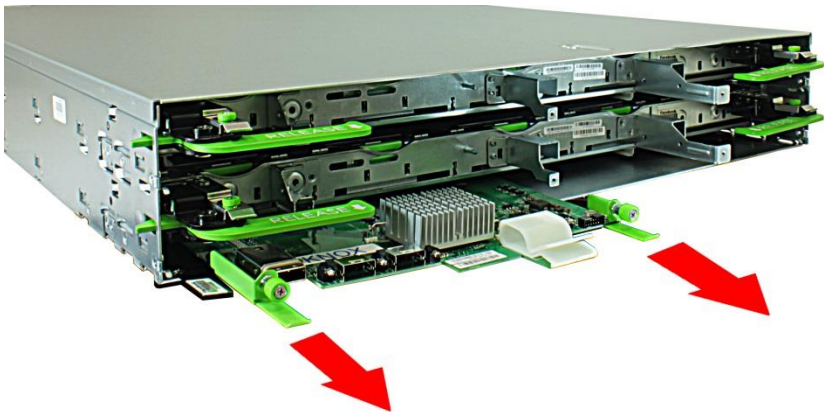
3.14.2 Installing the SAS Expander Board

1   Insert the SAS expander board into the HDD tray.
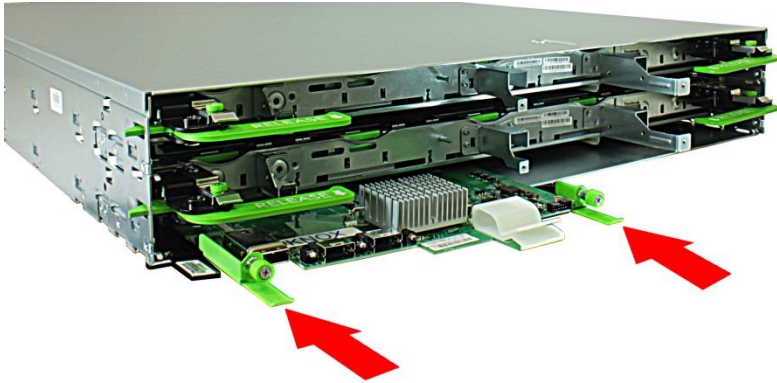
2   Secure the SAS expander board to the HDD tray by tightening the thumbscrew.
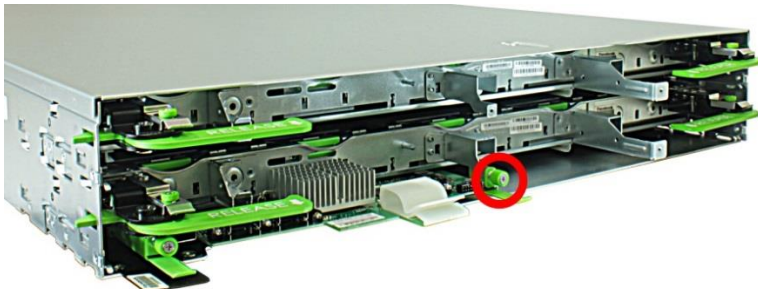
NOTE: Only the inboard thumbscrew is used; the thumbscrew under the release lever is not screwed into the tray.

3.15 Replacing the Hard Disk Drives

3.15.1 Removing the Hard Disk Drive

1 Lift the tabs to release the latch handles that secure the HDD tray to the chassis.
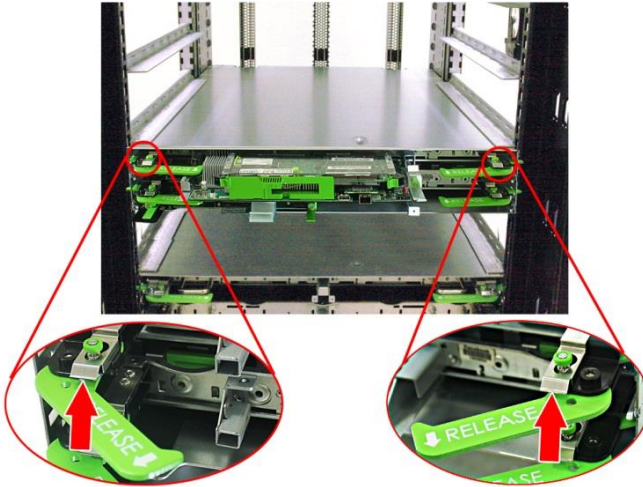
2 Pull out the HDD tray from the chassis using both hands.

3   Press the latch that secures the HDD cover to the tray (**1**) and lift
     up the HDD cover (**2**).
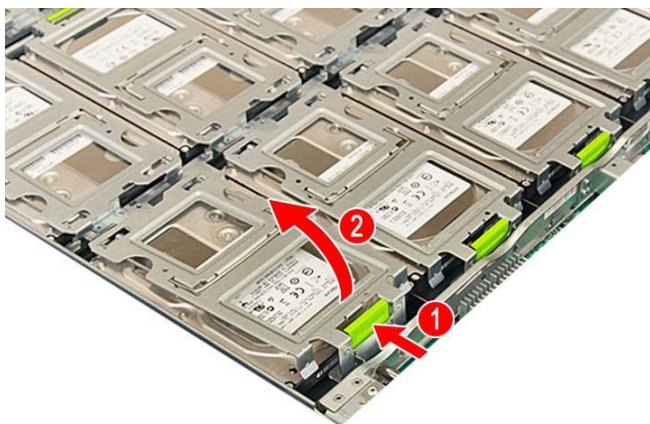
4   Slide the HDD to disengage it from its connector and remove the
     HDD from the HDD tray.
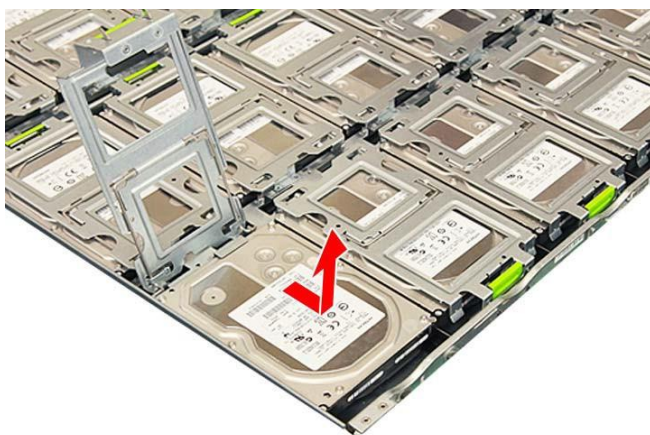
3.15.2 Installing the Hard Disk Drive

1 Insert the HDD into the tray and slide it toward the connector until it latches into place.
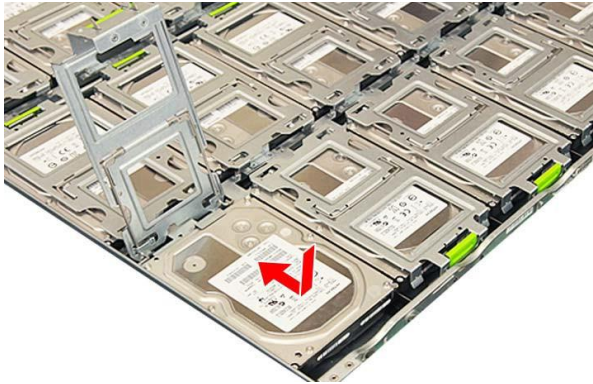
2 Push down the HDD cover until it latches into place. **DO NOT** slam the HDD cover in place – apply pressure to the green latch while pushing the cover downwards, then release the green latch to engage the tray. Pushing the cover into place without doing this may result in shock which may damage neighboring HDDs. Applying pressure to the HDD cover will cause unbalanced force, this may result in latch non- engagement to the tray.
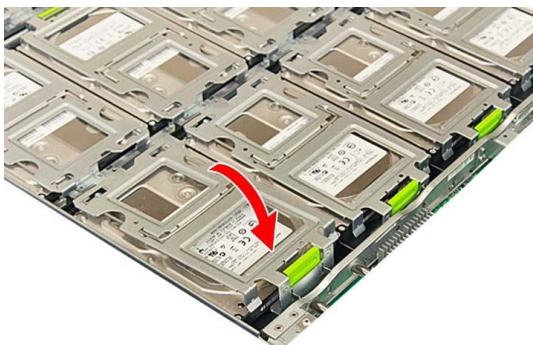
3   Push the HDD tray all the way into the chassis using both hands.

4   Push the latch handles until they lock into place.
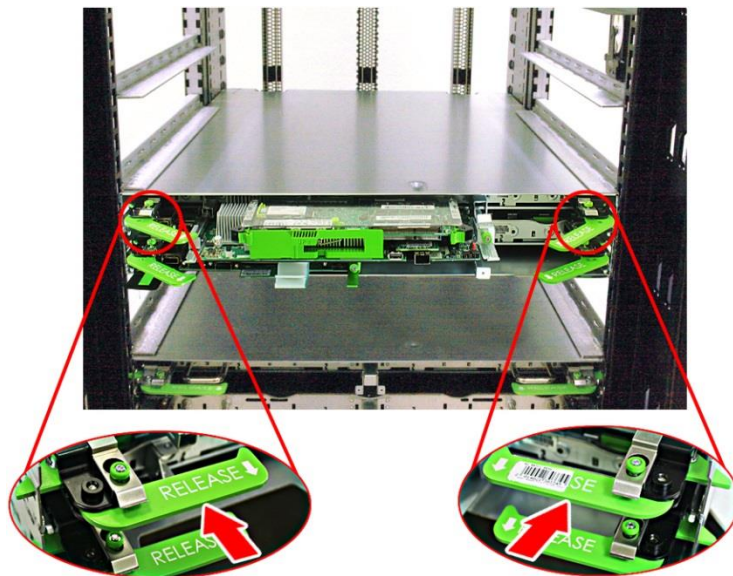
3.16   Replacing the Power Cable

3.16.1   Removing the Power Cable

1   Remove the system from the rack (see **Removing the System from the Rack** on page **23**).

2   Remove the top cover (see **Removing the Top Cover** on **page 27**).

3   Disconnect the power cable from the drive plane board.
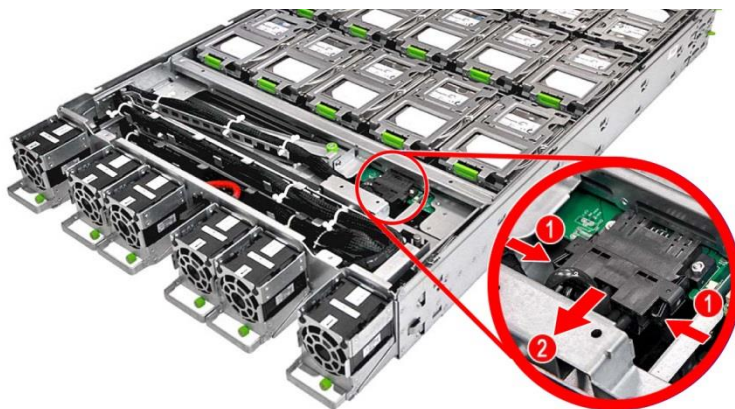
4   Remove the cable clips that secure the power cable to the guide
     rail.
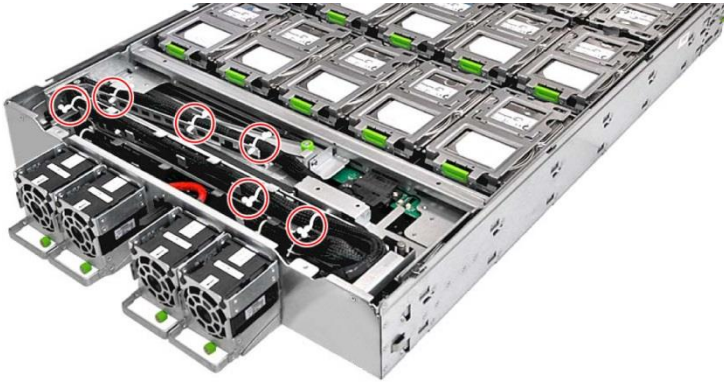
5   Disconnect the power cable from the fan controller board.

![wiwynn logo]
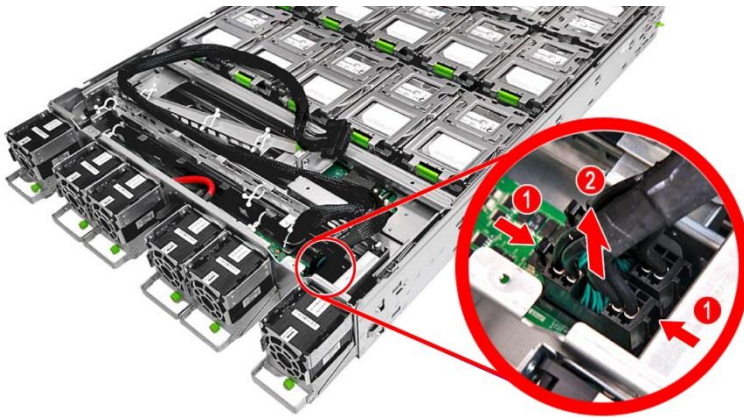
3.16.2 Installing the Power Cable

1   Connect the power cable to the fan controller board.
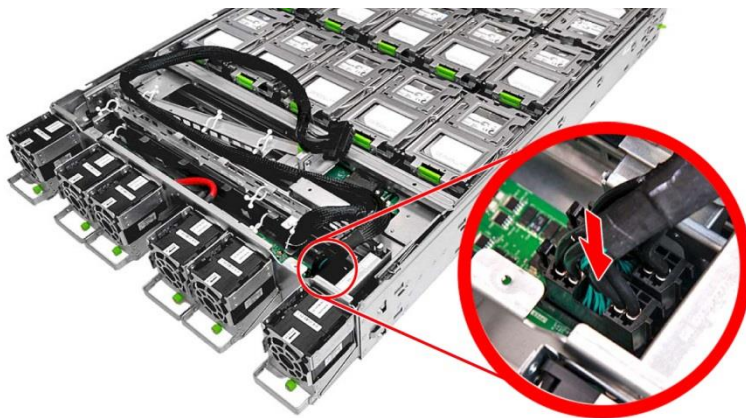
2   Secure the power cable to the guide rail using cable clips.

Note: Make sure that the green cables are placed at the upper

side of the guard rail housing.

3   Connect the power cable to the drive plane board.
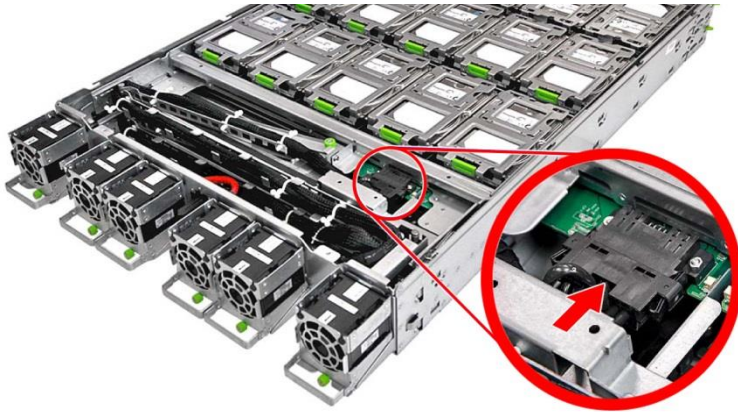
4   Install the top cover (see **Installing the Top Cover** on **page 28**).

5   Install the system into the rack (see **Installing the System into the Rack** on **page 25**).

![wiwynn logo]

3.17   Replacing the HDD Tray

3.17.1 Removing the HDD Tray

1   Lift the tabs to release the latch handles that secure the HDD tray to the chassis.
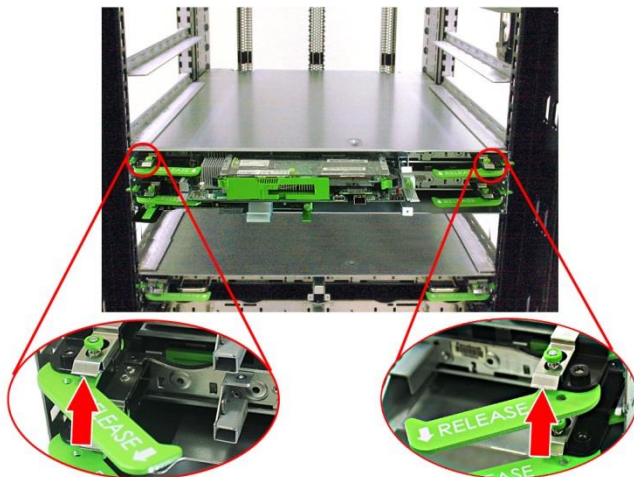
2   Pull out the HDD tray from the chassis using both hands.

3   Disconnect the power cable from the drive plane board.
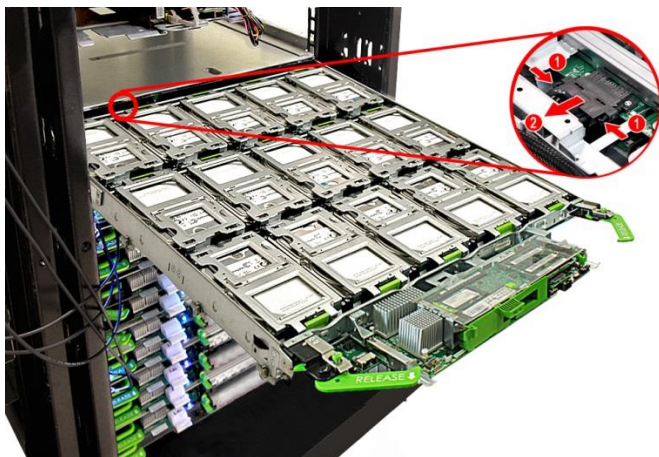
4   Loosen the thumbscrew securing the HDD tray to the guide rail.

![wiwynn logo]
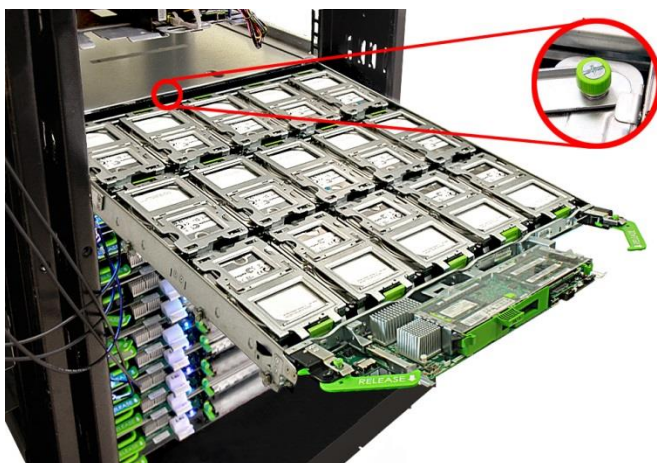
5   Push down the safety latches on both sides of the HDD tray (**1**),
     and then pull the HDD tray out of the chassis (**2**).   If the latches
     are not pushed down completely, or if the HDD tray cannot be
     pulled out, push the tray back into the chassis approximately 1/8"
     (3mm) and try again.
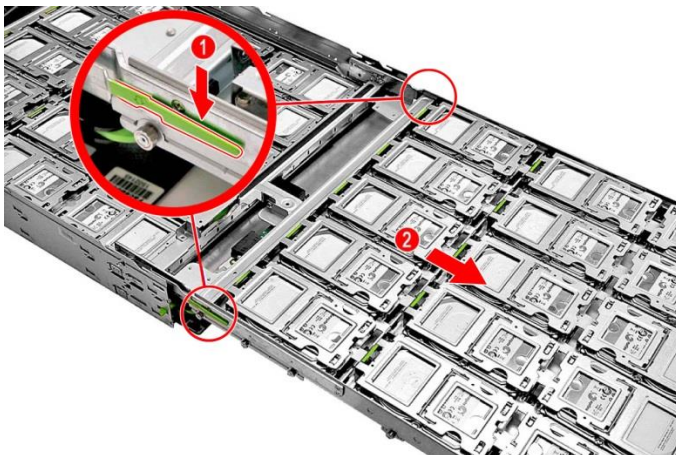
3.17.2 Installing the HDD Tray

1   Insert the HDD tray into the chassis, making sure the sliders are properly aligned with the rails in the chassis.
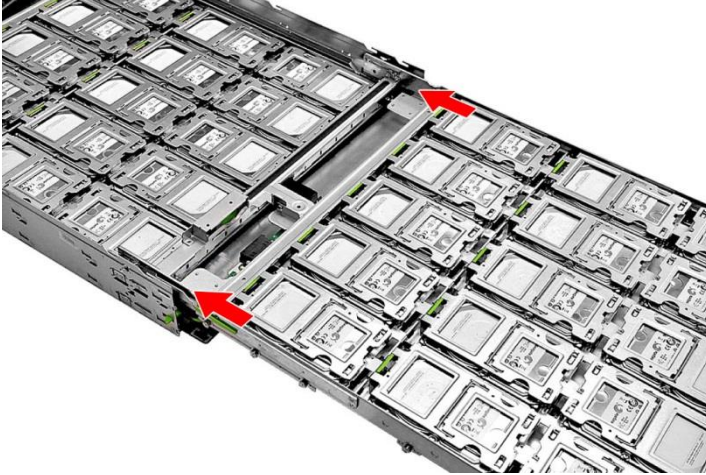
2   Secure the HDD tray to the guide rail by tightening the thumbscrew.
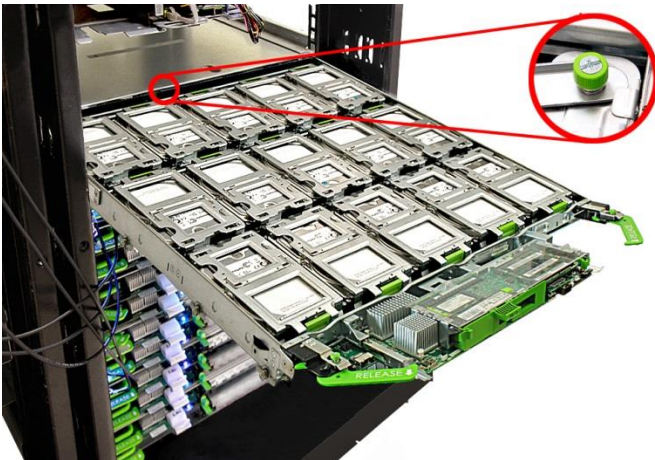
3   Connect the power cable to the drive plane board.
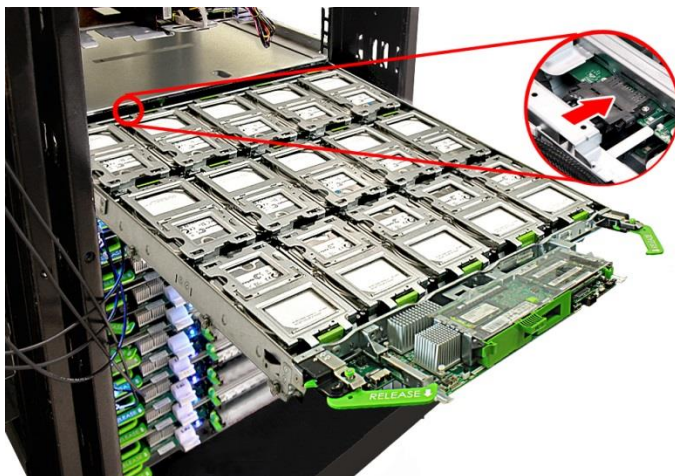
4   Press the HDD tray into the chassis until the handles latch into place.
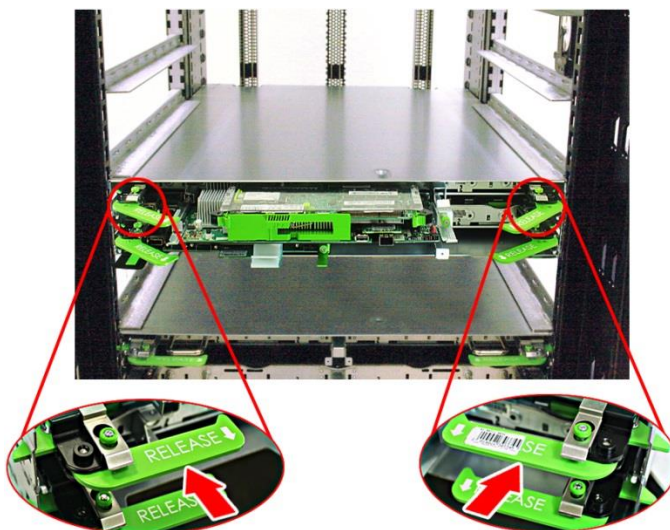
3.18 Replacing the Bus Bar Cables

3.18.1 Removing the Bus Bar Cables

1. Remove the system from the rack (see **Removing the System from the Rack** on page **23**).

2. Remove the top cover (see **Removing the Top Cover** on **page 27**).

3. Remove the fan modules (see **Removing the Fan Module** on **page 29**).

4. Remove the power cables (see **Removing the Power Cable** on **page 52**).

5. Remove the HDD trays (see **Removing the HDD Tray** on **page 56**).

6. Remove the five screws securing the bus bar cables to the fan controller board.

7   Use a torx screw driver to remove the four torx screws securing the
     bus bar cables to the chassis.
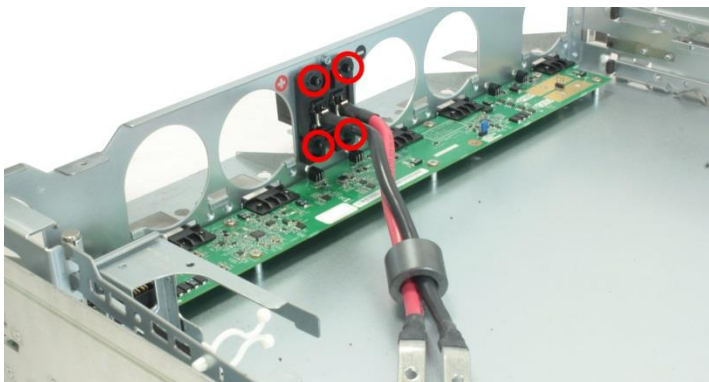
8   Lift the bus bar cables off the chassis.
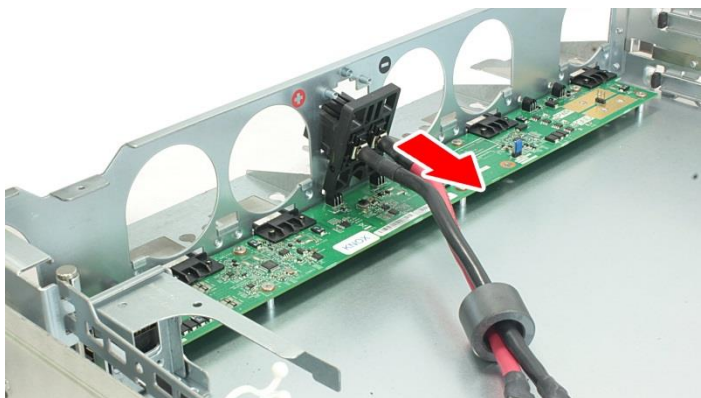
3.18.2 Installing the Bus Bar Cables

1   Place the bus bar cables into the chassis.

2   Use a torx screwdriver to secure the bus bar cables to the chassis with four torx screws.
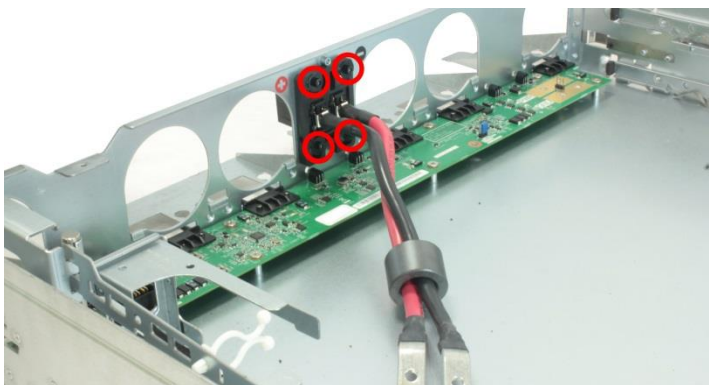
3   Secure the bus bar cables to the fan controller board using five
     screws.

4   Install the HDD trays (see **Installing the HDD Tray** on **page 59**).

5   Install the power cables (see **Installing the Power Cable** on **page
     54**).

6   Install the fan modules (see **Installing the Fan Module** on **page
     30**).

7   Install the top cover (see **Installing the Top Cover** on **page 28**).

8   Install the system into the rack (see **Installing the System into the
     Rack** on **page 25**).

3.19 Replacing the Fan Controller Board

3.19.1 Removing the Fan Controller Board

1 Remove the system from the rack (see **Removing the System from the Rack** on page **23**).

2 Remove the top cover (see **Removing the Top Cover** on **page 27**).

3 Remove the fan modules (see **Removing the Fan Module** on **page 29**).

4 Remove the power cables (see **Removing the Power Cable** on **page 52**).

5 Remove the HDD trays (see **Removing the HDD Tray** on **page 56**).

6 Remove the bus bar cables (see **Removing the Bus Bar Cables** on **page 61**).

7 Remove the eight screws securing the fan controller board to the chassis.
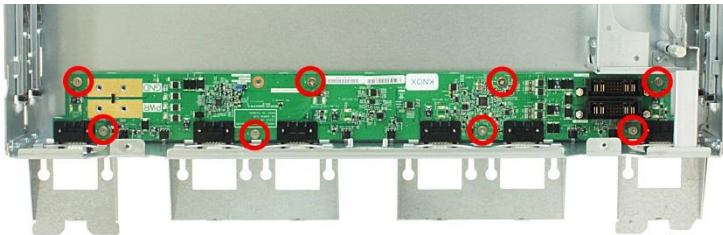
8   Lift the fan controller board off the chassis.
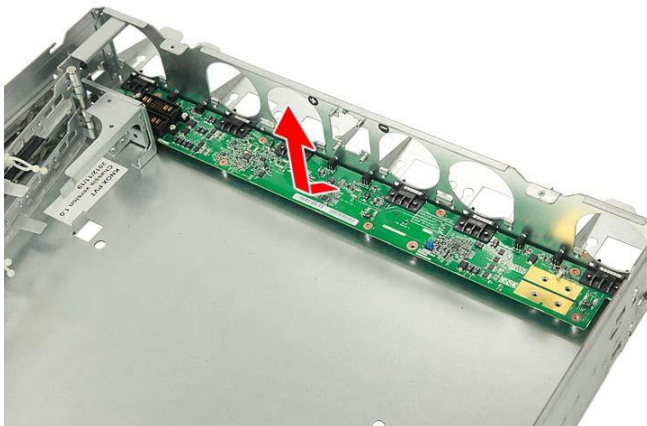
3.19.2 Installing the Fan Controller Board

1   Place the fan controller board into the chassis.
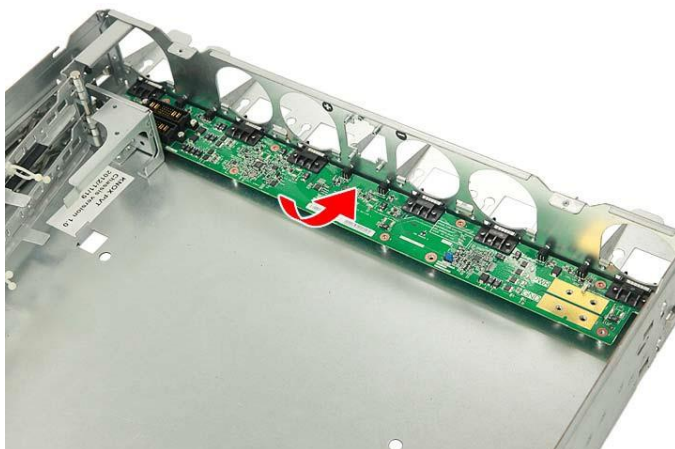
2	Secure the fan controller board to the chassis using eight screws.
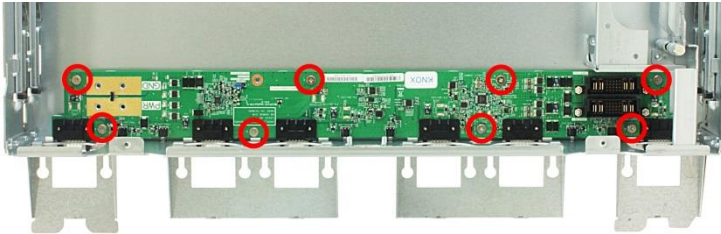
3	Install the bus bar cables (see **Installing the Bus Bar Cables** on **page 63**).

4	Install the HDD trays (see **Installing the HDD Tray** on **page 59**).

5	Install the power cables (see **Installing the Power Cable** on **page 53**).

6	Install the fan modules (see **Installing the Fan Module** on **page 30**).

7	Install the top cover (see **Installing the Top Cover** on **page 28**).

8	Install the system into the rack (see **Installing the System into the Rack** on **page 25**).

3.20   Replacing the Power Transition Board

3.20.1 Removing the Power Transition Board

1   Remove the LSI baseboard (see **Removing the LSI Baseboard** on **page 40**).

2   Remove the SAS expander board (see **Removing the SAS Expander Board** on **page 46**).

3   Remove the hard disk drives (see **Removing the Hard Disk Drive** on **page 48**).

4   Remove the HDD trays (see **Removing the HDD Tray** on **page 56**).

5   Turn the tray over to access the base of the tray.

6   Remove the four screws securing the power transition board to the chassis.
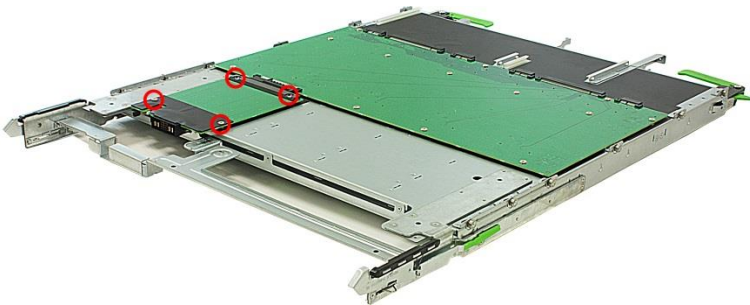
7 Detach the plastic ramp from the power transition board.
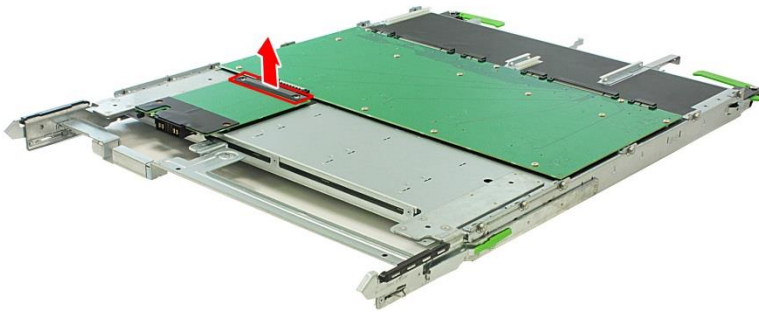
8 Slide the power transition board to disengage it from the drive plane board, and then lift it off the chassis.
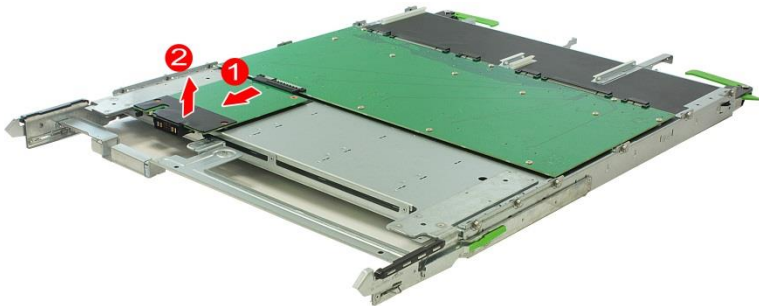
3.20.2 Installing the Power Transition Board

1   Insert the power transition board into the chassis and slide it toward
     the drive plane board until it latches into place.

2   Place the plastic ramp into the power transition board.
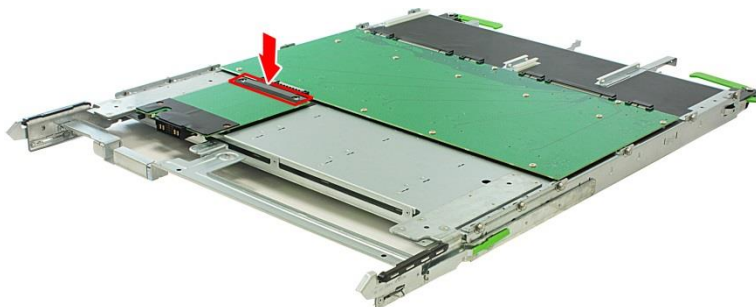
3   Secure the power transition board to the chassis using four screws.
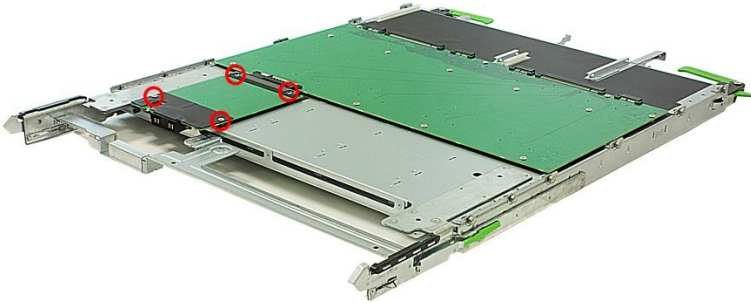
4   Install the HDD trays (see **Installing the HDD Tray** on **page 59**).

5   Install the hard disk drives (see **Installing the Hard Disk Drive** on **page 50**).

6   Install the LSI baseboard (see page **41**) and the SAS expander board (see **page 47**).

3.21   Replacing the Drive Plane Board

3.21.1   Removing the Drive Plane Board

1   Remove the LSI baseboard (see **page 40**) and the SAS expander board (see **page 46**).

2   Remove the hard disk drives (see **Removing the Hard Disk Drive** on **page 48**).

3   Remove the HDD trays (see **Removing the HDD Tray** on **page 56**).

4   Remove the power transition board (see **Removing the Power Transition Board** on **page 68**).

5   Remove the thirteen screws securing the drive plane board to the chassis.

6   Remove the drive plane board from the chassis
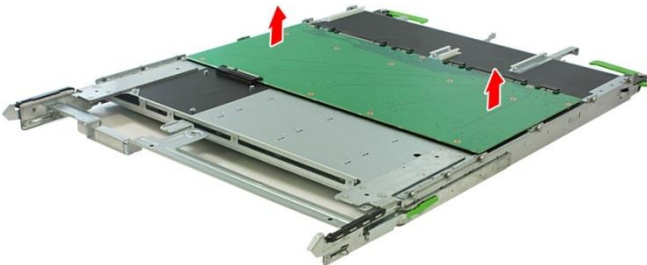
3.21.2 Installing the Drive Plane Board

1   Place the drive plane board into the chassis.
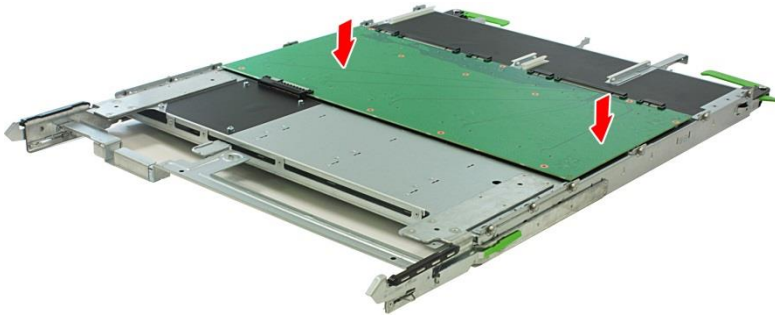
2   Secure the drive plane board to the chassis using thirteen screws.
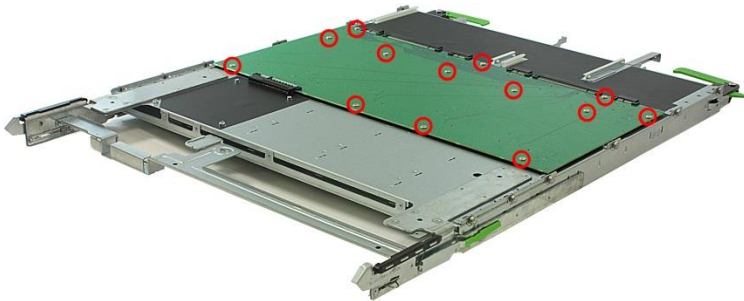
3   Install the power transition board (see **Installing the Power Transition Board** on **page 70**).

4   Install the HDD trays (see **Installing the HDD Tray** on **page 59**).

5   Install the hard disk drives (see **Installing the Hard Disk Drive** on **page 50**).

6   Install the LSI baseboard (see **page 41**) and the SAS expander board (see **page 47**).

3.22 Debug Card

3.22.1 Sub-System Selection for Debug Card

As a storage server, Honey Badger contains two sub-systems. One is the CPU system and the other is the storage system. Each sub-system has a 7-segment LED for displaying two-digit error codes and a reset switch to trigger a sub-system reset.

Use the slide switch located beside the baseboard debug card connector to select which debug code to be displayed on the Honey Badger debug card.   Manufacturer's default setting is POST code.

3.22.2 Installing Debug Card

1   Locate the ports for installing the debug card.
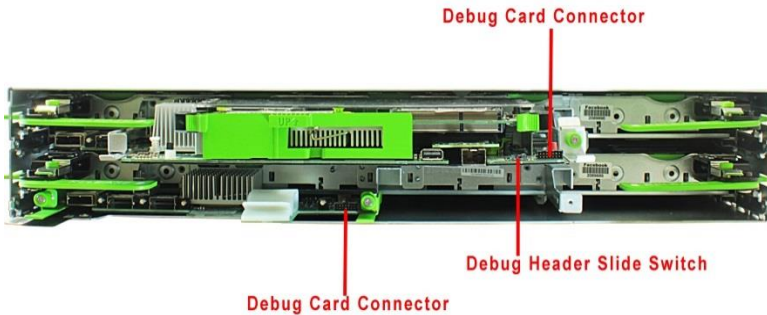
2   Install the debug card.

Slide Switch
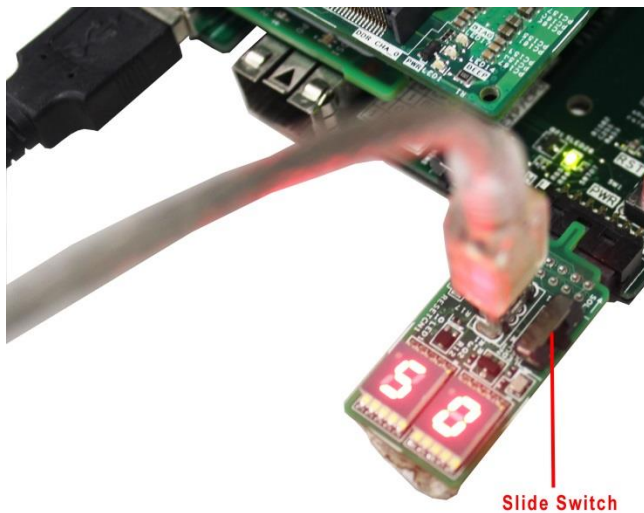
3   Connect the serial cable from the debug card to any USB port on
     your computer.

4.   Firmware Update

1.   BMC Firmware Update

BMC can implement remote BMC firmware update without requiring any physical input on the system. Remote update can be through Out-Of-Band by management network or through logging into local OS (CentOS) by data network. The BMC firmware update tool(s) support CentOS 5.2 and updated Facebook Kernel (FBK).

The following steps show the alternate BMC firmware update by USB:

1   Add this ipmitool command to enable virtual device (default is disable):

```
ipmitool raw 0x32 0xaa 0x00
```

2   Key in;

```
./Yafuflash –u USERID –p PASSW0RD –nw –ip
xxx.xxx.xxx.xxx filename.ima
```

NOTE: The IP address is based on the actual user environment

Wait for the flash process to finish and BMC will restart automatically.

A remote BMC firmware update may take a maximum of 5 minutes to complete. BMC firmware update and BMC reset processes do not require rebooting or powering down of the host system and have no impact on normal operation of host system. Wiwynn BMC is fully functional after firmware update and reset without requiring further configuration.

BMC supports dual images for fail-over function.

Normally, BCM always boots from image 1. If image 1 is damaged, u-boot selects image 2 to boot. After the user updates image 1, u-boot

selects image 1 to boot again.

2. FPGA Code Update

BMC can implement remote FPGA code update without requiring any physical input on the system. Remote update can be through Out-Of-Band by management network or through logging into local OS (CentOS) by data network. The BMC firmware update tool(s) support CentOS 5.2 and updated Facebook Kernel (FBK).

The following steps show the alternate FPGA code update by USB:

1   Add this ipmitool command to enable virtual device (default is disable):

```
ipmitool raw 0x32 0xaa 0x00
```

2   Key in

```
./Yafuflash -cd -cpld fpga.bin (at local OS)
```

   Wait for the flash process to finish and BMC will restart automatically.

3. Remote BIOS Recovery via OOB

BMC implements BIOS recovery mechanism through OOB. You can use this command to perform BIOS recovery:

Key in:

```
./Yafuflash-u USERID -p PASSW0RD -nw -ip
xxx.xxx.xxx.xxx -d 2 ~/filename.iso
```

NOTE: The IP address is based on the actual user environment

After issuing this command, BIOS recovery mechanism starts automatically.

The limitations are as follows:

1   BIOS boot section should be alive.

2   The image should be in ISO format. The ISO image includes also a
    CRC-32 checksum and BMC will check if the image is correct or not
    based it on.

4.   Expander Firmware Update via In-band SAS Interface

NOTE: Wiwynn customers can download XTools from Wiwynn or
contact Avago directly for license in using or downloading
XTools.

For 12G Expander:

The 12G Expander requires the sas3xfw.fw and mfg.bin binary files to
update the firmware via in-band SAS interface on the system. You need
to login to the local OS (CentOS) through the data network. The 12G
Expander firmware update script uses Avago 12G XTools that support
CentOS 6.x.

For example: Expander SAS ID is 570e28402007d0ff

1   Key in this command to update the expander firmware:

    ```
    ./g3Xflash -i 570e28402007d0ff -y down fw sas3xfw.fw
    ```

    Wait for the flash process to finish.

2   Key in this command to update the expander configuration region:

    ```
    ./g3Xflash -i 570e28402007d0ff -y down mfg mfg.bin 3
    ```

    Wait for the flash process to finish.

3　Key in this command to reset the expander and apply the new expander firmware:

```
./g3Xflash -i 570e28402007d0ff -y reset exp
```

Wait for at least one minute.

For 6G Expander:

The 6G Expander requires the sas2xfw.fw and mfg.bin binary files to update the firmware via in-band SAS interface on the system. You need to login to the local OS (CentOS) through the data network. The 6G Expander firmware update script uses Avago 6G XTools that support CentOS 6.x.

For example: Expander SAS ID is 570e28402007d0ff

1　Key in this command to update the expander firmware

```
./xflash -i 570e28402007d0ff -y down fw sas2xfw.fw 1
./xflash -i 570e28402007d0ff -y down fw sas2xfw.fw 2
```

Wait for the flash process to finish.

2　Key in this command to update the expander configuration region

```
./xflash -i 570e28402007d0ff -y down mfg mfg.bin 3
```

Wait for the flash process to finish.

3　Key in this command to reset the expander and apply the new expander firmware:

```
./xflash -i 570e28402007d0ff -y reset exp
```

Wait for at least one minute.

5.   Wiwynn Supported SES Pages

Wiwynn SAS Expander firmware follows SES (SCSI Enclosure Services) standard so that supported SES pages can be retrieved by opening source utility such as Linux sg_ses tool.

The following examples show you how to retrieve the status of some SES pages via Linux sg_ses tool.

1.   Get the status of SES page0

[root@localhost ~]# sg_ses -p 0 /dev/sg16

    wiwynn   HB2U   0415
Supported diagnostic pages:
    Supported Diagnostic Pages [sdp] [0x0]
    Configuration (SES) [cf] [0x1]
    Enclosure Status/Control (SES) [ec,es] [0x2]
    String In/Out (SES) [str] [0x4]
    Threshold In/Out (SES) [th] [0x5]
    Element Descriptor (SES) [ed] [0x7]
    Additional Element Status (SES-2) [aes] [0xa]
    Download Microcode (SES-2) [dm] [0xe]

2.   Get the status of SES page1

[root@localhost ~]# sg_ses -p 1 /dev/sg16

    wiwynn   HB2U   0415
Configuration diagnostic page:
    number of secondary subenclosures: 0
    generation code: 0x0
    enclosure descriptor list

Subenclosure identifier: 0 (primary)

relative ES process id: 1, number of ES processes: 1

number of type descriptor headers: 8

enclosure logical identifier (hex): 570e28402007d0ff

enclosure vendor: wiwynn   product: HB2U   rev: 0404

vendor-specific data:

    23 04 04 15 00 00 00 00

type descriptor header/text list

Element type: Array device slot, subenclosure id: 0

number of possible elements: 15

text: ArrayDevicesInSubEnclsr0

Element type: SAS connector, subenclosure id: 0

number of possible elements: 19

text: ConnectorsInSubEnclsr0

Element type: Cooling, subenclosure id: 0

number of possible elements: 12

text: CoolingElementInSubEnclsr0

Element type: Temperature sensor, subenclosure id: 0

number of possible elements: 34

text: TempSensorsInSubEnclsr0

Element type: Voltage sensor, subenclosure id: 0

number of possible elements: 25

text: VoltageSensorsInSubEnclsr0

Element type: Current sensor, subenclosure id: 0

number of possible elements: 3

text: CurrentSensorsInSubEnclsr0

Element type: Enclosure, subenclosure id: 0

number of possible elements: 1

text: EnclosureElementInSubEnclsr0

Element type: SAS expander, subenclosure id: 0

number of possible elements: 1

text: LSI SAS Expander

3. Get the status of SES page2

[root@localhost ~]# sg_ses -p 2 /dev/sg16

wiwynn   HB2U   0415

Primary enclosure logical identifier (hex): 5f80f41f1bbbbbff

Enclosure Status diagnostic page:

INVOP=0, INFO=1, NON-CRIT=1, CRIT=1, UNRECOV=0

generation code: 0x0

status descriptor list

Element type: Array device slot, subenclosure id: 0 [ti=0]

Overall descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: Unsupported

OK=0, Reserved device=0, Hot spare=0, Cons check=0

In crit array=0, In failed array=0, Rebuild/remap=0, R/R abort=0

App client bypass A=0, Do not remove=0, Enc bypass A=0, Enc bypass B=0

Ready to insert=0, RMV=0, Ident=0, Report=0

App client bypass B=0, Fault sensed=0, Fault reqstd=0, Device off=0

Bypassed A=0, Bypassed B=0, Dev bypassed A=0, Dev bypassed B=0

Element 0 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

OK=0, Reserved device=0, Hot spare=0, Cons check=0

In crit array=0, In failed array=0, Rebuild/remap=0, R/R abort=0

App client bypass A=0, Do not remove=0, Enc bypass A=0, Enc bypass B=0

Ready to insert=0, RMV=0, Ident=0, Report=0

App client bypass B=0, Fault sensed=0, Fault reqstd=0, Device off=0

Bypassed A=0, Bypassed B=0, Dev bypassed A=0, Dev bypassed B=0

Element 1 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

OK=0, Reserved device=0, Hot spare=0, Cons check=0

In crit array=0, In failed array=0, Rebuild/remap=0, R/R abort=0

App client bypass A=0, Do not remove=0, Enc bypass A=0, Enc bypass

B=0

Ready to insert=0, RMV=0, Ident=0, Report=0

App client bypass B=0, Fault sensed=0, Fault reqstd=0, Device off=0

Bypassed A=0, Bypassed B=0, Dev bypassed A=0, Dev bypassed B=0

......

......

Element type: SAS connector, subenclosure id: 0 [ti=1]

Overall descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: Unsupported

Ident=0, No information

Connector physical link=0x0, Fail=0

Element 0 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, SAS Drive backplane receptacle (SFF-8482) [max 2 phys]

Connector physical link=0x0, Fail=0

Element 1 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, SAS Drive backplane receptacle (SFF-8482) [max 2 phys]

Connector physical link=0x0, Fail=0

......

......

Element type: Cooling, subenclosure id: 0 [ti=2]

    Overall descriptor:

        Predicted failure=0, Disabled=0, Swap=0, status: Unsupported

        Ident=0, Hot swap=0, Fail=0, Requested on=0, Off=0

        Actual speed=0 rpm, Fan stopped

    Element 0 descriptor:

        Predicted failure=0, Disabled=0, Swap=0, status: OK

        Ident=0, Hot swap=0, Fail=0, Requested on=0, Off=0

        Actual speed=6220 rpm, Fan at third highest speed

    Element 1 descriptor:

        Predicted failure=0, Disabled=0, Swap=0, status: OK

        Ident=0, Hot swap=0, Fail=0, Requested on=0, Off=0

        Actual speed=6420 rpm, Fan at third highest speed

    ......

    ......

Element type: Temperature sensor, subenclosure id: 0 [ti=3]

    Overall descriptor:

        Predicted failure=0, Disabled=0, Swap=0, status: Unsupported

        Ident=0, Fail=0, OT failure=0, OT warning=0, UT failure=0

        UT warning=0

        Temperature: <reserved>

    Element 0 descriptor:

        Predicted failure=0, Disabled=0, Swap=0, status: OK

        Ident=0, Fail=0, OT failure=0, OT warning=0, UT failure=0

        UT warning=0

        Temperature=46 C

    Element 1 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, Fail=0, OT failure=0, OT warning=0, UT failure=0

UT warning=0

Temperature=54 C

......

......

Element type: Voltage sensor, subenclosure id: 0 [ti=4]

Overall descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: Unsupported

Ident=0, Fail=0, Warn Over=0, Warn Under=0, Crit Over=0

Crit Under=0

Voltage: 0.00 volts

Element 0 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, Fail=0, Warn Over=0, Warn Under=0, Crit Over=0

Crit Under=0

Voltage: 12.37 volts

Element 1 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, Fail=0, Warn Over=0, Warn Under=0, Crit Over=0

Crit Under=0

Voltage: 12.22 volts

......

......

Element type: Current sensor, subenclosure id: 0 [ti=5]

Overall descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: Unsupported

Ident=0, Fail=0, Warn Over=0, Crit Over=0

Current: 0.00 amps

Element 0 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, Fail=0, Warn Over=0, Crit Over=0

Current: 2.11 amps

Element 1 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, Fail=0, Warn Over=0, Crit Over=0

Current: 0.92 amps

Element 2 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, Fail=0, Warn Over=0, Crit Over=0

Current: 20.53 amps

Element type: Enclosure, subenclosure id: 0 [ti=6]

Overall descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: Unsupported

Ident=0, Time until power cycle=0, Failure indication=0

Warning indication=0, Requested power off duration=0

Failure requested=0, Warning requested=0

Element 0 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, Time until power cycle=0, Failure indication=0

Warning indication=0, Requested power off duration=0

Failure requested=0, Warning requested=0

Element type: SAS expander, subenclosure id: 0 [ti=7]

Overall descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: Unsupported

Ident=0, Fail=0

Element 0 descriptor:

Predicted failure=0, Disabled=0, Swap=0, status: OK

Ident=0, Fail=0

4. Get the status of SES page7

[root@localhost ~]# sg_ses -p 7 /dev/sg16

wiwynn   HB2U   0415

Primary enclosure logical identifier (hex): 5f80f41f1bbbbbff

Element Descriptor In diagnostic page:

generation code: 0x0

element descriptor by type list

Element type: Array device slot, subenclosure id: 0 [ti=0]

Overall descriptor: ArrayDevicesInSubEnclsr0

Element 0 descriptor: ArrayDevice00

Element 1 descriptor: ArrayDevice01

......

......

Element type: SAS connector, subenclosure id: 0 [ti=1]

Overall descriptor: ConnectorsInSubEnclsr0

Element 0 descriptor: Connector00

Element 1 descriptor: Connector01

......

......

Element type: Cooling, subenclosure id: 0 [ti=2]

Overall descriptor: CoolingElementInSubEnclsr0

Element 0 descriptor: Fan_1_Front

Element 1 descriptor: Fan_1_Rear

......

......

Element type: Temperature sensor, subenclosure id: 0 [ti=3]

Overall descriptor: TempSensorsInSubEnclsr0

Element 0 descriptor: HBB_SAS_CTRL_Temp

Element 1 descriptor: HBB_Expander_Temp

......

......

Element type: Voltage sensor, subenclosure id: 0 [ti=4]

Overall descriptor: VoltageSensorsInSubEnclsr0

Element 0 descriptor: HBB_Voltage_12.5V_HotSwap

Element 1 descriptor: HBB_Voltage_12.5V

......

......

Element type: Current sensor, subenclosure id: 0 [ti=5]

Overall descriptor: CurrentSensorsInSubEnclsr0

Element 0 descriptor: HBB_Current

Element 1 descriptor: PPC_Current

Element 2 descriptor: FCB_Current

Element type: Enclosure, subenclosure id: 0 [ti=6]

Overall descriptor: EnclosureElementInSubEnclsr0

Element 0 descriptor: EnclosureElement01

Element type: SAS expander, subenclosure id: 0 [ti=7]

    Overall descriptor: LSI SAS Expander

    Element 0 descriptor: Top ExpanderA

5. Get the status of SES page10

[root@localhost ~]# sg_ses -p 10 /dev/sg16

  wiwynn   HB2U   0415

  Primary enclosure logical identifier (hex): 570e28402007d0ff

Additional element status diagnostic page:

  generation code: 0x0

  additional element status descriptor list

    Element type: Array device slot, subenclosure id: 0 [ti=0]

    Element index: 0   eiioe=0

      Transport protocol: SAS

      number of phys: 1, not all phys: 0, device slot number: 0

      phy index: 0

        device type: end device

        initiator port for:

        target port for: SSP

        attached SAS address: 0x570e28402007d0ff

        SAS address: 0x5000cca0243792dd

        phy identifier: 0x0

    Element index: 1   eiioe=0

      Transport protocol: SAS

      number of phys: 1, not all phys: 0, device slot number: 1

      phy index: 0

        device type: end device

initiator port for:

target port for: SSP

attached SAS address: 0x570e28402007d0ff

SAS address: 0x5000cca024370f01

phy identifier: 0x0

......

......

Element index: 14   eiioe=0

Transport protocol: SAS

number of phys: 1, not all phys: 0, device slot number: 14

phy index: 0

device type: end device

initiator port for:

target port for: SSP

attached SAS address: 0x570e28402007d0ff

SAS address: 0x5000cca02437939d

phy identifier: 0x0

6. Checkpoints and Errors

6.1 Error Code Definition

This section lists the full definitions of the Honey Badger storage system error codes. These codes are displayed on the debug card when switch button selected and are stored in the storage system event log.

To get all error code via sg_read_buffer command with buffer id 0x76 as follows.

Example 1. Current status is "No error" means byte 0 (error code 0) will be set as 1.

sg_read_buffer --mode=1 --id=0x76 -l 100 /dev/sgX

```
00   01 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
10   00 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
20   00 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
30   00 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
40   00 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
50   00 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
60   00 00 00 00
```

Example 2. Current status has error code 50 & 94 means byte 50 & 94 (error code 50 & 94) will be set as 1.

sg_read_buffer --mode=1 --id=0x76 -l 100 /dev/sgX

```
00   00 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
10   00 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
20   00 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
30   00 00 01 00 00 00 00 00   00 00 00 00 00 00 00 00
40   00 00 00 00 00 00 00 00   00 00 00 00 00 00 00 00
50   00 00 00 00 00 00 00 00   00 00 00 00 00 00 01 00
60   00 00 00 00
```

where */dev/sgX* should be an SES device (such as sg1, sg2, ...)

Error Code	Description	Condition	Event Log
0	No error		
1	Reserved		
2	Reserved		
3	I2C bus A crash	Cannot query I2C device in I2C bus A	Critical-I2C Bus ID 0 Crash
4	I2C bus B crash	Cannot query I2C device in I2C bus B	Critical-I2C Bus ID 1 Crash
5	I2C bus C crash	Cannot query I2C device in I2C bus C	Critical-I2C Bus ID 2 Crash
6	I2C bus D crash	Cannot query I2C device in I2C bus D	Critical-I2C Bus ID 3 Crash
7	I2C bus E crash	Cannot query I2C device	Critical-I2C Bus ID
8	Reserved		
9	Reserved		
10	Reserved		
11	Fan 1 front fault	Cannot query fan speed in fan module 1 front	Critical-Cooling ID 0 Fail,X(RPM)
12	Fan 1 rear fault	Cannot query fan speed in fan module 1 rear	Critical-Cooling ID 1 Fail,X(RPM)
13	Fan 2 front fault	Cannot query fan speed in fan module 2 front	Critical-Cooling ID 2 Fail,X(RPM)
14	Fan 2 rear fault	Cannot query fan speed in fan module 2 rear	Critical-Cooling ID 3 Fail,X(RPM)
15	Fan 3 front fault	Cannot query fan speed in fan module 3 front	Critical-Cooling ID 4 Fail,X(RPM)
16	Fan 3 rear fault	Cannot query fan speed in fan module 3 rear	Critical-Cooling ID 5 Fail,X(RPM)
17	Fan 4 front fault	Cannot query fan speed in fan module 4 front	Critical-Cooling ID 6 Fail,X(RPM)

Error Code	Description	Condition	Event Log
18	Fan 4 rear fault	Cannot query fan speed in fan module 4 rear	Critical-Cooling ID 7 Fail,X(RPM)
19	Fan 5 front fault	Cannot query fan speed in fan module 5 front	Critical-Cooling ID 8 Fail,X(RPM)
20	Fan 5 rear fault	Cannot query fan speed in fan module 5 rear	Critical-Cooling ID 9 Fail,X(RPM)
21	Fan 6 front fault	Cannot query fan speed in fan module 6 front	Critical-Cooling ID 10 Fail,X(RPM)
22	Fan 6 rear fault	Cannot query fan speed in fan module 6 rear	Critical-Cooling ID 11 Fail,X(RPM)
23	Reserved		
24	Reserved		
25	PPC CPU Temp. warning	Temperature over critical threshold	Critical-Temp. ID 7 Fail,Temp=X(C)
26	PPC DIMM A0 Temp. warning	Temperature over critical threshold	Critical-Temp. ID 8 Fail,Temp=X(C)
27	PPC DIMM A1 Temp. warning	Temperature over critical threshold	Critical-Temp. ID 9 Fail,Temp=X(C)
28	PPC DIMM B0 Temp. warning	Temperature over critical threshold	Critical-Temp. ID 10 Fail,Temp=X(C)
29	PPC DIMM B1 Temp. warning	Temperature over critical threshold	Critical-Temp. ID 11 Fail,Temp=X(C)
30	PPC Ambient	Temperature over critical	Critical-Temp. ID 12
31	DPB temp. 1	Temperature over critical	Critical-Temp. ID 13
32	DPB temp. 2	Temperature over critical	Critical-Temp. ID 14
33	DPB temp. 3	Temperature over critical	Critical-Temp. ID 15
34	DPB temp. 4	Temperature over critical	Critical-Temp. ID 16
35	FCB BJT temp. 1 warning	Temperature over critical threshold	Critical-Temp. ID 17 Fail,Temp=X(C)

Error Code	Description	Condition	Event Log
36	FCB BJT temp. 2 warning	Temperature over critical threshold	Critical-Temp. ID 18 Fail,Temp=X(C)
37	HBB SAS CTRL	Temperature over critical	Critical-Temp. ID 0
38	HBB Expander	Temperature over critical	Critical-Temp. ID 1
39	HBB Ambient	Temperature over critical	Critical-Temp. ID 2
40	Reserved		
41	Reserved		
42	Reserved		
43	PPC voltage warning	Voltage over or under critical threshold	Critical-Voltage ID ? Fail,V=X(mV)
44	HBB voltage	Voltage over or under	Critical-Voltage ID ?
45	DPB voltage warning	Voltage over or under critical threshold	(ID : Voltage sensor on HBB)
46	FCB voltage warning	Voltage over or under critical threshold	(ID : Voltage sensor on DPB)
47	PPC current warning	Current over or under critical threshold	(ID : Voltage sensor on FCB)
48	HBB current	Current over or under	Critical-Current ID 1
49	FCB current	Current over or under	Critical-Current ID 2
50	HDD0 SMART temp. warning	HDD0 Temperature over critical threshold	Critical-Temp. ID 19 Fail,Temp=X(C)
51	HDD1 SMART temp. warning	HDD1 Temperature over critical threshold	Critical-Temp. ID 20 Fail,Temp=X(C)
52	HDD2 SMART temp. warning	HDD2 Temperature over critical threshold	Critical-Temp. ID 21 Fail,Temp=X(C)
53	HDD3 SMART temp. warning	HDD3 Temperature over critical threshold	Critical-Temp. ID 22 Fail,Temp=X(C)
54	HDD4 SMART temp. warning	HDD4 Temperature over critical threshold	Critical-Temp. ID 23 Fail,Temp=X(C)

Error Code	Description	Condition	Event Log
55	HDD5 SMART temp. warning	HDD5 Temperature over critical threshold	Critical-Temp. ID 24 Fail,Temp=X(C)
56	HDD6 SMART temp. warning	HDD6 Temperature over critical threshold	Critical-Temp. ID 25 Fail,Temp=X(C)
57	HDD7 SMART temp. warning	HDD7 Temperature over critical threshold	Critical-Temp. ID 26 Fail,Temp=X(C)
58	HDD8 SMART temp. warning	HDD8 Temperature over critical threshold	Critical-Temp. ID 27 Fail,Temp=X(C)
59	HDD9 SMART temp. warning	HDD9 Temperature over critical threshold	Critical-Temp. ID 28 Fail,Temp=X(C)
60	HDD10 SMART temp. warning	HDD10 Temperature over critical threshold	Critical-Temp. ID 29 Fail,Temp=X(C)
61	HDD11 SMART temp. warning	HDD11 Temperature over critical threshold	Critical-Temp. ID 30 Fail,Temp=X(C)
62	HDD12 SMART temp. warning	HDD12 Temperature over critical threshold	Critical-Temp. ID 31 Fail,Temp=X(C)
63	HDD13 SMART temp. warning	HDD13 Temperature over critical threshold	Critical-Temp. ID 32 Fail,Temp=X(C)
64	HDD14 SMART temp. warning	HDD14 Temperature over critical threshold	Critical-Temp. ID 33 Fail,Temp=X(C)
65	HBB System Outlet Temp.	Temperature over critical threshold	Critical-Temp. ID 3 Fail,Temp=X(C)
66	HBB IOC Ambient	Temperature over critical	Critical-Temp. ID 4
67	HBB Expander Ambient Temp.	Temperature over critical threshold	Critical-Temp. ID 5 Fail,Temp=X(C)
68	HBB Mezz Ambient Temp.	Temperature over critical threshold	Critical-Temp. ID 6 Fail,Temp=X(C)
69	Reserved		
70	HDD0 fault	HDD0 Array Device	Critical-HDD Slot 0
71	HDD1 fault	HDD1 Array Device	Critical-HDD Slot 1

Error Code	Description	Condition	Event Log
72	HDD2 fault	HDD2 Array Device	Critical-HDD Slot 2
73	HDD3 fault	HDD3 Array Device	Critical-HDD Slot 3
74	HDD4 fault	HDD4 Array Device	Critical-HDD Slot 4
75	HDD5 fault	HDD5 Array Device	Critical-HDD Slot 5
76	HDD6 fault	HDD6 Array Device	Critical-HDD Slot 6
77	HDD7 fault	HDD7 Array Device	Critical-HDD Slot 7
78	HDD8 fault	HDD8 Array Device	Critical-HDD Slot 8
79	HDD9 fault	HDD9 Array Device	Critical-HDD Slot 9
80	HDD10 fault	HDD10 Array Device	Critical-HDD Slot 10
81	HDD11 fault	HDD11 Array Device	Critical-HDD Slot 11
82	HDD12 fault	HDD12 Array Device	Critical-HDD Slot 12
83	HDD13 fault	HDD13 Array Device	Critical-HDD Slot 13
84	HDD14 fault	HDD14 Array Device	Critical-HDD Slot 14
85	Reserved		
86	Reserved		
87	Reserved		
88	Reserved		
89	Reserved		
90	External Mini-SAS link error	Loss of SAS links (x1~x3)	Critical-Connector ID 12 Loss Link(s)
91	Internal Mini-SAS link error	Loss of SAS links (x1~x3)	Critical-Connector ID 13 Loss Link(s)
92	Reserved		
93	Self tray be pulled out	F/W detect self tray be pulled out	Critical-Self Tray Be Pulled Out
94	Peer tray be pulled out	F/W detect peer tray be pulled out	Critical-Peer Tray Be Pulled Out
95	Reserved		

Error	Description	Condition	Event Log
96	Reserved		
97	Reserved		
98	Reserved		
99	Firmware and hardware not match	Only show this error code when FW initialization and then FW will hang	N/A

6.2 Post Code Table

6.2.1 PEI Phase

A.   Progress Codes

Normal:

Checkpoint	Description
0x10	PEI Core is started.
0x11	Pre-memory CPU initialization is started.
0x15	Pre-memory North Bridge initialization is started.
0x19	Pre-memory South Bridge initialization is started.
0x2B	Memory initialization. Serial Presence Detect (SPD) data reading.
0x2C	Memory initialization. Memory presence detection.
0x2D	Memory initialization. Programming memory timing information.
0x2E	Memory initialization. Configuring memory.
0x2F	Memory initialization (other).
0x30	Reserved for ASL.
0x31	Memory installed.
0x37	Post-Memory North Bridge initialization is started.
0x3B	Post-Memory South Bridge initialization is started.
0x4F	DXE IPL is started.
0x60	DXE Core is started.

Recovery:

Checkpoint	Description
0xF0	Recovery condition triggered by firmware (Auto recovery)
0xF1	Recovery condition triggered by user (Forced recovery)
0xF2	Recovery process started
0xF3	Recovery firmware image is found
0xF4	Recovery firmware image is loaded

B.   Error Codes

Normal:

Checkpoint	Description
0x50	Memory initialization error. Invalid memory type or incompatible memory speed
0x51	Memory initialization error. SPD reading has failed
0x52	Memory initialization error. Invalid memory size or memory modules do not match
0x53	Memory initialization error. No usable memory detected
0x54	Unspecified memory initialization error
0x55	Memory not installed
0x56	Invalid CPU type or Speed
0x57	CPU mismatch
0x58	CPU self-test failed or possible CPU cache error
0x59	CPU micro-code not found or micro-code update failed
0x5A	Internal CPU error
0x5B	Reset PPI is not available

Recovery:

Checkpoint	Description
0xF8	Recovery PPI is not available
0xF9	Recovery capsule is not found
0xFA	Invalid recovery capsule

6.2.2   DXE Phase

A.   Progress Codes

Checkpoint	Description
0x60	DXE Core is started.
0x61	NVRAM initialization.
0x62	Installation of the South Bridge Runtime Services.
0x63	CPU DXE initialization is started.
0x68	PCI host bridge initialization.
0x69	North Bridge DXE initialization is started.
0x6A	North Bridge DXE SMM initialization is started.
0x70	South Bridge DXE initialization is started.
0x71	South Bridge DXE SMM initialization is started.
0x72	South Bridge devices initialization.
0x78	ACPI module initialization.
0x79	CSM initialization.
0x90	Boot Device Selection (BDS) phase is started.
0x91	Driver connecting is started.
0x92	PCI Bus initialization is started.
0x93	PCI Bus Hot Plug Controller Initialization.
0x94	PCI Bus Enumeration.
0x95	PCI Bus Request Resources.
0x96	PCI Bus Assign Resources.

Checkpoint	Description
0x97	Console Output devices connect.
0x98	Console input devices connect.
0x99	Super IO Initialization.
0x9A	USB initialization is started.
0x9B	USB Reset.
0x9C	USB Detect.
0x9D	USB Enable.
0xA0	IDE initialization is started.
0xA1	IDE Reset.
0xA2	IDE Detect.
0xA3	IDE Enable.
0xA4	SCSI initialization is started.
0xA5	SCSI Reset.
0xA6	SCSI Detect.
0xA7	SCSI Enable.
0xA8	Setup Verifying Password.
0xA9	Start of Setup.
0xAB	Setup Input Wait
0xAD	Ready To Boot event.
0xAE	Legacy Boot event.
0xAF	Exit Boot Services event.
0xB0	Runtime Set Virtual Address MAP Begin.
0xB1	Runtime Set Virtual Address MAP End.
0xB2	Legacy Option ROM Initialization.
0xB3	System Reset.
0xB4	USB hot plug.
0xB5	PCI bus hot plug.
0xB6	Clean-up of NVRAM.
0xB7	Configuration Reset (reset of NVRAM settings).

B.   Error Codes

Checkpoint	Description
0xD0	CPU initialization error
0xD1	North Bridge initialization error
0xD2	South Bridge initialization error
0xD3	PCI resource allocation error. Out of Resources
0xD4	No Space for Legacy Option ROM
0xD5	No Console Output Devices are found
0xD6	No Console Input Devices are found
0xD7	Invalid password
0xD8	Error loading Boot Option
0xD9	Boot Option failed
0xDA	Flash update failed
0xDB	Reset protocol is not available

6.2.3　DIMM Post Code

During the boot sequence, the BIOS initializes and tests each DIMM module. If a module fails initialization or does not pass the BIOS test, the following post codes will flash on the debug card to indicate which DIMM has failed. The display sequence will be "00", DIMM location, error code and progress code, with 1 second delay for every code displayed. The BIOS shall repeat the display sequence indefinitely to allow time for a technician to service the system.

A.　　Error Codes

Checkpoint	Description
0x01	Debug
0x02	Detect DIMMs Failure
0x03	Invalid Host IO Boundary
0x04	Install PEI Memory Error.
0x05	Invalid Number of Channels
0x06	RCVEN Margin is too low
0x07	Invalid Memory Size Found
0x08	Memory Size per channel above Max Supported
0x09	Invalid VDD Configuration
0x0A	Illegal Voltage Configuration
0x0B	Invalid Strobe
0x0C	Invalid CPU Type
0x0D	Mailbox Error
0x0E	MemTest Error
0x0F	Warm Reset Error
0x10	Error trying to get SPD data
0x11	No DIMMs are Present
0x12	Timing does not comply with JEDEC spec.

Checkpoint	Description
0x13	Detect DIMM Tasks Error
0x14	Invalid Number of Ranks
0x15	Invalid Number of DIMMs
0x16	Error Configuring Memory
0x17	Null Pointer Error
0x18	GetSet Value exceeds limit
0x19	Faulty Parts Tracking: Halt on Correctable Error
0x1A	Faulty Parts Tracking: Uncorrectable Error on CH0.
0x1B	MRC Center Not Found
0x1C	Victim Aggressor Invalid Pattern Index
0x1D	Invalid Margin Type
0x1E	TxVref Margin is below 5 Ticks
0x1F	Invalid Frequency
0x20	Timeout waiting for RTOS_DONE from Punit

B.   Progress Codes

Checkpoint	Description
0x12	Programs the Clock gating feature for memory controller
0x13	Clear the self- refresh bits
0x14	OEM track init completed
0x42	Programs the DRAM timing and control registers
0x44	Programs the bustlength mode registers
0x45	Enables/ Disables the Low voltage in the DDRIO Unit
0x50	Initialize the DDRIO PHY
0xA0~0xB2	DDR PHY init tasks. DDRIO should be initialized and ready for training after these tasks are executed
0x51	Enables the DDRIO CKE for each rank
0x61	Programs the timing & control registers for memory

Checkpoint	Description
0x62	Programs the memory mapping in the memory controller registers
0x71	Wake command to DUNIT
0x81	Set configuration for Pre-Jedec init
0x82	Programs the Jedec init for a row of memory
0x83	Programs miscellaneous registers required to be set after memory
0x90	Programs the PMI to be release by BUNIT
0x91	Disables PMI
0x92	Indicates when memory training initialization is complete
0xB0	Handle rank overrides
0xB1	Enable overrides on diffampen and odt
0xB2	Sets write VREF prior to start all MRC training to a known value in order to avoid failures during early trainings.
0xB3	Programs the PMI to be release by BUNIT
0xB4	Enables PMI
0xB5	Handle memory training
0xB6	Overrides Vref
0xBE	Enables the BUNIT cache. Used after memory training to return to normal operation before MRC exits.
0xC0	Reconfigures the DRP registers with accurate information about the DDR memory.
0xD1	Programs the DDR timing control registers
0xE1	This function configures the scrambler
0xE2	Sets periodic resistive compensation
0xE3	Indicates when memory training initialization is complete
0xE4	Sends a wake command to DDR Memory
0xE5	Modifies the refresh period
0xE6	Programs the PMI to be release by BUNIT
0xE8	Enables PMI

Checkpoint	Description
0xE9	Handle post training
0xEA	Sends 'PMOP' command to Punit, in order to set the desired Power Mode.
0xF0	Executed prior to the memory testing, in order to do the proper setup
0xF1	Memory testing
0xF2	Develops the scrub memory functionality
0xF3	Programs the PMI to be owned by BUNIT
0xF4	Indicates when MRC has completed
0xF5	De-asserts a DDR reset
0xF6	Enables performance setup in the Bunit
0xF7	Disables the High Precision Event Timer