BPN-SAS3-216EL1-N4 BACKPLANE

USER'S GUIDE

1.0
The information in this User's Manual has been carefully reviewed and is believed to be accurate. The vendor assumes no responsibility for any inaccuracies that may be contained in this document, makes no commitment to update or to keep current the information in this manual, or to notify any person or organization of the updates. Please Note: For the most up-to-date version of this manual, please see our web site at www.supermicro.com.

Super Micro Computer, Inc. ("Supermicro") reserves the right to make changes to the product described in this manual at any time and without notice. This product, including software, if any, and documentation may not, in whole or in part, be copied, photocopied, reproduced, translated or reduced to any medium or machine without prior written consent.

IN NO EVENT WILL SUPERMICRO BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, SPECULATIVE OR CONSEQUENTIAL DAMAGES ARISING FROM THE USE OR INABILITY TO USE THIS PRODUCT OR DOCUMENTATION, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN PARTICULAR, SUPERMICRO SHALL NOT HAVE LIABILITY FOR ANY HARDWARE, SOFTWARE, OR DATA STORED OR USED WITH THE PRODUCT, INCLUDING THE COSTS OF REPAIRING, REPLACING, INTEGRATING, INSTALLING OR RECOVERING SUCH HARDWARE, SOFTWARE, OR DATA.

Any disputes arising between manufacturer and customer shall be governed by the laws of Santa Clara County in the State of California, USA. The State of California, County of Santa Clara shall be the exclusive venue for the resolution of any such disputes. Super Micro's total liability for all claims will not exceed the price paid for the hardware product.

FCC Statement: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer’s instruction manual, may cause harmful interference with radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

California Best Management Practices Regulations for Perchlorate Materials: This Perchlorate warning applies only to products containing CR (Manganese Dioxide) Lithium coin cells. “Perchlorate Material-special handling may apply. See www.dtsc.ca.gov/hazardouswaste/perchlorate”

WARNING: Handling of lead solder materials used in this product may expose you to lead, a chemical known to the State of California to cause birth defects and other reproductive harm.

Manual Revision 1.0
Release Date: February 02, 2016

Unless you request and receive written permission from Super Micro Computer, Inc., you may not copy any part of this document.

Information in this document is subject to change without notice. Other products and companies referred to herein are trademarks or registered trademarks of their respective companies or mark holders.

Copyright © 2016 by Super Micro Computer, Inc. All rights reserved.
Printed in the United States of America
# Contents

- Contacting Supermicro............................................................... iv
- Returning Merchandise for Service............................................. v

## Chapter 1 Guidelines

1-1 ESD Safety Guidelines ............................................................... 1-1
1-2 General Safety Guidelines ....................................................... 1-1
1-3 Version Information ............................................................... 1-2

## Chapter 2 Connectors, Jumpers and LEDs

2-1 Rear Connector Locations ....................................................... 2-1
2-2 Rear Connector Definitions .................................................... 2-2
2-3 Rear Jumpers ........................................................................ 2-3
   Explanation of Jumpers ......................................................... 2-3
2-4 Rear LED Indicators .............................................................. 2-4
2-5 Front Connectors and LED Indicators ..................................... 2-5

## Chapter 3 Cascading Configurations

3-1 Expander .............................................................................. 3-1
3-2 JBOD Control Board and Support Cables .............................. 3-2
   JBOD Control Board ............................................................. 3-2
   Connecting Internal HBAs to the Backplane ......................... 3-3
   Supported Internal HBA Cables ........................................... 3-4
   Connecting an External HBA to the Backplane ..................... 3-5
   Single External Host Bus Adapter ......................................... 3-5
   Connecting Multiple Backplanes in a Single Channel Environment ........................................... 3-6
   Single HBA Configuration Cables ........................................ 3-7
3-3 Supported Cascading Configurations ..................................... 3-8
Contacting Supermicro

Headquarters
Address: Super Micro Computer, Inc.
980 Rock Ave.
San Jose, CA 95131 U.S.A.
Tel: +1 (408) 503-8000
Fax: +1 (408) 503-8008
Email: marketing@supermicro.com (General Information)
support@supermicro.com (Technical Support)
Web Site: www.supermicro.com

Europe
Address: Super Micro Computer B.V.
Het Sterrenbeeld 28, 5215 ML
's-Hertogenbosch, The Netherlands
Tel: +31 (0) 73-6400390
Fax: +31 (0) 73-6416525
Email: sales@supermicro.nl (General Information)
support@supermicro.nl (Technical Support)
rma@supermicro.nl (Customer Support)
Web Site: www.supermicro.nl

Asia-Pacific
Address: Super Micro Computer, Inc.
3F, No. 150, Jian 1st Rd.
Zhonghe Dist., New Taipei City 235
Taiwan (R.O.C)
Tel: +886-(2) 8226-3990
Fax: +886-(2) 8226-3992
Email: support@supermicro.com.tw
Web Site: www.supermicro.com.tw
Returning Merchandise for Service

A receipt or copy of your invoice marked with the date of purchase is required before any warranty service will be rendered. You can obtain service by calling your vendor for a Returned Merchandise Authorization (RMA) number. When returning to the manufacturer, the RMA number should be prominently displayed on the outside of the shipping carton, and mailed prepaid or hand-carried. Shipping and handling charges will be applied for all orders that must be mailed when service is complete.

For faster service, RMA authorizations may be requested online (http://www.supermicro.com/support/rma/).

Whenever possible, repack the backplane in the original Supermicro box, using the original packaging materials. If these are no longer available, be sure to pack the backplane in an anti-static bag and inside the box. Make sure that there is enough packaging material surrounding the backplane so that it does not become damaged during shipping.

This warranty only covers normal consumer use and does not cover damages incurred in shipping or from failure due to the alteration, misuse, abuse or improper maintenance of products.

During the warranty period, contact your distributor first for any product problems.
Notes
Chapter 1

Guidelines

This chapter offers guidelines for personal and equipment safety, and notes about the BPN-SAS3-216EL1-N4 version documented in this manual.

1-1  ESD Safety Guidelines

Electrostatic Discharge (ESD) can damage electronic components. To prevent damage to your system, it is important to handle it very carefully. The following measures are generally sufficient to protect your equipment from ESD.

• Use a grounded wrist strap designed to prevent static discharge.

• Touch a grounded metal object before removing a component from the antistatic bag.

• Handle the backplane by its edges only; do not touch its components, peripheral chips, memory modules or gold contacts.

• When handling chips or modules, avoid touching their pins.

• Put the card and peripherals back into their antistatic bags when not in use.

1-2  General Safety Guidelines

• Always disconnect power cables before installing or removing any components from the computer, including the backplane.

• Disconnect the power cable before installing or removing any cables from the backplane.

• Make sure that the backplane is securely and properly installed on the mounting frame in the chassis to prevent damage to the system due to power shortage.
1-3  Version Information

The BPN-SAS3-216EL1-N4 backplane has been designed to utilize the most up-to-date technology available, providing your system with reliable, high-quality performance.

The BPN-SAS3-216EL1-N4 is composed of the backplane model BPN-SAS3-216EB1-N4, Rev 1.01, and the daughter board model BPN-SAS3-216EL1, Rev 1.01. These are the most current releases available at the time of publication. Refer to the Supermicro Web site at www.supermicro.com for the latest updates, compatible parts and supported configurations.
Chapter 2

Connectors, Jumpers and LEDs

This manual covers BPN-SAS3-216EL1-N4 with NVMe capabilities.

2-1 Rear Connector Locations

The following connectors are on the side of the backplane that faces the rear of the chassis. They are marked by silkscreen labels.

1. Power Connectors: PWR1-PWR6 (4-pin)
2. NVMe #4 Connector: JSM7
3. NVMe #3 Connector: JSM6
4. NVMe #2 Connector: JSM5
5. NVMe #1 Connector: JSM4
6. CPLD chip
7. CPLD upgrade: J27 (7-pin)
8. SMB: J38 (4-pin)

Figure 2-1. Rear Connector Locations

9. Cascade In/Out: J9A
10. Cascade In/Out: J9B
11. Cascade In/Out: J9C
12. Expander In/Out: J9D
13. LSI SAS3X40
2-2 Rear Connector Definitions

1. Main Power Connectors
   The 4-pin connectors, designated PWR1 through PWR6, provide power to the backplane.

<table>
<thead>
<tr>
<th>Pin#</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+12V</td>
</tr>
<tr>
<td>2 and 3</td>
<td>Ground</td>
</tr>
<tr>
<td>4</td>
<td>+5V</td>
</tr>
</tbody>
</table>

2-5. NVMe Connectors
   JSM4 through JSM7 provide connections for the NVMe drive cables. Pins are defined according to the NVMe standard.

6-7. Complex Programmable Logic Device (CPLD) and Upgrade Header
   This programmable chip allows the backplane to support NVMe devices.

8. Primary SMB Connector
   This header provides for a connection with an optional JBOD control board.

9-12. SAS Cable Sockets
   Cascade in or out: J9A - J9D

13. LSI SAS3X40 Expander chip

   Note: Connectors not described are for engineering or manufacturing diagnostics only.
2-3    Rear Jumpers

Figure 2-2. Rear Jumpers

<table>
<thead>
<tr>
<th>Jumper Settings</th>
<th>Jumper</th>
<th>Settings</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JP8: CPU_SEL0</td>
<td>see table below</td>
<td>NVMe mapping to CPU</td>
</tr>
<tr>
<td></td>
<td>JP9: CPU_SEL1</td>
<td>see table below</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jumpers</th>
<th>NVMe to CPU Connection</th>
<th>NVMe Cables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CPU_SEL0</td>
<td>CPU_SEL1</td>
</tr>
<tr>
<td>Open</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>Closed</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>Closed</td>
<td>Closed</td>
<td></td>
</tr>
</tbody>
</table>

Explanation of Jumpers

To modify the operation of the backplane, jumpers can be used to choose between optional settings. Jumpers create shorts between two pins to change the function of the connector. Pin 1 is identified with a square solder pad on the printed circuit board. **Note:** On two pin jumpers, "Closed" means the jumper is on and "Open" means the jumper is off the pins.
2-4 Rear LED Indicators

Figure 2-3. Rear LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>State</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>5V_LED1</td>
<td>On</td>
<td>Indicates normal operation. Light off indicates a 5V power failure</td>
</tr>
<tr>
<td>12V_LED1</td>
<td>On</td>
<td>Indicates normal operation. Light off indicates a 12V power failure</td>
</tr>
<tr>
<td>OVERHEATFAIL1</td>
<td>On</td>
<td>Indicates the temperature exceeds normal operation.</td>
</tr>
<tr>
<td>HB_LED</td>
<td>Blinking</td>
<td>Blinking heart beat indicates the expander is running normally with firmware loaded.</td>
</tr>
</tbody>
</table>
2-5  Front Connectors and LED Indicators

The drive slots labeled SAS#0 through SAS#19 are for SAS3 or SATA3 storage devices. Drive slots labeled SAS#20 through SAS#23 are hybrid ports that support SAS3, SATA3 or NVMe.

![Figure 2-4. Front Connectors and LEDs](image)

48 LEDs, two per receptacle, indicate activity and failure.
(along the bottom of the backplane)

**Figure 2-4. Front Connectors and LEDs**
(table on following page)

**Note:** For the hybrid ports, SAS#20 to SAS#23, when using NVMe, it is best to have all four NVMe cables connected all the time, even if some slots do not have NVMe devices. This is particularly true for the slot that provides the VPP connections, otherwise the other NVMe devices connected to the same CPU will not work.
Front SAS/SATA Connectors and LED Indicators

<table>
<thead>
<tr>
<th>Drive Number</th>
<th>Label</th>
<th>HDD Activity LED (blue)</th>
<th>Failure LED (red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS#0</td>
<td>J0</td>
<td>ACT0</td>
<td>FAIL0</td>
</tr>
<tr>
<td>SAS#1</td>
<td>J1</td>
<td>ACT1</td>
<td>FAIL1</td>
</tr>
<tr>
<td>SAS#2</td>
<td>J2</td>
<td>ACT2</td>
<td>FAIL2</td>
</tr>
<tr>
<td>SAS#3</td>
<td>J3</td>
<td>ACT3</td>
<td>FAIL3</td>
</tr>
<tr>
<td>SAS#4</td>
<td>J4</td>
<td>ACT4</td>
<td>FAIL4</td>
</tr>
<tr>
<td>SAS#5</td>
<td>J5</td>
<td>ACT5</td>
<td>FAIL5</td>
</tr>
<tr>
<td>SAS#6</td>
<td>J6</td>
<td>ACT6</td>
<td>FAIL6</td>
</tr>
<tr>
<td>SAS#7</td>
<td>J7</td>
<td>ACT7</td>
<td>FAIL7</td>
</tr>
<tr>
<td>SAS#8</td>
<td>J8</td>
<td>ACT8</td>
<td>FAIL8</td>
</tr>
<tr>
<td>SAS#9</td>
<td>J9</td>
<td>ACT9</td>
<td>FAIL9</td>
</tr>
<tr>
<td>SAS#10</td>
<td>J10</td>
<td>ACT10</td>
<td>FAIL10</td>
</tr>
<tr>
<td>SAS#11</td>
<td>J11</td>
<td>ACT11</td>
<td>FAIL11</td>
</tr>
<tr>
<td>SAS#12</td>
<td>J12</td>
<td>ACT12</td>
<td>FAIL12</td>
</tr>
<tr>
<td>SAS#13</td>
<td>J13</td>
<td>ACT13</td>
<td>FAIL13</td>
</tr>
<tr>
<td>SAS#14</td>
<td>J14</td>
<td>ACT14</td>
<td>FAIL14</td>
</tr>
<tr>
<td>SAS#15</td>
<td>J15</td>
<td>ACT15</td>
<td>FAIL15</td>
</tr>
<tr>
<td>SAS#16</td>
<td>J16</td>
<td>ACT16</td>
<td>FAIL16</td>
</tr>
<tr>
<td>SAS#17</td>
<td>J17</td>
<td>ACT17</td>
<td>FAIL17</td>
</tr>
<tr>
<td>SAS#18</td>
<td>J18</td>
<td>ACT18</td>
<td>FAIL18</td>
</tr>
<tr>
<td>SAS#19</td>
<td>J19</td>
<td>ACT19</td>
<td>FAIL19</td>
</tr>
<tr>
<td>SAS#20/NVMe#1*</td>
<td>J20</td>
<td>ACT20</td>
<td>FAIL20**</td>
</tr>
<tr>
<td>SAS#21/NVMe#2*</td>
<td>J21</td>
<td>ACT21</td>
<td>FAIL21**</td>
</tr>
<tr>
<td>SAS#22/NVMe#3*</td>
<td>J22</td>
<td>ACT22</td>
<td>FAIL22**</td>
</tr>
<tr>
<td>SAS#23/NVMe#4*</td>
<td>J23</td>
<td>ACT23</td>
<td>FAIL23**</td>
</tr>
</tbody>
</table>

*Hybrid ports; NVMe, SAS, or SATA

**For hybrid ports, this failure LED is multi-color, as described in the table below.

<table>
<thead>
<tr>
<th>Color and State</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red, solid</td>
<td>Failure</td>
</tr>
<tr>
<td>Red, blinking at 1Hz</td>
<td>Rebuild</td>
</tr>
<tr>
<td>Red, blinking at 4Hz</td>
<td>Identify</td>
</tr>
<tr>
<td>Amber, blinking**</td>
<td>Attention! Do not remove NVMe device</td>
</tr>
<tr>
<td>Green**</td>
<td>NVMe device ready be removed</td>
</tr>
</tbody>
</table>
Chapter 3

Cascading Configurations

3-1 Expander

BPN-SAS3-216EL1 model backplanes have a single expander on the daughter card that accesses all of the 24 SAS ports supporting drives connected through the slots on the baseboard and also 16 ports of SAS up-links or down-links through four mini-SAS HD cable sockets.

Figure 3-1. Port Configuration
(for 8 SAS up-links and 8 SAS down-links)
3-2  JBOD Control Board and Support Cables

JBOD Control Board

In a cascaded configuration, the first chassis includes a motherboard and at least one host bus adapter (HBA). Other "Just a Bunch Of Disks" (JBOD) chassis in the system must be equipped with a JBOD Control Board (such as CSE-PTJBOD-CB3). This board is available as a separate product and is used to manage the power and IPMI (in place of a motherboard) for the JBOD chassis. For more information, see the Supermicro website (www.supermicro.com).

Figure 3-7. JBOD Control Board (Sold Separately)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part Type</th>
<th>Where Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE-PTJBOD-CB3</td>
<td>JBOD Control Board</td>
<td>Allows the chassis to be used as a JBOD system; supports IPMI for remote power control.</td>
</tr>
</tbody>
</table>
Connecting Multiple Internal HBAs to the Backplane

The following section lists the most common cables used to connect the HBA to the backplane.

Figure 3-8. Internal Host Bus Adapters
Supported Internal HBA Cables

Use the following cables to create connections between the internal HBA and the backplane. The cables required depend upon the HBA connector.

**Cable Name:** Internal iPass (Mini-SAS) to HD (Mini-SAS)

- **Part #:** CBL-SAST-0508-01  **Length:** 50 cm (19 inches)
- **Part #:** CBL-SAST-0507-01  **Length:** 80 cm (31 inches)

**Description:** This cable has an iPass (SFF-8087/Mini-SAS) connector (36-pin) at one end and a Mini-SAS HD (SFF-8643) connector at the other end. It connects from the SAS2 HBA to the BPN-SAS3-216EL model backplane.

**Cable name:** Internal HD (Mini-SAS) to HD (Mini-SAS)

- **Part #:** CBL-SAST-0568  **Length:** 35 cm (13 inches)
- **Part #:** CBL-SAST-0593  **Length:** 60 cm (23 inches)
- **Part #:** CBL-SAST-0531  **Length:** 80 cm (31 inches)

**Description:** This cable has a Mini-SAS HD (SFF-8643) connector at both ends. It connects from the SAS3 HBA to the BPN-SAS2-216EL model backplane.
Connecting an External HBA to the Backplane

This backplane supports external host bus adapters. In this configuration, the HBA and the backplane are in different physical chassis. This allows a JBOD (Just a Bunch Of Drives) configuration from an existing system.

Single External Host Bus Adapter

![Diagram of Single External Host Bus Adapter]

Figure 3-10. Single External Host Adapter
Connecting Multiple Backplanes in a Single Channel Environment

This section describes the cables used when cascading from a single HBA. These connections use CBL-SAST-0531 internal cables and CBL-SAST-0573 external cables.

Figure 3-12. Single HBA Configuration
Single HBA Configuration Cables

Figure 3-13. External Mini-SAS HD to External Mini-SAS HD Cable

Cable Name: 1 Meter External Mini-SAS HD to External Mini-SAS HD Cable
Part #: CBL-SAST-0573
Ports: Single
Placement: External Cable
Description: External cascading cable, connects ports between servers and JBODs.

Figure 3-14. Mini-SAS HD Internal to External Adapter

Cable Name: 16-port Mini-SAS HD Internal to External Cable Adapter with LP Bracket
Part #: AOM-SAS3-16I16E-LP
Ports: Four wide-ports (sixteen ports total)
Placement: Internal cable with adapter
Description: Internal cable, connects the SAS3 backplane to external ports.
3-3  Supported Cascading Configurations

Cascading allows the system to access data at a faster rate by allowing several backplanes to share resources to reduce latency time.

The first backplane in a cascaded system requires a motherboard and an HBA. Other servers require a JBOD Control Board, but no motherboard and no HBA. For more information, specific chassis manuals are available at www.supermicro.com.

![Diagram of cascading configurations](image)

Figure 3-16. Simple Cascaded Configuration
Disclaimer (cont.)
The products sold by Supermicro are not intended for and will not be used in life sup-
port systems, medical equipment, nuclear facilities or systems, aircraft, aircraft devices,
aircraft/emergency communication devices or other critical systems whose failure to per-
form be reasonably expected to result in significant injury or loss of life or catastrophic
property damage. Accordingly, Supermicro disclaims any and all liability, and should
buyer use or sell such products for use in such ultra-hazardous applications, it does so
entirely at its own risk. Furthermore, buyer agrees to fully indemnify, defend and hold
Supermicro harmless for and against any and all claims, demands, actions, litigation,
and proceedings of any kind arising out of or related to such ultra-hazardous use or sale.