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 and documentation, is the property of Supermicro and/or its licensors, and is supplied only under a license. Any use or reproduction of this product is not allowed, except as expressly permitted by the terms of said license.

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.

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 1.0a
Release Date: March 11, 2015

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 © 2015 by Super Micro Computer, Inc.
All rights reserved.
**Printed in the United States of America**
Table of Contents

Contacting Supermicro.................................................................v
Returning Merchandise for Service.............................................vi
Overview of the BPN-SAS3-216EL1/EL2 Backplanes ...................... vii

Chapter 1 Safety Guidelines
1-1 ESD Safety Guidelines .......................................................... 1-1
1-2 General Safety Guidelines ..................................................... 1-1
1-3 An Important Note to Users ................................................... 1-2
1-4 Introduction to the BPN-SAS3-216EL1/EL2 Model Backplane .... 1-2

Chapter 2 Connectors, Daughter Cards and LEDs
2-1 Connectors and Daughter Cards ............................................. 2-1
2-2 Front Connector and Pin Definitions ..................................... 2-2
2-3 Front Connectors and LED Indicators .................................... 2-6

Chapter 3 Dual Port and Cascading Configurations
3-1 Single and Dual Port Expanders .......................................... 3-1
   Single Ports ............................................................................ 3-1
   Dual Ports ............................................................................. 3-1
3-2 Failover ................................................................................ 3-2
   Single Host Bus Adapter ....................................................... 3-2
   Single Host Bus Adapter Failover ......................................... 3-2
3-3 Failover with RAID Cards and Multiple HBAs ...................... 3-3
   Dual Host Bus Adapter .......................................................... 3-3
   Dual Host Bus Adapter Failover ............................................ 3-3
3-4 Chassis Control Card and Support Cables ......................... 3-4
   Chassis Control Card ............................................................. 3-4
   Connectioning an Internal Host Bus Adapter to the Backplane .. 3-5
   Supported Internal HBA Cables ............................................. 3-5
   Connecting an External Host Bus Adapter to the Backplane .... 3-7
   Single External Host Bus Adapter ......................................... 3-7
   Dual External Host Bus Adapter ............................................ 3-7
   Supported External HBA to Backplane Cable ....................... 3-8
   Connecting Multiple Backplanes in a Single Channel Environment .. 3-9
   Single HBA Configuration Cables ......................................... 3-10
   Connecting Multiple Backplanes in a Dual Channel Environment .... 3-11
   Dual HBA Configuration Cables .......................................... 3-12
3-5  Supported Cascading Configurations ........................................... 3-13
    Server System with Single SAS HBA ........................................... 3-14
    Dual SAS HBA and Cascaded Configuration .................................. 3-15
    Dual SAS HBA and Cascaded Configuration with Branching ............. 3-16
Preface

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)
Website: 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)
Website: 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
Website: 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.
Overview of the BPN-SAS3-216EL1/EL2 Backplanes

The BPN-SAS3-216EL1/EL2 model backplanes consist of a BPN-SAS3-216EB backplane (A) with one or two BPN-SAS3-216EL daughter cards (B and C) mounted on the rear of the backplane. The front of the backplane is defined as the side which faces toward the front of the chassis when installed.

The BPN-SAS3-216EL1 model consists of the BPN-SAS3-216EB backplane (A) and one BPN-SAS3-216EL primary daughter card (B), mounted on the right-hand side of the backplane.

The BPN-SAS3-216EL2 model consists of the BPN-SAS3-216EB backplane (A) with a BPN-SAS3-216EL primary daughter card mounted on the right (B) and a BPN-SAS3-216EL secondary daughter card mounted on the left (C).

Components on the front side of the BPN-SAS3-216EB backplane include twenty-four SAS connectors and their respective activity and failure LEDs. Components on the rear side of the backplane include jumpers and power connectors. The daughter card's components include SAS ports, flash and expander chips.
To avoid personal injury and property damage, carefully follow all the safety steps listed below when accessing your system or handling the components.

### 1-1 ESD Safety Guidelines

*Electrostatic Discharge (ESD) can damage electronic components. To prevent damage to your system, it is important to handle the backplane 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 and daughter cards by their edges only; do not touch the components, peripheral chips, memory modules or gold contacts.
- When handling chips or modules, avoid touching their pins.
- Put the backplane 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 motherboard to prevent damage to the system due to power shortage.
1-3 An Important Note to Users

All images and layouts shown in this user’s guide are based upon the latest PCB Revision available at the time of publishing. The card you have received may or may not look exactly the same as the graphics shown in this manual.

1-4 Introduction to the BPN-SAS3-216EL1/EL2 Backplane

The BPN-SAS3-216EL1/EL2 model backplane has been designed to utilize the most up-to-date technology available, providing your system with reliable, high-quality performance.

This manual reflects the BPN-SAS3-216EB Revision 1.00 backplane, the most current release available at the time of publication.

This manual also describes the BPN-SAS3-216EL daughter card, Revision 1.01, the most current release available at the time of publication. Always refer to the Supermicro website at www.supermicro.com for the latest updates, compatible parts and supported configurations.
Chapter 2
Connectors, Daughter Cards and LEDs

2-1 Connectors and Daughter Cards

Connectors
1. Flash Chip
2. Expander Chip
3. UART Connector: J5
4. SDB Connector: J10
5. Primary Expander Connector: PRI_I2C
6. SMB Expander Connector: J38
7. Power Connectors: PWR1 - PWR6
2-2 Front Connector and Pin Definitions

1. Flash Chips
   The flash chip enhances the backplane memory.

2. Expander Chips
   This expander chip allows the backplane to support dual ports, cascading, and failover.

3. UART Connector
   The UART connector is designated UART and J5. It is used for manufacturer’s diagnostic purposes only.

4. SDB Connector
   The SDB connector is designated SDB and J10. It is the debug connector and is used for manufacturer’s diagnostic purposes only.

5. Expander Connector
   The primary expander connector is designated PRI_i2C and is reserved for future expansion.

6. Expander Connector
   The secondary expander connector is designated J8. It is used to connect the chassis power cord and CSE-PTJBOD-CB3 for JBOD configuration.

7. Backplane Main Power Connectors
   The 4-pin connectors are designated PWR1 - PWR6. They provide power to the backplane. See the table on the right for pin definitions.

<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>
2-3 Front Connectors and LED Indicators

![Front Connectors and LEDs](image)

Figure 2-2. Front Connectors and LEDs

<table>
<thead>
<tr>
<th>Front SAS/SATA Connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Front Connector</strong></td>
</tr>
<tr>
<td>SAS #J0</td>
</tr>
<tr>
<td>SAS #J1</td>
</tr>
<tr>
<td>SAS #J2</td>
</tr>
<tr>
<td>SAS #J3</td>
</tr>
<tr>
<td>SAS #J4</td>
</tr>
<tr>
<td>SAS #J5</td>
</tr>
<tr>
<td>SAS #J6</td>
</tr>
<tr>
<td>SAS #J7</td>
</tr>
<tr>
<td>SAS #J8</td>
</tr>
<tr>
<td>SAS #J9</td>
</tr>
<tr>
<td>SAS #J10</td>
</tr>
<tr>
<td>SAS #J11</td>
</tr>
</tbody>
</table>
## Front LED Indicators

<table>
<thead>
<tr>
<th>Front LED</th>
<th>Hard Drive Activity</th>
<th>Failure LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS #J0</td>
<td>ACT #0</td>
<td>FAIL #0</td>
</tr>
<tr>
<td>SAS #J1</td>
<td>ACT #1</td>
<td>FAIL #1</td>
</tr>
<tr>
<td>SAS #J2</td>
<td>ACT #2</td>
<td>FAIL #2</td>
</tr>
<tr>
<td>SAS #J3</td>
<td>ACT #3</td>
<td>FAIL #3</td>
</tr>
<tr>
<td>SAS #J4</td>
<td>ACT #4</td>
<td>FAIL #4</td>
</tr>
<tr>
<td>SAS #J5</td>
<td>ACT #5</td>
<td>FAIL #5</td>
</tr>
<tr>
<td>SAS #J6</td>
<td>ACT #6</td>
<td>FAIL #6</td>
</tr>
<tr>
<td>SAS #J7</td>
<td>ACT #7</td>
<td>FAIL #7</td>
</tr>
<tr>
<td>SAS #J8</td>
<td>ACT #8</td>
<td>FAIL #8</td>
</tr>
<tr>
<td>SAS #J9</td>
<td>ACT #9</td>
<td>FAIL #9</td>
</tr>
<tr>
<td>SAS #J10</td>
<td>ACT #10</td>
<td>FAIL #10</td>
</tr>
<tr>
<td>SAS #J11</td>
<td>ACT #11</td>
<td>FAIL #11</td>
</tr>
<tr>
<td>SAS #J12</td>
<td>ACT #12</td>
<td>FAIL #12</td>
</tr>
<tr>
<td>SAS #J13</td>
<td>ACT #13</td>
<td>FAIL #13</td>
</tr>
<tr>
<td>SAS #J14</td>
<td>ACT #14</td>
<td>FAIL #14</td>
</tr>
<tr>
<td>SAS #J15</td>
<td>ACT #15</td>
<td>FAIL #15</td>
</tr>
<tr>
<td>SAS #J16</td>
<td>ACT #16</td>
<td>FAIL #16</td>
</tr>
<tr>
<td>SAS #J17</td>
<td>ACT #17</td>
<td>FAIL #17</td>
</tr>
<tr>
<td>SAS #J18</td>
<td>ACT #18</td>
<td>FAIL #18</td>
</tr>
<tr>
<td>SAS #J19</td>
<td>ACT #19</td>
<td>FAIL #19</td>
</tr>
<tr>
<td>SAS #J20</td>
<td>ACT #20</td>
<td>FAIL #20</td>
</tr>
<tr>
<td>SAS #J21</td>
<td>ACT #21</td>
<td>FAIL #21</td>
</tr>
<tr>
<td>SAS #J22</td>
<td>ACT #22</td>
<td>FAIL #22</td>
</tr>
<tr>
<td>SAS #J23</td>
<td>ACT #23</td>
<td>FAIL #23</td>
</tr>
</tbody>
</table>
3-1 Single and Dual Port Expanders

Single Ports
BPN-SAS3-216EL1 model backplanes have a single-port expander on the daughter card that accesses all of the drives and supports cascading.

Dual Ports
BPN-SAS3-216EL2 model backplanes have dual-port expanders on the daughter cards that access all of the hard drives. These dual-port expanders support cascading, failover, and recovery.

Figure 3-1. BPN-SAS3-216EL1 Single Port Configuration

Figure 3-2. BPN-SAS3-216EL2 Dual Port Configuration
3-2 Failover

The BPN-SAS3-216EL2 model backplane has two expanders which enable effective failover and recovery.

**Single Host Bus Adapter**

In a single host bus configuration, the backplane connects to one Host Bus Adapter (HBA).

![Single HBA](image)

**Figure 3-3. Single HBA**

**Single Host Bus Adapter Failover**

If the expander or data path in Port A fails, the system automatically switches to Port B with application software or failover support.

![Single HBA Failover](image)

**Figure 3-4. Single HBA Failover**
3-3 Failover with RAID Cards and Multiple HBAs

The BPN-SAS3-216EL backplane may be configured for failover with multiple HBAs using either RAID controllers or HBAs to achieve failover protection.

**RAID Controllers:** If RAID controllers are used, then the failover is accomplished through port failover on the same RAID card.

**HBAs:** If multiple HBAs are used to achieve failover protection and load balancing, Linux MPIO software must be installed and correctly configured to perform the load balancing and failover tasks.

**Dual Host Bus Adapter**

In a dual host bus configuration, the backplane connects to two HBA’s.

![Dual HBA Diagram](image)

**Figure 3-5. Dual HBA**

**Dual Host Bus Adapter Failover**

If the expander or data path in Port A fails, the system automatically switches to Port B. This maintains a full connection to all drives.

![Dual HBA Failover Diagram](image)

**Figure 3-6. Dual HBA Failover**

**IMPORTANT:** For RAID controllers, redundancy is achieved through port failover. For multiple HBAs MPIO software is required to achieve failover protection.
3-4 Chassis Control Card and Support Cables

Chassis Control Card

In a cascaded configuration, the first chassis includes a motherboard and at least one host bus adapter (HBA). Other servers in this enclosed system must be equipped with a control card. This section describes the supported control card for the BPN-SAS3-216EL series backplane.

For more information, see the Supermicro website at http://www.supermicro.com.

Figure 3-7. Chassis Control Card (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>Control card</td>
<td>Allows the chassis to be used as a JBOD (Just a Bunch of Drives) system, which supports IPMI for remote on/off control.</td>
</tr>
</tbody>
</table>
Connecting an Internal HBA to the Backplane

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

![Figure 3-8. Single Internal Host Bus Adapter](image)

![Figure 3-9. Dual Internal Host Bus Adapter](image)

Supported Internal HBA Cables

Use the following cables to create connections between the internal HBA and BPN-SAS3-216EL model backplane. The cables required depend upon the HBA connector.

**IMPORTANT:** See Section 3-3 of this manual, *Failover with RAID Cards and Multiple HBAs* for important information on supported configurations.
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**

![Single External Host Bus Adapter Diagram](image)

**Dual External Host Bus Adapter**

![Dual External Host Bus Adapter Diagram](image)

**IMPORTANT:** See Section 3-3 of this manual, *Failover with RAID Cards and Multiple HBAs* for important information on supported configurations.
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.

![Diagram](image)

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.
Connecting Multiple Backplanes in a Dual Channel Environment

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

Figure 3-15. Dual HBA Configuration

**IMPORTANT:** See Section 3-3 of this manual, *Failover with RAID Cards and Multiple HBAs* for important information on supported configurations.
3-5 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 chassis control card with no motherboard and no HBA. For more information, specific chassis manuals are available at www.supermicro.com.
Dual SAS HBA and Cascaded Configuration

IMPORTANT: See Section 3-3 of this manual, *Failover with RAID Cards and Multiple HBAs* for important information on supported configurations.
Notes
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.