AdvancedTCA®
10 Disk SAS JBOD Blade

SB-ATCA2020

Installation and Use Guide

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Preface

Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual could result in personal injury or damage to the equipment.

The safety precautions listed below represent warnings of certain dangers of which SANBlaze is aware. You, as the user of the product, should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

GROUND THE INSTRUMENT. To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. If the equipment is supplied with a three-conductor AC power cable, the power cable must be plugged into an approved three-contact electrical outlet, with the grounding wire (green/yellow) reliably connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards and local electrical regulatory codes.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE. Do not operate the equipment in any explosive atmosphere such as in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment could result in an explosion and cause injury or damage.

KEEP AWAY FROM LIVE CIRCUITS INSIDE THE EQUIPMENT. Operating personnel must not remove equipment covers. Only Factory Authorized Service Personnel or other qualified service personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment. Service personnel should not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, such personnel should always disconnect power and discharge circuits before touching components.

DO NOT SUBSTITUTE PARTS OR MODIFY EQUIPMENT. Do not install substitute parts or perform any unauthorized modification of the equipment. Contact your local SANBlaze representative for service and repair to ensure that all safety features are maintained.

OBSERVE WARNINGS IN MANUAL. Warnings, such as the example shown above, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions which you deem necessary for the operation of the equipment in your operating environment.

To prevent serious injury or death from dangerous voltages, use extreme caution when handling, testing, and adjusting this equipment and its components.

Flammability

All SANBlaze PWBs (printed wiring boards) are manufactured with a flammability rating of 94V-0 by UL-recognized manufacturers.

EMI Caution

This equipment generates, uses, and can radiate electromagnetic energy. It may cause or be susceptible to electromagnetic interference (EMI) if not installed and used with adequate EMI protection.

Safety Statement

The SB-ATCA2020 is designed to comply with EN60950-1 Revision 2, and is intended to be used with similarly tested AdvancedTCA products that have a user's guide detailing installation.

CE Notice (European Community)

SANBlaze Technology products with the CE marking comply with the EMC Directive (89/336/EEC). Compliance with this directive implies conformity to the following European Norms:

- EN55022 "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment"; this product tested to Equipment Class A
- EN50024-1:1998 "Information Technology Equipment - Immunity Characteristics -Limits and Methods of Measurement Amendment A1:2001, Amendment A2:2003

System products also fulfill EN60950 (product safety), which is essentially the requirement for the Low Voltage Directive (73/23/EEC).

Board products are tested in a representative system to show compliance with the above mentioned requirements. A proper installation in a CE-marked system will maintain the required EMC/safety performance.

In accordance with European Community directives, a "Declaration of Conformity" has been made and is on file within the European Union. The "Declaration of Conformity" is available on request. Please contact your sales representative.

Notice

While reasonable efforts have been made to assure the accuracy of this document, SANBlaze Technology, Inc. assumes no liability resulting from any omissions in this document, or from the use of the information obtained therein. SANBlaze reserves the right to revise this document and to make changes from time to time in the content hereof without obligation of SANBlaze to notify any person of such revision or changes.

About This Manual

This manual supports the following configurations and model numbers.

Part Number	Description
SB-ATCA2020	10 Disk SAS JBOD Blade

How this manual is organized

This manual is divided into the following chapters and appendices:

Chapter 1 SB-ATCA2020 JBOD Blade Overview

Chapter 2 Hardware Configurations

Chapter 3 SB-ATCA2020 Installation

Chapter 4 SB-ATCA2020 Firmware Upgrade Procedure

Appendixes Hardware and Mechanical Information , IPMI functions list

Conventions Used in This Manual

The following typographical conventions are used in this document:

Table 1 Conventions used in this manual

Convention	Is used for
bold	User input that you type just as it appears; it is also used for commands, options and arguments to commands, and names of programs, directories and files.
italic	Names of variables to which you assign values, for function parameters, and for structure names and fields. Italic is also used for comments in screen displays and examples, and to introduce new terms.
`courier`	System output (for example, screen displays and reports), examples, and system prompts.
ENTER	The carriage return or Enter key.
Ctrl	The Control key. Execute control characters by pressing the Ctrl key and the letter simultaneously, for example, Ctrl+D.

Hardware Preparation and Installation

Unpacking Instructions

If the shipping carton is damaged upon receipt, request that the carrier's agent be present during the unpacking and inspection of the equipment.

Unpack the equipment from the shipping carton. Refer to the packing list and verify that all items are present. Save the packing material for storing and reshipping of equipment.

Avoid touching areas of integrated circuitry. Static discharge can damage circuits.

After removing the product from the packaging:

- Check for obvious physical damage.
- Make sure that you disconnect the chassis from the main power supply before you continue.

Antistatic Precautions

SANBlaze strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing or upgrading a system. Electronic components, such as disk drives, computer boards, and memory modules, can be extremely sensitive to electrostatic discharge (ESD). After removing the component from its protective wrapper or from the system, place the component flat on a grounded, static-free surface (and, in the case of a board, component side up). Do not slide the component over any surface.

If an ESD station is not available, you can avoid damage resulting from ESD by wearing an antistatic wrist strap (available at electronics stores) that is attached to an active electrical ground. Note that a system chassis may not be grounded if it is unplugged.

Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing, and adjusting.

Avoid touching areas of integrated circuitry. Static discharge can damage these circuits.

1 SB-ATCA2020 JBOD Blade Overview

The SANBlaze SB-ATCA2020 is a single slot AdvancedTCA blade that accommodates up to 10 user serviceable disks for SAS JBOD (Just-a-Bunch-Of Disks) applications. Users may populate with standard 2.5" SAS, SATA or solid state disk (SSD) technologies, yielding a cumulative capacity of 6TB.

1.1 Features of the AdvancedTCA Storage Module

The SB-ATCA2020 is single slot carrier board for AdvancedTCA shelves. Measuring 8U (280mm) x 325 mm, the carrier includes up to eight Hard disk assemblies (HDA) for disk drive media. The supported disk configurations include:

- 4 SAS disks
- 8 SATA/SSD disks
- 2 RTM SAS/SATA or SSD disks

The prominent digital components include:

- LSI SAS2x36 Expander, 6Gb/s 36 port SAS expander
- Carrier IPMC, with hot swap and LED control
- IPMI FRUID serial EERPROM
- Temperature sensors
- Voltage sensors

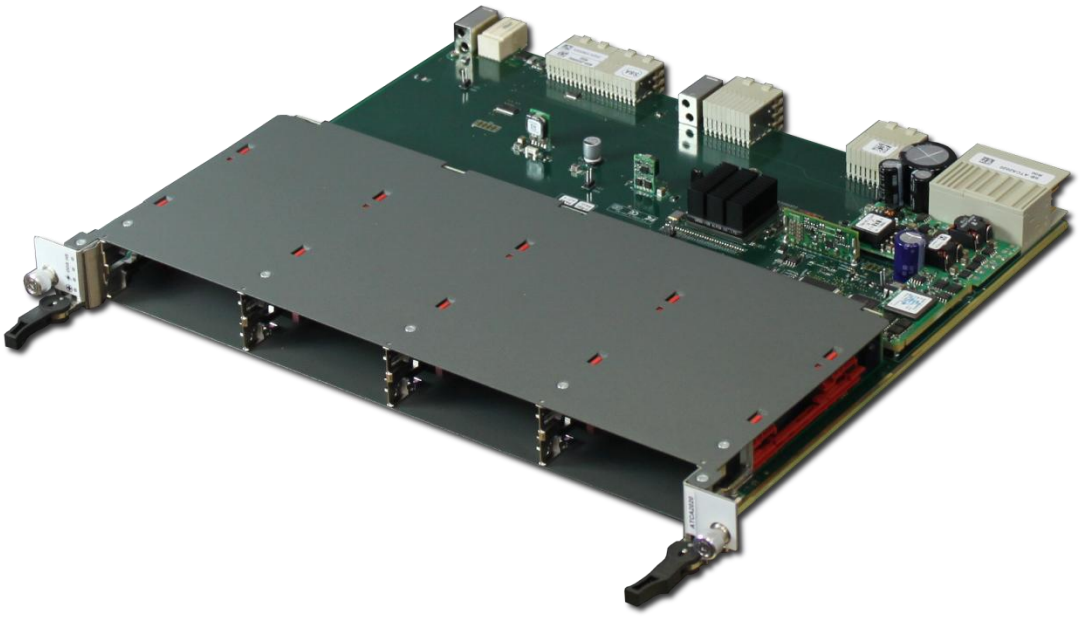


Figure 1. SB-ATCA2020 Module Top View, Front Panel

1.1.1 I/O PICMG standards compliance

The SB-ATCA2020 JBOD Carrier blade is fully compliant with the following PCI Industrial Computer Manufacturers Group (PICMG) and related specifications:

- PICMG 3.0 Advanced Telecommunications Computing Architecture (ATCA)
- PICMG 3.1 Ethernet for AdvancedTCA Systems (3.1.9)
- IPMI v1.5 Intelligent Platform Management Interface Specification

1.2 SB-ATCA2020 Components

The SB-ATCA2020 provides several connectors to facilitate operation in an AdvancedTCA chassis. In addition to the front Hard Disk Adapter (HDA) slots, the blade includes chassis backplane connections including ATCA zone 1 (power and control), zone 2 (update channel) and zone 3 RTM (Rear Transition Module).

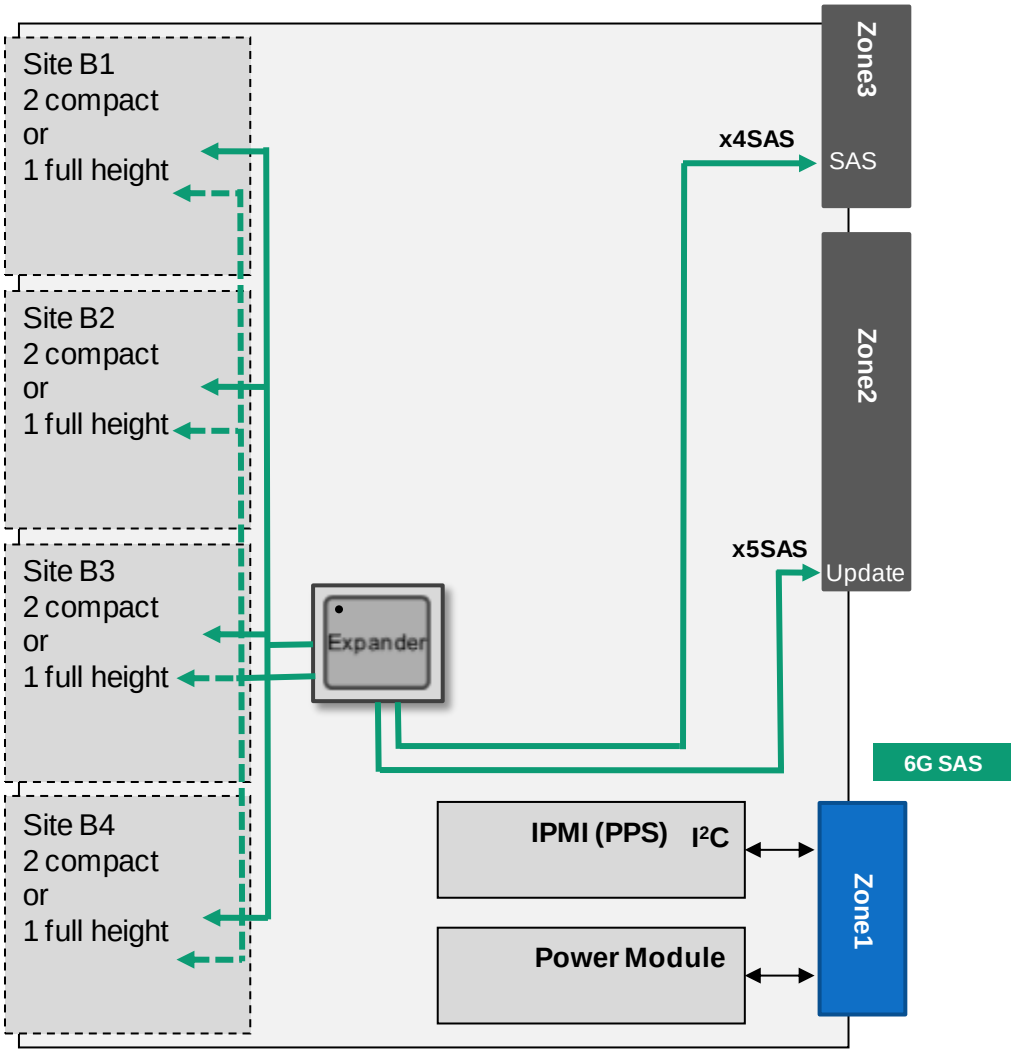


Figure 2 SB-ATCA2020 Functional Block Diagram

1.2.1 SANBlaze Hard Disk Adapter (HDA) Slots

The SB-ATCA2020 provides four slots to hold SANBlaze Hard Disk Adapters (HDA). A single slot can accommodate either two compact HDA or one full height HDA.

A full-height HDA module contains one 2.5" SAS disk with a case height of up to 14.5 mm. A compact-height HDA module contains one 2.5" SATA disk with a case height of 9.5mm or less. Both form factors support SAS and SATA data rates up to 6 Gbp/s.

You can mix compact and full-height disk adapters in the same blade, although not in the same bay. Any bay or slot left empty must have appropriate-height filler HDA installed to ensure proper system air flow.

Currently available disk capacities range from 160 GB to 1 TB.

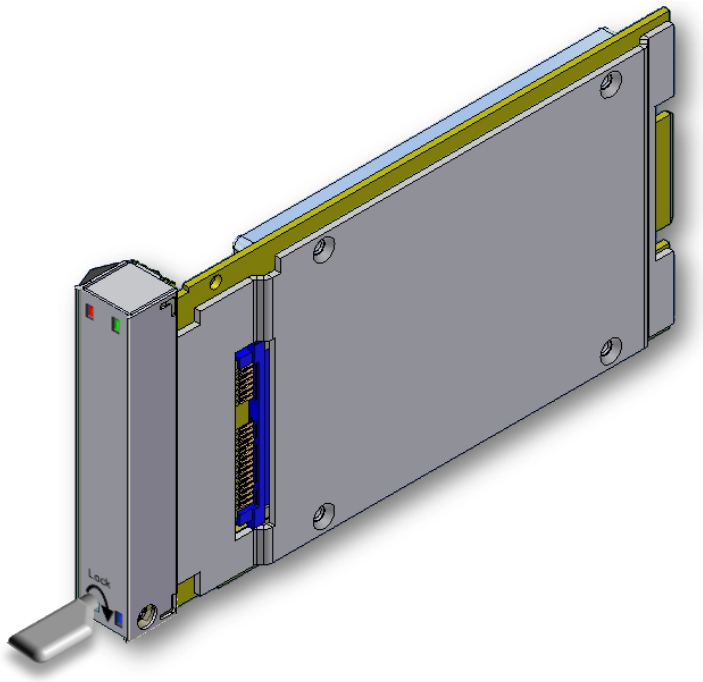


Figure 3 Hard Disk Adapter (Compact Height Shown)

1.2.2 SAS Expander

The SAS expander is an electronic component on the SB-ATCA2020 that enables you to connect its disk drives to an external SAS initiator. The connection is made either thru SAS ports available on the ATCA update channel, or thru SAS ports routed to a SAS connector available on a RTM (Rear transition Module).

The SAS expander operates in "edge expander" mode and is self configuring. As a self-configuring expander it automatically configures its own expander route table based upon its location within the topology of the SAS domain.

1.3 ATCA Connectors

Every ATCA blade provides high-density connectors for the three connectivity zones of an ATCA shelf.

1.3.1 Zone 1, ATCA Backplane Power Connection

The ATCA Zone 1 connector brings 48V DC power into the SB-ATCA2020 main board. This power is regulated and split into lower voltages by onboard power modules and related components. These devices convert and distribute the 48V power to the board components, HDAs and the Rear Transition Module (RTM). Zone 1 also carries the IMPI control paths.

See Appendix A for the pinout of this connector.

1.3.2 Zone 2, ATCA Backplane I/O Connections

This connector joins the SB-ATCA2020's main I/O links to the chassis backplane. This connector includes the following I/O ports:

- Five pair of 6 Gbs SAS connections, run over the ATCA zone 2 update channel (UC), for access to additional disk storage

See Appendix A for the pinout of these connectors.

1.3.3 Zone 3, ATCA RTM connector

This connector conforms to the advanced rear transition module (RTM) 3-row connector standard. The following functions are routed to this connector:

- Four SAS/SATA 6 GBs target connections
- IMPI IPMC support connection
- 3V and 12V power for the RTM

See Appendix A for the pinout of these connectors.

1.4 SB-ATCA2020 LEDs

Several LEDs are located on the panel of the SB-ATCA2020Advanced TCA Carrier.

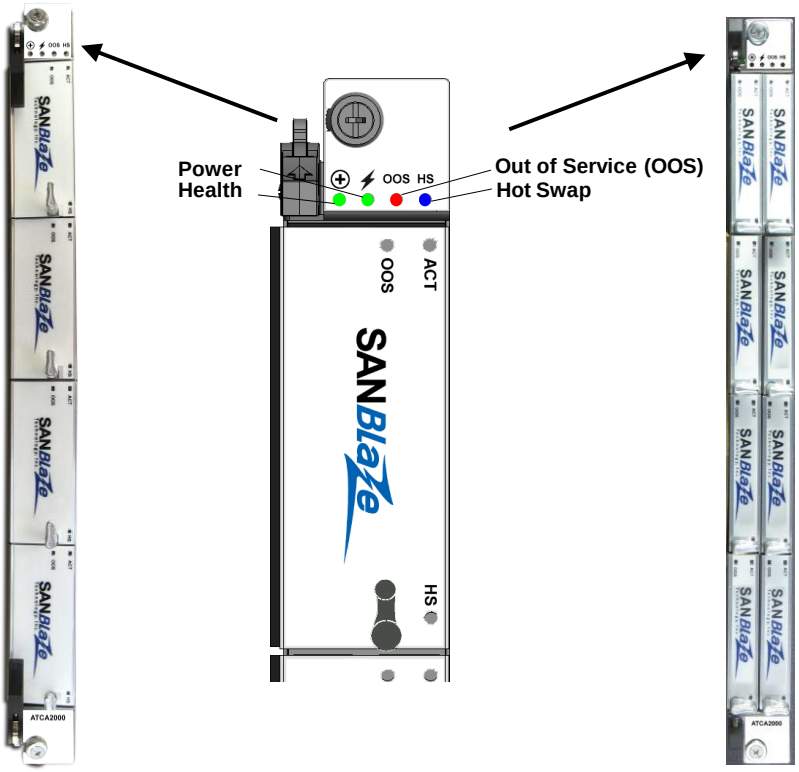


Figure 4 SB-ATCA2020 Blades Showing Panel LED Locations

These LEDs are described in the table below.

Table 2 SB-ATCA2020 LED Functional Descriptions

Abbreviation	LED	Description
(Health Icon)	ATCA Health Status	Green: Blade normal
Power (bolt Icon)	ATCA Blade power	Green-on solid: Blade normal
OOS	ATCA Out Of Service	Off: Normal Amber - on solid: Out of service
HS	ATCA Hot Swap LED	Off: Normal Blue- slow blink: Hot swap in in process Blue - fast blink: Hot swap out in progress Blue - on solid: OK to remove

1.5 Software Client support

The SB-ATCA2020 requires no special software to operate and it is approved for use with any 3or 6 Gb SAS device. As shipped from the factory, the expander is un-zoned, and will auto configure itself when connected to disks and a SAS initiator. The maximum negotiated SAS speed is determined by switch setting located on the module. See section A.3.1 titled DIP Switch Settings.

2 SB-ATCA2020 Hardware Configurations

This chapter introduces the SB-ATCA2020 accessory components and various user deployment configurations.

2.1 Hard Disk Adapters (HDAs)

Disks are added using Hard Disk Adapter 21 (HDA21 or HDA) cards. The HDA is not AMC compatible. The HDA architecture is shown in the diagram below.

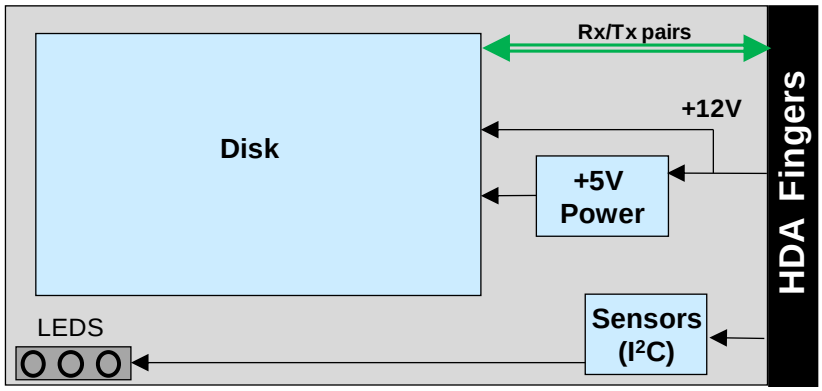


Figure 5 HDA Block Diagram

HDAs are available in two sizes, full size and compact. Each disk bay on the SB-ATCA2020 can accommodate either two compact HDAs or one full size HDA. You can mix HDA sizes in the same SB-ATCA2020 blade, but not in the same HDA bay.

Figure 6 HDA (Hard Disk Adapter), with SSD (compact shown)

2.1.1 HDA Disk Choices

This section briefly describes some of the disk models that are available on SB-ATCA2020 HDAs. Similar disks are available for the RTMs that can be attached to the blade.

Table 3 HDA-21 Disk options

SB-HDA21 (each)	SATA	SAS	SSD
Max Capacity	1000GB (1TB)	600GB	600GB
Typical IOPS	80-100	100-160	3000-5000
Typical Bandwidth	75 MB/s	125-150MB/s	250-400MB/s
Rotational Speed	7200 RPM	10,000 RPM	N/A
Typical Power	2.5W	6-8W	3-4W
Operating Temp	5ºC to +55ºC	5ºC to +55ºC	0ºC to +70ºC
Front Panel LEDs	Active/Power (Green), Out-of-Service (Red). Hot swap (Blue)		

Note: For the most current list of qualified disks, see: www.sanblaze.com/disk-selector-chart.

2.2 Supported RTMs

The SB-ATCA2020 JBOD blade currently supports the SB-RTM431D RTM, which includes 2 disks and a SAS connector for expansion to external SAS equipment. This RTM includes the following capabilities:

- Two 2.5” SAS/SATA/SAS disks (hot swappable)
- SAS x4 External connector (3 Gb/s)
- RJ45 Ethernet management port (not utilized)
- Micro-DB9 serial management port (not utilized)

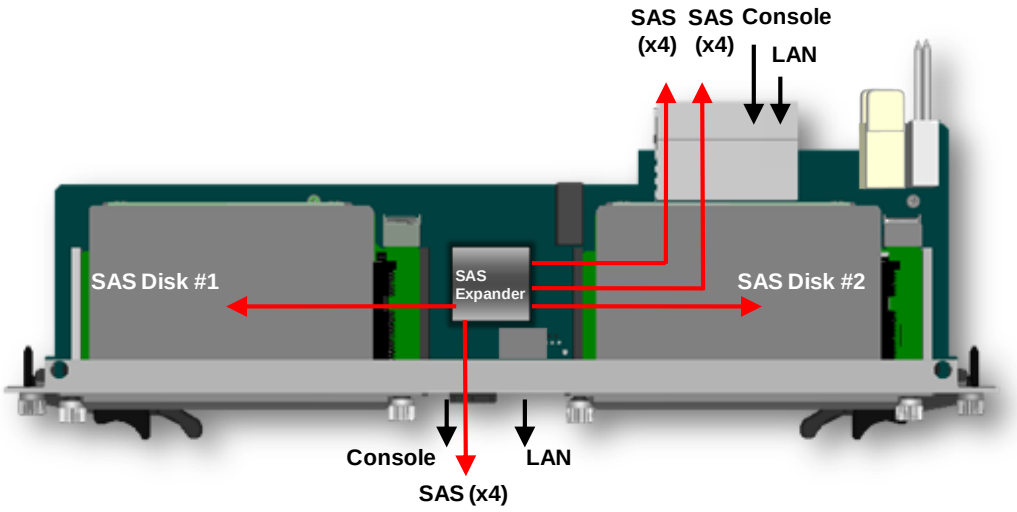


Figure 7 SB-RTM431D Block Diagram and Function Content

2.3 The SB-ATCA2000 RAID Blade

The SANBlaze SB-ATCA2020 is often parried with the SB-ATCA2000, which provides an in-chassis RAID storage function using Zone-2 Fabric connections. The SB-ATCA2000 blade utilizes the same type of disk FRU, supporting eight compact height (CH) or four full height (FH) disk modules. See section 2.1Hard Disk Adapters (HDAs).

Connections with the SB-ATCA2020 JBOD are made using these methods:

1. Cable-less – Five SAS connections routed over the zone 2 update channel
2. Cabled – SAS CX4 connector on the SB-ATCA2020's RTM

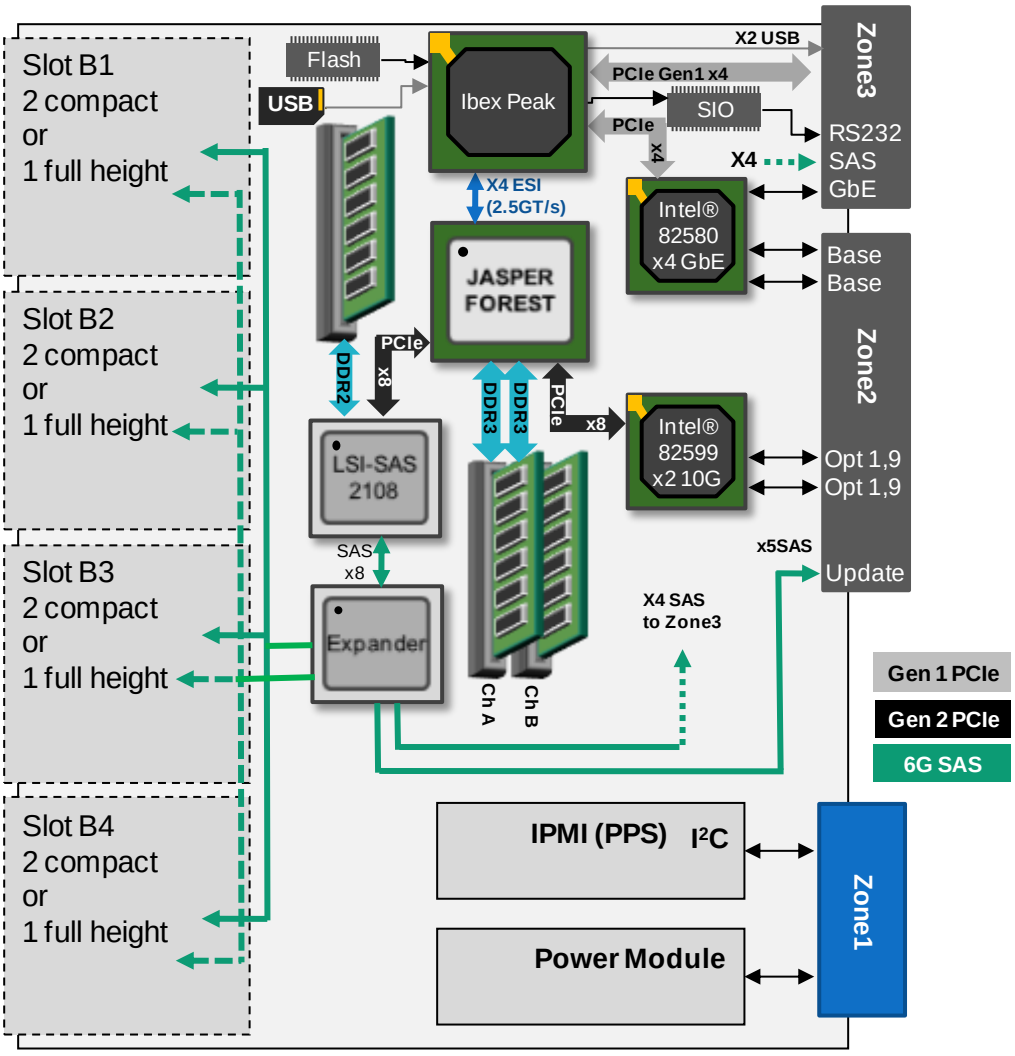


Figure 8 SB-ATCA2000 RAID Blade Block Diagram

2.4 Example Blade and RTM Configurations

There are a multitude of possible SB-ATCA2020 configurations. This section shows the most popular configurations.

2.4.1 2 Slot Configuration, with JBOD blade

The diagrams below show deployment with the ATCA2020, which doubles the available disk capacity. The SAS resources are bridged either via the ATCA update channel (x5 SAS, preferred), or an external SAS cable (x4 SAS).

- (12) physical disks total (SAS)
- (20) physical disks total (SSD/SATA)

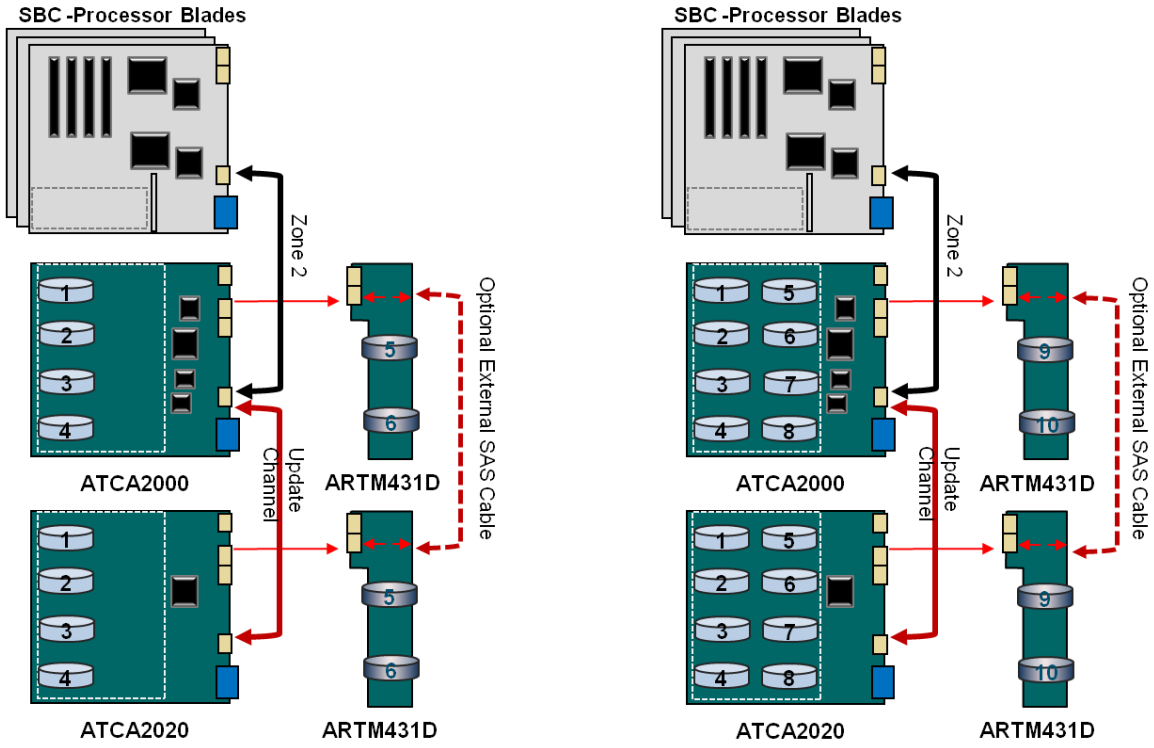


Figure 9 SB-ATCA2020, 12 and 20 Drive Configurations

3 SB-ATCA2020 Installation

This chapter contains the procedures for installing and removing the SB-ATCA2020 10GbE RAID storage services blade.

3.1 Installation and removal of the ATCA carrier blade

Install the SB-ATCA2020 blade into an ATCA 3.1 shelf (chassis). An ATCA 3.1 midplane has cutouts that permit the front ATCA carrier board to pass signals to an RTM (Rear Transition Module) through the Zone-3 connector.

3.1.1 Unpacking Instructions

If the SB-ATCA2020 shipping carton is damaged upon receipt, request that the carrier's agent be present during the unpacking and inspection of the equipment.

Unpack the equipment from the shipping carton. Refer to the packing list and verify that all items are present. Save the packing material for storing and reshipping of equipment.

Avoid touching any area of the integrated circuit board. Static discharge can easily damage circuits.

After removing the product from the packaging, check for obvious physical damage.

3.1.2 Antistatic Precautions

SANBlaze strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing or upgrading a system. Electronic components, such as disk drives, computer boards, and memory modules, can be extremely sensitive to electrostatic discharge (ESD). After removing the component from its protective wrapper or from the system, place the component flat on a grounded, static-free surface (and, in the case of a board, component side up). Do not slide the component over any surface.

If an ESD station is not available, you can avoid damage resulting from ESD by wearing an antistatic wrist strap (available at electronics stores) that is attached to an active electrical ground. Note that a system chassis may not be grounded if it is unplugged.

Note: Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing, and adjusting.

Avoid touching areas of integrated circuitry. Static discharge can damage these circuits. Select an Appropriate ATCA Chassis Slot.

An ATCA chassis usually designates one or two slots as hub (switch) slots and the others as general purpose slots. When installing the SB-ATCA2020, ensure that you have selected a general purpose slot for it.

Before installing a blade, ensure that you have the proper blade type by verifying the blade's part number. For information on identifying the SB-ATCA2020 blade, see appendix A.2, "Part Number, Serial Number, and Address Labels".

3.2 Safety Statement

The SB-ATCA2020 is designed to comply with UL60950-1 revision 2, and is intended to be used with similarly tested AdvancedTCA products that have a user's guide detailing user installation.

3.2.1 Observe maximum module current requirements

Be sure to validate the host chassis, and the host chassis meets the maximum current requirements.

The SB-ATCA2020 includes a power supply module with maximum rated output of 240W of power. This represents a surplus of power vs. the expected power consumption.

Table 4 SB-ATCA2020 Maximum Current requirements

Component	SB-ATCA2020 Power	
Max ATCA blade Current Draw (unpopulated)		0.21A @ 48V (10watts)
Max current draw (each disk slot)	10 watts (max each)	0.83A @ 48V (40 watts)
Max current draw (RTM slot)		0.83A @ 48V (40 watts)
Maximum draw, total		3.33A @ 48V (160 watts)

3.3 Before you install or Remove the SB-ATCA2020

Boards may be damaged if improperly installed or handled. Please read and follow the guidelines in this section to protect your equipment.

3.3.1 Observe ESD Precautions

SANBlaze strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing or upgrading a system. Electronic components, such as disk drives, computer boards, and memory modules, can be extremely sensitive to electrostatic discharge (ESD). After removing the component from its protective wrapper or from the system, place the component flat on a grounded, static-free surface (and, in the case of a board, component side up). Do not slide the component over any surface.

If an ESD station is not available, you can avoid damage resulting from ESD by wearing an antistatic wrist strap (available at electronics stores) that is attached to an active electrical ground. Note that a system chassis may not be grounded if it is unplugged.

3.3.2 Look for Bent Pins or Other Damage

Bent pins or loose components can cause damage to the board, the backplane, or other system components. Carefully inspect your board and the backplane for both pin and component integrity before installation. Our suppliers take significant steps to ensure there are no bent pins on the backplane or connector damage to the boards prior to leaving our factory. Bent pins caused by improper installation or by boards with damaged connectors could void the warranty for the backplane or boards.

If a system contains one or more crushed pins, power off the system and contact your local sales representative to schedule delivery of a replacement chassis assembly

3.4 Use Caution When Working With ATCA Blades

When installing boards in an empty chassis, we recommend that you start at the left of the card cage and work to the right. This helps to avoid mistakes in matching slots with the intended carrier boards.

When inserting or removing a board in a slot adjacent to other boards, use extra caution to avoid damage to the pins and components located on the primary or secondary sides of the boards.

3.4.1 Preserve EMI Compliance

To preserve compliance with applicable standards and regulations for electromagnetic interference (EMI), during operation all front and rear openings on the chassis or board faceplates must be filled with an appropriate card or covered with a filler panel. If the EMI barrier is open, devices may cause or be susceptible to excessive interference.

3.4.2 Verify Slot Usage

Prevent possible damage to module components by verifying the proper slot usage for your configuration.

In most cases, electronic keying (E-keying) will prevent power on of a board into an incompatible slot. However, as an extra precaution, you should be familiar with the shelf's slot configuration.

3.5 Connector Mechanical keying

The ATCA supports mechanical connector keying to help prevent installation with incompatible components and RTM. The ATCA carrier board utilizes an A1/K1 key that is set at universal)

3.6 Installing the SB-ATCA2020 Blade

This section describes a recommended procedure for installing the AdvancedTCA carrier module in a chassis.

- Before you install your module, please read all cautions, warnings, and instructions presented in this section.
- Handling modules and peripherals can result in static damage. Use a grounded wrist strap, static-dissipating work surface, and antistatic containers when handling and storing components.
- Insert the board by holding the Module Handles—do not exert unnecessary pressure on the faceplate.
- Hot swap compliant modules may be installed while the system is powered on. If a module is not hot swap compliant, you should remove power to the slot or system before installing the module.

When installing a blade:

1. Verify that you have taken the necessary antistatic precautions.
2. Go to the front of the ATCA shelf and choose an appropriate slot for the blade.
3. **If you are also installing a companion RTM, install it before installing the ATCA front board.**

   For example, if the ATCA front board is planned for slot 9, first install it's RTM at the back of the system in slot 9.
4. Prepare the new blade by opening the injector/ejector latches at the top and bottom of the module as shown in the figure below.

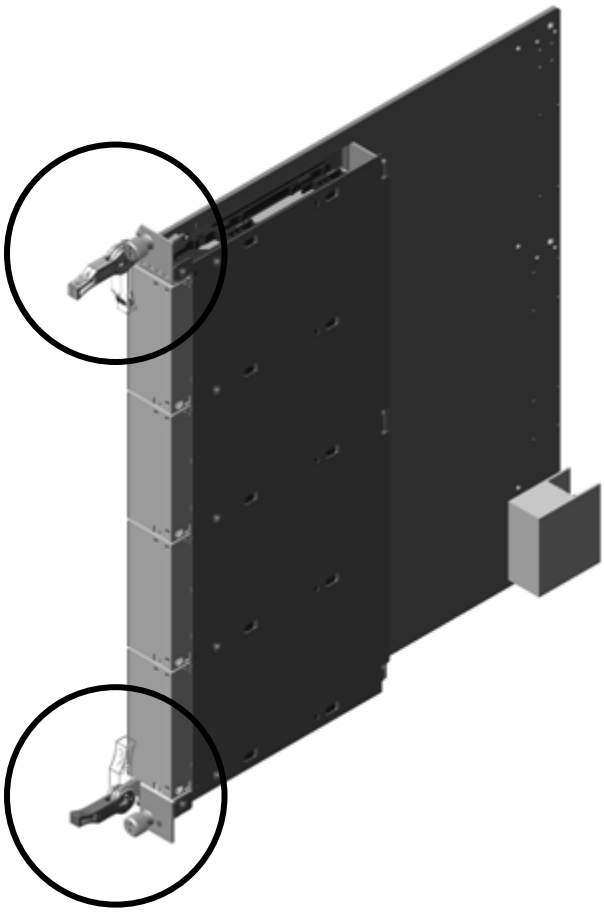


Figure 10 SB-ATCA2020 Blade Injector\Ejector latch locations

5. Remove the slot filler panel from the selected front board slot, if necessary.
6. Carefully align the edges of the module with the guides in the appropriate slot. It might be helpful to look into the enclosure to verify correct alignment of the rails in the guides. Align the edges of the module with the card cage rail guides in the appropriate slot.
7. Taking care to keep the module aligned in the guides, apply equal and steady pressure to the top and bottom and slide the module in until the injector/ejector mechanism

engages the retention bars. The latch handle should be up, with the locking pin retracted. See section A of the diagram below.

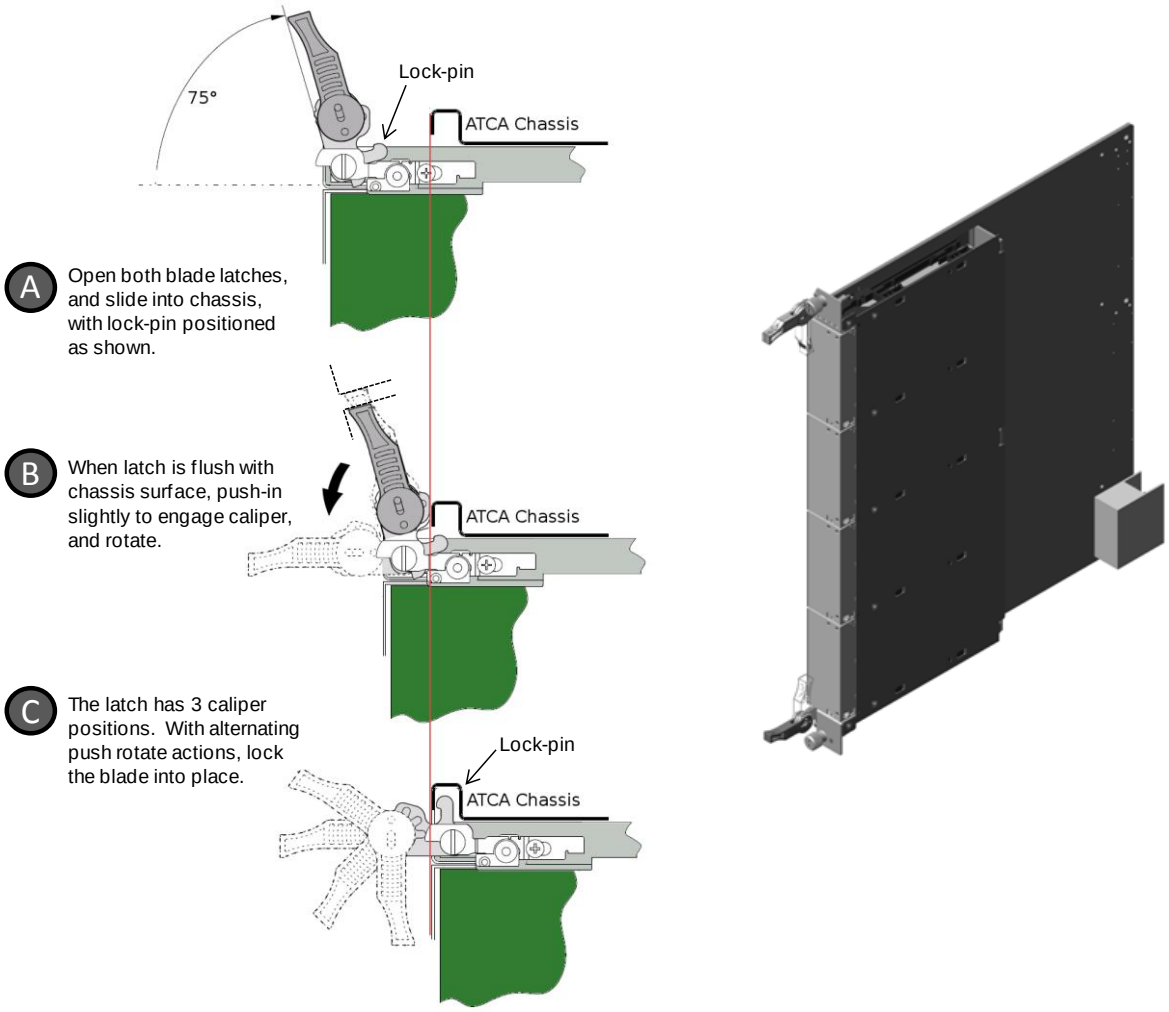


Figure 11 SB-ATCA2020 Injector / Ejector latch and locking screw

8. When the blade is flush with the chassis surface, rotate both latches inward toward the blade. (Section B in the diagram above.)
9. When latches are fully closed, the blade is locked into place. (Section C in the diagram above.) DO NOT FORCE THE BOARD INTO THE SLOT. If the latches will not close, remove the board and reinstall it.
10. Tighten the top and bottom module retention screws to secure the module into the shelf.
11. The Blade should automatically power itself. After a successful power up self-test, the blue hot swap LED will blink and then turn off. When the Hot Swap LED goes off, the blade is ready for operation.

3.7 Installing a Hard Disk Adapter (HDA)

This section describes a recommended procedure for installing a SANBlaze Hard Disk Adapter (HDA) card in a blade.

Before you install your card, please read all cautions, warnings, and instructions presented in this section.

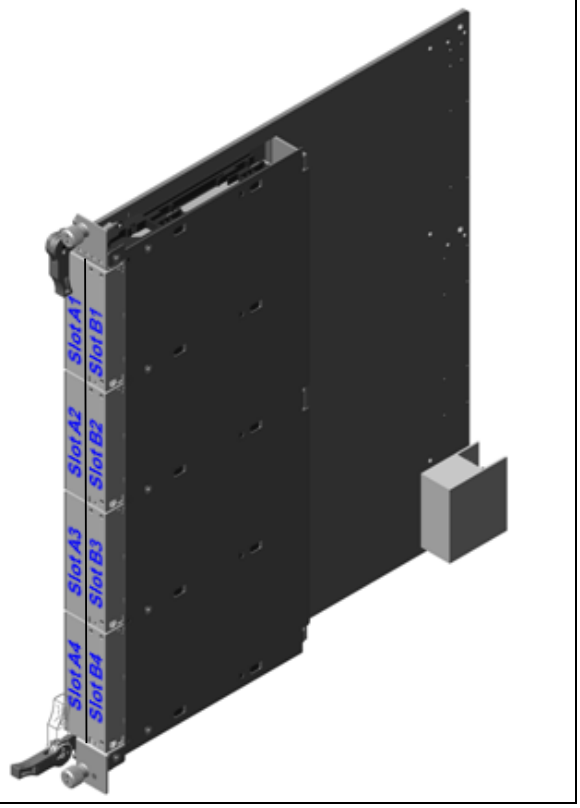
Handling modules and peripherals can result in static damage. Use a grounded wrist strap, static-dissipating work surface, and antistatic containers when handling and storing components.

HDA card installation can be done while the system is powered on.

3.7.1 HDA Locations

The HDA locations are shown in the table below.

Table 5 SB-ATCA2020 Hard Disk Adapter Locations

Slot	Description	Location
A1	Compact only	
A2	Compact only	
A3	Compact only	
A4	Compact only	
B1	Full or Compact	
B2	Full or Compact	
B3	Full or Compact	
B4	Full or Compact	

3.7.2 HDA Installation

To install a HDA, follow these instructions.

1. Rotate the HDA ejector handle counter clockwise, to open the locking mechanism.
2. Remove the slot filler panel from the selected HDA bay, if necessary.
3. Carefully align the edges of the HDA module with the slot rail guides.
4. Taking care to keep the module aligned in the guides, apply equal and steady pressure to the top and bottom of the card and slide the board in until the fingers of the card seat firmly into the internal HDA connector. DO NOT FORCE THE CARD INTO THE SLOT. If the latch will not close, remove the card and reinstall it
5. Rotate the HDA ejector handle clockwise to engage the card locking mechanism, as shown in the figure below
6. Power on the system, if necessary.

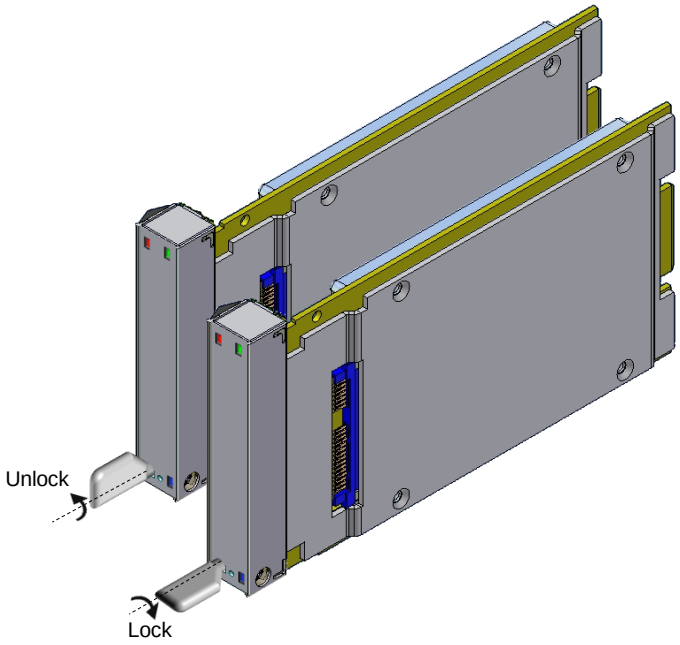


Figure 12 HDA Module Ejector Latch Operation

3.7.3 HDA LED indicators

	ACT	Active power	Green: Module is active/powered Blink Green: Disk I/O activity Off: Module is not powered
	OOS	Out Of Service	Off: Normal Red - on solid: Out of service
	HS	Hot Swap LED	Off: Normal Blue- blink: Hot swap in in process Blue - on solid: OK to remove

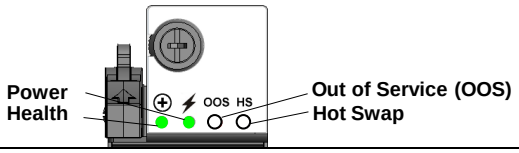
3.8 Verifying the Hardware Installation

This section provides information to verify the installation of the SB-ATCA2020 RAID blade.

3.8.1 To Verify the Hardware Installation

1. After power is applied to the system, wait approximately 2 minutes for firmware to initialize the board.
2. Inspect the LEDs on the front of the ATCA panel. (See section 1.4 titled SB-ATCA2020 LEDs, for more detail on their meaning.)
   When properly installed and powered, the LEDs are illuminated as follows:

Table 6 SB-ATCA2020 LED Color Following Successful Install

Front Panel LED	LED	Color	State
	Health	Green	On
	Power	Green	On
	OOS	Amber	Off
	Hot Swap	Blue	Off

3.9 Removing a HDA Module

Caution

The Hard Disk Adapter (HDA) is hot-swappable and can be removed from the chassis without powering down its host or chassis. This section describes the procedure for removing an HDA.

Before removing an HDA, please read all cautions, warnings, and instructions in this section.

1. Stop any use of the disk on the HDA. Powering down or removing a disk before it has been properly shut down may cause corruption of data or file systems.
2. Begin removal by rotating the HDA ejector handle counter-clockwise (see Figure 12 HDA Module Ejector Latch Operation on page 3-7).
3. After sensing the unlocked ejector position, the blue hot swap LED will blink to indicate mechanical lock was disengaged.
4. The blue LED will blink indefinitely, while handle is in the unlock position. The OS is not notified that the drive is being removed. You should manually unmount the drive at this time.

Note: Powering down or removing an active disk may cause corruption of data or file systems.

5. Grasp the ejector handle; carefully pull the HDA from its slot. If the HDA slot is to remain empty, you must install a filler panel in the slot to preserve system cooling.

3.10 Removing the SB-ATCA2020 Blade

The SB-ATCA2020 blade is hot-swappable and can be removed from a powered chassis. This section describes the procedure for removing a blade from an ATCA chassis.

Every ATCA blade is architected to support removal from a fully powered ATCA chassis, a procedure known as Hot Swapping. To indicate hot swap status, there is a blue LED on the front of every removable component. This LED is under software control of the IPMC.

The IPMC will light the blue hot swap LED when the using software has stopped and it is safe to remove the component. If the blue LED is not lit or is blinking, the component is not ready for removal.

Note: Powering down or removing a component before it has been properly shut down may cause corruption of data or file systems.

There is no host swap handle mechanism. Rather, hot swap must be initiated via shelf commands described in the next section.

3.10.1 ATCA Blade Removal Procedure

To remove an ATCA blade, follow these steps:

1. Using your shelf manager, issue a deactivate command. Example:

   ```
   #clia deactivate board <slot#>
   ```

2. The blades blue hot swap LED will blink to indicate the module is in the process of being deactivated. Once the module has been deactivated, the blue LED will be on continuously to indicate module extraction is ready.

3. Loosen the two locking retention screws at the top and bottom of the ATCA blade.

4. Follow these instructions, and carefully slide the remove from the chassis

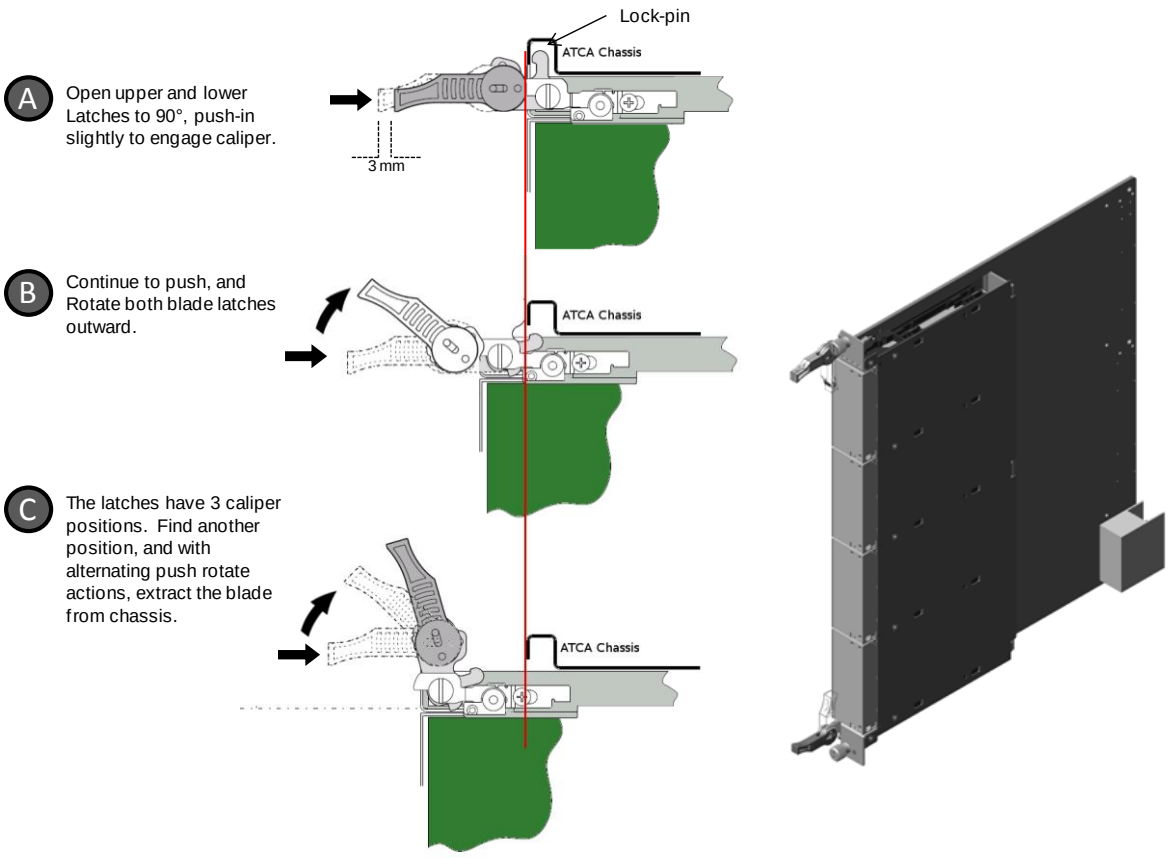


Figure 13 SB-ATCA2020 blade extraction, handle operation detail

5. If the blade slot is to remain empty, you must install a filler panel in the slot to preserve system cooling.

4 SB-ATCA2020 Firmware Upgrade Procedure

This chapter provides information about installing and updating the SB-ATCA2020 blade firmware. At manufacturing time, the most current blade firmware is loaded at the factory. Periodically, new firmware releases are offered to improve the functionality or performance of the SB-ATCA2020.

4.1 IPMI Firmware Upgrades

This section provides directions for upgrading the SB-ATCA2020 IPMC (Intelligent Platform Management Controller) firmware. If the SB-ATCA2020 IPMC requires new firmware, an upgrade can be performed remotely using a LAN connection to the ATCA chassis' Shelf Manager.

IPMC upgrades are reliable and reversible. The SB-ATCA2020 keeps a redundant copy of
the IPMC firmware in the IPMC's flash memory. A download failure (such as an error or interruption) does not disturb the IPMC's ability to continue using the current firmware nor its ability to restart the download process. The IPMC will automatically fail back to the previous firmware image if there is a problem when first booting the new image.

The IPMC firmware upgrade can be done from any host, and does not require the user to be root..

4.1.1 The `ipmitool` Utility

SYNOPSIS

The minimum information to complete a firmware upgrade is documented here.

```
$ ipmitool [-I|-H|-T|-B|-t|-b] hpm upgrade <firmware_file>
$ ipmitool [-I|-H|-T|-B|-t|-b] hpm activate
```

DESCRIPTION

`ipmitool` lets you manage Intelligent Platform Management Interface (IPMI) functions of either a local or remote system using IPMI V1.5 and IPMI v2.0. Capabilities include printing FRU data, LAN configuration, sensor readings, and remote power control.

OPTIONS

Table 7 ipmitool options relevant to firmware upgrades

Option	Description
`-I` *<interface>*	Selects IPMI interface to use. Supported interfaces that are compiled in are visible in the usage help output. Use **`lan`** to designate Ethernet.
`-H` *<address>*	Remote server address, can be IP address or hostname. This option is required for *lan* interfaces.

-T *<address>*	If updating AMC, use this to specify optional bus address of the bridge device (ex: Carrier IPMB-0 address if updating an AMC)
-B *<bus id>*	If updating an AMC, these this optional bus ID of the Bridge device (ex: 0 if updating through a IPMC
-t *<address>*	IPMB address of the final target
-b *<bus id>*	bus ID of the final target [0=IPMB-0(IPMC), 7=IPMB-L(AMC)]

COMMAND SYNTAX EXAMPLES

EXAMPLE 1. The following example shows the command performing firmware upgrade on the carrier itself:

```
$ ipmitool -I lan -H 192.168.0.2 -t 0x82 -b 0 hpm upgrade hpm1fw.img
$ ipmitool -I lan -H 192.168.0.2 -t 0x82 -b 0 hpm activate
```

Line 1 puts the new firmware in the flash device, where **`hpm1fw.img`** is the image. Line 2 is used to dynamically load and activate the new firmware.

Appendix A
Hardware and Mechanical Information

This chapter provides the hardware specifications and mechanical information including connector pin outs for the SB-ATCA2020 module.

A.1 Specifications for the SB-ATCA2020

This section provides mechanical, electrical, environmental, and other relevant physical information.

A.1.1 Physical Dimensions

The SB-ATCA2020 is an 8U blade that complies with IEEE 1101.11 mechanical standards, as specified by the PICMG 3.0 Revision 3.0 specification.

Table 8 SB-ATCA2020 Physical Dimensions

Dimensions (width x height x depth)	Value
Fully assembled product	30mm x 332 mm x 312mm
PCB (printed circuit board) only	2.4mm x 322 mm x 279mm

A.1.2 Weight

The weight of the SB-ATCA2020 baseboard by itself is 2000g.

Table 9 SB-ATCA2020 Weight

Dimensions (width x height x depth)	Value
ATCA2000 with 4 SAS disks	~ 3200g
ATCA2000 with 8 SSD disks	~ 3200g
SB-RTM413, with 1SAS disk	~ 880g
SB-RTM431 with 2 SAS Disk	~ 935g

A.1.3 Reliability (MTBF)

The MTBF (Mean time between failures) for the SB-ATCA2020 was calculated using Telcordia SR-332, Issue 2, parts count method.

Table 10 MTBF

Part number(s)	SB-ATCA2020M
MTBF	510,000 @25C.

A.1.4 Environmental Specifications and Compliance

The environmental specifications for the SB-ATCA2020 assembly are presented in the table below.

Table 11 Environmental specifications for the SB-ATCA2020

SPECIFICATION	VALUE
Operating Temperature (airflow 5.0 CFM)	0°C ~ 55 °C
Atmospheric Pressure and Altitude	Operating: 0 ~ 3,000 m Shipping: 0 ~ 12,000 m
Condensation	No condensation
Operating Humidity	8 % ~ 80 %
Operating Temperature (airflow 2.0 CFM)	0°C ~ 23 °C
Operating Temperature (airflow 2.0 CFM)	0°C ~ 55 °C
Operating Temperature Gradient	11 °C /H (max)
Storage Temperature	-40 °C ~ 85 °C
Operating Shock	See PICMG 3.0 specification, Regulatory guidelines.
Operating Vibration	See PICMG 3.0 specification, Regulatory guidelines.
Storage Temperature Gradient	20 °C /H (max)
Shipping Temperature Gradient	20 °C /H (max) *1
RoHS	6 of 6 compliant.
Storage Humidity	5 % ~ 95 %
Shipping Humidity	5 % ~ 95 % *1
Wet bulb Maximum Temperature	27 °C
Operating voltage	-36 to -72 Vdc

A.1.5 Power Requirements

The SB-ATCA2020 includes a power supply module with maximum rated output of 240W of power. This represents a surplus of power vs. the expected power consumption.

Table 4 SB-ATCA2020 Maximum Current requirements

Component	SB-ATCA2020 Power	
Max ATCA blade Current Draw (unpopulated)		0.21A @ 48V (10watts)
Max current draw (each disk slot)	10 watts (max each)	0.83A @ 48V (40 watts)
Max current draw (RTM slot)		0.83A @ 48V (40 watts)
Maximum draw, total		3.33A @ 48V (160 watts)

A.1.6 NEBS Compliance

NEBS certifications are performed by integrator at a system level (chassis, ATCA, RTM shelf managers etc). This blade module will not preclude the system form passing NEBS.

A.1.7 EMC Compliance

This product was tested in an EMC-compliant chassis and meets the requirements for EN55022 Class A equipment. Compliance was achieved under the following conditions:

- Conductive chassis rails connected to earth ground, providing the path for connecting shields to earth ground
- Front panel screws properly tightened

For minimum RF emissions, it is essential that the conditions above be implemented. Failure to do so could compromise the EMC compliance of the equipment containing the module.

Table 12 EMC Emission Compliancy

Description	Description
US: FCC 47 CFR Part 15 Class A	FCC Class A emissions requirements (United States)
ICES-003 2004 Class A	Class A Interference-causing Equipment standard (Canada)
VCCI V-3/2007.04 Class A	Class A ITE emissions requirements (Japan)
Europe Commercial: EN5022:2006 Class A, ITE	Class A ITE emissions requirements (EU, Europe)
AS/NZS CISPR 22:2005 Class A, ITE	Class A ITE emissions requirements (Australia)
Europe Commercial: EN 55022:1998/A1:2000/A2:2003	Immunity for ITE equipment
Europe Commercial: EN 55024:1998A1:2001/A2:2003	Immunity for ITE equipment
Europe Commercial: EN 61000-4-2,3,4,5,6 ,11: 2001	EMC Electrostatic discharge immunity
Europe Commercial: EN6100-3-2, 2000 Section 2	With A2 (2005) Limits for harmonic current emissions
Europe Commercial: EN6100-3-3, 2000 Section 3	With A2 (2005) limits for voltage fluctuations and flicker

A.2 Part Number, Serial Number, and Address Labels

At manufacturing time, several labels are affixed to the SB-ATCA2000 as shown below. For proper identification of the blade, use these barcode labels to determine the module identity. The barcode labels provide the following information:

Table 13 SB-ATCA2020 **Identification Labels**

Label	Description
Label 1: Serial number (S/N) Format: AAALYYSSSS (example: 202A1021234)	S/N Format :AAA = Assembly Number (202) L =Location of manufacturer Y = Calendar year of manufacturer (2010 = 0, 2011=1) MM = Calendar month of manufacturer (March = 03) SSSS = Sequence number (reset each month) (1234)
Label 2: Sub Assembly Part Number (example 600-202002, RXX)	P/N = sub assembly Part Number Rev = Assembly Revision (Refer to Bill Of Material)
Label 3: Final Assembly Part number----	P/N = sub assembly Part Number SB-ATCA2020 Rev = Assembly Revision (Refer to Bill Of Material)
Label 4: OEM part label (optional)	Format varies
Label 5: UL recognition Label	Reviewed to 60950-1, (File E318926)

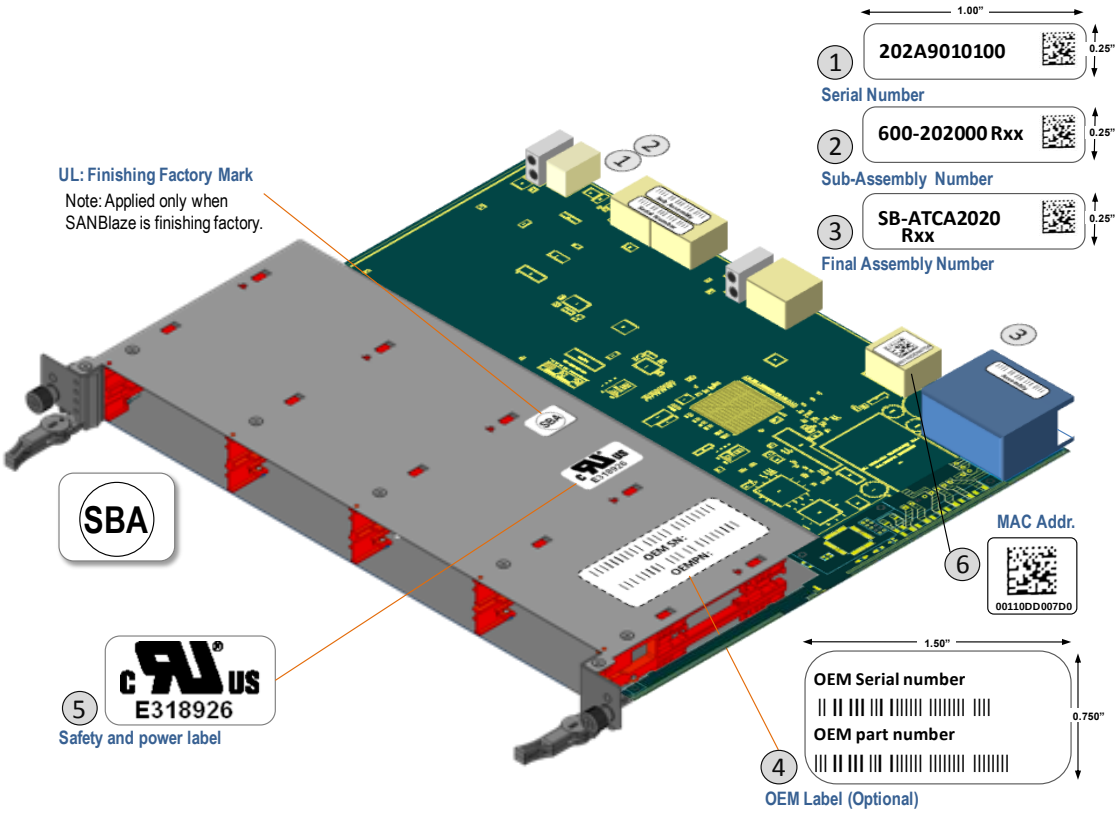


Figure 14. SB-ATCA2020 Identification Labels

A.3 Mechanical Layout

The following Graphic illustrates the mechanical layout of the SB-ATCA2020.

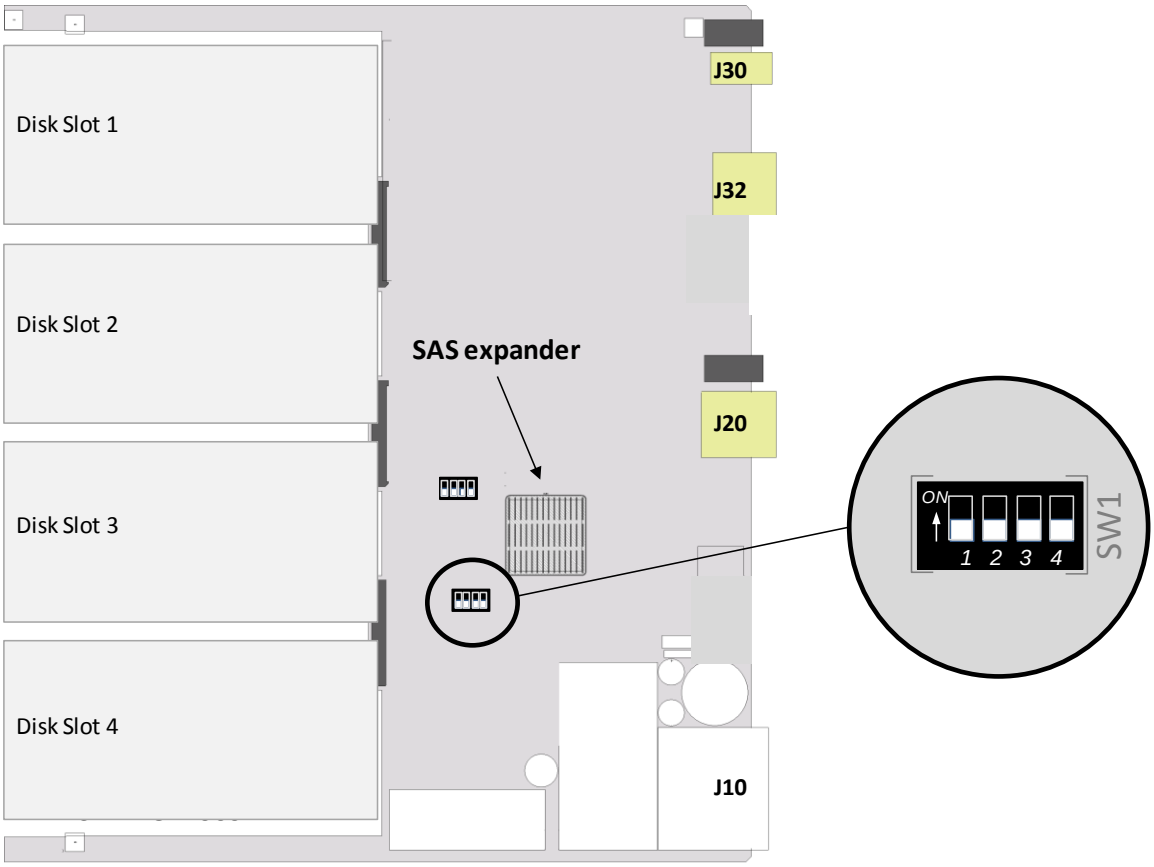


Figure 15 SB-ATCA2020 Mechanical Layout and DIP Switch Locations

A.3.1 DIP Switch Settings

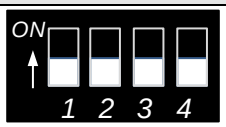
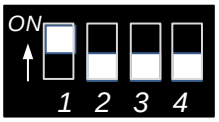
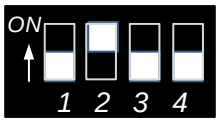
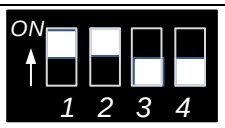
The SB-ATCA2020 carrier board includes a set of micro DIP switch (SW1) used to configure hardware attributes of the JBOD prior to installation. The location of switch (SW1) is highlighted in the previous figure. When shipped from the factory, all switches are set to the 'OFF' position.

The switch designated SW1.1 is used to activate (ON) E-key negotiation on the zone-2 Update Channel (UC). The switch is required because the ATCA specification does not provide a mechanism to differentiate UC symmetric vs., asymmetric ekeying.

Switch designated SW1.2 set to 'ON', will force all SAS ports to 3 Gb link speed. When set to 'OFF', all SAS ports will attempt to link at 6 Gb speeds. The UC ports of some older chassis backplanes may not work well unless set at 3Gb.

The remaining SW1.3 and SW1.4 switches are reserved and should be in OFF position.

Table 14 Switch (SW1) functional description

SW1	Update Channel	Max. SAS Link speed	Description
	OFF	6Gbps	Factory default setting. When in this position, the blade will NOT attempt to ekey over the zone-2 update channel. The JBOD will negotiate all SAS link speeds to a maximum of 6Gbps.
	ON	6Gbps	When in this position, the blade will attempt to ekey over the zone-2 update channel and negotiate all SAS link speeds to a maximum of 6Gbps.
	OFF	3Gbps	When in this position, the blade will NOT attempt to ekey over the zone-2 update channel. The blade will negotiate all SAS link speeds to a maximum of 3Gbps.
	ON	3Gbps	When in this position, the blade will attempt to ekey over the zone-2 update channel and negotiate all SAS link speeds to a maximum of 3Gbps.
RESERVED			All other switch positions are reserved.

A.4 ATCA Connectors and Pin Assignments

This section provides position and pin-out details of all connectors available on the SB-ATCA2020.

A.4.1 Connector J10, ATCA Zone-1

The SB-ATCA2020 includes a standard Zone-1 connector designated as J10 on the ATCA board. This connector is implemented with a 30-pin male connector with

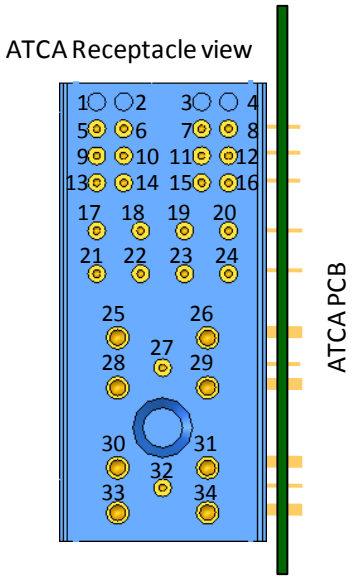


Figure 16 Connector J10, ATCA Zone-1 Pinout

Table 15 Connector J10, ATCA Zone-1 Pin Assignments

Pin#	Signal	Pin#	Signal	Pin#	Signal	Pin#	Signal
1	NC	10	PP_HA5	19	NC	28	VRTN_A
2	NC	11	PP_HA6	20	NC	29	VRTN_B
3	NC	12	PP_HA7	21	NC	30	N48V_A
4	NC	13	PP_IPMB_SCL_A	22	NC	31	N48V_B
5	PP_HA0	14	PP_IPMB_SDA_A	23	NC	32	PPENABLE_A
6	PP_HA1	15	PP_IPMB_SCL_B	24	NC	33	N48V_A
7	PP_HA2	16	PP_IPMB_SDA_B	25	Shelf Ground	34	N48V_B
8	PP_HA3	17	NC	26	Logic Ground		
9	PP_HA4	18	NC	27	PPENABLE_B		

Table 16 Connector J10, ATCA Zone-1 Signal Descriptions

PP_HAx	Geographic address signals
PP_IPMB_xxxx	IPMB bus signals
PPENABLE_x	Power Enable
N48V_x,VRTN_x	Power feed for the blade

A.4.2 Connector J20, ATCA Zone-2

The SB-ATCA2020 provides Ethernet fabric and base ports on the Zone-2 connector designated as J20 on the ATCA board.

Note: The connector pin-outs are presented from the point of view of ATCA blade:
'TX' refers to ATCA as the signal source, and chassis as the signal receiver.
'RX' refers to ATCA blade as signal receiver, and chassis as the signal source.

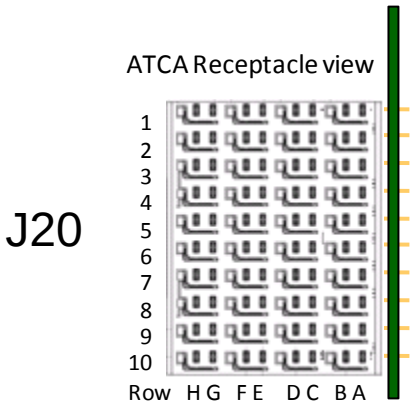


Figure 17 Connector J20, ATCA Zone-2 Pinout

Table 17 Connector J20, ATCA Zone-2 Pin Assignments

Row#	Interface	A	B	C	D	E	F	G	H
1									
2	SAS	SAS4_TX+	SAS4_TX-	SAS4_RX+	SAS4_RX-				
3	SAS	SAS2_TX+	SAS2_TX-	SAS2_RX+	SAS2_RX-	SAS3_TX+	SAS3_TX-	SAS3_RX+	SAS3_RX-
4	SAS	SAS0_TX+	SAS0_TX-	SAS0_RX+	SAS0_RX-	SAS1_TX+	SAS1_TX-	SAS1_RX+	SAS1_RX-
5									
6									
7									
8									
9									
10									

Table 18 Connector J20, ATCA Zone-2 Signal Descriptions

SAS	6Gb SAS, 5 lanes TX and Rx signals

A.4.3 Connector J30, Power for Advanced RTM

The SB-ATCA2020 supplies 12V and the 3.3V management voltages to an Advanced Rear Transition Modules (ARTM) via the P30 connector.

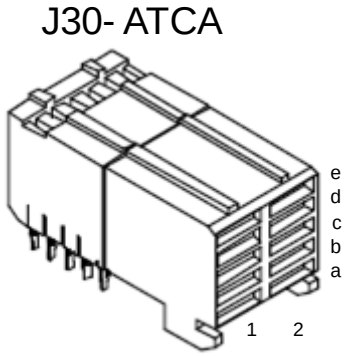


Figure 18 Connector J30, RTM Power Pinout

Table 19 Connector J30, ATCA Zone-3 RTM Power Pin Assignments

Row#	Interface	1	2
a	Pwr	Logic_GND	Shelf_GND
b	Pwr	Logic_GND	+3.3V MP
c	IPMI	IPMI_SCL_L	IPMI_SDA_L
d	Pwr	+12V PP	+12V PP
e	Pwr	PS1#	NC

Table 20 Connector J30, ATCA Zone-3 RTM Power Signal Descriptions

3.3V_MP	3.3V Management Power. ARTM must meet requirements posted for management power in AMC.0 specification.
Shelf_GND	Frame/Chassis Safety Ground
Logic_GND	(Logic 0vdc). Logic Ground- Common return for Management Power Payload Power, reference potential for single ended logic signaling, and shielding for differential pair signals in the AMC Connector.
IPMI_SCL_L	IPMI bus clock signal, as defined in AMC.0 specification. The ARTM shall have a pull-up resistor for this signal as indicated in AMC.0specification.
IPMI_SDA_L	IPMI bus data signal, as defined in AMC.0 specification. The ARTM shall have a pull-up resistor for this signal as indicated in AMC.0 specification.
12VPP	12V Payload Power, as outlined in the AMC.0 specification. ARTM must meet requirements posted for payload power in AMC specification
PS1#	Active low RTM present signal. PS1# shall be pulled up to 3.3V Management Power on the ATCA blade. PS0# (Connector P33) and PS1# (Connector P30) shall be connected through a diode on the SB-ATCA2020, exactly as defined in AMC.0 specification. PS1# is last mate on Power connector and PS0# is on the opposite end of the set of connectors. Logic low on PS1# indicates that RTM is present and fully inserted

A.4.4 Connector J32, ATCA Zone-3 Connector

The SB-ATCA2020 routes several I/O signals to the Zone-3 connector J32, which facilitates functional expansion using advanced rear transition modules (ARTM).

Note: The connector pin-outs are presented from the point of view of ATCA blade:
'TX' refers to ATCA as the signal source, and chassis as the signal receiver.
'RX' refers to ATCA blade as signal receiver, and chassis as the signal source.

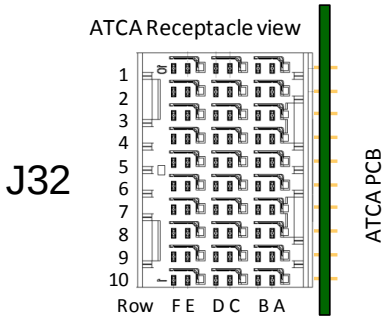


Figure 19 Connector J32, ATCA Zone-3 RTM I/O Pinout

Table 21 Connector J32, ATCA Zone-3 RTM I/O Pin Assignments

Row#	Interface	A	B	C	D	E	F
1							
2	SAS	SAS_TX0+	SAS_TX0-	SAS_RX0+	SAS_RX0-		
3	SAS	SAS_TX1+	SAS_TX1-	SAS_RX1+	SAS_RX1-		
4	SAS	SAS_TX2+	SAS_TX2-	SAS_RX2+	SAS_RX2-		
5	SAS	SAS_TX3+	SAS_TX3-	SAS_RX3+	SAS_RX3-		
6							
7							
8							
9							
10							

Table 22 Connector J32, ATCA Zone-3 RTM I/O Signal Descriptions

SAS	These signal pairs connect to the SAS Expander, which then routes to the SAS RAID controller.

Appendix B **IPMI functions list**

The SB-ATCA2020 module supports the intelligent platform management interface (IPMI) version 1.5. This system is used to collect status information from on on-board sensors as well as sensors installed on ARTM modules. Collected information items include:

- Hot Swap communication with the shelf manager
- Inlet air temperatures
- Voltage monitoring
- Electronic Keying as described in the AMC.0 specification
- FRU information
- Drives “blue” LED indicators for Hot Swap. OOS (out of service),
- Drives “green LED for module “OK”

B.1 IPMI FRU Info Data

The SB-ATCA2020 includes the standard FRU data records per the IPMI Platform Management FRU Information Storage Definition, Board Info Area. The SB-ATCA2020 includes additional FRU records as defined in the PICMG 2.9 specification.

Table 23 Standard FRU Data Records

Board Information	Value
Version	1
Language Code	EN (English)
MFG date.time	See note *1
Manufacturer	SANBlaze Technology, Inc.
Product Name	SB-ATCA2020
Serial Number	200LYMMssss (See note *2)
Part Number	SB-ATCA2020

*1. Manufacturing time is defined as 'minutes since 1/1/96' in the IPMI FRU spec.

*2. Serial Number format is 200LYMMSSSSwhere

AAA = Product ID (200 for SB-ATCA2020)

L =Location of manufacture

Y = One digit calendar year of manufacture (2008 = 8, 2010 = 0)

MM = Two digit calendar month of manufacture (March = 03)

ssss = Four digit sequence number (reset each month)

B.1.1 Sample Shelf Output

The following is the SB-ATCA2000 FRU information for the SB-ATCA2000, as seen from a Pigeon Point Shelf Manager.

```
CLI> fruinfo board 1
9a: FRU # 0, FRU Info
Common Header: Format Version = 1
Board Info Area:
Version = 1
Language Code = 25
Mfg Date/Time = Sep 20 12:00:00 2010 (7742160 minutes since 1996)
Board Manufacturer = SANBlaze Technology, Inc.
Board Product Name = SB-ATCA2020
Board Serial Number = 202LYMMSSSS
Board Part Number = SB-ATCA2020
FRU Programmer File ID = fru_200000r00.inf
Product Info Area:
Version = 1
Language Code = 25
Manufacturer Name = SANBlaze Technology, Inc.
Product Name = SB-ATCA2020
Product Part / Model# = SB-ATCA2020
Product Version = RR
Product Serial Number = 202LYMMSSSS
Asset Tag =
FRU Programmer File ID = fru_202000r00.inf
Multi Record Area:
PICMG Board Point-to-Point Connectivity Record (ID=0x14). Version = 0
AMC Carrier Information Table Record (ID=0x1a)
Version = 0
AMC Carrier Activation and Current Management Record (ID=0x17)
Version = 0
CLI>
```

B.1.2 Sensor data records

The IPMC monitors the status of the blade and makes this data available to be read by the ATCA shelf manager (ShMC) in the form of SDRs (Sensor Data Records). The table below lists the SDRs that the SB-ATCA2020 IPMC provides.

Table 24. Sensor Data Records

Sensor	Units	LNR	LC	LNC	UNC	UC	UNR
+12.0V	Volts	10.024	10.564	11.104	13.048	13.588	14.02
Disk Exit Temp	Degrees C	na	na	na	50	60	80
Inlet Temp	Degrees C	na	na	na	50	60.92	81.2
LSI2108 Bobcat	Degrees C	na	na	na	95	110	125
VCC_1V0	Volts	0.8433	0.8727	0.9021	1.1079	1.1373	1.1667
VCC_1V8B	Volts	1.6273	1.6665	1.7155	1.8919	1.9409	1.9801
VCC_3V3	Volts	2.9018	3.0194	3.1174	3.5094	3.6074	3.7054
Zone-3 Exit Temp	Degrees C	na	na	na	50	60	80

B.2 Update Channel, Ekey Value

The SB-ATCA2020 supports electronic keying to enable use of the Zone-2 update channel. The list of supported of link type and link type extensions are defined in the table below.

Table 25 SB-ATCA2020 Update Channel E-Key code

Port #	Value
Update Channel	Update, 1, 0 = {A7CA2020-76A4-0202-76A4-A7CA20000000}, 0
Update Channel	Update,1,0 = {A7CA2020-2000-0000-0000-A7CA73000000}, 0

You MUST set a DIP switch to enable Ekey function. This is required because the ATCA specification does not provide a mechanism to differentiate symmetric vs. asymmetric ekeying on the update channel. See Section A.3.1 “DIP Switch Settings” page A-7.

B.3 Supported IPMI commands

The IPMC communicates with the carrier controller through the local IPMB bus of the carrier and responds to all mandatory commands for AMC Module Management Controllers (as defined in the RTM Specification), as well as some optional ones.

Table 26 Supported IPMI Commands

Command	IPMI/PICMG /AMC Spec	NetFn	CMD	IPMC Req
IPM Device "Global" Commands				
Get Device ID	17.1	App	01h	Mandatory
Broadcast "Get Device ID"	17.9	App	01h	Mandatory
Messaging Commands				
Send Message	18.7	App	34h	Optional
Event Commands				
Platform Event	23.3	S/E	02h	Mandatory
Sensor Device Commands				
Get Device SDR Info	29.2	S/E	20h	Mandatory
Get Device SDR	29.3	S/E	21h	Mandatory
Reserve Device SDR Repository	29.4	S/E	22h	Mandatory
Get Sensor Reading Factors	29.5	S/E	23h	Optional
Set Sensor Hysteresis	29.6	S/E	24h	Optional
Get Sensor Hysteresis	29.7	S/E	25h	Optional
Set Sensor Threshold	29.8	S/E	26h	Optional
Get Sensor Threshold	29.9	S/E	27h	Optional
Set Sensor Event Enable	29.10	S/E	28h	Optional
Get Sensor Event Enable	29.11	S/E	29h	Optional
Rearm Sensor Events	29.12	S/E	2Ah	Optional
Get Sensor Event Status	29.13	S/E	2Bh	Optional
Get Sensor Reading	29.14	S/E	2Dh	Mandatory
FRU Device Commands				
Get FRU Inventory Area Info	28.1	Storage	10h	Mandatory
Read FRU Data	28.2	Storage	11h	Mandatory
Write FRU Data	28.3	Storage	12h	Mandatory
AdvancedTCA™ Commands				
Get PICMG Properties	3-9	PICMG	00h	Mandatory
FRU Control	3-22	PICMG	04h	Mandatory
Get FRU LED Properties	3-24	PICMG	05h	Mandatory
Get LED Color Capabilities	3-25	PICMG	06h	Mandatory
Set FRU LED State	3-26	PICMG	07h	Mandatory
Get FRU LED State	3-27	PICMG	08h	Mandatory
Get Device Locator Record ID	3-29	PICMG	0Dh	Mandatory

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