Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD (ARTM-HD)

User's Guide

Part No. 820-3147-13
May 2010, Revision A

Copyright © 2009, 2010, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related software documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT RIGHTS. Programs, software, databases, and related documentation and technical data delivered to U.S. Government customers are "commercial computer software" or "commercial technical data" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, the use, duplication, disclosure, modification, and adaptation shall be subject to the restrictions and license terms set forth in the applicable Government contract, and, to the extent applicable by the terms of the Government contract, the additional rights set forth in FAR 52.227-19, Commercial Computer Software License (December 2007). Oracle USA, Inc., 500 Oracle Parkway, Redwood City, CA 94065.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications which may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure the safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. UNIX is a registered trademark licensed through X/Open Company, Ltd.

This software or hardware and documentation may provide access to or information on content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.

Copyright © 2009, 2010, Oracle et/ou ses affiliés. Tous droits réservés.

Ce logiciel et la documentation qui l'accompagne sont protégés par les lois sur la propriété intellectuelle. Ils sont concédés sous licence et soumis à des restrictions d'utilisation et de divulgation. Sauf disposition de votre contrat de licence ou de la loi, vous ne pouvez pas copier, reproduire, traduire, diffuser, modifier, breveter, transmettre, distribuer, exposer, exécuter, publier ou afficher le logiciel, même partiellement, sous quelque forme et par quelque procédé que ce soit. Par ailleurs, il est interdit de procéder à toute ingénierie inverse du logiciel, de le désassembler ou de le décompiler, excepté à des fins d'interopérabilité avec des logiciels tiers ou tel que prescrit par la loi.

Les informations fournies dans ce document sont susceptibles de modification sans préavis. Par ailleurs, Oracle Corporation ne garantit pas qu'elles soient exemptes d'erreurs et vous invite, le cas échéant, à lui en faire part par écrit.

Si ce logiciel, ou la documentation qui l'accompagne, est concédé sous licence au Gouvernement des Etats-Unis, ou à toute entité qui délivre la licence de ce logiciel ou l'utilise pour le compte du Gouvernement des Etats-Unis, la notice suivante s'applique :

U.S. GOVERNMENT RIGHTS. Programs, software, databases, and related documentation and technical data delivered to U.S. Government customers are "commercial computer software" or "commercial technical data" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, the use, duplication, disclosure, modification, and adaptation shall be subject to the restrictions and license terms set forth in the applicable Government contract, and, to the extent applicable by the terms of the Government contract, the additional rights set forth in FAR 52.227-19, Commercial Computer Software License (December 2007). Oracle America, Inc., 500 Oracle Parkway, Redwood City, CA 94065.

Ce logiciel ou matériel a été développé pour un usage général dans le cadre d'applications de gestion des informations. Ce logiciel ou matériel n'est pas conçu ni n'est destiné à être utilisé dans des applications à risque, notamment dans des applications pouvant causer des dommages corporels. Si vous utilisez ce logiciel ou matériel dans le cadre d'applications dangereuses, il est de votre responsabilité de prendre toutes les mesures de secours, de sauvegarde, de redondance et autres mesures nécessaires à son utilisation dans des conditions optimales de sécurité. Oracle Corporation et ses affiliés déclinent toute responsabilité quant aux dommages causés par l'utilisation de ce logiciel ou matériel pour ce type d'applications.

Oracle et Java sont des marques déposées d'Oracle Corporation et/ou de ses affiliés.Tout autre nom mentionné peut correspondre à des marques appartenant à d'autres propriétaires qu'Oracle.

AMD, Opteron, le logo AMD et le logo AMD Opteron sont des marques ou des marques déposées d'Advanced Micro Devices. Intel et Intel Xeon sont des marques ou des marques déposées d'Intel Corporation. Toutes les marques SPARC sont utilisées sous licence et sont des marques ou des marques déposées de SPARC International, Inc. UNIX est une marque déposée concédée sous licence par X/Open Company, Ltd.

Ce logiciel ou matériel et la documentation qui l'accompagne peuvent fournir des informations ou des liens donnant accès à des contenus, des produits et des services émanant de tiers. Oracle Corporation et ses affiliés déclinent toute responsabilité ou garantie expresse quant aux contenus, produits ou services émanant de tiers. En aucun cas, Oracle Corporation et ses affiliés ne sauraient être tenus pour responsables des pertes subies, des coûts occasionnés ou des dommages causés par l'accès à des contenus, produits ou services tiers, ou à leur utilisation.

Please
Recycle

Contents

Preface vii

1. Overview 1–1

1.1 Features 1–2

1.2 PICMG Standards Compliance 1–3

1.2.1 Maximum Power Dissipation 1–3

1.2.2 Airflow Cooling Requirements 1–3

1.2.3 Pressure Drop Rates 1–4

1.3 ARTM-HD Component Diagram 1–5

1.4 Block Diagram 1–6

1.5 I/O Interfaces 1–7

1.6 Hard Disk Drives 1–9

1.7 Hard Disk-Drive Controller 1–9

1.8 External SAS Connectors 1–10

1.9 LEDs 1–11

1.10 Software Support 1–13

1.11 Part Number, Serial Number, and FC Address Labels 1–14

2. Installation and Service 2–1

2.1 About Installing and Removing the ARTM-HD 2–2

2.2 Installing the ARTM-HD 2–4

2.3 Removing the ARTM-HD 2–9

2.4 Installing a Hard Disk Drive 2–11

2.5 Removing a Hard Disk Drive 2–11

2.6 Changing the OOS LED Color 2–12

3. Disk Management 3–1

3.1 RAID Support 3–2

3.2 SAS BIOS Overview 3–2

3.3 Starting the SAS BIOS Configuration Utility 3–3

3.4 Creating a RAID 0 Volume 3–4

3.5 Creating a RAID 1 Volume 3–5

3.6 Creating a RAID 1E Volume 3–6

3.7 Viewing RAID Volume Properties 3–7

3.8 Synchronizing an Array 3–8

3.9 Activating an Array 3–8

3.10 Deleting an Array 3–9

3.11 Locating a Disk Drive 3–9

4. Specifications and Connectors 4–1

4.1 Specifications for the ARTM-HD 4–2

4.1.1 Physical Dimensions 4–2

4.1.2 Power Requirements 4–2

4.1.3 Electrical Requirements 4–2

4.1.4 Environmental Specifications and Compliance 4–2

4.2 Hardware Descriptions 4–3
4.2.1 Ethernet Management Port 4–3
4.2.2 Infinband-style Connectors 4–3
4.2.3 Serial Port 4–3
4.2.4 SAS Interface 4–3
4.2.5 Module Management Controller 4–3
4.2.6 FRU PROM 4–4
4.3 Connectors and Pin Assignments 4–4
4.3.1 I/O Connectors 4–5
4.3.1.1 Ethernet Port 4–5
4.3.1.2 Serial Port 4–6
4.3.1.3 SAS Connectors 4–7
4.3.2 Zone 3 Connectors 4–8

Index Index–1

Preface

This document provides installation instructions and hardware specifications for Oracle's Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD (ARTM-HD).

This document is written for system integration engineers, field applications and service engineers, and others involved in the integration of this module into Netra Advanced Telecommunications Computing Architecture (ATCA) systems.

The system designer is responsible for integrating peripheral devices with the connectors on the midplane in an ATCA shelf configuration. A designer can either connect directly to the midplane signals or use a ARTM-HD. This document provides information only for the integration of the ARTM-HD in a supported ATCA shelf.

UNIX Commands

This document might not contain information about basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices. Refer to the following for this information:

- Software documentation that you received with your system
- Oracle Solaris Operating System documentation, which is at:

  http://docs.sun.com

Related Documentation

The following table lists the documentation for this product. Except for the *Important Safety Information for Sun Hardware Systems*, all the documents listed are available online at:

http://docs.sun.com/app/docs/prod/cp32x0.sas?l=en#hic

Application	Title	Part Number	Format	Location
Start Here	*Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD (ARTM-HD) Start Here*	820-0460	Printed PDF HTML	Shipping kit Online Online
Latest information, Upgrades	*Sun Netra CP32x0 Advanced Rear Transition Module Product Notes*	820-3261	PDF HTML	Online Online
Usage (this document)	*Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD User's Guide*	820-3147	PDF HTML	Online Online
Safety and Compliance	*Sun Netra CP32x0 Advanced Rear Transition Module Safety and Compliance Guide*	820-3506	PDF HTML	Online Online
Safety	*Important Safety Information for Sun Hardware Systems*	821-1590	Printed	Shipping kit

Documentation, Support, and Training

These web sites provide additional resources:

Sun Function	URL
Documentation	http://docs.sun.com/
Support	http://www.sun.com/support/
Training	http://www.sun.com/training/

Documentation Feedback

Submit comments about this document by clicking the Feedback[+] link at http://docs.sun.com. Include the title and part number of your document with your feedback:

Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD User's Guide, part number 820-3147.

CHAPTER 1

Overview

This chapter provides an overview of the features, configurations, and system requirements of the Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD (ARTM-HD).

This chapter contains the following sections:

- Section 1.1, “Features” on page 1-2
- Section 1.2, “PICMG Standards Compliance” on page 1-3
- Section 1.3, “ARTM-HD Component Diagram” on page 1-5
- Section 1.4, “Block Diagram” on page 1-6
- Section 1.5, “I/O Interfaces” on page 1-7
- Section 1.6, “Hard Disk Drives” on page 1-9
- Section 1.7, “Hard Disk-Drive Controller” on page 1-9
- Section 1.8, “External SAS Connectors” on page 1-10
- Section 1.9, “LEDs” on page 1-11
- Section 1.10, “Software Support” on page 1-13
- Section 1.11, “Part Number, Serial Number, and FC Address Labels” on page 1-14

1.1 Features

The Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD (ARTM-HD) is a fully compatible, carrier-grade Advanced Telecom Computing Architecture® (ATCA) ARTM for ATCA blade servers designed to be compatible with the AdvancedRTM specification. The ARTM-HD is not compatible with ATCA cards that do not comply with this specification.

The 6 rack unit (6U) form factor, single-slot ARTM supplies single or dual SAS hard disk drives, and rear I/O connections that support additional peripherals for use with compatible ATCA blade servers and external storage arrays. The rear I/O access enables you to replace the ATCA blade servers without disconnecting cables. Industry-standard connectors and pin assignments ensure ease of use and flexible design. The ARTM-HD permits the creation of high-density systems by enabling easy access to I/O (FIGURE 1-1).

Features of the ARTM-HD include:

- Conforms to ARTM Interface specification
- Conforms to PICMG ATCA card specification for RTM cards
- ARTM is hot-plugable to its blade server
- Single or dual hot-plugable SAS hard disk drive (HD)
- One LSI1068E PCIe to 8-Port SAS controller, flash device, and NVSRAM to support boot code and RAID support
- Infinband-style connectors for external drive support using a type SFF-8470 SAS cable
- Supports primary and secondary external connections
- PCIe x8 bus interface to blade server
- One asynchronous serial port to RJ45 connector
- One 10/100/1000 MBASE-T management port, with LEDS
- Vitesse VSC410 MMC
- 25W Max power
- NEBS level 3 compliant

The ARTM-HD requires an ATCA shelf (chassis) with a midplane that accommodates front and rear blade server installations. The primary purpose of this module is to provide a single or dual SAS drive and rear access connections to the blade server's I/O devices.

1.2 PICMG Standards Compliance

The ARTM-HD is fully compliant with the PICMG® 2.0 Revision 3.1 specification.

1.2.1 Maximum Power Dissipation

The maximum power dissipation is 25 Watts.

1.2.2 Airflow Cooling Requirements

TABLE 1-1 lists the airflow cooling requirements based on a maximum power of 25W, which is the only power level available on this ARTM-HD.

TABLE 1-1 Airflow Cooling Requirements

Meters Cubed Per Minute (M^3/min)				Feet Cubed Per Minute (CFM)			
25	28	40	55	25	28	40	55
0.07	0.07	0.14	0.14	2.5	2.5	5	5

1.2.3 Pressure Drop Rates

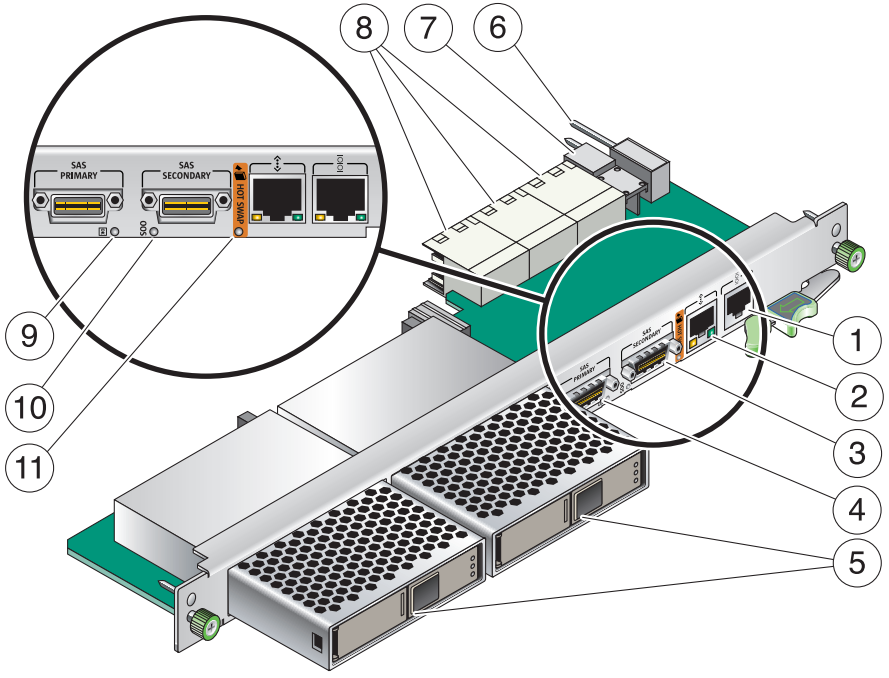
TABLE 1-2 lists the pressure drop rates for the ARTM-HD.

TABLE 1-2 Pressure Drop Rates

Volumetric Flow Rate CFM	Volumetric Flow Rate M^3/min	Pressure Drop Pascal	Pressure Drop Inches H_20
1	0.03	0.5	0.002
2	0.06	1.24	0.005
3	0.08	2.48	0.010
4	0.11	4.96	0.020
5	0.14	6.2	0.025
6	0.17	8.68	0.035
7	0.20	11.66	0.047
8	0.23	15.38	0.062
9	0.25	19.1	0.077
10	0.28	23.57	0.095

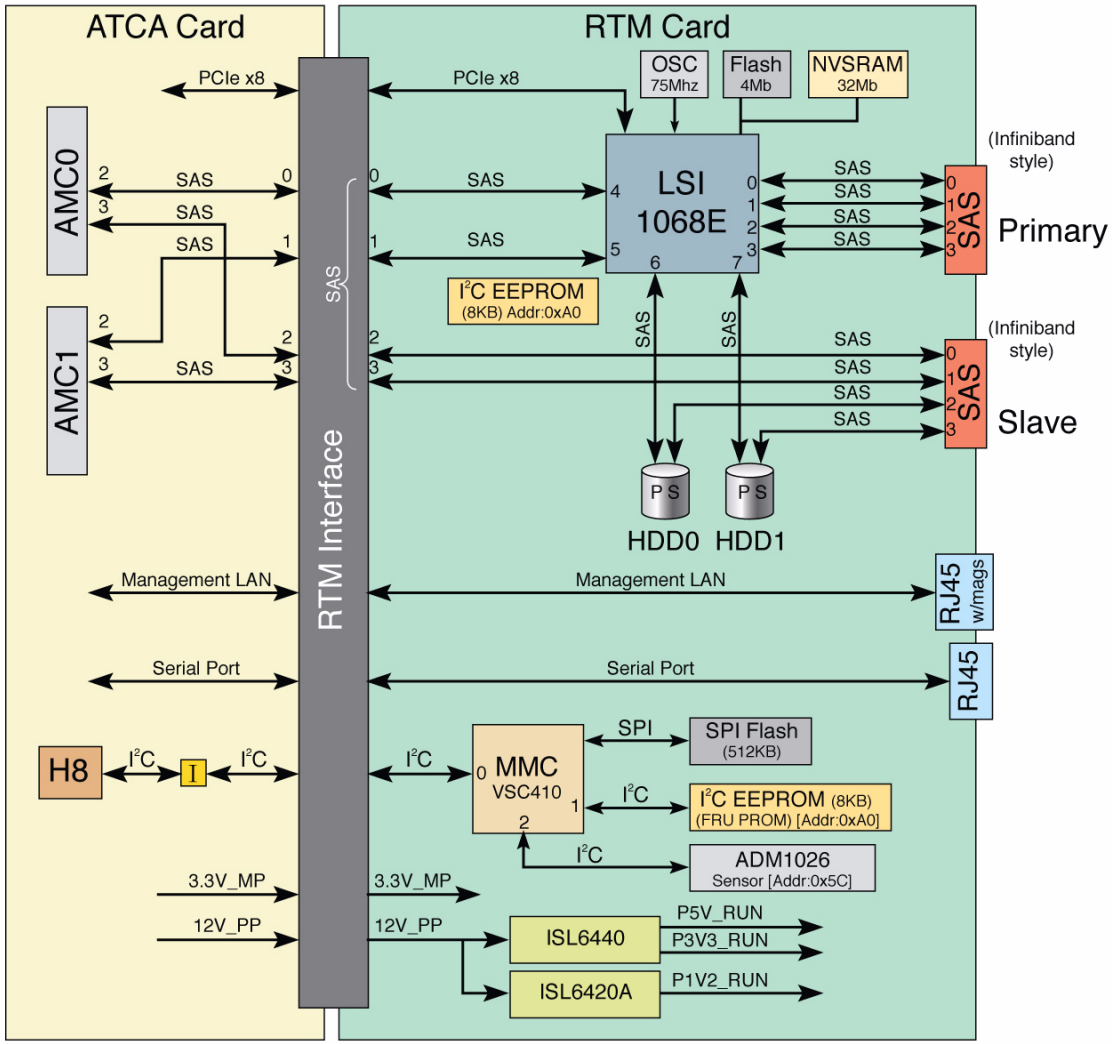
1.3 ARTM-HD Component Diagram

FIGURE 1-1 Sun Netra CP32x0 ARTM-HD Components



1.4 Block Diagram

FIGURE 1-2 Block Diagram

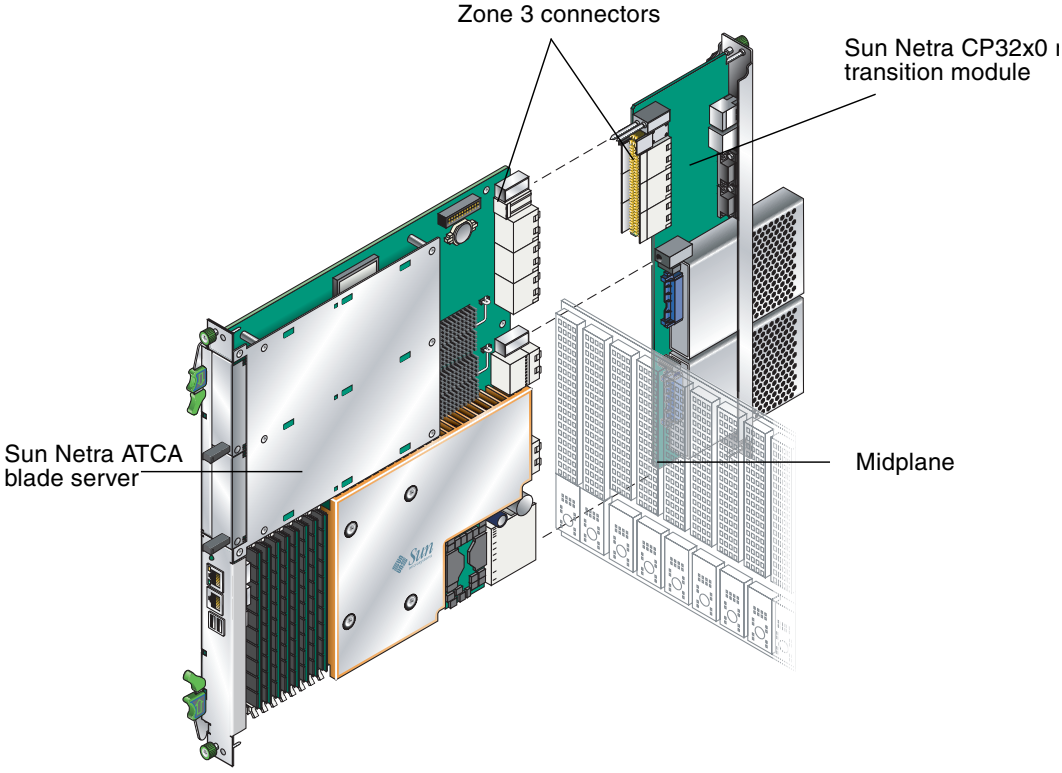


1.5 I/O Interfaces

The ARTM-HD installs into the rear of the ATCA enclosure, opposite an ATCA blade server. The ARTM-HD connects to the blade server's Zone 3 rear connectors. The ARTM-HD carries one serial port, one 10/100/1000 MBASE-T management port (RJ-45), and two external SAS ports to its faceplate (FIGURE 1-1).

FIGURE 1-3 shows the physical relationship between the blade server, ARTM-HD, and the midplane in a typical ATCA system.

FIGURE 1-3 Relationship of the Blade Server, ATCA Midplane, and ARTM-HD



Note – When the ARTM-HD is used with a Sun Netra ATCA blade server, shielded cables are required for serial I/O ports. The shields for all shielded cables must be terminated on both ends.

Caution – You must use shielded cables for all ports to satisfy EMI compliance standards.

The customer can order the ARTM-HD, build a custom module that is ACTA or ARTM compatible, or buy a module from an IHV. A minimum set of I/O is required to provide a boot path for the host blade server and for console I/O to issue commands and read board and system status.

Possible boot and console configurations are described in TABLE 1-3. Sun Microsystems provides the Sun Netra ATCA blade servers and compatible ARTM-HD. This module provides one 10/100/100 MBASE-T Ethernet RJ-45 port and one serial port from the host to the back of the system, and can optionally be used for network booting as a diskless client. The other configurations require IHV hardware.

TABLE 1-3 Sun Netra CP32x0 ARTM-HD I/O Configurations

I/O	Hardware Required	Description
Ethernet	Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD (ARTM-HD) (supplied as an option for rear access)	The Management Ethernet port must be enabled as a boot device in the BIOS before it can be used; the board can run in a diskless client configuration.
SAS	Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD (ARTM-HD)	Can be used for local boot; requires the optional ARTM-HD.
Serial data	Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD (ARTM-HD)	The Serial port on the front panel provides the path of the default console I/O. When the optional ARTM-HD is installed, the module's serial port becomes the path of the default console I/O (see FIGURE 1-1 for location).

1.6 Hard Disk Drives

The ARTM-HD supports up to two SAS hard disk drives (HDs), with various options. When you order the product, choose the part number corresponding to the capacity (in gigabytes) that you want in either single or dual HDs.

Each HD has the following features:

- 2.5″ server-grade HDs, mounted in a NEMO bracket
- 300GB or higher capacities at 10K RPM
- hot-plugable

Note – As higher capacities become available, lower capacities may be discontinued. Refer to the *Sun Netra CP32x0 Advanced Rear Transition Module Product Notes* (820-3261) for the latest capacity options and for end-of-life notices for lower capacities.

1.7 Hard Disk-Drive Controller

The ARTM-HD includes an LSI SAS 1068e hard disk drive controller with the following features:

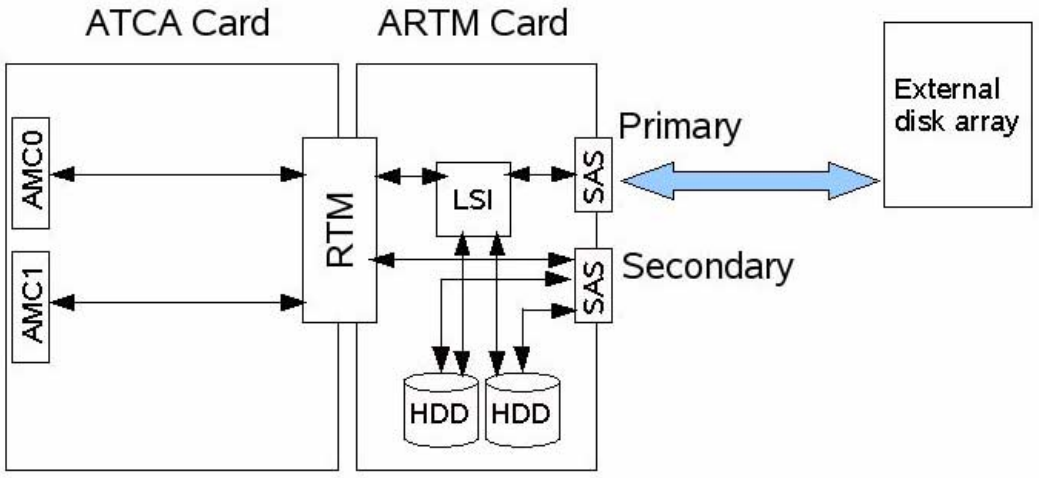
- 8 lane PCIe generation 1 (full duplex 2.5Gb/sec), compatible with generation 2 PCIe node blades
- 8 SAS ports (3.0Gb/sec) with 4 ports to the external connectors, 2 ports - 1 to each HD, and 2 ports to the Zone 3 connector (1 to each AMC).
- LSI Integrated hardware RAID support for RAID 0, RAID 1, and RAID 1E.

1.8 External SAS Connectors

The ARTM-HD includes two external SAS connectors. These connectors can be used to connect additional disk packs, or to create redundancy between two ARTM-HDs and their associated blade servers.

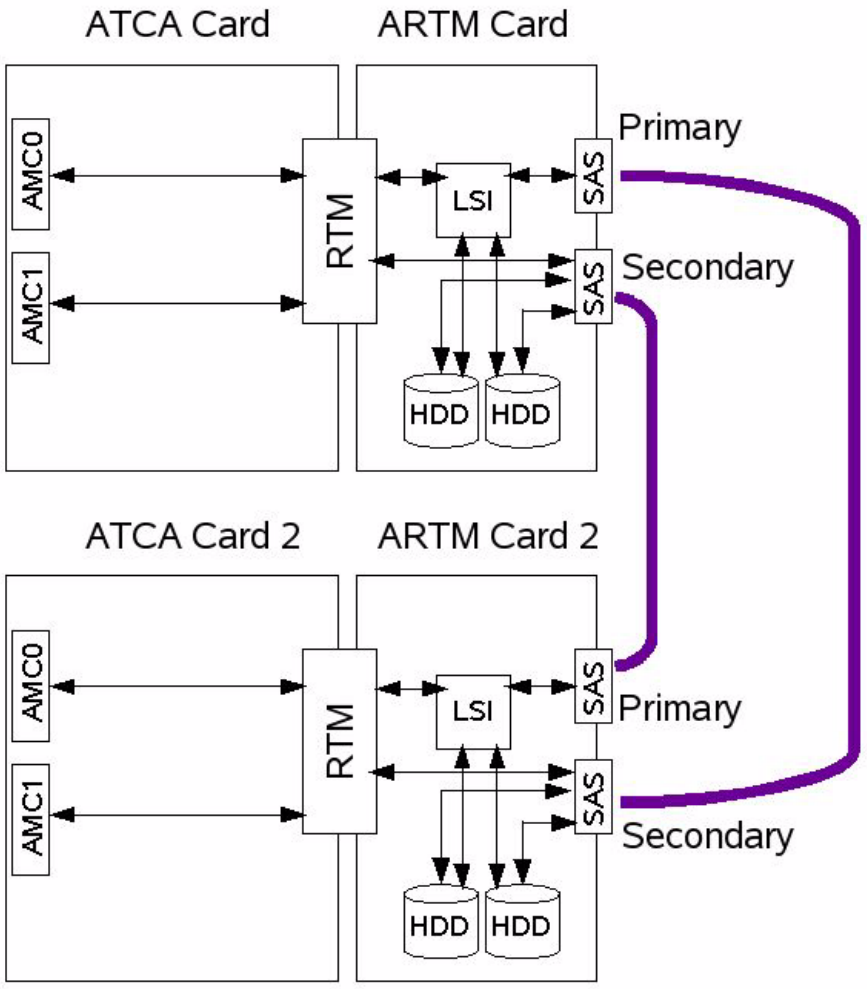
When connecting the ARTM-HD to an external disk array, use the Primary SAS port connector.

FIGURE 1-4 Connecting to an External Disk Array



When connecting to another ARTM-HD for redundancy, route the Primary port on each ARTM-HD to the Secondary port on the other ARTM-HD.

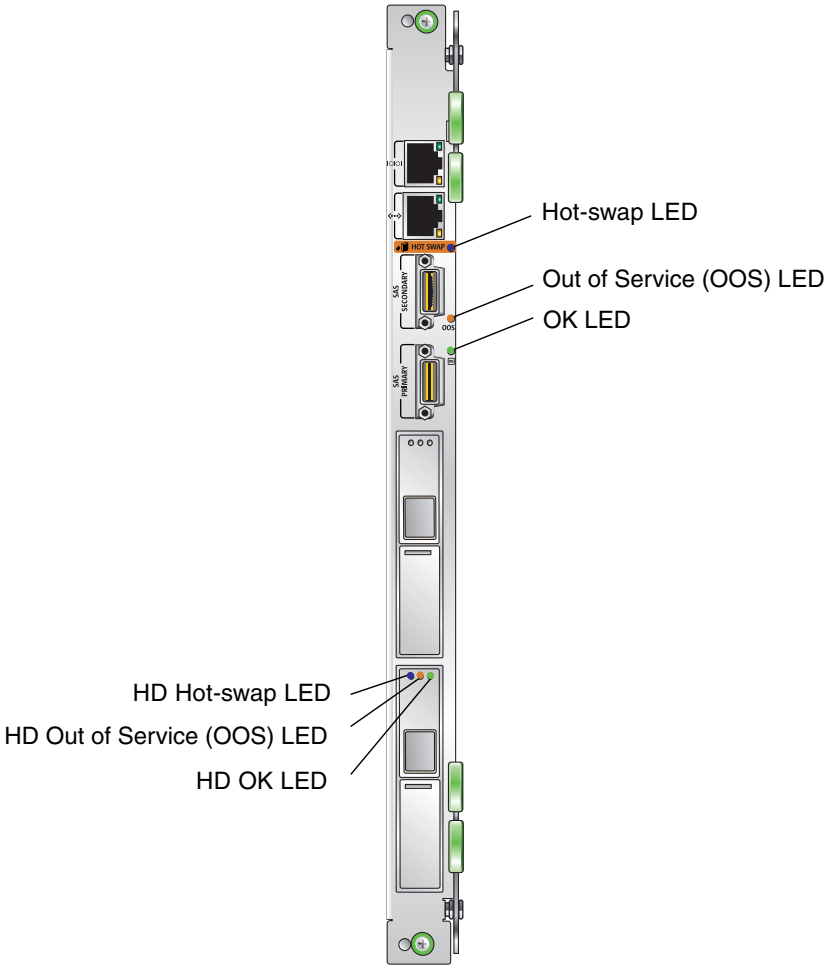
FIGURE 1-5 Connecting to Another ARTM



1.9 LEDs

LEDs are located on the panel of the ARTM-HD and on the hard disk drive(s).

FIGURE 1-6 LEDs



1.10 Software Support

The ARTM-HD supports ATCA blade servers designed to be compatible with the AdvancedRTM specification, and the software supported by those blade servers. Refer to the following documentation for software support information:

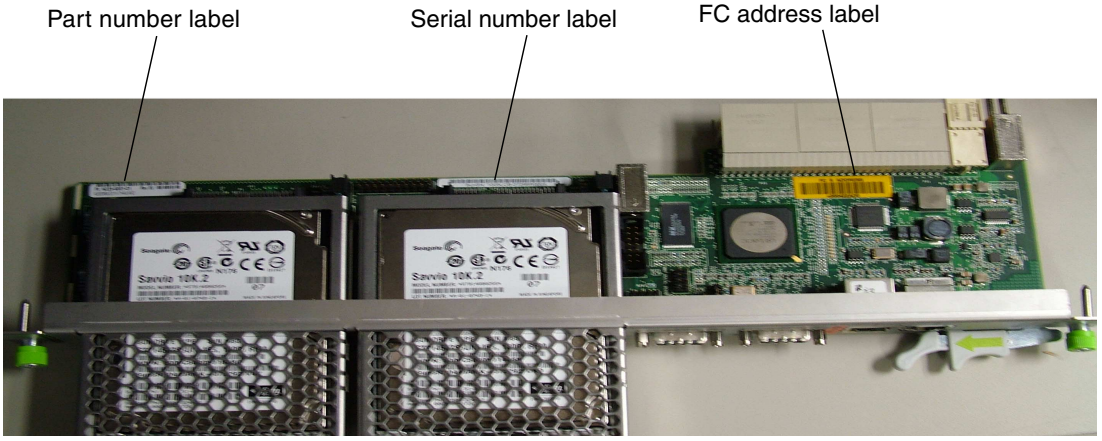
- *Sun Netra CP3220 Blade Server Product Notes* (820-1980)
- *Sun Netra CP3250 Blade Server Product Notes* (820-5194)
- *Sun Netra CP3260 Blade Server Product Notes* (820-0455)

1.11 Part Number, Serial Number, and FC Address Labels

The ARTM-HD serial number, part number, FibreChannel (FC) address are printed on stickers located on the module. For proper identification of the ARTM-HD, find the Sun Microsystems barcode labels on the module. The barcode labels provide the following information:

- Module serial number (for example, 1005LCB-07296R0912), which is on the barcode label
- Product part number, including dash level (for example, 594-4759-01) and revision number (for example, REV 50). (Based on the Part Number, you can identify whether the ARTM-HD has a single or dual HD.)

FIGURE 1-7 ARTM-HD Identification Labels



Note – The illustration shows a sample of the labels for a 146GB ARTM-HD. If your ARTM-HD has a different capacity, the labels show it.

CHAPTER 2

Installation and Service

This chapter contains the procedures for installing and removing the Sun Netra CP32x0 SAS Storage Advanced Rear Transition Module HD (ARTM-HD).

This chapter contains the following sections:

- Section 2.1, “About Installing and Removing the ARTM-HD” on page 2-2
- Section 2.2, “Installing the ARTM-HD” on page 2-4
- Section 2.3, “Removing the ARTM-HD” on page 2-9
- Section 2.4, “Installing a Hard Disk Drive” on page 2-11
- Section 2.5, “Removing a Hard Disk Drive” on page 2-11
- Section 2.6, “Changing the OOS LED Color” on page 2-12

2.1 About Installing and Removing the ARTM-HD

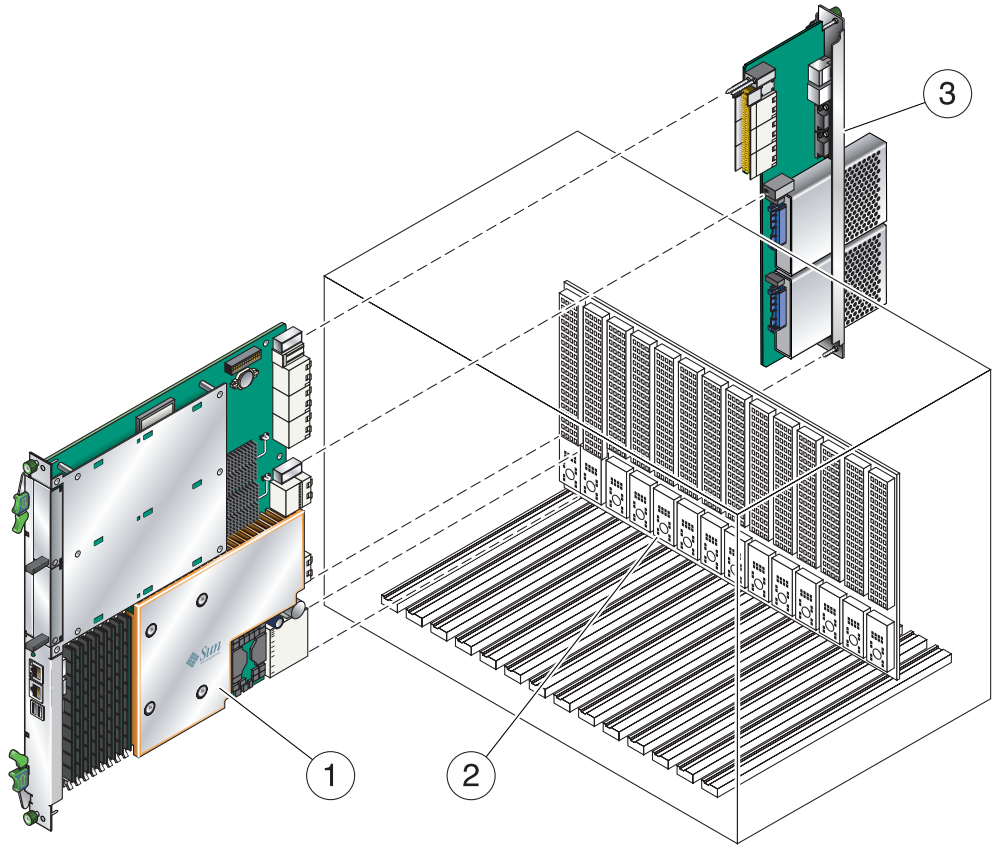
The ARTM-HD can be installed into an ATCA shelf (chassis) for front and rear board installations (FIGURE 2-1). The module must be installed in the slot directly behind the Sun Netra ATCA node blade server. These back-to-back slots have common pins to enable passing of signals.

Note – Connectors on previous blade servers do not mate with connectors on the ARTM-HD.

Before installing the ARTM-HD, verify the module's part number to ensure that the correct ARTM-HD is being installed into the system. For information on identifying the ARTM-HD, see Section 1.11, "Part Number, Serial Number, and FC Address Labels" on page 1-14.

Caution – Use the ARTM-HD only with compatible blade servers. Attempts to install the ARTM-HD with an incompatible blade server might cause damage to themselves and the blade server.

FIGURE 2-1 Installing the Blade Server and ARTM-HD Into the ATCA Shelf



2.2 Installing the ARTM-HD

The ARTM-HD must be used with a Sun Netra ATCA node blade server for rear I/O access. The ARTM-HD enables access to the network, to a boot device, and to a console terminal.

Note – The ARTM-HD and the corresponding Sun Netrablade server can be installed while the shelf is powered—however, start with a powered shelf only if you must do so.

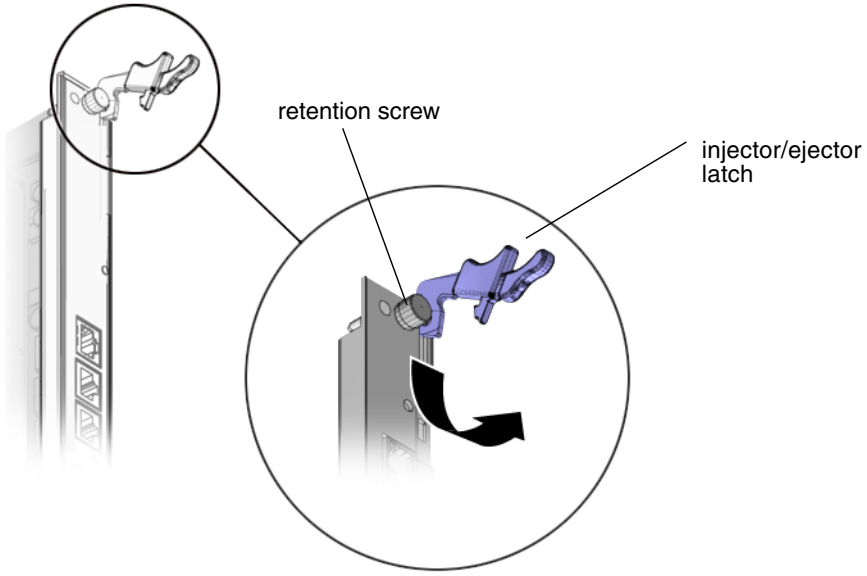
Note – Optimally, install the ARTM-HD before installing the corresponding Sun Netrablade server. This order ensures proper bring up of the ARTM-HD firmware.

---

1. **Verify that you have taken the necessary antistatic precautions.**
2. **Go to the back of the system and choose an appropriate slot for the ARTM-HD.**

   ARTMs must be installed inline behind the accompanying blade server. For example, if the accompanying blade server is going to be installed in slot 3, its ARTM must be installed at the back of the system in slot 3.
3. **Remove the slot filler panel from the selected blade server slot, if necessary.**
4. **Prepare the module by loosening the locking screws and opening the injector/ejector latch at the top of the module (**FIGURE 2-2**).**

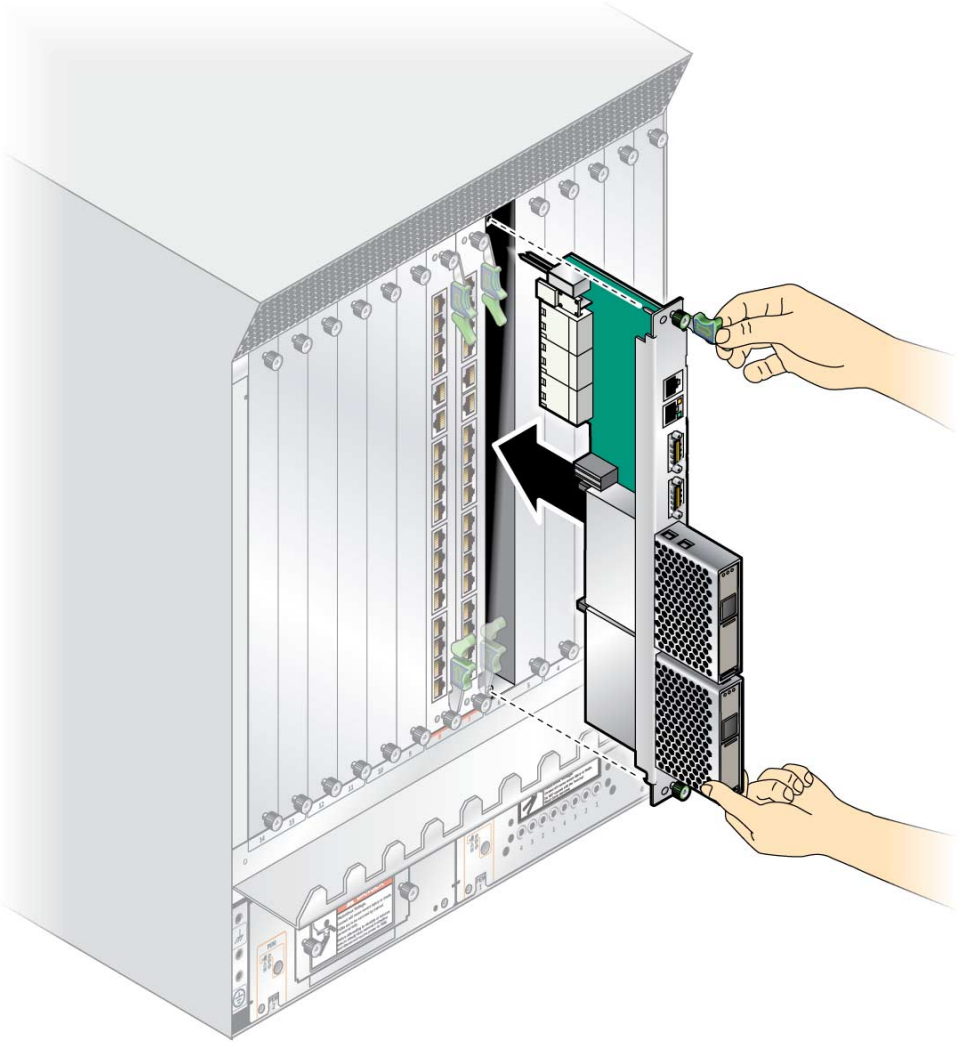
FIGURE 2-2 Injector/Ejector Latch and Locking Screw



5. **Hold the bottom disk cage with one hand and top injector/ejector latch with the other hand, as shown in** FIGURE 2-3**.**

Note – The following steps apply regardless of how many ARTMs are in the chassis, as long as there is an available slot for the ARTM you are installing.

FIGURE 2-3 Holding the ARTM-HD During Installation

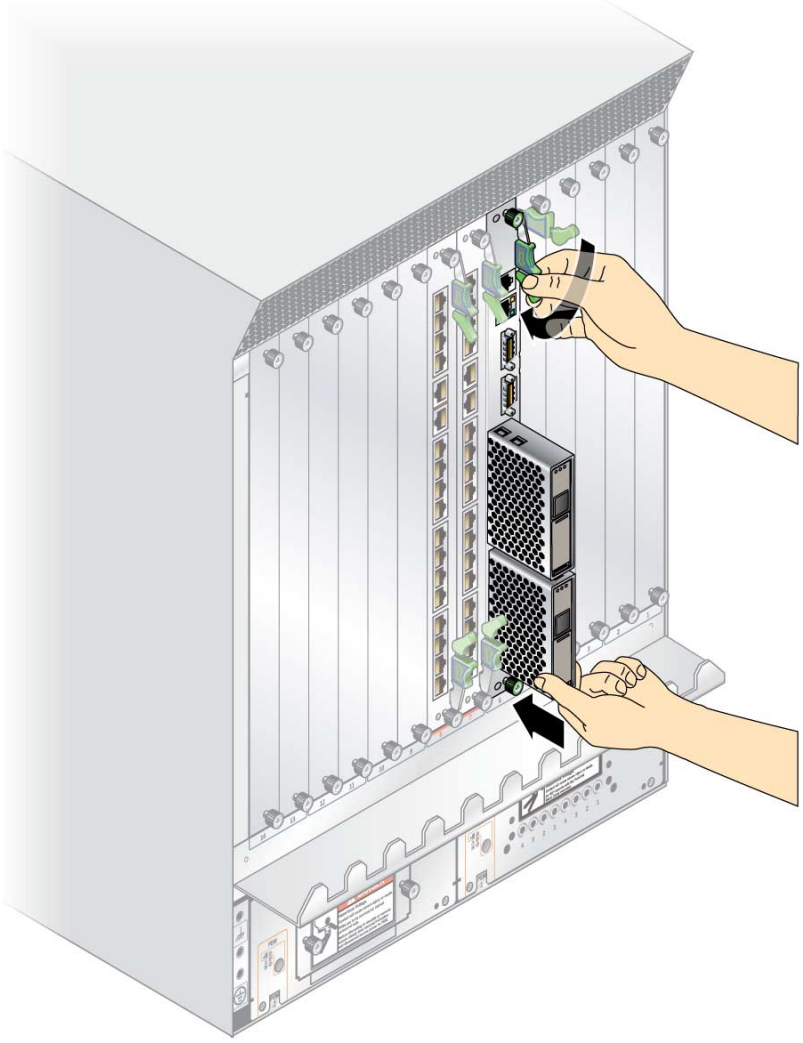


6. **Carefully align the top and bottom edges of the module with the guides in the appropriate slot.**

   It might be helpful to look into the enclosure to verify correct alignment of the rails in the guides.

7. **Taking care to keep the module aligned in the guides, carefully insert the module by simultaneously pressing the bottom disk cage and top injector/ejector latch, which is extended fully open.**

FIGURE 2-4 Inserting the ARTM-HD



8. **Slide the module in as far as possible and while maintaining pressure on the bottom disk cage, rotate the injector/ejector latch inward to its closed position to fully seat the module in the slot.**

9. **Tighten the module retention screws to ensure that the module is secured into the shelf.**

10. **Install the blade server into the front of the shelf (**FIGURE 2-1**) and push the blade server toward the midplane. Ensure that it is seated properly and that the connectors make good contact with the** ARTM-HD**.**

    For further details on installation of the blade server, refer to the appropriate user documentation for the blade server.

    If the module is inserted properly, the hotswap switch is activated. The blue Hot-swap LED will blink, then the green OK LED lights.

11. **Install the supported peripheral devices at the** ARTM-HD **connector ports, as required.**

    Use shielded cables for the ports on the ARTM-HD; the shield should be grounded at both ends. For further details on installation, refer to the appropriate user documentation.

12. **Power on the system, if necessary.**

    Refer to your system manual for instructions on correctly powering on the system.

Note – If you are installing a ARTM-HD, paired with a Sun Netra CP3220 blade server or Sun Netra CP3260 blade server, into a system with a 10 GbE switch, you must perform a one-time configuration on the Sun Netra CP3220 blade server or Sun Netra CP3260 blade server to assure the blade server and ARTM-HD operate at the correct speed for your switch. For information on configuring your blade server, see the *Sun Netra CP3220 Blade Server User's Guide* (820-1982) or the *Sun Netra CP3260 Blade Server User's Guide (*820-0457*)*.

2.3 Removing the ARTM-HD

Caution – Power to the ARTM-HD must be off before the module can be safely removed. Removing the ARTM-HD without properly removing power can cause data loss on hard disk drives installed in the ARTM-HD.

1. **Shut down any operating system accessing the ARTM-HD or its companion blade server.**
2. **Power off the ARTM-HD from the shelf manager.**

   For example, to power down just the ARTM-HD in slot 1, log in to the shelf manager and type:

```
# clia deactivate 9a 3
```

   where 9a is the IPMB address for slot 1, and 3 is the FRU number of the ARTM-HD in slot 1.

   Alternately, to power down both the ARTM-HD and its companion blade server, type:

```
# clia deactivate board 1
```

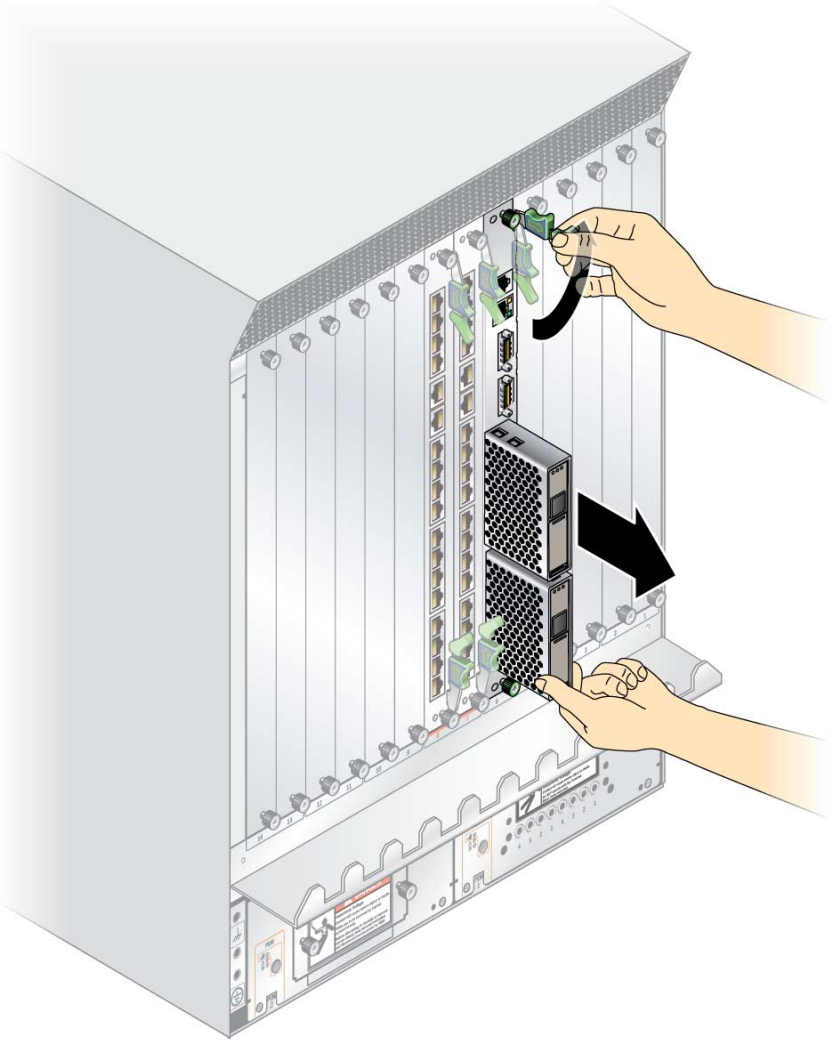
3. **Loosen the locking screws on the ARTM-HD.**
4. **Unlatch the top injector/ejector latch and wait for the blue Hot-swap LED to light and stay on solid.**

   Depending upon the status and functionality of the front blade server, the ARTM-HD blue Hot-swap LED will either blink or go to solid state.

Note – The following steps apply regardless of how many ARTMs are in the chassis. It might be a little more difficult to grasp an ARTM when the chassis is full.

5. **Remove the module by simultaneously pulling on the the bottom disk cage with one hand and the top injector/ejector latch with the other hand, as shown in** FIGURE 2-5**.**

FIGURE 2-5 Removing the ARTM-HD



6. **If the slot is to remain empty, install a filler panel in the slot.**
7. **Reinstall the blade server, if necessary.**ARTM-HD

2.4 Installing a Hard Disk Drive

1. **Open the HD latch by pressing the button on the face of the drive.**
2. **Insert the drive into the appropriate drive bay until the latch closes and the drive fully engages with the connectors.**

2.5 Removing a Hard Disk Drive

1. **Unmount any file systems using the HD.**
2. **Locate the drive to be replaced.**
   If a drive is faulty, the amber fault LED will light.
3. **Press the button on the face of the HD to release the latch.**
   The latch springs open.
4. **Grab the latch and remove the HD from the drive bay.**
5. **If the slot is to remain empty, install a filler panel in the slot.**

2.6 Changing the OOS LED Color

The color of the Out-of-service (OOS) LED can be set to red or amber by moving jumper JU1 to the appropriate position. Setting the jumper to the P1/P2 position makes the OOS LED appear red. Setting the jumper to the P2/P3 position makes the OOS LED appear amber. Amber (position P2/P3) is the default setting for the OOS LED.

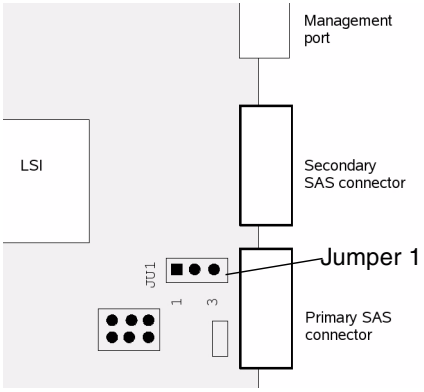
1. **Remove the ARTM-HD from the chassis.**

   See Section 2.3, "Removing the ARTM-HD" on page 2-9.

2. **Locate jumper JU1 on the board.**

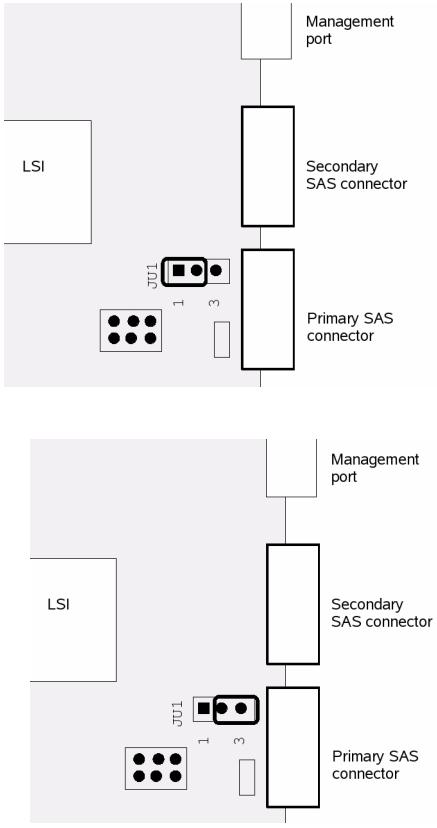
   JU1 is located next to the Primary SAS connector.

FIGURE 2-6 Jumper setting for red OOS LED (P1/P2)



3. **Set the jumper housing to the appropriate setting; P1/P2 for red, P2/P3 for amber.**

FIGURE 2-7 Jumper setting for amber OOS LED (P2/P3)



4. **Reinstall the ARTM-HD.**

   See Section 2.2, “Installing the ARTM-HD” on page 2-4.

CHAPTER 3

Disk Management

This chapter describes the disk management and BIOS configuration software.

This chapter contains the following sections:

- Section 3.1, “RAID Support” on page 3-2
- Section 3.2, “SAS BIOS Overview” on page 3-2
- Section 3.3, “Starting the SAS BIOS Configuration Utility” on page 3-3
- Section 3.4, “Creating a RAID 0 Volume” on page 3-4
- Section 3.5, “Creating a RAID 1 Volume” on page 3-5
- Section 3.6, “Creating a RAID 1E Volume” on page 3-6
- Section 3.8, “Synchronizing an Array” on page 3-8
- Section 3.9, “Activating an Array” on page 3-8
- Section 3.10, “Deleting an Array” on page 3-9
- Section 3.11, “Locating a Disk Drive” on page 3-9

3.1 RAID Support

The LSISAS1068e controller supports the Integrated RAID hardware solution, which is a highly integrated, low-cost RAID solution. It is designed for systems requiring redundancy and high availability, but not requiring a full-featured RAID implementation.

Integrated RAID includes Integrated Mirroring (IM or RAID 1), Integrated Mirroring Extended (IME), and Integrated Striping (IS or RAID 0) technology. Integrated RAID is OS independent, easy to install and configure, and does not require a special driver. A RAID Volume is seen as a single drive by the host BIOS and OS.

The LSISAS1068e controller is based on the Fusion-MPT (Message Passing Technology) architecture. The Fusion-MPT architecture requires only a thin device driver that is independent of the I/O bus. LSI Logic provides the device drivers for various operating environments.

3.2 SAS BIOS Overview

The SAS BIOS is the bootable ROM code that manages SAS hardware resources. It is specific to a family of LSI Logic Fusion-MPT SAS controllers or processors. The Fusion-MPT SAS BIOS integrates with a standard system BIOS, extending the standard disk service routine provided through INT13h.

During the boot time initialization, the SAS BIOS determines whether the system BIOS has already installed other hard disks, such as an IDE drive. If such drives are already installed, the SAS BIOS maps any SAS drives it finds behind these drives. Otherwise, the SAS BIOS installs drives starting with the system boot drive. In this case, the system boots from a drive controlled by the SAS BIOS.

The Fusion-MPT SAS BIOS features include:

- Configuration for up to 256 adapters; any four can be chosen for INT13 (bootrom) support
- Support for Message Passing Technology (MPT)
- Support for LSI53C1064 devices
- Support for SAS devices
- Support for Integrated RAID initialization (with proper firmware)

3.3 Starting the SAS BIOS Configuration Utility

If you have SAS BIOS version 6.x.x with the Fusion-MPT SAS BIOS Configuration Utility, you can change the default configuration of the SAS host adapters. You may decide to change these default values if there is a conflict between device settings or if you need to optimize system performance.

The version number of the SAS BIOS appears in a banner displayed on the computer monitor during bootup. If the utility is available, this message also appears during bootup:

```
Press Ctrl+C to start LSI Logic Configuration Utility...
```

This message remains on the screen for about five seconds, giving you time to start the utility. If you press Ctrl+C, the message changes to:

```
Please wait, invoking LSI Logic Configuration Utility...
```

After a brief pause, the computer monitor displays the Main menu of the Fusion-MPT SAS BIOS Configuration Utility. These messages may appear during the boot process:

- `Adapter removed from boot order!`

  This message appears when an adapter has been removed from the system or has been relocated behind a PCI bridge.

- `Adapter configuration may have changed, reconfiguration is suggested!`

  This message appears if none of the information in the NVRAM is valid.

- `Updating Adapter List!`

  This message appears when fewer than four adapters are in the boot order and more adapters exist than are shown.

Caution – The SAS BIOS Configuration Utility is a powerful tool. If, while using it, you disable the controller, press Ctrl+E (or Ctrl+A on versions earlier than 5.00) after memory initialization during reboot to reenable and reconfigure the controller.

Note – The RAID firmware needs at least 64 Mbytes of unused disk space at the end of each drive to store metadata.

3.4 Creating a RAID 0 Volume

A RAID 0 volume, also referred to as Integrated Striping (IS), offers the ability to stripe data across multiple hard disks. This can increase storage capacity and performance by combining multiple disks into one logical volume.

Note – Use RAID 0 with caution. The only advantage of RAID 0 is to improve the overall disk performance by striping data over several disk drives. By doing this, it decreases reliability because the failure of any drive within the striped volume results in a complete loss of data. In addition, any disk drive included in a RAID 0 volume becomes non-hot-plugable.

Follow these steps to create a RAID 0 volume on an adapter that does not currently have a volume configured.

1. **In the Configuration Utility, select an adapter from the Adapter List screen.**
2. **Select the RAID Properties option.**
3. **When you are prompted to create either an IS volume, an IME volume, or an IM volume, select Create IS Volume.**

   The next screen shows a list of disks that can be added to a volume.
4. **Move the cursor to the RAID Disk column. To add a disk to the volume, change the "No" to "Yes" by pressing the + key, - key, or space bar.**

   As disks are added, the Array Size field changes to reflect the size of the new volume. There are several limitations when creating a RAID 0 volume:

   - All disks must be SAS (with SMART support).
   - Disks must have 512-byte blocks and must not have removable media.
   - There must be at least two drives in a valid volume.
   - Hot spare drives are not allowed for RAID 0 volumes.

Note – RAID 0 does not provide any data protection in the event of disk failure. It is primarily used to increase speed.

Note – Once the number of disks in a RAID volume is set, it cannot be changed.

5. **When the volume has been fully configured, press C and select Save Changes, then exit this menu to commit the changes.**

   The Configuration Utility will pause while the array is being created.

3.5 Creating a RAID 1 Volume

A RAID 1 volume, also referred to as Integrated Mirroring (IM), offers the ability to mirror data from one hard disk onto another one. This can increase reliability by combining multiple disks into one logical volume. Follow these steps to create a RAID 1 volume on an adapter that does not currently have a volume configured.

1. **In the Configuration Utility, select an adapter from the Adapter List screen.**
2. **Select the RAID Properties option.**
3. **When you are prompted to create either an IS volume, and IME volume, or an IM volume, select Create IM Volume.**

   The next screen shows a list of disks that can be added to a volume.

4. **Move the cursor to the RAID Disk column. To add a disk to the volume, change the "No" to "Yes" by pressing the + key, - key, or space bar.**

   When the first disk is added, the utility will prompt you to keep existing data or overwrite existing data.

5. **Press M to keep the existing data on the first disk or press D to overwrite it.**

   If you keep the existing data, this is called a migration. The first disk will be mirrored onto the second disk, so the data you want to keep must be on the first disk added to the volume. Data on all other disks will be lost.

   As disks are added the Array Size field will change to reflect the size of the new volume. There are several limitations when creating a RAID 1 volume:

   - All disks must be SAS (with SMART support).
   - Disks must have 512-byte blocks and must not have removable media.
   - There must be two drives in a valid volume.

6. **(Optional) Add a hot spare to the volume by moving the cursor to the Hot Spare column and pressing the + key, - key, or space bar.**

7. **When the volume has been fully configured, press C and select Save Changes, then exit this menu to commit the changes.**

   The Configuration Utility will pause while the array is being created.

Note – RAID 1 provides protection against the failure of a single disk. When a disk fails, it is rebuilt to a hot spare if one is available. This can greatly increase the level of protection that RAID 1 provides.

Note – Even though multiple volumes can be created, the hot spare is a global hot spare. Only one active hot spare is allowed for all volumes.

3.6 Creating a RAID 1E Volume

A RAID 1E volume, also referred to as an Integrated Mirroring Enhanced (IME), combines the ability of RAID 0 to stripe data and the ability of RAID 1 to mirror the now-striped data. This can increase reliability of RAID 0 by adding the mirroring feature of RAID 1. Use RAID 1E for arrays with an odd number of disks. A minimum of three disks are needed to configure RAID 1E. Follow these steps to create a RAID 1E volume on an adapter that does not currently have a volume configured.

1. **In the Configuration Utility, select an adapter from the Adapter List screen.**
2. **Select the RAID Properties option.**
3. **When you are prompted to create either an IS volume, and IME volume, or an IM volume, select Create IME Volume.**

   The next screen shows a list of disks that can be added to a volume.

4. **Move the cursor to the RAID Disk column. To add a disk to the volume, change the "No" to "Yes" by pressing the + key, - key, or space bar.**

   When the first disk is added, the utility will prompt you to keep existing data or overwrite existing data.

5. **Press M to keep the existing data on the first disk or press D to overwrite it.**

   If you keep the existing data, this is called a migration. The first disk will be mirrored onto the second disk, so the data you want to keep must be on the first disk added to the volume. Data on all other disks will be lost.

As disks are added the Array Size field will change to reflect the size of the new volume. There are several limitations when creating a RAID 1E volume:

- All disks must be SAS (with SMART support).
- Disks must have 512-byte blocks and must not have removable media.
- There must be three drives in a valid volume.

6. **(Optional) Add a hot spare to the volume by moving the cursor to the Hot Spare column and pressing the + key, - key, or space bar.**
7. **When the volume has been fully configured, press C and select Save Changes, then exit this menu to commit the changes.**

The Configuration Utility will pause while the array is being created.

3.7 Viewing RAID Volume Properties

Follow these steps to view the properties of RAID volumes.

1. **In the Configuration Utility, select an adapter from the Adapter List screen.**
2. **Select the RAID Properties option.**

   The properties of the current volume are displayed.
3. **If more than one volume is configured, press Alt+N to view the next array.**
4. **To manage the current array, press Enter when the Manage Array item is selected.**

3.8 Synchronizing an Array

Synchronizing an array means that the firmware synchronizes the data on the secondary disk(s) with the data on the primary disk of the mirror. Follow these steps to start a synchronization for a RAID 1 volume.

1. **Select Synchronize Array.**
2. **Press Y to start the synchronization, or N to cancel it.**

Note – If the server is rebooted before the volume synchronization is completed, the resync resumes when the server boots.

3.9 Activating an Array

An array can become inactive if, for example, it is removed from one controller or computer and moved to another one. The Activate Array option enables you to reactivate an inactive array that has been added to a system. This option is only available when the selected array is currently inactive.

1. **Select Activate Array.**
2. **Press Y to proceed with the activation, or press N to abandon it.**

   After a pause, the array becomes active.

3.10 Deleting an Array

Caution – Before deleting an array, back up all data on the array that you want to keep.

Follow these steps to delete a selected array.

1. **Select Delete Array.**
2. **Press Y to delete the array, or press N to abandon the deletion.**

   After a pause, the firmware deletes the array.

Note – Once a volume has been deleted, it cannot be recovered. When a RAID 1 volume is deleted, the data is preserved on the primary disk. The master boot records (MBR) of other disks in the array are deleted. For other RAID types, the master boot records of all disks are deleted.

3.11 Locating a Disk Drive

There are several ways to physically locate a disk drive, as long as the firmware is correctly configured and the drives support disk location.

- During RAID creation, when a disk is set to Yes as part of a RAID volume, its Locate LED is enabled. When it is set back to No or the RAID volume is created, the Locate LED is cleared.
- Disks can also be located from the SAS Topology screen. To locate a disk, move the cursor to the disk and press Enter. The Locate LED on the disk remains lit until the next key is pressed.

CHAPTER 4

Specifications and Connectors

This chapter provides the specifications and connector pinouts for the ARTM-HD.

This chapter contains the following sections:

- Section 4.1, “Specifications for the ARTM-HD” on page 4-2
- Section 4.2, “Hardware Descriptions” on page 4-3
- Section 4.3, “Connectors and Pin Assignments” on page 4-4

4.1 Specifications for the ARTM-HD

This section provides mechanical, electrical, environmental, and other relevant specifications for the ARTM-HD.

4.1.1 Physical Dimensions

The ARTM-HD is a 6U (233.35 mm) height board with 80 mm in depth for standard applications. It complies with IEEE 1101.11 mechanical standards, as required by the PICMG 3.0 Revision 2.0 specification. The ARTM-HD is keyed to conform to the PICMG 2.10, Keying of ATCA Boards and Backplanes specification.

4.1.2 Power Requirements

The power consumption of the ARTM-HD is limited to 25W maximum. The blade server provides the following voltages: 3.3V Management Power and +12V Payload Power. The ARTM-HD creates 3.3V, 5V, and 1.2V from the 12v Payload Power.

4.1.3 Electrical Requirements

The ARTM-HD is powered through the Sun Netra ATCA node blade server. The blade server provides the following voltages: 3.3V/+12V.

4.1.4 Environmental Specifications and Compliance

For details on the environmental specifications and compliance, see *Important Safety Information for Sun Hardware Systems* (816-7190), the *Sun Netra CP3220 Blade Server User's Guide* (820-1982).

You can download and view these documents from the following web site:

`http://www.sun.com/documentation/`

4.2 Hardware Descriptions

4.2.1 Ethernet Management Port

The ARTM-HD provides one 10/100/1000 MBASE-T ethernet management port with an RJ-45 connector equipped with LEDs.

4.2.2 Infinband-style Connectors

The ARTM-HD provides two (primary and secondary) Infinband-style SAS connectors, with jack screws, for external drive support using a SFF-8470 style SAS cable.

4.2.3 Serial Port

One asynchronous serial port with an RJ-45 serial connector is included on the ARTM-HD I/O faceplate. The serial port may be redirected to the front blade server when using a Sun Netra CP3220 blade server, a Sun Netra CP3260 blade server, or other ARTM -compatible blade server. For more information on using both the front and rear serial ports, refer to the appropriate blade server documentation.

4.2.4 SAS Interface

The ARTM-HD includes a LSI 1068E PCIe to 8-port SAS controller chip.

4.2.5 Module Management Controller

The onboard Module Management Controller (MMC) provides IPMI management communication between the RTM and the blade server, and local monitoring of temperature and voltage.

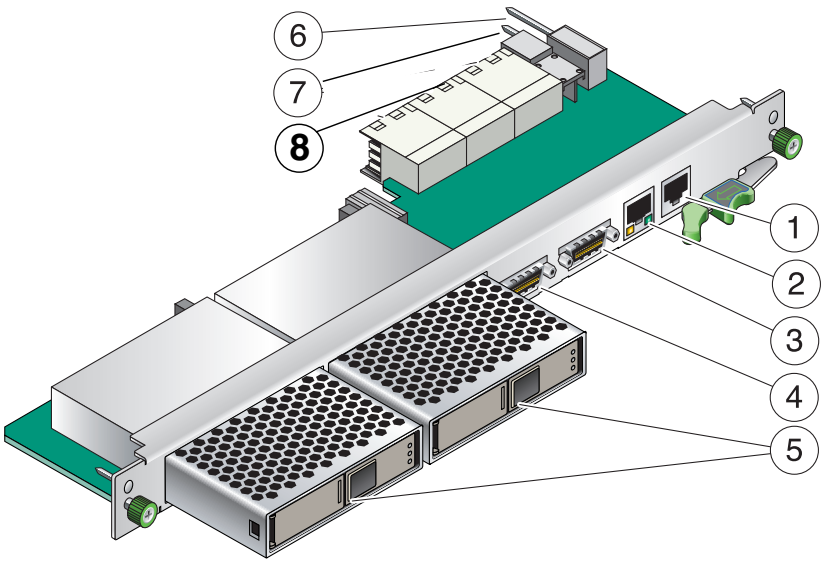
4.2.6 FRU PROM

The ARTM-HD contains an IPMI FRU Prom compatible with the ATCA specifications.

4.3 Connectors and Pin Assignments

FIGURE 4-1 shows the location of the connectors.

FIGURE 4-1 Sun Netra CP32x0 ARTM-HD Connectors



1 - Serial port

2 - 10/100/1000 Mb Management port

3 - External SAS port (secondary)

4 - External SAS port (primary)

5 - Hard disk drive(s) (single drive contains a filler panel on the second drive)

6 - RTM alignment pin

7 - Power connector

8 - Zone 3 connectors

4.3.1 I/O Connectors

This section lists the pins and signal names of the I/O faceplate connectors on the ARTM-HD. The faceplate has the following connectors:

- One 10/100/1000 BASE-T Ethernet management port (RJ-45)
- One serial ports (RS232)
- Two External SAS connectors (Infinband style)

4.3.1.1 Ethernet Port

The Ethernet connector is an RJ-45 connector with LEDs. The controller autonegotiates to either 10/100/1000BASE-T. FIGURE 4-2 shows an Ethernet RJ-45 connector.

FIGURE 4-2 Ethernet RJ-45 Connector

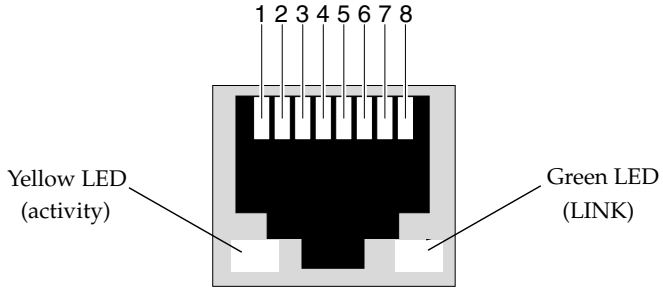


TABLE 4-1 gives the pin assignments for the Ethernet ports.

TABLE 4-1 Ethernet Port Connector Pin Assignments

Pin	Signal Name	Pin	Signal Name
1	DA+	5	DC-
2	DA-	6	DB-
3	DB+	7	DD+
4	DC+	8	DD-

4.3.1.2 Serial Port

The serial port connector is an RJ45 connector. FIGURE 4-3 shows a serial port connector.

FIGURE 4-3 Serial Port Connector

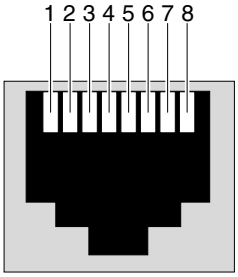


TABLE 4-2 gives the serial port connector pin assignments.

TABLE 4-2 Serial Port Connector Pin Assignments

Pin	Signal Name	Pin	Signal Name
1	RTS	5	GND
2	DTR	6	RXD
3	TXD	7	DSR
4	GND	8	CTS

4.3.1.3 SAS Connectors

The ARTM-HD provides two Serial Attached SCSI (SAS) ports using an Infinband-style connector.

FIGURE 4-4 SAS Connectors

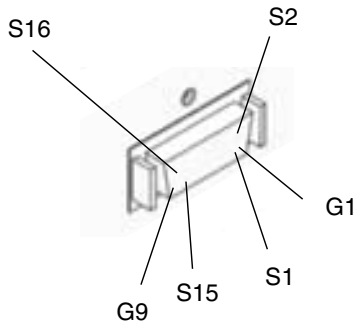


TABLE 4-3 External SAS Connector Pin Assignments

Pin	Function
S1	RX0+
S2	RX0-
S3	RX1+
S4	RX1-
S5	RX2+
S6	RX2-
S7	RX3+
S8	RX3-
S9	TX3-
S10	TX3+
S11	TX2-
S12	TX2+
S13	TX1-
S14	TX1+

TABLE 4-3 External SAS Connector Pin Assignments

Pin	Function
S15	TX0-
S16	TX0+
G1-9	Signal Ground
Housing	Chassis Ground

4.3.2 Zone 3 Connectors

All the I/O connections for rear access are provided by the Sun Netra blade server through the Zone 3 connectors. The Zone 3 connectors are P31, P32, and P33. The Zone 3 connectors are shown in FIGURE 4-5.

Note – The letters *TX* in a pin name indicate that the signal is transmitted from the ATCA card to the ARTM card.

FIGURE 4-5 Zone 3 Connectors

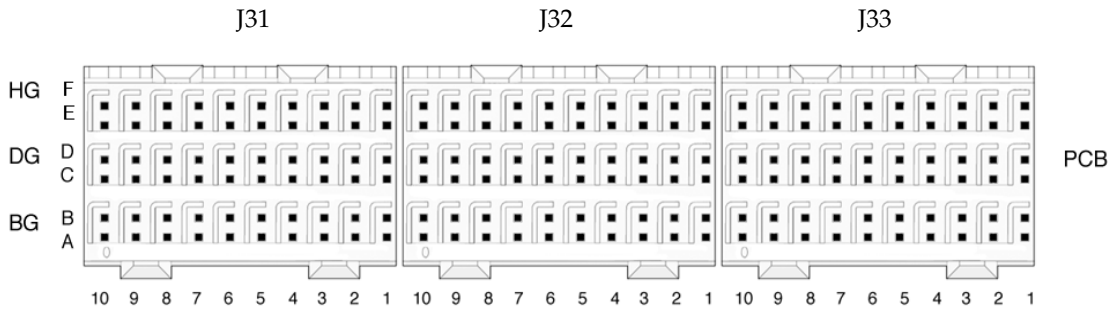


TABLE 4-4 lists the Zone 3, J31 connector pinouts.

TABLE 4-4 J31 Connector Pin Assignments

Row	Interface	A	B	C	D	E	F
1	AMC1 EO Ports	TX1_13+	TX1_13-	RX1_12+	RX1_12-	TX1_12+	TX1_12-
2		RX1_14+	RX1_14-	TX1_14+	TX1_14-	RX1_13+	RX1_13-
3		TX1_17+	TX1_17-	RX1_15+	RX1_15-	TX1_15+	TX1_15-
4		RX1_18+	RX1_18-	TX1_18+	TX1_18-	RX1_17+	RX1_17-
5		TX1_20+	TX1_20-	RX1_19+	RX1_19-	TX1_19+	TX1_19-
6		RX2_12+	RX2_12-	TX2_12+	TX2_12-	RX1_20+	RX1_20-
7	AMC2 EO Ports	TX2_14+	TX2_14-	RX2_13+	RX2_13-	TX2_13+	TX2_13-
8		RX2_15+	RX2_15-	TX2_15+	TX2_15-	RX2_14+	RX2_14-
9		TX2_18+	TX2_18-	RX2_17+	RX2_17-	TX2_17+	TX2_17-
10		RX2_19+	RX2_19-	TX2_19+	TX2_19-	RX2_18+	RX2_18-

TABLE 4-5 lists the Zone 3, J32 connector pinouts.

TABLE 4-5 J32 Connector Pin Assignments

Row	Interface	A	B	C	D	E	F
1	AMC2 EO Ports	NC	NC	RX2_20+	RX2_20-	TX2_20+	TX2_20+
2	SAS/SATA0 - SER0	SA_TX0+	SA_TX0-	SA_RX0+	SA_RX0-	SR0_RTS	SR0_DTR
3	SAS/SATA1 - SER0	SA_TX1+	SA_TX1-	SA_RX1+	SA_RX1-	SR0_TXD	SR0_RXD
4	SAS/SATA2 - SER0	SA_TX2+	SA_TX2-	SA_RX2+	SA_RX2-	SR0_DSR	SR0_CTS
5	SAS/SATA3 - SER0	SA_TX3+	SA_TX3-	SA_RX3+	SA_RX3-	NC	NC
6	LAN0 (MNGT)	LAN0_A+	LAN0_A-	LAN0_CTV	LAN0_CTV	LAN0_B+	LAN0_B-
7		LAN0_C+	LAN0_C-	ACT_LED#	LINK_LED#	LAN0_D+	LAN0_D-
8	LAN1 (SerDes)	SLAN_TX1+	SLAN_TX1-	SLAN_RX1+	SLAN_RX1-	NC	NC
9	LAN2 & LAN4 (SerDes)	SLAN_TX2+	SLAN_TX2-	SLAN_RX2+	SLAN_RX2-	SLAN_TX4+	SLAN_TX4-
10	LAN3 & LAN4 (SerDes)	SLAN_TX3+	SLAN_TX3-	SLAN_RX3+	SLAN_RX3-	SLAN_RX4+	SLAN_RX4-

TABLE 4-6 lists the Zone 3, J33 connector pinouts.

TABLE 4-6 J33 Connector Pin Assignments

Row	Interface	A	B	C	D	E	F
1	PCIe x8 Lane	PETx0+	PETx0-	PERx0+	PERx0-	FCLKA+	FCLKA-
2		PETx1+	PETx1-	PERx1+	PERx1-	TCLKA+	TCLKA-
3		PETx2+	PETx2-	PERx2+	PERx2-	TCLKB+	TCLKB-
4		PETx3+	PETx3-	PERx3+	PERx3-	TCLKC+	TCLKC-
5		PETx4+	PETx4-	PERx4+	PERx4-	TCLKD+	TCLKD-
6		PETx5+	PETx5-	PERx5+	PERx5-	TCK	TMS
7		PETx6+	PETx6-	PERx6+	PERx6-	TRST#	TDO
8		PETx7+	PETx7-	PERx7+	PERx7-	TDI	PCI_RST#
9		NC	NC	NC	NC	RTM#	PCI_CFG
10		NC	NC	NC	NC	PS0#	Enable#

Index

A

ATCA shelf, 2-2

B

BIOS
- SAS RAID, 3-2

C

compliance specifications, 4-2
compliance, PICMG, 1-3
configurations, I/O configurations, 1-8
connectors
- Ethernet, 4-5
- Zone 3, 4-8

E

electrical requirements, 4-2
environmental specifications, 4-2
Ethernet, RJ-45 connectors, 4-5

F

features, 1-2
FIGURE, 4-6
Fusion-MPT SAS BIOS, See SAS BIOS

I

I/O configurations, 1-8
installation, rear transition module, ?? to 2-10

P

pinouts, serial port, 4-6
power requirements, 4-2

R

RAID
- activating an array, 3-8
- creating RAID 0 volume, 3-4
- creating RAID 1 volume, 3-5
- deleting an array, 3-9
- locating a disk drive, 3-9
- synchronizing arrays, 3-8
- viewing RAID volume properties, 3-7

rear transition module
- features, 1-2
- installation, 2-2 to 2-10
- interfaces, 1-7
- removal, 2-9

RJ-45 Ethernet connectors, 4-5

S

SAS BIOS
- activating a RAID array, 3-8
- creating RAID 0 volume, 3-4
- creating RAID 1 volume, 3-5
- deleting a RAID array, 3-9
- locating a RAID disk, 3-9
- overview, 3-2
- starting Configuration Utility, 3-3
- synchronizing RAID arrays, 3-8
- viewing RAID volume properties, 3-7

serial
- number, locating, 1-14

Serial Attached SCSI BIOS, See SAS BIOS

serial interface, 4-3
serial port pinouts, 4-6
serial ports, 4-6
software support, 1-13
specifications, 1-3, 4-2
  compliance, 4-2
  electrical requirements, 4-2
  environmental, 4-2