Oracle Storage 12 Gb SAS PCIe HBA, External Installation Guide For HBA Models 7110118 and 7110119

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Oracle Storage 12 Gb SAS PCIe HBA, External Installation Guide For HBA Models 7110118 and 7110119,

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Preface

- **Overview** – Describes how to install and remove the Oracle Storage 12 Gb SAS PCIe HBA, External, and provides specifications and any known issues for the HBA
- **Audience** – System administrators, network administrators, and service technicians
- **Required knowledge** – Advanced experience troubleshooting and replacing hardware

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Product Documentation Library

Documentation and resources for this product and related products are available at Oracle Storage 12 Gb SAS PCIe HBA, External Documentation.

Feedback

Provide feedback about this documentation at https://www.oracle.com/goto/docfeedback.

1

HBA Overview

This chapter provides an overview of the external Oracle Storage 12 Gigabit per second (Gb/s) Serial Attached SCSI (SAS) PCI Express (PCIe) host bus adapter (HBA), which uses Broadcom technology. The chapter also describes the various operating systems, host platforms, storage, and infrastructure configurations that support the HBA.

This chapter contains the following topics:

- Ship Kit Contents
- HBA Features
- Valid Drive Mix Configurations With HDDs and SSDs
- Operating System and Technology Requirements
- System Interoperability
- Boot Support

Ship Kit Contents

- Oracle Storage 12 Gb/s SAS PCIe HBA, External
- *Installing Components* document

Related Topics

- HBA Overview

HBA Features

The Oracle Storage 12 Gb/s SAS PCIe HBA, External (7110118, 7110119) provides a low-cost, PCI Express SAS solution for computer manufacturers. The HBA uses either a standard or low-profile PCI bracket type and has the following features:

- PCI Express interface that is compatible with the *PCI Express Specification*, revision 3.0
- PCI Express 3.0 compliance x8 host interface
- Compatibility with the PCIe Low Profile standards
- PCI Express transmission and reception data rate of 12 Gb/s in each direction, yielding a total bandwidth of 24 Gb/s for each full-duplex lane
- Simplified cabling with a point-to-point, serial architecture
- Protocol controller with no on-board RAID support
- On-board Flash for firmware and boot support for SPARC servers

Related Topics

- HBA Overview

SAS/SATA Features

The following are the SAS/SATA features supported by the HBA:

- Two SAS3, x4 external mini-SAS HD (high-density) connectors
- Capability of running with either 4 or 8 serial ports for connection to SAS/SATA (Serial ATA) devices
- 12 Gb/s SAS3 target interface supporting 6-Gb/s and 3-Gb/s SAS link rates and 6-Gb/s and 3-Gb/s SATA link rates
- Support for multipath connection through separate physical HBAs and through a single HBA
- Support for the easy addition of SAS interfaces to any computer, workstation, or server with a PCI Express bus
- Narrow and wide ports
- Support for more than 1000 SAS addresses
- Transfer of data using SCSI information units

The following figure shows the physical layout of the HBA.

Oracle Storage 12 Gb/s SAS PCIe HBA, External
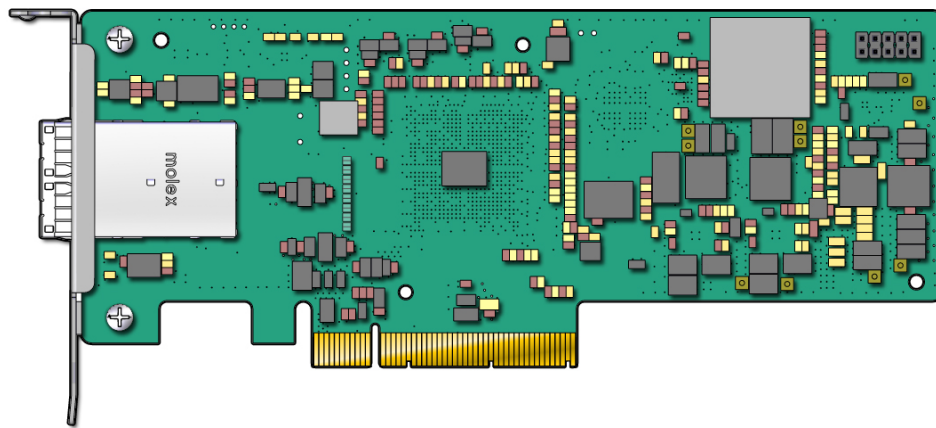
Related Topics

- HBA Features

Valid Drive Mix Configurations With HDDs and SSDs

The HBA supports connectivity using SATA II drives, SAS drives, or both.

Related Topics

- HBA Overview

Operating System and Technology Requirements

The HBA requires the operating system (OS) and technology levels, at minimum, listed in the following table.

Table 1-1   Supported Operating System/Technology Versions

Operating System/Technology	Recommended Versions (minimum)
Oracle Solaris OS	• Oracle Solaris 11.4 with SRU 16 • Oracle Solaris 11.3 with SRU 23 To obtain the latest SRUs, go to My Oracle Support
Linux OS (64-bit)	• Oracle Linux 7.2 with Red Hat Compatible Kernel (RHCK) • Oracle Linux 7.2 with with Unbreakable Enterprise Kernel (UEK), Release 4 • Red Hat Enterprise Linux (RHEL) 6.8 • SUSE Linux Enterprise Server (SLES) 11 SP3
Virtual Machine Technology	Oracle VM 3.4.6
Microsoft Windows OS (64-bit)	• Window Server 2019 • Windows Server 2016
VMware Technology	• VMware ESXi 6.5 U1

Related Topics

• HBA Overview

System Interoperability

This section provides host platform, storage, and software support information. This section contains the following topics:

• Host Platform Support

• Storage System Support

• Software Support

Related Topics

• HBA Overview

Host Platform Support

The following table lists the supported host platforms for the HBA. For the latest information, refer to the product notes for your system. For operating system version information, see Operating System and Technology Requirements.

Table 1-2   Oracle x86 Server Platform Support

Oracle x86 Server Platform	Supported OS/Technology
Oracle Server X9-2 and X9-2L	Oracle Solaris, Oracle Linux, Oracle VM, Linux, Windows, VMware
Oracle Server X8-2 and X8-2L	Oracle Solaris, Oracle Linux, Oracle VM, Linux, Windows, VMware
Oracle Server X7-2 and X7-2L	Oracle Solaris, Oracle Linux, Oracle VM, Linux, Windows, VMware
Oracle Exadata Database Machine X6-8	Oracle Solaris, Oracle Linux, Oracle VM, Linux, Windows, VMware
Exalytics In-Memory Machine X6-4	Oracle Solaris, Oracle Linux, Oracle VM, Linux, Windows, VMware
Oracle Server X6-2 and X6-2L	Oracle Solaris, Oracle Linux, Oracle VM, Linux, Windows, VMware
Oracle Server X5-8	Oracle Solaris, Oracle Linux, Oracle VM, Linux, Windows, VMware
Oracle Server X5-4	Oracle Solaris, Oracle Linux, Oracle VM, Linux, Windows, VMware
Oracle Server X5-2 and X5-2L	Oracle Solaris, Oracle Linux, Oracle VM, Linux, Windows, VMware

Table 1-3   Oracle SPARC Server Platform Support

Oracle SPARC Server Platform	Supported OS/Technology
Fujitsu M10-1, M10-4, and M10-4S	Oracle Solaris
Fujitsu M12-1, M12-2, and M12-2S	Oracle Solaris
Oracle SPARC T7-1, T7-2, and T7-4	Oracle Solaris
Oracle SPARC T8-1, T8-2, and T8-4	Oracle Solaris
Oracle SPARC M8-8	Oracle Solaris
Oracle SPARC M7-8 and M7-16	Oracle Solaris
Netra Server X5-2	Oracle Solaris

Related Topics

• System Interoperability

Storage System Support

The HBA is supported by the following storage systems:

• Linear-Tape Open (LTO)-3 Half-Height (HH) SAS in SL08

• LTO-3 HH SAS in SL24

• LTO-3 HH SAS in SL48

• LTO-3 HH 1U Rackmount Media Tray

• LTO-4 HH SAS in SL08

- LTO-4 HH SAS in SL24

- LTO-4 HH SAS in SL48

- LTO-4 HH Desktop

- LTO-4 HH 1U Rackmount Media Tray

- LTO-5 HH SAS in SL500 Tape Library

- LTO-5 HH SAS in SL150 Tape Library

- LTO-5 HH SAS in SL08 Tape Autoloader

- LTO-5 HH SAS in SL24 Tape Autoloader

- LTO-5 HH SAS in SL48 Tape Library

- LTO-5HH Desktop

- LTO-5 HH 1U Rackmount Media Tray

- LTO-6 HH SAS in SL150 Tape Library

- LTO-6 HH SAS in SL08 Tape Autoloader

- LTO-6 HH in 1U Rackmount Media Tray

- LTO-6 HH Desktop

Related Topics

- System Interoperability

Software Support

Install, Flash, and BIOS Configuration utilities are provided. The HBA uses the Fusion-MPT architecture for all major operating systems, which allows for thinner drivers for better performance. To obtain a device driver that supports your operating system, go to Oracle Downloads.

Related Topics

- System Interoperability

Boot Support

Booting through the HBA is supported in the following operating system and technology environments:

- Oracle Solaris 11.2 OS for the SPARC platform

Related Topics

- HBA Overview

2
Hardware Installation and Removal

This chapter explains how to install and remove the HBA. For more detailed instructions, see your system installation or service manual and the installation manual for the storage devices to be connected to the HBA.

This chapter contains the following topics:

- Observing ESD and Handling Precautions
- Installing the HBA
- Removing the HBA

Observing ESD and Handling Precautions

> ⚠️ **Caution:**
>
> Damage to the HBA can occur as the result of careless handling or electrostatic discharge (ESD). Always handle the HBA with care to avoid damage to electrostatic-sensitive components.

To minimize the possibility of ESD-related damage, use both a workstation antistatic mat and an ESD wrist strap. You can get an ESD wrist strap from any reputable electronics store or from Oracle as part number 250-1007.

Observe the following precautions to avoid ESD-related problems:

- Leave the HBA in its antistatic bag until you are ready to install it in the system.
- Always use a properly fitted and grounded wrist strap or other suitable ESD protection when handling the HBA and observe proper ESD grounding techniques.
- Always hold the HBA by the metal enclosure.
- Place the HBA on a properly grounded antistatic work surface pad when it is out of its protective antistatic bag.

Related Topics

- Hardware Installation and Removal

Installing the HBA

Before you start, read the instructions in this section as well as the installation instructions for the storage devices to be connected to the HBA. This section contains the following topics:

- To Prepare for Hardware Installation
- To Install the HBA
- To Connect the HBA to External Storage Devices

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- To Complete the Installation

Related Topics

- Hardware Installation and Removal

To Prepare for Hardware Installation

1. Read and observe the safety information for this product.

   See the Oracle Storage Safety and Compliance Guide.

2. Back up your data.

3. Familiarize yourself with the physical features of the HBA.

4. Ensure that you have the proper cables for the HBA.

   You will need at least one, straight mini-SAS HD (high-density) cable that has a SFF-8644 x4 connector on the host end that will connect to the HBA (the connector on the target end depends on the connection requirement of the hard disk drive enclosure).

   Use only Oracle-provided SAS cables (provided with your Oracle system at time of purchase). For more information or to purchase cables for your Oracle system, go to Oracle Store.

   Cable connectors are keyed so that you cannot insert them incorrectly.

5. Unpack the box containing the HBA in a static-free environment and inspect it for damage.

   > **Note:**
   >
   > Leave the HBA in its protective bag until you are ready to install it. If there is damage, contact Oracle customer support.

6. Refer to your system installation or service manual for instructions on how to remove the system cover, disconnect the AC power cords, and turn off power from the system, if required.

Related Topics

- Installing the HBA

To Install the HBA

1. Attach an antistatic wrist strap and remove the HBA from its protective bag.

   See Observing ESD and Handling Precautions.

2. Refer to your system installation or service manual to determine how to locate an empty PCIe slot in which you can insert the HBA.

3. Align the HBA to the PCIe slot and press down carefully and firmly to seat the HBA into the slot, as shown in the following figure.

> **Note:**
>
> Some PCIe slots support PCIe graphics cards only; if the HBA is installed in one of those PCIe slots, the HBA will not function.
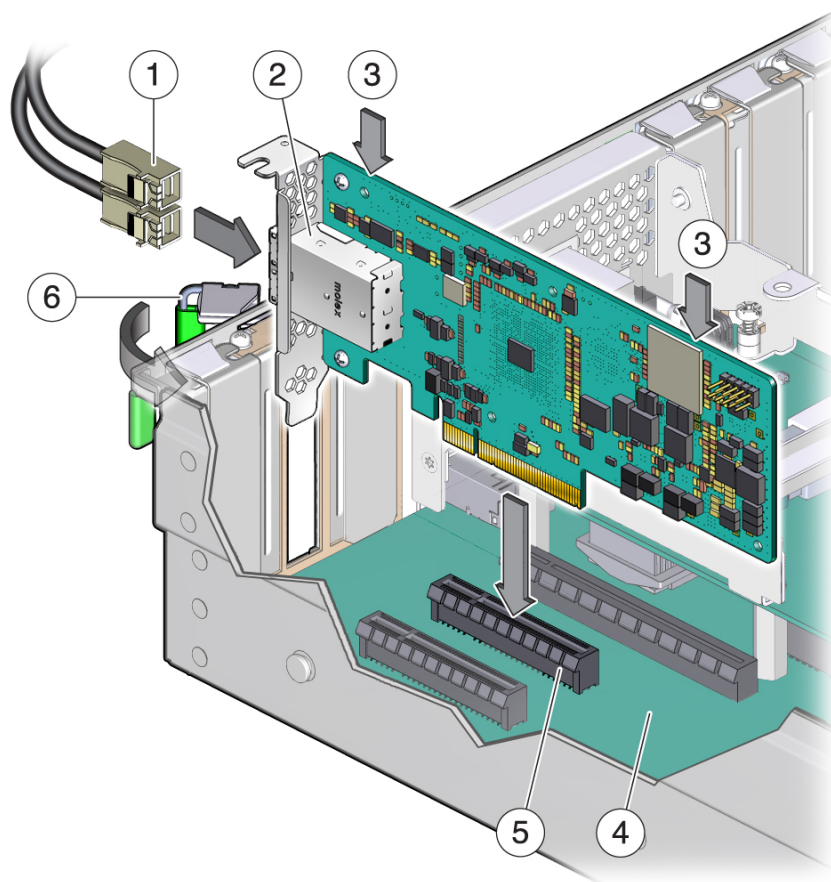
Callout	Description
1	SFF-8644 mini-SAS HD external cables
2	SFF-8644 mini-SAS HD connector
3	Press down here.
4	32-bit slot (3.3 V only)
5	PCIe x8 slot
6	Retention clip

> **Note:**
>
> The host bus adapter shape, size, and locations of components might vary from this illustration.

4. When the HBA is fully inserted in the slot, secure the HBA to the system chassis by engaging the retention clip.

Related Topics

• Installing the HBA

To Connect the HBA to External Storage Devices

• Connect the serial SAS cables to the two external x4 mini-SAS HD connectors and attach the other ends of the cables to the serial hard disk drive enclosures, per your requirements.

Use only Oracle-provided SAS cables (provided with your system at time of purchase). You can also purchase Oracle cables at: Oracle Store.

Related Topics

• Installing the HBA

To Complete the Installation

1. Replace the system cover and reconnect the AC power cords, if required, as described in the system documentation.

> **Note:**
>
> If you do need to return power to the system, ensure that the power is turned on to the SAS devices, SATA II devices, or both before or at the same time that the power is turned on to the host system. If the system is powered up before these devices, the devices might not be recognized.

2. Do one of the following:

   a. x86 system - During the power-up process of the system, review the BIOS bootup messages and look for the BIOS utility prompt (which prompts you to press Ctrl+R).

   If you see the banner and are prompted for the utility, it means the BIOS has detected the HBA card.

   b. SPARC system - During the power-up process of the system, enter the probe-scsi-all command at the OpenBoot PROM (OBP) ok prompt to verify that the system recognizes the HBA.

   The `probe-scsi-all` command displays the SCSI devices that are connected to the host, as shown in the following example.

```
{0} ok probe-scsi-all
```

```
/pci@0/pci@0/pci@8/pci@0/pci@a/LSI,sas@0
MPT Version 2.00, Firmware Version 4.00.00.00
Target 9
  Unit 0   Disk     SEAGATE ST914602SSUN146G0603     286739329 Blocks, 146 GB
  SASAddress 5000c5000b305b4d   PhyNum 0
Target a
  Unit 0   Disk     SEAGATE ST914602SSUN146G0603     286739329 Blocks, 146 GB
  SASAddress 5000c5000b304cad   PhyNum 1
Target b
  Unit 0   Disk     HITACHI H101414SCSUN146GSA23     286739329 Blocks, 146 GB
  SASAddress 5000cca000310015   PhyNum 2
Target c
  Unit 0   Disk     HITACHI H101414SCSUN146GSA23     286739329 Blocks, 146 GB
  SASAddress 5000cca0002cf035   PhyNum 3
{0} ok
```

This example shows a SAS 3 controller (`LSI,sas@0`) connected to four physical drives.

3. Install any software required by the HBA, specific to your operating system, as described in HBA Software Installation.

Related Topics

• Installing the HBA

Removing the HBA

If you need to remove the HBA, follow the procedure in this section.

To Remove the HBA

1. Prepare your operating system for HBA removal.

2. Attach an antistatic wrist strap.

   See Observing ESD and Handling Precautions.

3. Refer to the service manual for your specific system to remove the cover from the system, power down the system, and remove AC power cords from the system, if required.

4. Refer to the service manual for your specific system to locate the HBA in the chassis of the system.

5. Disengage the retention clip that is securing the HBA to the chassis of the system and pull up carefully to unseat the HBA from the PCIe slot.

6. Detach all cables from the HBA.

7. Refer to the service manual for your specific system to reattach the system cover, reinstall AC power cords to the system, and power on the system, as necessary.

Related Topics

• Hardware Installation and Removal

3

HBA Software Installation

After you have completed the hardware installation, follow the instructions listed in this chapter for your operating system to install the HBA driver and any other utilities required by the HBA.

> **Note:**
>
> Software listed in this chapter as being located at the Oracle designated web site will only be available at the web site if required by the HBA.

This chapter contains the following topics:

- Installing the Oracle Solaris Driver and Firmware
- Installing the Linux Driver and Firmware
- Installing the Windows Server Driver and Firmware
- Installing the Oracle VM Driver and Firmware
- Installing the VMware Driver and Firmware

> **Note:**
>
> This chapter describes how to obtain HBA driver and firmware updates from the Oracle support area of the Broadcom web site. For x86 systems, you can also obtain the HBA driver and firmware updates from the internal Oracle System Assistant USB flash drive, if provided with your system. For information about downloading the HBA driver from Oracle System Assistant, refer to your platform Administration Guide.

> **Note:**
>
> For x86 systems, another option to obtain HBA driver and firmware updates is to go to the My Oracle Support web site at: My Oracle Support

Installing the Oracle Solaris Driver and Firmware

The latest driver (`lsc`) for this HBA is included as part of the Oracle Solaris 11.4 with SRU 16 OS.

You can obtain the latest version of the Oracle Solaris OS at:

We are Oracle Solaris

You can obtain the latest Oracle Solaris SRUs at the My Oracle Support web site:

My Oracle Support

Before downloading any SRUs, install the utilities and then the firmware, in that order, for the HBA.

Firmware Updates

The Oracle Solaris firmware and boot code update for the HBA, along with any accompanying documentation, are available for download at:

Oracle Downloads

> **Note:**
>
> The Fujitsu M10 server supports the HBA with firmware version 06.00.02.00, at minimum.

Installing the Linux Driver and Firmware

Consult your system documentation to determine which Oracle Linux and Linux releases are supported on your specific system.

The drivers required to run the HBA with the Oracle Linux, Red Hat Enterprise Linux, and SUSE Linux Enterprise Server OSs are available for download at:

Oracle Downloads

To Install the Linux Driver

1. Log in to the host.
2. In a browser, go to Oracle Downloads.
3. Select the type and then model of the HBA that you want to use (7110118, 7110119).
4. Select and download the Linux driver that is supported by the Linux release (Oracle Linux, Red Hat Enterprise Linux, or SUSE Linux Enterprise Server) on your system.
5. Select and download the corresponding Readme file for the Linux driver, and follow the instructions in the Readme file to complete the driver installation.

Firmware Updates

The Linux firmware and boot code update for the HBA, along with any accompanying documentation, are available for download at:

Oracle Downloads

Installing the Windows Server Driver and Firmware

Consult the Oracle hardware platform documentation to determine which Windows releases are supported on your specific host platform. Immediately after HBA installation, you must upgrade the Windows Server 2012 or 2012 R2 driver to `MegaSAS2` version 6.702.04.00 or later.

The Windows Server driver required to run the HBA is available for download at:

Oracle Downloads

To Install the Windows Driver

1. Log in to the host.
2. In a browser, go to Oracle Downloads.
3. Select the type and then model of the HBA that you want to use (7110118, 7110119).
4. Select and download the specific Windows driver that is supported by the Windows release on your system.
5. Select and download the corresponding Readme file for the Windows driver, and follow the instructions in the Readme file to complete the driver installation.

Firmware Updates

The Windows firmware and boot code update for the HBA, along with any accompanying documentation, are available for download at:

Oracle Downloads

Installing the Oracle VM Driver and Firmware

Consult the Oracle hardware platform documentation to determine which Oracle VM releases are supported on your specific host platform.

The driver required to run the HBA with the Oracle VM technology is available for download at the Oracle designated web page at:

Oracle Downloads

To Install the Oracle VM Driver

1. Log in to the host.
2. In a browser, go to Oracle Downloads.
3. Select the type and then model of the HBA that you want to use (7110118, 7110119).
4. Select and download the Oracle VM driver that is supported by the Oracle VM release on your hardware platform.
5. Select and download the corresponding Readme file for the Oracle VM driver, and follow the instructions in the Readme file to complete the driver installation.

Installing the VMware Driver and Firmware

The HBA driver is included as part of the VMware ESXi Server installation. The VMware ESXi Server installation requires no further driver installation for the HBA.

4

Important Information and Known Issues

This section provides supplementary and workaround information for known issues related to the HBA. Specific bug identification numbers are provided for service personnel.

This section contains the following topic:

- From the BIOS Setup Utility, the State of a Drive Is Not Updating
- HBA Product Accessibility
- Diversity and Inclusion

From the BIOS Setup Utility, the State of a Drive Is Not Updating

Bug ID: 17556851

Issue: If your system is set to UEFI Boot Mode, and you access the BIOS Setup Utility to make changes to the state of a physical drive, you might not see the updated state of the drive after exiting from, and returning to, the screen where you originally changed the drive state.

Workaround: This is designed behavior of the BIOS Setup Utility. Per the UEFI specification, screens are not updated when a user performs a single key press in the UEFI BIOS Setup Utility. If you perform an operation in the utility, and you need to see a status update to confirm the operation completed successfully, exit out of the screen to the root level menu. Returning to the screen at the root level enables you to view the updated status of your operation.

HBA Product Accessibility

Oracle strives to make its products, services, and supporting documentation usable and accessible to the disabled community. To that end, products, services, and documentation include features that make the product accessible to users of assistive technology.

For more information about Oracle's commitment to accessibility, go to Oracle's Accessibility Program.

This section contains the following topics:

- HBA Hardware Accessibility
- Oracle ILOM Accessibility
- BIOS Accessibility
- Documentation Accessibility

HBA Hardware Accessibility

Oracle Storage 12 Gb SAS PCIe HBA, External Oracle Storage 12 Gb SAS PCIe HBA, External hardware has color-coded labels, component touch points, and status indicators

(LEDs) that provide information about the system. These labels, touch points, and indicators can be inaccessible features for sight-impaired users. The product's HTML documentation provides context and descriptive text available to assistive technologies to aid in interpreting status and understanding the system.

You can also use the built-in Oracle Integrated Lights Out Manager (ILOM) to obtain information about the system. Oracle ILOM provides a browser-based interface (BUI) and a command-line interface (CLI) that support assistive technologies for real-time viewing of system status, indicator interpretation, and system configuration. For details, see Oracle ILOM Accessibility.

Oracle ILOM Accessibility

You can use the Oracle ILOM BUI to monitor and manage the server hardware. The Oracle ILOM BUI does not require a special accessibility mode; rather, its accessibility features are always available. The BUI was developed using standard HTML and JavaScript and its features conform to accessibility guidelines.

To navigate a BUI page and select items or enter commands, use standard keyboard inputs, such as the Tab key to go to a selection, or the up and down arrow keys to scroll through the page. You can use standard keyboard combinations to make menu selections.

For example, using the Oracle ILOM Open Problems BUI page, you can identify faulted memory modules (DIMMs) or processors (CPUs) that would otherwise be identified by a lighted LED indicator on the motherboard. Likewise, you can use the Oracle ILOM BUI to monitor the hardware power states that are also indicated by flashing LED indicators on the hardware.

The Oracle ILOM CLI is an alternative and equivalent way to access the Oracle ILOM BUI features and functionality. Because the operating systems that run on the Oracle server hardware support assistive technologies to read the content of the screen, you can use the CLI as an equivalent means to access the color-based, mouse-based, and other visual-based utilities that are part of the BUI. For example, you can use a keyboard to enter CLI commands to identify faulted hardware components, check system status, and monitor system health.

You can use the Oracle ILOM Remote Console Plus to access both a text-based serial console and a graphics-based video console that enable you to remotely redirect host server system keyboard, video, mouse, and storage devices. Note, however, that the Oracle ILOM Java Remote Console Plus does not support scaling of the video frame within the Java application. You need to use assistive technology to enlarge or reduce the content in the Java Remote Console Plus display.

As an alternative method to using the BIOS Setup Utility to configure BIOS settings, Oracle ILOM provides a set of configurable properties that can help you manage the BIOS configuration parameters on an Oracle x86 server. Using Oracle ILOM, you can do the following:

- Back up a copy of the BIOS configuration parameters to an XML file using the Oracle ILOM BUI.
- Edit the XML file using a standard XML editor. The BIOS XML tags correlate directly to the BIOS screen labels.
- Restore the XML file of the backed up or edited configuration parameters to BIOS.

The BUI and CLI methods for using Oracle ILOM are described in the accessible HTML documentation for Oracle ILOM at Servers Documentation Systems Management.

BIOS Accessibility

When viewing BIOS output from a terminal using the serial console redirection feature, some terminals do not support function key input. However, BIOS supports the mapping of function keys to Control key sequences when serial redirection is enabled. Descriptions of the function key to Control key sequence mappings are provided in the product documentation, typically within the server Service Manual. You can navigate the BIOS Setup Utility by using either a mouse or keyboard commands.

As an alternative method of configuring BIOS settings using the BIOS Setup Utility screens, Oracle ILOM provides a set of configurable properties that can help you manage the BIOS configuration parameters on an Oracle x86 server. For more information, see Oracle ILOM Accessibility.

BIOS information and its functions are typically documented in the Oracle Storage 12 Gb SAS PCIe HBA, External Service Manual or Installation Guide.

Documentation Accessibility

Documentation for Oracle hardware is provided in HTML and PDF formats. The HTML documents are accessible using standard operating system controls and assistive technology. PDF documents are also provided, but are not an accessible format. PDF documents are considered support documents because the PDF content is available in accessible HTML format.

Product documentation provides figures, other types of images, and screenshots that do not rely on color for interpretation. Within the figures, callouts indicate the referenced component information. The callouts are mapped within a table to provide text descriptions of the referenced parts of the figures. In addition, alternative text is provided for all tables and images that provides the context of the information and images.

Note that screen readers might not always correctly read the code examples in the documentation. The conventions for writing code require that closing braces should appear on an otherwise empty line. However, some screen readers might not always read a line of text that consists solely of a bracket or brace.

The documentation might contain links to web sites of other companies and organizations that Oracle does not own or control. Oracle neither evaluates nor makes any representations regarding the accessibility of these web sites.

You can access the accessible HTML documentation for Oracle Storage 12 Gb SAS PCIe HBA, External products at Oracle Storage 12 Gb SAS PCIe HBA, External Documentation.

Diversity and Inclusion

Oracle is fully committed to diversity and inclusion. Oracle respects and values having a diverse workforce that increases thought leadership and innovation. As part of our initiative to build a more inclusive culture that positively impacts our employees, customers and partners, we are working to remove insensitive terms from our products and documentation. We are also mindful of the necessity to maintain compatibility with our customers' existing technologies, and the need to ensure continuity of service as Oracle's offerings and industry

standards evolve. Because of these technical constraints, our effort to remove insensitive terms is ongoing and will take time and external cooperation.

5

HBA Specifications

The section contains the specifications for the HBA. This section contains the following topics:

- Physical Characteristics
- Environmental Specifications
- Fault Tolerance
- Electrical Characteristics

Physical Characteristics

The HBA card size is as follows:

- Height: 94.31mm (2.731 inches)
- Length: 167.64mm (6.6 inches)

Environmental Specifications

The HBA environmental requirements are listed in the following table.

Table 5-1   HBA Environmental Specifications

Specification	Operating	Non-Operating
Temperature	10 °C to 55 °C, non-condensing	-40 °C to 70 °C, non-condensing
Humidity	20% to 80% RH, non-condensing, 40 °C max, 27 °C max wet bulb, 16 hour dwells at extreme	5% to 90% RH, non-condensing, 38 °C max wet bulb
Altitude	3000m at 40 °C, 4 hour dwell	12,000m at 0 °C, 4 hour dwell
Vibration	0.20G in all axes swept for 5-500 Hz, 5 sweeps in all at 1 octave/min	1.0G in all axes swept for 5-500 Hz, 5 sweeps in all at 1 octave/min
Shock	5G, 11 ms half-sine	30G, 11 ms half-sine
Airflow	At least 200 linear feet per minute (LFPM) to avoid operating the HBA processor above the ambient temperature	At least 200 linear feet per minute (LFPM)

Fault Tolerance

The following table lists the fault tolerance features for the HBA.

Table 5-2   Fault Tolerance Features

Specification	HBA Support
Support for SMART	Yes
Drive failure detection	Automatic
Drive rebuild using hot spares	Automatic
Parity generation and checking	Yes

> **Note:**
>
> The Self Monitoring Analysis and Reporting Technology (SMART) detects up to 70 percent of all predictable drive failures. In addition, SMART monitors the internal performance of all motors, heads, and drive electronics.

Electrical Characteristics

All power is supplied to the HBA through the PCI Express 3.3V rails and the 12V rail. Onboard switching regulator circuitry operating from the 3.3V rails and the 12V rail provide the necessary voltages. The following states determine the typical current consumption of the controller:

- State 1: During a hard reset
- State 2: During a disk stress test
- State 3: While sitting idle at the DOS prompt

The supply voltages are 12V 8 percent (from PCI edge connector only) and 3.3V 9 percent (from PCI edge connector only). The following table lists the power supply information for the controller for each of the three states at the different voltages.

Table 5-3   Power Supply for the HBA

PCI Edge Connector	State 1	State 2	State 3
3.3V supply	330mA	330mA	330mA
+12V supply	1.00A	1.81A	1.53A
3.3V auxiliary supply	30mA	30mA	30mA