Sun Storage 16 Gb Fibre Channel PCIe Host Bus Adapter, Emulex Installation Guide For HBA Model 7101684

Part No: E24462-10
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Contents

Using This Documentation

- **Overview** – Describes how to install and remove the Sun Storage 16 Gb FC PCIe Universal HBA, Emulex
- **Audience** – Technicians, system administrators, and authorized service providers
- **Required knowledge** – Advanced experience troubleshooting and replacing hardware

Product Documentation Library

Documentation and resources for this product and related products are available at http://docs.oracle.com/cd/E24649_01/index.html.

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♦ ♦ ♦ CHAPTER 1

HBA Overview

This chapter provides a basic overview of Oracle's Sun Storage 16 Gb Fibre Channel (FC) Peripheral Component Interconnect Express (PCIe) HBA, which is a low-profile HBA that uses Emulex (now Broadcom) technology. This chapter also describes the various operating systems, host platforms, storage, and infrastructure configurations that support the HBA, and lists the HBA environmental requirements.

This chapter contains the following topics:

Kit Contents

- Sun Storage 16 Gb FC PCIe HBA, Emulex, with a low-profile bracket installed
- Standard PCIe bracket
- *Accessing Documentation* document

HBA Features and Specifications

Oracle's Sun Storage 16 Gb FC PCIe HBA, Emulex (marketing part number 7101684) is a standalone, PCIe low-profile host bus adapter.

The board interfaces an eight-lane PCI Express bus, with eight lanes supporting two Fibre Channel (FC) ports. Each independent FC port operates at 16 Gb/sec and features 16/8/4 autonegotiation.

Table 1, " HBA Features and Specification," on page 10 lists the features and specifications of the universal HBA. For a list of supported operating systems, see Table 2, "Supported Operating System/Technology Versions," on page 11.

TABLE 1 HBA Features and Specification

Feature	Description
PCI connector	x8
PCI signaling environment	PCI Express x8 (8 active lanes)
PCI transfer rate (maximum)	PCI Express Generation Three (8 GT/s) x8
PCIe specification compliance	PCI Express Card Version 3.0 Specification
PCIe hot plug and hot swap functionality	Supported
Number of ports	Two
Number of devices supported	126 devices per FC loop (not supported at 16 Gb); 510 devices in Fabric mode
FC bus type (external)	Fiber-optic media, short-wave laser, multi-mode fiber (400 - M5-SN-S)
FC topologies	Switched fabric (N_Port), arbitrated loop (NL_Port) [FC-AL support for 4G and 8G only; 16G spec does not support FC-AL] and point-to-point (N_Port)
Receive Side Scaling	Supported
MSI-X	Supported
Solaris Dynamic Reconfiguration	Supported
Diagnostic support	Provided by Oracle VTS software
Boot support	For all supported operating systems. For more information about boot support for the universal HBA, see Table 3, "HBA Boot Support," on page 12.
RAM	1.5 MB, parity protected, per port
BIOS ROM	One 32-MB flash ROM, field-programmable
NVRAM	One 32-KB EEPROM
External connectors	■ Sun Storage 16 Gb FC optics, SR, Emulex (part number 7101686)
Small form-factor pluggable (SFP+)	Supporting options with short range, short-wave, and twin-ax cabling
Maximum FC cable length	At 16 Gb/s, up to 125 meters using 50/125 mm core OM4 fiber. Longer lengths are possible at slower data rates.
LED indicators	Two LEDs per channel (yellow and green) on the front panel as status indicators
Maximum power consumption	13.3 watts
Form Factor	Standard low-profile form factor

Operating System and Technology Requirements

The HBA requires the OS and technology levels listed in Table 2, “Supported Operating System/Technology Versions,” on page 11, at minimum.

Note - If you need to contact Oracle Support, first verify that you have a supported OS installed on the host system, and install the latest HBA driver, utility, and firmware versions. Updating the system and HBA to the latest OS, driver, utility, and firmware versions might address the issue, preventing the need to contact Oracle Support about an issue that has already been fixed.

TABLE 2 Supported Operating System/Technology Versions

Operating System/ Technology	Supported Versions (minimum)
Oracle Solaris OS	■ Oracle Solaris 10 1/13 for the x86 (64-bit) platform (+ patches 149168-07 and 149176-11) ■ Oracle Solaris 10 1/13 for the SPARC platform (+ patches 149167-07 and 149175-11) ■ Oracle Solaris 11.1 for the x86 (64-bit) platform (+ SRU 13.4) ■ Oracle Solaris 11.1 for the SPARC platform (+ SRU 13.4) ■ Oracle Solaris 11.2 for the x86 (64-bit) and SPARC platforms ■ Oracle Solaris 11.3 for the x86 (64-bit) and SPARC platforms
Oracle Linux OS	■ Oracle Enterprise Linux 5.9 (Unbreakable Enterprise Kernel (UEK) 2.6.39-400, at minimum) ■ Oracle Enterprise Linux 6.4 (UEK 2.6.39-400, at minimum)
SUSE Linux OS	■ SUSE Linux Enterprise Server (SLES) 10 SP4 ■ SLES 11 SP2
Red Hat Linux OS	■ Red Hat Enterprise Linux (RHEL) 5.89 (64-bit) ■ RHEL 6.4 (64-bit)
Microsoft Windows OS	■ Windows Server 2008 SP2+ (64-bit) ■ Windows Server 2008 R2 including SP1 (64-bit) ■ Windows Server 2012
VMware technology	■ VMware ESX/ESXi 5.1 ■ VMware ESX/ESXi 5.0

Boot Support

FC SAN booting through the HBA is supported, as listed in Table 3, “HBA Boot Support,” on page 12.

TABLE 3 HBA Boot Support

Operating System/Technology	FC SAN Boot Support
Oracle Solaris 10 1/13	Yes
Oracle Solaris 11.1	Yes
Oracle Linux 5.9	No
Oracle Linux 6.4	Yes
Oracle VM 2.3.1	Yes
RHEL 5.9	Yes†
RHEL 6.4	Yes†
SLES 10 U4	Yes†
SLES 11 U2	Yes†
Windows Server 2008 SP2+	Yes†
Windows Server 2008 R2	Yes†
Windows Server 2012	Yes†

†While using the Driver Update disk during the installation process. Driver Update is available at the Oracle support area of the Emulex web site: https://www.broadcom.com/support/download-search/?pg=Storage+Adapters,+Controllers,+and+ICs&pf=Fibre+Channel+Host+Bus+Adapters&pn=&po=Oracle&pa=&dk=

System Interoperability

This section provides information about selected platforms and storage that are compatible with the heterogeneous FC network design of the HBA. This section contains the following topics:

Host Platform Support

The HBA is supported by the platforms listed in the table in this section. For up-to-date information, see your system Product Notes and web pages.

For information about supported OS/technology versions, see Table 2, "Supported Operating System/Technology Versions," on page 11.

TABLE 4 Host Platform Support

Platform	Supported OS/Technology
Oracle's SPARC Servers	
Fujitsu M10-1, M10-4, and M10-4S	Oracle Solaris
Fujitsu M10 PCI Expansion Unit	Oracle Solaris
SPARC T4-1 and T4-2	Oracle Solaris
SPARC T5-2, T5-4, and T5-8	Oracle Solaris
SPARC T7-1, T7-2, and T7-4	Oracle Solaris
SPARC M5-32 and M6-32	Oracle Solaris
SPARC M7-8 and M7-16	Oracle Solaris
SPARC 7-2 and 7-2L	Oracle Solaris
Oracle SuperCluster M6-32	Oracle Solaris
Oracle's x86 Servers	
Sun Server X4-2, X4-2L, X4-4, and X4-8	Oracle Solaris, Windows, Linux, VMware
Oracle Server X5-2, X5-2L, X5-4, and X5-8	Oracle Solaris, Windows, Linux, VMware
Oracle Server X6-2 and X6-2L	Oracle Solaris, Windows, Linux, VMware
Oracle Exalytics In-Memory Machine X4-4 and X5-4	Oracle Solaris, Windows, Linux, VMware
Zero Data Loss Recovery Appliance X4, X5, and X6	Oracle Solaris, Windows, Linux, VMware
Oracle's Telco Servers	
Netra SPARC T4-1	Oracle Solaris
Netra SPARC S7-2	Oracle Solaris
Netra X4270 M3	Oracle Solaris, Windows, Linux, VMware
Netra Server X3-2 and X5-2	Oracle Solaris, Windows, Linux, VMware

Storage Support

This section lists the supported arrays and tape storage that can connect to the HBA through a supported switch (see “Switch Support” on page 15). This section contains the following topics:

Array Support

The HBA supports connecting, through a supported switch, to the following arrays:

- Oracle's Sun Storage 2540 M2
- Oracle's Sun Storage 6140
- Oracle's Sun Storage 6180
- Oracle's Sun Storage 6190
- Oracle's Sun Storage 6540
- Oracle's Sun Storage 6590
- Oracle's StorageTek 6580, 6780 with 8Gb/s FC Host Interface cards

Storage System Support

The HBA supports connecting, through a supported switch, to the following storage systems:

- Oracle's Pillar Axiom 600 storage system
- Oracle's StorageTek 9980, 9985, 9885V storage system
- Oracle's StorageTek 9990, 990V storage system

Tape Storage Support

The HBA supports connecting, through a supported switch, to the following tape storage:

- Oracle's StorageTek SL24 Tape Autoloader
- Oracle's StorageTek SL48 Tape Library
- Oracle's StorageTek SL500 Modular Library
- Oracle's StorageTek L1400 Tape Library
- Oracle's StorageTek SL3000 Modular Library
- Oracle's StorageTek SL8500 Modular Library
- Oracle's StorageTek Virtual Tape Library: VTL Value and VTL Value Plus
- Oracle's StorageTek T10000B, T10000C
- Oracle's StorageTek 9840C tape drive
- Oracle's StorageTek 9940B tape drive
- Oracle's StorageTek 9840D tape drive

- IBM LTO4
- IBM LTO5

Unified Storage

The HBA supports connecting, through a supported switch, to the following unified storage:

- Oracle's Sun Storage 7110, 7210, 7310, 7410 System (Target mode only)
- Oracle's Sun ZFS Storage 7120, 7320, 7420, 7720 System

Switch Support

Note - For technical support issues with any switches, refer to the product documentation or contact the switch manufacturer.

The HBA supports connecting to any 16 Gb/s Fibre Channel (FC) switch from any vendor that follows standard FC specifications, and follows 10GbE NIC/FCoE specifications, with the following considerations:

- Direct Access Storage for FC is supported with COMSTAR.
- FC-AL is not supported at 16 Gb/s or faster.

Note - This documentation lists switches that are specifically *not* supported by the HBA, when applicable.

Note - The HBA has been verified to function with Cisco 5*xxx* switches; however, Oracle Services does not support customers with questions or issues about these switches. Direct all inquiries about the use of Cisco 5*xxx* switches to Cisco Systems.

Environmental Requirements

The HBA environmental requirements are listed in Table 5, “ HBA Environmental Requirements ,” on page 16.

TABLE 5 HBA Environmental Requirements

Specification	Operating	Non-Operating
Temperature	0˚ to 55˚C, non-condensing	-20˚C to 85˚C, non-condensing
Relative Humidity (RH)	10% to 90% RH, non-condensing, 22˚C max wet bulb	5% to 95% RH, non-condensing, 22˚C max wet bulb
Altitude	3200 m	12,200 m
Vibration	0.25 g in all axes, 5-500 Hz sine	1.2 g in all axes, 5-500 Hz sine
Shock	5.5 g, 11 ms half-sine	33 g, 11 ms half-sine

♦ ♦ ♦ CHAPTER 2

HBA Installation, Configuration, and Removal

This chapter describes how to install, configure, and remove the HBA. For detailed instructions, refer to your system documentation.

This chapter contains the following topics:

Observing ESD and Handling Precautions

Caution - Damage to the HBA can occur as the result of improper handling or electrostatic discharge (ESD). Always handle the HBA with care to avoid damage to electrostatically 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.
- Hold the HBA by the edge of the printed circuit board (PCB), not by the connectors or heatsink.

- Place the HBA on a properly grounded antistatic work surface pad when it is out of its protective antistatic bag.

Best Practices For HBA Installation

Before installing the HBA into the system, review the best practices in this section to avoid potential issues:

General Best Practices

Follow these general best practices for installing and configuring the HBA:

- Spread the I/O load amongst multiple HBAs and multiple ports to avoid bottlenecks and promote higher availability.
- Use fixed link speeds instead of auto-negotiation wherever possible. While the HBA supports auto-negotiation, auto-negotiation slows things down in the event of a fabric rebuild.
- Do not configure both tape devices and disks on the same HBA port, even if using a switch and zoning.
- If more than one of a given HBA model is present in the configuration, enable only the OpROM for the first HBA seen in the boot sequence. There is a limited amount of space for OpROMs, so do *not* unnecessarily enable all OpROMs, as space usage issues might occur.
- When installing the HBA, be sure to also install the latest version (version 11.1.218.x or newer) of the command-line utility available from the manufacturer's website (See "To Upgrade Firmware Using the OneCommand Manager CLI" on page 33). Keep the HBA utilities, firmware, and drivers up-to-date, and update them in that order.
- After installing the OneCommand Manager CLI utility, ensure that the `elxhbamgrd` daemon process is running (The OneCommand Manager utility starts this daemon process, by default, upon installation.). In the event of a failure, the `elxhbamgrd` daemon produces a usable firmware dump for troubleshooting. The location of dump files varies, based on your operating system:
  - Windows: *OneCommandManager-installation-directory*`\Util\Dump`
  - Oracle Solaris: `/opt/ELXocm/Dump`

- Linux: `/var/log/emulex/ocmanager/Dump`

Firmware dumps are written to Flash memory on the HBA, and the files reside there until you manually extract and clear the files to produce room for new firmware dumps. A firmware dump cannot be overwritten in Flash. With the OneCommand Manager utility installed and running, if a failure occurs on the HBA, the utility captures and collects firmware dumps during boot up, and then automatically clears the Flash memory on the HBA. However, if the failure case does *not* capture the dump file, or the OnceCommand Manager utility is *not* running, you can manually run the OneCommand Manager utility in order to collect and capture the dump file.

Best Practices For Switches and Zoning

Follow these best practices for switches and zoning in your environment:

- FC-SW configurations: check with the switch manufacturer for optimal configuration recommendations, including zoning.
- Note that FC-AL is not supported at 16Gb/s or faster. Use FC-P2P instead.
- Use single initiator hard zoning to do the following:
  - Avoid Registered State Change Notification (RSCN) storms.
  - Shield devices from indiscriminate SCSI inquiries.
  - Provide security by avoiding inappropriate access.
- Use meaningful names for zones, and document the entire configuration.
- Use only FCP-2 (also called FC-TAPE or FCP Error Recovery) with tape and/or sequential devices. While FCP-2 might not cause problems for hard disk drives (HDDs), FCP-2 is a sequence-level error recovery mechanism that is irrelevant to HDDs.
- If using FC tape backups, place tape ports and backup servers on the same FC switch to avoid tying up inter-switch links (ISLs).
- SAN switches can be a major source of disruption if you do not take extreme care with respect to configuration. Do not perform updates to switch OSes and/or firmware, or enable new features on SAN switches, until you have first tried the updated switches in a test configuration. The HBA might not support newer switch features, and switch OS and/or firmware updates might require changes to, and/or restoration of, switch configuration settings.

Best Practices For Booting From SAN (BFS) Configurations

If you plan to install a Boot From SAN (BFS) HBA, follow these best practices:

- Some devices and operating systems do not yet support UEFI-based BIOS and can boot only from the Legacy BIOS boot mode. However, many servers with UEFI firmware allow you to enable a legacy BIOS compatibility mode.
- Legacy BIOS issues - many tweaks and patches have been added over the years to resolve various issues, and not all were done with the larger ecosystem (many different types of servers, HBAs, OSes, and so on) in mind.
- Secure Boot (a UEFI-specific feature) can help you control the boot process, preventing unauthorized code from running.
- Larger devices (>2TB) require the use of a GUID Partition Table (GPT) instead of a Master Boot Record (MBR). GPT is the standard for EFI; it can be implemented in legacy BIOSes, but it is more difficult to set up. So, while you might be able to boot from a >2TB device in the legacy BIOS, it might not be seamless. If you are dual-booting with an OS that is already installed in one mode or the other, however, it is good practice to boot in the same boot mode as the one that is already in use.
- Disable OpROM and BIOS for all HBA cards except the one connected to the boot device.
- When installing a Boot From SAN (BFS) HBA, configure a single connection to a single SAN target/LUN, install the boot OS, and get that working before installing other HBAs and storage. If the configuration is complex, finding the root cause for any BFS issues becomes far more complicated.
- Once BFS is installed and working, make sure the HBA driver and firmware are at the latest revision levels. If required, configure a multipath connection, and perhaps one or more alternate boot LUNs.

Best Practices For Testing the Environment

Test the storage environment by doing the following:

- Boot the OS on the host server, and then disable the primary path to the SAN boot device to validate the multipath connection.
- Physically pull the cable from the system.
- Intentionally disrupt zoning at the FC switch that you plan to attach to the HBA.
- If you have installed any alternate boot LUNs, try to boot from those (after disrupting the primary connection(s)).
- Make sure the boot LUN is set as the first boot device in the system BIOS/UEFI settings.

Installing the Hardware

The hardware installation process involves the following general steps, described in this section:

▼ To Install the HBA

The HBA is shipped with two mounting brackets: a pre-installed, low-profile PCIe mounting bracket, and a standard bracket, included in the box with the HBA. The low-profile mounting bracket is shorter than the standard bracket; approximately 3.11 in. (7.9 cm) compared to 4.75 in. (12.06 cm). If you need to change the bracket to install the HBA, you must first remove the optical transceivers from their housing. See "To Replace the Low-Profile Bracket With a Standard Bracket" on page 22. This procedure covers how to install the HBA with the low-profile mounting bracket installed.

1. **Attach an ESD strap to your wrist, as described in "Observing ESD and Handling Precautions" on page 17.**

2. **Perform the following actions, as necessary for your system:**

   - Determine an appropriate PCIe slot in which to install the HBA.
   - Power down the system.
   - Disconnect power from the system.
   - Remove the necessary covers and bezels from the system.

   For detailed instructions on how to perform these actions, refer to your system documentation.

3. **Rotate the PCI hold-down bracket (located on the edge of the chassis) 90 degrees so that the chassis edge can accept the HBA.**

4. **If required by your system, loosen the screw that holds the bracket to the chassis.**

5. **Line up the HBA with the PCIe connector on the rear of the motherboard.**

6. **Insert the HBA into the connector so it is fully seated.**

7. **Rotate the PCI hold-down bracket to the closed position and secure the screw on the bracket.**

8. **Perform the following actions, as necessary for your system:**

   - Replace the necessary covers and bezels onto the system.
   - Reinstall the server chassis in the rack.

For detailed instructions on how to perform these actions, refer to your system documentation.

The HBA is now installed and ready for optical or copper cable attachment.

▼ To Replace the Low-Profile Bracket With a Standard Bracket

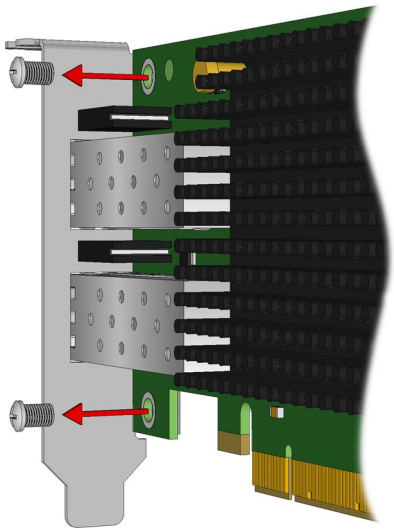
You do not need to perform this procedure if you plan to use the low-profile bracket that comes installed with the HBA. Instead, skip to "Connecting the Copper Cables" on page 23.

A standard bracket is included in the ship kit with the HBA. This procedure describes how to install that standard bracket onto the HBA, if you need to do so.

1. **Observing ESD precautions, store the transceiver in an ESD-safe place.**

2. **Remove the mounting bracket screws from the top of the HBA.**

   The following figure shows the screws that you need to remove from the bracket.



3. **Remove the low-profile bracket and store it for future use.**

Caution - Be careful not to push the bracket past the grounding tabs of the transceiver housing. Ensure the light emitting diodes (LEDs) are properly aligned with the holes in the bracket.

4. **Re-install the screws that attach the HBA to the bracket.**

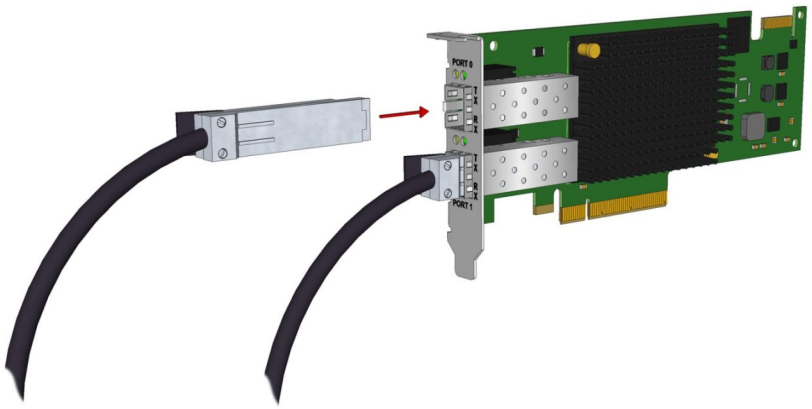
Connecting the Copper Cables

You can connect copper cables to the HBA. This section contains the following topic:

▼ To Connect Copper Cables

Use any SFP+ direct attach twin-ax copper cables to attach devices to the HBA.

1. **Insert one end of the copper cables into the empty SFP+ cages on the HBA.**
   Ensure that the cables are fully inserted and secured.
   The following figure shows how to connect the HBA with a copper cable.



2. **After the copper cables are connected to the HBA, insert the other end of the cables into the empty SFP+ cages on FC devices.**

Note - Link Aggregation Control Protocol (LACP) cannot be used on the same port as iSCSI.

Powering on the System

This section provides basic instructions on how to apply power to the system. For detailed instructions, see your system documentation.

▼ To Apply Power to the Server

1. **Verify that the HBA is securely installed in the system.**
   For more information, see "Installing the Hardware" on page 20.
2. **Verify that the correct optical or copper cable is attached to the HBA and to the FC device.**
3. **Power on the system, as described in your system documentation.**
4. **Observe the light-emitting diode (LED) status for Power On Self Test (POST) results, as described in "Viewing LEDs" on page 24.**

Viewing LEDs

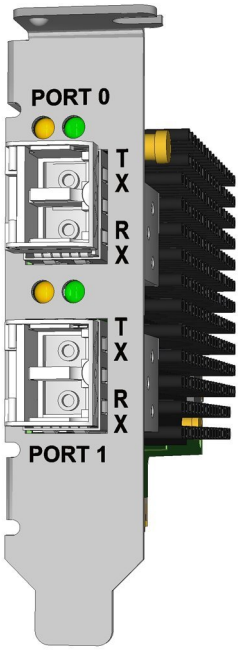
You can view green and yellow LEDs through openings in the mounting bracket of the HBA. Each port has a corresponding set of green and yellow LEDs. See Figure 1, "Optical HBA LED Indicators," on page 25. The green LED indicates firmware operation and the yellow LED indicates port activity or link speed.

This section describes how to interpret LED indicator combinations and power-on self test (POST) results. The section contains the following topics:

LED Indicator Combinations

Figure 1, “Optical HBA LED Indicators,” on page 25 shows the LED indicators on the HBA.

FIGURE 1 Optical HBA LED Indicators



Each port has a corresponding set of LEDs that provide a visual indication of the operating state.

Table 6, “FC Mode LED Status ,” on page 25 summarizes the LED indicator combinations, and their meanings, for the HBA. Refer to Figure 1, “Optical HBA LED Indicators,” on page 25 to determine the location of the LEDs.

TABLE 6 FC Mode LED Status

Green LED	Yellow LED	State
Off	Off	Boot failure (Dead board)

Green LED	Yellow LED	State
Off	On	POST failure (Dead board)
Off	Slow Blink	Boot failure after POST
Off	Fast Blink	Not Defined
Off	Flashing	POST processing in progress
On	Off	Failure in Common Code Module
On	On	Failure in Common Code Module
On	1 Fast Blink	Normal (Link up at 2 GFC) (legacy compatibility only)
On	2 Fast Blinks	Normal (Link up at 4 GFC)
On	3 Fast Blinks	Normal (Link up at 8 GFC)
On	4 Fast Blinks	Normal (Link up at 16 GFC)
On	Flashing	Not defined
Slow Blink	Off	Normal link down
Slow Blink	On	Not defined
Slow Blink	Slow Blink	Not defined
Slow Blink	Fast Blink	Not defined
Slow Blink	Flashing	Not defined
Fast Blink	Off	Not defined
Fast Blink	On	Not defined
Fast Blink	Slow Blink	Not defined
Fast Blink	Fast Blink	Beaconing
Fast Blink	Flashing	Not defined

Note - For the link rate conditions, there is a 1 second pause when the LED is off between each group of fast blinks (2, 3, or 4). Observe the LED sequence for several seconds to be sure you have correctly identified the pattern.

POST Results

Power-On Self Test (POST) is the default mode of self-test for the Sun Storage 16 Gb FC PCIe HBA. No jumpers or connectors are necessary for this test to run. These tests perform a quick confidence level check of the HBA before running the operational software.

At a minimum, the following tests are performed by POST:

- Flash boot image checksum test
- Internal ASIC RAM tests for proper ECC and parity operation

- NL Port loopback test

Removing the Hardware

The following procedure describes how to remove the HBA, if you need to do so for any reason. For detailed removal instructions, refer to your system documentation.

The hardware removal process involves these general steps:

1. Halt the operating system and remove power from the system.
2. Remove the HBA from the system.

▼ To Remove the HBA

1. **Attach an ESD strap to your wrist.**

   Refer to "Observing ESD and Handling Precautions" on page 17.

2. **Perform the following actions, based on your system:**

   - **Power down the system.**
   - **Disconnect power from the system.**

     If your system documentation states that hot-plug removal is supported for this HBA slot, and Emulex OneCommandManager is in use, you must first stop the OneCommandManager process prior to attempting hot-plug removal. If you do not stop the OneCommandManager process first, the hot-plug removal might fail, or a system panic might occur. To stop the OneCommandManager process, issue the `stop_ocmanager` command, which is located in this installation directory:

     - **Oracle Solaris - `/opt/ELXocm`**
     - **Linux - `/usr/sbin/ocmanager`**

3. **Disconnect all cables.**
4. **Remove the necessary covers and bezels from your system, as described in your system documentation.**

5. **Remove the HBA mounting bracket from the system by unscrewing the mounting bracket screw or removing the clip, whichever is being used.**

   You can now remove the HBA.

♦ ♦ ♦ CHAPTER 3

Software Installation

After you have completed the HBA hardware installation and powered on the system, follow the instructions in this chapter to install any HBA utilities, firmware, and operating system-specific drivers, in that order, that might be 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:

Utilities for Upgrading the BIOS and Firmware

Use the OneCommand Manager command-line interface (CLI) or the OneCommand Manager graphical user interface (GUI) to update the BIOS and firmware for the HBA. These utilities provide support for the following functions:

- Discover local and remote hosts, HBAs, targets, and LUNs.
- Reset HBAs.
- Set HBA driver parameters.
- Update firmware.
- Enable or disable the system BIOS.
- Run diagnostic tests on HBAs.
- Manage out-of-band HBAs.

- Manage local and in-band remote HBAs.

For more information about the `HBAnyware` and `OneCommandManager` utilities, download their user manuals from the Emulex (Broadcom) support site for Oracle at: `https://www.broadcom.com/support/oem/oracle-fc/`.

▼ To Install Utilities for Updating the BIOS or Firmware:

1. **Go to the Emulex (now Broadcom) support site for Oracle at:**

   `https://www.broadcom.com/support/oem/oracle-fc/`

2. **Click the type of HBA, and then click the model number of the HBA for which you want to install utility software.**

3. **In the Utilities section, click the utility for the OS that you want, and download the utility to a local file system.**

4. **Install the utility as described in the Emulex documentation, located on the Emulex (Broadcom) web site.**

Upgrading Firmware

This section provides basic instructions on how to update HBA firmware using the OneCommand Manager graphical user interface (GUI) and command-line interface (CLI). For detailed information, see the Emulex OneCommand Manager application documentation, located at the Oracle support area of the Emulex web site: `https://www.broadcom.com/support/download-search/?pg=Storage+Adapters,+Controllers,+and+ICs&pf=Fibre+Channel+Host+Bus+Adapters&pn=&po=Oracle&pa=&dk=`

If the HBA is in the CNA operating protocol mode and is installed in a system running the Oracle Linux UEK or Oracle VM operating systems, you must use the `elxflash` toolkit to update firmware. This toolkit and instructions are available at the Oracle support area of the Emulex web site: `https://www.broadcom.com/support/oem/oracle-fc/`

If the HBA is in a configuration that allows multiple virtual functions, note that firmware can only be upgraded in the primary function domain. Any attempt to do so in a virtual function domain might cause the system to hang.

This section contains the following topics:

▼ To Upgrade Firmware Using the OneCommand Manager GUI

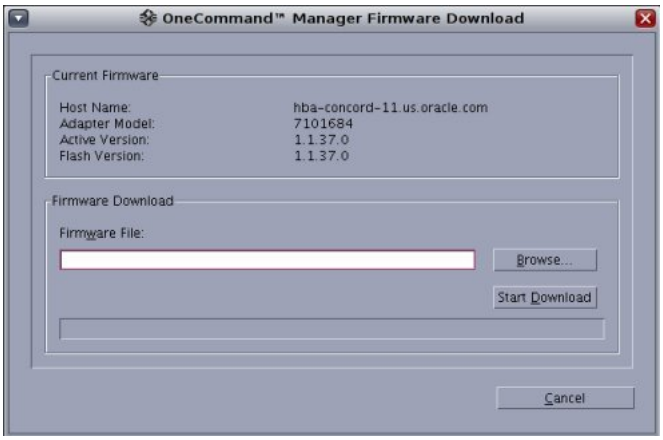
From the Maintenance or Firmware tab of the OneCommand Manager GUI, you can update firmware on local and remote HBAs.

Before You Begin Before performing this procedure, ensure the following is true:

- The HBA driver is installed, as described earlier in this chapter.
- The OneCommand Manager application is installed and the application is NOT running in read-only mode.
- The HBA firmware zip file is downloaded from the Oracle support area of the Emulex web site, unzipped, and extracted to a folder on a local drive.
- If the HBA is already connected to a boot device, the system is in a state in which this type of maintenance can be performed:
  - I/O activity on the bus is stopped.
  - Cluster software, or any other software that relies on the HBA to be available, is stopped or paused.

1. **From the OneCommand Manager GUI, select Host or Fabric view.**
2. **In the discovery-tree, select the HBA for which you want to upgrade firmware.**
3. **Select the Maintenance or Firmware tab and click Download Firmware.**
4. **If the warning screen appears, click Yes.**

The Firmware Download dialog box is displayed.



5. **From the Firmware Download dialog box, navigate to the unzipped, extracted firmware file you want to use for the upgrade.**

   You can navigate to the firmware image by clicking Browse or by typing the path to the file in the Firmware File field in the dialog box.

6. **After you have found the file and it is populated in the Firmware File field, click Start Download.**

   A warning dialog box is displayed.

7. **On the warning dialog box, click Yes.**

   A status bar shows the progress of the download, and the HBA in the discovery tree is displayed in black text when the update is complete.

Note - If the HBA is offline, the HBA is displayed in red text in the discovery tree.

8. **Click Close.**

   The Firmware tab displays the upgraded firmware information for the selected HBA.

Note - If the state of the boot code on the board has changed, this change is reflected immediately on the Port Information tab.

▼ To Upgrade Firmware Using the OneCommand Manager CLI

This section describes how to update firmware using the OneCommand Manager noninteractive and interactive command-line interface (CLI). Before performing this procedure, ensure the prerequisites are met, as described in "To Upgrade Firmware Using the OneCommand Manager GUI" on page 31.

- **Do one of the following:**

  - **From the noninteractive OneCommand Manager CLI, type the following command:**

    hbacmd Download <the-WWPN-of-the-HBA> <full-path-and-name-of-firmware-file>

  - **From the interactive OneCommand Manager CLI (for the Oracle Solaris OS), follow these steps:**

    a. **Navigate to the directory containing the emlxadm file (path: /opt/EMLXemlxu/bin), and run the emlxadm utility.**

    For example:

    root@<host-name>**:/opt/EMLXemlxu/bin# ./emlxadm**

    The available HBAs are listed.

    b. **Select the HBA you want to upgrade (you need to do this only once per device).**

```
EMLXADM Device Management Utility, Version: 1.08.4.0
Copyright (c) 2004-2012 Emulex. All rights reserved.

Available Emulex HBA's:

1. SFS:emlxs0 : /devices/pci@78,0/pci8086,3c04@2/pci10df,e20e@0/fp@0,0
 (CONNECTED)
2. SFS:emlxs1 : /devices/pci@78,0/pci8086,3c04@2/pci10df,e20e@0, 1/fp@0,0
 (CONNECTED)
3. SFS: emlxs10 : /devices/pci@78,0/pci8086,3c0a@3,2/pci10df,e20e@0/fp@0,0
 (CONNECTED)

Enter an HBA number or zero to exit: 1
```

    c. **Upgrade the firmware on the selected HBA by issuing the following command:**

```
emlxadm> download_fw <full-path-and-name-of-firmware-file>
```

d. **At the prompt, type `y` to confirm you want to upgrade the firmware.**
   A message is displayed upon completion of the upgrade.

```
Download may take several minutes. Do not interrupt.
Downloading...
Done.
```

e. **Type `q` to quit, or type `hba` to select a different HBA to update.**

f. **After you have updated all HBAs, type `q` to quit the `emlxadm` utility, and perform a full power reboot of the system.**

Installing Diagnostic Software

This section contains the following topics:

Diagnostic Support for the Oracle Solaris OS

In an Oracle Solaris OS environment, diagnostic support for the HBA is included in the Oracle VTS software. Oracle VTS software is available for download at: `https://support.oracle.com/`

For information about the Oracle VTS software, see the Oracle VTS documentation at: `http://docs.oracle.com/cd/E19719-01/index.html`

For information about diagnostic options using the OneCommand Manager utilities, see "Diagnostic Support for All Other Supported Operating Systems" on page 35.

The `emlxtest` utility, which is part of the Oracle VTS software, supports the following functions:

- Connectivity verification

- Firmware version and checksum test
- Self-test
- Loopback tests
  - External (all HBAs (in FC mode only) present in the system)
  - Internal, single-bit
  - Internal, 10-bit
  - Mailbox

Diagnostic Support for All Other Supported Operating Systems

Diagnostic support for the HBA with all supported operating systems other than the Oracle Solaris OS is available through version 11.1.218.x, or newer, of the OneCommand Manager application graphical user interface (GUI) or the OneCommand Manager application command-line interface (CLI) application. These applications support the following functions:

- Production of useful firmware dump information, in the unlikely event of a failure (from the OneCommand Manager CLI only)
- Discovery of local and remote hosts, HBAs, targets, and LUNs
- Ability to reset HBAs
- HBA driver parameters setup
- Firmware updates
- Ability to enable or disable the system BIOS
- Diagnostic tests on HBAs
- Management of out-of-band HBAs
- Management of local and in-band remote HBAs

For detailed information about performing any of these functions through the OneCommand Manager applications, see the Emulex OneCommand Manager application documentation, located at the Oracle support area of the Emulex web site: https://www.broadcom.com/support/download-search/?pg=Storage+Adapters,+Controllers,+and+ICs&pf=Fibre+Channel+Host+Bus+Adapters&pn=&po=Oracle&pa=&dk=

▼ To Install Diagnostic Support Utilities for a Supported OS Other Than the Oracle Solaris OS:

1. **Go to the Emulex (now Broadcom) support site for Oracle at:**

https://www.broadcom.com/support/oem/oracle-fc/

2. **Click the type of HBA, and then click the model number of the HBA for which you want to install diagnostic software.**
3. **In the Utilities section, click the diagnostic support utility for the OS that you want, and download the diagnostic utility to a local file system.**
4. **Install the diagnostic utility as described in the Emulex documentation, located on the Emulex (Broadcom) web site.**

Using the OneCommand Manager CLI for Troubleshooting a Fatal Error

In the event of a failure, the OneCommand Manager application command-line interface (CLI) produces a usable firmware (FW) dump that you can send to Emulex (now Broadcom) for troubleshooting. The default location of the firmware dump varies by operating system:

- Windows – `/Util/Dump` subdirectory of the OneCommand Manager installation directory
- Oracle Solaris – `/opt/ELXocm/Dump`
- Linux – `/var/log/emulex/ocmanager/Dump`

About Automatic Firmware Dumps

This section lists the requirements for producing automatic firmware dumps, and provides general information about the OneCommand Manager CLI firmware dumps.

Requirements:

- OneCommand Manager application command-line interface, version 11.1.218.x, or newer
- `elxhbamgrd` process must be running in the background (The ECD installer or system boot starts the process, by default.)

General Information:

- Firmware dumps are written to Flash memory on HBA.
- Firmware dumps reside in the dump directory until you manually extract and clear the firmware dumps.
- A firmware dump cannot be overwritten in Flash.
- You must extract and clear firmware dumps from the HBA Flash in order to make room for new firmware dump files.

Dump Collection if the OneCommand Manager application command-line interface (CLI) is Installed:

- During boot up, the OneCommand Manager CLI clears the flash region upon successful dump capture.
- If the failure occurs on the HBA, and the OneCommand Manager CLI is already installed, the OneCommand Manager CLI captures collect firmware dumps and automatically clears the flash region.
- If the failure case did not capture the dump file, or if the OneCommand Manager CLI is not running, you can manually run the OneCommand Manager CLI to collect the dump file.

Installing Drivers

This section contains the following topics:

Installing Drivers for the Oracle Solaris OS

Before using the HBA, update the HBA driver software for the Oracle Solaris OS with the following SRU version or patches, at minimum:

- Oracle Solaris 11.1 OS for the SPARC and x86 platforms - SRU 13.4
- Oracle Solaris 10 1/13 OS for the SPARC platform - Patches 149167-07 and 149175-11
- Oracle Solaris 10 1/13 OS for the x86 platform - Patches 149168-07 and 149176-11

The latest available SRU versions and patches are located at: `http://support.oracle.com/`

Before downloading any SRUs, install the utilities and then the firmware, in that order, for the HBA. You can then download and install the latest SRUs from this web site: `https://support.oracle.com`.

Installing Drivers for All Other Supported Operating Systems

If drivers for specific operating systems are required by the HBA, the drivers will be available for download at the Emulex (now Broadcom) support site for Oracle. Before installing

any drivers, install the utilities and then the firmware, in that order, for the HBA. For more information about installing utilities and firmware, see "To Install Utilities for Updating the BIOS or Firmware:" on page 30.

1. **After installing the utilities and the latest firmware for the HBA, go to the Emulex (now Broadcom) support site for Oracle at:**

   `https://www.broadcom.com/support/oem/oracle-fc/`

2. **Click the type of HBA, and then click the model number of the HBA for which you want to install a driver.**

3. **In the Driver section, click the OS driver that you want, and download the driver files to a local file system.**

4. **Install the driver for OS, as described in the Emulex documentation, located on the Emulex web site.**

SR-IOV/FC-IOR Support

Support for Solaris SR-IOV and FC-IOR is available with this HBA, subject to the following limitations.

TABLE 7 SR-IOV and FC-IOR Support Limitations

Use	Non-SR-IOV Mode	SR-IOV with a SPARC Server Running Oracle Solaris 11 OS	SR-IOV with a SPARC Server Running Oracle S OS
FC 16 Gb/s	Supported	Supported	T5: Supported, see next section M-Series: Limited to VF support in guest domai
FCoE 10 Gb/s	Supported	Not Supported	Not Supported
NIC 10 Gb/s	Supported	Not Supported	Not Supported

Running Oracle Solaris 10 in an SR-IOV root or I/O domain is an unsupported configuration. To adjust the configuration so that it is supported, do the following:

- If running Oracle Solaris 10 in an SR-IOV root domain, update the root domain to the latest Oracle Solaris 11 release. Otherwise, move the SR-IOV physical function to an Oracle Solaris 11 domain to bring the root domain into compliance for support.
- If running Oracle Solaris 10 in an SR-IOV I/O domain, update the I/O domain the the latest Oracle Solaris 11 release. If this is not possible, switch the SR-IOV I/O devices to virtual

I/O devices. Making either of these changes brings the configuration into compliance for support.

Direct any questions about Solaris SR-IOV/FC-IOR functionality to your Oracle Solaris Support Representative.

♦ ♦ ♦ CHAPTER 4

Known Issues

This chapter provides supplementary and workaround information about the HBA. Specific bug identification numbers are provided for service personnel.

This chapter contains the following topics:

Link Aggregation Control Protocol (LACP) Cannot Be Used In Certain Conditions

Bug 18707752

Conditions:

- System Platform: All supported systems using the Oracle Solaris driver
- Environment: HBA connected directly to supported storage

Issue:

LACP cannot be used on the same port as iSCSI.

Workaround:

None.

SAN Boot Fails Via Direct Attached Storage on Oracle SPARC Systems

Bug 15809064

Conditions:

- System Platform: Oracle SPARC systems
- Environment: HBA connected directly to supported storage
- Boot Method: SAN boot via the HBA

Issue:

When the HBA is in an Oracle SPARC Enterprise T4-1 or T4-2 system, and a direct connection is made with a fiber-optic cable from the HBA to a storage device, the system might not detect any bootable volume on that storage device. When you attempt to boot using the storage device, an error message is displayed.

```
ERROR: boot-read fail
```

Workaround:

Do not boot from a bootable volume on a storage device if that storage device is directly connected to the HBA. Instead, if you want to boot using the storage attached to the HBA, use a SAN topology that includes one or more FC switches connected in the path between the HBA and the target storage device.

You can use a direct connection to storage as long as the system is booting the Oracle Solaris operating system from a boot device that is not connected directly to the HBA.

Glossary

A

ASIC application-specific integrated circuit

B

BIOS Basic Input Output System

C

CENELEC European Committee for Electrotechnical Standardization

CLI command line interface

CNA converged network adapter

D

DAC direct-attach copper

DAS direct-attached storage

DCR direct connecting receptacle

DHHS Department of Health and Human Services

E

ECC Error Checking and Correction

EE Enhanced Ethernet

EEPROM electrically erasable programmable read-only memory

ESD electrostatic discharge

F

FC Fibre Channel

FCoE Fibre Channel over Ethernet

G

Gb gigabit

GbE gigabit Ethernet

GUI graphical user interface

H

HBA host bus adapter

I

IEEE Institute of Electrical and Electronics Engineers

IP internet protocol

iSCSI internet Small Computer System Interface

L

LED light emitting diode

LP low-profile

LUN logical unit number

M

MAC media access control

MSI-X message signaled interrupts - extended

N

NIC networking interface card

O

OFC optical fiber cable

OS operating system

P

PCI Peripheral Component Interconnect

PCIe Peripheral Component Interconnect Express

POST power-on self test

R

RAM random access memory

RH relative humidity

RoHS Restriction of Hazardous Substances Directive

S

SAN storage area network

SFP+ enhanced small form factor pluggable transceiver

SR short range

SW short wave

T

TOR top of rack

U

UCNA universal converged network adapter

V

VLAN virtual local area network

W

WWN world wide name

WWPN world wide port name