



LPe16000 Series HBA Installation Manual

EMULEX CONFIDENTIAL. Copyright © 2011 Emulex. All rights reserved worldwide. Unpublished work. No part of this document may be reproduced by any means or translated to any electronic medium without (a) the prior written consent of Emulex, and (b) the preservation of this notice on all copies and partial copies. Copying, access, use or distribution requires an applicable written agreement approved by Emulex.

Information furnished by Emulex is believed to be accurate and reliable. However, no responsibility is assumed by Emulex for its use; or for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent, copyright, trade secret or related rights of Emulex.

Emulex, the Emulex logo, AutoPilot Installer, AutoPilot Manager, BlockGuard, Connectivity Continuum, Convergenomics, Emulex Connect, Emulex Secure, EZPilot, FibreSpy, HBAnyware, InSpeed, LightPulse, MultiPulse, OneCommand, OneConnect, One Network. One Company., SBOD, SLI, and VEngine are trademarks of Emulex. All other brand or product names referenced herein are trademarks or registered trademarks of their respective companies or organizations.

Emulex provides this documentation "as is" without any warranty of any kind, either expressed or implied, including but not limited to the implied warranties of merchantability or fitness for a particular purpose. Emulex may make improvements and changes to the product described in this manual at any time and without any notice. Emulex assumes no responsibility for its use, nor for any infringements of patents or other rights of third parties that may result. Periodic changes are made to information contained herein; although these changes will be incorporated into new editions of this documentation, Emulex disclaims any undertaking to give notice of such changes.

US patent notice is given for one or more of the following: 6226680, 6247060, 6334153, 6389479, 6393487, 6427171, 6427173, 6434620, 6591302, 6658480, 6697868, 6751665, 6757746, 6941386, 6965941, 6687758, 7042898, 7133940, 7124205, 7089326, 6938092, 6996070.

Emulex, 3333 Susan Street
Costa Mesa, CA 92626

Table of Contents

List of Figures	4
List of Tables	5
1.Introduction	6
Overview	6
Major Features	6
Compatibility	7
Prerequisites.....	7
HBA Identification	7
2.Installation	8
Preparing the HBA for Installation	8
Installing the Adapter	11
Attaching Media	11
Applying Power.....	13
Viewing the LEDs.....	13
POST Conditions and Results	14
3.References	16
LPe16000/16002 HBA Specifications	16
FCC and Regulatory Notices	18
Declaration of Conformity	19
Laser Safety Notice	20
Certification and Classification	21
Labeling Requirements.....	21
Product Information	22
Small Form Factor Pluggable Transceiver	22
Usage Restrictions	22
System Level Certification	23
Abbreviations	24

List of Figures

Figure 2-1 Typical Optical Transceiver 9

Figure 2-2 Releasing the Latch on an Optical Transceiver..... 9

Figure 2-3 Removing an Optical Transceiver.....10

Figure 2-4 Removing the Bracket10

Figure 2-5 Installing an Optical Transceiver12

Figure 2-6 Connecting a Fiber Optic Cable.....13

Figure 2-7 Optical HBA LED Indicators14

List of Tables

Table 2-1 Media Specifications11

Table 2-2 POST Conditions and Results15

Table 3-1 LPe160000 Series HBA Specifications16

1. Introduction

Overview

This manual describes the Emulex® LPe16000 and the LPe16002, 16 gigabit per second (Gb/s) Fibre Channel (FC) to Peripheral Component Interconnect Express (PCIe) host bus adapters (HBAs).

The core technology of these HBAs is Emulex's 10th generation FC controller. The controller is a multi-function PCIe Gen2 interface controller that is compliant to the PCI Express Base Specification Rev 2.0 and PCI Express CEM Specification Rev 2.0. This product is targeted at FC storage networking environments that require the highest degrees of robustness, performance and ease of management. The LPe16000 is a single-channel adapter. The LPe16002 is a dual-channel adapter.

The HBAs support packet transfers up to 2.5 to 5 gigatransfers per second (2.5 to 5.0 GT/s) on the PCIe link (auto-negotiated with the system). The supported physical PCIe connector is x8. The fully featured FC port is compliant to various American National Standards Institute (ANSI) FC standards. The product is targeted at FC storage networking environments that require the highest degrees of robustness, performance and ease of management.

Note: Illustrations in this manual are only examples. The actual hardware may vary.

Major Features

- Multi-function PCIe 2.0 device with one (LPe16000) or two (LPe16002) independent FC ports.
- Auto-negotiation between 4-Gb/s, 8-Gb/s or 16-Gb/s FC link speeds.
- Complies with the PCIe base and CEM 2.0 specifications.
- x8-lane standard Generation 2, PCIe interface at 2.5GT/s or 5GT/s (auto-negotiated with the system).
- ECC protection of high density RAM (single-bit correction, double-bit detection).
- SFP+ interface supporting optics with LC connections and digital diagnostics capability.
- Host interface support provided through Emulex standard drivers for Windows, Linux, VMware, Solaris and other major operating system environments.
- Parts and construction are compliant to the European Union Directive of Restriction of Hazardous Substances (RoHS).

Compatibility

Table 1. Software and Hardware Environments

Software Environments	See the HBA's website for compatible operating systems.
Hardware Environments	PCIe 2.0 and CEM 2.0 compliant systems and backwards compatible to 1.0a and 1.1 compliant systems.

Prerequisites

Use PCIe Gen 2 compliant systems that are x8 or x16 lane at up to 5 GT/s per lane.

HBA Identification

Each HBA ships with several numbers clearly marked on the board. Emulex recommends recording these numbers before installation.

- Serial number – assigned by Emulex and used when communicating with Emulex.
- IEEE address – a unique 64-bit identifier used for system configuration
- World Wide Name (WWN) – derived from the IEEE address, the FC industry uses the WWN for FC connectivity.

Note: If the adapter has two ports, it has two IEEE addresses and two WWNs; one for each port with the second IEEE address/WWN being the next successive number of the first.

2. Installation

The standard LPe16000/16002 HBA can be connected to fiber optic cables.

Preparing the HBA for Installation

The Emulex LPe16000 and LPe16002 host bus adapters (HBAs) use removable optical transceivers. If you need to change the bracket for HBA installation, you must first remove the optical transceiver(s), if installed, from the housing (cage). This procedure explains how to install the HBA and, if necessary, how to remove the transceiver and bracket safely.

Each HBA is shipped with several numbers clearly marked on the board. these include

- IEEE Address
- World Wide Name (WWN)
- Serial number

The IEEE address is a unique 64-bit identifier that you use when configuring your system. The FC industry uses the World Wide Name (WWN) derived from the IEEE address for FC connectivity. If the adapter has two ports, there are two IEEE addresses and two WWNs. Use the serial number when communicating with Emulex. Record these numbers before installation.

To install the HBA:

1. Turn off the computer if hotplug is not supported on the server. See your server documentation to see if it supports Hot Plug/Hot Swap of PCIe adapter cards. Remove the HBA.

Note: The HBA comes with a standard PCIe bracket installed. A low-profile bracket is included in the box with the HBA. The low-profile mounting bracket is shorter than the standard bracket; approximately 3.11 inches (7.9 cm) compared to 4.75 inches (12.06 cm) long.

2. For the standard LPe16000/16002 HBA, if you want to change the bracket to a low profile version, follow steps 4–12; otherwise, proceed to “Installing the Adapter” on page 11.
3. Some standard LPe16000/16002 HBAs come with optical transceivers embedded in their cage assemblies. These optical transceivers must be removed before the bracket can be removed. If the HBA contains optical transceivers, continue with the following steps; otherwise, proceed to step 7.

CAUTION: This is a delicate operation. Take care not to damage the optical transceiver.

The HBA uses different types of optical transceivers. Figure 2-1 shows an example of one type with the bail (handle) extended.

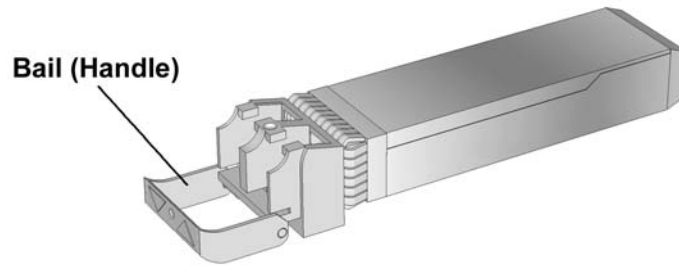


Figure 2-1 Typical Optical Transceiver

4. To remove a transceiver, pull the bail (handle) out and down to release the latch and gently pull the transceiver out. Do not force it. After the latch is released, the transceiver slides out easily.

Figure 2-2 shows a transceiver with the latch released (bail extended) and another transceiver latched in place.

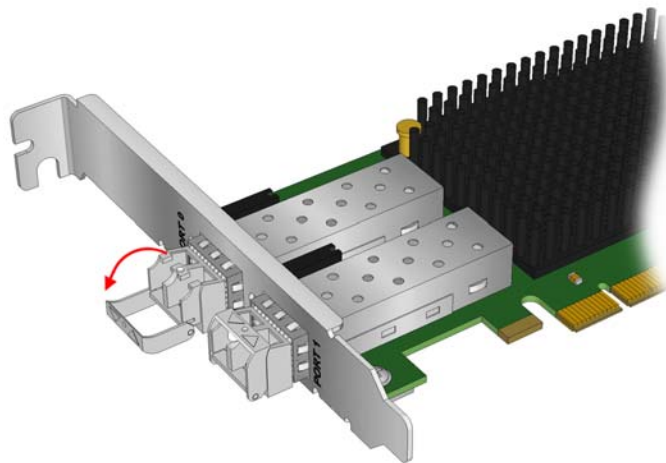


Figure 2-2 Releasing the Latch on an Optical Transceiver

Figure 2-3 shows an extracted transceiver and another transceiver latched in place.

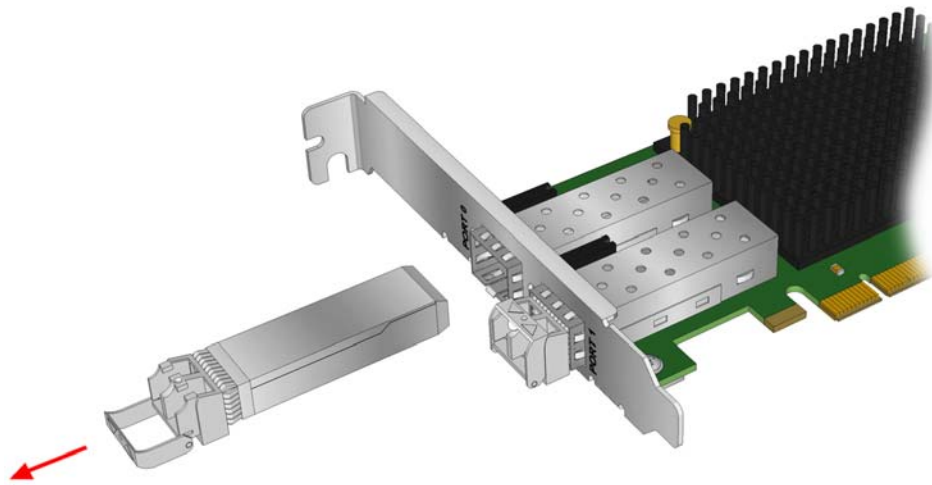


Figure 2-3 Removing an Optical Transceiver

5. Observing Electrostatic Discharge (ESD) precautions, store the transceiver in an ESD-safe place.
6. Remove the mounting bracket screws from the top of the HBA. Figure 2-4 shows the screws that are removed from the bracket.

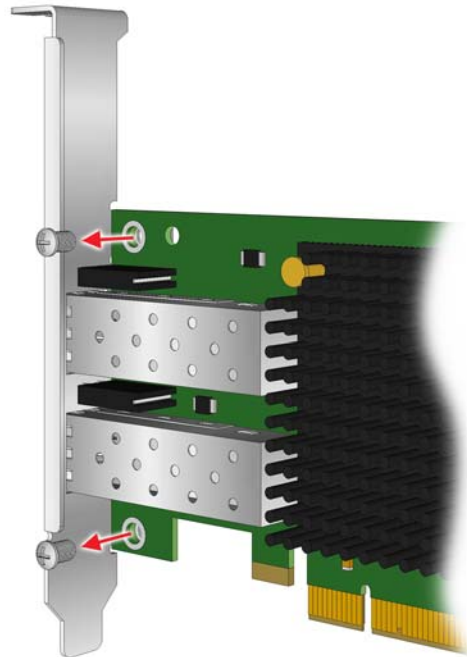


Figure 2-4 Removing the Bracket

7. Remove the bracket and store it for future use.
8. Align the new mounting bracket tabs with the holes in the HBA.

Note: Be careful not to push the bracket past the transceiver. Ensure the light emitting diodes (LEDs) are properly aligned with the holes in the bracket.

9. Re-install the screws that attach the HBA to the bracket.
10. Re-install the transceiver by sliding it into the housing. When the latch engages, it clicks.
11. Push the bail back into place.

Installing the Adapter

1. Turn off the computer if hotplug is not supported on the server. See your server documentation to see if it supports Hot Plug/Hot Swap of PCIe adapter cards.
2. Remove the computer case.
3. Remove the blank panel from an empty PCIe bus slot. See “Preparing the HBA for Installation” on page 8 to change the brackets if needed. Otherwise, proceed to “Attaching Media” on page 11.

Note: Place the HBA into an empty PCIe x8 or x16 slot. Make sure that the adapter is in an appropriate PCIe slot that does not interfere with other components or case to prevent damage to the HBA.

4. Insert the HBA into the empty x8 or x16 PCIe bus slot. Press firmly until the adapter is seated.
5. Secure the HBA mounting bracket to the case with a panel screw or clip.
6. Replace the computer case and tighten the case screws.

The HBA is now installed in the server and is ready for media attachment.

Attaching Media

Note: The HBA will not allow normal data transmission on an optical link unless it is connected to another similar or compatible laser product (that is, multimode to multimode.)

Note: The HBA will not automatically downgrade to the required FC speed based on cable length. You must downgrade the speed with the appropriate utility or link errors may occur.

Use multimode fiber optic cable, with short-wave lasers, that adheres to the following specifications:

Table 2-1 Media Specifications

Fiber Optic Cable	Maximum Length	Minimum Length	Connector
OM4 - Multi-mode 50/125 micrometer fiber (4700 MHz*km bandwidth cable)	4GFC: 0.5m - 400m 8GFC: 0.5m - 190m 16GFC: 0.5m - 125m	0.5 meters	LC

Table 2-1 Media Specifications (Continued)

Fiber Optic Cable	Maximum Length	Minimum Length	Connector
OM3 - Multimode 50/125 micron fiber (2000 MHz*km bandwidth cable)	4GFC: 0.5m - 380m 8GFC: 0.5m - 150m 16GFC: 0.5m - 100m	0.5 meters	LC
OM2 - Multimode 50/125 micron fiber (500 MHz*km bandwidth cable)	4GFC: 0.5m - 150m 8GFC: 0.5m - 50m 16GFC: 0.5m - 35m	0.5 meters	LC
OM1 - Multimode 62.5/125 micron fiber (200 MHz*km bandwidth cable)	4GFC: 0.5m - 70m 8GFC: 0.5m - 21m 16GFC: 0.5m - 15m	0.5 meters	LC

To attach media to the HBA:

1. Connect the appropriate cable to the HBA.

When connecting an optical cable, ensure the cages have optical transceivers installed in them (see Figure 2-5).

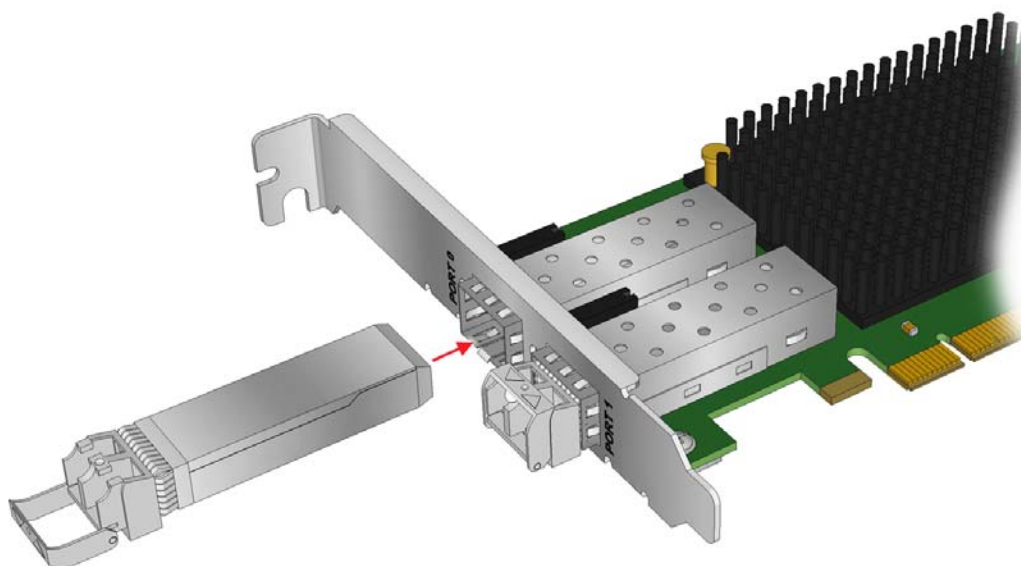


Figure 2-5 Installing an Optical Transceiver

Once the optical transceivers are installed, insert the optical cable into the LC connectors on the HBA (see Figure 2-6).

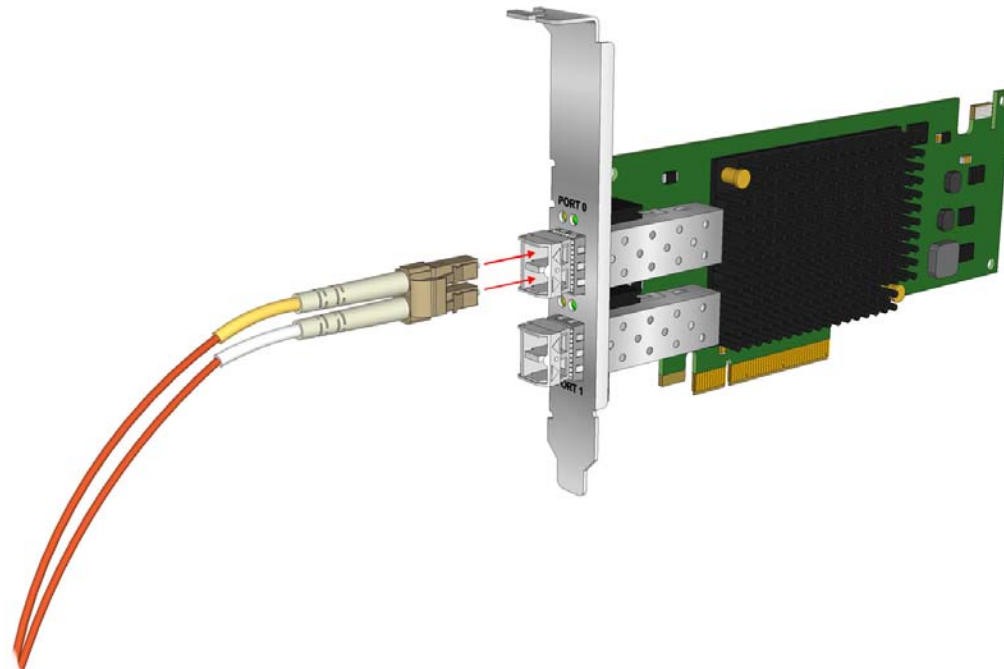


Figure 2-6 Connecting a Fiber Optic Cable

2. After the appropriate cable is connected to the HBA, connect the other end to the FC device.

After the appropriate fiber optic cable is connected to the HBA, connect the other end to a FC switch. After the cable is connected to the HBA, you are ready to apply power to the computer.

Applying Power

To apply power:

1. Verify that the HBA is securely installed in the computer.
2. Verify that the correct media is attached.
3. Plug in and turn on the computer.
4. Watch the LEDs for Power On Self Test (POST) results.

Viewing the LEDs

You can view green and yellow LEDs through openings in the HBA's mounting bracket. The green LED indicates firmware operation and the yellow LED indicates

port activity or link speed. Each port has a corresponding set of green and yellow LEDs as shown in the figure below.

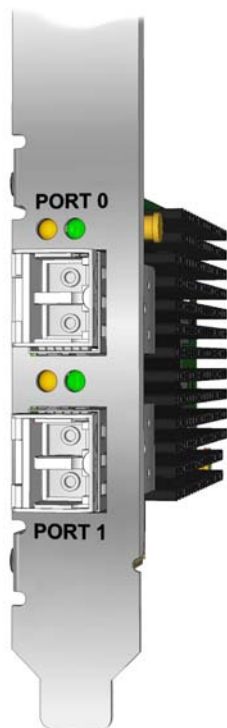


Figure 2-7 Optical HBA LED Indicators

POST Conditions and Results

Power-On-Self Test (POST) is the default mode of self-test for the LPe16000-series HBAs. 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
- NLPort loopback test

The following table summarizes POST conditions and results:

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.

Table 2-2 POST Conditions and Results

Green LED	Yellow LED	State
Off	Off	Boot failure (Dead board)
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 Blinks	Normal (Link up at 2GFC) (legacy compatibility only)
On	2 Fast Blinks	Normal (Link up at 4GFC)
On	3 Fast Blinks	Normal (Link up at 8GFC)
On	4 Fast Blinks	Normal (Link up at 16GFC)
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

3. References

LPe16000/16002 HBA Specifications

The specifications of the LPe16000/16002 HBAs are listed in Table 3-1:

Table 3-1 LPe16000 Series HBA Specifications

Parameter	Range																								
Physical Dimensions	Low-profile form factor, 6.600 inches by 2.713 inches.																								
Power Requirements	<div><div>Single Channel Power Requirement (Watts, Typ/Max)</div><table><tr><th>Voltage from PCIe Slot</th><th>Power w/ Optics (Watts, Typical)</th><th>Power w/ Optics (Watts, Max)</th></tr><tr><td>3.3V DC</td><td>0.9W</td><td>1.0W</td></tr><tr><td>12V DC</td><td>7.9W</td><td>10.6W</td></tr><tr><td>Total</td><td>8.8W</td><td>11.6W</td></tr></table></div> <div><div>Dual Channel Power Requirement (Watts, Typ/Max)</div><table><tr><th>Voltage from PCIe Slot</th><th>Power w/ Optics (Watts, Typical)</th><th>Power w/ Optics (Watts, Max)</th></tr><tr><td>3.3V DC</td><td>0.9W</td><td>1.0W</td></tr><tr><td>12V DC</td><td>9.2W</td><td>11.3W</td></tr><tr><td>Total</td><td>10.1W</td><td>12.3W</td></tr></table></div>	Voltage from PCIe Slot	Power w/ Optics (Watts, Typical)	Power w/ Optics (Watts, Max)	3.3V DC	0.9W	1.0W	12V DC	7.9W	10.6W	Total	8.8W	11.6W	Voltage from PCIe Slot	Power w/ Optics (Watts, Typical)	Power w/ Optics (Watts, Max)	3.3V DC	0.9W	1.0W	12V DC	9.2W	11.3W	Total	10.1W	12.3W
Voltage from PCIe Slot	Power w/ Optics (Watts, Typical)	Power w/ Optics (Watts, Max)																							
3.3V DC	0.9W	1.0W																							
12V DC	7.9W	10.6W																							
Total	8.8W	11.6W																							
Voltage from PCIe Slot	Power w/ Optics (Watts, Typical)	Power w/ Optics (Watts, Max)																							
3.3V DC	0.9W	1.0W																							
12V DC	9.2W	11.3W																							
Total	10.1W	12.3W																							
Power Susceptibility	The HBA can operate within the following voltage ranges: PCIe 3.3V: 3.3V +/- 9% PCIe 12V: 12V +/- 8% Power supply noise susceptibility: 100mV p-p at frequencies 100KHz or less																								
Airflow	200 linear feet per minute (minimum)																								
Temperature	0°C to 55°C (operating) -20°C to 85°C (storage) Note: Operating the LPe16000 series HBAs in higher temperature conditions may result in early failure.																								
Humidity	5% to 95% (non-condensing, 22°C wet bulb) for storage 10% to 90% (non-condensing, 22°C wet bulb) for operation																								

Table 3-1 LPe160000 Series HBA Specifications

Parameter	Range
Agency Approvals for LPe16000 Series HBAs	<ul style="list-style-type: none"> • Class 1 Laser Product per DHHS 21CFR (J) & EN60825-1 when equipped with approved optical devices • UL recognized to UL60950-1 2nd Edition • CUR recognized to CSA 22.2, No. 60950-1-07 • TUV certified by to EN60950-1 • FCC Rules, Part 15, Class A • Industry Canada, ICES-003, Class A • EMC Directive 2004/108/EEC (CE Mark) <ul style="list-style-type: none"> ◦ EN55022:2006+A1, Class A ◦ EN55024:1998+A1+A2 • Australian EMC Framework (C-Tick Mark) <ul style="list-style-type: none"> ◦ AS/NZS CISPR22:2009, Class A • Japan VCCI, Class A • Taiwan BSMI, Class A • Korea KCC, Class A • RoHS Compliant (Directive 2002/95/EC) • China RoHS compliant
Vibration, peak acceleration	0.25g (5 Hz to 500 Hz) (Sweep Rate = 1 octave/minute)

FCC and Regulatory Notices

LPe16000 Series HBA Model

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party:

Jim McCluney, Chief Executive Officer
Emulex Corporation (714) 662-5600
3333 Susan St. Costa Mesa, CA. 92626 USA

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. The reader is cautioned that changes or modifications made to the equipment not expressly approved by Emulex could void the user's authority to operate this equipment. The above statement applies to products marketed in the USA.

This class A digital apparatus meets all requirements of the Industry Canada (IC) Interference - Causing Equipment Standard (ICES-003).

Cet appareil numérique de la classe A respecte toutes les exigences du règlement sur le matériel brouilleur du Canada.

Notice for Japan and Translations (VCCI)

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

VCCI-A

Translation:

This is a Class A product. If this equipment is used in a domestic environment, radio interference may occur, in which case, the user may be required to take corrective action. VCCI—A.

Notice for Taiwan and Translations (BSMI)

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，
可能會造成射頻干擾，在這種情況下，使用者會
被要求採取某些適當的對策。

Translation:

This equipment is a Class A ITE, and operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

Notice for South Korea and Translations (KCC)

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외의 지역에서 사용하는 것을 목적으로 합니다.

Translation:

Sellers and users of this equipment take note that this equipment is EMC approved for Class A industrial use, and as such is not intended for residential use.


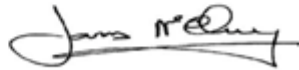
Declaration of Conformity

LPe16000 Series HBA

This equipment complies with CISPR22/EN55022 Class A.

WARNING: This is a class A product. In a domestic environment, this product may cause radio interference requiring the user to take adequate measures.

Note: Changes or modifications not expressly approved by Emulex Corporation, including the use of non-Emulex approved optical transceivers, could void the user's authority to operate this equipment.

 DECLARATION OF CONFORMITY	
Manufacturer:	Emulex Design and Manufacturing Corporation 3333 Susan Street Costa Mesa, California 92626 USA
declares under sole responsibility that the product:	
Product Name:	OneConnect™ UCNA / LightPulse™ HBA
Regulatory Model:	P005947
Assembly Number:	P005947-xxx / P006002-xxx (x = alphanumeric)
To which this Declaration relates is in conformity with the following standards or other documents for Information Technology Equipment (ITE):	
Product Safety:	UL Recognized to UL 60950-1:2007, Second Edition CUR Recognized to CSA22.2, No. 60950-1-07 IEC 60950-1:2005, Second Edition [CB Scheme] EN 60950-1:2006 + A11 EN 60825-1:2007 CFR Title 21, Laser AEL Class I, FDA/CDRH
EMC:	FCC Rules, CFR Title 47, Part 15, Subpart B, Class A Industry Canada, ICES-003:2004, Class A EN55022:2006 + A1, Class A / CISPR 22:2005 + A1 + A2, Class A EN55024:1998 + A1 + A2 AZ/NZS CISPR22:2009, Class A VCCI V-2 / V-3 Class A CNS 13438:2006 ² Class A, KN22 Class A, KN24
Supplementary Information:	<ol style="list-style-type: none"> 1. The Product was tested in a typical configuration. 2. CNS13438:2006 complete version, including 1-6GHz radiated emissions requirements. 3. The object of the declaration described above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment 4. The product complies with the requirements of the following directives: <ul style="list-style-type: none"> • European Union Low Voltage Directive 2006/95/EC • European Union EMC Directive 2004/108/EC • CE-Marking Directive 93/68/EEC (Carries the CE-Mark accordingly) • Australian EMC Framework (Carries the C-Tick mark accordingly)
October 17, 2011 Costa Mesa, CA.	 James M. McCluney, President and Chief Executive Officer
European Contact:	Emulex Corporation 7 & 8 Forest Court Oaklands Park Fishponds Road Wokingham, Berkshire RG41 2FD, England Telephone: 44-118-977-2929 Fax: 44-118-977-3237

Laser Safety Notice

This laser safety information contains certification and product information covering laser products known as optical small form factor transceivers incorporated in Emulex LightPulse host adapters. The small form factor transceiver is the primary cable connection mechanism for any optical port on the host adapter. This data is not intended to be a replacement for any safety regulations and standards; relevant safety documents should always be consulted if necessary. Contact Emulex Corporation with any questions or concerns about laser safety.

Certification and Classification

The LPe16000 Series HBA host adapters may contain one or more examples of a laser product known as a small form factor transceiver. This transceiver provides the physical connection to the optical cable, and its LC-style connector extends through the mounting bracket. In turn, the host adapter can be inserted into any host system's appropriate PCIe expansion slot.

In the United States, all optical small form factor transceivers sold by Emulex are certified as Class 1 laser products that conform to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR subchapter J. The certification is indicated by a label located on the optical small form factor transceiver.

In Europe, all optical small form factor transceivers sold by Emulex are certified as Class 1 laser component assemblies that conform to the requirements contained in the CENELEC (European Committee for Electrotechnical Standardization) standard EN60825-1:2007 (including amendment 11) and EN60825-2:2004 (including amendment 1). Small form factor transceivers are certified by a recognized European testing agency and have appropriate markings on the assembly. The DHHS conformity label and European conformity mark will not be visible externally once the optical small form factor transceiver is connected to or inserted in the host adapter and the adapter is installed into a system.

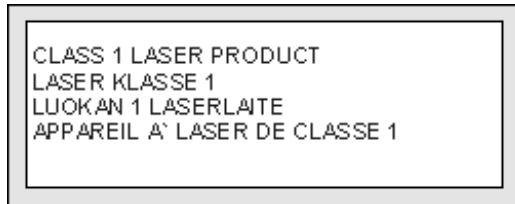
Labeling Requirements

No caution or danger labels are required for use of the small form factor transceiver since they are Class 1 laser component assembly. In the U.S., the only laser safety label required is the DHHS certification label that already appears on the small form factor transceiver. In Europe, the EN60825-1/EN60825-2 standards require that the system-level product has a Class 1 information label permanently attached and clearly visible whenever access to the small form factor transceiver optical port is possible. Each Class 1 product shall have affixed an explanatory label bearing the words:



Alternatively, at the discretion of the manufacturer, the same statement may be included in user information. If a label is used, an example of the IEC Class 1 information label that is suitable for most European countries is shown below. The label consists of black printing on a white background. Languages represented on this

label are English, German, Finnish and French, and they represent the minimum set for acceptance of a Class 1 product in most European countries.



Product Information

Small Form Factor Pluggable Transceiver

The small form factor pluggable transceiver is an integrated duplex data link for bi-directional communications over multimode or single mode optical fiber. Each small form factor transceiver consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser emitting in the wavelength range of 770 to 860 nanometers for small form factor pluggable short-wavelength transceivers and 1270 to 1355 nanometers for long wavelength small form factor pluggable transceivers. For non-optical fiber cable (OFC) links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed the small form factor transceiver.

Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and could possible lead to points of access that may emit laser radiation levels above the Class 1 limits established in the U. S. by the DHHS and within Europe by EN60825-1/EN60825-2.

Short wavelength and long wavelength small form factor transceivers allow normal data transmission on the optical link when they are connected to another compatible laser product. Short wavelength and long wavelength small form factor transceivers embedded in Emulex host adapter are non-OFC. For non-OFC links, a compatible laser device must be non-OFC and certified as a Class 1 laser product.

Any system level product that incorporates the small form factor transceivers must provide power supply protection that guarantees a voltage of 4.0 Volts or less at the small form factor transceivers. The functional power supply range of the small form factor transceivers product is specified as 3.135 to 3.465 Volts typically. Operation outside of this range may degrade the performance and lifetime of the transceiver. The transceiver will remain operational with laser emissions below Class 1 limits provided the power supply level at the adapter remains at or below 4.0 Volts. If the power supply level rises above 5.0 Volts, the small form factor transceiver cannot be guaranteed to operate correctly and could result in laser emissions that may exceed Class 1 limits.

System Level Certification

All host adapters containing embedded small form factor transceivers are certified as Class 1 laser products within the U.S. and Class 1 laser component assemblies outside of the U.S. Manufacturers of products properly incorporating the small form factor transceiver do not need to recertify their product for laser safety. The procedure for full system certification is therefore identical to that used for any other electronic system. When applying for system level certification to electronic standards such as IEC60950-1, the regulatory engineers may want to see the DHHS and European conformity labeling on the small form factor transceiver, and the system level documentation and labeling. Copies of the certificate of conformity for any small form factor transceiver sold by Emulex can be obtained upon request from Emulex Corporation, Costa Mesa.

Abbreviations

CENELEC	European Committee for Electrotechnical Standardization
DAC	direct-attach copper
DCR	direct connecting receptacle
DHHS	Department of Health and Human Services
EE	Enhanced Ethernet
EEPROM	electrically erasable programmable read-only memory
ESD	electrostatic discharge
FC	Fibre Channel
HBA	host bus adapter
IEEE	Institute of Electrical and Electronics Engineers
IP	internet protocol
iSCSI	internet Small Computer System Interface
LED	light emitting diode
LP	long range
MAC	media access control
MSI-X	message signaled interrupts - extended
NIC	networking interface card
OFC	optical fiber cable
OS	operating system
PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect Express
POST	power-on self test
RoHS	Restriction of Hazardous Substances Directive
SAN	storage area network
SFP+	enhanced small form factor pluggable transceiver
SR	short range
TOR	top of rack
UCNA	universal converged network adapter
VLAN	virtual local area network
WWN	world wide name
WWPN	world wide port name