Emulex® LPe31000-Series and LPe32000-Series Adapters

Quick Installation Guide
Version 11.4

Table of Contents

Chapter 1: Introduction

1.1 Overview

This manual describes the following FC to PCI Express PCIe Broadcom® Emulex® host bus adapters:

- LPe31000, LPe31002, and LPe31004, 16 Gb/s
- LPe32000 and LPe32002, 32Gb/s

NOTE: It is possible to change the speed of some adapters from 16Gb/s to 32Gb/s or from 32Gb/s to 16Gb/s through hardware. See Section 2.7, Changing the Speed of the Adapter.

The core technology of these adapters is Broadcom's 6th generation FC controller. The controller is a multi-function PCIe Gen3 interface controller that is compliant to the *PCI Express Base Specification, Rev 3.0* and *PCI Express CEM Specification, Rev 3.0*. The LPe31000 and LPe32000 are single-channel adapters, the LPe31002 and LPe32002 are dual-channel adapters, and the LPe31004 is a four-channel adapter.

These adapters support packet transfers at 2.5GT/s, 5.0GT/s, and 8GT/s on the PCIe link (auto-negotiated with the system). The supported physical PCIe connector is x8. The fully featured FC port is compliant with various ANSI FC standards.

NOTE: Illustrations in this document are only examples. The actual hardware may vary.

1.1.1 Major Features

- Multifunction PCIe 3.0 device with one (LPe31000 and LPe32000), or two (LPe31002 and 32002), or four (LPe31004) independent FC ports.
- Auto-negotiation between 4Gb/s, 8Gb/s, or 16Gb/s (LPe31000-series adapters) or between 8Gb/s, 16Gb/s, or 32Gb/s (LPe32000-series adapters) FC link speeds using factory-shipped optics.
- Complies with the PCIe base and CEM 3.0 specifications.
- x8-lane standard Generation 3, PCIe interface at 2.5GT/s, 5.0GT/s, and 8GT/s (auto-negotiated with the system).
- ECC protection of high-density RAM (single-bit correction, double-bit detection).
- Supports FEC using IEEE 802.3-2008 and later (applies to 16Gb/s and faster units).
- SFP+ interface supporting optics with LC connections and digital diagnostics capability.
- Host interface support is provided through Broadcom Emulex standard drivers.
  - The LPe31000-series and LPe32000-series adapters support Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Hyper-V, Citrix, Kernel-based Virtual Machine, Red Hat Enterprise Linux, VMware ESXi, and Solaris S11 (including Comstar).
  - The LPe31004 adapter supports Windows Server 2008 R2, Windows Server 2012, Linux 2.6 Kernel, VMware ESXi, and Solaris S11 (including Comstar), TM drivers (Kits 9.6 and 9.7), FreeBSD, and Debian.

NOTE: Windows Server 2008 and 2008 R2 support drivers written for these adapters; however, new features designed for 11.0 drivers are not supported for these operating systems.

- Parts and construction are compliant to the European Union Directive of RoHS.

1.1.2 Compatibility

Table 1: Software and Hardware Environments

Software Environments	Refer to the Product section of the Broadcom website at https://www.broadcom.com for compatible operating systems.
Hardware Environments	LPe31000-series: PCIe 3.0 supports x8, x4, x2, and x1. LPe32000-series: PCIe 3.0 supports x8, x4, and x1. **NOTE:** Adapters are PCIe 3.0 and CEM 3.0 compliant systems and are backwards compatible to 1.0a, 1.1, and 2.0 compliant systems.

1.1.2.1 Abbreviations

Table 2: Acronyms and Abbreviations

Acronym/Abbreviation	Description
ANSI	American National Standards Institute
ASIC	application-specific integrated circuit
CEM	Card Electromechanical
ECC	error checking and correction
EMI	electromagnetic interference
ESD	electrostatic discharge
FC	Fibre Channel
FEC	forward error correction
Gb/s	gigabit per second
GFC	gigabit Fibre Channel
GT/s	gigatransfers per second
HBA	host bus adapter
IEEE	Institute of Electrical and Electronics Engineers
kHz	kilohertz
LEDs	light-emitting diode
MHz	megahertz
mV	millivolt
NL_Port	Node Loop port
PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect Express
POST	power-on self-test
RAM	random access memory
RoHS	Restriction of Hazardous Substances
SFP+	small form-factor pluggable plus
TM	target mode
WWN	World Wide Name

1.1.3 Prerequisites

Use PCIe Gen3-compliant systems that are x8 or x16 lane at up to 8GT/s per lane.

1.1.3.1 Adapter Identification

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

- **Serial number** – Assigned by Broadcom. Use this number when communicating with Broadcom.
- IEEE **address** – An Institute of Electrical and Electronics Engineers (IEEE) unique 64-bit identifier used for system configuration.
- WWN – Derived from the IEEE address; the FC industry uses the WWN for FC connectivity.

NOTE: IEEE addresses and WWNs are assigned in sequential order. For example, if an adapter has four ports, it has four IEEE addresses and four WWNs; one for each port with the second, third, and fourth IEEE addresses and WWNs being the next successive number after the first.

Chapter 2: Installation

The standard adapters can be connected to fiber-optic cables.

2.1 Preparing the Adapter for Installation

The Broadcom Emulex LPe31000-series and LPe32000-series adapters use removable optical transceivers. If you need to change the bracket for an adapter installation, you must first remove the optical transceivers, if installed, from the housing (cage). This procedure explains how to remove the transceiver and bracket safely.

NOTE: The LPe31004 adapter does not include removable transceivers.

The LPe31000-series and LPe32000-series adapters come with a standard full–height PCIe bracket installed.

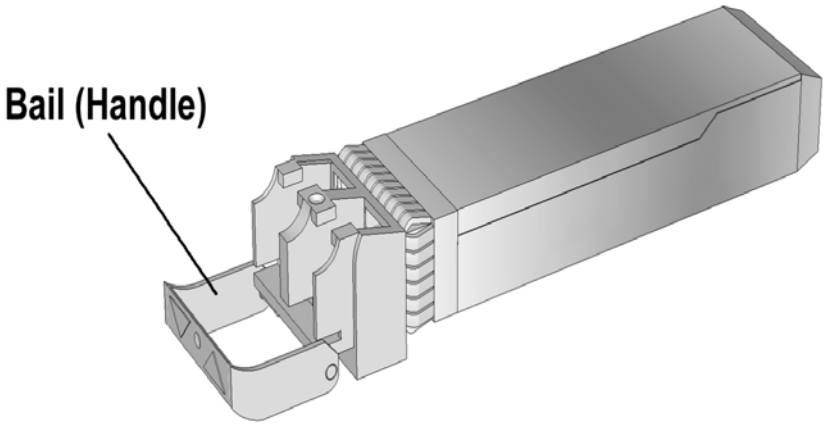
To change the bracket:

1. Some adapters have optical transceivers embedded in their cage assemblies. These optical transceivers must be removed before the bracket can be removed. If the adapter contains optical transceivers, continue with the following steps; otherwise, proceed to step 4.

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

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

Figure 1: Typical Optical Transceiver



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

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

Figure 2: Releasing the Latch on an Optical Transceiver

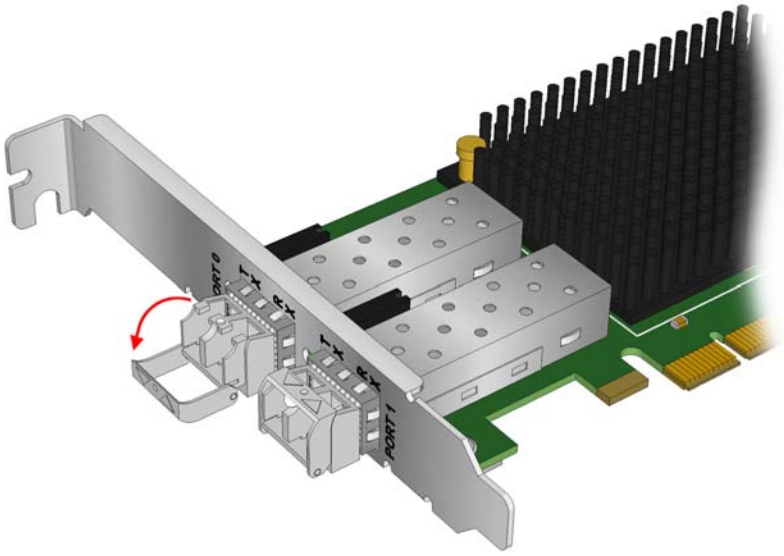
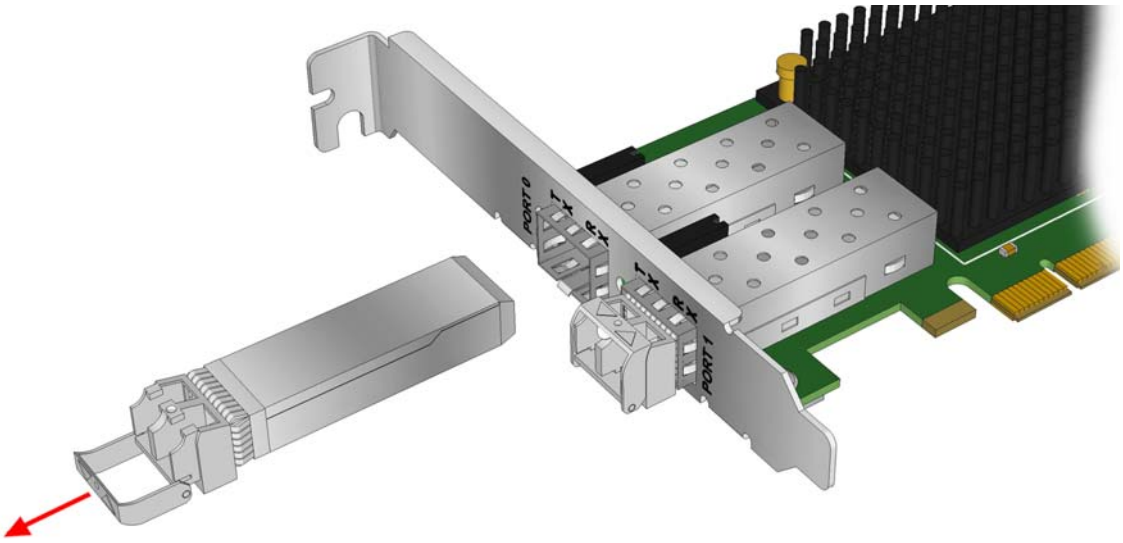


Figure 3 shows an extracted transceiver and another transceiver latched in place.

Figure 3: Removing an Optical Transceiver



3. Observing ESD precautions, store the transceiver in an ESD-safe place.
4. Remove the mounting bracket screws from the top of the adapter. Figure 4 shows the screws that are removed from the bracket.

Figure 4: Removing the Bracket

5. Remove the bracket, and store it for future use.
6. Align the new mounting bracket tabs with the holes in the adapter.

NOTE: Be careful not to push the bracket past the EMI compression tabs of the SFP+ cage. Ensure that the LEDs are properly aligned with the holes in the bracket.

7. Reinstall the screws that attach the adapter to the bracket.
8. Reinstall the transceiver by sliding it into the housing. When the latch engages, it clicks.
9. Push the bail back into place.

2.2 Installing the Adapter

To install the adapter:

1. Turn off the computer if hot-plug installation is not supported on the server.

   Refer to 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 Section 2.1, Preparing the Adapter for Installation, to change the brackets if needed. Otherwise, proceed to Section 2.3, Attaching the Media.
4. Insert the adapter into an empty PCIe x8 or x16 slot. Press firmly until the adapter is seated.

NOTE: Make sure that the adapter is in an appropriate PCIe slot that does not interfere with other components or with the computer case to prevent damage to the adapter.

5. Secure the adapter mounting bracket to the case with a panel screw or clip.
6. Replace the computer case and tighten the case screws.

The adapter is now installed in the server and is ready for an FC device.

2.3 Attaching the Media

NOTE: The adapter does 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).

The adapter does 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 a multimode fiber-optic cable with short-wave lasers that adheres to the specifications shown in Table 3:

Table 3: Media Specifications

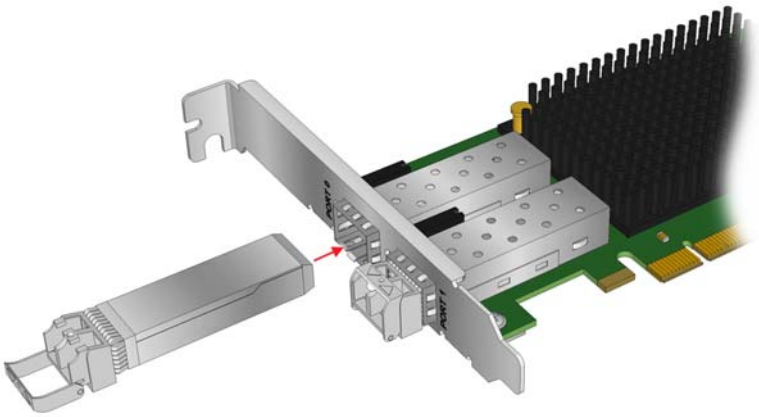
Fiber-Optic Cable	Maximum Length	Minimum Length	Connector
OM4 – Multi-mode 50/125 micrometer fiber (4700 MHz*km bandwidth cable)	4GFC: 0.5m to 400m 8GFC: 0.5m to 190m 16GFC: 0.5m to 125m 32GFC: 0.5m to 100m	0.5m	LC
OM3 – Multimode 50/125 micron fiber (2000 MHz*km bandwidth cable)	4GFC: 0.5m to 380m 8GFC: 0.5m to 150m 16GFC: 0.5m to 100m 32GFC: 0.5m to 70m	0.5m	LC
OM2 – Multimode 50/125 micron fiber (500 MHz*km bandwidth cable)	4GFC: 0.5m to 150m 8GFC: 0.5m to 50m 16GFC: 0.5m to 35m 32GFC: 0.5m to 20m	0.5m	LC
OM1 – Multimode 62.5/125 micron fiber (200 MHz*km bandwidth cable)	4GFC: 0.5m to 70m 8GFC: 0.5m to 21m 16GFC: 0.5m to 15m 32GFC: N/A	0.5m	LC

To attach media to the adapter:

1. Connect the appropriate cable to the adapter.

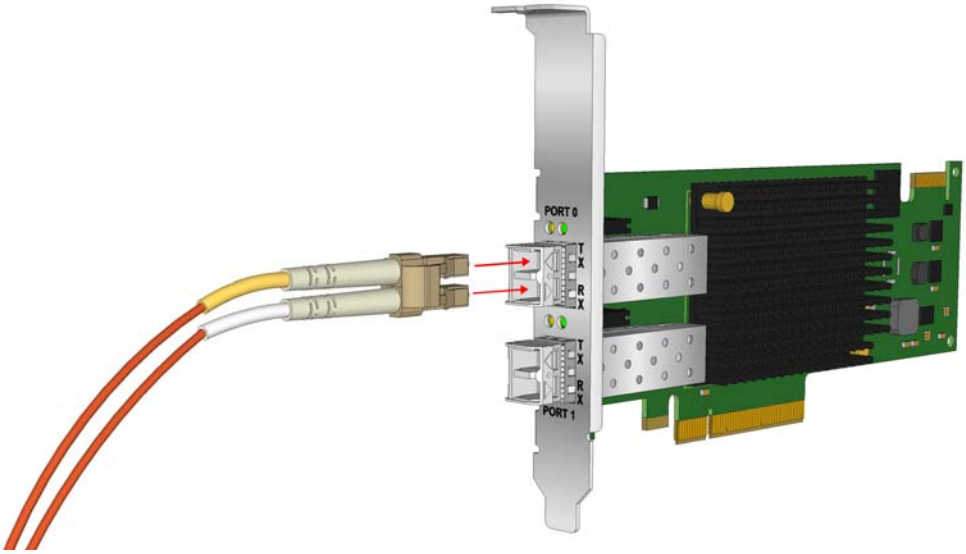
   When connecting an optical cable, ensure that the cages have optical transceivers installed in them (see Figure 5).

Figure 5: Installing an Optical Transceiver



After the optical transceivers are installed, insert the optical cable into the LC connectors on the adapter (see Figure 6).

Figure 6: Connecting a Fiber-Optic Cable



2. After the appropriate cable is connected to the adapter, connect the other end to the FC device.
   When the cable is connected to the adapter, you are ready to apply power to the system.

2.4 Broadcom LightPulse® Accessories

The following table provides a list of approved (locked) optics for the LPe31000-series and LPe32000-series adapters:

Table 4: Approved Optics for LPe31000-Series and LPe32000-Series Adapters

Model Number	Model Name	Quantity	Interface
LPe16100-OPT	16GFC spare optic (short wave laser with LC connector SFP+ optic) – 1 pack	1	SFP+
LPe16100-OPTx2	16GFC optics kit (short wave laser with LC connector SFP+ optic) – 2 packs	2	SFP+
LP32-SW-OPT-1	LP, 32GFC, SW, SFP+, OptTcvr, 1 piece	1	SFP+
LP32-SW-OPT-2	LP, 32GFC, SW, SFP+, OptTcvr, 2 pieces	2	SFP+

NOTE: Only Broadcom accessories are warranted and fully supported by Broadcom Technical Support.

2.5 Applying Power

To apply power:

1. Verify that the adapter is securely installed in the system.
2. Verify that the correct media is attached.
3. Plug in and turn on the system.
4. Watch the LEDs for POST results.

2.6 Viewing the LEDs

You can view the green and yellow LEDs through openings in the adapter'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 Figure 7.

Figure 7: Optical Adapter LED Indicators

2.6.1 POST Conditions and Results

POST is the default mode of self-test for the LPe31000-series and the LPe32000-series adapters. No jumpers or connectors are necessary for this test to run. These tests perform a quick confidence level check of the adapter 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 parity operation
- NL_Port 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, 4, or 5). Observe the LED sequence for several seconds to be sure you have correctly identified the pattern.

Table 5: POST Conditions and Results

Green LED	Yellow LED	State
Off	Off	No SFP modules installed or 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	2 Fast blinks	Normal (link up at GFC)
On	3 Fast blinks	Normal (link up at 8GFC)
On	4 Fast blinks	Normal (link up at 16GFC)
On	5 Fast blinks	Normal (link up at 32GFC)
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

2.7 Changing the Speed of the Adapter

On some adapters, the speed of the link can be changed from 16GFC to 32GFC or from 32GFC to 16GFC by replacing the optical transceivers. The transmission speed of the LPe31000-series and LPe32000-series adapters can be changed in this way.

2.8 Setting the Secure Firmware Jumper

The LPe31000-series and LPe32000-series adapters have a jumper that enables or disables the Secure Firmware feature as required.

To update the firmware using a tool, such as the OneCommand® Manager application, boot utilities, or Elxflash utilities, there is no need to remove the jumper; the Secure Firmware feature can remain enabled as long as the update is from a secure firmware version to another secure firmware version. To change the firmware version from a secure firmware version to an unsecured firmware version, you must first remove the jumper before updating the firmware.

Replace the jumper after the firmware update is complete.

The following illustrations (Figure 8 and Figure 9) provide examples of common locations of the Secure Firmware jumper.

Figure 8: Secure Firmware Jumper Location J2 on LPe31000, LPe31002, LPe32000, and LPe32002 Adapters

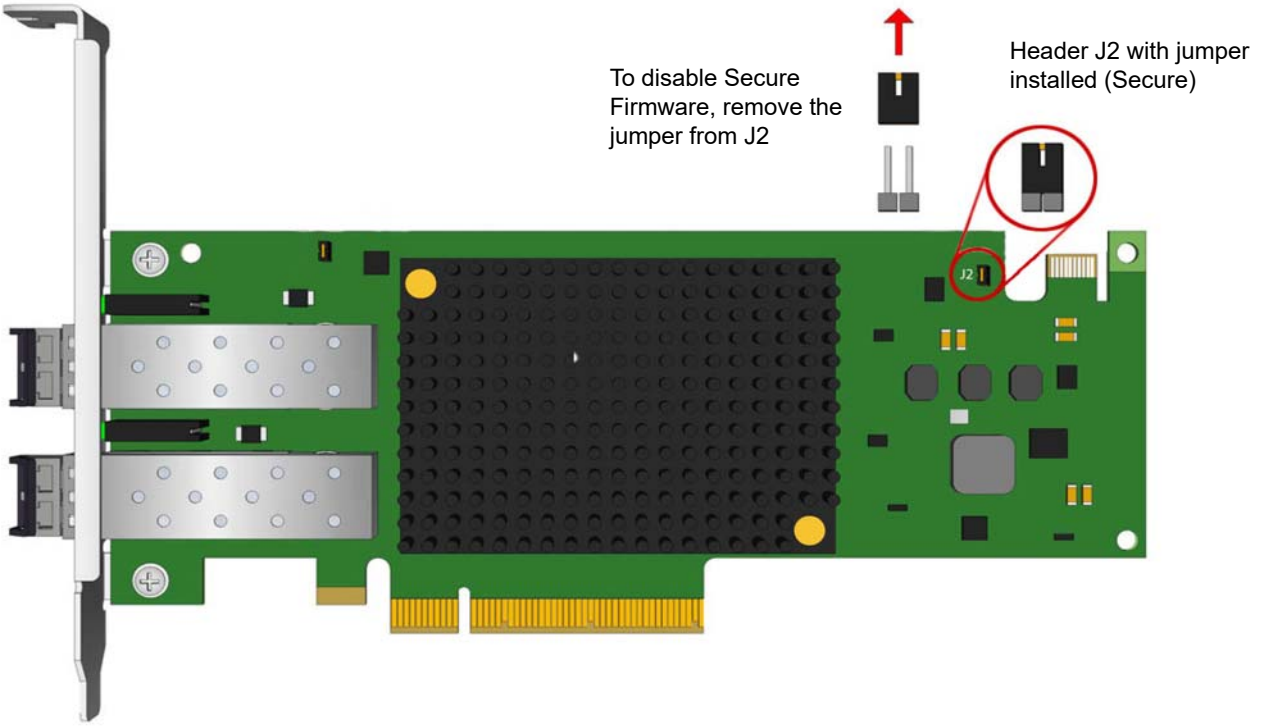
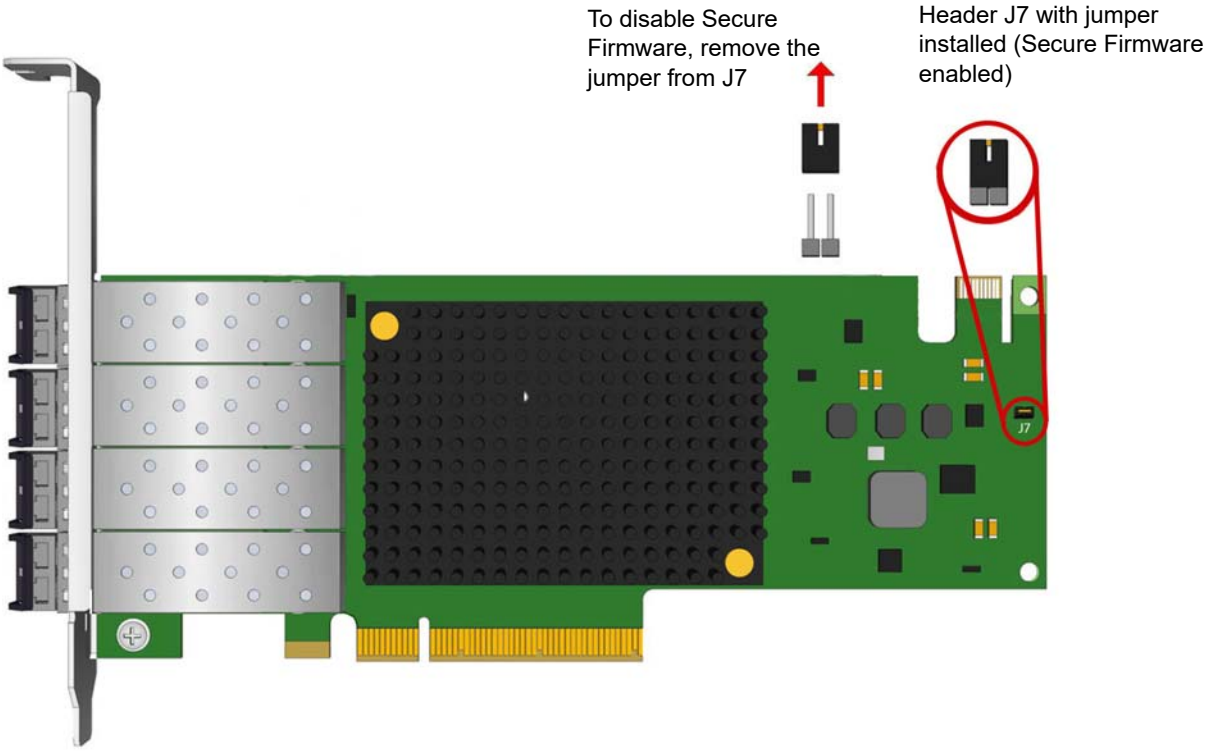


Figure 9: Secure Firmware Jumper Location J7 on LPe31004 Adapter



Chapter 3: References

3.1 LPe31000-Series and LPe32000-Series Adapter Specifications

The specifications of the LPe31000-series and LPe32000-series adapters are listed in Table 6.

Table 6: LPe31000-Series and LPe32000-Series Adapter Specifications

Parameter	Range
Physical dimensions	LPe31000-series and LPe32000-series adapters: Low-profile form factor, 6.600 inches by 2.713 inches.
Power requirements	Single-channel LPe31000 adapter: 8.6W (typical), 9.6W (maximum) Single-channel LPe32000 adapter: 8.8W (typical), 9.8W (maximum) Dual-channel LPe31002 adapter: 9.3W (typical), 10.3W (maximum) Dual-channel LPe32002 adapter: 9.6W (typical), 10.6W (maximum) Quad-channel LPe31004 adapter: 11.1W (typical), 11.9W (maximum)
Power susceptibility	The LPe31000-series, and LPe32000-series adapters can operate within the following voltage ranges: PCIe 12V: 12V ± 8%, 3.3V ±9% Power supply noise susceptibility: 100 mV p-p at frequencies 100 kHz or less
Airflow	200 linear feet per minute (minimum, LPe31000-series and LPe32000-series adapters)
Temperature	0°C to 55°C (operating) –20°C to 85°C (storage) **NOTE:** Operating adapters in higher temperature conditions may result in early failure.
Humidity	5% to 95% (noncondensing, 22°C wet bulb) for storage 10% to 90% (noncondensing, 22°C wet bulb) for operation
Agency approvals for LPe31000-series and LPe32000-series adapters	■ Class 1 Laser Product per DHHS 21CFR (J) and 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 to EN60950-1+A11+A1+A12+A2 ■ FCC Rules, Part 15, Class A ■ Industry Canada, ICES-003, Class A ■ EU (CE Mark) ■ EN55024:2010 ■ EN55032:2012, Class A ■ Australian EMC Framework (RCM) ■ AS/NZSCISPR32:2015, Class A ■ Japan VCCI, Class A ■ Taiwan BSMI (CNS 13438), RoHS (CNS 15663), Class A ■ Korea KCC, Class A ■ RoHS compliant (Directive 2011/65/EU) ■ China RoHS compliant
Vibration, peak acceleration	0.25g (5 Hz to 500 Hz) (Sweep rate = 1 octave/minute)

3.2 FCC and Regulatory Notices

3.2.1 LPe31000-Series and LPe32000-Series Adapter Models

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.

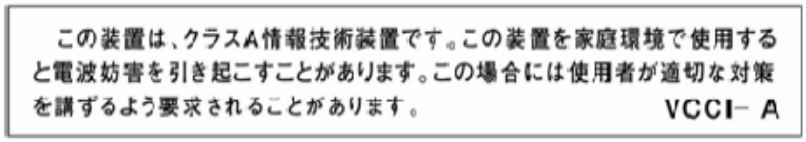
Responsible Party:

Jeff Hoogenboom, VP and General Manager of ECD
Broadcom Limited (949) 926-5000
15101 Alton Parkway Irvine, CA 92618 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 Broadcom could void the user's authority to operate this equipment.

This Class A digital apparatus meets all requirements of the Industry Canada (IC) Interference – Causing Equipment Standard (ICES-003). CAN ICES-3 (A)/ NMB-3 (A).

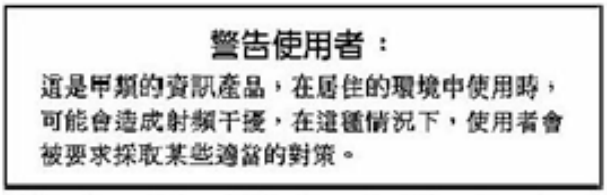
3.2.1.1 Notice for Japan and Translations (VCCI)



Translation:

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. VCCI—A.

3.2.1.2 Notice for Taiwan and Translations (BSMI)



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.

3.2.1.3 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:

Class A Equipment: 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.

3.3 Declarations of Conformity

3.3.1 LPe31000-Series and LPe32000-Series HBAs

Notice for European Union (CE-Mark):

DECLARATION OF CONFORMITY

Manufacturer: Emulex Corporation
5300 California Ave
Irvine, CA, 92617 USA

declares under sole responsibility that the product:

Product Name: LightPulse® HBA
Regulatory Model: P011324
Assembly Number: P011324-xxx *(x=alphanumeric or blank)*

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 CSA 22.2, No. 60950-1-07
IEC 60950-1:2005 +A1 +A2 (CB Scheme)
EN 60950-1:2006 +A11 +A1 +A12 +A2
EN 60825-1:2014*
CFR Title 21, Laser AEL Class 1, FDA/CDRH*
** when equipped with approved optical transceivers*

Electromagnetic Compatibility (Class A):
FCC Rules, CFR Title 47, Part 15, Subpart B
Industry Canada, ICES-003:2012 (Issue 5) +2014 update
EN55024:2010 / CISPR 24:2010
EN55032:2012 / CISPR 32:2015
AS/NZS CISPR 22:2009 +A1
AS/NZS CISPR 32:2013
VCCI:2014
CNS 13438:2006, KN22, KN24

Hazardous Substances:
The object of this 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, and has been validated per EN 50581:2012.

Supplementary Information:
1. The product was tested in a typical configuration.
2. The product is in compliance with the following directives:
   - European Union Low Voltage Directives 2014/35/EU
   - European Union EMC Directives 2014/30/EU and EU RoHS Directives 2011/65/EU
   - Australian RCM framework
   - Taiwan BSMI RoHS CNS 15663:2013.7

November 3, 2017
Irvine, CA

Jeff Hoogenboom
VP and General Manager of ECD

European Contact: Avago Technologies Fiber GmbH, Wernerwerkstraße 2, 93049 Regensburg

3.3.2 LPe31004-Series HBAs

Notice for European Union (CE-Mark):

DECLARATION OF CONFORMITY

Manufacturer: Broadcom Limited
5300 California Avenue
Irvine, CA 92617 USA

declares under sole responsibility that the product:

Product Name: LightPulse® HBA
Regulatory Model: 5189-1403
Assembly Number: 5189-1403

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 CSA 22.2, No. 60950-1-07
IEC 60950-1:2005 +A1 +A2 (CB Scheme)
EN 60950-1:2006 +A11 +A1 +A12 +A2
EN 60825-1:2014*
CFR Title 21, Laser AEL Class 1, FDA/CDRH*
** when equipped with approved optical transceivers*

Electromagnetic Compatibility (Class A):
FCC Rules, CFR Title 47, Part 15, Subpart B
Industry Canada, ICES-003:2012 (Issue 5) +2014 update
EN 55024:2010 / CISPR 24:2010
EN 55032:2012 / CISPR 32:2015
EN 61000-3-2:2014
EN 61000-3-3:2013
AS/NZS CISPR 32:2013
VCCI:2015
CNS 13438:2006, KN32, KN35

Hazardous Substances:
The object of this 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, and has been validated per EN 50581:2012.

Supplementary Information:
1. The product was tested in a typical configuration.
2. The product is in compliance with the following directives:
   - European Union Low Voltage Directives 2014/35/EU
   - European Union EMC Directives 2014/30/EU and EU RoHS Directive 2011/65/EU
   - Australian RCM framework
   - Taiwan BSMI RoHS CNS 15663:2013.7

November 3, 2017
Irvine, CA

Jeff Hoogenboom
VP and General Manager of ECD

European Contact: Avago Technologies Fiber GmbH, Wernerwerkstraße 2, 93049 Regensburg

3.3.3 LPe3x004-Series HBAs

Notice for European Union (CE-Mark):

DECLARATION OF CONFORMITY

Manufacturer: Broadcom Limited
5300 California Avenue
Irvine, CA 92617 USA

declares under sole responsibility that the product:

Product Name: LightPulse® HBA
Regulatory Model: P011712
Assembly Number: P011712-xxx

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 CSA 22.2, No. 60950-1-07
IEC 60950-1:2005 +A1 +A2 (CB Scheme)
EN 60950-1:2006 +A11 +A1 +A12 +A2
EN 60825-1:2014*
CFR Title 21, Laser AEL Class 1, FDA/CDRH*
** when equipped with approved optical transceivers*

Electromagnetic Compatibility (Class A):
FCC Rules, CFR Title 47, Part 15, Subpart B
Industry Canada, ICES-003:2012 (Issue 5) +2014 update
EN 55024:2010 / CISPR 24:2010
EN 55032:2012 / CISPR 32:2015
AS/NZS CISPR 32:2015
VCCI:2015
CNS 13438:2006, KN32, KN35

Hazardous Substances:
The object of this 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, and has been validated per EN 50581:2012.

Supplementary Information:
1. The product was tested in a typical configuration.
2. The product is in compliance with the following directives:
   - European Union Low Voltage Directive 2014/35/EU
   - European Union EMC Directive 2014/30/EU and EU RoHS Directive 2011/65/EU
   - Australian RCM framework
   - Taiwan BSMI RoHS CNS 15663:2013.7

November 3, 2017
Irvine, CA

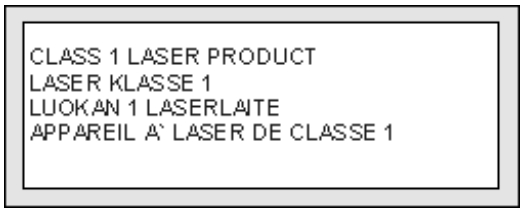
Jeff Hoogenboom
VP and General Manager of ECD

European Contact: Avago Technologies Fiber GmbH, Wernerwerkstraße 2, 93049 Regensburg

3.3.4 Laser Safety Notice

Broadcom products incorporating optical laser transceivers contain Class 1 laser devices, which comply with DHHS/CDRH 21CFR Sub-chapter J, and the international laser safety standard EN/IEC 60825-1. Class 1 laser devices are not considered to be hazardous.

The use of non-Broadcom approved optical transceivers, or transceivers that do not comply with the Class 1 radiation performance requirements defined in DHHS/CDRH 21CFR Sub-chapter J and IEC 60825-1 may expose the user to hazardous laser radiation, and such devices should not be used with Broadcom products.



3.4 Taiwan RoHS Notices

The following table provides the Taiwan RoHS notice for the following regulatory model numbers (RMNs):

- 5189-1403
- P011324
- P011687
- P011712

設備名稱:
Equipment name : LightPulse Fibre Channel Adapter Card

型號（型式）
Type designation (Type) : Board Assemblies

單元Unit	限用物質及其化學符號 Restricted substances and their chemical symbols					
	鉛Lead (Pb)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr+6)	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
电子被動元件– Passive Components	—	○	○	○	○	○
電路板– Printed Circuit Board	○	○	○	○	○	○
集成电路– Active Devices	○	○	○	○	○	○
連接器 – Connector/ Mechanical	○	○	○	○	○	○

設備名稱:
Equipment name : LightPulse Fibre Channel Adapter Card

型號（型式）
Type designation (Type) : Board Assemblies

	限用物質及其化學符號 **Restricted substances and their chemical symbols**					
單元Unit	**鉛Lead (Pb)**	**汞Mercury (Hg)**	**鎘Cadmium (Cd)**	六價鉻 **Hexavalent chromium (Cr+6)**	多溴聯苯 **Polybrominated biphenyls (PBB)**	多溴二苯醚 **Polybrominated diphenyl ethers (PBDE)**

備考1.〝超出0.1 wt %〞及〝超出0.01 wt %〞係指限用物質之百分比含量超出百分比含量基準值。

NOTE 1: “Exceeding 0.1 wt %” and “exceeding 0.01 wt %” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.

備考2.〝○〞係指該項限用物質之百分比含量未超出百分比含量基準值。

NOTE 2: “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.

備考3.〝—〞係指該項限用物質為排除項目。

NOTE 3: The “—” indicates that the restricted substance corresponds to the exemption.

The following table provides the Taiwan RoHS notice for the following RMNs:

- 5067-5396

設備名稱:
Equipment name : LightPulse Fibre Channel Adapter Card

型號（型式）
Type designation (Type) : Board Assemblies

單元Unit	限用物質及其化學符號 Restricted substances and their chemical symbols					
	鉛Lead (Pb)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr+6)	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
电子被動元件- Passive Components	—	○	○	○	○	○
電路板- Printed Circuit Board	○	○	○	○	○	○
連接器 - Connector/ Mechanical	○	○	○	○	○	○
集成电路- Active Devices	○	○	○	○	○	○
光纖收發器- Optical Transceiver	—	○	○	○	○	○

備考1.〝超出0.1 wt %〞及〝超出0.01 wt %〞係指限用物質之百分比含量超出百分比含量基準值。

NOTE 1: “Exceeding 0.1 wt %” and “exceeding 0.01 wt %” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.

備考2.〝○〞係指該項限用物質之百分比含量未超出百分比含量基準值。

NOTE 2: “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.

備考3.〝—〞係指該項限用物質為排除項目。

NOTE 3: The “—” indicates that the restricted substance corresponds to the exemption.


BROADCOM®