BROADCOM®

Emulex OCe14000B-Series Adapters

Installation Guide

Versions 11.0 and 11.1
March 1, 2016

pub-005279

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Chapter 1: Introduction

This manual describes the following Emulex® OneConnect OCe14000B-series of multi-protocol Peripheral Component Interconnect Express (PCIe) adapters that provide the following functionality for convergence of Fibre Channel (FC) traffic onto an Ethernet fabric:

■ Ethernet networking

■ RDMA over Converged Ethernet (RoCE)

■ internet Small Computer System Interface (iSCSI) functionality

■ Fibre Channel over Ethernet (FCoE)

Table 1 lists the OCe14000B-series adapters.

Table 1 OCe14000B-series Adapters

Adapter Models	Number of Ports	Supported Protocols	Cable Type
OCe14101B-NX	1x10GbE	NIC RoCE	10GbE SFP+ Passive Direct-attach Copper (DAC) cable 10GbE SFP+ Active DAC Cable 10GbE SFP+ Active Optical (AOC) Cable
OCe14101B-NM	1x10GbE	NIC RoCE	10GbE SFP+ fiber optic cable with Lucent connector (LC)
OCe14102B-NX	2x10GbE	NIC RoCE	10GbE SFP+ Passive DAC cable 10GbE SFP+ Active DAC cable
OCe14102B-UX	2x10GbE	NIC RoCE iSCSI FCoE	10GbE SFP+ AOC cable
OCe14102B-NM	2x10GbE	NIC RoCE	10GbE SFP+ fiber optic cable with LC connector
OCe14102B-UM	2x10GbE	NIC RoCE iSCSI FCoE	
OCe14102B-NT	2x10GbE	NIC RoCE	Unshielded twisted pair (UTP) copper Shielded twisted pair (STP) copper
OCe14102B-UT	2x10GbE	NIC RoCE iSCSI FCoE	
OCe14104B-NX	4x10GbE	NIC RoCE	10GbE SFP+ Passive DAC Cable 10GbE SFP+ Active DAC Cable 10GbE SFP+ AOC Cable
OCe14104B-UX	4x10GbE	NIC RoCE iSCSI FCoE	

Table 1 OCe14000B-series Adapters (Continued)

Adapter Models	Number of Ports	Supported Protocols	Cable Type
OCe14104B-NM	4x10GbE	NIC RoCE	10GbE SFP+ fiber optic cable with LC connector
OCe14104B-UM	4x10GbE	NIC RoCE iSCSI FCoE	
OCe14401B-NX	1x40GbE	NIC RoCE	40GbE QSFP+ Passive DAC Cable 40GbE QSFP+ Active DAC Cable
OCe14401B-UX	1x40GbE	NIC RoCE iSCSI FCoE	

All Broadcom Emulex adapters support network interface card (NIC) single root I/O virtualization (SR-IOV) and are fully compliant to the PCIe Card Electromechanical (CEM) Specification Rev. 3.0/2.0/1.1. Converged network adapters (CNAs) combine two major functional components: a 10GbE networking media access control (MAC) sublayer and an FC I/O controller (IOC) to interface with a unified lossless Ethernet switch. Adapters serve as a common interface for both storage and Internet Protocol (IP) traffic retaining familiar FC and networking software stacks, operating system drivers, and management. The supported PCIe connector is either an 8 or 16 (x8 or x16) data lane type.

NOTE   The illustrations in this manual are only examples. The actual hardware may vary.

The following figures show a number of Emulex OCe14000B-series adapters.

Figure 1 Emulex OCe14102B Adapter
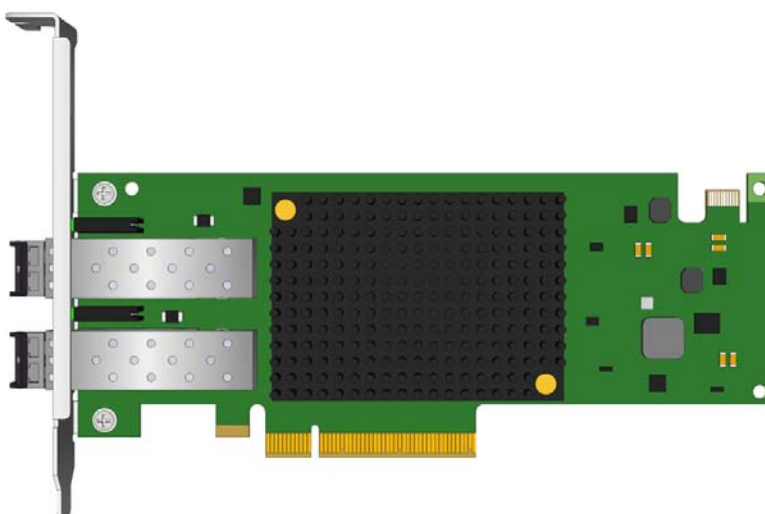
Figure 2 Emulex OCe14102B-NT/UT Adapter
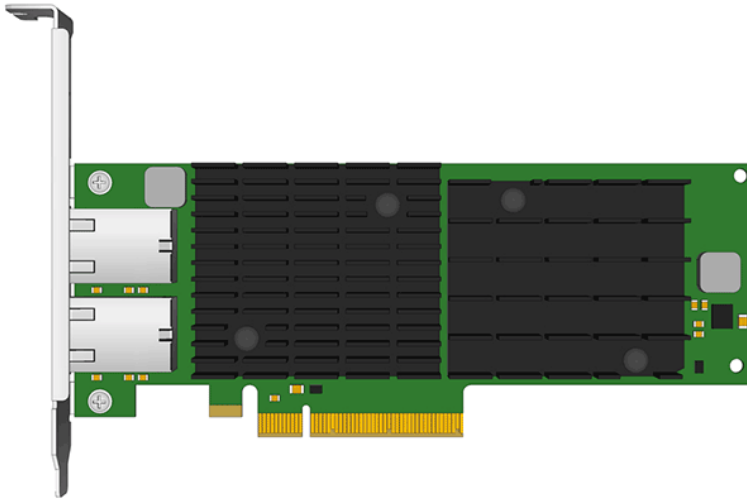
Figure 3 Emulex OCe14401B Adapter
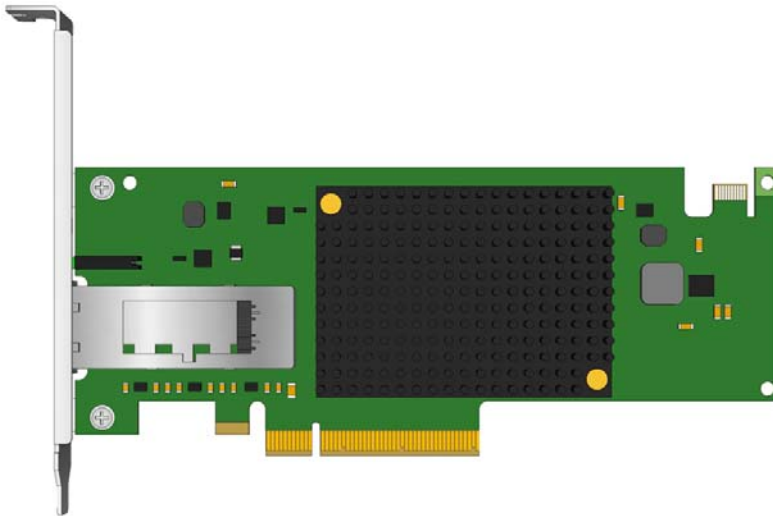
1.1   Features

The general features of the OCe14000B-series adapters include:

■   Eight-lane (x8) Generation 3 PCIe interface at 8GTps, 5GTps, or 2.5GTps (auto-negotiated with system).

■   Parts and construction are compliant to the European Union Directive of RoHS, and similar regulatory requirements for other countries.

■   Standard, full height I/O bracket is factory-installed. The standard, full-height form factor is 6.600 inches by 4.3760 inches (167.64 mm by 111.15 mm); for low–profile adapters, an optional low–profile I/O bracket is included. The low-profile PCIe form factor PCB is 6.600 inches by 2.713 inches (167.64 mm by 68.910 mm).

■   External volatile memory: 2GB or 4GB DDR3 SDRAM technology.

- On-board flash memory: The flash is 128Mbit with a serial peripheral interface (SPI) interface. The flash contains the firmware, vital product data (VPD), and boot BIOS images. You can update the flash with Broadcom Emulex utilities.

- Interoperates with existing FC SAN infrastructures such as switches, arrays, storage resource management (SRM) tools (including Broadcom Emulex utilities), SAN practices, and so forth.

- Host interface support is provided through Broadcom Emulex standard drivers.

- Jumper-enabled Secure Firmware feature.

- Support for Routable RoCE NIC operating system drivers (Windows Server and Linux OpenFabrics Enterprise Distribution (OFED)).

- As supported, a comprehensive array of NIC, iSCSI, FCoE, operating system drivers, including support for Windows, Linux, VMware, and Solaris.

- As supported, Unified Ethernet-to-FC SAN connectivity provided by an FCoE switch.

- Precision Clock Synchronization Protocol—IEEE-1588 precision time protocol (PTP).

1.1.1 OCe14101B Adapters

- Up to eight PCIe functions per adapter, individually configurable to NIC and RoCE personalities.
- Low-profile PCIe form factor
- OCe14101B-NM–SFF-8431 Small Form Factor Pluggable (SFP+) module compliant

1.1.2 OCe14102B Adapters

- Up to 16 PCIe functions per adapter
- OCe14102B-NX/-NM/-NT – individually configurable to NIC and RoCE personalities
  — OCe14102B-UX/-UM/-UT – individually configurable to NIC, RoCE, iSCSI, or FCoE personalities
- Low-profile PCIe form factor
- OCe14102B-NM/-UM - SFF-8431 SFP+ module compliant

1.1.3 OCe14104B Adapters

- Up to 16 PCIe functions per adapter
  — OCe14104B-NX/-NM - individually configurable to NIC and RoCE personalities
  — OCe14104B-UX/-UM - individually configurable to NIC, RoCE, iSCSI, or FCoE personalities
- Standard, full-height form factor only
- OCe14104B-NM/-UM - SFF-8431 SFP+ module compliant

1.1.4 OCe14401B Adapters

- OCe14101B-NX and the OCe14101B-NM adapters support eight functions
- Up to sixteen PCIe functions per adapter, if the system supports ARI
  — OCe14401B-NX - individually configurable to NIC and RoCE personalities
  — OCe14401B-UX - individually configurable to NIC, RoCE, iSCSI, or FCoE personalities
- Low-profile PCIe form factor
- SFF-8436 compliant QSFP+ interface supporting optics and direct attach cables

1.1.5   Protocol-Specific Capabilities

- NIC capabilities include
    - NDIS 5.2, 6.0, and 6.2-compliant Ethernet functionality
    - IPv4/IPv6 TCP, UDP checksum offload
    - IPv4/IPv6 receive-side scaling (RSS)
    - IPv4/IPv6 large receive offload (LRO)
    - IPv4/IPv6 large segment offload (LSO)
    - Programmable MAC addresses
    - Up to 128 MAC/VLAN addresses
    - Supports hash-based multicast MAC address filters
    - Supports hash-based broadcast frame filters per port
    - VLAN insertion and extraction
    - Jumbo packet support up to 9000 bytes
- iSCSI capabilities include
    - Full iSCSI protocol offload
    - Header, data digest (CRC), and PDUs
    - Direct data placement of SCSI data
    - Up to 4K outstanding commands (iSCSI initiator mode only)
    - Up to 512 offloaded iSCSI connections (iSCSI initiator mode only)
    - iSCSI initiator and concurrent initiator/target modes
    - Supports multipath I/O
    - T10 PI support for end-to-end data integrity (for target mode drivers)
- FCoE capabilities include
    - Hardware offloads of Ethernet TCP/IP and concurrent iSCSI and FCoE
    - ANSI T11 FC-BB-5 support
    - Programmable WWN
    - Supports FIP and FCoE ether types
    - Concurrent logins (RPI): up to 8K per adapter
    - Open exchanges (XRI): up to 4K per adapter
    - FCoE initiator and target modes
    - NPIV interfaces:
    - For 2x10GbE and 1x40GbE adapters, up to 255 NPIV interfaces per port
    - For the 4x10GbE adapter, up to 127 NPIV interfaces per port
    - T10 PI support for end-to-end data integrity (for target mode drivers)
- RoCE capabilities include
    - Direct data placement in application buffers without CPU intervention
    - Supports IBTA RoCE specifications
    - Supports Linux OFED
    - Low latency queues for small packet sends and receives
    - Windows Server SMB Direct (SMB over RDMA)

1.1.6   Adapter Identification

Each adapter has several identification numbers. Record these numbers before installation.

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

If the adapter has multiple ports, it has multiple IEEE addresses and multiple WWNs, one for each port.

1.2 Abbreviations

AOC	active optical cable
ARI	alternative routing-ID interpretation
CNA	Converged Network Adapter
CPU	central processing unit
CRC	cyclic redundancy check
DAC	direct-attach copper
DDR3	double data rate type three
ESD	Electrostatic Discharge
FC	Fibre Channel
FCoE	Fibre Channel over Ethernet
FIP	FCoE Initialization Protocol
GB	gigabyte
Gb	gigabit
GbE	gigabit Ethernet
Gbps	gigabits per seconds
GTps	gigatransfers per second
IBTA	InfiniBand Trade Association
IEEE	Institute of Electrical and Electronics Engineers
IOC	I/O controller
IP	Internet Protocol
iSCSI	Internet Small Computer System Interface
LC	Lucent connector
LED	light-emitting diode
LRO	large receive offload
LSO	large segment offload
MAC	Media Access Control
Mbit	megabit
mm	millimeters
NDIS	Network Driver Interface Specification
NIC	network interface card
NPIV	N_Port ID Virtualization
OFED	OpenFabrics Enterprise Distribution
PCBA	printed circuit board assembly
PCIe	Peripheral Component Interconnect Express
PCIe CEM	PCIe Card Electromechanical
PDU	protocol data unit
POST	power-on self-test
QSFP+	Quad Small Form Factor Pluggable

RDMA	remote direct memory access
RH	relative humidity
RoCE	RDMA over Converged Ethernet
RoHS	Restriction of Hazardous Substances
RSS	receive-side scaling
SAN	storage area network
SDRAM	synchronous dynamic random-access memory
SFP	small form-factor pluggable
SMB	server message block
SPI	Serial Peripheral Interface
SR-IOV	single root I/O virtualization
SRM	storage resource management
T10 PI	T10 Protection Information
TCP	Transmission Control Protocol
TOR	top of rack
UDP	User Datagram Protocol
VLAN	virtual local area network
vNIC	virtual network interface card
VPD	vital product data
WWN	World Wide Name

Chapter 2: Installation

This section provides information on changing from the adapter bracket from a standard bracket to a low-profile adapter bracket, and installing the adapter in a computer.

2.1 Preparing the Adapter for Installation

Before installing the adapter, perform one or both of the following procedures:

■ Change the bracket from a full-height to a low-profile version by following the instructions in Section 2.1.1, Changing the Bracket.

■ Disable the Secure Firmware feature found on some OCe14000B-series adapter models by following the instructions in Section 2.1.2, Enabling or Disabling the Secure Firmware Feature.

If these procedures are not applicable, proceed to Section 2.2, Installing the Adapter.

2.1.1 Changing the Bracket

A standard, full-height PCIe bracket is factory-installed; however, a low-profile bracket is included in the box with the adapter (except for the OCe14104B adapter, which cannot use the low-profile bracket).

To change the adapter from a full-height to a low-profile bracket, perform the following steps:

1. Some adapters come with optical transceivers embedded in their cage assemblies. These optical transceivers must be removed before the bracket can be removed. If the adapter does not include optical transceivers, go 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. The following table shows an example of one type with the bail (handle) extended.

Figure 4 Optical Transceiver Example
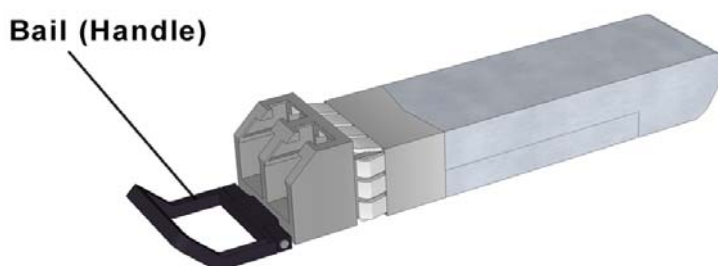
2. To remove a transceiver, pull the bail (handle) out and down to release the latch, and gently pull the transceiver from its cage. Be careful not to force the transceiver from the cage.

   Figure 5 shows a transceiver with the latch released (bail extended) and another transceiver latched in place.

Figure 5 Releasing the Latch on an Optical Transceiver
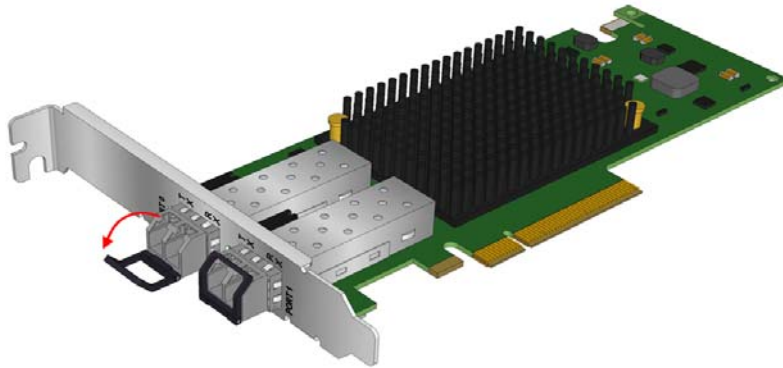
3. Observing ESD precautions, store the transceiver in an ESD-safe place.

4. Remove the mounting bracket screws from the top of the adapter. Figure 6 shows the screws that are removed from the bracket.

Figure 6 Removing the Bracket
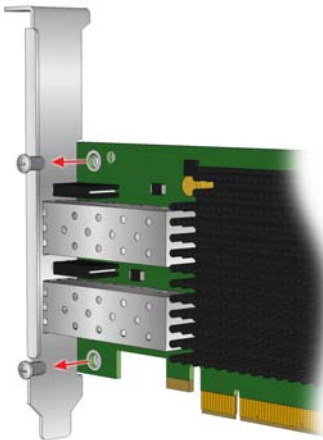
5. Remove the bracket and store it for future use.

6. Align the new mounting bracket tabs with the holes in the adapter.

> **NOTE**   For some adapters, be careful not to push the bracket past the transceiver. Ensure that the LEDs are properly aligned with the holes in the bracket.

7. Re-install the screws that attach the adapter to the bracket.

8. Re-install the transceiver, if it was removed, by sliding it into its cage. When the latch engages, it clicks. Push the bail back into place.

2.1.2   Enabling or Disabling the Secure Firmware Feature

Some Emulex OCe14000B-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 Emulex 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 unsecure firmware version, you must remove the jumper before updating the firmware.

Replace the jumper after the firmware update is complete.

The following illustrations, Figure 7 through Figure 9, provide examples of common locations of the Secure Firmware jumper

Figure 7 Secure Firmware Jumper Location J3 on OCe14401B-series Adapter

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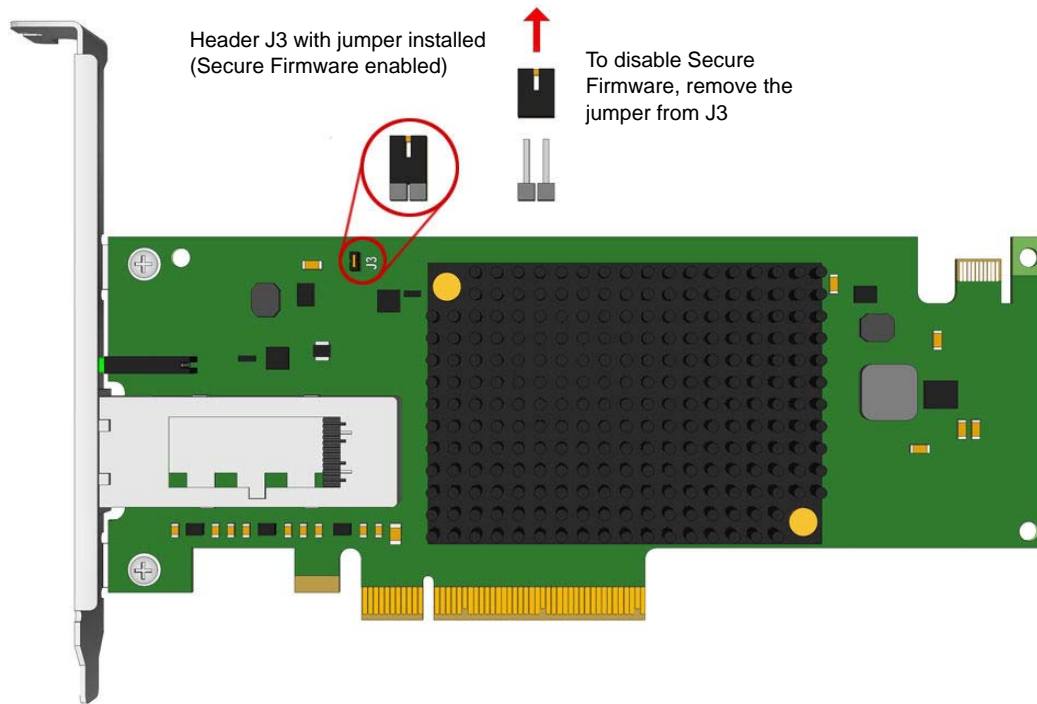
Figure 8 Secure Firmware Jumper Location J6 on OCe14104B-series Adapter

To disable Secure
Firmware, remove the
jumper from J6

Header J6 with jumper
installed (Secure Firmware
enabled)
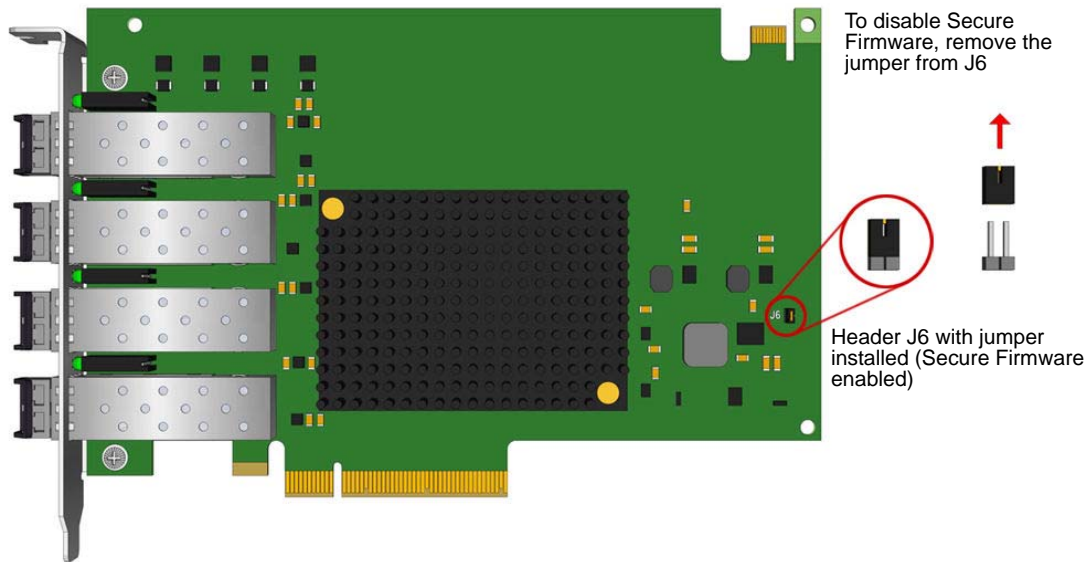
Figure 9 Secure Firmware Jumper Location J7 on OCe14102B-series Adapter

Header J7 with jumper installed
(Secure Firmware enabled)

To disable Secure
Firmware, remove the
jumper from J7
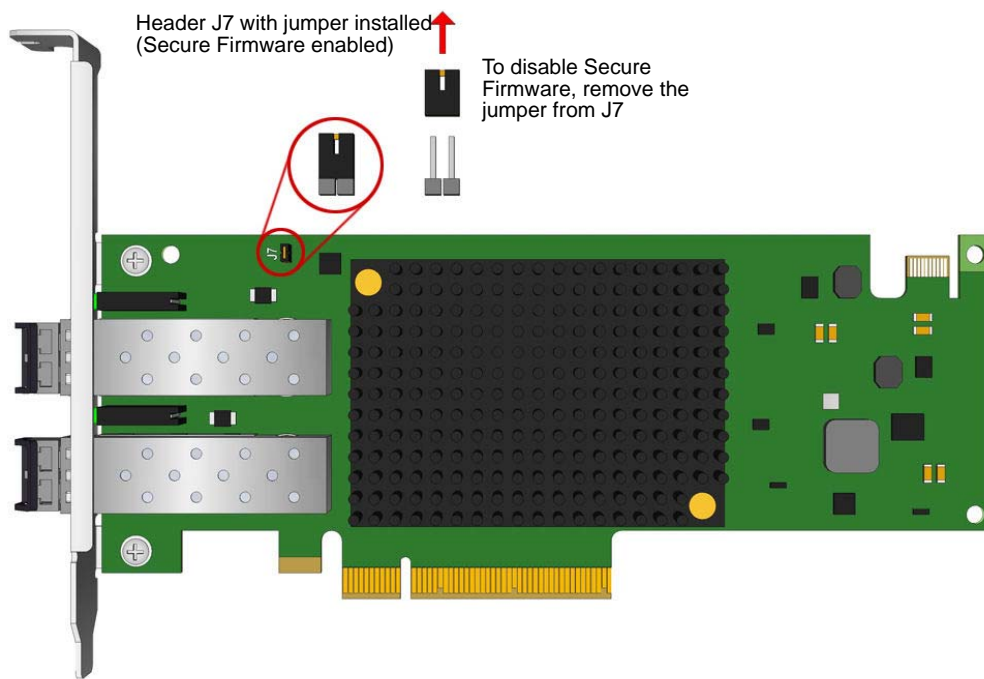
2.2   Installing the Adapter

To install the adapter in the computer, perform the following steps:

1. Turn off the computer and unplug it.
2. Remove the computer case.

3.   Remove the blank panel from an empty PCIe bus slot.

4.   Insert the adapter into the empty x8 or x16 PCIe bus slot. Press firmly until the adapter is seated.

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 to be attached to devices.

Chapter 3: Attaching Devices to the Adapter

The following sections describe how to connect devices to the adapter using different cable types.

3.1 Connecting Devices to Adapters Using a DAC or AOC Cable

The following adapters can be connected to a DAC or AOC cable:

- OCe14101B-NX
- OCe14102B-NX
- OCe14102B-UX
- OCe14104B-NX
- OCe14104B-UX
- OCe14401B-NX
- OCe14401B-UX

An adapter does not allow normal data transmission on a copper link unless it is connected to a compatible copper interface connection. The cable and connector specifications are listed in Table 2 and Table 3.

Table 2 OCe14101B-NX, OCe14102B-NX/-UX, and OCe14104B-NX/-UX Cable and Connector Specifications

Cable Type	Maximum Length (meters)	Minimum Length (meters)	Connector
10GbE SFP+ Passive DAC Cable	5	0.5	DAC
10GbE SFP+ Active DAC Cable	10	0.5	DAC
10GbE SFP+ Active Optical Cable	7	1	AOC

Table 3 OCe14401B-NX/-UX Cable and Connector Specifications

Cable Type	Maximum Length (meters)	Minimum Length (meters)	Connector
40GbE QSFP+ Passive DAC Cable	5	0.5	DAC
40GbE QSFP+ Active DAC Cable	10	0.5	DAC

To attach devices to the adapter, perform the following steps:

1. Connect the cable to the adapter. When connecting a DAC or AOC cable, ensure that the SFP+ cages do not have optical transceivers installed in them. To remove optical transceivers, see Section 2.1, Preparing the Adapter for Installation.

2. After confirming that there are no optical transceivers installed, insert the DAC or AOC transceiver into the SFP+ cage on the Emulex OCe14100B-series adapter as shown in Figure 10 or the Emulex OCe14400B-series adapter as shown in Figure 11.

Figure 10 Connecting a DAC Cable to the OCe14102B-series -NX/-UX Adapters
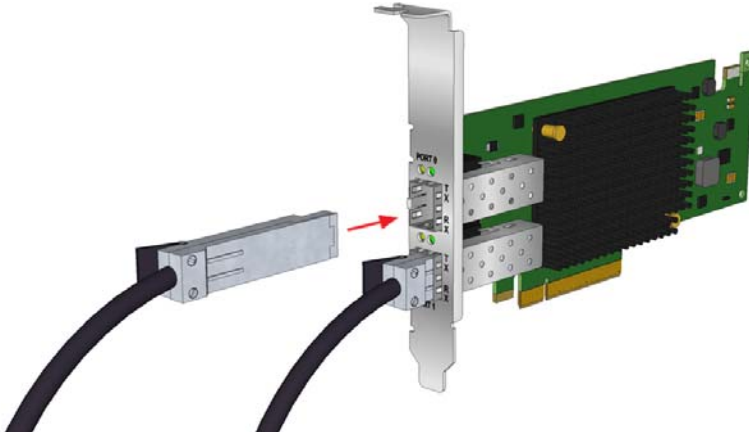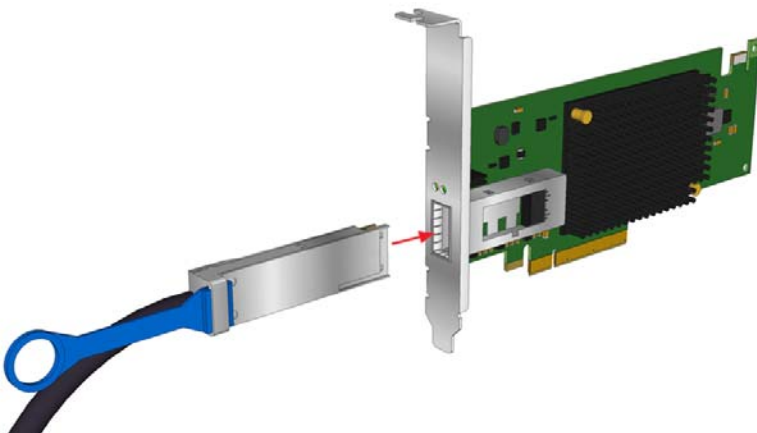

Figure 11 Connecting a DAC Cable to the OCe14401B-series -NX/-UX Adapters

3. After the cable is connected to the adapter, connect the other end of the cable to a suitable device, such as a TOR switch.

You can now apply power to the computer and view LEDs. For information on applying power and viewing LEDs, see Chapter 4, Applying Power and Viewing the LEDS, on page 22.

3.2   Emulex OneConnect Accessories

Table 4 and Table 5 provide model number, name, interface, and required quantities, for ordering additional or replacement transceivers or cables.

Table 4 OCe14101B-NX, OCe14102B-NX, and OCe14104B-NX/-UX Adapter Emulex OneConnect Accessories

Model Number	Model Name	Quantity	Interface
OC10-SR-OPT-1	Emulex OneConnect 10Base-SR Optical SFP+ Transceiver	1 pc	10GBASE-SR Optical
OC10-SR-OPT-2	Emulex OneConnect 10Base-SR Optical SFP+ Transceivers (2 pcs)	2 pcs	10GBASE-SR Optical
OC10-LR-OPT-1	Emulex OneConnect 10Base-LR Optical SFP+ Transceiver	1 pc	10GBASE-LR Optical

Table 5 OCe14401B-NX/UX Adapter Emulex OneConnect Accessories

Model Number	Model Name	Quantity	Interface
OC40-SR4-OPT-1	Emulex OneConnect 40Base-SR4 Optical QSFP+ Transceiver	1 pc	40Gbase-SR4 Optical

NOTE   For optical adapter support, you must order either a short reach optical adapter model (-NM or -UM) or a direct attach model with an Emulex OneConnect accessory transceiver kit.

Only Broadcom Emulex accessories are warranted and fully supported by Broadcom technical support.

3.3   Connecting Devices to Adapters Using an Optical Cable with LC Connectors

The following adapters can be connected to a fiber optic cable with an embedded optical transceiver:

- OCe14101B-NM
- OCe14102B-NM
- OCe14102B-UM
- OCe14104B-NM
- OCe14104B-UM

The cable and connector specifications are listed in Table 2. For AOC cables see Table 7.

Table 6 OCe14101B-NM, OCe14102B-NM/-UM, and OCe14104B-NM/-UM Adapter Cable and Connector Specifications

Cable Type	Maximum Length (meters)	Minimum Length (meters)	Connector
Fiber Optic Cable (Ethernet Only) Long Range, LC-LC Single Mode Fiber (SMF) 10 Gb per second (Gbps)	10,000	2	LC
OM3 – Multimode 50/125 micron fiber (2000 MH$_z$*km bandwidth cable) with LC connectors: 1 Gbps (Not specified by IEEE 802.3) 10 Gbps	550 300	2 2	LC LC
OM2 - Multimode 50/125 micron fiber (500 MH$_z$*km bandwidth cable) with LC connectors: 1 Gbps 10 Gbps	550 82	2 2	LC LC
OM1 - Multimode 62.5/125 micron fiber (200 MH$_z$*km bandwidth cable) with LC connectors: 1 Gbps 10 Gbps	275 26	2 2	LC LC

To attach devices to the adapter:

1. Connect the optical cable to the adapter. When connecting an optical cable, ensure that the cages have optical transceivers installed in them (Figure 12).

Figure 12 Installing an Optical Transceiver for the OCe14000B-series -NM/-UM Adapters
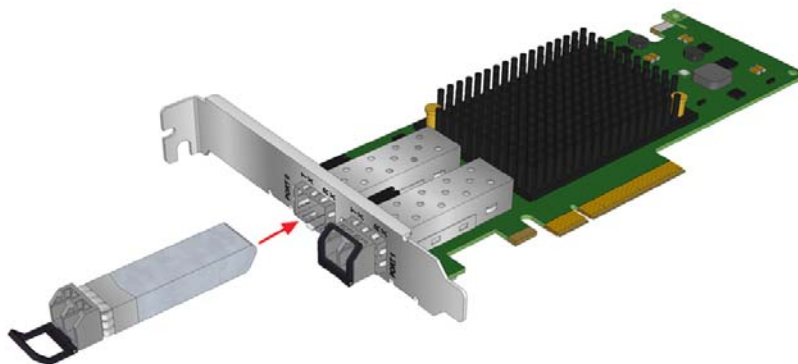
2. After the optical transceivers are installed, insert the optical cable into the LC connectors on the adapter as shown in Figure 13.

Figure 13 Connecting a Fiber Optic Cable for the OCe14000B-series -NM/-UM Adapters
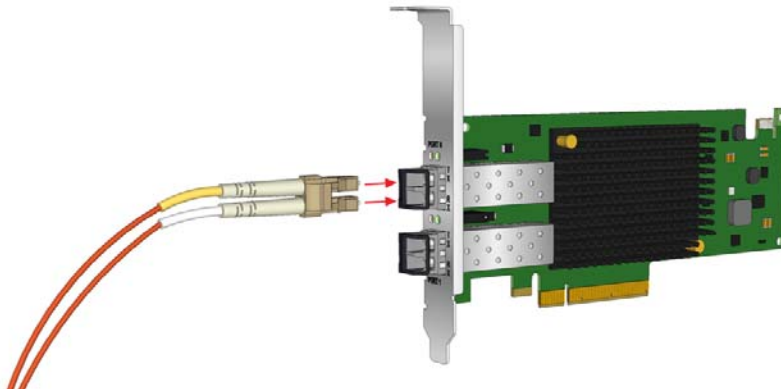
3.   After the appropriate cable is connected to the adapter, connect the other end of the cable to a suitable device, such as a TOR switch.

You can now apply power to the computer and view the LEDs. For information on applying power and viewing LEDs, see Chapter 4, Applying Power and Viewing the LEDS, on page 22.

3.4   Connecting Devices to Adapters Using a UTP or CAT Cable

The Emulex OCe14102B-NT and Emulex OCe14102B-UT adapters can be connected with an unshielded twisted pair (UTP) or shielded twisted pair (STP) copper cable (commonly referred to as a Category or 'CAT' cable).

 The cable and connector specifications are listed in Table 7.

Table 7 OCe14102B-NT/-UT Adapter Cable and Connector Specifications

Cable Type	Maximum Length	Connector
CAT 6 STP, CAT 6A UTP/STP, CAT 7 STP in 10G mode	100 meters (328 feet)	RJ-45
CAT 6 UTP (screened) in 10G mode	55 meters (180 feet	RJ-45
CAT 5E (or higher category cable) in 1G (1000BASE-T) mode	100 meters (328 feet)	RJ-45

To attach devices to the adapter:

1.   Connect one end of the CAT cable to the 10GBase-T adapter.

2.   After the appropriate cable is connected to the adapter, connect the other end of the cable to a suitable device, such as a TOR switch or female RJ45 patch panel.

3.   You can now apply power to the system and view the LEDs. For information on applying power and viewing LEDs, see Chapter 4, Applying Power and Viewing the LEDS, on page 22.

Chapter 4: Applying Power and Viewing the LEDS

This section provides instructions on how to apply power and how to interpret the LEDs for various adapter models.

4.1 Applying Power

To apply power, perform the following steps:

1. Verify that the adapter is securely installed in the system.
2. Verify that the correct device is attached.
3. Plug in and turn on the system.
4. Observe the boot banner for POST results.

4.2 LED Indicators

4.2.1 OCe14102B-NT/UT Adapters

4.2.1.1 Dual Color Amber/Green LED (Link Status)

- On (constantly green) = Link up at 1000BASE-T
- On (constantly amber) = Link up at 10GBASE-T
- Off = Link down

4.2.1.2 Green LED (Ethernet Activity)

- Blink = Activity on the Ethernet link
- Off = No activity on the Ethernet link

4.2.2 All Other OCe14000B-series Adapters

4.2.2.1 Amber LED (Link Status)

- On (constantly) = Link up
- Off = Link down

4.2.2.2 Green LED (Ethernet Activity)

- Blink = Activity on the Ethernet link
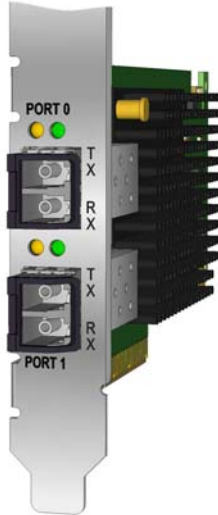- Off = No activity on the Ethernet link

4.3 Viewing the LEDs

The LED indicators in Figure 14 pertain to the following adapter models:

- OCe14101B-NM/-NX
- OCe14102B-NM/-NX
- OCe14102B-UX/-UM

Each port connector has one amber and one green LED.

Figure 14 OCe14101B-NM/-NX, OCe14102B-NM/-NX, and OCe14102B-UX/-UM Adapter LED Indicators
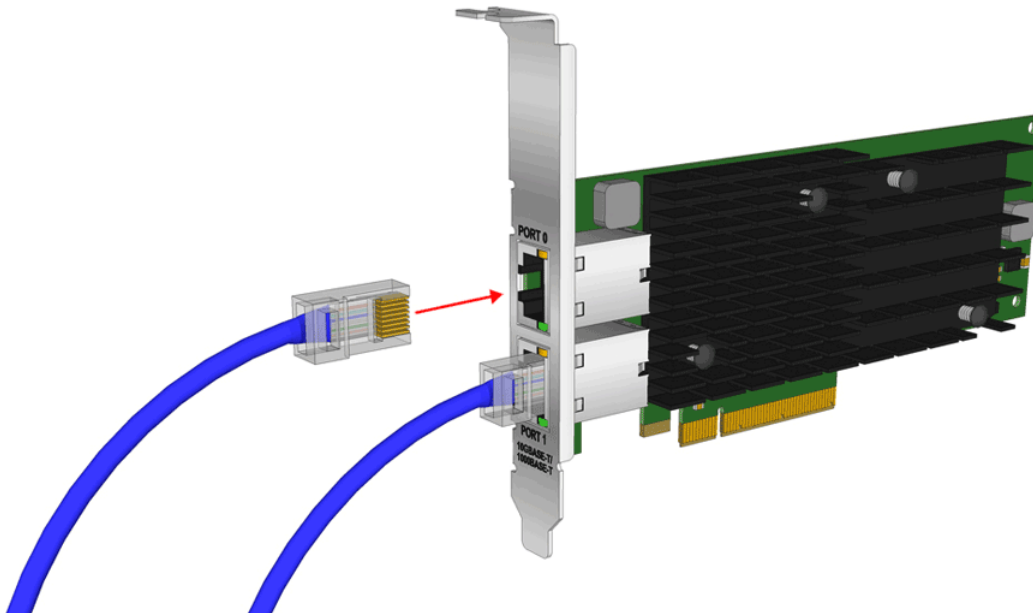

The LED indicators as shown in Figure 15 pertain to single port Emulex OCe14401B-NX/-UX adapter models. The OCe14401B adapters have one green and one amber LED.

Figure 15 OCe14401B-NX/-UX Adapter LED Indicators

The LED indicators as shown in Figure 16 pertain to dual port Emulex OCe14102B-NT/-UT adapter models. Each port connector has one green and one amber LED.

Figure 16 OCe14102B-NT and OCe14102B-UT LED Indicators

The LED indicators in Figure 17 pertain to the Emulex OCe14104B-NM and Emulex OCe14104B-UM adapter models. Each port connector has one green and one amber LED.

Figure 17 OCe14104B-NM/-UM LED Indicators
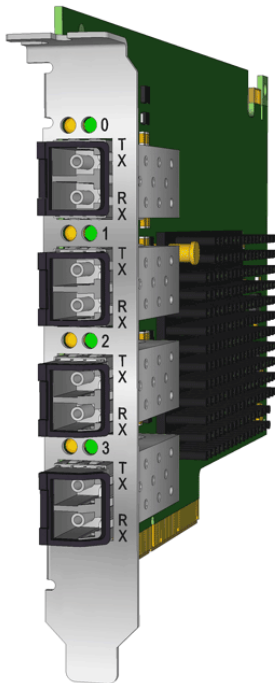
Chapter 5: References

5.1 Specifications

Table 8 provides the adapter specifications for Emulex OCe14101B, OCe14102B, OCe14104B, and OCe14401B adapters.

Table 8 Adapter Specifications

Parameter	Range
Physical Dimensions	OCe14104B-NX, OCe14104B-UX, OCe14104B-NM, and OCE14104B-UM four-port SFP+ adapters are available in the standard, full-height form factor only. ■ Standard, full-height form factor, 6.600 inches by 4.3760 inches (167.64 mm by 111.15 mm) and accommodates the full-height profile bracket only. All 1-port and 2-port SFP+, 1-port QSFP+, and 2-port 10GBASE-T OneConnect adapters: ■ Low-profile form factor, 6.600 inches by 2.713 inches (167.64 mm by 68.910mm), and accommodates both the full-height and low-profile brackets.
Power Requirements	OCe14101B and OCe14102B SFP+ adapters: ■ 9.2 watts (typical optical, 10GbE) ■ 8.2 watts (typical passive 10GbE DAC cable) OCe14102B 10GBASE-T adapters: ■ 16.0 watts (typical 10 Gbps, 2-ports) ■ 11.5 watts (typical 1 Gbps, 2-ports) ■ 12.9 watts (typical 10 Gbps, 1-port) ■ 10.8 watts (typical 1 Gbps, 1-port) OCe14104B adapters ■ 11.33 watts (typical card power with optic modules) ■ 8.69 watts (typical power with passive Cu DAC cables) OCe14401B QSFP+ adapters: ■ 9.96 watts (typical optical, 40GbE) ■ 8.63 watts (typical passive 40GbE DAC cable)
Airflow	OCe14101B, OCe14102B, and OCe14104B SFP+ adapters: 150 linear feet per minute (minimum) OCe14102B 10GBASE-T and OCe14401B QSFP+ adapters: 200 linear feet per minute (minimum)
Temperature	0°C to 55°C (operating) -40°C to 70°C (non-operating) **NOTE** Operating the adapter in higher temperatures or lower air flow may result in premature failures.

Table 8 Adapter Specifications (Continued)

Parameter	Range
Humidity	Operating: 10% to 90% RH, non-condensing, 22°C wet bulb Non-operating: 5% to 95% RH, non-condensing, 22°C wet bulb
Agency Approvals	■ 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 to EN60950-1:2006 +A11 +A1 +A12+A2 ■ FCC Rules, Part 15, Subpart B, Class A ■ Industry Canada, ICES-003, Class A ■ EMC Directive 2004/108/EC and 2014/30/EU (CE Mark) ■ EN55022:2010, Class A ■ EN55024:2010 ■ Australian EMC Framework (RCM Mark) ■ AS/NZS CISPR22:2009 +A1, Class A ■ Japan VCCI, Class A ■ Taiwan BSMI, Class A ■ Korea MSIP, 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/min.)

5.2 FCC and Regulatory Notices

5.2.1 OCe14000B-series Adapters

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 (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 Broadcom 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. CAN ICES-3 (A)/ NMB-3 (A)

5.2.1.1 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.

5.2.1.2 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.

5.2.1.3 Notice for South Korea and Translations (MSIP)

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.

5.3 Declaration of Conformity

5.3.1 OCe14000B-series Adapters

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 Broadcom Limited, including the use of non-Broadcom approved optical transceivers, could void the user's authority to operate this equipment.

DECLARATION OF CONFORMITY

Manufacturer: Emulex Corporation
3333 Susan Street
Costa Mesa, CA. 92626 USA

declares under sole responsibility that the product:

Product Name: OneConnect® UCNA
Regulatory Model: P008827, P008933, P009956, P010215
Assembly Number: P008827-xxx, P008933-xxx, P009956-xxx, P010215-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:	Electromagnetic Compatibility (Class A):
UL Recognized to UL 60950-1:2007, Second Edition	FCC Rules, CFR Title 47, Part 15, Subpart B
cUR Recognized to CSA 22.2, No. 60950-1-07	Industry Canada, ICES-003:2012 (Issue 5)
IEC 60950-1:2005 +A1 +A2 (CB Scheme)	EN55022:2010 / CISPR 22:2008
EN 60950-1:2006 +A11 +A1 +A12 +A2	EN55024:2010 / CISPR 24:2010
EN 60825-1:2007*	AS/NZS CISPR 22:2009 +A1
CFR Title 21, Laser AEL Class 1, FDA/CDRH*	VCCI:2014
* when equipped with approved optical transceivers	CNS 13438:2006 (complete), 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 2006/95/EC and 2014/35/EU
   - European Union EMC Directives 2004/108/EC and 2014/30/EU
   - European Union RoHS Directive 2011/65/EU
   - Australian RCM framework

December 16, 2015
Costa Mesa, CA

Jeff Hoogenboom
VP and General Manager of ECD

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

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5.4   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 which 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.

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CLASS 1 LASER PRODUCT
LASER KLASSE 1
LUOKAN 1 LASERLAITE
APPAREIL A` LASER DE CLASSE 1
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