ConnectX®-3 Ethernet Single and Dual SFP+ Port Adapter Card User Manual

P/N:

MCX312A-XCBT, MCX312B-XCBT, MCX311A-XCAT

Rev 1.7

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Revision History

This document was printed on November 14, 2012.

Table 1 - Revision History Table

Date	Rev	Comments/Changes
November 2012	1.7	• Added MCX312B-XCBT to the following locations: - Section 1.2, "Adapter Cards Covered in this Manual," on page 11 - Figure 4, "MCX312B-XCBT Card," on page 15 - Figure 7, "Dual-port Bracket for MCX312B-XCBT," on page 16 - Table 7, "MCX312B-XCBT VPD Layout," on page 21 - Figure 17, "Mechanical Drawing of the Dual-port MCX312B-XCBT," on page 40
October 2012	1.6	• Added single-port SFP+ card to all necessary locations • Fixed Table 5, "Jumper Configuration," on page 19 • Updated figures in Section 4.1.2, "Windows," on page 31 by providing ConnectX-3 examples
October 2012	1.5	• Removed all references to 40 Gigabit Ethernet from the User Manual
August 2012	1.4	• Added operational and non-operational temperature and humidity level to the following tables: - Table 10, "MCX312A-XCBT Specifications Table," on page 38
January 2012	1.2	• Minor edits • Updated LED functions in Section 2.1.3, "LED Assignment," on page 17 • Formatted specification tables in Appendix A, "Specifications," on page 37
October 2011	1.1	Added new OPNs based on ConnectX-3 Step A1 devices
July 2011	1.0	Minor edits
July 2011	0.10	First Release

About this Manual

This *User Manual* describes Mellanox Technologies ConnectX®-3 10 Gigabit Ethernet Single Dual SFP+ port PCI Express x4 or x8 adapter cards. It provides details as to the interfaces of the board, specifications, required software and firmware for operating the board, and relevant documentation.

Intended Audience

This manual is intended for the installer and user of these cards.

The manual assumes basic familiarity with Ethernet networks and architecture specifications.

Related Documentation

Table 2 - Documents List

Mellanox Firmware Tools (MFT) User Manual Document no. 2204UG	User Manual describing the set of MFT firmware management tools for a single node. See http://www.mellanox.com => Support => Download Firmware Tools
IEEE Std 802.3 Specification	This is the IEEE Ethernet specification http://standards.ieee.org/getieee802
PCI Express 3.0 Specifications	Industry Standard PCI Express 3.0 Base and Card Electromechanical Specifications

Document Conventions

When discussing memory sizes, MB and MBytes are used in this document to mean size in mega bytes. The use of Mb or Mbits (small b) indicates size in mega bits. In this document PCIe is used to mean PCI Express.

Technical Support

Customers who purchased Mellanox products directly from Mellanox are invited to contact us through the following methods.

- URL: http://www.mellanox.com => Support
- E-mail: support@mellanox.com
- Tel: +1.408.916.0055

Customers who purchased Mellanox M-1 Global Support Services, please see your contract for details regarding Technical Support.

Customers who purchased Mellanox products through a Mellanox approved reseller should first seek assistance through their reseller.

Firmware and Software Updates

The Mellanox support downloader contains software, firmware and knowledge database information for Mellanox products. Access the data base from the Mellanox Support web page,

http://www.mellanox.com => Support

or use the following link to go directly to the Mellanox Support Download Assistant page,

http://www.mellanox.com/supportdownloader/.

1 Overview

This document is a *User Manual* for Mellanox Technologies Ethernet cards based on the ConnectX®-3 EN integrated circuit device. The cards described in this manual have the following main features:

- IEEE Std. 802.3 compliant
- PCI Express 3.0 (1.1 and 2.0 compatible) through an x4 or x8 edge connector up to 8GT/s
- 10 Gb/s Ethernet
- Single and Dual SFP+ ports for connection Ethernet traffic
- RDMA over Converged Ethernet (RoCE)
- End-to-end QoS and congestion control
- Hardware-based I/O virtualization
- TCP/UDP/IP stateless off-load
- RoHS-R6 compliant
- Two bracket heights: short and tall

1.1 Supported Network Protocol Standards

1.1.1 10 Gigabit Ethernet

10 Gigabit Ethernet is an Ethernet network protocol standard for LANs specifying data transfer rate of 10Gb/s. Mellanox adapters comply with the following IEEE 802.3* standards:

- IEEE Std 802.3-2008 Ethernet
- IEEE Std 802.3ae 10 Gigabit Ethernet
- IEEE Std 802.3ad Link Aggregation and Failover

1.2 Adapter Cards Covered in this Manual

Table 3 lists the single and dual port 10 Gigabit Ethernet adapter cards described in this manual.

Table 3 - Single and Dual-port 10 Gigabit Ethernet Adapter Card

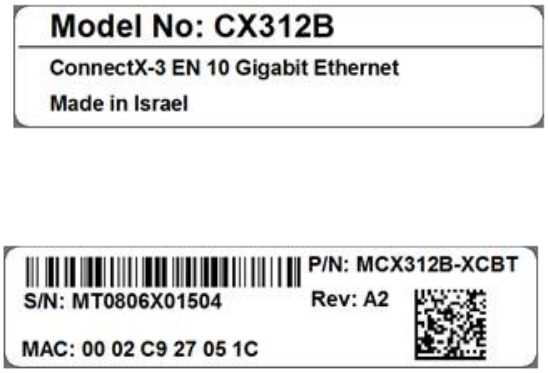
Ordering Part Number (OPN)	PCI Express SERDES Speed	Data Transmission Rate/ # of ports	RoHS	IC Part Number	Device ID (decimal)
MCX312A-XCAT (Legacy product)	PCIe 3.0 x4/x8 8GT/s	10 GigE dual-port SFP+	R-6	MT27518A0-FCCR-XE	• 4099 for Physical Function • 4100 for Virtual Function
MCX311A-XCAT	PCIe 3.0 x4 8GT/s	10 GigE single-port SFP+	R-6	MT27518A1-FCCR-XE	• 4099 for non-virtualized servers • 4100 for virtual machines
MCX312A-XCBT	PCIe 3.0 x4/x8 8GT/s	10 GigE dual-port SFP+	R-6	MT27518A1-FCCR-XE	• 4099 for Physical Function • 4100 for Virtual Function
MCX312B-XCBT	PCIe 3.0 x4/x8 8GT/s	10 GigE dual-port SFP+	R-6	MT27518A1-FCCR-XE	• 4099 for Physical Function • 4100 for Virtual Function

1.3 Finding the MAC and Serial Number on the Adapter Card

Each Mellanox adapter card has a label on the print side that shows the card serial number and the card MAC for the Ethernet protocol.

Figure 1: Card Product Label (Example)

Figure 2: Board Labels for MCX312B-XCBT



1.4 Safety Warnings

Below is a list of safety warnings in English. For safety warnings in other languages, please refer to the appendices in this user manual.

1. **Installation Instructions**

Read all installation instructions before connecting the equipment to the power source.

2. **Over-temperature**

This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 55°C (131°F).
To guarantee proper air flow, allow at least 8cm (3 inches) of clearance around the ventilation openings.

3. **During Lightning - Electrical Hazard**

During periods of lightning activity, do not work on the equipment or connect or disconnect cables.

4. **Copper Cable Connecting/Disconnecting**

Some copper cables are heavy and not flexible, as such they should be carefully attached to or detached from the connectors. Refer to the cable manufacturer for special warnings and instructions.

5. Equipment Installation

This equipment should be installed, replaced, or serviced only by trained and qualified personnel.

6. Equipment Disposal

Disposal of this equipment should be in accordance to all national laws and regulations.

7. Local and National Electrical Codes

This equipment should be installed in compliance with local and national electrical codes.

8. Hazardous Radiation Exposure

Caution – Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

CLASS 1 LASER PRODUCT and reference to the most recent laser standards: IEC 60 825-1:1993 + A1:1997 + A2:2001 and EN 60825-1:1994+A1:1996+ A2:2001

2 Adapter Card Interfaces

2.1 I/O Interfaces

Each adapter card includes the following interfaces:

- SFP+ port(s)
- PCI Express (PCIe) x4 or x8 edge connector
- I/O panel LEDs
- I^2C-compatible connector (for debug)

Figure 3: MCX312A-XCBT Card

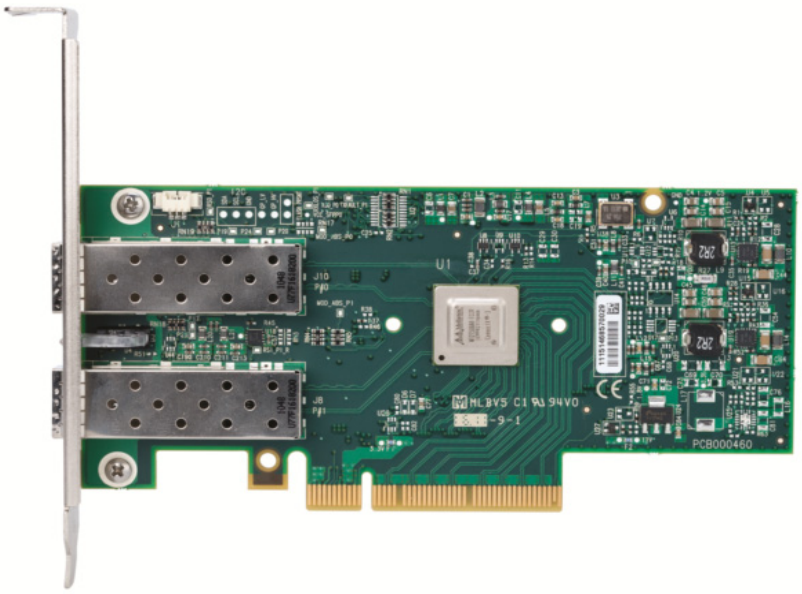


Figure 4: MCX312B-XCBT Card

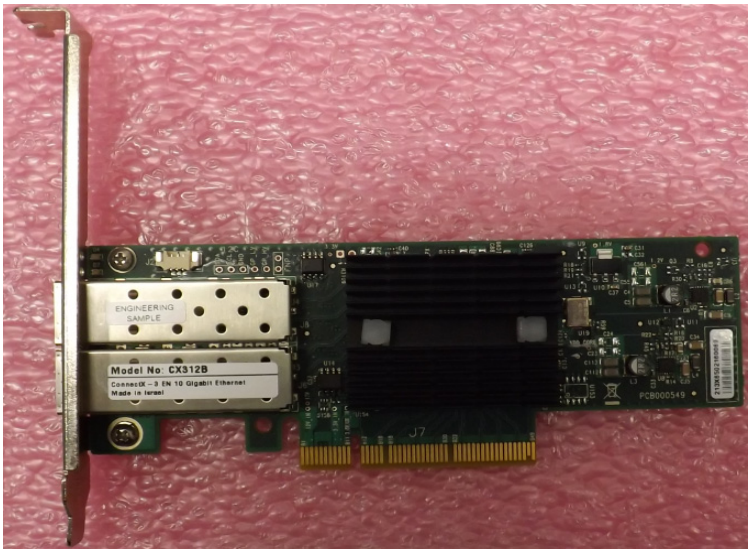


Figure 5: MCX311A-XCAT Card

The adapter cards include special circuits to protect from ESD shocks to the card/server when plugging copper cables.

Figure 6: Dual-port Bracket for MCX312A-XCBT

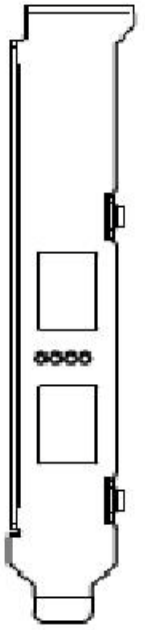


Figure 7: Dual-port Bracket for MCX312B-XCBT

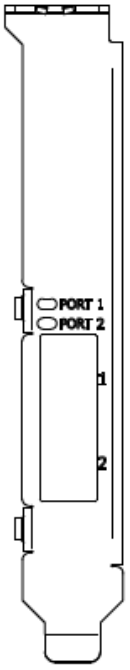
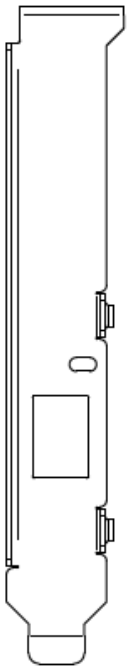


Figure 8: Single-port Bracket



For dual-port cards, Port 1 connects to connector 1 of the device, while Port 2 connects to connector 2 of the device.

2.1.1 Ethernet SFP+ Interface

The network ports of the ConnectX®-3 adapter cards are compliant with the IEEE 802.3 Ethernet standards listed in Section 1.1.1, “10 Gigabit Ethernet,” on page 10. The SFP+ port has one Tx/Rx pair of SerDes. Ethernet traffic is transmitted through the cards' SFP+ connectors.

2.1.2 PCI Express Interface

The ConnectX®-3 adapter cards support PCI Express 3.0 (1.1 and 2.0 compatible) through an x4 or x8 edge connector. The device can be either a master initiating the PCI Express bus operations or a slave responding to PCI bus operations.

2.1.3 LED Assignment

There are two I/O LEDs per port in dual-port designs and one bicolor LED in single-port designs, green and yellow, located on the I/O panel. See Table 4 for different LED functions.

Table 4 - Physical and Logical Link Indication

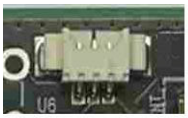
LED	Function
Green - physical link	• Constant on indicates a good physical link • If neither LED is lit, then the physical link has not been established
Yellow - logical (data activity link)	• A blinking yellow indicates activity (data transfer) • Stays off when there is no activity

The short bracket has the same port and LED footprints as the tall bracket.

2.1.4 I²C-compatible Interface

A three-pin header on the adapter cards is provided as the I²C-compatible interface. See Figure 16, “Mechanical Drawing of the Dual-port MCX312A-XCBT Adapter Card,” on page 40 for the location on the board.

Figure 9: I²C-compatible Connector



2.2 Power

All adapter cards receive 12V and 3.3V power from the PCI Express edge connector. All other required power voltages are generated by on-board switch mode regulators. See “Specifications” on page 37.

2.3 SFP+ Power Level

The adapter cards support power levels according to SFF Committee SFF-8431 Specification for SFP+ (Small Form-factor Pluggable) Transceiver.

2.4 Memory

The adapter cards support multiple memory devices through the PCIe, SPI (Flash) and I²C interfaces.

2.4.1 System Memory

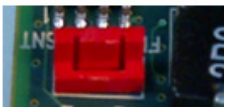
The adapter cards utilize the PCI Express interface to store and access Ethernet fabric connection information and packet data on the system memory.

2.4.2 SPI

Each of the adapter cards includes one 16MB SPI Flash device (M25PX16-VMN6P device by ST Microelectronics) accessible via the SPI interface of the ConnectX®-3 EN device.

When a jumper is inserted into the drill holes in the adapter it indicates to the device that the on-board Flash device should not be used for boot instructions. Contact your Mellanox support representative should you need to use this jumper. Table 5 provides information on this jumper. The jumper location on the board is illustrated in Appendix A.3, "Board Mechanical Drawing and Dimensions," on page 39.

Table 5 - Jumper Configuration

Description	Option	Card Default Configuration
Flash present/ not present	connection open – Flash present  connection shorted – Flash not present 	connection open – Flash present

2.4.3 EEPROM

Each board incorporates an EEPROM that is accessible through the I^2C-compatible interface. The EEPROM capacity is 4Kb. The EEPROM is used for storing the Vital Product Data (VPD).

The PCI VPD (Vital Product Data) layout for each of the adapter cards complies with the format defined in the *PCI 3.0 Specification, Appendix I.*

Table 6 - MCX312A-XCBT VPD Layout

Offset (Decimal)	Item	Value	Format	Description
0	Large Resource Type ID String Tag (0x02)	0x82		
1	Length [7:0] LSB	0x18		
2	Length [15:8] MSB	0x0		
3	Data	CX312A - ConnectX-3 SFP+	STR	
27	Large Resource Type VPD-R Tag (0x10)	0x90		

Offset (Decimal)	Item	Value	Format	Description
28	Length [7:0] LSB	0x4F		
29	Length [15:8] MSB	0x00		
30	VPD Keyword	PN	STR	Add in Card Part Number
32	Length	0x15		
33	Part Number	PN	%STR_SPC	
54	VPD Keyword	EC	STR	Engineering Change Level of the card (rev)
56	Length	0x2		
57	Revision	RV	%STR	PCB revision
59	VPD Keyword	SN	STR	Serial Number
61	Length	0x18		
62	SerialNumber	SN	%STR_SPC	“00..00XXXX..XX”
86	VPD Keyword	V0	STR	Misc Information
88	Length	0x10		
89	Data	PCIe Gen3 x8	STR_SPC	
105	VPD Keyword	RV	STR	
107	Length	0x1		
108	Data	0,107	%CS0	
109	Large Resource Type VPD-W Tag (0x11)	0x91		
110	Length [7:0] LSB	0x8F		
111	Length [15:8] MSB	0xF		
112	VPD Keyword	V1	STR	EFI Driver version
114	Length	0x6		
115	Data	N/A	STR_SPC	
121	VPD Keyword	YA	STR	Asset Tag
123	Length	0x18		
124	Data	N/A	STR_SPC	“N/A”
148	VPD Keyword	RW	STR	Remaining read/write area
150	Length	0x69		
151	Data		STR_ZERO	Reserved (0x00)
256	VPD Keyword	RW	STR	Remaining read/write area
258	Length	0xfd		
259	Data		STR_ZERO	Reserved (0x00)
512	VPD Keyword	RW	STR	Remaining read/write area
514	Length	0xfd		
515	Data		STR_ZERO	Reserved (0x00)
768	VPD Keyword	RW	STR	Remaining read/write area
770	Length	0xfd		
771	Data		STR_ZERO	Reserved (0x00)
1024	VPD Keyword	RW	STR	Remaining read/write area
1026	Length	0xfd		
1027	Data		STR_ZERO	Reserved (0x00)
1280	VPD Keyword	RW	STR	Remaining read/write area

Offset (Decimal)	Item	Value	Format	Description
1282	Length	0xfd		
1283	Data		STR_ZERO	Reserved (0x00)
1536	VPD Keyword	RW	STR	Remaining read/write area
1538	Length	0xfd		
1539	Data		STR_ZERO	Reserved (0x00)
1792	VPD Keyword	RW	STR	Remaining read/write area
1794	Length	0xfd		
1795	Data		STR_ZERO	Reserved (0x00)
2048	VPD Keyword	RW	STR	Remaining read/write area
2050	Length	0xfd		
2051	Data		STR_ZERO	Reserved (0x00)
2304	VPD Keyword	RW	STR	Remaining read/write area
2306	Length	0xfd		
2307	Data		STR_ZERO	Reserved (0x00)
2560	VPD Keyword	RW	STR	Remaining read/write area
2562	Length	0xfd		
2563	Data		STR_ZERO	Reserved (0x00)
2816	VPD Keyword	RW	STR	Remaining read/write area
2818	Length	0xfd		
2819	Data		STR_ZERO	Reserved (0x00)
3072	VPD Keyword	RW	STR	Remaining read/write area
3074	Length	0xfd		
3075	Data		STR_ZERO	Reserved (0x00)
3328	VPD Keyword	RW	STR	Remaining read/write area
3330	Length	0xfd		
3331	Data		STR_ZERO	Reserved (0x00)
3584	VPD Keyword	RW	STR	Remaining read/write area
3586	Length	0xfd		
3587	Data		STR_ZERO	Reserved (0x00)
3840	VPD Keyword	RW	STR	Remaining read/write area
3842	Length	0xfc		
3843	Data		STR_ZERO	Reserved (0x00)
4095	Small Resource Type END Tag (0x11)	0x78		

Table 7 - MCX312B-XCBT VPD Layout

Offset (Decimal)	Item	Value	Format	Description
0	Large Resource Type ID String Tag (0x02)	0x82		
1	Length [7:0] LSB	0x18		
2	Length [15:8] MSB	0x0		

Table 7 - MCX312B-XCBT VPD Layout

Offset (Decimal)	Item	Value	Format	Description
3	Data	CX312B - ConnectX-3 SFP+	STR	
27	Large Resource Type VPD-R Tag (0x10)	0x90		
28	Length [7:0] LSB	0x4F		
29	Length [15:8] MSB	0x00		
30	VPD Keyword	PN	STR	Add in Card Part Number
32	Length	0x15		
33	Part Number	PN	%STR_SPC	
54	VPD Keyword	EC	STR	Engineering Change Level of the card (rev)
56	Length	0x2		
57	Revision	RV	%STR	PCB revision
59	VPD Keyword	SN	STR	Serial Number
61	Length	0x18		
62	SerialNumber	SN	%STR_SPC	“00..00XXXX..XX”
86	VPD Keyword	V0	STR	Misc Information
88	Length	0x10		
89	Data	PCIe Gen3 x8	STR_SPC	
105	VPD Keyword	RV	STR	
107	Length	0x1		
108	Data	0,107	%CS0	
109	Large Resource Type VPD-W Tag (0x11)	0x91		
110	Length [7:0] LSB	0x8F		
111	Length [15:8] MSB	0xF		
112	VPD Keyword	V1	STR	EFI Driver version
114	Length	0x6		
115	Data	N/A	STR_SPC	
121	VPD Keyword	YA	STR	Asset Tag
123	Length	0x18		
124	Data	N/A	STR_SPC	“N/A”
148	VPD Keyword	RW	STR	Remaining read/write area
150	Length	0x69		
151	Data		STR_ZERO	Reserved (0x00)
256	VPD Keyword	RW	STR	Remaining read/write area
258	Length	0xfd		
259	Data		STR_ZERO	Reserved (0x00)
512	VPD Keyword	RW	STR	Remaining read/write area
514	Length	0xfd		
515	Data		STR_ZERO	Reserved (0x00)
768	VPD Keyword	RW	STR	Remaining read/write area
770	Length	0xfd		
771	Data		STR_ZERO	Reserved (0x00)

Table 7 - MCX312B-XCBT VPD Layout

Offset (Decimal)	Item	Value	Format	Description
1024	VPD Keyword	RW	STR	Remaining read/write area
1026	Length	0xfd		
1027	Data		STR_ZERO	Reserved (0x00)
1280	VPD Keyword	RW	STR	Remaining read/write area
1282	Length	0xfd		
1283	Data		STR_ZERO	Reserved (0x00)
1536	VPD Keyword	RW	STR	Remaining read/write area
1538	Length	0xfd		
1539	Data		STR_ZERO	Reserved (0x00)
1792	VPD Keyword	RW	STR	Remaining read/write area
1794	Length	0xfd		
1795	Data		STR_ZERO	Reserved (0x00)
2048	VPD Keyword	RW	STR	Remaining read/write area
2050	Length	0xfd		
2051	Data		STR_ZERO	Reserved (0x00)
2304	VPD Keyword	RW	STR	Remaining read/write area
2306	Length	0xfd		
2307	Data		STR_ZERO	Reserved (0x00)
2560	VPD Keyword	RW	STR	Remaining read/write area
2562	Length	0xfd		
2563	Data		STR_ZERO	Reserved (0x00)
2816	VPD Keyword	RW	STR	Remaining read/write area
2818	Length	0xfd		
2819	Data		STR_ZERO	Reserved (0x00)
3072	VPD Keyword	RW	STR	Remaining read/write area
3074	Length	0xfd		
3075	Data		STR_ZERO	Reserved (0x00)
3328	VPD Keyword	RW	STR	Remaining read/write area
3330	Length	0xfd		
3331	Data		STR_ZERO	Reserved (0x00)
3584	VPD Keyword	RW	STR	Remaining read/write area
3586	Length	0xfd		
3587	Data		STR_ZERO	Reserved (0x00)
3840	VPD Keyword	RW	STR	Remaining read/write area
3842	Length	0xfc		
3843	Data		STR_ZERO	Reserved (0x00)
4095	Small Resource Type END Tag (0x11)	0x78		

Table 8 - MCX311A-XCAT VPD Layout

Offset (Decimal)	Item	Value	Format	Description
0	Large Resource Type ID String Tag (0x02)	0x82		
1	Length [7:0] LSB	0x18		
2	Length [15:8] MSB	0x0		
3	Data	CX311A - ConnectX-3 SFP+	STR	
27	Large Resource Type VPD-R Tag (0x10)	0x90		
28	Length [7:0] LSB	0x4F		
29	Length [15:8] MSB	0x00		
30	VPD Keyword	PN	STR	Add in Card Part Number
32	Length	0x15		
33	Part Number	PN	%STR_SPC	
54	VPD Keyword	EC	STR	Engineering Change Level of the card (rev)
56	Length	0x2		
57	Revision	RV	%STR	PCB revision
59	VPD Keyword	SN	STR	Serial Number
61	Length	0x18		
62	SerialNumber	SN	%STR_SPC	“00..00XXXX..XX”
86	VPD Keyword	V0	STR	Misc Information
88	Length	0x10		
89	Data	PCIe Gen3 x4	STR_SPC	
105	VPD Keyword	RV	STR	
107	Length	0x1		
108	Data	0,107	%CS0	
109	Large Resource Type VPD-W Tag (0x11)	0x91		
110	Length [7:0] LSB	0x8F		
111	Length [15:8] MSB	0xF		
112	VPD Keyword	V1	STR	EFI Driver version
114	Length	0x6		
115	Data	N/A	STR_SPC	
121	VPD Keyword	YA	STR	Asset Tag
123	Length	0x18		
124	Data	N/A	STR_SPC	“N/A”
148	VPD Keyword	RW	STR	Remaining read/write area
150	Length	0x69		
151	Data		STR_ZERO	Reserved (0x00)
256	VPD Keyword	RW	STR	Remaining read/write area
258	Length	0xfd		
259	Data		STR_ZERO	Reserved (0x00)
512	VPD Keyword	RW	STR	Remaining read/write area

Table 8 - MCX311A-XCAT VPD Layout

Offset (Decimal)	Item	Value	Format	Description
514	Length	0xfd		
515	Data		STR_ZERO	Reserved (0x00)
768	VPD Keyword	RW	STR	Remaining read/write area
770	Length	0xfd		
771	Data		STR_ZERO	Reserved (0x00)
1024	VPD Keyword	RW	STR	Remaining read/write area
1026	Length	0xfd		
1027	Data		STR_ZERO	Reserved (0x00)
1280	VPD Keyword	RW	STR	Remaining read/write area
1282	Length	0xfd		
1283	Data		STR_ZERO	Reserved (0x00)
1536	VPD Keyword	RW	STR	Remaining read/write area
1538	Length	0xfd		
1539	Data		STR_ZERO	Reserved (0x00)
1792	VPD Keyword	RW	STR	Remaining read/write area
1794	Length	0xfd		
1795	Data		STR_ZERO	Reserved (0x00)
2048	VPD Keyword	RW	STR	Remaining read/write area
2050	Length	0xfd		
2051	Data		STR_ZERO	Reserved (0x00)
2304	VPD Keyword	RW	STR	Remaining read/write area
2306	Length	0xfd		
2307	Data		STR_ZERO	Reserved (0x00)
2560	VPD Keyword	RW	STR	Remaining read/write area
2562	Length	0xfd		
2563	Data		STR_ZERO	Reserved (0x00)
2816	VPD Keyword	RW	STR	Remaining read/write area
2818	Length	0xfd		
2819	Data		STR_ZERO	Reserved (0x00)
3072	VPD Keyword	RW	STR	Remaining read/write area
3074	Length	0xfd		
3075	Data		STR_ZERO	Reserved (0x00)
3328	VPD Keyword	RW	STR	Remaining read/write area
3330	Length	0xfd		
3331	Data		STR_ZERO	Reserved (0x00)
3584	VPD Keyword	RW	STR	Remaining read/write area
3586	Length	0xfd		
3587	Data		STR_ZERO	Reserved (0x00)
3840	VPD Keyword	RW	STR	Remaining read/write area
3842	Length	0xfc		
3843	Data		STR_ZERO	Reserved (0x00)
4095	Small Resource Type END Tag (0x11)	0x78		

3 Ethernet Adapter Card Installation

3.1 Hardware Requirements

A system with a PCI Express x4 or x8 slot is required for installing the card.

3.2 Installation Instructions

Read all installation instructions before connecting the equipment to the power source.

To change a tall bracket to a short bracket see Replacing a Tall Bracket With a Short Bracket on page 46.

The adapter cards listed above are standard PCI Express cards, each with a standard x8 edge connector. The cards require a PCI Express x4 or x8. Please consult the host machine documentation for instructions on how to install a PCI Express card.

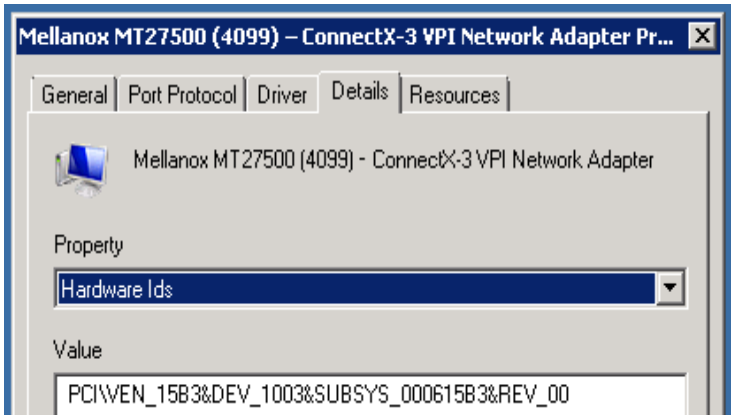
If the card is installed in a PCI slot with less lanes than the card requires then the adapter card will not provide the optimum data transfer.

3.3 Identify the Card in Your System

3.3.1 On Windows

1. Open Device Manager on the server. Click start => Run, and then enter “devmgmt.msc”.
2. Expand System Devices and locate your Mellanox ConnectX-3 adapter card.
3. Select Properties to display the adapter card properties window.
4. Click the Details tab and select **Device Instance Id** (Windows 2003) or **Hardware Ids** (Windows 2008/R2) from the Property pull-down menu.

Figure 10: PCI Device



5. In the Value display box, check the fields VEN and DEV (fields are separated by '&'). In the display example above, notice the sub-string "PCI\VEN_15B3&DEV_1003": VEN is equal to 0x15B3 – this is the Vendor ID of Mellanox Technologies; and DEV is equal to 1003 – this is a valid Mellanox Technologies PCI Device ID.

If the PCI device does not have a Mellanox adapter ID, return to Step 4 to check another device.

The list of Mellanox Technologies PCI Device IDs can be found in the PCI ID repository at http://pci-ids.ucw.cz/read/PC/15b3.

3.3.2 On Linux

Get the device location on the PCI bus by running lspci and locating lines with the string "Mellanox Technologies":

```
> lspci |grep -i Mellanox

27:00.0 Network controller: Mellanox Technologies MT27500 Fam-
ily [ConnectX-3]
```

3.4 Cables and Modules

Please refer to "Mellanox Products Approved Cable Lists" at http://www.mellanox.com/related-docs/user_manuals/Mellanox_approved_cables.pdf

3.4.1 Inserting the Optical Transceiver Module

To insert the module into the cage:

1. Open the module's locking mechanism – see Figure 11 and Figure 12.
2. Make sure that the male connectors on the module will align with the female connectors inside of the cage. Also check that there is no dirt or foreign matter in the module or in the cage.

Figure 11: Module With Locking Mechanism Closed

Figure 12: Module With Locking Mechanism Open

3. Insert the module into the adapter card module cage.
4. Close the locking Mechanism.

To remove the module from the cage:

1. Unlock the locking mechanism by opening the handle.
2. Pull the module out of the cage.

3.4.2 Cable Installation

1. All cables can be inserted or removed with the unit powered on. To insert a cable, press the connector into the port receptacle until the connector is firmly seated.
2. After inserting a cable into a port, the GREEN LED indicator will light when the physical connection is established (that is, when the unit is powered on and a cable is plugged into the port with the other end of the connector plugged into a functioning port).
3. After plugging in a cable, lock the connector using the latching mechanism particular to the cable vendor. When a logical connection is made the YELLOW LED will come on. When data is being transferred the yellow led will blink.

When installing cables make sure that the latches engage.

Always install and remove cables by pushing or pulling the cable and connector in a straight line with the card.

4. Care should be taken as not to impede the air exhaust flow through the ventilation holes. Cable lengths which allow for routing horizontally around to the side of the chassis before bending upward or downward in the rack should be used
5. To remove a cable, disengage the locks and slowly pull the connector away from the port receptacle. Both LED indicators will turn off when the cable is unseated.

Cables, especially long copper cables, can weigh a substantial amount. Make sure that the weight of the cable is supported on its own and is not hanging from the adapter card.

4 Driver Software and Firmware

4.1 Driver Software

4.1.1 Linux

For Linux, download and install the latest MLNX_EN driver software package available via the Mellanox web site at: http://www.mellanox.com => Products => Software/Drivers => Ethernet SW/Drivers => ConnectX®-3 EN 10GigE Linux Driver => Download. Follow the installation instructions included in the download package (also available from the download page). To ensure that communication has been established follow the instructions below.

Check the link status

First check the network interface name by running the “ifconfig –a” command

To assign an IP address to the interface run:

```
> ifconfig eth<x> <ip>
```

where 'x' is the OS assigned interface number.

To check driver and device information run:

```
> ethtool -i eth<x>
```

Example:

```
> ethtool -i eth2
driver:mlx4_en (MT_1020110019_CX-3)
version: 1.5.6.33 (Oct 2011)
firmware-version:2.10.0000
bus-info: 0000:07:00.0
```

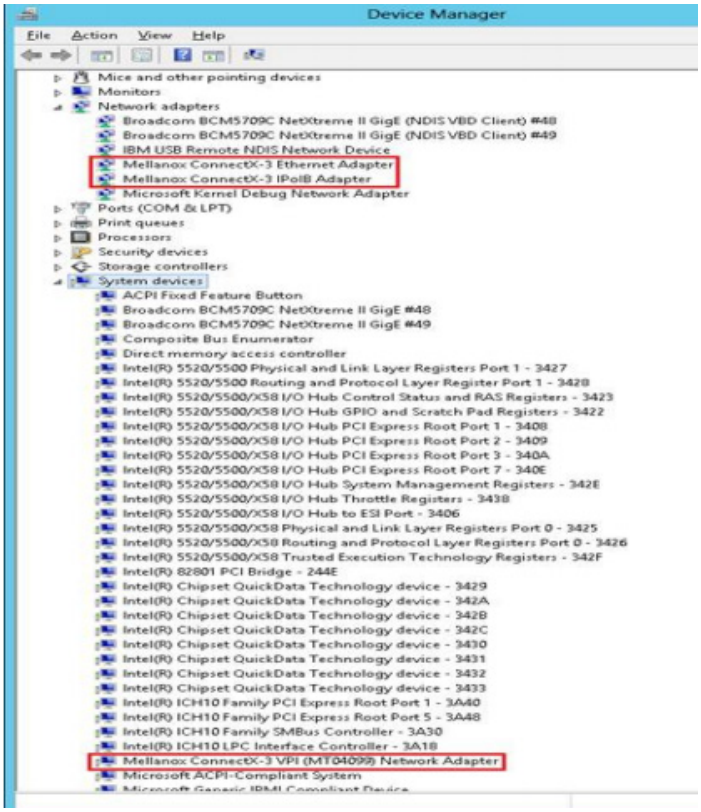
4.1.2 Windows

For Windows, download the MLNX EN – Ethernet driver. Download this package from the Mellanox web site at: http://www.mellanox.com => Products => Software/Drivers => Ethernet SW/Drivers => ConnectX® EN 10GigE Windows Driver => Download. Follow the installation instructions included in the download package (also available from the download page). To ensure that communication has been established follow the instructions below.

To display a summary of network adapter software-, firmware- and hardware-related information such as driver version, firmware version, bus interface, adapter identity, and network port link information, perform the following steps:

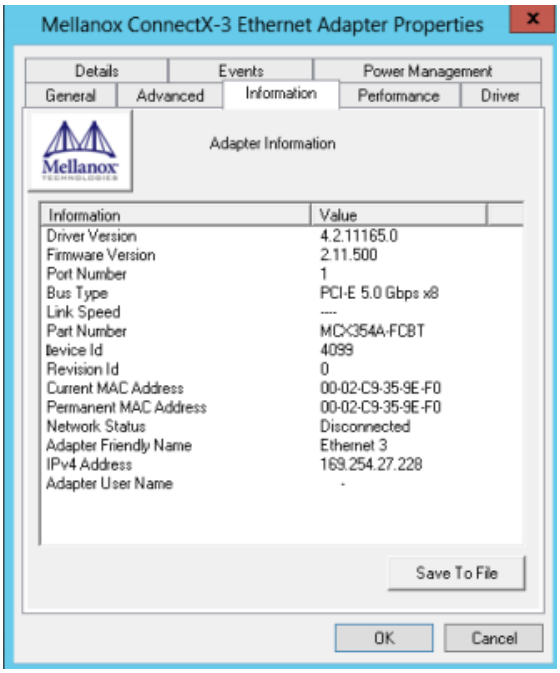
Step 1: Display the Device Manager

Figure 13: Device Manager



Step 2: Right-click a Mellanox ConnectX Ethernet adapter (under “Network adapters list) and left-click Properties.

Step 3: Select the Information tab from the Properties sheet (example).



To save this information for debug purposes, click Save To File and provide the output file name.

4.2 FlexBoot

FlexBoot enables remote boot over Ethernet, Boot over Ethernet (BoE) or Boot over iSCSI (Bo-iSCSI). This technology is based on the Preboot Execution Environment (PXE) standard specification, and FlexBoot software is based on the open source iPXE project (see www.ipxe.org). For more information go to http://www.mellanox.com_=> Products => Software/Drivers => Ethernet Software/Drivers => FlexBoot => Download.

4.3 RDMA over Converged Ethernet

ConnectX®-3 connected to an Ethernet fabric provides all of the basic NIC functionality plus RDMA over Converged Ethernet (RoCE). RoCE utilizes advances in Data Center Bridging (DCB) to enable efficient and low cost implementations of RDMA over Ethernet, supporting the entire breadth of RDMA and low latency features. This includes reliable connected service, datagram service, RDMA and send/receive semantics, atomic operations, user level multicast, user level I/O access, kernel bypass, and zero copy. This capability is enabled when using the Mellanox OFED or WinOF VPI drivers.

ConnectX®-3 EN with RoCE based network management is the same as that for any Ethernet and DCB-based network management, eliminating the need for IT managers to learn new technologies.

4.3.1 Hardware and Software Requirements

Software:

- Mellanox OFED 1.5.1 or WinOF 2.1.2 or later. To download these packages go to http://www.mellanox.com => Products => Software/Drivers => InfiniBand & VPI SW/Driver.

Hardware:

- ConnectX®-3 EN adapter card

4.4 Updating Adapter Card Firmware

Each card is shipped with the latest version of qualified firmware at the time of manufacturing. Firmware is updated occasionally, and the most recent firmware can be obtained from: http://www.mellanox.com => Support => Download Firmware. Check that the firmware on your card is the latest found on the Mellanox site, if not update to the latest version found on the Mellanox web site.

Firmware can be updated on the stand alone single card using the **flint** tool of the *Mellanox Firmware Tools (MFT)* package. This package is available for download, along with its user manual, from the Mellanox Firmware Tools page. See http://www.mellanox.com => Support => Download Firmware Tools.

A firmware binaries table lists a binary file per adapter card. The file name of each such binary is composed by combining the firmware name, the firmware release version, and the card part number. Please contact Mellanox System Support if you cannot find the firmware binary for your adapter card.

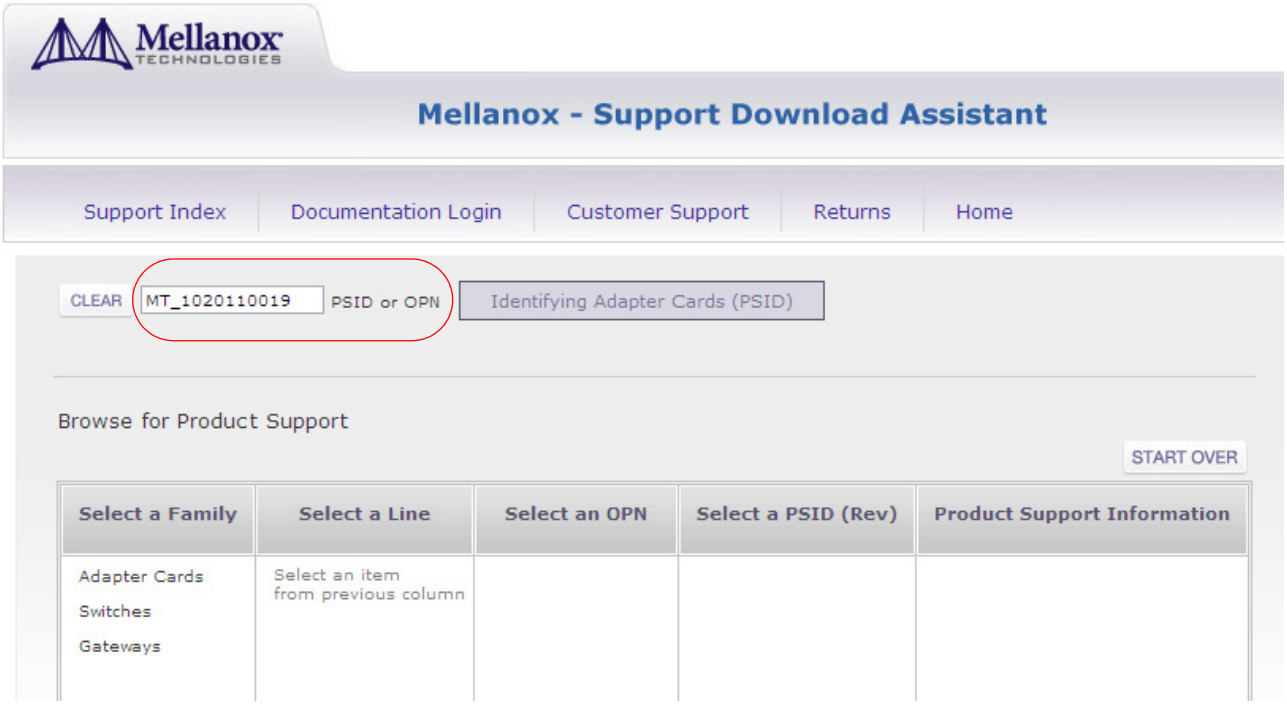
The following steps describe how to retrieve the PSID (firmware identification) and programmed firmware version of your adapter card. They also describe how to update the card with the latest firmware version available.

1. Retrieve the PSID and firmware version:
   a. Install the MFT package. The package is available at http://www.mellanox.com => Products => Software/Drivers => Ethernet Software/Drivers => Firmware Tools. Make sure to download the package corresponding to your computer's operating system.
   b. Enter: mst start.
   c. Get the Mellanox *mst device name* using the command "mst status". The mst device name will be of the form: /dev/mst/mt4099_pci_cr0.
   d. Get the PSID (firmware identification) and programmed firmware version using the command.

```
> flint -d /dev/mst/mt4099_pci_cr0  q
Image type:      ConnectX
FW Version:     2.9.4000
Device ID:         4099
Chip Revision:  0
Description:     Node                  Port1
Port2                        Sys image
GUIDs:              000002c900000200 000002c900000201
000002c900000202 000002c900000203
MACs:
000002c90200        000002c90201
Board ID:          (MT_1020110019)
VSD:
PSID:                MT_1020110019
```

2. Compare the programmed firmware version with the latest available.
   a. Go to Mellanox's web site: http://www.mellanox.com/supportdownloader. See Figure 14.
   b. Enter your card PSID to display the latest firmware.

Figure 14: Support Download Assistant



3. If a newer firmware version exists for your adapter card, update the firmware as follows:
   a. Download the firmware image zip file from the Download Center (see Step 2a above).
   b. Unzip the firmware image.
   c. Burn the firmware image. Enter:

```
> flint -d /dev/mst/mt4099_pci_cr0 -i <binary image> burn
```

d. Reboot the computer.

e. Enter: mst start.

f. Verify that the card firmware was updated successfully.

```
> flint -d /dev/mst/mt4099_pci_cr0  q
Image type:      ConnectX
FW Version:     2.9.4100
Device ID:         4099
...
```

Appendix A: Specifications

A.1 MCX311A-XCAT Specifications

Table 9 - MCX311A-XCAT Specifications Table

Physical	**Size:** 2.11in. x 4.18 in. (53.59mm x 106.06 mm)
	Connector: SFP+ 10Gb/s
Protocol Support	**Ethernet:** XAUI/10GBASE-KX4 – 4X 10GigE port, XFI/SFI/10GBASE-KR – 1X 10GigE port, SGMII/1000BASE-KX – 1X 1GigE port
	Data Rate: 1/10Gb/s – Ethernet
	PCI Express Gen3: SERDES @ 8.0GT/s, 4 lanes (2.0 and 1.1 compatible)
Power and Environmental	**Voltage:** 12V, 3.3V
	Typ Power: Passive Cables 3.47W
	Max Power: Passive Cables 4.84W
	Temperature: Operational 0°C to 55°C Non-operational 0°C to 70°C
	Humidity: 90% relative humidity[a]
	Air Flow: 200LFM[b]
Regulatory	**EMC:** Refer to the following link: www.mellanox.com/related-docs/user_manuals/Regulatory_and_Compliance_Guide.pdf
	Safety: IEC/EN 60950-1:2006 ETSI EN 300 019-2-2 IEC 60068-2- 64, 29, 32
	RoHS: RoHS-R6
Cable Support	Please refer to "Mellanox Products Approved Cable Lists" at: www.mellanox.com/related-docs/user_manuals/Mellanox_approved_cables.pdf

a. For both operational and non-operational states

b. Air flow is measured ~1” from the heat sink between the heat sink and the cooling air inlet.

A.2 MCX312[AB]-XCBT Specifications

Table 10 - MCX312A-XCBT Specifications Table

Physical	**Size:** 2.71in. x 5.6in. (68.90 mm x 142.25 mm)
	Connector: SFP+ 10Gb/s
Protocol Support	**Ethernet:** 10GBASE-CX4, 10GBASE-R, and 1000BASE-R
	Data Rate: 1/10Gb/s – Ethernet
	PCI Express Gen3: SERDES @ 8.0GT/s, 4 lanes (2.0 and 1.1 compatible) **PCI Express Gen2:** SERDES @ 5.0GT/s, 8 lanes (1.1 compatible)
Power and Environmental	**Voltage:** 12V, 3.3V
	Typ Power: PCIe x4 Gen3 Passive Cables 3.83W PCIe x8 Gen2 Passive Cables 5.31W
	Max Power: PCIe x4 Gen3 Passive Cables 4.55W PCIe x8 Gen2 Passive Cables 6.20W
	Temperature: Operational 0°C to 55°C Non-operational 0°C to 70°C
	Humidity: 90% relative humidity[a]
	Air Flow: 200LFM[b]
Regulatory	**EMC:** Refer to the following link: www.mellanox.com/related-docs/user_manuals/Regulatory_and_Compliance_Guide.pdf
	Safety: IEC/EN 60950-1:2006 ETSI EN 300 019-2-2 IEC 60068-2- 64, 29, 32
	RoHS: RoHS-R6
Cable Support	Please refer to "Mellanox Products Approved Cable Lists" at: www.mellanox.com/related-docs/user_manuals/Mellanox_approved_cables.pdf

a. For both operational and non-operational states

b. Air flow is measured ~1” from the heat sink between the heat sink and the cooling air inlet.

A.3 Board Mechanical Drawing and Dimensions

All dimensions are in millimeters.
All the mechanical tolerances are +/- 0.1mm

Figure 15: Mechanical Drawing of the Dual-port MCX311A-XCAT Adapter Card

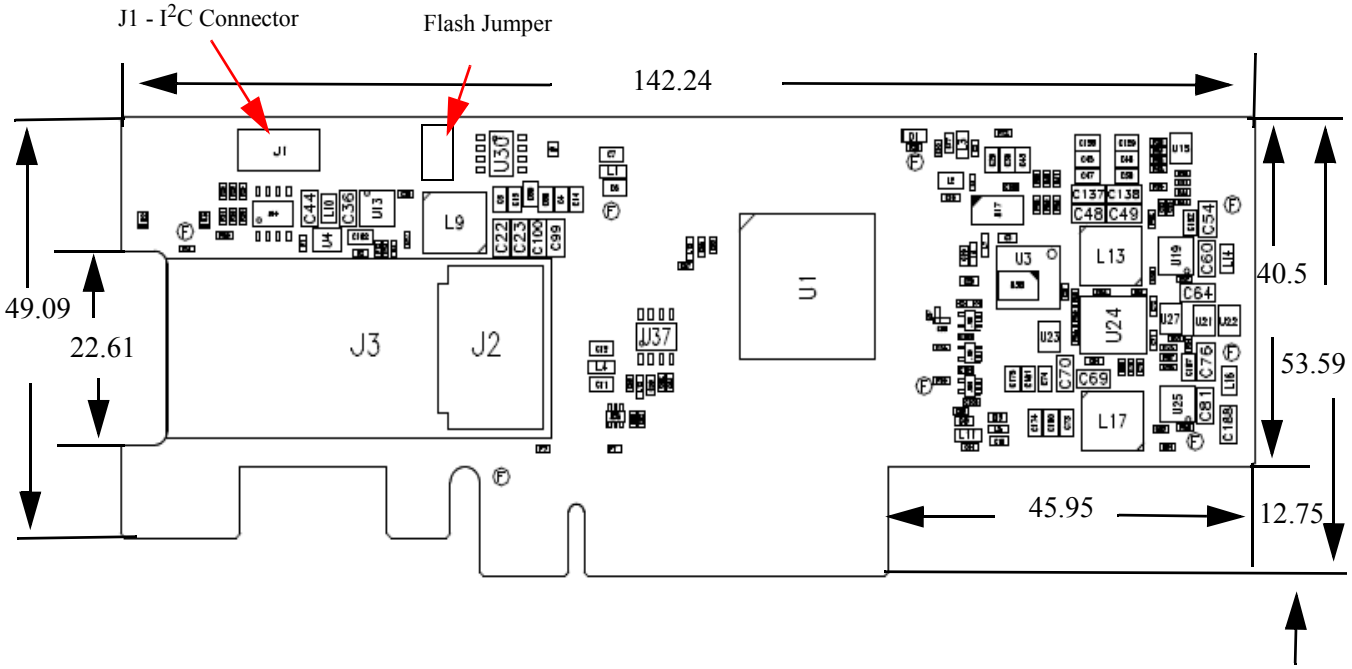


Figure 16: Mechanical Drawing of the Dual-port MCX312A-XCBT Adapter Card

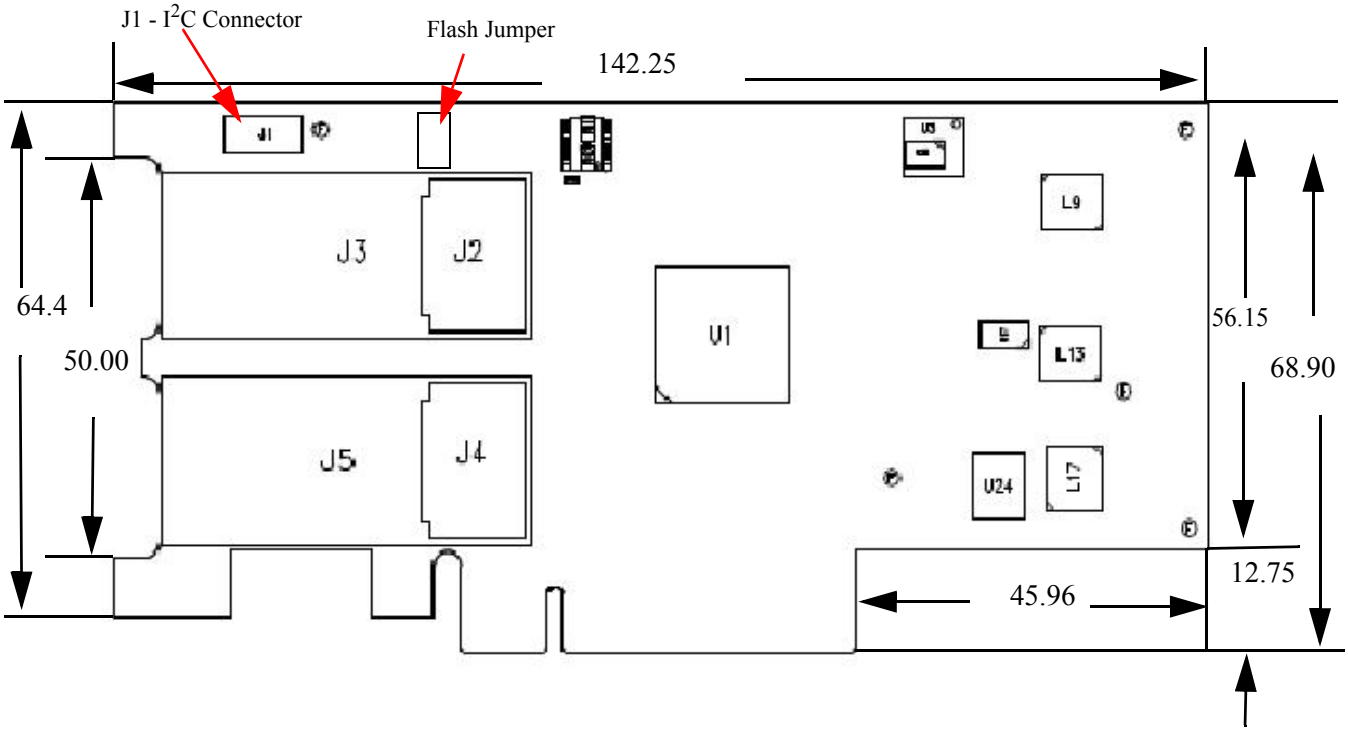
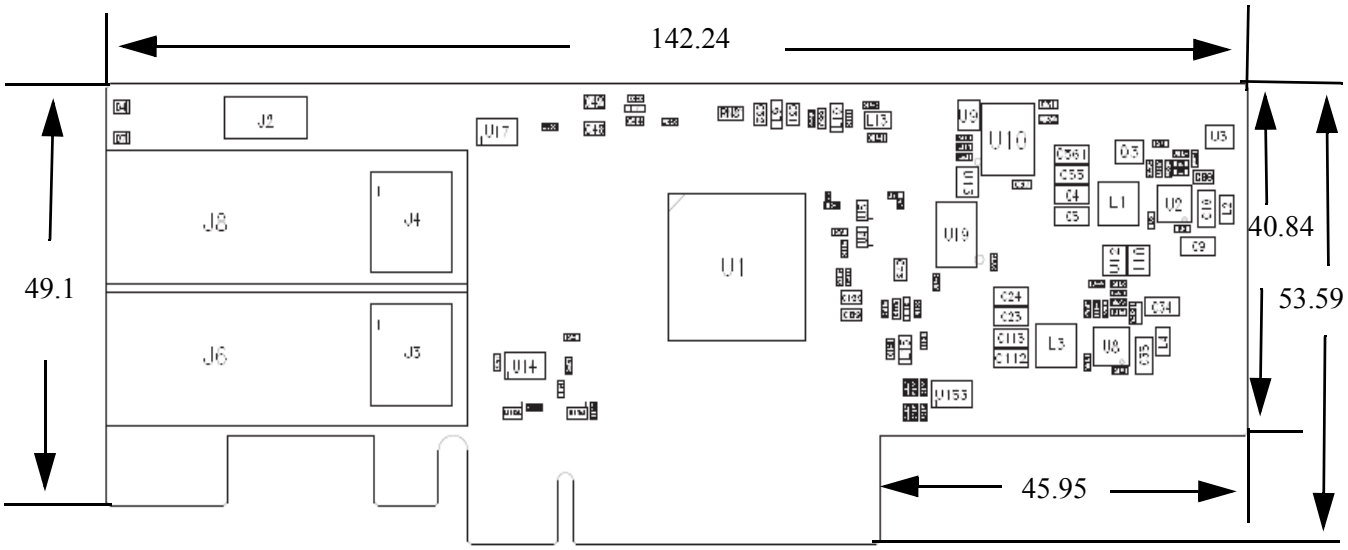


Figure 17: Mechanical Drawing of the Dual-port MCX312B-XCBT



A.4 Regulatory Statements

For regulatory statements for all ConnectX®-3 cards please refer to:
http://www.mellanox.com/related-docs/user_manuals/Regulatory_and_Compliance_Guide.pdf

Appendix B: Interface Connectors Pinout

B.1 I²C-compatible Connector Pinout

Figure 18: Compatible Connector Plug and Pinout

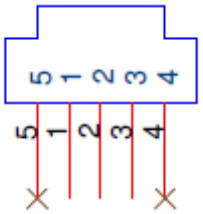


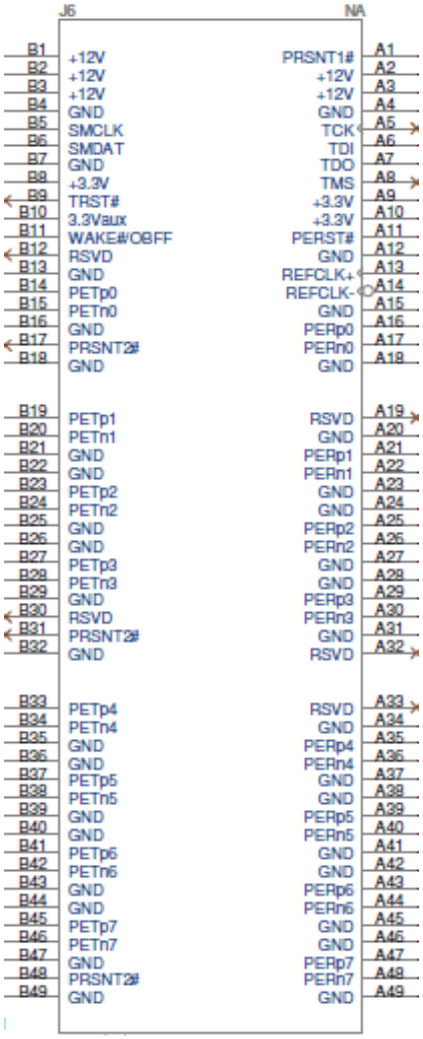
Table 11 - I2C-compatible Connector Pinout

Connector Pin Number	Signal Name
1	SPSDA
2	SPSCL
3	GND
4	NC
5	NC

B.2 PCI Express x8 Connector Pinout

The adapter cards use a standard PCI Express x4 or x8 edge connector and the PCI Express x8 standard pinout according to the PCI Express 3.0 specification.

Figure 19: PCIe Connector Pinout



B.3 SFP+ Connector Pinout

Figure 20: Rear View of Module With Pin Placement

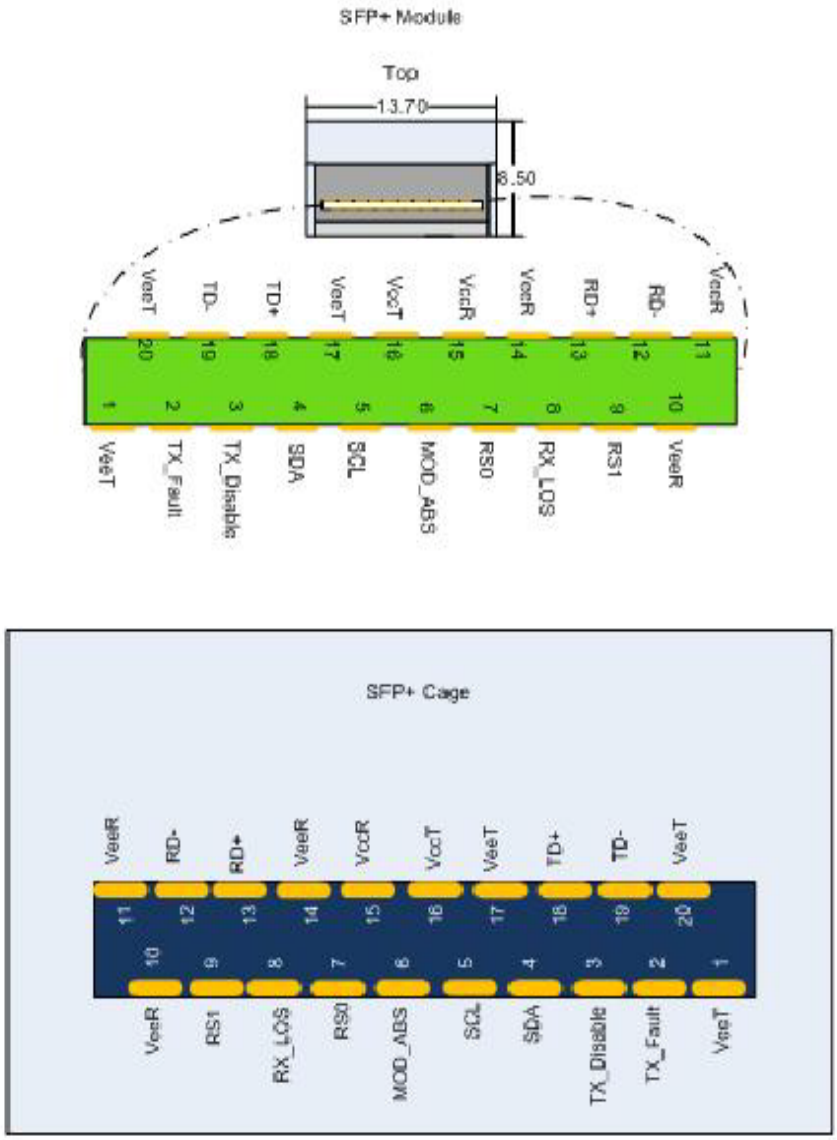


Table 12 - SFP+ Connector Pinout

Pin	Symbol Name	Description
1	VeeT	Transmitter Ground (Common with Receiver Ground) [a]
2	TX_Fault	Transmitter Fault.[b]
3	TX_Disable	Transmitter Disable. Laser output disabled on high or open. [c]
4	SDA	2-wire Serial Interface Data Line [d]
5	SCL	2-wire Serial Interface Clock Line [d]
6	MOD_ABS	Module Absent. Grounded within the module [d]
7	RS0	No connection required
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation. [e]
9	RS1	No connection required
10	VeeR	Receiver Ground (Common with Transmitter Ground) [a]
11	VeeR	Receiver Ground (Common with Transmitter Ground)[a]
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver Non-inverted DATA out. AC Coupled
14	VeeR	Receiver Ground (Common with Transmitter Ground) [a]
15	VccR	Receiver Power Supply
16	VccT	Transmitter Power Supply
17	VeeT	Transmitter Ground (Common with Receiver Ground) [a]
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.
19	TD-	Transmitter Inverted DATA in. AC Coupled.
20	VeeT	Transmitter Ground (Common with Receiver Ground)[a]

a. Circuit ground is internally isolated from chassis ground.
b. T_{FAULT} is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
c. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V
d. Should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
e. LOS is open collector output. Should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Appendix C: Replacing a Tall Bracket With a Short Bracket

This section provides instructions on how to remove the tall bracket of a standard Mellanox Technologies adapter card and replace it with a short one.

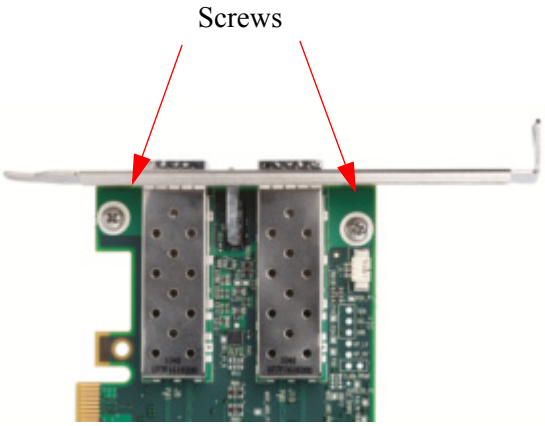
C.1 Replacing a Bracket

To replace the bracket you will need the following parts:

- the new bracket of the proper height
- one new square gasket for each of the ports
- the 2 screws saved from the removal of the bracket
- the 2 fiber washers saved from the removal of the bracket

C.2 Removing the Existing Bracket from the Adapter Card

Figure 21: Bracket Screws



1. Remove the two screws holding the bracket in place.
2. The bracket comes loose from the card.

Be careful not to put stress on the LEDs.

3. Save the two screws and the two fiber washers.

C.3 Installing the New Bracket

1. Place the bracket onto the card until the screw holes line up.

Do not force the bracket onto the card. You may have to gently push the LEDs using a small screwdriver to align the LEDs with the holes in the bracket.

2. Screw on the bracket using the screws and washers saved from the procedure above step 1.

Figure 22: Placing the Bracket on the Card (MCX312A-XCBT)

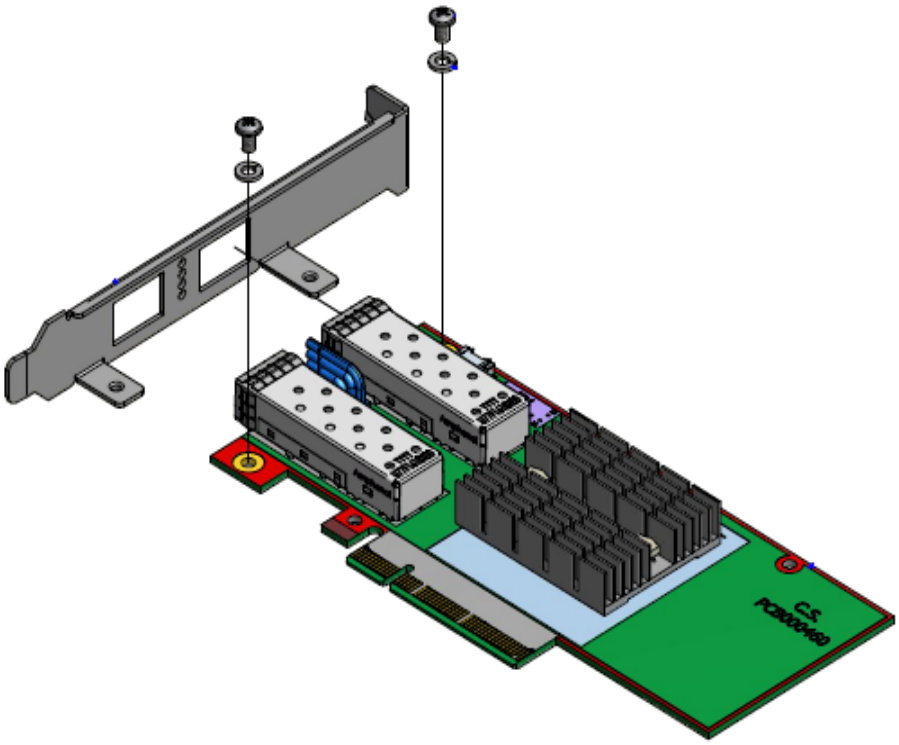


Figure 23: Placing the Bracket on the Card (MCX312B-XCBT)

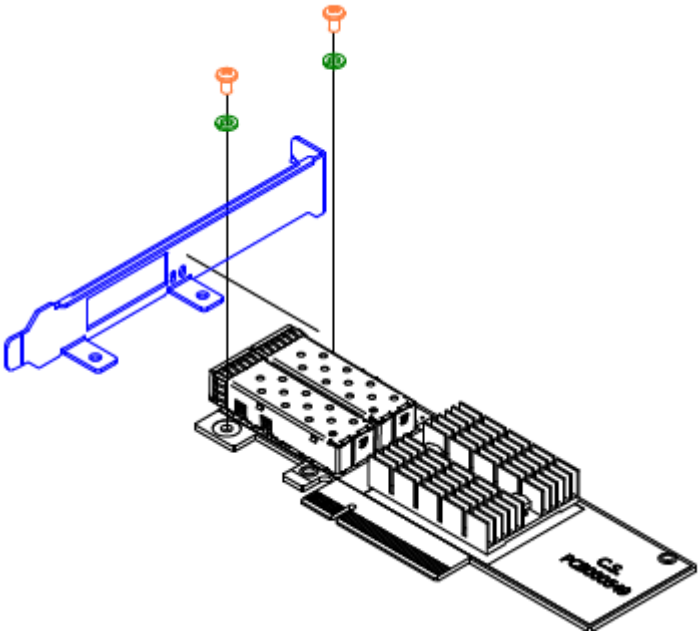
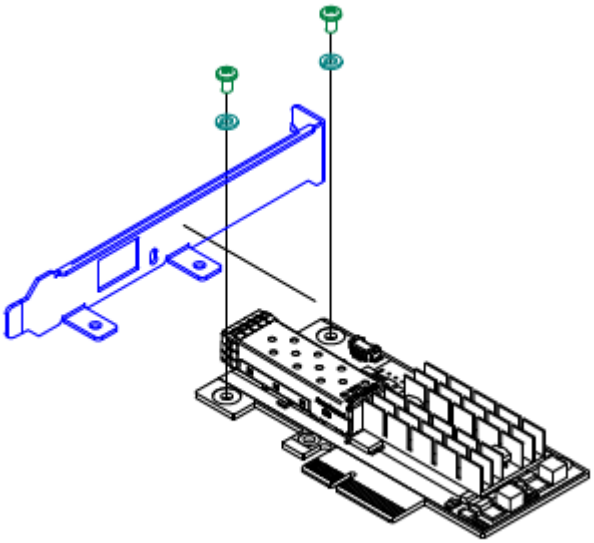


Figure 24: Placing the Bracket on the Card (MCX311A-XCAT)



3. Make sure that the LEDs are aligned onto the bracket holes.
4. Use a torque driver to apply up to 2 lbs-in torque on the screws.

Appendix D: Avertissements de sécurité d'installation (Warnings in French)

1. Instructions d'installation

Lisez toutes les instructions d'installation avant de brancher le matériel à la source d'alimentation électrique.

2. Température excessive

Ce matériel ne doit pas fonctionner dans une zone avec une température ambiante dépassant le maximum recommandé de 55°C (131°F). Un flux d'air de 200LFM à cette température ambiante maximale est nécessaire. En outre, pour garantir un bon écoulement de l'air, laissez au moins 8 cm (3 pouces) d'espace libre autour des ouvertures de ventilation.

3. Orages – dangers électriques

Pendant un orage, il ne faut pas utiliser le matériel et il ne faut pas brancher ou débrancher les câbles.

4. Branchement/débranchement des câbles en cuivre

Les câbles en cuivre sont lourds et ne sont pas flexibles, il faut donc faire très attention en les branchant et en les débranchant des connecteurs. Consultez le fabricant des câbles pour connaître les mises en garde et les instructions spéciales.

5. Installation du matériel

Ce matériel ne doit être installé, remplacé ou entretenu que par du personnel formé et qualifié.

6. Elimination du matériel

L'élimination de ce matériel doit s'effectuer dans le respect de toutes les législations et réglementations nationales en vigueur.

7. Codes électriques locaux et nationaux

Ce matériel doit être installé dans le respect des codes électriques locaux et nationaux.

8. Exposition au rayonnement grave

Mise en garde – l'utilisation de commandes ou de réglages ou l'exécution de procédures autres que ce qui est spécifié dans les présentes peut engendrer une exposition au rayonnement grave.

PRODUIT LASER DE CLASSE 1 » et références aux normes laser les plus récentes CEI 60 825-1:1993 + A1:1997 + A2:2001 et NE 60825-1:1994+A1:1996+ A2:2001

Appendix E: Sicherheitshinweise (Warnings in German)

1. Installationsanleitungen

Lesen Sie alle Installationsanleitungen, bevor Sie das Gerät an die Stromversorgung anschließen.

2. Übertemperatur

Dieses Gerät sollte nicht in einem Bereich mit einer Umgebungstemperatur über der maximal empfohlenen Temperatur von 55°C (131°F) betrieben werden. Es ist ein Luftstrom von 200 LFM bei maximaler Umgebungstemperatur erforderlich. Außerdem sollten mindestens 8 cm (3 in.) Freiraum um die Belüftungsöffnungen sein, um einen einwandfreien Luftstrom zu gewährleisten.

3. Bei Gewitter - Elektrische Gefahr

Arbeiten Sie während eines Gewitters und Blitzschlag nicht am Gerät, schließen Sie keine Kabel an oder ab.

4. Anschließen/Trennen von -Kupferkabel

Kupferkabel sind schwer und nicht flexible. Deshalb müssen sie vorsichtig an die Anschlüsse angebracht bzw. davon getrennt werden. Lesen Sie die speziellen Warnungen und Anleitungen des Kabelherstellers.

5. Geräteinstallation

Diese Gerät sollte nur von geschultem und qualifiziertem Personal installiert, ausgetauscht oder gewartet werden.

6. Geräteentsorgung

Die Entsorgung dieses Geräts sollte unter Beachtung aller nationalen Gesetze Bestimmungen erfolgen.

7. Regionale und nationale elektrische Bestimmungen t

Dieses Gerät sollte unter Beachtung der regionalen und nationalen elektrischen Bestimmungen installiert werden.

This equipment should be installed in compliance with local and national electrical codes.

8. Strahlenkontak

Achtung – Nutzung von Steuerungen oder Einstellungen oder Ausführung von Prozeduren, die hier nicht spezifiziert sind, kann zu gefährlichem Strahlenkontakt führen..

Klasse 1 Laserprodukt und Referenzen zu den aktuellsten Lasterstandards : ICE 60 825-1:1993 + A1:1997 + A2:2001 und EN 60825-1:1994+A1:1996+ A2:2001

Appendix F: Advertencias de seguridad para la instalación (Warnings in Spanish)

1. Instrucciones de instalación

Antes de conectar el equipo a la fuente de alimentación, leer todas las instrucciones de instalación.

2. Sobrecalentamiento

No se debe utilizar el equipo en un área con una temperatura ambiente superior a la máxima recomendada: 55°C(131°F). Además, para garantizar una circulación de aire adecuada, se debe dejar como mínimo un espacio de 8 cm (3 pulgadas) alrededor de las aberturas de ventilación.

3. Cuando hay rayos: peligro de descarga eléctrica

No utilizar el equipo ni conectar o desconectar cables durante períodos de actividad de rayos.

4. Conexión y desconexión del cable Copper

Dado que los cables de cobre son pesados y no son flexibles, su conexión a los conectores y su desconexión se deben efectuar con mucho cuidado. Para ver advertencias o instrucciones especiales, consultar al fabricante del cable.

5. Instalación de equipos

La instalación, el reemplazo y el mantenimiento de este equipo estarán a cargo únicamente de personal capacitado y competente.

6. Eliminación de equipos

La eliminación definitiva de este equipo se debe efectuar conforme a todas las leyes y reglamentaciones nacionales.

7. Códigos eléctricos locales y nacionales

Este equipo se debe instalar conforme a los códigos eléctricos locales y nacionales.

8. Exposición a niveles de radiación peligrosos

Precaución: el uso de controles o ajustes o la realización de procedimientos distintos de los que aquí se especifican podrían causar exposición a niveles de radiación peligrosos.

PRODUCTO LÁSER DE CLASE 1 y referencia a las normas de láser más recientes: IEC 60825-1:2007/03 y EN 60825-1:2007