ConnectX®-2 Dual Port I/O Card for Dell C6100 User Manual

MCQH29-XDR

Rev 1.0

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ConnectX®-2 Dual Port VPI I/O Card for Dell C6100

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Revision History

This document was first printed on 5/6/10.

Table 1 - Revision History Table

Date	Rev	Comments/Changes
April 2010	1.0	Initial release

About this Manual

This *User Manual* describes ConnectX-2 Dual Port VPI I/O cards for the Dell C6100 chassis.

It provides details as to the interfaces of the board, specifications, required software and firmware for operating the cards, installation instructions, and relevant documentation.

Intended Audience

This manual is intended for the installer and user of the I/O cards.

The manual assumes basic familiarity with the Infiniband® architecture specifications.

Related Documentation

Table 2 - Documents List

InfiniBand® Architecture Specification Volume 1 Release 1.2 and Volume 2 release 1.2.1– Infiniband Architecture Specifications Descriptions
PCI Express Base 2.0 Specification (1.1 compatible)
PCI Local Bus Specification Rev 2.3

Online Resources

- Mellanox Technologies Web pages: http://www.mellanox.com
- Dell Support Web pages: http://support.dell.com

Document Conventions


These symbols indicate a situation, status, or condition that may cause harm to people or damage to the equipment.

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.

1 Overview

This document is a *User Manual* for the Mellanox ConnectX-2 20 and 40Gb/s InfiniBand / 10GigE Ethernet dual port QSFP I/O cards for the Dell C6100 chassis.

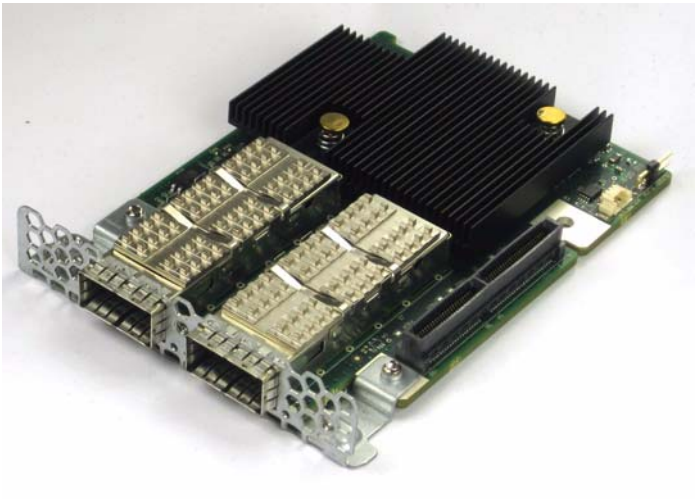
The cards described in this manual have the following main features:

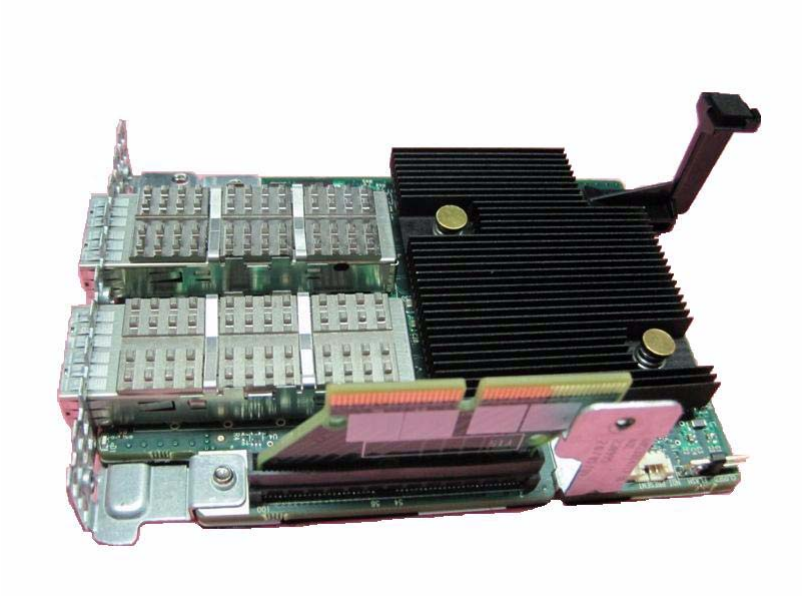
- 1µs MPI ping latency
- Selectable 10, 20, or 40Gb/s InfiniBand or 10GigE per port
- CPU offload of transport operations
- End-to-end QoS and congestion control
- Hardware-based I/O virtualization
- PCI Express 2.0 (up to 5GT/s)
- TCP/UDP/IP stateless offload
- Fibre Channel encapsulation (FCoIB or FCoE)

1.1 I/O Card

Table 3 - ConnectX-2 I/O Card Details

Ordering Part Number (OPN)	PCI Express SERDES Speed	IB Data Transmission Rate	Eth Data Transmission Rate	RoHS	Adapter IC Part Number
MCQH29-XDR	PCIe Gen2 5.0 GT/s	InfiniBand 40 Gb/s QDR	10 Gb/s	R-6	MT25408B0-FCCR-QI

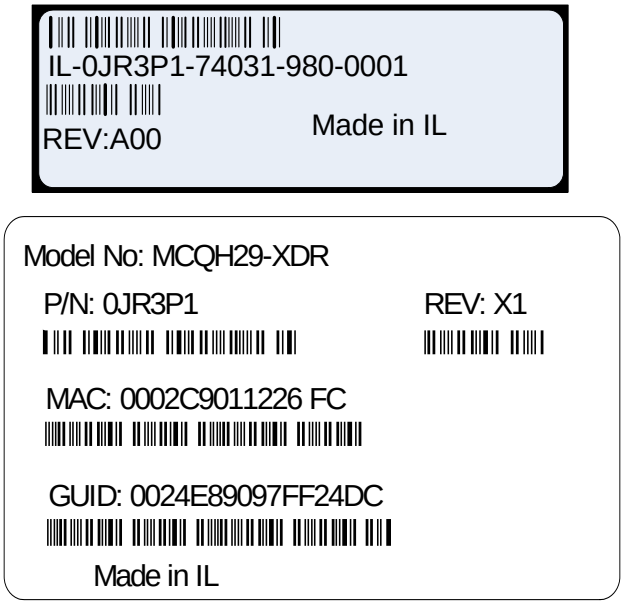




1.2 Finding the GUID/MAC and Serial Number on the Adapter Cards

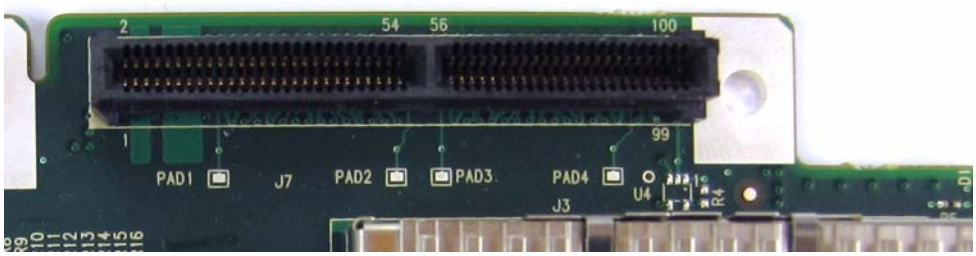
All cards have a label on the printed side of the card that has the card serial number, the card MAC for Ethernet protocol, and the card GUID for InfiniBand protocol. VPI Cards have both a MAC and a GUID.

Figure 1: Card Product Labels



2 I/O Card Interfaces

Figure 2: PCI Connection



2.1 I/O Interfaces

The ConnectX-2 I/O card is VPI-capable, supporting InfiniBand or Ethernet on either port. The following table shows the supported configurations.

Table 4 - VPI Support

Port 1	Port 2	Supported
IB	IB	supported
IB	EN	supported
EN	IB	not supported
EN	EN	supported

2.1.1 InfiniBand Interface

The ConnectX-2 VPI adapter card is compliant with the *InfiniBand Architecture Specification, Release 1.2.1*. It has two compliant QSFP InfiniBand ports, with four Tx/Rx pairs of SerDes connected to QSFP connectors.

2.1.2 Ethernet Interface

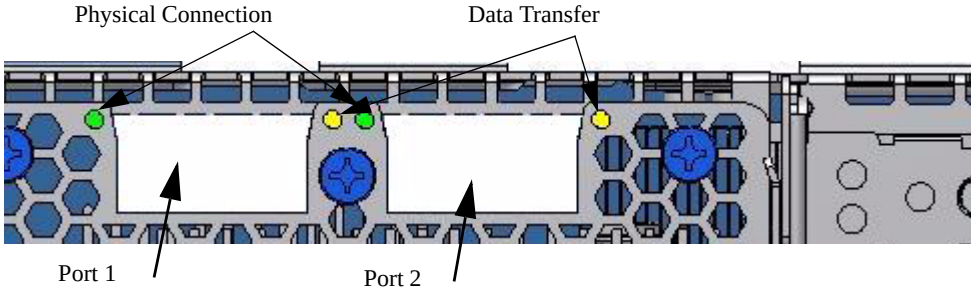
The ConnectX® -2 VPI adapter card is compliant with the *IEEE Std 802.3ae Specification.* Each port can be connected to a 10 Gigabit Ethernet switch through the use of QSFP to SFP+ hybrid cables.

2.2 LED Assignment

Table 5 - Physical and Logical Link Indications

Port Number	LED Name
Port 1	Physical Link - Green Constant on indicates a good physical link Blinking indicates a problem with the Physical link
	Data Activity - Yellow Blinking indicates Data Transfer Constant on indicates no Data Transfer
Port 2	Physical Link - Green Constant on indicates a good physical link Blinking indicates a problem with the Physical link
	Data Activity - Yellow Blinking indicates Data Transfer Constant on indicates no Data Transfer

Figure 3: Front Panel



2.3 PCI Express Interface

The I/O card attaches to the blade's PCI Express interface through a press fit connector. The PCI Express x8 interface is version 2.0 compliant and compatible with base 1.1 chipsets. The device can be either a master initiating the PCI Express bus operations or a slave responding to PCI bus operations.

2.4 Memory

The I/O card supports multiple memory devices through the PCI Express, Flash, and I2C compatible interfaces.

2.4.1 System Memory

The I/O card utilizes the PCI Express interface to store and access fabric connection information on the system memory.

2.4.2 EEPROM

The I/O card incorporates an EEPROM that is accessible through the I2C-compatible interface. The EEPROM is used for storing the Vital Product Data (VPD). The VPD format adheres to the *PCI Local Bus Specification Rev 2.3* VPD definition. The EEPROM capacity is 4Kb.

2.4.3 Flash

The I/O card includes one SPI Flash device accessible via the Flash interface of the MT25408B0 ConnectX-2 device.

There is a jumper on the card that indicates to the device whether an on-board Flash device is to be used. Table 6 provides information on this jumper. See the schematic in Figure 14 on page 23 for the jumper location.

Table 6 - Jumper Configuration

Description	Option	Card Default Configuration	Comments
Flash present/ not present	connection open – Flash present connection shorted – Flash not present ***Figure 4: Flash Jumper*** 	connection open – Flash present	Header 1x2

2.5 EEPROM VPD

The I/O card incorporates an EEPROM that is accessible through the I2C-compatible interface. The EEPROM is used for storing the Vital Product Data (VPD) and FRU. The VPD format adheres to the *PCI Local Bus specification rev 2.3* VPD definition. The EEPROM capacity is 4Kb.

Table 7 - MCQH29-XDR VPD

Offset (Decimal)	Item	Value	Format	Description
0	Large Resource Type ID String Tag (0x02)	0x82		
1	Length	0x12		
3	Data	"DELL PE C6100 MEZZ IB QDR"	Alphanumeric	Short description / ID
21	Large Resource Type VPD-R Tag (0x10)	0x90		Read Only Area
22	Length	0x43		
24	VPD Keyword	“PN”	Numbers	Add in Card Part Number
26	Length	0x6		
27	Data	“059MP7”		
33	VPD Keyword	“EC”	Alphanumeric	Engineering Change Level of the card (rev)
35	Length	0x3		

Table 7 - MCQH29-XDR VPD

Offset (Decimal)	Item	Value	Format	Description
36	Data	”A00”		
39	VPD Keyword	“SN”	Alphanumeric	Serial Number
41	Length	0x14		
42	Data	“OO059MP7MMMMMYMDSSSS”		according to the board label
62	VPD Keyword	“V0”		Misc Information
64	Length	0x16		
65	Data	"DELL PE C6100 MEZZ IB QDR"		
87	VPD Keyword	“RV”		
89	Length	0x1		
90	Data	Checksum		
91	Large Resource Type VPD-W Tag (0x11)	0x91		Read / Write Area
92	Length	0xA1		
94	VPD Keyword	“V1”		Driver version
96	Length	0x6		
97	Data	“N/A”	Number	
103	VPD Keyword	“YA”		Asset Tag
105	Length	0x20		
106	Data	“N/A”	Alphanumeric	
138	VPD Keyword	“RW”		Remaining read/write area
140	Length	0x72		
141	Data	Reserved (0x00)		
255	Small Resource Type END Tag (0x11)	0x78		
256	Mellanox Read Only Mask	0x0....0	Numbers	
350	Mellanox Read/Write Mask	0x1...1	Numbers	
511	Mellanox Read Only Mask	0x0	Numbers	

3 Driver Software and Firmware

3.1 Driver Software

3.1.1 Linux

For Linux, download and install the latest OpenFabrics Enterprise Distribution (OFED) software package available via the Mellanox Web site at:
http://www.mellanox.com => Downloads => InfiniBand/VPI SW/Drivers. Follow the installation instructions included in the download package.

3.1.2 Windows

For Windows, download and install the latest WinOF for VPI software package available via the Mellanox Web site at:
http://www.mellanox.com => Downloads => InfiniBand/VPI SW/Drivers

3.2 Updating 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 => Downloads => Firmware.

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 => Downloads => Firmware Tools.

A firmware binaries table lists a binary file per 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 or your assigned Field Application Engineer if you cannot find the firmware binary for your adapter card.

3.3 FlexBoot

FlexBoot enables remote boot over Ethernet or InfiniBand using Boot over InfiniBand (BoIB), 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 EtherBoot/gPXE project (see www.etherboot.org). For more information go to http://www.mellanox.com > Products > InfiniBand/VPI SW/Drivers > FlexBoot.

4 I/O Card Installation

4.1 Hardware and Software Requirements

Before installing the VPI I/O card, please make sure that the system meets the hardware and software requirements listed in Table 8, “Hardware and Software Requirements”.

Table 8 - Hardware and Software Requirements

Requirement	Description
Hardware	Used with Dell C6100 chassis
Software Operating Systems/Distributions	Refer to the C6100 chassis Manuals
Software Stacks	Mellanox OpenFabric software package (either MLNX_OFED for Linux or MLNX_WinOF for Microsoft Windows)

4.2 Installation Kit

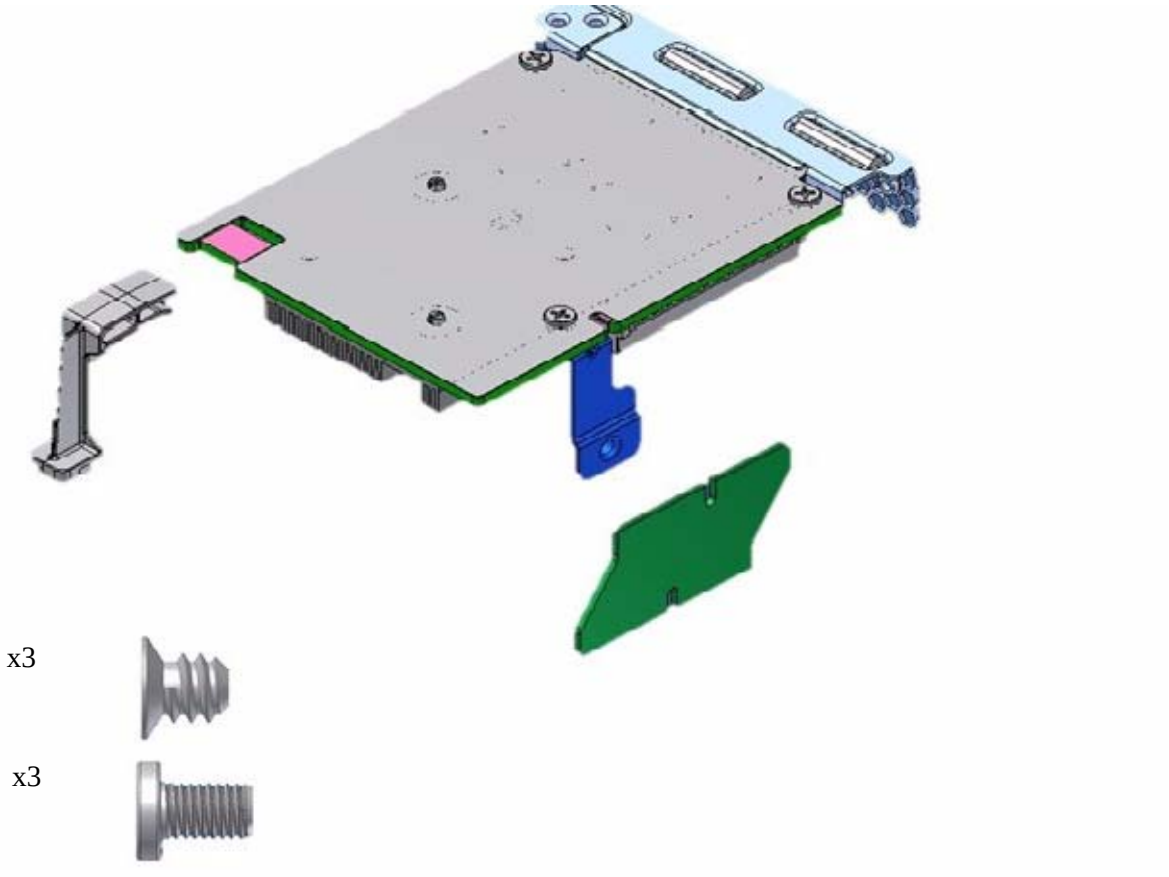
Make sure all of the parts are in the kit before you start the installation. If any parts are damaged or missing, call your supplier immediately.

The kit includes:

Table 9 - ConnectX® Dual-Port InfiniBand I/O Card Installation Kit

1 I/O Card	1 connector board
3 flathead screws	1 plastic leg
3 panhead screws	

Figure 5: Installation Kit Parts

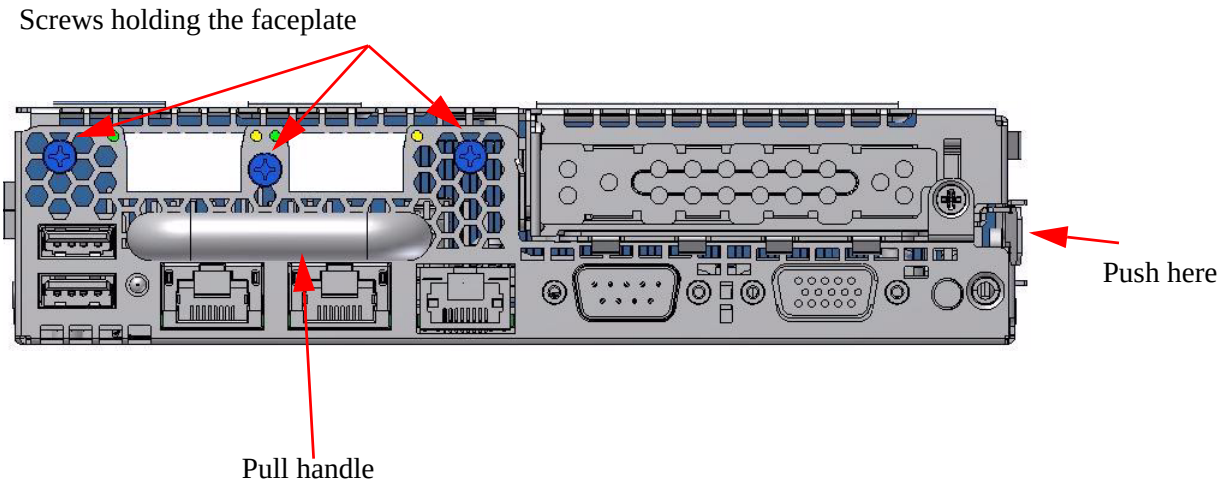


4.3 Installation Instructions

Remove the server from the chassis.

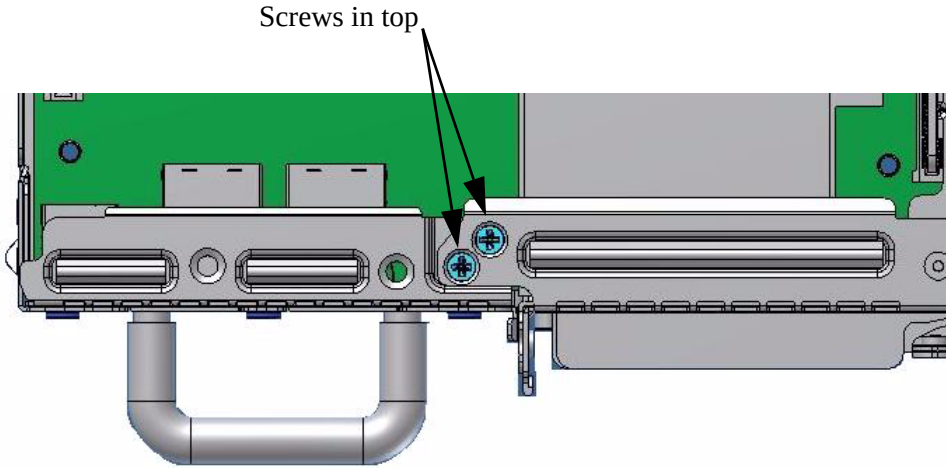
1. Connect an ESD strap to your wrist and to a valid ESD ground.
2. Push the latch and pull on the handle.

Figure 6: Removing From the Server



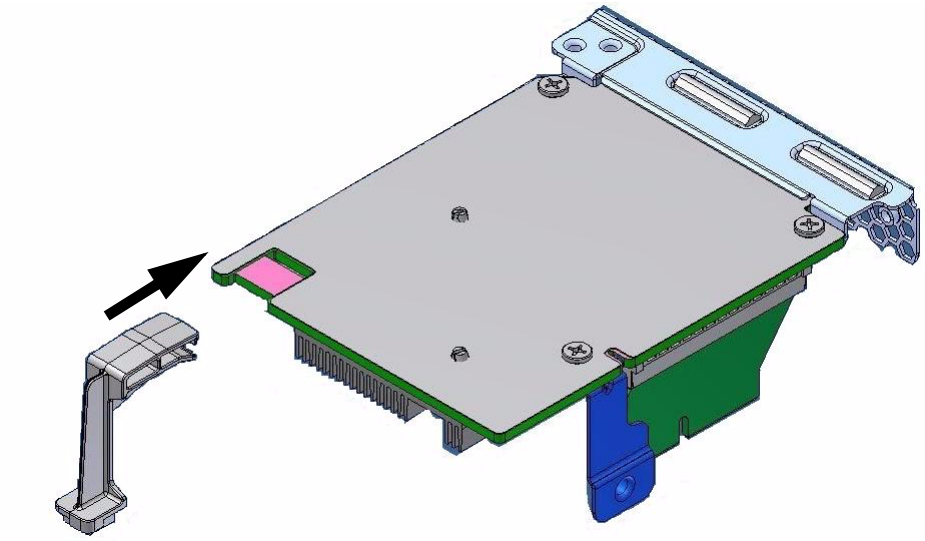
3. Remove the server and place on a work bench.
4. Above the handle are screws holding on the faceplate.
5. Remove these screws and discard.
6. Remove the two screws on the top side of the server and discard.

Figure 7: Top View



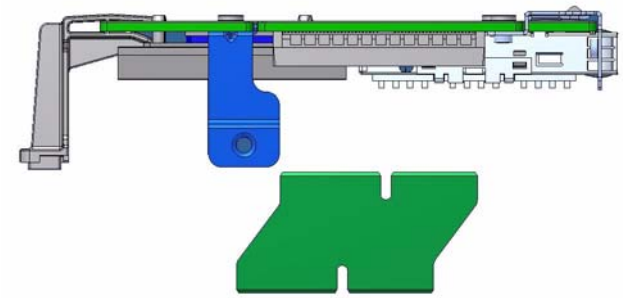
7. Remove the faceplate.
8. Push the plastic leg onto the board.

Figure 8: Install the Plastic Leg onto the Board



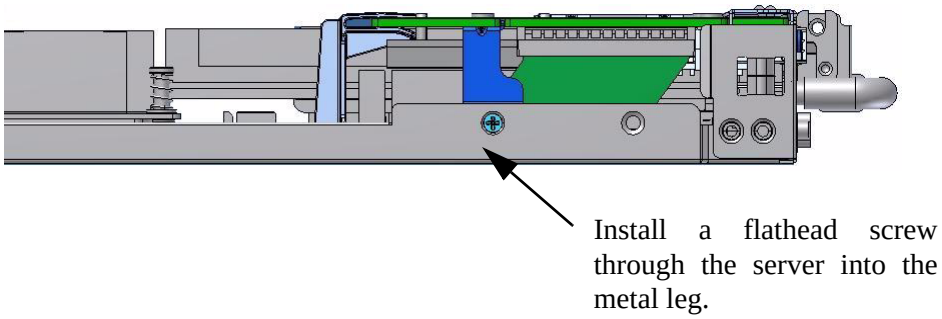
9. Push the Connector board into the card. The connector board must be installed as seen in Figure 9, directed toward the back of the server.

Figure 9: Installing the Connector Board into the HCA Card



10. Put the card into place in the server, catching the cages into the front panel of the server. The metal leg must go inside of the server and line up with the hole in the side of the server. Also push the connector board into the socket in the server.
11. Screw in a flat head screw for the metal leg.

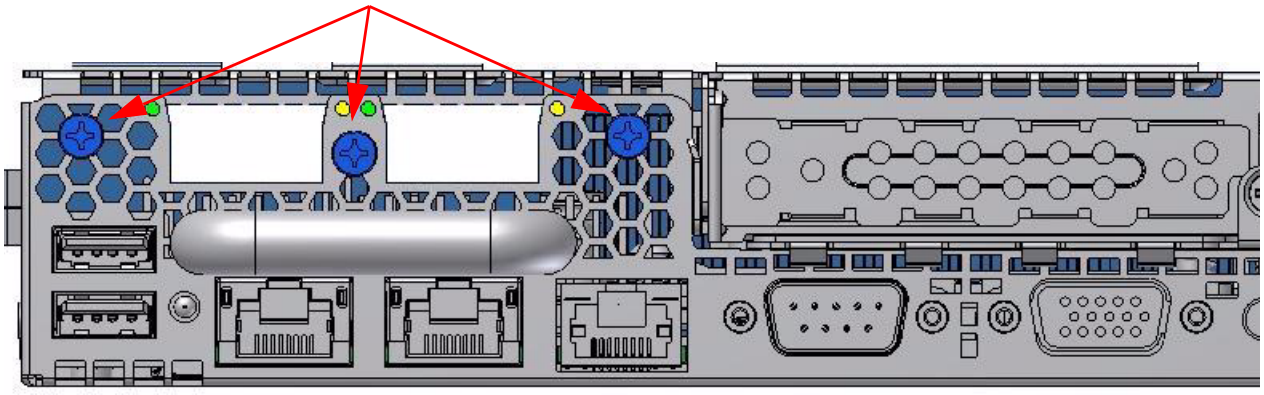
Figure 10: Dell Card Installed



12. Screw in three panhead screws into the front panel.

Figure 11: Front Panel

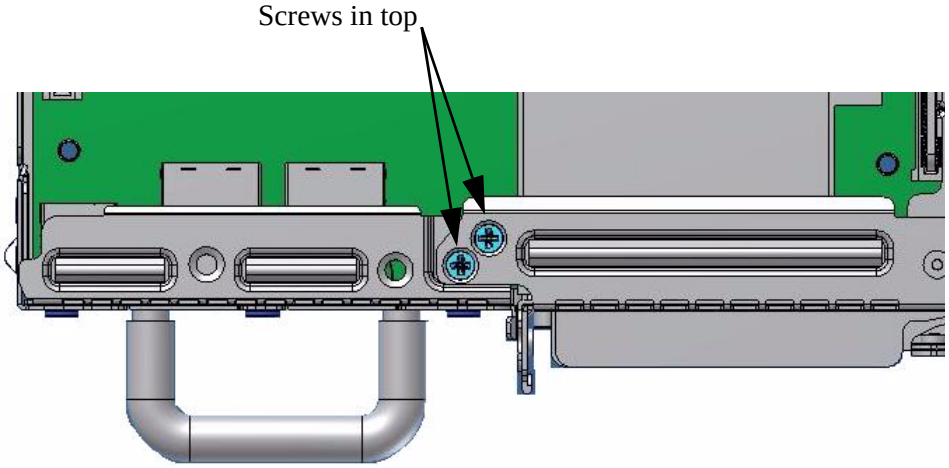
Screws holding the faceplate



13. Screw in two flathead screws on the top of the server into the HCA card.

Figure 12: Top View

Screws in top



14. Slide the server in the chassis.

4.4 Safety Warnings

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. Lightening – Electrical Hazard

During periods of lightning activity, do not work on the equipment.

4. Installation of Equipment

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

5. Disposal of Equipment

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

6. Compliance with Local and National Codes

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

5 Cables and Modules

These cards support passive copper cables and active optical cables, both direct attach and through a transceiver module, at up to QDR data rates. See www.mellanox.com => Products => Cables for cable type, model, module, and length recommendations.

5.1 Cable Installation

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. 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). 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.

Note: When installing cables make sure that the latches engage.

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

Care should be taken not to impede the air exhaust flow through the ventilation holes. Cable lengths should be used which allow for routing horizontally around to the side of the chassis before bending upward or downward in the rack.

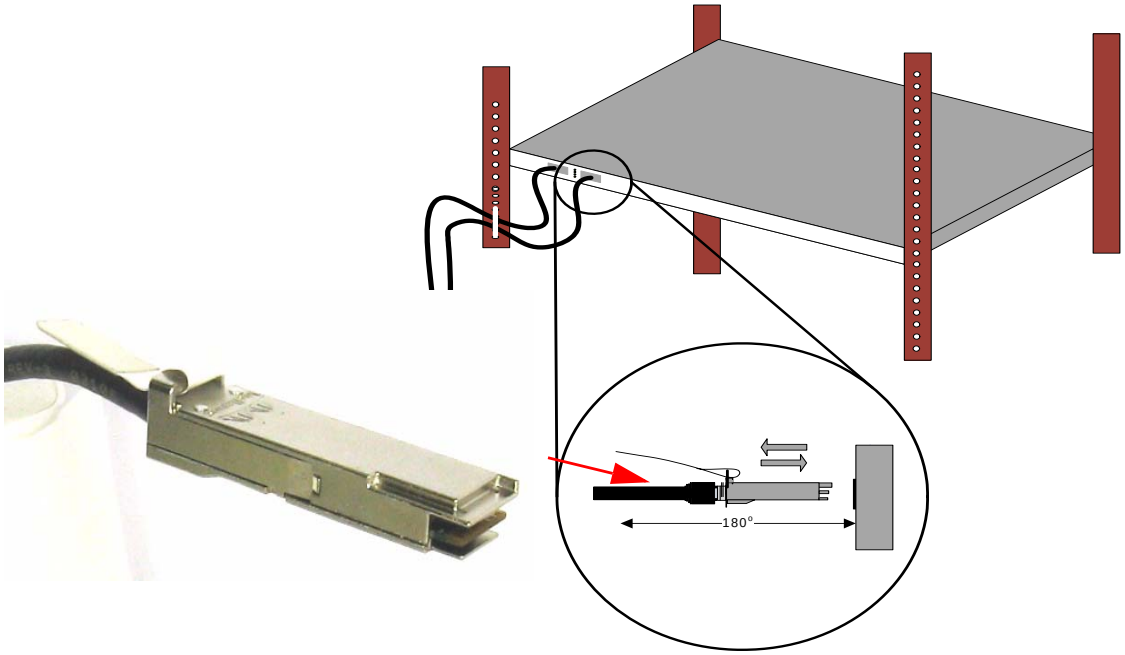
To remove a cable, disengage the locks and slowly pull the connector away from the port receptacle. Both LED indicators will turn off when the cable is unseated.

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.

5.1.1 Inserting a Cable into the Card

1. Support the weight of the cable before connecting the cable to the card. Do this by using a cable holder or tying the cable to the rack.
2. Determine the correct orientation of the connector to the card before inserting the connector. Do not try and insert the connector up side down. This may damage the card.
3. Insert the connector into the card. Be careful to insert the connector straight into the cage. Do not apply any torque, up or down, to the connector cage in the card.
4. Make sure that the connector locks in place.

Figure 13: Connector Orientation



5.1.2 Removing a Cable from the Card

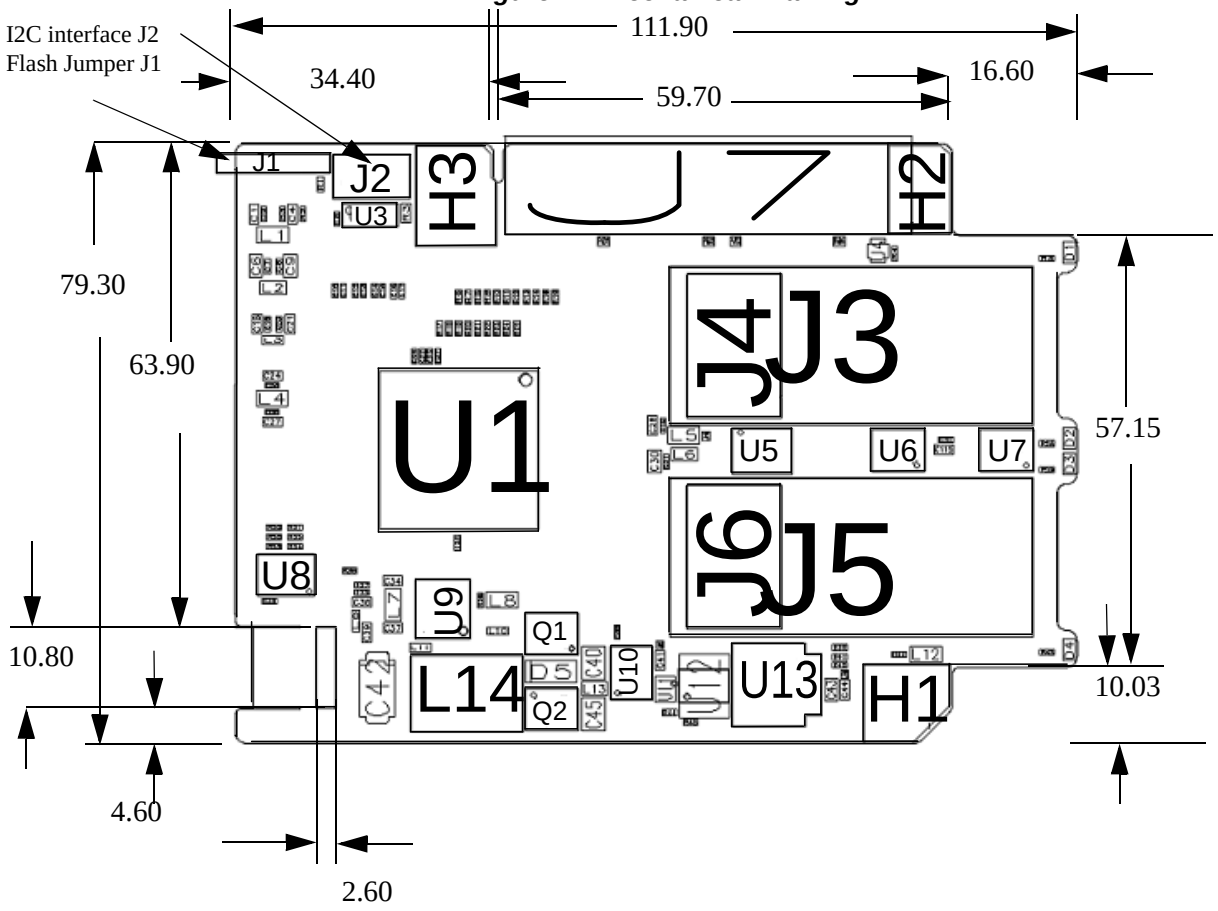
1. Pull on the latch release mechanism thereby unlatching the connector and pull the connector out of the cage.
2. Do not apply torque to the connector when removing it from the card.
3. Remove any cable supports that were used to support the cable's weight.

Appendix A: Specifications

A.1 Board Mechanical Drawing and Dimensions

The ConnectX-2 I/O card mechanical drawing is depicted in Figure 14.

Figure 14: Mechanical Drawing



Note: All dimensions are in millimeters.

J1 is the flash jumper.
J2 is the I2C Connector.

A.2 EMC Certification Statements

A.2.1 FCC Statements (USA)

Class A Statements:

§ 15.21

Statement

Warning! Changes or modifications to this equipment not expressly approved by the party responsible for compliance (Mellanox Technologies) could void the user's authority to operate the equipment.

§15.105(a)

Statement

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.

A.2.2 EN Statements (Europe)

EN55022 Class A Statement:

Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be

A.2.3 ICES Statements (Canada)

Class A Statement:

"This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada."

A.2.4 VCCI Statements (Japan)

Class A Statement:

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラス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。

(Translation - "This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.")

A.2.5 KCC Notice (Republic of Korea Only)

The KCC label may be located separately from the other regulatory markings applied to your product.

Class A devices are for business purposes.

Class A Device

기 종 별	사 용 자 안 내 문
A급 기기 (업무용 정보통신기기)	이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

KCC Class A Regulatory Label

If the regulatory label includes the following marking, your device is a Class A product:

1. 기기의 명칭(모델명):
2. 인증번호:(A)
3. 인증받은 자의 상호:
4. 제조년월일:
5. 제조자/제조국가:

A.3 Specifications

Table 10 - ConnectX-2 MCQH29-XDR Specifications

Physical		**Power and Environmental**	
Size:	79.30mm X 111.90 mm	Voltage:	12V, 3.3V
Air Flow:	200LFM @55°C	Typ Power:	8.74W Passive cables 12.74W Active cables
QSFP 40Gb/s Connector:	InfiniBand (Copper and optical) Max power per port 3.5 W.	Maximum Power:	10.11W Passive cables 14.11 Active cables
		Temperature:	0°C to 55°C
Protocol Support		**Regulatory**	
InfiniBand:	IBTA v1.2.1, Auto-Negotiation (20Gb/s@5Gt/s) or (10Gb/s@2.5Gt/s)	Safety:	US/Canada: cTUVus EU: IEC60950 International: CB
Ethernet:	IEEE Std 802.3ae 10 Gigabit Ethernet IEEE Std 802.3ad Link Aggregation and Failover IEEE Std 802.3x Pause IEEE Std 802.1Q VLAN tags IEEE Std 802.1p Priorities Multicast Jumbo frame support (10KB) 128 MAC/VLAN addresses per port	EMC (Emissions):	USA: FCC, Class A Canada: ICES, Class A EU: CE Mark (EN55022 Class A, EN50024, EN61000-3-2, EN61000-3-3) Japan: VCCI, Class A Korea: KCC Class A Australia/ New Zealand: C-Tick Class A
		RoHS:	R-6
QoS:	8 Virtual Lanes for InfiniBand 8 Priority Queues for Ethernet		
RDMA Support:	Yes, All Ports		
Data Rate SFP+ Ethernet:	10 Gb/s		
QSFP InfiniBand:	40 Gb/s		
PCI Express:	2.0 SERDES @ 5.0 GT/s		

Appendix B: QSFP Interface

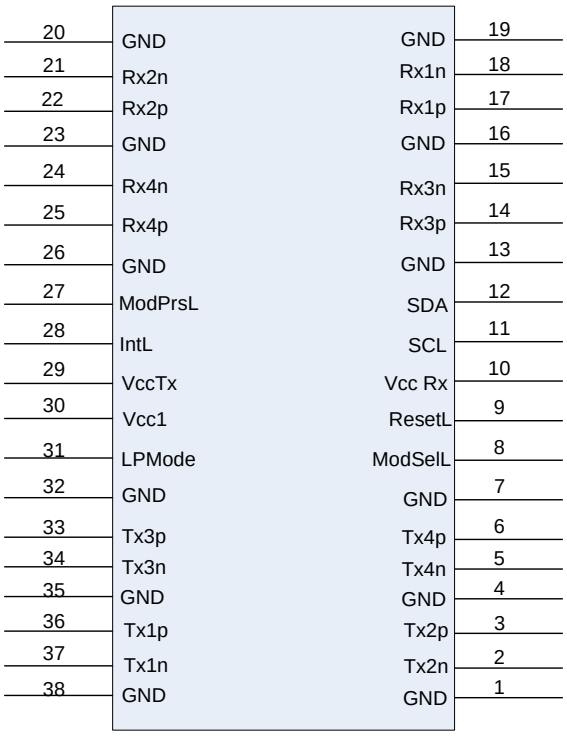
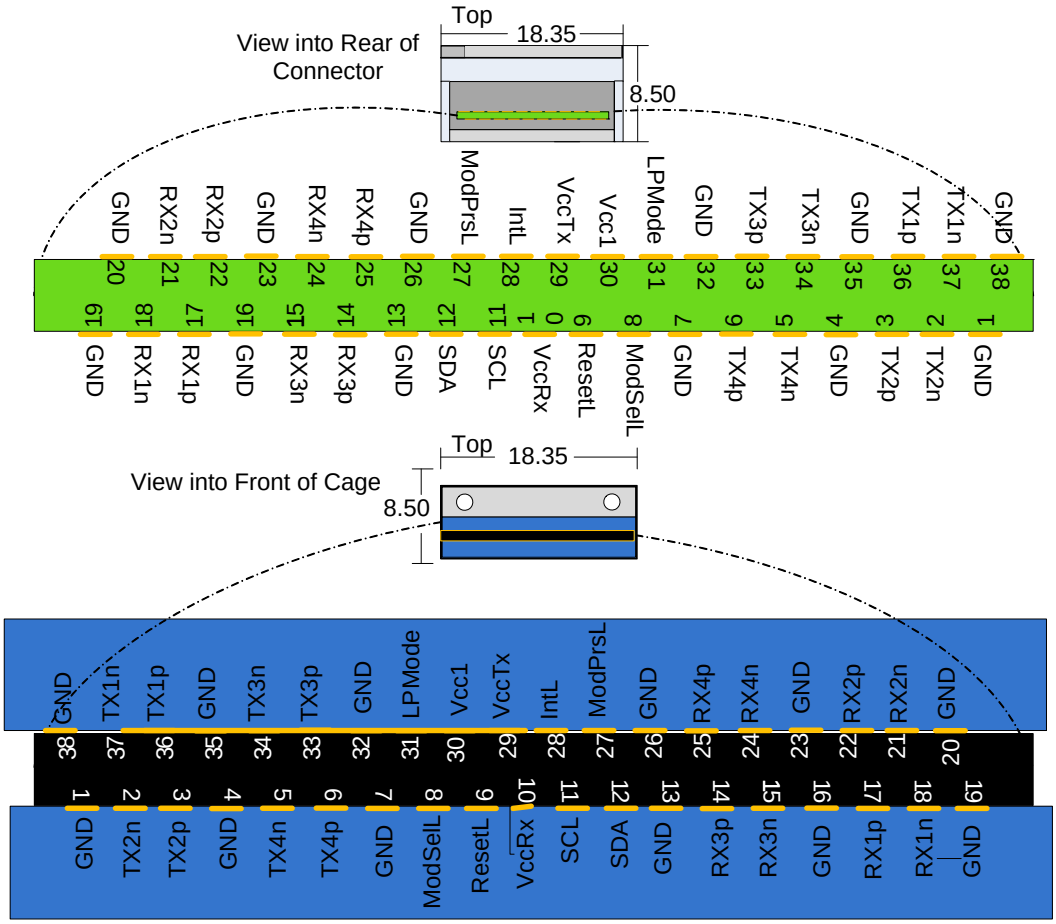


Table 3- InfiniBand QSFP Connector Pinout

Connector Pin Number	Connector Pin Name	Signal Description
1	GND	Ground
2	Tx2n	Transmitter Inverted Data Input
3	Tx2p	Transmitter Non-Inverted Data Input
4	GND	Ground
5	Tx4n	Transmitter Inverted Data Input
6	Tx4p	Transmitter Non-Inverted Data Input
7	GND	Ground
8	ModSelL	Module Select
9	ResetL	Module Reset
10	Vcc Rx	+3.3 V Power supply receiver
11	SCL	2-wire serial interface clock
12	SDA	2-wire serial interface data
13	GND	Ground
14	Rx3p	Receiver Non-Inverted Data Output
15	Rx3n	Receiver Inverted Data Output
16	GND	Ground
17	Rx1p	Receiver Non-Inverted Data Output
18	Rx1n	Receiver Inverted Data Output
19	GND	Ground
20	GND	Ground
21	Rx2n	Receiver Inverted Data Output 3
22	Rx2p	Receiver Non-Inverted Data Output 3
23	GND	Ground
24	Rx4n	Receiver Inverted Data Output 3
25	Rx4p	Receiver Non-Inverted Data Output 3
26	GND	Ground
27	ModPrsL	Module Present
28	IntL	Interrupt
29	Vcc Tx	+3.3 V Power supply transmitter
30	Vcc 1	+3.3 V Power Supply
31	LPMode	Low Power Mode
32	GND	Ground
33	Tx3p	Transmitter Non-Inverted Data Input
34	Tx3n	Transmitter Inverted Data Input
35	GND	Ground
36	Tx1p	Transmitter Non-Inverted Data Input
37	Tx1n	Transmitter Inverted Data Input
38	GND	Ground

Figure 15: QSFP Connector Male and Female Views



Appendix C: Avertissements de sécurité d'installation (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.

4. Installation du matériel

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

5. Elimination du matériel

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

6. Codes électriques locaux et nationaux

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

Appendix D: Installation - Sicherheitshinweise (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. 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.

4. Geräteinstallation

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

5. Geräteentsorgung

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

6. Regionale und nationale elektrische Bestimmungen

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