NOTE:
THIS HARDWARE, SOFTWARE OR TEST SUITE PRODUCT (“PRODUCT(S)”) AND ITS RELATED DOCUMENTATION ARE
PROVIDED BY MELLANOX TECHNOLOGIES “AS-IS” WITH ALL FAULTS OF ANY KIND AND SOLELY FOR THE PURPOSE
OF AIDING THE CUSTOMER IN TESTING APPLICATIONS THAT USE THE PRODUCTS IN DESIGNATED SOLUTIONS. THE
CUSTOMER’S MANUFACTURING TEST ENVIRONMENT HAS NOT MET THE STANDARDS SET BY MELLANOX
TECHNOLOGIES TO FULLY QUALIFY THE PRODUCT(S) AND/OR THE SYSTEM USING IT. THEREFORE, MELLANOX
TECHNOLOGIES CANNOT AND DOES NOT GUARANTEE OR WARRANT THAT THE PRODUCTS WILL OPERATE WITH THE
HIGHEST QUALITY. ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED
WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT ARE
DISCLAIMED. IN NO EVENT SHALL MELLANOX BE LIABLE TO CUSTOMER OR ANY THIRD PARTIES FOR ANY DIRECT,
INDIRECT, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES OF ANY KIND (INCLUDING, BUT NOT LIMITED TO,
PAYMENT FOR PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS
INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY,
OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY FROM THE USE OF THE PRODUCT(S) AND
RELATED DOCUMENTATION EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
Table of Contents

Table of Contents 3
List of Figures 5
List of Tables 6
Revision History 7
About this Manual 8

Intended Audience 8
Related Documentation 8
Online Resources 8
Document Conventions 8
Technical Support 8
Firmware and Software Updates 9

Chapter 1 Overview 10
1.1 Adapter Cards Covered in this Manual 11
1.2 Mellanox Part Numbering Legend 13
1.3 Finding the MAC and Serial Number on the Adapter Cards 14
1.4 Safety Warnings 14

Chapter 2 Adapter Card Interfaces 16
2.1 I/O Interfaces 16
2.2 Power 18
2.3 Memory 18
2.4 VPD Layout 19

Chapter 3 Driver Software and Firmware 22
3.1 Driver Software 22
3.2 RDMA over Converged Ethernet (RoCE) 22
3.3 Updating Card Firmware 23
3.4 ConnectX EN PXE 24

Chapter 4 Ethernet Adapter Card Installation 25
4.1 Hardware and Software Requirements 25
4.2 Installation Instructions 25
4.3 Set Up 26
4.4 Cables and Modules 31

Appendix A Specifications 34
A.1 MNPH29D-X[ST]R Specifications 34
A.2 MNPH29C-X[ST]R Specifications 35
A.3 Board Mechanical Drawing and Dimensions 35
A.4 EMC Certification Statements 37

Appendix B Interface Connectors Pinout 40
B.1 I2C-Compatible Connector Pinout 40
B.2 PCI Express x8Connector Pinout 40
B.3 PCI Express Connector Pinout 41
B.4 SFP+ Connector Pinout 41

Appendix C Replacing a Tall Bracket With a Short Bracket 43
C.1 Remove the Existing Bracket from the Adapter Card 43
C.2 Installing the New Bracket 43

Appendix D Avertissements de sécurité d’installation (Warnings in French) 45
List of Figures

Figure 1: SFP+ NIC Component Side and Bracket Views 12
Figure 2: Card Product Label 14
Figure 3: Port Numbering 16
Figure 4: LED - Port Association 17
Figure 5: Physical and Logical Link Indications 17
Figure 6: I2C Connector 18
Figure 7: Flash Jumper 19
Figure 8: Support Download Assistant 24
Figure 9: Hardware Devices 27
Figure 10: PCI Device 28
Figure 11: Module With Locking Mechanism Closed 32
Figure 12: Module With Locking Mechanism Open 32
Figure 13: Schematic of the ConnectX-2 Small Form Factor MNPH29D Adapter Card 36
Figure 14: Schematic of the ConnectX-2 Card MNPH29C Adapter Card 37
Figure 15: Compatible Connector Plug and Pinout 40
Figure 16: Rear View of Module With Pin Placement 41
Figure 17: Remove the Bracket 43
Figure 18: Putting on the Bracket 44
List of Tables

Table 1: Revision History Table 7
Table 2: Documents List 8
Table 3: Network Interface Cards 11
Table 4: Mellanox Cards Part Numbering Key 13
Table 5: LEDs 17
Table 6: Jumper Configuration 19
Table 7: VPD Layout for MNPH29D-X[ST]R 19
Table 8: VPD Layout for MNPH29C-X[ST]R 20
Table 9: Hardware and Software Requirements 25
Table 10: Specifications for MNPH29D-X[ST]R 34
Table 11: Specifications for MNPH29C-X[ST]R 35
Table 12: Adapter Cards Certification Status 37
Table 13: I2C-Compatible Connector Pinout 40
Table 14: SFP+ Connector Pinout 42
Revision History

This document was printed on 2/15/11.

Table 1 - Revision History Table

<table>
<thead>
<tr>
<th>Date</th>
<th>Rev</th>
<th>Comments/Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 2011</td>
<td>1.6</td>
<td>Changed Air flow requirement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added to the Setup section</td>
</tr>
<tr>
<td>Dec. 19th, 2010</td>
<td>1.5</td>
<td>Minor formatting changes</td>
</tr>
<tr>
<td>Nov. 22nd, 2010</td>
<td>1.4</td>
<td>Added Generation D card Mini Form Factor</td>
</tr>
<tr>
<td>Oct. 28th, 2010</td>
<td>1.3</td>
<td>Added Technical Support and Firmware and Software Updates sections to the Preface section</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added RoCE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added ConnectX EN PXE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added Setup section, This is a sanity check after card installation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added KCC statement to Appendix A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added QSFP to SFP+ QSA adapter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Removed Gen 1 cards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formatted EMC table</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed EN 60950-1: 2001 to EN 60950-1: 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed RDMA over Ethernet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added RDMA over Ethernet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New template</td>
</tr>
<tr>
<td>April 2010</td>
<td>1.2</td>
<td>New power numbers</td>
</tr>
<tr>
<td>Feb. 2010</td>
<td>1.1</td>
<td>Added Section on PXE boot</td>
</tr>
<tr>
<td>Feb. 2010</td>
<td>1.0</td>
<td>Initial Release</td>
</tr>
</tbody>
</table>
**About this Manual**

This *User Manual* describes Mellanox Technologies ConnectX®-2 Dual Port 10Gigabit Ethernet PCI Express 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*

<table>
<thead>
<tr>
<th>Document</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE Std 802.3 Specification</td>
<td>This is the IEEE Ethernet specification <a href="http://standards.ieee.org/getieee802">http://standards.ieee.org/getieee802</a></td>
</tr>
<tr>
<td>PCI Express 2.0 Specifications</td>
<td>Industry Standard PCI Express 2.0 Card Electromechanical Specification, Rev 1.3.</td>
</tr>
</tbody>
</table>

**Online Resources**

- Mellanox Technologies Web pages: [http://www.mellanox.com](http://www.mellanox.com)
- Mellanox Technologies Firmware download Web page: [http://www.mellanox.com =>](http://www.mellanox.com)

**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.

**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](http://www.mellanox.com)
- 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 informa-
tion 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 cards based on the ConnectX®-2 ENintegrated circuit device. The cards described in this manual have the following main features:

- IEEE Std 802.3 compliant
- 10 Gb/s Ethernet
- Dual SFP+ ports for connection Ethernet traffic
- PCI Express 2.0 (1.1 compatible) through an x8 edge connector up to 5GT/s
- Fiber Channel encapsulation (FCoE)
- RDMA over Converged Ethernet (RoCE)
- RoHS-R6
- Two bracket heights: short and tall
1.1 Adapter Cards Covered in this Manual

Table 3 lists the Ethernet adapter cards described in this manual.

**Table 3 - Network Interface Cards**

<table>
<thead>
<tr>
<th>Ordering Part Number (OPN)</th>
<th>PCI Express SERDES Speed</th>
<th>Data Transmission Rate/ # of ports</th>
<th>Short / Tall Bracket</th>
<th>RoHS</th>
<th>Adapter IC Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNPH29D-XTR</td>
<td>PCIe Gen2 5.0 GT/s</td>
<td>10 +10 Gb/s Ethernet 2 ports</td>
<td>Tall</td>
<td>R-6</td>
<td>MT25408B0-FCCR-TE</td>
</tr>
<tr>
<td>MNPH29D-XSR</td>
<td>PCIe Gen2 5.0 GT/s</td>
<td>10 +10 Gb/s Ethernet 2 ports</td>
<td>Short</td>
<td>R-6</td>
<td>MT25408B0-FCCR-TE</td>
</tr>
<tr>
<td>MNPH29C-XTR</td>
<td>PCIe Gen2 5.0 GT/s</td>
<td>10 +10 Gb/s Ethernet 2 ports</td>
<td>Tall</td>
<td>R-6</td>
<td>MT25408B0-FCCR-TE</td>
</tr>
<tr>
<td>MNPH29C-XSR</td>
<td>PCIe Gen2 5.0 GT/s</td>
<td>10 +10 Gb/s Ethernet 2 ports</td>
<td>Short</td>
<td>R-6</td>
<td>MT25408B0-FCCR-TE</td>
</tr>
</tbody>
</table>
Figure 1: SFP+ NIC Component Side and Bracket Views
1.2 Mellanox Part Numbering Legend

Table 4 describes the Mellanox Technologies adapter cards part numbering legend.

**Table 4 - Mellanox Cards Part Numbering Key**

<table>
<thead>
<tr>
<th>Adapter Card OPN MHTS#/I-XBR</th>
<th>Field</th>
<th>Decoder</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Mellanox Technologies</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Adapter Type</td>
<td>H = InfiniBand Host Channel Adapter, N = Ethernet Network Interface Card</td>
</tr>
<tr>
<td>T</td>
<td>Media</td>
<td>P = SFP+</td>
</tr>
<tr>
<td>S</td>
<td>Adapter Architecture</td>
<td>H = ConnectX® or ConnectX-2</td>
</tr>
<tr>
<td>#</td>
<td># ports</td>
<td>1 = 1, 2 = 2</td>
</tr>
<tr>
<td>I</td>
<td>Host Interface</td>
<td>X = PCI-X, 4 = PCIe x4, 8 = PCIe Gen1 x8, 9 = PCIe (Gen2 x8)</td>
</tr>
<tr>
<td>G</td>
<td>Generation</td>
<td>&lt;blank&gt; = Initial product generation, B = generation B, C = generation C</td>
</tr>
<tr>
<td>-</td>
<td>Separator</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Memory Size</td>
<td>X = MemFree, 1 = 128MB, 2 = 256MB, 3 = 512MB</td>
</tr>
<tr>
<td>B</td>
<td>Bracket</td>
<td>S = Short, T = Tall, N = None</td>
</tr>
<tr>
<td>R</td>
<td>RoHS</td>
<td>&lt;blank&gt; = non RoHS, C = RoHS R-5 w/ Exemption, R = RoHS R-6 Lead-Free</td>
</tr>
</tbody>
</table>

For example, the part number MNPH29C-XTR describes Mellanox Technologies’ ConnectX EN adapter card with two SFP+ ports, a PCIe2.0 x8 5.0GT/s interface, no on-board memory (mem-free), a tall bracket, and RoHS R6 compliance. Using the legend,

- field M = M to indicate a Mellanox Technologies product,
- field H = N to indicate a Network Interface Card,
- field T = P to indicate 10GBASE-SR/LR,
- field S = H to indicate ConnectX
- field # = 2 to indicate two ports,
- field I = 9 to indicate PCI Express 2.0 x8 running at 5.0GT/s,
- field G = C to indicate Generation C ConnectX-2
- field X = X to indicate no on-board memory,
- field B = T to indicate a tall bracket, and
- field R = R to indicate RoHS R6 compliance
1.3 Finding the MAC and Serial Number on the Adapter Cards

All Mellanox adapter cards have a label on the printed side of the adapter card that has the card serial number, and the card MAC.

Figure 2: Card Product Label

Port 1 uses the GUID or MAC ID described on the label, for port 2 GUID or MAC add 1 to port 1’s description.

1.4 Safety Warnings

For safety warnings in French see “Avertissements de sécurité d’installation (Warnings in French)” on page 45. For safety warnings in German see “Sicherheitshinweise (Warnings in German)” on page 46. For safety warnings in Spanish see “Advertencias de seguridad para la instalación (Warnings in Spanish)” on page 47.

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.
2 Adapter Card Interfaces

2.1 I/O Interfaces

Each card includes the following interfaces:

- SFP+ ports
- I/O panel LEDs
- I²C compatible connector (for debug)

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

ConnectX-2 Ethernet Adapter Cards are compliant with the IEEE Std 802.3 Specification.

2.1.1 Ethernet SFP+ Interface

The ConnectX®-2 device is compliant with the IEEE Std 802.3. The SFP+ port has one Tx/Rx pair of SerDes. Ethernet NIC cards listed in Table 3 on page 11 based on this device provide access to the Ethernet ports by means of SFP+ connectors.

2.1.2 PCI Express Interface

The ConnectX-2 adapter cards support PCI Express 2.0 (1.1 compatible) through an 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

The board has I/O LEDs located on the I/O panel. The green LED, when lit, indicates that the driver is running and a valid physical connection between nodes exists. If the green LED is blinking, it indicates a problem with the physical link. The yellow LED when lit, indicates a valid data activity link, this is the logical link. The yellow LED lights up when the network is discovered over the physical link. A valid data activity link without data transfer is designated by a constant yellow LED indication. A valid data activity link with data transfer is designated by a blinking yellow LED indication. If the LEDs are not active, either the physical link or the logical link (or both) connections have not been established.

Figure 4: LED - Port Association

![Figure 4: LED - Port Association](image)

Figure 5: Physical and Logical Link Indications

Table 5 - LEDs

<table>
<thead>
<tr>
<th>Port Number</th>
<th>LED Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port 1</td>
<td>Physical Link - Green</td>
</tr>
<tr>
<td></td>
<td>Constant on indicates a good physical link</td>
</tr>
<tr>
<td></td>
<td>Blinking indicates a problem with the Physical link</td>
</tr>
<tr>
<td>Port 1</td>
<td>Data Activity - Yellow</td>
</tr>
<tr>
<td></td>
<td>Blinking indicates Data Transfer</td>
</tr>
<tr>
<td></td>
<td>Constant on indicates no Data Transfer</td>
</tr>
<tr>
<td>Port 2</td>
<td>Physical Link - Green</td>
</tr>
<tr>
<td></td>
<td>Constant on indicates a good physical link</td>
</tr>
<tr>
<td></td>
<td>Blinking indicates a problem with the Physical link</td>
</tr>
<tr>
<td>Port 2</td>
<td>Data Activity - Yellow</td>
</tr>
<tr>
<td></td>
<td>Blinking indicates Data Transfer</td>
</tr>
<tr>
<td></td>
<td>Constant on indicates no Data Transfer</td>
</tr>
</tbody>
</table>
The short bracket has the same port and LED footprint as the tall bracket.

2.1.4 I²C Compatible Interface

A three-pin header on the card is provided as the I²C compatible interface. See Appendix A, “Specifications,” on page 34 for the location on the board.

Figure 6: I²C 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 34.

2.3 Memory

The adapter cards support multiple memory devices through the PCI Flash, and I2C.

2.3.1 System Memory

The card utilizes the PCI Express interface to store and access Ethernet fabric connection information and packet data on the system memory.

2.3.2 Flash

Each of the cards include one SPI Flash device accessible via the Flash interface of the MT25408B0 ConnectX-2 EN device.

There is a jumper on each adapter 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 Appendix A, “Specifications,” on page 34 for the jumper location.
2.3.3 EEPROM

Each board incorporates an EEPROM that is accessible through the I2C. The EEPROM is used for storing the Vital Product Data (VPD). The EEPROM capacity is 4Kb.

2.4 VPD Layout

The PCI VPD (Vital Product Data) layout, for each of the described Mellanox Technologies ConnectX®-2 adapter cards complies with the format defined in the *PCI 2.3 Specification, Appendix I*. All ConnectX-2® adapter cards have the same PCI VPD layout.

### Table 6 - Jumper Configuration

<table>
<thead>
<tr>
<th>Description</th>
<th>Option</th>
<th>Card Default Configuration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash present/ not present</td>
<td>connection open – Flash present connection shorted – Flash not present</td>
<td>connection open – Flash present</td>
<td>Header 1x2</td>
</tr>
</tbody>
</table>

**Figure 7: Flash Jumper**

### Table 7 - VPD Layout for MNPH29D-X(ST)R

<table>
<thead>
<tr>
<th>Offset (Decimal)</th>
<th>Item</th>
<th>Value</th>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Large Resource Type ID String Tag (0x02)</td>
<td>0x82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Length [7:0] LSB</td>
<td>0xE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Length [15:8] MSB</td>
<td>0x0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Data</td>
<td>Hawk Dual Port</td>
<td>STR</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Large Resource Type VPD-R Tag (0x10)</td>
<td>0x90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Length [7:0] LSB</td>
<td>0x4F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Length [15:8] MSB</td>
<td>0x00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>VPD Keyword</td>
<td>PN</td>
<td>STR</td>
<td>Add in Card Part Number</td>
</tr>
<tr>
<td>22</td>
<td>Length</td>
<td>0x15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>PN</td>
<td>PN</td>
<td>%STR_SPC</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>VPD Keyword</td>
<td>EC</td>
<td>STR</td>
<td>Engineering Change Level of the card (rev)</td>
</tr>
<tr>
<td>46</td>
<td>Length</td>
<td>0x2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Revision</td>
<td>RV</td>
<td>%STR</td>
<td>PCB revision</td>
</tr>
<tr>
<td>49</td>
<td>VPD Keyword</td>
<td>SN</td>
<td>STR</td>
<td>Serial Number</td>
</tr>
<tr>
<td>51</td>
<td>Length</td>
<td>0x18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Serial Number</td>
<td></td>
<td>%STR_SPC</td>
<td>&quot;00..00XXXX..XX&quot;</td>
</tr>
</tbody>
</table>
### Table 7 - VPD Layout for MNPH29D-X[ST]R

<table>
<thead>
<tr>
<th>Offset (Decimal)</th>
<th>Item</th>
<th>Value</th>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Large Resource Type ID String Tag (0x02)</td>
<td>0x82</td>
<td>STR</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Length [7:0] LSB</td>
<td>0xE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Length [15:8] MSB</td>
<td>0x00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Data</td>
<td>Hawk Dual Port</td>
<td>STR</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Large Resource Type VPD-R Tag (0x10)</td>
<td>0x90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Length [7:0] LSB</td>
<td>0x4F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Length [15:8] MSB</td>
<td>0x00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>VPD Keyword</td>
<td>PN</td>
<td>STR</td>
<td>Add in Card Part Number</td>
</tr>
<tr>
<td>22</td>
<td>Length</td>
<td>0x15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>PN</td>
<td>PN</td>
<td>%STR_SPC</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>VPD Keyword</td>
<td>EC</td>
<td>STR</td>
<td>Engineering Change Level of the card (rev)</td>
</tr>
<tr>
<td>46</td>
<td>Length</td>
<td>0x2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Revision</td>
<td>RV</td>
<td>%STR</td>
<td>PCB revision</td>
</tr>
<tr>
<td>49</td>
<td>VPD Keyword</td>
<td>SN</td>
<td>STR</td>
<td>Serial Number</td>
</tr>
<tr>
<td>51</td>
<td>Length</td>
<td>0x18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Serial Number</td>
<td></td>
<td>%STR_SPC</td>
<td>“00_00XXXX_XX”</td>
</tr>
</tbody>
</table>

### Table 8 - VPD Layout for MNPH29C-X[ST]R

<table>
<thead>
<tr>
<th>Offset (Decimal)</th>
<th>Item</th>
<th>Value</th>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Large Resource Type ID String Tag (0x02)</td>
<td>0x82</td>
<td>STR</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Length [7:0] LSB</td>
<td>0xE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Length [15:8] MSB</td>
<td>0x00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Data</td>
<td>Hawk Dual Port</td>
<td>STR</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Large Resource Type VPD-R Tag (0x10)</td>
<td>0x90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Length [7:0] LSB</td>
<td>0x4F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Length [15:8] MSB</td>
<td>0x00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>VPD Keyword</td>
<td>PN</td>
<td>STR</td>
<td>Add in Card Part Number</td>
</tr>
<tr>
<td>22</td>
<td>Length</td>
<td>0x15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>PN</td>
<td>PN</td>
<td>%STR_SPC</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>VPD Keyword</td>
<td>EC</td>
<td>STR</td>
<td>Engineering Change Level of the card (rev)</td>
</tr>
<tr>
<td>46</td>
<td>Length</td>
<td>0x2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Revision</td>
<td>RV</td>
<td>%STR</td>
<td>PCB revision</td>
</tr>
<tr>
<td>49</td>
<td>VPD Keyword</td>
<td>SN</td>
<td>STR</td>
<td>Serial Number</td>
</tr>
<tr>
<td>51</td>
<td>Length</td>
<td>0x18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Serial Number</td>
<td></td>
<td>%STR_SPC</td>
<td>“00_00XXXX_XX”</td>
</tr>
</tbody>
</table>
### Table 8 - VPD Layout for MNPH29C-X[ST]R

<table>
<thead>
<tr>
<th>Offset (Decimal)</th>
<th>Item</th>
<th>Value</th>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>VPD Keyword</td>
<td>V0</td>
<td>STR</td>
<td>Misc Information</td>
</tr>
<tr>
<td>78</td>
<td>Length</td>
<td>0x10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>Data</td>
<td>PCIe Gen2 x8</td>
<td>STR_SPC</td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>VPD Keyword</td>
<td>RV</td>
<td>STR</td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Length</td>
<td>0x1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>Data</td>
<td>0x97</td>
<td>%CS0</td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>Large Resource Type VPD-W Tag (0x11)</td>
<td>0x91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Length [7:0] LSB</td>
<td>0x99</td>
<td>STR_SPC</td>
<td></td>
</tr>
<tr>
<td>101</td>
<td>Length [15:8] MSB</td>
<td>0x00</td>
<td>STR_SPC</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>VPD Keyword</td>
<td>V1</td>
<td>STR</td>
<td>EFI Driver version</td>
</tr>
<tr>
<td>104</td>
<td>Length</td>
<td>0x6</td>
<td>STR_SPC</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>Data</td>
<td>N/A</td>
<td>STR_SPC</td>
<td></td>
</tr>
<tr>
<td>111</td>
<td>VPD Keyword</td>
<td>YA</td>
<td>STR</td>
<td>Asset Tag</td>
</tr>
<tr>
<td>113</td>
<td>Length</td>
<td>0x20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>Data</td>
<td>N/A</td>
<td>STR_SPC</td>
<td>“N/A”</td>
</tr>
<tr>
<td>146</td>
<td>VPD Keyword</td>
<td>RW</td>
<td>STR</td>
<td>Remaining read/write area</td>
</tr>
<tr>
<td>148</td>
<td>Length</td>
<td>0x6A</td>
<td>STR</td>
<td></td>
</tr>
<tr>
<td>149</td>
<td>Data</td>
<td>STR_ZERO</td>
<td></td>
<td>Reserved (0x00)</td>
</tr>
<tr>
<td>255</td>
<td>Small Resource Type END Tag (0x11)</td>
<td>0x78</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 Driver Software and Firmware

3.1 Driver Software

3.1.1 Linux

For Linux, download and install the latest MLNX_EN driver software package available via the Mellanox Web site at: http://www.mellanox.com => Downloads => Ethernet SW/Drivers. Follow the installation instructions included in the download package.

3.1.2 Windows

For Windows, download the MLNX EN – Ethernet driver. Download this package from the Mellanox Web site at: http://www.mellanox.com => Downloads => Ethernet SW/Drivers. Follow the installation instructions included in the download package.

3.2 RDMA over Converged Ethernet (RoCE)

ConnectX-2 EN with 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.

ConnectX-2 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.

3.2.1 Hardware and Software Requirements

Software:

- Operating System
  - Mellanox OFED 1.5.1 or later

Hardware:

- ConnectX-2 EN Adapter Card

To use RoCE you will need the following versions of firmware and software:

- OFED 1.5.1 or later
- firmware version 2.7.700 or later

3.2.2 Installation

For installation instructions visit: www.mellanox.com => Support => Ethernet SW/Driver
3.3 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 => Support > Download Center. 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 website.

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 Center.

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.

To check the latest firmware:

1. Go to Mellanox web site to check current firmware version.
   Go to: http://www.mellanox.com/supportdownloader
2. Enter your card PSID and compare the firmware versions.
3.4 ConnectX EN PXE

The Mellanox ConnectX EN PXE solution enables the booting of servers from an IP based LAN environment.

To enable or disable PXE use the following procedure:

The user must use the MFT tools:

To disable one must delete the PXE ROM image from the flash.

To enable one must place the PXE ROM image to the flash.

This software is based on the open source Etherboot/gPXE project (see www.etherboot.org).

For more details go to http://www.mellanox.com Products => Ethernet SW/Drivers > ConnectX EN PXE.
4 Ethernet Adapter Card Installation

4.1 Hardware and Software Requirements

Before installing the adapter card, please make sure that the system meets the hardware and software requirements listed in Table 9. Refer to Chapter 3, “Driver Software and Firmware” on page 22 for download and installation instructions.

Table 9 - Hardware and Software Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>• PCI Express x8 or x16 slots</td>
</tr>
<tr>
<td>Firmware and Software Operating</td>
<td>• For the latest firmware available please check <a href="http://www.mellanox.com">http://www.mellanox.com</a> =&gt; Downloads =&gt; Firmware</td>
</tr>
<tr>
<td>Systems/Distributions</td>
<td>Management Tools and Drivers</td>
</tr>
<tr>
<td></td>
<td>• Mellanox management tools can be found at:</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.mellanox.com">http://www.mellanox.com</a> =&gt; Downloads =&gt; Firmware Tools</td>
</tr>
<tr>
<td></td>
<td>• Linux Driver for ConnectX EN Based Network Interface Cards with 10GigE Support can be found at:</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.mellanox.com">http://www.mellanox.com</a> =&gt; Downloads =&gt; Ethernet SW/Drivers</td>
</tr>
<tr>
<td></td>
<td>• Windows Driver for ConnectX EN Based Network Interface Cards with 10GigE. Support can be found at:</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.mellanox.com">http://www.mellanox.com</a> =&gt; Downloads =&gt; Ethernet SW/Drivers</td>
</tr>
<tr>
<td></td>
<td>• Mellanox Ethernet Driver for Citrix XenServer 4.1, Mellanox ConnectX EN 10GbE Dual port NIC Support can be found at:</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.mellanox.com">http://www.mellanox.com</a> =&gt; Downloads =&gt; Ethernet SW/Drivers</td>
</tr>
</tbody>
</table>

When more than one PCI slot is available make sure to use the PCI slot with the proper configuration.

4.2 Installation Instructions

To change a tall bracket to a short bracket see Replacing a Tall Bracket With a Short Bracket on page 43.

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

The adapter cards listed in Table 3 on page 11 are standard PCI Express cards, each with a standard x8 edge connector. Please consult the host machine documentation for instructions on how to install a PCI Express card.
Any PCI slot with the proper configuration is acceptable for connection. 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.

4.3 **Set Up**

This section is valid for InfiniBand, Ethernet and VPI cards. Disregard sections that are not relevant to your card.

The basic steps to embed Mellanox cards in your computer are:

1. Identify the card in your system.
2. Verify the computer is recognizing the new adapter.
3. Install the adapter drivers.
4. Update the adapter firmware if needed.

The configuration of the card is dependant upon your choice to use InfiniBand or Ethernet.

4.3.1 **Identify the Card in Your System**

For instructions to identify your adapter card using specific tools see http://www.mellanox.com/content/pages.php?pg=firmware_HCA_FW_identification

Otherwise, use the instructions below relevant to your particular card and OS.

4.3.1.1 **Windows**

1. Open Device Manager. Click start--> Run, and then enter “devmgmt.msc”.
2. Check the Device Manager under “Other devices” for “PCI Device” (Windows 2003) or “InfiniBand Controller” (Windows 2008/R2).

   If you cannot find any PCI device, click Action --> Scan for hardware changes. If no PCI devices are detected, check that the network adapter card(s) is correctly installed in the PCI slot or try installing the adapter card into a different PCI slot.
Figure 9: Hardware Devices

3. Select a PCI Device / InfiniBand Controller entry.
4. Right-click.
5. Select “Properties to display the PCI Device Properties” window.
6. Click the Details tab and select Device Instance Id (Windows 2003) or Hardware Ids (Windows 2008/R2) from the Property pull-down menu.
7. 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_6368”: VEN is equal to 0x15B3 – this is the Vendor ID of Mellanox Technologies; and DEV is equal to 0x6368 – this is a valid Mellanox Technologies PCI Device ID.

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.

8. If the PCI device does not have a Mellanox adapter ID, return to Step 3 to check another device.
4.3.1.2 Linux

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

```bash
> lspci | grep Mellanox

2:00.0 InfiniBand: Mellanox Technologies MT26428 [ConnectX VPI PCIe 2.0 5GT/s - IB QDR / 10GigE] (rev b0)
```

Make sure that either the MLNX_OFED driver or the MLNX_EN driver is loaded and configured.

**Check the link status**

First check the network interface name by running the “`ifconfig -a`” command.

To check the Ethernet link status, for EN only and VPI cards, run: `ethtool <interface>`

```bash
Host# ethtool eth1
Supported ports: [ TP ]
Supported link modes:  10baseT/Half 10baseT/Full
                       100baseT/Half 100baseT/Full
                       1000baseT/Half 1000baseT/Full
Supports auto-negotiation: Yes
Advertised link modes:  10baseT/Half 10baseT/Full
                       100baseT/Half 100baseT/Full
                       1000baseT/Half 1000baseT/Full
Advertised auto-negotiation: Yes
Speed: Unknown! (0)
Duplex: Half
Port: Twisted Pair
PHYAD: 1
Transceiver: internal
Auto-negotiation: on
Supports Wake-on: g
Wake-on: d
Current message level: 0x000000ff (255)
Link detected: yes
```

To check the IB link status, for IB and VPI cards, run “`ibstat`” and focus on the Physical state attributes.

**Example:**

```bash
Host# ibstat
CA 'mlx4_0'
CA type: MT26428
 Number of ports: 1
Firmware version: 2.7.616
Hardware version: b0
Node GUID: 0x0002c903000c8710
System image GUID: 0x0002c903000c8713
Port 1:
   State: Down
   Physical state: Polling
```
Rate: 10
Base lid: 6
LID: 0
SM lid: 3
Capability mask: 0x0251086a
Port GUID: 0x0002c903000c8711
Link layer: IB

Check the OFED version

To get the version of the running Mellanox OFED/BXOFED, run the following command:

```
Host# ofed_info | head -1
BXOFED-1.5.1-1.3.7-rc19:
```

Troubleshooting MLNX_OFED Installation

For troubleshooting driver installation, please check Mellanox OFED driver user manual:
http://www.mellanox.com => Support > Adapter IB/VPI SW.

If you need to update your card firmware, download the new firmware.

Unzip the downloaded file and run flint/mstflint command:

```
flint -d <device> -i <fw-file> [-guid <GUID> | -guids <4 GUIDS> | -mac <MAC> | -macs <2 MACS>] burn
```

Check VPI setup – Ethernet / InfiniBand configuration

For Example:

```
flint -d /dev/mst/mt26428_pci_cr0 -i fw-25408-2_7_000-MNPH28B-XTC_A1-A2.bin burn
```

Loading the Ethernet Driver

By default, the Mellanox OFED stack loads mlx4_en. Run ‘lsmod’ to verify that the module is listed.

Example:

```
Host# lsmod | grep mlx4_en
mlx4_en               109708  0
mlx4_core             136804  2 mlx4_en,mlx4_ib
```

If you don’t see the mlx4_en driver, run: `modprobe mlx4_en`

Another option is to use the command below to see which modules are active.

Edit “/etc/infiniband/openib.conf” which modules needs to loaded from a service.

For example:

```
# Load MLX4_EN module
MLX4_EN_LOAD=yes
```
The “Usage: openibd {start|stop|restart|status}” command to modify this file and thereby control the drivers.

**Ethernet Driver Usage and Configuration**

To assign an IP address to the interface run:

```
#> ifconfig eth<n> <ip>
```

where ‘n’ is the OS assigned interface number.

- To check driver and device information run:

```
#> ethtool -i eth<n>
```

Example:

```
#> ethtool -i eth2
driver: mlx4_en (MT_04A0140005)
version: 1.5.1 (March 2010)
firmware-version: 2.7.000
bus-info: 0000:13:00.0
```

- The mlx4_en parameters can be found under /sys/module/mlx4_en (or /sys/module/mlx4_en/parameters, depending on the OS) and can be listed using the command:

```
#> modinfo mlx4_en
```

To set non-default values to module parameters, the following line should be added to the file/etc/modprobe.conf:

```
"options mlx4_en <param_name>=<value> <param_name>=<value> ...
```

**Ethernet Network Tuning**

To improve network performance by tuning your network see the Mellanox Performance Tuning Guide located at:

[http://www.mellanox.com/related-docs/prod_software/Performance_Tuning_Guide_for_Mellanox_Network_Adapters_rev_1_0.pdf](http://www.mellanox.com/related-docs/prod_software/Performance_Tuning_Guide_for_Mellanox_Network_Adapters_rev_1_0.pdf)

### 4.4 Cables and Modules

The SFP+ port can connect to the Ethernet through both direct attach cables and stand alone transceivers with optical cables. SFP+ transceiver modules are available for both SR and LR protocols.

See [www.mellanox.com => Products => Cables](http://www.mellanox.com) for certified and approved cable recommendations.

#### 4.4.1 Optical modules for SFP+

SFP+ transceiver modules can be used to connect fiber optic cables to the cards greatly increasing the cable reach.
The adapter cards are shipped without optical modules. Mellanox 10GBASE-SR (MFM1T02A-SR) and 10GBASE-LR (MFM1T02A-LR) optical modules are recommended. The figure below shows the Mellanox SFP+ module.

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.

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.

4.4.2 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.

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.

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.
Appendix A: Specifications

A.1 MNPH29D-X[ST]R Specifications

Table 10 - Specifications for MNPH29D-X[ST]R

<table>
<thead>
<tr>
<th>Physical</th>
<th>Power and Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size: 2.71in x 5.60in (68.90mm x 142.25mm)</td>
<td>Voltage: 12V, 3.3V</td>
</tr>
<tr>
<td>10Gb/s Connector: SFP+</td>
<td>Active Cables 7.83W</td>
</tr>
<tr>
<td></td>
<td>Maximum Power: Passive Cables 7.08W</td>
</tr>
<tr>
<td></td>
<td>Active Cables 8.48W</td>
</tr>
<tr>
<td></td>
<td>Temperature: 0°C to 55°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protocol Support</th>
<th>Regulatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE Std 802.3ad Link Aggregation and Failover</td>
<td>Safety: UL, EU: IEC, TUV, and CB EN 60950-1:2006</td>
</tr>
<tr>
<td>IEEE Std 802.1Q VLAN tags, 1p priorities</td>
<td>RoHS: RoHS R6</td>
</tr>
<tr>
<td>IEEE Std 802.1p Priorities</td>
<td></td>
</tr>
<tr>
<td>IEEE P802.1au D2.0 Congestion Notification</td>
<td></td>
</tr>
<tr>
<td>IEEE P802.1az D0.2 Enhanced Transmission Selection</td>
<td></td>
</tr>
<tr>
<td>IEEE P802.1bb D1.0 Priority-based Flow ControlMulticast</td>
<td></td>
</tr>
<tr>
<td>PCI Express 2.0 SerDes @ 5.0 GT/s</td>
<td></td>
</tr>
</tbody>
</table>

a. Air flow is measured ~1” from the heat sink between the heat sink and the cooling air inlet.
A.2 MNPH29C-X[ST]R Specifications

Table 11 - Specifications for MNPH29C-X[ST]R

<table>
<thead>
<tr>
<th>Physical</th>
<th>Power and Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size: 2.71in x 6.60in (68.90mm x 167.65mm)</td>
<td>Voltage: 12V, 3.3V</td>
</tr>
<tr>
<td>10Gb/s Connector: SFP+</td>
<td>Active Cables 7.83W</td>
</tr>
<tr>
<td></td>
<td>Maximum Power: Passive Cables 7.08W</td>
</tr>
<tr>
<td></td>
<td>Active Cables 8.48W</td>
</tr>
<tr>
<td></td>
<td>Temperature: 0°C to 55°C</td>
</tr>
</tbody>
</table>

Protocol Support

- **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, .1p priorities
  - IEEE Std 802.1p Priorities
  - IEEE P802.1au D2.0 Congestion Notification
  - IEEE P802.1az D0.2 Enhanced Transmission Selection
  - IEEE P802.1bb D1.0 Priority-based Flow Control/Multicast

- **PCI Express**: 2.0 SerDes @ 5.0 GT/s

Regulatory

- **Safety**: UL, EU: IEC, TUV, and CB EN 60950-1:2006
- **EMI**: CLASS 1 LASER PRODUCT
- **RoHS**: RoHS R6

---

A.3 Board Mechanical Drawing and Dimensions

All of the cards covered in this User Manual have the same mechanical drawing and share the same dimensions as depicted in Figure 13 or Figure 14.
All dimensions are in millimeters.
All the mechanical tolerances are +/-0.1mm

Figure 13: Schematic of the ConnectX-2 Small Form Factor MNPH29D Adapter Card
A.4 EMC Certification Statements

Table 12 lists the approved certification status per in different regions of the world.

**Table 12 - Adapter Cards Certification Status**

<table>
<thead>
<tr>
<th>Adapter Card P/N</th>
<th>FCC</th>
<th>VCCI</th>
<th>EN</th>
<th>ICES</th>
<th>CE</th>
<th>CB</th>
<th>cTUVus</th>
<th>KCC</th>
<th>C-TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNPH29C-XTR</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>MNPH29C-XSR</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>MNPH29D-XTR</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>MNPH29D-XSR</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>
A.4.1 FCC Statements (USA)

Class A Statements:

§ 15.19(a)(4)

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.

§ 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.4.2 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 required to take adequate measures.

A.4.3 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.4.4 VCCI Statements (Japan)

Class A Statement:

(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.4.5 KCC Certification (Korea)

English Translation

<table>
<thead>
<tr>
<th>Device</th>
<th>User’s information</th>
</tr>
</thead>
<tbody>
<tr>
<td>A급 기기 (업무용 방송통신기기)</td>
<td>이 기기는 업무용(A급)으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.</td>
</tr>
</tbody>
</table>

**CLASS A device**

(commercial broadcasting and communication equipment)

This device has been approved by EMC registration. Distributors or users pay attention to this point. This device is usually aimed to be used in other area except at home.

- **Remark**

  Class A device: operated in a commercial area.
Appendix B: Interface Connectors Pinout

B.1 \(i^2C\)-Compatible Connector Pinout

*Figure 15: Compatible Connector Plug and Pinout*

<table>
<thead>
<tr>
<th>Connector Pin Number</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SPSDA</td>
</tr>
<tr>
<td>2</td>
<td>SPSCL</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
</tr>
</tbody>
</table>

Table 13 - \(i^2C\)-Compatible Connector

B.2 PCI Express x8 Connector Pinout

These cards use a standard PCI Express x8 edge connector and the PCI Express x8 standard pinout according to the PCI Express 2.0 specification.
B.3 PCI Express Connector Pinout

B.4 SFP+ Connector Pinout

Figure 16: Rear View of Module With Pin Placement

![Diagram of Rear View of Module With Pin Placement]

![Diagram of SFP+ Cage]

Figure 16: Rear View of Module With Pin Placement

![Diagram of Rear View of Module With Pin Placement]

Figure 16: Rear View of Module With Pin Placement

![Diagram of Rear View of Module With Pin Placement]
Table 14 - SFP+ Connector Pinout

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

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. It includes the following sections:

- Removing a bracket
- Installing a new bracket

C.1 Remove the Existing Bracket from the Adapter Card

1. Remove the two screws holding the bracket in place.
2. Push the bracket off using equal pressure at the top and bottom of the bracket. See Figure 17
3. Save the two screws and the two fiber washers.

C.2 Installing the New Bracket

4. Place the bracket onto the card until the screw holes line up.
5. Screw on the bracket using the screws and washers saved from the procedure above step 1.

Be careful not to put stress on the LEDs.

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.
6. Make sure that the LEDs are aligned onto the bracket holes.
7. 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 InfiniBand en cuivre**
   
   Les câbles InfiniBand 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.
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 InfiniBand-Kupferkabel

InfiniBand-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

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

   Dado que los cables de cobre InfiniBand 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.
Códigos eléctricos locales y nacionales

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