Preface

About this User's Guide

This user's guide is written for system integrators, PC technicians, and knowledgeable PC users. It provides information for the installation and use of the AOC-MHIBF-m2Q2G and AOC-MHIBF-m1Q2G add-on cards.

About this Add-on Card

The AOC-MHIBF-m2Q2G and AOC-MHIBF-m1Q2G are the most powerful InfiniBand controllers in the market. In the small form factor SIOM, available as part of an integrated solution with Supermicro servers, they provide both InfiniBand FDR 56Gbps and 40Gbps Ethernet as well as remote server management through a dedicated Gigabit LAN controller. Based on Mellanox® ConnectX-3 Pro and Intel® i350 controllers, they provide unparalleled performance and flexible interconnect solutions for Supermicro servers in data centers and enterprise environments.

An Important Note to the User

All images and layouts shown in this user's guide are based upon the latest PCB revision available at the time of publishing. The card you have received may or may not look exactly the same as the graphics shown in this user's guide.

Returning Merchandise for Service

A receipt or copy of your invoice marked with the date of purchase is required before any warranty service will be rendered. You can obtain service by calling your vendor for a Returned Merchandise Authorization (RMA) number. When returning the add-on card to the manufacturer, the RMA number should be prominently displayed on the outside of the shipping carton, and the shipping package is mailed prepaid or hand-carried. Shipping and handling charges will be applied for all orders that must be mailed when service is complete. For faster service, You can also request a RMA authorization online (http://www.supermicro.com).

This warranty only covers normal consumer use and does not cover damages incurred in shipping or from failure due to the alternation, misuse, abuse or improper maintenance of products.

During the warranty period, contact your distributor first for any product problems.
Conventions Used in the User's Guide

Pay special attention to the following symbols for proper system installation and to prevent damage to the system or injury to yourself:

Note: Additional information given to provide information for correct system setup.

Naming Convention

AOC-MHIBF-m2Q2G

<table>
<thead>
<tr>
<th>Character</th>
<th>Representation</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Product Family</td>
<td>AOC: Add On Card</td>
</tr>
<tr>
<td>2nd</td>
<td>Form Factor</td>
<td>S: Standard, P: Proprietary, C: MicroLP, M: Super IO Module (SIOM), MH: SIOM Hybrid</td>
</tr>
<tr>
<td>4th</td>
<td>Chipset Model (Optional)</td>
<td>N: Niantec (82599), P: Powerville (i350), S: Sageville (X550)</td>
</tr>
<tr>
<td>5th</td>
<td>Chipset Manufacturer</td>
<td>i: Intel, m: Mellanox, b: Broadcom</td>
</tr>
<tr>
<td>6th</td>
<td>Number of Ports</td>
<td>1: 1 port, 2: 2 ports, 4: 4 ports</td>
</tr>
<tr>
<td>7th</td>
<td>Connector Type (Optional)</td>
<td>S: SFP+/SFP28, T: 10GBase-T, Q: QSFP+, C: QSFP28</td>
</tr>
<tr>
<td>8th</td>
<td>2nd Controller/Connector Type (Optional)</td>
<td>G: 1x GbE RJ45, 2G: GbE 2x RJ45, 4G: 2x GbE 2x RJ45, S: 1x 10G SFP+, T: 10GBase-T, 2T: 2x 10GBase-T</td>
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SMC Networking Add-on Cards
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<th>Model</th>
<th>Type</th>
<th>Form Factor</th>
<th>Interface</th>
<th>Controller</th>
<th>Connection</th>
<th>Dimension (w/o Brackets) (L x H)</th>
<th>Power (W)</th>
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<td>AOC-SGP-i2</td>
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<td>Standard LP</td>
<td>PCI-E x4</td>
<td>Intel® X550 AM2</td>
<td>2 RJ45 (1Gb/port)</td>
<td>3.9” (99mm) x 2.73” (69mm)</td>
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<td>Standard LP</td>
<td>PCI-E x8</td>
<td>Mellanox® CX-4 LX</td>
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<td>AOC-S25G-32S</td>
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<td>Standard LP</td>
<td>PCI-E x8</td>
<td>Intel® XXV710</td>
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<td>AOC-CGP-i2</td>
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<td>MicroLP</td>
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<td>MicroLP</td>
<td>PCI-E x8</td>
<td>Intel® 82599ES</td>
<td>2 SFP+ (10Gb/port)</td>
<td>4.85” (123mm) x 1.54” (39mm)</td>
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<tr>
<td>AOC-CTG-32S</td>
<td>10GbE</td>
<td>MicroLP</td>
<td>PCI-E x8</td>
<td>Intel® X535-AT2</td>
<td>2 RJ45 (10GBase-T)</td>
<td>4.45” (113mm) x 1.54” (39mm)</td>
<td>12</td>
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<td>AOC-C25G-11S</td>
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<td>MicroLP</td>
<td>PCI-E x8</td>
<td>Mellanox® CX-4 LE EN</td>
<td>1 SFP28 (25Gb/port)</td>
<td>4.45” (113mm) x 1.54” (39mm)</td>
<td>8.5</td>
</tr>
</tbody>
</table>
Contacting Supermicro

**Headquarters**
Address: Super Micro Computer, Inc.
980 Rock Ave.
San Jose, CA  95131 U.S.A.
Tel: +1 (408) 503-8000
Fax: +1 (408) 503-8008
Email: marketing@supermicro.com (General Information)
support@supermicro.com (Technical Support)
Website: www.supermicro.com

**Europe**
Address: Super Micro Computer B.V.
Het Sterrenbeeld 28, 5215 ML
’s-Hertogenbosch, The Netherlands
Tel: +31 (0) 73-6400390
Fax: +31 (0) 73-6416525
Email: sales@supermicro.nl (General Information)
support@supermicro.nl (Technical Support)
rma@supermicro.nl (Customer Support)

**Asia-Pacific**
Address: Super Micro Computer, Inc.
4F, No. 232-1, Liancheng Rd.
Chung-Ho Dist., New Taipei City 235
Taiwan, R.O.C.
Tel: +886-(2) 8226-3990
Fax: +886-(2) 8226-3991
Website: www.supermicro.com.tw
Email: support@supermicro.com.tw (Technical Support)
Tel: +886-(2) 8226-5990 (Technical Support)
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Chapter 1

Overview

1-1 Overview

Congratulations on purchasing your add-on card from an acknowledged leader in the industry. Supermicro products are designed with the utmost attention to detail to provide you with the highest standards in quality and performance. For product support and updates, please refer to our website at http://www.supermicro.com/products/nfo/networking.cfm#adapter.

1-2 Key Features

The key features of this add-on card include the following:

- Super I/O Module (SIOM) form factor
- Mellanox® ConnectX-3 Pro InfiniBand FDR controller
- Dual and single QSFP connector models
- Up to 56Gbps InfiniBand or 40Gbps Ethernet
- Virtual Protocol Interconnect (VPI)
- VXLAN and NVGRE
- Intel® i350 GbE controller
- Dual RJ45 connectors
- NC-SI for remote management
- Asset Management features with thermal sensor
- RoHS compliant 6/6

1-3 Specifications

General

- Super I/O Module (SIOM) form factor
• Mellanox® ConnectX-3 Pro FDR controller

• Intel® i350 GbE controller

• Dual QSFP ports and dual RJ45 ports (AOC-MHIBF-m2Q2G)

• Single QSFP port and dual RJ45 ports (AOC-MHIBF-m1Q2G)

**Cables Support**

• InfiniBand FDR: QSFP 56Gbps copper cables

• GbE: RJ45 category 5/5e up to 100m

**Power Consumption**

• AOC-MHIBF-m2Q2G: Maximum 11W

• AOC-MHIBF-m1Q2G: Maximum 9W

**Operating Condition**

• Operating temperature: 0°C to 55°C (32°F to 131°F)

• Storage temperature: -40°C to 70°C (-40°F to 158°F)

• Storage humidity: 90% non-condensing relative humidity at 35°C

**Physical Dimensions**

• Card PCB dimensions: 92mm (3.62in) x 87.1mm (3.43in) (WxD)

**Supported Platforms**

• Supermicro® motherboards with Super I/O Module (SIOM) slot

• Supermicro® server systems with Super I/O Module slot (see SIOM Compatibility Matrix online at [http://www.supermicro.com/support/resources/AOC/AOC_Compatibility_SIOM.cfm](http://www.supermicro.com/support/resources/AOC/AOC_Compatibility_SIOM.cfm))

*Note:* This product is sold only as part of an integrated solution with Supermicro server systems.
InfiniBand FDR QSFP Specifications

Connectivity
• Interoperable with InfiniBand or 40GbE switches
• Passive copper cable with ESD protection

InfiniBand
• IBTA specification 1.2.1 compliant
• Hardware-based congestion control
• 256 to 4K byte MTU, 2GB messages

Enhanced InfiniBand
• Hardware-based reliable transport
• Collective operations offloads
• Hardware-based reliable multicast
• Extended reliable connected transport
• Enhanced atomic operations

Ethernet
• IEEE 802.3ba 40 Gigabit Ethernet
• IEEE Std 802.3ad Link Aggregation
• IEEE Std 802.3az Energy Efficient Ethernet
• IEEE Std 802.1Q, 802.1P VLAN tags and priority
• IEEE P802.1bb D1.0 priority-based flow control
• IEEE 1588
• Jumbo frame support (9600B)
Hardware-based I/O Virtualization

- Single root IOV
- Address translation and protection
- Dedicated adapter resources
- Multiple queues per virtual machine
- Enhanced QoS for vNICs
- VMware NetQueue support

Overlay Networks

- VXLAN and NVGRE

Additional CPU Offloads

- RDMA over converged Ethernet (RoCE)
- TCP/UDP/IP stateless offload
- Intelligent interrupt coalescence

FlexBoot™ Technology

- Remote boot over InfiniBand
- Remote boot over Ethernet
- Remote boot over iSCSI

Protocol Support

- Open MPI, OSU MVAPICH, Intel® MPI, MS
- MPI, Platform MPI
- TCP/UDP, EoIB, IPoIB, RDS
- SRP, iSER, NFS RDMA
• uDAPL

Operating System Support
• Citrix XenServer 6.1
• RHEL/CentOS 5.X and 6.X, Novell SLES10 SP4; SLES11 SP1, SLES11 SP2, OEL, Fedora 14, 15, 17, Ubuntu 12.04
• Windows Server 2008/2012/2012 R2
• FreeBSD
• OpenFabrics Enterprise Distribution (OFED)
• OpenFabrics Windows Distribution (WinOF)
• VMware ESXi 4.x and 5.x

GbE RJ45 Specifications

Ethernet and Virtualization Features
• PC-SIG SR-IOV support
• Jumbo frames support

Performance and Efficiency Features
• Energy Efficient Ethernet (EEE)
• TCP/UDP, IPv4, and IPv6 checksum offloads to improve CPU usage
• Low latency interrupts

Management Features
• Asset Management support on Supermicro® platforms
• Preboot eXecution Environment (PXE) support
• iSCSI remote boot support

• NC-SI for remote management via Intel® i350 GbE RJ45 connector

**Operating System Support**


• Windows 8.1, 8, 7 (x64 Edition)

• RedHat Linux

• SUSE Linux

• FreeBSD

• UEFI

• VMware
### 1-4 Available SKUs

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<thead>
<tr>
<th>SKUs</th>
<th>Bracket Included</th>
<th>Description</th>
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<tbody>
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<td>AOC-MHIBF-m2Q2G</td>
<td>BKT-0122L</td>
<td>2-port InfiniBand FDR Adapter with a swappable bracket for 2U+ chassis (Storage Servers)</td>
</tr>
<tr>
<td>AOC-MHIBF-m2Q2GM</td>
<td>BKT-0118L</td>
<td>2-port InfiniBand FDR Adapter with an internal bracket for 1U chassis (Twin Servers)</td>
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<tr>
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<td>BKT-0123L</td>
<td>1-port InfiniBand FDR Adapter with a swappable bracket for 2U+ chassis (Storage Servers)</td>
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<tr>
<td>AOC-MHIBF-m1Q2GM</td>
<td>BKT-0119L</td>
<td>1-port InfiniBand FDR Adapter with an internal bracket for 1U chassis (Twin Servers)</td>
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### 1-5 Similar Products

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<td>RJ45</td>
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<td>Intel® X550</td>
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<td>RJ45</td>
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<td>Intel® X550</td>
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1-6  Optional Accessories

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<th>Part Number</th>
<th>Description</th>
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<tbody>
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<td>QSFP Copper Cable</td>
<td>CBL-0490L</td>
<td>1M QSFP to QSFP InfiniBand FDR 56Gb/s Passive Copper, PBF, 30AWG</td>
</tr>
<tr>
<td>QSFP Copper Cable</td>
<td>CBL-NTWK-0642</td>
<td>2M QSFP to QSFP InfiniBand FDR 56Gb/s Passive Copper, PBF, 30AWG</td>
</tr>
<tr>
<td>QSFP Copper Cable</td>
<td>CBL-0496L</td>
<td>3M QSFP to QSFP InfiniBand FDR 56Gb/s Passive Copper, PBF, 28AWG</td>
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<td>QSFP Active Optical Cable</td>
<td>CBL-QSFP+56-AOC-3M</td>
<td>3M 56 Gb/s QSFP to QSFP FDR Fiber Active Optical Cable</td>
</tr>
<tr>
<td>QSFP Active Optical Cable</td>
<td>CBL-QSFP+56-AOC-5M</td>
<td>5M 56Gb/s QSFP to QSFP FDR Fiber Active Optical Cable</td>
</tr>
<tr>
<td>QSFP Active Optical Cable</td>
<td>CBL-QSFP+56-AOC-10M</td>
<td>10M 56Gb/s QSFP to QSFP FDR Fiber Active Optical Cable</td>
</tr>
<tr>
<td>QSFP Active Optical Cable</td>
<td>CBL-QSFP+56-AOC-15M</td>
<td>15M 56Gb/s QSFP to QSFP FDR Fiber Active Optical Cable</td>
</tr>
</tbody>
</table>
Chapter 2

Hardware Components

2-1 Add-On Card Image and Layout

The AOC-MHIBF-m1Q2G Image

The AOC-MHIBF-m1Q2G Layout
(Top View)

The AOC-MHIBF-m1Q2G Layout
(Bottom View)

1. Intel® i350
2. Mellanox® ConnectX-3 Pro
3. LAN1: RJ45 Port1
4. LAN2: RJ45 Port2
5. QSFP1: QSFP Port1
6. JPL1: RJ45 LAN Ports Enable/Disable
7. LED1: QSFP Link LED
1. Intel® i350
2. Mellanox® ConnectX-3 Pro
3. LAN1: RJ45 Port1
4. LAN2: RJ45 Port2
5. QSFP1: QSFP Port1
6. QSFP2: QSFP Port2
7. JPL1: RJ45 LAN Ports Enable/Disable
8. LED1: QSFP Port1 Link LED
9. LED2: QSFP Port2 Link LED
2-2  Major Components

The following major components are installed on the AOC-MHIBF-m1Q2G:

1. Intel® i350

2. Mellanox® ConnectX-3 Pro

3. Dual RJ45 LAN ports

4. Single QSFP (Small Form Factor Pluggable) port

5. JPL1: RJ45 LAN ports Enable/Disable

6. LED1: QSFP Link LED

The following major components are installed on the AOC-MHIBF-m2Q2G:

1. Intel® i350

2. Mellanox® ConnectX-3 Pro

3. Dual RJ45 LAN ports

4. Dual QSFP (Small Form Factor Pluggable) ports

5. JPL1: RJ45 LAN ports Enable/Disable

6. LED1/LED2: QSFP Link LEDs
2-3  QSFP Ethernet Connections and LED indicators

**QSFP Ports**

A single QSFP port is located on the AOC-MHIBF-m1Q2G. Two QSFP ports are located on the AOC-MHIBF-m2Q2G. Connect a QSFP cable to the port to provide Infiniband (56Gb/s) and Ethernet (40Gbp/s) communication. See the layout below for the locations.

*Note:* Please refer to "Optional Accessories" on page 1-8 for recommended cables.
QSFP PCB LEDs

On the back of the AOC-MHIBF-m2Q2G/m1Q2G, two LEDs are on the AOC-MHIBF-m2Q2G, and one LED is on the AOC-MHIBF-m1Q2G. A solid green LED indicates the link-up connection. Refer to the layout below for the locations.

<table>
<thead>
<tr>
<th>Color/Status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>No Connection</td>
</tr>
<tr>
<td>Green</td>
<td>Physical Link-up</td>
</tr>
</tbody>
</table>

1. LED1: QSFP Link LED
2. LED2: QSFP Link LED (for AOC-MHIBF-m2Q2G only)

The AOC-MHIBF-m2Q2G Layout
(Bottom View)
2-4 RJ45 LAN Ports and LAN LED indicators

RJ45 LAN Ports (LAN1/LAN2)
There are two RJ45 LAN ports (LAN1/LAN2) on the AOC-MHIBF-m2Q2G/m1Q2G. These LAN ports support connection speeds of 1Gbps. Use a direct-attach RJ45 type LAN cable. See the layout below for the locations.

RJ45 LAN Port LED Indicators
Each LAN port has two LEDs to indicate speeds and data activities. Refer to the tables below for LED color and definition.

<table>
<thead>
<tr>
<th>LED Color</th>
<th>Status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>No Connection</td>
</tr>
<tr>
<td>Amber</td>
<td>Solid</td>
<td>Link</td>
</tr>
<tr>
<td>Amber</td>
<td>Flasing</td>
<td>Active</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LED Color</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>100 Mbps</td>
</tr>
<tr>
<td>Amber</td>
<td>1 Gbps</td>
</tr>
<tr>
<td>Off</td>
<td>10 Mbps</td>
</tr>
</tbody>
</table>

1. RJ45 LAN Ports
2-5 RJ45 LAN Ports Enable/Disable

Use Jumper JPL1 to enable or disable LAN1 and LAN2. See the table and layout below for jumper settings and locations. The default setting is Enabled.

<table>
<thead>
<tr>
<th>RJ45 LAN Ports Enable/Disable Jumper Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jumper setting</td>
</tr>
<tr>
<td>Pins 1-2</td>
</tr>
<tr>
<td>Pins 2-3</td>
</tr>
</tbody>
</table>

1. JPL1
3-1 Static-Sensitive Devices

Electrostatic Discharge (ESD) can damage electronic components. To avoid damaging your add-on card, it is important to handle it very carefully. The following measures are generally sufficient to protect your equipment from ESD.

Precautions

• Use a grounded wrist strap designed to prevent static discharge.

• Touch a grounded metal object before removing the add-on card from the antistatic bag.

• Handle the add-on card by its edges only; do not touch its components.

• Put the add-on card back into the antistatic bags when not in use.

• For grounding purposes, make sure that your system chassis provides excellent conductivity between the power supply, the case, the mounting fasteners and the add-on card.

Unpacking

The add-on card is shipped in antistatic packaging to avoid static damage. When unpacking your component or system, make sure you are static protected.

Note: To avoid damaging your components and to ensure proper installation, always connect the power cord last, and always unplug it before adding, removing, or changing any hardware components.
3-2 Before Installation

Before you install the add-on card, follow the instructions below.

1. Power down the system.

2. Unplug the power cord.

3. Use industry-standard anti-static equipment such as gloves or a wrist strap and follow the precautions on page 3-1 to avoid damage caused by ESD.

4. Familiarize yourself with the server, motherboard, and/or chassis documentation.

5. Confirm that your operating system includes the latest updates and hotfixes.

3-3 Installing the Add-on Card

Follow the steps below to install the add-on card into your system.

1. Remove the server cover and, if any, set aside any screws for later use.

2. Remove the add-on card slot cover. If the slot cover has a screw, place it aside for later use.

3. Position the add-on card in front of the SIOM slot and gently push in both sides of the card until it slides into the slot.

Note: This add-on card does not support hot plug. Please turn off the AC power and remove the power cord from the wall socket before you install or remove the add-on card.
4. Secure the add-on card to the chassis. If required, use the screws that you previously removed.

5. Attach any necessary external cables to the add-on card.

6. Replace the system cover.

7. Plug in the power cord and power up the system.

Follow this step to install the add-on card if your system does not support a swappable bracket. Insert the SIOM card in the motherboard and then install the motherboard in the chassis. An internal bracket comes with the SIOM card 1U chassis SKU. It needs to be installed onto the chassis.

Note: Supermicro recommends that this SIOM card be installed by a system integrator or by the manufacturer.
Follow the steps below to install the add-on card into your system that supports a swappable bracket. The add-on card must be installed in the swappable bracket before it can be installed in the your system.

1. Install the add-on card into the swappable bracket.

2. Position the add-on card in front of the SIOM slot and gently push in both sides of the card until it slides into the slot.

3. Once the card is in the slot, push both knobs in and turn to the right to lock the card in the system. The left knob has the unlock/lock symbols next to it. To ensure that the add-on is locked, make sure that the knob position indicator is pointing to the lock symbol.
3-4  Installing Drivers on Windows (for Intel® i350)

Follow the steps below to install the drivers for Windows. Download the driver from the Supermicro CDR-NIC LAN driver CD, the Intel® support website that contains the latest driver, or go to the Supermicro site at https://www.supermicro.com/wftp/Networking_Drivers/.

1. Run CDR-NIC.

2. When the SUPERMICRO window appears, click on the computer icon next to the product model.

3. Click on INSTALL DRIVERS AND SOFTWARE.

4. Follow the prompts to complete the installation.

3-5  Installing Drivers on Linux (for Intel® i350)

Follow the steps below to install the drivers for Linux or refer to the Intel® support website for more driver installation information.

Build a Binary RPM Package

1. Run ‘rpmbuild -tb <filename.tar.gz>’

Note: If the FOUND NEW HARDWARE WIZARD screen displays on your system, click CANCEL.
2. Replace <filename.tar.gz> with the specific filename of the driver.

Note: For the build to work properly, the current running kernel MUST match the version and configuration of the installed kernel sources. If you have just recompiled the kernel, reboot the system at this time.

Follow the instructions below to build the driver manually.

1. Move the base driver tar file to the directory of your choice. For example:

   /home/username/ixgbe

   or

   /usr/local/src/ixgbe

2. Untar/unzip archive, where <x.x.x> is the version number for the driver tar file:

   tar zxf ixgbe-x.x.x.tar.gz

3. Change to the driver src directory, where <x.x.x> is the version number for the driver tar:

   cd ixgbe-x.x.x/src/

4. Compile the driver module:

   make install

   The binary will be installed as:

   /lib/modules/[KERNEL_VERSION]/kernel/drivers/net/ethernet/intel/ixgbe/ixgbe.

   [k]o

   The install locations listed above are the default locations. They may not be correct for certain Linux distributions. For more information, see the ldistrib.txt file included in the driver tar.

   Note: IXGBE_NO_LRO is a compile time flag. The user can enable it at the compile time to remove support for LRO from the driver. The flag is used by adding CFLAGS_EXTRA=-"DIXGBE_NO_LRO" to the make file when it’s being compiled.

   make CFLAGS_EXTRA="-DIXGBE_NO_LRO" install
5. Load the module:

For kernel 2.6.x, use the modprobe command:

    modprobe ixgbe <parameter>=<value>

For 2.6 kernels, the insmod command can be used if the full path to the driver module is specified. For example:

    insmod/lib/modules/[KERNEL_VERSION]/kernel/drivers/net/ethernet/intel/ixgbe/ixgbe.ko

In addition, when using 2.6-based kernels, make sure that older ixgbe drivers are removed from the kernel before loading the new module. To do this, use:

    rmmod ixgbe; modprobe ixgbe

Note: For more driver installation information, please refer to the Intel® support website.

6. Assign an IP address to the interface by entering the following, where x is the interface number:

    ifconfig ethx <IP_address> netmask <netmask>

7. Verify that the interface works. Enter the following, where <IP_address> is the IP address for another machine on the same subnet as the interface that is being tested:

    ping <IP_address>

### 3-6 Installing Drivers on FreeBSD (for Intel® i350)

Follow the instructions below to install the drivers for FreeBSD kernel 4.8 or later or refer to the Intel® support website for more driver installation information. In the instructions below, x.x.x is the driver version as indicated in the name of the drive tar file.

Note: You must have kernel sources installed in order to compile the driver module.

1. Move the base driver tar file to the directory of your choice. For example, use /home/username/ixgb or /usr/local/src/ixgb.

2. Untar/unzip the archive:

    tar xzf ixgb-x.x.x directory
3. To install man page:

   cd ixgb-x.x.x
   gzip -c ixgb.4 > /usr/share/man/man4/ixgb.4.gz

4. To load the driver onto a running system, perform the following steps:

   cd ixgb-x.x.x
   make
   or
   cd ixgb-x.x.x/src
   make load

5. To assign an IP address to the interface, enter the following:

   ifconfig ixgb<interface_num> <IP_address>

6. Verify that the interface works. Enter the following, where <IP_address> is the
   IP address for another machine on the same subnet as the interface that is
   being tested:

   ping <IP_address>

7. If you want the driver to load automatically when the system is booted:

   cd ixgb-x.x.x/src
   make load
   cp if_ixgb.ko /modules
   Edit /boot/loader.conf, and add the following line:
   
   if_ixgb_load="YES"
   
   or
   compile the driver into the kernel (see item 8 below). Edit /etc/rc.conf, and create
   the appropriate ifconfig_ixgb<interface_num> entry:
   
   ifconfig_ixgb<interface_num>="<ifconfig_settings>"
   
   Example of usage:
   
   ifconfig_ixgb0="inet 192.168.10.1 netmask 255.255.255.0"

8. If you want to compile the driver into the kernel, enter:

   cd ixgb-x.x.x/src
   mkdir /usr/src/sys/dev/ixgb
Chapter 3: Installation

```
cp if_ixgb* /usr/src/sys/dev/ixgb
cp ixgb* /usr/src/sys/dev/ixgb
cp Makefile.kernel /usr/src/sys/modules/ixgb/Makefile
```

Edit the `/usr/src/sys/conf/files.i386` file, and add the following lines:

```
dev/ixgb/ixgb_hw.c optional ixgb
dev/ixgb/ixgb_ee.c optional ixgb
dev/ixgb/if_ixgb.c optional ixgb
```

Remove the following lines from the `/usr/src/sys/conf/files.i386` file, if they exist:

```
/dev/ixgb/if_ixgb_fx_hw.c optional ixgb
/dev/ixgb/if_ixgb_phy.c optional ixgb
```

Edit the kernel configuration file (i.e., GENERIC or MYKERNEL) in `/usr/src/sys/i386/conf`, and ensure the following line is present:

```
device ixgb
```

Compile and install the kernel. Reboot the system for the kernel updates to take affect.
3-7 Installing Drivers (for Mellanox® ConnectX®-3 Pro)

Use the procedures below to install drivers for Linux.

**Linux Drivers**

Use the following procedures to install drivers on the Linux operating system or refer to the Mellanox® support website for more driver installation information.

*Installing InfiniBand Drivers for the Linux Operating System*

1. Download the driver from the Supermicro CDR-NIC LAN driver CD, the Mellanox® support website that contains the latest driver, or go to the Supermicro site at [https://www.supermicro.com/wftp/Networking_Drivers/Mellanox/](https://www.supermicro.com/wftp/Networking_Drivers/Mellanox/). Go to the following directory: Mellanox > Linux.

2. Choose the desired *InfiniBand Linux* driver package file.

3. Install the driver by entering the following commands:

   ```
   tar xzvf MLNX_OFED-<ver>.tgz
   cd OFED-<ver>
   ./mlnoxfedinstall --without-fw-update
   ```

   This installs the Linux drivers to your system. For more driver installation information, please refer to the Mellanox® support website.

**Windows Drivers**

Use the following procedures to install drivers on the Windows operating system or refer to the Mellanox® support website for more driver installation information.

*Installing InfiniBand Drivers for the Windows Operating System*

1. Download the driver from the Supermicro CDR-NIC LAN driver CD, the Mellanox® support website that contains the latest driver, or go to the Supermicro site at [https://www.supermicro.com/wftp/Networking_Drivers/Mellanox/](https://www.supermicro.com/wftp/Networking_Drivers/Mellanox/). Go to the following directory: Mellanox > Windows.

2. Choose the desired InfiniBand Windows driver package file.

3. Double-click to run and install the driver package file.
3-8 Changing from InfiniBand to Ethernet mode

AOC-MHIBF-m1Q2G and AOC-MHIBF-m2Q2G are by default set to InfiniBand mode. To change the setting to Ethernet mode, please follow the instructions below.

1. Double-check and make sure that the add-on card is detected. Run the lspci command:

```
[root@localhost ~]# lspci | grep Mellanox
17:00.0 Ethernet controller: Mellanox Technologies
MT27520 Family [ConnectX-3 Pro]
```

2. If the setting remains unchanged, start MST:

```
[root@localhost ~]# mst start
Starting MST (Mellanox Software Tools) driver set
Loading MST PCI module - Success
[warn] mst_pciconf is already loaded, skipping
Create devices
Unloading MST PCI module (unused) - Success
```
3. To check whether the add-on card is set to Ethernet or InfiniBand mode and to verify if the LAN ports are active or not, run the following command:

```
ibv_devinfo
[root@localhost ~]# ibv_devinfo
hca_id: mlx4_0
  transport: InfiniBand (0)
fw_ver: 2.42.5000
node_guid: 0030:48ff:ffff:eb54
sys_image_guid: 0030:48ff:ffff:eb57
vendor_id: 0x02c9
vendor_part_id: 4103
hw_ver: 0x0
board_id: SM_1171000001000
phys_port_cnt: 2
Device ports:
  port: 1
    state: PORT_DOWN (1)
    max_mtu: 4096 (5)
    active_mtu: 4096 (5)
    sm_lid: 0
    port_lid: 0
    port_lmc: 0x00
    link_layer: InfiniBand
  port: 2
    state: PORT_DOWN (1)
    max_mtu: 4096 (5)
    active_mtu: 4096 (5)
    sm_lid: 0
    port_lid: 0
    port_lmc: 0x00
    link_layer: InfiniBand
[root@localhost ~]#_
```
4. Use the command `#mlxfwmanager` to extract the "vendor_part id" parameter.

```
[root@localhost ~]# mlxfwmanager
Querying Mellanox devices firmware...
```

Device#1:
- - - - - - -
  Device Type:   ConnectX3Pro
  Part Number:   Super_Micro_AOC-MHIBF-m2Q2G
  Description:   Hybrid SIOM 2-port IB FDR CX3-Pro
  PSID:    SM_1171000001000
  PCI Device Name: /dev/mst/mt4103_pci_cr0
  Port1 GUID:   003048ffffffeb55
  Port2 GUID:   003048ffffffeb56
  Versions:   Current         Available
              FW    2.42.5000  N/A
              PXE    3.4.0752  N/A
              UEFI   14.11.0045  N/A
  Status:    No matching image found

5. To change the add-on card to Ethernet mode (LINK_TYPE=2), please enter command `#mlxconfig -d <vendor_part id>` and then key in "y" to apply the new configuration. (The command below is using the device ID in step 4.)

```
[root@localhost ~]# mlxconfig -d /dev/mst/mt4103_pci_cr0
set LINK_TYPE_P1=2
Device#1:
- - - - - - -
  Device type: ConnectX3Pro
  Device:     /dev/mst/mt4103_pci_cr0
  Configurations:   Next Boot       New
                      LINK_TYPE_P1  IB(1)   ETH(2)
  Apply new Configuration? (y/n) [n]: 
```

**Note:** The command above will change Port1 to Ethernet mode. In changing Port2 to Ethernet mode, replace "LINK_TYPE_P1=2" with "LINK_TYPE_P2=2" at the end of the command line.

**Note:** To change the LAN ports from Ethernet to InfiniBand mode, the command line must specify "LINK_TYPE_P1=1" for Port1 and "LINK_TYPE_P2=1" for Port2 at the end of the command line.
6. Reboot your computer and then the changes made will take effect.

7. Once the system is rebooted, you can use the following command to verify whether the LAN ports are changed to Ethernet mode or not:

```
[root@localhost ~]# ibv_devinfo
```

```
hca_id: mlx4_0
  transport: InfiniBand (0)
  fw_ver: 2.42.5000
  node_guid: 0030:48ff:ffff:eb54
  sys_image_guid: 0030:48ff:ffff:eb57
  vendor_id: 0x02c9
  vendor_part_id: 4103
  hw_ver: 0x0
  board_id: SM_1171000001000
  phys_port_cnt: 2
  Device ports:

  port: 1
    state: PORT_DOWN (1)
    max_mtu: 4096 (5)
    active_mtu: 1024 (3)
    sm_lid: 0
    port_lid: 0
    port_lmc: 0x00
    link_layer: Ethernet

  port: 2
    state: PORT_DOWN (1)
    max_mtu: 4096 (5)
    active_mtu: 4096 (5)
    sm_lid: 0
    port_lid: 0
    port_lmc: 0x00
    link_layer: InfiniBand
```
3-9 Using Mellanox Controller for PXE Boot

To use PXE boot, the Mellanox (QSFP) ports need to be configured as either Ethernet or InfiniBand mode depending on the previous setup. Please follow the instructions below to use PXE boot.

1. After a QSFP cable is connected, boot up the system and keep pressing <CTRL+B> to boot into FlexBoot Menu:

   FlexBoot v3.5.385
   FlexBoot PCI 17:00.0 3000 PCI13.00 PnP FMM+13870000+13854000 C900
   Press Ctrl-B to configure FlexBoot v3.5.385 (PCI 17:00.0)...

2. When the System setup page appears, select "net0: Port1". (If Port1 is the one you use to connect to PXE.)

3. Click on "NIC Configuration" and then select "PXE" under "Legacy boot protocol".
4. Go to BIOS. From the top of the tool bar, select "Boot" to enter the submenu. Select "Network Drive BBS Priorities" and then select "FlexBoot v#.#.###..." under Boot Option #1.

![Boot Configuration Screenshot]

5. To boot from PXE automatically, make sure Boot Option #1 is "Network: Flex boot" as the image shown below.

![Boot Configuration Screenshot]