Oracle Dual Port QDR InfiniBand Adapter M3

User's Guide

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Contents

Using This Documentation

This guide provides an overview, installation instructions, and specifications of the Oracle Dual Port QDR InfiniBand Adapter M3. The instructions in this guide are designed for system administrators with experience installing network hardware and software.

Product Notes

For late-breaking information and known issues about this product, refer to the product notes at:

`http://docs.oracle.com/cd/E40985_01/`

Related Documentation

Documentation	Links
All Oracle products	http://docs.oracle.com
Oracle Dual Port QDR InfiniBand Adapter M3	http://docs.oracle.com/cd/E40985_01/
Oracle Integrated Lights Out Manager (ILOM)	http://www.oracle.com/goto/ILOM/docs
Oracle Solaris 11 OS	http://www.oracle.com/goto/Solaris11/docs
Oracle VM Server for SPARC	http://www.oracle.com/goto/VM-SPARC/docs
Oracle VTS	http://www.oracle.com/goto/VTS/docs

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Installing the Adapter

The adapter is a dual-port 4x InfiniBand PCIe Generation 3.0 low-profile adapter.

Related Information

Hardware and Software Requirements

For the latest list of supported platforms and operating systems, refer to the *Oracle Dual Port QDR InfiniBand Adapter M3 Product Notes*. This document is available at: `http://docs.oracle.com/cd/E40985_01/`.

For Solaris OS systems, Oracle Solaris 11.1 SRU9 or newer is required.

Related Information

▼ Install the Adapter

Refer to the installation or service manual that applies to your server for detailed instructions for the following procedure.

Caution – Electronic components on printed circuit boards are extremely sensitive to static electricity. Ordinary amounts of static electricity generated by your clothing or work environment can damage electronic equipment. When installing the adapter in a system, use antistatic grounding straps and antistatic mats to help prevent damage due to electrostatic discharge.

Note – Hot-swapping is not supported with Oracle Solaris 11.1 SRU9.

1. **Check that the bracket on the adapter is the correct size for your system.**

   An alternative tall bracket is supplied with the adapter. If you need to use a different bracket, perform the instructions in "Replacing a Short Bracket With a Tall Bracket" on page 21.

2. **Power off the server, using the standard shutdown procedures described in the system service manual for your server.**

   Product documentation for Sun servers is available at: `http://docs.oracle.com`.

3. **Remove the cover from the system to access the adapter slots and connectors.**

4. **Select an available PCIe x8 slot:**
   - Remove the blank filler panel for that slot.
   - Or, if you are replacing an existing adapter in that slot, remove the adapter.

5. **Attach an antistatic wrist strap.**

6. **Install the adapter into the slot, pushing the adapter's edge connector into the connector on the chassis.**

7. **Ensure that the front plate on the adapter mounts flush with the chassis panel opening.**

8. **If applicable, install the screw in the front plate to secure the adapter into the chassis.**

9. **Replace the cover on the unit.**

10. **Attach the 4x end of each InfiniBand cable to an IB-HCA port connector.**

Caution – Avoid putting unnecessary stress on the connection. Do not bend or twist the cable near the connectors, and avoid cable bends of more than 90 degrees.

11. **Ensure that the connectors are properly engaged.**
12. **If not already connected, connect the other end of the InfiniBand I/O cables to the appropriate ports on the switch or switches.**

    The IB-HCA ports can be connected to different ports on the same switch or to a port on different switches.
13. **Power on the system and allow the server to reboot.**

    This step completes the hardware installation.
14. **Verify the installation.**

    See "Verify the Installation (Oracle Solaris)" on page 12 or "Verify the Installation (Oracle Linux)" on page 18.

Related Information

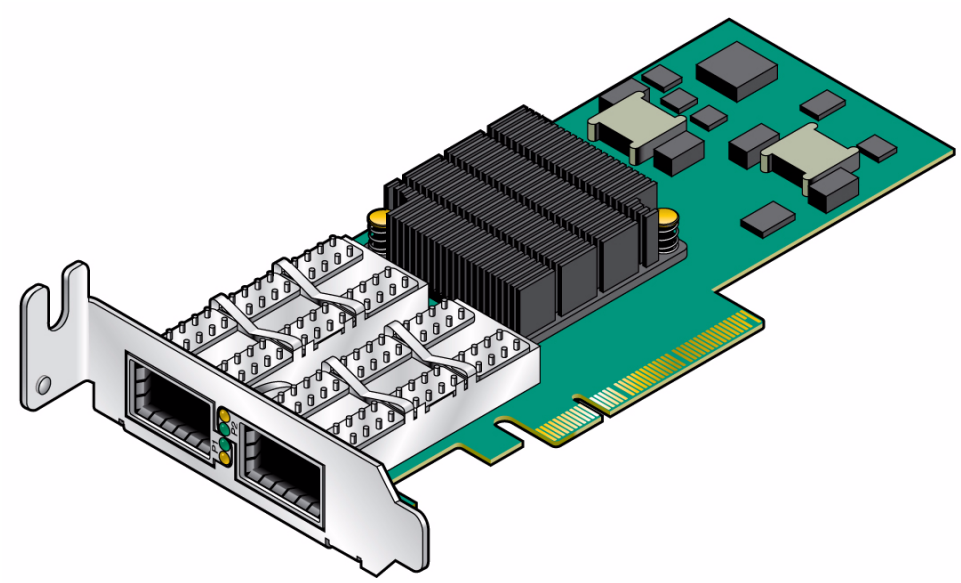
- "Installing InfiniBand on Oracle Solaris OS" on page 11
- "Installing InfiniBand on Oracle Linux OS" on page 17

Adapter Features

The main features of the adapter are as follows:

- QDR active-active support
- Delivers full QDR bandwidth on both InfiniBand ports concurrently, in active-active configuration
- PCI Express expansion board with an x8 edge connector compatible to the PCI Express 3.0 specification
- Two 4x InfiniBand ports (QSFP+) for connecting InfiniBand traffic (4x IB connectors)
- 4x IB port speed support: 10 Gbps, 20 Gbps, or 40 Gbps (QDR)
- Short mounting bracket (an alternative tall bracket is supplied with the adapter)
- IBTA v1.2.1 compliant
- Media detect circuit, which supports external InfiniBand fiber solutions
- RoHS compliant

FIGURE: Adapter With Short Bracket



Related Information

- "Adapter Specifications" on page 4

Adapter Specifications

The adapter receives power from the PCI Express edge connector. All other required power voltages are generated by on-board switch mode regulators.

Physical	
Size	2.71in. x5.6 in. (68.90mm x 142.25 mm)
Connector	QSFP+ InfiniBand (copper and optical)
Protocol Support	
InfiniBand	IBTA v1.2.1, autonegotiation SDR, DDR, and QDR: • Links: 1x/4x • Speeds per lane: 2.5 Gb/s, 5 Gb/s, and 10 Gb/s

QoS	8 InfiniBand virtual lanes for each port
RDMA support	All ports
PCIe	PCIe 3.0 compliant: SERDES @ 8.0GT/s, 8 lanes (2.0 and 1.1 compatible)
Power and Environmental	
Voltage	12V, 3.3V
Typical power	Passive Cables 7.94W
Maximum power	Passive Cables 9.35W
Temperature	Operational 0 to 55°C Non-operational 0 to 70°C
Humidity	90% relative humidity
Regulatory	
Safety	IEC/EN 60950-1:2006, ETSI EN 300 019-2-2
Environmental	IEC 60068-2- 64, 29, 32
RoHS	RoHS-R6

Related Information

- "Adapter Features" on page 3

InfiniBand Interface

The adapter is compliant with the *InfiniBand Architecture Specification, Release 1.2.* The adapter has two compliant 4x InfiniBand ports, 1 and 2. The adapter provides access to these ports by means of two 4x InfiniBand QSFP+ connectors for external InfiniBand cables. These cables must be compliant with the *InfiniBand Architecture Specification, Release 1.2*. Connector 1 connects to Port 1 of the device, while connector 2 connects to Port 2.

The adapter is embedded with a media-detect circuit, which supports external InfiniBand fiber solutions. These external devices are connected to the InfiniBand port connectors using active media converters, such as the Oracle QSFP+ parallel short wave transceiver (X2124a-N).

Related Information

- "PCIe Interface" on page 6
- "LEDs and Ports" on page 6
- "I2C Compatible Interface" on page 8

PCIe Interface

The adapter has eight Tx/Rx pairs of SerDes, providing for a PCI Express x8 edge connector interface, version 3.0 compliant. The adapter can be either a master, initiating the PCI Express bus operations, or a slave responding to PCI bus operations.

Related Information

- "InfiniBand Interface" on page 5
- "LEDs and Ports" on page 6
- "I2C Compatible Interface" on page 8

LEDs and Ports

The adapter has four LEDs located on the I/O panel. Two LEDs are assigned to each 4X port.

FIGURE: I/O Panel With Ports and LEDs

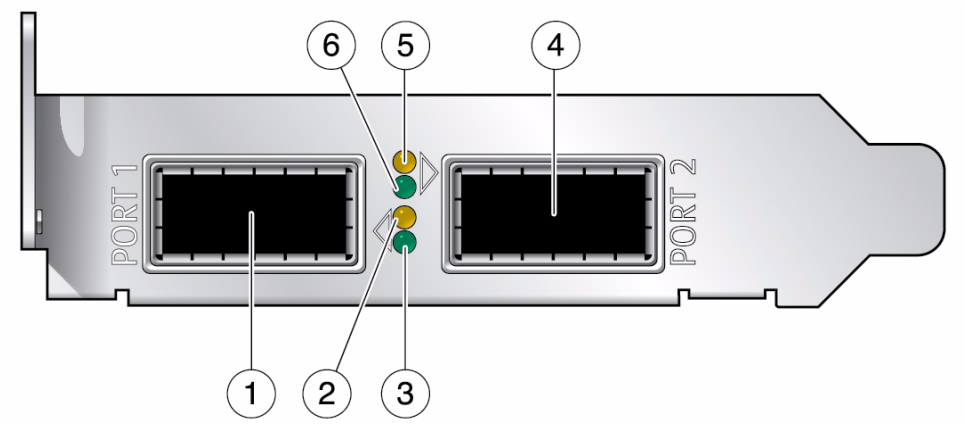


Figure Legend

1	InfiniBand Port 1 (QSFP+)
2	Yellow LED for Port 1 (Logical Link)
3	Green LED for Port 1 (Physical Link)
4	InfiniBand Port 2 (QSFP+)
5	Yellow LED for Port 2 (Logical Link)
6	Green LED for Port 2 (Physical Link)

The same port names and LED footprints apply when a tall bracket is installed on the adapter. To install the tall bracket, see "Replacing a Short Bracket With a Tall Bracket" on page 21.

The pair of LEDs for each port have the meanings described in the following table.

TABLE: LED Meanings

LED Color	LED Name	LED State	Meaning
Green	Physical Link	Lit	The link bringup process has successfully completed and the link width, link speed, link polarity, and link reversal have been negotiated with the neighbor port on the other end of the cable.
		Unlit	A physical connection has not been established.
Yellow	Logical Link (data activity)	Steady light	Infiniband is discovered over the link, but no data is being passed.
		Blinking light	Data is being passed.
		Unlit	A physical or logical connection (or both) has not been established.

Related Information

- "InfiniBand Interface" on page 5
- "PCIe Interface" on page 6
- "I2C Compatible Interface" on page 8

I²C Compatible Interface

A three-pin header, designated with reference name J5 on the adapter, is provided as the I²C compatible interface.

Related Information

- "InfiniBand Interface" on page 5
- "PCIe Interface" on page 6
- "LEDs and Ports" on page 6

Node GUID

A label on the back of the adapter displays the 64-bit GUID. This GUID uniquely identifies this adapter in the server and on the IB fabric.

Installing InfiniBand on Oracle Solaris OS

These topics provide an overview of installing and using the InfiniBand software stack for the Oracle Solaris OS.

Refer to the product notes for the adapter and your server for recent information about supported operating systems, firmware and software updates, and other issues not covered in the main product documentation.

Related Information

InfiniBand for Oracle Solaris OS

InfiniBand is a network architecture for the large-scale interconnection of computing and I/O nodes through a high-speed switched fabric. To operate InfiniBand on an Oracle server, you need an InfiniBand HCA (the adapter) and an InfiniBand software stack.

InfiniBand software is bundled with the Oracle Solaris OS. For Oracle Solaris 11, The package containing the device driver for the adapter is `driver/infiniband/connectx`.

Note – You must use `driver/infiniband/` package that is available in the Oracle Solaris 11 and newer releases.

If you don't have the package on the system or your system is running an older release of Oracle Solaris, you must use `pkg install/update` utility to add or update the package prior to using the adapter.

For details about InfiniBand software supported in Oracle Solaris OS releases, refer to the following documents in the Solaris OS Release and Installation Collection at `http://www.oracle.com/goto/Solaris11/docs`:

- *Oracle Solaris 11 What's New*
- *Oracle Solaris 11 Release Notes*
- *Oracle Solaris 11 Package List*

The InfiniBand software stack, consisting of the upper-layer protocols and transport framework, is included in all of the Solaris software groups described in the *Oracle Solaris Installation Guide*.

Related Information

- "Verify the Installation (Oracle Solaris)" on page 12
- "Update the Firmware (Oracle Solaris)" on page 14
- "InfiniBand Devices (Oracle Solaris)" on page 15

▼ Verify the Installation (Oracle Solaris)

1. **Install the adapter in the chassis.**

   See "Install the Adapter" on page 2.

2. **Power on the server and cable the server to an operational InfiniBand switch.**

   Refer to the documentation for your server.

3. **Ensure that the cables are connected to the adapter and switches.**

4. **Verify that the IB Subnet Manager is in operation on the network.**

   Refer to the documentation for your network hardware for more information.

5. **Check that the green LED is illuminated for each port that is connected to the switch.**

   If the green LED is not on, check the cable connections at the adapter and the switch.

6. **Check that the yellow LED is illuminated for each port that is connected to the switch.**

7. **Verify that the IB-HCA ports are up and the driver is attached.**

   a. **Obtain the state of the device installed.**

```
# cfgadm -als "cols=ap_id:condition" hca
Ap_Id                          Condition
hca:2C90109763F70              ok
```

   If more than one IB-HCA device is installed in the server, a row is displayed for each. Look for the row displaying `hca:`*GUID* where *GUID* is the 64-bit number from the physical label on the adapter. See "Node GUID" on page 9.

   The `Condition` column must display `ok` to indicate that the driver has discovered the hardware and is bound to it. Refer to the `cfgadm_ib`(1m) man pages for details about the IB specific extensions.

   b. **Obtain port GUIDs for each port on the adapter.**

```
# cfgadm -als "cols=ap_id:info" hca
Ap_Id                          Information
hca:2C90109763F70              VID: 0x15b3, PID: 0x5a44,
#ports: 0x2, port1 GUID: 0x2C90109763F71, port2 GUID:
0x2C90109763F72
```

   If more than one IB-HCA device is installed in the server, a row is displayed for each device. Look for the row displaying `hca:`*GUID*, where *GUID* is the 64-bit number from the physical label on the adapter. See "Node GUID" on page 9.

   Use the port number and GUID displayed by this command for your IB-HCA device in the following step.

   c. **Verify that the IB ports and partitions are configured by the Subnet Manager.**

```
# dladm show-ib
LINK HCAGUID          PORTGUID         PORT STATE  PKEYS
net6 2C90300A38360    2C90300A38361 1 up
17,18,33,34,800A,800B,8033,8034,FFFF
net7 2C90300A38360   2C90300A38362   2    up     800A,8033,8034,FFFF
```

   The command displays the `AP_ID` column: where each row has the format of `ib:`*Port GUID*, *P_Key*, `ipib`. Match the Port GUIDs from the previous command with these port GUIDs. There must be one row corresponding to the port and *P_Key* setup by the Subnet Manager. If an entry is missing, check the Subnet Manager configuration.

```
# dladm show-part
```

```
LINK         PKEY  OVER         STATE    FLAGS
ibd1         FFFF  net9         up       ----
ibd2         FFFF  net10        up       ----
```

Related Information

- "Update the Firmware (Oracle Solaris)" on page 14
- "InfiniBand Devices (Oracle Solaris)" on page 15

▼ Update the Firmware (Oracle Solaris)

To use this adapter with the Solaris OS, the minimum firmware version must be 2.11.1280.

1. **Display the revision level of your adapter.**

```
# fwflash -l -c IB
```

   Look for the revision number that appears after the `Firmware revision` string. If more than one IB-HCA device is displayed, look for the `Node Image` GUID that matches the GUID displayed on the physical GUID label of the adapter being installed. See "Node GUID" on page 9.

   If the firmware version is not at 2.11.1280 or higher, you must update the firmware. Only update the firmware on your adapter with files specifically approved for the product.

2. **Select and download approved firmware files from My Oracle Support at:**

   `https://support.oracle.com/`

3. **Use the `fwflash` command to install the firmware.**

```
# fwflash -d device-path-of-IB-adapter -f firmware-image-file
```

4. **Reboot the system to enable the new firmware.**

Related Information

- "Verify the Installation (Oracle Solaris)" on page 12
- "InfiniBand Devices (Oracle Solaris)" on page 15

InfiniBand Devices (Oracle Solaris)

For details about InfiniBand software stack configurations in an Oracle Solaris OS update release, refer to the *System Administration Guide: Devices and File Systems* document in the *Solaris 11 System Administrator Collection* at `http://www.oracle.com/goto/Solaris11/docs`.

This administrator's guide includes instructions for setting up upper layer protocols such as IPoIB.

When using IPoIB, verify that the `broadcast` group is configured by the Subnet Manager in the partition where the IPoIB link will be used. Refer to the documentation for the IB Subnet Manager for more information.

Related Information

- "InfiniBand for Oracle Solaris OS" on page 11
- "Verify the Installation (Oracle Solaris)" on page 12
- "Update the Firmware (Oracle Solaris)" on page 14

Installing InfiniBand on Oracle Linux OS

These topics provide an overview of enabling and using the InfiniBand software stack for Oracle Linux OS.

Refer to the release notes for your server for recent information about supported operating systems, firmware and software updates, and other issues not covered in the main product documentation.

- "InfiniBand for Oracle Linux OS" on page 17
- "Verify the Installation (Oracle Linux)" on page 18

Related Information

- "Installing InfiniBand on Oracle Solaris OS" on page 11

InfiniBand for Oracle Linux OS

InfiniBand is a network architecture for the large-scale interconnection of computing and I/O nodes through a high-speed switched fabric. To operate InfiniBand on an Oracle server, you need an InfiniBand HCA (the adapter) and an InfiniBand software stack.

Note – An InfiniBand software stack is part of the Oracle Linux OS distribution.

Refer to your Linux vendor for software installation recommendations and support.

Related Information

- "Verify the Installation (Oracle Linux)" on page 18

▼ Enable Ethernet Over Oracle IB Gateway

Depending upon which version of Oracle Linux OS you are running, perform the following tasks to enable the Sun Network QDR InfiniBand Gateway Switch Ehternet over IB gateway.

1. **If you are using Oracle Linux 6.4 or newer, use `yum` to perform a `groupinstall` of "Infiniband Support."**

Note – You must use the default Linux kernel (UEK2-400 or newer) when performing this task on Oracle Linux OS 6.4 or newer.

Once this task is complete, you will have an IB stack that is usable with the IB Gateway Switch.

2. **If using earlier versions of Oracle Linux OS 6 or 5:**

   a. **Upgrade the kernel to a supported UEK2-400 version with EoIB support.**

   b. **Add the IB stack.**

Related Information

- "Verify the Installation (Oracle Linux)" on page 18

▼ Verify the Installation (Oracle Linux)

1. **Install the adapter in the chassis.**

   See "Install the Adapter" on page 2.

2. **Power on the server and cable it to an operational InfiniBand switch.**

   Refer to the documentation for your server.

Note – The InfiniBand switch automatically recognizes the adapter when it is connected to the fabric, if the IB Subnet Manager is running on the switch or on a host within the subnet.

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3. **Ensure that the cables are connected to the adapter and switches.**
4. **Verify that the IB Subnet Manager is running on the switch or a host within the subnet.**

   Refer to the documentation for the IB Subnet Manager for more information.
5. **Check that the green LED is illuminated for each port that is connected to the switch.**

   If the green LED is not on, check the cable connections at the adapter and the switch.
6. **Check that the yellow LED is illuminated for each port that is connected to the switch.**
7. **Verify that the IB-HCA ports are up and the driver is attached:**

```
# ibstat
CA 'mlx4_0'
        CA type: MT4099
        Number of ports: 2
        Firmware version: 2.11.1280
        Hardware version: 0
        Node GUID: 0x0002c90300a383c0
        System image GUID: 0x0002c90300a383c3
        Port 1:
                State: Active
                Physical state: LinkUp
                Rate: 40
                Base lid: 1
                LMC: 0
                SM lid: 14
                Capability mask: 0x02514868
                Port GUID: 0x0002c90300a383c1
                Link layer: IB
        Port 2:
                State: Active
                Physical state: LinkUp
                Rate: 40
                Base lid: 3
                LMC: 0
                SM lid: 14
                Capability mask: 0x02514868
                Port GUID: 0x0002c90300a383c2
                Link layer: IB
```

The output shows system diagnostic messages that have the string `mlx4` in the message (the name of the Linux driver). Included in the output is a message that indicates whether the port is up or down.

Related Information

- "InfiniBand for Oracle Linux OS" on page 17

Replacing a Short Bracket With a Tall Bracket

By default, the Oracle Dual Port QDR InfiniBand Adapter M3 from Oracle is installed on a short bracket. A tall bracket is provided.

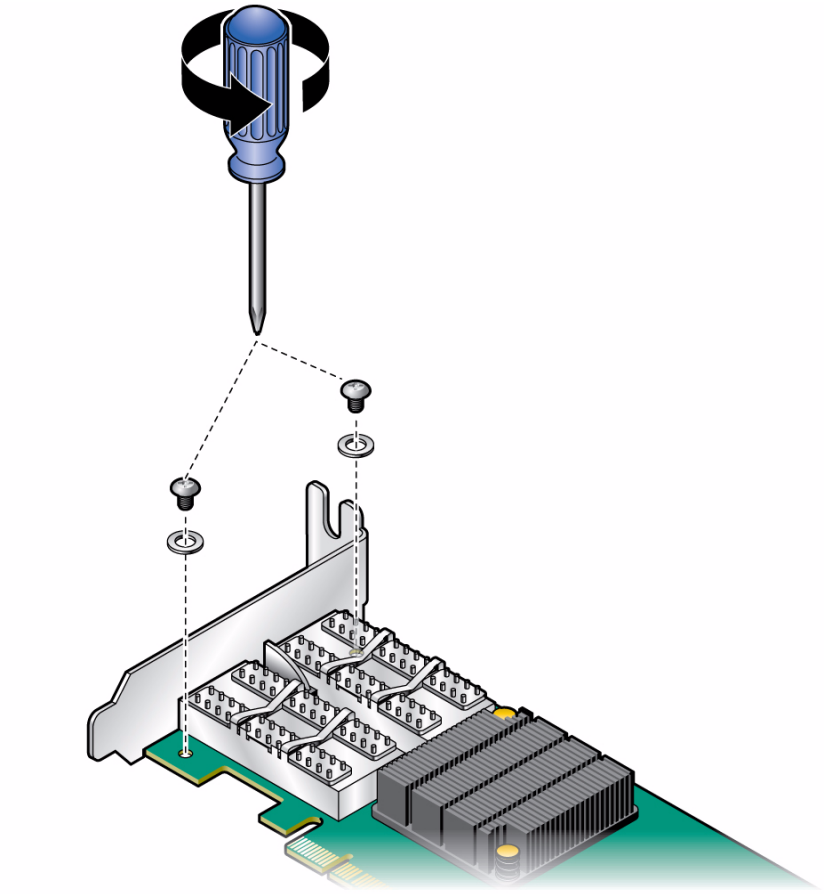
- "Remove the Short Bracket From the Adapter" on page 21
- "Assemble and Install a Tall Bracket" on page 23

Related Information

- "Adapter Features" on page 3

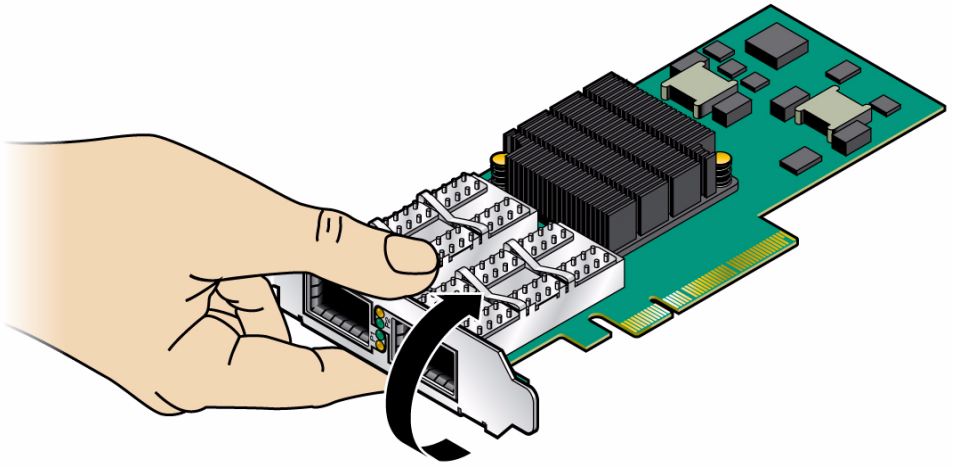
▼ Remove the Short Bracket From the Adapter

1. **Attach an antistatis wriststrap.**
2. **Remove the bracket screws and washers.**
   Unscrew both screws from the adapter using a torque screwdriver.



3. **Detach the bracket.**

   a. **Grip the bracket as shown in the following figure, placing your thumb on the LED component.**



b. In a rotating move toward the component side of the adapter, slide the bracket out of the connectors.

c. Gently hold your thumb on the LED component (as shown in the figure) while at the same time extracting the bracket, making sure to protect the LEDs.

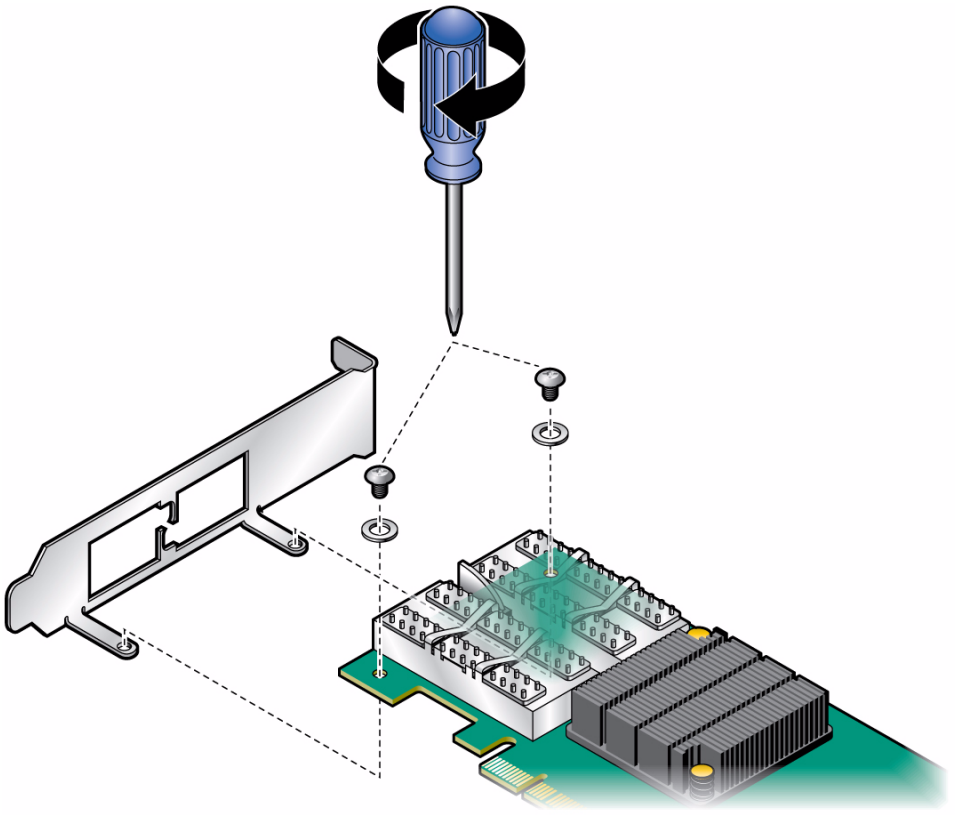
d. Make a rotating move to detach the short bracket, as shown in the figure.

Related Information

- "Assemble and Install a Tall Bracket" on page 23

▼ Assemble and Install a Tall Bracket

1. Place the tall bracket onto the adapter.
2. Gently fit the connectors through the bracket connector holes.
3. Ensure that the LEDs are aligned with their intended bracket holes.



4. **Insert a screw with a washer into each of the two holes for holding the bracket as shown in the figure.**
5. **Use a torque screwdriver to apply up to 2 lbs per-inch torque on each screw.**

Related Information

- "Remove the Short Bracket From the Adapter" on page 21

Glossary

B

BoIB Boot over InfiniBand.

I

IB InfiniBand. A switched fabric communications link primarily used in high-performance computing.

IB-HCA InfiniBand Host Channel Adapter.

IBTA InfiniBand Trade Association.

IPoIB Internet Protocol over InfiniBand.

Q

QDR Quad data rate. A communication signaling technique wherein data is transmitted at four points in the clock cycle.

QSFP+ Quad small form-factor pluggable. An interconnect system for the I/O ports. QSFP supports Ethernet, Fibre Channel, InfiniBand, and SONET/SDH standards. QSFP+ transceivers support Serial Attached SCSI, 40G Ethernet, 20G/40G Infiniband, and other standards. QSFP modules increase the port-density by three to four times, compared to SFP+ modules.

R

RoHS European Union Restriction of Hazardous Substances.

S

SerDes Serializer/Deserializer. A pair of functional blocks used in high-speed communications to compensate for limited input/output.

Index